

Title 194 - Department of Environmental Quality

Chapter 5 - TECHNICAL REQUIREMENTS FOR FACILITIES

001 Disposal site suitability requirements.

001.01 Near-surface disposal.

001.01A This section specifies the minimum characteristics a disposal site must have to be acceptable for use as a near-surface facility. The primary emphasis is given to isolation of wastes and to disposal site features that ensure that the long-term performance objectives of Chapter 4 are met.

001.01B The disposal site shall be capable of being characterized, modeled, analyzed and monitored.

001.01C A disposal site shall be selected so that projected population growth and future developments are not likely to affect the ability of the facility to meet the performance objectives of Chapter 4.

001.01D Areas shall be avoided having known natural resources which, if exploited, would result in failure to meet the performance objectives of Chapter 4.

001.01E The disposal site shall be well drained and free of areas of flooding or frequent ponding. Waste disposal shall not take place in a 100-year flood plain or wetland as defined in Executive Order 11988, 'Floodplain Management Guidelines.'

001.01F Upstream drainage areas shall be minimal to decrease the amount of runoff which could erode or inundate waste disposal units.

001.01G The disposal site shall provide sufficient depth to the water table that ground water intrusion, perennial or otherwise, into the waste will not occur. In no case will waste disposal be permitted in the zone of fluctuation of the water table.

001.01H The hydrogeologic unit used for disposal shall not discharge ground water to the surface within the disposal site.

001.01I Areas shall be avoided where tectonic processes such as faulting, folding, seismic activity, or vulcanism may occur with such frequency and extent to significantly affect the ability of the disposal site to meet the performance objectives of Chapter 4, or may preclude defensible modeling and prediction of long-term impacts.

001.01J Areas shall be avoided where surface geologic processes such as mass wasting, erosion, slumping, landsliding or weathering occur with such frequency and extent to significantly affect the ability of the disposal site to meet the performance objectives of Chapter 4, or may preclude defensible modeling and prediction of long-term impacts.

001.01K The disposal site shall not be located where nearby facilities or activities could adversely impact the ability of the site to meet the performance objectives of Chapter 4 or significantly mask the environmental monitoring program.

001.02 Engineered structures and barriers shall not be viewed as a planned substitute for a suitable site.

002 Disposal site design.

002.01 General design requirement.

002.01A Disposal design which uses traditional shallow land burial as used prior to 1979 is not acceptable.

002.01B Disposal design shall include above-ground disposal or other technology which contains one or more engineered, artificially constructed barriers to isolate the waste from the surrounding environment.

002.01C The disposal cells of the facility shall be built above grade levels and designed to meet the zero-release objective.

002.01D The facility design shall include a plan for retrievability and removal of all waste.

002.02 Near-surface disposal.

002.02A Site design features shall be directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure.

002.02B The disposal site design and operation shall be compatible with the disposal site closure and stabilization plan and lead to disposal site closure that provides reasonable assurance that the performance objectives of Chapter 4 will be met.

002.02C The disposal site shall be designed to complement and improve, where appropriate, the ability of the disposal site's natural characteristics to assure that the performance objectives of Chapter 4 will be met.

002.02D Covers shall be designed to minimize, to the extent practicable, water infiltration, to direct percolating or surface water away from the disposed waste, and to resist degradation by surface geologic processes and biotic activity.

002.02E Surface features shall direct surface water drainage away from disposal units at velocities and gradients which will not result in erosion that will require ongoing active maintenance in the future.

002.02F The disposal site shall be designed to prevent, to the extent practicable, the contact of water with waste during storage, the contact of standing water with waste during disposal, and the contact of percolating or standing water with wastes after disposal.

003 Facility operation and disposal site closure.

003.01 Near-surface disposal operation and disposal site closure.

003.01A Wastes designated as Class A pursuant to 006 of this Chapter shall be segregated from other wastes by placing in disposal units which are sufficiently separated from disposal units for the other waste classes so that any interaction between Class A wastes and other wastes will not result in the failure to meet the performance objectives in Chapter 4. This segregation is not necessary for Class A wastes if they meet the stability requirements in 007.02 of this Chapter.

003.01B Wastes designated as Class C pursuant to 006 of this Chapter shall be disposed of so that the top of the waste is a minimum of 5 meters

below the top surface of the cover or shall be disposed of with intruder barriers that are designed to protect against an inadvertent intrusion for at least 500 years. Class C waste shall also be stored or disposed of separately from other types of waste in containers which can be easily monitored and retrieved and shall be handled, stored, and disposed of in a manner consistent with the zero-release objective.

003.01C Only waste classified as Class A, B, or C shall be accepted for disposal. All wastes shall be disposed of in accordance with the requirements of 003.01D - 003.01K of this Chapter.

003.01D Wastes shall be emplaced in a manner that maintains the package integrity during emplacement, minimizes the void spaces between packages, and permits the void spaces to be filled.

003.01E Void spaces between waste packages shall be filled with earth or other material to reduce future subsidence within the fill.

003.01F Waste shall be placed and covered in a manner that limits the radiation dose rate at the surface of the cover to levels that at a minimum will permit the licensee to comply with all provisions of Title 180, at the time the license is transferred pursuant to Title 194 Chapter 3, 016.

003.01G. The boundaries and locations of each disposal unit shall be accurately located and mapped by means of a land survey. Near-surface disposal units shall be marked in such a way that the boundaries of each unit can be easily defined. Three permanent survey marker control points, referenced to United States Geological Survey (USGS) or National Geodetic Survey (NGS) survey control stations, shall be established on the site to facilitate surveys. The USGS or NGS control stations shall provide horizontal and vertical controls as checked against USGS or NGS record files.

003.01H A buffer zone of land shall be maintained between any buried waste and the disposal site boundary and beneath disposed waste. The buffer zone shall be of adequate dimensions to carry out environmental monitoring activities specified in 004.04 of this Chapter and take mitigative measures if needed.

003.01I Closure and stabilization measures as set forth in the approved site closure plan shall be carried out as each disposal unit is filled and covered.

003.01J Active waste disposal operations shall not have an adverse effect on completed closure and stabilization measures.

003.01K Only low-level radioactive waste shall be disposed of at the disposal site except mixed waste which is solidified, neutralized, and stabilized to the maximum degree practicable prior to shipment to the facility. See Title 128 for any hazardous waste permit which may be required for the facility to accept mixed waste.

004 Environmental monitoring.

004.01 At the time a license application is submitted, the applicant shall have conducted a preoperational monitoring program to provide basic environmental data on the disposal site characteristics and those of approved selected media of the surrounding area within a 10km radius of the site. The applicant shall obtain information about the environmental background radioactivity, ecology, meteorology, climate, hydrology, geology,

geochemistry, and seismology relative to the disposal site. For those characteristics that are subject to seasonal variation, data shall cover at least a twelve month period.

004.02 The licensee shall have plans for recovery, cleanup, or other corrective measures if the environmental monitoring program detects migration of waste or components of such waste which would indicate that the performance objectives of Chapter 4 may not be met.

004.03 During the facility site construction and operation, the licensee shall maintain a monitoring program. Measurements and observations shall be made and recorded to provide data to evaluate the potential health and environmental impacts during both the construction and the operation of the facility and to enable the evaluation of long-term effects and the need for mitigative measures. The monitoring program shall be capable of providing early warning of releases of waste from the disposal site and shall continue until the license is transferred to the institutional control agency.

004.04 After the disposal site is closed, the licensee responsible for post-operational surveillance of the disposal site shall maintain a monitoring system based on the operating history and the closure and stabilization of the disposal site. The monitoring system must be capable of providing early warning of releases of waste from the disposal site.

005 Alternative requirements for design and operations.

The disposal site design specified in 002.01 above shall comply with the performance objectives of Chapter 4.

006 Radioactive Waste Classification.

006.01 Near-surface disposal.

006.01A Considerations.

Determination of the classification of low-level radioactive waste involves two considerations. First, consideration shall be given to the concentration of long-lived radionuclides (and their shorter-lived precursors) whose potential hazard will persist long after such precautions as institutional control, improved waste form, and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides could cause exposures. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration must be given to the concentration of shorter-lived radionuclides for which requirements on institutional control, waste form, and disposal methods are effective.

006.01B Classes of waste.

006.01B1. Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of Class A waste shall meet the minimum requirements in 007.01 of this Chapter. If Class A waste also meets the stability requirements in 007.02 of this Chapter, it is not necessary to segregate the waste for disposal.

006.01B2. Class B waste is waste that shall meet more rigorous requirements on waste form to ensure stability after disposal. The physical form and characteristics of Class B waste shall meet both the

minimum and stability requirements in 007 of this Chapter.

006.01B3. Class C waste, as defined by 10 C.F.R. §61.55 in effect on January 26, 1983, which is adopted and incorporated herein, is waste that not only shall meet more rigorous requirements on waste form to ensure stability but also requires additional measures at the facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste shall meet both the minimum and stability requirements in 007 of this Chapter. All material adopted by reference is available and on file with the department and with the Secretary of State.

006.01C Classification determined by long-lived radionuclides. If low-level radioactive waste contains only radionuclides listed in Table 1, classification shall be determined as follows:

006.01C1. If the concentration does not exceed 0.1 times the value in Table 1, the waste is Class A.

006.01C2. If the concentration exceeds 0.1 times the value in Table 1 but does not exceed the value of Table 1, the waste is Class C.

006.01C3. If the concentration exceeds the value in Table 1, the waste is not generally acceptable for disposal.

006.01C4. For wastes containing mixtures of radionuclides listed in Table 1, the total concentration shall be determined by the sum of fractions rule in 006.01G of this Chapter.

TABLE 1

RADIONUCLIDE	CONCENTRATION (curies/cubic meter)*
C-14	8
C-14 in activated metal	80
Ni-59 in activated metal	220
Nb-94 in activated metal	0.2
Tc-99	3
I-129	0.08
Alpha-emitting transuranic radionuclides with half- life greater than five years	100*
Pu-241	3,500*
Cm-242	20,000*
Ra-226	100*
* Units are nanocuries per gram.	

006.01D Classification determined by short-lived radionuclides.

If radioactive waste does not contain any of the radionuclides listed in Table 1, classifications shall be determined based on the concentrations

shown in Table 2. If the waste does not contain any radionuclides listed in either Table 1 or 2, it is Class A.

006.01D1. If the concentration does not exceed the value in Column 1, the waste is Class A.

006.01D2. If the concentration exceeds the value in Column 1 but does not exceed the value in Column 2, the waste is Class B.

006.01D3. If the concentration exceeds the value in Column 2, but does not exceed the value in Column 3, the waste is Class C.

006.01D4. If the concentration exceeds the value in Column 3, the waste is not generally acceptable for near-surface disposal.

006.01D5. For wastes containing mixtures of the radionuclides listed in Table 2, the total concentration shall be determined by the sum of fractions rule described in 006.01G of this Chapter.

TABLE 2

RADIONUCLIDE	CONCENTRATION (curies/cubic meter)		
	Column 1	Column 2	Column 3
Total of all radionuclides with less than 5-year half-life	700	*	*
H-3	40	*	*
Co-60	700	*	*
Ni-63	3.5	70	700
Ni-63 in activated metal	35	700	7000
Sr-90	.04	150	7000
Cs-137	1	44	4600

*There are no limits established for these radionuclides in Class B or C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling, and disposal will limit the concentrations for these wastes. These wastes shall be Class B unless the concentrations of other radionuclides in Table 2 determine the waste to be Class C independent of these radionuclides.

006.01E Classification determined by both long- and short-lived radionuclides.

If the waste contains a mixture of radionuclides, some of which are listed in Table 1, and some of which are listed in Table 2, classification shall be determined as follows:

006.01E1. If the concentration of a radionuclide listed in Table 1 does not exceed 0.1 times the value listed in Table 1, the class shall be that determined by the concentration of radionuclides listed in Table 2.

006.01E2. If the concentration of a radionuclide listed

in Table 1 exceeds 0.1 times the value listed in Table 1 but does not exceed the value in Table 1, the waste shall be Class C, provided the concentration of radionuclides listed in Table 2 does not exceed the value shown in Column 3 of Table 2.

006.01F Classification of wastes with radionuclides other than those listed in Tables 1 and 2.

If radioactive waste does not contain any radionuclides listed in either Table 1 or 2, it is Class A.

006.01G 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 must be taken from the same column of the same table. The sum of the fractions for the column must be less than or equal to 1.0 if the waste class is to be determined by that column. Example: A waste contains Sr-90 in a concentration of 50 Ci/m³ and Cs-137 in a concentration of 22 Ci/m³. Since the concentrations both exceed the values in Table 2, Column 1, they 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.

006.01H Determination of concentrations in wastes.

The concentration of a radionuclide may be determined by indirect methods such as use of scaling factors which relate the inferred concentration of one radionuclide to another that is measured, or radionuclide material accountability, if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The concentration of a radionuclide may be averaged over the volume of the waste, or weight of the waste if the units are expressed as nanocuries per gram.

007 Radioactive Waste Characteristics.

007.01 The following requirements are minimum requirements for all classes of waste and are intended to facilitate handling at the disposal site and provide protection of health and safety of personnel at the disposal site.

007.01A Waste shall not be packaged for disposal in cardboard or fiberboard boxes.

007.01B Liquid waste shall be solidified or packaged in sufficient absorbent material to absorb twice the volume of the liquid.

007.01C Solid waste containing liquid shall contain as little freestanding and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume.

007.01D Waste shall not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.

007.01E Waste shall not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste. This does not apply to radioactive

gaseous waste packaged as specified in 007.01G of this Chapter.

007.01F Waste shall not be pyrophoric. Pyrophoric materials contained in waste shall be treated, prepared, and packaged to be nonflammable.

007.01G Waste in a gaseous form shall be packaged at a pressure that does not exceed 1.5 atmospheres at 20°C. Total activity shall not exceed 100 curies per container.

007.01H Waste containing hazardous, biological, pathogenic, or infectious material shall be treated to reduce to the maximum extent practicable the potential hazard from the non-radiological materials.

007.01I Wastes shall be packaged in conformance with the conditions of the license. When the license conditions are more restrictive than these regulations, the license conditions govern.

007.02 The following are minimum requirements intended to provide stability of the waste. Stability is intended to ensure that the waste does not structurally degrade and affect overall stability of the site through slumping, collapse, or other failure of the disposal unit and thereby lead to water infiltration. Stability is also a factor in limiting exposure to an inadvertent intruder, since it provides a recognizable and nondispersible waste.

007.02A Waste shall have structural stability. A structurally stable waste form will generally maintain its physical dimensions and its form, under the expected disposal conditions such as weight of overburden and compaction equipment, the presence of moisture, and microbial activity, and internal factors such as radiation effects and chemical changes. Structural stability can be provided by the waste form itself, processing the waste to a stable form, or placing the waste in a disposal container or structure that provides stability after disposal.

007.02B Notwithstanding the provisions in 007.01B and 007.01C of this Chapter, liquid wastes, or wastes containing liquid shall be converted into a form that contains as little freestanding and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume of the waste when the waste is in a disposal container designed to ensure stability, or 0.5% of the volume of the waste for waste processed to a stable form.

007.02C Void spaces within the waste and between the waste and its package shall be reduced to the extent practicable.

008 Labeling.

Each package of waste shall be clearly labeled as Class A waste, Class B waste, or Class C waste as specified in 006 of this Chapter.

009 Institutional requirements.

009.01 Land ownership.

Disposal of low-level radioactive waste received from other persons may be permitted only at a licensed facility on land owned in fee by the federal government or the State of Nebraska.

009.02 Institutional control.

The institutional control agency shall carry out an institutional control program,

approved by the department, to physically control access to the disposal site following transfer of control of the disposal site from the disposal site operator. The institutional control program shall also include, but not be limited to, custodial care activities such as carrying out an environmental monitoring program at the disposal site, repair or replacement of monitoring equipment, periodic surveillance, repair of fencing, revegetation, minor additions to soil cover, minor repair of disposal unit covers, general disposal site upkeep such as mowing grass, and other requirements as determined by the department; and administration of funds to cover the costs for these activities as provided in Chapter 6. The period of institutional control will be determined by the department, after public hearing, but may not be less than 100 years following transfer of the license to the department.

009.03 A map of the type, location and quantity of low-level radioactive wastes disposed of at the site shall be filed, within 60 days of transfer of the license to the department, with the Register of Deeds of the county where such land is located and with the department.

Enabling Legislation: Neb. Rev. Stat. §§81-15,100; 81-15,101(4); 81-15,101.02; 81-15,101.04; 81-15,101.05 and 81-15,102

Legal Citation: Title 194, Ch. 5, Nebraska Department of Environmental Quality

For more information, contact
MoreInfo@NDEQ.state.NE.US

Nebraska Department of Environmental Quality
1200 "N" Street, Suite 400
PO Box 98922
Lincoln, NE 68509
(402)471-2186 fax: (402)471-2909