Department of Health

Proposed Permanent Rules Relating to Radioactive Materials

4731.0100 DEFINITIONS.

[For text of subps 1 to 4a, see M.R.]

Subp. 4b. **Access control.** "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.

[For text of subps 5 to 9, see M.R.]

Subp. 9a. **Aggregated.** "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.

[For text of subps 10 to 16, see M.R.]

Subp. 16a. **Approved individual.** "Approved individual" means an individual whom the licensee has determined to be trustworthy and reliable for unescorted access in accordance with parts 4731.8010 to 4731.8040 and who has completed the training required by part 4731.8055, subpart 3.

[For text of subps 17 to 24, see M.R.]

Subp. 24a. **Background investigation.** "Background investigation" means the investigation conducted by a licensee or applicant to support the determination of trustworthiness and reliability.

[For text of subps 25 to 33, see M.R.]

Subp. 33a. **Category 1 quantity of radioactive material.** "Category 1 quantity of radioactive material" means a quantity of radioactive material meeting or exceeding the

category 1 threshold under part 4731.8140, subpart 1. 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 is equal to or exceeds one, 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.

Subp. 33b. **Category 2 quantity of radioactive material.** "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 under part 4731.8140, subpart 1. 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 is equal to or exceeds one, 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.

Subp. ~~33a~~ 33c. **Certificate holder.** "Certificate holder" means a person who has been issued a certificate of compliance or other package approval by the NRC.

Subp. ~~33b~~ 33d. **Certificate of compliance.** "Certificate of compliance" means the certificate issued by the NRC under Code of Federal Regulations, title 10, part 71, subpart D, which approves the design of a package for transportation of radioactive material.

[For text of subps 34 to 39, see M.R.]

Subp. 40. **Commencement of construction.** "Commencement of construction" means ~~any clearing of land, excavation, or other substantial action that would adversely affect the natural environment of a site but does not include:~~ 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.

~~A. changes desirable for the temporary use of the land for public recreational uses; or~~

~~B. necessary borings to determine site characteristics or other preconstruction monitoring to establish background information related to the suitability of a site or to the protection of environmental values.~~

[For text of subps 41 to 44, see M.R.]

Subp. 44a. **Construction.** "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 regulations in this chapter that are related to radiological safety or security. 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 subject to this part;

E. excavation;

F. erection of support buildings, such as 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, such as 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.

Subp. ~~44a~~ 44b. **Containment system.** "Containment system" means the assembly of components of the packaging intended to retain the radioactive material during transport.

[For text of subps 45 to 63, see M.R.]

Subp. 63a. **Diversion.** "Diversion" 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.

[For text of subps 64 to 75, see M.R.]

Subp. 75a. **Escorted access.** "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.

[For text of subps 76 to 83, see M.R.]

Subp. 83a. **Fingerprint orders.** "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.

[For text of subps 84 to 100, see M.R.]

Subp. 100a. **Indian tribe.** "Indian tribe" means an Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian tribe pursuant to the Federally Recognized Indian Tribe List Act of 1994, United States Code, title 25, section 479a.

[For text of subps 101 to 118, see M.R.]

Subp. 118a. **License issuing authority.** "License issuing authority" means the commissioner, the NRC, or the appropriate agency of an agreement state that issued the license.

[For text of subps 119 to 121a, see M.R.]

Subp. 121b. **Local law enforcement agency or LLEA.** "Local law enforcement agency" or "LLEA" 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.

[For text of subps 122 to 144, see M.R.]

Subp. 144a. **Mobile device.** "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. A mobile device does not include stationary equipment installed in a fixed location.

[For text of subps 145 and 146, see M.R.]

Subp. 146a. **Movement control center.** "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.

[For text of subps 147 to 152, see M.R.]

Subp. 152a. **No-later-than arrival time.** "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.

[For text of subps 153 to 205, see M.R.]

Subp. 205a. **Reviewing official.** "Reviewing official" means the individual who must make 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.

[For text of subps 206 and 207, see M.R.]

Subp. 207a. **Sabotage.** "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.

Subp. 207b. **Safe haven.** "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.

[For text of subps 208 to 210, see M.R.]

Subp. 210a. **Security zone.** "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.

[For text of subps 211 to 237, see M.R.]

Subp. 237a. **Telemetric position monitoring system.** "Telemetric position monitoring system" means a data transfer system that captures information by instrumentation and measuring devices about the location and status of a transport vehicle or package between the departure and destination locations.

[For text of subps 238 to 247, see M.R.]

Subp. 247a. **Tribal official.** "Tribal official" means the highest ranking individual that represents tribal leadership, such as the chief, president, or tribal council leadership.

[For text of subp 248, see M.R.]

Subp. 248a. **Trustworthiness and reliability.** "Trustworthiness and reliability" means 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 public health and safety or security. A determination of trustworthiness and reliability for this purpose is based upon the results from a background investigation.

[For text of subps 249 to 253, see M.R.]

Subp. 253a. **Unescorted access.** "Unescorted access" means solitary access to an aggregated category 1 or category 2 quantity of radioactive material or the devices that contain the material.

Subp. ~~253a~~ 253b. **Unirradiated uranium.** "Unirradiated uranium" means uranium containing not more than 2×10^3 Bq of plutonium per gram of uranium-235, not more than 9×10^6 Bq of fission products per gram of uranium-235, and not more than 5×10^{-3} gram of uranium-236 per gram of uranium-235.

[For text of subp 254, see M.R.]

Subp. 255. **Unrefined and unprocessed ore.** "Unrefined and unprocessed ore" means ore in its natural form prior to any processing, such as grinding, roasting, or beneficiating, or refining. Processing does not include sieving or encapsulation of ore or preparation of samples for laboratory analysis.

[For text of subps 256 to 269, see M.R.]

4731.0355 RECIPROCITY.

Subpart 1. **Application; recognition.**

A. Subject to this chapter, a person who holds a specific license from the NRC or an agreement state, and issued by the agency having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, may apply for reciprocity. Once reciprocity is approved, the out-of-state licensee is granted a general license to conduct the activities authorized in the NRC or agreement state license within this state for a period not in excess of 180 days in a calendar year.

~~A.~~ B. Applications for reciprocal recognition of licenses issued by the NRC or other agreement states may be made by completing a report of proposed activity reciprocity form prescribed by the commissioner. The form may be obtained by contacting the Radioactive Materials Unit, Minnesota Department of Health, 625 Robert Street N, P.O. Box 64975, St. Paul, MN 55164-0975.

~~B. The commissioner shall reciprocally recognize radioactive materials licenses issued by the NRC or another agreement state according to this part. The NRC maintains jurisdiction in nonagreement states, areas of exclusive federal jurisdiction within agreement states, and offshore waters.~~

C. The application must be signed and dated by the radiation safety officer or the responsible management representative.

D. The applicant must submit a copy of the current licensing document. The licensing document must not limit the activity authorized by the document to specified installations or locations.

E. The applicant must pay the reciprocity fee under Minnesota Statutes, section 144.1205.

Subp. 2. **Review and inspection.**

A. The commissioner shall review applications for reciprocity for compliance with this chapter ~~in the same manner as applications from within the state. The application must be signed and dated by the radiation safety officer or the responsible management representative~~. The commissioner may withdraw, limit, or qualify acceptance of a specific license or equivalent licensing document issued by the NRC or an agreement state or a product distributed under the licensing document upon determining that the action is necessary to prevent undue hazard to public health and safety or property.

B. Inspections by the commissioner may be performed on any licensee who has been granted a reciprocal license. ~~Considerations for selecting reciprocal licensees for inspection include:~~

~~(1) potential risk to employees, the public, or the environment;~~

~~(2) activities that are new or unusual for the state;~~

~~(3) the frequency of the licensee entering the state to perform activities;~~

~~(4) the length of time to complete the intended activity; and~~

~~(5) the concern expressed by the public about a specific activity.~~

~~C. The frequency of inspection for any particular licensee is dependent on the considerations listed in item B.~~

Subp. 3. **~~Licenses of radioactive material, source and special nuclear material in quantities not sufficient to form a critical mass~~ Notification.**

A. ~~Subject to this chapter, a person who holds a specific license from the NRC or an agreement state, and issued by the agency having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, is granted a general license to conduct the activities authorized in such licensing document within this state for a period not in excess of 180 days in a one-year period if:~~

~~(1)~~ ~~the~~ An out-of-state licensee ~~notifies~~ approved for reciprocity must notify the commissioner in writing at least three days before engaging in ~~the~~ activities in the state. The notification must include:

(1) ~~(a)~~ the name of the company for whom service will be performed;

(2) ~~(b)~~ the name and telephone number of the individual representing the company under ~~unit (a)~~ subitem (1);

(3) ~~(c)~~ the location where services will be performed;

(4) ~~(d)~~ the start date;

(5) ~~(e)~~ the duration of the service;

(6) ~~(f)~~ the type of service to be performed;

(7) ~~(g)~~ the name of individuals performing the service; and

(8) ~~(h)~~ identification of the sources of radiation to be used~~;~~.

~~(2) the notification is accompanied by a copy of the current licensing document;~~

~~(3) the licensing document does not limit the activity authorized by the document to specified installations or locations; and~~

~~(4) the licensee pays the reciprocity fee under Minnesota Statutes, section 144.1205.~~

[For text of items B to D, see M.R.]

~~E. Failure to provide the required information or fee may result in denial of reciprocity privileges.~~

~~F. Notwithstanding item A, a person who holds a specific license issued by the NRC or an agreement state authorizing the holder to manufacture, transfer, install, or service a device described in parts 4731.3200 to 4731.3245 within areas subject to the jurisdiction of the licensing body is granted a general license to install, transfer, demonstrate, or service the device if:~~

~~(1) the person files a report with the commissioner within 30 days after the end of each calendar quarter in which any device is transferred to or installed in this state. The report must identify each general licensee to whom the device is transferred by name and address, the type and model number of devices transferred, and the quantity and type of radioactive material contained in the device;~~

~~(2) the device has been manufactured, labeled, installed, and serviced under applicable provisions of the specific license issued to the person by the NRC or an agreement state;~~

~~(3) the person provides assurance that any labels required to be affixed to the device under rules of the authority that licensed manufacture of the device bear the statement "Removal of this label is prohibited"; and~~

~~(4) the holder of the specific license furnishes to each general licensee to whom the device is transferred or on whose premises the device is installed a copy of the general license issued under this item, or under equivalent rules of the agency having jurisdiction over the manufacture and distribution of the device.~~

~~G. The commissioner may withdraw, limit, or qualify acceptance of a specific license or equivalent licensing document issued by the NRC or an agreement state or a product distributed under the licensing document upon determining that the action is necessary to prevent undue hazard to public health and safety or property.~~

[For text of subp 4, see M.R.]

4731.0419 ADVANCE NOTIFICATION OF SHIPMENT OF IRRADIATED REACTOR FUEL AND NUCLEAR WASTE.

Subpart 1. **Notice required.** As specified in subparts 2 to 4, a licensee must provide advance notification to:

A. the commissioner, the governor of the state or the governor's designee, and the NRC of a shipment of licensed material through or across the boundary of the state before the transport, or delivery to a carrier for transport, of licensed material outside the confines of the licensee's plant or other place of use or storage~~.~~; and

B. the tribal official of participating tribes referenced in subpart 3, item B, or the official's designee, of the shipment of licensed material, within or across the boundary of the tribe's reservation, before the transport, or delivery to a carrier, for transport, of licensed material outside the confines of the licensee's plant or other place of use or storage.

Subp. 2. **Shipments requiring notice.** ~~Advance notification is required under this part for shipments of irradiated reactor fuel in quantities less than that subject to the advance notification requirements of Code of Federal Regulations, title 10, section 73.37, paragraph (f).~~ Advance notification is ~~also~~ required under this part for shipments of licensed material, other than irradiated fuel, meeting the following three conditions:

[For text of items A to C, see M.R.]

Subp. 3. **Procedures for submitting notification.**

A. The notification required under this part must:

(1) be made in writing to the commissioner, the office of each appropriate state governor or governor's designee, the office of each appropriate tribal official or tribal official's designee, and to the director of the Division of ~~Nuclear~~ Security Policy, Office of Nuclear Security and Incident Response, NRC;

(2) if delivered by mail, be postmarked at least seven days before the beginning of the seven-day period during which departure of the shipment is estimated to occur; and

(3) if delivered by any other means than mail, reach the office of the commissioner and the governor or governor's designee or the tribal official or tribal official's designee at least four days before the beginning of the seven-day period during which departure of the shipment is estimated to occur.

B. A list of the names and mailing addresses of the ~~governor's~~ governors' designees and tribal officials' designees of participating tribes receiving advance notification of transportation of nuclear waste is published annually in the Federal Register on or about June 30 to reflect changes in information. The list ~~of the names and mailing addresses of the governor's designees~~ is available on request from the Director, Office of ~~State and Tribal~~ Federal and State Materials and Environmental Programs, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

C. The licensee must retain a copy of the notification as a record for three years.

Subp. 4. **Information to be furnished in advance notification of shipment.** An advance notification of shipment of irradiated reactor fuel or nuclear waste must contain the following information:

[For text of items A to C, see M.R.]

D. the seven-day period during which arrival of the shipment at state boundaries or tribal reservation boundaries is estimated to occur;

[For text of items E and F, see M.R.]

Subp. 5. **Revision notice.** A licensee who finds that schedule information, previously furnished under this part to the commissioner and a governor or governor's designee or a tribal official or tribal official's designee, will not be met must telephone a responsible individual in the commissioner's office and the governor or governor's designee or the tribal official or the tribal official's designee and inform the individual of the extent of the delay beyond the schedule originally reported.

[For text of subp 5a, see M.R.]

Subp. 6. **Cancellation notice.**

A. A licensee who cancels an irradiated reactor fuel or nuclear waste shipment for which advance notification has been sent must send a cancellation notice to the commissioner, the governor of each state or the governor's designee previously notified, each tribal official or the tribal official's designee previously notified, and the director of the Division of ~~Nuclear~~ Security Policy, Office of Nuclear Security and Incident Response, NRC.

[For text of items B and C, see M.R.]

4731.0422 A_1 AND A_2 VALUES FOR RADIONUCLIDES.

Subpart 1. [Repealed, 32 SR 831]

Subp. 1a. **A_1 and A_2 values.**

Element and atomic number and symbol of radionuclide	A_1 (TBq)	A_1 (Ci)[b]	A_2 (TBq)	A_2 (Ci)[b]
Actinium (89)				
Ac-225[a]	8.0×10^{-1}	2.2×10^{1}	6.0×10^{-3}	1.6×10^{-1}
Ac-227[a]	9.0×10^{-1}	2.4×10^{1}	9.0×10^{-5}	2.4×10^{-3}

Ac-228	6.0×10^{-1}	1.6×10^{1}	5.0×10^{-1}	1.4×10^{1}
Silver (47)				
Ag-105	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Ag-108m[a]	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Ag-110m[a]	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Ag-111	2.0	5.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Aluminum (13)				
Al-26	1.0×10^{-1}	2.7	1.0×10^{-1}	2.7
Americium (95)				
Am-241	1.0×10^{1}	2.7×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Am-242m[a]	1.0×10^{1}	2.7×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Am-243[a]	5.0	1.4×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Argon (18)				
Ar-37	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Ar-39	4.0×10^{1}	1.1×10^{3}	2.0×10^{1}	5.4×10^{2}
Ar-41	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Arsenic (33)				
As-72	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
As-73	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
As-74	1.0	2.7×10^{1}	9.0×10^{-1}	2.4×10^{1}
As-76	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
As-77	2.0×10^{1}	5.4×10^{2}	7.0×10^{-1}	1.9×10^{1}
Astatine (85)				
At-211[a]	2.0×10^{1}	5.4×10^{2}	5.0×10^{-1}	1.4×10^{1}
Gold (79)				
Au-193	7.0	1.9×10^{2}	2.0	5.4×10^{1}
Au-194	1.0	2.7×10^{1}	1.0	2.7×10^{1}

Au-195	1.0×10^{1}	2.7×10^{2}	6.0	1.6×10^{2}
Au-198	1.0	2.7×10^{1}	6.0×10^{-1}	1.6×10^{1}
Au-199	1.0×10^{1}	2.7×10^{2}	6.0×10^{-1}	1.6×10^{1}
Barium (56)				
Ba-131[a]	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Ba-133	3.0	8.1×10^{1}	3.0	8.1×10^{1}
Ba-133m	2.0×10^{1}	5.4×10^{2}	6.0×10^{-1}	1.6×10^{1}
Ba-140[a]	5.0×10^{-1}	1.4×10^{1}	3.0×10^{-1}	8.1
Beryllium (4)				
Be-7	2.0×10^{1}	5.4×10^{2}	2.0×10^{1}	5.4×10^{2}
Be-10	4.0×10^{1}	1.1×10^{3}	6.0×10^{-1}	1.6×10^{1}
Bismuth (83)				
Bi-205	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Bi-206	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Bi-207	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Bi-210	1.0	2.7×10^{1}	6.0×10^{-1}	1.6×10^{1}
Bi-210m[a]	6.0×10^{-1}	1.6×10^{1}	2.0×10^{-2}	5.4×10^{-1}
Bi-212[a]	7.0×10^{-1}	1.9×10^{1}	6.0×10^{-1}	1.6×10^{1}
Berkelium (97)				
Bk-247	8.0	2.2×10^{2}	8.0×10^{-4}	2.2×10^{-2}
Bk-249[a]	4.0×10^{1}	1.1×10^{3}	3.0×10^{-1}	8.1
Bromine (35)				
Br-76	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Br-77	3.0	8.1×10^{1}	3.0	8.1×10^{1}
Br-82	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Carbon (6)				
C-11	1.0	2.7×10^{1}	6.0×10^{-1}	1.6×10^{1}
C-14	4.0×10^{1}	1.1×10^{3}	3.0	8.1×10^{1}

Calcium (20)				
Ca-41	Unlimited	Unlimited	Unlimited	Unlimited
Ca-45	4.0×10^{1}	1.1×10^{3}	1.0	2.7×10^{1}
Ca-47[a]	3.0	8.1×10^{1}	3.0×10^{-1}	8.1
Cadmium (48)				
Cd-109	3.0×10^{1}	8.1×10^{2}	2.0	5.4×10^{1}
Cd-113m	4.0×10^{1}	1.1×10^{3}	5.0×10^{-1}	1.4×10^{1}
Cd-115[a]	3.0	8.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Cd-115m	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Cerium (58)				
Ce-139	7.0	1.9×10^{2}	2.0	5.4×10^{1}
Ce-141	2.0×10^{1}	5.4×10^{2}	6.0×10^{-1}	1.6×10^{1}
Ce-143	9.0×10^{-1}	2.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Ce-144[a]	2.0×10^{-1}	5.4	2.0×10^{-1}	5.4
Californium (98)				
Cf-248	4.0×10^{1}	1.1×10^{3}	6.0×10^{-3}	1.6×10^{-1}
Cf-249	3.0	8.1×10^{1}	8.0×10^{-4}	2.2×10^{-2}
Cf-250	2.0×10^{1}	5.4×10^{2}	2.0×10^{-3}	5.4×10^{-2}
Cf-251	7.0	1.9×10^{2}	7.0×10^{-4}	1.9×10^{-2}
Cf-252[h]	5.0×10^{-2}	1.4	3.0×10^{-3}	8.1×10^{-2}
Cf-253[a]	4.0×10^{1}	1.1×10^{3}	4.0×10^{-2}	1.1
Cf-254	1.0×10^{-3}	2.7×10^{-2}	1.0×10^{-3}	2.7×10^{-2}
Chlorine (17)				
Cl-36	1.0×10^{1}	2.7×10^{2}	6.0×10^{-1}	1.6×10^{1}
Cl-38	2.0×10^{-1}	5.4	2.0×10^{-1}	5.4
Curium (96)				
Cm-240	4.0×10^{1}	1.1×10^{3}	2.0×10^{-2}	5.4×10^{-1}
Cm-241	2.0	5.4×10^{1}	1.0	2.7×10^{1}

Cm-242	4.0×10^{1}	1.1×10^{3}	1.0×10^{-2}	2.7×10^{-1}
Cm-243	9.0	2.4×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Cm-244	2.0×10^{1}	5.4×10^{2}	2.0×10^{-3}	5.4×10^{-2}
Cm-245	9.0	2.4×10^{2}	9.0×10^{-4}	2.4×10^{-2}
Cm-246	9.0	2.4×10^{2}	9.0×10^{-4}	2.4×10^{-2}
Cm-247[a]	3.0	8.1×10^{1}	1.0×10^{-3}	2.7×10^{-2}
Cm-248	2.0×10^{-2}	5.4×10^{-1}	3.0×10^{-4}	8.1×10^{-3}
Cobalt (27)				
Co-55	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Co-56	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Co-57	1.0×10^{1}	2.7×10^{2}	1.0×10^{1}	2.7×10^{2}
Co-58	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Co-58m	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Co-60	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Chromium (24)				
Cr-51	3.0×10^{1}	8.1×10^{2}	3.0×10^{1}	8.1×10^{2}
Cesium (55)				
Cs-129	4.0	1.1×10^{2}	4.0	1.1×10^{2}
Cs-131	3.0×10^{1}	8.1×10^{2}	3.0×10^{1}	8.1×10^{2}
Cs-132	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Cs-134	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Cs-134m	4.0×10^{1}	1.1×10^{3}	6.0×10^{-1}	1.6×10^{1}
Cs-135	4.0×10^{1}	1.1×10^{3}	1.0	2.7×10^{1}
Cs-136	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Cs-137[a]	2.0	5.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Copper (29)				
Cu-64	6.0	1.6×10^{2}	1.0	2.7×10^{1}
Cu-67	1.0×10^{1}	2.7×10^{2}	7.0×10^{-1}	1.9×10^{1}

Dysprosium (66)				
Dy-159	2.0×10^{1}	5.4×10^{2}	2.0×10^{1}	5.4×10^{2}
Dy-165	9.0×10^{-1}	2.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Dy-166[a]	9.0×10^{-1}	2.4×10^{1}	3.0×10^{-1}	8.1
Erbium (68)				
Er-169	4.0×10^{1}	1.1×10^{3}	1.0	2.7×10^{1}
Er-171	8.0×10^{-1}	2.2×10^{1}	5.0×10^{-1}	1.4×10^{1}
Europium (63)				
Eu-147	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Eu-148	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Eu-149	2.0×10^{1}	5.4×10^{2}	2.0×10^{1}	5.4×10^{2}
Eu-150 (short-lived)	2.0	5.4×10^{1}	7.0×10^{-1}	1.9×10^{1}
Eu-150 (long-lived)	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Eu-152	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Eu-152m	8.0×10^{-1}	2.2×10^{1}	8.0×10^{-1}	2.2×10^{1}
Eu-154	9.0×10^{-1}	2.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Eu-155	2.0×10^{1}	5.4×10^{2}	3.0	8.1×10^{1}
Eu-156	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Fluorine (9)				
F-18	1.0	2.7×10^{1}	6.0×10^{-1}	1.6×10^{1}
Iron (26)				
Fe-52[a]	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Fe-55	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Fe-59	9.0×10^{-1}	2.4×10^{1}	9.0×10^{-1}	2.4×10^{1}
Fe-60[a]	4.0×10^{1}	1.1×10^{3}	2.0×10^{-1}	5.4
Gallium (31)				
Ga-67	7.0	1.9×10^{2}	3.0	8.1×10^{1}

Ga-68	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Ga-72	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Gadolinium (64)				
Gd-146[a]	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Gd-148	2.0×10^{1}	5.4×10^{2}	2.0×10^{-3}	5.4×10^{-2}
Gd-153	1.0×10^{1}	2.7×10^{2}	9.0	2.4×10^{2}
Gd-159	3.0	8.1×10^{1}	6.0×10^{-1}	1.6×10^{1}
Germanium (32)				
Ge-68[a]	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Ge-71	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Ge-77	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Hafnium (72)				
Hf-172[a]	6.0×10^{-1}	1.6×10^{1}	6.0×10^{-1}	1.6×10^{1}
Hf-175	3.0	8.1×10^{1}	3.0	8.1×10^{1}
Hf-181	2.0	5.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Hf-182	Unlimited	Unlimited	Unlimited	Unlimited
Mercury (80)				
Hg-194[a]	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Hg-195m[a]	3.0	8.1×10^{1}	7.0×10^{-1}	1.9×10^{1}
Hg-197	2.0×10^{1}	5.4×10^{2}	1.0×10^{1}	2.7×10^{2}
Hg-197m	1.0×10^{1}	2.7×10^{2}	4.0×10^{-1}	1.1×10^{1}
Hg-203	5.0	1.4×10^{2}	1.0	2.7×10^{1}
Holmium (67)				
Ho-166	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Ho-166m	6.0×10^{-1}	1.6×10^{1}	5.0×10^{-1}	1.4×10^{1}
Iodine (53)				
I-123	6.0	1.6×10^{2}	3.0	8.1×10^{1}
I-124	1.0	2.7×10^{1}	1.0	2.7×10^{1}

I-125	2.0×10^{1}	5.4×10^{2}	3.0	8.1×10^{1}
I-126	2.0	5.4×10^{1}	1.0	2.7×10^{1}
I-129	Unlimited	Unlimited	Unlimited	Unlimited
I-131	3.0	8.1×10^{1}	7.0×10^{-1}	1.9×10^{1}
I-132	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
I-133	7.0×10^{-1}	1.9×10^{1}	6.0×10^{-1}	1.6×10^{1}
I-134	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
I-135[a]	6.0×10^{-1}	1.6×10^{1}	6.0×10^{-1}	1.6×10^{1}
Indium (49)				
In-111	3.0	8.1×10^{1}	3.0	8.1×10^{1}
In-113m	4.0	1.1×10^{2}	2.0	5.4×10^{1}
In-114m[a]	1.0×10^{1}	2.7×10^{2}	5.0×10^{-1}	1.4×10^{1}
In-115m	7.0	1.9×10^{2}	1.0	2.7×10^{1}
Iridium (77)				
Ir-189[a]	1.0×10^{1}	2.7×10^{2}	1.0×10^{1}	2.7×10^{2}
Ir-190	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Ir-192[c]	1.0	2.7×10^{1}	6.0×10^{-1}	1.6×10^{1}
Ir-194	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Potassium (19)				
K-40	9.0×10^{-1}	2.4×10^{1}	9.0×10^{-1}	2.4×10^{1}
K-42	2.0×10^{-1}	5.4	2.0×10^{-1}	5.4
K-43	7.0×10^{-1}	1.9×10^{1}	6.0×10^{-1}	1.6×10^{1}
Krypton (36)				
Kr-81	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Kr-85	1.0×10^{1}	2.7×10^{2}	1.0×10^{1}	2.7×10^{2}
Kr-85m	8.0	2.2×10^{2}	3.0	8.1×10^{1}
Kr-87	2.0×10^{-1}	5.4	2.0×10^{-1}	5.4
Lanthanum (57)				

La-137	3.0×10^{1}	8.1×10^{2}	6.0	1.6×10^{2}
La-140	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Lutetium (71)				
Lu-172	6.0×10^{-1}	1.6×10^{1}	6.0×10^{-1}	1.6×10^{1}
Lu-173	8.0	2.2×10^{2}	8.0	2.2×10^{2}
Lu-174	9.0	2.4×10^{2}	9.0	2.4×10^{2}
Lu-174m	2.0×10^{1}	5.4×10^{2}	1.0×10^{1}	2.7×10^{2}
Lu-177	3.0×10^{1}	8.1×10^{2}	7.0×10^{-1}	1.9×10^{1}
Magnesium (12)				
Mg-28[a]	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Manganese (25)				
Mn-52	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Mn-53	Unlimited	Unlimited	Unlimited	Unlimited
Mn-54	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Mn-56	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Molybdenum (42)				
Mo-93	4.0×10^{1}	1.1×10^{3}	2.0×10^{1}	5.4×10^{2}
Mo-99[a,i]	1.0	2.7×10^{1}	6.0×10^{-1}	1.6×10^{1}
Nitrogen (7)				
N-13	9.0×10^{-1}	2.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Sodium (11)				
Na-22	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Na-24	2.0×10^{-1}	5.4	2.0×10^{-1}	5.4
Niobium (41)				
Nb-93m	4.0×10^{1}	1.1×10^{3}	3.0×10^{1}	8.1×10^{2}
Nb-94	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Nb-95	1.0	2.7×10^{1}	1.0	2.7×10^{1}

Nb-97	9.0×10^{-1}	2.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Neodymium (60)				
Nd-147	6.0	1.6×10^{2}	6.0×10^{-1}	1.6×10^{1}
Nd-149	6.0×10^{-1}	1.6×10^{1}	5.0×10^{-1}	1.4×10^{1}
Nickel (28)				
Ni-59	Unlimited	Unlimited	Unlimited	Unlimited
Ni-63	4.0×10^{1}	1.1×10^{3}	3.0×10^{1}	8.1×10^{2}
Ni-65	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Neptunium (93)				
Np-235	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Np-236 (short-lived)	2.0×10^{1}	5.4×10^{2}	2.0	5.4×10^{1}
Np-236 (long-lived)	9.0×10^{0}	2.4×10^{2}	2.0×10^{-2}	5.4×10^{-1}
Np-237	2.0×10^{1}	5.4×10^{2}	2.0×10^{-3}	5.4×10^{-2}
Np-239	7.0	1.9×10^{2}	4.0×10^{-1}	1.1×10^{1}
Osmium (76)				
Os-185	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Os-191	1.0×10^{1}	2.7×10^{2}	2.0	5.4×10^{1}
Os-191m	4.0×10^{1}	1.1×10^{3}	3.0×10^{1}	8.1×10^{2}
Os-193	2.0	5.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Os-194[a]	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Phosphorus (15)				
P-32	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
P-33	4.0×10^{1}	1.1×10^{3}	1.0	2.7×10^{1}
Protactinium (91)				
Pa-230[a]	2.0	5.4×10^{1}	7.0×10^{-2}	1.9
Pa-231	4.0	1.1×10^{2}	4.0×10^{-4}	1.1×10^{-2}
Pa-233	5.0	1.4×10^{2}	7.0×10^{-1}	1.9×10^{1}

Lead (82)				
Pb-201	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Pb-202	4.0×10^{1}	1.1×10^{3}	2.0×10^{1}	5.4×10^{2}
Pb-203	4.0	1.1×10^{2}	3.0	8.1×10^{1}
Pb-205	Unlimited	Unlimited	Unlimited	Unlimited
Pb-210[a]	1.0	2.7×10^{1}	5.0×10^{-2}	1.4
Pb-212[a]	7.0×10^{-1}	1.9×10^{1}	2.0×10^{-1}	5.4
Palladium (46)				
Pd-103[a]	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Pd-107	Unlimited	Unlimited	Unlimited	Unlimited
Pd-109	2.0	5.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Promethium (61)				
Pm-143	3.0	8.1×10^{1}	3.0	8.1×10^{1}
Pm-144	7.0×10^{-1}	1.9×10^{1}	7.0×10^{-1}	1.9×10^{1}
Pm-145	3.0×10^{1}	8.1×10^{2}	1.0×10^{1}	2.7×10^{2}
Pm-147	4.0×10^{1}	1.1×10^{3}	2.0	5.4×10^{1}
Pm-148m[a]	8.0×10^{-1}	2.2×10^{1}	7.0×10^{-1}	1.9×10^{1}
Pm-149	2.0	5.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Pm-151	2.0	5.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Polonium (84)				
Po-210	4.0×10^{1}	1.1×10^{3}	2.0×10^{-2}	5.4×10^{-1}
Praseodymium (59)				
Pr-142	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Pr-143	3.0	8.1×10^{1}	6.0×10^{-1}	1.6×10^{1}
Platinum (78)				
Pt-188[a]	1.0	2.7×10^{1}	8.0×10^{-1}	2.2×10^{1}
Pt-191	4.0	1.1×10^{2}	3.0	8.1×10^{1}
Pt-193	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}

Pt-193m	4.0×10^{1}	1.1×10^{3}	5.0×10^{-1}	1.4×10^{1}
Pt-195m	1.0×10^{1}	2.7×10^{2}	5.0×10^{-1}	1.4×10^{1}
Pt-197	2.0×10^{1}	5.4×10^{2}	6.0×10^{-1}	1.6×10^{1}
Pt-197m	1.0×10^{1}	2.7×10^{2}	6.0×10^{-1}	1.6×10^{1}
Plutonium (94)				
Pu-236	3.0×10^{1}	8.1×10^{2}	3.0×10^{-3}	8.1×10^{-2}
Pu-237	2.0×10^{1}	5.4×10^{2}	2.0×10^{1}	5.4×10^{2}
Pu-238	1.0×10^{1}	2.7×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Pu-239	1.0×10^{1}	2.7×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Pu-240	1.0×10^{1}	2.7×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Pu-241[a]	4.0×10^{1}	1.1×10^{3}	6.0×10^{-2}	1.6
Pu-242	1.0×10^{1}	2.7×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Pu-244[a]	4.0×10^{-1}	1.1×10^{1}	1.0×10^{-3}	2.7×10^{-2}
Radium (88)				
Ra-223[a]	4.0×10^{-1}	1.1×10^{1}	7.0×10^{-3}	1.9×10^{-1}
Ra-224[a]	4.0×10^{-1}	1.1×10^{1}	2.0×10^{-2}	5.4×10^{-1}
Ra-225[a]	2.0×10^{-1}	5.4	4.0×10^{-3}	1.1×10^{-1}
Ra-226[a]	2.0×10^{-1}	5.4	3.0×10^{-3}	8.1×10^{-2}
Ra-228[a]	6.0×10^{-1}	1.6×10^{1}	2.0×10^{-2}	5.4×10^{-1}
Rubidium (37)				
Rb-81	2.0	5.4×10^{1}	8.0×10^{-1}	2.2×10^{1}
Rb-83[a]	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Rb-84	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Rb-86	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Rb-87	Unlimited	Unlimited	Unlimited	Unlimited
Rb (nat)	Unlimited	Unlimited	Unlimited	Unlimited
Rhenium (75)				
Re-184	1.0	2.7×10^{1}	1.0	2.7×10^{1}

Re-184m	3.0	8.1×10^{1}	1.0	2.7×10^{1}
Re-186	2.0	5.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
Re-187	Unlimited	Unlimited	Unlimited	Unlimited
Re-188	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Re-189[a]	3.0	8.1×10^{1}	6.0×10^{-1}	1.6×10^{1}
Re (nat)	Unlimited	Unlimited	Unlimited	Unlimited
Rhodium (45)				
Rh-99	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Rh-101	4.0	1.1×10^{2}	3.0	8.1×10^{1}
Rh-102	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Rh-102m	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Rh-103m	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Rh-105	1.0×10^{1}	2.7×10^{2}	8.0×10^{-1}	2.2×10^{1}
Radon (86)				
Rn-222[a]	3.0×10^{-1}	8.1	4.0×10^{-3}	1.1×10^{-1}
Ruthenium (44)				
Ru-97	5.0	1.4×10^{2}	5.0	1.4×10^{2}
Ru-103[a]	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Ru-105	1.0	2.7×10^{1}	6.0×10^{-1}	1.6×10^{1}
Ru-106[a]	2.0×10^{-1}	5.4	2.0×10^{-1}	5.4
Sulphur (16)				
S-35	4.0×10^{1}	1.1×10^{3}	3.0	8.1×10^{1}
Antimony (51)				
Sb-122	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Sb-124	6.0×10^{-1}	1.6×10^{1}	6.0×10^{-1}	1.6×10^{1}
Sb-125	2.0	5.4×10^{1}	1.0	2.7×10^{1}
Sb-126	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Scandium (21)				

Sc-44	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Sc-46	5.0×10^{-1}	1.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Sc-47	1.0×10^{1}	2.7×10^{2}	7.0×10^{-1}	1.9×10^{1}
Sc-48	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Selenium (34)				
Se-75	3.0	8.1×10^{1}	3.0	8.1×10^{1}
Se-79	4.0×10^{1}	1.1×10^{3}	2.0	5.4×10^{1}
Silicon (14)				
Si-31	6.0×10^{-1}	1.6×10^{1}	6.0×10^{-1}	1.6×10^{1}
Si-32	4.0×10^{1}	1.1×10^{3}	5.0×10^{-1}	1.4×10^{1}
Samarium (62)				
Sm-145	1.0×10^{1}	2.7×10^{2}	1.0×10^{1}	2.7×10^{2}
Sm-147	Unlimited	Unlimited	Unlimited	Unlimited
Sm-151	4.0×10^{1}	1.1×10^{3}	1.0×10^{1}	2.7×10^{2}
Sm-153	9.0	2.4×10^{2}	6.0×10^{-1}	1.6×10^{1}
Tin (50)				
Sn-113[a]	4.0	1.1×10^{2}	2.0	5.4×10^{1}
Sn-117m	7.0	1.9×10^{2}	4.0×10^{-1}	1.1×10^{1}
Sn-119m	4.0×10^{1}	1.1×10^{3}	3.0×10^{1}	8.1×10^{2}
Sn-121m[a]	4.0×10^{1}	1.1×10^{3}	9.0×10^{-1}	2.4×10^{1}
Sn-123	8.0×10^{-1}	2.2×10^{1}	6.0×10^{-1}	1.6×10^{1}
Sn-125	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Sn-126[a]	6.0×10^{-1}	1.6×10^{1}	4.0×10^{-1}	1.1×10^{1}
Strontium (38)				
Sr-82[a]	2.0×10^{-1}	5.4	2.0×10^{-1}	5.4
Sr-85	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Sr-85m	5.0	1.4×10^{2}	5.0	1.4×10^{2}
Sr-87m	3.0	8.1×10^{1}	3.0	8.1×10^{1}

Sr-89	6.0×10^{-1}	1.6×10^{1}	6.0×10^{-1}	1.6×10^{1}
Sr-90[a]	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Sr-91[a]	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Sr-92[a]	1.0	2.7×10^{1}	3.0×10^{-1}	8.1
Tritium (1)				
T (H-3)	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Tantalum (73)				
Ta-178 (long-lived)	1.0	2.7×10^{1}	8.0×10^{-1}	2.2×10^{1}
Ta-179	3.0×10^{1}	8.1×10^{2}	3.0×10^{1}	8.1×10^{2}
Ta-182	9.0×10^{-1}	2.4×10^{1}	5.0×10^{-1}	1.4×10^{1}
Terbium (65)				
Tb-157	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Tb-158	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Tb-160	1.0	2.7×10^{1}	6.0×10^{-1}	1.6×10^{1}
Technetium (43)				
Tc-95m[a]	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Tc-96	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Tc-96m[a]	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Tc-97	Unlimited	Unlimited	Unlimited	Unlimited
Tc-97m	4.0×10^{1}	1.1×10^{3}	1.0	2.7×10^{1}
Tc-98	8.0×10^{-1}	2.2×10^{1}	7.0×10^{-1}	1.9×10^{1}
Tc-99	4.0×10^{1}	1.1×10^{3}	9.0×10^{-1}	2.4×10^{1}
Tc-99m	1.0×10^{1}	2.7×10^{2}	4.0	1.1×10^{2}
Tellurium (52)				
Te-121	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Te-121m	5.0	1.4×10^{2}	3.0	8.1×10^{1}
Te-123m	8.0	2.2×10^{2}	1.0	2.7×10^{1}
Te-125m	2.0×10^{1}	5.4×10^{2}	9.0×10^{-1}	2.4×10^{1}

Te-127	2.0×10^{1}	5.4×10^{2}	7.0×10^{-1}	1.9×10^{1}
Te-127m[a]	2.0×10^{1}	5.4×10^{2}	5.0×10^{-1}	1.4×10^{1}
Te-129	7.0×10^{-1}	1.9×10^{1}	6.0×10^{-1}	1.6×10^{1}
Te-129m[a]	8.0×10^{-1}	2.2×10^{1}	4.0×10^{-1}	1.1×10^{1}
Te-131m[a]	7.0×10^{-1}	1.9×10^{1}	5.0×10^{-1}	1.4×10^{1}
Te-132[a]	5.0×10^{-1}	1.4×10^{1}	4.0×10^{-1}	1.1×10^{1}
Thorium (90)				
Th-227	1.0×10^{1}	2.7×10^{2}	5.0×10^{-3}	1.4×10^{-1}
Th-228[a]	5.0×10^{-1}	1.4×10^{1}	1.0×10^{-3}	2.7×10^{-2}
Th-229	5.0	1.4×10^{2}	5.0×10^{-4}	1.4×10^{-2}
Th-230	1.0×10^{1}	2.7×10^{2}	1.0×10^{-3}	2.7×10^{-2}
Th-231	4.0×10^{1}	1.1×10^{3}	2.0×10^{-2}	5.4×10^{-1}
Th-232	Unlimited	Unlimited	Unlimited	Unlimited
Th-234[a]	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Th (nat)	Unlimited	Unlimited	Unlimited	Unlimited
Titanium (22)				
Ti-44[a]	5.0×10^{-1}	1.4×10^{1}	4.0×10^{-1}	1.1×10^{1}
Thallium (81)				
Tl-200	9.0×10^{-1}	2.4×10^{1}	9.0×10^{-1}	2.4×10^{1}
Tl-201	1.0×10^{1}	2.7×10^{2}	4.0	1.1×10^{2}
Tl-202	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Tl-204	1.0×10^{1}	2.7×10^{2}	7.0×10^{-1}	1.9×10^{1}
Thulium (69)				
Tm-167	7.0	1.9×10^{2}	8.0×10^{-1}	2.2×10^{1}
Tm-170	3.0	8.1×10^{1}	6.0×10^{-1}	1.6×10^{1}
Tm-171	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}

Uranium (92)				
U-230 (fast lung absorption)[a,d]	4.0×10^{1}	1.1×10^{3}	1.0×10^{-1}	2.7
U-230 (medium lung absorption)[a,e]	4.0×10^{1}	1.1×10^{3}	4.0×10^{-3}	1.1×10^{-1}
U-230 (slow lung absorption)[a,f]	3.0×10^{1}	8.1×10^{2}	3.0×10^{-3}	8.1×10^{-2}
U-232 (fast lung absorption)[d]	4.0×10^{1}	1.1×10^{3}	1.0×10^{-2}	2.7×10^{-1}
U-232 (medium lung absorption)[e]	4.0×10^{1}	1.1×10^{3}	7.0×10^{-3}	1.9×10^{-1}
U-232 (slow lung absorption)[f]	1.0×10^{1}	2.7×10^{2}	1.0×10^{-3}	2.7×10^{-2}
U-233 (fast lung absorption)[d]	4.0×10^{1}	1.1×10^{3}	9.0×10^{-2}	2.4
U-233 (medium lung absorption)[e]	4.0×10^{1}	1.1×10^{3}	2.0×10^{-2}	5.4×10^{-1}
U-233 (slow lung absorption)[f]	4.0×10^{1}	1.1×10^{3}	6.0×10^{-3}	1.6×10^{-1}
U-234 (fast lung absorption)[d]	4.0×10^{1}	1.1×10^{3}	9.0×10^{-2}	2.4
U-234 (medium lung absorption)[e]	4.0×10^{1}	1.1×10^{3}	2.0×10^{-2}	5.4×10^{-1}
U-234 (slow lung absorption)[f]	4.0×10^{1}	1.1×10^{3}	6.0×10^{-3}	1.6×10^{-1}
U-235 (all lung absorption types)[a,d,e,f]	Unlimited	Unlimited	Unlimited	Unlimited
U-236 (fast lung absorption)[d]	Unlimited	Unlimited	Unlimited	Unlimited
U-236 (medium lung absorption)[e]	4.0×10^{1}	1.1×10^{3}	2.0×10^{-2}	5.4×10^{-1}
U-236 (slow lung absorption)[f]	4.0×10^{1}	1.1×10^{3}	6.0×10^{-3}	1.6×10^{-1}

U-238 (all lung absorption types)[d,e,f]	Unlimited	Unlimited	Unlimited	Unlimited
U (nat)	Unlimited	Unlimited	Unlimited	Unlimited
U (enriched to 20% or less)[g]	Unlimited	Unlimited	Unlimited	Unlimited
U (dep)	Unlimited	Unlimited	Unlimited	Unlimited
Vanadium (23)				
V-48	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
V-49	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Tungsten (74)				
W-178[a]	9.0	2.4×10^{2}	5.0	1.4×10^{2}
W-181	3.0×10^{1}	8.1×10^{2}	3.0×10^{1}	8.1×10^{2}
W-185	4.0×10^{1}	1.1×10^{3}	8.0×10^{-1}	2.2×10^{1}
W-187	2.0	5.4×10^{1}	6.0×10^{-1}	1.6×10^{1}
W-188[a]	4.0×10^{-1}	1.1×10^{1}	3.0×10^{-1}	8.1
Xenon (54)				
Xe-122[a]	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Xe-123	2.0	5.4×10^{1}	7.0×10^{-1}	1.9×10^{1}
Xe-127	4.0	1.1×10^{2}	2.0	5.4×10^{1}
Xe-131m	4.0×10^{1}	1.1×10^{3}	4.0×10^{1}	1.1×10^{3}
Xe-133	2.0×10^{1}	5.4×10^{2}	1.0×10^{1}	2.7×10^{2}
Xe-135	3.0	8.1×10^{1}	2.0	5.4×10^{1}
Yttrium (39)				
Y-87[a]	1.0	2.7×10^{1}	1.0	2.7×10^{1}
Y-88	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}
Y-90	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Y-91	6.0×10^{-1}	1.6×10^{1}	6.0×10^{-1}	1.6×10^{1}
Y-91m	2.0	5.4×10^{1}	2.0	5.4×10^{1}

Y-92	2.0×10^{-1}	5.4	2.0×10^{-1}	5.4
Y-93	3.0×10^{-1}	8.1	3.0×10^{-1}	8.1
Ytterbium (70)				
Yb-169	4.0	1.1×10^{2}	1.0	2.7×10^{1}
Yb-175	3.0×10^{1}	8.1×10^{2}	9.0×10^{-1}	2.4×10^{1}
Zinc (30)				
Zn-65	2.0	5.4×10^{1}	2.0	5.4×10^{1}
Zn-69	3.0	8.1×10^{1}	6.0×10^{-1}	1.6×10^{1}
Zn-69m[a]	3.0	8.1×10^{1}	6.0×10^{-1}	1.6×10^{1}
Zirconium (40)				
Zr-88	3.0	8.1×10^{1}	3.0	8.1×10^{1}
Zr-93	Unlimited	Unlimited	Unlimited	Unlimited
Zr-95[a]	2.0	5.4×10^{1}	8.0×10^{-1}	2.2×10^{1}
Zr-97[a]	4.0×10^{-1}	1.1×10^{1}	4.0×10^{-1}	1.1×10^{1}

[a]A_1 and A_2 values include contributions from daughter nuclides with half-lives less than ten days.

[b]The values of A_1 and A_2 in curies (Ci) are approximate and for information only; the regulatory standard units are Terabecquerels (TBq). See ~~Appendix A to Code of Federal Regulations, title 10, Part 71~~ part 4731.0423, subpart 1 - Determination of A_1 and A_2; ~~Section I~~.

[c]The quantity may be determined from a measurement of the rate of decay or a measurement of the radiation level at a prescribed distance from the source.

[d]These values apply only to compounds of uranium that take the chemical form of UF_6, UO_2F_2, and $UO_2(NO_3)_2$ in both normal and accident conditions of transport.

[e]These values apply only to compounds of uranium that take the chemical form of UO_3, UF_4, and UCl_4 and hexavalent compounds in both normal and accident conditions of transport.

[f]These values apply to all compounds of uranium other than those specified in notes d and e.

[g]These values apply to unirradiated uranium only.

[h]A_1 = 0.1 TBq (2.7 Ci) and A_2 = 0.001 TBq (0.027 Ci) for Cf-252 for domestic use.

[i]A_2 = 0.74 TBq (20 Ci) for Mo-99 for domestic use.

Subp. 2. **Specific activity.** This subpart specifies specific activity for individual radionuclides.

Element and Atomic Number and Symbol of Radionuclide	Specific Activity (Tbq/g)	Specific Activity (Ci/g)
Actinium (89)		
Ac-225	2.1×10^{3}	5.8×10^{4}
Ac-227	2.7	7.2×10^{1}
Ac-228	8.4×10^{4}	2.2×10^{6}
Silver (47)		
Ag-105	1.1×10^{3}	3.0×10^{4}
Ag-108m	9.7×10^{-1}	2.6×10^{1}
Ag-110m	1.8×10^{2}	4.7×10^{3}
Ag-111	5.8×10^{3}	1.6×10^{5}
Aluminum (13)		
Al-26	7.0×10^{-4}	1.9×10^{-2}
Americium (95)		
Am-241	1.3×10^{-1}	3.4
Am-242m	3.6×10^{-1}	1.0×10^{1}
Am-243	7.4×10^{-3}	2.0×10^{-1}
Argon (18)		

Ar-37	3.7×10^{3}	9.9×10^{4}
Ar-39	1.3	3.4×10^{1}
Ar-41	1.5×10^{6}	4.2×10^{7}
Ar-42	9.6	2.6×10^{2}
Arsenic (33)		
As-72	6.2×10^{4}	1.7×10^{6}
As-73	8.2×10^{2}	2.2×10^{4}
As-74	3.7×10^{3}	9.9×10^{4}
As-76	5.8×10^{4}	1.6×10^{6}
As-77	3.9×10^{4}	1.0×10^{6}
Astatine (85)		
At-211	7.6×10^{4}	2.1×10^{6}
Gold (79)		
Au-193	3.4×10^{4}	9.2×10^{5}
Au-194	1.5×10^{4}	4.1×10^{5}
Au-195	1.4×10^{2}	3.7×10^{3}
Au-196	4.0×10^{3}	1.1×10^{5}
Au-198	9.0×10^{3}	2.4×10^{5}
Au-199	7.7×10^{3}	2.1×10^{5}
Barium (56)		
Ba-131	3.1×10^{3}	8.4×10^{4}
Ba-133m	2.2×10^{4}	6.1×10^{5}
Ba-133	9.4	2.6×10^{2}
Ba-140	2.7×10^{3}	7.3×10^{4}
Beryllium (4)		
Be-7	1.3×10^{4}	3.5×10^{5}
Be-10	8.3×10^{-4}	2.2×10^{-2}
Bismuth (83)		

Bi-205	1.5×10^{-3} 3	4.2×10^{4}
Bi-206	3.8×10^{3}	1.0×10^{5}
Bi-207	1.9	5.2×10^{1}
Bi-210m	2.1×10^{-5}	5.7×10^{-4}
Bi-210	4.6×10^{3}	1.2×10^{5}
Bi-212	5.4×10^{5}	1.5×10^{7}
Berkelium (97)		
Bk-247	3.8×10^{-2}	1.0
Bk-249	6.1×10^{1}	1.6×10^{3}
Bromine (35)		
Br-76	9.4×10^{4}	2.5×10^{6}
Br-77	2.6×10^{4}	7.1×10^{5}
Br-82	4.0×10^{4}	1.1×10^{6}
Carbon (6)		
C-11	3.1×10^{7}	8.4×10^{8}
C-14	1.6×10^{-1}	4.5
Calcium (20)		
Ca-41	3.1×10^{-3}	8.5×10^{-2}
Ca-45	6.6×10^{2}	1.8×10^{4}
Ca-47	2.3×10^{4}	6.1×10^{5}
Cadmium (48)		
Cd-109	9.6×10^{1}	2.6×10^{3}
Cd-113m	8.3	2.2×10^{2}
Cd-115m	9.4×10^{2}	2.5×10^{4}
Cd-115	1.9×10^{4}	5.1×10^{5}
Cerium (58)		
Ce-139	2.5×10^{2}	6.8×10^{3}
Ce-141	1.1×10^{3}	2.8×10^{4}

Ce-143	2.5×10^{4}	6.6×10^{5}
Ce-144	1.2×10^{2}	3.2×10^{3}
Californium (98)		
Cf-248	5.8×10^{1}	1.6×10^{3}
Cf-249	1.5×10^{-1}	4.1
Cf-250	4.0	1.1×10^{2}
Cf-251	5.9×10^{-2}	1.6
Cf-252	2.0×10^{1}	5.4×10^{2}
Cf-253	1.1×10^{3}	2.9×10^{4}
Cf-254	3.1×10^{2}	8.5×10^{3}
Chlorine (17)		
Cl-36	1.2×10^{-3}	3.3×10^{-2}
Cl-38	4.9×10^{6}	1.3×10^{8}
Curium (96)		
Cm-240	7.5×10^{2}	2.0×10^{4}
Cm-241	6.1×10^{2}	1.7×10^{4}
Cm-242	1.2×10^{2}	3.3×10^{3}
Cm-243	1.9×10^{-3}	5.2×10^{1}
Cm-244	3.0	8.1×10^{1}
Cm-245	6.4×10^{-3}	1.7×10^{-1}
Cm-246	1.1×10^{-2}	3.1×10^{-1}
Cm-247	3.4×10^{-6}	9.3×10^{-5}
Cm-248	$1.6 \times 10^{-5\ -4}$	4.2×10^{-3}
Cobalt (27)		
Co-55	1.1×10^{5}	3.1×10^{6}
Co-56	1.1×10^{3}	3.0×10^{4}
Co-57	3.1×10^{2}	8.4×10^{3}
Co-58m	2.2×10^{5}	5.9×10^{6}

Co-58	1.2×10^{3}	3.2×10^{4}
Co-60	4.2×10^{1}	1.1×10^{3}
Chromium (24)		
Cr-51	3.4×10^{3}	9.2×10^{4}
Cesium (55)		
Cs-129	2.8×10^{4}	7.6×10^{5}
Cs-131	3.8×10^{3}	1.0×10^{5}
Cs-132	5.7×10^{3}	1.5×10^{5}
Cs-134m	3.0×10^{5}	8.0×10^{6}
Cs-134	4.8×10^{1}	1.3×10^{3}
Cs-135	4.3×10^{-5}	1.2×10^{-3}
Cs-136	2.7×10^{3}	7.3×10^{4}
Cs-137	3.2	8.7×10^{1}
Copper (29)		
Cu-64	1.4×10^{5}	3.9×10^{6}
Cu-67	2.8×10^{4}	7.6×10^{5}
Dysprosium (66)		
Dy-159	2.1×10^{2}	5.7×10^{3}
Dy-165	3.0×10^{5}	8.2×10^{6}
Dy-166	8.6×10^{3}	2.3×10^{5}
Erbium (68)		
Er-169	3.1×10^{3}	8.3×10^{4}
Er-171	9.0×10^{4}	2.4×10^{6}
Einsteinium (99)		
Es-253	—	—
Es-254	—	—
Es-254m	—	—
Es-255	—	—

Europium (63)		
Eu-147	1.4×10^{3}	3.7×10^{4}
Eu-148	6.0×10^{2}	1.6×10^{4}
Eu-149	3.5×10^{2}	9.4×10^{3}
Eu-150	6.1×10^{4}	1.6×10^{6}
Eu-152m	8.2×10^{4}	2.2×10^{6}
Eu-152	6.5	1.8×10^{2}
Eu-154	9.8	2.6×10^{2}
Eu-155	1.8×10^{1}	4.9×10^{2}
Eu-156	2.0×10^{3}	5.5×10^{4}
Fluorine (9)		
F-18	3.5×10^{6}	9.5×10^{7}
Iron (26)		
Fe-52	2.7×10^{5}	7.3×10^{6}
Fe-55	8.8×10^{1}	2.4×10^{3}
Fe-59	1.8×10^{3}	5.0×10^{4}
Fe-60	7.4×10^{-4}	2.0×10^{-2}
Fermium (100)		
Fm-255	—	—
Fm-257	—	—
Gallium (31)		
Ga-67	2.2×10^{4}	6.0×10^{5}
Ga-68	1.5×10^{6}	4.1×10^{7}
Ga-72	1.1×10^{5}	3.1×10^{6}
Gadolinium (64)		
Gd-146	6.9×10^{2}	1.9×10^{4}
Gd-148	1.2	3.2×10^{1}
Gd-153	1.3×10^{2}	3.5×10^{3}

Gd-159	3.9×10^{4}	1.1×10^{6}
Germanium (32)		
Ge-68	2.6×10^{2}	7.1×10^{3}
Ge-71	5.8×10^{3}	1.6×10^{5}
Ge-77	1.3×10^{5}	3.6×10^{6}
Hydrogen (1)		
H-3 (T)	3.6×10^{2}	9.7×10^{3}
Hafnium (72)		
Hf-172	4.1×10^{1}	1.1×10^{3}
Hf-175	3.9×10^{2}	1.1×10^{4}
Hf-181	6.3×10^{2}	1.7×10^{4}
Hf-182	8.1×10^{-6}	2.2×10^{-4}
Mercury (80)		
Hg-194	1.3×10^{-1}	3.5
Hg-195m	1.5×10^{4}	4.0×10^{5}
Hg-197m	2.5×10^{4}	6.7×10^{5}
Hg-197	9.2×10^{3}	2.5×10^{5}
Hg-203	5.1×10^{2}	1.4×10^{4}
Holmium (67)		
Ho-163	2.7	7.6×10^{1}
Ho-166m	6.6×10^{-2}	1.8
Ho-166	2.6×10^{4}	7.0×10^{5}
Iodine (53)		
I-123	7.1×10^{4}	1.9×10^{6}
I-124	9.3×10^{3}	2.5×10^{5}
I-125	6.4×10^{2}	1.7×10^{4}
I-126	2.9×10^{3}	8.0×10^{4}
I-129	6.5×10^{-6}	1.8×10^{-4}

I-131	4.6×10^{3}	1.2×10^{5}
I-132	3.8×10^{5}	1.0×10^{7}
I-133	4.2×10^{4}	1.1×10^{6}
I-134	9.9×10^{5}	2.7×10^{7}
I-135	1.3×10^{5}	3.5×10^{6}
Indium (49)		
In-111	1.5×10^{4}	4.2×10^{5}
In-113m	6.2×10^{5}	1.7×10^{7}
In-114m	8.6×10^{2}	2.3×10^{4}
In-115m	2.2×10^{5}	6.1×10^{6}
Iridium (77)		
Ir-189	1.9×10^{3}	5.2×10^{4}
Ir-190	2.3×10^{3}	6.2×10^{4}
Ir-192	3.4×10^{2}	9.2×10^{3}
Ir-193m	2.4×10^{3}	6.4×10^{4}
Ir-194	3.1×10^{4}	8.4×10^{5}
Potassium (19)		
K-40	2.4×10^{-7}	6.4×10^{-6}
K-42	2.2×10^{5}	6.0×10^{6}
K-43	1.2×10^{5}	3.3×10^{6}
Krypton (36)		
Kr-81	7.8×10^{-4}	2.1×10^{-2}
Kr-85m	3.0×10^{5}	8.2×10^{6}
Kr-85	1.5×10^{1}	3.9×10^{2}
Kr-87	1.0×10^{6}	2.8×10^{7}
Lanthanum (57)		
La-137	1.6×10^{-3}	4.4×10^{-2}
La-140	2.1×10^{4}	5.6×10^{5}

Lutetium (71)		
Lu-172	4.2×10^{3}	1.1×10^{5}
Lu-173	5.6×10^{1}	1.5×10^{3}
Lu-174m	2.0×10^{2}	5.3×10^{3}
Lu-174	2.3×10^{1}	6.2×10^{2}
Lu-177	4.1×10^{3}	1.1×10^{5}
Magnesium (12)		
Mg-28	2.0×10^{5}	5.4×10^{6}
Manganese (25)		
Mn-52	1.6×10^{4}	4.4×10^{5}
Mn-53	6.8×10^{-5}	1.8×10^{-3}
Mn-54	2.9×10^{2}	7.7×10^{3}
Mn-56	8.0×10^{5}	2.2×10^{7}
Molybdenum (42)		
Mo-93	4.1×10^{-2}	1.1
Mo-99	1.8×10^{4}	4.8×10^{5}
Nitrogen (7)		
N-13	5.4×10^{7}	1.5×10^{9}
Sodium (11)		
Na-22	2.3×10^{2}	6.3×10^{3}
Na-24	3.2×10^{5}	8.7×10^{6}
Niobium (41)		
Nb-92m	5.2×10^{3}	1.4×10^{5}
Nb-93m	8.8	2.4×10^{2}
Nb-94	6.9×10^{-3}	1.9×10^{-1}
Nb-95	1.5×10^{3}	3.9×10^{4}
Nb-97	9.9×10^{5}	2.7×10^{7}

Neodymium (60)		
Nd-147	3.0×10^{3}	8.1×10^{4}
Nd-149	4.5×10^{5}	1.2×10^{7}
Nickel (28)		
Ni-59	3.0×10^{-3}	8.0×10^{-2}
Ni-63	2.1	5.7×10^{1}
Ni-65	7.1×10^{5}	1.9×10^{7}
Neptunium (93)		
Np-235	5.2×10^{1}	1.4×10^{3}
Np-236	4.7×10^{-4}	1.3×10^{-2}
Np-237	2.6×10^{-5}	7.1×10^{-4}
Np-239	8.6×10^{3}	2.3×10^{5}
Osmium (76)		
Os-185	2.8×10^{2}	7.5×10^{3}
Os-191m	4.6×10^{4}	1.3×10^{6}
Os-191	1.6×10^{3}	4.4×10^{4}
Os-193	2.0×10^{4}	5.3×10^{5}
Os-194	1.1×10^{1}	3.1×10^{2}
Phosphorus (15)		
P-32	1.1×10^{4}	2.9×10^{5}
P-33	5.8×10^{3}	1.6×10^{5}
Protactinium (91)		
Pa-230	1.2×10^{3}	3.3×10^{4}
Pa-231	1.7×10^{-3}	4.7×10^{-2}
Pa-233	7.7×10^{2}	2.1×10^{4}
Lead (82)		
Pb-201	6.2×10^{4}	1.7×10^{6}
Pb-202	1.2×10^{-4}	3.4×10^{-3}

Pb-203	1.1×10^{4}	3.0×10^{5}
Pb-205	4.5×10^{-6}	1.2×10^{-4}
Pb-210	2.8	7.6×10^{1}
Pb-212	5.1×10^{4}	1.4×10^{6}
Palladium (46)		
Pd-103	2.8×10^{3}	7.5×10^{4}
Pd-107	1.9×10^{-5}	5.1×10^{-4}
Pd-109	7.9×10^{4}	2.1×10^{6}
Promethium (61)		
Pm-143	1.3×10^{2}	3.4×10^{3}
Pm-144	9.2×10^{1}	2.5×10^{3}
Pm-145	5.2	1.4×10^{2}
Pm-147	3.4×10^{1}	9.3×10^{2}
Pm-148m	7.9×10^{2}	2.1×10^{4}
Pm-149	1.5×10^{4}	4.0×10^{5}
Pm-151	2.7×10^{4}	7.3×10^{5}
Polonium (84)		
Po-208	2.2×10^{1}	5.9×10^{2}
Po-209	6.2×10^{-1}	1.7×10^{1}
Po-210	1.7×10^{2}	4.5×10^{3}
Praseodymium (59)		
Pr-142	4.3×10^{4}	1.2×10^{6}
Pr-143	2.5×10^{3}	6.7×10^{4}
Platinum (78)		
Pt-188	2.5×10^{3}	6.8×10^{4}
Pt-191	8.7×10^{3}	2.4×10^{5}
Pt-193m	5.8×10^{3}	1.6×10^{5}
Pt-193	1.4	3.7×10^{1}

Pt-195m	6.2×10^{3}	1.7×10^{5}
Pt-197m	3.7×10^{5}	1.0×10^{7}
Pt-197	3.2×10^{4}	8.7×10^{5}
Plutonium (94)		
Pu-236	2.0×10^{1}	5.3×10^{2}
Pu-237	4.5×10^{2}	1.2×10^{4}
Pu-238	6.3×10^{-1}	1.7×10^{1}
Pu-239	2.3×10^{-3}	6.2×10^{-2}
Pu-240	8.4×10^{-3}	2.3×10^{-1}
Pu-241	3.8	1.0×10^{2}
Pu-242	1.5×10^{-4}	3.9×10^{-3}
Pu-244	6.7×10^{-7}	1.8×10^{-5}
Radium (88)		
Ra-223	1.9×10^{3}	5.1×10^{4}
Ra-224	5.9×10^{3}	1.6×10^{5}
Ra-225	1.5×10^{3}	3.9×10^{4}
Ra-226	3.7×10^{-2}	1.0
Ra-228	1.0×10^{1}	2.7×10^{2}
Rubidium (37)		
Rb-81	3.1×10^{5}	8.4×10^{6}
Rb-83	6.8×10^{2}	1.8×10^{4}
Rb-84	1.8×10^{3}	4.7×10^{4}
Rb-86	3.0×10^{3}	8.1×10^{4}
Rb-87	3.2×10^{-9}	8.6×10^{-8}
Rb (natural)	6.7×10^{6}	1.8×10^{8}
Rhenium (75)		
Re-183	3.8×10^{2}	1.0×10^{4}
Re-184m	1.6×10^{2}	4.3×10^{3}

Re-184	6.9×10^{2}	1.9×10^{4}
Re-186	6.9×10^{3}	1.9×10^{5}
Re-187	1.4×10^{-9}	3.8×10^{-8}
Re-188	3.6×10^{4}	9.8×10^{5}
Re-189	2.5×10^{4}	6.8×10^{5}
Re (natural)	—	2.4×10^{-8}
Rhodium (45)		
Rh-99	3.0×10^{3}	8.2×10^{4}
Rh-101	4.1×10^{1}	1.1×10^{3}
Rh-102m	2.3×10^{2}	6.2×10^{3}
Rh-102	4.5×10^{1}	1.2×10^{3}
Rh-103m	1.2×10^{6}	3.3×10^{7}
Rh-105	3.1×10^{4}	8.4×10^{5}
Radon (86)		
Rn-222	5.7×10^{3}	1.5×10^{5}
Ruthenium (44)		
Ru-97	1.7×10^{4}	4.6×10^{5}
Ru-103	1.2×10^{3}	3.2×10^{4}
Ru-105	2.5×10^{5}	6.7×10^{6}
Ru-106	1.2×10^{2}	3.3×10^{3}
Sulfur (16)		
S-35	1.6×10^{3}	4.3×10^{4}
Antimony (51)		
Sb-122	1.5×10^{4}	4.0×10^{5}
Sb-124	6.5×10^{2}	1.7×10^{4}
Sb-125	3.9×10^{1}	1.0×10^{3}
Sb-126	3.1×10^{3}	8.4×10^{4}
Scandium (21)		

Sc-44	6.7×10^{5}	1.8×10^{7}
Sc-46	1.3×10^{3}	3.4×10^{4}
Sc-47	3.1×10^{4}	8.3×10^{5}
Sc-48	5.5×10^{4}	1.5×10^{6}
Selenium (34)		
Se-75	5.4×10^{2}	1.5×10^{4}
Se-79	2.6×10^{-3}	7.0×10^{-2}
Silicon (14)		
Si-31	1.4×10^{6}	3.9×10^{7}
Si-32	3.9	1.1×10^{2}
Samarium (62)		
Sm-145	9.8×10^{1}	2.6×10^{3}
Sm-147	8.5×10^{-1}	2.3×10^{-8}
Sm-151	9.7×10^{-1}	2.6×10^{1}
Sm-153	1.6×10^{4}	4.4×10^{5}
Tin (50)		
Sn-113	3.7×10^{2}	1.0×10^{4}
Sn-117m	3.0×10^{3}	8.2×10^{4}
Sn-119m	1.4×10^{2}	3.7×10^{3}
Sn-121m	2.0	5.4×10^{1}
Sn-123	3.0×10^{2}	8.2×10^{3}
Sn-125	4.0×10^{3}	1.1×10^{5}
Sn-126	1.0×10^{-3}	2.8×10^{-2}
Strontium (38)		
Sr-82	2.3×10^{3}	6.2×10^{4}
Sr-85m	1.2×10^{6}	3.3×10^{7}
Sr-85	8.8×10^{2}	2.4×10^{4}
Sr-87m	4.8×10^{5}	1.3×10^{7}

Sr-89	1.1×10^{3}	2.9×10^{4}
Sr-90	5.1	1.4×10^{2}
Sr-91	1.3×10^{5}	3.6×10^{6}
Sr-92	4.7×10^{5}	1.3×10^{7}
Tritium (1)		
T (H-3)	3.6×10^{2}	9.7×10^{3}
Tantalum (73)		
Ta-178	4.2×10^{6}	1.1×10^{8}
Ta-179	4.1×10^{1}	1.1×10^{3}
Ta-182	2.3×10^{2}	6.2×10^{3}
Terbium (65)		
Tb-157	5.6×10^{-1}	1.5×10^{1}
Tb-158	5.6×10^{-1}	1.5×10^{1}
Tb-160	4.2×10^{2}	1.1×10^{4}
Technetium (43)		
Tc-95m	8.3×10^{2}	2.2×10^{4}
Tc-96m	1.4×10^{6}	3.8×10^{7}
Tc-96	1.2×10^{4}	3.2×10^{5}
Tc-97m	5.6×10^{2}	1.5×10^{4}
Tc-97	5.2×10^{-5}	1.4×10^{-3}
Tc-98	3.2×10^{-5}	8.7×10^{-4}
Tc-99m	1.9×10^{5}	5.3×10^{6}
Tc-99	6.3×10^{-4}	1.7×10^{-2}
Tellurium (52)		
Te-118	6.8×10^{3}	1.8×10^{5}
Te-121m	2.6×10^{2}	7.0×10^{3}
Te-121	2.4×10^{3}	6.4×10^{4}
Te-123m	3.3×10^{2}	8.9×10^{3}

Te-125m	6.7×10^{2}	1.8×10^{4}
Te-127m	3.5×10^{2}	9.4×10^{3}
Te-127	9.8×10^{4}	2.6×10^{6}
Te-129m	1.1×10^{3}	3.0×10^{4}
Te-129	7.7×10^{5}	2.1×10^{7}
Te-131m	3.0×10^{4}	8.0×10^{5}
Te-132	1.1×10^{4}	~~8.0~~ 3.0 $\times 10^{5}$
Thorium (90)		
Th-227	1.1×10^{3}	3.1×10^{4}
Th-228	3.0×10^{1}	8.2×10^{2}
Th-229	7.9×10^{-3}	2.1×10^{-1}
Th-230	7.6×10^{-4}	2.1×10^{-2}
Th-231	2.0×10^{4}	5.3×10^{5}
Th-232	4.0×10^{-9}	1.1×10^{-7}
Th-234	8.6×10^{2}	2.3×10^{4}
Th (natural)	8.1×10^{-9}	2.2×10^{-7}
Titanium (22)		
Ti-44	6.4	1.7×10^{2}
Thallium (81)		
Tl-200	2.2×10^{4}	6.0×10^{5}
Tl-201	7.9×10^{3}	2.1×10^{5}
Tl-202	2.0×10^{3}	5.3×10^{4}
Tl-204	1.7×10^{1}	4.6×10^{2}
Thulium (69)		
Tm-167	3.1×10^{3}	8.5×10^{4}
Tm-168	3.1×10^{2}	8.3×10^{3}
Tm-170	2.2×10^{2}	6.0×10^{3}
Tm-171	4.0×10^{1}	1.1×10^{3}

Uranium (92)		
U-230	1.0×10^{3}	2.7×10^{4}
U-232	8.3×10^{-1}	2.2×10^{1}
U-233	3.6×10^{-4}	9.7×10^{-3}
U-234	2.3×10^{-4}	6.2×10^{-3}
U-235	8.0×10^{-8}	2.2×10^{-6}
U-236	2.4×10^{-6}	6.5×10^{-5}
U-238	1.2×10^{-8}	3.4×10^{-7}
U (natural)	2.6×10^{-8}	7.1×10^{-7}
U (enriched 5% or less)	—	(See part 4731.0424)
U (enriched more than 5%)	—	(See part 4731.0424)
U (depleted)	—	(See part 4731.0424)
Vanadium (23)		
V-48	6.3×10^{3}	1.7×10^{5}
V-49	3.0×10^{2}	8.1×10^{3}
Tungsten (74)		
W-178	1.3×10^{3}	3.4×10^{4}
W-181	2.2×10^{2}	6.0×10^{3}
W-185	3.5×10^{2}	9.4×10^{3}
W-187	2.6×10^{4}	7.0×10^{5}
W-188	3.7×10^{2}	1.0×10^{4}
Xenon (54)		
Xe-122	4.8×10^{4}	1.3×10^{6}
Xe-123	4.4×10^{5}	1.2×10^{7}
Xe-127	1.0×10^{3}	2.8×10^{4}
Xe-131m	3.1×10^{3}	8.4×10^{4}
Xe-133	6.9×10^{3}	1.9×10^{5}
Xe-135	9.5×10^{4}	2.6×10^{6}

Yttrium (39)		
Y-87	1.7×10^{4}	4.5×10^{5}
Y-88	5.2×10^{2}	1.4×10^{4}
Y-90	2.0×10^{4}	5.4×10^{5}
Y-91m	1.5×10^{6}	4.2×10^{7}
Y-91	9.1×10^{2}	2.5×10^{4}
Y-92	3.6×10^{5}	9.6×10^{6}
Y-93	1.2×10^{5}	3.3×10^{6}
Ytterbium (70)		
Yb-169	8.9×10^{2}	2.4×10^{4}
Yb-175	6.6×10^{3}	1.8×10^{5}
Zinc (30)		
Zn-65	3.0×10^{2}	8.2×10^{3}
Zn-69m	1.2×10^{5}	3.3×10^{6}
Zn-69	1.8×10^{6}	4.9×10^{7}
Zirconium (40)		
Zr-88	6.6×10^{2}	1.8×10^{4}
Zr-93	9.3×10^{-5}	2.5×10^{-3}
Zr-95	7.9×10^{2}	2.1×10^{4}
Zr-97	7.1×10^{4}	1.9×10^{6}

[For text of subp 3, see M.R.]

4731.0580 APPLICATION; FINANCIAL ASSURANCE AND RECORD KEEPING FOR DECOMMISSIONING.

[For text of subps 1 to 3, see M.R.]

Subp. 4. **Funding plan requirements.** ~~A~~ Each decommissioning funding plan must be submitted for review and approval and must contain:

A. a detailed cost estimate for decommissioning ~~and a description of the method of assuring funds for decommissioning from subpart 5, including means of adjusting cost estimates and associated funding levels periodically over the life of the facility. Cost estimates must be adjusted at intervals not to exceed three years; and~~, in an amount reflecting:

(1) the cost of an independent contractor to perform all decommissioning activities;

(2) the cost of meeting part 4731.2100, subpart 2, criteria for unrestricted use, provided that, if the applicant or licensee can demonstrate the ability to meet the provisions of part 4731.2100, subpart 3, the cost estimate may be based on meeting the part 4731.2100, subpart 3, criteria;

(3) the volume of on-site subsurface material containing residual radioactivity that will require remediation; and

(4) an adequate contingency factor;

B. identification of and justification for using the key assumptions contained in the DCE;

C. a description of the method of assuring funds for decommissioning from subpart 5, including the means for adjusting cost estimates and associated funding levels periodically over the life of the facility;

~~B.~~ D. a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning~~. A signed original of the financial instrument obtained to satisfy the requirements of subpart 5 must accompany the certification.~~; and

E. a signed original, or, if permitted, a copy, of the financial instrument obtained to satisfy the requirements of subpart 5, unless a previously submitted and accepted financial instrument continues to cover the cost estimate for decommissioning.

Subp. 4a. **Resubmittal of decommissioning funding plan.** At the time of license renewal and at intervals not to exceed three years, the decommissioning funding plan must be resubmitted with adjustments as necessary to account for changes in costs and the extent of contamination. If the amount of financial assurance will be adjusted downward, this cannot be done until the updated decommissioning funding plan is approved. The decommissioning funding plan must update the information submitted with the original or prior approved plan, and must specifically consider the effect of the following events on decommissioning costs:

A. spills of radioactive material producing additional residual radioactivity in on-site subsurface material;

B. waste inventory increasing above the amount previously estimated;

C. waste disposal costs increasing above the amount previously estimated;

D. facility modifications;

E. changes in authorized possession limits;

F. actual remediation costs that exceed the previous cost estimate;

G. on-site disposal; and

H. use of a settling pond.

[For text of subps 5 and 6, see M.R.]

4731.0597 INALIENABILITY OF LICENSES.

A. No license granted under parts 4731.0525 to 4731.0630 and no right to possess or utilize special nuclear material granted by a license issued under parts

4731.0525 to 4731.0630 shall be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of a license to a person unless the commissioner, after securing full information, finds that the transfer is in accordance with this chapter and gives consent in writing.

B. An application for transfer of license must include:

(1) the identity, technical, and financial qualifications of the proposed transferee; and

(2) financial assurance for decommissioning information required by part 4731.0580.

4731.0725 EXEMPTION; UNIMPORTANT QUANTITIES OF SOURCE MATERIAL.

[For text of subps 1 and 2, see M.R.]

Subp. 3. **Certain items and materials.**

A. A person is exempt from parts 4731.0700 to ~~4731.0840~~ 4731.2950 to the extent that the person receives, possesses, uses, or transfers:

[For text of subitem (1), see M.R.]

(2) source material contained in the following products:

(a) glazed ceramic tableware manufactured before August 27, 2013, provided that the glaze contains not more than 20 percent by weight source material;

(b) piezoelectric ceramic containing not more than two percent by weight source material;

(c) 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; or

(d) glass enamel or glass enamel frit containing not more than ten percent by weight source material imported or ordered for importation into the United States, or initially distributed by manufacturers in the United States, before July 25, 1983;

[For text of subitems (3) and (4), see M.R.]

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

~~(a) the counterweights are manufactured according to a specific license issued by the NRC or the Atomic Energy Commission authorizing distribution by the licensee according to parts 4731.0700 to 4731.0840;~~

~~(b)~~ (a) each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "Depleted Uranium." This subunit does not apply to counterweights manufactured before December 31, 1969, if the counterweights were manufactured under a specific license issued by the Atomic Energy Commission and were impressed with the legend required under Code of Federal Regulations, title 10, section 40.13, paragraph (c), clause (5), subclause ~~(ii)~~ (i), in effect June 30, 1969;

~~(c)~~ (b) each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "Unauthorized Alterations Prohibited." This subunit does not apply to counterweights manufactured before December 31, 1969, if the counterweights were manufactured under a specific license issued by the Atomic Energy Commission and were impressed with the legend required under Code of Federal Regulations, title 10, section 40.13, paragraph (c), clause (5), subclause ~~(ii)~~ (i), in effect June 30, 1969; and

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

[For text of subitem (6), see M.R.]

(7) thorium or uranium contained in or on finished optical lenses or mirrors, provided that each does not contain more than ~~30~~ ten percent by weight of thorium or uranium or for lenses manufactured before August 27, 2013, 30 percent by weight of thorium. The exemption in this subitem shall not be deemed to authorize:

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

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

[For text of subitem (8), see M.R.]

[For text of item B, see M.R.]

C. No person may initially transfer for sale or distribution a product containing source material to persons exempt under this subpart, or equivalent regulations of the NRC or an agreement state, unless authorized by a license issued under Code of Federal Regulations, title 10, section 40.52, to initially transfer such products for sale or distribution.

(1) Persons initially distributing source material in products covered by the exemptions in this subpart before August 27, 2013, without specific authorization may continue distribution for one year beyond this date. Initial distribution may also be continued until the 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.

(2) Persons authorized to manufacture, process, or produce these materials or products containing source material by the NRC or an agreement state, and persons who import finished products or parts, for sale or distribution must be authorized by a license issued under Code of Federal Regulations, title 10, section 40.52, for distribution only and are exempt from the requirements of parts 4731.0765, items B and C, and 4731.1000 to 4731.2950.

Subp. 4. [See repealer.]

4731.0745 GENERAL LICENSE; SMALL QUANTITIES OF SOURCE MATERIAL.

Subpart 1. **General license issued.** A general license is issued authorizing commercial and industrial firms; research, educational, and medical institutions; and state and local government agencies to ~~use and transfer not more than 15 pounds of source material at any one time for research, development, educational, commercial, or operational purposes. A person authorized to use or transfer source material under this general license may not receive more than a total of 150 pounds of source material in any one calendar year.~~ receive, possess, use, and transfer 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 lb) 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 item may not receive more than a total of 7 kg (15.4 lb) of uranium and thorium in any one calendar year. Persons possessing source

material in excess of these limits as of December 31, 2014, may continue to possess up to 7 kg (15.4 lb) of uranium and thorium at any one time for one year beyond this date, or until the commissioner takes final action on a pending application submitted on or before December 31, 2015, for a specific license for such material and receive up to 70 kg (154 lb) of uranium or thorium in any one calendar year until December 31, 2015, or until the commissioner takes final action on a pending application submitted on or before December 31, 2015, for a specific license for such material; and

B. no more than a total of 7 kg (15.4 lb) of uranium and thorium at any one time. A person authorized to possess, use, and transfer source material under this item may not receive more than a total of 70 kg (154 lb) of uranium and thorium in any one calendar year. A person may not alter the chemical or physical form of the source material possessed under this item unless it is accounted for under the limits of item A; or

C. no more than 7 kg (15.4 lb) of uranium, removed during the treatment of drinking water, at any one time. A person may not remove more than 70 kg (154 lb) of uranium from drinking water during a calendar year under this item; or

D. no more than 7 kg (15.4 lb) 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 item may not receive more than a total of 70 kg (154 lb) of source material in any one calendar year.

Subp. 2. **Other law.** A person who receives, possesses, uses, or transfers source material under the general license issued under subpart 1 ~~is exempt from parts 4731.1000to 4731.2950, to the extent that the receipt, possession, use, or transfer is within the terms of the general license. This exemption does not apply to a person who is also in possession of source material under a specific license issued under parts 4731.0700 to 4731.0840.~~:

A. is prohibited from administering source material, or the radiation therefrom, either externally or internally, to human beings except as authorized by the commissioner in a specific license;

B. must not abandon the source material. Source material may be disposed of as follows:

(1) a cumulative total of 0.5 kg (1.1 lb) 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 subitem is exempt from the requirements to obtain a license under parts 4731.0700 to 4731.0840 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 this chapter; or

(2) in accordance with part 4731.2400;

C. is subject to the provisions in parts 4731.0700 to 4731.0710, 4731.0785, and 4731.0810 to 4731.0840;

D. must respond to written requests from the commissioner to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the person cannot provide the requested information within the allotted time, the person must, within that same time period, request a longer period to supply the information by providing the commissioner a written justification for the request; and

E. must not export such source material except in accordance with Code of Federal Regulations, title 10, section 110.

Subp. 2a. **Contamination.** Any person who receives, possesses, uses, or transfers source material in accordance with subpart 1 must conduct activities to minimize contamination of the facility and the environment. When activities involving source material are permanently ceased at any site, if evidence of significant contamination is identified, the general licensee must notify the commissioner about the contamination and may consult with the commissioner as to the appropriateness of sampling and restoration activities to ensure that any contamination or residual source material remaining at the site where source material was used under this general license is not likely to result in exposures that exceed the limits in part 4731.2100.

Subp. 3. ~~**Prohibition**~~ **Exemption.** A person who receives, possesses, uses, or transfers source material under the general license issued under subpart 1 is ~~prohibited from administering source material, or the radiation therefrom, either externally or internally, to human beings except as may be authorized by the commissioner, the NRC, or an agreement state in a specific license.~~ exempt from the provisions of parts 4731.1000 to 4731.2950 to the extent that receipt, possession, use, and transfer are within the terms of this general license, except that the person must comply with the provisions of parts 4731.2100, subpart 1, and 4731.2400 to the extent necessary to meet the provisions of subparts 2, item B, and 3. However, this exemption does not apply to any person who also holds a specific license issued under this chapter.

Subp. 4. **Transfer authorization required.** No person may initially transfer or distribute source material to persons generally licensed under subpart 1, item A or B, or equivalent regulations of the NRC or an agreement state, unless authorized by a specific license issued in accordance with part 4731.0816 or equivalent provisions of the NRC or an agreement state. 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 subpart 1 before December 31, 2014, without specific authorization may continue for one year beyond this date. Distribution

may also be continued until the commissioner takes final action on a pending application for license or license amendment to specifically authorize distribution submitted on or before December 31, 2014.

4731.0780 FINANCIAL ASSURANCE AND RECORD KEEPING FOR DECOMMISSIONING.

[For text of subps 1 to 3, see M.R.]

Subp. 4. **Funding plan requirements.**

A. ~~A~~ Each decommissioning funding plan must be submitted for review and approval and must contain:

~~A.~~ (1) a detailed cost estimate for decommissioning ~~and a description of the method of assuring funds for decommissioning from subpart 5, including means of adjusting cost estimates and associated funding levels periodically over the life of the facility. Cost estimates must be adjusted at intervals not to exceed three years; and~~, in an amount reflecting:

(a) the cost of an independent contractor to perform all decommissioning activities;

(b) the cost of meeting the criteria in part 4731.2100, subpart 2, for unrestricted use, provided that, if the applicant or licensee can demonstrate its ability to meet the provisions of part 4731.2100, subpart 3, the cost estimate may be based on meeting the criteria in part 4731.2100, subpart 3;

(c) the volume of on-site subsurface material containing residual radioactivity that will require remediation; and

(d) an adequate contingency factor;

(2) identification of and justification for using the key assumptions contained in the DCE;

(3) a description of the method of assuring funds for decommissioning from subpart 5, including means for adjusting cost estimates and associated funding levels periodically over the life of the facility;

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

(5) a signed original, or if permitted, a copy, of the financial instrument obtained to satisfy the requirements of subpart 5, unless a previously submitted and accepted financial instrument continues to cover the cost estimate for decommissioning.

B. ~~a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning. A signed original of the financial instrument obtained to satisfy the requirements of subpart 5 must accompany the certification.~~ At the time of license renewal and at intervals not to exceed three years, the decommissioning funding plan must be resubmitted with adjustments as necessary to account for changes in costs and the extent of contamination. If the amount of financial assurance will be adjusted downward, this cannot be done until the updated decommissioning funding plan is approved. The decommissioning funding plan must update the information submitted with the original or prior approved plan, and must specifically consider the effect of the following events on decommissioning costs:

(1) spills of radioactive material producing additional residual radioactivity in on-site subsurface material;

(2) waste inventory increasing above the amount previously estimated;

(3) waste disposal costs increasing above the amount previously estimated;

(4) facility modifications;

(5) changes in authorized possession limits;

(6) actual remediation costs that exceed the previous cost estimate;

(7) on-site disposal; and

(8) use of a settling pond.

[For text of subps 5 and 6, see M.R.]

4731.0810 INALIENABILITY OF LICENSES.

A. No license issued or granted under parts 4731.0700 to 4731.0840 shall be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of a license to a person unless the commissioner, after securing full information, finds that the transfer is in accordance with this chapter and gives consent in writing.

B. An application for transfer of license must include:

(1) the identity, technical, and financial qualifications of the proposed transferee; and

(2) financial assurance for decommissioning information required by part 4731.0780, as applicable.

4731.0816 LICENSE TO TRANSFER SOURCE MATERIAL.

An application for a specific license to initially transfer source material for use under part 4731.0745 or equivalent regulations of the NRC or an agreement state shall be approved if:

A. the applicant satisfies the general requirements specified in part 4731.0765; and

B. the applicant submits adequate information on, and the commission approves, the methods to be used for quality control, labeling, and providing safety instructions to recipients.

4731.0817 REQUIREMENTS FOR LABELING SOURCE MATERIAL; INSTRUCTIONS.

Subpart 1. **Label required.** Each person licensed under part 4731.0816 must label the immediate container of each quantity of source material with the type of source material and quantity of material and the words "radioactive material."

Subp. 2. **Transfer records.** Each person licensed under part 4731.0816 must ensure that the quantities and concentrations of source material are as labeled and indicated in any transfer records.

Subp. 3. **Transfer information.** A person licensed under part 4731.0816 must provide the information specified in this subpart to each person to whom source material is transferred for use under part 4731.0745 or equivalent regulations of the NRC or an agreement state. 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 parts 4731.0745 and 4731.0815 or equivalent regulations of the NRC or an agreement state; and

B. appropriate radiation safety precautions and instructions relating to handling, use, storage, and disposal of the material.

Subp. 4. **Transfer report.** Each person licensed under part 4731.0816 must report transfers as follows:

A. file a report with the commissioner. The report must include the following information:

(1) the name, address, and license number of the person who transferred the source material;

(2) for each general licensee under part 4731.0745 or equivalent NRC or agreement state regulations to whom greater than 50 grams (0.11 lb) of source material has been transferred in a single calendar quarter, the name and address of the general licensee to whom source material is distributed; a responsible agent, by name and position and telephone number, of the general licensee to whom the material was sent; and the type, physical form, and quantity of source material transferred; and

(3) the total quantity of each type and physical form of source material transferred in the reporting period to all generally licensed recipients;

B. file a report with the commissioner, NRC, and each responsible agreement state agency that identifies all persons operating under provisions equivalent to part 4731.0745 to whom greater than 50 grams (0.11 lb) of source material has been transferred within a single calendar quarter. The report must include the following information specific to those transfers made to the agreement state being reported to:

(1) the name, address, and license number of the person who transferred the source material; and

(2) the name and address of the general licensee to whom source material was distributed; a responsible agent, by name and position and telephone number, of the general licensee to whom the material was sent; and the type, physical form, and quantity of source material transferred; and

(3) the total quantity of each type and physical form of source material transferred in the reporting period to all such generally licensed recipients within NRC jurisdiction or the agreement state;

C. submit each report by January 31 of each year covering all transfers for the previous calendar year. If no transfers were made to persons generally licensed under part 4731.0745 or equivalent NRC or agreement state regulations during the current period, a report must be submitted to the commissioner indicating so. If no transfers have been

made to general licensees in NRC jurisdiction or a particular agreement state during the reporting period, this information must be reported to the NRC or responsible agreement state agency upon request of the agency.

Subp. 5. **Records retention.** Each person licensed under part 4731.0816 must maintain all information that supports the reports required by this part concerning each transfer to a general licensee for a period of one year after the event is included in a report to the commissioner or to the NRC or an agreement state agency.

4731.1010 POSTING WORKER NOTICES.

Subpart 1. **Required postings.**

A. A licensee must post current copies of the following documents:

[For text of subitems (1) to (3), see M.R.]

(4) any ~~notice of violation~~ correction order involving radiological working conditions, ~~proposed imposition of civil penalty, or order issued under part 4731.1090~~ administrative penalty order (APO), and any response from the licensee.

[For text of item B, see M.R.]

[For text of subps 2 and 3, see M.R.]

Subp. 4. ~~**Notice of violation**~~ **Correction order and APO.** Documents posted according to subpart 1, item A, subitem (4), must be posted within two working days after receipt of the documents from the commissioner. A licensee's response, if any, must be posted within two working days after dispatch by the licensee. The documents must remain posted for a minimum of five working days or until action correcting the violation is completed, whichever is later.

4731.2100 RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION.

[For text of subps 1 and 2, see M.R.]

Subp. 3. **Criteria for termination under restricted conditions.** A site is considered acceptable for license termination under restricted conditions, if the licensee:

[For text of items A and B, see M.R.]

C. has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site. Acceptable financial assurance mechanisms are:

(1) funds placed into ~~an account~~ a trust segregated from the licensee's assets and outside the licensee's administrative control ~~as described under part 4731.3080, subpart 6, item B~~, and in which the adequacy of the trust funds is to be assessed based on an assumed annual one percent real rate of return on investment;

~~(2) surety method, insurance, or other guarantee method as described under part 4731.3080, subpart 6, item C;~~

~~(3)~~ (2) a statement of intent, in the case of federal, state, or local government licensees, as described under part 4731.3080, subpart 6, item E; or

~~(4)~~ (3) when a governmental entity is assuming custody and ownership of a site, an arrangement that is deemed acceptable by the governmental entity;

[For text of items D to G, see M.R.]

Subp. 4. **Alternative criteria for license termination.**

A. The commissioner may terminate a license using alternative criteria greater than the dose criterion of subparts 2 and 3, items B and E, subitem (1), unit (a), if the licensee:

[For text of subitems (1) and (2), see M.R.]

(3) reduces doses to ALARA levels, taking into consideration any detriments, such as traffic accidents, expected to potentially result from decontamination and waste disposal; ~~and~~

(4) submits a decommissioning plan or license termination plan to the commissioner indicating the licensee's intent to decommission according to part 4731.0600, subpart 2; 4731.0790, subpart 4; or 4731.3085, subpart 4, or Code of Federal Regulations, title 10, section 50.82, paragraphs (a) and (b), or 72.54, and specifying that the licensee proposes to decommission by use of alternate criteria. The licensee must document in the decommissioning plan or license termination plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice. In seeking such advice, the licensee must provide for:

(a) participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;

(b) an opportunity for a comprehensive, collective discussion on the issues by the participants represented; and

(c) a publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues~~.~~; and

(5) has provided sufficient financial assurance in the form of a trust fund to enable an independent third party, including a government custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site.

[For text of item B, see M.R.]

[For text of subp 5, see M.R.]

4731.2150 MINIMIZATION OF CONTAMINATION.

A. Applicants for licenses, other than renewals, must describe in the application how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

B. Licensees must, to the extent practical, conduct operations to minimize the introduction of residual radioactivity into the site, including the subsurface, in accordance with the existing radiation protection requirements in part 4731.2010 and radiological criteria for license termination in item A and part 4731.2100.

4731.2200 SURVEYS AND MONITORING.

Subpart 1. **Required surveys.** A licensee must make or cause to be made, surveys of areas, including the subsurface, that:

A. may be necessary for the licensee to comply with this chapter; and

B. are reasonable under the circumstances to evaluate:

(1) the magnitude and extent of radiation levels;

(2) concentrations or quantities of ~~radioactive material~~ residual radioactivity; and

(3) potential radiological hazards of the radiation levels and residual radioactivity detected.

Subp. 1a. **Records.** Notwithstanding part 4731.2510, subpart 1, records from surveys describing the location and amount of subsurface residual radioactivity identified at the site must be kept with records important for decommissioning, and must be retained according to part 4731.0580, subpart 6; 4731.0780, subpart 6; or 4731.3080, subpart 7, as applicable.

[For text of subps 2 and 3, see M.R.]

4731.2620 REPORTS; RADIATION EXPOSURES, LEVELS, AND CONCENTRATIONS EXCEEDING CONSTRAINTS OR LIMITS.

[For text of subps 1 and 2, see M.R.]

Subp. 3. **Individual information.**

A. A report filed under subpart 1 must include, for each occupationally overexposed individual:

(1) the name; and

~~(2) Social Security number; and~~

~~(3)~~ (2) date of birth.

[For text of items B and C, see M.R.]

[For text of subp 4, see M.R.]

4731.3020 EXEMPTION; CARRIERS.

Common and contract carriers, freight forwarders, warehousers, and the United States Postal Service are exempt from parts 4731.3000 to ~~4731.7280~~ 4731.8140 to the extent that they transport or store radioactive material in the regular course of the carriage for another or storage incident thereto.

4731.3030 EXEMPTION; CERTAIN ITEMS CONTAINING RADIOACTIVE MATERIAL.

Subpart 1. **Exempt products.** Except for persons who apply radioactive material to or incorporate radioactive material into the following products or persons who initially transfer for sale or distribution the following products containing radioactive material, a person is exempt from parts 4731.3000 to 4731.7280 to the extent that the person receives, possesses, uses, transfers, owns, or acquires the following products:

[For text of item A, see M.R.]

B. (1) static elimination devices which contain, as a sealed source or sources, by-product material consisting of a total of not more than 18.5 MBq (500 μCi) of polonium-210 per device;

(2) ion-generating tubes designed for ionization of air that contain, as a sealed source or sources, by-product material consisting of a total of not more than 18.5 MBq (500μCi) of polonium-210 per device or of a total of not more than 1.85 GBq (50 mCi) of hydrogen-3 (tritium) per device; and

(3) devices authorized before December 31, 2014, for use under the general license then provided in part 4731.3210 and equivalent regulations of the NRC or agreement states and manufactured, tested, and labeled by the manufacturer in accordance with the specifications contained in a specific license issued by the commissioner, the NRC, or an agreement state.

~~B.~~ C. balances of precision containing not more than one millicurie of tritium per balance or not more than 0.5 millicurie of tritium per balance part manufactured before December 17, 2007;

~~C.~~ D. marine compasses containing not more than 750 millicuries of tritium gas and other marine navigational instruments containing not more than 250 millicuries of tritium gas manufactured before December 17, 2007;

~~D.~~ E. ionization chamber smoke detectors containing not more than one microcurie (μCi) of americium-241 per detector in the form of a foil and designed to protect life and property from fires;

~~E.~~ F. electron tubes. For purposes of this item, "electron tubes" include spark gap tubes, power tubes, gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pickup tubes, radiation detection tubes, and any other completely sealed tube that is designed to conduct or control electrical currents. The exemption under this item applies only if the levels of radiation from each electron tube containing radioactive

material do not exceed one millirad per hour at one centimeter from any surface when measured through seven milligrams per square centimeter of absorber and if each tube does not contain more than one of the following specified quantities of radioactive materials:

(1) 150 millicuries of tritium per microwave receiver protector tube or ten millicuries of tritium per any other electron tube;

(2) one microcurie of cobalt-60;

(3) five microcuries of nickel-63;

(4) 30 microcuries of krypton-85;

(5) five microcuries of cesium-137; or

(6) 30 microcuries of promethium-147; or

~~F.~~ G. ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, one or more sources of radioactive material. For purposes of this item, an instrument's source may contain either one type or different types of radionuclides and an individual exempt quantity may be composed of fractional parts of one or more of the exempt quantities in part 4731.3145, provided that the sum of the fractions does not exceed unity. For purposes of this item, 0.05 microcurie of americium-241 is an exempt quantity under part 4731.3145. The exemption under this item applies only if:

(1) each source contains no more than one exempt quantity under part 4731.3145; and

(2) each instrument contains no more than ten exempt quantities.

[For text of subp 2, see M.R.]

4731.3045 EXEMPTION; SELF-LUMINOUS PRODUCTS CONTAINING TRITIUM, KRYPTON-85, OR PROMETHIUM-147.

[For text of subp 1, see M.R.]

Subp. 2. **Specific license required.** A person who desires to manufacture, process, ~~or~~ produce, or initially transfer for sale or distribution self-luminous products containing tritium, krypton-85, or promethium-147 ~~or to transfer such products~~ for use under subpart 1 must apply for a license according to Code of Federal Regulations, title 10, section 32.22, ~~that states that the product may be transferred by the licensee to persons exempt under subpart 1 or equivalent regulations of the NRC or an agreement state~~ and for a certificate of registration in accordance with Code of Federal Regulations, title 10, section 32.210.

[For text of subp 3, see M.R.]

4731.3050 EXEMPTION; GAS AND AEROSOL DETECTORS CONTAINING RADIOACTIVE MATERIAL.

Subpart 1. **Specific license exemption.** Except for persons who manufacture, process, produce, or initially transfer for sale or distribution gas and aerosol detectors containing radioactive material, a person is exempt from parts 4731.1000 to 4731.2090 and 4731.3000 to 4731.7280 to the extent that the person receives, possesses, uses, transfers, owns, or acquires radioactive material in gas or aerosol detectors designed to protect ~~life~~ health, safety, or property ~~from fires and airborne hazards~~, and manufactured, processed, produced, or initially transferred according to a specific license issued under Code of Federal Regulations, title 10, section 32.26, that authorizes the initial transfer of the product for use under this part. This exemption also covers gas and aerosol detectors manufactured or distributed before November 30, 2007, in accordance with a specific license issued by a state under comparable provisions to Code of Federal Regulations, title 10, section 32.26, authorizing distribution to persons exempt from regulatory requirements.

Subp. 2. **Specific license required.** A person who desires to manufacture, process, or produce gas and aerosol detectors containing radioactive material or to initially transfer such products for use under subpart 1 must apply for a license under Code of Federal Regulations, title 10, section 32.26, ~~that states that the product may be initially transferred by the licensee to persons exempt under subpart 1 or equivalent regulations of the NRC or an agreement state~~ and for a certificate of registration under Code of Federal Regulations, title 10, section 32.210.

4731.3056 EXEMPTION; CERTAIN INDUSTRIAL DEVICES.

Subpart 1. **Specific license exemption.** 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, a person is exempt from parts 4731.1000 to 4731.2090 and 4731.3000 to 4731.7280 to the extent that the person receives, possesses, uses, transfers, owns, or acquires radioactive material in these certain detecting, measuring, gauging, or controlling devices and certain devices for producing and ionized atmosphere, and manufactured, processed, produced, or initially transferred according to a specific license issued under Code of Federal Regulations, title 10, section 32.30, that authorizes the initial transfer of the device for use under this part. This exemption does not cover sources not incorporated into a device, such as calibration and reference sources.

Subp. 2. **Specific license required.** A person who desires to manufacture, process, produce, or initially transfer for sale or distribution industrial devices containing radioactive material for use under subpart 1 must apply for a license under Code of Federal Regulations, title 10, section 32.30, and for a certificate of registration under Code of Federal Regulations, title 10, section 32.210.

4731.3065 SPECIFIC LICENSES; APPLICATION.

Subpart 1. **General requirements.**

A. Applications for specific licenses must be filed ~~in duplicate~~ on an application for radioactive material license form prescribed by the commissioner.

[For text of items B to G, see M.R.]

Subp. 2. **Sealed source requirements.**

A. Except as provided in items B, C, and D, an application for a specific license to use radioactive material in the form of a sealed source or in a device that contains the sealed source must:

~~A.~~ (1) identify the source or device by manufacturer and model number as registered with the NRC under Code of Federal Regulations, title 10, section 32.210, with an agreement state, or for a source or a device containing radium-226 or accelerator-produced radioactive material with a state under provisions comparable to Code of Federal Regulations, title 10, section 32.210; or

~~B.~~ (2) contain the information identified in Code of Federal Regulations, title 10, section 32.210 (c)~~; or~~.

~~C.~~ B. For sources or devices ~~containing naturally occurring or accelerator-produced radioactive material~~ manufactured prior to ~~November 30, 2007~~ October 23, 2012, that are not registered with the NRC under Code of Federal Regulations, title 10, section 32.210, or with an agreement state, and for which the applicant is unable to provide all categories of information specified in Code of Federal Regulations, title 10, section 32.210 (c), the applicant must provide:

(1) all available information identified in Code of Federal Regulations, title 10, section 32.210 (c) and this chapter concerning the source, and, if applicable, the device; and

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

C. For sealed sources and devices allowed to be distributed without registration of safety information according to Code of Federal Regulations, title 10, section 32.210(g)(1), the applicant may supply only the manufacturer, model number, and radionuclide and quantity.

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

Subp. 3. **Decommissioning requirements.** As provided under ~~parts~~ part 4731.3080, ~~4731.3300 to 4731.3420, and 4731.4000 to 4731.4527,~~ certain applications for specific licenses filed under ~~part 4731.3065~~ parts 4731.3000 to 4731.3175 and 4731.3300 to 4731.4527 must contain a proposed decommissioning funding plan or a certification of financial assurance for decommissioning.

[For text of subps 4 to 7, see M.R.]

4731.3070 SPECIFIC LICENSES; APPROVAL.

Subpart 1. **Application.** The commissioner shall approve an application for a specific license if:

A. the application is for a purpose authorized under this chapter;

B. the applicant is qualified by training and experience to use the material for the purpose requested in such manner as to protect health and minimize danger to life and property;

C. the applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life and property;

D. the applicant satisfies any applicable special requirements under this chapter; and

E. in the case of an application for a license to receive and possess radioactive material for the conduct of any activity that the commissioner determines will significantly affect the quality of the environment, before commencement of construction of the plant or facility in which the activity will be conducted, the commissioner, on the basis of information filed and evaluations made according to Code of Federal Regulations, title 10, part 51, subpart A, has concluded, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values. Commencement of construction prior to such conclusion is grounds for denial of a license to receive and possess radioactive material in such plant or facility. ~~Commencement of construction does not mean site exploration, necessary roads for site exploration, borings to determine foundation conditions, or other preconstruction monitoring or testing to establish background information related to the suitability of the site or the protection of environmental values.~~

Subp. 2. **License.** Upon a determination that an application meets the requirements of this chapter, the commissioner shall issue a specific license authorizing the possession and use of radioactive material.

4731.3075 TERMS AND CONDITIONS OF LICENSES.

[For text of subp 1, see M.R.]

Subp. 2. **Transfer prohibited.**

A. No license issued or granted under this chapter nor any right under a license must be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of a license to any person, unless the commissioner, after securing full information, finds that the transfer is in accordance with this chapter and gives consent in writing.

B. An application for transfer of license must include:

(1) the identity, technical, and financial qualifications of the proposed transferee; and

(2) financial assurance for decommissioning information required by part 4731.3080.

[For text of subp 3, see M.R.]

Subp. 4. **Bankruptcy.**

A. A general licensee required to register under part 4731.3215, subpart 3a, and a specific licensee issued a license under this chapter must notify the commissioner, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any chapter of United States Code, title 11, by or against:

(1) the licensee;

(2) an entity, ~~which includes a person, estate, trust, governmental unit, or United States trustee~~ as defined under United States Code, title 11, section 101, paragraph (15), that controls the licensee or lists the license or licensee as property; or

(3) an affiliate of the licensee, as defined under United States Code, ~~chapter~~ title 11, section 101, ~~clause~~ paragraph (2).

[For text of item B, see M.R.]

[For text of subps 5 to 9, see M.R.]

4731.3080 FINANCIAL ASSURANCE AND RECORD KEEPING FOR DECOMMISSIONING.

[For text of subps 1 to 4, see M.R.]

Subp. 5. **Funding plan requirements.**

A. ~~A~~ Each decommissioning funding plan must be submitted for review and approval and must contain:

~~A.~~ (1) a detailed cost estimate for decommissioning ~~and a description of the method of assuring funds for decommissioning from subpart 6, including means of adjusting cost estimates and associated funding levels periodically over the life of the facility. Cost estimates must be adjusted at intervals not to exceed three years; and~~, in an amount reflecting:

(a) the cost of an independent contractor to perform all decommissioning activities;

(b) the cost of meeting the criteria in part 4731.2100, subpart 2, for unrestricted use, provided that, if the applicant or licensee can demonstrate the ability to meet the provisions of part 4731.2100, subpart 3, the cost estimate may be based on meeting the criteria in part 4731.2100, subpart 3;

(c) the volume of on-site subsurface material containing residual radioactivity that will require remediation to meet the criteria for license termination; and

(d) an adequate contingency factor;

(2) identification of and justification for using the key assumptions contained in the DCE;

(3) a description of the method of assuring funds for decommissioning under subpart 6, including the means for adjusting cost estimates and associated funding levels periodically over the life of the facility;

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

(5) a signed original of the financial instrument obtained to satisfy the requirements of subpart 6, unless a previously submitted and accepted financial instrument continues to cover the cost estimate for decommissioning.

B. ~~a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning. A signed original of the financial instrument obtained to satisfy the requirements of subpart 6 must accompany the certification.~~ At the time of license renewal and at intervals not to exceed three years, the decommissioning funding plan must be resubmitted with adjustments as necessary to account for changes in costs and the extent of contamination. If the amount of financial assurance will be adjusted downward, this cannot be done until the updated decommissioning funding plan is approved. The decommissioning funding plan must update the information submitted with the original or prior approved plan, and must specifically consider the effect of the following events on decommissioning costs:

(1) spills of radioactive material producing additional residual radioactivity in on-site subsurface material;

(2) waste inventory increasing above the amount previously estimated;

(3) waste disposal costs increasing above the amount previously estimated;

(4) facility modifications;

(5) changes in authorized possession limits;

(6) actual remediation costs that exceed the previous cost estimate;

(7) on-site disposal; and

(8) use of a settling pond.

[For text of subps 6 and 7, see M.R.]

4731.3145 EXEMPT QUANTITIES.

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
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 11 (C 11)~~	~~1,000~~
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 9.2 h (Eu 152 9.2 h)	100
Europium 152 13 yr (Eu 152 13 yr)	1
Europium 154 (Eu 154)	1
Europium 155 (Eu 155)	10
Fluorine 18 (F 18)	1,000
Gadolinium 153 (Gd 153)	10
Gadolinium 159 (Gd 159)	100
Gallium 67 (Ga 67)	100

Gallium 72 (Ga 72)	10
Germanium 68 (Ge 68)	10
Germanium 71 (Ge 71)	100
Gold 195 (Au 195)	10
Gold 198 (Au 198)	100
Gold 199 (Au 199)	100
Hafnium 181 (Hf 181)	10
Holmium 166 (Ho 166)	100
Hydrogen 3 (H 3)	1,000
Indium 111 (In 111)	100
Indium 113m (In 113m)	100
Indium 114m (In 114m)	10
Indium 115m (In 115m)	100
Indium 115 (In 115)	10
Iodine 123 (I 123)	100
Iodine 125 (I 125)	1
Iodine 126 (I 126)	1
Iodine 129 (I 129)	0.1
Iodine 131 (I 131)	1
Iodine 132 (I 132)	10
Iodine 133 (I 133)	1
Iodine 134 (I 134)	10
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
~~Nitrogen 13 (N 13)~~	~~1,000~~
Osmium 185 (Os 185)	10
Osmium 191m (Os 191m)	100
Osmium 191 (Os 191)	100
Osmium 193 (Os 193)	100
~~Oxygen 15 (O 15)~~	~~1,000~~
Palladium 103 (Pd 103)	100
Palladium 109 (Pd 109)	100
Phosphorus 32 (P 32)	10
Platinum 191 (Pt 191)	100

Platinum 193m (Pt 193m)	100
Platinum 193 (Pt 193)	100
Platinum 197m (Pt 197m)	100
Platinum 197 (Pt 197)	100
Polonium 210 (Po 210)	0.1
Potassium 42 (K 42)	10
Potassium 43 (K 43)	10
Praseodymium 142 (Pr 142)	100
Praseodymium 143 (Pr 143)	100
Promethium 147 (Pm 147)	10
Promethium 149 (Pm 149)	10
~~Radium 226 (Ra 226)~~	~~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 (Si 31)	100
Silver 105 (Ag 105)	10
Silver 110m (Ag 110m)	1
Silver 111 (Ag 111)	100
Sodium 22 (Na 22)	10
Sodium 24 (Na 24)	10
Strontium 85 (Sr 85)	10
Strontium 89 (Sr 89)	1
Strontium 90 (Sr 90)	0.1
Strontium 91 (Sr 91)	10
Strontium 92 (Sr 92)	10
Sulfur 35 (S 35)	100
Tantalum 182 (Ta 182)	10
Technetium 96 (Tc 96)	10
Technetium 97m (Tc 97m)	100
Technetium 97 (Tc 97)	100
Technetium 99m (Tc 99m)	100
Technetium 99 (Tc 99)	10
Tellurium 125m (Te 125m)	10
Tellurium 127m (Te 127m)	10
Tellurium 127 (Te 127)	100
Tellurium 129m (Te 129m)	10
Tellurium 129 (Te 129)	100
Tellurium 131m (Te 131m)	10
Tellurium 132 (Te 132)	10
Terbium 160 (Tb 160)	10
Thallium 200 (Tl 200)	100
Thallium 201 (Tl 201)	100
Thallium 202 (Tl 202)	100
Thallium 204 (Tl 204)	10

Thulium 170 (Tm 170)	10
Thulium 171 (Tm 171)	10
Tin 113 (Sn 113)	10
Tin 125 (Sn 125)	10
Tungsten 181 (W 181)	10
Tungsten 185 (W 185)	10
Tungsten 187 (W 187)	100
Vanadium 48 (V 48)	10
Xenon 131m (Xe 131m)	1,000
Xenon 133 (Xe 133)	100
Xenon 135 (Xe 135)	100
Ytterbium 175 (Yb 175)	100
Yttrium 87 (Y 87)	10
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 materials	0.1

4731.3215 GENERAL LICENSE; DETECTING, MEASURING, GAUGING, CONTROLLING, AND OTHER DEVICES.

[For text of subps 1 and 2, see M.R.]

Subp. 3. **Requirements.** A person who acquires, receives, possesses, uses, or transfers radioactive material in a device according to the general license issued under subpart 1 must:

[For text of items A and B, see M.R.]

C. ensure that the tests under item B and other testing, installation, servicing, and removal from installation involving the radioactive material, its shielding, or its containment are performed:

(1) according to the instructions provided by the labels; or

(2) by a person holding a specific license issued under parts 4731.3000 to 4731.3175 or 4731.3300 to ~~4731.3420~~ 4731.3400 or issued by the NRC or an agreement state to perform such activities;

[For text of items D and E, see M.R.]

F. immediately suspend operation of the device if there is a failure of or damage to or any indication of a possible failure of or damage to the shielding of the radioactive material or the on-off mechanism or indicator or upon the detection of 0.005 microcurie (185 Bq) or more removable radioactive material until the device has been repaired by the manufacturer or other person holding a specific license issued under parts 4731.3000 to 4731.3175 or 4731.3300 to ~~4731.3420~~ 4731.3400 or issued by the NRC or an agreement state to repair the device. The device and any radioactive material from the device may only be disposed of by transfer to a person authorized by a specific license to receive the radioactive material contained in the device or as otherwise approved by the commissioner;

G. within 30 days, furnish to the commissioner a report containing a brief description of any event under item F and the remedial actions taken and, in the case of detection of 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 environs, a plan for ensuring that the premises and environs are acceptable for unrestricted use. Under these circumstances, the criteria under part ~~4731.2105~~ 4731.2100, subpart 2, may be applicable, as determined by the commissioner on a case-by-case basis;

[For text of items H and I, see M.R.]

J. transfer or dispose of the device containing radioactive material only:

(1) by export as provided in item I;

(2) by transfer to another general licensee as authorized under item M;

(3) to a person authorized to receive the device by a specific license issued under parts 4731.3000 to 4731.3175 or 4731.3300 to ~~4731.3420~~ 4731.3400 or under equivalent regulations of the NRC or an agreement state that authorizes waste collection; or

(4) as otherwise approved under item L;

[For text of items K to R, see M.R.]

Subp. 3a. **Registration of generally licensed devices.**

[For text of item A, see M.R.]

B. If in possession of a device meeting the criteria of item A, a person to whom subpart 3 applies must register the device annually with the commissioner and pay the fee required under Minnesota Statutes, section 144.1205.

[For text of subitems (1) and (2), see M.R.]

(3) Persons generally licensed by the NRC or an agreement state with respect to devices meeting the criteria in item A are not subject to registration under this item if the devices are used in areas subject to the commissioner's jurisdiction for a period of less than 180 days in any calendar year. The commissioner shall not request registration information from such licensees.

[For text of item C, see M.R.]

[For text of subp 4, see M.R.]

4731.3240 GENERAL LICENSE; STRONTIUM-90 ICE DETECTION DEVICES.

[For text of subp 1, see M.R.]

Subp. 2. **Requirements.** Persons who own, receive, acquire, possess, use, or transfer strontium-90 contained in ice detection devices under the general license issued under subpart 1:

A. must, upon occurrence of visually observable damage to the device, such as a bend, crack, or discoloration from overheating:

(1) discontinue use of the device until it has been inspected, tested for leakage, and repaired by a person holding a specific license issued under parts 4731.3000to 4731.3175 or 4731.3300 to ~~4731.3420~~ 4731.3400 or by the NRC or an agreement state to manufacture or service the device; or

(2) dispose of the device according to part 4731.2400;

[For text of items B and C, see M.R.]

[For text of subp 3, see M.R.]

4731.3250 GENERAL LICENSE; CERTAIN ITEMS AND SELF-LUMINOUS PRODUCTS CONTAINING RADIUM-226.

[For text of subp 1, see M.R.]

Subp. 2. **Exempt provisions.** Persons who acquire, receive, possess, use, or transfer byproduct material under the general license issued in subpart 1~~, item A,~~ are exempt from the provisions of parts 4731.1000 to 4731.2950, 4731.3110 and 4731.3115, and Code of Federal Regulations, title 10, part 21, to the extent that the receipt, possession, use, or transfer of byproduct material is within the terms of the general license; provided, that this exemption is not deemed to apply to any person specifically licensed under this chapter.

[For text of subps 3 and 4, see M.R.]

4731.3300 SPECIFIC DOMESTIC LICENSES TO MANUFACTURE OR TRANSFER CERTAIN ITEMS CONTAINING RADIOACTIVE MATERIAL.

Subpart 1. **Scope.** Parts 4731.3300 to ~~4731.3420~~ 4731.3400 provide for:

[For text of items A to C, see M.R.]

Subp. 2. **Applicability.** Parts 4731.3300 to ~~4731.3420~~ 4731.3400 are in addition to, and not in substitution for, other requirements of this chapter. In particular, the provisions of parts 4731.3000 to 4731.3175 apply to applications, licenses, and certificates of registration subject to parts 4731.3300 to ~~4731.3420~~ 4731.3400.

4731.3330 SPECIFIC LICENSE; CERTAIN DEVICES CONTAINING RADIOACTIVE MATERIALS; MANUFACTURE OR INITIAL TRANSFER.

Subpart 1. **Approval criteria.** An application for a specific license to manufacture or initially transfer devices containing radioactive material to a person generally licensed under part 4731.3215 or equivalent regulations of the NRC or an agreement state shall be approved if:

[For text of items A to C, see M.R.]

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 isotope and quantity, the words

"Caution-Radioactive Material," the radiation symbol described in part 4731.2300, and the name of the manufacturer or initial distributor; ~~and~~

E. each device meeting the criteria of part 4731.3215, subpart 3a, bears a permanent 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 part 4731.2300~~.~~; and

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

[For text of subps 2 to 11, see M.R.]

4731.3345 SPECIFIC LICENSE; LUMINOUS SAFETY DEVICES; MANUFACTURE, ASSEMBLE, REPAIR, OR INITIALLY TRANSFER.

Subpart 1. **Approval criteria.** An application for a specific license to manufacture, assemble, repair, or initially transfer luminous safety devices containing tritium or promethium-147 for use in aircraft, for distribution to persons generally licensed under part 4731.3225, shall be approved if:

A. the applicant satisfies the general requirements of part 4731.3070;

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

[For text of subitems (1) to (4), see M.R.]

(5) ~~any~~ quality ~~control~~ assurance procedures ~~proposed as alternatives to those prescribed in~~ to be followed that are sufficient to ensure compliance with subpart 4; and

(6) any additional information, including experimental studies and tests, required by the commissioner to facilitate a determination of the safety of the device;

C. each device will contain no more than ten curies of tritium or 300 millicuries of promethium-147. The levels of radiation from each device containing promethium-147 will not exceed 0.5 millirad per hour at ten centimeters from any surface when measured through 50 milligrams per square centimeter of absorber; ~~and~~

D. the commissioner determines that:

[For text of subitems (1) to (3), see M.R.]

(4) prototypes of the device ~~has~~ have been subjected to and ~~has~~ have satisfactorily passed the ~~prototype~~ tests under ~~part 4731.3405.~~ item E;

E. the applicant must subject at least five prototypes of the device to tests as follows:

(1) the devices are subjected to tests that adequately take into account the individual, aggregate, and cumulative effects of environmental conditions expected in service that could adversely affect the effective containment of tritium or promethium-147, such as temperature, moisture, absolute pressure, water immersion, vibration, shock, and weathering;

(2) the devices are inspected for evidence of physical damage and for loss of tritium or promethium-147, after each stage of testing, using methods of inspection adequate for determining compliance with the criteria in subitem (3); and

(3) device designs are rejected for which the following has been detected for any unit:

(a) a leak resulting in a loss of 0.1 percent or more of the original amount of tritium or promethium-147 from the device;

(b) surface contamination of tritium or promethium-147 on the device of more than 2,200 disintegrations per minute per 100 square centimeters of surface area; or

(c) any other evidence of physical damage; and

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

[For text of subps 2 and 3, see M.R.]

Subp. 4. **Quality assurance; transfer prohibition.**

A. A person licensed under this part must visually inspect each device and must reject any that has an observable physical defect that could adversely affect containment of the tritium or promethium-147.

B. A person licensed under this part must ~~take a random sample of the size required under part 4731.3420 for lot tolerance percent defective of five percent from each inspection lot and must subject each unit in the sample to the tests under items C to E.~~:

(1) maintain quality assurance systems in the manufacture of the luminous safety device in a manner sufficient to provide reasonable assurance that the safety-related components of the distributed devices are capable of performing their intended functions; and

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

C. ~~Each device must be immersed in 30 inches of water for 24 hours and must show no visible evidence of water entry. Absolute pressure of the air above the water must then be reduced to one inch of mercury. Lowered pressure must be maintained for one minute or until air bubbles cease to be given off by the water, whichever is longer. Pressure must then be increased to normal atmospheric pressure. Any device that leaks as evidenced by bubbles emanating from within the device or water entering the device must be considered a defective unit.~~ The licensee must subject each inspection lot to:

(1) tests that adequately take into account the individual, aggregate, and cumulative effects of environmental conditions expected in service that could adversely affect the effective containment of tritium or promethium-147, such as absolute pressure and water immersion; and

(2) inspection for evidence of physical damage, containment failure, or for loss of tritium or promethium-147 after each stage of testing, using methods of inspection adequate for applying the following criteria for defective:

~~D.~~ (a) ~~The immersion test water from the test in item C must be measured for tritium or promethium-147 content by an apparatus that has been calibrated to measure tritium or promethium-147, as appropriate. If more than~~ a leak resulting in a loss of 0.1 percent or more of the original amount of tritium or promethium-147 ~~in any device is found to have leaked into the immersion test water, the leaking device must be considered a defective unit.~~ from the device;

~~E.~~ (b) ~~The~~ levels of radiation ~~from each device containing promethium-147 must be measured. Any device that has a radiation level~~ in excess of 0.5 millirad (5 microgray) per hour at ten centimeters from any surface when measured through 50 milligrams per square centimeter of absorber ~~must be considered a defective unit.~~, if the device contains promethium-147; and

(c) any other criteria specified in the license issued under this part.

~~F. An application for a license or for amendment of a license may include a description of procedures proposed as alternatives to those under items B to E and proposed criteria for acceptance under those procedures. The commissioner shall approve the proposed alternative procedures if the applicant demonstrates that:~~

~~(1) the procedures will consider defective any sampled device that has a leakage rate exceeding 0.1 percent of the original quantity of tritium or promethium-147 in any 24-hour period; and~~

~~(2) the operating characteristic curve or confidence interval estimate for the alternative procedures provides a lot tolerance percent defective of five percent at the consumer's risk of 0.10.~~

~~G.~~ D. No person licensed under this part shall transfer to persons generally licensed under part 4731.3225 or under an equivalent general license of the NRC or an agreement state:

(1) any luminous safety device that has been tested and found defective under ~~the criteria and procedures in this subpart~~ a condition of a license issued under this part, unless the defective ~~units have~~ luminous safety device has been repaired or reworked ~~and have then met the tests in items B to E~~, retested, and determined by an independent inspector to meet the applicable acceptance criteria; or

(2) ~~any inspection lot that has been rejected as a result of the procedures under part 4731.3420, or alternative procedures under item F, unless the defective units have been sorted and removed or have been repaired or reworked and have then met the tests under items B to E.~~ any luminous safety device contained within any lot that has been sampled and rejected as a result of the procedures in item B, subitem (2), unless:

(a) a procedure for defining sub-lot size, independence, and additional testing procedures is contained in the license issued under this part; and

(b) each individual sub-lot is sampled, tested, and accepted in accordance with items B, subitem (2), and D, subitem (2), unit (a), and any other criteria that may be required as a condition of the license issued under this part.

Subp. 5. **Transfer reports.**

A. A person licensed under this part must file an annual report with the commissioner that covers the year ending June 30 and is filed within 30 days thereafter. If

no transfers have been made to persons generally licensed under part 4731.3225 during the reporting period, the report must so indicate. The report must:

~~A.~~ (1) ~~states~~ state the total quantity of tritium or promethium-147 transferred to persons generally licensed under part 4731.3225;

~~B.~~ (2) ~~identifies~~ identify each general licensee by name;

~~C.~~ (3) ~~states~~ state the kinds and numbers of luminous devices transferred; and

~~D.~~ (4) ~~specifies~~ specify the quantity of tritium or promethium-147 in each kind of device~~; and~~.

~~E. covers the year ending June 30 and is filed within 30 days thereafter.~~

B. A person licensed under this part must report annually all transfers of devices to persons for use under a general license in the NRC's or an agreement state's regulations that are equivalent to part 4731.3225 to the NRC or responsible agreement state agency. If no transfers have been made to the NRC or a particular agreement state during the reporting period, this information must be reported to the NRC or responsible agreement state agency upon request of the agency. The report must:

(1) state the total quantity of tritium of promethium-147 transferred;

(2) identify each general licensee by name;

(3) state the kinds and numbers of luminous devices transferred; and

(4) specify the quantity of tritium or promethium-147 in each kind of device.

4731.3365 SPECIFIC LICENSE; CALIBRATION OR REFERENCE SOURCES; MANUFACTURE OR INITIAL TRANSFER.

Subpart 1. **Approval criteria.** An application for a specific license to manufacture or initially transfer calibration and reference sources containing americium-241 or

radium-226 for distribution to persons generally licensed under part 4731.3230 shall be approved if:

[For text of items A and B, see M.R.]

C. each source will contain no more than five microcuries (185 kBq) of americium-241 or radium-226; ~~and~~

D. the commissioner determines, with respect to any type of source containing more than 0.005 microcurie (185 Bq) of americium-241 or radium-226, that:

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

(2) the source has been subjected to and has satisfactorily passed ~~the prototype tests under part 4731.3410.~~ appropriate tests required by item E; and

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

(1) the initial quantity of radioactive material deposited on each source is measured by direct counting of the source;

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

(3) the sources are inspected for evidence of physical damage and for loss of americium-241 or radium-226, after each stage of testing, using methods of inspection adequate for determining compliance with the criteria in subitem (4); and

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

[For text of subp 2, see M.R.]

Subp. 3. **Leak testing.**

A. A person licensed under this part must perform a dry wipe test upon each source containing more than 0.1 microcurie (3.7 kBq) of americium-241 or radium-226 before transferring the source to a general licensee under part 4731.3230 or equivalent regulations of the NRC or an agreement state.

B. The test must be performed by wiping the entire radioactive surface of the source with a filter paper with the application of moderate finger pressure.

C. The radioactivity on the paper must be measured by using ~~radiation detection instrumentation~~ methods capable of detecting 0.005 microcurie (0.185 kBq) of americium-241 or radium-226.

D. If ~~the test discloses~~ a source has been shown to be leaking or losing more than 0.005 microcurie (0.185kBq) of ~~radioactive material~~ americium-241 or radium-226 by the methods described in this subpart, the source must be ~~deemed to be leaking or losing americium-241 or radium-226~~ rejected and must not be transferred to a general licensee under part 4731.3230, or equivalent regulations of the NRC or an agreement state.

4731.3380 SPECIFIC LICENSE; ICE DETECTION DEVICES; MANUFACTURE OR INITIAL TRANSFER.

Subpart 1. **Approval criteria.** An application for a specific license to manufacture or initially transfer ice detection devices containing strontium-90 for distribution to persons generally licensed under part 4731.3240 shall be approved if:

[For text of items A to D, see M.R.]

E. the commissioner determines that:

[For text of subitems (1) to (3), see M.R.]

(4) prototypes of the device ~~has~~ have been subjected to and ~~has~~ have satisfactorily passed the ~~prototype~~ tests under ~~part 4731.3415~~ item F; and

(5) quality control procedures have been established to satisfy the requirements of subpart 2~~.~~;

F. the applicant subjects at least five prototypes of the device to tests as follows:

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

(2) the devices are inspected for evidence of physical damage and for loss of strontium-90 after each stage of testing, using methods of inspection adequate for determining compliance with the criteria in subitem (3); and

(3) device designs are rejected for which the following has been detected for any unit:

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

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

(c) any other evidence of physical damage; and

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

Subp. 2. **Quality assurance; transfer prohibition.**

[For text of items A and B, see M.R.]

C. A person licensed under this part must ~~take a random sample of the size required by part 4731.3420 for lot tolerance percent defective of five percent from each inspection lot and must subject each unit in the sample to the tests in items D and E.~~:

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

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

D. Each ~~device must be immersed in 30 inches of water for 24 hours and must show no visible evidence of physical contact between the water and the strontium-90. Absolute pressure of the air above the water must then be reduced to one inch of mercury. Lowered pressure must be maintained for one minute or until air bubbles cease to be given off by the water, whichever is longer. Pressure must then be increased to normal atmospheric pressure. Any device that leaks, as evidenced by physical contact between the water and the strontium-90, must be considered a defective unit.~~ person licensed under this part must subject each inspection lot to:

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

(2) inspection for evidence of physical damage, containment failure, or for loss of strontium-90 after each stage of testing, using methods of inspection adequate to

determine compliance with the following criteria for defective: a leak resulting in a loss of 0.1 percent or more of the original amount of strontium-90 from the device and any other criteria specified in the license issued under this part.

~~E. The immersion test water from the test under item D must be measured for radioactive material. If the amount of radioactive material in the immersion test water is greater than 0.1 percent of the original amount of strontium-90 in any device, the device must be considered a defective unit.~~

~~F. An application for a license or for amendment to a license may include a description of procedures proposed as alternatives to those prescribed under items C to E and proposed criteria for acceptance under those procedures. The commissioner shall approve the proposed alternative procedures if the applicant demonstrates that:~~

~~(1) the procedures will consider defective any sampled device that has a leakage rate exceeding 0.1 percent of the original quantity of strontium-90 in any 24-hour period; and~~

~~(2) the operating characteristic curve or confidence interval estimate for the alternative procedures provides a lot tolerance percent defective of five percent at the consumer's risk of 0.10.~~

~~G.~~ E. No person licensed under this part shall transfer to persons generally licensed under part 4731.3240, or under an equivalent general license of the NRC or an agreement state:

(1) any ice detection device ~~that has been~~ containing strontium-90 tested and found defective under the criteria ~~and procedures~~ specified in a license issued under this ~~subpart~~ part, unless the defective ~~units have~~ ice detection device has been repaired or reworked ~~and then met the tests required under items C to E~~, retested, and determined by an independent inspector to meet the applicable acceptance criteria; or

(2) any ~~inspection lot that has been rejected as a result of the procedures under part 4731.3420, or alternative procedures under item F, unless the defective units have been sorted and removed or have been repaired or reworked and have then met the tests required under items C to E.~~ ice detection device containing strontium-90 contained within any lot that has been sampled and rejected as a result of the procedures in item C, subitem (2), unless:

(a) a procedure for defining sub-lot size, independence, and additional testing procedures is contained in the license issued under this part; and

(b) each individual sub-lot is sampled, tested, and accepted in accordance with unit (a) and item C, subitem (2), and any other criteria as may be required as a condition of the license issued under this part.

4731.3400 SPECIFIC LICENSE; SOURCES OR DEVICES FOR MEDICAL USE; MANUFACTURE AND DISTRIBUTION.

Subpart 1. **Approval criteria.** An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed according to parts 4731.4400 to 4731.4527 for use as a calibration, transmission, or reference source or for the uses listed under parts 4731.4404, 4731.4450, 4731.4460, and 4731.4463 shall be approved if:

[For text of item A, see M.R.]

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

[For text of subitems (1) to (7), see M.R.]

(8) instructions for handling and storing the source or device from the radiation safety standpoint. These instructions must be:

(a) included on a durable label attached to the source or device;

(b) attached to a permanent storage container for the source of device; or

(c) summarized on the label, for instructions that are too lengthy for the label, and printed in detail on a brochure that is referenced on the label; ~~and~~

C. the label affixed to the source or device, or to the permanent storage container for the source or device, contains:

[For text of subitems (1) to (3), see M.R.]

(4) a statement that the commissioner has approved distribution of the (name of source or device) to persons licensed to use radioactive material identified under parts 4731.4423, 4731.4450, 4731.4460, and 4731.4463, as appropriate, and to persons who hold equivalent licenses issued by the NRC or an agreement state~~.~~; and

D. the source or device has been registered in the Sealed Source and Device Registry.

[For text of subps 2 and 3, see M.R.]

4731.3520 SPECIFIC LICENSE OF BROAD SCOPE; APPLICATION.

A person must file an application for a specific license of broad scope ~~in duplicate~~ on an application for radioactive material license form according to part 4731.3065.

4731.4010 SPECIFIC LICENSE; APPLICATION.

A person must file an application for a specific license for use of sealed sources in industrial radiography ~~in duplicate~~ on the application for radioactive material license form according to part 4731.3070.

4731.4421 CALIBRATION OF SURVEY INSTRUMENTS.

A. A licensee must calibrate the survey instruments used to show compliance with parts 4731.2000 to 4731.2950 and 4731.4400 to 4731.4527 before first use, ~~annually~~

intervals not to exceed 12 months, and following a repair that affects the calibration. A licensee must:

[For text of subitems (1) to (3), see M.R.]

[For text of items B and C, see M.R.]

4731.4612 TRAINING FOR INDIVIDUALS FUNCTIONING AS A NUCLEAR MEDICINE TECHNOLOGIST BEFORE JANUARY 1, 2011, WHO ARE NOT ACCREDITED.

[For text of subps 1 to 3, see M.R.]

Subp. 4. **Continuing education.** Individuals working as nuclear medicine technologists before January 1, 2011, who are not accredited must:

A. obtain 24 hours of continuing education ~~on nuclear medicine~~ every 24 months;

[For text of items B and C, see M.R.]

4731.6020 SPECIFIC LICENSE; APPROVAL.

The commissioner shall approve an application for a specific license for the use of licensed material in an irradiator if the applicant meets the general requirements under ~~part~~ parts 4731.3070, subpart 1, items A to D, and 4731.3070, subpart 2, and if the application includes:

[For text of items A to I, see M.R.]

4731.7020 SPECIFIC LICENSE; WELL LOGGING.

The commissioner shall approve an application for a specific license for the use of licensed material in well logging if the applicant:

A. satisfies the general licensing requirements under parts ~~4731.0595~~ 4731.0575 for special nuclear material, 4731.0765 for source material, and 4731.3070 for radioactive material, as appropriate, and any special requirements under parts 4731.7000 to 4731.7280;

[For text of items B to G, see M.R.]

4731.8000 APPLICABILITY; CATEGORY 1 OR CATEGORY 2 QUANTITIES OF RADIOACTIVE MATERIAL.

A. Parts 4731.8010 to 4731.8090 apply to any person who, under the regulations in this chapter, possesses or uses at any site, an aggregated category 1 or category 2 quantity of radioactive material.

B. Parts 4731.8100 to 4731.8125 apply to any person who, under the regulations of this chapter:

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

(2) imports or exports a category 1 or category 2 quantity of radioactive material; the provisions only apply to the domestic portion of the transport.

4731.8005 EXEMPTION FOR WASTE.

A licensee that possesses radioactive waste that contains category 1 or category 2 quantities of radioactive material is exempt from the requirements of parts 4731.8010 to 4731.8125. Except that any radioactive waste that contains discrete sources, ion-exchange resins, or activated material that weighs less than 2,000 kg (4.409 lbs) is not exempt from the requirements of this part. The licensee must implement the following requirements to secure the radioactive waste:

A. use continuous physical barriers that 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 local law enforcement agency (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.

4731.8010 PERSONNEL ACCESS AUTHORIZATION REQUIREMENTS FOR CATEGORY 1 OR CATEGORY 2 QUANTITIES OF RADIOACTIVE MATERIAL.

Subpart 1. **General.**

A. Each licensee that possesses an aggregated quantity of radioactive material at or above the category 2 threshold must establish, implement, and maintain its access authorization program in accordance with the requirements of this subpart.

B. An applicant for a new license and each licensee that is newly subject to the requirements of this subpart upon application for modification of its license must implement the requirements of parts 4731.8010 to 4731.8040, as appropriate, before taking possession of an aggregated category 1 or category 2 quantity of radioactive material.

C. Any licensee that has not previously implemented the Security Orders or been subject to the provisions of parts 4731.8010 to 4731.8040 must implement the provisions of parts 4731.8010 to 4731.8040 before aggregating radioactive material to a quantity that equals or exceeds the category 2 threshold.

Subp. 2. **General performance objective.** The licensee's access authorization program must ensure that the individuals specified in subpart 3, item A, are trustworthy and reliable.

Subp. 3. **Applicability.**

A. Licensees must subject the following individuals to an access authorization program:

(1) 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

(2) reviewing officials.

B. Licensees need not subject the categories of individuals listed in part 4731.8030, subpart 1, items A to M, to the investigation elements of the access authorization program.

C. Licensees must approve for unescorted access to category 1 or category 2 quantities of radioactive material only those individuals with job duties that 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 Code of Federal Regulations, title 10, part 73, in the access authorization program under parts 4731.8010 to 4731.8040.

4731.8015 ACCESS AUTHORIZATION PROGRAM REQUIREMENTS.

Subpart 1. **Granting unescorted access authorization.**

A. Licensees must implement the requirements of parts 4731.8010 to 4731.8040 for granting initial or reinstated unescorted access authorization.

B. Individuals who have been determined to be trustworthy and reliable must also complete the security training required by part 4731.8055, subpart 3, before being allowed unescorted access to category 1 or category 2 quantities of radioactive material.

Subp. 2. **Reviewing officials.**

A. Reviewing officials are the only individuals authorized to 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.

B. Each licensee must name one or more individuals to be reviewing officials. After completing the background investigation on the reviewing official, the licensee must 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 agency that provides fingerprinting services to the public, or commercial fingerprinting services authorized by a state to take fingerprints. The licensee must recertify that the reviewing official is deemed trustworthy and reliable every ten years in accordance with part 4731.8020, subpart 3.

C. 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.

D. Reviewing officials cannot approve other individuals to act as reviewing officials.

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

(1) 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

(2) the individual is subject to a category listed in part 4731.8030, subpart 1.

Subp. 3. **Informed consent.**

A. Licensees must 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

must 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 that meet the requirements of part 4731.8020, subpart 2. A signed consent must be obtained prior to any reinvestigation.

B. The subject individual may withdraw consent at any time. Licensees must inform the individual that:

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

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

Subp. 4. **Personal history disclosure.** Any individual who is applying for unescorted access authorization must 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 parts 4731.8010 to 4731.8040 is sufficient cause for denial or termination of unescorted access.

Subp. 5. **Determination basis.**

A. The reviewing official must determine whether to permit, deny, unfavorably terminate, maintain, or administratively withdraw an individual's unescorted access authorization based on an evaluation of all information collected to meet the requirements of parts 4731.8010 to 4731.8040.

B. The reviewing official must not permit any individual to have unescorted access until the reviewing official has evaluated all of the information collected to meet the requirements of parts 4731.8010 to 4731.8040 and determined that the individual is

trustworthy and reliable. The reviewing official has authority to deny unescorted access to any individual based on information obtained at any time during the background investigation.

C. The licensee must document the basis for concluding whether or not there is reasonable assurance that an individual is trustworthy and reliable.

D. The reviewing official has authority to 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 must 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 must 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.

Subp. 6. **Procedures.** Licensees must 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.

Subp. 7. **Right to correct and complete information.**

A. Prior to any final adverse determination, licensees must provide each individual subject to this subpart 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 a 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 and must be sent to the Federal Bureau of Investigation, Criminal Justice Information Services (CJIS) Division, ATTN: SCU, Mod. D-2, 1000 Custer Hollow Road, Clarksburg, WV 26306, as specified in Code of Federal Regulations, title 28, sections 16.30 to 16.34. In the latter case, the Federal Bureau of Investigation (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 according to 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 individual has reviewed the criminal history record. The licensee shall make a final adverse determination based upon the criminal history records only after receipt of the FBI's confirmation or correction of the record.

Subp. 8. **Records.**

A. The licensee must 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 must 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 must retain the superseded material for three years after the record is superseded.

C. The licensee must retain the list of persons approved for unescorted access authorization for three years after the list is superseded or replaced.

4731.8020 BACKGROUND INVESTIGATIONS.

Subpart 1. **Initial investigation.**

A. 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 must 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 18th birthday, whichever is shorter. The background investigation must include, at a minimum:

(1) fingerprinting and an FBI identification and criminal history records check under part 4731.8025;

(2) verification of true identity. Licensees must verify the true identity of the individual who is applying for unescorted access authorization to ensure that the applicant is who he or she claims to be. A licensee must review official identification documents such as driver's license, passport, government identification, and 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 must document the type, expiration, and identification number of the identification document, or maintain a photocopy of identifying documents on file in accordance with part 4731.8035. Licensees must certify in writing that the identification

was properly reviewed and must maintain the certification and all related documents for review upon inspection;

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

(4) verification of education. Licensees must verify that the individual participated in the education process during the claimed period;

(5) character and reputation determination. Licensees must 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 subpart must be limited to whether the individual has been and continues to be trustworthy and reliable;

(6) the licensee must also, to the extent possible, obtain independent information to corroborate that provided by the individual, such as seeking references not supplied by the individual; and

B. 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 must document the refusal, unwillingness, or inability in the record of investigation; and attempt to obtain the information from an alternate source.

Subp. 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 a Fingerprint Order may continue to have unescorted access to category 1 and category 2 quantities of radioactive material without further investigation. These individuals must be subject to the reinvestigation requirement under subpart 3.

B. Individuals who have been determined to be trustworthy and reliable under the provisions of Code of Federal Regulations, title 10, 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 must document that the individual was determined to be trustworthy and reliable under the provisions of Code of Federal Regulations, title 10, part 73, or a security order. Security order, in this context, refers to any order that was issued by the NRC 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 must be subject to the reinvestigation requirement under subpart 3.

Subp. 3. **Reinvestigations.** Licensees must conduct a reinvestigation every ten years for any individual with unescorted access to category 1 or category 2 quantities of radioactive material. The reinvestigation must consist of fingerprinting and an FBI identification and criminal history records check in accordance with part 4731.8025. The reinvestigations must be completed within ten years of the date on which these elements were last completed.

4731.8025 REQUIREMENTS FOR CRIMINAL HISTORY RECORDS CHECKS OF INDIVIDUALS GRANTED UNESCORTED ACCESS TO CATEGORY 1 OR CATEGORY 2 QUANTITIES OF RADIOACTIVE MATERIAL.

Subpart 1. **General performance objective and requirements.**

A. Except for those individuals listed in part 4731.8030 and those individuals grandfathered under part 4731.8020, subpart 2, each licensee subject to the provisions of this subpart must fingerprint each individual who is to be permitted unescorted access to category 1 or category 2 quantities of radioactive material. Licensees must transmit all collected fingerprints to the NRC for transmission to the FBI. The licensee must 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 must notify each affected individual that fingerprints are used to secure a review of the individual's criminal history record, and must inform the individual 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:

(1) the individual returns to the same facility that granted unescorted access authorization within 365 days of the termination of the individual's unescorted access authorization; and

(2) the previous access 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 parts 4731.8010 to 4731.8040, the Fingerprint Orders, or Code of Federal Regulations, title 10, part 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 part 4731.8035, item C.

E. Licensees must use the 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.

Subp. 2. **Prohibitions.**

A. Licensees shall 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:

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

(2) an arrest that resulted in dismissal of the charge or an acquittal.

B. Licensees shall not use information received from a criminal history records check obtained under this subpart in a manner that 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.

Subp. 3. **Procedures for processing of fingerprint checks.**

A. For the purpose of complying with this subpart, licensees must submit to the Office of Administration, Division of Facilities and Security, Mail Stop TWB-05 B32M, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0012, one completed, legible standard fingerprint card (Form FD-258, ORIMDNRCOOOZ), 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 Information Services, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, by calling (301) 415-7232, 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 must 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) 492-3531. Combined payment for multiple applications is acceptable. The commission publishes the amount of the fingerprint check application fee on the NRC public Web site. To find the current fee amount, go to the Electronic Submittals page at http://www.nrc.gov/site-help/e-submittals.html and see the link for the Criminal History Program under Electronic Submission Systems.

C. The commission must forward to the submitting licensee all data received from the FBI as a result of the licensee's applications for criminal history records checks.

4731.8030 RELIEF FROM FINGERPRINTING, IDENTIFICATION, AND CRIMINAL HISTORY RECORDS CHECKS AND OTHER ELEMENTS OF BACKGROUND INVESTIGATIONS.

Subpart 1. **Exemption to certain security checks.** Fingerprinting, and the identification and criminal history records checks required by 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 commission 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 a congressional committee who has undergone fingerprinting for a prior U.S. government criminal history records check;

D. the governor of a state or the governor's 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 (IAEA) engaged in activities associated with the U.S./IAEA 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 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 the individual makes available the appropriate documentation. Written confirmation from the agency/employer that granted the federal security clearance or reviewed the criminal history records check must be provided to the licensee. The licensee must 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 must 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.

Subp. 2. **Additional exemption.** Fingerprinting, and the identification and criminal history records checks required by 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 the individual makes available the appropriate documentation. Written confirmation from the agency/employer that reviewed the criminal history records check must be provided to the licensee. The licensee must 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 Code of Federal Regulations, title 49, part 1572;

C. Bureau of Alcohol, Tobacco, Firearms, and Explosives background check and clearances under Code of Federal Regulations, title 27, part 555;

D. Health and Human Services security risk assessments for possession and use of select agents and toxins under Code of Federal Regulations, title 42, part 73;

E. hazardous material security threat assessment for hazardous material endorsement to commercial driver's license under Code of Federal Regulations, title 49, part 1572; and

F. Customs and Border Protection's Free and Secure Trade (FAST) Program.

4731.8035 PROTECTION OF INFORMATION.

A. Each licensee who obtains background information on an individual under parts 4731.8010 to 4731.8040 must establish and maintain a system of files and written procedures for protection of the record and the personal information from unauthorized disclosure.

B. The licensee shall not disclose the record or personal information collected and maintained to persons other than the subject individual, the individual's 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 shall disseminate the information to any other individual who does not have a need to know.

C. The personal information obtained on an individual from a background investigation may be provided to another licensee:

(1) upon the individual's written request to the licensee holding the data to disseminate the information contained in the individual's file; and

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

D. The licensee must make background investigation records obtained under this subpart available for examination by an authorized representative of the commissioner to determine compliance with the regulations and laws.

E. The licensee must retain all fingerprint and criminal history records received from the FBI, including data indicating no record, 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.

4731.8040 ACCESS AUTHORIZATION PROGRAM REVIEW.

A. Each licensee must be responsible for the continuing effectiveness of the access authorization program. Each licensee must ensure that access authorization programs are reviewed to confirm compliance with the requirements of parts 4731.8010 to 4731.8040 and that comprehensive actions are taken to correct any noncompliance that is identified. The review program must evaluate all program performance objectives and requirements. Each licensee must at least annually review the access program content and implementation.

B. 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 conditions, and, when appropriate, recommend corrective actions, and corrective actions taken. The licensee must review the findings and take any additional corrective actions necessary to preclude repetition of the condition, including reassessment of the deficient areas where indicated.

C. Review records must be maintained for three years.

4731.8050 SECURITY PROGRAM.

Subpart 1. **Applicability.**

A. Each licensee that possesses an aggregated category 1 or category 2 quantity of radioactive material must establish, implement, and maintain a security program in accordance with the requirements of parts 4731.8050 to 4731.8090.

B. An applicant for a new license and each licensee that would become newly subject to the requirements of parts 4731.8050 to 4731.8090 upon application

for modification of its license must implement the requirements of parts 4731.8050 to 4731.8090, as appropriate, before taking possession of an aggregated category 1 or category 2 quantity of radioactive material.

C. Any licensee that has not previously implemented the security orders or been subject to the provisions of parts 4731.8050 to 4731.8090 must provide written notification to the commissioner at least 90 days before aggregating radioactive material to a quantity that equals or exceeds the category 2 threshold.

Subp. 2. **General performance objective.** Each licensee must establish, implement, and maintain a security program that is 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.

Subp. 3. **Program features.** Each licensee's security program must include the program features, as appropriate, described in parts 4731.8055 to 4731.8085.

4731.8055 GENERAL SECURITY PROGRAM REQUIREMENTS.

Subpart 1. **Security plan.**

A. Each licensee identified in part 4731.8050 must 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 parts 4731.8050 to 4731.8090. The security plan must, at a minimum:

(1) describe the measures and strategies used to implement the requirements of parts 4731.8050 to 4731.8090; and

(2) identify the security resources, equipment, and technology used to satisfy the requirements of parts 4731.8050 to 4731.8090.

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

C. A licensee must revise its security plan as necessary to ensure the effective implementation of commissioner requirements. The licensee must ensure that:

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

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

D. The licensee must 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 must retain the superseded material for three years after the record is superseded.

Subp. 2. **Implementing procedures.**

A. The licensee must develop and maintain written procedures that document how the requirements of parts 4731.8050 to 4731.8090 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 must 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.

Subp. 3. **Training.**

A. Each licensee must conduct training to ensure that those individuals implementing the security program possess and maintain the knowledge, skills, and abilities to carry out their assigned duties and responsibilities effectively. The training must include instruction in:

(1) 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;

(2) the responsibility to report promptly to the licensee any condition that causes or may cause a violation of commissioner requirements;

(3) the responsibility of the licensee to report promptly to the local law enforcement agency and licensee any actual or attempted theft, sabotage, or diversion of category 1 or category 2 quantities of radioactive material; and

(4) the appropriate response to security alarms.

B. In determining those individuals who must be trained on the security program, the licensee must 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 12 months and when significant changes have been made to the security program. This training must include:

(1) review of the training requirements of this subpart and any changes made to the security program since the last training;

(2) reports on any relevant security issues, problems, and lessons learned;

(3) relevant results of commissioner inspections; and

(4) relevant results of the licensee's program review and testing and maintenance.

D. The licensee must 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.

Subp. 4. **Protection of information.**

A. Licensees authorized to possess category 1 or category 2 quantities of radioactive material must limit access to and unauthorized disclosure of their security plan, implementing procedures, and the list of individuals that have been approved for unescorted access.

B. Efforts to limit access must 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 must:

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

(2) 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 must be conducted by the reviewing official and must include the background investigation elements contained in part 4731.8020, subpart 1, items B to G.

D. Licensees need not subject the following individuals to the background investigation elements for protection of information:

(1) the categories of individuals listed in part 4731.8030, subpart 1, items A to M; or

(2) security service provider employees, provided written verification that the employee has been determined to be trustworthy and reliable, by the required background investigation in part 4731.8020, subpart 1, items B to G, has been provided by the security service provider.

E. The licensee must document the basis for concluding that an individual is trustworthy and reliable in order to be granted access to the security plan or implementing procedures.

F. Licensees must 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 must 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 must 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 must retain as a record for three years after the document is no longer needed:

(1) a copy of the information protection procedures; and

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

4731.8060 LOCAL LAW ENFORCEMENT AGENCY (LLEA) COORDINATION.

A. A licensee subject to this subpart must coordinate, to the extent practicable, with an LLEA for responding to threats to the licensee's facility, including any necessary armed response. The information provided to the LLEA must include:

(1) 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 that have been implemented to comply with this subpart; and

(2) a notification that the licensee shall 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.

B. The licensee must notify the commissioner within three business days if:

(1) the LLEA has not responded to the request for coordination within 60 days of the coordination request; or

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

C. The licensee must document its efforts to coordinate with the LLEA. The documentation must be kept for three years.

D. The licensee must coordinate with the LLEA at least every 12 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.

4731.8065 SECURITY ZONES.

A. Licensees must 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.

B. 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.

C. Security zones must, at a minimum, allow unescorted access only to approved individuals through:

(1) 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

(2) direct control of the security zone by approved individuals at all times; or

(3) a combination of continuous physical barriers and direct control.

D. For category 1 quantities of radioactive material during periods of maintenance, source receipt, preparation for shipment, installation, or source removal or exchange, the licensee must, 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.

E. 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.

4731.8070 MONITORING, DETECTION, AND ASSESSMENT.

Subpart 1. **Monitoring and detection.**

A. Licensees must establish and maintain the capability to continuously monitor and detect without delay all unauthorized entries into its security zones. Licensees must 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:

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

(2) electronic devices for intrusion detection alarms that will alert nearby facility personnel;

(3) a monitored video surveillance system;

(4) direct visual surveillance by approved individuals located within the security zone; or

(5) direct visual surveillance by a licensee designated individual located outside the security zone.

C. A licensee subject to this subpart must also have a means to detect unauthorized removal of the radioactive material from the security zone. This detection capability must provide:

(1) 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) continuous monitored video surveillance; or

(c) direct visual surveillance; or

(2) 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.

Subp. 2. **Assessment.** Licensees must 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.

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

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 a 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.

Subp. 4. **Response.** Licensees must 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 must include requesting, without delay, an armed response from the LLEA.

4731.8075 MAINTENANCE AND TESTING.

A. Each licensee subject to parts 4731.8050 to 4731.8090 must 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 unauthorized 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 12 months.

B. The licensee must maintain records on the maintenance and testing activities for three years.

4731.8080 REQUIREMENTS FOR MOBILE DEVICES.

Each licensee that possesses mobile devices containing category 1 or category 2 quantities of radioactive material must:

A. 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

B. 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 must utilize a method to disable the vehicle or trailer when not under direct control and constant surveillance by the licensee. Licensees must not rely on the removal of an ignition key to meet this requirement.

4731.8085 SECURITY PROGRAM REVIEW.

A. Each licensee must be responsible for the continuing effectiveness of the security program. Each licensee must ensure that the security program is reviewed to confirm compliance with the requirements of this subpart and that comprehensive actions are taken to correct any noncompliance that is identified. The review must include the radioactive material security program content and implementation. Each licensee must, at least annually, review the security program content and implementation.

B. 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 conditions, and, when appropriate, recommend corrective actions, and any corrective actions taken. The licensee must review the findings and take any additional corrective actions necessary to preclude repetition of the condition, including reassessment of the deficient areas where indicated.

C. The licensee must maintain the review documentation for three years.

4731.8090 REPORTING OF EVENTS.

A. The licensee must immediately notify the local law enforcement agency (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 must notify the commissioner. In no case shall the notification to the commissioner be later than four hours after the discovery of any attempted or actual theft, sabotage, or diversion.

B. The licensee must 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 must notify the commissioner.

C. The initial telephone notification required by item A must be followed within 30 days by a written report submitted to the commissioner. The report must include sufficient information for commissioner analysis and evaluation, including identification of any necessary corrective actions to prevent future instances.

4731.8100 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 commissioner, the NRC, or an agreement state must meet the license verification provisions of this part instead of those listed in part 4731.3105, subpart 3.

A. Any licensee transferring category 1 quantities of radioactive material to a licensee of the commission or an agreement state, prior to conducting such transfer, must verify with the NRC's license verification system or the license-issuing authority that the transferee's license authorizes the 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 must document the verification. For transfers within the same organization, the licensee does not need to verify the transfer.

B. Any licensee transferring category 2 quantities of radioactive material to a licensee of the commissioner, the NRC, or an agreement state, prior to conducting such transfer, must verify with the NRC's license verification system or the license-issuing authority that the transferee's license authorizes the 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 must document the verification. For transfers within the same organization, the licensee does not need to verify the transfer.

C. In an emergency where the licensee cannot reach the license-issuing authority and the 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 number, issuing agency, expiration date, and, for a category 1 shipment, the authorized address. The licensee must keep a copy of the certification. The certification must be confirmed by use of the NRC's license verification system or by contacting the license-issuing authority by the end of the next business day.

D. The transferor must keep a copy of the verification documentation as a record for three years.

4731.8105 APPLICABILITY OF PHYSICAL PROTECTION OF CATEGORY 1 AND CATEGORY 2 QUANTITIES OF RADIOACTIVE MATERIAL DURING TRANSIT.

The shipping licensee must meet the requirements of parts 4731.8100 to 4731.8125 unless the receiving licensee has agreed in writing to arrange for the in-transit physical protection required under parts 4731.8100 to 4731.8125.

4731.8110 PREPLANNING AND COORDINATION OF SHIPMENT OF CATEGORY 1 OR CATEGORY 2 QUANTITIES OF RADIOACTIVE MATERIAL.

A. Each licensee that 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 must:

(1) preplan and coordinate shipment arrival and departure times with the receiving licensee;

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

(a) discuss the state's intention to provide law enforcement escorts; and

(b) identify safe havens; and

(3) document the preplanning and coordination activities.

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

C. Each licensee who receives a shipment of a category 2 quantity of radioactive material must confirm receipt of the shipment with the originator. If the shipment has not arrived by the no-later-than arrival time, the receiving licensee must notify the originator.

D. 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 in item B must promptly notify the receiving licensee of the new no-later-than arrival time.

E. The licensee must retain a copy of the documentation for preplanning and coordination, and any revision thereof, as a record for three years.

4731.8115 ADVANCE NOTIFICATION OF SHIPMENT OF CATEGORY 1 QUANTITIES OF RADIOACTIVE MATERIAL.

Subpart 1. **Advanced notification required.** As specified in subparts 2 and 3, each licensee must provide advance notification to the commissioner 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 the 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.

Subp. 2. **Procedures for submitting advance notification.**

A. The notification must be made to the commissioner 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

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 Intergovernmental Liaison and Rulemaking, Office of Federal and State Materials and Environmental Management Programs, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Notifications to the commissioner must be to the Radioactive Materials Unit, Minnesota Department of Health, 625 Robert Street N, P.O. Box 64975, St. Paul, MN 55164-0975, or e-mail at health.ram@state.mn.us.

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 commissioner at least four days before the 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.

Subp. 3. **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 quantity;

D. the point of origin of the shipment and the estimated time and date that shipment will commence;

E. the estimated time and date that 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.

Subp. 4. **Revision notice.**

A. The licensee must 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 commissioner.

B. A licensee must promptly notify the governor of the state or the governor's designee of any changes to the information provided under item A and subpart 3. The licensee must also immediately notify the commissioner of any such changes.

Subp. 5. **Cancellation notice.** Each licensee who cancels a shipment for which advance notification has been sent must send a cancellation notice to the governor of each state or to the governor's designee previously notified and to the NRC's Director, Division of Security Policy, Office of Nuclear Security and Incident Response. The licensee must send the cancellation notice before the shipment would have commenced or as soon thereafter as possible. The licensee must state in the notice that it is a cancellation and identify the advance notification that is being canceled.

Subp. 6. **Records.** The licensee must retain a copy of the advance notification and any revision and cancellation notices as a record for three years.

4731.8120 PHYSICAL PROTECTION OF CATEGORY 1 AND CATEGORY 2 QUANTITIES OF RADIOACTIVE MATERIAL DURING SHIPMENT.

Subpart 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, must:

(1) ensure that movement control centers are established that maintain position information from a remote location. These control centers must monitor shipments 24 hours a day, seven days a week, and have the ability to communicate immediately, in an emergency, with the appropriate law enforcement agencies;

(2) 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;

(3) 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 shall include, but not be limited to, the identification of and contact information for the appropriate LLEA along the shipment route;

(4) 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 24-hour duty day as established by the Department of Transportation Federal Motor Carrier Safety Administration. The accompanying individual may be another driver;

(5) develop written normal and contingency procedures to address:

(a) notifications to the communication center and law enforcement agencies;

(b) communication protocols that 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; and

(6) each licensee who makes arrangements for the shipment of category 1 quantities of radioactive material must 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 must maintain constant control and/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 must:

(1) 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 and/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;

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

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

Subp. 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 must:

(1) 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 must provide positive confirmation of the location of the shipment and its status. The communications center must 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 shall include, but not be limited to, the identification of and contact information for the appropriate LLEA along the shipment route; and

(2) 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 must:

(1) 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 and/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;

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

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

Subp. 3. **Investigations.** Each licensee who makes arrangements for the shipment of category 1 quantities of radioactive material must immediately conduct an investigation upon the 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 must 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.

4731.8125 REPORTING OF EVENTS.

A. The shipping licensee must notify the appropriate local law enforcement agency (LLEA) and the commissioner within one hour of its determination that a shipment of category 1 quantities of radioactive material is lost or missing. The appropriate LLEA is the law enforcement agency in the area of the shipment's last confirmed location. During the investigation required by part 4731.8120, subpart 3, the shipping licensee must provide agreed upon updates to the commissioner on the status of the investigation.

B. The shipping licensee must notify the commissioner within four hours of its determination that a shipment of category 2 quantities of radioactive material is lost or missing. If, after 24 hours of its determination that the shipment is lost or missing, the radioactive material has not been located and secured, the licensee must immediately notify the commissioner.

C. The shipping licensee must 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 must notify the commissioner 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.

D. The shipping licensee must notify the commissioner 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.

E. The shipping licensee must notify the commissioner and the LLEA as soon as possible upon recovery of any lost or missing category 1 quantities of radioactive material.

F. The shipping licensee must notify the commissioner as soon as possible upon recovery of any lost or missing category 2 quantities of radioactive material.

G. The initial telephone notification required by items A to D must be followed within a period of 30 days by a written report submitted to the commissioner. The report must include:

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

(2) a description of the circumstances under which the loss or theft occurred;

(3) a statement of disposition, or probable disposition, of the licensed material involved;

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

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

H. Subsequent to filing the written report, the licensee must also report any additional substantive information on the loss or theft within 30 days after the licensee learns of such information.

4731.8130 FORM OF RECORDS.

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

4731.8135 RECORD RETENTION.

Licensees must maintain the records that are required by parts 4731.8000 to 4731.8140 for the period specified by the applicable rule. If a retention period is not otherwise specified, these records must be retained until the commissioner terminates the facility's license. All records related to parts 4731.8000 to 4731.8140 may be destroyed upon termination of the license.

4731.8140 CATEGORY 1 AND CATEGORY 2 RADIOACTIVE MATERIALS.

Subpart 1. **Table 1 - category 1 and category 2 threshold.** The terabecquerel (TBq) values are the regulatory standard. The curie (Ci) values specified are obtained by converting from the TBq value. The Ci values are 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

Subp. 2. **Calculations concerning multiple sources or multiple radionuclides.** The "sum of fractions" methodology for evaluating combinations of multiple sources or multiple radionuclides, described in items A and B, is to be used in determining whether a location meets or exceeds the threshold and is thus subject to the requirements of parts 4731.8000 to 4731.8140.

A. If multiple sources of the same radionuclide and/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 parts 4731.8000 to 4731.8140 apply.

B. 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 in this item 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 (i.e., TBq) and the numerator and denominator values must be in the same units.

$$\sum_{1}^{n}\left[\frac{R1}{AR1}+\frac{R2}{AR2}+\frac{Rn}{ARn}\right]\geq 1.0$$

Where,

R1 = total activity for radionuclide 1

R2 = total activity for radionuclide 2

Rn = total activity for radionuclide n

AR1 = activity threshold for radionuclide 1

AR2 = activity threshold for radionuclide 2

ARn = activity threshold for radionuclide n

REPEALER. Minnesota Rules, parts 4731.0725, subpart 4; 4731.2650; 4731.3210; 4731.3405; 4731.3410; 4731.3415; and 4731.3420, are repealed.