

Legend: (Proposed Amendments)

Single Underline = Proposed new language

[Bold, Print, and Brackets] = Current language proposed for deletion

Regular Print = Current language

(No change.) = No changes are being considered for the designated subdivision

§289.201. General Provisions for Radioactive Material.

(a) (No change.)

(b) Definitions. The following words and terms when used in this chapter shall have the following meanings, unless the context clearly indicates otherwise.

(1) - (11) (No change.)

(12) Becquerel (Bq)--The International System of Units (SI) **[SI]** unit of activity. One becquerel is equal to 1 disintegration or transformation per second (dps or tps).

(13) - (20) (No change.)

(21) Committed effective dose equivalent ($H_{E,50}$)--The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to each of these organs or tissues ($H_{E,50} = \sum w_T H_{T,50}$) **[($H_{E,50} = \sum w_T H_{T,50}$)]**.

(22) - (24) (No change.)

(25) Curie (Ci)--A unit of measurement of radioactivity. One curie (Ci) is that quantity of radioactive material that decays at the rate of 3.7×10^{10} **[3.7×10^{10}]** disintegrations per second (dps). Commonly used submultiples of the curie are the millicurie (mCi) and the microcurie (μ Ci). One mCi = 1×10^{-3} Ci = 3.7×10^7 dps. One μ Ci = 1×10^{-6} Ci = 3.7×10^4 dps. One nanocurie (nCi) = 1×10^{-9} Ci = 3.7×10^1 dps. One picocurie (pCi) = 1×10^{-12} Ci = 3.7×10^{-2} dps.

(26) - (92) (No change.)

(93) Residual radioactivity--The radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the licensee's control. This includes radioactivity from all licensed and unlicensed sources used by the licensee, but excludes background radiation. It also includes radioactive materials remaining at the site as a result of routine or accidental releases of radioactive material at the site and previous burials at the site, even if those burials were made in accordance with the provisions of Title 30, Texas Administrative Code (TAC), §336.334.

(94) - (110) (No change.)

(111) Texas Regulations for Control of Radiation (TRCR)--All sections of Title 25 TAC [Texas Administrative Code (TAC)], Chapter 289.

(112) - (113) (No change.)

(114) Transport index--The dimensionless number (rounded up to the next tenth) placed on the label of a package, to designate the degree of control to be exercised by the carrier during transportation. The transport index is determined as follows:

(A) (No change.)

(B) For fissile material packages, the number determined by multiplying the maximum radiation level in mSv/hr at 1 m (3.3 feet) from the external surface of the package by 100 (equivalent to the maximum radiation level in mrem/hr at 1 m (3.3 feet), or, for criticality control purposes, the number obtained as described in Title 10, CFR, §71.59 [10 CFR 71.59], whichever is larger.

(115) Type A quantity--A quantity of radioactive material, the aggregate radioactivity of which does not exceed A_1 for special form radioactive material or A_2 for normal form radioactive material, where A_1 and A_2 are given in §289.257(ee) [§289.257(ff)] of this title (relating to Packaging and Transportation of Radioactive Material) or may be determined by procedures described in §289.257(ee) [§289.257(ff)] of this title.

(116) - (127) (No change.)

(c) - (f) (No change.)

(g) Tests for leakage and/or contamination of sealed sources.

(1) The licensee in possession of any sealed source shall assure that:

(A) (No change.)

(B) each sealed source that is not designed to emit alpha particles is tested for leakage or contamination at intervals not to exceed six months or at alternative intervals approved by the agency, or by NRC, an agreement state, or a licensing state after evaluation of information specified in §289.252(v) of this title [**(relating to Licensing of Radioactive Material)**];

(C) - (H) (No change.)

(2) - (7) (No change.)

(h) - (o) (No change.)

§289.202. Standards for Protection Against Radiation from Radioactive Materials.

(a) (No change.)

(b) Scope.

(1) (No change.)

(2) Licensees who are also registered by the agency to receive, possess, use, and transfer radiation machines shall **[must]** also comply with the requirements of §289.231 of this title (relating to General Provisions and Standards for Protection Against Machine-Produced Radiation).

(c) Definitions. The following words and terms when used in this section shall have the following meaning, unless the context clearly indicates otherwise.

(1) - (5) (No change.)

(6) Debris--The remains of something destroyed, disintegrated, or decayed. Debris does not include soils, sludges, liquids, gases, naturally occurring radioactive material regulated in accordance with §289.259 of this title (relating to Licensing of Naturally Occurring Radioactive Material (NORM)), or low-level radioactive waste (LLRW) received from other persons.

(7) - (39) (No change.)

(d) (No change.)

(e) Radiation protection programs.

(1) - (3) (No change.)

(4) To implement the ALARA requirement in paragraph (2) of this subsection and notwithstanding the requirements in subsection (n) of this section, a constraint on air emissions of radioactive material to the environment, excluding radon-222 and its daughters, shall be established by licensees such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent (TEDE) in excess of 10 millirems (mrem) (0.1 millisievert (mSv)) **[(0.1 mSv)]** per year from these emissions. If a licensee subject to this requirement exceeds this dose constraint, the licensee shall report the exceedance as required in subsection (yy) of this section and promptly take appropriate corrective action.

(5) (No change.)

(f) - (i) (No change.)

(j) Determination of occupational dose for the current year.

(1) (No change.)

(2) In complying with the requirements of paragraph (1) of this subsection, a licensee may:

(A) accept, as a record of the occupational dose that the individual received during the current year, RC Form 202-2 [**BRC Form 202-2**] from prior or other current employers, or other clear and legible record, of all information required on that form and indicating any periods of time for which data are not available; or

(B) - (C) (No change.)

(3) The licensee shall record the exposure data for the current year, as required by paragraph (1) of this subsection, on RC Form 202-3 [**BRC Form 202-3**], or other clear and legible record, of all the information required on that form.

(4) If the licensee is unable to obtain a complete record of an individual's current occupational dose while employed by any other licensee, the licensee shall assume in establishing administrative controls in accordance with subsection (f)(7) of this section for the current year, that the allowable dose limit for the individual is reduced by 1.25 rems (12.5 mSv) [**millisieverts (mSv)**] for each quarter; or 416 mrem (4.16 mSv) for each month for which records were unavailable and the individual was engaged in activities that could have resulted in occupational radiation exposure.

(5) - (6) (No change.)

(k) Planned special exposures. A licensee may authorize an adult worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in subsection (f) of this section provided that each of the following conditions is satisfied.

(1) - (4) (No change.)

(5) In complying with the requirements of paragraph (4)(C) of this subsection, a licensee may:

(A) accept, as the record of lifetime cumulative radiation dose, an up-to-date RC Form 202-2 [**BRC Form 202-2**] or equivalent, signed by the individual and countersigned by an appropriate official of the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee; and

(B) (No change.)

(6) - (8) (No change.)

(9) The licensee shall record the exposure history, as required by paragraph (4) of this subsection, on RC Form 202-2 [BRC Form 202-2], or other clear and legible record, of all the information required on that form. The form or record shall show each period in which the individual received occupational exposure to radiation or radioactive material and shall be signed by the individual who received the exposure. For each period for which the licensee obtains reports, the licensee shall use the dose shown in the report in preparing RC Form 202-2 [BRC Form 202-2] or equivalent.

(l) - (o) (No change.)

(p) General surveys and monitoring.

(1) Each licensee shall make, or cause to be made, surveys of areas, including the subsurface that:

(A) (No change.)

(B) are necessary under the circumstances to evaluate:

(i) (No change.)

(ii) concentrations or quantities of residual radioactivity **[radioactive material]**; and

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

(2) In addition to subsection (nn) of this section, records from surveys describing the location and amount of subsurface residual radioactivity identified at the site shall be kept with records important for decommissioning, and such records shall be retained in accordance with §289.252(gg) of this title.

(3) [(2)] The licensee shall ensure that instruments and equipment used for quantitative radiation measurements, for example, dose rate and effluent monitoring, are operable and calibrated:

(A) by a person licensed or registered by the agency, another agreement state, a licensing state, or the United States Nuclear Regulatory Commission (NRC) to perform such service;

(B) at intervals not to exceed 12 months unless a different time interval is specified in another section of this chapter;

(C) after each instrument or equipment repair;

(D) for the types of radiation used and at energies appropriate for use; and

(E) at an accuracy within 20% of the true radiation level.

(4) [(3)] All individual monitoring devices, except for direct and indirect reading pocket dosimeters, electronic personal dosimeters, and those individual monitoring devices used to measure the dose to any extremity, that require processing to determine the radiation dose and that are used by licensees to comply with subsection (f) of this section, with other applicable provisions of this chapter, or with conditions specified in a license, shall be processed and evaluated by a dosimetry processor:

(A) holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology; and

(B) approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

(5) [(4)] All individual monitoring devices shall be appropriate for the environment in which they are used.

(q) - (r) (No change.)

(s) Control of access to high radiation areas.

(1) - (4) (No change.)

(5) The licensee is not required to control each entrance or access point to a room or other area that is a high radiation area solely because of the presence of radioactive materials prepared for transport and packaged and labeled in accordance with the regulations of the United States Department of Transportation (DOT) provided that:

(A) (No change.)

(B) the dose rate at 1 meter (m) from the external surface of any package does not exceed 0.01 rem (0.1 mSv [**millisievert**]) per hour.

(6) (No change.)

(t) (No change.)

(u) Control of access to very high radiation areas for irradiators.

(1) - (2) (No change.)

(3) Licensees or applicants for licenses for sources of radiation within the purview of paragraph (2) of this subsection that will be used in a variety of positions or in locations, such as open fields or forests, which make it impracticable to comply with certain requirements of paragraph (2) of this subsection, such as those for the automatic control of radiation levels, may apply to the agency [Agency] for approval of alternative safety measures. Alternative safety measures shall provide personnel protection at least equivalent to those specified in paragraph (2) of this subsection. At least one of the alternative measures shall include an entry-preventing interlock control based on a measurement of the radiation that ensures the absence of high radiation levels before an individual can gain access to the area where such sources of radiation are used.

(4) (No change.)

(v) - (w) (No change.)

(x) Use of individual respiratory protection equipment.

(1) If the licensee uses respiratory protection equipment to limit intakes of radioactive material in accordance with subsection (w) of this section, the licensee shall do the following.

(A) - (F) (No change.)

(G) Atmosphere-supplying respirators shall be supplied with respirable air of grade D quality or better as defined by the Compressed Gas Association in publication G-7.1, "Commodity Specification for Air," 1997 and included in the regulations of the Occupational Safety and Health Administration (Title 29, CFR, §1910.134(i)(1)(ii)(A) through (E). Grade D quality air criteria include:

(i) (No change.)

(ii) hydrocarbon (condensed) content of 5 mg [milligrams] per cubic meter of air or less;

(iii) - (v) (No change.)

(H) The [the] licensee shall ensure that no objects, materials or substances, such as facial hair, or any conditions that interfere with the face-facepiece seal or valve function, and that are under the control of the respirator wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator facepiece.

(I) In estimating the dose to individuals from intake of airborne radioactive materials, the concentration of radioactive material in the air that is inhaled when respirators are worn is initially assumed to be the ambient concentration in air without respiratory protection, divided by the assigned protection factor. If the dose is later found to be

greater than the estimated dose, the corrected value shall **[must]** be used. If the dose is later found to be less than the estimated dose, the corrected value may be used.

(2) - (3) (No change.)

(y) - (aa) (No change.)

(bb) Exceptions to posting requirements.

(1) - (2) (No change.)

(3) A room or area is not required to be posted with a caution sign because of the presence of a sealed source(s) provided the radiation level at 30 cm **[centimeters]** from the surface of the sealed source container(s) or housing(s) does not exceed 0.005 rem (0.05 mSv) per hour.

(4) (No change.)

(cc) - (dd) (No change.)

(ee) Procedures for receiving and opening packages.

(1) Each licensee who expects to receive a package containing quantities of radioactive material in excess of a Type A quantity, as defined in §289.201(b) of this title and specified in §289.257(ee) **[§289.257(ee)(6)]** of this title (relating to Packaging and Transportation of Radioactive Material), shall make arrangements to receive:

(A) - (B) (No change.)

(2) Each licensee shall:

(A) (No change.)

(B) monitor the external surfaces of a labeled package, labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in DOT regulations 49, CFR, §§172.403 and 172.436-440, for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the Type A quantity, as defined in §289.201(b) of this title and specified in §289.257(ee) **[§289.257(ee)(6)]** of this title; and

(C) (No change.)

(3) (No change.)

(4) The licensee shall immediately notify the final delivery carrier and, by telephone and telegram, mailgram, or facsimile, the agency when removable radioactive surface

contamination or external radiation levels exceed the limits established in subparagraphs (A) and (B) of this paragraph.

(A) Limits for removable radioactive surface contamination levels.

(i) The level of removable radioactive contamination on the external surfaces of each package offered for shipment shall be ALARA. The level of removable radioactive contamination may be determined by wiping an area of 300 square centimeters (cm^2) [cm²] of the surface concerned with an absorbent material, using moderate pressure, and measuring the activity on the wiping material. Sufficient measurements shall [must] be taken in the most appropriate locations to yield a representative assessment of the removable contamination levels. Except as provided in clause (iii) of this subparagraph, the amount of radioactivity measured on any single wiping material, when averaged over the surface wiped, shall [must] not exceed the limits given in clause (ii) of this subparagraph at any time during transport. If other methods are used, the detection efficiency of the method used shall [must] be taken into account and in no case may the removable contamination on the external surfaces of the package exceed 10 times the limits listed in clause (ii) of this subparagraph.

(ii) - (iii) (No change.)

(B) (No change.)

(5) - (6) (No change.)

(ff) General requirements for waste management.

(1) Unless otherwise exempted, a licensee shall discharge, treat, or decay licensed material or transfer waste for disposal only:

(A) (No change.)

(B) by decay in storage with prior approval from the agency, except as authorized in §289.256(ee) of this title [**(relating to Medical and Veterinary Use of Radioactive Material)**];

(C) - (D) (No change.)

(2) Upon agency approval, emission control dust and other material from electric arc furnaces or foundries contaminated as a result of inadvertent melting of cesium-137 or americium-241 sources may be transferred for disposal to a hazardous waste disposal facility authorized by the Texas Commission on Environmental Quality (Commission) or its successor, another state's regulatory agency with jurisdiction to regulate hazardous waste as classified under Subtitle C of the Resource Conservation and Recovery Act (RCRA), or the EPA. The material may be transferred for disposal without regard to its radioactivity if the following conditions are met.

(A) - (E) (No change.)

(F) The packaged stabilized material has been packaged for transportation and disposal in non-bulk steel packaging as defined in DOT regulations at Title 49, CFR, §173.213.

(G) - (I) (No change.)

(J) The licensee transferring the cesium-137 or americium-241 contaminated incident-related material shall [must] consult with the agency, the Commission or its successor, another state's regulatory agency with jurisdiction to regulate hazardous waste as classified under RCRA, or the EPA and other authorized parties, including state and local governments, and obtain all necessary approvals, in addition to those of NRC and/or appropriate agreement states, for the transfers described in paragraph (2) of this subsection.

(K) (No change.)

(L) The total incident-related cesium-137 activity described in paragraph (2) of this subsection received by a facility over its operating life shall not exceed 1 Ci (37 gigabecquerels (GBq) [**GBq**]). The total incident-related americium-241 activity described in paragraph (2) of this subsection received by a facility over its operating life shall not exceed 30 mCi (1.11 megabecquerels (MBq)) [**(1.11MBq)**]. The agency will maintain a record of the total incident-related cesium-137 or americium-241 activity shipped by a person licensed by the agency. Upon consultation with the Commission, the agency will determine if the total incident-related activity received by a hazardous waste disposal facility over its operating life has reached 1 Ci (37 GBq) of cesium-137 or 30 mCi (1.11 MBq) [**(1.11MBq)**] of americium-241. The agency will not approve shipments of cesium-137 or americium-241 contaminated incident-related material that will cause this limit to be exceeded.

(3) - (6) (No change.)

(gg) Discharge by release into sanitary sewerage.

(1) A licensee may discharge licensed material into sanitary sewerage if each of the following conditions is satisfied:

(A) - (C) (No change.)

(D) the total quantity of licensed radioactive material that the licensee releases into the sanitary sewerage in a year does not exceed 5 curies (Ci) (185 GBq [**gigabecquerels (GBq)**]) of hydrogen-3, 1 Ci (37 GBq) of carbon-14, and 1 Ci (37 GBq) of all other radioactive materials combined.

(2) (No change.)

(hh) - (ii) (No change.)

(jj) Transfer for disposal and manifests.

(1) The control of transfers of LLRW intended for disposal at a licensed low-level radioactive waste disposal facility, the establishment of a manifest tracking system, and additional requirements concerning transfers and recordkeeping for those wastes are found in §289.257(ff) [§289.257(s)(5)] of this title.

(2) Each person involved in the transfer of waste for disposal including the waste generator, waste collector, and waste processor, shall comply with the requirements specified in §289.257(ff) [§289.257(s)(5)] of this title.

(kk) - (oo) (No change.)

(pp) Records of lifetime cumulative occupational radiation dose. The licensee shall retain the records of lifetime cumulative occupational radiation dose as specified in subsection (k) of this section on RC Form 202-2 [BRC Form 202-2] or equivalent until the agency terminates each pertinent license requiring this record. The licensee shall retain records used in preparing RC Form 202-2 [BRC Form 202-2] or equivalent for three years after the record is made.

(qq) (No change.)

(rr) Records of individual monitoring results.

(1) - (2) (No change.)

(3) The licensee shall maintain the records specified in paragraph (1) of this subsection on RC Form 202-3 [BRC Form 202-3], in accordance with the instructions for RC Form 202-3 [BRC Form 202-3], or in clear and legible records containing all the information required by RC Form 202-3 [BRC Form 202-3].

(4) (No change.)

(5) The licensee shall retain each required form or record until the agency terminates each pertinent license requiring the record. The licensee shall retain records used in preparing RC Form 202-3 [BRC Form 202-3] or equivalent for three years after the record is made.

(ss) - (ccc) (No change.)

(ddd) Radiological requirements for license termination.

(1) General provisions and scope.

(A) The requirements in this section apply to the decommissioning of facilities licensed in accordance with §289.252 of this title, §289.253 of this title (relating to Radiation Safety Requirements for Well Logging Service Operations and Tracer Studies).

§289.255 of this title (relating to Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography), **[and]** §289.258 of this title (relating to Licensing and Radiation Safety Requirements for Irradiators), and §289.259 of this title (relating to Licensing of Naturally Occurring Radioactive Material).

(B) - (D) (No change.)

(2) Radiological requirements for unrestricted use.

(A) A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are ALARA. Determination of the levels that are ALARA shall **[must]** take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

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

(i) funds placed into a trust segregated from the licensee's assets and outside the licensee's administrative control, and in which the adequacy of the trust funds is to be assessed based on an assumed annual 1% real rate of return on investment;

(ii) a statement of intent in the case of federal, state, or local government licensees, as described in §289.252(gg) of this title; or

(iii) when a governmental entity is assuming custody and ownership of a site, an arrangement that is deemed acceptable by such governmental entity.

(C) The licensee has submitted a decommissioning plan or License Termination Plan (LTP) to the agency indicating the licensee's intent to decommission in accordance with §289.252(y) of this title, and specifying that the licensee intends to decommission by restricting use of the site. The licensee shall document in the LTP or decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated, as appropriate, following analysis of that advice.

(i) Licensees proposing to decommission by restricting use of the site shall seek advice from such affected parties regarding the following matters concerning the proposed decommissioning:

(I) whether provisions for institutional controls proposed by the licensee;

(-a-) will provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 25 mrem (0.25 mSv) TEDE per year;

(-b-) will be enforceable; and

(-c-) will not impose undue burdens on the local community or other affected parties; and

(II) whether the licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site.

(ii) In seeking advice on the issues identified in clause (i) of this subparagraph, the licensee shall provide for:

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

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

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

(D) Residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group is ALARA and would not exceed either:

(i) 100 mrem (1 mSv) per year; or

(ii) 500 mrem (5 mSv) per year provided the licensee:

(I) demonstrates that further reductions in residual radioactivity necessary to comply with the 100 mrem/y (1 mSv/y) value of clause (i) of this subparagraph are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm;

(II) makes provisions for durable institutional controls; and

(III) provides sufficient financial assurance to enable a responsible government entity or independent third party, including a governmental custodian of a site, both to carry out periodic rechecks of the site no less frequently than every 5 years to

assure that the institutional controls remain in place as necessary to meet the criteria of subparagraph (A) of this paragraph and to assume and carry out responsibilities for any necessary control and maintenance of those controls. Acceptable financial assurance mechanisms are those in subparagraph (B) of this paragraph.

(3) Alternate requirements for license termination.

(A) The agency may terminate a license using alternate requirements greater than the dose requirements specified in paragraph (2) of this subsection if the licensee does the following:

(i) (No change.)

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

(iii) has submitted a decommissioning plan to the agency indicating the licensee's intent to decommission in accordance with the requirements in §289.252(1)(7) of this title, and specifying that the licensee proposes to decommission by use of alternate requirements. The licensee shall document in the decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice. In seeking such advice, the licensee shall provide for the following:

(I) - (II) (No change.)

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

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

(B) (No change.)

(4) Public notification and public participation. Upon receipt of a decommissioning plan from the licensee, or a proposal from the licensee for release of a site in accordance with paragraph (3) of this subsection, or whenever the agency deems such notice to be in the public interest, the agency will do the following:

(A) (No change.)

(B) publish a notice in the *Texas Register* and a forum, such as local newspapers, letters to state or [of] local organizations, or other appropriate forum, that is readily accessible to individuals in the vicinity of the site, and solicit comments from affected parties.

(5) Minimization of contamination.

(A) Applicants for licenses, other than renewals, after October 1, 2000, shall describe in the application how facility design and procedures for operation will minimize, to the extent practical, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practical, the generation of LLRW.

(B) Licensees shall, to the extent practical, conduct operations to minimize the introduction of residual radioactivity into the site, including the subsurface, in accordance with the existing radiation protection requirements and radiological criteria for license termination in this subsection.

(eee) (No change.)

(fff) Exemption of specific wastes.

(1) - (3) (No change.)

(4) Any licensee may, upon agency approval of procedures required in paragraph (6) of this subsection, discard licensed material included in subsection (ggg)(7) of this section, provided that it does not exceed the concentration and total curie limits contained therein, in a Type I municipal solid waste site as defined in the Municipal Solid Waste Regulations of the authorized regulatory agency Title 30, Texas Administrative Code, Chapter 330 [(31 Texas Administrative Code Chapter 330)], unless such licensed material also contains hazardous waste, as defined in §3(15) of the Solid Waste Disposal Act, Health and Safety Code, Chapter 361. Any licensed material included in subsection (ggg)(7) of this section and which is a hazardous waste as defined in the Solid Waste Disposal Act may be discarded at a facility authorized to manage hazardous waste by the authorized regulatory agency.

(5) - (9) (No change.)

(ggg) Appendices.

(1) (No change.)

(2) Annual limits on intake (ALI) and derived air concentrations (DAC) of radionuclides for occupational exposure; effluent concentrations; concentrations for release to sanitary sewerage.

(A) (No change.)

(B) Occupational values.

(i) - (iii) (No change.)

(iv) The dose equivalents for an extremity, skin, and lens of the eye are not considered in computing the committed effective dose equivalent, but are subject to limits that shall **[must]** be met separately.

(v) - (xii) (No change.)

(C) - (F) (No change.)

(3) (No change.)

(4) Classification and characteristics of low-level radioactive waste (LLRW).

(A) Classification of radioactive waste for land disposal.

(i) - (vi) (No change.)

(vii) The sum of the fractions rule for mixtures of radionuclides. For determining classification for waste that contains a mixture of radionuclides, it is necessary to determine the sum of fractions by dividing each radionuclide's concentration by the appropriate limit and adding the resulting values. The appropriate limits shall **[must]** all be taken from the same column of the same table. The sum of the fractions for the column shall **[must]** be less than 1.0 if the waste class is to be determined by that column. Example: A waste contains Sr-90 in a concentration of 50 curies per cubic meter (Ci/m^3) (1.85 terabecquerels per cubic meter (TBq/m^3)) and Cs-137 in a concentration of 22 Ci/m^3 (814 gigabecquerels per cubic meter (GBq/m^3)). Since the concentrations both exceed the values in Column 1 of clause (iv)(VI) of this subparagraph, they shall **[must]** be compared to Column 2 values. For Sr-90 fraction, $50/150 = 0.33$, for Cs-137 fraction, $22/44 = 0.5$; the sum of the fractions = 0.83. Since the sum is less than 1.0, the waste is Class B.

(viii) (No change.)

(B) - (C) (No change.)

(5) Time requirements for record keeping.

Figure: 25 TAC §289.202(ggg)(5) [**Figure: 25 TAC §289.202(ggg)(5)**]

(6) - (9) (No change.)

(hhh) (No change.)

Specific Subsection	Name of Record	Time Interval Required for Record Keeping
(ll)(4)	Records at Additional Authorized Use/ Storage Sites	While site is authorized on license/registration
(mm)(1)(A)	Radiation Protection Programs	Until termination of license/registration
(mm)(1)(B)	Program Audits	3 years
(nn)(1)	Routine Surveys, Instrument Calibrations and Package Surveys	3 years
(nn)(2)	Surveys, Measurements, Calculations Used for Dose Determination; Results of Air Sampling, Bioassays; Measurements, Calculations Used to Determine Release of Radioactive Effluents	Until termination of license/registration
(oo)	Tests for leakage/contamination of sealed sources	5 years
(pp)	Lifetime Cumulative Occupational Radiation Dose, RC Form 202-2	Until termination of license
(pp)	Records Used to Prepare RC Form 202-2	3 years
(qq)(B)	Planned Special Exposures	Until termination of license

Specific Subsection	Name of Record	Time Interval Required for Record Keeping
(rr)(1) - (3)	Individual Monitoring Results; RC Form 202-3	Update annually; Maintain until termination of license/registration
(rr)(5)	Records Used to Prepare RC Form 202-3	3 years
(rr)(4)	Embryo/Fetus Dose	Until termination of license/registration
(ss)	Dose to Individual Members of the Public	Until termination of license/registration
(tt)	Discharge, Treatment, or Transfer for Disposal	Until termination of license/registration
(uu)	Entry Control Device Testing for Very High Radiation Areas	3 years

§289.251. Exemptions, General Licenses, and General License Acknowledgements.

(a) (No change.)

(b) Scope. Except as otherwise authorized, no person shall receive, possess, use, transfer, own, or acquire radioactive material except as authorized in a general license or general license acknowledgement issued in accordance with this section, or in a specific license issued in accordance with §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),**] §289.255 of this title (relating to Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography), §289.256 of this title (relating to Medical and Veterinary Use of Radioactive Material), §289.258 of this title (relating to Licensing and Radiation Safety Requirements for Irradiators), or §289.259 of this title (relating to Licensing of Naturally Occurring Radioactive Material (NORM))[, **or §289.260 of this title (relating to Licensing of Uranium Recovery and Byproduct Material Disposal Facilities)**].

(c) - (d) (No change.)

(e) Exemptions for radioactive material other than source material.

(1) Exempt concentrations.

(A) - (B) (No change.)

(C) A manufacturer, processor, or producer of a product or material is exempt from the requirements for a license, as specified in §289.252 of this title, if the manufacturer, processor, or producer transfers radioactive material contained in a product or material that does not exceed the concentrations specified in subsection (1)(1) of this section, and that has been introduced into the product or material by a licensee holding a specific license issued by the NRC, any agreement state, or any licensing state that expressly authorizes such introduction. The exemption specified in this subparagraph does not apply to the transfer of radioactive material contained in any food, beverage, cosmetic, drug, or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

(2) Exempt quantities.

(A) Except as provided in subparagraphs (C), (D), and (F) of this paragraph, any person is exempt from these rules if that person receives, possesses, uses, transfers, owns, or acquires radioactive material in individual quantities, each of which does not exceed the applicable quantity set forth in subsection (1)(2) of this section.

(B) - (F) (No change.)

(3) Exempt items.

(A) Certain items containing radioactive material.

(i) Except for persons who apply radioactive material to, or persons who incorporate radioactive material into the following products, any person is exempt from this chapter if that person receives, possesses, uses, transfers, or acquires the following products:

(I) timepieces, hands, or dials containing not more than the following specified quantities of radioactive material and not exceeding the following specified levels of radiation:

(-a-) 25 millicuries (mCi) (925 megabecquerels (MBq)) of [(**mCi**) of] tritium per timepiece;

(-b-) - (-g-) (No change.)

(-h-) 1 μ Ci (0.037 MBq) [(**0.037 megabecquerel (MBq)**)] of radium-226 per timepiece in intact timepieces manufactured prior to January 1, 1986;

(II) static elimination devices which contain, as a sealed source or sources, radioactive material consisting of a total of not more than 500 μ Ci (18.5 MBq) of polonium-210 per device;

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

(IV) such devices authorized before October 23, 2012, for use under a general license issued in accordance with this section or equivalent regulations of the NRC or an agreement state and manufactured, tested, and labeled by the manufacturer in accordance with the specifications contained in a specific license issued by the NRC, any agreement state, or any licensing state;

(V) [(II)] lock illuminators containing not more than 15 mCi (555 MBq) of tritium or not more than 2 mCi (74 MBq) of promethium-147 installed in automobile locks. The levels of radiation from each lock illuminator containing promethium-147 will not exceed 1 mrad/hr at 1 cm from any surface when measured through 50 mg/cm² of absorber;

(VI) [(III)] balances of precision containing not more than 1 mCi (37 MBq) of tritium per balance or not more than 0.5 mCi (18.5 MBq) of tritium per balance part manufactured before December 17, 2007;

[(IV) automobile shift quadrants containing not more than 25 mCi of tritium;]

(VII) [(V)] marine compasses containing not more than 750 mCi (27.75 MBq) of tritium gas and other marine navigational instruments containing not more than 250 mCi (9.25 GBq) of tritium gas manufactured before December 17, 2007;

[(VI) thermostat dials and pointers containing not more than 25 mCi of tritium per thermostat;]

(VIII) [(VII)] electron tubes, provided that each tube does not contain more than one of the following specified quantities of radioactive material and that the levels of radiation from each electron tube containing radioactive [byproduct] material do not exceed 1 mrad/hr at 1 cm from any surface when measured through 7 mg/cm² of absorber (For purposes of this clause, "electron tubes" include spark gap tubes, power tubes, gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pick-up tubes, radiation detection tubes, and any other completely sealed tube designed to control electrical currents):

(-a-) 150 mCi (5.55 GBq) of tritium per microwave receiver protector tube or 10 mCi (0.37 GBq) of tritium per any other electron tube;

(-b-) 1 μ Ci (0.037 MBq) of cobalt-60;

(-c-) 5 μ Ci (0.185 GBq) of nickel-63;

(-d-) 30 μ Ci (1.11 GBq) of krypton-85;

(-e-) 5 μ Ci (0.185 GBq) of cesium-137; or

(-f-) 30 μ Ci (1.11 GBq) of promethium-147;

(IX) [(VIII)] ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, a source of radioactive material not exceeding:

(-a-) the applicable quantity set forth in subsection (1)(2) of this section or 0.05 μ Ci (1.85 kilobecquerels (kBq)) of americium-241; and

(-b-) each instrument contains no more than 10 exempt quantities. For purposes of this subclause, an instrument's source(s) shall contain either one type or different types of radionuclides and an individual exempt quantity shall be composed of fractional parts of one or more of the exempt quantities in accordance with subsection (1)(2) of this section, provided that the sum of such fractions shall not exceed unity.

[(IX) spark gap irradiators containing not more than 1 μ Ci of cobalt-60 per spark gap irradiator for use in electrically ignited fuel oil burners having a firing rate of at least 3 gallons per hour; or]

(X) ionization chamber smoke detectors containing not more than 1 μCi (37 kBq) [**microcurie (μCi)**] of americium-241 per detector in the form of a foil and designed to protect life and property from fires.

(ii) (No change.)

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

(B) Self-luminous products containing tritium, krypton-85, promethium-147, or radium-226.

(i) Except for persons who manufacture, process, or produce, or initially transfer for sale or distribution self-luminous products containing tritium, krypton-85, or promethium-147, and except as provided in clause (iii) of this subparagraph, any person is exempt from this chapter if that person receives, possesses, uses, transfers, owns, or acquires tritium, krypton-85, or promethium-147 in self-luminous products manufactured, processed, produced, [**imported,**] or initially transferred in accordance with a specific license issued by the NRC in accordance with Title 10, CFR, §32.22, which authorizes the initial transfer of the product to persons who are exempt from regulatory requirements. [**The exemption in this subparagraph does not apply to tritium, krypton-85, or promethium-147 used in products for frivolous purposes or in toys or adornments.**]

(ii) Any person who desires to manufacture, process, or produce, or initially transfer for sale or distribution self-luminous products containing tritium, krypton-85, or promethium-147 for use under clause (i) of this subparagraph, shall apply for:

(I) a specific license to be issued by the NRC in accordance with Title 10, CFR, §32.22; and

(II) a certificate of registration to be issued by the NRC in accordance with Title 10, CFR, §32.210.

[(ii) Any person is exempt from this chapter if that person receives, possesses, uses, transfers, or owns articles acquired prior to January 1, 1986, each of which contains less than 0.1 μCi of radium-226.]

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

(C) Gas and aerosol detectors containing radioactive material.

(i) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution gas and aerosol detectors containing radioactive material, any person is exempt from this chapter to the extent [if] that such person receives, possesses, uses, transfers, owns, or acquires radioactive material in gas and aerosol detectors designed to protect health, safety, [life] or property, [from fires and airborne hazards provided that:]

(I) Detectors [detectors] containing radioactive material shall have been manufactured, processed, produced, or initially transferred in accordance with a specific license issued by the NRC in accordance with Title 10, CFR, §32.26, [, or an agreement state or a licensing state in accordance with §289.252(k) of this title;]

(II) The [the] specific license issued in accordance with Title 10, CFR, §32.26, [§289.252 of this title] authorizes the initial transfer of the product for use to persons who are exempt from regulatory requirements. [; and]

(III) This [this] exemption also covers gas and aerosol detectors manufactured or distributed before November 30, 2007 in accordance with a specific license issued in accordance with §289.252 of this title or under comparable provisions to Title 10, CFR, §32.26 authorizing distribution to persons exempt from regulatory requirements.

(IV) Any person who desires to manufacture, process, or produce, gas and aerosol detectors containing radioactive material, or to initially transfer such products for use under this clause, shall apply for:

(-a-) a specific license to be issued by the NRC in accordance with Title 10, CFR, §32.26; and

(-b-) a certificate of registration to be issued by the NRC in accordance with Title 10, CFR, §32.210.

(ii) - (iii) (No change.)

(D) Certain industrial devices. Except for persons who manufacture, process, produce, or initially transfer for sale or distribution industrial devices containing radioactive material designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing an ionized atmosphere, any person is exempt from the requirements of this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material, in these certain detecting, measuring, gauging, or controlling devices and certain devices for producing an ionized atmosphere.

(i) Devices containing radioactive material shall have been manufactured, processed, produced, or initially transferred in accordance with a specific license issued under Title 10, CFR, §32.30.

(ii) The specific license issued in accordance with Title 10, CFR, §32.30, authorizes the initial transfer of the device for use under Title 10, CFR, §32.30.

(iii) This exemption does not cover sources not incorporated into a device, such as calibration and reference sources.

(iv) Any person who desires to manufacture, process, produce, or initially transfer for sale or distribution industrial devices containing radioactive material for use under this subparagraph, shall apply for:

(I) a license to be issued by the NRC under Title 10, CFR, §32.30; and

(II) a certificate of registration to be issued by the NRC in accordance with Title 10, CFR, §32.210.

(4) (No change.)

(f) General licenses. In addition to the requirements of this section, all general licenses, unless otherwise specified, are subject to the requirements of §289.201 of this title (relating to General Provisions for Radioactive Material), §289.202(ww) and (xx) of this title (relating to Standards for Protection Against Radiation from Radioactive Materials), §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), and §289.257 of this title (relating to Packaging and Transportation of Radioactive Material).

(1) - (3) (No change.)

(4) General licenses for radioactive material other than source material.

(A) - (C) (No change.)

(D) General license for calibration, stabilization, and reference sources.

(i) (No change.)

(ii) The general license in clause (i) of this subparagraph applies only to calibration, stabilization, or reference sources that have been manufactured or initially transferred in accordance with the specifications contained in a specific license issued to the manufacturer or importer of the sources by the NRC in accordance with Title 10, CFR, §32.57 or Title 10, CFR, §70.39 or that have been manufactured or initially transferred in accordance with the authorizations contained in a specific license issued to the manufacturer by the agency, any agreement state, or any licensing state, in accordance with licensing requirements equivalent to those contained in Title 10, CFR, §32.57 or Title 10, CFR, §70.39.

(iii) - (iv) (No change.)

(E) - (G) (No change.)

(H) General license for certain detecting, measuring, gauging, or controlling devices and certain devices for producing light or an ionized atmosphere.

(i) - (iii) (No change.)

(iv) Any person who receives, acquires, possesses, uses, or transfers radioactive material in a device in accordance with the general license in this subparagraph shall do the following:

(I) - (III) (No change.)

(IV) maintain records for inspection by the agency showing compliance with the requirements of subclauses (II) and (III) of this clause. The records shall show the test results. The records also shall identify the device tested by manufacturer, model and serial number of the device, serial number of the sealed source, and show the dates of performance of and the names of persons performing testing, installation, servicing, and removal from location of installation, of the radioactive material, its shielding or containment. Retention shall be as follows:

(-a-) records for tests for leakage of **[or]** radioactive material required by subclause (II) of this clause shall **[must]** be kept for three years after the next required leak test **[text]** is performed or until the sealed source is transferred or disposed of;

(-b-) records of the test of the on-off mechanism and indicator required by subclause (II) of this clause shall **[must]** be kept for three years after the next required test of the on-off mechanism and indicator is performed or until the sealed source is transferred or disposed of; and

(-c-) records of the testing, installation (removal of the manufacturer's lock and initial alignment of the radiation beam), servicing, and removal from location of installation involving the radioactive materials, its shielding or containment required by subclause (III) of this clause shall be kept for three years from the date of the recorded event or until the device is transferred or disposed of; **[.]**

(V) - (XIX) (No change.)

(I) - (J) (No change.)

(K) General license for certain items and self-luminous products containing radium-226.

(i) A general license is hereby issued to any person to acquire, receive, possess, use, or transfer radium-226 contained in the following products manufactured prior to November 30, 2007.

(I) - (V) (No change.)

(ii) Any person who acquires, receives, possesses, uses, or transfers radioactive material in accordance with this subparagraph shall do the following.

(I) - (III) (No change.)

(IV) Not export products containing radium-226 except in accordance with or equivalent regulations of the NRC Title 10, CFR, §110.

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

(VI) Respond to written requests from the agency to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested information within the allotted time, it shall, within that same time period, request a longer period to supply the information by providing the agency's Radiation Safety Licensing Branch, a written justification for the request.

(g) General license acknowledgements for radioactive material other than source material. In addition to the requirements of this section, all general license acknowledgement holders, unless otherwise specified, are subject to the requirements of §§289.201, 289.202(ww) and (xx), 289.204, 289.205, and 289.257 of this title.

(1) Persons possessing a general license for devices in accordance with subsection (f)(4)(H) of this section and being in the possession of radioactive material in devices containing at least 370 MBq (10 mCi) of cesium-137, 3.7 MBq (0.1 mCi) of strontium-90, 37 MBq (1 mCi) of cobalt-60, 3.7 MBq (0.1 mCi) of radium-226, 37 MBq (1 mCi) of americium-241, or any transuranic (for example, element with atomic number greater than uranium (92)), based on the activity indicated on the label on the device, shall file an application for acknowledgement within 30 days of receipt, acquisition, or possession of such a device. The application shall be on a form prescribed by the agency to include the following information and any other information specifically requested by the agency:

(A) - (F) (No change.)

(G) a completed RC Form 252-1 [BRC Form 252-1], Business Information Form and the applicable fee as required by §289.204 of this title.

(2) - (3) (No change.)

(h) - (l) (No change.)

§289.252. Licensing of Radioactive Material.

(a) - (c) (No change.)

(d) Filing application for specific licenses. The agency may, at any time after the filing of the original application, require further statements in order to enable the agency to determine whether the application should be denied or the license should be issued.

(1) - (4) (No change.)

(5) Each application shall be accompanied by a completed RC Form 252-1 [BRC Form 252-1] (Business Information Form).

(6) - (8) (No change.)

(9) Except as provided in this paragraph, an application for a specific license to use radioactive material in the form of a sealed source or in a device that contains the sealed source shall:

(A) identify the source or device by manufacturer and model number as registered in accordance with subsection (v) of this section or with equivalent regulations of the NRC, an agreement state, or a licensing state, or for a source or a device containing radium-226 or accelerator-produced radioactive material registered in accordance with subsection (v) of this section; or

(B) contain the information specified in subsection (v)(3) - (4) of this section.

(10) For sources or devices manufactured before October 23, 2012, that are not registered in accordance with subsection (v) of this section or with equivalent regulations of the NRC, an agreement state, or a licensing state, and for which the applicant is unable to provide all categories of information specified in subsection (v)(3) - (4) of this section, the application shall include:

(A) all available information identified in subsection (v)(3) - (4) of this section concerning the source, and, if applicable, the device; and

(B) sufficient additional information to demonstrate that there is reasonable assurance that the radiation safety properties of the source or device are adequate to protect health and minimize danger to life and property. Such information shall include:

(i) a description of the source or device;

(ii) a description of radiation safety features;

(iii) the intended use and associated operating experience; and

(iv) the results of a recent leak test.

(11) For sealed sources and devices allowed to be distributed without registration of safety information in accordance with subsection (v)(8)(A) of this section, the applicant shall supply only the manufacturer, model number, and radionuclide and quantity.

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

(13) [(9)] Notwithstanding the provisions of §289.204(d)(1) of this title, reimbursement of application fees may be granted in the following manner.

(A) In the event the application is not processed in the time periods as stated in paragraph (8) of this subsection, the applicant has the right to request of the director of the Radiation Control Program full reimbursement of all application fees paid in that particular application process. If the director does not agree that the established periods have been violated or finds that good cause existed for exceeding the established periods, the request will be denied.

(B) Good cause for exceeding the period established is considered to exist if:

(i) the number of applications for licenses to be processed exceeds by 15% or more the number processed in the same calendar quarter the preceding year;

(ii) another public or private entity utilized in the application process caused the delay; or

(iii) other conditions existed giving good cause for exceeding the established periods.

(C) If the request for full reimbursement authorized by subparagraph (A) of this paragraph is denied, the applicant may then request a hearing by appeal to the Commissioner of Health for a resolution of the dispute. The appeal will be processed in accordance with Title 1, TAC [Texas Administrative Code], Chapter 155, and the Formal Hearing Procedures, §§1.21, 1.23, 1.25, and 1.27 of this title.

(14) [(10)] Applications for licenses may be denied for the following reasons:

(A) any material false statement in the application or any statement of fact required under provisions of the Texas Radiation Control Act (Act);

(B) conditions revealed by the application or statement of fact or any report, record, or inspection, or other means that would warrant the agency to refuse to grant a license on an application; or

(C) failure to clearly demonstrate how the requirements in this chapter have been addressed.

(15) [(11)] Action on a specific license application will be considered abandoned if the applicant does not respond within 30 days from the date of a request for any information by the agency. Abandonment of such actions does not provide an opportunity for a hearing; however, the applicant retains the right to resubmit the application in accordance with paragraphs (1) - (7) of this subsection.

(e) General requirements for the issuance of specific licenses. A license application will be approved if the agency determines that:

(1) - (9) (No change.)

(10) there is no reason to deny the license as specified in subsections (d)(14) or (x)(9) [(d)(10) or (x)(8)] of this section; and

(11) (No change.)

(f) - (i) (No change.)

(j) Specific licenses for commercial distribution of radioactive material in exempt quantities.

(1) Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing source material, [or] byproduct material, or naturally accelerator-produced radioactive material (NARM) whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the United States Nuclear Regulatory Commission (NRC), Washington, DC 20555 in accordance with Title 10, Code of Federal Regulations (CFR), §32.18.

[(2) In addition to the requirements in subsection (e) of this section, a specific license to distribute naturally occurring or accelerator-produced radioactive material (NARM) to persons exempt from this chapter in accordance with §289.251(e)(2) of this title will be issued if the agency approves the following information submitted by the applicant:]

[(A) that the radioactive material is not contained in any food, beverage, cosmetic, drug, or other commodity designed for ingestion or inhalation by, or application to, a human;]

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

[(C) copies of prototype labels and brochures; and]

[(D) procedures for disposition of unwanted or unused radioactive material.]

[(3) The license issued in accordance with paragraph (2) of this subsection is subject to the following conditions.]

[(A) No more than 10 exempt quantities shall be sold or commercially distributed in any single transaction. However, an exempt quantity may be composed of fractional parts of one or more of the exempt quantities provided the sum of the fractions shall not exceed unity.]

[(B) Each exempt quantity shall be separately and individually packaged. No more than 10 such packaged exempt quantities shall be contained in any other package for commercial distribution to persons exempt from this chapter in accordance with §289.251(e)(2) of this title. The outer package shall be such that the dose rate at the external surface of the package does not exceed 0.5 millirem per hour (mrem/hr).]

[(C) The immediate container of each quantity or separately packaged fractional quantity of radioactive material shall bear a durable, legible label that:]

[(i) identifies the radionuclide and the quantity of radioactivity; and]

[(ii) bears the words "Radioactive Material."]

[(D) In addition to the labeling information required by subparagraph (C) of this paragraph, the label affixed to the immediate container, or an accompanying brochure, shall:]

[(i) state that the contents are exempt from the NRC, agreement state, or licensing state requirements;]

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

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

[(4) Each person licensed in accordance with this subsection shall maintain records identifying, by name and address, each person to whom radioactive material is commercially distributed for use in accordance with §289.251(e)(2) of this title or the equivalent regulations of an agreement state or a licensing state, and stating the kinds and quantities of radioactive material commercially distributed. An annual summary report stating the total quantity of each radionuclide commercially distributed in accordance with the specific license shall be filed with the agency. Each report shall cover the year ending June 30, and shall be filed within 30 days thereafter. If no commercial distributions of radioactive material have been made in accordance with this subsection during the reporting period, the report shall so indicate.]

(2) [(5)] Licenses issued in accordance with this subsection do not authorize the following:

(A) combining of exempt quantities of radioactive material in a single device;

(B) any program advising persons to combine exempt quantity sources and providing devices for them to do so; and

(C) the possession and use of combined exempt sources, in a single unregistered device, by persons exempt from licensing in accordance with §289.251(e)(2) of this title.

(k) Specific licenses for incorporation of byproduct material or NARM into gas and aerosol detectors. A [In addition to the requirements in subsection (e) of this section, a] specific license authorizing the incorporation of byproduct material or NARM into gas and aerosol detectors to be distributed to persons exempt from this chapter shall be issued only by the NRC in accordance with [§289.251(e)(3)(C) of this title will be issued if the agency approves the information submitted by the applicant. This information shall satisfy the requirements equivalent to those contained in] Title 10, CFR [Code of Federal Regulations (CFR)], §32.26. [The maximum quantity of radium-226 in each device shall not exceed 0.1 µCi.]

(l) Specific licenses for the manufacture and commercial distribution of devices to persons generally licensed in accordance with §289.251(f)(4)(H) of this title.

(1) In addition to the requirements in subsection (e) of this section, a specific license to manufacture or commercially distribute devices containing radioactive material to persons generally licensed in accordance with §289.251(f)(4)(H) of this title or equivalent requirements of the NRC, an agreement state, or a licensing state will be issued if the agency approves the following information submitted by the applicant:

(A) - (E) (No change.)

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

(2) - (7) (No change.)

(8) If a notification of bankruptcy has been made in accordance with subsection ~~(x)(6)~~ **[(x)(5)]** of this section or the license is to be terminated, each person licensed under this subsection shall provide, upon request to the NRC and to any appropriate agreement state or licensing state, records of final disposition required under subsection (y)(16)(A) of this section.

(9) (No change.)

(m) Specific licenses for the manufacture, assembly, **[or]** repair, or initial transfer of luminous safety devices containing tritium or promethium-147 for use in aircraft for **[commercial]** distribution to persons generally licensed in accordance with §289.251(f)(4)(B) of this title. In addition to the requirements in subsection (e) of this section, a specific license to manufacture, assemble, **[or]** repair, or initially transfer luminous safety devices containing tritium or promethium-147 for use in aircraft, for **[commercial]** distribution to persons generally licensed in accordance with §289.251(f)(4)(B) of this title, will be issued if the agency approves the information submitted by the applicant. The information shall satisfy the requirements of Title 10, CFR, §§32.53, 32.54, 32.55, and 32.56, **and 32.101** or their equivalent.

(n) Specific licenses for the manufacture or initial transfer of calibration sources containing americium-241, **[plutonium,]** or radium-226 for commercial distribution to persons generally licensed in accordance with §289.251(f)(4)(D) of this title.

(1) In addition to the requirements in subsection (e) of this section, a specific license to manufacture or initially transfer calibration sources containing americium-241, **[plutonium,]** or radium-226 to persons generally licensed in accordance with §289.251(f)(4)(D) of this title will be issued if the agency approves the information submitted by the applicant. The information shall satisfy the requirements of Title 10, CFR, §§32.57, 32.58, 32.59, and **[32.102, and Title 10, CFR,]** §70.39 or their equivalent.

(2) Each person licensed in accordance with this subsection [section] shall perform a dry wipe test on each source containing more than 0.1 µCi (3.7 kilobecquerels (**kBq**)) of americium-241 or radium-226 before transferring the source to a general licensee in accordance with §289.251(f)(4)(D) of this title or equivalent regulations of the NRC, an agreement state, or a licensing state. This test shall be performed by wiping the entire

radioactive surface of the source with a filter paper with the application of moderate finger pressure. The radioactivity on the filter paper shall be measured by using radiation detection instrumentation capable of detecting 0.005 μCi (0.185 kBq [**kilobecquerel**]) of americium-241 or radium-226. If a source has been shown to be leaking or losing more than 0.005 μCi (0.185 kBq) of americium-241 or radium-226 by methods described in this paragraph, the source shall be rejected and shall not be transferred to a general licensee under §289.251(f)(4)(D) of this title or equivalent regulations of the NRC, an agreement state, or a licensing state. [If removable contamination from any source wipe test exceeds 0.005 μCi (0.185 kilobecquerels) of americium-241 or radium-226, the source is deemed to be leaking and it shall not be transferred to a general licensee.]

(o) Specific licenses for the manufacture and commercial distribution of sealed sources or devices containing radioactive material for medical use. In addition to the requirements in subsection (e) of this section, a specific license to manufacture and commercially distribute sealed sources and devices containing radioactive material to persons licensed in accordance with §289.256 of this title for use as a calibration, transmission, or reference source or for use of sealed sources listed in §289.256(q), (rr), (bbb), and (ddd) of this title will be issued if the agency approves the following information submitted by the applicant:

(1) - (2) (No change.)

(3) documentation that in the event the applicant desires that the sealed source or device be required to be tested for radioactive material leakage at intervals longer than six months, the applicant shall include in the application sufficient information to demonstrate that the longer interval is justified by performance characteristics of the sealed source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of radioactive material leakage from the sealed source; [**and**]

(4) documentation that in determining the acceptable interval for testing radioactive material leakage, information will be considered that includes, but is not limited to the following:

(A) - (I) (No change.)

(J) operating experience with identical sealed sources or devices or similarly designed and constructed sealed sources or devices; and [.]

(5) the source or device has been registered in the Sealed Source and Device Registry.

(p) Specific licenses for the manufacture and commercial distribution of radioactive material for certain *in vitro* clinical or laboratory testing in accordance with the general license. In addition to the requirements in subsection (e) of this section, a specific license to manufacture or commercially distribute radioactive material for use in accordance with the general license in §289.251(f)(4)(G) of this title will be issued if the agency approves the following information submitted by the applicant:

(1) documentation that the radioactive material will be prepared for distribution in prepackaged units of:

(A) iodine-125 in units not exceeding 10 μCi [**microcuries (μCi)**] (0.37 megabecquerel) each;

(B) - (H) (No change.)

(2) - (4) (No change.)

(q) Specific licenses for the manufacture and commercial distribution of ice detection devices. In addition to the requirements of subsection (e) of this section, a specific license to manufacture and commercially distribute ice detection devices to persons generally licensed in accordance with §289.251(f)(4)(E) of this title will be issued if the agency approves the information submitted by the applicant. This information shall satisfy the requirements of Title 10, CFR, §§32.61 and [,] 32.62[, **and 32.103**].

(r) - (u) (No change.)

(v) Sealed source or device evaluation.

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

(2) The request for review shall be sent to the Radiation Safety Licensing Branch in accordance with §289.201(k) of this title and shall be submitted in duplicate accompanied by the appropriate fee in §289.204 of this title.

(3) In order to provide reasonable assurance that the radiation safety properties of the source or device are adequate to protect health and minimize danger to life and property, the request for evaluation of a sealed source or device shall include sufficient information about the:

(A) design;

(B) manufacture;

(C) prototype testing;

(D) quality control program;

(E) labeling;

(F) proposed uses; and

(G) leak testing.

(4) The request for evaluation of a device shall also include sufficient information about:

(A) installation;

(B) service and maintenance;

(C) operating and safety instructions; and

(D) its potential hazards.

(5) The agency normally evaluates a sealed source or a device using radiation safety criteria in accepted industry standards. If these standards and criteria do not readily apply to a particular case, the agency formulates reasonable standards and criteria with the help of the manufacturer or distributor. The agency shall use criteria and standards sufficient to ensure that the radiation safety properties of the device or sealed source are adequate to protect health and minimize danger to life and property. Section §289.251(e)(1) - (3) of this title includes specific criteria that apply to certain exempt products and §289.251(f) of this title includes specific criteria applicable to certain generally licensed devices. This section includes specific provisions that apply to certain specifically licensed items.

(6) After completion of the evaluation, the agency issues a sealed source and device (SS & D) registration to the person making the request. The SS & D registration acknowledges the availability of the submitted information for inclusion in an application for a specific license proposing use of the product, or concerning use under an exemption from licensing or general license as applicable for the category of SS & D registration.

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

(A) the statements and representations, including quality control program, contained in the request; and

(B) the provisions of the SS & D registration.

(8) Authority to manufacture or initially distribute a sealed source or device to specific licensees shall be provided in the license without the issuance of a SS & D registration in the following cases:

(A) calibration and reference sources shall contain no more than:

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

or

(ii) 10 μ Ci (0.37 MBq) for alpha emitting radionuclides; or

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

(i) the intended recipients are licensed in accordance with this section or equivalent regulations of the NRC, an agreement state, or a licensing state; or

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

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

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

(10) Inactivation of SS & D registrations.

(A) An SS & D registration holder who no longer manufactures or initially transfers any of the sealed source(s) or device(s) covered by a particular SS & D registration issued by the agency shall request inactivation of the SS & D registration. Such a request shall be made to the Radiation Safety Licensing Branch by an appropriate method in accordance with §289.201(k) of this title and shall normally be made no later than two years after initial distribution of all of the source(s) or device(s) covered by the SS & D registration has ceased. However, if the SS & D registration holder determines that an initial transfer was in fact the last initial transfer more than two years after that transfer, the SS & D registration holder shall request inactivation of the SS & D registration within 90 days of this determination and briefly describe the circumstances of the delay.

(B) If a distribution license is to be terminated in accordance with subsection (y) of this section, the licensee shall request inactivation of its SS & D registration(s) associated with that distribution license before the agency will terminate the license. Such a request for inactivation of the SS & D registration(s) shall indicate that the license is being terminated and include the associated specific license number.

(C) A specific license to manufacture or initially transfer a source or device covered only by an inactivated SS & D registration no longer authorizes the licensee to initially transfer such sources or devices for use. Servicing of devices shall be in accordance with any conditions in the SS & D registration, including in the case of an inactive SS & D registration.

[(v) Sealed source or device evaluation. Except as provided in paragraphs (7) and (8) of this subsection, sealed sources and devices shall only be authorized for use on radioactive material licenses in accordance with the information contained in the safety evaluation.]

[(1) An applicant shall submit a request to the agency for evaluation of radiation safety information on the sealed source or device containing a sealed source.]

[(2) The request for review shall be submitted in duplicate accompanied by the appropriate fee in §289.204 of this title.]

[(3) The request for review shall contain sufficient information about the sealed source or device to include the following:]

[(A) the radioactive material contained, its chemical and physical form, and amount;]

[(B) details of design and construction;]

[(C) procedures for, and results of, prototype tests to demonstrate that the sealed source or device will maintain its integrity under stresses likely to be encountered in normal use and accidents;]

[(D) details of quality control procedures to assure that production of sealed sources and devices meet the standards of the design and prototype tests;]

[(E) labeling;]

[(F) proposed uses; and]

[(G) procedures for leak testing.]

[(4) For a device containing radioactive material, the request shall also contain sufficient information about the device to include:]

[(A) the radiation profile of a prototype device;]

[(B) method of installation;]

[(C) service and maintenance requirements; and]

[(D) operating and safety instructions.]

[(5) After review of the request, the agency may issue an evaluation documenting the information in paragraphs (3) and (4) of this subsection.]

[(6) The applicant submitting the request for evaluation of the safety information about the product shall manufacture and distribute or cause the product to be manufactured or distributed in accordance with:]

[(A) the statements and representations contained in the request;]

[(B) documentation required to support the request;]

[(C) the provisions of the evaluation; and]

[(D) all applicable provisions contained in a radioactive material license.]

[(7) Custom (manufactured in accordance with the unique specifications of, and use by, a single licensee) sources and devices shall be evaluated using the criteria in paragraphs (1) - (6) of this subsection.]

[(8) Sealed sources or devices used for calibration and reference sources of 100 μ Ci or less for beta or gamma-emitting radionuclides and 10 μ Ci or less for alpha-emitting radionuclide do not require radiation safety evaluations.]

[(9) Sealed sources or devices used in research and development that have not had safety evaluations.]

[(A) For sealed sources or devices used in research and development, the following shall be submitted:]

[(i) the radioactive material contained, its chemical and physical form, and amount;]

[(ii) details of the design and construction sufficient to determine that no obvious mechanical flaws exist;]

[(iii) information that demonstrates that sealed sources meet ANSI/HPS N43.6-1997 criteria for the particular category of use and that devices will maintain their integrity during normal use and accident conditions; and]

[(iv) procedures for use that demonstrate a safe environment for users and others nearby.]

[(B) For custom (one-of-a-kind) sealed sources or devices used in research and development, the licensee shall be qualified by sufficient training and experience and have sufficient facilities and equipment to safely use the requested quantity of radioactive material in unsealed form.]

(w) (No change.)

(x) Specific terms and conditions of licenses.

(1) - (2) (No change.)

(3) An application for transfer of license shall include:

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

(B) financial assurance for decommissioning information required by subsection (gg) of this section.

(4) [(3)] Each person licensed by the agency in accordance with this section shall confine use and possession of the radioactive material licensed to the locations and purposes authorized in the license. Radioactive material shall not be used or stored in residential locations unless specifically authorized by the agency.

(5) [(4)] The licensee shall notify the agency, in writing within 15 calendar days, of any of the following changes:

(A) name;

(B) mailing address; or

(C) RSO.

(6) [(5)] Each licensee shall notify the agency's Radiation Safety Licensing Branch, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy by the licensee or its parent company, if the parent company is involved in the bankruptcy.

(7) [(6)] The notification in paragraph (6) [(5)] of this subsection shall include:

(A) the bankruptcy court in which the petition for bankruptcy was filed;
and

(B) the date of the filing of the petition.

(8) [(7)] A copy of the petition for bankruptcy shall be submitted to the agency along with the written notification.

(9) [(8)] In making a determination whether to grant, deny, amend, renew, revoke, suspend, or restrict a license, the agency may consider the technical competence and compliance history of an applicant or holder of a license. After an opportunity for a hearing, the agency shall deny an application for a license, an amendment to a license, or renewal of a license if the applicant's compliance history reveals that at least three agency actions have been issued against the applicant, within the previous six years, that assess administrative or civil penalties against the applicant, or that revoke or suspend the license.

(10) [(9)] Each licensee preparing technetium-99m radiopharmaceuticals from molybdenum-99/technetium-99m generators or rubidium-82 from strontium-82/rubidium-82 generators shall test the generator eluates for molybdenum-99 breakthrough or strontium-82 and strontium-85 contamination, respectively, in accordance with §289.256 of this title. The licensee shall record the results of each test and retain each record for 3 years after the record is made for inspection by the agency.

(y) - (dd) (No change.)

(ee) Reciprocal recognition of licenses.

(1) Subject to this section, any person who holds a specific license from NRC, any agreement state, or any licensing state, and issued by the agency having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, is granted a general license to conduct the activities authorized in such licensing document within the State of Texas provided that:

(A) - (E) (No change.)

(F) The out-of-state licensee shall have the following documents in their possession at all times when conducting work in Texas, and make them available for agency review upon request:

(i) - (iv) (No change.)

(v) a copy of the completed RC Form 252-3 [**BRC Form 252-3**] notifying the agency of the licensee's intent to work in Texas.

(2) - (3) (No change.)

(ff) (No change.)

(gg) Financial assurance and record keeping for decommissioning.

(1) - (3) (No change.)

(4) Each decommissioning funding plan shall:

(A) be submitted for review and approval and shall contain the following:

(i) a detailed cost estimate for decommissioning in an amount reflecting: [sufficient to allow the agency to engage a third party to decommission the site(s) specified on the license and a description of the method of assuring funds for decommissioning from paragraph (6) of this subsection, including means of adjusting cost estimates and associated funding levels periodically over the life of the facility. The required amount of financial assurance for decommissioning is determined by the quantity of material authorized by the license. Upon approval of the decommissioning funding plan by the agency, the amount of financial assurance shall be adjusted and submitted in conformance with the agency approval.]

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

(II) the cost of meeting the criteria of §289.202(ddd)(2) of this title for unrestricted use, provided that, if the applicant or licensee can demonstrate its ability to meet the provisions of §289.202(ddd)(3) of this title, the cost estimate may be based on meeting the criteria of §289.202(ddd)(3) of this title;

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

(IV) an adequate contingency factor.

(ii) identification of and justification for using the key assumptions contained in the detailed cost estimate;

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

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

(v) a signed original of the financial instrument obtained to satisfy the requirements of paragraph (5) of this subsection (unless a previously submitted and accepted financial instrument continues to cover the cost estimate for decommissioning); and

(B) at the time of license renewal and at intervals not to exceed three years, the decommissioning funding plan, be resubmitted with adjustments as necessary to

account for changes in costs and the extent of contamination. If the amount of financial assurance will be adjusted downward, this cannot be done until the updated decommissioning funding plan is approved. The decommissioning funding plan shall update the information submitted with the original or prior approved plan, and shall specifically consider the effect of the following events on decommissioning costs:

(i) spills of radioactive material producing additional residual radioactivity in onsite subsurface material;

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

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

(iv) facility modifications;

(v) changes in authorized possession limits;

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

(vii) onsite disposal; and

(viii) use of a settling pond.

(5) - (8) (No change.)

(hh) - (jj) (No change.)

(kk) Requirements for the issuance of specific licenses for a medical facility or educational institution to produce Positron Emission Tomography (PET) radioactive drugs for noncommercial transfer to licensees in its consortium.

(1) - (2) (No change.)

(3) Each licensee authorized in accordance with paragraph (1) of this subsection to produce PET radioactive drugs for noncommercial transfer to medical use licensees in its consortium shall:

(A) (No change.)

(B) possess and use instrumentation meeting the requirements of §289.202(p)(3)(D) [§289.202(p)(2)(D)] of this title to measure the radioactivity of the PET radioactive drugs intended for noncommercial distribution to members of its consortium and

meet the procedural, radioactivity measurement, instrument test, instrument check, and instrument adjustment requirements in subsection (r)(2) of this section.

(4) - (5) (No change.)

(ll) (No change.)

§289.253. Radiation Safety Requirements for Well Logging Service Operations and Tracer Studies.

(a) (No change.)

(b) Scope. This section applies to all persons who use sources of radiation for well logging service operations, radioactive markers, mineral exploration and tracer studies. In addition to the requirements of this section, persons are 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), §289.226 of this title (relating to Registration of Radiation Machine Use and Services), §289.229 of this title (relating to Radiation Safety Requirements for Accelerators, Therapeutic Radiation Machines, Simulators, and Electronic Brachytherapy Devices [and Simulators]), §289.231 of this title (relating to General Provisions and Standards for Protection Against Machine-Produced Radiation), §289.252 of this title (relating to Licensing of Radioactive Material), and §289.257 of this title (relating to Packaging and Transportation of Radioactive Material).

(c) - (h) (No change.)

(i) Leak testing of sealed sources.

(1) (No change.)

(2) Each energy compensation source that is not exempt from testing in accordance with §289.201(g)(2) of this title shall [must] be tested at intervals not to exceed three years. In the absence of a certificate from a transferor that a test has been made within the three years before the transfer, the energy compensation source may not be used until tested in accordance with §289.201(g) of this title.

(3) (No change.)

(j) - (p) (No change.)

(q) Personnel monitoring.

(1) In addition to the requirements of §289.202(p)(4) [**§289.202(p)(3)**] and (q) of this title or §289.231(n) and (s)(3) of this title, as applicable, no licensee or registrant shall permit any individual to act as a logging supervisor or logging assistant unless that individual wears an individual monitoring device that is processed and evaluated by an accredited National Laboratory Accreditation Program (NVLAP) processor, at all times during well logging service operations and/or tracer studies utilizing sources of radiation. Each individual monitoring device shall be assigned to and worn by only one individual. Film badges shall be replaced at least monthly. Other individual monitoring devices shall be replaced at least quarterly. After replacement, each individual monitoring device shall be returned to the supplier for processing within 14 calendar days or as soon as practicable. In circumstances that make it impossible to return each individual monitoring device to the supplier for processing within 14 calendar days, such circumstances shall be documented and available for review by the agency.

(2) - (3) (No change.)

(r) - (t) (No change.)

(u) Tracer studies.

(1) - (2) (No change.)

[(3) A licensee may discard well-logging screenouts (well returns) containing residual radioactive materials into Class II disposal wells authorized by the Texas Railroad Commission (RRC) for such residuals, provided that the following requirements are met:]

[(A) the total radioactive concentration of all isotopes involved in the screenout is 1000 picocuries per gram (pCi/g) or less, and the physical half-life of the radioactive material is 120 days or less;]

[(B) the well is licensed by the RRC to accept non-hazardous oil and gas waste; and]

[(C) the licensee maintains an agreement with the owner or operator to control access to the Class II disposal well until the radioactivity has decayed to unrestricted release levels.]

(3) [(4)] The well operator shall contact the licensee when a decision is made to reverse the radioactive tracer material out of a well. The licensee shall be on site and present at the well when radioactive tracer material is reversed out of a well.

(v) - (y) (No change.)

(z) Tritium neutron generator target source.

(1) Use of a tritium neutron generator target source, containing quantities not exceeding 30 curies (Ci) (1,110 gigabecquerel (GBq) [**GBq**]) and in a well with a surface casing

to protect fresh water aquifers, is subject to the requirements of this section, except subsections (d), (l), and (cc) of this section.

(2) (No change.)

(aa) - (bb) (No change.)

(cc) Notification of incidents and lost sources; abandonment procedures for irretrievable sources.

(1) - (4) (No change.)

(5) When efforts to recover the radioactive source are not successful, the licensee shall do the following:

(A) (No change.)

(B) advise the well operator of the Railroad Commission of Texas [RRC] requirements regarding abandonment and an appropriate method of abandonment, that shall include the following:

(i) - (iii) (No change.)

(C) - (D) (No change.)

(6) - (8) (No change.)

(dd) (No change.)

§289.255. Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography.

(a) (No change.)

(b) Scope.

(1) - (3) (No change.)

(4) The requirements of §289.228 of this title (relating to Radiation Safety Requirements for [**Analytical and Other**] Industrial Radiation Machines) apply to persons using analytical and other industrial radiation machines subject to this section.

(5) The requirements of §289.229 of this title (relating to Radiation Safety Requirements for Accelerators, Therapeutic Radiation Machines, Simulators and Electronic

Brachytherapy Devices) [and Simulators)] apply to persons using accelerators subject to this section.

(c) Definitions. The following words and terms, when used in this section, shall have the following meaning, unless the context clearly indicates otherwise.

(1) - (19) (No change.)

(20) Independent certifying organization--An independent organization that meets all of the criteria of Title 10, CFR, Part 34, Appendix A, for radioactive material, or comparable standards for x-ray machines.

(21) - (23) (No change.)

(24) Offshore--Within the territorial waters of the State [state] of Texas. The territorial waters of Texas extend to the three marine league line or nine nautical miles from the Texas coast.

(25) - (52) (No change.)

(d) (No change.)

(e) Requirements for qualifications of radiographic personnel.

(1) Radiographer trainee. No licensee or registrant shall permit any individual to act as a radiographer trainee until the individual possesses the original or a copy of an agency-issued trainee status card or certification ID card.

(A) To obtain an agency-issued trainee status card, the licensee, registrant, or the individual shall document to the agency on RC Form 255-E [BRC Form 255-E] or equivalent that such individual has successfully completed a course of at least 40 hours on the applicable subjects outlined in subsection (x)(1) of this section. The course shall be one accepted by the agency, another agreement state, or the United States Nuclear Regulatory Commission (NRC).

(B) The trainee shall carry a copy of the completed RC Form 255-E [BRC Form 255-E], in the interim period after submitting documentation to the agency and before receiving a trainee status card. The copy of the completed RC Form 255-E [BRC Form 255-E] that was submitted to the agency may be used in lieu of the trainee status card for a period of 30 days from the date recorded by the trainee on the documentation.

(C) - (E) (No change.)

(2) Radiographer. No licensee or registrant shall permit any individual to act as a radiographer until the individual possesses a valid radiographer certification.

(A) To obtain a radiographer certification, an individual shall submit the fee as prescribed in subsection (h)(1) of this section and comply with the following:

(i) (No change.)

(ii) document to the Agency on RC Form 255-R [**BRC Form 255-R**], completion of on-the-job training as a radiographer trainee supervised by one or more radiographer trainers authorized on a license or certificate of registration;

(I) - (IV) (No change.)

(V) One year of documented experience of on-the-job training as authorized by another agreement state or the NRC may be substituted for subclauses (II) or (III) of this clause. The documentation shall be submitted to the agency on RC Form 255-OS [**BRC Form 255-OS**] or equivalent.

(VI) - (VII) (No change.)

(iii) - (iv) (No change.)

(B) - (E) (No change.)

(3) Radiographer trainer.

(A) No licensee or registrant shall permit any individual to act as a radiographer trainer until:

(i) it has been documented to the agency on RC Form 255-T [**BRC Form 255-T**] or equivalent that such individual has:

(I) - (II) (No change.)

(ii) - (iii) (No change.)

(B) (No change.)

(4) (No change.)

(f) - (g) (No change.)

(h) Radiographer certification.

(1) An application for radiographer certification shall be on RC Form 255-R, RC Form 255-OS [**BRC Form 255-R**, **BRC Form 255-OS**], or equivalent.

(A) - (B) (No change.)

(2) - (5) (No change.)

(i) (No change.)

(j) Radiation survey instruments.

(1) Each licensee and registrant shall have a sufficient number of calibrated, appropriate, and operable radiation survey instruments at each location where sources of radiation are present to perform the radiation surveys required by this section and §289.202(p)(1) and (3) [**§289.202(p)(1) and (2)**] of this title and §289.231(s)(1) and (2) of this title, as applicable. These radiation survey instruments shall be capable of measuring a range from 2 mrem/hr (0.002 mSv/hr) through 1 rem per hour (rem/hr) (0.01 sievert per hour (Sv/hr)).

(2) - (4) (No change.)

(k) Quarterly inventory.

(1) - (2) (No change.)

(3) The record shall include the following for each source of radiation, as appropriate:

(A) - (B) (No change.)

(C) number of curies (except for DU [**depleted uranium**]);

(D) - (F) (No change.)

(l) - (o) (No change.)

(p) Individual monitoring.

(1) (No change.)

(2) During industrial radiographic operations, the following shall apply. [:]

(A) No licensee or registrant shall permit an individual to act as a radiographer, radiographer trainer, or radiographer trainee unless each individual wears, on the trunk of the body at all times during radiographic operations:

(i) an individual monitoring device that meets the applicable requirements of §289.202(p)(4) [**§289.202(p)(3)**] of this title or §289.231(s)(3) of this title; [**and**]

(ii) a direct-reading pocket dosimeter or [,] an electronic personal dosimeter; and [**or an operable alarming ratemeter.**]

(iii) an operable alarming ratemeter.

(B) - (J) (No change.)

(3) - (6) (No change.)

(q) - (r) (No change.)

(s) Specific requirements for radiographic personnel performing industrial radiography.

(1) At a job site, the following shall be supplied by the licensee or registrant:

(A) (No change.)

(B) an individual monitoring device that meets the requirements of §289.202(p)(4) [~~§289.202(p)(3)~~] of this title or §289.231(s)(3) of this title, as applicable, for each worker;

(C) - (E) (No change.)

(2) - (5) (No change.)

(t) (No change.)

(u) Radiation safety and licensing requirements for the use of sealed sources.

(1) - (4) (No change.)

(5) Performance requirements for industrial radiography equipment. Equipment used in industrial radiographic operations shall meet the following minimum criteria.

(A) Each radiographic exposure device, source assembly, sealed source, and associated equipment shall meet the criteria set forth by ANSI N432-1980. This publication may be purchased from the American National Standards Institute, Inc., 25 West 43rd Street, New York, New York 10036; Telephone (212) 642-4900.

(i) - (iii) (No change.)

(B) - (C) (No change.)

(D) In addition to the requirements specified in subparagraphs (A) - (C) of this paragraph, radiographic exposure devices, source assemblies, and associated equipment that allow the source to move outside the device shall meet the following criteria. [:]

(i) - (x) (No change.)

(6) Leak testing, repair, opening, and replacement of sealed sources and devices. Leak testing, repair, opening, and replacement of sealed sources and devices shall be performed according to the following criteria. [:]

(A) - (D) (No change.)

(7) - (10) (No change.)

(11) Underwater, offshore platform, and lay-barge radiography.

(A) (No change.)

(B) In addition to the other requirements of this section, the following requirements apply to the performance of offshore platform or lay-barge radiography.

(i) Cobalt-60 sources with activities in excess of 20 curies (nominal) (3.7 terabecquerels) and iridium-192 sources with activities in excess of 100 curies (nominal) (740 gigabecquerels) shall not be used in the performance of offshore platform or lay-barge radiography.

(ii) (No change.)

(12) - (13) (No change.)

(v) - (x) (No change.)

§289.256. Medical and Veterinary Use of Radioactive Material.

(a) (No change.)

(b) Scope.

(1) - (2) (No change.)

(3) An entity that is a "covered entity" as that term is defined in HIPAA (the Health Insurance Portability and Accountability Act of 1996, Title 45, [45] Code of Federal Regulations, Parts 160 and 164) may be subject to privacy standards governing how information that identifies a patient can be used and disclosed. Failure to follow HIPAA requirements may result in the department making a referral of a potential violation to the United States Department of Health and Human Services.

(c) Definitions. The following words and terms when used in this section shall have the following meaning unless the context clearly indicates otherwise.

(1) - (3) (No change.)

(4) Authorized nuclear pharmacist--A pharmacist who meets the following:

(A) (No change.)

(B) is identified as an authorized nuclear pharmacist on one of the following: [;]

(i) - (iii) (No change.)

(iv) a permit issued by an NRC master material license broad scope medical use permittee that authorizes medical use or the practice of nuclear pharmacy; or

(C) - (E) (No change.)

(5) Authorized user--An authorized user is defined as follows:

(A) (No change.)

(B) for veterinary use, an individual who is, a veterinarian licensed by the Texas State Board of Veterinary Medical Examiners; and

(i) (No change.)

(ii) has received training in accordance with subsections (gg), (jj), (nn) - (qq), (aaa), (ccc), and (ttt) [(gg), (jj), (oo), (pp) and (ttt)] of this section as applicable; or

(iii) (No change.)

(6) - (36) (No change.)

(d) - (g) (No change.)

(h) Training for radiation safety officer. Except as provided in subsection (l) of this section, the licensee shall require the individual fulfilling the responsibilities of an RSO in accordance with subsection (g) of this section for licenses for medical or veterinary use of radioactive material to be an individual who:

(1) is certified by a specialty board whose certification process has been recognized by the agency, the NRC, or an agreement state and who meets the requirements in paragraphs (5) and (6) of this subsection. (The names of board certifications that have been recognized by the agency, the NRC, an agreement state, or licensing state will be posted on the agency's web page, www.dshs.state.tx.us/radiation).

(A) (No change.)

(B) To have its certification process recognized, a specialty board shall require all candidates for certification to:

(i) (No change.)

(ii) have two years of full-time practical training and/or supervised experience in medical physics as follows:

(I) under the supervision of a medical physicist who is certified in medical physics by a specialty board recognized by the agency, the NRC, an agreement state, [;] or a licensing state; or

(II) (No change.)

(iii) (No change.)

(2) - (6) (No change.)

(i) - (j) (No change.)

(k) Training for an authorized nuclear pharmacist. Except as provided in subsection (l) of this section, the licensee shall require the authorized nuclear pharmacist to be a pharmacist who:

(1) is certified by a specialty board whose certification process has been recognized by the agency, the NRC or an agreement state and who meets the requirements of paragraph (2)(C) of this subsection. (The names of board certifications that have been recognized by the agency, the NRC, an agreement state, or licensing state will be posted on the agency's web page, www.dshs.state.tx.us/radiation). To have its certification process recognized, a specialty board shall require all candidates for certification to:

(A) (No change.)

(B) hold a current, active license to practice pharmacy in the State [state] of Texas;

(C) - (D) (No change.)

(2) (No change.)

(l) Training for experienced RSO, teletherapy or medical physicist, authorized medical physicist, authorized user, nuclear pharmacist, and authorized nuclear pharmacist.

(1) An individual identified as an RSO, a teletherapy or medical physicist, or a nuclear pharmacist on one of the following before October 24, 2002, [the effective date of this rule] need not comply with the training requirements of subsections (h), (j), or (k) of this section, respectively:

(A) - (D) (No change.)

(2) An individual identified as an RSO, an authorized medical physicist, or an authorized nuclear pharmacist on one of the following between October 24, 2002, and April 29, 2005, need not comply with the training requirements of subsections (h), (j) and (k) of this section, respectively:

(A) an agency, NRC, agreement state, or licensing state license;

(B) a permit issued by an agency, NRC, agreement state, or licensing state with broad scope authorization;

(C) an NRC master material license permit; or

(D) an NRC master material license permit with broad scope authorization.

(3) [(2)] An individual identified as a physician, dentist, podiatrist or veterinarian authorized for the medical or veterinary use of radioactive material and who performs only those medical or veterinary uses for which they were authorized on one of the following before the effective date of this rule need not comply with the training requirements of subsections (ff) - (ttt) of this section:

(A) an agency, NRC, agreement state, or licensing state license;

(B) a permit issued by an agency, NRC, agreement state, or licensing state licensee with broad scope authorization;

(C) an NRC master material license permit; or

(D) an NRC master material license permit with broad scope authorization.

(4) [(3)] Individuals who need not comply with training requirements in this subsection may serve as preceptors for, and supervisors of, applicants seeking authorization on an agency license for the same uses for which these individuals are authorized.

(m) Recentness of training. The training and experience specified in subsections (h), (j) - (m), and (ff) - (ttt) [(h), (j), (k), (l), (ff) - (kk), (rr), (tt), (zz), (aaa), (bbb), and (ddd)] of this section for medical and veterinary use shall have been obtained within the seven years preceding the date of application or the individual shall have had related continuing education and experience since the required training and experience was completed.

(n) - (w) (No change.)

(x) Determination of dosages of unsealed radioactive material for medical use.

(1) (No change.)

(2) For a unit dosage, this determination shall be made by:

(A) (No change.)

(B) a decay correction, based on the activity or activity concentration determined by the following:

(i) (No change.)

(ii) an NRC or agreement state licensee for use in research in accordance with a Radioactive Drug Research Committee-approved protocol or an Investigational New Drug (IND) protocol accepted by the FDA [U.S. Food and Drug Administration (FDA)]; or

(iii) a positron emission tomography (PET) [PET] radioactive drug producer licensed in accordance with §289.252(kk) of this title or equivalent NRC or agreement state requirements.

(3) - (4) (No change.)

(5) A licensee restricted to only unit doses prepared in accordance with §289.252(r) of this title need not comply with paragraph (2) of this subsection, unless the administration time of the unit dose deviates from the nuclear pharmacy's pre-calibrated time by 15 minutes or more.

(6) [(5)] A licensee shall maintain a record of the dosage determination required by this subsection in accordance with subsection (www) of this section for inspection by the agency. The record shall contain the following:

(A) the radiopharmaceutical;

(B) patient's or human research subject's name or identification number if one has been assigned;

(C) prescribed dosage;

(D) determined dosage or a notation that the total activity is less than 30 μCi (1.1 MBq);

(E) the date and time of the dosage determination; and

(F) the name of the individual who determined the dosage.

(y) - (bb) (No change.)

(cc) Release of individuals containing radioactive drugs or implants containing radioactive material.

(1) The licensee may authorize the release from its control any individual who has been administered radioactive drugs or implants containing radioactive material if the total effective dose equivalent (TEDE) to any other individual from exposure to the released individual is not likely to exceed 0.5 rem (5 mSv). Patients treated with temporary eye plaques may be released from the hospital provided that the procedures ensure that the exposure rate from the patient is less than 5 mrem (0.05 mSv) [**mr**] per hour at a distance of 1 meter from the eye plaque location.

(2) - (3) (No change.)

(dd) - (gg) (No change.)

(hh) Use of unsealed radioactive material for imaging and localization studies that do not require a written directive. Except for quantities that require a written directive in accordance with subsection (t) of this section, a licensee may use any unsealed radioactive material prepared for medical or veterinary use for imaging and localization studies that meets the following:

(1) is obtained from:

(A) (No change.)

(B) a [**A**] PET radioactive drug producer licensed in accordance with §289.252(kk) of this title or equivalent NRC, agreement state, or licensing state requirements; or

(2) - (4) (No change.)

(ii) (No change.)

(jj) Training for imaging and localization studies. [**(1)**] Except as provided in subsection (l) of this section, the licensee shall require an authorized user of unsealed radioactive material for the uses authorized in subsection (hh) of this section to be a physician who:

(1) [**(A)**] is certified by a medical specialty board whose certification process has been recognized by the agency, the NRC or an agreement state and who meets the requirements of paragraph (3)(C) of this subsection [**subparagraph (C)(iii) of this paragraph**]. (The names of board certifications that have been recognized by the agency, the NRC, an agreement state, or licensing state will be posted on the agency's web page, www.dshs.state.tx.us/radiation). To have its certification process recognized, a specialty board shall require all candidates for certification to:

(A) [(i)] complete 700 hours of training and experience in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed radioactive material for imaging and localization studies that includes the topics listed in paragraph (3) of this subsection [**subparagraph (C) of this paragraph**]; and

(B) [(ii)] pass an examination, administered by diplomates of the specialty board, that assesses knowledge and competence in radiation safety, radionuclide handling, and quality control; or

(2) [(B)] is an authorized user in accordance with subsection (nn) of this section and meets the requirements of paragraph (3)(B)(vii) of this subsection [**subparagraph (C)(ii)(VII) of this paragraph**] or equivalent NRC or agreement state requirements; or

(3) [(C)] has completed 700 hours of training and experience, including a minimum of 80 hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material for imaging and localization studies. The training and experience shall include the following.

(A) [(i)] classroom [**Classroom**] and laboratory training in the following areas:

(i) [(I)] radiation physics and instrumentation;

(ii) [(II)] radiation protection;

(iii) [(III)] mathematics pertaining to the use and measurement of radioactivity;

(iv) [(IV)] chemistry of radioactive material for medical use; and

(v) [(V)] radiation biology; and [.]

(B) [(ii)] work [**Work**] experience under the supervision of an authorized user who meets the requirements in subsection (l) of this section, this subsection, or clause (vii) of this subparagraph [**subclause (VII) of this clause**], and subsection (nn) of this section, or equivalent NRC or agreement state requirements involving the following:

(i) [(I)] ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;

(ii) [(II)] performing quality control procedures on instruments used to determine the activity of dosages and performing checks for proper operation of survey meters;

(iii) [(III)] calculating, measuring, and safely preparing patient or human research subject dosages;

(iv) [(IV)] using administrative controls to prevent a medical event involving the use of unsealed radioactive material;

(v) [(V)] using procedures to contain spilled radioactive material safely and using proper decontamination procedures;

(vi) [(VI)] administering dosages of radioactive drugs to patients or human research subjects; and

(vii) [(VII)] eluting generator systems appropriate for preparation of radioactive drugs for imaging and localization studies, measuring and testing the eluate for radionuclide purity, and processing the eluate with reagent kits to prepare labeled radioactive drugs; and

(C) [(iii)] written [Written] attestation, signed by a preceptor authorized user who meets the requirements of subsection (l) of this section, this subsection or paragraph (3)(B)(vii) of this subsection [subparagraph (C)(ii)(VII) of this paragraph] and subsection (nn) of this section or equivalent NRC or agreement state requirements, that the individual has satisfactorily completed the requirements of paragraph (1)(A) or (3)(A) and (B) of this subsection [subparagraph (A)(i) or (C)(i) and (ii) of this paragraph] and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized in accordance with subsections (ff) and (hh) of this section.

[(2) In addition to the training and experience requirements of paragraph (1) of this subsection, for the use of positron emission tomography (PET) radionuclides, the licensee shall require that the authorized user has:]

[(A) completed 24 hours of work experience specific to the use of PET radionuclides consistent with paragraph (1)(C)(ii)(I) - (VI) of this subsection; and]

[(B) a written attestation statement specific to the use of PET radionuclides for diagnostic imaging.]

(kk) Use of unsealed radioactive material that requires a written directive. A licensee may use any unsealed radioactive material prepared for medical use that requires a written directive that meets the following:

(1) is obtained from:

(A) (No change.)

(B) a [A] PET radioactive drug producer licensed in accordance with §289.252(kk) of this title or equivalent NRC or agreement state requirements; or

(2) - (4) (No change.)

(ll) - (mm) (No change.)

(nn) Training for use of unsealed radioactive material that requires a written directive. Except as provided in subsection (l) of this section, the licensee shall require an authorized user of unsealed radioactive material for the uses authorized in subsection (kk) of this section to be a physician who:

(1) (No change.)

(2) has completed 700 hours of training and experience, including a minimum of 200 hours of classroom and laboratory training, in basic radionuclide handling techniques applicable to the medical use of unsealed radioactive material requiring a written directive. The training and experience shall include the following.

(A) classroom [**Classroom**] and laboratory training in the following areas:

(i) - (iv) (No change.)

(v) radiation biology; and [.]

(B) work [**Work**] experience, under the supervision of an authorized user who meets the requirements of subsection (l) of this section, this subsection or equivalent NRC or agreement state requirements. A supervising authorized user, who meets the requirements of this paragraph shall also have experience in administering dosages in the same dosage category or categories (for example, in accordance with clause (vi) of this subparagraph) as the individual requesting authorized user status. The work experience shall involve the following:

(i) - (v) (No change.)

(vi) administering dosages of radioactive drugs to patients or human research subjects involving a minimum of three cases in each of the following categories for which the individual is requesting authorized user status:

(I) - (II) (No change.)

(III) parenteral administration of any beta emitter or a photon-emitting radionuclide with a photon energy less than 150 kiloelectron [**kiloelectron**] volts (keV) for which a written directive is required; and/or

(IV) (No change.)

(C) written [**Written**] attestation that the individual has satisfactorily completed the requirements of paragraphs (1)(A) and (2)(B)(vi) or (2) of this subsection, and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized in accordance with subsection (kk) of this section. The written attestation shall be signed by a preceptor authorized user who meets the requirements of subsection (l) of this section, this subsection or equivalent NRC or agreement state requirements. The preceptor authorized user who meets the requirements in paragraph (2) of this subsection shall have experience in administering dosages in the same dosage category or categories (for example, in accordance with paragraph (2)(B)(vi) of this subsection) as the individual requesting authorized user status.

(oo) Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities less than or equal to 33 mCi (1.22 GBq). Except as provided in subsection (l) of this section, the licensee shall require an authorized user for the oral administration of sodium iodide I-131 requiring a written directive in quantities less than or equal to 33 mCi (1.22 GBq) to be a physician who:

(1) - (2) (No change.)

(3) has successfully completed 80 hours of classroom and laboratory training and work experience applicable to the medical use of sodium iodide I-131 for procedures requiring a written directive. The training and experience shall include the following.

(A) classroom [**Classroom**] and laboratory training shall include the following:

(i) - (iv) (No change.)

(v) radiation biology; and [.]

(B) work [**Work**] experience, under the supervision of an authorized user who meets the requirements of subsection (l) of this section, this subsection, subsection (nn) or subsection (pp) of this section, or equivalent NRC or agreement state requirements. A supervising authorized user who meets the requirements in subsection (nn)(2) of this section, shall also have experience in administering dosages as specified in subsection (nn)(2)(B)(vi)(I) or (II) of this section. The work experience shall involve the following:

(i) - (vi) (No change.)

(C) written [**Written**] attestation that the individual has satisfactorily completed the requirements of subparagraphs (A) and (B) of this paragraph, and has achieved a level of competency sufficient to function independently as an authorized user for the medical uses authorized in accordance with subsection (kk) of this section. The written attestation shall be signed by a preceptor authorized user who meets the requirements of subsection (l) of this section, this subsection, subsection (nn) or subsection (pp) of this section or equivalent NRC or agreement state requirements. A preceptor authorized user, who meets the requirements in

subsection (nn)(2) of this section shall also have experience in administering dosages as specified in subsection (nn)(2)(B)(vi)(I) or (II) of this section.

(pp) Training for the oral administration of sodium iodide I-131 requiring a written directive in quantities greater than 33 mCi (1.22 GBq). Except as provided in subsection (l) of this section, the licensee shall require an authorized user for the oral administration of sodium iodide I-131 requiring a written directive in quantities greater than 33 mCi (1.22 GBq) to be a physician who:

(1) is certified by a medical specialty board whose certification process includes all of the requirements in paragraph (3)(A) and (B) of this subsection and whose certification has been recognized by the agency, the NRC, an agreement state, or licensing state and who meets the requirements of paragraph (3) of this subsection. (The names of board certifications which have been recognized by the agency, the NRC, agreement state or licensing state will be posted on the agency's web page, www.dshs.state.tx.us/radiation); or

(2) (No change.)

(3) has training and experience including, successful completion of 80 hours of classroom and laboratory training applicable to the medical use of sodium iodide I-131 for procedures requiring a written directive. The training and experience shall include the following.

(A) classroom [**Classroom**] and laboratory training shall include the following:

(i) - (iii) (No change.)

(iv) chemistry of radioactive material for medical use; and

(v) radiation biology; and [.]

(B) work [**Work**] experience, under the supervision of an authorized user who meets the requirements of subsection (l) of this section, subsections (nn) or (pp) of this section or equivalent NRC or agreement state requirements. A supervising authorized user who meets the requirements of subsection (nn)(2) of this section, shall also have experience in administering dosages as specified in subsection (nn)(2)(B)(vi)(II) of this section. The work experience shall involve the following:

(i) - (v) (No change.)

(vi) administering dosages of radioactive drugs to patients or human research subjects that includes at least three cases involving the oral administration of greater than 33 mCi [**33mCi**] (1.22 GBq) of sodium iodide I-131; and

(C) written [**Written**] attestation that the individual has satisfactorily completed the requirements of subparagraphs (A) and (B) of this paragraph, and has achieved a

level of competency sufficient to function independently as an authorized user for the medical uses authorized in accordance with subsection (kk) of this section. The written attestation shall be signed by a preceptor authorized user who meets the requirements in subsection (l) of this section, this subsection or subsection (nn) of this section or equivalent NRC or agreement state requirements. The preceptor authorized user, who meets the requirements in subsection (nn)(2) of this section, shall also have experience in administering dosages as specified in subsection (nn)(2)(B)(vi)(II) of this section.

(qq) Training for the parenteral administration of unsealed radioactive material requiring a written directive. Except as provided in subsection (l) of this section, the licensee shall require an authorized user for the parenteral administration requiring a written directive to be a physician who:

(1) - (3) (No change.)

(4) has successfully completed training and experience including 80 hours of classroom and laboratory training applicable to parenteral administrations requiring a written directive, of any beta emitting radionuclide or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. The training and experience shall include the following.

(A) classroom [**Classroom**] and laboratory training shall include the following:

(i) - (iv) (No change.)

(v) radiation biology; and [.]

(B) work [**Work**] experience, under the supervision of an authorized user who meets the requirements of subsection (l) of this section, this subsection or subsection (nn) of this section or equivalent NRC or agreement state requirements in the parenteral administration, for which a written directive is required, of any beta emitter or any photon-emitting radionuclide with a photon energy less than 150 keV, and/or parenteral administration of any other radionuclide for which a written directive is required. A supervising authorized user who meets the requirements of subsection (nn) of this section, shall have experience in administering dosages as specified in subsection (nn)(2)(B)(vi)(III) and/or (IV) of this section. The work experience shall involve the following:

(i) - (vi) (No change.)

(C) written [**Written**] attestation that the individual has satisfactorily completed the requirements of paragraphs (2) or (3) of this subsection, and has achieved a level of competency sufficient to function independently as an authorized user for the parenteral administration of unsealed radioactive materials requiring a written directive. The written attestation shall be signed by a preceptor authorized user who meets the requirements of subsection (l) of this section, this subsection or subsection (nn) of this section or equivalent NRC

or agreement state requirements. A preceptor authorized user, who meets the requirements of subsection (nn) of this section shall have experience in administering dosages as specified in subsection (nn)(2)(B)(vi)(III) and/or (IV) of this section.

(rr) - (yy) (No change.)

(zz) Training for use of manual brachytherapy sealed sources. Except as provided in subsection (l) of this section, the licensee shall require an authorized user of a manual brachytherapy source for the uses authorized in subsection (rr) of this section to be a physician who:

(1) (No change.)

(2) has completed a structured educational program in basic radionuclide handling techniques applicable to the use of manual brachytherapy sources including the following:

(A) 200 hours of classroom and laboratory training in the following areas:

(i) - (iii) (No change.)

(iv) radiation biology; and [.]

(B) (No change.)

(C) completion [**Completion**] of three years of supervised clinical experience in radiation oncology, under an authorized user who meets the requirements of subsection (l) of this section, this subsection, or equivalent NRC or agreement state requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education, the Royal College of Physicians and Surgeons of Canada, or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by subparagraph (B) of this paragraph; and

(D) written [**Written**] attestation, signed by a preceptor authorized user who meets the requirements of subsection (l) of this section, this subsection, or equivalent NRC or agreement state requirements, that the individual has satisfactorily completed the requirements of paragraph (1)(A) of this subsection or subparagraphs (A) - (C) of this paragraph and has achieved a level of competency sufficient to function independently as an authorized user of manual brachytherapy for the medical uses authorized in accordance with subsection (rr) of this section.

(aaa) Training for ophthalmic use of strontium-90. Except as provided in subsection (l) of this section, the licensee shall require an authorized user of strontium-90 for ophthalmic radiotherapy to be a physician who:

(1) (No change.)

(2) has completed 24 hours of classroom and laboratory training applicable to the medical use of strontium-90 for ophthalmic radiotherapy. The training shall include the following.

(A) classroom [**Classroom**] training shall include the following:

(i) - (iii) (No change.)

(iv) radiation biology; and [.]

(B) supervised [**Supervised**] clinical training in ophthalmic radiotherapy under the supervision of an authorized user at a medical institution, clinic, or private practice that includes the use of strontium-90 for the ophthalmic treatment of five individuals. This supervised clinical training shall involve:

(i) - (iv) (No change.)

(C) written [**Written**] attestation, signed by a preceptor authorized user who meets the requirements of subsection (l) of this section, this subsection or subsection (zz) of this section, or equivalent NRC or agreement state requirements, that the individual has satisfactorily completed the requirements of this paragraph of this subsection and has achieved a level of competency sufficient to function independently as an authorized user of strontium-90 for ophthalmic use.

(bbb) - (iii) (No change.)

(jjj) Full calibration measurements on teletherapy units.

(1) A licensee authorized to use a teletherapy unit for medical use shall perform full calibration measurements on each teletherapy unit as follows:

(A) before the first medical use of the unit; and

(B) - (C) (No change.)

(2) - (7) (No change.)

(kkk) Full calibration measurements on remote afterloader units.

(1) A licensee authorized to use a remote afterloader for medical use shall perform full calibration measurements on each unit as follows:

(A) (No change.)

(B) before medical use under any of the following conditions:

(i) (No change.)

(ii) following reinstallation of the unit in a new location outside the facility; and

(iii) (No change.)

(C) - (D) (No change.)

(2) - (9) (No change.)

(III) - (sss) (No change.)

(ttt) Training for use of remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units. Except as provided in subsection (l) of this section, the licensee shall require an authorized user of a sealed source for a use authorized in subsection (ddd) of this section to be a physician who:

(1) (No change.)

(2) has completed a structured educational program in basic radionuclide handling techniques applicable to the use of a sealed source in a therapeutic medical unit including the following:

(A) 200 hours of classroom and laboratory training in the following areas:

(i) - (iii) (No change.)

(iv) radiation biology; and [.]

(B) (No change.)

(C) completion [**Completion**] of three years of supervised clinical experience in radiation therapy, under an authorized user who meets the requirements of subsection (l) of this section, this subsection, or equivalent NRC or agreement state requirements, as part of a formal training program approved by the Residency Review Committee for Radiation Oncology of the Accreditation Council for Graduate Medical Education, the Royal College of Physicians and Surgeons of Canada, or the Committee on Postdoctoral Training of the American Osteopathic Association. This experience may be obtained concurrently with the supervised work experience required by subparagraph (B) of this paragraph; and

(D) written [**Written**] attestation that the individual has satisfactorily completed the requirements of paragraphs (1)(A) or (2), and (3) of this subsection, and has

achieved a level of competency sufficient to function independently as an authorized user of each type of therapeutic medical unit for which the individual is requesting authorized user status. The written attestation shall be signed by a preceptor authorized user who meets the requirements in subsection (l) of this section, this subsection, or equivalent NRC or agreement state requirements for an authorized user for each type of therapeutic medical unit for which the individual is requesting authorized user status; and

(3) (No change.)

(uuu) - (vvv) (No change.)

(www) Records/documents for agency inspection. Each licensee shall maintain copies of the following records/documents at each authorized use site and make them available to the agency for inspection, upon reasonable notice.

Figure: 25 TAC §289.256(www) [Figure: 25 TAC §289.256(www)]

Figure: 25 TAC §289.256(www)

Rule Cross Reference	Name of Records/Documents	Time Interval for Keeping Records/Documents
§289.201(d)(1)	Records of receipt, transfer, and disposal of radioactive material	Until disposal is authorized by the agency
§289.201(g)(7), §289.202(bbb)	Records of leak tests for specific devices and sealed sources	3 years
§289.203(b)(1)(B)	Current applicable sections of this chapter as listed in the radioactive material license	Until termination of the radioactive material license
§289.203(b)(1)(B)	Copy of the current radioactive material license	Until termination of the radioactive material license
§289.203(b)(1)(C), §289.256(f)(3)(A)	Current operating, safety, and emergency procedures	Until termination of the radioactive material license
§289.256(f)(3)(C)(i)	Qualifications of RSO	Duration of employment
§289.256(f)(3)(C)(ii)	Qualifications of authorized users	Duration of employment
§289.256(f)(3)(C)(iii)	Qualifications of authorized medical physicist	Duration of employment
§289.256(f)(3)(C)(iv)	Qualifications of authorized nuclear pharmacist, if applicable	Duration of employment
§289.256(g)(1)	Authority of RSO	Duration of employment
§289.256(g)(5)	Qualifications and dates of service for temporary RSO	3 years
§289.256(i)(4)	RSC meetings	3 years
§289.256(t)(3)	Written directives	3 years
§289.256(t)(4)(C)	Procedures for administrations requiring a written directive	Until termination of the radioactive material license
§289.256(v)(4)	Calibration of instruments (dose calibrators)	3 years
§289.256(w)(5)	Calibration of survey instruments	3 years
§289.256(x)(5)	Dosage determinations of unsealed radioactive material for medical use	3 years
§289.256(z)(2)	Physical inventory for all sealed source/brachytherapy inventory	3 years
§289.256(bb)(3)	Surveys for ambient radiation exposure rate	3 years
§289.256(cc)(3) §289.256(eee)(2)	Patient release	3 years after date of release
§289.256(dd)(3)	Mobile nuclear medicine service client letters	Duration of licensee/client relationship
§289.256(dd)(3)	Mobile nuclear medicine service surveys	3 years
§289.256(ee)(2)	Decay in storage/disposal	3 years
§289.256(ii)(4)	Molybdenum-99 concentrations	3 years
§289.256(ll)(2)	Safety instructions - unsealed radioactive materials	3 years

Figure: 25 TAC §289.256(www)

Rule Cross Reference	Name of Records/Documents	Time Interval for Keeping Records/Documents
§289.256(ss)(3)	Surveys after sealed source implant and removal	3 years
§289.256(tt)(3)	Brachytherapy sealed sources accountability	3 years
§289.256(uu)(2)	Safety instructions - brachytherapy	3 years
§289.256(ww)(4)	Calibration measurements of brachytherapy sealed sources	3 years
§289.256(xx)(2)	Strontium 90 activity of source	Duration of life of source
§289.256(bbb)(2)	Service provider documentation	3 years
§289.256(fff)(4)	Installation, maintenance, adjustment and repair-remote afterloader units, teletherapy units, and gamma stereotactic radiosurgery units	3 years
§289.256(iii)(3)	Dosimetry equipment calibration, intercomparison and comparison	Until termination of the radioactive material license
§289.256(jjj)(7)	Calibration - teletherapy units	3 years
§289.256(kkk)(9)	Calibration - remote afterloader units	3 years
§289.256(lll)(7)	Calibration - gamma stereotactic radiosurgery units	3 years
§289.256(mmm)(2)	Written procedures for spot checks- teletherapy units	Until licensee no longer possesses unit
§289.256(mmm)(6)	Spot checks - teletherapy units	Until licensee no longer possesses unit
§289.256(nnn)(2)	Written procedures for spot checks - remote afterloaders	3 years
§289.256(nnn)(6)	Spot checks- remote afterloader	3 years
§289.256(ooo)(2)	Written procedures for spot checks-gamma stereotactic radiosurgery units	3 years
§289.256(ooo)(8)	Spot checks-gamma stereotactic radiosurgery units	3 years
§289.256(ppp)(5)	Technical requirements for mobile remote afterloader units	3 years
§289.256(qqq)(3)	Radiation surveys	Duration of the use of the unit
§289.256(rrr)(3)	Five-year inspection for teletherapy and gamma sterotactic radiosurgery units	Duration of the use of the unit
§289.256(uuu)(9)	Annotated report - medical event	Until termination of the radioactive material license
§289.256(vvv)(8)	Annotated report - dose to embryo/fetus or nursing child	Until termination of the radioactive material license

§289.257. Packaging and Transportation of Radioactive Material.

(a) Purpose.

(1) (No change.)

(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), and §289.256 of this title (relating to Medical and Veterinary Use of Radioactive Material) 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) - (c) (No change.)

(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) - (21) (No change.)

(22) Indian tribe--An Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian tribe pursuant to the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. 479a.

(23) [(22)] 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) [(23)] 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 (3.7 kilobecquerels) per gram (g).

(25) [(24)] 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 (ee) 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 7 [seven] days, would not exceed $0.1 A_2$; and

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

(26) [(25)] 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 10 [ten] days.

(27) [(26)] Maximum normal operating pressure--The maximum gauge pressure that would develop in the containment system in a period of 1 [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) [(27)] Natural thorium--Thorium with the naturally occurring distribution of thorium isotopes (essentially 100 weight percent thorium-232).

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

(30) [(29)] NRC Forms 540, 540A, 541, 541A, 542, and 542A--Official NRC forms referenced in subsection (ff) of this section which includes the information required by DOT in Title 49, CFR [Code of Federal Regulations], Part 172. Licensees need not use originals of these forms as long as any substitute forms contain the [are] equivalent information [to the original documentation in respect to content, clarity, size, and location of information]. Licensees may include additional information deemed relevant to the licensee's shipment of low-level radioactive waste. Upon agreement between the shipper and consignee, NRC Forms 541 (and 541A) and NRC Forms 542 (and 542A) or equivalent documents 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.

(31) [(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/in²)) 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.

(32) [(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.

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

(34) [(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.

(35) [(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.

(36) [(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.

(37) [(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.

(38) [(37)] Spent nuclear fuel or spent fuel--Fuel that has been withdrawn from a nuclear reactor following irradiation, has undergone at least 1 [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.

(39) [(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 ($\mu\text{Ci}/\text{cm}^2$)) for beta and gamma and low toxicity alpha emitters, or $4 \times 10^{-1} \text{ Bq}/\text{cm}^2$ ($10^{-5} \mu\text{Ci}/\text{cm}^2$) 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 $4 \times 10^4 \text{ Bq/cm}^2$ ($1 \text{ } \mu\text{Ci/cm}^2$) for beta and gamma and low toxicity alpha emitters, or $4 \times 10^3 \text{ Bq/cm}^2$ ($10^{-1} \text{ } \mu\text{Ci/cm}^2$) [$10^{-2} \text{ } \mu\text{Ci/cm}^2$] 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 $4 \times 10^4 \text{ Bq/cm}^2$ ($1 \text{ } \mu\text{Ci/cm}^2$) for beta and gamma and low toxicity alpha emitters, or $4 \times 10^3 \text{ Bq/cm}^2$ ($10^{-1} \text{ } \mu\text{Ci/cm}^2$) [$10^{-2} \text{ } \mu\text{Ci/cm}^2$] 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 ($10^{-2} \text{ } \mu\text{Ci/cm}^2$) for beta and gamma and low toxicity alpha emitters or 40 Bq/cm^2 ($10^{-3} \text{ } \mu\text{Ci/cm}^2$) 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 $8 \times 10^5 \text{ Bq/cm}^2$ ($20 \text{ } \mu\text{Ci/cm}^2$) for beta and gamma and low toxicity alpha emitters, or $8 \times 10^4 \text{ Bq/cm}^2$ ($2 \text{ } \mu\text{Ci/cm}^2$) 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 $8 \times 10^5 \text{ Bq/cm}^2$ ($20 \text{ } \mu\text{Ci/cm}^2$) for beta and gamma and low toxicity alpha emitters, or $8 \times 10^4 \text{ Bq/cm}^2$ ($2 \text{ } \mu\text{Ci/cm}^2$) for all other alpha emitters.

(40) Tribal official--The highest ranking individual that represents Tribal leadership, such as the Chief, President, or Tribal Council leadership.

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

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

(43) [(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.

(44) [(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.

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

(46) [(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.

(47) [(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.

(48) [(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) - (h) (No change.)

(i) General license.

(1) NRC-approved package.

(A) - (B) (No change.)

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

(i) - (ii) (No change.)

(iii) before [**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) - (F) (No change.)

(2) Previously approved package.

(A) - (B) (No change.)

(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 [**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 [**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) - (5) (No change.)

(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) - (E) (No change.)

(j) - (p) (No change.)

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

(1) As specified in paragraphs (3)-(5) [(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, within [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) As specified in paragraphs (3)-(5) of this subsection, after June 11, 2013, each licensee shall provide advance notification to the Tribal official of participating Tribes referenced in paragraph (4)(C)(iii) of this subsection, or the official's designee, of the shipment of radioactive waste, within or across the boundary of the Tribe's reservation, 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.

(3) [(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) 3,000 [**3000**] times the A_1 value of the radionuclides as specified in subsection (ee) of this section for special form radioactive material;

(ii) 3,000 [**3000**] times the A_2 value of the radionuclides as specified in subsection (ee) of this section for normal form radioactive material; or

(iii) 1,000 [**1000**] terabecquerels (TBq) (27,000 curies (Ci)).

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

(A) The notification shall be made in writing to:

(i) the office of each appropriate governor or governor's designee and to the agency;[.]

(ii) the office of each appropriate Tribal official or Tribal official's designee; and

(iii) the Director, Division of Security Policy, Office of Nuclear Security and Incident Response.

(B) A notification delivered by mail shall be postmarked at least 7 [seven] days before the beginning of the 7-day [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 or the Tribal official or Tribal official's designee at least 4 [four] days before the beginning of the 7-day [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 [Federal Register] on June 30, 1995 (60 FR 34306).

(ii) The list of governor's designees and Tribal official's designees of participating Tribes will be published annually in the Federal Register [Federal Register] on or about June 30th [30] to reflect any changes in information.

(iii) A list of the names and mailing addresses of the governors' designees and Tribal officials' designees of participating Tribes is available on request from the Director, Division of Intergovernmental Liaison and Rulemaking, Office of Federal and State Materials and Environmental Management Programs [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 3 [three] years.

(5) [(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 7-day [seven-day] period during which departure of the shipment is estimated to occur;

(D) the 7-day [seven-day] period during which arrival of the shipment at state boundaries or Tribal reservation is estimated to occur;

(E) the destination of the shipment, and the 7-day [**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.

(6) [(5)] A licensee who finds that schedule information previously furnished to a governor or governor's designee or a Tribal official or Tribal official'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 or the Tribal official or the Tribal official'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 3 [**three**] years.

(7) [(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, each Tribal official or to the Tribal official's designee previously notified, and to the Director, Division of Security Policy, Office of Nuclear Security and Incident Response, 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 3 [**three**] years.

(r) - (v) (No change.)

(w) Handling, storage, and shipping control. The licensee, certificate holder, and applicant for a CoC shall establish measures to control, in accordance with instructions, the handling, storage, shipping, cleaning, and preservation of materials and equipment to be used in packaging to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere, and specific moisture content and temperature levels shall [**must**] be specified and provided.

(x) Inspection, test, and operating status. Measures to track inspection, test and operating status shall be established as follows.

(1) The licensee, certificate holder, and applicant for a CoC shall establish measures to indicate, by the use of markings such as stamps, tags, labels, routing cards, or other suitable means, the status of inspections and tests performed upon individual items of the packaging. These measures shall [**must**] provide for the identification of items that have satisfactorily passed required inspections and tests, where necessary to preclude inadvertent bypassing of the inspections and tests; and

(2) (No change.)

(y) Nonconforming materials, parts, or components. The licensee, certificate holder, and applicant for a CoC shall establish measures to control materials, parts, or components that do not conform to the licensee's requirements to prevent their inadvertent use or installation. These measures shall **[must]** include the following, as appropriate;

(1) (No change.)

(2) nonconforming items shall **[must]** be reviewed and accepted, rejected, repaired, or reworked in accordance with documented procedures.

(z) Corrective action. The licensee, certificate holder, and applicant for a CoC shall establish measures to assure that conditions adverse to quality, such as deficiencies, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected.

(1) In the case of a significant condition adverse to quality, the measures shall **[must]** assure that the cause of the condition is determined and corrective action taken to preclude repetition.

(2) The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall **[must]** be documented and reported to appropriate levels of management.

(aa) Quality assurance records. The licensee, certificate holder, and applicant for a CoC shall maintain written records sufficient to describe the activities affecting quality for inspection by the agency for 3 years beyond the date when the licensee, certificate holder, and applicant for a CoC last engage in the activity for which the quality assurance program was developed. If any portion of the written procedures or instructions is superseded, the licensee, certificate holder, and applicant for a CoC shall retain the superseded material for 3 years after it is superseded. The records shall **[must]** include the following: [;]

(1) - (2) (No change.)

(bb) (No change.)

(cc) Transfer for disposal and manifests.

(1) - (6) (No change.)

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

(dd) 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) be \$10 per cubic foot of shipped LLRW;

(B) be collected by the agency **[department]** and deposited to the credit of the agency's Radiation and Perpetual Care Account; **[radiation and perpetual care account; and]**

(C) be used **[exclusively]** by the agency for emergency planning for and response to transportation accidents involving LLRW, including first responder training in counties through which transportation routes are designated in accordance with this section; and[.]

(D) not be collected on waste disposed of at a federal waste disposal facility.

(2) The agency shall collect the fees in accordance with this subsection so long as the sum of the balances of the perpetual care accounts specified under Health and Safety Code, §401.307, does not exceed \$100 million; and if the sum of such balances subsequently is reduced to \$50 million or less, the agency shall reinstitute assessment of the fee until the sum of such balances reaches \$100 million.

[(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 reinstated to bring the balance of fees collected to \$500,000.]

(3) Notwithstanding paragraph (2) of this subsection, fee assessments are suspended from imposition against a party state compact waste generator when the amount in the agency's Radiation and Perpetual Care Account attributable to those fees reaches \$500,000. If the amount in that account attributable to those fees is reduced to \$350,000 or less, the fee is reinstated until the amount reaches \$500,000.

(4) **[(3)]** Money expended from the agency's Radiation and Perpetual Care Account **[radiation and perpetual care account]** to respond to accidents involving LLRW shall be reimbursed to the agency's Radiation and Perpetual Care Account **[radiation and perpetual care account]** by the responsible shipper or transporter according to rules adopted by the board.

(5) **[(4)]** For purposes of this subsection, "shipper" means a person who generates low-level radioactive waste and ships or arranges with others to ship the waste to a disposal site.

(6) This subsection does not relieve a generator from liability for a transportation accident involving LLRW.

(ee) Appendices for determination of A_1 and A_2 .

(1) - (2) (No change.)

(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 10 [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 10 [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) - (5) (No change.)

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

Figure: 25 TAC §289.257(ee)(6) [**Figure: 25 TAC §289.257(ee)(6)**]

(7) - (9) (No change.)

(ff) (No change.)

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
As-77		2.0X10 ¹	5.4X10 ²	7.0X10 ⁻¹	1.9X10 ¹	3.9X10 ⁴	1.0X10 ⁶

Figure: 25 TAC §289.257(ee)(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)
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
Bk-249 (a)		4.0X10 ¹	1.1X10 ³	3.0X10 ⁻¹	8.1	6.1X10 ¹	1.6X10 ³

Figure: 25 TAC §289.257(ee)(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)
Br-76	Bromine (35)	4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	9.4X10 ⁴	2.5X10 ⁶
Br-77		3.0	8.1X10 ¹	3.0	8.1X10 ¹	2.6X10 ⁴	7.1X10 ⁵
Br-82		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁴	1.1X10 ⁶
C-11	Carbon (6)	1.0	2.7X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	3.1X10 ⁷	8.4X10 ⁸
C-14		4.0X10 ¹	1.1X10 ³	3.0	8.1X10 ¹	1.6X10 ⁻¹	4.5
Ca-41	Calcium (20)	Unlimited	Unlimited	Unlimited	Unlimited	3.1X10 ⁻³	8.5X10 ⁻²
Ca-45		4.0X10 ¹	1.1X10 ³	1.0	2.7X10 ¹	6.6X10 ²	1.8X10 ⁴
Ca-47 (a)		3.0	8.1X10 ¹	3.0X10 ⁻¹	8.1	2.3X10 ⁴	6.1X10 ⁵
Cd-109	Cadmium (48)	3.0X10 ¹	8.1X10 ²	2.0	5.4X10 ¹	9.6X10 ¹	2.6X10 ³
Cd-113m		4.0X10 ¹	1.1X10 ³	5.0X10 ⁻¹	1.4X10 ¹	8.3	2.2X10 ²
Cd-115 (a)		3.0	8.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.9X10 ⁴	5.1X10 ⁵
Cd-115m		5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	9.4X10 ²	2.5X10 ⁴
Ce-139	Cerium (58)	7.0	1.9X10 ²	2.0	5.4X10 ¹	2.5X10 ²	6.8X10 ³
Ce-141		2.0X10 ¹	5.4X10 ²	6.0X10 ⁻¹	1.6X10 ¹	1.1X10 ³	2.8X10 ⁴
Ce-143		9.0X10 ⁻¹	2.4X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	2.5X10 ⁴	6.6X10 ⁵
Ce-144 (a)		2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	1.2X10 ²	3.2X10 ³
Cf-248	Californium (98)	4.0X10 ¹	1.1X10 ³	6.0X10 ⁻³	1.6X10 ⁻¹	5.8X10 ¹	1.6X10 ³
Cf-249		3.0	8.1X10 ¹	8.0X10 ⁻⁴	2.2X10 ⁻²	1.5X10 ⁻¹	4.1
Cf-250		2.0X10 ¹	5.4X10 ²	2.0X10 ⁻³	5.4X10 ⁻²	4.0	1.1X10 ²
Cf-251		7.0	1.9X10 ²	7.0X10 ⁻⁴	1.9X10 ⁻²	5.9X10 ⁻²	1.6

Figure: 25 TAC §289.257(ee)(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)
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
Co-60		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	4.2X10 ¹	1.1X10 ³

Figure: 25 TAC §289.257(ee)(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)
Cr-51	Chromium (24)	3.0X10 ¹	8.1X10 ²	3.0X10 ¹	8.1X10 ²	3.4X10 ³	9.2X10 ⁴
Cs-129	Cesium (55)	4.0	1.1X10 ²	4.0	1.1X10 ²	2.8X10 ⁴	7.6X10 ⁵
Cs-131		3.0X10 ¹	8.1X10 ²	3.0X10 ¹	8.1X10 ²	3.8X10 ³	1.0X10 ⁵
Cs-132		1.0	2.7X10 ¹	1.0	2.7X10 ¹	5.7X10 ³	1.5X10 ⁵
Cs-134		7.0X10 ⁻¹	1.9X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	4.8X10 ¹	1.3X10 ³
Cs-134m		4.0X10 ¹	1.1X10 ³	6.0X10 ⁻¹	1.6X10 ¹	3.0X10 ⁵	8.0X10 ⁶
Cs-135		4.0X10 ¹	1.1X10 ³	1.0	2.7X10 ¹	4.3X10 ⁻⁵	1.2X10 ⁻³
Cs-136		5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	2.7X10 ³	7.3X10 ⁴
Cs-137 (a)		2.0	5.4X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	3.2	8.7X10 ¹
Cu-64	Copper (29)	6.0	1.6X10 ²	1.0	2.7X10 ¹	1.4X10 ⁵	3.9X10 ⁶
Cu-67		1.0X10 ¹	2.7X10 ²	7.0X10 ⁻¹	1.9X10 ¹	2.8X10 ⁴	7.6X10 ⁵
Dy-159	Dysprosium (66)	2.0X10 ¹	5.4X10 ²	2.0X10 ¹	5.4X10 ²	2.1X10 ²	5.7X10 ³
Dy-165		9.0X10 ⁻¹	2.4X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	3.0X10 ⁵	8.2X10 ⁶
Dy-166 (a)		9.0X10 ⁻¹	2.4X10 ¹	3.0X10 ⁻¹	8.1	8.6X10 ³	2.3X10 ⁵
Er-169	Erbium (68)	4.0X10 ¹	1.1X10 ³	1.0	2.7X10 ¹	3.1X10 ³	8.3X10 ⁴
Er-171		8.0X10 ⁻¹	2.2X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	9.0X10 ⁴	2.4X10 ⁶
Eu-147	Europium (63)	2.0	5.4X10 ¹	2.0	5.4X10 ¹	1.4X10 ³	3.7X10 ⁴
Eu-148		5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	6.0X10 ²	1.6X10 ⁴
Eu-149		2.0X10 ¹	5.4X10 ²	2.0X10 ¹	5.4X10 ²	3.5X10 ²	9.4X10 ³
Eu-150 (short lived)		2.0	5.4X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	6.1X10 ⁴	1.6X10 ⁶

Figure: 25 TAC §289.257(ee)(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)
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
Ge-71		4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	5.8X10 ³	1.6X10 ⁵

Figure: 25 TAC §289.257(ee)(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)
Ge-77		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	1.3X10 ⁵	3.6X10 ⁶
Hf-172 (a)	Hafnium (72)	6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	4.1X10 ¹	1.1X10 ³
Hf-175		3.0	8.1X10 ¹	3.0	8.1X10 ¹	3.9X10 ²	1.1X10 ⁴
Hf-181		2.0	5.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	6.3X10 ²	1.7X10 ⁴
Hf-182		Unlimited	Unlimited	Unlimited	Unlimited	8.1X10 ⁻⁶	2.2X10 ⁻⁴
Hg-194 (a)	Mercury (80)	1.0	2.7X10 ¹	1.0	2.7X10 ¹	1.3X10 ⁻¹	3.5
Hg-195m (a)		3.0	8.1X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	1.5X10 ⁴	4.0X10 ⁵
Hg-197		2.0X10 ¹	5.4X10 ²	1.0X10 ¹	2.7X10 ²	9.2X10 ³	2.5X10 ⁵
Hg-197m		1.0X10 ¹	2.7X10 ²	4.0X10 ⁻¹	1.1X10 ¹	2.5X10 ⁴	6.7X10 ⁵
Hg-203		5.0	1.4X10 ²	1.0	2.7X10 ¹	5.1X10 ²	1.4X10 ⁴
Ho-166	Holmium (67)	4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	2.6X10 ⁴	7.0X10 ⁵
Ho-166m		6.0X10 ⁻¹	1.6X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	6.6X10 ⁻²	1.8
I-123	Iodine (53)	6.0	1.6X10 ²	3.0	8.1X10 ¹	7.1X10 ⁴	1.9X10 ⁶
I-124		1.0	2.7X10 ¹	1.0	2.7X10 ¹	9.3X10 ³	2.5X10 ⁵
I-125		2.0X10 ¹	5.4X10 ²	3.0	8.1X10 ¹	6.4X10 ²	1.7X10 ⁴
I-126		2.0	5.4X10 ¹	1.0	2.7X10 ¹	2.9X10 ³	8.0X10 ⁴
I-129		Unlimited	Unlimited	Unlimited	Unlimited	6.5X10 ⁻⁶	1.8X10 ⁻⁴
I-131		3.0	8.1X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	4.6X10 ³	1.2X10 ⁵
I-132		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	3.8X10 ⁵	1.0X10 ⁷
I-133		7.0X10 ⁻¹	1.9X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	4.2X10 ⁴	1.1X10 ⁶

Figure: 25 TAC §289.257(ee)(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)
I-134		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	9.9X10 ⁵	2.7X10 ⁷
I-135 (a)		6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.3X10 ⁵	3.5X10 ⁶
In-111	Indium (49)	3.0	8.1X10 ¹	3.0	8.1X10 ¹	1.5X10 ⁴	4.2X10 ⁵
In-113m		4.0	1.1X10 ²	2.0	5.4X10 ¹	6.2X10 ⁵	1.7X10 ⁷
In-114m (a)		1.0X10 ¹	2.7X10 ²	5.0X10 ⁻¹	1.4X10 ¹	8.6X10 ²	2.3X10 ⁴
In-115m		7.0	1.9X10 ²	1.0	2.7X10 ¹	2.2X10 ⁵	6.1X10 ⁶
Ir-189 (a)	Iridium (77)	1.0X10 ¹	2.7X10 ²	1.0X10 ¹	2.7X10 ²	1.9X10 ³	5.2X10 ⁴
Ir-190		7.0X10 ⁻¹	1.9X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	2.3X10 ³	6.2X10 ⁴
Ir-192 (c)		1.0	2.7X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	3.4X10 ²	9.2X10 ³
Ir-194		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	3.1X10 ⁴	8.4X10 ⁵
K-40	Potassium (19)	9.0X10 ⁻¹	2.4X10 ¹	9.0X10 ⁻¹	2.4X10 ¹	2.4X10 ⁻⁷	6.4X10 ⁻⁶
K-42		2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	2.2X10 ⁵	6.0X10 ⁶
K-43		7.0X10 ⁻¹	1.9X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.2X10 ⁵	3.3X10 ⁶
Kr-81	Krypton (36)	4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	7.8X10 ⁻⁴	2.1X10 ⁻²
Kr-85		1.0X10 ¹	2.7X10 ²	1.0X10 ¹	2.7X10 ²	1.5X10 ¹	3.9X10 ²
Kr-85m		8.0	2.2X10 ²	3.0	8.1X10 ¹	3.0X10 ⁵	8.2X10 ⁶
Kr-87		2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	1.0X10 ⁶	2.8X10 ⁷
La-137	Lanthanum (57)	3.0X10 ¹	8.1X10 ²	6.0	1.6X10 ²	1.6X10 ⁻³	4.4X10 ⁻²
La-140		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	2.1X10 ⁴	5.6X10 ⁵
Lu-172	Lutetium (71)	6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	4.2X10 ³	1.1X10 ⁵

Figure: 25 TAC §289.257(ee)(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)
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
Nd-149		6.0X10 ⁻¹	1.6X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	4.5X10 ⁵	1.2X10 ⁷

Figure: 25 TAC §289.257(ee)(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)
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
Pb-202		4.0X10 ¹	1.1X10 ³	2.0X10 ¹	5.4X10 ²	1.2X10 ⁻⁴	3.4X10 ⁻³

Figure: 25 TAC §289.257(ee)(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-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
Pt-193		4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	1.4	3.7X10 ¹

Figure: 25 TAC §289.257(ee)(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)
Pt-193m		4.0X10 ¹	1.1X10 ³	5.0X10 ⁻¹	1.4X10 ¹	5.8X10 ³	1.6X10 ⁵
Pt-195m		1.0X10 ¹	2.7X10 ²	5.0X10 ⁻¹	1.4X10 ¹	6.2X10 ³	1.7X10 ⁵
Pt-197		2.0X10 ¹	5.4X10 ²	6.0X10 ⁻¹	1.6X10 ¹	3.2X10 ⁴	8.7X10 ⁵
Pt-197m		1.0X10 ¹	2.7X10 ²	6.0X10 ⁻¹	1.6X10 ¹	3.7X10 ⁵	1.0X10 ⁷
Pu-236	Plutonium (94)	3.0X10 ¹	8.1X10 ²	3.0X10 ⁻³	8.1X10 ⁻²	2.0X10 ¹	5.3X10 ²
Pu-237		2.0X10 ¹	5.4X10 ²	2.0X10 ¹	5.4X10 ²	4.5X10 ²	1.2X10 ⁴
Pu-238		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	6.3X10 ⁻¹	1.7X10 ¹
Pu-239		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	2.3X10 ⁻³	6.2X10 ⁻²
Pu-240		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	8.4X10 ⁻³	2.3X10 ⁻¹
Pu-241 (a)		4.0X10 ¹	1.1X10 ³	6.0X10 ⁻²	1.6	3.8	1.0X10 ²
Pu-242		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	1.5X10 ⁻⁴	3.9X10 ⁻³
Pu-244 (a)		4.0X10 ⁻¹	1.1X10 ¹	1.0X10 ⁻³	2.7X10 ⁻²	6.7X10 ⁻⁷	1.8X10 ⁻⁵
Ra-223 (a)	Radium (88)	4.0X10 ⁻¹	1.1X10 ¹	7.0X10 ⁻³	1.9X10 ⁻¹	1.9X10 ³	5.1X10 ⁴
Ra-224 (a)		4.0X10 ⁻¹	1.1X10 ¹	2.0X10 ⁻²	5.4X10 ⁻¹	5.9X10 ³	1.6X10 ⁵
Ra-225 (a)		2.0X10 ⁻¹	5.4	4.0X10 ⁻³	1.1X10 ⁻¹	1.5X10 ³	3.9X10 ⁴
Ra-226 (a)		2.0X10 ⁻¹	5.4	3.0X10 ⁻³	8.1X10 ⁻²	3.7X10 ⁻²	1.0
Ra-228 (a)		6.0X10 ⁻¹	1.6X10 ¹	2.0X10 ⁻²	5.4X10 ⁻¹	1.0X10 ¹	2.7X10 ²
Rb-81	Rubidium (37)	2.0	5.4X10 ¹	8.0X10 ⁻¹	2.2X10 ¹	3.1X10 ⁵	8.4X10 ⁶
Rb-83 (a)		2.0	5.4X10 ¹	2.0	5.4X10 ¹	6.8X10 ²	1.8X10 ⁴
Rb-84		1.0	2.7X10 ¹	1.0	2.7X10 ¹	1.8X10 ³	4.7X10 ⁴

Figure: 25 TAC §289.257(ee)(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)
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
Ru-105		1.0	2.7X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	2.5X10 ⁵	6.7X10 ⁶

Figure: 25 TAC §289.257(ee)(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)
Ru-106 (a)		2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	1.2X10 ²	3.3X10 ³
S-35	Sulfur (16)	4.0X10 ¹	1.1X10 ³	3.0	8.1X10 ¹	1.6X10 ³	4.3X10 ⁴
Sb-122	Antimony (51)	4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.5X10 ⁴	4.0X10 ⁵
Sb-124		6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	6.5X10 ²	1.7X10 ⁴
Sb-125		2.0	5.4X10 ¹	1.0	2.7X10 ¹	3.9X10 ¹	1.0X10 ³
Sb-126		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	3.1X10 ³	8.4X10 ⁴
Sc-44	Scandium (21)	5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	6.7X10 ⁵	1.8X10 ⁷
Sc-46		5.0X10 ⁻¹	1.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	1.3X10 ³	3.4X10 ⁴
Sc-47		1.0X10 ¹	2.7X10 ²	7.0X10 ⁻¹	1.9X10 ¹	3.1X10 ⁴	8.3X10 ⁵
Sc-48		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	5.5X10 ⁴	1.5X10 ⁶
Se-75	Selenium (34)	3.0	8.1X10 ¹	3.0	8.1X10 ¹	5.4X10 ²	1.5X10 ⁴
Se-79		4.0X10 ¹	1.1X10 ³	2.0	5.4X10 ¹	2.6X10 ⁻³	7.0X10 ⁻²
Si-31	Silicon (14)	6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.4X10 ⁶	3.9X10 ⁷
Si-32		4.0X10 ¹	1.1X10 ³	5.0X10 ⁻¹	1.4X10 ¹	3.9	1.1X10 ²
Sm-145	Samarium (62)	1.0X10 ¹	2.7X10 ²	1.0X10 ¹	2.7X10 ²	9.8X10 ¹	2.6X10 ³
Sm-147		Unlimited	Unlimited	Unlimited	Unlimited	8.5X10 ⁻¹	2.3X10 ⁻⁸
Sm-151		4.0X10 ¹	1.1X10 ³	1.0X10 ¹	2.7X10 ²	9.7X10 ⁻¹	2.6X10 ¹
Sm-153		9.0	2.4X10 ²	6.0X10 ⁻¹	1.6X10 ¹	1.6X10 ⁴	4.4X10 ⁵
Sn-113 (a)	Tin (50)	4.0	1.1X10 ²	2.0	5.4X10 ¹	3.7X10 ²	1.0X10 ⁴
Sn-117m		7.0	1.9X10 ²	4.0X10 ⁻¹	1.1X10 ¹	3.0X10 ³	8.2X10 ⁴

Figure: 25 TAC §289.257(ee)(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)
Sn-119m		4.0X10 ¹	1.1X10 ³	3.0X10 ¹	8.1X10 ²	1.4X10 ²	3.7X10 ³
Sn-121m (a)		4.0X10 ¹	1.1X10 ³	9.0X10 ⁻¹	2.4X10 ¹	2.0	5.4X10 ¹
Sn-123		8.0X10 ⁻¹	2.2X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	3.0X10 ²	8.2X10 ³
Sn-125		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ³	1.1X10 ⁵
Sn-126 (a)		6.0X10 ⁻¹	1.6X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.0X10 ⁻³	2.8X10 ⁻²
Sr-82 (a)	Strontium (38)	2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	2.3X10 ³	6.2X10 ⁴
Sr-85		2.0	5.4X10 ¹	2.0	5.4X10 ¹	8.8X10 ²	2.4X10 ⁴
Sr-85m		5.0	1.4X10 ²	5.0	1.4X10 ²	1.2X10 ⁶	3.3X10 ⁷
Sr-87m		3.0	8.1X10 ¹	3.0	8.1X10 ¹	4.8X10 ⁵	1.3X10 ⁷
Sr-89		6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.1X10 ³	2.9X10 ⁴
Sr-90 (a)		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	5.1	1.4X10 ²
Sr-91 (a)		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	1.3X10 ⁵	3.6X10 ⁶
Sr-92 (a)		1.0	2.7X10 ¹	3.0X10 ⁻¹	8.1	4.7X10 ⁵	1.3X10 ⁷
T(H-3)	Tritium (1)	4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	3.6X10 ²	9.7X10 ³
Ta-178 (long-lived)	Tantalum (73)	1.0	2.7X10 ¹	8.0X10 ⁻¹	2.2X10 ¹	4.2X10 ⁶	1.1X10 ⁸
Ta-179		3.0X10 ¹	8.1X10 ²	3.0X10 ¹	8.1X10 ²	4.1X10 ¹	1.1X10 ³
Ta-182		9.0X10 ⁻¹	2.4X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	2.3X10 ²	6.2X10 ³
Tb-157	Terbium (65)	4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	5.6X10 ⁻¹	1.5X10 ¹
Tb-158		1.0	2.7X10 ¹	1.0	2.7X10 ¹	5.6X10 ⁻¹	1.5X10 ¹
Tb-160		1.0	2.7X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	4.2X10 ²	1.1X10 ⁴

Figure: 25 TAC §289.257(ee)(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)
Tc-95m (a)	Technetium (43)	2.0	5.4X10 ¹	2.0	5.4X10 ¹	8.3X10 ²	2.2X10 ⁴
Tc-96		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.2X10 ⁴	3.2X10 ⁵
Tc-96m (a)		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.4X10 ⁶	3.8X10 ⁷
Tc-97		Unlimited	Unlimited	Unlimited	Unlimited	5.2X10 ⁻⁵	1.4X10 ⁻³
Tc-97m		4.0X10 ¹	1.1X10 ³	1.0	2.7X10 ¹	5.6X10 ²	1.5X10 ⁴
Tc-98		8.0X10 ⁻¹	2.2X10 ¹	7.0X10 ⁻¹	1.9X10 ¹	3.2X10 ⁻⁵	8.7X10 ⁻⁴
Tc-99		4.0X10 ¹	1.1X10 ³	9.0X10 ⁻¹	2.4X10 ¹	6.3X10 ⁻⁴	1.7X10 ⁻²
Tc-99m		1.0X10 ¹	2.7X10 ²	4.0	1.1X10 ²	1.9X10 ⁵	5.3X10 ⁶
Te-121	Tellurium (52)	2.0	5.4X10 ¹	2.0	5.4X10 ¹	2.4X10 ³	6.4X10 ⁴
Te-121m		5.0	1.4X10 ²	3.0	8.1X10 ¹	2.6X10 ²	7.0X10 ³
Te-123m		8.0	2.2X10 ²	1.0	2.7X10 ¹	3.3X10 ²	8.9X10 ³
Te-125m		2.0X10 ¹	5.4X10 ²	9.0X10 ⁻¹	2.4X10 ¹	6.7X10 ²	1.8X10 ⁴
Te-127		2.0X10 ¹	5.4X10 ²	7.0X10 ⁻¹	1.9X10 ¹	9.8X10 ⁴	2.6X10 ⁶
Te-127m (a)		2.0X10 ¹	5.4X10 ²	5.0X10 ⁻¹	1.4X10 ¹	3.5X10 ²	9.4X10 ³
Te-129		7.0X10 ⁻¹	1.9X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	7.7X10 ⁵	2.1X10 ⁷
Te-129m (a)		8.0X10 ⁻¹	2.2X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.1X10 ³	3.0X10 ⁴
Te-131m (a)		7.0X10 ⁻¹	1.9X10 ¹	5.0X10 ⁻¹	1.4X10 ¹	3.0X10 ⁴	8.0X10 ⁵
Te-132 (a)		5.0X10 ⁻¹	1.4X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	1.1X10 ⁴	3.0X10 ⁵
Th-227	Thorium (90)	1.0X10 ¹	2.7X10 ²	5.0X10 ⁻³	1.4X10 ⁻¹	1.1X10 ³	3.1X10 ⁴
Th-228 (a)		5.0X10 ⁻¹	1.4X10 ¹	1.0X10 ⁻³	2.7X10 ⁻²	3.0X10 ¹	8.2X10 ²

Figure: 25 TAC §289.257(ee)(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)
Th-229		5.0	1.4X10 ²	5.0X10 ⁻⁴	1.4X10 ⁻²	7.9X10 ⁻³	2.1X10 ⁻¹
Th-230		1.0X10 ¹	2.7X10 ²	1.0X10 ⁻³	2.7X10 ⁻²	7.6X10 ⁻⁴	2.1X10 ⁻²
Th-231		4.0X10 ¹	1.1X10 ³	2.0X10 ⁻²	5.4X10 ⁻¹	2.0X10 ⁴	5.3X10 ⁵
Th-232		Unlimited	Unlimited	Unlimited	Unlimited	4.0X10 ⁻⁹	1.1X10 ⁻⁷
Th-234 (a)		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	8.6X10 ²	2.3X10 ⁴
Th(nat)		Unlimited	Unlimited	Unlimited	Unlimited	8.1X10 ⁻⁹	2.2X10 ⁻⁷
Ti-44 (a)	Titanium (22)	5.0X10 ⁻¹	1.4X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	6.4	1.7X10 ²
Tl-200	Thallium (81)	9.0X10 ⁻¹	2.4X10 ¹	9.0X10 ⁻¹	2.4X10 ¹	2.2X10 ⁴	6.0X10 ⁵
Tl-201		1.0X10 ¹	2.7X10 ²	4.0	1.1X10 ²	7.9X10 ³	2.1X10 ⁵
Tl-202		2.0	5.4X10 ¹	2.0	5.4X10 ¹	2.0X10 ³	5.3X10 ⁴
Tl-204		1.0X10 ¹	2.7X10 ²	7.0X10 ⁻¹	1.9X10 ¹	1.7X10 ¹	4.6X10 ²
Tm-167	Thulium (69)	7.0	1.9X10 ²	8.0X10 ⁻¹	2.2X10 ¹	3.1X10 ³	8.5X10 ⁴
Tm-170		3.0	8.1X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	2.2X10 ²	6.0X10 ³
Tm-171		4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³	4.0X10 ¹	1.1X10 ³
U-230 (fast lung absorption) (a)(d)	Uranium (92)	4.0X10 ¹	1.1X10 ³	1.0X10 ⁻¹	2.7	1.0X10 ³	2.7X10 ⁴
U-230 (medium lung absorption) (a)(e)		4.0X10 ¹	1.1X10 ³	4.0X10 ⁻³	1.1X10 ⁻¹	1.0X10 ³	2.7X10 ⁴
U-230 (slow lung absorption) (a)(f)		3.0X10 ¹	8.1X10 ²	3.0X10 ⁻³	8.1X10 ⁻²	1.0X10 ³	2.7X10 ⁴
U-232 (fast lung absorption) (d)		4.0X10 ¹	1.1X10 ³	1.0X10 ⁻²	2.7X10 ⁻¹	8.3X10 ⁻¹	2.2X10 ¹

Figure: 25 TAC §289.257(ee)(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)
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
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

Figure: 25 TAC §289.257(ee)(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)
absorption) (f)							
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
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

Figure: 25 TAC §289.257(ee)(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)
Y-87 (a)	Yttrium (39)	1.0	2.7X10 ¹	1.0	2.7X10 ¹	1.7X10 ⁴	4.5X10 ⁵
Y-88		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	5.2X10 ²	1.4X10 ⁴
Y-90		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	2.0X10 ⁴	5.4X10 ⁵
Y-91		6.0X10 ⁻¹	1.6X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	9.1X10 ²	2.5X10 ⁴
Y-91m		2.0	5.4X10 ¹	2.0	5.4X10 ¹	1.5X10 ⁶	4.2X10 ⁷
Y-92		2.0X10 ⁻¹	5.4	2.0X10 ⁻¹	5.4	3.6X10 ⁵	9.6X10 ⁶
Y-93		3.0X10 ⁻¹	8.1	3.0X10 ⁻¹	8.1	1.2X10 ⁵	3.3X10 ⁶
Yb-169	Ytterbium (70)	4.0	1.1X10 ²	1.0	2.7X10 ¹	8.9X10 ²	2.4X10 ⁴
Yb-175		3.0X10 ¹	8.1X10 ²	9.0X10 ⁻¹	2.4X10 ¹	6.6X10 ³	1.8X10 ⁵
Zn-65	Zinc (30)	2.0	5.4X10 ¹	2.0	5.4X10 ¹	3.0X10 ²	8.2X10 ³
Zn-69		3.0	8.1X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.8X10 ⁶	4.9X10 ⁷
Zn-69m (a)		3.0	8.1X10 ¹	6.0X10 ⁻¹	1.6X10 ¹	1.2X10 ⁵	3.3X10 ⁶
Zr-88	Zirconium (40)	3.0	8.1X10 ¹	3.0	8.1X10 ¹	6.6X10 ²	1.8X10 ⁴
Zr-93		Unlimited	Unlimited	Unlimited	Unlimited	9.3X10 ⁻⁵	2.5X10 ⁻³
Zr-95 (a)		2.0	5.4X10 ¹	8.0X10 ⁻¹	2.2X10 ¹	7.9X10 ²	2.1X10 ⁴
Zr-97 (a)		4.0X10 ⁻¹	1.1X10 ¹	4.0X10 ⁻¹	1.1X10 ¹	7.1X10 ⁴	1.9X10 ⁶

^a A₁ and/or A₂ values include contributions from daughter nuclides with half-lives less than 10 days.

^b The values of A₁ and A₂ in Curies (Ci) are approximate and for information only; the regulatory standard units are Terabecquerels (TBq), (see subsection (ee)(1) [(ff)(1)] of this section - Determination of A₁ and A₂, Section I).

Figure: 25 TAC §289.257(ee)(6)

^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.