Legend: (Proposed New Rule)
Regular Print = Proposed new language

§289.257. Packaging and Transportation of Radioactive Material.

(a) Purpose.

(1) This section establishes requirements for packaging, preparation for shipment, and transportation of radioactive material including radioactive waste.

(2) The packaging and transport of radioactive material are also subject to the requirements of §289.201 of this title (relating to General Provisions for Radioactive Material), §289.202 of this title (relating to Standards for Protection Against Radiation from Radioactive Materials), §289.203 of this title (relating to Notices, Instructions, and Reports to Workers; Inspections), §289.204 of this title (relating to Fees for Certificates of Registration, Radioactive Material Licenses, Emergency Planning and Implementation, and Other Regulatory Services), §289.205 of this title (relating to Hearing and Enforcement Procedures), §289.251 of this title (relating to Exemptions, General Licenses, and General License Acknowledgements), §289.252 of this title (relating to Licensing of Radioactive Material), §289.254 of this title (relating to Licensing of Radioactive Waste Processing and Storage Facilities), §289.256 of this title (relating to Medical and Veterinary Use of Radioactive Material, and §289.260 of this title (relating to Licensing of Uranium Recovery and Byproduct Material Disposal Facilities) and to the regulations of other agencies (e.g., the United States Department of Transportation (DOT) and the United States Postal Service) having jurisdiction over means of transport. The requirements of this section are in addition to, and not in substitution for, other requirements.

(b) Scope.

(1) The requirements of this section apply to any licensee authorized by a specific or general license issued by the agency to receive, possess, use, or transfer radioactive material, if the licensee delivers that material to a carrier for transport, transports the material outside the site of usage as specified in the agency license, or transports that material on public highways. No provision of this section authorizes possession of radioactive material.

(2) Exemptions from the requirements for a license in subsection (c) of this section are specified in subsection (f) of this section. The general license in subsection (i) of this section requires that a United States Nuclear Regulatory Commission (NRC) certificate of compliance or other package approval be issued for the package to be used in accordance with the general license. The transport of radioactive material or delivery of radioactive material to a carrier for transport is subject to the operating controls and procedural requirements of subsections (l) - (q) of this section and to the general provisions of subsections (a) - (e) of this section, including DOT regulations referenced in subsection (e) of this section.

(c) Requirement for license. Except as authorized in a general or specific license issued by the agency, or as exempted in accordance with this section, no licensee may transport radioactive material or deliver radioactive material to a carrier for transport.

(d) Definitions. The following words and terms when used in this section shall have the following meaning, unless the context clearly indicates otherwise. To ensure compatibility with international transportation standards, all limits in this section are given in terms of dual units: The International System of Units (SI) followed or preceded by United States (U.S.) standard or customary units. The U.S. customary units are not exact equivalents, but are rounded to a convenient value, providing a functionally equivalent unit. For the purpose of this section, SI units shall be used.

(1) $A_1$ -- The maximum activity of special form radioactive material permitted in a Type A package. This value is either listed in Table 257-3 of subsection (aa)(6) of this section, or may be derived in accordance with the procedure prescribed in subsection (aa) of this section.

(2) $A_2$ -- The maximum activity of radioactive material, other than special form, low specific activity (LSA) and surface contaminated object (SCO) material, permitted in a Type A package. This value is either listed in Table 257-3 of subsection (aa)(6) of this section, or may be derived in accordance with the procedure prescribed in subsection (aa) of this section.

(3) BRC Forms 540, 540A, 541, 541A, 542, and 542A -- Official agency forms referenced in subsection (bb) of this section which includes the information required by DOT in Title 49, Code of Federal Regulations (CFR), Part 172. BRC Form 541B contains additional information for low-level radioactive waste (LLRW) shipments to a Texas LLRW disposal facility. Licensees need not use originals of these forms as long as any substitute forms are equivalent to the original documentation in respect to content, clarity, size, and location of information. Upon agreement between the shipper and consignee, BRC Forms 541 (and 541A and 541B) and BRC Forms 542 (and 542A) may be completed, transmitted, and stored in electronic media. The electronic media shall have the capability for producing legible, accurate, and complete records in the format of the uniform manifest.

(4) Carrier -- A person engaged in the transportation of passengers or property by land or water as a common, contract, or private carrier, or by civil aircraft.

(5) Certificate holder -- A person who has been issued a certificate of compliance or other package approval by the agency.

(6) Certificate of compliance -- The certificate issued by the NRC that approves the design of a package for the transportation of radioactive materials.

(7) Chelating agent -- Amine polycarboxylic acids (e.g., EDTA, DTPA), hydroxy-carboxylic acids, and polycarboxylic acids (e.g., citric acid, carbolic acid, and glucinic acid).

(8) Chemical description -- A description of the principal chemical characteristics of a LLRW.

(9) Consignee -- The designated receiver of the shipment of low-level radioactive waste.

(10) Consignment -- each shipment of a package or groups of packages or load of radioactive material offered by a shipper for transport.

(11) Containment system -- The assembly of components of the packaging intended to retain the radioactive material during transport.

(12) Conveyance -- For transport on:

(A) public highway or rail by transport vehicle or large freight container;

(B) water by vessel, or any hold, compartment, or defined deck area of a vessel including any transport vehicle on board the vessel; and

(C) aircraft.

(13) Criticality Safety Index (CSI) -- The dimensionless number (rounded up to the next tenth) assigned to and placed on the label of a fissile material package, to designate the degree of control of accumulation of packages containing fissile material during transportation. Determination of the criticality safety index is described in subsection (i) of this section and Title 10, CFR, §71.59.

(14) Decontamination facility -- A facility operating in accordance with an NRC, agreement state, or agency license whose principal purpose is decontamination of equipment or materials to accomplish recycle, reuse, or other waste management objectives, and, for purposes of this section, is not considered to be a consignee for LLRW shipments.

(15) Deuterium -- For the purposes of this section, this means deuterium and any deuterium compound, including heavy water, in which the ratio of deuterium atoms to hydrogen atoms exceeds 1:5000.

(16) Disposal container -- A transport container principally used to confine LLRW during disposal operations at a land disposal facility (also see definition for high integrity container). Note that for some shipments, the disposal container may be the transport package.

(17) Environmental Protection Agency (EPA) identification number -- The number received by a transporter following application to the administrator of EPA as required by Title 40, CFR, Part 263.

(18) Exclusive use -- The sole use by a single consignor of a conveyance for which all initial, intermediate, and final loading and unloading are carried out in accordance with the direction of the consignor or consignee. The consignor and the carrier shall ensure that any loading or unloading is performed by personnel having radiological training and resources appropriate for safe handling of the consignment. The consignor shall issue specific instructions, in writing, for maintenance of exclusive use shipment controls, and include them with the shipping paper information provided to the carrier by the consignor.

(19) Fissile material -- The radionuclides plutonium-239, plutonium-241, uranium-233, uranium-235, or any combination of these radionuclides. Fissile material means the fissile nuclides themselves, not material containing fissile nuclides. Unirradiated natural uranium and depleted uranium, and natural uranium or depleted uranium that has been irradiated in thermal reactors only are not included in this definition. Agency jurisdiction extends only to special nuclear material in quantities not sufficient to form a "critical mass" as defined in §289.201(b) of this title. Certain exclusions from fissile material controls are provided in subsection (h) of this section.

(20) Generator -- A licensee operating in accordance with an NRC, agreement state, or agency license who:

(A) is a waste generator as defined in this section; or

(B) is the licensee to whom waste can be attributed within the context of the Low-Level Radioactive Waste Policy Amendments Act of 1985 (e.g., waste generated as a result of decontamination or recycle activities).

(21) Graphite -- For the purposes of this section, this means graphite with a boron equivalent content of less than five parts per million and density greater than 1.5 grams per cubic centimeter.

(22) High integrity container (HIC) -- A container commonly designed to meet the structural stability requirements of Title 10, CFR, §61.56, and to meet DOT requirements for a Type A package.

(23) Industrial package (IP) -- A packaging that, together with its low specific activity (LSA) material or surface contaminated object (SCO) contents, meets the requirements of Title 49, CFR, §173.410 and §173.411. Industrial packages are categorized in Title 49, CFR, §173.411 as either:

(A) Industrial package Type 1 (IP-1);

(B) Industrial package Type 2 (IP-2); or

(C) Industrial package Type 3 (IP-3).

(24) Low-level radioactive waste (LLRW) -- Radioactive material that meets the following criteria:

(A) LLRW is radioactive material that is:

(i) discarded or unwanted and is not exempt by rule adopted in accordance with the Texas Radiation Control Act (Act), Health and Safety Code, §401.106;

(ii) waste, as that term is defined in Title 10, CFR, §61.2; and

(iii) subject to:

(I) concentration limits established in Title 10, CFR §61.55, or compatible rules adopted by the agency or the Texas Commission on Environmental Quality (TCEQ), as applicable; and

(II) disposal criteria established in Title 10, CFR, or established by the agency or TCEQ, as applicable.

(B) LLRW does not include:

(i) high-level radioactive waste as defined in Title 10, CFR, §60.2;

(ii) spent nuclear fuel as defined in Title 10, CFR, §72.3;

(iii) byproduct material defined in the Act, Health and Safety Code, §401.003(3)(B);

(iv) naturally occurring radioactive material (NORM) waste that is not oil and gas NORM waste;

(v) oil and gas NORM waste; or

(vi) transuranics greater than 100 nanocuries per gram.

(25) Low specific activity (LSA) material -- Radioactive material with limited specific activity which is nonfissile or is excepted in accordance with subsection (h) of this section, and which satisfies the following descriptions and limits set forth. Shielding materials surrounding the LSA material may not be considered in determining the estimated average specific activity of the package contents. LSA material shall be in one of the following three groups:

(A) LSA-I.

(i) Ores containing only naturally occurring radionuclides (e.g., uranium, thorium) and uranium or thorium concentrates of such ores which are not intended to be processed for the use of these radionuclides; or

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

(iii) Radioactive material for which the $A_2$ value is unlimited; or

(iv) Other radioactive material (e.g.: mill tailings, contaminated earth, concrete, rubble, other debris, and activated material) in which the radioactivity is distributed throughout, and the estimated average specific activity does not exceed 30 times the value for exempt material activity concentration determined in accordance with subsection (aa) of this section.

(B) LSA-II.

(i) Water with tritium concentration up to 0.8 terabecquerel per liter (TBq/l) (20.0 curies per liter (Ci/l)); or

(ii) Other material in which the radioactivity is distributed throughout, and the average specific activity does not exceed $10^{-4}$ $A_2$/g for solids and gases, and $10^{-5}$ $A_2$/g for liquids.

(C) LSA-III. Solids (e.g., consolidated wastes, activated materials), excluding powders, that satisfy the requirements of Title 10, CFR, §71.77 in which:

(i) the radioactive material is distributed throughout a solid or a collection of solid objects, or is essentially uniformly distributed in a solid compact binding agent (such as concrete, bitumen, ceramic, etc.); and

(ii) the radioactive material is relatively insoluble, or it is intrinsically contained in a relatively insoluble material, so that, even with a loss of packaging, the loss of radioactive material per package by leaching, when placed in water for seven days, would not exceed 0.1 $A_2$; and

(iii) the average specific activity of the solid does not exceed 2 x $10^{-3}$ $A_2$/g.

(26) Low toxicity alpha emitters -- Natural uranium, depleted uranium, natural thorium; uranium-235, uranium-238, thorium-232, thorium-228 or thorium-230 when contained in ores or physical or chemical concentrates or tailings; or alpha emitters with a half-life of less than ten days.

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

(28) Natural thorium -- Thorium with the naturally occurring distribution of thorium isotopes (essentially 100 weight percent thorium-232).

(29) Normal form radioactive material -- Radioactive material that has not been demonstrated to qualify as special form radioactive material.

(30) Package -- The packaging together with its radioactive contents as presented for transport.

(A) Fissile material package, Type AF package, Type BF package, Type B(U)F package, or Type B(M)F package -- A fissile material packaging together with its fissile material contents.

(B) Type A package -- A Type A packaging together with its radioactive contents. A Type A package is defined and shall comply with the DOT regulations in Title 49, CFR, Part 173.

(C) Type B package -- A Type B packaging together with its radioactive contents. On approval by the NRC, a Type B package design is designated by NRC as B(U) unless the package has a maximum normal operating pressure of more than 700 kilopascals (kPa) (100 pounds per square inch ($lb/in^2$)) gauge or a pressure relief device that would allow the release of radioactive material to the environment under the tests specified in Title 10, CFR, §71.73 (hypothetical accident conditions), in which case it will receive a designation B(M). B(U) refers to the need for unilateral approval of international shipments; B(M) refers to the need for multilateral approval of international shipments. There is no distinction made in how packages with these designations may be used in domestic transportation. To determine their distinction for international transportation, see DOT regulations in Title 49, CFR, Part 173. A Type B package approved before September 6, 1983, was designated only as Type B. Limitations on its use are specified in Title 10, CFR, §71.19.

(31) Packaging -- The assembly of components necessary to ensure compliance with the packaging requirements of this section. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie-down system, and auxiliary equipment may be designated as part of the packaging.

(32) Physical description -- The items called for on BRC Form 541 to describe a LLRW.

(33) Residual waste -- LLRW resulting from processing or decontamination activities that cannot be easily separated into distinct batches attributable to specific waste generators. This waste is attributable to the processor or decontamination facility, as applicable.

(34) Shipper -- The licensed entity (i.e., the waste generator, waste collector, or waste processor) who offers LLRW for transportation, typically consigning this type of waste to a licensed waste collector, waste processor, or land disposal facility operator. This definition applies only to shipments of LLRW shipped to a Texas LLRW disposal facility.

(35) Site of usage -- The licensee's facility, including all buildings and structures between which radioactive material is transported and all roadways that are not within the public domain on which radioactive material can be transported.

(36) Specific activity of a radionuclide -- The radioactivity of the radionuclide per unit mass of that nuclide. The specific activity of a material in which the radionuclide is essentially uniformly distributed is the radioactivity per unit mass of the material.

(37) Spent nuclear fuel or spent fuel -- Fuel that has been withdrawn from a nuclear reactor following irradiation, has undergone at least one year's decay since being used as a source of energy in a power reactor, and has not been chemically separated into its constituent elements by reprocessing. Spent fuel includes the special nuclear material, byproduct material, source material, and other radioactive materials associated with fuel assemblies.

(38) Surface contaminated object (SCO) -- A solid object that is not itself classed as radioactive material, but which has radioactive material distributed on any of its surfaces. A SCO shall be in one of the following two groups with surface activity not exceeding the following limits:

(A) SCO-I -- A solid object on which:

(i) the non-fixed contamination on the accessible surface averaged over 300 square centimeters ($cm^2$) (or the area of the surface if less than 300 $cm^2$) does not exceed 4 becquerels per square centimeter ($Bq/cm^2$) ($10^{-4}$ microcurie per square centimeter ($\mu Ci/cm^2$)) for beta and gamma and low toxicity alpha emitters, or 4 x $10^{-1}$ $Bq/cm^2$ ($10^{-5}$ $\mu Ci/cm^2$) for all other alpha emitters;

(ii) the fixed contamination on the accessible surface averaged over 300 $cm^2$ (or the area of the surface if less than 300 $cm^2$) does not exceed 4 x $10^4$ $Bq/cm^2$ (1 $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters, or 4 x $10^3$ $Bq/cm^2$ ($10^{-1}$ $\mu Ci/cm^2$) for all other alpha emitters; and

(iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 $cm^2$ (or the area of the surface if less than 300 $cm^2$) does not exceed 4 x $10^4$ $Bq/cm^2$ (1 $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters, or 4 x $10^3$ $Bq/cm^2$ ($10^{-1}$ $\mu Ci/cm^2$) for all other alpha emitters.

(B) SCO-II -- A solid object on which the limits for SCO-I are exceeded and on which the following limits are not exceeded:

(i) the non-fixed contamination on the accessible surface averaged over 300 $cm^2$ (or the area of the surface if less than 300 $cm^2$) does not exceed 400 $Bq/cm^2$ ($10^{-2}$ $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters or 40 $Bq/cm^2$ ($10^{-3}$ $\mu Ci/cm^2$) for all other alpha emitters;

(ii) the fixed contamination on the accessible surface averaged over 300 $cm^2$ (or the area of the surface if less than 300 $cm^2$) does not exceed 8 x $10^5$ $Bq/cm^2$ (20 $\mu Ci/cm^2$) for beta and gamma and low toxicity alpha emitters, or 8 x $10^4$ $Bq/cm^2$ (2 $\mu Ci/cm^2$) for all other alpha emitters; and

(iii) the non-fixed contamination plus the fixed contamination on the inaccessible surface averaged over 300 $cm^2$ (or the area of the surface if less than 300 $cm^2$) does not exceed 8 x $10^5$ Bq/$cm^2$ (20 μCi/$cm^2$) for beta and gamma and low toxicity alpha emitters, or 8 x $10^4$ Bq/$cm^2$ (2 μCi/$cm^2$) for all other alpha emitters.

(39) Uniform Low-Level Radioactive Waste Manifest or uniform manifest -- The combination of BRC Forms 540, 541, and, if necessary, 542, and their respective continuation sheets as needed, or equivalent.

(40) Unirradiated uranium -- Uranium containing not more than 2 x $10^3$ Bq of plutonium per gram of uranium-235, not more than 9 x $10^6$ Bq of fission products per gram of uranium-235, and not more than 5 x $10^{-3}$ g of uranium-236 per gram of uranium-235.

(41) Uranium -- Natural, depleted, enriched:

(A) Natural uranium -- Uranium with the naturally occurring distribution of uranium isotopes (approximately 0.711 weight percent uranium-235, and the remainder by weight essentially uranium-238).

(B) Depleted uranium -- Uranium containing less uranium-235 than the naturally occurring distribution of uranium isotopes.

(C) Enriched uranium -- Uranium containing more uranium-235 than the naturally occurring distribution of uranium isotopes.

(42) Waste collector -- An entity, operating in accordance with an NRC, agreement state, or agency license, whose principal purpose is to collect and consolidate waste generated by others, and to transfer this waste, without processing or repackaging the collected waste, to another licensed waste collector, licensed waste processor, or licensed land disposal facility.

(43) Waste description -- The physical, chemical and radiological description of a LLRW as called for on BRC Form 541.

(44) Waste generator -- An entity, operating in accordance with an NRC, agreement state, or agency license, who:

(A) possesses any material or component that contains radioactivity or is radioactively contaminated for which the licensee foresees no further use; and

(B) transfers this material or component to a licensed land disposal facility or to a licensed waste collector or processor for handling or treatment prior to disposal. A licensee performing processing or decontamination services may be a waste generator if the transfer of LLRW from its facility is defined as residual waste.

(45) Waste processor -- An entity, operating in accordance with an NRC or agreement state license, whose principal purpose is to process, repackage, or otherwise treat LLRW or waste generated by others prior to eventual transfer of waste to a licensed LLRW land disposal facility.

(46) Waste type -- A waste within a disposal container having a unique physical description (i.e., a specific waste descriptor code or description; or a waste sorbed on or solidified in a specifically-defined media).

(e) Transportation of radioactive material.

(1) Each licensee who transports radioactive material outside the site of usage as specified in the agency license, transports on public highways, or delivers radioactive material to a carrier for transport, shall comply with the applicable requirements of the DOT regulations in Title 49, CFR, Part 107, Parts 171 - 189 and 390 - 397 appropriate to the mode of transport. The licensee shall particularly note DOT regulations in the following areas:

(A) Packaging - Title 49, CFR, Part 173: Subparts A, B, and I.

(B) Marking and labeling - Title 49, CFR, Part 172: Subpart D, and §§172.400 - 172.407 and §§172.436 - 172.441 of Subpart E.

(C) Placarding - Title 49, CFR, Part 172: Subpart F, especially §§172.500-172.519 and §172.556, and Appendices B and C.

(D) Accident reporting - Title 49, CFR, Part 171: §171.15 and §171.16.

(E) Shipping papers and emergency information - Title 49, CFR, Part 172: Subparts C and G.

(F) Hazardous material employee training - Title 49, CFR, Part 172: Subpart H.

(G) Hazardous material shipper/carrier registration - Title 49, CFR, Part 107: Subpart G.

(H) Security Plans - Title 49, CFR, Part 172: Subpart I.

(2) The licensee shall also note DOT regulations pertaining to the following modes of transportation:

(A) Rail: Title 49, CFR Part 174: Subparts A through D and K.

(B) Air: Title 49, CFR Part 175.

(C) Vessel: Title 49, CFR Part 176: Subparts A through F and M.

(D) Public Highway: Title 49, CFR Part 177 and Parts 390 through 397.

(3) If DOT regulations are not applicable to a shipment of radioactive material (i.e. DOT does not have jurisdiction), the licensee shall conform to DOT standards and requirements specified in paragraph (1) of this subsection to the same extent as if the shipment or transportation were subject to DOT regulations. A request for modification, waiver, or exemption from those requirements shall be filed and approved by the agency. Any notification referred to in those requirements, shall be submitted to the agency.

(f) Exemption for low-level radioactive materials.

(1) A licensee is exempt from all requirements of this section with respect to shipment or carriage of the following low-level materials:

(A) Natural material and ores containing naturally occurring radionuclides that are not intended to be processed for use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the values specified in Table 257-4 of subsection (aa)(7) of this section.

(B) Materials for which the activity concentration is not greater than the activity concentration values specified in Table 257-4 of subsection (aa)(7) of this section, or for which the consignment activity is not greater than the limit for an exempt consignment found in Table 257-4 of subsection (aa)(7) of this section.

(2) Common and contract carriers, freight forwarders, and warehousemen, who are subject to the rules and regulations of the DOT or the United States Postal Service (Title 39, CFR, Parts 14 and 15), are exempt from these regulations to the extent that they transport or store sources of radiation in the regular course of their carriage for another or storage incident thereto. Private carriers who are subject to the rules and regulations of the DOT are exempted from these regulations to the extent that they transport sources of radiation. Common, contract, and private carriers who are not subject to the rules and regulations of the DOT or the United States Postal Service are subject to applicable sections of these regulations.

(3) Persons who discard licensed material in accordance with §289.202(fff) of this title are exempt from all requirements of this section.

(g) Exemption of physicians. Any physician licensed by a State to dispense drugs in the practice of medicine is exempt from Title 10, CFR, §71.5 with respect to transport by the physician of licensed material for use in the practice of medicine. However, any physician operating under this exemption shall be licensed under Title 10, CFR, Part 35 or the equivalent agreement state regulations.

(h) Exemption from classification as fissile material. Fissile materials meeting the requirements of at least one of the paragraphs (1) through (6) of this subsection are exempt from

classification as fissile material and from the fissile material package standards of Title 10, CFR §71.55 and §71.59, but are subject to all other requirements of this section, except as noted.

(1) An individual package containing 2 grams or less fissile material.

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

(3) Solid fissile material commingled with solid non-fissile material.

(A) Low concentrations of solid fissile material commingled with solid nonfissile material provided:

(i) that there is at least 2000 grams of solid nonfissile material for every gram of fissile material, and

(ii) there is no more than 180 grams of fissile material distributed within 360 kg of contiguous non-fissile material.

(B) Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but shall not be included in determining the required mass of solid nonfissile material.

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

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

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

(i) General license.

(1) NRC-approved package.

(A) A general license is issued to any licensee of the agency to transport, or to deliver to a carrier for transport, radioactive material in a package for which a license, certificate of compliance (CoC), or other approval has been issued by the NRC.

(B) This general license applies only to a licensee who has a quality assurance program approved by the NRC as satisfying the provisions of Title 10, CFR, Part 71, Subpart H.

(C) This general license applies only to a licensee who meets the following requirements:

(i) has a copy of the CoC or other approval by the NRC of the package, and has the drawings and other documents referenced in the approval relating to the use and maintenance of the packaging and to the actions to be taken before shipment; and

(ii) complies with the terms and conditions of the specific license, certificate, or other approval by the NRC, as applicable, and the applicable requirements of Title 10, CFR, Part 71, Subparts A, G, and H; and

(iii) Before the licensee's first use of the package, submits in writing to: ATTN: Document Control Desk, Director, Spent Fuel Project Office, Office of Nuclear Material Safety and Safeguards, using an appropriate method listed in Title 10, CFR, Part 71, the licensee's name and license number and the package identification number specified in the package approval.

(D) This general license applies only when the package approval authorizes use of the package in accordance with this general license.

(E) For a Type B or fissile material package, the design of which was approved by NRC before April 1, 1996, the general license is subject to the additional restrictions of paragraph (2) of this subsection.

(F) For radiography containers, a program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or packages transporting these devices and meeting the requirements of §289.255(m)(2)(B) of this title (relating to Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography), is deemed to satisfy the requirements of subparagraph (B) of this paragraph.

(2) Previously approved package.

(A) A Type B package previously approved by the NRC, but not designated as B(U), B(M), B(U)F or B(M)F in the identification number of the NRC certificate of compliance, or Type AF packages approved by the NRC prior to September 6, 1983, may be used in accordance with the general license of paragraph (1) of this subsection with the following additional conditions:

(i) fabrication of the packaging was satisfactorily completed before August 31, 1986, as demonstrated by application of its model number in accordance with subsection (k)(3) of this section;

(ii) a serial number that uniquely identifies each packaging which conforms to the approved design is assigned to, and legibly and durably marked on, the outside of each packaging ; and

(iii) subparagraph (A) of this paragraph expires October 1, 2008.

(B) A Type B(U) package, a Type B(M) package, or a fissile material package, previously approved by the NRC but without the designation "-85" in the identification number of the NRC CoC, may be used in accordance with the general license of paragraph (1) of this subsection with the following additional conditions:

(i) fabrication of the package is satisfactorily completed by April 1, 1999, as demonstrated by application of its model number in accordance with subsection (k)(3) of this section;

(ii) a package used for a shipment to a location outside the United States is subject to multilateral approval as defined in DOT regulations Title 49, CFR §173.403; and

(iii) a serial number which uniquely identifies each packaging which conforms to the approved design is assigned to and legibly and durably marked on the outside of each packaging.

(C) A Type B(U) package, a Type B(M) package, or a fissile material package, previously approved by the NRC with the designation "-85" in the identification number of the NRC CoC, may be used in accordance with the general license of paragraph (1) of this subsection with the following additional conditions:

(i) Fabrication of the package shall be satisfactorily completed by December 31, 2006, as demonstrated by application of its model number in accordance with subsection (k)(3) of this section.

(ii) After December 31, 2003, a package used for a shipment to a location outside the United States is subject to multilateral approval as defined in DOT regulations Title 49, CFR, §173.403.

(3) DOT specification container.

(A) A general license is issued to any licensee to transport, or to deliver to a carrier for transport, licensed material in a specification container for fissile material or for a Type B quantity of radioactive material as specified in Title 49, CFR, Parts 173 and 178.

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

(i) has a quality assurance program required by subsections (t), (u), and (v) of this section and Title 10, CFR, Part 71, Subpart H**;**

(ii) has a copy of the specification; and

(iii) complies with the terms and conditions of the specification and the applicable requirements of this section.

(C) The general license in subparagraph (A) of this paragraph is subject to the limitation that the specification container may not be used for a shipment to a location outside the United States except by multilateral approval as defined in Title 49, CFR, §173.403.

(4) Use of foreign approved package

(A) A general license is issued to any licensee to transport, or to deliver to a carrier for transport, licensed material in a package the design of which has been approved in a foreign national competent authority certificate that has been revalidated by the DOT as meeting the applicable requirements of Title 49, CFR, §171.12.

(B) Except as otherwise provided by this section, the general license applies only to a licensee who has a quality assurance program approved by the NRC as satisfying the applicable provisions of Title 10, CFR, Part 71.

(C) This general license applies only to international shipments.

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

(i) has a copy of the applicable certificate, the revalidation, and the drawings and other documents referenced in the certificate relating to the use and maintenance of the packaging and to the actions to be taken prior to shipment; and

(ii) complies with the terms and conditions of the certificate and revalidation, and with the applicable requirements of this section. With respect to the quality assurance provisions of Title 10, CFR, Part 71, the licensee is exempt from design, construction, and fabrication considerations.

(5) Fissile material.

(A) A general license is issued to any licensee to transport fissile material, or to deliver fissile material to a carrier for transport, if the material is shipped in accordance with this section. The fissile material need not be contained in a package that meets the standards of this section; however, the material shall be contained in a Type A package. The Type A package shall also meet the DOT requirements of Title 49, CFR, §173.417(a).

(B) The general license applies only to a licensee who has a quality assurance program approved by the NRC as satisfying the provisions of Title 10, CFR, Part 71.

(C) The general license applies only when a package's contents:

(i) contain no more than a Type A quantity of radioactive material; and

(ii) contain less than 500 total grams of beryllium, graphite, or hydrogeneous material enriched in deuterium.

(D) The general license applies only to packages containing fissile material that are labeled with a CSI that:

(i) has been determined in accordance with paragraph (E) of this subsection;

(ii) has a value less than or equal to 10.0; and

(iii) for a shipment of multiple packages containing fissile material, the sum of the CSIs shall be less than or equal to 50.0 (for shipment on a nonexclusive use conveyance) and less than or equal to 100.0 (for shipment on an exclusive use conveyance).

(E) The CSI shall be as follows:

(i) the value for the CSI shall be greater than or equal to the number calculated by the following equation:

Figure: 25 TAC §289.257(i)(5)(E)(i)

(ii) the calculated CSI shall be rounded up to the first decimal place;

(iii) the values of X, Y, and Z used in the CSI equation shall be taken from Tables 257-1 or 257-2 of this clause, as appropriate;

Figure: 25 TAC §289.257(i)(5)(E)(iii)

(iv) if Table 257-2 of clause (iii) of this subparagraph is used to obtain the value of X, then the values for the terms in the equation for uranium-233 and plutonium shall be assumed to be zero; and

(v) Table 257-2 values of clause (iii) of this subparagraph for X, Y, and Z shall be used to determine the CSI if:

(I) uranium-233 is present in the package;

(II) the mass of plutonium exceeds 1% of the mass of uranium-235;

(III) the uranium is of unknown uranium-235 enrichment, or greater than 24 weight percent enrichment; or

(IV) substances having a moderating effectiveness (i.e. an average hydrogen density greater than $H_20$) (e.g. certain hydrocarbon oils or plastics) are present in any form, except as polyethylene used for packing or wrapping.

(6) Plutonium-beryllium special form material.

(A) A general license is issued to any licensee to transport fissile material in the form of plutonium-beryllium (Pu-Be) special form sealed sources, or to deliver Pu-Be sealed sources to a carrier for transport, if the material is shipped in accordance with this section This material need not be contained in a package that meets the standards of Title 10, CFR, Part 71, however, the material shall be contained in a Type A package. The Type A package shall also meet the DOT requirements of Title 49, CFR, §173.417(a).

(B) The general license applies only to a licensee who has a quality assurance program approved by the NRC as satisfying the provisions of Title 10, CFR, Part 71.

(C) The general license applies only when a package's contents:

(i) contain no more than a Type A quantity of material; and

(ii) contain less than 1000g of plutonium, provided that plutonium-239, plutonium-241, or any combination of these radionuclides, constitutes less than 240 g of the total quantity of plutonium in the package.

(D) The general license applies only to packages labeled with a CSI that:

(i) has been determined in accordance with subparagraph (E) of this paragraph;

(ii) has a value less than or equal to 100.0; and

(iii) for a shipment of multiple packages containing Pu-Be sealed sources, the sum of the CSIs shall be less than or equal to 50.0 (for shipment on a nonexclusive use conveyance) and less than or equal to 100.0 (for shipment on or exclusive use conveyance).

(E) The value for the CSI shall be as follows:

(i) the CSI shall be greater than or equal to the number calculated by the following equation:

Figure: 25 TAC §289.257(i)(6)(E)(i)

(ii) the calculated CSI shall be rounded up to the first decimal place.

(j) Assumptions as to unknown properties. When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee shall package the fissile material as if the unknown properties have credible values that will cause the maximum neutron multiplication.

(k) Preliminary determinations. Before the first use of any packaging for the shipment of licensed material the licensee shall:

(1) ascertain that there are no cracks, pinholes, uncontrolled voids, or other defects that could significantly reduce the effectiveness of the packaging;

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

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

(l) Routine determinations. Before each shipment of radioactive material, the licensee shall ensure that the package with its contents satisfies the applicable requirements of this section and of the license. The licensee shall determine that:

(1) the package is proper for the contents to be shipped;

(2) the package is in unimpaired physical condition except for superficial defects such as marks or dents;

(3) each closure device of the packaging, including any required gasket, is properly installed, secured, and free of defects;

(4) any system for containing liquid is adequately sealed and has adequate space or other specified provision for expansion of the liquid;

(5) any pressure relief device is operable and set in accordance with written procedures;

(6) the package has been loaded and closed in accordance with written procedures;

(7) for fissile material, any moderator or neutron absorber, if required, is present and in proper condition;

(8) any structural part of the package that could be used to lift or tie down the package during transport is rendered inoperable for that purpose, unless it satisfies the design requirements of Title 10, CFR, §71.45;

(9) the level of non-fixed (removable) radioactive contamination on the external surfaces of each package offered for shipment is as low as reasonably achievable (ALARA), and within the limits specified in DOT regulations in Title 49, CFR, §173.443;

(10) external radiation levels around the package and around the vehicle, if applicable, will not exceed the following limits at any time during transportation:

(A) Except as provided in subparagraph (B) of this paragraph, each package of radioactive materials offered for transportation shall be designed and prepared for shipment so that under conditions normally incident to transportation the radiation level does not exceed 2 mSv/hr (200 mrem/hr) at any point on the external surface of the package, and the transport index does not exceed 10.

(B) A package that exceeds the radiation level limits specified in subparagraph (A) of this paragraph shall be transported by exclusive use shipment only, and the radiation levels for such shipment shall not exceed the following during transportation:

(i) 2 mSv/hr (200 mrem/hr) on the external surface of the package, unless the following conditions are met, in which case the limit is 10 mSv/hr (1,000 mrem/hr):

(I) the shipment is made in a closed transport vehicle;

(II) the package is secured within the vehicle so that its position remains fixed during transportation; and

(III) there are no loading or unloading operations between the beginning and end of the transportation;

(ii) 2 mSv/hr (200 mrem/hr) at any point on the outer surface of the vehicle, including the top and underside of the vehicle; or in the case of a flat-bed style vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load or enclosure, if used, and on the lower external surface of the vehicle; and

(iii) 0.1 mSv/hr (10 mrem/hr) at any point 2 meters (m) (6.6 feet (ft)) from the outer lateral surfaces of the vehicle (excluding the top and underside of the

vehicle); or in the case of a flat-bed style vehicle, at any point 2 m (6.6 ft) from the vertical planes projected by the outer edges of the vehicle (excluding the top and underside of the vehicle); and

(iv) 0.02 mSv/hr (2 mrem/hr) in any normally occupied space, except that this provision does not apply to private carriers, if exposed personnel under their control wear radiation dosimetry devices in conformance with §289.202(q) of this title;

(C) For shipments made in accordance with the provisions of subparagraph (B) of this paragraph, the shipper shall provide specific written instructions to the carrier for maintenance of the exclusive use shipment controls. The instructions shall be included with the shipping paper information.

(D) The written instructions required for exclusive use shipments shall be sufficient so that, when followed, they will cause the carrier to avoid actions that will unnecessarily delay delivery or unnecessarily result in increased radiation levels or radiation exposures to transport workers or members of the general public.

(11) a package shall be designed, constructed, and prepared for transport so that in still air at 38 degrees Celsius (100 degrees Fahrenheit) and in the shade, no accessible surface of a package would have a temperature exceeding 50 degrees Celsius (122 degrees Fahrenheit) in a nonexclusive use shipment, or 85 degrees Celsius (185 degrees Fahrenheit) in an exclusive use shipment. Accessible package surface temperatures shall not exceed these limits at any time during transportation.

(m) Air transport of plutonium.

(1) Notwithstanding the provisions of any general licenses and notwithstanding any exemptions stated directly in this section or included indirectly by citation of Title 49, CFR, Chapter I, as may be applicable, the licensee shall assure that plutonium in any form, whether for import, export, or domestic shipment, is not transported by air or delivered to a carrier for air transport unless:

(A) the plutonium is contained in a medical device designed for individual human application; or

(B) the plutonium is contained in a material in which the specific activity is less than or equal to the activity concentration values for plutonium specified in Table 257-4 of subsection (aa)(7) of this section, and in which the radioactivity is essentially uniformly distributed; or

(C) the plutonium is shipped in a single package containing no more than an $A_2$ quantity of plutonium in any isotope or form, and is shipped in accordance with subsection (e) of this section; or

(D) the plutonium is shipped in a package specifically authorized for the shipment of plutonium by air in the Certificate of Compliance for that package issued by the NRC.

(2) Nothing in paragraph (1) of this subsection is to be interpreted as removing or diminishing the requirements of Title 10, CFR, §73.24.

(3) For a shipment of plutonium by air which is subject to paragraph (1) of this subsection, the licensee shall, through special arrangement with the carrier, require compliance with Title 49, CFR, §175.704, DOT regulations applicable to the air transport of plutonium.

(n) Opening instructions. Before delivery of a package to a carrier for transport, the licensee shall ensure that any special instructions needed to safely open the package have been sent to, or otherwise made available to, the consignee for the consignee's use in accordance with §289.202(ee)(5) of this title.

(o) Records. For a period of three years after shipment, each licensee shall maintain, for inspection by the agency, a record of each shipment of radioactive material showing the following where applicable:

(1) identification of the packaging by model number and serial number;

(2) verification that there are no significant defects in the packaging, as shipped;

(3) type and quantity of radioactive material in each package, and the total quantity of each shipment;

(4) date of the shipment;

(5) for fissile packages and for Type B packages, any special controls exercised;

(6) name and address of the transferee;

(7) address to which the shipment was made; and

(8) surveys performed to determine compliance with subsection (l)(9) and (10) of this section.

(p) Reports. The shipper shall immediately report by telephone, telegram, mailgram, or facsimile, all radioactive waste transportation accidents to the agency and the local emergency planning committees in the county where the radioactive waste accident occurs. All other accidents involving radioactive material shall be reported in accordance with §289.202(xx) and (yy) of this title.

(q) Advance notification of transport of irradiated reactor fuel and certain radioactive waste.

(1) As specified in paragraphs (2)-(4) of this subsection, each licensee shall provide advance notification to the governor of a state, or the governor's designee, of the shipment of radioactive waste, through, or across the boundary of the state, before the transport, or delivery to a carrier, for transport, of radioactive waste outside the confines of the licensee's facility or other place of use or storage.

(2) Advance notification is required in accordance with this section for shipment of irradiated reactor fuel in quantities less than that subject to advance notification requirements of Title 10, CFR, §73.37. Advanced notification is also required under this subsection for shipments of radioactive material, other than irradiated fuel, meeting the following three conditions:

(A) the radioactive waste is required by this section to be in Type B packaging for transportation;

(B) the radioactive waste is being transported to or across a state boundary en route to a disposal facility or to a collection point for transport to a disposal facility; and

(C) the quantity of radioactive waste in a single package exceeds the least of the following:

(i) 3000 times the $A_1$ value of the radionuclides as specified in subsection (aa) of this section for special form radioactive material;

(ii) 3000 times the $A_2$ value of the radionuclides as specified in subsection (aa) of this section for normal form radioactive material; or

(iii) 1000 terabecquerels (TBq) (27,000 curies (Ci)).

(3) The following are procedures for submitting advance notification:

(A) The notification shall be made in writing to the office of each appropriate governor or governor’s designee and to the agency.

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

(C) A notification delivered by any other means than mail shall reach the office of the governor or of the governor’s designee at least four days before the beginning of the seven-day period during which departure of the shipment is estimated to occur.

(i) A list of the names and mailing addresses of the governors’ designees receiving advance notification of transportation of radioactive waste was published in the Federal Register on June 30, 1995 (60 FR 34306).

(ii) The list will be published annually in the Federal Register on or about June 30 to reflect any changes in information.

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

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

(4) Each advance notification of shipment of irradiated reactor fuel or radioactive waste shall contain the following information:

(A) the name, address, and telephone number of the shipper, carrier, and receiver of the irradiated reactor fuel or radioactive waste shipment;

(B) a description of the irradiated reactor fuel or radioactive waste contained in the shipment, as specified in the regulations of DOT in Title 49, CFR, §172.202 and §172.203(d);

(C) the point of origin of the shipment and the seven-day period during which departure of the shipment is estimated to occur;

(D) the seven-day period during which arrival of the shipment at state boundaries is estimated to occur;

(E) the destination of the shipment, and the seven-day period during which arrival of the shipment is estimated to occur; and

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

(5) A licensee who finds that schedule information previously furnished to a governor or governor's designee, in accordance with this section, will not be met, shall telephone a responsible individual in the office of the governor of the state or of the governor's designee and inform that individual of the extent of the delay beyond the schedule originally reported. The licensee shall maintain a record of the name of the individual contacted for three years.

(6) The following are procedures for a cancellation notice.

(A) Each licensee who cancels an irradiated reactor fuel or radioactive waste shipment for which advance notification has been sent shall send a cancellation notice to the governor of each state or to the governor's designee previously notified, and to the agency.

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

(r) Emergency plan. Each shipper and transporter of radioactive waste shall adopt an emergency plan approved by the agency for responding to transportation accidents.

(s) Inspections. Each shipment of LLRW to a licensed land disposal facility in Texas shall be inspected by the agency prior to shipment. The waste shipper shall notify the agency no less than 72 hours prior to the scheduled shipment of the intent to transport waste to the licensed land disposal facility.

(t) Quality assurance requirements.

(1) Purpose. This subsection describes quality assurance requirements applying to design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, and modification of components of packaging that are important to safety.

(A) Quality Assurance comprises all those planned and systematic actions necessary to provide adequate confidence that a system or component will perform satisfactorily in service.

(B) Quality assurance includes quality control, which comprises those quality assurance actions related to control of the physical characteristics and quality of the material or component to predetermined requirements.

(C) The license, certificate holder, and applicant for a CoC are responsible for the following:

(i) the quality assurance requirements as they apply to design, fabrication, testing, and modification of packaging; and

(ii) the quality assurance provision which applies to its use of a packaging for the shipment of licensed material subject to this subpart.

(2) Establishment of program. Each licensee, certificate holder, and applicant for a CoC shall:

(A) Establish, maintain, and execute a quality assurance program satisfying each of the applicable criteria of this subsection, subsections (t) and (u) of this section and Title 10, CFR, §§71.101 through 71.137 and satisfying any specific provisions that are applicable to the licensee's activities including procurement of packaging; and

(B) Execute the applicable criteria in a graded approach to an extent that is commensurate with the quality assurance requirement's importance to safety.

(3) Approval of program. Before the use of any package for the shipment of licensed material subject to this subsection, each licensee shall:

(A) obtain agency approval of its quality assurance program; and

(B) file a description of its quality assurance program, including a discussion of which requirements of this subsection and subsections (u) and (v) are applicable and how they will be satisfied.

(4) Radiography containers. A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers, or packages transporting these devices and meeting the requirements of §289.255(m) of this title, is deemed to satisfy the requirements of subsection (i)(B) of this section and paragraph (2) of this subsection.

(u) Quality assurance organization. The licensee, certificate holder, and applicant for a CoC shall:

(1) be responsible for the establishment and execution of the quality assurance program. The licensee, certificate holder, and applicant for a CoC may delegate to others, such as contractors, agents, or consultants, the work of establishing and executing the quality assurance program, or any part of the quality assurance program, but shall retain responsibility for the program; and

(2) clearly establish and delineate, in writing, the authority and duties of persons and organizations performing activities affecting the functions of structures, systems, and components that are important to safety. These activities include performing the functions associated with attaining quality objectives and the quality assurance functions.

(3) establish quality assurance functions as follows:

(A) assuring that an appropriate quality assurance program is established and effectively executed; and

(B) verifying , by procedures such as checking, auditing, and inspection, that activities affecting the functions that are important to safety have been correctly performed.

(4) assure that persons and organizations performing quality assurance functions have sufficient authority and organizational freedom to:

(A) identify quality problems;

(B) initiate, recommend, or provide solutions; and

(C) verify implementation of solutions.

(v) Quality assurance program. A quality assurance program shall be maintained as follows:

(1) The licensee, certificate holder, and applicant for a CoC shall:

(A) establish, at the earliest practicable time consistent with the schedule for accomplishing the activities, a quality assurance program that complies with the requirements of this section and Title 10, CFR, §§71.01 through 71.137;

(B) document the quality assurance program by written procedures or instructions and shall carry out the program in accordance with those procedures throughout the period during which the packaging is used; and

(C) identify the material and components to be covered by the quality assurance program, the major organizations participating in the program, and the designated functions of these organizations.

(2) The licensee, certificate holder, and applicant for a CoC, through its quality assurance program, shall:

(A) provide control over activities affecting the quality of the identified materials and components to an extent consistent with their importance to safety, and as necessary to assure conformance to the approved design of each individual package used for the shipment of radioactive material;

(B) assure that activities affecting quality are accomplished under suitable controlled conditions which include:

(i) the use of appropriate equipment;

(ii) suitable environmental conditions for accomplishing the activity, such as adequate cleanliness; and

(iii) all prerequisites for the given activity have been satisfied; and

(C) take into account the need for special controls, processes, test equipment, tools, and skills to attain the required quality, and the need for verification of quality by inspection and test.

(3) The licensee, certificate holder, and applicant for a CoC shall base the requirements and procedures of its quality assurance program on the following considerations concerning the complexity and proposed use of the package and its components.

(A) The impact of malfunction or failure of the item to safety;

(B) The design and fabrication complexity or uniqueness of the item;

(C) The need for special controls and surveillance over processes and equipment;

(D) The degree to which functional compliance can be demonstrated by inspection or test; and

(E) The quality history and degree of standardization of the item.

(4) The licensee, certificate holder, and applicant for a CoC shall provide for indoctrination and training of personnel performing activities affecting quality, as necessary to assure that suitable proficiency is achieved and maintained.

(5) The licensee, certificate holder, and applicant for a CoC shall review the status and adequacy of the quality assurance program at established intervals. Management of other organizations participating in the quality assurance program shall review regularly the status and adequacy of that part of the quality assurance program they are executing.

(w) Quality control program. Each shipper shall adopt a quality control program to include verification of the following to ensure that shipping containers are suitable for shipments to a licensed disposal facility:

(1) identification of appropriate container(s);

(2) container testing documentation is adequate;

(3) appropriate container used;

(4) container packaged appropriately;

(5) container labeled appropriately;

(6) manifest filled out appropriately; and

(7) documentation maintained of each step.

(x) Audits. The licensee, certificate holder, and applicant for a CoC shall carry out a comprehensive system of planned and periodic audits, to verify compliance with all aspects of the quality assurance program, and to determine the effectiveness of the program. The audit program shall include:

(1) performance in accordance with written procedures or checklists by appropriately trained personnel not having direct responsibilities in the area being audited;

(2) documented results that are reviewed by management having responsibility in the area audited; and

(3) follow-up action, including reaudit of deficient areas, shall be taken where indicated.

(y) Transfer for disposal and manifests.

(1) The requirements of this section and subsection (bb) of this section are designed to:

(A) control transfers of LLRW by any waste generator, waste collector, or waste processor licensee, as defined in this section, who ships LLRW either directly, or indirectly through a waste collector or waste processor, to a licensed LLRW land disposal facility, as defined in §289.201(b) of this title;

(B) establish a manifest tracking system; and

(C) supplement existing requirements concerning transfers and recordkeeping for those wastes.

(2) Beginning March 1, 1998, all affected licensees shall use subsection (bb) of this section.

(3) Each shipment of LLRW intended for disposal at a licensed land disposal facility shall be accompanied by a shipment manifest in accordance with subsection (bb)(1) of this section.

(4) Any licensee shipping LLRW intended for ultimate disposal at a licensed land disposal facility shall document the information required on the uniform manifest and transfer this recorded manifest information to the intended consignee in accordance with subsection (bb) of this section.

(5) Each shipment manifest shall include a certification by the waste generator as specified in subsection (bb)(10) of this section, as appropriate.

(6) Each person involved in the transfer for disposal and disposal of LLRW, including the waste generator, waste collector, waste processor, and disposal facility operator, shall comply with the requirements specified in subsection (bb) of this section, as appropriate.

(7) Any licensee shipping LLRW to a licensed Texas LLRW disposal facility shall comply with the waste acceptance criteria in 30 Texas Administrative Code (TAC) Part 1, Chapter 336.

(z) Fees

(1) Each shipper shall be assessed a fee for shipments of LLRW originating in Texas or originating out-of-state being shipped to a licensed Texas LLRW disposal facility and these fees shall be:

(A) $10 per cubic foot of shipped LLRW;

(B) collected by the compact waste disposal facility and remitted to the TCEQ and deposited to the credit of the radiation and perpetual care account**;** and

(C) used exclusively by the agency for emergency planning for and response to transportation accidents involving LLRW.

(2) Fee assessments in accordance with this section shall be suspended when the amount of fees collected reaches $500,000, except that if the balance of fees collected is reduced to $350,000 or less, the assessments shall be reinstituted to bring the balance of fees collected to $500,000.

(3) Money expended from the radiation and perpetual care account to respond to accidents involving LLRW shall be reimbursed to the radiation and perpetual care account by the responsible shipper or transporter according to rules adopted by the board.

(aa) Appendices for determination of $A_1$ and $A_2$

(1) Values of $A_1$ and $A_2$. Values of $A_1$ and $A_2$ for individual radionuclides, which are the bases for many activity limits elsewhere in these rules are given in Table 257-3 of paragraph (6) of this subsection. The curie (Ci) values specified are obtained by converting from the terabecquerel (TBq) figure. The Terabecquerel values are the regulatory standard. The curie values are for information only and are not intended to be the regulatory standard. Where values of $A_1$ or $A_2$ are unlimited, it is for radiation control purposes only. For nuclear criticality safety, some materials are subject to controls placed on fissile material.

(2) Values of radionuclides not listed.

(A) For individual radionuclides whose identities are known, but are not listed in Table 257-3 of paragraph (6) of this subsection, the $A_1$ and $A_2$ values contained in Table 257-5 of paragraph (8) of this subsection may be used. Otherwise, the licensee shall obtain prior NRC approval of the $A_1$ and $A_2$ values for radionuclides not listed in Table 257-3 of paragraph (6) of this subsection, before shipping the material.

(B) For individual radionuclides whose identities are known, but that are not listed in Table 257-4 of paragraph (7) of this subsection, the exempt material activity concentration and exempt consignment activity values contained in Table 257-5 of paragraph (8) of this subsection may be used. Otherwise, the licensee shall obtain prior approval of the exempt material activity concentration and exempt consignment activity values, for radionuclides not listed in Table 257-3 of paragraph (6) of this subsection, before shipping the material.

(C) The licensee shall submit requests for prior approval, described in subparagraphs (A) and (B) of this paragraph to the agency.

(3) Calculations of $A_1$ and $A_2$ for a radionuclide not in Table 257-3 of paragraph (6) of this subsection. In the calculations of $A_1$ and $A_2$ for a radionuclide not in Table 257-3 of paragraph (6) of this subsection, a single radioactive decay chain, in which radionuclides are present in their naturally occurring proportions, and in which no daughter radionuclide has a half-life either longer than ten days, or longer than that of the parent radionuclide, shall be considered as a single radionuclide, and the activity to be taken into account and the $A_1$ or $A_2$ value to be applied shall be those corresponding to the parent radionuclide of that chain. In the case of radioactive decay chains in which any daughter radionuclide has a half-life either longer than ten days, or greater than that of the parent radionuclide, the parent and those daughter radionuclides shall be considered as mixtures of different radionuclides.

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

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

Figure: 25 TAC §289.257(aa)(4)(A)

(B) For normal form radioactive material, the maximum quantity transported in a Type A package is as follows:

Figure: 25 TAC §289.257(aa)(4)(B)

(C) Alternatively, an $A_1$ value for mixtures of special form material may be determined as follows:

Figure: 25 TAC §289.257(aa)(4)(C)

(D) An $A_2$ value for mixtures of normal form material may be determined as follows:

Figure: 25 TAC §289.257(aa)(4)(D)

(E) The exempt activity concentration for mixtures of nuclides may be determined as follows:

Figure: 25 TAC §289.257(aa)(4)(E)

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

Figure: 25 TAC §289.257(aa)(4)(F)

(5) Determination when activities of some of the radionuclides are not known. When the identity of each radionuclide is known, but the individual activities of some of the radionuclides are not known, the radionuclides may be grouped and the lowest $A_1$ or $A_2$ value, as appropriate, for the radionuclides in each group may be used in applying the formulas in paragraph (4) of this subsection. Groups may be based on the total alpha activity and the total beta/gamma activity when these are known, using the lowest $A_1$ or $A_2$ values for the alpha emitters and beta/gamma emitters.

(6) $A_1$ and $A_2$ values for radionuclides. The following Table 257-3 contains $A_1$ an $A_2$ values for radionuclides:

Figure: 25 TAC §289.257(aa)(6)

(7) Exempt material activity concentrations and exempt consignment activity limits for radionuclides. The following Table 257-4 contains exempt material activity concentrations and exempt consignment activity limits for radionuclides:

Figure: 25 TAC §289.257(aa)(7)

(8) General values for $A_1$ and $A_2$. The following Table 257-5 contains general values for $A_1$ and $A_2$:

Figure: 25 TAC §289.257(aa)(8)

(9) Activity-mass relationships for uranium. The following Table 257-6 contains activity-mass relationships for uranium:

Figure: 25 TAC §289.257(aa)(9)

(bb) Appendices for the requirements for transfers of LLRW intended for disposal at licensed land disposal facilities and manifests.

(1) Manifest. A waste generator, collector, or processor who transports, or offers for transportation, LLRW intended for ultimate disposal at a licensed LLRW land disposal facility shall prepare a manifest reflecting information requested on applicable BRC Forms 540 (Uniform Low-Level Radioactive Waste Manifest (Shipping Paper)) and 541 (Uniform Low-Level Radioactive Waste Manifest (Container and Waste Description)) and, if necessary, on an applicable BRC Form 542 (Uniform Low-Level Radioactive Waste Manifest (Manifest Index and Regional Compact Tabulation)) or their equivalent. BRC Forms 540 and 540A shall be completed and shall physically accompany the pertinent LLRW shipment. Upon agreement between shipper and consignee, BRC Forms 541, 541A and 541B, and 542 and 542A may be completed, transmitted, and stored in electronic media with the capability for producing legible, accurate, and complete records on the respective forms. Licensees are not required by the agency to comply with the manifesting requirements of this section when they ship:

(A) LLRW for processing and expect its return (i.e., for storage in accordance with their license) prior to disposal at a licensed land disposal facility;

(B) LLRW that is being returned to the licensee who is the waste generator or generator, as defined in this section; or

(C) radioactively contaminated material to a waste processor that becomes the processor's residual waste.

(2) Form instructions. For guidance in completing these forms, refer to the instructions that accompany the forms. Copies of manifests required by this subsection may be legible carbon copies, photocopies, or computer printouts that reproduce the data in the format of the uniform manifest.

(3) Forms. BRC Forms 540, 540A, 541, 541A, 541B, 542 and 542A, and the accompanying instructions, in hard copy, may be obtained from the agency.

(4) Information requirements of the DOT. This subsection includes information requirements of the DOT, as codified in Title 49, CFR, Part 172. Information on hazardous, medical, or other waste, required to meet EPA regulations, as codified in Title 40, CFR, Parts 259 and 261 or elsewhere, is not addressed in this section, and shall be provided on the required EPA forms. However, the required EPA forms shall accompany the uniform manifest required by this section.

(5) General information. The shipper of the LLRW, shall provide the following information on the uniform manifest:

(A) the name, facility address, and telephone number of the licensee shipping the waste;

(B) an explicit declaration indicating whether the shipper is acting as a waste generator, collector, processor, or a combination of these identifiers for purposes of the manifested shipment; and

(C) the name, address, and telephone number, or the name and EPA identification number for the carrier transporting the waste.

(6) Shipment information. The shipper of the LLRW shall provide the following information regarding the waste shipment on the uniform manifest:

(A) the date of the waste shipment;

(B) the total number of packages/disposal containers;

(C) the total disposal volume and disposal weight in the shipment;

(D) the total radionuclide activity in the shipment;

(E) the activity of each of the radionuclides hydrogren-3, carbon-14, technetium-99, iodine-129, radium-226 contained in the shipment; and

(F) the total masses of uranium-233, uranium-235, and plutonium in special nuclear material, and the total mass of uranium and thorium in source material.

(7) Disposal container and waste information. The shipper of the LLRW shall provide the following information on the uniform manifest regarding the waste and each disposal container of waste in the shipment:

(A) an alphabetic or numeric identification that uniquely identifies each disposal container in the shipment;

(B) a physical description of the disposal container, including the manufacturer and model of any high integrity container;

(C) the volume displaced by the disposal container;

(D) the gross weight of the disposal container, including the waste;

(E) for waste consigned to a disposal facility, the maximum radiation level at the surface of each disposal container;

(F) a physical and chemical description of the waste;

(G) the total weight percentage of chelating agent for any waste containing more than 0.1% chelating agent by weight, plus the identity of the principal chelating agent;

(H) the approximate volume of waste within a container;

(I) the sorbing or solidification media, if any, and the identity of the solidification media vendor and brand name;

(J) the identities and activities of individual radionuclides contained in each container, the masses of uranium-233, uranium-235, and plutonium in special nuclear material, and the masses of uranium and thorium in source material. For discrete waste types (i.e., activated materials, contaminated equipment, mechanical filters, sealed source/devices, and wastes in solidification/stabilization media), the identities and activities of individual radionuclides associated with or contained on these waste types within a disposal container shall be reported;

(K) the total radioactivity within each container; and

(L) for wastes consigned to a disposal facility, the classification of the waste in accordance with §289.202(ggg)(4)(A) of this title. Waste not meeting the structural stability requirements of §289.202(ggg)(4)(B)(ii) of this title shall be identified.

(8) Uncontainerized waste information. The shipper of the LLRW shall provide the following information on the uniform manifest regarding a waste shipment delivered without a disposal container:

(A) the approximate volume and weight of the waste;

(B) a physical and chemical description of the waste;

(C) the total weight percentage of chelating agent if the chelating agent exceeds 0.1% by weight, plus the identity of the principal chelating agent;

(D) for waste consigned to a disposal facility, the classification of the waste in accordance with §289.202(ggg)(4)(A) of this title. Waste not meeting the structural stability requirements of §289.202(ggg)(4)(B)(ii) of this title shall be identified;

(E) the identities and activities of individual radionuclides contained in the waste, the masses of uranium-233, uranium-235, and plutonium in special nuclear material, and the masses of uranium and thorium in source material; and

(F) for wastes consigned to a disposal facility, the maximum radiation levels at the surface of the waste.

(9) Multi-generator disposal container information. This paragraph applies to disposal containers enclosing mixtures of waste originating from different generators. (Note: The origin of the LLRW resulting from a processor's activities may be attributable to one or more generators (including waste generators) as defined in this section). It also applies to mixtures of wastes shipped in an uncontainerized form, for which portions of the mixture within the shipment originate from different generators.

(A) For homogeneous mixtures of waste, such as incinerator ash, provide the waste description applicable to the mixture and the volume of the waste attributed to each generator.

(B) For heterogeneous mixtures of waste, such as the combined products from a large compactor, identify each generator contributing waste to the disposal container, and, for discrete waste types (i.e., activated materials, contaminated equipment, mechanical filters, sealed source/devices, and wastes in solidification/stabilization media), the identities and activities of individual radionuclides contained on these waste types within the disposal container. For each generator, provide the following:

(i) the volume of waste within the disposal container;

(ii) a physical and chemical description of the waste, including the solidification agent, if any;

(iii) the total weight percentage of chelating agents for any disposal container containing more than 0.1% chelating agent by weight, plus the identity of the principal chelating agent;

(iv) the sorbing or solidification media, if any, and the identity of the solidification media vendor and brand name if the media is claimed to meet stability requirements in §289.202(ggg)(4)(B)(ii) of this title; and

(v) radionuclide identities and activities contained in the waste, the masses of uranium-233, uranium-235, and plutonium in special nuclear material, and the masses of uranium and thorium in source material if contained in the waste.

(10) Certification. An authorized representative of the waste generator, processor, or collector shall certify by signing and dating the shipment manifest that the transported materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the DOT and the agency. A collector in signing the certification is certifying that nothing has been done to the collected waste that would invalidate the waste generator's certification.

(11) Control and tracking.

(A) Any licensee who transfers LLRW to a land disposal facility or a licensed waste collector shall comply with the requirements in clauses (i) - (ix) of this subparagraph. Any licensee who transfers waste to a licensed waste processor for waste treatment or repackaging shall comply with the requirements of clauses (iv) - (ix) of this subparagraph. A licensee shall:

(i) prepare all wastes so that the waste is classified according to §289.202(ggg)(4)(A) of this title and meets the waste characteristic requirements in §289.202(ggg)(4)(B) of this title;

(ii) label each disposal container (or transport package if potential radiation hazards preclude labeling of the individual disposal container) of waste to identify whether it is Class A waste, Class B waste, Class C waste, or greater than Class C waste, in accordance with §289.202(ggg)(4)(A) of this title;

(iii) conduct a quality assurance program to assure compliance with §289.202(ggg)(4)(A) and (B) of this title;

(iv) prepare the uniform manifest as required by this subsection;

(v) forward a copy or electronically transfer the uniform manifest to the intended consignee so that either:

(I) receipt of the manifest precedes the LLRW shipment; and

(II) the manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both subclauses (I) and (II) of this clause are also acceptable;

(vi) include the uniform manifest with the shipment regardless of the option chosen in clause (v) of this clause;

(vii) receive acknowledgement of the receipt of the shipment in the form of a signed copy of the uniform manifest;

(viii) retain a copy of or electronically store the uniform manifest and documentation of acknowledgement of receipt as the record of transfer of radioactive material as required by §289.251 of this title, §289.252 of this title, and §289.254 of this title; and

(ix) for any shipments or any part of a shipment for which acknowledgement of receipt has not been received within the times set forth in this subsection, conduct an investigation in accordance with subparagraph (D) of this paragraph.

(B) Any waste collector licensee who handles only prepackaged waste shall:

(i) acknowledge receipt of the waste from the shipper within one week of receipt by returning a signed copy of the uniform manifest;

(ii) prepare a new uniform manifest to reflect consolidated shipments that meet the requirements of this subsection. The waste collector shall ensure that, for each container of waste in the shipment, the uniform manifest identifies the generator of that container of waste;

(iii) forward a copy or electronically transfer the uniform manifest to the intended consignee so that either:

(I) receipt of the uniform manifest precedes the LLRW shipment; or

(II) the uniform manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both subclauses (I) and (II) of this clause are also acceptable;

(iv) include the uniform manifest with the shipment regardless of the option chosen in clause (iii) of this subparagraph**;**

(v) receive acknowledgement of the receipt of the shipment in the form of a signed copy of the uniform manifest;

(vi) retain a copy of or electronically store the uniform manifest and documentation of acknowledgement of receipt as the record of transfer of radioactive material as required by §289.251 of this title, §289.252 of this title, and §289.254 of this title;

(vii) for any shipments or any part of a shipment for which acknowledgement of receipt has not been received within the times set forth in accordance with this clause, conduct an investigation in accordance with subparagraph (D) of this paragraph; and

(viii) notify the shipper and the agency when any shipment, or part of a shipment, has not arrived within 60 days after receipt of an advance uniform manifest, unless notified by the shipper that the shipment has been cancelled.

(C) Any licensed waste processor who treats or repackages waste shall:

(i) acknowledge receipt of the waste from the shipper within one week of receipt by returning a signed copy of the uniform manifest;

(ii) prepare a new uniform manifest that meets the requirements of this subsection. Preparation of the new uniform manifest reflects that the processor is responsible for meeting these requirements. For each container of waste in the shipment, the manifest shall identify the waste generators, the preprocessed waste volume, and the other information as required in clause (i) of this subparagraph;

(iii) prepare all wastes so that the waste is classified according to §289.202(ggg)(4)(A) of this title and meets the waste characteristics requirements in §289.202(ggg)(4)(B) of this title;

(iv) label each package of waste to identify whether it is Class A waste, Class B waste, or Class C waste, in accordance with §289.202(ggg)(4)(A) and (C) of this title;

(v) conduct a quality assurance program to assure compliance with §289.202(ggg)(4)(A) and (B) of this title;

(vi) forward a copy or electronically transfer the uniform manifest to the intended consignee so that either:

(I) receipt of the uniform manifest precedes the LLRW shipment; or

(II) the uniform manifest is delivered to the consignee with the waste at the time the waste is transferred to the consignee. Using both subclause (I) of this clause and this subclause is also acceptable;

(vii) include the uniform manifest with the shipment regardless of the option chosen in clause (vi) of this subparagraph;

(viii) receive acknowledgement of the receipt of the shipment in the form of a signed copy of the uniform manifest;

(ix) retain a copy of or electronically store the uniform manifest and documentation of acknowledgement of receipt as the record of transfer of radioactive material as required by §289.251 of this title, §289.252 of this title, and §289.254 of this title;

(x) for any shipment or any part of a shipment for which acknowledgement of receipt has not been received within the times set forth in accordance with this clause, conduct an investigation in accordance with clause (v) of this subparagraph; and

(xi) notify the shipper and the agency when any shipment, or part of a shipment, has not arrived within 60 days after receipt of an advance uniform manifest, unless notified by the shipper that the shipment has been cancelled.

(D) Any shipment or part of a shipment for which acknowledgement is not received within the times set forth in accordance with this section shall undergo the following:

(i) be investigated by the shipper if the shipper has not received notification or receipt within 20 days after transfer; and

(ii) be traced and reported. The investigation shall include tracing the shipment and filing a report with the agency. Each licensee who conducts a trace investigation shall file a written report with the agency within two weeks of completion of the investigation.

Figure: 25 TAC §289257(i)(5)(E)(i)

$$CSI = 10\left[\frac{grams^{235}U}{X} + \frac{grams^{233}U}{Y} + \frac{gramsPu}{Z}\right]$$

Figure: 25 TAC §289.257(i)(5)(E)(iii)

---

Table 257-1
Mass Limits for General License Packages Containing Mixed Quantities of Fissile Material or Uranium-235 of Unknown Enrichment per §289.257(i)(5)(E)

| Fissile Material | Fissile material mass mixed with moderating substances having an average hydrogen density less than or equal to $H_2O$. (grams) | Fissile material mass mixed with moderating substances having an average hydrogen density greater than $H_2O$ [a]. (grams) |
|---|---|---|
| $^{235}U$ (X)..... | 60 | 38 |
| $^{233}U$ (Y)..... | 43 | 27 |
| $^{239}PU$ or $^{241}PU$ (Z)..... | 37 | 24 |

[a]When mixtures of moderating substances are present, the lower mass limits shall be used if more than 15% of the moderating substance has an average hydrogen density greater than $H_2O$.

---

Table 257-2
Mass Limits for General License Packages Containing Uranium-235 of Known Enrichment per §289.257(i)(5)(E)

| Uranium enrichment in weight percent of $^{235}U$ not exceeding | Fissile material mass of $^{235}U$ (X). (grams) |
|---|---|
| 24..... | 60 |
| 20..... | 63 |
| 15..... | 67 |
| 11..... | 72 |
| 10..... | 76 |
| 9.5..... | 78 |
| 9..... | 81 |

| | |
|---|---|
| 8.5..... | 82 |
| 8..... | 85 |
| 7.5..... | 88 |
| 7..... | 90 |
| 6.5..... | 93 |
| 6..... | 97 |
| 5.5..... | 102 |
| 5..... | 108 |
| 4.5..... | 114 |
| 4..... | 120 |
| 3.5..... | 132 |
| 3..... | 150 |
| 2.5..... | 180 |
| 2..... | 246 |
| 1.5..... | 408 |
| 1.35..... | 480 |
| 1..... | 1,020 |
| 0.92..... | 1,800 |

Figure: 25 TAC §289.257(i)(6)(E)(i)

$$CSI = 10\left[\frac{grams^{232}Pu + grams^{241}Pu}{24}\right]; \text{ and}$$

Figure: 25 TAC §289.257(aa)(4)(A)

$$\sum_i \frac{B(i)}{A_1(i)} \leq 1$$

where B(i) is the activity of radionuclide I, and $A_1(i)$ is the $A_1$ value for radionuclide I.

Figure: 25 TAC §289.257(aa)(4)(B)

$$\sum_i \frac{B(i)}{A_2(i)} \leq 1$$

where B(i) is the activity of radionuclide I and $A_2(i)$ is the $A_2$ value for radionuclide I.

Figure: 25 TAC §289.257(aa)(4)(C)

$$A_1 \text{ for mixture} = \frac{1}{\sum_i \frac{f(i)}{A_1(i)}}$$

where f(i) is the fraction of activity of nuclide I in the mixture and $A_1(i)$ is the appropriate $A_1$ value for nuclide I.

Figure: 25 TAC §289.257(aa)(4)(D)

$$A_2 \text{ for mixture} = \frac{1}{\sum_i \frac{f(i)}{A_2(i)}}$$

where f(i) is the fraction of activity of nuclide I in the mixture and $A_2(i)$ is the appropriate $A_2$ value for nuclide I.

Figure: 25 TAC §289.257(aa)(4)(E)

$$\text{Exempt activity concentration for mixture} = \frac{1}{\sum \frac{f(i)}{[A](i)}}$$

**where f(i) is the fraction of activity concentration of radionuclide I in the mixture, and [A] is the activity concentration for exempt material containing radionuclide I.**

**Figure: 25 TAC §289.257(aa)(4)(F)**

$$\text{Exempt activity concentration for mixture} = \frac{1}{\sum \frac{f(i)}{A(i)}}$$

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

Table 257-3

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Ac-225 (a) | Actinium (89) | $8.0X10^{-1}$ | $2.2X10^{1}$ | $6.0X10^{-3}$ | $1.6X10^{-1}$ | $2.1X10^{3}$ | $5.8X10^{4}$ |
| Ac-227 (a) | | $9.0X10^{-1}$ | $2.4X10^{1}$ | $9.0X10^{-5}$ | $2.4X10^{-3}$ | 2.7 | $7.2X10^{1}$ |
| Ac-228 | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $8.4X10^{4}$ | $2.2X10^{6}$ |
| Ag-105 | Silver (47) | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $1.1X10^{3}$ | $3.0X10^{4}$ |
| Ag-108m (a) | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $9.7X10^{-1}$ | $2.6X10^{1}$ |
| Ag-110m (a) | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.8X10^{2}$ | $4.7X10^{3}$ |
| Ag-111 | | 2.0 | $5.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $5.8X10^{3}$ | $1.6X10^{5}$ |
| Al-26 | Aluminum (13) | $1.0X10^{-1}$ | 2.7 | $1.0X10^{-1}$ | 2.7 | $7.0X10^{-4}$ | $1.9X10^{-2}$ |
| Am-241 | Americium (95) | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $1.3X10^{-1}$ | 3.4 |
| Am-242m (a) | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $3.6X10^{-1}$ | $1.0X10^{1}$ |
| Am-243 (a) | | 5.0 | $1.4X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $7.4X10^{-3}$ | $2.0X10^{-1}$ |
| Ar-37 | Argon (18) | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.7X10^{3}$ | $9.9X10^{4}$ |
| Ar-39 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{1}$ | $5.4X10^{2}$ | 1.3 | $3.4X10^{1}$ |
| Ar-41 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $1.5X10^{6}$ | $4.2X10^{7}$ |
| As-72 | Arsenic (33) | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $6.2X10^{4}$ | $1.7X10^{6}$ |
| As-73 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $8.2X10^{2}$ | $2.2X10^{4}$ |
| As-74 | | 1.0 | $2.7X10^{1}$ | $9.0X10^{-1}$ | $2.4X10^{1}$ | $3.7X10^{3}$ | $9.9X10^{4}$ |
| As-76 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $5.8X10^{4}$ | $1.6X10^{6}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| As-77 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $3.9X10^{4}$ | $1.0X10^{6}$ |
| At-211 (a) | Astatine (85) | $2.0X10^{1}$ | $5.4X10^{2}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $7.6X10^{4}$ | $2.1X10^{6}$ |
| Au-193 | Gold (79) | 7.0 | $1.9X10^{2}$ | 2.0 | $5.4X10^{1}$ | $3.4X10^{4}$ | $9.2X10^{5}$ |
| Au-194 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $1.5X10^{4}$ | $4.1X10^{5}$ |
| Au-195 | | $1.0X10^{1}$ | $2.7X10^{2}$ | 6.0 | $1.6X10^{2}$ | $1.4X10^{2}$ | $3.7X10^{3}$ |
| Au-198 | | 1.0 | $2.7X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $9.0X10^{3}$ | $2.4X10^{5}$ |
| Au-199 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $7.7X10^{3}$ | $2.1X10^{5}$ |
| Ba-131 (a) | Barium (56) | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $3.1X10^{3}$ | $8.4X10^{4}$ |
| Ba-133 | | 3.0 | $8.1X10^{1}$ | 3.0 | $8.1X10^{1}$ | 9.4 | $2.6X10^{2}$ |
| Ba-133m | | $2.0X10^{1}$ | $5.4X10^{2}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.2X10^{4}$ | $6.1X10^{5}$ |
| Ba-140 (a) | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $3.0X10^{-1}$ | 8.1 | $2.7X10^{3}$ | $7.3X10^{4}$ |
| Be-7 | Beryllium (4) | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.0X10^{1}$ | $5.4X10^{2}$ | $1.3X10^{4}$ | $3.5X10^{5}$ |
| Be-10 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $8.3X10^{-4}$ | $2.2X10^{-2}$ |
| Bi-205 | Bismuth (83) | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $1.5X10^{3}$ | $4.2X10^{4}$ |
| Bi-206 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $3.8X10^{3}$ | $1.0X10^{5}$ |
| Bi-207 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | 1.9 | $5.2X10^{1}$ |
| Bi-210 | | 1.0 | $2.7X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $4.6X10^{3}$ | $1.2X10^{5}$ |
| Bi-210m (a) | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $2.1X10^{-5}$ | $5.7X10^{-4}$ |
| Bi-212 (a) | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $5.4X10^{5}$ | $1.5X10^{7}$ |
| Bk-247 | Berkelium (97) | 8.0 | $2.2X10^{2}$ | $8.0X10^{-4}$ | $2.2X10^{-2}$ | $3.8X10^{-2}$ | 1.0 |

Figure: 25 TAC §289.257(aa)(6) Graphics- 6

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Bk-249 (a) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.0X10^{-1}$ | 8.1 | $6.1X10^{1}$ | $1.6X10^{3}$ |
| Br-76 | Bromine (35) | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $9.4X10^{4}$ | $2.5X10^{6}$ |
| Br-77 | | 3.0 | $8.1X10^{1}$ | 3.0 | $8.1X10^{1}$ | $2.6X10^{4}$ | $7.1X10^{5}$ |
| Br-82 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{4}$ | $1.1X10^{6}$ |
| C-11 | Carbon (6) | 1.0 | $2.7X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.1X10^{7}$ | $8.4X10^{8}$ |
| C-14 | | $4.0X10^{1}$ | $1.1X10^{3}$ | 3.0 | $8.1X10^{1}$ | $1.6X10^{-1}$ | 4.5 |
| Ca-41 | Calcium (20) | Unlimited | Unlimited | Unlimited | Unlimited | $3.1X10^{-3}$ | $8.5X10^{-2}$ |
| Ca-45 | | $4.0X10^{1}$ | $1.1X10^{3}$ | 1.0 | $2.7X10^{1}$ | $6.6X10^{2}$ | $1.8X10^{4}$ |
| Ca-47 (a) | | 3.0 | $8.1X10^{1}$ | $3.0X10^{-1}$ | 8.1 | $2.3X10^{4}$ | $6.1X10^{5}$ |
| Cd-109 | Cadmium (48) | $3.0X10^{1}$ | $8.1X10^{2}$ | 2.0 | $5.4X10^{1}$ | $9.6X10^{1}$ | $2.6X10^{3}$ |
| Cd-113m | | $4.0X10^{1}$ | $1.1X10^{3}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | 8.3 | $2.2X10^{2}$ |
| Cd-115 (a) | | 3.0 | $8.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.9X10^{4}$ | $5.1X10^{5}$ |
| Cd-115m | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $9.4X10^{2}$ | $2.5X10^{4}$ |
| Ce-139 | Cerium (58) | 7.0 | $1.9X10^{2}$ | 2.0 | $5.4X10^{1}$ | $2.5X10^{2}$ | $6.8X10^{3}$ |
| Ce-141 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.1X10^{3}$ | $2.8X10^{4}$ |
| Ce-143 | | $9.0X10^{-1}$ | $2.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.5X10^{4}$ | $6.6X10^{5}$ |
| Ce-144 (a) | | $2.0X10^{-1}$ | 5.4 | $2.0X10^{-1}$ | 5.4 | $1.2X10^{2}$ | $3.2X10^{3}$ |
| Cf-248 | Californium (98) | $4.0X10^{1}$ | $1.1X10^{3}$ | $6.0X10^{-3}$ | $1.6X10^{-1}$ | $5.8X10^{1}$ | $1.6X10^{3}$ |
| Cf-249 | | 3.0 | $8.1X10^{1}$ | $8.0X10^{-4}$ | $2.2X10^{-2}$ | $1.5X10^{-1}$ | 4.1 |
| Cf-250 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.0X10^{-3}$ | $5.4X10^{-2}$ | 4.0 | $1.1X10^{2}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Cf-251 | | 7.0 | $1.9X10^{2}$ | $7.0X10^{-4}$ | $1.9X10^{-2}$ | $5.9X10^{-2}$ | 1.6 |
| Cf-252 (h) | | $5.0X10^{-2}$ | 1.4 | $3.0X10^{-3}$ | $8.1X10^{-2}$ | $2.0X10^{1}$ | $5.4X10^{2}$ |
| Cf-253 (a) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{-2}$ | 1.1 | $1.1X10^{3}$ | $2.9X10^{4}$ |
| Cf-254 | | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $3.1X10^{2}$ | $8.5X10^{3}$ |
| Cl-36 | Chlorine (17) | $1.0X10^{1}$ | $2.7X10^{2}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.2X10^{-3}$ | $3.3X10^{-2}$ |
| Cl-38 | | $2.0X10^{-1}$ | 5.4 | $2.0X10^{-1}$ | 5.4 | $4.9X10^{6}$ | $1.3X10^{8}$ |
| Cm-240 | Curium (96) | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $7.5X10^{2}$ | $2.0X10^{4}$ |
| Cm-241 | | 2.0 | $5.4X10^{1}$ | 1.0 | $2.7X10^{1}$ | $6.1X10^{2}$ | $1.7X10^{4}$ |
| Cm-242 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $1.0X10^{-2}$ | $2.7X10^{-1}$ | $1.2X10^{2}$ | $3.3X10^{3}$ |
| Cm-243 | | 9.0 | $2.4X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $1.9X10^{-3}$ | $5.2X10^{1}$ |
| Cm-244 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.0X10^{-3}$ | $5.4X10^{-2}$ | 3.0 | $8.1X10^{1}$ |
| Cm-245 | | 9.0 | $2.4X10^{2}$ | $9.0X10^{-4}$ | $2.4X10^{-2}$ | $6.4X10^{-3}$ | $1.7X10^{-1}$ |
| Cm-246 | | 9.0 | $2.4X10^{2}$ | $9.0X10^{-4}$ | $2.4X10^{-2}$ | $1.1X10^{-2}$ | $3.1X10^{-1}$ |
| Cm-247 (a) | | 3.0 | $8.1X10^{1}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $3.4X10^{-6}$ | $9.3X10^{-5}$ |
| Cm-248 | | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $3.0X10^{-4}$ | $8.1X10^{-3}$ | $1.6X10^{-4}$ | $4.2X10^{-3}$ |
| Co-55 | Cobalt (27) | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $1.1X10^{5}$ | $3.1X10^{6}$ |
| Co-56 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $1.1X10^{3}$ | $3.0X10^{4}$ |
| Co-57 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | $3.1X10^{2}$ | $8.4X10^{3}$ |
| Co-58 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $1.2X10^{3}$ | $3.2X10^{4}$ |
| Co-58m | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.2X10^{5}$ | $5.9X10^{6}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Co-60 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.2X10^{1}$ | $1.1X10^{3}$ |
| Cr-51 | Chromium (24) | $3.0X10^{1}$ | $8.1X10^{2}$ | $3.0X10^{1}$ | $8.1X10^{2}$ | $3.4X10^{3}$ | $9.2X10^{4}$ |
| Cs-129 | Cesium (55) | 4.0 | $1.1X10^{2}$ | 4.0 | $1.1X10^{2}$ | $2.8X10^{4}$ | $7.6X10^{5}$ |
| Cs-131 | | $3.0X10^{1}$ | $8.1X10^{2}$ | $3.0X10^{1}$ | $8.1X10^{2}$ | $3.8X10^{3}$ | $1.0X10^{5}$ |
| Cs-132 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $5.7X10^{3}$ | $1.5X10^{5}$ |
| Cs-134 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $4.8X10^{1}$ | $1.3X10^{3}$ |
| Cs-134m | | $4.0X10^{1}$ | $1.1X10^{3}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.0X10^{5}$ | $8.0X10^{6}$ |
| Cs-135 | | $4.0X10^{1}$ | $1.1X10^{3}$ | 1.0 | $2.7X10^{1}$ | $4.3X10^{-5}$ | $1.2X10^{-3}$ |
| Cs-136 | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $2.7X10^{3}$ | $7.3X10^{4}$ |
| Cs-137 (a) | | 2.0 | $5.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | 3.2 | $8.7X10^{1}$ |
| Cu-64 | Copper (29) | 6.0 | $1.6X10^{2}$ | 1.0 | $2.7X10^{1}$ | $1.4X10^{5}$ | $3.9X10^{6}$ |
| Cu-67 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $2.8X10^{4}$ | $7.6X10^{5}$ |
| Dy-159 | Dysprosium (66) | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.1X10^{2}$ | $5.7X10^{3}$ |
| Dy-165 | | $9.0X10^{-1}$ | $2.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.0X10^{5}$ | $8.2X10^{6}$ |
| Dy-166 (a) | | $9.0X10^{-1}$ | $2.4X10^{1}$ | $3.0X10^{-1}$ | 8.1 | $8.6X10^{3}$ | $2.3X10^{5}$ |
| Er-169 | Erbium (68) | $4.0X10^{1}$ | $1.1X10^{3}$ | 1.0 | $2.7X10^{1}$ | $3.1X10^{3}$ | $8.3X10^{4}$ |
| Er-171 | | $8.0X10^{-1}$ | $2.2X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $9.0X10^{4}$ | $2.4X10^{6}$ |
| Eu-147 | Europium (63) | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $1.4X10^{3}$ | $3.7X10^{4}$ |
| Eu-148 | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $6.0X10^{2}$ | $1.6X10^{4}$ |
| Eu-149 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.0X10^{1}$ | $5.4X10^{2}$ | $3.5X10^{2}$ | $9.4X10^{3}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Eu-150 (short lived) | | 2.0 | $5.4X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $6.1X10^{4}$ | $1.6X10^{6}$ |
| Eu-150 (long lived) | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $6.1X10^{4}$ | $1.6X10^{6}$ |
| Eu-152 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | 6.5 | $1.8X10^{2}$ |
| Eu-152m | | $8.0X10^{-1}$ | $2.2X10^{1}$ | $8.0X10^{-1}$ | $2.2X10^{1}$ | $8.2X10^{4}$ | $2.2X10^{6}$ |
| Eu-154 | | $9.0X10^{-1}$ | $2.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | 9.8 | $2.6X10^{2}$ |
| Eu-155 | | $2.0X10^{1}$ | $5.4X10^{2}$ | 3.0 | $8.1X10^{1}$ | $1.8X10^{1}$ | $4.9X10^{2}$ |
| Eu-156 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $2.0X10^{3}$ | $5.5X10^{4}$ |
| F-18 | Fluorine (9) | 1.0 | $2.7X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.5X10^{6}$ | $9.5X10^{7}$ |
| Fe-52 (a) | Iron (26) | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $2.7X10^{5}$ | $7.3X10^{6}$ |
| Fe-55 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $8.8X10^{1}$ | $2.4X10^{3}$ |
| Fe-59 | | $9.0X10^{-1}$ | $2.4X10^{1}$ | $9.0X10^{-1}$ | $2.4X10^{1}$ | $1.8X10^{3}$ | $5.0X10^{4}$ |
| Fe-60 (a) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{-1}$ | 5.4 | $7.4X10^{-4}$ | $2.0X10^{-2}$ |
| Ga-67 | Gallium (31) | 7.0 | $1.9X10^{2}$ | 3.0 | $8.1X10^{1}$ | $2.2X10^{4}$ | $6.0X10^{5}$ |
| Ga-68 | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $1.5X10^{6}$ | $4.1X10^{7}$ |
| Ga-72 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.1X10^{5}$ | $3.1X10^{6}$ |
| Gd-146 (a) | Gadolinium (64) | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $6.9X10^{2}$ | $1.9X10^{4}$ |
| Gd-148 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.0X10^{-3}$ | $5.4X10^{-2}$ | 1.2 | $3.2X10^{1}$ |
| Gd-153 | | $1.0X10^{1}$ | $2.7X10^{2}$ | 9.0 | $2.4X10^{2}$ | $1.3X10^{2}$ | $3.5X10^{3}$ |
| Gd-159 | | 3.0 | $8.1X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.9X10^{4}$ | $1.1X10^{6}$ |
| Ge-68 (a) | Germanium (32) | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $2.6X10^{2}$ | $7.1X10^{3}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Ge-71 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $5.8X10^{3}$ | $1.6X10^{5}$ |
| Ge-77 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $1.3X10^{5}$ | $3.6X10^{6}$ |
| Hf-172 (a) | Hafnium (72) | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $4.1X10^{1}$ | $1.1X10^{3}$ |
| Hf-175 | | 3.0 | $8.1X10^{1}$ | 3.0 | $8.1X10^{1}$ | $3.9X10^{2}$ | $1.1X10^{4}$ |
| Hf-181 | | 2.0 | $5.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $6.3X10^{2}$ | $1.7X10^{4}$ |
| Hf-182 | | Unlimited | Unlimited | Unlimited | Unlimited | $8.1X10^{-6}$ | $2.2X10^{-4}$ |
| Hg-194 (a) | Mercury (80) | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $1.3X10^{-1}$ | 3.5 |
| Hg-195m (a) | | 3.0 | $8.1X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $1.5X10^{4}$ | $4.0X10^{5}$ |
| Hg-197 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | $9.2X10^{3}$ | $2.5X10^{5}$ |
| Hg-197m | | $1.0X10^{1}$ | $2.7X10^{2}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $2.5X10^{4}$ | $6.7X10^{5}$ |
| Hg-203 | | 5.0 | $1.4X10^{2}$ | 1.0 | $2.7X10^{1}$ | $5.1X10^{2}$ | $1.4X10^{4}$ |
| Ho-166 | Holmium (67) | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $2.6X10^{4}$ | $7.0X10^{5}$ |
| Ho-166m | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $6.6X10^{-2}$ | 1.8 |
| I-123 | Iodine (53) | 6.0 | $1.6X10^{2}$ | 3.0 | $8.1X10^{1}$ | $7.1X10^{4}$ | $1.9X10^{6}$ |
| I-124 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $9.3X10^{3}$ | $2.5X10^{5}$ |
| I-125 | | $2.0X10^{1}$ | $5.4X10^{2}$ | 3.0 | $8.1X10^{1}$ | $6.4X10^{2}$ | $1.7X10^{4}$ |
| I-126 | | 2.0 | $5.4X10^{1}$ | 1.0 | $2.7X10^{1}$ | $2.9X10^{3}$ | $8.0X10^{4}$ |
| I-129 | | Unlimited | Unlimited | Unlimited | Unlimited | $6.5X10^{-6}$ | $1.8X10^{-4}$ |
| I-131 | | 3.0 | $8.1X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $4.6X10^{3}$ | $1.2X10^{5}$ |
| I-132 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $3.8X10^{5}$ | $1.0X10^{7}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| I-133 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $4.2X10^{4}$ | $1.1X10^{6}$ |
| I-134 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $9.9X10^{5}$ | $2.7X10^{7}$ |
| I-135 (a) | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.3X10^{5}$ | $3.5X10^{6}$ |
| In-111 | Indium (49) | 3.0 | $8.1X10^{1}$ | 3.0 | $8.1X10^{1}$ | $1.5X10^{4}$ | $4.2X10^{5}$ |
| In-113m | | 4.0 | $1.1X10^{2}$ | 2.0 | $5.4X10^{1}$ | $6.2X10^{5}$ | $1.7X10^{7}$ |
| In-114m (a) | | $1.0X10^{1}$ | $2.7X10^{2}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $8.6X10^{2}$ | $2.3X10^{4}$ |
| In-115m | | 7.0 | $1.9X10^{2}$ | 1.0 | $2.7X10^{1}$ | $2.2X10^{5}$ | $6.1X10^{6}$ |
| Ir-189 (a) | Iridium (77) | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.9X10^{3}$ | $5.2X10^{4}$ |
| Ir-190 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $2.3X10^{3}$ | $6.2X10^{4}$ |
| Ir-192 (c) | | 1.0 | $2.7X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.4X10^{2}$ | $9.2X10^{3}$ |
| Ir-194 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $3.1X10^{4}$ | $8.4X10^{5}$ |
| K-40 | Potassium (19) | $9.0X10^{-1}$ | $2.4X10^{1}$ | $9.0X10^{-1}$ | $2.4X10^{1}$ | $2.4X10^{-7}$ | $6.4X10^{-6}$ |
| K-42 | | $2.0X10^{-1}$ | 5.4 | $2.0X10^{-1}$ | 5.4 | $2.2X10^{5}$ | $6.0X10^{6}$ |
| K-43 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.2X10^{5}$ | $3.3X10^{6}$ |
| Kr-81 | Krypton (36) | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $7.8X10^{-4}$ | $2.1X10^{-2}$ |
| Kr-85 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.5X10^{1}$ | $3.9X10^{2}$ |
| Kr-85m | | 8.0 | $2.2X10^{2}$ | 3.0 | $8.1X10^{1}$ | $3.0X10^{5}$ | $8.2X10^{6}$ |
| Kr-87 | | $2.0X10^{-1}$ | 5.4 | $2.0X10^{-1}$ | 5.4 | $1.0X10^{6}$ | $2.8X10^{7}$ |
| La-137 | Lanthanum (57) | $3.0X10^{1}$ | $8.1X10^{2}$ | 6.0 | $1.6X10^{2}$ | $1.6X10^{-3}$ | $4.4X10^{-2}$ |
| La-140 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $2.1X10^{4}$ | $5.6X10^{5}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Lu-172 | Lutetium (71) | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $4.2X10^{3}$ | $1.1X10^{5}$ |
| Lu-173 | | 8.0 | $2.2X10^{2}$ | 8.0 | $2.2X10^{2}$ | $5.6X10^{1}$ | $1.5X10^{3}$ |
| Lu-174 | | 9.0 | $2.4X10^{2}$ | 9.0 | $2.4X10^{2}$ | $2.3X10^{1}$ | $6.2X10^{2}$ |
| Lu-174m | | $2.0X10^{1}$ | $5.4X10^{2}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | $2.0X10^{2}$ | $5.3X10^{3}$ |
| Lu-177 | | $3.0X10^{1}$ | $8.1X10^{2}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $4.1X10^{3}$ | $1.1X10^{5}$ |
| Mg-28 (a) | Magnesium (12) | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $2.0X10^{5}$ | $5.4X10^{6}$ |
| Mn-52 | Manganese (25) | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $1.6X10^{4}$ | $4.4X10^{5}$ |
| Mn-53 | | Unlimited | Unlimited | Unlimited | Unlimited | $6.8X10^{-5}$ | $1.8X10^{-3}$ |
| Mn-54 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $2.9X10^{2}$ | $7.7X10^{3}$ |
| Mn-56 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $8.0X10^{5}$ | $2.2X10^{7}$ |
| Mo-93 | Molybdenum (42) | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{1}$ | $5.4X10^{2}$ | $4.1X10^{-2}$ | 1.1 |
| Mo-99 (a) (i) | | 1.0 | $2.7X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.8X10^{4}$ | $4.8X10^{5}$ |
| N-13 | Nitrogen (7) | $9.0X10^{-1}$ | $2.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $5.4X10^{7}$ | $1.5X10^{9}$ |
| Na-22 | Sodium (11) | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $2.3X10^{2}$ | $6.3X10^{3}$ |
| Na-24 | | $2.0X10^{-1}$ | 5.4 | $2.0X10^{-1}$ | 5.4 | $3.2X10^{5}$ | $8.7X10^{6}$ |
| Nb-93m | Niobium (41) | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.0X10^{1}$ | $8.1X10^{2}$ | 8.8 | $2.4X10^{2}$ |
| Nb-94 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $6.9X10^{-3}$ | $1.9X10^{-1}$ |
| Nb-95 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $1.5X10^{3}$ | $3.9X10^{4}$ |
| Nb-97 | | $9.0X10^{-1}$ | $2.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $9.9X10^{5}$ | $2.7X10^{7}$ |
| Nd-147 | Neodymium (60) | 6.0 | $1.6X10^{2}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.0X10^{3}$ | $8.1X10^{4}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Nd-149 | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $4.5X10^{5}$ | $1.2X10^{7}$ |
| Ni-59 | Nickel (28) | Unlimited | Unlimited | Unlimited | Unlimited | $3.0X10^{-3}$ | $8.0X10^{-2}$ |
| Ni-63 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.0X10^{1}$ | $8.1X10^{2}$ | 2.1 | $5.7X10^{1}$ |
| Ni-65 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $7.1X10^{5}$ | $1.9X10^{7}$ |
| Np-235 | Neptunium (93) | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $5.2X10^{1}$ | $1.4X10^{3}$ |
| Np-236 (short-lived) | | $2.0X10^{1}$ | $5.4X10^{2}$ | 2.0 | $5.4X10^{1}$ | $4.7X10^{-4}$ | $1.3X10^{-2}$ |
| Np-236 (long-lived) | | $9.0X10^{0}$ | $2.4X10^{2}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $4.7X10^{-4}$ | $1.3X10^{-2}$ |
| Np-237 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.0X10^{-3}$ | $5.4X10^{-2}$ | $2.6X10^{-5}$ | $7.1X10^{-4}$ |
| Np-239 | | 7.0 | $1.9X10^{2}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $8.6X10^{3}$ | $2.3X10^{5}$ |
| Os-185 | Osmium (76) | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $2.8X10^{2}$ | $7.5X10^{3}$ |
| Os-191 | | $1.0X10^{1}$ | $2.7X10^{2}$ | 2.0 | $5.4X10^{1}$ | $1.6X10^{3}$ | $4.4X10^{4}$ |
| Os-191m | | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.0X10^{1}$ | $8.1X10^{2}$ | $4.6X10^{4}$ | $1.3X10^{6}$ |
| Os-193 | | 2.0 | $5.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.0X10^{4}$ | $5.3X10^{5}$ |
| Os-194 (a) | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $1.1X10^{1}$ | $3.1X10^{2}$ |
| P-32 | Phosphorus (15) | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $1.1X10^{4}$ | $2.9X10^{5}$ |
| P-33 | | $4.0X10^{1}$ | $1.1X10^{3}$ | 1.0 | $2.7X10^{1}$ | $5.8X10^{3}$ | $1.6X10^{5}$ |
| Pa-230 (a) | Protactinium (91) | 2.0 | $5.4X10^{1}$ | $7.0X10^{-2}$ | 1.9 | $1.2X10^{3}$ | $3.3X10^{4}$ |
| Pa-231 | | 4.0 | $1.1X10^{2}$ | $4.0X10^{-4}$ | $1.1X10^{-2}$ | $1.7X10^{-3}$ | $4.7X10^{-2}$ |
| Pa-233 | | 5.0 | $1.4X10^{2}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.7X10^{2}$ | $2.1X10^{4}$ |
| Pb-201 | Lead (82) | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $6.2X10^{4}$ | $1.7X10^{6}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Pb-202 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{1}$ | $5.4X10^{2}$ | $1.2X10^{-4}$ | $3.4X10^{-3}$ |
| Pb-203 | | 4.0 | $1.1X10^{2}$ | 3.0 | $8.1X10^{1}$ | $1.1X10^{4}$ | $3.0X10^{5}$ |
| Pb-205 | | Unlimited | Unlimited | Unlimited | Unlimited | $4.5X10^{-6}$ | $1.2X10^{-4}$ |
| Pb-210 (a) | | 1.0 | $2.7X10^{1}$ | $5.0X10^{-2}$ | 1.4 | 2.8 | $7.6X10^{1}$ |
| Pb-212 (a) | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $2.0X10^{-1}$ | 5.4 | $5.1X10^{4}$ | $1.4X10^{6}$ |
| Pd-103 (a) | Palladium (46) | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.8X10^{3}$ | $7.5X10^{4}$ |
| Pd-107 | | Unlimited | Unlimited | Unlimited | Unlimited | $1.9X10^{-5}$ | $5.1X10^{-4}$ |
| Pd-109 | | 2.0 | $5.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $7.9X10^{4}$ | $2.1X10^{6}$ |
| Pm-143 | Promethium (61) | 3.0 | $8.1X10^{1}$ | 3.0 | $8.1X10^{1}$ | $1.3X10^{2}$ | $3.4X10^{3}$ |
| Pm-144 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $9.2X10^{1}$ | $2.5X10^{3}$ |
| Pm-145 | | $3.0X10^{1}$ | $8.1X10^{2}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | 5.2 | $1.4X10^{2}$ |
| Pm-147 | | $4.0X10^{1}$ | $1.1X10^{3}$ | 2.0 | $5.4X10^{1}$ | $3.4X10^{1}$ | $9.3X10^{2}$ |
| Pm-148m (a) | | $8.0X10^{-1}$ | $2.2X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $7.9X10^{2}$ | $2.1X10^{4}$ |
| Pm-149 | | 2.0 | $5.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.5X10^{4}$ | $4.0X10^{5}$ |
| Pm-151 | | 2.0 | $5.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.7X10^{4}$ | $7.3X10^{5}$ |
| Po-210 | Polonium (84) | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $1.7X10^{2}$ | $4.5X10^{3}$ |
| Pr-142 | Praseodymium (59) | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.3X10^{4}$ | $1.2X10^{6}$ |
| Pr-143 | | 3.0 | $8.1X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.5X10^{3}$ | $6.7X10^{4}$ |
| Pt-188 (a) | Platinum (78) | 1.0 | $2.7X10^{1}$ | $8.0X10^{-1}$ | $2.2X10^{1}$ | $2.5X10^{3}$ | $6.8X10^{4}$ |
| Pt-191 | | 4.0 | $1.1X10^{2}$ | 3.0 | $8.1X10^{1}$ | $8.7X10^{3}$ | $2.4X10^{5}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Pt-193 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | 1.4 | $3.7X10^{1}$ |
| Pt-193m | | $4.0X10^{1}$ | $1.1X10^{3}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.8X10^{3}$ | $1.6X10^{5}$ |
| Pt-195m | | $1.0X10^{1}$ | $2.7X10^{2}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $6.2X10^{3}$ | $1.7X10^{5}$ |
| Pt-197 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.2X10^{4}$ | $8.7X10^{5}$ |
| Pt-197m | | $1.0X10^{1}$ | $2.7X10^{2}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.7X10^{5}$ | $1.0X10^{7}$ |
| Pu-236 | Plutonium (94) | $3.0X10^{1}$ | $8.1X10^{2}$ | $3.0X10^{-3}$ | $8.1X10^{-2}$ | $2.0X10^{1}$ | $5.3X10^{2}$ |
| Pu-237 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $2.0X10^{1}$ | $5.4X10^{2}$ | $4.5X10^{2}$ | $1.2X10^{4}$ |
| Pu-238 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $6.3X10^{-1}$ | $1.7X10^{1}$ |
| Pu-239 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $2.3X10^{-3}$ | $6.2X10^{-2}$ |
| Pu-240 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $8.4X10^{-3}$ | $2.3X10^{-1}$ |
| Pu-241 (a) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $6.0X10^{-2}$ | 1.6 | 3.8 | $1.0X10^{2}$ |
| Pu-242 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $1.5X10^{-4}$ | $3.9X10^{-3}$ |
| Pu-244 (a) | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $6.7X10^{-7}$ | $1.8X10^{-5}$ |
| Ra-223 (a) | Radium (88) | $4.0X10^{-1}$ | $1.1X10^{1}$ | $7.0X10^{-3}$ | $1.9X10^{-1}$ | $1.9X10^{3}$ | $5.1X10^{4}$ |
| Ra-224 (a) | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $5.9X10^{3}$ | $1.6X10^{5}$ |
| Ra-225 (a) | | $2.0X10^{-1}$ | 5.4 | $4.0X10^{-3}$ | $1.1X10^{-1}$ | $1.5X10^{3}$ | $3.9X10^{4}$ |
| Ra-226 (a) | | $2.0X10^{-1}$ | 5.4 | $3.0X10^{-3}$ | $8.1X10^{-2}$ | $3.7X10^{-2}$ | 1.0 |
| Ra-228 (a) | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $1.0X10^{1}$ | $2.7X10^{2}$ |
| Rb-81 | Rubidium (37) | 2.0 | $5.4X10^{1}$ | $8.0X10^{-1}$ | $2.2X10^{1}$ | $3.1X10^{5}$ | $8.4X10^{6}$ |
| Rb-83 (a) | | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $6.8X10^{2}$ | $1.8X10^{4}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Rb-84 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $1.8X10^{3}$ | $4.7X10^{4}$ |
| Rb-86 | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $3.0X10^{3}$ | $8.1X10^{4}$ |
| Rb-87 | | Unlimited | Unlimited | Unlimited | Unlimited | $3.2X10^{-9}$ | $8.6X10^{-8}$ |
| Rb(nat) | | Unlimited | Unlimited | Unlimited | Unlimited | $6.7X10^{6}$ | $1.8X10^{8}$ |
| Re-184 | Rhenium (75) | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $6.9X10^{2}$ | $1.9X10^{4}$ |
| Re-184m | | 3.0 | $8.1X10^{1}$ | 1.0 | $2.7X10^{1}$ | $1.6X10^{2}$ | $4.3X10^{3}$ |
| Re-186 | | 2.0 | $5.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.9X10^{3}$ | $1.9X10^{5}$ |
| Re-187 | | Unlimited | Unlimited | Unlimited | Unlimited | $1.4X10^{-9}$ | $3.8X10^{-8}$ |
| Re-188 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $3.6X10^{4}$ | $9.8X10^{5}$ |
| Re-189 (a) | | 3.0 | $8.1X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.5X10^{4}$ | $6.8X10^{5}$ |
| Re(nat) | | Unlimited | Unlimited | Unlimited | Unlimited | 0.0 | $2.4X10^{-8}$ |
| Rh-99 | Rhodium (45) | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $3.0X10^{3}$ | $8.2X10^{4}$ |
| Rh-101 | | 4.0 | $1.1X10^{2}$ | 3.0 | $8.1X10^{1}$ | $4.1X10^{1}$ | $1.1X10^{3}$ |
| Rh-102 | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $4.5X10^{1}$ | $1.2X10^{3}$ |
| Rh-102m | | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $2.3X10^{2}$ | $6.2X10^{3}$ |
| Rh-103m | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $1.2X10^{6}$ | $3.3X10^{7}$ |
| Rh-105 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $8.0X10^{-1}$ | $2.2X10^{1}$ | $3.1X10^{4}$ | $8.4X10^{5}$ |
| Rn-222 (a) | Radon (86) | $3.0X10^{-1}$ | 8.1 | $4.0X10^{-3}$ | $1.1X10^{-1}$ | $5.7X10^{3}$ | $1.5X10^{5}$ |
| Ru-97 | Ruthenium (44) | 5.0 | $1.4X10^{2}$ | 5.0 | $1.4X10^{2}$ | $1.7X10^{4}$ | $4.6X10^{5}$ |
| Ru-103 (a) | | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $1.2X10^{3}$ | $3.2X10^{4}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Ru-105 | | 1.0 | $2.7X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.5X10^{5}$ | $6.7X10^{6}$ |
| Ru-106 (a) | | $2.0X10^{-1}$ | 5.4 | $2.0X10^{-1}$ | 5.4 | $1.2X10^{2}$ | $3.3X10^{3}$ |
| S-35 | Sulphur (16) | $4.0X10^{1}$ | $1.1X10^{3}$ | 3.0 | $8.1X10^{1}$ | $1.6X10^{3}$ | $4.3X10^{4}$ |
| Sb-122 | Antimony (51) | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.5X10^{4}$ | $4.0X10^{5}$ |
| Sb-124 | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.5X10^{2}$ | $1.7X10^{4}$ |
| Sb-125 | | 2.0 | $5.4X10^{1}$ | 1.0 | $2.7X10^{1}$ | $3.9X10^{1}$ | $1.0X10^{3}$ |
| Sb-126 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $3.1X10^{3}$ | $8.4X10^{4}$ |
| Sc-44 | Scandium (21) | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $6.7X10^{5}$ | $1.8X10^{7}$ |
| Sc-46 | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $1.3X10^{3}$ | $3.4X10^{4}$ |
| Sc-47 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $3.1X10^{4}$ | $8.3X10^{5}$ |
| Sc-48 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $5.5X10^{4}$ | $1.5X10^{6}$ |
| Se-75 | Selenium (34) | 3.0 | $8.1X10^{1}$ | 3.0 | $8.1X10^{1}$ | $5.4X10^{2}$ | $1.5X10^{4}$ |
| Se-79 | | $4.0X10^{1}$ | $1.1X10^{3}$ | 2.0 | $5.4X10^{1}$ | $2.6X10^{-3}$ | $7.0X10^{-2}$ |
| Si-31 | Silicon (14) | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.4X10^{6}$ | $3.9X10^{7}$ |
| Si-32 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | 3.9 | $1.1X10^{2}$ |
| Sm-145 | Samarium (62) | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | $9.8X10^{1}$ | $2.6X10^{3}$ |
| Sm-147 | | Unlimited | Unlimited | Unlimited | Unlimited | $8.5X10^{-1}$ | $2.3X10^{-8}$ |
| Sm-151 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | $9.7X10^{-1}$ | $2.6X10^{1}$ |
| Sm-153 | | 9.0 | $2.4X10^{2}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.6X10^{4}$ | $4.4X10^{5}$ |
| Sn-113 (a) | Tin (50) | 4.0 | $1.1X10^{2}$ | 2.0 | $5.4X10^{1}$ | $3.7X10^{2}$ | $1.0X10^{4}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Sn-117m | | 7.0 | $1.9X10^{2}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $3.0X10^{3}$ | $8.2X10^{4}$ |
| Sn-119m | | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.0X10^{1}$ | $8.1X10^{2}$ | $1.4X10^{2}$ | $3.7X10^{3}$ |
| Sn-121m (a) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $9.0X10^{-1}$ | $2.4X10^{1}$ | 2.0 | $5.4X10^{1}$ |
| Sn-123 | | $8.0X10^{-1}$ | $2.2X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $3.0X10^{2}$ | $8.2X10^{3}$ |
| Sn-125 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{3}$ | $1.1X10^{5}$ |
| Sn-126 (a) | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.0X10^{-3}$ | $2.8X10^{-2}$ |
| Sr-82 (a) | Strontium (38) | $2.0X10^{-1}$ | 5.4 | $2.0X10^{-1}$ | 5.4 | $2.3X10^{3}$ | $6.2X10^{4}$ |
| Sr-85 | | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $8.8X10^{2}$ | $2.4X10^{4}$ |
| Sr-85m | | 5.0 | $1.4X10^{2}$ | 5.0 | $1.4X10^{2}$ | $1.2X10^{6}$ | $3.3X10^{7}$ |
| Sr-87m | | 3.0 | $8.1X10^{1}$ | 3.0 | $8.1X10^{1}$ | $4.8X10^{5}$ | $1.3X10^{7}$ |
| Sr-89 | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.1X10^{3}$ | $2.9X10^{4}$ |
| Sr-90 (a) | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | 5.1 | $1.4X10^{2}$ |
| Sr-91 (a) | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $1.3X10^{5}$ | $3.6X10^{6}$ |
| Sr-92 (a) | | 1.0 | $2.7X10^{1}$ | $3.0X10^{-1}$ | 8.1 | $4.7X10^{5}$ | $1.3X10^{7}$ |
| T(H-3) | Tritium (1) | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.6X10^{2}$ | $9.7X10^{3}$ |
| Ta-178 (long-lived) | Tantalum (73) | 1.0 | $2.7X10^{1}$ | $8.0X10^{-1}$ | $2.2X10^{1}$ | $4.2X10^{6}$ | $1.1X10^{8}$ |
| Ta-179 | | $3.0X10^{1}$ | $8.1X10^{2}$ | $3.0X10^{1}$ | $8.1X10^{2}$ | $4.1X10^{1}$ | $1.1X10^{3}$ |
| Ta-182 | | $9.0X10^{-1}$ | $2.4X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $2.3X10^{2}$ | $6.2X10^{3}$ |
| Tb-157 | Terbium (65) | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $5.6X10^{-1}$ | $1.5X10^{1}$ |
| Tb-158 | | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $5.6X10^{-1}$ | $1.5X10^{1}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Tb-160 | | 1.0 | $2.7X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $4.2X10^{2}$ | $1.1X10^{4}$ |
| Tc-95m (a) | Technetium (43) | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $8.3X10^{2}$ | $2.2X10^{4}$ |
| Tc-96 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.2X10^{4}$ | $3.2X10^{5}$ |
| Tc-96m (a) | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.4X10^{6}$ | $3.8X10^{7}$ |
| Tc-97 | | Unlimited | Unlimited | Unlimited | Unlimited | $5.2X10^{-5}$ | $1.4X10^{-3}$ |
| Tc-97m | | $4.0X10^{1}$ | $1.1X10^{3}$ | 1.0 | $2.7X10^{1}$ | $5.6X10^{2}$ | $1.5X10^{4}$ |
| Tc-98 | | $8.0X10^{-1}$ | $2.2X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $3.2X10^{-5}$ | $8.7X10^{-4}$ |
| Tc-99 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $9.0X10^{-1}$ | $2.4X10^{1}$ | $6.3X10^{-4}$ | $1.7X10^{-2}$ |
| Tc-99m | | $1.0X10^{1}$ | $2.7X10^{2}$ | 4.0 | $1.1X10^{2}$ | $1.9X10^{5}$ | $5.3X10^{6}$ |
| Te-121 | Tellurium (52) | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $2.4X10^{3}$ | $6.4X10^{4}$ |
| Te-121m | | 5.0 | $1.4X10^{2}$ | 3.0 | $8.1X10^{1}$ | $2.6X10^{2}$ | $7.0X10^{3}$ |
| Te-123m | | 8.0 | $2.2X10^{2}$ | 1.0 | $2.7X10^{1}$ | $3.3X10^{2}$ | $8.9X10^{3}$ |
| Te-125m | | $2.0X10^{1}$ | $5.4X10^{2}$ | $9.0X10^{-1}$ | $2.4X10^{1}$ | $6.7X10^{2}$ | $1.8X10^{4}$ |
| Te-127 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $9.8X10^{4}$ | $2.6X10^{6}$ |
| Te-127m (a) | | $2.0X10^{1}$ | $5.4X10^{2}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $3.5X10^{2}$ | $9.4X10^{3}$ |
| Te-129 | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $7.7X10^{5}$ | $2.1X10^{7}$ |
| Te-129m (a) | | $8.0X10^{-1}$ | $2.2X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $1.1X10^{3}$ | $3.0X10^{4}$ |
| Te-131m (a) | | $7.0X10^{-1}$ | $1.9X10^{1}$ | $5.0X10^{-1}$ | $1.4X10^{1}$ | $3.0X10^{4}$ | $8.0X10^{5}$ |
| Te-132 (a) | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $3.1X10^{4}$ | $3.0X10^{5}$ |
| Th-227 | Thorium (90) | $1.0X10^{1}$ | $2.7X10^{2}$ | $5.0X10^{-3}$ | $1.4X10^{-1}$ | $1.1X10^{3}$ | $3.1X10^{4}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Th-228 (a) | | $5.0X10^{-1}$ | $1.4X10^{1}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $3.0X10^{1}$ | $8.2X10^{2}$ |
| Th-229 | | 5.0 | $1.4X10^{2}$ | $5.0X10^{-4}$ | $1.4X10^{-2}$ | $7.9X10^{-3}$ | $2.1X10^{-1}$ |
| Th-230 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $7.6X10^{-4}$ | $2.1X10^{-2}$ |
| Th-231 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $2.0X10^{4}$ | $5.3X10^{5}$ |
| Th-232 | | Unlimited | Unlimited | Unlimited | Unlimited | $4.0X10^{-9}$ | $1.1X10^{-7}$ |
| Th-234 (a) | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $8.6X10^{2}$ | $2.3X10^{4}$ |
| Th(nat) | | Unlimited | Unlimited | Unlimited | Unlimited | $8.1X10^{-9}$ | $2.2X10^{-7}$ |
| Ti-44 (a) | Titanium (22) | $5.0X10^{-1}$ | $1.4X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | 6.4 | $1.7X10^{2}$ |
| Tl-200 | Thallium (81) | $9.0X10^{-1}$ | $2.4X10^{1}$ | $9.0X10^{-1}$ | $2.4X10^{1}$ | $2.2X10^{4}$ | $6.0X10^{5}$ |
| Tl-201 | | $1.0X10^{1}$ | $2.7X10^{2}$ | 4.0 | $1.1X10^{2}$ | $7.9X10^{3}$ | $2.1X10^{5}$ |
| Tl-202 | | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $2.0X10^{3}$ | $5.3X10^{4}$ |
| Tl-204 | | $1.0X10^{1}$ | $2.7X10^{2}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $1.7X10^{1}$ | $4.6X10^{2}$ |
| Tm-167 | Thulium (69) | 7.0 | $1.9X10^{2}$ | $8.0X10^{-1}$ | $2.2X10^{1}$ | $3.1X10^{3}$ | $8.5X10^{4}$ |
| Tm-170 | | 3.0 | $8.1X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.2X10^{2}$ | $6.0X10^{3}$ |
| Tm-171 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ |
| U-230 (fast lung absorption) (a)(d) | Uranium (92) | $4.0X10^{1}$ | $1.1X10^{3}$ | $1.0X10^{-1}$ | 2.7 | $1.0X10^{3}$ | $2.7X10^{4}$ |
| U-230 (medium lung absorption) (a)(e) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{-3}$ | $1.1X10^{-1}$ | $1.0X10^{3}$ | $2.7X10^{4}$ |
| U-230 (slow lung absorption) (a)(f) | | $3.0X10^{1}$ | $8.1X10^{2}$ | $3.0X10^{-3}$ | $8.1X10^{-2}$ | $1.0X10^{3}$ | $2.7X10^{4}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| U-232 (fast lung absorption) (d) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $1.0X10^{-2}$ | $2.7X10^{-1}$ | $8.3X10^{-1}$ | $2.2X10^{1}$ |
| U-232 (medium lung absorption) (e) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $7.0X10^{-3}$ | $1.9X10^{-1}$ | $8.3X10^{-1}$ | $2.2X10^{1}$ |
| U-232 (slow lung absorption) (f) | | $1.0X10^{1}$ | $2.7X10^{2}$ | $1.0X10^{-3}$ | $2.7X10^{-2}$ | $8.3X10^{-1}$ | $2.2X10^{1}$ |
| U-233 (fast lung absorption) (d) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $9.0X10^{-2}$ | 2.4 | $3.6X10^{-4}$ | $9.7X10^{-3}$ |
| U-233 (medium lung absorption) (e) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $3.6X10^{-4}$ | $9.7X10^{-3}$ |
| U-233 (slow lung absorption) (f) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $6.0X10^{-3}$ | $1.6X10^{-1}$ | $3.6X10^{-4}$ | $9.7X10^{-3}$ |
| U-234 (fast lung absorption) (d) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $9.0X10^{-2}$ | 2.4 | $2.3X10^{-4}$ | $6.2X10^{-3}$ |
| U-234 (medium lung absorption) (e) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $2.3X10^{-4}$ | $6.2X10^{-3}$ |
| U-234 (slow lung absorption) (f) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $6.0X10^{-3}$ | $1.6X10^{-1}$ | $2.3X10^{-4}$ | $6.2X10^{-3}$ |
| U-235 (all lung absorption types) (a),(d),(e),(f) | | Unlimited | Unlimited | Unlimited | Unlimited | $8.0X10^{-8}$ | $2.2X10^{-6}$ |
| U-236 (fast lung absorption) (d) | | Unlimited | Unlimited | Unlimited | Unlimited | $2.4X10^{-6}$ | $6.5X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| U-236 (medium lung absorption) (e) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $2.0X10^{-2}$ | $5.4X10^{-1}$ | $2.4X10^{-6}$ | $6.5X10^{-5}$ |
| U-236 (slow lung absorption) (f) | | $4.0X10^{1}$ | $1.1X10^{3}$ | $6.0X10^{-3}$ | $1.6X10^{-1}$ | $2.4X10^{-6}$ | $6.5X10^{-5}$ |
| U-238 (all lung absorption types) (d),(e),(f) | | Unlimited | Unlimited | Unlimited | Unlimited | $1.2X10^{-8}$ | $3.4X10^{-7}$ |
| U (nat) | | Unlimited | Unlimited | Unlimited | Unlimited | $2.6X10^{-8}$ | $7.1X10^{-7}$ |
| U (enriched to 20% or less) (g) | | Unlimited | Unlimited | Unlimited | Unlimited | See Table 257-6 | See Table 257-6 |
| U (dep) | | Unlimited | Unlimited | Unlimited | Unlimited | See Table 257-6 | (See Table 257-5) |
| V-48 | Vanadium (23) | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $6.3X10^{3}$ | $1.7X10^{5}$ |
| V-49 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.0X10^{2}$ | $8.1X10^{3}$ |
| W-178 (a) | Tungsten (74) | 9.0 | $2.4X10^{2}$ | 5.0 | $1.4X10^{2}$ | $1.3X10^{3}$ | $3.4X10^{4}$ |
| W-181 | | $3.0X10^{1}$ | $8.1X10^{2}$ | $3.0X10^{1}$ | $8.1X10^{2}$ | $2.2X10^{2}$ | $6.0X10^{3}$ |
| W-185 | | $4.0X10^{1}$ | $1.1X10^{3}$ | $8.0X10^{-1}$ | $2.2X10^{1}$ | $3.5X10^{2}$ | $9.4X10^{3}$ |
| W-187 | | 2.0 | $5.4X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $2.6X10^{4}$ | $7.0X10^{5}$ |
| W-188 (a) | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $3.0X10^{-1}$ | 8.1 | $3.7X10^{2}$ | $1.0X10^{4}$ |
| Xe-122 (a) | Xenon (54) | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.8X10^{4}$ | $1.3X10^{6}$ |
| Xe-123 | | 2.0 | $5.4X10^{1}$ | $7.0X10^{-1}$ | $1.9X10^{1}$ | $4.4X10^{5}$ | $1.2X10^{7}$ |
| Xe-127 | | 4.0 | $1.1X10^{2}$ | 2.0 | $5.4X10^{1}$ | $1.0X10^{3}$ | $2.8X10^{4}$ |

| Symbol of radionuclide | Element and atomic number | $A_1$ (TBq) | $A_1$(Ci)[b] | $A_2$ (TBq) | $A_2$(Ci)[b] | Specific activity | |
|---|---|---|---|---|---|---|---|
| | | | | | | (TBq/g) | (Ci/g) |
| Xe-131m | | $4.0X10^{1}$ | $1.1X10^{3}$ | $4.0X10^{1}$ | $1.1X10^{3}$ | $3.1X10^{3}$ | $8.4X10^{4}$ |
| Xe-133 | | $2.0X10^{1}$ | $5.4X10^{2}$ | $1.0X10^{1}$ | $2.7X10^{2}$ | $6.9X10^{3}$ | $1.9X10^{5}$ |
| Xe-135 | | 3.0 | $8.1X10^{1}$ | 2.0 | $5.4X10^{1}$ | $9.5X10^{4}$ | $2.6X10^{6}$ |
| Y-87 (a) | Yttrium (39) | 1.0 | $2.7X10^{1}$ | 1.0 | $2.7X10^{1}$ | $1.7X10^{4}$ | $4.5X10^{5}$ |
| Y-88 | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $5.2X10^{2}$ | $1.4X10^{4}$ |
| Y-90 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $2.0X10^{4}$ | $5.4X10^{5}$ |
| Y-91 | | $6.0X10^{-1}$ | $1.6X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $9.1X10^{2}$ | $2.5X10^{4}$ |
| Y-91m | | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $1.5X10^{6}$ | $4.2X10^{7}$ |
| Y-92 | | $2.0X10^{-1}$ | 5.4 | $2.0X10^{-1}$ | 5.4 | $3.6X10^{5}$ | $9.6X10^{6}$ |
| Y-93 | | $3.0X10^{-1}$ | 8.1 | $3.0X10^{-1}$ | 8.1 | $1.2X10^{5}$ | $3.3X10^{6}$ |
| Yb-169 | Ytterbium (70) | 4.0 | $1.1X10^{2}$ | 1.0 | $2.7X10^{1}$ | $8.9X10^{2}$ | $2.4X10^{4}$ |
| Yb-175 | | $3.0X10^{1}$ | $8.1X10^{2}$ | $9.0X10^{-1}$ | $2.4X10^{1}$ | $6.6X10^{3}$ | $1.8X10^{5}$ |
| Zn-65 | Zinc (30) | 2.0 | $5.4X10^{1}$ | 2.0 | $5.4X10^{1}$ | $3.0X10^{2}$ | $8.2X10^{3}$ |
| Zn-69 | | 3.0 | $8.1X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.8X10^{6}$ | $4.9X10^{7}$ |
| Zn-69m (a) | | 3.0 | $8.1X10^{1}$ | $6.0X10^{-1}$ | $1.6X10^{1}$ | $1.2X10^{5}$ | $3.3X10^{6}$ |
| Zr-88 | Zirconium (40) | 3.0 | $8.1X10^{1}$ | 3.0 | $8.1X10^{1}$ | $6.6X10^{2}$ | $1.8X10^{4}$ |
| Zr-93 | | Unlimited | Unlimited | Unlimited | Unlimited | $9.3X10^{-5}$ | $2.5X10^{-3}$ |
| Zr-95 (a) | | 2.0 | $5.4X10^{1}$ | $8.0X10^{-1}$ | $2.2X10^{1}$ | $7.9X10^{2}$ | $2.1X10^{4}$ |
| Zr-97 (a) | | $4.0X10^{-1}$ | $1.1X10^{1}$ | $4.0X10^{-1}$ | $1.1X10^{1}$ | $7.1X10^{4}$ | $1.9X10^{6}$ |

[a] $A_1$ and/or $A_2$ values include contributions from daughter nuclides with half-lives less than 10 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), (subsection (aa)(1) of this section - 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 $UO_3$, $UF_4$, $UCl_4$ and hexavalent compounds in both normal and accident conditions of transport.
[f] These values apply to all compounds of uranium other than those specified in notes (d) and (e) of this table.
[g] These values apply to unirradiated uranium only.
[h] $A_1$ = 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.

Table 257-4

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Ac-225 | Actinium (89) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Ac-227 | | $1.0X10^{-1}$ | $2.7X10^{-12}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Ac-228 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ag-105 | Silver (47) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ag-108m (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ag-110m | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ag-111 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Al-26 | Aluminum (13) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Am-241 | Americium (95) | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Am-242m (b) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Am-243 (b) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Ar-37 | Argon (18) | $1.0X10^{6}$ | $2.7X10^{-5}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Ar-39 | | $1.0X10^{7}$ | $2.7X10^{-4}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Ar-41 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| As-72 | Arsenic (33) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| As-73 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| As-74 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| As-76 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| As-77 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| At-211 | Astatine (85) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Au-193 | Gold (79) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Au-194 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Au-195 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Au-198 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Au-199 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ba-131 | Barium (56) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ba-133 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ba-133m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ba-140 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Be-7 | Beryllium (4) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Be-10 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Bi-205 | Bismuth (83) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Bi-206 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Bi-207 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Bi-210 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Bi-210m | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Bi-212 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Bk-247 | Berkelium (97) | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Bk-249 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Br-76 | Bromine (35) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Br-77 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Br-82 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| C-11 | Carbon (6) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| C-14 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Ca-41 | Calcium (20) | $1.0X10^{5}$ | $2.7X10^{-6}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Ca-45 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Ca-47 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Cd-109 | Cadmium (48) | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Cd-113m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Cd-115 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Cd-115m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ce-139 | Cerium (58) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ce-141 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Ce-143 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ce-144 (b) | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Cf-248 | Californium (98) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Cf-249 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Cf-250 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Cf-251 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Cf-252 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Cf-253 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cf-254 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Cl-36 | Chlorine (17) | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Cl-38 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cm-240 | Curium (96) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cm-241 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Cm-242 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cm-243 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Cm-244 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Cm-245 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Cm-246 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Cm-247 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Cm-248 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Co-55 | Cobalt (27) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Co-56 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Co-57 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Co-58 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Co-58m | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Co-60 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cr-51 | Chromium (24) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Cs-129 | Cesium (55) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cs-131 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Cs-132 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cs-134 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Cs-134m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cs-135 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Cs-136 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Cs-137 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Cu-64 | Copper (29) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Cu-67 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Dy-159 | Dysprosium (66) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Dy-165 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Dy-166 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Er-169 | Erbium (68) | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Er-171 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Eu-147 | Europium (63) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Eu-148 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Eu-149 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Eu-150 (short lived) | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Eu-150 (long lived) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Eu-152 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Eu-152m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Eu-154 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Eu-155 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Eu-156 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| F-18 | Fluorine (9) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Fe-52 | Iron (26) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Fe-55 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Fe-59 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Fe-60 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Ga-67 | Gallium (31) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ga-68 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Ga-72 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Gd-146 | Gadolinium (64) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Gd-148 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Gd-153 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Gd-159 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ge-68 | Germanium (32) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Ge-71 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Ge-77 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Hf-172 | Hafnium (72) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Hf-175 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Hf-181 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Hf-182 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Hg-194 | Mercury (80) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Hg-195m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Hg-197 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Hg-197m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Hg-203 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Ho-166 | Holmium (67) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Ho-166m | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| I-123 | Iodine (53) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| I-124 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| I-125 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| I-126 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| I-129 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| I-131 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| I-132 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| I-133 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| I-134 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| I-135 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| In-111 | Indium (49) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| In-113m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| In-114m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| In-115m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ir-189 | Iridium (77) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Ir-190 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ir-192 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Ir-194 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| K-40 | Potassium (19) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| K-42 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| K-43 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Kr-81 | Krypton (36) | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Kr-85 | | $1.0X10^{5}$ | $2.7X10^{-6}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Kr-85m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{10}$ | $2.7X10^{-1}$ |
| Kr-87 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| La-137 | Lanthanum (57) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| La-140 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Lu-172 | Lutetium (71) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Lu-173 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Lu-174 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Lu-174m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Lu-177 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Mg-28 | Magnesium (12) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Mn-52 | Manganese (25) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Mn-53 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| Mn-54 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Mn-56 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Mo-93 | Molybdenum (42) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Mo-99 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| N-13 | Nitrogen (7) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| Na-22 | Sodium (11) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Na-24 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Nb-93m | Niobium (41) | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Nb-94 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Nb-95 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Nb-97 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Nd-147 | Neodymium (60) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Nd-149 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ni-59 | Nickel (28) | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Ni-63 | | $1.0X10^{5}$ | $2.7X10^{-6}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Ni-65 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Np-235 | Neptunium (93) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Np-236 (short-lived) | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Np-236 (long-lived) | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Np-237 (b) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Np-239 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Os-185 | Osmium (76) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Os-191 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Os-191m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Os-193 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Os-194 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| P-32 | Phosphorus (15) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| P-33 | | $1.0X10^{5}$ | $2.7X10^{-6}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Pa-230 | Protactinium (91) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pa-231 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Pa-233 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Pb-201 | Lead (82) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pb-202 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pb-203 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pb-205 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Pb-210 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Pb-212 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Pd-103 | Palladium (46) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Pd-107 | | $1.0X10^{5}$ | $2.7X10^{-6}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Pd-109 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pm-143 | Promethium (61) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Pm-144 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pm-145 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Pm-147 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Pm-148m | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pm-149 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pm-151 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Po-210 | Polonium (84) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Pr-142 | Praseodymium (59) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Pr-143 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pt-188 | Platinum (78) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pt-191 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pt-193 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Pt-193m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Pt-195m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pt-197 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pt-197m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Pu-236 | Plutonium (94) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Pu-237 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Pu-238 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Pu-239 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Pu-240 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Pu-241 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Pu-242 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Pu-244 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Ra-223 (b) | Radium (88) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Ra-224 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Ra-225 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Ra-226 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Ra-228 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Rb-81 | Rubidium (37) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Rb-83 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Rb-84 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Rb-86 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Rb-87 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Rb(nat) | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Re-184 | Rhenium (75) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Re-184m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Re-186 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Re-187 | | $1.0X10^{6}$ | $2.7X10^{-5}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| Re-188 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Re-189 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Re(nat) | | $1.0X10^{6}$ | $2.7X10^{-5}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| Rh-99 | Rhodium (45) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Rh-101 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Rh-102 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Rh-102m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Rh-103m | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Rh-105 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Rn-222 (b) | Radon (86) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Ru-97 | Ruthenium (44) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Ru-103 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ru-105 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ru-106 (b) | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| S-35 | Sulphur (16) | $1.0X10^{5}$ | $2.7X10^{-6}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Sb-122 | Antimony (51) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Sb-124 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sb-125 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Sb-126 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Sc-44 | Scandium (21) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Sc-46 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sc-47 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sc-48 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Se-75 | Selenium (34) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Se-79 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Si-31 | Silicon (14) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Si-32 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sm-145 | Samarium (62) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Sm-147 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Sm-151 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Sm-153 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sn-113 | Tin (50) | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Sn-117m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sn-119m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Sn-121m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Sn-123 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sn-125 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Sn-126 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Sr-82 | Strontium (38) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Sr-85 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sr-85m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Sr-87m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sr-89 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Sr-90 (b) | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Sr-91 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Sr-92 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| T(H-3) | Tritium (1) | $1.0X10^{6}$ | $2.7X10^{-5}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| Ta-178 (long-lived) | Tantalum (73) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Ta-179 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Ta-182 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Tb-157 | Terbium (65) | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Tb-158 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tb-160 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tc-95m | Technetium (43) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tc-96 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tc-96m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Tc-97 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| Tc-97m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Tc-98 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tc-99 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Tc-99m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Te-121 | Tellurium (52) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Te-121m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Te-123m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Te-125m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Te-127 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Te-127m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Te-129 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Te-129m | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Te-131m | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Te-132 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Th-227 | Thorium (90) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Th-228 (b) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Th-229 (b) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Th-230 | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Th-231 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Th-232 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Th-234 (b) | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Th (nat) (b) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| Ti-44 | Titanium (22) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Tl-200 | Thallium (81) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tl-201 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tl-202 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tl-204 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Tm-167 | Thulium (69) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tm-170 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Tm-171 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{8}$ | $2.7X10^{-3}$ |
| U-230 (fast lung absorption) (b),(d) | Uranium (92) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| U-230 (medium lung absorption) (e) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-230 (slow lung absorption) (f) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-232 (fast lung absorption) (b),(d) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| U-232 (medium lung absorption) (e) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-232 (slow lung absorption) (f) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-233 (fast lung absorption) (d) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-233 (medium lung absorption) (e) | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| U-233 (slow lung absorption) (f) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| U-234 (fast lung absorption) (d) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-234 (medium lung absorption) (e) | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| U-234 (slow lung absorption) (f) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| U-235 (all lung absorption types) (b),(d),(e),(f) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-236 (fast lung absorption) (d) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-236 (medium lung | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| absorption) (e) | | | | | |
| U-236 (slow lung absorption) (f) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U-238 (all lung absorption types) (b),(d),(e),(f) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| U (nat) (b) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| U (enriched to 20% or less) (g) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| U (dep) | | 1.0 | $2.7X10^{-11}$ | $1.0X10^{3}$ | $2.7X10^{-8}$ |
| V-48 | Vanadium (23) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| V-49 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| W-178 | Tungsten (74) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| W-181 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| W-185 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| W-187 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| W-188 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Xe-122 | Xenon (54) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| Xe-123 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{9}$ | $2.7X10^{-2}$ |
| Xe-127 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |

| Symbol of radionuclide | Element and atomic number | Activity concentration for exempt material (Bq/g) | Activity concentration for exempt material (Ci/g) | Activity limit for exempt consignment (Bq) | Activity limit for exempt consignment (Ci) |
|---|---|---|---|---|---|
| Xe-131m | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Xe-133 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{4}$ | $2.7X10^{-7}$ |
| Xe-135 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{10}$ | $2.7X10^{-1}$ |
| Y-87 | Yttrium (39) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Y-88 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Y-90 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Y-91 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Y-91m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Y-92 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Y-93 | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |
| Yb-169 | Ytterbium (70) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Yb-175 | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Zn-65 | Zinc (30) | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Zn-69 | | $1.0X10^{4}$ | $2.7X10^{-7}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Zn-69m | | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Zr-88 | Zirconium (40) | $1.0X10^{2}$ | $2.7X10^{-9}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Zr-93 (b) | | $1.0X10^{3}$ | $2.7X10^{-8}$ | $1.0X10^{7}$ | $2.7X10^{-4}$ |
| Zr-95 | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{6}$ | $2.7X10^{-5}$ |
| Zr-97 (b) | | $1.0X10^{1}$ | $2.7X10^{-10}$ | $1.0X10^{5}$ | $2.7X10^{-6}$ |

[Reserved]

[b] Parent nuclides and their progeny included in secular equilibrium are listed in the following:

| | |
|---|---|
| Sr-90 | Y-90 |
| Zr-93 | Nb-93m |
| Zr-97 | Nb-97 |
| Ru-106 | Rh-106 |
| Cs-137 | Ba-137m |
| Ce-134 | La-134 |
| Ce-144 | Pr-144 |
| Ba-140 | La-140 |
| Bi-212 | Tl-208 (0.36), Po-212 (0.64) |
| Pb-210 | Bi-210, Po-210 |
| Pb-212 | Bi-212, Tl-208 (0.36), Po-212 (0.64) |
| Rn-220 | Po-216 |
| Rn-222 | Po-218, Pb-214, Bi-214, Po-214 |
| Ra-223 | Rn-219, Po-215, Pb-211, Bi-211, Tl-207 |
| Ra-224 | Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36), Po-212 (0.64) |
| Ra-226 | Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210 |
| Ra-228 | Ac-228 |
| Th-226 | Ra-222, Rn-218, Po-214 |
| Th-228 | Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64) |
| Th-229 | Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-20 |
| Th-nat | Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 0.36), Po-212 (0.64) |
| Th-234 | Pa-234m |
| U-230 | Th-226, Ra-222, Rn-218, Po-214 |
| U-232 | Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64) |
| U-235 | Th-231 |
| U-238 | Th-234, Pa-234m |
| U-nat | Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210 |
| U-240 | Np-240m |