



PROPOSED RULE MAKING

CR-102 (June 2012)

(Implements RCW 34.05.320)

Do NOT use for expedited rule making

Agency: Department of Health

- Preproposal Statement of Inquiry was filed as WSR ; or
- Expedited Rule Making--Proposed notice was filed as WSR ; or
- Proposal is exempt under RCW 34.05.310(4) or 34.05.330(1).

- Original Notice
- Supplemental Notice to WSR
- Continuance of WSR

Title of rule and other identifying information: (Describe Subject)

WAC chapters 246-220 General provisions, 246-221 Radiation protection standards, 246-231 packaging and transportation of radioactive material, 246-232 Licensing applicability, 246-233 Radioactive materials - General licenses, 246-235 Radioactive materials - Specific licenses, 246-237 Physical protection of category 1 and category 2 quantities of radioactive material, 246-243 Industrial radiography, and 246-252 Uranium or thorium milling. The Department of Health is proposing to revise these rules to be consistent with U.S. Nuclear Regulatory Commission's rules and make editorial changes.

Hearing location(s): Department of Health
Town Center Two, Room 145
111 Israel Road SE
Tumwater WA 98501

Date: 6/7/16 Time: 10:00 a.m.

Submit written comments to:

Name: Vicki M. Bouvier
Address: Department of Health
PO Box 47820
Olympia WA 98504-7820
e-mail: <http://www3.doh.wa.gov/policyreview/>
fax 360-236-2250 by (date) 06/07/2016

Assistance for persons with disabilities: Contact

Vicki M. Bouvier by 05/31/2016

TTY (800) 833-6388 or () 711

Date of intended adoption: 06/10/2016

(Note: This is NOT the effective date)

Purpose of the proposal and its anticipated effects, including any changes in existing rules:

This rule making is necessary to amend 8 chapters of rules and create 1 new chapter of rules in order to adopt federally required rule changes related to licensing and use of radioactive materials. Chapter 246-237 WAC, Physical protection of category 1 & category 2 - quantities of radioactive material, is being proposed to permanently adopt emergency rules adopted on March 19, 2016.

Reasons supporting proposal:

This rule making is required to comply with RCW 70.98.050, State Radiation Control Agency, and 70.98.110, Federal-state agreements. Under the formal state agreement between the Governor and the U.S. Nuclear Regulatory Commission, the Department of Health is required to remain compatible with the U.S. Nuclear Regulatory Commission rules. This is done through rule making.

Statutory authority for adoption:

RCW 70.98.050

Statute being implemented:

RCW 70.98.050 and 70.98.110

Is rule necessary because of a:

- Federal Law? Yes No
 - Federal Court Decision? Yes No
 - State Court Decision? Yes No
- If yes, CITATION:
77 FR 39899, 77 FR 43666, 78 FR 16922,
78 FR 32310, 79 FR 57721, 79 FR 58664,
and 80 FR 45841

DATE 05/03/16

NAME (type or print)
Clark Halvorson

SIGNATURE

TITLE
Assistant Secretary

CODE REVISER USE ONLY

OFFICE OF THE CODE REVISER
STATE OF WASHINGTON
FILED

DATE: May 03, 2016

TIME: 11:17 AM

WSR 16-10-086

Agency comments or recommendations, if any, as to statutory language, implementation, enforcement, and fiscal matters:

None

Name of proponent: (person or organization) Department of Health

- Private
 Public
 Governmental

Name of agency personnel responsible for:

Name	Office Location	Phone
Drafting..... Curt DeMaris	111 Israel Rd SE, Tumwater WA 98501	360-236-3223
Implementation....Curt DeMaris	111 Israel Rd SE, Tumwater WA 98501	360-236-3223
Enforcement.....Curt DeMaris	111 Israel Rd SE, Tumwater WA 98501	360-236-3223

Has a small business economic impact statement been prepared under chapter 19.85 RCW or has a school district fiscal impact statement been prepared under section 1, chapter 210, Laws of 2012?

Yes. Attach copy of small business economic impact statement.

A copy of the statement may be obtained by contacting:

Name:
Address:

phone
fax
e-mail

No. Explain why no statement was prepared.

A small business economic impact statement (SBEIS) was not prepared. Under RCW 19.85.025 and 34.05.310(4)(c), a SBEIS is not required for proposed rules that adopt or incorporate by reference - without material change - federal statutes or regulations, Washington state law, the rules of other Washington state agencies, or national consensus codes that generally establish industry standards.

Is a cost-benefit analysis required under RCW 34.05.328?

Yes A preliminary cost-benefit analysis may be obtained by contacting:

Name:
Address:

phone
fax
e-mail

No: Please explain: The agency did not complete a cost benefit analysis under RCW 34.05.328. RCW 34.05.328(5)(b)(iii) exempts rules that adopt or incorporate by reference without material change federal statutes or regulations, Washington state law, the rules of other Washington state agencies, or national consensus codes that generally establish industry standards.

Chapter 246-237 WAC
RADIATION PROTECTION—PHYSICAL PROTECTION OF CATEGORY 1 AND CATEGORY 2
QUANTITIES OF RADIOACTIVE MATERIAL

NEW SECTION

WAC 246-237-001 Purpose and scope. (1) This chapter has been established to provide the requirements for the physical protection program for any licensee that possesses an aggregated Category 1 or Category 2 quantity of radioactive material listed in WAC 246-237-900 Appendix A: Table 1—Category 1 and Category 2. These requirements provide reasonable assurance of the security of Category 1 or Category 2 quantities of radioactive material by protecting these materials from theft or diversion. Specific requirements for access to material, use of material, transfer of material, and transport of material are included. No provision of this chapter authorizes possession of licensed material.

(2) WAC 246-237-021 through 246-237-057 apply to any person who, under the rules in this chapter, possesses or uses at any site an aggregated Category 1 or Category 2 quantity of radioactive material.

(3) WAC 246-237-071 through 246-237-081 apply to any person who, under the rules of this chapter:

(a) Transports or delivers to a carrier for transport in a single shipment, a Category 1 or Category 2 quantity of radioactive material; or

(b) Imports or exports a Category 1 or Category 2 quantity of radioactive material. The provisions in this chapter apply only to the domestic portion of the transport.

NEW SECTION

WAC 246-237-010 Definitions, abbreviations, and acronyms. The definitions, abbreviations, and acronyms in this section and in WAC 246-220-010 apply throughout this chapter unless the context clearly indicates otherwise:

(1) **"Access control"** means a system for allowing only approved individuals to have unescorted access to the security zone and for ensuring that all other individuals are subject to escorted access.

(2) **"Act"** means the Atomic Energy Act of 1954, including any amendments thereto.

(3) **"Aggregated"** means accessible by the breach of a single physical barrier that would allow access to radioactive material in any form, including any devices that contain the radioactive material, when the total activity equals or exceeds a Category 2 quantity of radioactive material.

(4) **"Agreement state"** means any state with which the Atomic Energy Commission or the NRC has entered into an effective agreement under subsection 274b of the act. Nonagreement state means any other state.

(5) **"Approved individual"** means an individual whom the licensee has determined to be trustworthy and reliable for unescorted access in accordance with WAC 246-237-021 through 246-237-033 and who has completed the training required by WAC 246-237-043(3).

(6) **"Background investigation"** means the investigation conducted by a licensee or applicant to support the determination of trustworthiness and reliability.

(7) **"Becquerel (Bq)"** means the SI unit of activity. One becquerel is equal to 1 disintegration or transformation per second (s^{-1}).

(8) **"By-product material"** means:

(a) 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;

(b) 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 "by-product material" within this definition;

(c)(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

(d) 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.

(9) **"Carrier"** means a person engaged in the transportation of passengers or property by land or water as a common, contract, or private carrier, or by civil aircraft.

(10) **"Category 1 quantity of radioactive material"** means a quantity of radioactive material meeting or exceeding the Category 1 threshold in Table 1 of WAC 246-237-900 Appendix A: Table 1—Category 1 and Category 2. This is determined by calculating the ratio of the total activity of each radionuclide to the Category 1 threshold for that radionuclide and adding the ratios together. If the sum equals or exceeds 1, the quantity would be considered a Category 1 quantity. Category 1 quantities of radioactive material do not include the radioactive material contained in any fuel assembly, subassembly, fuel rod, or fuel pellet.

(11) **"Category 2 quantity of radioactive material"** means a quantity of radioactive material meeting or exceeding the Category 2 threshold but less than the Category 1 threshold in Table 1 of WAC 246-237-900 Appendix A: Table 1—Category 1 and Category 2. This is

determined by calculating the ratio of the total activity of each radionuclide to the Category 2 threshold for that radionuclide and adding the ratios together. If the sum equals or exceeds 1, the quantity would be considered a Category 2 quantity. Category 2 quantities of radioactive material do not include the radioactive material contained in any fuel assembly, subassembly, fuel rod, or fuel pellet.

(12) "**Curie**" means a unit of quantity of radioactivity. One curie (Ci) is that quantity of radioactive material which decays at the rate of 3.7×10^{10} transformations per second (tps).

(13) "**Diversions**" means the unauthorized movement of radioactive material subject to this chapter to a location different from the material's authorized destination inside or outside of the site at which the material is used or stored.

(14) "**Escorted access**" means accompaniment while in a security zone by an approved individual who maintains continuous direct visual surveillance at all times over an individual who is not approved for unescorted access.

(15) "**FBI**" means the federal bureau of investigation.

(16) "**Fingerprint orders**" means the orders issued by the NRC or the legally binding requirements issued by agreement states that require fingerprints and criminal history records checks for individuals with unescorted access to Category 1 and Category 2 quantities of radioactive material or safeguards information-modified handling.

(17) "**Government agency**" means any executive department, commission, independent establishment, corporation, wholly or partly owned by the United States of America which is an instrumentality of the United States, or any board, bureau, division, service, office, officer, authority, administration, or other establishment in the executive branch of the government.

(18) "**License**" means, except where otherwise specified, a license for radioactive material issued pursuant to the regulations in chapters 246-232, 246-233, 246-235, 246-240, 246-243, or 246-244 WAC.

(19) "**License issuing authority**" means the licensing agency (the department, NRC, or an agreement state) that issued the license.

(20) "**LLEA (local law enforcement agency)**" means a public or private organization that has been approved by a federal, state, or local government to carry firearms and make arrests, and is authorized and has the capability to provide an armed response in the jurisdiction where the licensed Category 1 or Category 2 quantity of radioactive material is used, stored, or transported.

(21) "**Lost or missing licensed material**" means licensed material whose location is unknown. It includes material that has been shipped but has not reached its destination and whose location cannot be readily traced in the transportation system.

(22) "**Mobile device**" means a piece of equipment containing licensed radioactive material that is either mounted on wheels or casters, or otherwise equipped for moving without a need for disassembly or dismounting; or designed to be hand carried. Mobile devices do not include stationary equipment installed in a fixed location.

(23) "**Movement control center**" means an operations center that is remote from transport activity and that maintains position information on the movement of radioactive material, receives reports of attempted attacks or thefts, provides a means for reporting these and other problems to appropriate agencies, and can request and coordinate appropriate aid.

(24) **"No-later-than arrival time"** means the date and time that the shipping licensee and receiving licensee have established as the time at which an investigation will be initiated if the shipment has not arrived at the receiving facility. The no-later-than arrival time may not be more than six hours after the estimated arrival time for shipments of Category 2 quantities of radioactive material.

(25) **"NRC"** means the U.S. Nuclear Regulatory Commission.

(26) **"Person"** means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than NRC or the Department of Energy, any state or any political subdivision of, or any political entity within, a state, any foreign government or nation, or any political subdivision of any such government or nation, or other entity, and any legal successor, representative, agent or agency of the foregoing.

(27) **"Reviewing official"** means the individual who makes the trustworthiness and reliability determination of an individual to determine whether the individual may have, or continue to have, unescorted access to the Category 1 or Category 2 quantities of radioactive materials that are possessed by the licensee.

(28) **"Sabotage"** means deliberate damage, with malevolent intent, to a Category 1 or Category 2 quantity of radioactive material, a device that contains a Category 1 or Category 2 quantity of radioactive material, or the components of the security system.

(29) **"Safe haven"** means a readily recognizable and readily accessible site at which security is present or from which, in the event of an emergency, the transport crew can notify and wait for the local law enforcement authorities.

(30) **"Security zone"** means any temporary or permanent area determined and established by the licensee for the physical protection of Category 1 or Category 2 quantities of radioactive material.

(31) **"State"** means a state of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

(32) **"Telemetric position monitoring system"** means a data transfer system that captures information by instrumentation or measuring devices about the location and status of a transport vehicle or package between the departure and destination locations.

(33) **"Trustworthiness and reliability"** are characteristics of an individual considered dependable in judgment, character, and performance, such that unescorted access to Category 1 or Category 2 quantities of radioactive material by that individual does not constitute an unreasonable risk to the public health and safety or security. A determination of trustworthiness and reliability for this purpose is based upon the results from a background investigation.

(34) **"Unescorted access"** means solitary access to an aggregated Category 1 or Category 2 quantity of radioactive material or the devices that contain the material.

(35) **"United States"** means when used in a geographical sense includes Puerto Rico and all territories and possessions of the United States.

NEW SECTION

WAC 246-237-011 Specific exemptions. (1) The department may, upon application of any interested person or upon its own initiative, grant such exemptions from the requirements of the rules in this chapter as it determines are authorized by law and will not endanger life or property or the common defense and security, and are otherwise in the public interest.

(2) Any licensee's activities are exempt from the requirements of WAC 246-237-021 through 246-237-057 to the extent that its activities are included in a security plan required by 10 C.F.R. Part 73.

(3) A licensee who possesses radioactive waste that contains Category 1 or Category 2 quantities of radioactive material is exempt from the requirements of WAC 246-237-021 through 246-237-081, except that any radioactive waste that contains discrete sources, ion-exchange resins, or activated material that weighs less than two thousand kg (four thousand four hundred nine pounds) is not exempt from the requirements of this chapter. The licensee shall implement the following requirements to secure the radioactive waste:

(a) Use continuous physical barriers which allow access to the radioactive waste only through established access control points;

(b) Use a locked door or gate with monitored alarm at the access control point;

(c) Assess and respond to each actual or attempted unauthorized access to determine whether an actual or attempted theft, sabotage, or diversion occurred; and

(d) Immediately notify the LLEA and request an armed response from the LLEA upon determination that there was an actual or attempted theft, sabotage, or diversion of the radioactive waste that contains Category 1 or Category 2 quantities of radioactive material.

NEW SECTION

WAC 246-237-021 Personnel access authorization requirements for Category 1 or Category 2 quantities of radioactive material. (1) General.

(a) Each licensee who possesses an aggregated quantity of radioactive material at or above the Category 2 threshold shall establish, implement, and maintain its access authorization program in accordance with the requirements of this chapter.

(b) An applicant for a new license and each licensee who would become newly subject to the requirements of this chapter, upon application for modification of its license, shall implement the requirements of this chapter, as appropriate, before taking possession of an aggregated Category 1 or Category 2 quantity of radioactive material.

(c) Any licensee who has not previously implemented the security orders or been subject to the provisions of this chapter shall implement the provisions of this chapter before aggregating radioactive material to a quantity that equals or exceeds the Category 2 threshold.

(2) General performance objective. The licensee's access authorization program must ensure that the individuals specified in subsection (3)(a)(i) and (ii) of this section are trustworthy and reliable.

(3) Applicability.

(a) Licensees shall subject the following individuals to an access authorization program:

(i) Any individual whose assigned duties require unescorted access to Category 1 or Category 2 quantities of radioactive material or to any device that contains the radioactive material; and

(ii) Reviewing officials.

(b) Licensees need not subject the categories of individuals listed in WAC 246-237-029(1) to the investigation elements of the access authorization program.

(c) Licensees shall approve for unescorted access to Category 1 or Category 2 quantities of radioactive material only those individuals with job duties which require unescorted access to Category 1 or Category 2 quantities of radioactive material.

(d) Licensees may include individuals needing access to safeguards information-modified handling under 10 C.F.R. Part 73 in the access authorization program under WAC 246-237-021 through 246-237-033.

NEW SECTION

WAC 246-237-023 Access authorization program requirements. (1) Granting unescorted access authorization.

(a) Licensees shall implement the requirements of this chapter for granting initial or reinstated unescorted access authorization.

(b) Individuals who have been determined to be trustworthy and reliable shall also complete the security training required by WAC 246-237-043(3) before being allowed unescorted access to Category 1 or Category 2 quantities of radioactive material.

(2) Reviewing officials. Reviewing officials are the only individuals who may make trustworthiness and reliability determinations that allow individuals to have unescorted access to Category 1 or Category 2 quantities of radioactive materials possessed by the licensee.

(a) Each licensee shall name one or more individuals to be reviewing officials. After completing the background investigation on the reviewing official, the licensee shall provide, under oath or affirmation, a certification that the reviewing official is deemed trustworthy and reliable by the licensee. The fingerprints of the named reviewing official must be taken by a law enforcement agency, federal or state agencies that provide fingerprinting services to the public, or commercial fingerprinting services authorized by a state to take fingerprints. The licensee shall recertify that the reviewing official is deemed trustworthy and reliable every ten years in accordance with WAC 246-237-025(2).

(b) Reviewing officials must be permitted to have unescorted access to Category 1 or Category 2 quantities of radioactive materials or access to safeguards information or safeguards information-modified handling, if the licensee possesses safeguards information or safeguards information-modified handling.

(c) Reviewing officials cannot approve other individuals to act as reviewing officials.

(d) A reviewing official does not need to undergo a new background investigation before being named by the licensee as the reviewing official if:

(i) The individual has undergone a background investigation that included fingerprinting and an FBI criminal history records check and has been determined to be trustworthy and reliable by the licensee; or

(ii) The individual is subject to a category listed in WAC 246-237-029(1).

(3) Informed consent.

(a) Licensees may not initiate a background investigation without the informed and signed consent of the subject individual. This consent must include authorization to share personal information with other individuals or organizations as necessary to complete the background investigation. Before a final adverse determination, the licensee shall provide the individual with an opportunity to correct any inaccurate or incomplete information that is developed during the background investigation. Licensees do not need to obtain signed consent from those individuals who meet the requirements of WAC 246-237-025(2). A signed consent must be obtained prior to any reinvestigation.

(b) The subject individual may withdraw their consent at any time. Licensees shall inform the individual that:

(i) If an individual withdraws their consent, the licensee may not initiate any elements of the background investigation that were not in progress at the time the individual withdrew their consent; and

(ii) The withdrawal of consent for the background investigation is sufficient cause for denial or termination of unescorted access authorization.

(4) Personal history disclosure. Any individual who is applying for unescorted access authorization shall disclose the personal history information that is required by the licensee's access authorization program for the reviewing official to make a determination of the individual's trustworthiness and reliability. Refusal to provide, or the falsification of, any personal history information required by this chapter is sufficient cause for denial or termination of unescorted access.

(5) Determination basis.

(a) The reviewing official shall determine whether to permit, deny, unfavorably terminate, maintain, or administratively withdraw an individual's unescorted access authorization based on an evaluation of all of the information collected to meet the requirements of this chapter.

(b) The reviewing official may not permit any individual to have unescorted access until the reviewing official has evaluated all of the information collected to meet the requirements of this chapter and determined that the individual is trustworthy and reliable. The reviewing official may deny unescorted access to any individual based on information obtained at any time during the background investigation.

(c) The licensee shall document the basis for concluding whether or not there is reasonable assurance that an individual is trustworthy and reliable.

(d) The reviewing official may terminate or administratively withdraw an individual's unescorted access authorization based on information obtained after the background investigation has been completed and the individual granted unescorted access authorization.

(e) Licensees shall maintain a list of persons currently approved for unescorted access authorization. When a licensee determines that a person no longer requires unescorted access or meets the access authorization requirement, the licensee shall remove the person from the approved list as soon as possible, but no later than seven working

days, and take prompt measures to ensure that the individual is unable to have unescorted access to the material.

(6) Procedures. Licensees shall develop, implement, and maintain written procedures for implementing the access authorization program. The procedures must include provisions for the notification of individuals who are denied unescorted access. The procedures must include provisions for the review, at the request of the affected individual, of a denial or termination of unescorted access authorization. The procedures must contain a provision to ensure that the individual is informed of the grounds for the denial or termination of unescorted access authorization and allow the individual an opportunity to provide additional relevant information.

(7) Right to correct and complete information.

(a) Prior to any final adverse determination, licensees shall provide each individual subject to this chapter with the right to complete, correct, and explain information obtained as a result of the licensee's background investigation. Confirmation of receipt by the individual of this notification must be maintained by the licensee for a period of one year from the date of the notification.

(b) If, after reviewing their criminal history record, an individual believes that it is incorrect or incomplete in any respect and wishes to change, correct, update, or explain anything in the record, the individual may initiate challenge procedures. These procedures include direct application by the individual challenging the record to the law enforcement agency that contributed the questioned information or a direct challenge as to the accuracy or completeness of any entry on the criminal history record to the FBI, Criminal Justice Information Services Division, ATTN: SCU, Mod. D-2, 1000 Custer Hollow Road, Clarksburg, WV 26306 as set forth in 28 C.F.R. 16.30 through 16.34. In the latter case, the FBI will forward the challenge to the agency that submitted the data, and will request that the agency verify or correct the challenged entry. Upon receipt of an official communication directly from the agency that contributed the original information, the FBI Identification Division makes any changes necessary in accordance with the information supplied by that agency. Licensees must provide at least ten days for an individual to initiate action to challenge the results of an FBI criminal history records check after the record being made available for their review. The licensee may make a final adverse determination based upon the criminal history records only after receipt of the FBI's confirmation or correction of the record.

(8) Records.

(a) The licensee shall retain documentation regarding the trustworthiness and reliability of individual employees for three years from the date the individual no longer requires unescorted access to Category 1 or Category 2 quantities of radioactive material.

(b) The licensee shall retain a copy of the current access authorization program procedures as a record for three years after the procedure is no longer needed. If any portion of the procedure is superseded, the licensee shall retain the superseded material for three years after the record is superseded.

(c) The licensee shall retain the list of persons approved for unescorted access authorization for three years after the list is superseded or replaced.

NEW SECTION

WAC 246-237-025 Background investigations. (1) Initial investigation. Before allowing an individual unescorted access to Category 1 or Category 2 quantities of radioactive material or to the devices that contain the material, licensees shall complete a background investigation of the individual seeking unescorted access authorization. The scope of the investigation must encompass at least the seven years preceding the date of the background investigation or since the individual's eighteenth birthday, whichever is shorter. The background investigation must include at a minimum:

(a) Fingerprinting and an FBI identification and criminal history records check in accordance with WAC 246-237-027;

(b) Verification of true identity. Licensees shall verify the true identity of the individual who is applying for unescorted access authorization to ensure that the applicant is who they claim to be. A licensee shall review official identification documents (driver's license; passport; government identification; certificate of birth issued by the state, province, or country of birth) and compare the documents to personal information data provided by the individual to identify any discrepancy in the information. Licensees shall document the type, expiration, and identification number of the identification document, or maintain a photocopy of identifying documents on file in accordance with WAC 246-237-031. Licensees shall certify in writing that the identification was properly reviewed, and shall maintain the certification and all related documents for review upon inspection;

(c) Employment history verification. Licensees shall complete an employment history verification, including military history. Licensees shall verify the individual's employment with each previous employer for the most recent seven years before the date of application;

(d) Verification of education. Licensees shall verify that the individual participated in the education process during the claimed period;

(e) Character and reputation determination. Licensees shall complete reference checks to determine the character and reputation of the individual who has applied for unescorted access authorization. Unless other references are not available, reference checks may not be conducted with any person who is known to be a close member of the individual's family including, but not limited to, the individual's spouse, parents, siblings, or children, or any individual who resides in the individual's permanent household. Reference checks under this chapter must be limited to whether the individual has been and continues to be trustworthy and reliable;

(f) The licensee shall also, to the extent possible, obtain independent information to corroborate that provided by the individual (for example, seek references not supplied by the individual); and

(g) If a previous employer, educational institution, or any other entity with which the individual claims to have been engaged fails to provide information or indicates an inability or unwillingness to provide information within a time frame deemed appropriate by the licensee but at least after ten business days of the request or if the licensee is unable to reach the entity, the licensee shall document the refusal, unwillingness, or inability in the record of investigation; and attempt to obtain the information from an alternate source.

(2) Grandfathering.

(a) Individuals who have been determined to be trustworthy and reliable for unescorted access to Category 1 or Category 2 quantities of radioactive material under the fingerprint orders may continue to have unescorted access to Category 1 and Category 2 quantities of radioactive material without further investigation. These individuals shall be subject to the reinvestigation requirement.

(b) Individuals who have been determined to be trustworthy and reliable under the provisions of 10 C.F.R. Part 73 or the security orders for access to safeguards information, safeguards information-modified handling, or risk-significant material may have unescorted access to Category 1 and Category 2 quantities of radioactive material without further investigation. The licensee shall document that the individual was determined to be trustworthy and reliable under the provisions of 10 C.F.R. Part 73 or a security order. Security order, in this context, refers to any order that was issued by the department that required fingerprints and an FBI criminal history records check for access to safeguards information, safeguards information-modified handling, or risk-significant material such as special nuclear material or large quantities of uranium hexafluoride. These individuals shall be subject to the reinvestigation requirement.

(3) Reinvestigations. Licensees shall conduct a reinvestigation every ten years for any individual with unescorted access to Category 1 or Category 2 quantities of radioactive material. The reinvestigation shall consist of fingerprinting and an FBI identification and criminal history records check in accordance with WAC 246-237-027. The reinvestigations must be completed within ten years of the date on which these elements were last completed.

NEW SECTION

WAC 246-237-027 Requirements for criminal history records checks of individuals granted unescorted access to Category 1 or Category 2 quantities of radioactive material. (1) General performance objective and requirements.

(a) Except for those individuals listed in WAC 246-237-029 and those individuals grandfathered under WAC 246-237-025(2), each licensee subject to the provisions of this chapter shall fingerprint each individual who is to be permitted unescorted access to Category 1 or Category 2 quantities of radioactive material. Licensees shall transmit all collected fingerprints to the NRC for transmission to the FBI. The licensee shall use the information received from the FBI as part of the required background investigation to determine whether to grant or deny further unescorted access to Category 1 or Category 2 quantities of radioactive materials for that individual.

(b) The licensee shall notify each affected individual that their fingerprints will be used to secure a review of their criminal history record, and shall inform them of the procedures for revising the record or adding explanations to the record.

(c) Fingerprinting is not required if a licensee is reinstating an individual's unescorted access authorization to Category 1 or Category 2 quantities of radioactive materials if:

(i) The individual returns to the same facility that granted unescorted access authorization within three hundred sixty-five days of the termination of their unescorted access authorization; and

(ii) The previous access authorization was terminated under favorable conditions.

(d) Fingerprints do not need to be taken if an individual who is an employee of a licensee, contractor, manufacturer, or supplier has been granted unescorted access to Category 1 or Category 2 quantities of radioactive material, access to safeguards information, or safeguards information-modified handling by another licensee, based upon a background investigation conducted under this chapter, or the fingerprint orders, or 10 C.F.R. 73. An existing criminal history records check file may be transferred to the licensee asked to grant unescorted access in accordance with the provisions of WAC 246-237-031(3).

(e) Licensees shall use information obtained as part of a criminal history records check solely for the purpose of determining an individual's suitability for unescorted access authorization to Category 1 or Category 2 quantities of radioactive materials, access to safeguards information, or safeguards information-modified handling.

(2) Prohibitions.

(a) Licensees may not base a final determination to deny an individual unescorted access authorization to Category 1 or Category 2 quantities of radioactive material solely on the basis of information received from the FBI involving:

(i) An arrest more than one year old for which there is no information of the disposition of the case; or

(ii) An arrest which resulted in dismissal of the charge or an acquittal.

(b) Licensees may not use information received from a criminal history records check obtained under this chapter in a manner which would infringe upon the rights of any individual under the First Amendment to the Constitution of the United States, nor shall licensees use the information in any way that would discriminate among individuals on the basis of race, religion, national origin, gender, or age.

(3) Procedures for processing of fingerprint checks.

(a) For the purpose of complying with this chapter, licensees shall use an appropriate method to submit to the U.S. Nuclear Regulatory Commission, Director, Division of Facilities and Security, 11545 Rockville Pike, ATTN: Criminal History Program/Mail Stop TWB-05B32M, Rockville, MD 20852, one completed, legible standard fingerprint card (Form FD-258, ORIMDNRC000Z), electronic fingerprint scan or, where practicable, other fingerprint record for each individual requiring unescorted access to Category 1 or Category 2 quantities of radioactive material. Copies of these forms may be obtained by writing the Office of the Chief Information Officer, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, by calling 1-630-829-9565, or by e-mail to FORMS.Resource@nrc.gov. Guidance on submitting electronic fingerprints can be found at <http://www.nrc.gov/site-help/e-submittals.html>.

(b) Fees for the processing of fingerprint checks are due upon application. Licensees shall submit payment with the application for the processing of fingerprints through corporate check, certified check, cashier's check, money order, or electronic payment, made payable to "U.S. NRC." (For guidance on making electronic payments, contact the Security Branch, Division of Facilities and Security at 301-415-7513.) Combined payment for multiple applications is acceptable. The NRC publishes the amount of the fingerprint check application fee on the NRC's public web site. (To find the current fee amount, go to the electronic submittals page at [\[11 \]](http://www.nrc.gov/site-help/e-</p></div><div data-bbox=)

submittals.html and see the link for the Criminal History Program under Electronic Submission Systems.)

(c) The NRC will forward to the submitting licensee all data received from the FBI as a result of the licensee's application for criminal history records checks.

NEW SECTION

WAC 246-237-029 Relief from fingerprinting, identification, and criminal history records checks and other elements of background investigations for designated categories of individuals permitted unescorted access to certain radioactive materials. (1) Fingerprinting, and the identification and criminal history records checks required by WAC 246-237-025, 246-237-027 and Section 149 of the Atomic Energy Act of 1954, as amended, and other elements of the background investigation are not required for the following individuals prior to granting unescorted access to Category 1 or Category 2 quantities of radioactive materials:

(a) An employee of the NRC or of the Executive Branch of the U.S. Government who has undergone fingerprinting for a prior U.S. Government criminal history records check;

(b) A Member of Congress;

(c) An employee of a member of Congress or Congressional committee who has undergone fingerprinting for a prior U.S. Government criminal history records check;

(d) The governor of a state or their designated state employee representative;

(e) Federal, state, or local law enforcement personnel;

(f) State Radiation Control Program Directors and State Homeland Security Advisors or their designated state employee representatives;

(g) Agreement state employees conducting security inspections on behalf of the NRC under an agreement executed under Section 274.i. of the Atomic Energy Act;

(h) Representatives of the International Atomic Energy Agency engaged in activities associated with the U.S./International Atomic Energy Agency Safeguards Agreement who have been certified by the NRC;

(i) Emergency response personnel who are responding to an emergency;

(j) Commercial vehicle drivers for road shipments of Category 1 and Category 2 quantities of radioactive material;

(k) Package handlers at transportation facilities such as freight terminals and railroad yards;

(l) Any individual who has an active federal security clearance, provided that they make available the appropriate documentation. Written confirmation from the agency/employer which granted the federal security clearance or reviewed the criminal history records check must be provided to the licensee. The licensee shall retain this documentation for a period of three years from the date the individual no longer requires unescorted access to Category 1 or Category 2 quantities of radioactive material; and

(m) Any individual employed by a service provider licensee for which the service provider licensee has conducted the background investigation for the individual and approved the individual for unescorted access to Category 1 or Category 2 quantities of radioactive

material. Written verification from the service provider must be provided to the licensee. The licensee shall retain the documentation for a period of three years from the date the individual no longer requires unescorted access to Category 1 or Category 2 quantities of radioactive material.

(2) Fingerprinting, and the identification and criminal history records checks required by WAC 246-237-025, 246-237-027 and Section 149 of the Atomic Energy Act of 1954, as amended, are not required for an individual who has had a favorably adjudicated U.S. Government criminal history records check within the last five years, under a comparable U.S. Government program involving fingerprinting and an FBI identification and criminal history records check provided that they make available the appropriate documentation. Written confirmation from the agency or employer who reviewed the criminal history records check must be provided to the licensee. The licensee shall retain this documentation for a period of three years from the date the individual no longer requires unescorted access to Category 1 or Category 2 quantities of radioactive material. These programs include, but are not limited to:

(a) National Agency Check;

(b) Transportation Worker Identification Credentials (TWIC) under 49 C.F.R. Part 1572;

(c) Bureau of Alcohol, Tobacco, Firearms, and Explosives background check and clearances under 27 C.F.R. Part 555;

(d) Health and Human Services security risk assessments for possession and use of select agents and toxins under 42 C.F.R. Part 73;

(e) Hazardous Material security threat assessment for hazardous material endorsement to commercial driver's license under 49 C.F.R. Part 1572; and

(f) U.S. Customs and Border Protection's Free and Secure Trade (FAST) program.

NEW SECTION

WAC 246-237-031 Protection of information. (1) Each licensee who obtains background information on an individual under this chapter shall establish and maintain a system of files and written procedures for protection of the record and the personal information from unauthorized disclosure.

(2) The licensee may not disclose the record or personal information collected and maintained to persons other than the subject individual, their representative, or to those who have a need to have access to the information in performing assigned duties in the process of granting or denying unescorted access to Category 1 or Category 2 quantities of radioactive material, safeguards information, or safeguards information-modified handling. No individual authorized to have access to the information may disseminate the information to any other individual who does not have a need to know.

(3) The personal information obtained on an individual from a background investigation may be provided to another licensee:

(a) Upon the individual's written request to the licensee holding the data to disseminate the information contained in their file; and

(b) The recipient licensee verifies information such as name, date of birth, Social Security number, gender, and other applicable physical characteristics.

(4) The licensee shall make background investigation records obtained under this chapter available for examination by an authorized representative of the department to determine compliance with the applicable rules and laws.

(5) The licensee shall retain all fingerprint and criminal history records (including data indicating no record) received from the FBI, or a copy of these records if the individual's file has been transferred, on an individual for three years from the date the individual no longer requires unescorted access to Category 1 or Category 2 quantities of radioactive material.

NEW SECTION

WAC 246-237-033 Access authorization program review. (1) Each licensee shall be responsible for the continuing effectiveness of the access authorization program. Each licensee shall ensure that access authorization programs are reviewed to confirm compliance with the requirements of this chapter and that comprehensive actions are taken to correct any noncompliance that is identified. The review program shall evaluate all program performance objectives and requirements. Each licensee shall periodically, at least annually, review the access program content and implementation.

(2) The results of the reviews, along with any recommendations, must be documented. Each review report must identify conditions that are adverse to the proper performance of the access authorization program, the cause of the condition or conditions, and, when appropriate, recommend corrective actions, and corrective actions taken. The licensee shall review the findings and take any additional corrective actions necessary to preclude repetition of the condition, including re-assessment of the deficient areas where indicated.

(3) Review records must be maintained for three years.

NEW SECTION

WAC 246-237-041 Security program. (1) Applicability.

(a) Each licensee who possesses an aggregated Category 1 or Category 2 quantity of radioactive material shall establish, implement, and maintain a security program in accordance with the requirements of this chapter.

(b) An applicant for a new license, and each licensee who would become newly subject to the requirements of this chapter, upon application for modification of its license, shall implement the requirements of this chapter, as appropriate, before taking possession of an aggregated Category 1 or Category 2 quantity of radioactive material.

(c) Any licensee who has not previously implemented the security orders or been subject to the provisions of WAC 246-237-041 through 246-237-057 shall provide written notification to the department at

least ninety days before aggregating radioactive material to a quantity that equals or exceeds the Category 2 threshold.

(2) General performance objective. Each licensee shall establish, implement, and maintain a security program designed to monitor and, without delay, detect, assess, and respond to an actual or attempted unauthorized access to Category 1 or Category 2 quantities of radioactive material.

(3) Program features. Each licensee's security program must include the program features, as appropriate, described in WAC 246-237-043 through 246-237-055.

NEW SECTION

WAC 246-237-043 General security program requirements. (1) Security plan.

(a) Each licensee identified in WAC 246-237-041(1) shall develop a written security plan specific to its facilities and operations. The purpose of the security plan is to establish the licensee's overall security strategy to ensure the integrated and effective functioning of the security program required by this chapter. The security plan must, at a minimum:

(i) Describe the measures and strategies used to implement the requirements of this chapter; and

(ii) Identify the security resources, equipment, and technology used to satisfy the requirements of this chapter.

(b) The security plan must be reviewed and approved by the individual with overall responsibility for the security program.

(c) A licensee shall revise its security plan as necessary to ensure the effective implementation of department requirements. The licensee shall ensure that:

(i) The revision has been reviewed and approved by the individual with overall responsibility for the security program; and

(ii) The affected individuals are instructed on the revised plan before the changes are implemented.

(d) The licensee shall retain a copy of the current security plan as a record for three years after the security plan is no longer required. If any portion of the plan is superseded, the licensee shall retain the superseded material for three years after the record is superseded.

(2) Implementing procedures.

(a) The licensee shall develop and maintain written procedures that document how the requirements of this chapter and the security plan will be met.

(b) The implementing procedures and revisions to these procedures must be approved in writing by the individual with overall responsibility for the security program.

(c) The licensee shall retain a copy of the current procedure as a record for three years after the procedure is no longer needed. Superseded portions of the procedure must be retained for three years after the record is superseded.

(3) Training.

(a) Each licensee shall conduct training to ensure those individuals implementing the security program possess and maintain the knowl-

edge, skills, and abilities to carry out their assigned duties and responsibilities effectively. The training must include instruction in:

(i) The licensee's security program and procedures to secure Category 1 or Category 2 quantities of radioactive material, and in the purposes and functions of the security measures employed;

(ii) The responsibility to report promptly to the licensee any condition which causes or may cause a violation of department requirements;

(iii) The responsibility of the licensee to report promptly to the LLEA and licensee any actual or attempted theft, sabotage, or diversion of Category 1 or Category 2 quantities of radioactive material; and

(iv) The appropriate response to security alarms.

(b) In determining those individuals who shall be trained on the security program, the licensee shall consider each individual's assigned activities during authorized use and response to potential situations involving actual or attempted theft, diversion, or sabotage of Category 1 or Category 2 quantities of radioactive material. The extent of the training must be commensurate with the individual's potential involvement in the security of Category 1 or Category 2 quantities of radioactive material.

(c) Refresher training must be provided at a frequency not to exceed twelve months and when significant changes have been made to the security program. This training must include:

(i) Review of the training requirements of this subsection and any changes made to the security program since the last training;

(ii) Reports on any relevant security issues, problems, and lessons learned;

(iii) Relevant results of department inspections; and

(iv) Relevant results of the licensee's program review and testing and maintenance.

(d) The licensee shall maintain records of the initial and refresher training for three years from the date of the training. The training records must include dates of the training, topics covered, a list of licensee personnel in attendance, and related information.

(4) Protection of information.

(a) Licensees authorized to possess Category 1 or Category 2 quantities of radioactive material shall limit access to, and unauthorized disclosure of, their security plan, implementing procedures, and the list of individuals who have been approved for unescorted access.

(b) Efforts to limit access shall include the development, implementation, and maintenance of written policies and procedures for controlling access to, and for proper handling and protection against unauthorized disclosure of, the security plan and implementing procedures.

(c) Before granting an individual access to the security plan or implementing procedures, licensees shall:

(i) Evaluate an individual's need to know the security plan or implementing procedures; and

(ii) If the individual has not been authorized for unescorted access to Category 1 or Category 2 quantities of radioactive material, safeguards information, or safeguards information-modified handling, the licensee must complete a background investigation to determine the individual's trustworthiness and reliability. A trustworthiness and reliability determination shall be conducted by the reviewing official

and shall include the background investigation elements contained in WAC 246-237-025 (1)(b) through (g).

(d) Licensees need not subject the following individuals to the background investigation elements for protection of information:

(i) The categories of individuals listed in WAC 246-237-029 (1)(a) through (m); or

(ii) Security service provider employees, provided written verification that the employee has been determined to be trustworthy and reliable, by the required background investigation in WAC 246-237-025 (1)(b) through (g), has been provided by the security service provider.

(e) The licensee shall document the basis for concluding that an individual is trustworthy and reliable and should be granted access to the security plan or implementing procedures.

(f) Licensees shall maintain a list of persons currently approved for access to the security plan or implementing procedures. When a licensee determines that a person no longer needs access to the security plan or implementing procedures or no longer meets the access authorization requirements for access to the information, the licensee shall remove the person from the approved list as soon as possible, but no later than seven working days, and take prompt measures to ensure that the individual is unable to obtain the security plan or implementing procedures.

(g) When not in use, the licensee shall store its security plan and implementing procedures in a manner to prevent unauthorized access. Information stored in nonremovable electronic form must be password protected.

(h) The licensee shall retain as a record for three years after the document is no longer needed:

(i) A copy of the information protection procedures; and

(ii) The list of individuals approved for access to the security plan or implementing procedures.

NEW SECTION

WAC 246-237-045 LLEA coordination. (1) A licensee subject to this chapter shall coordinate, to the extent practicable, with a LLEA for responding to threats to the licensee's facility, including any necessary armed response. The information provided to the LLEA must include:

(a) A description of the facilities and the Category 1 and Category 2 quantities of radioactive materials along with a description of the licensee's security measures which have been implemented to comply with this chapter; and

(b) A notification that the licensee will request a timely armed response by the LLEA to any actual or attempted theft, sabotage, or diversion of Category 1 or Category 2 quantities of material.

(2) The licensee shall notify the department within three business days if:

(a) The LLEA has not responded to the request for coordination within sixty days of the coordination request; or

(b) The LLEA notifies the licensee that the LLEA does not plan to participate in coordination activities.

(3) The licensee shall document its efforts to coordinate with the LLEA. The documentation must be kept for three years.

(4) The licensee shall coordinate with the LLEA at least every twelve months, or when changes to the facility design or operation adversely affect the potential vulnerability of the licensee's material to theft, sabotage, or diversion.

NEW SECTION

WAC 246-237-047 Security zones. (1) Licensees shall ensure that all aggregated Category 1 and Category 2 quantities of radioactive material are used or stored within licensee-established security zones. Security zones may be permanent or temporary.

(2) Temporary security zones must be established as necessary to meet the licensee's transitory or intermittent business activities, such as periods of maintenance, source delivery, and source replacement.

(3) Security zones must, at a minimum, allow unescorted access only to approved individuals through:

(a) Isolation of Category 1 and Category 2 quantities of radioactive materials by the use of continuous physical barriers that allow access to the security zone only through established access control points. A physical barrier is a natural or man-made structure or formation sufficient for the isolation of the Category 1 or Category 2 quantities of radioactive material within a security zone; or

(b) Direct control of the security zone by approved individuals at all times; or

(c) A combination of continuous physical barriers and direct control.

(4) For Category 1 quantities of radioactive material during periods of maintenance, source receipt, preparation for shipment, installation, or source removal or exchange, the licensee shall, at a minimum, provide sufficient individuals approved for unescorted access to maintain continuous surveillance of sources in temporary security zones and in any security zone in which physical barriers or intrusion detection systems have been disabled to allow such activities.

(5) Individuals not approved for unescorted access to Category 1 or Category 2 quantities of radioactive material must be escorted by an approved individual when in a security zone.

NEW SECTION

WAC 246-237-049 Monitoring, detection, and assessment. (1) Monitoring and detection.

(a) Licensees shall establish and maintain the capability to continuously monitor and detect without delay all unauthorized entries into its security zones. Licensees shall provide the means to maintain continuous monitoring and detection capability in the event of a loss of the primary power source, or provide for an alarm and response in the event of a loss of this capability to continuously monitor and detect unauthorized entries.

(b) Monitoring and detection must be performed by:

(i) A monitored intrusion detection system that is linked to an on-site or off-site central monitoring facility;

(ii) Electronic devices for intrusion detection alarms that will alert nearby facility personnel;

(iii) A monitored video surveillance system;

(iv) Direct visual surveillance by approved individuals located within the security zone; or

(v) Direct visual surveillance by a licensee designated individual located outside the security zone.

(c) A licensee subject to this chapter shall also have a means to detect unauthorized removal of the radioactive material from the security zone. This detection capability must provide:

(i) For Category 1 quantities of radioactive material, immediate detection of any attempted unauthorized removal of the radioactive material from the security zone. Such immediate detection capability must be provided by:

(A) Electronic sensors linked to an alarm;

(B) Continuously monitored video surveillance; or

(C) Direct visual surveillance.

(ii) For Category 2 quantities of radioactive material, weekly verification through physical checks, tamper indicating devices, use, or other means to ensure that the radioactive material is present.

(2) Assessment. Licensees shall immediately assess each actual or attempted unauthorized entry into the security zone to determine whether the unauthorized access was an actual or attempted theft, sabotage, or diversion.

(3) Personnel communications and data transmission. For personnel, and automated or electronic systems, supporting the licensee's monitoring, detection, and assessment systems, licensees shall:

(a) Maintain continuous capability for personnel communication and electronic data transmission and processing among site security systems; and

(b) Provide an alternative communication capability for personnel, and an alternative data transmission and processing capability, in the event of loss of the primary means of communication or data transmission and processing. Alternative communications and data transmission systems may not be subject to the same failure modes as the primary systems.

(4) Response. Licensees shall immediately respond to any actual or attempted unauthorized access to the security zones, or actual or attempted theft, sabotage, or diversion of Category 1 or Category 2 quantities of radioactive material at licensee facilities or temporary job sites. For any unauthorized access involving an actual or attempted theft, sabotage, or diversion of Category 1 or Category 2 quantities of radioactive material, the licensee's response shall include requesting, without delay, an armed response from the LLEA.

NEW SECTION

WAC 246-237-051 Maintenance and testing. (1) Each licensee subject to this chapter shall implement a maintenance and testing program to ensure that intrusion alarms, associated communication systems, and other physical components of the systems used to secure or detect un-

authorized access to radioactive material are maintained in operable condition and are capable of performing their intended function when needed. The equipment relied on to meet the security requirements of this part must be inspected and tested for operability and performance at the manufacturer's suggested frequency. If there is no suggested manufacturer's suggested frequency, the testing must be performed at least annually, not to exceed twelve months.

(2) The licensee shall maintain records of the maintenance and testing activities for three years.

NEW SECTION

WAC 246-237-053 Requirements for mobile devices. Each licensee who possesses mobile devices containing Category 1 or Category 2 quantities of radioactive material must:

(1) Have two independent physical controls that form tangible barriers to secure the material from unauthorized removal when the device is not under direct control and constant surveillance by the licensee; and

(2) For devices in or on a vehicle or trailer, unless the health and safety requirements for a site prohibit the disabling of the vehicle, the licensee shall utilize a method to disable the vehicle or trailer when not under direct control and constant surveillance by the licensee. Licensees shall not rely on the removal of the ignition key to meet this requirement.

NEW SECTION

WAC 246-237-055 Security program review. (1) Each licensee shall be responsible for the continuing effectiveness of their security program. Each licensee shall ensure that the security program is reviewed to confirm compliance with the requirements of this chapter and that comprehensive actions are taken to correct any noncompliance which is identified. The review must include the radioactive material security program content and implementation. Each licensee shall periodically, at least annually, review the security program content and implementation.

(2) The results of the review, along with any recommendations, must be documented. Each review report must identify conditions that are adverse to the proper performance of the security program, the cause of the condition or conditions, and, when appropriate, recommend corrective actions, and corrective actions taken. The licensee shall review the findings and take any additional corrective actions necessary to preclude repetition of the condition or conditions, including reassessment of the deficient areas where indicated.

(3) The licensee shall maintain the review documentation for three years.

NEW SECTION

WAC 246-237-057 Reporting of events. (1) The licensee shall immediately notify the LLEA after determining that an unauthorized entry resulted in an actual or attempted theft, sabotage, or diversion of a Category 1 or Category 2 quantity of radioactive material. As soon as possible after initiating a response, but not at the expense of causing delay or interfering with the LLEA response to the event, the licensee shall notify the department. In no case shall the notification to the department be later than four hours after the discovery of any attempted or actual theft, sabotage, or diversion.

(2) The licensee shall assess any suspicious activity related to possible theft, sabotage, or diversion of Category 1 or Category 2 quantities of radioactive material and notify the LLEA as appropriate. As soon as possible but not later than four hours after notifying the LLEA, the licensee shall notify the department.

(3) The initial telephonic notification required by subsection (1) of this section must be followed within a period of thirty days by a written report submitted to the department. The report must include sufficient information for department analysis and evaluation, including identification of any necessary corrective actions to prevent future instances.

NEW SECTION

WAC 246-237-071 Additional requirements for transfer of Category 1 and Category 2 quantities of radioactive material. A licensee transferring a Category 1 or Category 2 quantity of radioactive material to a licensee of the department, the NRC, or an agreement state shall meet the license verification provisions listed in this section instead of those listed in WAC 246-232-080(4):

(1) Any licensee transferring Category 1 quantities of radioactive material to a licensee of the department, the NRC, or an agreement state, prior to conducting such transfer, shall verify with the department, the NRC's license verification system, or the license issuing authority that the transferee's license authorizes receipt of the type, form, and quantity of radioactive material to be transferred and that the licensee is authorized to receive radioactive material at the location requested for delivery. If the verification is conducted by contacting the license issuing authority, the transferor shall document the verification. For transfers within the same organization, the licensee does not need to verify the transfer.

(2) Any licensee transferring Category 2 quantities of radioactive material to a licensee of the department, the NRC, or an agreement state, prior to conducting such transfer, shall verify with the department, the NRC's license verification system, or the license issuing authority that the transferee's license authorizes receipt of the type, form, and quantity of radioactive material to be transferred. If the verification is conducted by contacting the license issuing authority, the transferor shall document the verification. For transfers within the same organization, the licensee does not need to verify the transfer.

(3) In an emergency where the licensee cannot reach the department or the license issuing authority, and the NRC license verification system is nonfunctional, the licensee may accept a written certification by the transferee that it is authorized by license to receive the type, form, and quantity of radioactive material to be transferred. The certification must include the license number, current revision or amendment number, issuing agency, expiration date and, for a Category 1 shipment, the authorized address. The licensee shall keep a copy of the certification. The certification must be confirmed by use of NRC's license verification system or by contacting the department or the license issuing authority by the end of the next business day.

(4) The transferor shall keep a copy of the verification documentation as a record for three years.

NEW SECTION

WAC 246-237-073 Applicability of physical protection of Category 1 and Category 2 quantities of radioactive material during transit.

(1) For shipments of Category 1 quantities of radioactive material, each shipping licensee shall comply with the requirements for physical protection contained in WAC 246-237-075 (1) and (5); 246-237-077; 246-237-079 (1)(a), (2)(a), and (3); and 246-237-081 (1), (3), (5), (7), and (8).

(2) For shipments of Category 2 quantities of radioactive material, each shipping licensee shall comply with the requirements for physical protection contained in WAC 246-237-075 (2) through (5); 246-237-079 (1)(b), (c), (2)(b), and (3); and 246-237-081 (2), (4), (6), (7), and (8). For those shipments of Category 2 quantities of radioactive material which meet the criteria of WAC 246-231-140(2), the shipping licensee shall also comply with the advance notification provisions of WAC 246-231-140.

(3) The shipping licensee shall be responsible for meeting the requirements of this chapter unless the receiving licensee has agreed in writing to arrange for the in-transit physical protection required under this chapter.

(4) Each licensee that imports or exports Category 1 quantities of radioactive material shall comply with the requirements for physical protection during transit contained in WAC 246-237-075 (1)(b) and (5); 246-237-077; 246-237-079 (1)(a), (2)(a), and (3); and 246-237-081 (1), (3), (5), (7), and (8) for the domestic portion of the shipment.

(5) Each licensee that imports or exports Category 2 quantities of radioactive material shall comply with the requirements for physical protection during transit contained in WAC 246-237-079 (1)(b), (c), and (2)(b); and 246-237-081 (2), (4), (6), (7), and (8) for the domestic portion of the shipment.

NEW SECTION

WAC 246-237-075 Preplanning and coordination of shipment of Category 1 or Category 2 quantities of radioactive material. (1) Each

licensee who plans to transport, or deliver to a carrier for transport, licensed material that is a Category 1 quantity of radioactive material outside the confines of the licensee's facility or other place of use or storage shall:

(a) Preplan and coordinate shipment arrival and departure times with the receiving licensee;

(b) Preplan and coordinate shipment information with the governor or the governor's designee of any state through which the shipment will pass to:

(i) Discuss the state's intention to provide law enforcement escorts; and

(ii) Identify safe havens; and

(c) Document the preplanning and coordination activities.

(2) Each licensee who plans to transport, or deliver to a carrier for transport, licensed material which is a Category 2 quantity of radioactive material outside the confines of the licensee's facility or other place of use or storage shall coordinate the shipment no-later-than arrival time and the expected shipment arrival with the receiving licensee. The licensee shall document the coordination activities.

(3) Each licensee who receives a shipment of a Category 2 quantity of radioactive material shall confirm receipt of the shipment with the originator. If the shipment has not arrived by the no-later-than arrival time, the receiving licensee shall notify the originator.

(4) Each licensee, who transports or plans to transport a shipment of a Category 2 quantity of radioactive material, and determines that the shipment will arrive after the no-later-than arrival time provided pursuant to subsection (2) of this section, shall promptly notify the receiving licensee of the new no-later-than arrival time.

(5) The licensee shall retain a copy of the documentation for preplanning and coordination, and any revision thereof, as a record for three years.

NEW SECTION

WAC 246-237-077 Advance notification of shipment of Category 1 quantities of radioactive material. As specified in subsections (1) and (2) of this section, each licensee shall provide advance notification to the department and the governor of a state, or the governor's designee, of the shipment of licensed material in a Category 1 quantity, through or across the boundary of the state, before transport, or delivery to a carrier for transport, of the licensed material outside the confines of the licensee's facility or other place of use or storage.

(1) Procedures for submitting advance notification.

(a) The notification must be made to the department and to the office of each appropriate governor or governor's designee. The contact information, including telephone and mailing addresses, of governors and governors' designees, is available on the NRC's web site at <http://nrc-stp.ornl.gov/special/designee.pdf>. A list of the contact information is also available upon request from the Director, Division of Material Safety, State, Tribal and Rulemaking Programs, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001. Notifications to the department

must be made to the attention of the Director, Office of Radiation Protection.

(b) A notification delivered by mail must be postmarked at least seven days before transport of the shipment commences at the shipping facility.

(c) A notification delivered by any means other than mail must reach the department at least four days before transport of the shipment commences and must reach the office of the governor or the governor's designee at least four days before transport of a shipment within or through the state.

(2) Information to be furnished in advance notification of shipment. Each advance notification of shipment of Category 1 quantities of radioactive material must contain the following information, if available at the time of notification:

(a) The name, address, and telephone number of the shipper, carrier, and receiver of the Category 1 radioactive material;

(b) The license numbers of the shipper and receiver;

(c) A description of the radioactive material contained in the shipment, including the radionuclides and quantities;

(d) The point of origin of the shipment and the estimated time and date when shipment will commence;

(e) The estimated time and date the shipment is expected to enter each state along the route;

(f) The estimated time and date of arrival of the shipment at the destination; and

(g) A point of contact, with a telephone number, for current shipment information.

(3) Revision notice.

(a) The licensee shall provide any information not previously available at the time of the initial notification, as soon as the information becomes available but not later than commencement of the shipment, to the governor of the state or the governor's designee and to the department.

(b) A licensee shall promptly notify the governor of the state or the governor's designee of any changes to the information provided in accordance with subsections (2) and (3)(a) of this section. The licensee shall also immediately notify the department of any such changes.

(4) Cancellation notice. Each licensee who cancels a shipment for which advance notification has been sent shall send a cancellation notice to the department and to the governor of each state or to the governor's designee previously notified. The licensee shall send the cancellation notice before the shipment would have commenced or as soon thereafter as possible. The licensee shall state in the notice that it is a cancellation and identify the advance notification which is being canceled.

(5) Records. The licensee shall retain a copy of the advance notification and any revision and cancellation notices as a record for three years.

(6) Protection of information. State officials, state employees, and other individuals, whether or not licensees of the department, NRC, or an agreement state who receive schedule information of the kind specified in subsection (2) of this section shall protect that information against unauthorized disclosure as specified in WAC 246-237-043(4).

NEW SECTION

WAC 246-237-079 Requirements for physical protection of Category 1 and Category 2 quantities of radioactive material during shipment.

(1) Shipments by road.

(a) Each licensee who transports, or delivers to a carrier for transport, in a single shipment, a Category 1 quantity of radioactive material shall:

(i) Ensure that movement control centers are established that maintain position information from a remote location. These control centers must monitor shipments twenty-four hours a day, seven days a week, and have the ability to communicate immediately, in an emergency, with the appropriate law enforcement agencies.

(ii) Ensure that redundant communications are established that allow the transport to contact the escort vehicle (when used) and movement control center at all times. Redundant communications may not be subject to the same interference factors as the primary communication.

(iii) Ensure that shipments are continuously and actively monitored by a telemetric position monitoring system or an alternative tracking system reporting to a movement control center. A movement control center must provide positive confirmation of the location, status, and control over the shipment. The movement control center must be prepared to promptly implement preplanned procedures in response to deviations from the authorized route or a notification of actual, attempted, or suspicious activities related to the theft, loss, or diversion of a shipment. These procedures will include, but not be limited to, the identification of and contact information for the appropriate LLEA along the shipment route.

(iv) Provide an individual to accompany the driver for those highway shipments with a driving time period greater than the maximum number of allowable hours of service in a twenty-four hour duty day as established by the Department of Transportation Federal Motor Carrier Safety Administration. The accompanying individual may be another driver.

(v) Develop written normal and contingency procedures to address:

(A) Notifications to the communication center and law enforcement agencies;

(B) Communication protocols. Communication protocols must include a strategy for the use of authentication codes and duress codes and provisions for refueling or other stops, detours, and locations where communication is expected to be temporarily lost;

(C) Loss of communications; and

(D) Responses to an actual or attempted theft or diversion of a shipment.

(vi) Each licensee who makes arrangements for the shipment of Category 1 quantities of radioactive material shall ensure that drivers, accompanying personnel, and movement control center personnel have access to the normal and contingency procedures.

(b) Each licensee who transports Category 2 quantities of radioactive material shall maintain constant control or surveillance during transit and have the capability for immediate communication to summon appropriate response or assistance.

(c) Each licensee who delivers to a carrier for transport, in a single shipment, a Category 2 quantity of radioactive material shall:

(i) Use carriers who have established package tracking systems. An established package tracking system is a documented, proven, and reliable system routinely used to transport objects of value. In order for a package tracking system to maintain constant control or surveillance, the package tracking system must allow the shipper or transporter to identify when and where the package was last and when it should arrive at the next point of control.

(ii) Use carriers who maintain constant control or surveillance during transit and have the capability for immediate communication to summon appropriate response or assistance; and

(iii) Use carriers who have established tracking systems that require an authorized signature prior to releasing the package for delivery or return.

(2) Shipments by rail.

(a) Each licensee who transports, or delivers to a carrier for transport, in a single shipment, a Category 1 quantity of radioactive material shall:

(i) Ensure that rail shipments are monitored by a telemetric position monitoring system or an alternative tracking system reporting to the licensee, third-party, or railroad communications center. The communications center shall provide positive confirmation of the location of the shipment and its status. The communications center shall implement preplanned procedures in response to deviations from the authorized route or to a notification of actual, attempted, or suspicious activities related to the theft or diversion of a shipment. These procedures will include, but not be limited to, the identification of and contact information for the appropriate LLEA along the shipment route.

(ii) Ensure that periodic reports to the communications center are made at preset intervals.

(b) Each licensee who transports, or delivers to a carrier for transport, in a single shipment, a Category 2 quantity of radioactive material shall:

(i) Use carriers who have established package tracking systems. An established package tracking system is a documented, proven, and reliable system routinely used to transport objects of value. In order for a package tracking system to maintain constant control or surveillance, the package tracking system must allow the shipper or transporter to identify when and where the package was last and when it should arrive at the next point of control.

(ii) Use carriers who maintain constant control or surveillance during transit and have the capability for immediate communication to summon appropriate response or assistance; and

(iii) Use carriers who have established tracking systems that require an authorized signature prior to releasing the package for delivery or return.

(3) Investigations. Each licensee who makes arrangements for the shipment of Category 1 quantities of radioactive material shall immediately conduct an investigation upon discovery that a Category 1 shipment is lost or missing. Each licensee who makes arrangements for the shipment of Category 2 quantities of radioactive material shall immediately conduct an investigation, in coordination with the receiving licensee, of any shipment that has not arrived by the designated no-later-than arrival time.

NEW SECTION

WAC 246-237-081 Reporting requirements. (1) The shipping licensee shall notify the appropriate LLEA and the department within one hour of its determination that a shipment of Category 1 quantities of radioactive material is lost or missing. The appropriate LLEA would be the law enforcement agency in the area of the shipment's last confirmed location. During the investigation required by WAC 246-237-079(3), the shipping licensee will provide agreed upon updates to the department on the status of the investigation.

(2) The shipping licensee shall notify the department within four hours of its determination that a shipment of Category 2 quantities of radioactive material is lost or missing. If, after twenty-four hours of the determination that the shipment is lost or missing, the radioactive material has not been located and secured, the licensee shall immediately notify the department.

(3) The shipping licensee shall notify the designated LLEA along the shipment route as soon as possible upon discovery of any actual or attempted theft or diversion of a shipment or suspicious activities related to the theft or diversion of a shipment of a Category 1 quantity of radioactive material. As soon as possible after notifying the LLEA, the licensee shall notify the department upon discovery of any actual or attempted theft or diversion of a shipment, or any suspicious activity related to the shipment of Category 1 radioactive material.

(4) The shipping licensee shall notify the department as soon as possible upon discovery of any actual or attempted theft or diversion of a shipment, or any suspicious activity related to the shipment, of a Category 2 quantity of radioactive material.

(5) The shipping licensee shall notify the department and the LLEA as soon as possible upon recovery of any lost or missing Category 1 quantities of radioactive material.

(6) The shipping licensee shall notify the department as soon as possible upon recovery of any lost or missing Category 2 quantities of radioactive material.

(7) The initial telephonic notification required by subsections (1) through (4) of this section must be followed within a period of thirty days by a written report submitted to the department by an appropriate method. A written report is not required for notifications of suspicious activities required by subsections (3) and (4) of this section. In addition, the licensee shall provide a copy of the written report to the department. The report must set forth the following information:

(a) A description of the licensed material involved, including kind, quantity, chemical and physical form;

(b) A description of the circumstances under which the loss or theft occurred;

(c) A statement of disposition, or probable disposition, of the licensed material involved;

(d) Actions that have been taken, or will be taken, to recover the material; and

(e) Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed material.

(8) Subsequent to filing the written report, the licensee shall also report any additional substantive information about the loss or

theft to the department within thirty days after the licensee learns of such information.

NEW SECTION

WAC 246-237-101 Form of records. Each record required by this chapter must be legible throughout the retention period specified by department rule. The record may be the original or a reproduced copy or a microform, provided the copy or microform is authenticated by authorized personnel and the microform is capable of producing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability of producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, and specifications, must include all pertinent information such as stamps, initials, and signatures. The licensee shall maintain adequate safeguards against tampering with, and loss of, records.

NEW SECTION

WAC 246-237-103 Record retention. Licensees shall maintain records required by this chapter for the period specified by the appropriate rule. If a retention period is not otherwise specified, these records must be retained until the department terminates the facility's license. All records related to this chapter may be destroyed upon department termination of the facility license.

NEW SECTION

WAC 246-237-105 Inspections. (1) Each licensee shall afford the department, at all reasonable times, opportunity to inspect Category 1 or Category 2 quantities of radioactive material and the premises and facilities wherein the nuclear material is used, produced, or stored.

(2) Each licensee shall make available to the department for inspection, upon reasonable notice, records kept by the licensee pertaining to receipt, possession, use, acquisition, import, export, or transfer of Category 1 or Category 2 quantities of radioactive material.

NEW SECTION

WAC 246-237-900 Appendix A: Table 1—Category 1 and Category 2 thresholds. Terabecquerel (TBq) values are the regulatory standard.

The curie (Ci) values specified are obtained by converting from the TBq value. The curie values provided for practical usefulness only.

Radioactive material	Category 1 (TBq)	Category 1 (Ci)	Category 2 (TBq)	Category 2 (Ci)
Americium-241	60	1,620	0.6	16.2
Americium-241/Be	60	1,620	0.6	16.2
Californium-252	20	540	0.2	5.40
Cobalt-60	30	810	0.3	8.10
Curium-244	50	1,350	0.5	13.5
Cesium-137	100	2,700	1	27.0
Gadolinium-153	1,000	27,000	10	270
Iridium-192	80	2,160	0.8	21.6
Plutonium-238	60	1,620	0.6	16.2
Plutonium-239/Be	60	1,620	0.6	16.2
Promethium-147	40,000	1,080,000	400	10,800
Radium-226	40	1,080	0.4	10.8
Selenium-75	200	5,400	2	54.0
Strontium-90	1,000	27,000	10	270
Thulium-170	20,000	540,000	200	5,400
Ytterbium-169	300	8,100	3	81.0

Note: Calculations Concerning Multiple Sources or Multiple Radionuclides

The "sum of fractions" methodology for evaluating combinations of multiple sources or multiple radionuclides is to be used in determining whether a location meets or exceeds the threshold and is thus subject to the requirements of this chapter.

I. If multiple sources of the same radionuclide or multiple radionuclides are aggregated at a location, the sum of the ratios of the total activity of each of the radionuclides must be determined to verify whether the activity at the location is less than the Category 1 or Category 2 thresholds of Table 1, as appropriate. If the calculated sum of the ratios, using the equation below, is greater than or equal to 1.0, then the applicable requirements of this chapter apply.

II. First determine the total activity for each radionuclide from Table 1. This is done by adding the activity of each individual source, material in any device, and any loose or bulk material that contains the radionuclide. Then use the equation below to calculate the sum of the ratios by inserting the total activity of the applicable radionuclides from Table 1 in the numerator of the equation and the corresponding threshold activity from Table 1 in the denominator of the equation. Calculations must be performed in metric values (TBq) and the numerator and denominator values must be in the same units.

R_1 = total activity for radionuclide 1

R_2 = total activity for radionuclide 2

R_N = total activity for radionuclide n

AR_1 = activity threshold for radionuclide 1

AR_2 = activity threshold for radionuclide 2

AR_N = activity threshold for radionuclide n

$$\sum_1^n \left[\frac{R_1}{AR_1} + \frac{R_2}{AR_2} + \frac{R_n}{AR_n} \right] \geq 1.0$$

WAC 246-232-006 Exemption of certain source material. (1) A person is exempt from the requirements for a license and from this chapter and chapters 246-233 and 246-235 WAC to the extent that the person receives, possesses, uses, transfers, or delivers, source material in any chemical mixture, compound, solution or alloy in which the source material is by weight less than 1/20 of one percent (0.05 percent) of the mixture, compound, solution, or alloy.

(2) A person is exempt from the requirements for a license and from this chapter and chapters 246-233 and 246-235 WAC to the extent that the person receives, possesses, uses or transfers unrefined and unprocessed ore containing source material, provided such person shall not refine or process such ore unless authorized to do so in a specific license.

(3) A person is exempt from the requirements for a license and from this chapter and chapters 246-221, 246-246, 246-222, 246-233, and 246-235 WAC to the extent that the person receives, possesses, uses or transfers:

(a) Any quantities of thorium contained in:

(i) Incandescent gas mantles;

(ii) Vacuum tubes;

(iii) Welding rods;

(iv) Electric lamps for illuminating purposes if each lamp contains fifty milligrams or less of thorium;

(v) Germicidal lamps, sunlamps and lamps for outdoor or industrial lighting if each lamp contains two grams or less of thorium;

(vi) Rare earth metals and compounds, mixtures, and products containing 0.25 percent or less by weight thorium, uranium, or any combination of these; or

(vii) Personnel neutron dosimeters if each dosimeter contains 1.85 gigabecquerels (50 milligrams) or less of thorium;

(b) Source material contained in the following products:

(i) Glazed ceramic tableware manufactured before August 27, 2013, if the glaze contains twenty percent or less by weight source material; ((and))

(ii) Piezoelectric ceramic containing two percent or less by weight source material; and

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

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

(d) Any finished product or part fabricated of, or containing, tungsten-thorium or magnesium-thorium alloys if the thorium content of the alloy is four percent or less by weight. 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;

(e) Thorium or uranium contained in or on finished optical lenses ((if each lens contains)) and mirrors, provided that each lens or mirror does not contain more than ten percent by weight of thorium or uranium or, for lenses manufactured before August 27, 2013, thirty

percent (~~or less~~) by weight of thorium. The exemption contained in this subparagraph shall not be deemed to authorize either:

(i) 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 alteration of the lens or mirror; or

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

(f) Uranium contained in detector heads for use in fire detection units if each detector head contains 185 becquerels (0.005 microcuries) or less of uranium; or

(g) Thorium contained in any finished aircraft engine part containing nickel-thoria alloy if:

(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 is four percent or less by weight.

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

(5) No person may initially transfer for sale or distribution a product containing source material to persons exempt under this section, or equivalent regulations of an agreement state, unless authorized by a license issued under 10 C.F.R. 40.52, chapter 246-235 WAC, or equivalent regulations of an agreement state to initially transfer such products for sale or distribution.

(a) Persons initially distributing source material in products covered by the exemptions in this section before August 27, 2013, without specific authorization may continue such distribution for one year beyond this date. Initial distribution may also be continued until 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 by an agreement state to manufacture, process, or produce these materials or products containing source material, and persons who import finished products or parts for sale or distribution must be authorized by a license issued under 10 C.F.R. 40.52 for distribution only and are exempt from the requirements of chapters 246-221 and 246-222 WAC, and WAC 246-235-020 (1) and (2).

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-232-007 Exemption of certain depleted uranium items.

(1) A person is exempt from the requirements for a license and from this chapter and chapters 246-233 and 246-235 WAC to the extent that the person receives, possesses, uses or transfers:

(a) Depleted uranium contained in counterweights installed in aircraft, rockets, projectiles and missiles, or stored or handled in connection with installation or removal of such counterweights if:

(i) (~~The counterweights are manufactured in accordance with a specific license issued by the NRC authorizing distribution by the licensee pursuant to 10 C.F.R. Part 40;~~

~~(ii))~~ Each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM" *;

~~((iii))~~ (ii) Each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED" *; and

~~((iv))~~ (iii) The exemption contained in this subparagraph shall not be deemed to authorize the chemical, physical or metallurgical treatment or processing of any such counterweight other than repair or restoration of any plating or other covering;

*Note: The requirements specified in ~~((e)(B) and (C))~~ (1)(a)(i) and (ii) of this subsection 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 rules, provided that such counterweights were manufactured under a specific license issued by the Atomic Energy Commission and were impressed with the legend required by WAC 246-232-007 (1)(a)(i) in effect on June 30, 1969.

(b) Natural or depleted uranium used as shielding constituting part of any shipping container which is conspicuously and legibly impressed with the legend "CAUTION - RADIOACTIVE SHIELDING - URANIUM" and the uranium metal is encased in mild steel or in an equally fire resistant metal of a minimum wall thickness of 3.2 millimeters.

(2) The exemptions in this subsection do not authorize the manufacture of any of the products described.

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-232-011 Exemption of certain self-luminous products containing radioactive material(s). (1) Hydrogen-3 (tritium), krypton-85, or promethium-147.

(a) A person is exempt from the requirements for a license and from this chapter and chapters 246-233 and 246-235 WAC to the extent that the person receives, possesses, uses, transfers, owns or acquires, and does not manufacture, process, produce, apply radioactive material to, incorporate radioactive material into, or initially transfer for sale or distribution, self-luminous products containing hydrogen-3 (tritium), krypton-85, or promethium-147 in self-luminous products manufactured, processed, produced, imported or initially transferred in accordance with a specific license issued by the NRC. The exemption in this subsection does not apply to hydrogen-3, (tritium), krypton-85, or promethium-147 used in products primarily for frivolous purposes or in toys or adornments.

(b) Any person who desires to manufacture, process, produce, or initially transfer for sale or distribution self-luminous products containing tritium (H-3), krypton-85 (Kr-85), or promethium-147 (Pm-147) for use under (a) of this subsection shall apply for a license under chapter 246-235 WAC.

(2) 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 this section or other sections or equivalent regulations of the NRC or an agreement state, except in accordance with a specific license issued by the NRC, Washington, D.C. 20555.

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-232-012 Exemption of certain gas and aerosol detectors containing radioactive material. (1) ((A)) (a) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution gas or aerosol detectors containing radioactive material, any person is exempt from the requirements for a license and from this chapter and chapters 246-233 and 246-235 WAC to the extent that the person receives, possesses, uses, transfers, owns or acquires(, and does not apply radioactive material to, or incorporate radioactive material into, manufacture, process or produce,)) radioactive material in gas and aerosol detectors designed to protect ((life)) health, safety, or property ((from fires and airborne hazards if the detectors have been manufactured, imported, or transferred in accordance with a specific license issued by the NRC)), and manufactured, processed, produced, or initially transferred in accordance with a specific license issued by the department, NRC, or an agreement state which authorizes the initial transfer of the product for use under this chapter. This exemption also covers gas and aerosol detectors manufactured or distributed before November 30, 2007, in accordance with a specific license authorizing distribution to persons exempt from regulatory requirements.

(b) Any person who desires to manufacture, process, or produce gas or aerosol detectors containing radioactive material, or to initially transfer such products for use under this chapter shall apply for a license under chapter 246-235 WAC.

(2) 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 this section or other sections or equivalent regulations of the NRC or an agreement state, except in accordance with a specific license issued by the NRC, Washington, D.C. 20555.

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-232-014 Exemption of C-14 urea diagnostic capsules for human use. (1) Except as provided in subsections (2) and (3) of this section, a person is exempt from the requirements for a license and from this chapter and chapters 246-233 and 246-235 WAC if the person receives, possesses, uses, transfers, owns, or acquires, and does not apply radioactive material to, or incorporate radioactive material into, capsules containing 37 ((kilobecquerels)) kilobecquerels (1 microcurie) of carbon-14 urea (allowing for nominal variation that may occur during the manufacturing process) each, for "in-vivo" diagnostic use for humans.

(2) A person who desires to use the capsules for research involving human subjects must apply for and receive a specific license under chapters 246-240 and 246-235 WAC.

(3) A person who desires to manufacture, prepare, process, produce, package, repackage, or transfer for commercial distribution

these capsules must do so in accordance with a specific license issued by the NRC, Washington, D.C. 20555.

(4) Nothing in this section relieves persons from complying with applicable United States Food and Drug Administration, federal, and state requirements governing receipt, administration, and use of drugs.

NEW SECTION

WAC 246-232-015 Certain industrial devices. (1) 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 and from the regulations in chapters 246-222, 246-221, 246-232, 246-233, 246-235, 246-243, 246-240, and 246-244 WAC 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, or initially transferred in accordance with a specific license which authorizes the initial transfer of the device for use under this chapter. This exemption does not cover sources not incorporated into a device, such as calibration and reference sources.

(2) Any person who desires to manufacture, process, produce, or initially transfer for sale or distribution industrial devices containing radioactive material for use under subsection (1) of this section, shall apply for a license under chapter 246-235 WAC.

AMENDATORY SECTION (Amending WSR 09-06-003, filed 2/18/09, effective 3/21/09)

WAC 246-232-120 Schedule B, exempt quantities of radioactive materials. (See also WAC 246-232-010(2).)

Radioactive Material	Microcuries
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

Radioactive Material	Microcuries
Bromine-82 (Br-82)	10
Cadmium-109 (Cd-109)	10
Cadmium-115m (Cd-115m)	10
Cadmium-115 (Cd-115)	100
Calcium-45 (Ca-45)	10
Calcium-47 (Ca-47)	10
Carbon-14 (C-14)	100
Cerium-141 (Ce-141)	100
Cerium-143 (Ce-143)	100
Cerium-144 (Ce-144)	1
Cesium-129 (Cs-129)	100
Cesium-131 (Cs-131)	1,000
Cesium-134m (Cs-134m)	100
Cesium-134 (Cs-134)	1
Cesium-135 (Cs-135)	10
Cesium-136 (Cs-136)	10
Cesium-137 (Cs-137)	10
Chlorine-36 (Cl-36)	10
Chlorine-38 (Cl-38)	10
Chromium-51 (Cr-51)	1,000
Cobalt-57 (Co-57)	100
Cobalt-58m (Co-58m)	10
Cobalt-58 (Co-58)	10
Cobalt-60 (Co-60)	1
Copper-64 (Cu-64)	100
Dysprosium-165 (Dy-165)	10
Dysprosium-166 (Dy-166)	100
Erbium-169 (Er-169)	100
Erbium-171 (Er-171)	100
Europium-152 (Eu-152) 9.2h	100
Europium-152 (Eu-152) 13 yr	1
Europium-154 (Eu-154)	1
Europium-155 (Eu-155)	10
Fluorine-18 (F-18)	1,000
Gadolinium-153 (Gd-153)	10
Gadolinium-159 (Gd-159)	100
Gallium-67 (Ga-67)	100
Gallium-72 (Ga-72)	10
Germanium-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

Radioactive Material	Microcuries
Indium-113m (In-113m)	100
Indium-114m (In-114m)	10
Indium-115m (In-115m)	100
Indium-115 (In-115)	10
Iodine-123 (I-123)	100
Iodine-125 (I-125)	1
Iodine-126 (I-126)	1
Iodine-129 (I-129)	0.1
Iodine-131 (I-131)	1
Iodine-132 (I-132)	10
Iodine-133 (I-133)	1
Iodine-134 (I-134)	10
Iodine-135 (I-135)	10
Iridium-192 (Ir-192)	10
Iridium-194 (Ir-194)	100
Iron-52 (Fe-52)	10
Iron-55 (Fe-55)	100
Iron-59 (Fe-59)	10
Krypton-85 (Kr-85)	100
Krypton-87 (Kr-87)	10
Lanthanum-140 (La-140)	10
Lutetium-177 (Lu-177)	100
Manganese-52 (Mn-52)	10
Manganese-54 (Mn-54)	10
Manganese-56 (Mn-56)	10
Mercury-197m (Hg-197m)	100
Mercury-197 (Hg-197)	100
Mercury-203 (Hg-203)	10
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)) <u>Os-191</u>	100
Osmium-193 ((Os-193)) <u>Os-193</u>	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

Radioactive Material	Microcuries
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
Radium-226 (Ra-226)	0.1
Rhenium-186 (Re-186)	100
Rhenium-188 (Re-188)	100
Rhodium-103m (Rh-103m)	100
Rhodium-105 (Rh-105)	100
Rubidium-81 (Rb-81)	10
Rubidium-86 (Rb-86)	10
Rubidium-87 (Rb-87)	10
Ruthenium-97 (Ru-97)	100
Ruthenium-103 (Ru-103)	10
Ruthenium-105 (Ru-105)	10
Ruthenium-106 (Ru-106)	1
Samarium-151 (Sm-151)	10
Samarium-153 (Sm-153)	100
Scandium-46 (Sc-46)	10
Scandium-47 (Sc-47)	100
Scandium-48 (Sc-48)	10
Selenium-75 (Se-75)	10
Silicon-31 ((³¹Si) <u>Si-31</u>)	100
Silver-105 (Ag-105)	10
Silver-110m (Ag-110m)	1
Silver-111 (Ag-111)	100
Sodium-22 (Na-22)	10
Sodium-24 (Na-24)	10
Strontium-85 (Sr-85)	10
Strontium-89 (Sr-89)	1
Strontium-90 (Sr-90)	0.1
Strontium-91 (Sr-91)	10
Strontium-92 (Sr-92)	10
Sulphur-35 (S-35)	100
Tantalum-182 (Ta-182)	10
Technetium-96 (Tc-96)	10
Technetium-97m (Tc-97m)	100
Technetium-97 (Tc-97)	100
Technetium-99m (Tc-99m)	100
Technetium-99 (Tc-99)	10
Tellurium-125m (Te-125m)	10
Tellurium-127m (Te-127m)	10

Radioactive Material	Microcuries
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-169 (Yb-169)	10
Ytterbium-175 (Yb-175)	100
Yttrium-87 (Y-87)	10
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

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-232-130 Schedule C, exempt concentrations. (See WAC 246-232-010(1).)

Element (atomic number)	Radionuclide	Column I Gas concentration $\mu\text{Ci}/\text{ml}^1$	Column II Liquid and solid concentration $\mu\text{Ci}/\text{ml}^2$
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}
Europium (63)	Eu-152 (9.2 h)		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}

Element (atomic number)	Radionuclide	Column I Gas concentration $\mu\text{Ci}/\text{ml}^1$	Column II Liquid and solid concentration $\mu\text{Ci}/\text{ml}^2$
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-125	3×10^{-9}	2×10^{-5}
	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)) Nd-147		6×10^{-4}
	((Nd-149)) Nd-149		3×10^{-3}
Nickel (28)	Ni-65		1×10^{-3}
Niobium ((Columbium)) (41)	Nb-95		1×10^{-3}
	Nb-97		9×10^{-3}
Osmium (76)	((Os-185)) Os-185		7×10^{-4}
	((Os-191m)) Os-191m		3×10^{-2}
	((Os-191)) Os-191		2×10^{-3}
	((Os-193)) 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}

Element (atomic number)	Radionuclide	Column I Gas concentration $\mu\text{Ci}/\text{ml}^1$	Column II Liquid and solid concentration $\mu\text{Ci}/\text{ml}^2$
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)	((Is-31) 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^{-3}
	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}

Element (atomic number)	Radionuclide	Column I Gas concentration $\mu\text{Ci}/\text{ml}^1$	Column II Liquid and solid concentration $\mu\text{Ci}/\text{ml}^2$
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 (Wolfram) (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}	
	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 or gamma emitting radioactive material not listed above with half-life less than 3 years		1×10^{-10}	1×10^{-6}

Notes: ¹ Values are given in Column I only for those materials normally used as gases
² $\mu\text{Ci}/\text{gm}$ for solids

Note 1: Many radionuclides decay into nuclides which are also radioactive. In expressing the concentrations in Schedule C the activity stated is that of the parent nuclide and takes into account the daughters.

Note 2: For purposes of WAC 246-232-010(1) where there is involved a combination of nuclides, the limit for the combination should be derived as follows: Determine for each nuclide in the product the ratio between the concentration present in the product and the exempt concentration established in Schedule C for the specific nuclide when not in combination. The sum of such ratios may not exceed "1" (i.e., unity).

Example:

$$\frac{\text{Concentration of Nuclide A in Product}}{\text{Exempt concentration of Nuclide A}} + \frac{\text{Concentration of Nuclide B in Product}}{\text{Exempt concentration of Nuclide B}} \leq 1$$

Note 3: For the purpose of determining concentration in a product or device, the total quantity of radioactive material present is divided by only that weight or volume of the discrete part or component throughout which the radioactive material is relatively uniformly distributed. If the weight or volume of this part or component cannot be determined then the product or device should be evaluated on the basis of the total quantity of radioactive material present.

WAC 246-231-040 Exemptions. (1) Common and contract carriers, freight forwarders, ((and)) warehouse workers ((~~who are subject to the rules and regulations of the United States Department of Transportation (49 C.F.R. 170 through 189) or the United States Postal Service (Mailing Standards of the United States Postal Service, Domestic Mail Manual, 39 C.F.R. 111.1)~~)), and the U.S. Postal Service are exempt from this chapter and chapters 246-232, 246-233, 246-235, 246-237, 246-240, 246-243, and 246-244 WAC to the extent that they transport or store radioactive material in the regular course of their carriage for another or storage incident thereto. Common and contract carriers who are not subject to the rules and regulations of the DOT or United States Postal Service are subject to WAC 246-231-005 and other applicable sections of these regulations.

(2) Any licensee who delivers radioactive material to a carrier for transport, where such transport is subject to the regulations of the United States Postal Service, is exempt from the provisions of WAC 246-231-005.

(3) **Exemption of physicians.** Any physician as defined in WAC 246-220-010 who is licensed by the department, NRC or an agreement state, to dispense drugs in the practice of medicine, is exempt from WAC 246-220-030 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 246-240 WAC, 10 C.F.R. 35, or the equivalent agreement state regulations.

(4) **Exemption for low-level materials.** A licensee is exempt from all requirements of this chapter with respect to shipment or carriage of the following low-level materials:

(a) Natural material and ores containing naturally occurring radionuclides that are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed ten times the values specified in WAC 246-231-200, Table A-2.

(b) Materials for which the activity concentration is not greater than the activity concentration values specified in WAC 246-231-200, Table A-2, or for which the consignment activity is not greater than the limit for an exempt consignment found in WAC 246-231-200, Table A-2.

(5) **Exemption from classification as fissile material.** Fissile material meeting at least one of the requirements in (a) through (f) of this subsection is exempt from classification as fissile material and from the fissile material package standards of 10 C.F.R. 71.55 and 71.59, but are subject to all other requirements of this chapter, except as noted.

(a) Individual package containing 2 grams or less fissile material.

(b) Individual or bulk packaging containing 15 grams or less of fissile material provided the package has at least 200 grams of solid nonfissile material for every gram of fissile material. Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass for solid nonfissile material.

(c)(i) Low concentrations of solid fissile material commingled with solid nonfissile material, provided that:

(A) There are at least 2000 grams of solid nonfissile material for every gram of fissile material; and

(B) There are 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.

(d) Uranium enriched in uranium-235 to a maximum of 1 percent by weight, and with total plutonium and uranium-233 content of up to 1 percent of the mass of uranium-235, provided that the mass of any beryllium, graphite, and hydrogenous material enriched in deuterium constitutes less than 5 percent of the uranium mass.

(e) Liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2 percent by mass, with a total plutonium and uranium-233 content not exceeding 0.002 percent of the mass of uranium, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2. The material must be contained in at least a DOT Type A package.

(f) Packages containing, individually, a total plutonium mass of not more than 1000 grams, of which not more than 20 percent by mass may consist of plutonium-239, plutonium-241, or any combination of these radionuclides.

AMENDATORY SECTION (Amending WSR 14-09-017, filed 4/7/14, effective 5/8/14)

WAC 246-231-200 Appendix A—Determination of A1 and A2. (1) Values of A1 and A2 for individual radionuclides, which are the basis for many activity limits elsewhere in these regulations, are given in this section, 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 A1 or A2 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 which are not listed in this section, Table A-1, the A1 and A2 values contained in this section, Table A-3 may be used. Otherwise, the licensee shall obtain prior NRC approval of the A1 and A2 values for radionuclides not listed in this section, Table A-1, before shipping the material.

(b) For individual radionuclides whose identities are known, but which are not listed in this section, Table A-2, the exempt material activity concentration and exempt consignment activity values contained in this section, Table A-3 may be used. Otherwise, the licensee shall obtain prior NRC approval of the exempt material activity concentration and exempt consignment activity values for radionuclides not listed in this section, Table A-2, before shipping the material.

(c) The licensee shall submit requests for prior approval, described under (a) and (b) of this subsection, to NRC in accordance with 10 C.F.R. 71.1.

(3) In the calculations of A1 and A2 for a radionuclide not in this section, Table A-1, a single radioactive decay chain, in which

radionuclides are present in their naturally occurring proportions, and in which no daughter radionuclide has a half-life either longer than ten days, or longer than that of the parent radionuclide, shall be considered as a single radionuclide, and the activity to be taken into account, and the A1 or A2 value to be applied shall be those corresponding to the parent radionuclide of that chain. In the case of radioactive decay chains in which any daughter radionuclide has a half-life either longer than ten days, or greater than that of the parent radionuclide, the parent and those daughter radionuclides shall be considered as mixtures of different radionuclides.

(4) For mixtures of radionuclides whose identities and respective activities are known, the following conditions apply:

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

$$\sum_I \frac{B(i)}{A1(i)} \quad \text{less than or equal to 1}$$

Where B(i) is the activity of radionuclide I, and A1(i) is the A1 value for radionuclide I.

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

$$\sum_I \frac{B(i)}{A2(i)} \quad \text{less than or equal to 1}$$

Where B(i) is the activity of radionuclide I and A2(i) is the A2 value for radionuclide I.

(c) Alternatively, the A1 value for mixtures of special form material may be determined as follows:

$$A1 \text{ for mixture} = \frac{1}{\sum_I \frac{f(i)}{A1(i)}}$$

Where f(i) is the fraction of activity for radionuclide I in the mixture and A1(i) is the appropriate A1 value for radionuclide I.

(d) Alternatively, the A2 value for mixtures of normal form material may be determined as follows:

$$A2 \text{ for mixture} = \frac{1}{\sum_I \frac{f(i)}{A2(i)}}$$

Where f(i) is the fraction of activity for radionuclide I in the mixture and A2(i) is the appropriate A2 value for radionuclide I.

(e) 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 of material containing radionuclide I.

(f) The activity limit for an exempt consignment for mixtures of radionuclides may be determined as follows:

$$\text{Exempt consignment activity limit for mixture} = \frac{1}{\sum_I \frac{f(i)}{A(i)}}$$

Where f(i) is the fraction of activity of radionuclide I in the mixture, and A is the activity limit for exempt consignments for radionuclide I.

(5) When the identity of each radionuclide is known, but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest A1 or A2 value, as appropriate, for the radionuclides in each group may be used in applying the formulas in subsection (4) of this section. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest A1 or A2 values for the alpha emitters and beta/gamma emitters.

Table A-1.—A1 and A2 Values for Radionuclides

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (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

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (Ci) ^b	Specific activity	
						(TBq/g)	(Ci/g)
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
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 (h)		5.0X10 ⁻²	1.4	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

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (Ci) ^b	Specific activity	
						(TBq/g)	(Ci/g)
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
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
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

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (Ci) ^b	Specific activity	
						(TBq/g)	(Ci/g)
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
Ir-192 (c)		1.0	2.7X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	3.4X10 ²	9.2X10 ³
Ir-194		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	3.1X10 ⁴	8.4X10 ⁵
K-40	Potassium (19)	9.0X10 ⁻¹	2.4X10 ¹	9.0X10 ⁻¹	2.4X10 ¹	2.4X10 ⁻⁷	6.4X10 ⁻⁶
K-42		2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	2.2X10 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-81	Krypton (36)	4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	7.8X10 ⁻⁴	2.1X10 ⁻²
Kr-85		1.0X10 ¹	2.7X10 ²	1.0X10 ¹	2.7X10 ²	1.5X10 ¹	3.9X10 ²
Kr-85m		8.0	2.2X10 ²	3.0	8.1X10 ¹	3.0X10 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

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (Ci) ^b	Specific activity	
						(TBq/g)	(Ci/g)
Lu-174m		2.0X10 ¹	5.4X10 ²	1.0X10 ¹	2.7X10 ²	2.0X10 ²	5.3X10 ³
Lu-177		3.0X10 ¹	8.1X10 ²	7.0X10 ⁻¹	1.9X10 ¹	4.1X10 ³	1.1X10 ⁵
Mg-28 (a)	Magnesium (12)	3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	2.0X10 ⁵	5.4X10 ⁶
Mn-52	Manganese (25)	3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	1.6X10 ⁴	4.4X10 ⁵
Mn-53		Unlimited	Unlimited	Unlimited	Unlimited	6.8X10 ⁻⁵	1.8X10 ⁻³
Mn-54		1.0	2.7X10 ¹	1.0	2.7X10 ¹	2.9X10 ²	7.7X10 ³
Mn-56		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	8.0X10 ⁵	2.2X10 ⁷
Mo-93	Molybdenum (42)	4.0X10 ¹	1.1X10 ³	2.0X10 ¹	5.4X10 ²	4.1X10 ⁻²	1.1
Mo-99 (a) (i)		1.0	2.7X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.8X10 ⁴	4.8X10 ⁵
N-13	Nitrogen (7)	9.0X10 ⁻¹	2.4X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	5.4X10 ⁷	1.5X10 ⁹
Na-22	Sodium (11)	5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	2.3X10 ²	6.3X10 ³
Na-24		2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	3.2X10 ⁵	8.7X10 ⁶
Nb-93m	Niobium (41)	4.0X10 ¹	1.1X10 ³	3.0X10 ¹	8.1X10 ²	8.8	2.4X10 ²
Nb-94		7.0X10 ⁻¹	1.9X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	6.9X10 ⁻³	1.9X10 ⁻¹
Nb-95		1.0	2.7X10 ¹	1.0	2.7X10 ¹	1.5X10 ³	3.9X10 ⁴
Nb-97		9.0X10 ⁻¹	2.4X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	9.9X10 ⁵	2.7X10 ⁷
Nd-147	Neodymium (60)	6.0	1.6X10 ²	6.0X10 ⁻¹	1.6X10 ¹	3.0X10 ³	8.1X10 ⁴
Nd-149		6.0X10 ⁻¹	1.6X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	4.5X10 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
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	6.2X10 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

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (Ci) ^b	Specific activity	
						(TBq/g)	(Ci/g)
Pm-143	Promethium (61)	3.0	8.1X10 ¹	3.0	8.1X10 ¹	1.3X10 ²	3.4X10 ³
Pm-144		7.0X10 ⁻¹	1.9X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	9.2X10 ¹	2.5X10 ³
Pm-145		3.0X10 ¹	8.1X10 ²	1.0X10 ¹	2.7X10 ²	5.2	1.4X10 ²
Pm-147		4.0X10 ¹	1.1X10 ³	2.0	5.4X10 ¹	3.4X10 ¹	9.3X10 ²
Pm-148m (a)		8.0X10 ⁻¹	2.2X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	7.9X10 ²	2.1X10 ⁴
Pm-149		2.0	5.4X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.5X10 ⁴	4.0X10 ⁵
Pm-151		2.0	5.4X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	2.7X10 ⁴	7.3X10 ⁵
Po-210	Polonium (84)	4.0X10 ¹	1.1X10 ³	2.0X10 ⁻²	5.4X10 ⁻¹	1.7X10 ²	4.5X10 ³
Pr-142	Praseodymium (59)	4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	4.3X10 ⁴	1.2X10 ⁶
Pr-143		3.0	8.1X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	2.5X10 ³	6.7X10 ⁴
Pt-188 (a)	Platinum (78)	1.0	2.7X10 ¹	8.0X10 ⁻¹	2.2X10 ¹	2.5X10 ³	6.8X10 ⁴
Pt-191		4.0	1.1X10 ²	3.0	8.1X10 ¹	8.7X10 ³	2.4X10 ⁵
Pt-193		4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	1.4	3.7X10 ¹
Pt-193m		4.0X10 ¹	1.1X10 ³	5.0X10 ⁻¹	1.4X10 ¹	5.8X10 ³	1.6X10 ⁵
Pt-195m		1.0X10 ¹	2.7X10 ²	5.0X10 ⁻¹	1.4X10 ¹	6.2X10 ³	1.7X10 ⁵
Pt-197		2.0X10 ¹	5.4X10 ²	6.0X10 ⁻¹	1.6X10 ¹	3.2X10 ⁴	8.7X10 ⁵
Pt-197m		1.0X10 ¹	2.7X10 ²	6.0X10 ⁻¹	1.6X10 ¹	3.7X10 ⁵	1.0X10 ⁷
Pu-236	Plutonium (94)	3.0X10 ¹	8.1X10 ²	3.0X10 ⁻³	8.1X10 ⁻²	2.0X10 ¹	5.3X10 ²
Pu-237		2.0X10 ¹	5.4X10 ²	2.0X10 ¹	5.4X10 ²	4.5X10 ²	1.2X10 ⁴
Pu-238		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	6.3X10 ⁻¹	1.7X10 ¹
Pu-239		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	2.3X10 ⁻³	6.2X10 ⁻²
Pu-240		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	8.4X10 ⁻³	2.3X10 ⁻¹
Pu-241 (a)		4.0X10 ¹	1.1X10 ³	6.0X10 ⁻²	1.6	3.8	1.0X10 ²
Pu-242		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	1.5X10 ⁻⁴	3.9X10 ⁻³
Pu-244 (a)		4.0X10 ⁻¹	1.1X10 ¹	1.0X10 ⁻³	2.7X10 ⁻²	6.7X10 ⁻⁷	1.8X10 ⁻⁵
Ra-223 (a)	Radium (88)	4.0X10 ⁻¹	1.1X10 ¹	7.0X10 ⁻³	1.9X10 ⁻¹	1.9X10 ³	5.1X10 ⁴
Ra-224 (a)		4.0X10 ⁻¹	1.1X10 ¹	2.0X10 ⁻²	5.4X10 ⁻¹	5.9X10 ³	1.6X10 ⁵
Ra-225 (a)		2.0X10 ⁻¹	5.4	4.0X10 ⁻³	1.1X10 ⁻¹	1.5X10 ³	3.9X10 ⁴
Ra-226 (a)		2.0X10 ⁻¹	5.4	3.0X10 ⁻³	8.1X10 ⁻²	3.7X10 ⁻²	1.0
Ra-228 (a)		6.0X10 ⁻¹	1.6X10 ¹	2.0X10 ⁻²	5.4X10 ⁻¹	1.0X10 ¹	2.7X10 ²
Rb-81	Rubidium (37)	2.0	5.4X10 ¹	8.0X10 ⁻¹	2.2X10 ¹	3.1X10 ⁵	8.4X10 ⁶
Rb-83 (a)		2.0	5.4X10 ¹	2.0	5.4X10 ¹	6.8X10 ²	1.8X10 ⁴
Rb-84		1.0	2.7X10 ¹	1.0	2.7X10 ¹	1.8X10 ³	4.7X10 ⁴
Rb-86		5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	3.0X10 ³	8.1X10 ⁴
Rb-87		Unlimited	Unlimited	Unlimited	Unlimited	3.2X10 ⁻⁹	8.6X10 ⁻⁸
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

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (Ci) ^b	Specific activity	
						(TBq/g)	(Ci/g)
Rh-102m		2.0	5.4X10 ¹	2.0	5.4X10 ¹	2.3X10 ²	6.2X10 ³
Rh-103m		4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	1.2X10 ⁶	3.3X10 ⁷
Rh-105		1.0X10 ¹	2.7X10 ²	8.0X10 ⁻¹	2.2X10 ¹	3.1X10 ⁴	8.4X10 ⁵
Rn-222 (a)	Radon (86)	3.0X10 ⁻¹	8.1	4.0X10 ⁻³	1.1X10 ⁻¹	5.7X10 ³	1.5X10 ⁵
Ru-97	Ruthenium (44)	5.0	1.4X10 ²	5.0	1.4X10 ²	1.7X10 ⁴	4.6X10 ⁵
Ru-103 (a)		2.0	5.4X10 ¹	2.0	5.4X10 ¹	1.2X10 ³	3.2X10 ⁴
Ru-105		1.0	2.7X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	2.5X10 ⁵	6.7X10 ⁶
Ru-106 (a)		2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	1.2X10 ²	3.3X10 ³
S-35	Sulphur (16)	4.0X10 ¹	1.1X10 ³	3.0	8.1X10 ¹	1.6X10 ³	4.3X10 ⁴
Sb-122	Antimony (51)	4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.5X10 ⁴	4.0X10 ⁵
Sb-124		6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	6.5X10 ²	1.7X10 ⁴
Sb-125		2.0	5.4X10 ¹	1.0	2.7X10 ¹	3.9X10 ¹	1.0X10 ³
Sb-126		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	3.1X10 ³	8.4X10 ⁴
Sc-44	Scandium (21)	5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	6.7X10 ⁵	1.8X10 ⁷
Sc-46		5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	1.3X10 ³	3.4X10 ⁴
Sc-47		1.0X10 ¹	2.7X10 ²	7.0X10 ⁻¹	1.9X10 ¹	3.1X10 ⁴	8.3X10 ⁵
Sc-48		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	5.5X10 ⁴	1.5X10 ⁶
Se-75	Selenium (34)	3.0	8.1X10 ¹	3.0	8.1X10 ¹	5.4X10 ²	1.5X10 ⁴
Se-79		4.0X10 ¹	1.1X10 ³	2.0	5.4X10 ¹	2.6X10 ⁻³	7.0X10 ⁻²
Si-31	Silicon (14)	6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.4X10 ⁶	3.9X10 ⁷
Si-32		4.0X10 ¹	1.1X10 ³	5.0X10 ⁻¹	1.4X10 ¹	3.9	1.1X10 ²
Sm-145	Samarium (62)	1.0X10 ¹	2.7X10 ²	1.0X10 ¹	2.7X10 ²	9.8X10 ¹	2.6X10 ³
Sm-147		Unlimited	Unlimited	Unlimited	Unlimited	8.5X10 ⁻¹	2.3X10 ⁻⁸
Sm-151		4.0X10 ¹	1.1X10 ³	1.0X10 ¹	2.7X10 ²	9.7X10 ⁻¹	2.6X10 ¹
Sm-153		9.0	2.4X10 ²	6.0X10 ⁻¹	1.6X10 ¹	1.6X10 ⁴	4.4X10 ⁵
Sn-113 (a)	Tin (50)	4.0	1.1X10 ²	2.0	5.4X10 ¹	3.7X10 ²	1.0X10 ⁴
Sn-117m		7.0	1.9X10 ²	4.0X10 ⁻¹	1.1X10 ¹	3.0X10 ³	8.2X10 ⁴
Sn-119m		4.0X10 ¹	1.1X10 ³	3.0X10 ¹	8.1X10 ²	1.4X10 ²	3.7X10 ³
Sn-121m (a)		4.0X10 ¹	1.1X10 ³	9.0X10 ⁻¹	2.4X10 ¹	2.0	5.4X10 ¹
Sn-123		8.0X10 ⁻¹	2.2X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	3.0X10 ²	8.2X10 ³
Sn-125		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ³	1.1X10 ⁵
Sn-126 (a)		6.0X10 ⁻¹	1.6X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.0X10 ⁻³	2.8X10 ⁻²
Sr-82 (a)	Strontium (38)	2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	2.3X10 ³	6.2X10 ⁴
Sr-85		2.0	5.4X10 ¹	2.0	5.4X10 ¹	8.8X10 ²	2.4X10 ⁴
Sr-85m		5.0	1.4X10 ²	5.0	1.4X10 ²	1.2X10 ⁶	3.3X10 ⁷
Sr-87m		3.0	8.1X10 ¹	3.0	8.1X10 ¹	4.8X10 ⁵	1.3X10 ⁷
Sr-89		6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.1X10 ³	2.9X10 ⁴
Sr-90 (a)		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	5.1	1.4X10 ²
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
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

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (Ci) ^b	Specific activity	
						(TBq/g)	(Ci/g)
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	(3.1X10⁴) 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
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

Symbol of radionuclide	Element and atomic number	A1 (TBq)	A1 (Ci) ^b	A2 (TBq)	A2 (Ci) ^b	Specific activity	
						(TBq/g)	(Ci/g)
U-233 (slow lung absorption) (f)		4.0X10 ¹	1.1X10 ³	6.0X10 ⁻³	1.6X10 ⁻¹	3.6X10 ⁻⁴	9.7X10 ⁻³
U-234 (fast lung absorption) (d)		4.0X10 ¹	1.1X10 ³	9.0X10 ⁻²	2.4	2.3X10 ⁻⁴	6.2X10 ⁻³
U-234 (medium lung absorption) (e)		4.0X10 ¹	1.1X10 ³	2.0X10 ⁻²	5.4X10 ⁻¹	2.3X10 ⁻⁴	6.2X10 ⁻³
U-234 (slow lung absorption) (f)		4.0X10 ¹	1.1X10 ³	6.0X10 ⁻³	1.6X10 ⁻¹	2.3X10 ⁻⁴	6.2X10 ⁻³
U-235 (all lung absorption types) (a), (d), (e), (f)		Unlimited	Unlimited	Unlimited	Unlimited	8.0X10 ⁻⁸	2.2X10 ⁻⁶
U-236 (fast lung absorption) (d)		Unlimited	Unlimited	Unlimited	Unlimited	2.4X10 ⁻⁶	6.5X10 ⁻⁵
U-236 (medium lung absorption) (e)		4.0X10 ¹	1.1X10 ³	2.0X10 ⁻²	5.4X10 ⁻¹	2.4X10 ⁻⁶	6.5X10 ⁻⁵
U-236 (slow lung absorption) (f)		4.0X10 ¹	1.1X10 ³	6.0X10 ⁻³	1.6X10 ⁻¹	2.4X10 ⁻⁶	6.5X10 ⁻⁵
U-238 (all lung absorption types) (d), (e), (f)		Unlimited	Unlimited	Unlimited	Unlimited	1.2X10 ⁻⁸	3.4X10 ⁻⁷
U (nat)		Unlimited	Unlimited	Unlimited	Unlimited	2.6X10 ⁻⁸	7.1X10 ⁻⁷
U (enriched to 20% or less) (g)		Unlimited	Unlimited	Unlimited	Unlimited	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
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) A₁ or A₂ values include contributions from daughter nuclides with half-lives less than ten days.

- (b) (Reserved.)
- (c) The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.
- (d) These values apply only to compounds of uranium that take the chemical form of UF₆, UO₂F₂ and UO₂(NO₃)₂ in both normal and accident conditions of transport.
- (e) These values apply only to compounds of uranium that take the chemical form of UO₃, UF₄, UCl₄ 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) A₁ = 0.1 TBq (2.7 Ci) and A₂ = 0.001 TBq (0.027 Ci) for Cf-252 for domestic use.
- (i) A₂ = 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
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

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)
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
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

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)
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
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

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)
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
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-81	Krypton (36)	1.0X10 ⁴	2.7X10 ⁻⁷	1.0X10 ⁷	2.7X10 ⁻⁴
Kr-85	-	1.0X10 ⁵	2.7X10 ⁻⁶	1.0X10 ⁴	2.7X10 ⁻⁷
Kr-85m	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ¹⁰	2.7X10 ⁻¹
Kr-87	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁹	2.7X10 ⁻²
La-137	Lanthanum (57)	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ⁷	2.7X10 ⁻⁴
La-140	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁵	2.7X10 ⁻⁶
Lu-172	Lutetium (71)	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁶	2.7X10 ⁻⁵
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

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)
Nb-95	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁶	2.7X10 ⁻⁵
Nb-97	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁶	2.7X10 ⁻⁵
Nd-147	Neodymium (60)	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁶	2.7X10 ⁻⁵
Nd-149	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁶	2.7X10 ⁻⁵
Ni-59	Nickel (28)	1.0X10 ⁴	2.7X10 ⁻⁷	1.0X10 ⁸	2.7X10 ⁻³
Ni-63	-	1.0X10 ⁵	2.7X10 ⁻⁶	1.0X10 ⁸	2.7X10 ⁻³
Ni-65	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁶	2.7X10 ⁻⁵
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
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

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)
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
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

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)
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
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 ⁵	2.7X10 ⁻⁶
Te-123m	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁷	2.7X10 ⁻⁴
Te-125m	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ⁷	2.7X10 ⁻⁴
Te-127	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ⁶	2.7X10 ⁻⁵
Te-127m	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ⁷	2.7X10 ⁻⁴

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)
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
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 absorption) (f)	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁵	2.7X10 ⁻⁶
U-234 (fast lung absorption) (d)	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁴	2.7X10 ⁻⁷
U-234 (medium lung absorption) (e)	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁵	2.7X10 ⁻⁶
U-234 (slow lung absorption) (f)	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁵	2.7X10 ⁻⁶
U-235 (all lung absorption types) (b), (d), (e), (f)	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁴	2.7X10 ⁻⁷
U-236 (fast lung absorption) (d)	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁴	2.7X10 ⁻⁷
U-236 (medium lung absorption) (e)	-	1.0X10 ²	2.7X10 ⁻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

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)
W-187	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁶	2.7X10 ⁻⁵
W-188	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁵	2.7X10 ⁻⁶
Xe-122	Xenon (54)	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁹	2.7X10 ⁻²
Xe-123	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁹	2.7X10 ⁻²
Xe-127	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ⁵	2.7X10 ⁻⁶
Xe-131m	-	1.0X10 ⁴	2.7X10 ⁻⁷	1.0X10 ⁴	2.7X10 ⁻⁷
Xe-133	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ⁴	2.7X10 ⁻⁷
Xe-135	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ¹⁰	2.7X10 ⁻¹
Y-87	Yttrium (39)	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁶	2.7X10 ⁻⁵
Y-88	-	1.0X10 ¹	2.7X10 ⁻¹⁰	1.0X10 ⁶	2.7X10 ⁻⁵
Y-90	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ⁵	2.7X10 ⁻⁶
Y-91	-	1.0X10 ³	2.7X10 ⁻⁸	1.0X10 ⁶	2.7X10 ⁻⁵
Y-91m	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁶	2.7X10 ⁻⁵
Y-92	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁵	2.7X10 ⁻⁶
Y-93	-	1.0X10 ²	2.7X10 ⁻⁹	1.0X10 ⁵	2.7X10 ⁻⁶
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
Cs-137	Ba-137m
Ce-134	La-134
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-220	Po-216
Rn-222	Po-218, Pb-214, Bi-214, Po-214
Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-226	Ra-222, Rn-218, Po-214
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
U-240	Np-240m
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

(c) (Reserved)

(d) These values apply only to compounds of uranium that take the chemical form of UF₆, UO₂F₂ and UO₂(NO₃)₂ in both normal and accident conditions of transport.

- (e) These values apply only to compounds of uranium that take the chemical form of UO₃, UF₄, UCl₄ 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 A1 and A2

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 x 10 ⁻¹	2.7 x 10 ⁰	2 x 10 ⁻²	5.4 x 10 ⁻¹	1 x 10 ¹	2.7 x 10 ⁻¹⁰	1 x 10 ⁴	2.7 x 10 ⁻⁷
Only alpha emitting radionuclides are known to be present	2 x 10 ⁻¹	5.4 x 10 ⁰	9 x 10 ⁻⁵	2.4 x 10 ⁻³	1 x 10 ⁻¹	2.7 x 10 ⁻¹²	1 x 10 ³	2.7 x 10 ⁻⁸
No relevant data are available	1 x 10 ⁻³	2.7 x 10 ⁻²	9 x 10 ⁻⁵	2.4 x 10 ⁻³	1 x 10 ⁻¹	2.7 x 10 ⁻¹²	1 x 10 ³	2.7 x 10 ⁻⁸

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 x 10 ⁻⁸	5.0 x 10 ⁻⁷
0.72	2.6 x 10 ⁻⁸	7.1 x 10 ⁻⁷
1	2.8 x 10 ⁻⁸	7.6 x 10 ⁻⁷
1.5	3.7 x 10 ⁻⁸	1.0 x 10 ⁻⁶
5	1.0 x 10 ⁻⁷	2.7 x 10 ⁻⁶
10	1.8 x 10 ⁻⁷	4.8 x 10 ⁻⁶
20	3.7 x 10 ⁻⁷	1.0 x 10 ⁻⁵
35	7.4 x 10 ⁻⁷	2.0 x 10 ⁻⁵
50	9.3 x 10 ⁻⁷	2.5 x 10 ⁻⁵
90	2.2 x 10 ⁻⁶	5.8 x 10 ⁻⁵
93	2.6 x 10 ⁻⁶	7.0 x 10 ⁻⁵
95	3.4 x 10 ⁻⁶	9.1 x 10 ⁻⁵

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

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-220-007 Statement of philosophy. In accordance with the recommendations of the Environmental Protection Agency, formerly the Federal Radiation Council, approved by the president of the United States of America, persons engaged in activities under licenses issued by the Washington state department of health pursuant to the Atomic Energy Act of 1954, as amended, shall, in addition to complying with the requirements set forth in chapter 246-221 WAC, make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable. Such persons should make particular efforts to keep the radiation exposure of an embryo or fetus as low as is reasonably achievable during the entire gestation period as recommended by the National Council on Radiation Protection and Measurements. The term "as low as is reasonably achievable" (~~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 the 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 the utilization of nuclear energy, ionizing radiation, and radioactive materials in the public interest~~) has the same meaning as defined in WAC 246-220-010(10).

AMENDATORY SECTION (Amending WSR 15-06-015, filed 2/23/15, effective 3/26/15)

WAC 246-220-010 Definitions, abbreviations, and acronyms. The definitions, abbreviations, and acronyms in this section apply throughout chapters 246-220 through 246-254 WAC unless the context clearly indicates otherwise. Additional definitions used only in a certain chapter are included in that chapter.

(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) **"Accelerator produced material"** means any material made radioactive by exposing it in a particle accelerator.

(3) **"Act"** means (~~nuclear energy and radiation, chapter 70.98 RCW~~) the Atomic Energy Act of 1954, including any amendments thereto.

(4) **"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).

(5) **"Adult"** means an individual eighteen or more years of age.

(6) **"Agreement state"** means any state with which the Atomic Energy Commission or the NRC has entered into an effective agreement under subsection 274b of the (~~Atomic Energy Act of 1954, as amended~~) act. Nonagreement state means any other state.

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

(8) **"Airborne radioactivity area"** means a room, enclosure, or operating area in which airborne radioactive material exists in concentrations (a) in excess of the derived air concentration (DAC) specified in WAC 246-221-290, Appendix A, or (b) to the degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or twelve DAC-hours.

(9) **"Air purifying respirator"** means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

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

(11) **"Alert"** means events may occur, are in progress, or have occurred that could lead to a release of radioactive material but that the release is not expected to require a response by off-site response organizations to protect persons off-site.

(12) **"ALI (annual limit on intake)"** means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 0.05 Sv (5 rem) or a committed dose equivalent of 0.5 Sv (50 rem) to any individual organ or tissue. ALI values for intake by ingestion and by inhalation of selected radionuclides are given in WAC 246-221-290.

(13) **"APF (assigned protection factor)"** means the expected workplace level of respiratory protection that would be provided by a properly functioning respirator or a class of respirators to properly fitted and trained users. Operationally, the inhaled concentration can be estimated by dividing the ambient airborne concentration by the APF.

(14) **"Atmosphere-supplying respirator"** means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes SARs and SCBA units.

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

(16) **"Bq (becquerel)"** means the SI unit of activity. One becquerel is equal to 1 disintegration or transformation per second (s^{-1}).

(17) **"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 rules, "radiobioassay" is an equivalent term.

(18) **"By-product material"** means:

(a) 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;

(b) 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 "by-product material" within this definition;

(c)(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

(d) Any discrete source of naturally occurring radioactive material, other than source material, that:

(i) The (~~commission~~) 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 what 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 for in a commercial, medical, or research activity.

(19) **"Calendar quarter"** means at least twelve but no more than fourteen consecutive weeks. The first calendar quarter of each year begins in January and subsequent calendar quarters shall be arranged so 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. A licensee or registrant may not change the method of determining calendar quarters for purposes of these rules.

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

(21) **"C.F.R."** means Code of Federal Regulations.

(22) **"Class"** means a classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y, which applies to a range of clearance half-times: For Class D, Days, of less than ten days, for Class W, Weeks, from ten to one hundred days, and for Class Y, Years, of greater than one hundred days. For purposes of these rules, "lung class" and "inhalation class" are equivalent terms. For "class of waste" see WAC 246-249-040.

(23) **"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.

(24) **"Commencement of construction"** means taking any action defined as construction or any other activity at the site of a facility subject to the regulations in this chapter that has a reasonable nexus to radiological health and safety.

(25) **"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 fifty-year period following the intake.

(26) **"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 ($H_{E,50} = \sum w_T H_{T,50}$).

(27) **"Consortium"** means an association of medical use licensees and a PET radionuclide production facility in the same geographical area that jointly own or share in the operation and maintenance cost of the PET radionuclide production facility that produces PET radionuclides for use in producing radioactive drugs within the consortium for noncommercial distributions among its associated members for medical use. The PET radionuclide production facility within the consortium must be located at an educational institution or a federal facility or a medical facility.

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

(29) **"Construction"** means the installation of foundations, or in-place assembly, erection, fabrication, or testing for any structure, system, or component of a facility or activity subject to the requirements in chapters 246-220 through 246-254 WAC that are related to radiological safety or security. The term construction does not include:

(a) Changes for temporary use of the land for public recreational purposes;

(b) Site exploration, including necessary borings to determine foundation conditions or other preconstruction monitoring to establish background information related to the suitability of the site, the environmental impacts of construction or operation, or the protection of environmental values;

(c) Preparation of the site for construction of the facility, including clearing of the site, grading, installation of drainage, erosion and other environmental mitigation measures, and construction of temporary roads and borrow areas;

(d) Erection of fences and other access control measures that are not related to the safe use of, or security of, radiological materials;

(e) Excavation;

(f) Erection of support buildings (e.g., construction equipment storage sheds, warehouse and shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and office buildings) for use in connection with the construction of the facility;

(g) Building of service facilities (e.g., paved roads, parking lots, railroad spurs, exterior utility and lighting systems, potable water systems, sanitary sewerage treatment facilities, and transmission lines);

(h) Procurement or fabrication of components or portions of the proposed facility occurring at other than the final in-place location at the facility; or

(i) Taking any other action that has no reasonable nexus to radiological health and safety.

(30) **"Controlled area."** See "Restricted area."

(31) **"Curie"** means a unit of quantity of radioactivity. One curie (Ci) is that quantity of radioactive material which decays at the rate of 3.7×10^{10} transformations per second (tps).

(32) **"Declared pregnant woman"** means a woman who has voluntarily informed the licensee or registrant, in writing, of her pregnancy, and the estimated date of conception. The declaration remains in effect until the declared pregnant woman withdraws the declaration in writing or is no longer pregnant.

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

(34) **"Demand respirator"** means an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

(35) **"Department"** means the Washington state department of health, which has been designated as the state radiation control agency under chapter 70.98 RCW.

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

(37) **"Derived air concentration"** (DAC) means the concentration of a given radionuclide in air which, if breathed by the reference man for a working year of two thousand hours under conditions of light work, results in an intake of one ALI. For purposes of these rules, the condition of light work is an inhalation rate of 1.2 cubic meters of air per hour for two thousand hours in a year. DAC values are given in WAC 246-221-290.

(38) **"DAC-hour (derived air concentration-hour)"** means the product of the concentration of radioactive material in air, expressed as a fraction or multiple of the derived air concentration for each radionuclide, and the time of exposure to that radionuclide, in hours. A licensee or registrant may take two thousand DAC-hours to represent one ALI, equivalent to a committed effective dose equivalent of 0.05 Sv (5 rem).

(39) **"Discrete source"** means a radionuclide that has been processed so that its concentration within a material has been purposely increased for use for commercial, medical or research activities.

(40) **"Disposable respirator"** means a respirator for which maintenance is not intended and that is designed to be discarded after excessive breathing resistance, sorbent exhaustion, physical damage, or end-of-service-life renders it unsuitable for use. Examples of this type of respirator are a disposable half-mask respirator or a disposable escape-only self-contained breathing apparatus (SCBA).

(41) **"Dose"** is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, total organ dose equivalent, or total effective dose equivalent. For purposes of these rules, "radiation dose" is an equivalent term.

(42) **"Dose commitment"** means the total radiation dose to a part of the body that will result from retention in the body of radioactive material. For purposes of estimating the dose commitment, it is assumed that from the time of intake the period of exposure to retained material will not exceed fifty years.

(43) **"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.

(44) **"Dose limits"** means the permissible upper bounds of radiation doses established in accordance with these rules. For purposes of these rules, "limits" is an equivalent term.

(45) **"Dosimetry processor"** means a person that processes and evaluates individual monitoring devices in order to determine the radiation dose delivered to the monitoring devices.

(46) **"dpm"** means disintegrations per minute. See also "curie."

(47) **"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 ($H_E = \sum w_T H_T$).

(48) **"Embryo/fetus"** means the developing human organism from conception until the time of birth.

(49) **"Entrance or access point"** means any opening through which an individual or extremity of an individual could gain access to radiation areas or to licensed radioactive materials. This includes entry or exit portals of sufficient size to permit human entry, without respect to their intended use.

(50) **"Exposure"** means (a) being exposed to ionizing radiation or to radioactive material, or (b) the quotient of dQ by dm where " dQ " is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass " dm " are completely stopped in air. The special unit of exposure is the roentgen (R) and the SI equivalent is the coulomb per kilogram (c/kg). One roentgen is equal to 2.58×10^{-4} coulomb per kilogram of air.

(51) **"Exposure rate"** means the exposure per unit of time, such as roentgen per minute and milliroentgen per hour.

(52) **"External dose"** means that portion of the dose equivalent received from any source of radiation outside the body.

(53) **"Extremity"** means hand, elbow, arm below the elbow, foot, knee, and leg below the knee.

(54) **"Filtering facepiece"** (dust mask) means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium, not equipped with elastomeric sealing surfaces and adjustable straps.

(55) **"Fit factor"** means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

(56) **"Fit test"** means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

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

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

(59) **"Gray"** (Gy) means the SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule/kilogram (100 rad).

(60) **"Healing arts"** means the disciplines of medicine, dentistry, osteopathy, chiropractic, podiatry, and veterinary medicine.

(61) **"Helmet"** means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

(62) **"High radiation area"** means any area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 1 mSv (0.1 rem) in one hour at 30 centimeters from any source of radiation or 30 centimeters from any surface that the radiation penetrates. For purposes of these rules, rooms or areas in which diagnostic X-ray systems are used for healing arts purposes are not considered high radiation areas.

(63) **"Hood"** means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

(64) **"Human use"** means the intentional internal or external administration of radiation or radioactive material to human beings.

(65) **"Immediate"** or **"immediately"** means as soon as possible but no later than four hours after the initiating condition.

(66) **"IND"** means investigatory new drug for which an exemption has been claimed under the United States Food, Drug and Cosmetic Act (Title 21 C.F.R.).

(67) **"Individual"** means any human being.

(68) **"Individual monitoring"** means the assessment of:

(a) Dose equivalent (i) by the use of individual monitoring devices or (ii) by the use of survey data; or

(b) Committed effective dose equivalent (i) by bioassay or (ii) by determination of the time-weighted air concentrations to which an individual has been exposed, that is, DAC-hours.

(69) **"Individual monitoring devices"** (individual monitoring equipment) means devices designed to be worn by a single individual for the assessment of dose equivalent e.g., as film badges, thermoluminescent dosimeters (TLDs), pocket ionization chambers, and personal ("lapel") air sampling devices.

(70) **"Inspection"** means an official examination or observation by the department including, but not limited to, tests, surveys, and monitoring to determine compliance with rules, orders, requirements and conditions of the department.

(71) **"Interlock"** means a device arranged or connected so that the occurrence of an event or condition is required before a second event or condition can occur or continue to occur.

(72) **"Internal dose"** means that portion of the dose equivalent received from radioactive material taken into the body.

(73) **"Irretrievable source"** means any sealed source containing licensed material which is pulled off or not connected to the wireline downhole and for which all reasonable effort at recovery, as determined by the department, has been expended.

(74) "**LDE (lens dose equivalent)**" 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 centimeters (300 mg/cm²).

(75) "**License**" means a license issued by the department.

(76) "**Licensed material**" means radioactive material received, possessed, used, transferred, or disposed under a general or specific license issued by the department.

(77) "**Licensee**" means any person who is licensed by the department under (~~these rules and the act~~) chapter 70.98 RCW.

(78) "**Loose-fitting facepiece**" means a respiratory inlet covering that is designed to form a partial seal with the face.

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

(80) "**Member of the public**" means an individual except when the individual is receiving an occupational dose.

(81) "**Minor**" means an individual less than eighteen years of age.

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

(83) "**NARM**" means any naturally occurring or accelerator-produced radioactive material. It does not include by-product, source, or special nuclear material.

(84) "**Nationally tracked source**" means a sealed source containing a quantity equal to or greater than Category 1 or Category 2 levels of any radioactive material listed in WAC 246-221-236. In this context a sealed source is defined as radioactive material that is sealed in a capsule or closely bonded, in a solid form and which is not exempt from regulatory control. It does not mean material encapsulated solely for disposal, or nuclear material contained in any fuel assembly, sub-assembly, fuel rod, or fuel pellet. Category 1 nationally tracked sources are those containing radioactive material at a quantity equal to or greater than the Category 1 threshold. Category 2 nationally tracked sources are those containing radioactive material at a quantity equal to or greater than the Category 2 threshold but less than the Category 1 threshold.

(85) "**Natural radioactivity**" means radioactivity of naturally occurring nuclides.

(86) "**NDA**" means a new drug application which has been submitted to the United States Food and Drug Administration.

(87) "**Negative pressure respirator**" (tight-fitting) means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

(88) "**Nonstochastic effect**" means a health effect, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a nonstochastic effect. For purposes of these rules, a "deterministic effect" is an equivalent term.

(89) "**NRC**" means the U.S. Nuclear Regulatory Commission.

(90) "**Occupational dose**" means the dose received by an individual in the course of employment in which the individual's assigned duties

involve exposure to radiation or to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee, registrant, or other person. Occupational dose does not include dose received: From background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under chapter 246-240 WAC, from voluntary participation in medical research programs, or as a member of the public.

(91) "**Ore refineries**" means all processors of a radioactive material ore.

(92) "**Particle accelerator**" means any machine capable of accelerating electrons, protons, deuterons, or other charged particles in a vacuum and of discharging the resultant particulate or other radiation into a medium at energies usually in excess of 1 MeV. For purposes of this definition, "accelerator" is an equivalent term.

(93) "**Permittee**" means a person who has applied for, and received, a valid site use permit for use of the low-level waste disposal facility at Hanford, Washington.

(94) "**Person**" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, and any legal successor, representative, agent or agency of the foregoing.

(95) "**Personal supervision**" means supervision where the supervisor is physically present at the facility and in sufficient proximity that contact can be maintained and immediate assistance given as required.

(96) "**Personnel monitoring equipment.**" See individual monitoring devices.

(97) "**PET**" means positron emission tomography.

(98) "**Pharmacist**" means an individual licensed by this state to compound and dispense drugs, and poisons.

(99) "**Physician**" means a medical doctor or doctor of osteopathy licensed by this state to prescribe and dispense drugs in the practice of medicine.

(100) "**Planned special exposure**" means an infrequent exposure to radiation, separate from and in addition to the annual occupational dose limits.

(101) "**Positive pressure respirator**" means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

(102) "**PAPR (powered air-purifying respirator)**" means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

(103) "**Practitioner**" means an individual licensed by the state for the practice of a healing art (i.e., physician, dentist, podiatrist, chiropractor, etc.).

(104) "**Pressure demand respirator**" means a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

(105) "**Public dose**" means the dose received by a member of the public from exposure to sources of radiation under the licensee's or registrant's control or to radiation or radioactive material released by the licensee. Public dose does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals admin-

istered radioactive material and released under chapter 246-240 WAC, or from voluntary participation in medical research programs.

(106) **"Qualified expert"** means an individual who has demonstrated to the satisfaction of the department the knowledge, training, and experience to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs. The department reserves the right to recognize the qualifications of an individual in specific areas of radiation protection.

(107) **"QLFT (qualitative fit test)"** means a pass/fail fit test to assess the adequacy of respirator fit which relies on the individual's response to the test agent.

(108) **"Quality factor (Q)"** means the modifying factor, listed in Tables I and II, that is used to derive dose equivalent from absorbed dose.

TABLE I
QUALITY FACTORS AND ABSORBED DOSE EQUIVALENCIES

TYPE OF RADIATION	Quality Factor (Q)	Absorbed Dose Equal to A Unit Dose Equivalent ^a
X, gamma, or beta radiation and high-speed electrons	1	1
Alpha particles, multiple-charged particles, fission fragments and heavy particles of unknown charge	20	0.05
Neutrons of unknown energy	10	0.1
High-energy protons	10	0.1

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

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

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

Neutron Energy (MeV)	Quality Factor ^a (Q)	Fluence per Unit Dose Equivalent ^b (neutrons cm ⁻² rem ⁻¹)	Fluence per Unit Dose Equivalent ^b (neutrons cm ⁻² Sv ⁻¹)
(thermal) 2.5 x 10 ⁻⁸	2	980 x 10 ⁶	980 x 10 ⁸
1 x 10 ⁻⁷	2	980 x 10 ⁶	980 x 10 ⁸
1 x 10 ⁻⁶	2	810 x 10 ⁶	810 x 10 ⁸
1 x 10 ⁻⁵	2	810 x 10 ⁶	810 x 10 ⁸
1 x 10 ⁻⁴	2	840 x 10 ⁶	840 x 10 ⁸
1 x 10 ⁻³	2	980 x 10 ⁶	980 x 10 ⁸
1 x 10 ⁻²	2.5	1010 x 10 ⁶	1010 x 10 ⁸
1 x 10 ⁻¹	7.5	170 x 10 ⁶	170 x 10 ⁸
5 x 10 ⁻¹	11	39 x 10 ⁶	39 x 10 ⁸

Neutron Energy (MeV)	Quality Factor ^a (Q)	Fluence per Unit Dose Equivalent ^b (neutrons cm ⁻² rem ⁻¹)	Fluence per Unit Dose Equivalent ^b (neutrons cm ⁻² Sv ⁻¹)
1	11	27 x 10 ⁶	27 x 10 ⁸
2.5	9	29 x 10 ⁶	29 x 10 ⁸
5	8	23 x 10 ⁶	23 x 10 ⁸
7	7	24 x 10 ⁶	24 x 10 ⁸
10	6.5	24 x 10 ⁶	24 x 10 ⁸
14	7.5	17 x 10 ⁶	17 x 10 ⁸
20	8	16 x 10 ⁶	16 x 10 ⁸
40	7	14 x 10 ⁶	14 x 10 ⁸
60	5.5	16 x 10 ⁶	16 x 10 ⁸
1 x 10 ²	4	20 x 10 ⁶	20 x 10 ⁸
2 x 10 ²	3.5	19 x 10 ⁶	19 x 10 ⁸
3 x 10 ²	3.5	16 x 10 ⁶	16 x 10 ⁸
4 x 10 ²	3.5	14 x 10 ⁶	14 x 10 ⁸

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

^b Monoenergetic neutrons incident normally on a 30-cm diameter cylinder tissue-equivalent phantom.

(109) **"QNFT (quantitative fit test)"** means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

(110) **"Quarter"** means a period of time equal to one-fourth of the year observed by the licensee, approximately thirteen consecutive weeks, providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters.

(111) **"Rad"** means the special unit of absorbed dose. One rad equals one-hundredth of a joule per kilogram of material; for example, if tissue is the material of interest, then 1 rad equals 100 ergs per gram of tissue. One rad is equal to an absorbed dose of 100 erg/gram or 0.01 joule/kilogram (0.01 gray).

(112) **"Radiation"** means alpha particles, beta particles, gamma rays, X rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. For purposes of these rules: Radiation does not include magnetic fields or nonionizing radiation, such as radiowaves or microwaves, visible, infrared, or ultraviolet light; and ionizing radiation is an equivalent term.

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

(114) **"Radiation machine"** means any device capable of producing ionizing radiation except those devices with radioactive material as the only source of radiation.

(115) **"Radiation safety officer"** means an individual who has the knowledge and responsibility to apply appropriate radiation protection rules and has been assigned that responsibility by the licensee or registrant.

(116) **"Radiation source."** See "Source of radiation."

(117) **"Radioactive material"** means any material (solid, liquid, or gas) which emits radiation spontaneously.

(118) **"Radioactive waste"** means any radioactive material which is no longer of use and intended for disposal or treatment for the purposes of disposal.

(119) **"Radioactivity"** means the transformation of unstable atomic nuclei by the emission of radiation.

(120) **"Reference man"** means a hypothetical aggregation of human physical and physiological characteristics determined by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base.

(121) **"Registrable item"** means any radiation-producing machine except those exempted by RCW 70.98.180 or exempted by the department under the authority of RCW 70.98.080.

(122) **"Registrant"** means any person who is registered by the department or is legally obligated to register with the department in accordance with these rules and the act.

(123) **"Registration"** means registration with the department in accordance with the rules adopted by the department.

(124) **"Regulations of the United States Department of Transportation"** means the regulations in 49 C.F.R. Parts 170-189, 14 C.F.R. Part 103, and 46 C.F.R. Part 146.

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

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

(127) **"Respiratory protective equipment"** means an apparatus, such as a respirator, used to reduce an individual's intake of airborne radioactive materials.

(128) **"Restricted area"** means any area to which access is limited by the licensee or registrant for purposes of protecting individuals against undue risks from exposure to radiation and radioactive material. "Restricted area" does not include any areas used for residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area.

(129) **"Roentgen"** (R) means the special unit of exposure. One roentgen equals 2.58×10^{-4} coulombs/kilogram of air.

(130) **"Sanitary sewerage"** means a system of public sewers for carrying off waste water and refuse, but excluding sewage treatment facilities, septic tanks, and leach fields owned or operated by the licensee or registrant.

(131) **"Sealed source"** means any radioactive material that is encased in a capsule designed to prevent leakage or the escape of the radioactive material.

(132) **"SEPA"** means the State Environmental Policy Act under chapter 43.21C RCW.

(133) **"SCBA (self-contained breathing apparatus)"** means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

(134) **"Shallow dose equivalent"** (H_s), which applies to the external exposure of the skin of the whole body or the skin of an extremity, means the dose equivalent at a tissue depth of 0.007 centimeter (7 mg/cm²).

(135) **"SI"** means an abbreviation of the International System of Units.

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

(137) **"Site area emergency"** means events which may occur, are in progress, or have occurred that could lead to a significant release of radioactive material and that could require a response by off-site response organizations to protect persons off-site.

(138) **"Site boundary"** means that line beyond which the land or property is not owned, leased, or otherwise controlled by the licensee or registrant.

(139) **"Source container"** means a device in which radioactive material is transported or stored.

(140) **"Source material"** means: (a) Uranium or thorium, or any combination thereof, in any physical or chemical form, or (b) ores which contain by weight one-twentieth of one percent (0.05 percent) or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

(141) **"Source material milling"** means the extraction or concentration of uranium or thorium from any ore processing primarily for its source material content.

(142) **"Source of radiation"** means any radioactive material, or any device or equipment emitting or capable of producing ionizing radiation.

(143) **"Special nuclear material"** means:

(a) Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the NRC, under the provisions of section 51 of the Atomic Energy Act of 1954, as amended, determines to be special nuclear material, but does not include source material; or

(b) Any material artificially enriched in any of the foregoing, but does not include source material.

(144) **"Special nuclear material in quantities not sufficient to form a critical mass"** means uranium enriched in the isotope U-235 in quantities not exceeding three hundred fifty grams of contained U-235; uranium-233 in quantities not exceeding two hundred grams; plutonium in quantities not exceeding two hundred grams; or any combination of them in accordance with the following formula: For each kind of special nuclear material, determine the ratio between the quantity of that special nuclear material and the quantity specified above for the same kind of special nuclear material. The sum of the ratios for all of the kinds of special nuclear material in combination shall not exceed "1" (i.e., unity). For example, the following quantities in combination would not exceed the limitation and are within the formula:

$$\begin{array}{r} \frac{175 \text{ (grams contained U-235)}}{350} \quad + \\ \frac{50 \text{ (grams U-233)}}{200} \quad + \\ \frac{50 \text{ (grams Pu)}}{200} \quad < 1 \end{array}$$

(145) **"Stochastic effect"** means a health effect that occurs randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects. For purposes of these rules, probabilistic effect is an equivalent term.

(146) **"SAR (supplied-air respirator)"** or **"airline respirator"** means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

(147) **"Survey"** means an evaluation of the radiological conditions and potential hazards incident to the production, use, release, disposal, or presence of sources of radiation. When appropriate, the evaluation includes, but is not limited to, tests, physical examinations, calculations and measurements of levels of radiation or concentration of radioactive material present.

(148) **"Test"** means (a) the process of verifying compliance with an applicable rule, or (b) a method for determining the characteristics or condition of sources of radiation or components thereof.

(149) **"These rules"** mean all parts of the rules for radiation protection of the state of Washington.

(150) **"Tight-fitting facepiece"** means a respiratory inlet covering that forms a complete seal with the face.

(151) **"TEDE (total effective dose equivalent)"** means the sum of the effective dose equivalent for external exposures and the committed effective dose equivalent for internal exposures.

(152) **"TODE (total organ dose equivalent)"** means the sum of the deep dose equivalent and the committed dose equivalent to the organ or tissue receiving the highest dose.

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

(154) **"Unrefined and unprocessed ore"** means ore in its natural form prior to any processing, such as grinding, roasting((7)) or beneficiating, or refining. Processing does not include sieving or encapsulation of ore, or preparation of samples for laboratory analysis.

(155) **"Unrestricted area"** (uncontrolled area) means any area which is not a restricted area. Areas where the external dose exceeds 2 mrem in any one hour or where the public dose, taking into account occupancy factors, will exceed 100 mrem total effective dose equivalent in any one year must be restricted.

(156) **"User seal check"** (fit check) means an action conducted by the respirator user to determine if the respirator is properly seated to the face. Examples include negative pressure check, positive pressure check, irritant smoke check, or isoamyl acetate check.

(157) **"Very high radiation area"** means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose

in excess of 5 Gy (500 rad) in one hour at one meter from a source of radiation or one meter from any surface that the radiation penetrates.

(158) **"Waste"** means those low-level radioactive wastes containing source, special nuclear or by-product material that are acceptable for disposal in a land disposal facility. For purposes of this definition, low-level radioactive waste means radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or by-product material as defined in subsection (17)(b), (c), and (d) of the definition of by-product material in this section.

(159) **"Waste handling licensees"** mean persons licensed to receive and store radioactive wastes prior to disposal or persons licensed to dispose of radioactive waste.

(160) **"Week"** means seven consecutive days starting on Sunday.

(161) **"Weighting factor"** w_T for an organ or tissue (T) means the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly. For calculating the effective dose equivalent, the values of w_T are:

ORGAN DOSE WEIGHTING FACTORS

Organ or Tissue	w_T
Gonads	0.25
Breast	0.15
Red bone marrow	0.12
Lung	0.12
Thyroid	0.03
Bone surfaces	0.03
Remainder	0.30 ^a
Whole Body	1.00 ^b

^a 0.30 results from 0.06 for each of 5 "remainder" organs, excluding the skin and the lens of the eye, that receive the highest doses.

^b For the purpose of weighting the external whole body dose, for adding it to the internal dose, a single weighting factor, $w_T=1.0$, has been specified. The use of other weighting factors for external exposure will be approved on a case-by-case basis until such time as specific guidance is issued.

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

(163) **"Worker"** means an individual engaged in activities under a license or registration issued by the department and controlled by a licensee or registrant but does not include the licensee or registrant. Where the licensee or registrant is an individual rather than one of the other legal entities defined under "person," the radiation exposure limits for the worker also apply to the individual who is the licensee or registrant. If students of age eighteen years or older are subjected routinely to work involving radiation, then the students are considered to be workers. Individuals of less than eighteen years of age shall meet the requirements of WAC 246-221-050.

(164) **"WL (working level)"** means any combination of short-lived radon daughters in 1 liter of air that will result in the ultimate emission of 1.3×10^5 MeV of potential alpha particle energy. The short-lived radon daughters are (—) — For radon-222: Polonium-218, lead-214, bismuth-214, and polonium-214; and for radon-220: Polonium-216, lead-212, bismuth-212, and polonium-212.

(165) "**WLM (working level month)**" means an exposure to one working level for one hundred seventy hours((—))_Two thousand working hours per year divided by twelve months per year is approximately equal to one hundred seventy hours per month.

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

WAC 246-221-020 Determination of prior occupational dose. (1)

For each individual who is likely to receive, in a year, an occupational dose requiring monitoring pursuant to WAC 246-221-090 and 246-221-100, the licensee or registrant shall:

(a) Determine the occupational radiation dose received during the current year; and

(b) Attempt to obtain the records of lifetime cumulative occupational radiation dose.

(2) Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant shall determine:

(a) The internal and external doses from all previous planned special exposures; and

(b) All doses in excess of the limits, including doses received during accidents and emergencies, received during the lifetime of the individual.

(3) In complying with the requirements of subsection (1) of this section, a licensee or registrant may:

(a) Accept, as a record of the occupational dose that the individual received during the current year, a written signed statement from the individual, or from the individual's most recent employer for work involving radiation exposure, that discloses the nature and the amount of any occupational dose that the individual received during the current year; and

(b) Accept, as the record of lifetime cumulative radiation dose, an up-to-date Form RHF-4A, or equivalent, signed by the individual and countersigned by an appropriate official of the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee or registrant; and

(c) Obtain reports of the individual's dose equivalent from the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee or registrant, by telephone, (~~telegram,~~) facsimile, e-mail, or letter. The licensee or registrant shall request a written verification of the dose data if the authenticity of the transmitted report cannot be established.

(4) The licensee or registrant shall record the exposure history, as required by subsection (1) of this section, on Form RHF-4A, or other clear and legible record, of all the information required on that form. The form or record shall show each period in which the individual received occupational exposure to radiation or radioactive material and shall be signed by the individual who received the exposure. For each period for which the licensee or registrant obtains reports, the licensee or registrant shall use the dose shown in the report in preparing Form RHF-4A. For any period in which the licensee or registrant does not obtain a report, the licensee or registrant shall place a notation on Form RHF-4A indicating the periods of time for which data are not available.

(5) Licensees or registrants are not required to reevaluate the separate external dose equivalents and internal committed dose equivalents or intakes of radionuclides assessed under the regulations in effect before January 1, 1994. Further, occupational exposure histories obtained and recorded on Form RHF-4 before January 1, 1994, would

not have included effective dose equivalent, but may be used in the absence of specific information on the intake of radionuclides by the individual.

(6) If the licensee or registrant is unable to obtain a complete record of an individual's current and previously accumulated occupational dose, the licensee or registrant shall assume:

(a) In establishing administrative controls under WAC 246-221-010(6) for the current year, that the allowable dose limit for the individual is reduced by 12.5 mSv (1.25 rem) for each calendar quarter for which records were unavailable and the individual was engaged in activities that could have resulted in occupational radiation exposure; and

(b) That the individual is not available for planned special exposures.

(7) The licensee or registrant shall retain the records on Form RHF-4A or equivalent until the department terminates each pertinent license requiring this record. The licensee or registrant shall retain records used in preparing Form RHF-4 or RHF-4A for three years after the record is made.

AMENDATORY SECTION (Amending WSR 14-01-077, filed 12/16/13, effective 1/16/14)

WAC 246-221-160 Procedures for picking up, receiving, and opening packages. (1) Each licensee who expects to receive a package containing quantities of radioactive material in excess of the Type A₁ or A₂ quantities specified in WAC 246-231-200 shall make arrangements to receive:

(a) The package when it is offered for delivery by the carrier; or

(b) Immediate notification from the carrier of the arrival of the package at the carrier's terminal.

(2) Each licensee who picks up a package of radioactive material from a carrier's terminal shall pick up the package expeditiously upon receipt of notification from the carrier of its arrival.

(3) Each licensee shall:

(a) Monitor for radioactive contamination the external surfaces of any package labeled with a Radioactive White I, Yellow II or Yellow III label unless the package contains only radioactive material in the form of gas or in special form as defined in WAC 246-231-010; and

(b) Monitor the radiation levels of the external surfaces of any package labeled with a Radioactive White I, Yellow II or Yellow III label unless the package contains quantities of radioactive material that are less than or equal to the Type A quantity, as defined in WAC 246-231-200; and

(c) Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if the package has evidence of potential contamination, such as packages that are crushed, wet, or damaged.

(4) Monitoring shall be performed:

(a) Immediately upon receipt if there is evidence of package degradation or any other evidence of potential contamination or excessive radiation levels; or

(b) As soon as practicable after receipt, but no later than three hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or no later than three hours from the beginning of the next working day if received after normal working hours.

(5) The licensee shall immediately notify the final delivery carrier and, by telephone (~~and telegram, mailgram, or~~), facsimile, e-mail, or letter, the department when:

(a) For normal shipments, removable radioactive surface contamination exceeds either 22 dpm/ cm² for beta-gamma emitting radionuclides, all radionuclides with half-lives less than ten days, natural uranium, natural thorium, uranium-235, uranium-238, thorium-232, and thorium-228 and thorium 230 when contained in ores or concentrates; or 2.2 dpm/ cm² for all other alpha emitting radionuclides; or

(b) For exclusive use shipments, removable radioactive surface contamination exceeds either 220 dpm/ cm² for beta-gamma emitting radionuclides, all radionuclides with half-lives less than ten days, natural uranium, natural thorium, uranium-235, uranium-238, thorium-232, and thorium-228 and thorium 230 when contained in ores or concentrates; or 22 dpm/ cm² for all other alpha emitting radionuclides; or

(c) For normal or exclusive use shipments, external radiation levels exceed two mSv/hour (200 millirem per hour) at any point on the external surface of the package; or

(d) For exclusive use shipments where the shipment is made in a closed transport vehicle, packages are secured in a fixed position, and no loading or unloading occurs between the beginning and end of transportation, external radiation levels exceed ten mSv/hour (1000 millirem per hour) at any point on the external surface of the package.

(6) Each licensee shall establish and maintain procedures for safely opening packages in which radioactive material is received, and shall assure that such procedures are followed and that due consideration is given to instructions for the type of package being opened and the monitoring of potentially contaminated packaging material (including packages containing radioactive material in gaseous form) to assure that only background levels of radiation are present prior to disposal of such material as nonradioactive waste.

(7) Licensees transferring special form sources to and from a work site in vehicles owned or operated by the licensee are exempt from the contamination monitoring requirements of subsection (3)(a) of this section but are not exempt from the monitoring requirement in subsection (3)(b) of this section for measuring radiation levels to ensure that the source is still properly lodged in its shield.

AMENDATORY SECTION (Amending WSR 14-01-077, filed 12/16/13, effective 1/16/14)

WAC 246-221-240 Reports of stolen, lost or missing radiation sources. (1) Each licensee and registrant shall report by telephone (206-682-5327) and confirm promptly by letter, (~~telegram, mailgram, or~~) facsimile, or e-mail to the State Department of Health, Office of Radiation Protection, P.O. Box 47827, Olympia, Washington 98504-7827.

(a) Immediately after its occurrence becomes known to the licensee, stolen, lost, or missing radioactive material in an aggregate quantity equal to or greater than one thousand times the quantity specified in WAC 246-221-300, Appendix B; or

(b) Within thirty days after its occurrence becomes known to the licensee, lost, stolen, or missing radioactive material in an aggregate quantity greater than ten times the quantity specified in WAC 246-221-300, Appendix B that is still missing or any item not exempted in chapter 246-232 WAC; or

(c) Immediately after its occurrence becomes known to the registrant, a stolen, lost, or missing radiation machine.

(2) Each licensee or registrant required to make a report pursuant to subsection (1) of this section shall, within thirty days after making the telephone report, make a written report to the department setting forth the following information:

(a) A description of the licensed or registered source of radiation involved, including, for radioactive material, the kind, quantity, and chemical and physical form; and, for radiation machines, the manufacturer, model and serial number, type and maximum energy of radiation emitted; and

(b) A description of the circumstances under which the loss or theft occurred; and

(c) A statement of disposition, or probable disposition, of the licensed or registered source of radiation involved; and

(d) Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas; and

(e) Actions that have been taken, or will be taken, to recover the source of radiation; and

(f) Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed or registered sources of radiation.

(3) Subsequent to filing the written report, the licensee or registrant shall also report additional substantive information on the loss or theft within thirty days after the licensee or registrant learns of such information.

(4) The licensee or registrant shall prepare any report filed with the department pursuant to this section so that names of individuals who may have received exposure to radiation are stated in a separate and detachable portion of the report.

AMENDATORY SECTION (Amending WSR 14-01-077, filed 12/16/13, effective 1/16/14)

WAC 246-221-250 Notification of incidents. (1) **Immediate notification.** Notwithstanding other requirements for notification, each licensee and registrant shall immediately (as soon as possible but no later than four hours after discovery of an incident) notify the State Department of Health, Office of Radiation Protection, P.O. Box 47827, Olympia, Washington 98504-7827, by telephone (206-682-5327) and confirming letter, (~~telegram, mailgram, or~~) facsimile, or e-mail with a follow-up written report within thirty days of any incident involving any radiation source which may have caused or threatens to cause:

(a) An individual to receive:

(i) A total effective dose equivalent of 0.25 Sv (25 rem) or more;

(ii) A lens dose equivalent of 0.75 Sv (75 rem) or more; or

(iii) A shallow dose equivalent to the skin or extremities or a total organ dose equivalent of 2.5 Sv (250 rem) or more;

(b) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for twenty-four hours, the individual could have received an intake five times the occupational ALI. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures; or

(c) The loss of ability to take immediate protective actions necessary to avoid exposure to sources of radiation or releases of radioactive material that could exceed regulatory limits. Events which could cause such a loss of ability include fires, explosions, toxic gas releases, etc.

(2) **Twenty-four hour notification.** Each licensee and registrant shall within twenty-four hours of discovery of the event, notify the State Department of Health, Office of Radiation Protection, P.O. Box 47827, Olympia, Washington 98504-7827, by telephone (206-682-5327) and confirming letter, (~~telegram, mailgram, or~~) facsimile, or e-mail with a follow-up written report within thirty days of any incident involving any radiation source possessed which may have caused or threatens to cause:

(a) An individual to receive, in a period of twenty-four hours:

(i) A total effective dose equivalent exceeding 0.05 Sv (5 rem);

(ii) A lens dose equivalent exceeding 0.15 Sv (15 rem); or

(iii) A shallow dose equivalent to the skin or extremities or a total organ dose equivalent exceeding 0.5 Sv (50 rem);

(b) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for twenty-four hours, the individual could have received an intake in excess of one occupational ALI. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures;

(c) An unplanned contamination incident that:

(i) Requires access to the contaminated area, by workers or the general public, to be restricted for more than twenty-four hours by imposing additional radiological controls or by prohibiting entry into the area;

(ii) Involves a quantity of material greater than five times the lowest annual limit on intake specified in WAC 246-221-290; and

(iii) Has access to the area restricted for a reason other than to allow radionuclides with a half-life of less than twenty-four hours to decay prior to decontamination;

(d) Equipment failure or inability to function as designed when:

(i) The equipment is required by regulation or license condition to prevent releases exceeding regulatory limits, to prevent exposures to radiation and radioactive material exceeding regulatory limits or to mitigate the consequences of an accident;

(ii) The equipment is required to be available and operable at the time it becomes disabled or fails to function; and

(iii) No redundant equipment is available and operable to perform the required safety functions;

(e) An unplanned medical treatment at a medical facility of an individual with removable radioactive contamination on the individual's clothing or body; or

(f) An unplanned fire or explosion damaging any radioactive material or any device, container or equipment containing radioactive material when:

(i) The quantity of radioactive material involved is greater than five times the lowest annual limit on intake specified in WAC 246-221-290; and

(ii) The damage affects the integrity of the radioactive material or its container.

(3) For each occurrence requiring notification pursuant to this section, a prompt investigation of the situation shall be initiated by the licensee/registrant. A written report of the findings of the investigation shall be sent to the department within thirty days.

(4) The licensee or registrant shall prepare each report filed with the department under this section so that names of individuals who have received exposure to sources of radiation are stated in a separate and detachable portion of the report.

Any report filed with the department under this section shall contain the information described in WAC 246-221-260 (2) and (3).

(5) The provisions of this section do not apply to doses that result from planned special exposures, provided such doses are within the limits for planned special exposures and are reported pursuant to WAC 246-221-265.

(6) Telephone notifications that do not involve immediate or twenty-four hour notification should be made to the Tumwater office (360-236-3300).

(7) Telephone notification required under this section shall include, to the extent that the information is available at the time of notification:

- (a) The caller's name and call-back telephone number;
- (b) A description of the incident including date and time;
- (c) The exact location of the incident;
- (d) The radionuclides, quantities, and chemical and physical forms of the radioactive materials involved; and
- (e) Any personnel radiation exposure data available.

AMENDATORY SECTION (Amending WSR 91-02-049, filed 12/27/90, effective 1/31/91)

WAC 246-243-001 Purpose. The regulations in this chapter establish radiation safety requirements for persons utilizing sources of radiation for industrial radiography. The requirements of this ~~((part))~~ chapter are in addition to and not in substitution for ~~((the))~~ other requirements of these regulations.

AMENDATORY SECTION (Amending WSR 94-01-073, filed 12/9/93, effective 1/9/94)

WAC 246-243-010 Scope. The regulations in this chapter apply to all licensees who use sources of radiation for industrial radiography: Provided, however, that nothing in this ~~((part))~~ chapter shall apply to the use of sources of radiation in the healing arts.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-020 Definitions, abbreviations, and acronyms. ~~((As used in this part:))~~ The definitions, abbreviations, and acronyms in this section and in WAC 246-220-010 apply throughout this chapter, unless the context clearly indicates otherwise.

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

(2) **"Associated equipment"** means equipment that is used in conjunction with a radiographic exposure device to make radiographic exposures ~~((that))~~ which drives, guides, or comes in contact with the source, ~~((e.g.,))~~ for example guide tube, control tube, control (drive) cable, removable source stop, "J" tube and collimator~~((+))~~ when it is used as an exposure head.

(3) **"Certifying entity"** means an independent certifying organization meeting the requirements in WAC 246-243-250 Appendix C or an agreement state meeting the requirements in WAC 246-243-250 Appendix C, subsections (2) and (3).

(4) **"Collimator"** means a radiation shield that is placed on the end of the guide tube or directly onto a radiographic exposure device to restrict the size of the radiation beam when the sealed source is cranked into position to make a radiographic exposure.

(5) **"Control (drive) cable"** means the cable that is connected to the source assembly and used to drive the source to and from the exposure location.

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

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

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

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

(10) **"Guide tube (projection sheath)"** means a flexible or rigid tube (~~((i.e., "J" tube))~~) for guiding the source assembly and the attached control cable from the exposure device to the exposure head. The guide tube may also include the connections necessary for attachment to the exposure device and to the exposure head.

(11) **"Hands-on experience"** means experience in all of those areas considered to be directly involved in the radiography process.

(12) **"Independent certifying organization"** means an independent organization that meets all of the criteria of WAC 246-243-250 Appendix C.

(13) **"Industrial radiography"** (~~((radiography))~~) means the examination of the macroscopic structure of materials by nondestructive methods utilizing sources of radiation to make radiographic images. Industrial radiography as used in this chapter does not include well logging operations.

(14) **"Lay-barge radiography"** means industrial radiography performed on any water vessel used for laying pipe.

(15) **"Offshore platform radiography"** means industrial radiography conducted from a platform over a body of water.

(16) **"Permanent radiographic installation"** means an enclosed shielded room, cell or vault, not located at a temporary job site, in which radiography is performed, regardless of ownership.

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

(18) **"Radiation safety officer for industrial radiography"** means an individual with the responsibility for the overall radiation safety program on behalf of the licensee and who meets the requirements of WAC 246-243-047.

(19) **"Radiographer"** means any individual who performs or who, in attendance at the site where sources of radiation are being used, personally supervises industrial radiographic operations and who is responsible to the licensee for assuring compliance with the requirements of these regulations and all license conditions.

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

(21) **"Radiographer's assistant"** means any individual who, under the personal supervision of a radiographer, uses sources of radiation, related handling tools, or radiation survey instruments in industrial radiography.

(22) **"Radiographic exposure device"** means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure.

(23) **"Radiographic operations"** means all activities associated with the presence of radioactive sources in a radiographic exposure

device during use of the device or transport (except when being transported by a common or contract carrier), to include surveys to confirm the adequacy of boundaries, setting up equipment and any activity inside restricted area boundaries.

(24) "**S-tube**" means a tube through which the radioactive source travels when inside a radiographic exposure device.

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

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

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

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

(29) "**Storage container**" means a container in which sealed sources are secured and stored.

(30) "**Temporary job site**" means a location where radiographic operations are conducted and where licensed material may be stored other than those ((location(s))) locations of use authorized on the license.

(31) "**Underwater radiography**" means industrial radiography performed when the radiographic exposure device ((and/)) or related equipment are beneath the surface of the water.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-030 Conducting industrial radiography operations.

(1) Whenever radiography is performed at a location other than a permanent radiographic installation, the radiographer must be accompanied by at least one other qualified radiographer or an individual who has at a minimum met the requirements of WAC 246-243-130(2) (radiographer's assistant). The additional qualified individual shall observe the operations and be capable of providing immediate assistance to prevent unauthorized entry. Radiography may not be performed if only one qualified individual is present.

(2) All radiographic operations conducted at locations of use authorized on the license must be conducted in a permanent radiographic installation, unless specifically authorized by the department.

(3) Offshore platform, lay-barge, ((and/)) or underwater radiography shall be performed only by licensees whose license specifically authorizes such activity. Such operations fall under the jurisdiction of the United States Nuclear Regulatory Commission when conducted outside of the territorial waters of the state of Washington.

~~((4) Licensees will have until January 1, 2001, to meet the requirement for having two qualified individuals present at locations~~

~~other than a permanent radiographic installation as specified in subsection (1) of this section.)~~

AMENDATORY SECTION (Amending WSR 99-05-012, filed 2/5/99, effective 3/8/99)

WAC 246-243-040 Equipment performance requirements. Equipment used in industrial radiography operations must meet the following minimum criteria:

(1)(a) Each radiographic exposure device, source assembly or sealed source, and all associated equipment must meet the requirements specified in American National Standards Institute, N432-1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography," (published as NBS Handbook 136, issued January 1981). This publication may be purchased from American National Standards Institute, Inc., 25 West 43rd Street, New York, New York, 10036; telephone: 212-642-4900. Copies of the document are available for inspection at the Department of Health, ((Division)) Office of Radiation Protection, Olympia, Washington. A copy of the document is also on file at the National Archives and Records Administration. For information on the availability of this material at the National Archives and Records Administration call 202-741-6030, or go to: http://www.archives.gov/federal/register/code_of_federal_regulations/ibr_locations.html.

(b) Engineering analysis may be submitted by an applicant or licensee to demonstrate the applicability of previously performed testing on similar individual radiography equipment components. Upon review, the department may find this an acceptable alternative to actual testing of the component pursuant to the above referenced standard.

(c) Notwithstanding (a) of this subsection, equipment used in industrial radiographic operations need not comply with § 8.9.2(c) of the Endurance Test in American National Standards Institute N432-1980, if the prototype equipment has been tested using a torque value representative of the torque that an individual using the radiography equipment can realistically exert on the lever or crankshaft of the drive mechanism.

(2) In addition to the requirements specified in subsection (1) of this section, the following requirements apply to radiographic exposure devices, source changers, source assemblies and sealed sources.

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

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

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

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

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

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

(b) Radiographic exposure devices intended for use as Type B transport containers must meet the applicable requirements of 10 C.F.R. Part 71.

(c) Modification of radiographic exposure devices, source changers, and source assemblies and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes would not compromise the design safety features of the system.

(3) In addition to the requirements specified in subsections (1) and (2) of this section, the following requirements apply to radiographic exposure devices, source assemblies, and associated equipment that allow the source to be moved out of the device for radiographic operations or to source changers.

(a) The coupling between the source assembly and the control cable must be designed in such a manner that the source assembly will not become disconnected if cranked outside the guide tube. The coupling must be such that it (~~can not~~) cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions.

(b) The device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. The securing system may only be released by means of a deliberate operation on the exposure device.

(c) The outlet fittings, lock box, and drive cable fitting on each radiographic exposure device must be equipped with safety plugs or covers which must be installed during storage and transportation to protect the source assembly from water, mud, sand, or other foreign matter.

(d)(i) Each sealed source or source assembly must have attached to it or engraved on it, a durable, legible, visible label with the words: "DANGER—RADIOACTIVE."

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

(e) The guide tube must be able to withstand a crushing test that closely approximates the crushing forces that are likely to be encountered during use, and be able to withstand a kinking resistance test that closely approximates the kinking forces likely to be encountered during use.

(f) Guide tubes must be used when moving the source out of the device.

(g) An exposure head or similar device designed to prevent the source assembly from passing out of the end of the guide tube must be attached to the outermost end of the guide tube during radiographic operations.

(h) The guide tube exposure head connection must be able to withstand the tensile test for control units specified in ANSI N432-1980.

(i) Source changers must provide a system for ensuring that the source will not be accidentally withdrawn from the changer when connecting or disconnecting the drive cable to or from a source assembly.

(4) All radiographic exposure devices and associated equipment in use after January 1, 1998, must comply with the requirements of this section.

(5) The maximum exposure rate limits for storage containers and source changers with the sealed source in the shielded position are:

(a) 2 millisieverts (200 millirem) per hour at any exterior surface; and

(b) 0.1 millisieverts (10 millirem) per hour at one meter from any exterior surface.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-042 Labeling, storage, and transportation. (1) The licensee may not use a source changer or a container to store licensed material unless the source changer or the storage container has securely attached to it a durable, legible, and clearly visible label bearing the standard trefoil radiation caution symbol in conventional colors, (~~i.e.~~) that is, magenta, purple or black on a yellow background, having a minimum diameter of 25 mm, and the wording:

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

(2) The licensee may not transport licensed material unless the material is packaged, and the package is labeled, marked, and accompanied with appropriate shipping papers in accordance with regulations set out in 10 C.F.R. Part 71.

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

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

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-044 Records of receipt and transfer of sealed sources. (1) Each licensee shall maintain records showing the receipts and transfers of sealed sources and of devices using depleted uranium (DU) for shielding and retain each record for three years after it is made.

(2) These records must include the date, shipper or destination, the name of the individual making the record, radionuclide, number of becquerels (curies) or mass (for DU), and manufacturer, model, and serial number of each sealed source (~~and~~) or device, as appropriate.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-047 Radiation safety officer for industrial radiography. The radiation safety officer (RSO) shall ensure that radiation safety activities are being performed in accordance with approved procedures and regulatory requirements in the daily operation of the licensee's program.

(1) The minimum qualifications, training, and experience for RSOs for industrial radiography are as follows:

(a) Completion of the training and testing requirements of WAC 246-243-130(1);

(b) Two thousand hours of hands-on experience as a qualified radiographer in industrial radiographic operations utilizing sealed radioactive material; and

(c) Formal training in the establishment and maintenance of a radiation protection program.

(2) The department will consider alternatives when the RSO has appropriate training (~~and~~) or experience in the field of ionizing radiation, and in addition, has adequate formal training with respect to the establishment and maintenance of a radiation safety protection program.

(3) The specific duties and authorities of the RSO include, but are not limited to:

(a) Establishing and overseeing all operating, emergency, and ALARA procedures as required by chapter 246-221 WAC, and reviewing them regularly to ensure that the procedures in use conform to current chapter 246-221 WAC requirements, conform to other department regulations and to the license conditions;

(b) Overseeing and approving all phases of the training program for radiographic personnel, ensuring that appropriate and effective radiation protection practices are taught;

(c) Ensuring that required radiation surveys and leak tests are performed and documented in accordance with the regulations, including any corrective measures when levels of radiation exceed established limits;

(d) Ensuring that personnel monitoring devices are calibrated and used properly by occupationally exposed personnel, that records are kept of the monitoring results, and that timely notifications are made as required by WAC 246-221-260; and

(e) Ensuring that operations are conducted safely and to assume control for instituting corrective actions including stopping of operations when necessary.

(4) The licensee will have until January 1, 2001, to meet the requirements of subsection (1) or (2) of this section.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-100 Quarterly inventory. Each licensee shall conduct a quarterly physical inventory to account for all sealed sources and for devices containing depleted uranium (DU) received or possessed. The records of the inventories shall be maintained for three years from the date of inventory for inspection by the department and shall include:

(1) Exposure device or source changer make, model, and serial number;

(2) Sealed source serial number and manufacturer;

(3) Radionuclide and current activity in becquerels (curies) or mass (for DU) in each device;

(4) Location of sealed source (~~and~~) or device/changer;

(5) Date of inventory;

(6) Name of person who performed inventory.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-120 Inspection and maintenance of radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments. (1) The licensee shall perform visual and operability checks on survey meters, radiographic exposure devices, transport and storage containers, associated equipment and source changers before use on each day the equipment is to be used to ensure that the equipment is in good working condition, that the sources are adequately shielded, and that required labeling is present. Survey instrument operability must be performed using check sources or other appropriate means. If equipment problems are found, the equipment must be removed from service until repaired.

(2) Each licensee shall have written procedures for:

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

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

(3) Any maintenance performed on radiographic exposure devices and accessories shall be in accordance with the manufacturer's specifications.

(4) Records of daily checks and quarterly inspections including any equipment problems identified and of any maintenance performed under subsections (1) and (2) of this section shall be made and retained for three years. The record shall include:

(a) The date of check or inspection;

(b) Name of inspector;

(c) Equipment involved;

(d) Any problems found; and

(e) What repair (~~and~~) or maintenance, if any, was done.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-130 Limitations—Personal radiation safety requirements for radiographers and radiographers' assistants. (1) No licensee shall permit any individual to act as a radiographer as defined in this chapter until such individual:

(a) Has been instructed in the subjects outlined in WAC 246-243-230, in addition to a minimum of two months of on-the-job training, and is certified through a radiographer certification program by a certifying entity in accordance with the criteria specified in WAC 246-243-250, Appendix C or equivalent regulations of the United States Nuclear Regulatory Commission or an agreement state. The department maintains a list of recognized certifying entities for reference. The licensee may, until January 1, 2001, allow an individual who has not met the requirement of this subsection, to act as a radiographer after the individual has received training in the subjects outlined in WAC 246-243-230 and demonstrated an understanding of these subjects by successful completion of a written examination that was previously submitted to and approved by the department;

(b) Has received copies of and instruction in the regulations contained in chapters 246-220, 246-221, 246-222, 246-231, and 246-243 WAC, in the United States Department of Transportation regulations as referenced in chapter 246-231 WAC, and the applicable sections of appropriate ((license(s))) license, and the licensee's operating and emergency procedures, and shall have demonstrated understanding thereof by successful completion of a written or oral examination covering this material;

(c) Has received training in the use of the licensee's radiographic exposure devices, sealed sources, in the daily inspection of devices and associated equipment, and in the use of radiation survey instruments; and

(d) Has demonstrated understanding of the use of radiographic exposure devices, sources, survey instruments and associated equipment described in subsection (1)(c) of this section by successful completion of a practical examination on the subjects covered.

(2) No licensee shall permit any individual to act as a radiographer's assistant as defined in this chapter until such individual:

(a) Has received copies of and instruction in the regulations contained in chapters 246-220, 246-221, 246-222, 246-231, and 246-243 WAC, in the United States Department of Transportation regulations as referenced in chapter 246-231 WAC, and the applicable sections of appropriate ((license(s))) license, and the licensee's operating and emergency procedures;

(b) Has developed competence to use under the personal supervision of the radiographer the radiographic exposure devices, sealed sources, associated equipment, and radiation survey instruments which will be employed in the individual's assignment; and

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

(3) Each licensee shall maintain, for inspection by the department, records of training and certification which demonstrate that the requirements of subsections (1) and (2) of this section are met. These records shall be maintained for three years after the record is made. The record shall include:

(a) Radiographer certification documents and verification of certification status;

(b) Copies of written tests;

(c) Dates of oral and practical examinations; and

(d) Names of individuals conducting and receiving the oral and practical examinations.

(4) Licensees will have until January 1, 2001, to comply with the certification requirements specified in subsection (1)(a) of this section, and the additional training requirements specified in subsections (1)(b) and (2)(a) of this section.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-200 Records required at temporary job sites. Each licensee conducting radiographic operations at a temporary site shall have copies of the following documents and records available at that site for inspection by the department:

- (1) Appropriate license;
- (2) Operating and emergency procedures;
- (3) Applicable regulations;
- (4) Survey records required pursuant to WAC 246-243-190 for the period of operation at the site;
- (5) Direct reading dosimeter records for the period of operation at the site;
- (6) The latest radiation survey instrument calibration record and leak test record for specific devices in use at the site;
- (7) The latest calibration record for alarm rate meters and operability checks of pocket dosimeters (~~(and/)~~) or electronic personal dosimeters as required by WAC 246-243-150;
- (8) Utilization records for each radiographic exposure device dispatched from that location as required by WAC 246-243-110;
- (9) Records of equipment problems identified in daily checks of equipment as required by WAC 246-243-120;
- (10) Records of alarm system and entrance control checks required by WAC 246-243-220, if applicable;
- (11) The shipping papers for the transportation of radioactive materials; and
- (12) When operating under reciprocity pursuant to WAC 246-232-040, a copy of the NRC or agreement state license authorizing the use of radioactive material.

AMENDATORY SECTION (Amending WSR 94-01-073, filed 12/9/93, effective 1/9/94)

WAC 246-243-205 Temporary job site notification. (1) Each licensee shall provide notification to the department as required by the department, preferably twenty-four hours but no later than two hours, prior to beginning radiographic operations at a temporary job site. The notification will be given by using the prescribed 1-800 telephone notification system. The notification shall include:

- (a) Name and office telephone number of the licensee;
- (b) Radioactive materials license number;
- (c) Address or directions to the temporary job site;
- (d) Specific (~~(date(s), time(s))~~) dates, times, and duration of expected radiographic operations;

(e) Names of radiographers and, if applicable, radiographer assistants taking part in the radiographic operations; and

(f) Name and telephone number of a contact person at the temporary job site.

(2) In the event that operations at a temporary job site continue for longer than thirty days, the licensee will (~~re~~notify) again notify the department, as required by subsection (1) of this section, each succeeding month.

AMENDATORY SECTION (Amending WSR 94-01-073, filed 12/9/93, effective 1/9/94)

WAC 246-243-240 Appendix B—General guidelines for inspection of radiography equipment.

(1) Panoramic devices (devices in which the source is physically removed from shielded container during exposure) should be inspected for:

- (a) Radiographic exposure unit;
- (i) Abnormal surface radiation levels anywhere on camera;
- (ii) Condition of safety plugs;
- (iii) Proper operation of locking mechanism;
- (iv) Condition of pigtail connector;
- (v) Alignment of "S" tube with exit port;
- (vi) Condition of carrying device (for example, straps(~~, handle,~~ etc.)) and handles);

(b) Source tube;

- (i) Rust, corrosion, dirt, or sludge buildup inside the source tube;

- (ii) Condition of source tube connector;
 - (iii) Condition of source stop;
 - (iv) Kinks or damage that could prevent proper operation;
- (c) Control cables and drive mechanism;
- (i) Proper drive mechanism for this camera, if appropriate;
 - (ii) Changes in general operating characteristics;
 - (iii) Condition of connector on drive cable;
 - (iv) Drive cable flexibility, wear, and rust;
 - (v) Excessive wear or damage to crank assembly parts;
 - (vi) Damage to drive cable conduit that could prevent the cable from moving freely;

(vii) Connection of the control cable connector with the pigtail connector for proper mating;

(viii) Proper operation of source position indicator, if applicable.

(2) Directional beam devices should be inspected for:

- (a) Abnormal surface radiation;
- (b) Changes in the general operating characteristics of the unit;
- (c) Proper operation of shutter mechanism;
- (d) Chafing or binding of shutter mechanism;
- (e) Damage to the device which might impair its operation;
- (f) Proper operation of locking mechanism;
- (g) Proper drive mechanism with this camera, if appropriate;
- (h) Condition of carrying device (~~(strap, handle, etc.)~~) for example, straps and handles);

- (i) Proper labeling.

AMENDATORY SECTION (Amending WSR 00-08-013, filed 3/24/00, effective 4/24/00)

WAC 246-243-250 Appendix C—Radiographer certification. (1) Requirements for an independent certifying organization. An independent certifying organization shall:

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

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

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

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

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

- (f) Have a set of written organizational by-laws and policies that provide adequate assurance of lack of conflict of interest and a system for monitoring and enforcing those by-laws and policies;

- (g) Have a committee, whose members can carry out their responsibilities impartially, to review and approve the certification guidelines and procedures, and to advise the organization's staff in implementing the certification program.

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

- (i) Have written procedures describing all aspects of its certification program, maintain records of the current status of each individual's certification and the administration of its certification program;

- (j) Have procedures to ensure that certified individuals are provided due process with respect to the administration of its certification program, including the process of becoming certified and any sanctions imposed against certified individuals;

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

- (l) Exchange information about certified individuals with the department, the US Nuclear Regulatory Commission, other independent certifying organizations (~~and~~) or agreement states and allow periodic review of its certification program and related records; and

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

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

(a) Require applicants for certification to:

(i) Receive training in the topics set forth in WAC 246-243-230 or equivalent NRC or agreement state regulations; and

(ii) Satisfactorily complete a written examination covering these topics;

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

(i) Received training in the topics set forth in WAC 246-243-230 or equivalent NRC or agreement state regulations;

(ii) Satisfactorily completed a minimum period of on-the-job training; and

(iii) Received verification by an agreement state or a NRC licensee that the applicant has demonstrated the capability of independently working as a radiographer;

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

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

(e) Provide a certification period of not less than three years nor more than five years;

(f) Include procedures for renewing certifications and, if the procedures allow renewals without examination, require evidence of recent full-time employment and annual refresher training;

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

(3) Requirements for written examinations.

All examinations must be:

(a) Designed to test an individual's knowledge and understanding of the topics listed in WAC 246-243-230 or equivalent NRC or agreement state requirements;

(b) Written in a multiple-choice format;

(c) Have test items drawn from a question bank containing psychometrically valid questions based on the material in WAC 246-243-230.

WAC 246-252-030 Criteria related to disposition of uranium mill tailings or wastes. As used in this section, the term "by-product material" means the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

As required by WAC 246-235-110(6), each applicant for a license to possess and use source material in conjunction with uranium or thorium milling, or by-product material at sites formerly associated with such milling, is required to include in a license application proposed specifications relating to the milling operation and the disposition of tailings or waste resulting from such milling activities. This section establishes criteria relating to the siting, operation, decontamination, decommissioning, and reclamation of mills and tailings or waste systems and sites at which such mills and systems are located and site and by-product material ownership. Applications must clearly demonstrate how these criteria have been addressed. The specifications shall be developed considering the expected full capacity of tailings or waste systems and the lifetime of mill operations. Where later expansions of systems or operations may be likely, the amenability of the disposal system to accommodate increased capacities without degradation in long-term stability and other performance factors shall be evaluated.

Licensees or applicants may propose alternatives to the specific requirements in these criteria. The alternative proposals may take into account local or regional conditions, including geology, topography, hydrology, and meteorology. The department may find that the proposed alternatives meet the department's requirements if the alternatives will achieve a level of stabilization and containment of the sites concerned, and a level of protection for public health, safety, and the environment from radiological and nonradiological hazards associated with the sites, which is equivalent to, to the extent practicable, or more stringent than the level which would be achieved by the requirements of the standards promulgated by the United States Environmental Protection Agency in 40 C.F.R. 192, Subparts D and E.

(1) Criterion 1 - In selecting among alternative tailings disposal sites or judging the adequacy of existing tailings sites, the following site features which would contribute to meeting the broad objective of permanent isolation of the tailings and associated contaminants from man and the environment for one thousand years to the extent reasonably achievable, and in any case, for at least two hundred years without ongoing active maintenance shall be considered:

- (a) Remoteness from populated areas;
- (b) Hydrogeologic and other environmental conditions conducive to continued immobilization and isolation of contaminants from groundwater sources; and
- (c) Potential for minimizing erosion, disturbance, and dispersion by natural forces over the long term.

The site selection process must be an optimization to the maximum extent reasonably achievable in terms of these features.

In the selection of disposal sites, primary emphasis shall be given to isolation of tailings or wastes, a matter having long-term impacts, as opposed to consideration only of short-term convenience or benefits, such as minimization of transportation or land acquisition

costs. While isolation of tailings will be a function of both site characteristics and engineering design, overriding consideration shall be given to siting features given the long-term nature of the tailings hazards.

Tailings shall be disposed in a manner such that no active maintenance is required to preserve the condition of the site.

(2) Criterion 2 - To avoid proliferation of small waste disposal sites, by-product material from in-situ extraction operations, such as residues from solution evaporation or contaminated control processes, and wastes from small remote above ground extraction operations shall be disposed at existing large mill tailings disposal sites; unless, considering the nature of the wastes, such as their volume and specific activity and the costs and environmental impacts of transporting the wastes to a large disposal site, such off-site disposal is demonstrated to be impracticable or the advantage of on-site burial clearly outweighs the benefits of reducing the perpetual surveillance obligations.

(3) Criterion 3 - The "prime option" for disposal of tailings is placement below grade, either in mines or specially excavated pits (that is, where the need for any specially constructed retention structure is eliminated).

The evaluation of alternative sites and disposal methods performed by mill operators in support of their proposed tailings disposal program (provided in applicants' environmental reports) shall reflect serious consideration of this disposal mode. In some instances, below grade disposal may not be the most environmentally sound approach, such as might be the case if a groundwater formation is relatively close to the surface or not very well isolated by overlying soils and rock. Also, geologic and topographic conditions might make full, below grade burial impracticable; for example, near-surface bedrock could create prominent excavation costs while more suitable alternate sites may be available. Where full below grade burial is not practicable, the size of the retention structures, and the size and steepness of slopes of associated exposed embankments, shall be minimized by excavation to the maximum extent reasonably achievable or appropriate, given the geologic and hydrogeologic conditions at a site. In these cases, it must be demonstrated that an above-grade disposal program will provide reasonably equivalent isolation of the tailings from natural erosional forces.

(4) Criterion 4 - The following site and design criteria shall be adhered to whether tailings or wastes are disposed of above or below grade:

(a) Upstream rainfall catchment areas must be minimized to decrease erosion potential and the size of the probable maximum flood which could erode or wash out sections of the tailings disposal area.

(b) Topographic features shall provide good wind protection.

(c) Embankment and cover slopes shall be relatively flat after final stabilization to minimize erosion potential and to provide conservative factors of safety assuring long-term stability. The broad objective should be to contour final slopes to grades which are as close as possible to those which would be provided if tailings were disposed of below grade; this could, for example, lead to slopes of about ten horizontal to one vertical (10h:1v) or less steep. In general, slopes should not be steeper than about 5h:1v. Where steeper slopes are proposed, reasons why a slope less steep than 5h:1v would be impracticable should be provided, and compensating factors and conditions which make such slopes acceptable should be identified.

(d) A fully self-sustaining vegetative cover shall be established or rock cover employed to reduce wind and water erosion to negligible levels.

Where a full vegetative cover is not likely to be self-sustaining due to climatic conditions, such as in semi-arid and arid regions, rock cover shall be employed on slopes of the impoundment system. The NRC will consider relaxing this requirement for extremely gentle slopes such as those which may exist on the top of the pile.

The following factors shall be considered in establishing the final rock cover design to avoid displacement of rock particles by human and animal traffic or by natural processes, and to preclude undercutting and piping:

(i) Shape, size, composition, gradation of rock particles (excepting bedding material, average particle size shall be at least cobble size or greater);

(ii) Rock cover thickness and zoning of particles by size; and

(iii) Steepness of underlying slopes.

(e) Individual rock fragments (~~shall~~) must be dense, sound, and resistant to abrasion, and free from defects that would tend to unduly increase their destruction by water and frost actions. Weak, friable, or laminated aggregate (~~shall~~) may not be used. Shale, rock laminated with shale, and cherts (~~shall~~) may not be used.

Rock covering of slopes may (~~not be required~~) be unnecessary where top covers are very thick (on the order of ten meters or greater); impoundment slopes are very gentle (on the order of 10h:1v or less); bulk cover materials have inherently favorable erosion resistance characteristics; and there is negligible drainage catchment area upstream of the pile, and (~~there is~~) good wind protection as described in (a) and (b) of this subsection (Criterion 4).

(f) Impoundment surfaces shall be contoured to avoid areas of concentrated surface runoff or abrupt or sharp changes in slope gradient. In addition to rock cover on slopes, areas toward which surface runoff might be directed shall be well protected with substantial rock cover (riprap). In addition to providing for stability of the impoundment systems itself, the overall stability, erosion potential, and geomorphology of surrounding terrain shall be evaluated to assure that there are no processes, such as gully erosion, which would lead to impoundment instability.

(g) The impoundment (~~shall~~) may not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in Section III (g) of Appendix A of 10 C.F.R. Part 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material.

(h) The impoundment, where feasible, should be designed to incorporate features which will promote deposition of suspended particles. For example, design features which promote deposition of sediment suspended in any runoff which flows into the impoundment area might be utilized; the object of such a design feature would be to enhance the thickness of cover over time.

(5) Criterion 5 - Criteria 5(a) through 5(g) and new Criterion 13 incorporate the basic groundwater protection standards imposed by the United States Environmental Protection Agency in 40 C.F.R. Part 192, Subparts D and E (48 FR 45926; October 7, 1983) which apply during op-

erations and prior to the end of closure. Groundwater monitoring to comply with these standards is required by Criterion 7.

(a) The primary groundwater protection standard is a design standard for surface impoundments used to manage uranium and thorium by-product material. Surface impoundments (except for an existing portion) must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, groundwater, or surface water at any time during the active life (including the closure period) of the impoundment. The liner may be constructed of materials that may allow wastes to migrate into the liner (but not into the adjacent subsurface soil, groundwater, or surface water) during the active life of the facility, provided that impoundment closure includes removal or decontamination of all waste residues, contaminated containment system components (liners), contaminated subsoils, and structures and equipment contaminated with waste and leachate. For impoundments that will be closed with the liner material left in place, the liner must be constructed of materials that can prevent wastes from migrating into the liner during the active life of the facility.

(b) The liner required by (a) of this subsection must be:

(i) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(ii) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and

(iii) Installed to cover all surrounding earth likely to be in contact with the wastes or leachate.

(c) The applicant or licensee will be exempted from the requirements of (a) of this subsection if the department finds, based on a demonstration by the applicant or licensee, that alternate design and operating practices, including the closure plan, together with site characteristics will prevent the migration of any hazardous constituents into groundwater or surface water at any future time. In deciding whether to grant an exemption, the department will consider:

(i) The nature and quantity of the wastes;

(ii) The proposed alternate design and operation;

(iii) The hydrogeologic setting of the facility, including the attenuation capacity and thickness of the liners and soils present between the impoundment and groundwater or surface water; and

(iv) All other factors which would influence the quality and mobility of the leachate produced and the potential for it to migrate to groundwater or surface water.

(d) A surface impoundment must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and wave actions; rainfall; run-on; from malfunctions of level controllers, alarms, and other equipment; and human error.

(e) When dikes are used to form the surface impoundment, the dikes must be designed, constructed, and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner

system will function without leakage during the active life of the impoundment.

(f) Uranium and thorium by-product materials must be managed to conform to the following secondary groundwater protection standard: Hazardous constituents entering the groundwater from a licensed site must not exceed the specified concentration limits in the uppermost aquifer beyond the point of compliance during the compliance period. Hazardous constituents are those constituents identified by the department pursuant to (g) of this subsection. Specified concentration limits are those limits established by the department as indicated in (j) of this subsection. The department will also establish the point of compliance and compliance period on a site specific basis through license conditions and orders. The objective in selecting the point of compliance is to provide the earliest practicable warning that the impoundment is releasing hazardous constituents to the groundwater. The point of compliance must be selected to provide prompt indication of groundwater contamination on the hydraulically downgradient edge of the disposal area. The department must identify hazardous constituents, establish concentration limits, set the compliance period, and adjust the point of compliance, if needed, when the detection monitoring established under criterion 7 indicates leakage of hazardous constituents from the disposal area.

(g) A constituent becomes a hazardous constituent subject to (j) of this subsection when the constituent:

(i) Is reasonably expected to be in or derived from the by-product material in the disposal area;

(ii) Has been detected in the groundwater in the uppermost aquifer; and

(iii) Is listed in WAC 246-252-050 Appendix A.

(h) The department may exclude a detected constituent from the set of hazardous constituents on a site specific basis if it finds that the constituent is not capable of posing a substantial present or potential hazard to human health or the environment. In deciding whether to exclude constituents, the department will consider the following:

(i) Potential adverse effect on groundwater quality, considering:

(A) The physical and chemical characteristics of the waste in the licensed site, including its potential for migration;

(B) The hydrogeological characteristics of the facility and surrounding land;

(C) The quantity of groundwater and the direction of groundwater flow;

(D) The proximity and withdrawal rates of groundwater users;

(E) The current and future uses of groundwater in the area;

(F) The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater quality;

(G) The potential for health risks caused by human exposure to waste constituents;

(H) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;

(I) The persistence and permanence of the potential adverse effects.

(ii) Potential adverse effects on hydraulically connected surface water quality, considering:

(A) The volume and physical and chemical characteristics of the waste in the licensed site;

(B) The hydrogeological characteristics of the facility and surrounding land;

(C) The quantity and quality of groundwater, and the direction of groundwater flow;

(D) The patterns of rainfall in the region;

(E) The proximity of the licensed site to surface waters;

(F) The current and future uses of surface waters in the area and any water quality standards established for those surface waters;

(G) The existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality;

(H) The potential for health risks caused by human exposure to waste constituents;

(I) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and

(J) The persistence and permanence of the potential adverse effects.

(i) In making any determinations under (h) and (k) of this subsection about the use of groundwater in the area around the facility, the department will consider any identification of underground sources of drinking water and exempted aquifers made by the United States Environmental Protection Agency.

(j) At the point of compliance, the concentration of a hazardous constituent must not exceed:

(i) The department approved background concentration of that constituent in the groundwater;

(ii) The respective value given in the table in subsection (5)(1) of this section if the constituent is listed in the table and if the background level of the constituent is below the value listed; or

(iii) An alternate concentration limit established by the department.

(k) Conceptually, background concentrations pose no incremental hazards and the drinking water limits in (j)(i) of this subsection state acceptable hazards but these two options may not be practically achievable at a specific site. Alternate concentration limits that present no significant hazard may be proposed by licensees for department consideration. Licensees must provide the basis for any proposed limits including consideration of practicable corrective actions, that limits are as low as reasonably achievable, and information on the factors the department must consider.

The department will establish a site specific alternate concentration limit for a hazardous constituent as provided in (j) of this subsection if it finds that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In establishing alternate concentration limits, the department will apply its as low as reasonably achievable criterion in this chapter. The department will also consider the following factors:

(i) Potential adverse effects on groundwater quality, considering:

(A) The physical and chemical characteristics of the waste in the licensed site including its potential for migration;

(B) The hydrogeological characteristics of the facility and surrounding land;

(C) The quantity of groundwater and the direction of groundwater flow;

(D) The proximity and withdrawal rates of groundwater users;

- (E) The current and future uses of groundwater in the area;
- (F) The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater quality;
- (G) The potential for health risks caused by human exposure to waste constituents;
- (H) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;
- (I) The persistence and permanence of the potential adverse effects.
- (ii) Potential adverse effects on hydraulically connected surface water quality, considering:
 - (A) The volume and physical and chemical characteristics of the waste in the licensed site;
 - (B) The hydrogeological characteristics of the facility and surrounding land;
 - (C) The quantity and quality of groundwater, and the direction of groundwater flow;
 - (D) The patterns of rainfall in the region;
 - (E) The proximity of the licensed site to surface waters;
 - (F) The current and future uses of surface waters in the area and any water quality standards established for those surface waters;
 - (G) The existing quality of surface water including other sources of contamination and the cumulative impact on surface water quality;
 - (H) The potential for health risks caused by human exposure to waste constituents;
 - (I) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and
 - (J) The persistence and permanence of the potential adverse effects.
- (1) MAXIMUM VALUES FOR GROUNDWATER PROTECTION:

Constituent or Property	Maximum Concentration
	Milligrams per liter
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10,10-hexachloro-1,7 -exoxy-1,4,4a,5,6,7,8,9a-octahydro-1, 4-endo-5,8-dimethano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2,2-bis(p-methoxyphenylethane)	0.1
Toxaphene (C ₁₀ H ₁₀ Cl ₆ , Technical chlorinated camphene, 67-69 percent chlorine)	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid)	0.01
	Picocuries per liter
Combined radium - 226 and radium - 228	5

Constituent or Property	Maximum Concentration
Gross alpha - particle activity (excluding radon and uranium when producing uranium by-product material or thorium when producing thorium by-product material)	Milligrams per liter 15

(m) If the groundwater protection standards established under (f) of this subsection are exceeded at a licensed site, a corrective action program must be put into operation as soon as is practicable, and in no event later than eighteen months after the department finds that the standards have been exceeded. The licensee shall submit the proposed corrective action program and supporting rationale for department approval prior to putting the program into operation, unless otherwise directed by the department. The objective of the program is to return hazardous constituent concentration levels in groundwater to the concentration limits set as standards. The licensee's proposed program must address removing the hazardous constituents that have entered the groundwater at the point of compliance or treating them in place. The program must also address removing or treating in place any hazardous constituents that exceed concentration limits in groundwater between the point of compliance and the downgradient facility property boundary. The licensee shall continue corrective action measures to the extent necessary to achieve and maintain compliance with the groundwater protection standard. The department will determine when the licensee may terminate corrective action measures based on data from the groundwater monitoring program and other information that provide reasonable assurance that the groundwater protection standard will not be exceeded.

(n) In developing and conducting groundwater protection programs, applicants and licensees shall also consider the following:

(i) Installation of bottom liners (where synthetic liners are used, a leakage detection system must be installed immediately below the liner to ensure major failures are detected if they occur. This is in addition to the groundwater monitoring program conducted as provided in Criterion 7. Where clay liners are proposed or relatively thin, in-situ clay soils are to be relied upon for seepage control, tests must be conducted with representative tailings solutions and clay materials to confirm that no significant deterioration of permeability or stability properties will occur with continuous exposure of clay to tailings solutions. Tests must be run for a sufficient period of time to reveal any effects if they are going to occur (in some cases deterioration has been observed to occur rather rapidly after about nine months of exposure)).

(ii) Mill process designs which provide the maximum practicable recycle of solutions and conservation of water to reduce the net input of liquid to the tailings impoundment.

(iii) Dewatering of tailings by process devices or in-situ drainage systems (at new sites, tailings must be dewatered by a drainage system installed at the bottom of the impoundment to lower the phreatic surface and reduce the driving head of seepage, unless tests show tailings are not amenable to such a system. Where in-situ dewatering is to be conducted, the impoundment bottom must be graded to assure that the drains are at a low point. The drains must be protected by suitable filter materials to assure that drains remain free running.

The drainage system must also be adequately sized to assure good drainage).

(iv) Neutralization to promote immobilization of hazardous constituents.

(o) Where groundwater impacts are occurring at an existing site due to seepage, action must be taken to alleviate conditions that lead to excessive seepage impacts and restore groundwater quality. The specific seepage control and groundwater protection method, or combination of methods, to be used must be worked out on a site-specific basis. Technical specifications must be prepared to control installation of seepage control systems. A quality assurance, testing, and inspection program, which includes supervision by a qualified engineer or scientist, must be established to assure the specifications are met.

(p) In support of a tailings disposal system proposal, the applicant/operator shall supply information concerning the following:

(i) The chemical and radioactive characteristics of the waste solutions.

(ii) The characteristics of the underlying soil and geologic formations particularly as they will control transport of contaminants and solutions. This includes detailed information concerning extent, thickness, uniformity, shape, and orientation of underlying strata. Hydraulic gradients and conductivities of the various formations must be determined. This information must be gathered from borings and field survey methods taken within the proposed impoundment area and in surrounding areas where contaminants might migrate to groundwater. The information gathered on boreholes must include both geologic and geophysical logs in sufficient number and degree of sophistication to allow determining significant discontinuities, fractures, and channeled deposits of high hydraulic conductivity. If field survey methods are used, they should be in addition to and calibrated with borehole logging. Hydrologic parameters such as permeability may not be determined on the basis of laboratory analysis of samples alone; a sufficient amount of field testing (e.g., pump tests) must be conducted to assure actual field properties are adequately understood. Testing must be conducted to allow estimating chemi-sorption attenuation properties of underlying soil and rock.

(iii) Location, extent, quality, capacity and current uses of any groundwater at and near the site.

(q) Steps must be taken during stockpiling of ore to minimize penetration of radionuclides into underlying soils; suitable methods include lining or compaction of ore storage areas.

(6) Criterion 6 - (a) In disposing of waste by-product material, licensees shall place an earthen cover (or approved alternative) over tailings or wastes at the end of milling operations and shall close the waste disposal area in accordance with a design¹ which provides reasonable assurance of control of radiological hazards to:

(i) Be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years; and

(ii) Limit releases of Radon-222 from uranium by-product materials, and Radon-220 from thorium by-product materials, to the atmosphere so as not to exceed an average² release rate of 20 picocuries per square meter per second (pCi/m²s) to the extent practicable throughout the effective design life determined pursuant to (a)(i) of this subsection (this criterion). In computing required tailings cover thicknesses, moisture in soils in excess of amounts found normally in similar soils in similar circumstances may not be considered. Direct

gamma exposure from the tailings or wastes should be reduced to background levels. The effects of any thin synthetic layer may not be taken into account in determining the calculated radon exhalation level. If nonsoil materials are proposed as cover materials, it must be demonstrated that these materials will not crack or degrade by differential settlement, weathering, or other mechanism, over long-term intervals.

(b) As soon as reasonably achievable after emplacement of the final cover to limit releases of Radon-222 from uranium by-product material and prior to placement of erosion protection barriers or other features necessary for long-term control of the tailings, the licensee shall verify through appropriate testing and analysis that the design and construction of the final radon barrier is effective in limiting releases of Radon-222 to a level not exceeding 20 pCi/m²s averaged over the entire pile or impoundment using the procedures described in 40 C.F.R. part 61, appendix B, Method 115, or another method of verification approved by NRC as being at least as effective in demonstrating the effectiveness of the final radon barrier.

(c) When phased emplacement of the final radon barrier is included in the applicable reclamation plan, the verification of Radon-222 release rates required in (b) of this subsection (this criterion) must be conducted for each portion of the pile or impoundment as the final radon barrier for that portion is emplaced.

(d) Within ninety days of the completion of all testing and analysis relevant to the required verification in (b) and (c) of this subsection (this criterion), the uranium mill licensee shall report to the department the results detailing the actions taken to verify that levels of release of Radon-222 do not exceed 20 pCi/m²s when averaged over the entire pile or impoundment. The licensee shall maintain records until termination of the license documenting the source of input parameters including the results of all measurements on which they are based, the calculations or analytical methods used to derive values for input parameters, and the procedure used to determine compliance. These records shall be kept in a form suitable for transfer to the custodial agency at the time of transfer of the site to DOE or a state for long-term care if requested.

(e) Near surface cover materials (i.e., within the top three meters) may not include waste or rock that contains elevated levels of radium; soils used for near surface cover must be essentially the same, as far as radioactivity is concerned, as that of surrounding surface soils. This is to ensure that surface radon exhalation is not significantly above background because of the cover material itself.

(f) The design requirements in this criterion for longevity and control of radon releases apply to any portion of a licensed or disposal site unless such portion contains a concentration of radium in land, averaged over areas of 100 square meters, which, as a result of by-product material, does not exceed the background level by more than:

(i) 5 picocuries per gram (pCi/g) of radium-226, or, in the case of thorium by-product material, radium-228, averaged over the first 15 centimeters (cm) below the surface; and

(ii) 15 pCi/g of radium-226, or, in the case of thorium by-product material, radium-228, averaged over 15-cm thick layers more than 15 cm below the surface.

(g) By-product material containing concentrations of radionuclides other than radium in soil, and surface activity on remaining

structures, must not result in a total effective dose equivalent (TEDE) exceeding the dose from cleanup of radium contaminated soil to the standard (benchmark dose) contained in (f) of this subsection, and must be at levels which are as low as is reasonably achievable (ALARA). If more than one residual radionuclide is present in the same 100 square meter area, the sum of the ratios for each radionuclide of concentration present to the concentration limit will not exceed "1" (unity). A calculation of the potential peak annual TEDE within 1000 years to the average member of the critical group that would result from applying the radium standard, not including radon, on the site must be submitted for approval. The use of decommissioning plans with benchmark doses which exceed 100 mrem/yr, before application of ALARA, requires the approval of the department. This requirement for dose criteria does not apply to sites that have decommissioning plans for soil and structures approved before June 11, 1999.

(h) The licensee shall also address the nonradiological hazards associated with the wastes in planning and implementing closure. The licensee shall ensure that disposal areas are closed in a manner that minimizes the need for further maintenance. To the extent necessary to prevent threats to human health and the environment, the licensee shall control, minimize, or eliminate post-closure escape of nonradiological hazardous constituents, leachate, contaminated rainwater, or waste decomposition products to the ground or surface waters or to the atmosphere.

- 1 In the case of thorium by-product materials, the standard applies only to design. Monitoring for radon emissions from thorium by-product materials after installation of an appropriately designed cover is not required.
- 2 This average applies to the entire surface of each disposal area over a period of at least one year, but a period short compared to 100 years. Radon will come from both by-product materials and from covering materials. Radon emissions from covering materials should be estimated as part of developing a closure plan for each site. The standard, however, applies only to emissions from by-product materials to the atmosphere.

Criterion 6A - (a) For impoundments containing uranium by-product materials, the final radon barrier must be completed as expeditiously as practicable considering technological feasibility after the pile or impoundment ceases operation in accordance with a written, department-approved reclamation plan. (The term as expeditiously as practicable considering technological feasibility as specifically defined in WAC 246-252-010 includes factors beyond the control of the licensee.) Deadlines for completion of the final radon barrier and, if applicable, the following interim milestones must be established as a condition of the individual license: Windblown tailings retrieval and placement on the pile and interim stabilization (including dewatering or the removal of freestanding liquids and recontouring). The placement of erosion protection barriers or other features necessary for long-term control of the tailings must also be completed in a timely manner in accordance with a written, approved reclamation plan.

(b) The department may approve a licensee's request to extend the time for performance of milestones related to emplacement of the final radon barrier if, after providing an opportunity for public participation, the department finds that the licensee has adequately demonstrated in the manner required in subsection (6)(b) of this section (Criterion 6) that releases of Radon-222 do not exceed an average of 20 pCi/m²s. If the delay is approved on the basis that the radon releases do not exceed 20 pCi/m²s, a verification of radon levels, as required by subsection (6)(b) of this section (Criterion 6), must be made annually during the period of delay. In addition, once the department has established the date in the reclamation plan for the milestone for completion of the final radon barrier, the department may extend that

date based on cost if, after providing an opportunity for public participation, the department finds that the licensee is making good faith efforts to emplace the final radon barrier, the delay is consistent with the definitions of available technology, and the radon releases caused by the delay will not result in a significant incremental risk to the public health.

(c) The department may authorize by license amendment, upon licensee request, a portion of the impoundment to accept uranium by-product material or such materials that are similar in physical, chemical, and radiological characteristics to the uranium mill tailings and associated wastes already in the pile or impoundment from other sources, during the closure process. No such authorization will be made if it results in a delay or impediment to emplacement of the final radon barrier over the remainder of the impoundment in a manner that will achieve levels of Radon-222 releases not exceeding 20 pCi/m²s averaged over the entire impoundment. The verification required in subsection (6)(b) of this section (Criterion 6) may be completed with a portion of the impoundment being used for further disposal if the department makes a final finding that the impoundment will continue to achieve a level of Radon-222 releases not exceeding 20 pCi/m²s averaged over the entire impoundment. In this case, after the final radon barrier is complete except for the continuing disposal area:

- (i) Only by-product material will be authorized for disposal;
- (ii) The disposal will be limited to the specified existing disposal area; and
- (iii) This authorization will only be made after providing opportunity for public participation.

Reclamation of the disposal area, as appropriate, must be completed in a timely manner after disposal operations cease in accordance with subsection (6)(a) of this section (Criterion 6); however, these actions are not required to be complete as part of meeting the deadline for final radon barrier construction.

(7) Criterion 7 - At least one full year prior to any major site construction, a preoperational monitoring program must be conducted to provide complete baseline data on a milling site and its environs. Throughout the construction and operating phases of the mill, an operational monitoring program must be conducted to complete the following:

- (a) To measure or evaluate compliance with applicable standards and regulations;
- (b) To evaluate performance of control systems and procedures;
- (c) To evaluate environmental impacts of operation; and
- (d) To detect potential long-term effects.

The licensee shall establish a detection monitoring program needed for the department to set the site-specific groundwater protection standards in Criterion 5 of this section. For all monitoring under this paragraph, the licensee or applicant will propose for department approval as license conditions, which constituents are to be monitored on a site-specific basis. A detection monitoring program has two purposes. The initial purpose of the program is to detect leakage of hazardous constituents from the disposal area so that the need to set groundwater protection standards is monitored. If leakage is detected, the second purpose of the program is to generate data and information needed for the department to establish the standards under Criterion 5. The data and information must provide a sufficient basis to identi-

fy those hazardous constituents which require concentration limit standards and to enable the department to set the limits for those constituents and the compliance period. They may also need to provide the basis for adjustments to the point of compliance. For licenses in effect September 30, 1983, the detection monitoring programs must have been in place by October 1, 1984. For licenses issued after September 30, 1983, the detection monitoring programs must be in place when specified by the department in orders or license conditions. Once groundwater protection standards have been established pursuant to Criterion 5, the licensee shall establish and implement a compliance monitoring program. The purpose of the compliance monitoring program is to determine that the hazardous constituent concentrations in groundwater continue to comply with the standards set by the department. In conjunction with a corrective action program, the licensee shall establish and implement a corrective action monitoring program. The purpose of the corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. Any monitoring program required by this paragraph may be based on existing monitoring programs to the extent the existing programs can meet the stated objective for the program.

(8) Criterion 8 - Milling operations shall be conducted so that all airborne effluent releases are reduced to as low as is reasonably achievable. The primary means of accomplishing this shall be by means of emission controls. Institutional controls, such as extending the site boundary and exclusion area, may be employed to ensure that off-site exposure limits are met, but only after all practicable measures have been taken to control emissions at the source. Notwithstanding the existence of individual dose standards, strict control of emissions is necessary to assure that population exposures are reduced to the maximum extent reasonably achievable and to avoid site contamination. The greatest potential sources of off-site radiation exposure (aside from radon exposure) are dusting from dry surfaces of the tailings disposal area not covered by tailings solution and emissions from yellowcake drying and packaging operations. During operations and prior to closure, radiation doses from radon emissions from surface impoundments shall be kept as low as is reasonably achievable. Checks shall be made and logged hourly of all parameters (e.g., differential pressure and scrubber water flow rate) which determine the efficiency of yellowcake stack emission control equipment operation. It shall be determined whether or not conditions are within a range prescribed to ensure that the equipment is operating consistently near peak efficiency; corrective action shall be taken when performance is outside of prescribed ranges. Effluent control devices shall be operative at all times during drying and packaging operations and whenever air is exhausting from the yellowcake stack.

Drying and packaging operations shall terminate when controls are inoperative. When checks indicate the equipment is not operating within the range prescribed for peak efficiency, actions shall be taken to restore parameters to the prescribed range. When this cannot be done without shutdown and repairs, drying and packaging operations shall cease as soon as practicable.

Operations may not be restarted after cessation due to off-normal performance until needed corrective actions have been identified and implemented. All such cessations, corrective actions, and restarts shall be reported to the department in writing, within ten days of the subsequent restart.

To control dusting from tailings, that portion not covered by standing liquids shall be wetted or chemically stabilized to prevent or minimize blowing and dusting to the maximum extent reasonably achievable. This requirement may be relaxed if tailings are effectively sheltered from wind, such as may be the case where they are disposed of below grade and the tailings surface is not exposed to wind. Consideration shall be given in planning tailings disposal programs to methods which would allow phased covering and reclamation of tailings impoundments since this will help in controlling particulate and radon emissions during operation. To control dustings from diffuse sources, such as tailings and ore pads where automatic controls do not apply, operators shall develop written operating procedures specifying the methods of control which will be utilized.

Milling operations producing or involving thorium by-product material shall be conducted in such a manner as to provide reasonable assurance that the annual dose equivalent does not exceed twenty-five millirems to the whole body, seventy-five millirems to the thyroid, and twenty-five millirems to any other organ of any member of the public as a result of exposures to the planned discharge of radioactive materials, Radon-220 and its daughters excepted, to the general environment.

Uranium and thorium by-product materials shall be managed so as to conform to the applicable provisions of Title 40 of the Code of Federal Regulations, Part 440, Ore Mining and Dressing Point Source Category: Effluent Limitations Guidelines and New Source Performance Standards, Subpart C, Uranium, Radium, and Vanadium Ores Subcategory, as codified on January 1, 1983.

The licensee shall establish a detection monitoring program needed to establish the groundwater protection standards in subsection (5)(f) of this section. A detection monitoring program has two purposes. The initial purpose of the program is to detect leakage of hazardous constituents from the disposal area so that the need to set groundwater protection standards is monitored. If leakage is detected, the second purpose of the program is to generate data and information needed for the department to establish the standards under subsection (5)(f) of this section. The data and information must provide a sufficient basis to identify those hazardous constituents which require concentration limit standards and to enable the department to set the limits for those constituents and the compliance period. They may also need to provide the basis for adjustments to the point of compliance. For licenses in effect September 30, 1983, the detection monitoring programs must have been in place by October 1, 1984. For licenses issued after September 30, 1983, the detection monitoring programs must be in place when specified by the department in orders or license conditions. Once groundwater protection standards have been established pursuant to subsection (5)(f) of this section, the licensee shall establish and implement a compliance monitoring program. The purpose of the compliance monitoring program is to determine that the hazardous constituent concentrations in groundwater continue to comply with the standards set by the department. In conjunction with a corrective action program, the licensee shall establish and implement a corrective action monitoring program. The purpose of the corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. Any monitoring program required by this paragraph may be based on existing monitoring programs to the extent the existing programs can meet the stated objective for the program.

Daily inspections of tailings or waste retention systems must be conducted by a qualified engineer or scientist and documented. The department must be immediately notified of any failure in a tailings or waste retention system (~~which~~) that results in a release of tailings or waste into unrestricted areas, or of any unusual conditions (conditions not contemplated in the design of the retention system) which if not corrected could indicate the potential or lead to failure of the system and result in a release of tailings or waste into unrestricted areas.

(9) Criterion 9 - (a) Pursuant to chapter 70.121 RCW, and except as otherwise provided, financial surety arrangements must be established by each mill operator before the commencement of operations to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the mill and site and for the reclamation of any tailings or waste disposal areas. The amount of funds to be ensured by such surety arrangements must be based on department-approved cost estimates in a department-approved plan, or a proposed revision to the plan submitted to the department for approval, if the proposed revision contains a higher cost estimate for:

(i) Decontamination and decommissioning of mill buildings and the milling site to levels which allow unrestricted use of these areas upon decommissioning; and

(ii) The reclamation of tailings or waste areas in accordance with technical criteria delineated in this section.

(b) Each cost estimate must contain:

(i) A detailed cost estimate for decontamination, decommissioning, and reclamation, in an amount reflecting:

(A) The cost of an independent contractor to perform the decontamination, decommissioning, and reclamation activities; and

(B) An adequate contingency factor.

(ii) An estimate of the amount of radioactive contamination in on-site subsurface material;

(iii) Identification of and justification for using the key assumptions contained in the decommissioning cost estimate; and

(iv) A description of the method of assuring funds for decontamination, decommissioning, and reclamation.

(c) The licensee shall submit this plan in conjunction with an environmental report that addresses the expected environmental impacts of the milling operation, decommissioning and tailings reclamation, and evaluates alternatives for mitigating these impacts. The plan must include a signed original of the financial instrument obtained to satisfy the surety arrangement requirements of this criterion (unless a previously submitted and approved financial instrument continues to cover the cost estimate for decommissioning). The surety arrangement must also cover the cost estimate and the payment of the charge for long-term surveillance and control required by subsection (10) of this section.

(d) To avoid unnecessary duplication and expense, the department may accept financial sureties that have been consolidated with financial or surety arrangements established to meet requirements of other federal or state agencies or local governing bodies for decommissioning, decontamination, reclamation, and long-term site surveillance and control, provided such arrangements are considered adequate to satisfy these requirements and that the portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas, and the long-term funding charge is clearly identified and committed for use in accomplishing these activities.

(e) The licensee's surety mechanism will be reviewed annually by the department to assure, that sufficient funds would be available for completion of the reclamation plan if the work had to be performed by an independent contractor.

(f) The amount of surety liability should be adjusted to recognize any increases or decreases resulting from:

(i) Inflation;

(ii) Changes in engineering plans;

(iii) Activities performed;

(iv) Spills, leakage or migration of radioactive material producing additional contamination in on-site subsurface material that must be remediated to meet applicable remediation criteria;

(v) Waste inventory increasing above the amount previously estimated;

(vi) Waste disposal costs increasing above the amount previously estimated;

(vii) Facility modifications;

(viii) Changes in authorized possession limits;

(ix) Actual remediation costs that exceed the previous cost estimate;

(x) On-site disposal; and

(xi) Any other conditions affecting costs.

(g) Regardless of whether reclamation is phased through the life of the operation or takes place at the end of operations, an appropriate portion of surety liability must be retained until final compliance with the reclamation plan is determined.

(h) The appropriate portion of surety liability retained until final compliance with the reclamation plan is determined will be at least sufficient at all times to cover the costs of decommissioning and reclamation of the areas that are expected to be disturbed before the next license renewal. The term of the surety mechanism must be open ended, unless it can be demonstrated that another arrangement would provide an equivalent level of assurance. This assurance would be provided with a surety instrument which is written for a specified time (for example five years) and which must be automatically renewed unless the surety notifies the department and the licensee with reasonable time (for example ninety days) before the renewal date of their intention not to renew. In such a situation the surety requirement still exists and the licensee would be required to submit an acceptable replacement surety within a brief time to allow at least sixty days for the department to collect.

(i) Proof of forfeiture must not be necessary to collect the surety. In the event that the licensee cannot provide an acceptable replacement surety within the required time, the surety shall be automatically collected before its expiration. The surety instrument must provide for collection of the full face amount immediately on demand without reduction for any reason, except for trustee fees and expenses provided for in a trust agreement, and that the surety will not refuse to make full payment. The conditions described previously would have to be clearly stated on any surety instrument which is not open-ended, and must be agreed to by all parties. Financial surety arrangements generally acceptable to the department are:

(i) Trust funds;

(ii) Surety bonds;

(iii) Irrevocable letters of credit; and

(iv) Combinations of the financial surety arrangements or other types of arrangements as may be approved by the department. If a trust

is not used, then a standby trust must be set up to receive funds in the event the department exercises its right to collect the surety. The surety arrangement and the surety or trustee, as applicable, must be acceptable to the department. Self-insurance, or any arrangement which essentially constitutes self-insurance (for example, a contract with a state or federal agency), will not satisfy the surety requirement because this provides no additional assurance other than that which already exists through license requirements.

(10) Criterion 10 - (a) A minimum charge of two hundred fifty thousand dollars (1978 United States dollars) accrued as specified in WAC 246-235-086(4) to cover the costs of long-term surveillance shall be paid by each mill operator to the agency prior to the termination of a uranium or thorium mill license. If site surveillance or control requirements at a particular site are determined, on the basis of a site-specific evaluation, to be significantly greater than those specified in (a) of this subsection (e.g., if fencing is determined to be necessary), variance in funding requirements may be specified by the department. The total charge to cover the costs of long-term surveillance shall be such that, with an assumed one percent annual real interest rate, the collected funds will yield interest in an amount sufficient to cover the annual costs of site surveillance. The charge will be adjusted annually prior to actual payments to recognize inflation. The inflation rate to be used is that indicated by the change in the consumer price index published by the United States Department of Labor, Bureau of Labor Statistics. Contributions by a licensee to the long-term care trust fund pursuant to chapter 70.121 RCW shall be transferred to cover the costs assessed under this criterion.

(11) Criterion 11 - These criteria relating to ownership of tailings and their disposal sites become effective on November 8, 1981, and apply to all licenses terminated, issued, or renewed after that date.

Any uranium or thorium milling license or tailings license shall contain such terms and conditions as NRC determines necessary to assure that prior to termination of the license, the licensee will comply with ownership requirements of this criterion for sites used for tailings disposal.

Title to the by-product material licensed pursuant to WAC 246-252-030 and land, including any interests therein (other than land owned by the United States or by the state of Washington) which is used for the disposal of any such by-product material, or is essential to ensure the long-term stability of such disposal site, shall be transferred to the United States or the state of Washington. In view of the fact that physical isolation must be the primary means of long-term control, and government land ownership is a desirable supplementary measure, ownership of certain severable subsurface interests (for example, mineral rights) may be determined to be unnecessary to protect the public health and safety and the environment. In any case, the applicant/operator must demonstrate a serious effort to obtain such subsurface rights, and must, in the event that certain rights cannot be obtained, provide notification in local public land records of the fact that the land is being used for the disposal of radioactive material and is subject to either a NRC general or specific license prohibiting the disruption and disturbance of the tailings. In some rare cases, such as may occur with deep burial where no ongoing site surveillance will be required, surface land ownership transfer requirements may be waived. For licenses issued before November 8, 1981, NRC may take into account the status of the ownership of such

land, and interests therein, and the ability of a licensee to transfer title and custody thereof to the United States or the state. If NRC, subsequent to title transfer, determines that use of the surface or subsurface estates, or both, of the land transferred to the United States or to a state will not endanger the public health, safety, welfare or environment, NRC may permit the use of the surface or subsurface estates, or both, of such land in a manner consistent with the provisions provided in these criteria. If NRC permits such use of such land, it will provide the person who transferred such land with the right of first refusal with respect to such use of such land.

Material and land transferred to the United States or a state in accordance with this criterion must be transferred without cost to the United States or a state other than administrative and legal costs incurred in carrying out such transfer.

The provisions of this part, respecting transfer of title and custody to land and tailings and wastes, do not apply in the case of lands held in trust by the United States for any Indian tribe, or lands owned by such Indian tribe subject to a restriction against alienation imposed by the United States. In the case of such lands which are used for the disposal of by-product material, as defined in this section, the licensee shall enter into arrangements with NRC as may be appropriate to assure the long-term surveillance of such lands by the United States.

(12) Criterion 12 - The final disposition of tailings or wastes at milling sites should be such that ongoing active maintenance is not necessary to preserve isolation. As a minimum, annual site inspections must be conducted by the government agency retaining ultimate custody of the site where tailings or wastes are stored, to confirm the integrity of the stabilized tailings or waste systems, and to determine the need, if any, for maintenance or monitoring. Results of the inspection must be reported to NRC within sixty days following each inspection. NRC may require more frequent site inspections if, on the basis of a site-specific evaluation, such a need appears necessary, due to the features of a particular tailings or waste disposal system.

(13) Criterion 13 - Secondary groundwater protection standards required by Criterion 5 of this section are concentration limits for individual hazardous constituents. The list of constituents found in Appendix A of this chapter, chapter 246-252 WAC, identifies the constituents for which standards must be set and complied with if the specific constituent is reasonably expected to be in or derived from the by-product material and has been detected in groundwater. For purposes of this criterion, the property of gross alpha activity will be treated as if it is a hazardous constituent. Thus, when setting standards under subsection (5)(j) of this section, the department will also set a limit for gross alpha activity.

WAC 246-235-010 Filing application for specific licenses. (1) Applications for specific licenses must be filed on department form RHF-1.

(2) The department 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 department to determine whether the application should be granted or denied or whether a license should be modified or revoked.

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

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

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

(6) Except as provided in (c), (d), and (e) of this subsection, an application for a specific license to use radioactive materials in the form of a sealed source or in a device that contains the sealed source must:

(a) Identify the source or device by manufacturer and model number; or

(b) Be registered with the NRC under 10 C.F.R. 32.210; or

(c) For sources or devices manufactured before October 23, 2012, that are not registered with the NRC(~~(, provide)~~) or an agreement state, and for which the applicant is unable to provide all categories of information specified in WAC 246-235-108(3), the application must include:

(i) All available information identified in WAC 246-235-108(3) concerning the source, and, if applicable, the device;

(ii) 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(~~(, relevant operational safety history)~~) and associated operating experience, and the results of the most recent leak test.

(d) For sealed sources and devices allowed to be distributed without registration of safety information in accordance with 10 C.F.R. 32.210 or this section, the applicant may supply only the manufacturer, model number, and radionuclide and quantity.

(e) 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.

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

NEW SECTION

WAC 246-235-082 Special requirements for issuance of a specific license to initially transfer source material. In addition to the requirements set forth in WAC 246-235-020, an application for a specific license to initially transfer source material for use under 10 C.F.R. 40.22 or WAC 246-233-010 or equivalent regulations of an agreement state will be approved if:

(1) The applicant satisfies the general requirements specified in WAC 246-235-020; and

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

NEW SECTION

WAC 246-235-083 Conditions of licenses to initially transfer source material for use under general license—Quality control, labeling, safety instructions, and reports and records. (1) Each person licensed under WAC 246-235-082 shall label the immediate container of each quantity of source material with the type and quantity of source material and the words "radioactive material."

(2) Each person licensed under WAC 246-235-082 shall ensure that the quantities and concentrations of source material are as labeled and indicated in any transfer records.

(3) Each person licensed under WAC 246-235-082 shall provide the information specified in this section to each person to whom source material is transferred for use under WAC 246-233-010, 10 C.F.R. 40.22, or equivalent provisions in agreement state regulations. This information must be transferred before the source material is transferred for the first time in each calendar year to the particular recipient. The required information includes:

(a) A copy of 10 C.F.R. 40.22 and 10 C.F.R. 40.51, or WAC 246-232-080 and 246-233-010, or equivalent agreement state regulations.

(b) Appropriate radiation safety precautions and instructions relating to handling, use, storage, and disposal of the material.

(4) Each person licensed under this section shall report transfers as follows:

(a) File a report with the director, Office of Radiation Protection, Radioactive Materials Section, P.O. Box 47827, Olympia, WA 98504. 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 these rules, 10 C.F.R. 40.22, or equivalent agreement state regulations, to whom greater than 50 grams (0.11 lbs.) 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 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.

(b) File a report with each responsible agreement state agency that identifies all persons, operating under provisions of 10 C.F.R. 40.22 or equivalent regulations of the department or an agreement state, to whom greater than 50 grams (0.11 lbs.) of source material has been transferred within a single calendar quarter. The report shall include the following 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) The name and address of the general licensee to whom source material was distributed; a responsible agent, by name 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 within the agreement state.

(c) Submit each report by January 31st of each year covering all transfers for the previous calendar year. If no transfers were made to persons generally licensed under 10 C.F.R. 40.22 or equivalent department rules or agreement state regulations during the current period, a report shall be submitted to the department so indicating. If no transfers have been made to general licensees in a particular agreement state during the reporting period, this information shall be reported to the responsible agreement state agency upon request by the agency.

(5) Each person licensed under 10 C.F.R. 40.54 or equivalent department or agreement state regulations shall maintain all information that supports the reports required by this section concerning each transfer to a general licensee for a period of one year after the event is included in a report to the department, NRC, or to an agreement state agency.

AMENDATORY SECTION (Amending WSR 15-06-015, filed 2/23/15, effective 3/26/15)

WAC 246-235-093 Manufacture, assembly or distribution of devices under general license. (1) An application for a specific license to manufacture or initially transfer or distribute devices containing radioactive material, excluding special nuclear material, to persons generally licensed under WAC 246-233-020 or equivalent regulations of the NRC or an agreement state will be approved if:

(a) The applicant satisfies the general requirements of WAC 246-235-020;

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

(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 it is unlikely that any person will receive in one year a dose in excess of ten percent of the limits specified in the table in WAC 246-221-010(1); 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 following organ doses:

- Whole body; head and trunk; active blood-forming organs; gonads; or lens of eye 15 centigray (15 rem)
- Hands and forearms; feet and ankles; localized areas of skin averaged over areas no larger than one square centimeter 200 centigray (200 rem)
- Other organs 50 centigray (50 rem)

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

(i) 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);

(ii) 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 nuclide, quantity of radioactivity, and date of determination of the quantity; and

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

(A) The receipt, possession, use and transfer of this device, Model , Serial No. Note*, are subject to a general license or the equivalent, and the regulations of the NRC or a state with which the NRC has entered into an agreement for the exercise of regulatory authority. This label must be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION - RADIOACTIVE MATERIAL

.....
(Name of manufacturer or distributor)*

(B) The receipt, possession, use and transfer of this device, Model , Serial No. Note*, are subject to a general license or the equivalent, and the rules of an agreement state. This label must be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION - RADIOACTIVE MATERIAL

.....
(Name of manufacturer or distributor)*

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

(d) Each device having a separable source housing that provides the primary shielding for the source also bears, on the source housing, a durable label containing the device model number and serial number, the nuclide and quantity, the words, "CAUTION - RADIOACTIVE MATERI-

AL," the radiation symbol described in WAC 246-221-120, and the name of the manufacturer or initial distributor;

(e) Each device meeting the criteria of WAC 246-233-020 (3)(k), 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 WAC 246-221-120;

(f) The device has been registered in the sealed source and device registry.

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

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

(3) In the event the applicant desires that the general licensee under WAC 246-233-020, or under equivalent regulations of the NRC or an agreement state be authorized to install the device, collect the sample to be analyzed by a specific licensee for leakage of radioactive material, service the device, test the on-off mechanism and indicator, or remove the device from installation, the applicant must include in the application written instructions to be followed by the general licensee, estimated calendar quarter doses associated with such activity or activities, and bases for such estimates. The submitted information must demonstrate that performance of such activity or activities by an individual untrained in radiological protection, in addition to other handling, storage, and use of devices under the general license, is unlikely to cause that individual to receive in one year a radiation dose in excess of ten percent of the limits specified in the table in WAC 246-221-010(1).

(4) Each person licensed under subsection (1) of this section to distribute or initially transfer devices to generally licensed persons must provide the information specified in this section to each person to whom a device is to be transferred. This information must be provided before the device may be transferred. If transfer is through an intermediate person, the information must also be provided to the intended user before initial transfer to the intermediate person.

(a) If a device containing radioactive material is to be transferred for use under the general license contained in WAC 246-233-020, the required information must include:

(i) A copy of the general license contained in WAC 246-233-020. If WAC 246-233-020 (3)(b), (c), and (d) or (k) do not apply, those subsections may be omitted;

(ii) A copy of WAC 246-232-050, 246-221-230, 246-221-240, and 246-221-250;

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

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

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

(b) If a device containing radioactive material is to be transferred for use in another jurisdiction under a general license equivalent to WAC 246-233-020, the required information must include:

(i) A copy of the appropriate NRC or an agreement state's regulations, equivalent to WAC 246-233-020, 246-232-050, 246-221-230, 246-221-240, and 246-221-250. If a copy of WAC 246-233-020, 246-232-050, 246-221-230, 246-221-240, and 246-221-250 is provided to a prospective general licensee in lieu of the NRC's or the agreement state's regulations, it must be accompanied by a note explaining that the use of the device is regulated by the NRC or the agreement state. If certain subsections do not apply to the particular device, those subsections may be omitted;

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

(iii) Information on acceptable disposal options including estimated cost of disposal;

(iv) The name or title, address, and phone number of the contact at the appropriate NRC or an agreement state regulatory agency from which additional information may be obtained; and

(v) An indication that NRC policy is to issue high civil penalties for improper disposal;

(c) Each person licensed under subsection (1) of this section to distribute or initially transfer devices to persons generally licensed under WAC 246-233-020 must report to the department all transfers of devices to persons for use under the general license in WAC 246-233-020 and all receipts of devices from persons licensed under WAC 246-233-020.

(i) Each report must be clear and legible and contain all of the data required. The required information for transfers to general licensees includes:

(A) The identity of each general licensee by name and mailing address for the location of use; if there is no mailing address for the location of use, an alternative address for the general licensee must be included with information on the actual location of use;

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

(C) The date of transfer;

(D) The manufacturer or initial transferor, the type, model number and serial number of the device transferred; and

(E) The source serial(s), nuclide(s), activity, and date(s) of original activity of radioactive material contained in the device.

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

(iii) For devices received from a general licensee under WAC 246-233-020, the report must include:

(A) The identity of the general licensee by name and address;

(B) The type, model number, and serial number of the device received; and the source serial(s), nuclide(s), activity, and date(s) of original activity of radioactive material contained in the device;

(C) The date of receipt; and

(D) In the case of devices not initially transferred by the reporting licensee, the name of the manufacturer or initial transferor.

(iv) If the licensee makes changes to a device possessed by a person generally licensed under WAC 246-233-020, such that the label must be changed to update required information, the report must identify the general licensee, the device, and the changes to information on the device label.

(v) If no transfers have been made to or from persons generally licensed under WAC 246-233-020 during the reporting period, the report must so indicate.

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

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

(d) Reports to NRC or an agreement state regulatory agency.

(i) Each person licensed under subsection (1) of this section to distribute or initially transfer devices to persons generally licensed under the NRC's regulations equivalent to WAC 246-233-020 must report to the NRC all transfers of devices to persons for use under a general license equivalent to WAC 246-233-020 and all receipts of devices from persons licensed under regulations equivalent to WAC 246-233-020.

(ii) Each person licensed under subsection (1) of this section to distribute or initially transfer devices to persons generally licensed under an agreement state's regulations equivalent to WAC 246-233-020 must report to the agreement state's regulatory authority all transfers of devices to persons for use under a general license equivalent to WAC 246-233-020 and all receipts of devices from persons licensed under regulations equivalent to WAC 243-233-020.

(iii) Such report must be clear and legible and contain all of the data required. The required information for transfers to general licenses must include:

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

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

(C) The date of transfer;

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

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

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

(v) For devices received from persons generally licensed under NRC's or an agreement state's regulations equivalent to WAC 246-233-020, the report must include:

(A) The identity of the general licensee by name and address;

(B) The type, model number, and serial number of the device received;

(C) The date of receipt; and

(D) In the case of devices not initially transferred by the reporting licensee, the name of the manufacturer or initial transferor.

(vi) If the licensee makes changes to a device possessed by a person generally licensed under NRC's or an agreement state's regulations equivalent to WAC 246-233-020, such that the label must be changed to update required information, the report must identify the general licensee, the device, and the changes to information on the device label.

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

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

(ix) If no transfers have been made to or from NRC licensees during the reporting period, this information must be reported to the NRC.

(x) If no transfers have been made to or from general licensees within an agreement state during the reporting period, this information must be reported to the responsible agreement state agency upon request of the agency.

(e) The person shall maintain all information and keep records concerning transfers and receipts of devices that support the reports required by this section. Records required by this section must be maintained for a period of three years following the date of the recorded event.

(f) If a notification of bankruptcy has been made under WAC 246-233-050 or the license is to be terminated, each person licensed under this section shall provide, upon request, to the department, the NRC or an agreement state, records of final disposition required under ~~((this subsection (4))~~(e) of this subsection.

AMENDATORY SECTION (Amending WSR 04-04-055, filed 1/30/04, effective 3/1/04)

WAC 246-235-095 Manufacture, assembly, or distribution of luminous safety devices, certain calibration sources or ice detectors under general license. (1) *Special requirements for the manufacture, assembly or repair of luminous safety devices for use in aircraft.* An application for a specific license to manufacture, assemble ~~((or))~~,

repair, or initially transfer luminous safety devices containing tritium or promethium-147 for use in aircraft for distribution to persons generally licensed under WAC 246-233-025 will be approved subject to the following conditions:

(a) The applicant satisfies the general requirements specified in WAC 246-235-020; and

(b) The applicant satisfies the requirements of Sections 32.53, 32.54, 32.55, and 32.56(~~(, 32.101)~~) of 10 C.F.R. Part 32 or their equivalent.

(2) *Special requirements for license to manufacture calibration sources containing americium-241, plutonium or radium-226 for distribution to persons generally licensed under WAC 246-233-035.* An application for a specific license to manufacture calibration and reference sources containing americium-241, plutonium or radium-226 to persons generally licensed under WAC 246-233-035 will be approved subject to the following conditions:

(a) The applicant satisfies the general requirement of WAC 246-235-020; and

(b) The applicant satisfies the requirements of Sections 32.57, 32.58, and 32.59(~~(, 32.102)~~) of 10 C.F.R. Part 32 and Section 70.39 of 10 C.F.R. Part 70 or their equivalent.

(3) *Licensing the manufacture and distribution of ice detection devices.* An application for a specific license to manufacture and distribute ice detection devices to persons generally licensed under WAC 246-233-030 will be approved subject to the following conditions:

(a) The applicant satisfies the general requirements of WAC 246-235-020; and

(b) The criteria of Sections 32.61(~~(,)~~) and 32.62(~~(, 32.103)~~) of 10 C.F.R. Part 32 are met.

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-235-102 Manufacture and distribution of sources or devices containing radioactive material for medical use. An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed under chapter 246-240 WAC for use as a calibration, transmission, or reference source or for the uses listed in WAC 246-240-251, 246-240-301, and 246-240-351 will be approved if:

(1) The applicant satisfies the general requirements in WAC 246-235-020;

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

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

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

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

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

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

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

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

(h) Instructions for handling and storing the source or device from the radiation safety standpoint, these instructions are to be included on a durable label attached to the source or device or attached to a permanent storage container for the source or device: Provided that instructions which are too lengthy for the 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 named source or device is licensed by the department for distribution to persons licensed under chapter 246-240 WAC or under equivalent regulations of the NRC or an agreement state: Provided that the labeling for sources which do not require long term storage may be on a leaflet or brochure which accompanies the source((-));

(4) The source or device has been registered in the sealed source and device registry.

(5) If the applicant desires that the source or device be tested for leakage of radioactive material at intervals longer than six months, the applicant shall include in the application sufficient information to demonstrate that the longer interval is justified by performance characteristics of the source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material from the source.

(~~(5)~~) (6) In determining the acceptable interval for test of leakage of radioactive material, the department will consider information that includes, but is not limited to:

(a) Primary containment (source capsule);

(b) Protection of primary containment;

(c) Method of sealing containment;

(d) Containment construction materials;

(e) Form of contained radioactive material;

(f) Maximum temperature withstood during prototype tests;

(g) Maximum pressure withstood during prototype tests;

(h) Maximum quantity of contained radioactive material;

(i) Radiotoxicity of contained radioactive material; and

(j) Operating experience with identical sources or devices or similarly designed and constructed sources or devices.

NEW SECTION

WAC 246-235-108 Sealed source and device registration and inactivation. (1) Any manufacturer or initial distributor of a sealed source or device containing a sealed source may submit a request to the department or NRC for evaluation of radiation safety information about its product and for its registration.

(2) Request for review must be sent to the department or to NRC's office of nuclear material safety and safeguards, ATTN: SDDR, by an appropriate method listed in 10 C.F.R. 30.6(a).

(3) 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.

(4) The department 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 department formulates reasonable standards and criteria with the help of the manufacturer or distributor. The department 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. 10 C.F.R. 32 Subpart A includes specific criteria that apply to certain exempt products, Subpart B includes specific criteria applicable to certain generally licensed devices, and Subpart C includes specific provisions that apply to certain specifically licensed items.

(5) After completion of the evaluation, the department 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.

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

(a) The statements and representations, including quality control program, contained in the request; and

(b) The provisions of the registration certificate.

(7) 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:

(a) Calibration and reference sources containing no more than:

(i) 37 megabecquerels (one millicurie) for beta or gamma emitting radionuclides; or

(ii) 0.37 megabecquerels (ten microcuries), for alpha emitting radionuclides; or

(b) 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 WAC 246-235-090 of this chapter, 10 C.F.R. 33, or comparable provisions of an agreement state;

(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 gigabecquerels (20 curies) of tritium (H-3) or 7.4 gigabecquerels (200 millicuries) of any other radionuclide.

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

(9)(a) A certificate holder who no longer manufactures or initially transfers any of the sealed sources or devices covered by a particular certificate issued by the department or NRC shall request inactivation of the registration certificate from the issuing regulatory authority. Such a request must be made to the department, or (as appropriate) to NRC's office of nuclear material safety and safeguards, ATTN: SSDR by an appropriate method listed in 10 C.F.R. 30.6(a) and must normally be made no later than two years after initial distribution of all of the sources or devices 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 ninety days of this determination and briefly describe the circumstances of the delay.

(b) If a distribution license is to be terminated in accordance with chapters 246-232, 246-233, and 246-235 WAC, the licensee shall request inactivation of its registration certificates associated with that distribution license before the department will terminate the license. Such a request for inactivation of certificates 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.

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-233-001 Purpose and scope. (1) This chapter establishes general licenses for the possession and use of radioactive material and a general license for ownership of radioactive material.

(2) Chapter 246-232 WAC also contains provisions applicable to the general licenses established in this part.

(3) The definitions contained in WAC 246-220-010 also apply to this chapter.

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-233-010 General licenses—Source material. (1) A general license is hereby issued authorizing commercial and industrial firms; research, educational, and medical institutions; and federal, state, and local government agencies to receive, possess, use, ((possession,)) and transfer ((of not more than fifteen pounds of source material at any one time by persons in the following categories:

~~(a) Pharmacists using the source material solely for the preparation of medicinal compounds;~~

~~(b) Physicians using the source material for medicinal purposes;~~

~~(c) Persons receiving possession of source material from pharmacists and physicians in the form of medicinals or drugs;~~

~~(d) Commercial and industrial firms, and research, educational, and medical institutions, and state and local government agencies for research, development, educational, operational, or commercial purposes: And provided, That no such person shall, pursuant to this general license, receive more than a total of one hundred fifty pounds of source material in any one calendar year.)~~ uranium and thorium, 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 lbs.) of uranium and thorium in dispersible forms, for example, gaseous, liquid, or powder 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 section may not receive more than a total of 7 kg (15.4 lbs.) of uranium and thorium in any one calendar year. Persons possessing source material in excess of these limits as of August 27, 2013, may continue to possess up to 7 kg (15.4 lbs.) of uranium and thorium at any one time for one year beyond this date, or until the department takes final action on a pending application submitted on or before August 27, 2014, for a specific license for such material; and receive up to 70 kg (154 lbs.) of uranium or thorium in any one calendar year until December 31, 2014, or until the department takes final action on a pending application submitted on or before August 27, 2014, for a specific license for such material; and

(b) No more than a total of 7 kg (15.4 lbs.) of uranium and thorium at any one time. A person authorized to possess, use, and transfer source material under this section may not receive more than a total of 70 kg (154 lbs.) 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 section unless it is accounted for under the limits of (a) of this subsection; or

(c) No more than 7 kg (15.4 lbs.) of uranium, removed during the treatment of drinking water, at any one time. A person may not remove more than 70 kg (154 lbs.) of uranium from drinking water during a calendar year under this section; or

(d) No more than 7 kg (15.4 lbs.) of uranium and thorium at laboratories for the purpose of determining the concentration of uranium and thorium contained within the material being analyzed at any one time. A person authorized to possess, use, and transfer source material under this section may not receive more than a total of 70 kg (154 lbs.) of source material in any one calendar year.

(2) Any person((s)) who receives, ((possess)) possesses, uses, or transfers source material pursuant to the general license issued in subsection (1) of this section ((are exempt from the provisions of chapters 246-221 and 246-222 WAC to the extent that such receipt, possession, use, or transfer is within the terms of such general license: Provided, however, That 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 chapter 246-235 WAC.

(3))):

(a) Is prohibited from administering source material, or the radiation therefrom, either externally or internally, to humans except as may be authorized by the department, NRC, or an agreement state in a specific license.

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

(i) A cumulative total of 0.5 kg (1.1 lbs.) of source material in a solid, nondispersible 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 section is exempt from the requirements to obtain a license under this chapter to the extent the source material is permanently disposed. This provision does not apply to any person who is in possession of source material under a specific license issued under chapter 246-235 WAC; or

(ii) In accordance with WAC 246-221-170.

(c) Is subject to the provisions of chapters 246-221, 246-232, 246-233, and 246-235 WAC.

(d) Shall respond to written requests from the department to provide information relating to the general license within thirty calendar days of the date of the request, or other time period specified in the request. If the person cannot provide the requested information within the allotted time, the person shall, within that same time period, request a longer period to supply the information by providing the director, office of radiation protection, using an appropriate method of communication, a written justification for the request;

(e) May not export such source material except in accordance with 10 C.F.R. 110.

(3) Any person who receives, possesses, uses, or transfers source material in accordance with subsection (1) of this section shall con-

duct 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 director, office of radiation protection, by an appropriate method of communication about such contamination, and may consult with the department regarding 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 the general license is not likely to result in exposures that exceed the limits in WAC 246-246-020.

(4) Any person who receives, possesses, uses, or transfers source material in accordance with the general license granted in subsection (1) of this section is exempt from the provisions of chapters 246-221 and 246-222 WAC to the extent that such receipt, possession, use, and transfer are within the terms of this general license, except that such person shall comply with the provisions of WAC 246-246-020 and 246-221-170 to the extent necessary to meet the provisions of this section. However, this exemption does not apply to any person who also holds a specific license issued under chapter 246-235 WAC.

(5) No person may initially transfer or distribute source material to persons generally licensed under subsection (1)(a) or (b) of this section, or equivalent regulations of an agreement state or NRC, unless authorized by a specific license issued in accordance with chapter 246-235 WAC or equivalent provisions of an agreement state or NRC. 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 subsection (1) of this section before August 27, 2013, without specific authorization may continue for one year beyond this date. Distribution may also be continued until the department takes final action on a pending application for license or license amendment to specifically authorize distribution submitted on or before August 27, 2014.

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

((4)) (7) Depleted uranium in industrial products and devices.

(a) A general license is hereby issued to receive, acquire, possess, use, or transfer, in accordance with the provisions of (b), (c), (d), and (e) of this subsection, depleted uranium contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of the product or device.

(b) The general license in (a) of this subsection applies only to industrial products or devices which have been manufactured either in accordance with a specific license issued to the manufacturer of the products or devices pursuant to WAC 246-235-091 or in accordance with a specific license issued to the manufacturer by the department, NRC, or an agreement state which authorizes manufacture of the products or devices for distribution to persons generally licensed by the NRC or an agreement state.

(c)(i) Persons who receive, acquire, possess, or use depleted uranium pursuant to the general license established by (a) of this subsection shall file department form RHF-20 "Registration certificate - Use of depleted uranium under general license," with the department. The form shall be submitted within thirty days after the first receipt

or acquisition of such depleted uranium. The registrant shall furnish on department form RHF-20 the following information and such other information as may be required by that form:

(A) Name and address of the registrant;

(B) A statement that the registrant has developed and will maintain procedures designed to establish physical control over the depleted uranium described in (a) of this subsection and designed to prevent transfer of such depleted uranium in any form, including metal scrap, to persons not authorized to receive the depleted uranium; and

(C) Name and title, address, and telephone number of the individual duly authorized to act for and on behalf of the registrant in supervising the procedures identified in (c)(i)(B) of this subsection.

(ii) The registrant possessing or using depleted uranium under the general license established by (a) of this subsection shall report in writing to the department any changes in information previously furnished on the "Registration certificate - Use of depleted uranium under general license." The report shall be submitted within thirty days after the effective date of such change.

(d) A person who receives, acquires, possesses, or uses depleted uranium pursuant to the general license established by (a) of this subsection:

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

(ii) Shall not abandon such depleted uranium.

(iii) Shall transfer or dispose of such depleted uranium only by transfer in accordance with the provision of chapter 246-232 WAC. In the case where the transferee receives the depleted uranium pursuant to the general license established by (a) of this subsection the transferor shall furnish the transferee a copy of this regulation and a copy of department form RHF-20.

In the case where the transferee receives the depleted uranium pursuant to a general license contained in the NRC's or agreement state's regulation equivalent to (a) of this subsection the transferor shall furnish the transferee a copy of this regulation and a copy of department form RHF-20 accompanied by a note explaining that use of the product or device is regulated by the NRC or agreement state under requirements substantially the same as those in this regulation.

(iv) Shall maintain and make available to the department upon request the name and address of the person receiving the depleted uranium pursuant to such transfer.

(v) Shall not export such depleted uranium except in accordance with a license issued by the NRC pursuant to 10 C.F.R. Part 110.

(e) Any person receiving, acquiring, possessing, using, or transferring depleted uranium pursuant to the general license established by (a) of this subsection is exempt from the requirements of chapters 246-221 and 246-222 WAC of these regulations with respect to the depleted uranium covered by that general license.

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-233-015 Certain devices and equipment. A general license is hereby issued to transfer, receive, acquire, own, possess, and use radioactive material incorporated in the following devices or equipment which have been manufactured, tested and labeled by the manufacturer in accordance with a specific license issued to the manufacturer by the NRC for use pursuant to (~~Section 31.3 of~~) 10 C.F.R. (~~Part 31~~) 30.15. This general license is subject to the provisions of WAC 246-220-020, 246-220-030, 246-220-040, 246-220-050, 246-220-060, 246-220-070, chapters 246-232, 246-221** and 246-222 WAC.

(1) *Static elimination device.* Devices designed for use as static eliminators (~~which~~) that contain, as a sealed source or sources, radioactive material consisting of a total of not more than 18.5 megabecquerels (500 microcuries) of Polonium-210 per device.

(2) *Ion generating tube.* Devices designed for ionization of air (~~which~~) that contain, as a sealed source or sources, radioactive material consisting of a total of not more than 18.5 megabecquerels (500 microcuries) of Polonium-210 per device or a total of not more than 1.85 gigabecquerels (50 millicuries) of Hydrogen-3 (tritium) per device.

(3) Such devices authorized before October 23, 2012, for use under the general license provided in 10 C.F.R. 30.15, department license, or equivalent regulations of an agreement state and manufactured, tested, and labeled by the manufacturer in accordance with the specifications contained in a specific license issued by the department or an agreement state.

** Attention is directed particularly to the provisions of chapter 246-221 WAC which relate to the labeling of containers.

AMENDATORY SECTION (Amending WSR 13-24-025, filed 11/22/13, effective 12/23/13)

WAC 246-233-020 Certain detecting, measuring, gauging, or controlling devices and certain devices for producing light or an ionized atmosphere. (1) 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 federal, state, or local government agencies to acquire, receive, possess, use or transfer, in accordance with the provisions of subsections (2), (3), and (4) of this section, radioactive material, excluding special nuclear material, contained in devices designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.

(2) The general license in subsection (1) of this section applies only to radioactive material contained in devices which have been manufactured or initially transferred and labeled in accordance with the specifications contained in a specific license issued by the department pursuant to WAC 246-235-093 or in accordance with an equivalent specific license issued by the department, NRC, or an agreement state, which authorizes distribution or transfer of devices to persons gener-

ally licensed by the department, NRC, or an agreement state**. The devices must have been received from one of the specific licensees described in this subsection or through a transfer made under subsection (3)(h) of this section.

**Note: Regulations under the Federal Food, Drug, and Cosmetic Act authorizing the use of radioactive control devices in food production require certain additional labeling thereon which is found in Section 179.21 of 21 C.F.R. Part 179.

(3) Any person who acquires, receives, possesses, uses or transfers radioactive material in a device pursuant to the general license in subsection (1) of this section:

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

(b) 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 six-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 3.7 megabecquerels (100 microcuries) of other beta or gamma emitting material or 370 kilobecquerels (10 microcuries) of alpha emitting material need not be tested for any purpose. Devices held in storage in the original shipping container prior to initial installation need not be tested until immediately prior to use;

(c) Shall assure that the tests required by (b) of this subsection and other testing, installing, servicing, and removing 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 a specific license issued by the department, the NRC or an agreement state to perform such activities;

(d) Shall maintain records showing compliance with the requirements of (b) and (c) of this subsection. The records must show the results of tests. The records also must show the dates of performance and the names of persons performing, testing, installing, servicing, and removing from installation radioactive material and its shielding or containment. Records of tests for leakage of radioactive material required by (b) of this subsection must be retained for three years after the next required leak test is performed or the sealed source is transferred or disposed. Records of tests of the on/off mechanism and indicator required by (b) of this subsection must be retained for three years after the next required test of the on/off mechanism and indicator is performed or the sealed source is transferred or disposed. Records of other testing, installation, servicing, and removal from installation required by (c) of this subsection must be retained for a period of three years from the date of the recorded event or until the device is transferred or disposed;

(e) 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 becquerels (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 issued by the department, the NRC or an agreement state to repair such devices, or disposed by

transfer to a person authorized by a specific license to receive the radioactive material contained in the device or as otherwise approved by the department. Within thirty days, the licensee must send the department a written report containing a brief description of the event and the remedial action taken; and, in the case of detection of 185 becquerels (0.005 microcurie) or more of 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 (see WAC 246-246-020);

(f)(i) Shall not abandon the device containing radioactive material;

(ii) Shall not export the device containing radioactive material except in accordance with the provisions of 10 C.F.R. 110;

(g) Except as provided in (h) of this subsection, must transfer or dispose of the device containing radioactive material only by transfer to a person with a specific license issued by the department, the NRC, or an agreement state, which authorizes the person to receive the device. Within thirty days after export or transfer of a device to a specific licensee, the general licensee must send a report to the department, containing the identity of the device and manufacturer (or initial transferor), model number, serial number, the nuclide(s), and activity of radioactive material contained in the devices; the name, address, and license number of the person receiving the device, and the date of transfer. Prior written approval from the department is required before transferring the device to any other specific licensee not specifically identified in this subsection; however, a specific licensee may transfer a device for possession and use under its own specific license without prior approval, if the specific licensee:

(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, so that the device is labeled in compliance with WAC 246-221-120(9); however, the manufacturer, model number, and serial number must be retained;

(iii) Obtains the manufacturer's or initial transferor's maintenance information applicable under the specific license (such as leak test procedures); and

(iv) Reports the transfer under WAC 246-233-020 (3)(g)((-));

(h) Shall transfer the device to another general licensee only if:

(i) The device remains in use at a particular location. In such case, the transferor shall give the transferee a copy of this section, a copy of WAC 246-221-240, 246-221-250, 246-232-050, and 246-232-060, and any safety documents identified by the label of the device. Within thirty days of the transfer, the transferor shall report to the department: The name of the manufacturer (or initial transferor), model number, serial number, and the source, nuclide(s), and original activity contained in the device(s) transferred; the transferee's name and mailing address for the location of use, and the name, title, and phone number of the responsible individual identified by the transferee in accordance with (j) of this subsection to have knowledge of and authority to take action 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;

(i) Shall comply with the provisions of WAC 246-221-240 and 246-221-250 for reporting radiation incidents, or theft or loss of radioactive material, but shall be exempt from other requirements of chapters 246-221 and 246-222 WAC;

(j) 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 responsibility in this regard;

(k)(i) Shall register, in accordance with (k)(ii) and (iii) of this subsection, devices containing at least 370 megabecquerels (10 millicuries) of Cesium-137, 3.7 megabecquerels (0.1 millicurie(~~s~~)) of Strontium-90, 3.7 megabecquerels (100 microcuries) of Radium-226, 37 megabecquerels (1 millicurie) of Cobalt-60, or 37 megabecquerels (1 millicurie) of Americium-241, or any other transuranic (i.e., element with atomic number greater than uranium (92)), based on the activity indicated on the label. Each address for a location of use, as described under (k)(iii)(D) of this subsection, represents a separate general licensee and requires a separate registration and fee;

(ii) If in possession of a device meeting the criteria of (k)(i) of this subsection, shall register these devices annually with the department and shall pay the fee required by WAC 246-254-090. Registration must be done by verifying, correcting, or adding to the information provided in a request for registration received from the department. The registration information must be submitted to the department within thirty days of the date of the request for registration or as otherwise indicated in the request. In addition, a general licensee holding devices meeting the criteria of (k)(i) of this subsection is subject to the bankruptcy notification requirement in WAC 246-232-050;

(iii) When registering devices, the general licensee shall provide the following information and any other information specifically requested by the department:

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

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

(C) Name, title, and telephone number of the responsible person designated as a representative of the general licensee under (j) of this subsection;

(D) Address or location at which the device(s) are used or stored. For portable devices, the address of the primary place of storage;

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

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

(iv) WAC 246-232-040, Reciprocal recognition of licenses describes how persons licensed by the NRC or an agreement state may obtain approval to work in Washington((-));

(l) Shall report changes to the mailing address for the location of use (including change in name of general licensee) to the department within thirty 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;

(m) Shall not hold devices that are not in use for longer than two years. If devices with shutters are not being used, the shutter must be locked in the closed position. The testing required by subsection (3)(b) of this section 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;

(n) Must respond to written requests from the department to provide information relating to the general license within thirty 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 the same time period, request a longer period to supply the information by providing a written justification for the extension request.

(4) The general license in subsection (1) of this section does not authorize the manufacture, import, or export of devices containing radioactive material. A person must not export the device containing radioactive material except in accordance with NRC's regulations, including 10 C.F.R. Part 110, and in accordance with other applicable federal, state, and local regulations including, but not limited to, the U.S. Department of Commerce, U.S. Department of Revenue, U.S. Department of Transportation, and any other applicable jurisdiction for each export.

(5) The general license provided in this subsection is subject to the provisions of WAC 246-220-020, 246-220-030, 246-220-040, 246-220-060, 246-220-070, 246-220-100, 246-221-240, 246-221-250, 246-232-050, 246-232-060, 246-232-070, 246-232-080, and 246-232-090.