

Federal Institutional Control Requirements for Radioactive Waste and Restricted Release of Property Containing Radioactive Material

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The Interagency Steering Committee on Radiation Standards (ISCORS) was established in 1994 to facilitate U.S. Federal agency coordination in the development of a consistent approach for setting national radiation protection standards. Membership includes participants from all Federal agencies with radiation protection responsibilities. The Risk Harmonization Subcommittee of the ISCORS was tasked with evaluating the similarities and differences in risk assessment and risk management approaches developed by the different Federal agencies. One of the specific tasks of this subcommittee is to evaluate the use of institutional controls in standards, regulations, and licensing criteria developed by the Environmental Protection Agency (EPA), Department of Energy (DOE) and Nuclear Regulatory Commission (NRC). The attached four tables describe the regulatory requirements for disposal of radioactive waste and restricted release of sites containing radioactive material, set forth by these U.S. Federal organizations, with an emphasis on institutional controls.

The four tables address:

- High-level and transuranic radioactive wastes and spent nuclear fuel;
- Low-level radioactive waste;
- Uranium and thorium mill tailings; and
- Property released under restricted use conditions.

Comparison Table

Disposal of High-Level and TRU Wastes and Spent Nuclear Fuel

Disposal requirements for spent nuclear fuel (SNF), high-level waste (HLW) and transuranic waste (TRU).
SNF is fuel withdrawn from a nuclear reactor. HLW is highly radioactive material from the processing of spent fuel.
TRU contains high levels of alpha-emitting transuranic radionuclides and usually has been generated from defense activities.

Comparison Table--High-Level and TRU Wastes and Spent Nuclear Fuel¹

PROGRAM		AEA (Reorg. Plan No. 3), NWPA EPA/Disposal of Spent Nuclear Fuel, HLW, and TRU Waste 40 CFR 191	WIPP LWA EPA/Waste Isolation Pilot Plant 40 CFR 194	AEA, NWPA NRC/Geologic Disposal of HLW and Spent Nuclear Fuel 10 CFR 60
ATTRIBUTE	DESCRIPTION			
Applicability	The type of waste that is disposed of and the facility that is regulated.	Disposal of spent nuclear fuel, high-level waste, or transuranic waste, except at Yucca Mountain or directly into the ocean or ocean sediments.	Disposal of transuranic waste in the Waste Isolation Pilot Plant (WIPP). Implements 40 CFR 191.	Disposal of spent nuclear fuel and high-level waste in a geologic repository. ²
Scope of Standard³	Regulations may define “generally applicable environmental standards” for all agencies to follow, define methods for implementing those standards, or define siting, design, and closure requirements for a facility.	Generally applicable standard for implementing agencies to follow; applies to releases of radioactive material into the accessible environment beyond the controlled area (defined as an area that encompasses ≤100 km ² , and extends < 5 km from the original location of waste in the disposal system).	Facility specific regulation setting forth requirements for EPA certification of DOE compliance with 40 CFR 191, for the WIPP.	Regulation for licensing DOE for siting, design, construction, and closure of a geologic repository sited under the NWPA. Addresses releases of radioactive material to the accessible environment beyond the controlled area.
Performance Criteria	Protective standards that define acceptable performance of a disposal facility or decommissioned property.	The disposal system must be designed to provide a reasonable expectation that cumulative releases to the accessible environment from all significant processes and events shall: <ul style="list-style-type: none"> have a likelihood of less than one chance in 10 of exceeding limits specified in Table 1 of Appendix A of 40 CFR 191, and less than one chance in 1000 of exceeding 10 times these specified limits; undisturbed performance of the disposal system shall not cause the dose from all potential pathways to any member of the public to exceed 15 mrem/yr; and undisturbed performance of the disposal system shall not cause the levels of radioactivity in any underground source of drinking water to exceed the maximum contaminant levels (MCLs), developed under the authority of the Safe Drinking Water Act, specified at 40 CFR 141, as they existed on January 19, 1994. Any event or process with less than 1 chance in 10,000 of occurring over 10,000 years need not be considered. 10,000 years.	Same as 40 CFR 191.	Rule requires compliance with applicable EPA general environmental standards plus additional NRC requirements, including those listed below in "Engineered Barrier Criteria."
Timeframe	Length of time that future performance is projected.		10,000 years.	10,000 years.

¹This table is intended for informational purposes only and is not intended to substitute for the requirements found in the relevant statutes or regulations.

²EPA and NRC are developing standards for the proposed Yucca Mountain geologic repository in 10 CFR 63 and 40 CFR 197, respectively. 10 CFR 60 will not apply to Yucca Mountain.

³This discussion focuses on those portions of existing Federal programs that apply directly to the use of institutional controls to protect the public and the environment. The listed Federal standards, regulations, and directives include many additional requirements that although important, are not directly germane to the discussion. Examples include those requirements pertaining to releases of radionuclides and public and worker protection during the operation of a high-level or low-level waste disposal facility, unrestricted release of property by DOE or an NRC licensee.

PROGRAM		AEA (Reorg. Plan No. 3), NWPA EPA/Disposal of Spent Nuclear Fuel, HLW, and TRU Waste 40 CFR 191	WIPP LWA EPA/Waste Isolation Pilot Plant 40 CFR 194	AEA, NWPA NRC/Geologic Disposal of HLW and Spent Nuclear Fuel 10 CFR 60
Engineered Barrier Criteria	Standards of performance for an engineered barrier or physical characteristics of the barrier.	Engineered barriers are required to isolate waste from the accessible environment; design criteria for the barriers are not specified.	Engineered barriers are required to prevent or substantially delay movement of water or radionuclides toward the accessible environment. Before selecting engineering barriers, alternatives shall be evaluated that consider: worker exposure, compliance assessment, public comment, the effects of mitigating the consequences of human intrusion, and others. Alternatives to be evaluated include cementation, vitrification, incineration, etc.	Waste packages shall provide for substantially complete containment for the time period specified below. After 1000 years, the maximum release rate is 10^{-5} per year of the total inventory in the repository.
Timeframe	The time period that engineered barriers are designed to perform, as specified in the regulation.	Not specified; however, the entire disposal system must be designed to meet the performance criteria over a 10,000 year period.	Same as 40 CFR 191.	300-1000 years for waste packages.
Method for Determining Compliance with Performance or Engineered Barrier Criteria	Overall approach for determining compliance with principal requirements -- e.g., a requirement for modeling facility performance into the distant future (typically 1000 - 10,000 years), performing engineering assessments of structures or barriers, demonstrating that a specified design (e.g., materials of construction) has been implemented, or a mix of these.	The standard requires modeling and analysis of the long-term performance of the disposal system to provide reasonable expectation of compliance with the performance criteria.	Same as 40 CFR 191. Includes additional site-specific assumptions for containment, individual, and groundwater protection standards.	The regulation requires modeling and analysis of the long-term performance of the repository to demonstrate compliance with the performance and engineered barrier criteria.
Siting Criteria	Features of a site upon which a facility is built that are designed to contribute to waste isolation. Often includes requirements related to flooding, seismic activity, proximity to groundwater, etc.	Avoid places where mining for resources has been or can reasonably be expected to occur, unless favorable characteristics compensate for their greater likelihood of being disturbed in the future.	Compliance with 40 CFR 191. Siting considerations included: minimal ground water, minimum number of existing boreholes, low population density, annual precipitation, geochemical conditions, and maximum use of Federal lands	Detailed requirements are specified, including remoteness from population centers, groundwater travel time, annual precipitation, geochemical conditions, etc.
Intruder Requirements	An intruder is a person who inadvertently becomes exposed to waste in a disposal facility, through home construction, well drilling, etc.			
Protection of Intruder	Requirements that provide for protection of the health and safety of a postulated intruder.	The likelihood of intrusion is reduced by repository design, site selection, and passive institutional controls.	Same as 40 CFR Part 191.	Same as 40 CFR Part 191.
Consideration of intruder on facility performance	Requirements that provide for analysis of continued performance of a facility after a person intrudes.	The impact of inadvertent intrusion on facility performance must be considered as part of the analysis for the containment requirement. As long as passive institutional controls endure and are understood, they may reduce the likelihood of inadvertent, intermittent human intrusion. Nonetheless, an implementing agency should not assume that passive controls entirely eliminate human intrusion.	Intrusion scenarios are specified. Scenarios primarily consider mining and drilling, and are more extensive than the general Part 191 guidance.	Inadvertent intrusion must be addressed, subject to certain specified assumptions in the rule. Actual intrusion scenarios are not specified. Only intruder impacts on projected facility performance are considered.

PROGRAM		AEA (Reorg. Plan No. 3), NWPA EPA/Disposal of Spent Nuclear Fuel, HLW, and TRU Waste 40 CFR 191	WIPP LWA EPA/Waste Isolation Pilot Plant 40 CFR 194	AEA, NWPA NRC/Geologic Disposal of HLW and Spent Nuclear Fuel 10 CFR 60
Active Institutional Controls	Actions taken at a site to ensure that performance criteria continue to be met, engineered structures perform as expected, and to prevent human intrusion.	Control access. Monitor/assess disposal system. Monitor groundwater. Perform corrective actions.	Consistent with 40 CFR Part 191. However, assumptions pertaining to active institutional controls shall be supported by a description, including location and period of time the controls are proposed to remain active. 40 CFR 194 also requires a plan for pre-closure and post-closure monitoring.	Specific controls are not defined in the rule.
Timeframe	The length of time in the regulation for which risk assessments take credit for the operation of the active controls.	As long as practicable. Assume no more than 100 years for purposes of regulatory compliance.	As long as practicable. Assume 100 years for purposes of regulatory compliance.	As long as practicable. Assume 100 years for analysis.
Passive Institutional Controls	Controls that are self-implementing and preserve knowledge about the location, design, and contents of a disposal system.	Must use the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location.	Same as 40 CFR Part 191.	Monuments, markers, records.
Land Ownership	Organization that takes title to the land after closure and during the institutional control period.	Federal land ownership.	Federal land ownership.	Federal land ownership.
Documentation	Knowledge is preserved in documents for future generations' use.	Documented in public records and archives, and other methods of preserving knowledge.	Documented in public records that must be placed in the archives and land record systems of local, state, and Federal governments, and international archives that would be likely to be consulted by individuals in search of unexploited resources. There are extensive requirements for information contained in the records, including the location of the repository and the boundaries of the controlled area, and the nature and hazard of the waste. DOE must provide a recertification document on a five-year basis.	Documented in public records that must be placed in the archives and land record systems of local, state, and Federal governments, and international archives, that would be likely to be consulted by potential inadvertent intruders. Records must identify the location of the repository and the boundaries of the controlled area, and the nature and hazard of the waste.
Timeframe	The length of time in the regulation for which risk assessments take credit for the functioning of the passive controls.	Required permanently, but limited effectiveness must be assumed for regulatory compliance.	Required permanently, but limited effectiveness must be assumed for regulatory compliance	Required permanently. Monuments assumed to be sufficiently permanent to serve intended function; records assumed accessible for several hundred years. Limited effectiveness of other controls must be assumed for analysis.
Funding Assurances	Money is set aside at closure, and often sooner, in a protected account, such as a trust fund, for implementing the institutional control program.	Funding is provided by the Federal government.	Funding is provided by the Federal government.	Funding is provided by the Federal government.

PROGRAM		AEA (Reorg. Plan No. 3), NWPA EPA/Disposal of Spent Nuclear Fuel, HLW, and TRU Waste 40 CFR 191	WIPP LWA EPA/Waste Isolation Pilot Plant 40 CFR 194	AEA, NWPA NRC/Geologic Disposal of HLW and Spent Nuclear Fuel 10 CFR 60
Public Participation	Procedures used to engage the public in the regulatory process	The rule was published for public comment and public hearings were held prior to promulgation. EPA consulted with affected State and Tribal governments. Otherwise, EPA encourages public participation in the implementation of this generally applicable standard (e.g., see the discussion for 40 CFR 194 (WIPP)) including consultation with affected State and Tribal governments.	EPA established a process of public participation that exceeded the basic requirements of the Administrative Procedures Act, and provided the public with an opportunity to participate in the regulatory process. EPA considered environmental justice issues with regard to impact of this action on environmental and health conditions in low income, minority, and native American communities. EPA provided for enhanced rulemaking procedures, including extended comment periods, advance notice of proposed rulemaking, notice of proposed rulemaking, stakeholders meeting, public hearings in New Mexico, a full response to comments, and the maintenance of informational dockets in New Mexico.	In addition to the requirements of 10 CFR 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," Commission rules require consultation with affected State and Tribal governments and consideration of State and Tribal proposals for participation in the license review.
Other	Additional relevant information that is not included in the above attributes.	Waste shall be disposed in a form and manner that allows location of the waste and removal for a reasonable period of time after disposal. Disposal systems shall use different types of barriers to isolate the wastes from the accessible environment. Both engineered and natural barriers shall be included. The rule includes non-quantitative assurance requirements, including that to monitor disposal systems after disposal to detect substantial and detrimental deviations from expected performance. This shall be done with techniques that do not jeopardize the isolation of the wastes, until there are no significant concerns to be addressed by further monitoring.	From 1965, the U.S. Geological Survey conducted studies to identify a site for the disposal of TRU. In 1975, at the invitation of local officials, a salt formation east of Carlsbad, New Mexico was explored. By 1979, DOE completed the initial environmental studies of the site. The Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act, of 1979 provided the authorization for the development of the WIPP at that site.	A performance monitoring program is required that begins during site characterization and continues until permanent facility closure.

Comparison Table

Disposal of Low-Level Radioactive Waste

Disposal requirements for radioactive waste other than high-level waste, transuranic waste, spent nuclear fuel, or uranium mill tailings.

Comparison Table–Low-Level Radioactive Waste⁴

PROGRAM		AEA NRC/Low-Level Radioactive Waste Disposal 10 CFR 61	AEA DOE/Low-Level Radioactive Waste Disposal Orders 435.1 and 5400.5
ATTRIBUTE	DESCRIPTION		
Applicability	The type of waste that is disposed of and the facility that is regulated.	Land disposal facilities for low-level radioactive waste.	Land disposal facilities for low-level radioactive waste.
Scope of Standard⁵	Regulations may define “generally applicable environmental standards” for all agencies to follow, define methods for implementing those standards, or define siting, design, and closure requirements for a facility.	NRC regulations for licensing the siting, construction, closure, and long-term control of a low-level radioactive waste disposal facility.	DOE requirements for authorizing siting, construction, closure, and long-term control of low-level radioactive waste disposal facilities within DOE sites.
Performance Criteria	Protective standards that define acceptable performance of a disposal facility or decommissioned property.	<p>Three of Part 61's four performance objectives apply to the long-term performance of a disposal facility:</p> <p>Protection of the general population from releases of radioactivity :</p> <p>Releases of radioactive material to the general environment must not result in an annual dose to a member of the public exceeding 75 mrem to the thyroid or 25 mrem to the whole body or any other organ; and</p> <ul style="list-style-type: none"> • Maintain releases as low as reasonably achievable (ALARA). <p>2. Protection of individuals from inadvertent intrusion; and</p> <p>3. Stability of the disposal site after closure.</p>	<p>The following performance objectives are applicable to LLW disposed after 9/26/88, as determined (except for Rn flux) at a point of compliance 100 meters from the edge of the waste (DOE M 435.1):</p> <ol style="list-style-type: none"> 1. Dose to representative members of the public shall not exceed 25mrem (ede) in a year from all exposure pathways, except for Rn in air; 7. Dose to representative members of the public via the air pathway shall not exceed 10 mrem (ede) in a year, excluding Rn; and 3. Release of Rn from the disposal facility surface shall either not exceed a surface flux of 20 pc/m²-sec, or a concentration of 0.5 pc/l of air at the 100-meter point of compliance. <p>In addition, for the LLW disposal facility plus all other interacting sources (e.g., inactive disposal facilities), projected doses to members of the public at the projected future site boundary may not exceed 100 mrem in a year considering the ALARA process.</p> <p>Annual doses calculated at areas where members of the public use (e.g., residences, workplace, recreational areas) may not exceed 100 mrem from all sources and must be controlled to low levels considering the ALARA process (DOE 5400.5).</p>
Timeframe	Length of time that future performance is projected.	Typical practice is to carry out site-specific analyses pertaining to protection of the general population from releases of radioactivity over 10,000 years.	Typical practice has been to conduct site-specific analysis demonstrating compliance with the performance objectives over 10,000 years. However, M 435.1 calls for a 1000-year time of compliance as well as a sensitivity/uncertainty analysis. Guidance for the sensitivity/uncertainty analysis calls for extending the analysis to peak dose (G 435.1).

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⁵This discussion focuses on those portions of existing Federal programs that apply directly to the use of institutional controls to protect the public and the environment. The listed Federal standards, regulations, and directives include many additional requirements that although important, are not directly germane to the discussion. Examples include those requirements pertaining to releases of radionuclides and public and worker protection during the operation of a high-level or low-level waste disposal facility, unrestricted release of property by DOE or an NRC licensee, or remediation and unrestricted release of land contaminated with uranium mill tailings.

PROGRAM		AEA NRC/Low-Level Radioactive Waste Disposal 10 CFR 61	AEA DOE/Low-Level Radioactive Waste Disposal Orders 435.1 and 5400.5
Method for Determining Compliance with Performance Criteria	Overall approach for determining compliance with performance criteria -- e.g., a requirement for modeling facility performance into the distant future (typically 1000-10,000 years), performing engineering assessments of structures or barriers, demonstrating that a specified design (e.g., materials of construction) has been implemented, or a mix of these.	Compliance with the general population performance objective is based on modeling and analysis of the long-term performance of a specific disposal facility, where the point of compliance is anywhere in the general environment beyond the site boundary. Compliance with the intrusion performance objective is based on adherence to the Part 61 waste classification system (which was determined generically based on modeling inadvertent intrusion at a hypothetical site over a 500-year period). Compliance with the site stability performance objective is based on adherence to the Part 61 waste classification system and on engineering assessment.	Compliance with the 100-mrem in a year dose limit in DOE 5400.5 is determined annually by means of monitoring, surveillance, and analysis. Compliance with the performance objectives for waste disposed after 9/26/88 is determined using long-term performance models (termed performance assessments) that also consider separate analyses of impacts to water resources and to potential inadvertent intruders, as well as ALARA assessments. Compliance with the "all other interactive sources" requirement is also determined using long-term modeling assessments (termed composite analyses) conducted over a 1000-year period.
Engineered Barrier Criteria	Standards of performance for an engineered barrier or physical characteristics of the barrier.	Class B and C wastes must be structurally stable to ensure gross physical properties, and disposed segregated from structurally unstable waste. Class C waste must be disposed at a 5-meter minimum depth or have a barrier against intrusion designed to last at least 500 years.	None specified. Barrier requirements are determined on a site-specific basis using the assessments described above.
Timeframe	The time period that engineered barriers are designed to perform, as specified in the regulation.	Per guidance, Class B and C wastes are designed to remain stable for at least 300 years. Per rule, a Class C barrier is designed to last at least 500 years.	Longevity requirements, if any, are determined on a site-specific basis.
Siting Criteria	Features of a site upon which a facility is built that are designed to contribute to waste isolation. Often includes requirements related to flooding, seismic activity, proximity to groundwater, etc.	Use of isolated, stand-alone sites is assumed. Requirements are specified, and include avoiding areas with natural resources, projected population growth, faulting, seismic activity, flooding, and others. The site must also be capable of being characterized, modeled, analyzed, and monitored.	Use of existing DOE sites is assumed. Siting assessments must address, inter alia, environmental and geotechnical characteristics, human activities, flooding, tectonics, and predictability, with the goal of achieving long-term site stability (minimize active maintenance after closure).
Intruder Requirements	An intruder is a person who inadvertently becomes exposed to waste in a disposal facility, through home construction, well drilling, etc.		
Protection of Intruder	Requirements that provide for protection of the health and safety of a postulated intruder.	An annual radiation dose limit of 500 mrem (whole body) to inadvertent intruders was used to establish the concentration limits for the radionuclides considered in the Part 61 waste classification system. Various scenarios for temporarily exposing intruders to radiation were analyzed, including home construction and resident farmer. Site-specific intrusion analyses are not required.	Radiation doses to intruders are limited to 100 mrem/yr for chronic exposures (a few years) or 500 mrem/yr for acute exposures. Temporary intrusion is considered on a site-specific basis to determine the acceptability of waste for near-surface disposal. The analysis strongly affects waste acceptance criteria (e.g., concentration limits).
Consideration of intruder on facility performance	Requirements that provide for analysis of continued performance of a facility after a person intrudes	Impacts on the facility performance are not considered.	Impacts on facility performance are not considered, since temporary intrusion damage can be repaired (permanent institutional controls).

PROGRAM		AEA NRC/Low-Level Radioactive Waste Disposal 10 CFR 61	AEA DOE/Low-Level Radioactive Waste Disposal Orders 435.1 and 5400.5
Active Institutional Controls	Actions taken at a site to ensure that performance criteria continue to be met, engineered structures perform as expected, and to prevent human intrusion.	Control access. Perform corrective actions, such as minor repair of disposal unit covers. Monitor/assess disposal system. Monitor groundwater.	Control access. Perform corrective actions. Monitor & assess system performance. Monitor environment (air, water, biota). Determine, document, and report annual compliance with the 100-mrem overall dose limit.
Timeframe	The length of time in the regulation for which risk assessments take credit for the operation of the active controls.	100 years after closure.	Permanently required (scope may change over time). 100 years is usually assumed for purpose of analysis.
Passive Institutional Controls	Controls that are self-implementing and preserve knowledge about the location, design, and contents of a disposal system.	Permanent markers. Surveys of disposal units. Records of location and quantity of waste disposed of.	Permanent markers. Records of waste disposed of, including physical, chemical, and radiological characteristics.
Land Ownership	Organization that takes title to the land after closure and during the institutional control period.	Federal/State ownership of land.	Federal ownership of land.
Documentation	Knowledge is preserved in documents for future generations' use.	Documented in public records widely distributed.	Documented in records and archives.
Timeframe	The length of time in the regulation for which risk assessments take credit for the functioning of the passive controls.	After 100 years of post-closure care, passive controls replace active controls, and continue thereafter. To establish the waste classification system, an intruder analysis was performed assuming that these passive controls temporarily fail.	Permanently required, although temporary failures of institutional controls are assumed to occur after 100 years following disposal facility closure.
Funding Assurances	Money is set aside at closure, and often sooner, in a protected account, such as a trust fund, for implementing the institutional control program.	Financial assurances are provided by the licensee.	Funding is provided by the Federal government.
Public Participation	Procedures used to engage the public in the regulatory process.	In addition to the requirements of 10 CFR 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," the Commission will consult with affected States and Tribal governments and consider State and Tribal proposals for participation in the license review.	Performance assessments, composite analyses, and related documents are shared with citizen advisory boards and state and Federal regulators. Otherwise, public participation is conducted in accordance with DOE policy P 1210.1.
Other	Additional relevant information that is not included in the above attributes.	Pursuant to an agreement with a State under Section 274 of the AEA, NRC may relinquish authority to this "Agreement State" for regulating source, byproduct, and special nuclear material in quantities not sufficient to form a critical mass. Hence, under NRC's Agreement State program, Agreement States may license LLW disposal facilities in accordance with State regulations that are compatible with those of NRC's.	DOE 435.1, consisting of an order (O 435.1), a mandatory manual (M 435.1), and an implementation guide (G 435.1), replaced DOE 5820.2A (as it was interpreted through 11/1/96 DOE guidance) on 7/14/99. DOE 5400.5 will be replaced by 10 CFR 834. Performance assessments, composite analyses, and related documents are used as bases for disposal facility authorization. The DOE authorization document is similar to an NRC license. Assessment documents must be maintained and updated through closure of the disposal facility to incorporate new information as needed.

Comparison Table

Stabilization and Disposal of Uranium and Thorium Mill Tailings

Disposal requirements for waste generated
as a byproduct of the extraction of uranium or thorium from ore.

Comparison Table–Uranium and Thorium Mill Tailings Sites⁶

PROGRAM		UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subparts A,B,C Title I Sites	UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subpart D,E Title II Sites	UMTRCA, AEA DOE/Uranium Mill Tailings Programs UMTRA Site Management Manual, LTSP Guidance Document, etc. Title I and II Sites	UMTRCA, AEA NRC/Disposal of Uranium or Thorium Mill Tailings 10 CFR Part 40, including Appendix A Title I and II Sites
ATTRIBUTE	DESCRIPTION				
Applicability	The type of waste that is disposed of and the facility that is regulated.	Remediation, stabilization, and disposal of uranium mill tailings and waste from inactive uranium processing sites and vicinity properties. (See “Other” below, for definition of Title I and Title II sites.)	Stabilization and disposal of mill tailings from active uranium and thorium processing sites.	Remediation, stabilization, and disposal of uranium mill tailings and waste from inactive uranium processing sites and vicinity properties, and disposal of mill tailings from active uranium and thorium processing sites.	Remediation, stabilization, and disposal of uranium mill tailings and waste from inactive uranium processing sites and vicinity properties, and disposal of mill tailings from active uranium and thorium processing sites.
Scope of Standard⁷	Regulations may define “generally applicable environmental standards” for all agencies to follow, define methods for implementing those standards, or define siting, design, and closure requirements for a facility.	Generally applicable environmental standard for implementing agencies to follow.	Generally applicable environmental standard for implementing agencies to follow.	DOE guidance applicable to remediation, stabilization, and disposal of tailings and waste under Title I of UMTRCA and long-term care of disposal sites under Title I and Title II of UMTRCA.	NRC regulation for licensing uranium and thorium disposal sites under Title II of UMTRCA, and long-term care of sites under Title I and Title II of UMTRCA.

⁶This table is intended for informational purposes only and is not intended to substitute for the requirements found in the relevant statutes or regulations.

⁷The discussion focuses on those portions of existing Federal programs that apply directly to the use of institutional controls to protect the public and the environment. The listed Federal standards, regulations, and directives include many additional requirements that although important, are not directly germane to the discussion. Examples include those requirements pertaining to releases of radionuclides and public and worker protection during the operation of a high-level or low-level waste disposal facility, unrestricted release of property by DOE or an NRC licensee, or remediation.

PROGRAM		UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subparts A,B,C Title I Sites	UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subpart D,E Title II Sites	UMTRCA, AEA DOE/Uranium Mill Tailings Programs UMTRA Site Management Manual, LTSP Guidance Document, etc. Title I and II Sites	UMTRCA, AEA NRC/Disposal of Uranium or Thorium Mill Tailings 10 CFR Part 40, including Appendix A Title I and II Sites
Performance Criteria	Protective standards that define acceptable performance of a disposal facility, decommissioned site, or remedial action.	<p>Remedial Action Remedial action shall provide reasonable assurance that</p> <ul style="list-style-type: none"> Residual radium-226 concentration in soil, averaged over any area of 100 m², does not exceed the background level by more than 5 pCi/g in first 15 cm of soil below surface; and 15 pCi/g over 15 cm thick layers of soil more than 15 cm below the surface In any occupied or habitable building the goal is to limit the radon decay product to an annual average of 0.02 WL, but shall not exceed 0.03 WL; and gamma shall not exceed background by more than 20 microrentgens/hr, Groundwater should be restored to specified limits. <p>Stabilization and Disposal Radon releases are limited to:</p> <ul style="list-style-type: none"> 20 pCi/m²-sec. from the surface of the disposal site; or 0.5 pCi/l in air at or above any location outside the disposal site <p>Groundwater protection limits are specified for radiation and chemical contaminants.</p> <p>1000 years to extent reasonably achievable; in any case for at least 200 years.</p>	<p>Disposal Radon releases to the atmosphere must not exceed 20 pCi/m²-sec from the surface of the disposal site.</p> <p>The disposal requirements apply to any portion of a site which contains a concentration of radium-226 in land, averaged over 100 m², that exceeds the background level by more than 5 pCi/g average over the first 15 cm of soil below surface; and 15 pCi/g averaged over 15 cm thick layers of soil more than 15 cm below the surface</p> <p>Corrective Action If groundwater standards are exceeded, a corrective action shall be put into operation as specified.</p> <p>1000 years to extent reasonably achievable; in any case for at least 200 years.</p>	Implements EPA (40 CFR 192) and NRC (10 CFR 40) requirements.	Implements 40 CFR 192 and NRC's AEA authority and disposal sites. For Title I sites, DOE's task of remediation and disposal/stabilization can occur in two steps. Step one is to decontaminate property (soil and buildings) and to stabilize or dispose of waste and tailings. Step two is to complete the groundwater restoration program.
Timeframe	Length of time that future performance is projected.			1000 years to extent reasonably achievable; in any case for at least 200 years.	1000 years to extent reasonably achievable; in any case for at least 200 years.

PROGRAM		UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subparts A,B,C Title I Sites	UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subpart D,E Title II Sites	UMTRCA, AEA DOE/Uranium Mill Tailings Programs UMTRA Site Management Manual, LTSP Guidance Document, etc. Title I and II Sites	UMTRCA, AEA NRC/Disposal of Uranium or Thorium Mill Tailings 10 CFR Part 40, including Appendix A Title I and II Sites
Engineered Barrier Criteria	Standards of performance for an engineered barrier or physical characteristics of the barrier.	The disposal system must be designed to insure that protective air and groundwater standards are met. A liner or equivalent is recommended Each disposal site shall be designed and stabilized in a manner that minimizes the need for future maintenance.	The disposal system must be designed as follows: <ul style="list-style-type: none"> • Emplacement of a permanent radon barrier constructed to achieve the protective air standard is required. • New impoundments require a liner, are limited to a 40-acre surface area, and are limited to two operational impoundments at any time. • The facility must be designed, constructed, and managed according to the RCRA standard at 40 CFR 264.221 as of January 1, 1983. The radon barrier should be constructed as expeditiously as practicable considering technological feasibility, after the impoundment ceases to be operational. 	Implements EPA (40 CFR 192) and NRC (10 CFR 40) requirements.	Implements 40 CFR 192 plus additional NRC requirements (e.g., preferred use of below-grade disposal units).
Timeframe	The time period that engineered barriers are designed to perform, as specified in the regulation.	1000 years to extent reasonably achievable; in any case for at least 200 years.	1000 years to extent reasonably achievable; in any case for at least 200 years.	1000 years to extent reasonably achievable; in any case for at least 200 years.	1000 years to extent reasonably achievable; in any case for at least 200 years.

PROGRAM		UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subparts A,B,C Title I Sites	UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subpart D,E Title II Sites	UMTRCA, AEA DOE/Uranium Mill Tailings Programs UMTRA Site Management Manual, LTSP Guidance Document, etc. Title I and II Sites	UMTRCA, AEA NRC/Disposal of Uranium or Thorium Mill Tailings 10 CFR Part 40, including Appendix A Title I and II Sites
Method for Determining Compliance with Performance or Engineered Barrier Criteria	Overall approach for determining compliance with principal requirements -- e.g., a requirement for modeling facility performance into the distant future (typically 1000 - 10,000 years), performing engineering assessments of structures or barriers, demonstrating that a specified design (e.g., materials of construction) has been implemented, or a mix of these.	<p>Remedial Action Requires measurements in accordance with reasonable survey and sampling procedures to provide reasonable assurance that remediation performance criteria are met. A plan for remedial action, addressing decontamination of soil and structures, stabilization and disposal of waste, groundwater characterization and remediation, etc. is also required.</p> <p>Disposal Requires the use of long-term analytic models and site-specific analyses to provide reasonable assurance that performance criteria for disposal are met.</p>	<p>Disposal Requires a written tailings closure plan (radon). The plan shall include key closure milestones, detailing activities to accomplish timely emplacement of a permanent radon barrier.</p>	<p>Compliance is demonstrated through DOE preparation, and NRC review and concurrence, of Remedial Action Plans (RAPs) and Construction Completion Reports (CCRs) that include NRC- and EPA-required information (i.e., the 40 CFR 192 requirement for "plans of remedial action").</p> <p>(See below ("Other") for additional regulatory information.)</p>	<p>Compliance is determined based on a combination of engineering assessments and long-term modeling. Engineering assessments include field tests and analyses pertaining to seismicity, slope stability, flooding and erosion protection, radon attenuation, hydrological characteristics, etc. Some forward-looking analyses (e.g., probable maximum flood, seismic analyses), are conducted, generally over a 1000-year period.</p> <p>(See below ("Other") for additional regulatory information.)</p>
Siting Criteria	Features of a site upon which a facility is built that are designed to contribute to waste isolation. Often includes requirements related to flooding, seismic activity, proximity to groundwater, etc.	An analysis of the physical properties of the site and the control system and projection of the effects of natural systems over time should be performed. Events and processes that could significantly affect the average radon release rate from the entire disposal site should be considered. Emphasis is given to waste isolation.	An analysis of the physical properties of the site and the control system and projection of the effects of natural systems over time should be performed. Events and processes that could significantly affect the average radon release rate from the entire disposal site should be considered. Emphasis is given to waste isolation	Under its Uranium Mill Tailings Remedial Action (UMTRA) program, DOE relocated tailings and wastes from numerous sites and vicinity properties to alternative disposal sites. Criteria for relocation of tailings emphasized groundwater protection and protection against flooding, among other natural site conditions and population concerns. Other tailings sites were stabilized in place.	The goal is permanent isolation of tailings without ongoing active maintenance. Contributing site features, considered when selecting among alternative disposal sites or judging the adequacy of existing tailings sites, include: remoteness from populated areas; hydrologic and other natural conditions; and the potential for minimizing erosion, disturbance, and dispersion by natural forces. Emphasis is given to waste isolation rather than short-term convenience or benefits.

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Intruder Requirements	An intruder is a person who inadvertently becomes exposed to waste in a disposal facility, through home construction, well drilling, etc.				
Protection of Intruder	Requirements that provide for protection of the health and safety of a postulated intruder.	Reliance on facility design and institutional controls to protect an intruder (isolated location, engineering design, use of thick and difficult-to-penetrate cover).	Reliance on facility design and institutional controls to protect an intruder (isolated location, engineering design, use of thick and difficult-to-penetrate cover).	Reliance on facility design and institutional controls to protect an intruder (isolated location, engineering design, use of thick and difficult-to-penetrate cover).	Reliance on facility design and institutional controls to protect an intruder (isolated location, engineering design, use of thick and difficult-to-penetrate cover).
Consideration of intruder on facility performance	Requirements that provide for analysis of continued performance of a facility after a person intrudes.	No specific requirements.	No specific requirements.	The effects of intrusion on facility performance are not assessed.	The effects of intrusion on facility performance are not assessed.

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Active Institutional Controls	Actions taken at a site to ensure that performance criteria continue to be met, engineered structures perform as expected, and to prevent human intrusion.	<p>Remedial Action Ground-water restoration can be accomplished using natural flushing if specified conditions are met, including the establishment of institutional controls having a high degree of permanence and extending for no more than 100 years.</p> <p>Disposal Implement a groundwater monitoring plan of adequate duration to demonstrate future compliance of the disposal system with the groundwater protection standard. If the standard is exceeded, a corrective action program must be implemented to restore the performance of the disposal system.</p> <p>Monitor radon emissions to the atmosphere for 1 year after closure, to insure compliance with the standard.</p>	<p>Upon placement of the radon barrier, the licensee shall monitor to demonstrate the effectiveness of the barrier design in meeting the performance criteria.</p> <p>If groundwater standards are exceeded, a corrective action program must be put into operation</p>	DOE documents active institutional control plans in long-term surveillance plans, including use of fences; monitoring, inspection, and maintenance (e.g., repair) programs; remediation programs, etc.	Long-term surveillance plans (LTSPs) are required for Title I and II sites, and must include a legal description of the disposal site, the final disposal site conditions, the long-term surveillance program, the criteria for follow-up inspections in response to observations from routine inspections or unusual natural events, and the criteria for instituting maintenance or emergency measures. NRC accepts LTSPs as a condition for licensing long-term care of disposal sites, generally by DOE.
Timeframe	The length of time in the regulation for which risk assessments take credit for the operation of the active controls.	Not specified. A government agency is assumed to maintain the sites in perpetuity, and repair or remediate as needed.	Not specified. A government agency is assumed to maintain the sites in perpetuity, and repair or remediate as needed.	Not specified. There can be no termination of the long-term care license. Hence, there is no end to active institutional controls, although the scope of the program can change over time.	Not specified. There can be no termination of the long-term care license. Hence, there is no end to active institutional controls, although the scope of the program can change over time.

PROGRAM		UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subparts A,B,C Title I Sites	UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subpart D,E Title II Sites	UMTRCA, AEA DOE/Uranium Mill Tailings Programs UMTRA Site Management Manual, LTSP Guidance Document, etc. Title I and II Sites	UMTRCA, AEA NRC/Disposal of Uranium or Thorium Mill Tailings 10 CFR Part 40, including Appendix A Title I and II Sites
Passive Institutional Controls	Controls that are self-implementing and preserve knowledge about the location, design, and contents of a disposal system.	None specified except as described below.	None specified except as described below.	Passive institutional controls implemented for title I and II sites include markers, disposal unit surveys, archived records, deed restrictions, and government or Tribal ownership.	Passive (and active) institutional controls are addressed in required LTSPs for Title I and II sites.
Land Ownership	Organization that takes title to the land after closure and during the institutional control period.	Federal ownership or Tribal ownership with Federal access of Title I disposal sites; Federal or State ownership for Title II disposal sites.	Federal ownership or Tribal ownership with Federal access of Title I disposal sites; Federal or State ownership for Title II disposal sites.	Federal ownership or Tribal ownership with Federal access of Title I disposal sites; Federal or State ownership for Title II disposal sites.	Federal ownership or Tribal ownership with Federal access of Title I disposal sites; Federal or State ownership for Title II disposal sites.
Documentation	Knowledge is preserved in documents for future generations' use.	Written plan for remedial action	Written tailings closure plan to be incorporated into the NRC or Agreement State license	Documentation includes a site RAP, LTSP, photographs, monitoring results, etc. Documents will be archived in accordance with NARA standards.	Documentation includes site RAPs, CCRs, LTSPs, and other information as provided for under 10 CFR 2 and 40.
Timeframe	Period of time that institutional controls are considered to be effective.	Not specified, although perpetual Federal control was assumed for the rulemaking.	Not specified, although perpetual Federal control was assumed for the rulemaking.	Not specified. DOE maintains Title I sites under permanent NRC license.	Not specified. DOE or State maintains Title II sites under permanent NRC license.
Funding Assurances	Money is set aside at closure, and often sooner, in a protected account, such as a trust fund, to provide funding for implementing the institutional control program.	Not addressed.	Not addressed.	Not addressed. However, per UMTRCA, DOE and States fund remediation of Title I sites; and the Federal government funds long-term care of Title I and II sites.	Licensees of Title II sites provide (1) financial surety for site closure and D&D, and (2) pay a one-time long-term care fee to the Federal government. Otherwise, long-term care and maintenance costs for Title I and Title II sites are funded by the Federal government.
Public Participation	Procedures used to engage the public in the regulatory process.	All standards and regulations were proposed in the Federal Register for public comment, and public hearings were held in local locations, prior to finalization.	All standards and regulations were proposed in the Federal Register for public comment, and public hearings were held in local locations, prior to finalization.	Remedial action plans (RAPs) and LTSPs are coordinated with the public, States and Tribes. DOE conducts public information programs and includes State and Tribal representatives in site inspection programs.	NRC concurs with RAPs and CCRs (Title I), and grants long-term care licenses (Title I and II), in accordance with NRC public notice and comment procedures (10 CFR 2). Otherwise, NRC rules of practice (10 CFR 2) apply to licensing actions for Title II mill sites.

PROGRAM		UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subparts A,B,C Title I Sites	UMTRCA, AEA EPA/Health and Environmental Standards for Uranium and Thorium Mill Tailings 40 CFR 192 Subpart D,E Title II Sites	UMTRCA, AEA DOE/Uranium Mill Tailings Programs UMTRA Site Management Manual, LTSP Guidance Document, etc. Title I and II Sites	UMTRCA, AEA NRC/Disposal of Uranium or Thorium Mill Tailings 10 CFR Part 40, including Appendix A Title I and II Sites
Other	Additional relevant information that is not included in the above attributes.	<p>UMTRCA established two programs for the protection of public health and the environment from uranium mill tailings: one for designated inactive sites and vicinity properties, that are not licensed and where all milling has stopped (Title I sites), and another for operating sites licensed by the NRC or an Agreement State (Title II sites).</p> <p>For Title I sites, UMTRCA requires EPA to set health and environmental standards to govern the stabilization, control, and cleanup of uranium mill tailings by DOE. These standards were to provide protection that is consistent to the maximum extent practicable with the Solid Waste Disposal Act (SWDA), as amended. DOE is required to conduct remedial actions in compliance with EPA standards, and with the concurrence of NRC and in cooperation with States and Tribes.</p>	<p>For Title II sites, UMTRCA directed EPA to promulgate general environmental standards for the processing, possession, transfer, and disposal of uranium mill tailings at licensed operating uranium processing sites. The standards were to be consistent with Subtitle C of the SWDA, as amended, and implemented by NRC or the Agreement States, at these sites. No EPA permit is required under UMTRCA or the SWDA, as amended, for the processing, possession, transfer, or disposal of mill tailings.</p>	<p>For Title I sites, DOE prepares RAPs, CCRs, and LTSPs that are approved by NRC. For both Title I and Title II sites, DOE prepares LTSPs that are approved by NRC. Upon NRC confirmation that remediation is complete and in compliance with EPA and NRC standards, and NRC approval of LTSPs, NRC issues a general license specifically to DOE (or optionally a state agency for Title II sites). DOE then carries out long-term care and maintenance of the stabilized and disposed tailings.</p>	<p>For Title I sites, NRC approves RAPs, CCRs and LTSPs, inspects remediated sites and stabilized and disposed tailings for compliance with EPA standards, and issues a general license to DOE for long-term site control and maintenance. For Title II sites, license applications must address compliance with NRC and EPA standards, including processing site reclamation (structure decommissioning, final tailings disposition including impoundment closure, soil and structure decontamination, and groundwater remediation as needed). After site reclamation and closeout are completed according to NRC-approved plans, title to the site and radioactive materials is transferred to DOE (or a State). NRC issues a general license to DOE (or a State) for long-term site control and maintenance.</p>

Comparison Table

Restricted Release of Property

Requirements for sites containing residual radioactive material
released under restricted conditions.

Comparison Table–DOE and NRC Sites Released Under Restricted Use Conditions⁸

PROGRAM		AEA DOE/ Property Released Under Restricted Use Conditions Order 5400.5 and Guidance	AEA NRC/ Sites Released With Restricted Use 10 CFR 20. Subpart E
ATTRIBUTE	DESCRIPTION		
Applicability	The type of waste that is disposed of and the facility that is regulated.	DOE property containing residual radioactive material that is released under restricted conditions.	Sites of NRC licensees that are released with residual radioactivity above unrestricted release levels.
Scope of Standard⁹	Regulations may define “generally applicable environmental standards” for all agencies to follow, define methods for implementing these standards, or define specific requirements for siting, design, and closure of a facility.	DOE requirements and guidance applicable to restricted release of property.	NRC regulation and guidance for restricted release of decommissioned facilities after termination of the NRC license.

⁸This table is intended for informational purposes only and is not intended to substitute for the requirements found in the relevant statutes or regulations.

⁹This discussion focuses on those portions of existing Federal programs that apply directly to the use of institutional controls to protect the public and the environment. The listed Federal standards, regulations, and directives include many additional requirements that although important, are not directly germane to the discussion. Examples include those requirements pertaining to releases of radionuclides and public and worker protection during the operation of a high-level or low-level waste disposal facility, unrestricted release of property by DOE or an NRC licensee, or remediation and unrestricted release of land contaminated with uranium mill tailings.

PROGRAM		AEA DOE/ Property Released Under Restricted Use Conditions Order 5400.5 and Guidance	AEA NRC/ Sites Released With Restricted Use 10 CFR 20, Subpart E
Performance Criteria	Protective standards that define acceptable performance of a disposal facility or decommissioned property.	Authorized limits for release of property must be derived under the ALARA process and be projected to result in doses that are <25 mrem/yr under actual or likely use scenarios (reduced to a few mrem/yr or less). Projected doses under worst plausible use scenarios, without restrictions on property use, should not exceed 100 mrem/yr. (An authorized limit is a limit on the concentrations of residual radioactive material on the surfaces or within property, that has been derived consistent with the ALARA process, given the anticipated use of the property, and has been authorized by DOE to permit the release of the property from DOE control.)	With the implementation of legally enforceable institutional controls following license termination, projected doses to an average member of a critical group (including those from groundwater sources) must be ALARA and not exceed 25 mrem/yr. Assuming these institutional controls are removed, projected doses must not exceed 100 mrem/yr. In unusual site-specific cases, doses up to 500 mrem/yr may be allowable, assuming removal of institutional controls. In these cases additional controls must be imposed, including durable institutional controls and site rechecks at five-year intervals or less.
Timeframe	Length of time that future performance is projected.	1000 years.	<p>Legally enforceable institutional controls may be based on property rights (e.g., the right to restrict the use of, or access to, property) or on a government's sovereign or police powers, and may include physical controls such as fences, markers, earthen covers, monitoring, etc. Although legally enforceable institutional controls may include control by a private individual or organization, or a government agency, durable institutional controls should be either government ownership of the land or property or government enforcement of the property restrictions.</p> <p>1000 years.</p>
Engineered Barrier Criteria	Standards of performance for an engineered barrier or physical characteristics of the barrier.	None specified, although the effectiveness of barriers or other physical controls, if any, may be considered in the analysis.	None specified in rule, although the effectiveness of barriers or other physical controls (e.g., fences), if any, may be considered in the analysis provided that they are used in combination with legally enforceable or durable institutional controls.
Timeframe	The time period that engineered barriers are designed to perform, as specified in the regulation.	Not specified.	Not specified.
Method for Determining Compliance with Performance or Engineered Barrier Criteria	Overall approach for determining compliance with principal requirements -- e.g., a requirement for modeling facility performance into the distant future (typically 1000 - 10,000 years), performing engineering assessments of structures or barriers, demonstrating that a specified design (e.g., materials of construction) has been implemented, or a mix of these.	To demonstrate compliance with dose limits, hypothetical exposure scenarios are hypothesized, and radiation doses are projected for up to 1000 years into the future.	To demonstrate compliance with dose limits, hypothetical exposure scenarios, such as resident farming, are hypothesized, and radiation doses are projected for up to 1000-year periods.

PROGRAM		AEA DOE/ Property Released Under Restricted Use Conditions Order 5400.5 and Guidance	AEA NRC/ Sites Released With Restricted Use 10 CFR 20. Subpart E
Siting Criteria	Features of a site upon which a facility is built that are designed to contribute to waste isolation. Often includes requirements related to flooding, seismic activity, proximity to groundwater, etc.	Not applicable.	Not applicable.
Intruder Requirements	An intruder is a person who inadvertently becomes exposed to waste in a disposal facility, through home construction, well drilling, etc.	Projected dose under the worst plausible use scenario, which for many situations is similar to a LLW intrusion scenario, should not exceed 100 mrem/yr. If the worst plausible use scenario is deemed likely, it must conform to the 25-mrem/yr dose constraint.	The institutional controls must be assumed to fail, and projected intruder doses limited to 100 mrem/yr. The rule also provides for allowable intruder doses after institutional controls fail of up to 500 mrem/yr, although potential doses larger than 100 mrem/yr are expected to be approved only in unusual site-specific circumstances. In these cases, additional, durable institutional controls must be imposed including periodic third-party rechecks of the site at least every five years.
Protection of Intruder	Requirements that provide for protection of the health and safety of a postulated intruder.		
Consideration of intruder on facility performance	Requirements that provide for analysis of continued performance of a facility after a person intrudes.	Not directly applicable.	Not directly applicable.
Active Institutional Controls	Actions taken at a site to ensure that performance criteria continue to be met, engineered structures perform as expected, and to prevent human intrusion.	Restrictions on use are imposed according to a graded approach, depending on the projected dose under the worst plausible use scenario, and may include monitoring, inspections, and appropriate radiological safety measures during maintenance, demolition or other activities. DOE review of restrictions should occur frequently (not less infrequent than every 5 years) to ensure restrictions are being maintained.	Site-specific application of legally enforceable and durable institutional controls may include active measures such as site monitoring and inspections, and maintenance of controls such as fences and signs, as may be determined to be appropriate and needed.
Timeframe	The length of time in the regulation for which risk assessments take credit for the operation of the active controls.	Not directly applicable. However, actual and likely use scenarios include those that are plausible, unlikely to substantially underestimate dose, and have a reasonable chance of occurring within at least the first 50 years. Scenarios that are not expected to occur for at least 100 years after property release need not be considered as likely use. A worst plausible use scenario is one that is credible over the long term.	Not directly addressed in rule. However, although institutional controls must be designed to last for as long as required, consideration of their failure and the resulting dose to members of the public is also required.

PROGRAM		AEA DOE/ Property Released Under Restricted Use Conditions Order 5400.5 and Guidance	AEA NRC/ Sites Released With Restricted Use 10 CFR 20, Subpart E
Passive Institutional Controls	Controls that are self-implementing and preserve knowledge about the location, design, and contents of a disposal system.	Mainly land use controls -- deed restrictions, zoning, etc.	Mainly land use controls--deed restrictions, zoning, etc.
Land Ownership	Organization that takes title to the land after closure and during the institutional control period.	Private or government land ownership or control (e.g., leasing) is permitted.	Private or governmental land ownership is permitted. Governmental land ownership is generally expected if durable institutional controls are required.
Documentation	Knowledge is preserved in documents for future generations' use.	Documentation of restrictions on land use must be clear to persons receiving control, through notification, land records, or other suitable methods.	Documentation of restrictions on land use should be clear to current and future owners, either through notification, placement in land records, or other standard publicly available records archives.
Timeframe	The length of time in the regulation for which risk assessments take credit for the functioning of the passive controls.	Not directly applicable. However, active and passive controls should be designed to last as long as necessary, although consideration of their failure is required.	Not directly applicable. However, active and passive controls should be designed to last as long as necessary, although consideration of their failure is required.
Funding Assurances	Money is set aside at closure, and often sooner, in a protected account, such as a trust fund, for implementing the institutional control program.	Funding for DOE review of restrictions, etc., is provided by the Federal government.	Financial assurances are provided by the licensee
Public Participation	Procedures used to engage the public in the regulatory process.	Release of property should be coordinated with NRC or Agreement States to ensure that licensable radioactive material is not transferred to unauthorized persons. Documentation on release of property is publicly available. Otherwise, public participation is conducted in accordance with DOE policy P 1210.1.	In addition to 10 CFR 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," Commission rules require public notification of licensee plans and that licensees seek advice from affected parties on the adequacy of institutional controls and financial assurances. NRC also conducts meetings in the local community, and implements the NEPA public participation requirements for an EIS, including public meetings for scoping and documenting the resolution of comments on the draft EIS.
Other	Additional relevant information that is not included in the above attributes.	Although the same criteria (dose limits, the ALARA process) apply to release of real and non-real property, the DOE approval process is more rigorous for release of non-real property because of the greater possibility of multiple exposures to humans.	Pursuant to a agreement with a State under Section 274 of the AEA, NRC may relinquish authority to this "Agreement State" for regulating source, byproduct, and special nuclear material in quantities not sufficient to form a critical mass. Hence, under NRC's Agreement State program, Agreement States may implement Subpart E in accordance with State regulations that are compatible with those of NRC's.