

25 TEXAS ADMINISTRATIVE CODE

§289.254

Licensing of Radioactive Waste Processing and Storage Facilities

Texas Regulations for Control of Radiation

(revisions effective September 1, 2004  
are shown as shaded text)

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§289.254. Licensing of Radioactive Waste Processing and Storage Facilities.

(a) Purpose and scope.

(1) This section establishes the requirements for management of commercial radioactive waste processing and storage facilities, the procedures and criteria for the issuance of licenses to receive, possess, transport, store, and process radioactive waste from other persons, and the terms and conditions upon which the agency will issue such licenses.

(2) Except as otherwise provided, this section applies to all persons who transport, receive, possess, store, or process radioactive waste from other persons. In addition to the requirements of this section, all licensees, unless otherwise specified, 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), §289.252 of this title (relating to Licensing of Radioactive Material), and §289.257 of this title (relating to Packaging and Transportation of Radioactive Material).

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

(1) Commencement of major construction - Any major structural erection or major alterations to existing structures, or other substantial action that would change the facility design or site for the purpose of establishing a radioactive waste processing or storage facility. The term does not mean the acquisition of existing structures or minor changes thereto.

(2) Decommissioning - The final activities carried out at a radioactive waste processing or storage site after completion of processing operations to remove safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and/or termination of the license. Such activities shall include:

(A) disposing of all radioactive waste at a licensed radioactive waste disposal site;

(B) dismantling or decontaminating site structures;

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- (C) decontaminating site surfaces and remaining equipment; and
  - (D) conducting final closure surveys, decontamination, and reclamation of the site.
- (3) Disposal - Isolation or removal of radioactive wastes from mankind and his environment. The term does not include emissions and discharges under rules of the agency.
- (4) Engineered barriers - Man-made devices to contain or limit the potential movement of radioactive material, which might result from spills or other accidents.
- (5) Floodplain - The lowland and relatively flat areas adjoining inland and coastal waters, including flood prone areas of off-shore islands.
- (6) Local government - A county, an incorporated city or town, a special district, or other political subdivision of the state.
- (7) Major aquifer - An aquifer that yields large quantities of water in a comparatively large area of the state. Major aquifers are located in the following formations: Ogallala, Alluvium and Bolson Deposits, Edwards-Trinity (Plateau), Edwards (Balcones Fault Zone - San Antonio Region), Edwards (Balcones Fault Zone - Austin Region), Trinity Group, Carrizo-Wilcox, and Gulf Coast.
- (8) Natural barriers - The natural characteristics of a site or surface and subsurface composition that serves to impede the movement of radioactive material. Natural barriers may include, for example, the location of a facility remote from an aquifer, or the sorptive capability of the soil surrounding a facility.
- (9) Processing - The storage, extraction of materials, transfer, volume reduction, compaction, incineration, solidification, or other separation and preparation of radioactive waste from other persons for reuse or disposal, including any treatment or activity that renders the waste less hazardous, safer for transport, or amenable to recovery, storage, or disposal.
- (10) Radioactive waste processing facility - A facility where radioactive waste received from other persons is processed and/or repackaged according to United States Department of Transportation (DOT) regulations.
- (11) Radioactive waste storage facility - A facility where radioactive waste received from other persons is stored while awaiting shipment to a licensed radioactive waste processing or disposal facility.

(12) Reconnaissance level information - Any information or analysis that can be retrieved or generated without the performance of new comprehensive site-specific investigations. Reconnaissance level information includes, but is not limited to, relevant published scientific literature; drilling records required by state agencies, such as the Railroad Commission of Texas, the Texas Environmental Quality Commission (Commission), and the Texas Natural Resources Information System; and reports of governmental agencies.

(13) Site - The real property, including the buffer zone, on which a radioactive waste processing or storage facility may be located.

(14) Site monitoring - The procedures for the monitoring of the site and environment to assess quality of site operations and performance and to detect and quantify levels and types of radioactivity and chemicals in the environment. It includes preoperational, operational, and license termination phases.

(15) Site operations - The routine day-to-day activities carried out at the site for the receipt, processing, and storage of radioactive waste.

(16) Site suitability - The capability of the various characteristics of a processing or storage facility or site to safely contain the radioactive waste expected to be present at the site.

(17) Sole source aquifer - The aquifer that is the sole or principal source of drinking water for an area designated under the Safe Drinking Water Act of 1974, 42 United States Codes Annotated 300f, et seq.

(18) Waste processing and storage categories - Radionuclides classified as follows:

(A) any one of seven groups into which radionuclides in normal form are classified, according to their toxicity and their relative potential hazard in transport, as specified in subsection (p) of this section; and

(B) any radionuclide not specifically listed in one of the categories in subsection (p) of this section shall be assigned to one of the categories in accordance with subsection (p)(2) of this section.

(19) Wetlands - Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include playa lakes, swamps, marshes, bogs, and similar areas.

(c) Activities requiring license. Except for persons exempted by this section, no person shall receive, possess, and store or process radioactive waste from another person except as authorized in a specific license issued in accordance with this section.

(d) Radioactive waste processing and storage facility classification.

(1) Classification of radioactive waste processing and storage facilities. Radioactive waste processing and storage facilities are classified according to the radionuclides, other than sealed sources, received, possessed, or processed in each of the waste processing and storage categories, as defined in subsection (b) of this section with all applicable provisions, except that, for the purposes of this section which apply to processing and storage of radioactive waste, Category IV shall include waste processing and storage categories IV-VII. The total possession limit of each category of unsealed (dispersible) radionuclides for each class of facility is as follows:

	<u>Category I</u>	<u>Category II</u>	<u>Category III</u>	<u>Category IV</u>
Class I Storage or Processing Facility	10 mCi	100 mCi	1 Ci	10 Ci
Class II Storage Facility	2 Ci	20 Ci	200 Ci	2000 Ci
Class II Processing Facility	1 Ci	10 Ci	100 Ci	1000 Ci

(2) Class III storage facilities are those in which the applicable possession limit of radioactive waste exceeds any limit of Class II storage facilities.

(3) Class III processing facilities are those in which the applicable possession limit of radioactive waste exceeds any limit of Class II processing facilities.

(e) Exemptions.

(1) Sealed sources. Persons who receive, possess, or process sealed sources of radioactive material as radioactive waste from other persons are exempt from this section, provided that:

(A) encapsulated sources are tested upon receipt and determined to have less than 0.005 microcurie of removable contamination; and

(B) sealed sources of radioactive material remain in sealed form after receipt.

(2) Unsealed sources.

§289.254(e)(2)(A)

(A) Persons who receive, possess, or process sources of radioactive material in unsealed form as radioactive waste from other persons are exempt from this section provided that:

(i) the total radioactivity of all radioactive waste possessed at any one time does not exceed the applicable limits for Class I processing or storage facilities as described in subsection (d) of this section; and

(ii) the total volume of radioactive waste processed in any one year does not exceed 50 cubic feet.

(B) Persons who receive, possess, and store radioactive material in unsealed form as radioactive waste from other persons are exempt from this section provided that:

(i) the radioactive waste consists only of radiopharmaceutical residues resulting from radiopharmaceuticals manufactured, compounded, and supplied by those persons receiving the radiopharmaceutical residues as radioactive waste;

(ii) the radioactive waste is held in storage for decay to background radiation levels; and

(iii) the radioactive waste is not shipped to a radioactive waste processing or disposal facility.

(3) Radioactive material. A person who receives, possesses, and stores radioactive material as radioactive waste from sites owned and controlled by that same person is not considered to have received waste from other persons.

(f) Filing application for a specific license. Unless otherwise specified, an applicant for a license to receive, possess, or process radioactive waste from other persons is subject to the requirements in §289.252(d) of this title. The applicant shall also comply with the following additional filing requirements.

(1) The applicant for a license to receive, possess, or process radioactive waste from other persons shall submit seven copies of each license application or application for amendment and any supporting documents in a manner specified by the agency. Applications for issuance of licenses shall include all general and specific technical requirements, financial information, and environmental requirements, if applicable, described in this section.

(2) Each application shall clearly demonstrate how the requirements of this subsection and subsections (g), (h), and (i) of this section have been addressed.

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(3) Applications for licenses shall be processed in accordance with the following time periods.

(A) The first period is the time from receipt of an application by the Division of Licensing, Registration and Standards to the date of issuance or denial of the license or a written notice outlining why the application is incomplete or unacceptable. This time period is 90 days.

(B) The second period is the time from receipt of the last item necessary to complete the application to the date of issuance or denial of the license. This time period is 90 days.

(C) These time periods are exclusive of any time period incident to hearings and post-hearing activities required by Government Code, Chapters 2001 and 2002.

(4) 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 (3) 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, Texas Administrative Code, Chapter 155 (relating to Rules of Procedure) and the Formal Hearing Procedures, §§1.21, 1.23, 1.25, and 1.27 of this title.

(5) An applicant for a license under this section shall include the following additional information in the application to the agency:

(A) identity of the applicant including the full name, address, telephone number, and description of the business(es) or occupation(s) of the applicant;

(B) the organizational structure of the applicant, both off-site and on-site, including a description of lines of authority and assignments of responsibilities, whether in the form of administrative directives, contract provisions, or otherwise;

(C) a description of past operations that the applicant has been involved in including any license limitations, suspensions or revocations of such licenses, and any other information that will allow the agency to assess the applicant's past operating history;

(D) the technical qualifications, including training and experience, of the applicant and members of the applicant's staff to engage in the proposed activities; and minimum training and experience requirements for personnel;

(E) a description of the personnel training and retraining program;

(F) a statement of need and a description of the proposed activities identifying:

(i) the location of the proposed site;

(ii) the character of the proposed activities;

(iii) the types, chemical and/or physical forms and quantities of radioactive waste to be received, possessed, and processed; and

(iv) the plans for use of the facility for purposes other than processing of radioactive waste;

(G) proposed time schedules for construction and receipt and processing of radioactive waste at the proposed facility;

(H) description of the site and accurate drawings of the facility including, but not limited to:

(i) construction;

(ii) foundation details;



- (iii) ventilation;
- (iv) plumbing and fire suppression systems;
- (v) physical security system;
- (vi) storage areas;
- (vii) radioactive waste handling or processing areas;
- (viii) proximity to creeks or culverts; and
- (ix) soil types under the facility with respect to compatibility with foundation and structural design;

(I) a description that demonstrates that the site suitability characteristics will meet the following requirements:

(j) the overall hydrogeologic environment of the site, in combination with engineering design, shall act to minimize and control potential radioactive waste migration into surface water and groundwaters;

(ii) no new site shall be located in a 100-year floodplain, as designated by the Commission, or a wetland; and

(iii) no new site shall be located in the recharge area of a sole source aquifer or a major aquifer unless it can be demonstrated with reasonable assurance that the new site will be designed, constructed, operated, and closed without an unreasonable risk to the aquifer.

(J) minimum criteria for facility design and operation to include:

(j) the building used for processing radioactive wastes shall have a minimum classification of Type II (111) in accordance with National Fire Protection Association 220 titled, "Standard Types of Building Construction;"

(j) buildings used for processing or storage of radioactive wastes shall have ventilation and fire protection systems to minimize the release of radioactive materials into the soils, waters, and the atmosphere; and

(II) facilities and equipment for repackaging leaking and/or damaged containers shall be provided.

(ii) the design and operation of the radioactive waste processing or storage facility shall be such that:

(J) releases of non-radiological noxious materials from the facility are minimized; and

(II) radiation levels, concentrations, and potential exposures off-site due to airborne releases during operations are within the limits established in §289.202 of this title and are maintained as low as reasonably achievable.

(iii) the design and operation of the radioactive waste processing or storage facility shall be compatible with the objectives of the site closure and decommissioning plan;

(iv) the facility shall be designed to confine spills. Independent and diverse engineered barriers shall be provided, as necessary, to complement natural barriers in minimizing potential releases from the facility and in complying with this section;

(v) the location and construction of any new radioactive waste processing facility shall have a buffer zone adequate to permit emergency measures to be implemented following accidents and to address airborne plume dispersions and, as a minimum, shall be such that:

(J) the active components of a Class II facility are located at least 30 meters from the nearest residence as of the date of the license application; and

(II) the active components of a Class III facility are located at least 30 meters from the nearest property not owned or occupied by the licensee.

(K) a flow diagram of radioactive waste processing operations;

(L) a description and accurate drawings of processing equipment and any required special handling techniques to be employed;

(M) a description of personnel monitoring methods, training, and procedures to be followed to keep employees from ingesting and inhaling radioactive materials, including a description of methods to keep the radiation exposure to levels as low as reasonably achievable;

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(N) a description of the site monitoring program to include prelicense data and proposed operational monitoring programs for direct gamma radiation measurements and radioactive and chemical characteristics of the soils, groundwater, surface waters, and vegetation, as applicable;

(i) for radioactive waste storage facilities, the applicant shall address on-site air quality; and

(ii) for radioactive waste processing facilities, the applicant shall address on-site and off-site air quality;

(O) spill detection and cleanup plans for the licensed site and for associated transportation of radioactive material;

(P) an operating, safety, and emergency procedures manual that shall provide detailed procedures for receiving, handling, storing, processing, and shipping radioactive waste;

(Q) for radioactive waste processing facilities, a description of the equipment to be installed to maintain control over maximum concentrations of radioactive materials in gaseous and liquid effluents produced during normal operations and the means to be employed for keeping levels of radioactive material in effluents to unrestricted areas as low as reasonably achievable and within the limits listed in §289.202 of this title;

(R) methods of ultimate disposal and decommissioning; and

(S) the system for maintaining inventory of receipt, storage, and transfer of radioactive waste.

(g) Additional environmental requirements for Class III facilities. An application for a license for a class III processing or storage facility shall include environmental information that may be based on reconnaissance level information when appropriate and addresses the following:

(1) description of present land uses and population distribution in the vicinity of the site:

(A) for radioactive waste storage facilities, the description shall address properties adjacent to the site; and

(B) for radioactive waste processing facilities, the description shall address properties adjacent to the site and shall include population distribution within a one-mile radius of the site;

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(2) area/site suitability including geology, hydrology, and natural hazards. For radioactive waste processing facilities, area meteorology also shall be addressed;

(3) site and project alternatives including alternative siting analysis;

(4) socioeconomic effects on surrounding communities of operation of the licensed activity and of associated transportation of radioactive material; and

(5) environmental effects of postulated accidents

**(h)** Issuance of licenses.

(1) A license for a radioactive waste processing or storage facility will be issued if the agency finds reasonable assurance that:

**(A)** an application meets the requirements of the Act and the rules of the agency;

**(B)** the proposed radioactive waste facility will be sited, designed, operated, decommissioned, and closed in accordance with this section;

**(C)** the issuance of the license will not be inimical to the health and safety of the public or the environment; and

**(D)** there is no reason to deny the license as specified in §289.252(d)(10) of this title.

**(2)** The agency may request, and the licensee shall provide, additional information after the license has been issued to enable the agency to determine whether the license should be modified in accordance with §289.202(dd) of this title.

**(i)** Commencement of major construction. Commencement of major construction is prohibited until 30 days after the agency has given notice that a license is proposed to be granted, and the environmental analysis is available. If a hearing is requested, the commencement of major construction is prohibited until notice of the contested case hearing is noticed in accordance with the Act. Commencement of major construction subsequent to issuance of the notices is at the economic risk of the applicant.

**(j)** Commencement of operations. No licensee issued a license under this section may commence operations until the licensee has obtained licenses or permits from other agencies as required by law

(k) Specific terms and conditions of licenses. Unless otherwise specified, each license issued in accordance with this section is subject to the requirements in §289.252(x) of this title. A license issued under this section shall include license conditions derived from the evaluations of the application and analyses performed by the agency, including amendments and changes made before a license is issued. License conditions may include, but are not limited to, the following:

(1) restrictions as to the total radioactive inventory of radioactive waste to be received;

(2) restrictions as to size, shape, and materials and methods of construction of radioactive waste packaging and maximum number of package units stored, at any one time;

(3) restrictions as to the physical and chemical form and radioisotopic content and concentration of radioactive waste;

(4) controls to be applied to restrict access to the site;

(5) controls to be applied to maintain and protect the health and safety of the public and site employees and the environment;

(6) administrative controls, which are the provisions relating to organization, management, and operating procedures; record-keeping, review and audit; and reporting necessary to assure that activities at the facility are conducted in a safe manner and in conformity with agency rules and license conditions; and

(7) maximum retention time for radioactive waste received at the facility.

(l) Technical renewal of licenses.

(1) Technical renewal of licenses shall be filed in accordance with §289.252(z) of this title.

(2) The licensee is responsible for decommissioning the facility and continued safe storage of any radioactive waste whether an application for continued receipt of wastes is filed or not.

(m) Amendment of license at request of licensee. Applications for amendment of a license shall be filed in accordance with subsection (f) of this section and §289.252(d)(1) and (3) of this title. Such applications shall be signed by the RSO and specify how the licensee desires his license to be amended and the basis for such amendment.

(n) Waste processing and packaging requirements. All processed radioactive waste offered for transport or disposal shall meet:

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(1) all applicable transportation requirements of the agency, the United States Nuclear Regulatory Commission, and of the DOT; and

(2) all applicable disposal facility license conditions.

(o) Environmental assessment. A written analysis of the impact on the human environment will be prepared or secured by the agency for any license for a class III processing or storage facility and shall be available to the public for written comment at least 30 days prior to the beginning of a hearing, if any, on the issuance or renewal of the license.

(p) Waste processing and storage categories of radionuclides.

(1) The following table contains waste processing and storage categories of radionuclides.

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Element*	Radionuclide**	Category
Actinium (89)	Ac-227	I
	Ac-228	I
Americium (95)	Am-241	I
	Am-243	I
Antimony (51)	Sb-122	IV
	Sb-124	III
	Sb-125	III
Argon (18)	Ar-37	VI
	Ar-41	II
	Ar-41 (uncompressed)†	V
Arsenic (33)	As-73	IV
	As-74	IV
	As-76	IV
	As-77	IV
Astatine (85)	At-211	III
Barium (56)	Ba-131	IV
	Ba-133	II
	Ba-140	III
Berkelium (97)	Bk-249	I
Beryllium (4)	Be-7	IV
Bismuth (83)	Bi-206	IV
	Bi-207	III
	Bi-210	II
	Bi-212	III
	Bi-214	IV
Bromine (35)	Br-82	IV
Cadmium (48)	Cd-109	IV
	Cd-115m	III
	Cd-115	IV
Calcium (20)	Ca-45	IV
	Ca-47	IV
Californium (98)	Cf-249	I
	Cf-250	I
	Cf-252	I
Carbon (6)	C-14	IV

\* Atomic number shown in parentheses.

\*\* Atomic mass number shown after the element symbol.

† Uncompressed means at a pressure not exceeding 1 atmosphere.

m Metastable state.

Element*	Radionuclide**	Category
Cerium (58)	Ce-141	IV
	Ce-143	IV
	Ce-144	III
Cesium (55)	Cs-131	IV
	Cs-134m	III
	Cs-134	III
	Cs-135	IV
	Cs-136	IV
	Cs-137	III
	Chlorine (17)	Cl-36
Cl-38		IV
Chromium (24)	Cr-51	IV
Cobalt (27)	Co-56	III
	Co-57	IV
	Co-58m	IV
	Co-58	IV
	Co-60	III
	Copper (29)	Cu-64
Curium (96)	Cm-242	I
	Cm-243	I
	Cm-244	I
	Cm-245	I
	Cm-246	I
	Dysprosium (66)	Dy-154
Dy-165		IV
Dy-166		IV
Erbium (68)	Er-169	IV
	Er-171	IV
Europium (63)	Eu-150	III
	Eu-152m	IV
	Eu-152	III
	Eu-154	II
	Eu-155	IV
Fluorine (9)	F-18	IV
Gadolinium (64)	Gd-153	IV
	Gd-159	IV

\* Atomic number shown in parentheses.

\*\* Atomic mass number shown after the element symbol.

m Metastable state.



Element*	Radionuclide**	Category
Gallium (31)	Ga-67	III
	Ga-72	IV
Germanium (32)	Ge-71	IV
Gold (79)	Au-193	III
	Au-194	III
	Au-195	III
	Au-196	IV
	Au-198	IV
	Au-199	IV
	Hafnium (72)	Hf-181
Holmium (67)	Ho-166	IV
Hydrogen (1)	H-3 (see tritium)	
Indium (49)	In-113m	IV
	In-114m	III
	In-115m	IV
	In-115	IV
Iodine (53)	I-124	III
	I-125	III
	I-126	III
	I-129	III
	I-131	III
	I-132	IV
	I-133	III
	I-134	IV
	I-135	IV
Iridium (77)	Ir-190	IV
	Ir-192	III
	Ir-194	IV
Iron (26)	Fe-55	IV
	Fe-59	IV
Krypton (36)	Kr-85m	III
	Kr-85m (uncompressed)†	V
	Kr-85	III
	Kr-85 (uncompressed)†	VI
	Kr-87	II
	Kr-87 (uncompressed)†	V

\* Atomic number shown in parentheses.

\*\* Atomic mass number shown after the element symbol.

m Metastable state.

† Uncompressed means at a pressure not exceeding 1 atmosphere.

Element*	Radionuclide**	Category
Lanthanum (57)	La-140	IV
Lead (82)	Pb-203	IV
	Pb-210	II
	Pb-212	II
	Lu-172	III
Lutetium (71)	Lu-172	III
	Lu-177	IV
Magnesium (12)	Mg-28	III
Manganese (25)	Mn-52	IV
	Mn-54	IV
	Mn-56	IV
Mercury (80)	Hg-197m	IV
	Hg-197	IV
	Hg-203	IV
Mixed fission products (MFP)		II
Molybdenum (42)	Mo-99	IV
Neodymium (60)	Nd-147	IV
	Nd-149	IV
Neptunium (93)	Np-237	I
	Np-239	I
Nickel (28)	Ni-56	III
	Ni-59	IV
	Ni-63	IV
	Ni-65	IV
Niobium (41)	Nb-93m	IV
	Nb-95	IV
	Nb-97	IV
Osmium (76)	Os-185	IV
	Os-191m	IV
	Os-191	IV
	Os-193	IV
Palladium (46)	Pd-103	IV
	Pd-109	IV
Phosphorus (15)	P-32	IV

\* Atomic number shown in parentheses.

\*\* Atomic mass number shown after the element symbol.

m Metastable state.

Element*	Radionuclide**	Category
Platinum (73)	Pt-191	IV
	Pt-193	IV
	Pt-193m	IV
	Pt-197m	IV
	Pt-197	IV
Plutonium (94)	Pu-238 F	I
	Pu-239 F	I
	Pu-240	I
	Pu-241 F	I
	Pu-242	I
Polonium (84)	Po-210	I
Potassium (19)	K-42	IV
	K-43	III
Praseodymium (59)	Pr-142	IV
	Pr-143	IV
Promethium (61)	Pm-147	IV
	Pm-149	IV
Protactinium (91)	Pa-230	I
	Pa-231	I
	Pa-233	II
Radium (88)	Ra-223	II
	Ra-224	II
	Ra-226	I
	Ra-228	I
Radon (86)	Rn-220	IV
	Rn-222	II
Rhenium (75)	Re-183	IV
	Re-186	IV
	Re-187	IV
	Re-188	IV
	Re-Natural	IV
Rhodium (45)	Rh-103m	IV
	Rh-105	IV
Rubidium (37)	Rb-86	IV
	Rb-87	IV
	Rb-Natural	IV

\* Atomic number shown in parentheses.

\*\* Atomic mass number shown after the element symbol.

m Metastable state.

F Fissile material.

Element*	Radionuclide**	Category
Ruthenium (44)	Ru-97	IV
	Ru-103	IV
	Ru-105	IV
	Ru-106	III
Samarium (62)	Sm-145	III
	Sm-147	III
	Sm-151	IV
	Sm-153	IV
Scandium (21)	Sc-46	III
	Sc-47	IV
	Sc-48	IV
Selenium (34)	Se-75	IV
Silicon (14)	Si-31	IV
Silver (47)	Ag-105	IV
	Ag-110m	III
	Ag-111	IV
Sodium (11)	Na-22	III
	Na-24	IV
Strontium (38)	Sr-85m	IV
	Sr-85	IV
	Sr-89	III
	Sr-90	II
	Sr-91	III
	Sr-92	IV
Sulfur (16)	S-35	IV
Tantalum (73)	Ta-182	III
Technetium (43)	Tc-96m	IV
	Tc-96	IV
	Tc-97m	IV
	Tc-97	IV
	Tc-99m	IV
	Tc-99	IV

\* Atomic number shown in parentheses.

\*\* Atomic mass number shown after the element symbol.

m Metastable state.

Element*	Radionuclide**	Category
Tellurium (52)	Te-125m	IV
	Te-127m	IV
	Te-127	IV
	Te-129m	III
	Te-129	IV
	Te-131m	III
	Te-132	IV
	Terbium (65)	Tb-160
Thallium (81)	Tl-200	IV
	Tl-201	IV
	Tl-202	IV
	Tl-204	III
Thorium (90)	Th-227	II
	Th-228	I
	Th-230	I
	Th-231	I
	Th-232	III
	Th-234	II
	Th-Natural	III
Thulium (69)	Tm-168	III
	Tm-170	III
	Tm-171	IV
Tin (50)	Sn-113	IV
	Sn-117m	III
	Sn-121	III
	Sn-125	IV
Tritium (1)	H-3	IV
	H-3 (as a gas, as luminous paint, or adsorbed on solid material.)	VII
Tungsten (74)	W-181	IV
	W-185	IV
	W-187	IV

\* Atomic number shown in parentheses.

\*\* Atomic mass number shown after the element symbol.

m Metastable state.

Element*	Radionuclide**	Category
Uranium (92)	U-230	II
	U-232	I
	U-233 F	II
	U-234	II
	U-235 F	III
	U-236	II
	U-238	III
	U-Natural	III
	U-Enriched F	III
	U-Depleted	III
	Vanadium (23)	V-48
V-49		III
Xenon (54)	Xe-125	III
	Xe-131m	III
	Xe-131m (uncompressed)†	V
	Xe-133	III
	Xe-133 (uncompressed)†	VI
	Xe-135	II
	Xe-135 (uncompressed)†	V
Ytterbium (70)	Yb-175	IV
Yttrium (39)	Y-88	III
	Y-90	IV
	Y-91m	III
	Y-91	III
	Y-92	IV
	Y-93	IV
Zinc (30)	Zn-65	IV
	Zn-69m	IV
	Zn-69	IV
Zirconium (40)	Zr-93	IV
	Zr-95	III
	Zr-97	IV

NOTE: For mixtures of radionuclides and for radionuclides not included in this subsection, see subsection (b) of this section, waste processing and storage categories.

\* Atomic number shown in parentheses.

\*\* Atomic mass number shown after the element symbol.

F Fissile material.

m Metastable state.

† Uncompressed means at a pressure not exceeding 1 atmosphere.

(2) Any radionuclide not specifically listed in paragraph (1) of this section shall be assigned to one of the categories in accordance with the following table.

RADIOACTIVE HALF-LIFE

<u>Radionuclide</u>	<u>0 to 1000 days</u>	<u>1000 days to 10<sup>6</sup> years</u>	<u>Over 10<sup>6</sup> years</u>
Atomic No. 1-81	Category III	Category II	Category III
Atomic No. 82 and over	Category I	Category I	Category III

(3) For mixtures of radionuclides, the following shall apply.

(A) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all categories present, of the ratio between the total activity for each category to the permissible activity for each category will not be greater than unity.

(B) If the categories of the radionuclides are known but the amount in each category cannot be reasonably determined, the mixture shall be assigned to the most restrictive category present.

(C) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive category that cannot be positively excluded.

(D) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The category and activity shall be that of the first member present in the chain, except that if radionuclide "X" has a half-life longer than that of that first member and an activity greater than that of any other member, including the first, at any time during processing, the waste processing and storage category shall be that of nuclide "X" and the activity of the mixture shall be the maximum activity of nuclide "X" during processing.