

NRC INSPECTION MANUAL

RDB

INSPECTION PROCEDURE 86750

SOLID RADIOACTIVE WASTE MANAGEMENT AND TRANSPORTATION OF RADIOACTIVE MATERIALS

Effective Date: 01/01/2021

PROGRAM APPLICABILITY: IMC 2561, Appendix A

86750-01 INSPECTION OBJECTIVES

01.01 To verify the effectiveness of the licensee's programs for processing, handling, storage, and transportation of radioactive material.

86750-02 INSPECTION REQUIREMENTS

02.01 Radioactive Material Storage and Control

- a. Select and walkdown 1 – 3 radioactive waste storage areas, if available to verify radioactive materials are controlled, labelled, posted, and secured against unauthorized removal and that the areas meet requirements of their licensing basis and are appropriately described in the site licensing basis.
- b. Select 5 – 10 containers of stored radioactive materials, as applicable, and evaluate the material condition of the containers, including whether there are signs of swelling, leakage, or deformation. Verify that the licensee is performing periodic container inventories and inspections sufficient to meet 10 *Code of Federal Regulations* (CFR) 20.1406(c) and 10 CFR 20.1501(a)(2) requirements and is monitoring the impact of low-level radioactive waste storage sufficient to identify potential unmonitored releases, unplanned releases, or nonconformances with waste disposal facility requirements.
- c. Verify the adequate implementation of the 10 CFR Part 37 security plan focusing on material that is located outside of the protected area (PA), as described in the 10 CFR Part 73 security plan, or that has the potential to be moved outside the PA.
- d. Select 1 – 2 sealed sources, as available, from the licensee's inventory that present the greatest radiological risk and evaluate if the sources are accounted for and have been verified to be intact (i.e., they are not leaking their radioactive content) and if any transactions since the last inspection involving nationally tracked sources were reported in accordance with 10 CFR 20.2207.

02.02 Radioactive Waste Processing

- a. Select 1 – 2 waste processing systems, as available, and walk down the accessible portions of the system to verify that the current system configuration and operation

agree with the descriptions in the Decommissioning Safety Analysis Report (DSAR), Offsite Dose Calculation Manual (ODCM), and process control program (PCP). Observe work activities, as available.

- b. Verify the adequate implementation of any new or temporary waste processing systems on-site, including portable systems, as available.

02.03 Transportation of Radioactive Materials

- a. Select 1-2 qualified shippers, as available and review the applicable education, experience, qualifications and training to determine if they meet the training requirements found in the Administrative Controls section of the plant TSs, 10 CFR 71.5 and DOT requirements contained in 49 CFR Part 172, Subpart H.
- b. Review any major changes since the last inspection in organization, personnel, facilities, equipment, programs, and procedures that may affect waste management and transportation of radioactive materials, including new shipping containers and scaling factors via the licensee's 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," analyses.
- c. Observe at least one shipment of radioactive material, as available, and verify the adequacy of shipment preparation, including surveys. Verify if the shipment marking, labeling, and placarding is consistent with the information in the shipping documentation.
- d. Select 2 – 3 shipping packages, as available, and verify that they have been appropriately characterized, classified, and prepared in accordance with procedures. At a minimum, consider if the shipping documents indicate the proper shipping name; emergency response information and a 24-hour contact telephone number; accurate curie content and volume of material; and appropriate waste classification, transport index, and United Nations (UN) identification number.
- e. For all Type B shipments and all shipments of category 1 or category 2 material, verify that the additional requirements described in 03.03(e) are met.

02.04 Problem Identification and Resolution. Verify that the licensee is identifying problems related to radioactive waste storage, processing, and transportation activities at an appropriate threshold and entering them into the corrective action program. If applicable, for a sample of problems documented in the corrective action program, verify that the licensee has identified and implemented appropriate corrective actions.

86750-03 INSPECTION GUIDANCE

General Guidance

The inspector is not required to complete all of the inspection requirements listed in this IP, nor is the inspector limited to those inspection requirements listed if additional safety concerns are identified. However, the objectives of this IP shall be met. Due to variance in decommissioning strategies and timelines, inspection effort is expected to vary based on the amount of radioactive material on-site and the number of radioactive material shipments

since the last inspection. When there have not been many or any radioactive material shipments, the inspector should focus on any changes to the radioactive material storage, processing, and transportation programs and on walkthroughs of radioactive material storage areas to assess material condition as well as consideration of 10 CFR Part 37 requirements.

NRC and DOT share responsibility for regulating the transportation of radioactive materials within the United States. NRC regulations for the transportation of radioactive materials are codified in 10 CFR Part 71, "Packaging and Transportation of Radioactive Materials." DOT's hazardous materials regulations, which include radioactive material, are codified in 49 CFR Parts 100-199. A provision in the NRC regulations, 10 CFR 71.5, requires that NRC licensees comply with DOT's hazardous material regulations and lists many of the requirements and where to find them in the regulations. Applicable definitions can be found in 49 CFR 173.403. Further applicable regulations include 49 CFR Subpart I – Class 7 (Radioactive Materials).

Inspectors should select inspection items using a performance based, risk-informed approach, while also considering variety. Inspectors should review a sampling of past inspection reports to inform their selection.

Specific Guidance

03.01 Radioactive Material Storage and Control

- a. The inspector should risk-inform their selections of walkthroughs, while also varying the selections to, over the course of time, to observe all accessible areas of the plant. Labelling should be in accordance with 10 CFR 20.1904, "Labeling Containers," or material should be controlled in accordance with 10 CFR 20.1905, "Exemptions to Labeling Requirements," as appropriate. For materials stored or used in the controlled or unrestricted areas, verify that they are secured against unauthorized removal and controlled in accordance with 10 CFR 20.1801, "Security of Stored Material," and 10 CFR 20.1802, "Control of Material Not in Storage," as appropriate. The inspector should exercise caution in that some storage containers may exhibit elevated dose rates and some containers may not be accessible. Container conditions should be verified by direct observation as the preferred method, however, a review of licensee programs consistent with as low as reasonably achievable (ALARA) principles can be considered acceptable. The inspector should focus on radioactive material storage areas that have been moved, modified, or created during decommissioning. The inspector should review requirements and descriptions of these areas found in the site licensing basis and compare them to on-site conditions.
- b. See Regulatory Guide 4.22, "Decommissioning Planning during Operations." for guidance on early detection of subsurface contamination through surveys and monitoring. Consider if buildup of any gases produced by waste decomposition or chemical reactions results in container deformation or loss of container integrity. Inspectors should consider buildup of any gases produced by waste decomposition, chemical reactions, container deformation, loss of container integrity, or re-release of free-flowing water. Additional guidance of LLW storage is provided in Regulatory Issue Summary 08-32, "Interim Low-Level Radioactive Waste Storage at Reactor Sites," Additionally, see Information Notice 90-50, "Minimization of Methane Gas in Plant Systems and Radwaste Shipping Containers," August 8, 1990.

- c. Consider if the licensee has adequately evaluated radioactive material to determine if the material contains aggregated quantities of category 1 or category 2 material as defined by 10 CFR Part 37. Inspectors should focus on material that is located outside of the protected area (PA), as described in the 10 CFR Part 73 security plan, or that has the potential to be moved outside of the PA. Inspectors should note that radioactive material will likely be moved around the site numerous times during decommissioning. Inspectors should determine whether any radioactive material movement challenged the aggregated quantities and corresponding characterization and security and 10 CFR Part 20 requirements, including posting requirements. Inspectors should consider reviewing the annual access authorization program review and consider if unauthorized personnel were granted access to category 1 or category 2 material that is located outside the PA. Consider if the personnel who implement the 10 CFR Part 37 security plan (e.g. security staff and health physics staff) were properly trained and received required refresher training.

Review the annual security program review and consider the following:

1. For material located outside of the PA, failures of equipment used to detect the unauthorized removal of category 1 and category 2 material;
2. For material located outside of the PA, failures to maintain continuous surveillance of category 1 material during periods when physical barriers or intrusion detection systems were disabled (e.g., during periods of movement);
3. For radioactive waste that is located outside of the PA and that contains category 1 or category 2 quantities of radioactive material, failures to correctly apply the exemption criteria of 10 CFR 37.11(c);
4. Failures to respond appropriately to any actual or attempted theft or diversion of category 1 or category 2 material;
5. Failures to notify the local law enforcement agency (LLEA) or the NRC of an actual theft or diversion of a category 1 or category 2 quantity of radioactive material, or of LLEA to respond to notifications as coordinated with the site; and
6. Actual cases where category 1 or category 2 radioactive material was accessed by unauthorized individuals, stolen or diverted from its intended location.

Consult regional security inspection staff or other appropriate staff to determine how to disposition any identified issues involving radioactive material protection that reveal potential violations of 10 CFR Part 73 requirements. NRC Regulatory Information Summary 2015-15, "Information Regarding a Specific Exemption in the Requirements for the Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material," provides information on the relationship between the 10 CFR Part 73 security plan and 10 CFR Part 37 requirements.

Performance deficiencies within the scope of Enforcement Guidance Memorandum (EGM) 2014-001 (i.e., involving category 1 or category 2 radioactive material in large components or robust structures, as defined in the EGM, where the underlying violation qualifies for enforcement discretion) are to be dispositioned as minor violations. However, these minor violations shall be documented in inspection

reports in accordance with IMC 0610 and—for tracking purposes—issued a new enforcement action (EA) number each time enforcement discretion is granted. In these cases, the justification for the issue being dispositioned as a minor violation is the extremely low risk associated with theft or diversion of radioactive material contained in large components and robust structures as described in EGM-2014-001.

- d. Licensees are required under 20.1501(a)(2) to conduct surveys that may be necessary to comply with Part 20 and that are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels; evaluate quantities of radioactivity; and evaluate potential radiological hazards.

Some plants have technical specification (TS) requirements to inventory and leak test sources greater than a certain activity (e.g., > 100 microcurie beta/gamma, and 5 microcurie alpha activity). Other plants may have moved this requirement to a licensee-controlled document. In cases where the specific requirements, as stated in a plant's license, are different than the applicable regulations, licensees are obligated to meet the specific requirements as stated in their license. Therefore, it is possible that a licensee would be obligated to leak test sources that are otherwise exempt from leak testing per NRC regulations, if for example, that licensee's TS contains a provision that generically states that sources above a certain level require leak testing. Routine maintenance can be performed by licensee personnel, but non-routine maintenance must be performed by the device manufacturer (or distributor) or a person specifically authorized by NRC or an Agreement State.

The focus of this specific inspection item is on sealed sources that present the greatest radiological risk in the event their leakage is not adequately monitored. The inspector should note that many sources may have been segregated and staged for eventual disposal or may have already been disposed of. Inspection effort in this area should reflect the current site conditions. Devices that only contain exempt concentrations (10 CFR 30.14) or exempt quantities (10 CFR 30.18); or certain devices that are exempt from NRC materials licensing requirements under 10 CFR 30.15, 10 CFR 30.19, 10 CFR 30.20 or 10 CFR 30.22; or devices that contain generally licensed by-product materials that are exempt from leak testing as described in 10 CFR 31.5(c)(2)(i) or (ii) do not require leak testing per NRC regulations and do not fall within the scope of this inspection item. Performance deficiencies that result from licensees failing to leak test sources that require leak testing by a TS or a procedure but are exempt per NRC regulations specifically listed in this paragraph should be dispositioned as minor violations.

High activity irradiators/calibrators are required to be registered in the NRC Sealed Source and Device Registry (SSDR). The SSDR lists which sources can be used in a particular device, the frequency for leak tests, the ANSI Category (ANSI CAT I is a self-shielded irradiator whereas a CAT II would fall under 10 CFR Part 36, "Licenses and Radiation Safety Requirements for Irradiators"), conditions of normal use, and other information related to the use of the device.

03.02 Radioactive Waste Processing

- a. Consider if solid radioactive waste is processed consistent with the Process Control program (PCP) and licensee procedures and evaluate if the licensee's PCP correctly describes the current methods and procedures for dewatering and waste stabilization.

Consider the process the licensee uses for the removal of freestanding liquid; particularly prior to shipment. If the licensee uses an on-site vendor to perform dewatering or waste stabilization, inspect the methods and procedures to assure compliance with vendor manuals, diagrams and procedures.

For those systems that provide tank recirculation, consider if the tank recirculation procedure provides sufficient mixing. Generally, a minimum of three volumes of mixing is provided. See ASTM D3370-10, "Standard Practices for Sampling Water from Closed Conduits" section 11.4 for tank recirculation information and section 12.2 for sample line flushing.

As available, select work activities to observe. The inspector should review greater than class C (GTCC) waste generation and any stranded waste to determine if the licensee has adequate plans for minimization and resolution. The inspector should consider unusual activities such as spent fuel pool rack removal, large component processing, and general demolition as activities for review. The inspector should review the licensee's radiation protection controls, heavy loads controls, and any mixed waste, environmental, and Part 61 considerations.

- b. Consider portable, temporary, and new radioactive waste processing equipment and systems and evaluate licensee controls to ensure that the systems and equipment have been properly evaluated, including determining that equipment will not contribute to an unmonitored release path. Review any changes made to the radioactive waste processing system. If the system is described in the ODCM, then the change should be evaluated against requirements contained in Technical Specifications or the Quality Assurance Program Document as applicable. Consider if changes from what is described in the DSAR were reviewed and documented as required. Changes to the DSAR must consider whether prior NRC approval is required consistent with 10 CFR 50.59. If the licensee uses a vendor to perform on-site waste handling or processing, consider if any changes in the system configuration were made in accordance with vendor manuals, diagrams and procedures.

03.03 Transportation of Radioactive Materials

- a. No further guidance.
- b. Consider if the waste stream mixing, sampling procedures and methodology for waste concentration averaging are consistent with the NRC branch technical positions on concentration averaging and encapsulation and waste classification, or if the licensee's approach is acceptable. The inspector should consider reviewing shipping containers that are new, unique, or homemade to determine if they provide reasonable assurance of being able to perform their intended function.
- c. Inspectors may choose to observe multiple shipments over the course of an inspection year dependent on licensee activities. Inspectors should consider Type B and Category I and II shipments and others for variety as available. Inspectors should review the adequacy of shipment preparation (e.g., shipment packaging, surveying, labeling, marking, placarding, vehicle checks, emergency response information, disposal manifests, shipping papers provided to the driver, and licensee verification of shipment and receipt readiness), as applicable. Waste generators shipping material intended for ultimate disposal (even through a waste processor) are required to document

information on the Uniform Low-Level Radioactive Waste Manifest (NRC Forms 540 and 541) in accordance with 10 CFR 20.2006, which will require some characterization of the shipment. However, the waste classification section on NRC Form 541 is only required if the waste is consigned to a disposal facility. Instructions on filling out these forms (and what is/isn't required based on destination) can be found in 10 CFR Part 20, Appendix G and NUREG/BR-0204.

Consider how the licensee meets requirements in accordance with applicable regulations, including 49 CFR 397.101, for highway route control quantities (HRCQs) of materials in transport as defined in 49 CFR 173.403.

For shipments of LLRW or other low-level radioactive materials using NRC-certified packages, and which are not exempted by § 71.10 from the 10 CFR Part 71 requirements, verify that the licensee has implemented the requirements, as applicable, of 10 CFR 71, Subparts C, G and H. Applicable regulations can be found in 10 CFR 20 Appendix G, "Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests," 10 CFR 61.56, "Waste Characteristics," and 10 CFR 71, "Packaging and Transportation of Radioactive Material."

Based on direct observation of packaging and shipping activities in progress (if possible), review of appropriate records, and from discussions held with responsible licensee staff, determine if the following transportation program activities are adequate:

1. Radiation and contamination surveys of packages and vehicles (10 CFR 173.441 and 173.443).
2. Shipping paper documentation (49 CFR Part 172, Subpart C).
3. Package marking and labeling (49 CFR Part 172, Subpart D; and §§ 172.400-407 and 172.436-440.)
4. Loading and storage, blocking and bracing of packages.
5. Vehicle placarding and driver's instructions, when required.
6. Notifications to state agencies, when required.
7. Emergency response information (49 CFR 172, subpart G).
8. Compliance, as applicable, with the shipper/carrier registration requirements of 49 CFR Part 107 Subpart G (see Information Notice 92-72, dated October 28, 1992).
9. Consider calling the licensee's emergency response number listed on the shipping paper during the backshift while a licensee's radioactive material shipment is in transit to determine whether the licensee can provide, in a timely manner, the emergency response information, required by DOT requirements specified in 49 CFR 172.600-172.604. The specific contents of the emergency response information that must be provided are described in 49 CFR 172.602.

Requirements for the 24-hour emergency response telephone number are described in 49 CFR 172.604 and include the following:

- i. The number must be monitored at all times while the hazardous material is in transit.
- ii. The number must be the number of a person who is either knowledgeable of the hazardous material being shipped, and has comprehensive emergency response and incident mitigation information, or who has immediate access to such a person.
- iii. The number must be entered on the shipping paper.

All emergency response information required by DOT regulations must be accurately provided on shipping papers or other documents, and the licensee must be prepared to respond promptly with the information needed, when called.

Emergency responders will expect the licensee to remain on the line until the information needed has been provided. As general guidance, emergency responders will also expect this information to be provided within 15 minutes. For additional background information on this requirement, see NRC Information Notice 92-62, dated August 24, 1992.

- d. Consider if the licensee correctly uses radiochemical analyses results to support radioactive waste characterization and if the licensee's use of scaling factors and calculations to account for hard to detect radionuclides is technically sound. Refer to 10 CFR 61.55 Waste Classification for applicable regulations on classification.

For one or two shipments made since the last inspection, review licensee guidance used to determine the licensee's waste form and classification. Determine if the scaling factors used for these shipments were appropriately based on actual waste stream analysis. Based on the licensee's records of one or two shipments of waste requiring processing prior to shipment for disposal, determine whether the processed waste meets the waste form stability requirements of 10 CFR Part 61.56. Determine whether this waste processed using a quality control program as required by 10 CFR 20.2006(d). Guidance for implementing this inspection requirement can be found in the branch technical position (BTP) on Waste Form. Radioactive material must be properly packaged based on the hazard that the material represents. Proper packaging ensures that the material will be contained based on normal conditions that the package will encounter during transport, and, for higher activity material, accident conditions for which the package was designed. If the material is not properly packaged, the desired level of safety will not be achieved and hence the material cannot be safely shipped.

- e. For Type B shipments, consider if the requirements of the transport package Certificate of Compliance (CoC) have been met; that the user is a registered package user and has an NRC approved QA program; and that the licensee followed procedures for cask loading and closure procedures consistent with the vendor's current approved procedures.

For shipments of category 1 or category 2 material, consider if the licensee met the requirements for recipient's license verification. For shipments of category 1 material, consider if adequate movement control centers are established; if communications are adequate; if the driver is provided with an accompanying individual (if applicable); and if the driver is provided with written normal and contingency procedures. For shipments

of category 2 material, consider if the shipment is in constant control and surveillance of the licensee (or carrier); if the licensee (or carrier) has the capability to immediately establish communications; and, for situations when a licensee uses a carrier, if the carrier requires an authorized signature prior to release of the material for delivery. Inspectors should review if the licensee satisfied the advanced notification requirements applicable to category 1 material shipments.

The inspector should make an effort to observe Type B and Category 1 shipment activities, as available.

03.04 Problem Identification and Resolution. Additional guidance can be found in IP 71152, "Problem Identification and resolution" and IP 40801, " Problem Identification and Resolution at Permanently Shutdown Reactors."

86750-04 RESOURCE ESTIMATE

Note that for all decommissioning inspection activities, the frequency of performance, level of effort needed, and specific inspection requirements to be evaluated and verified vary based on the stage of decommissioning at the facility, the scope of licensee activities, and the overall decommissioning strategy chosen for the plant (i.e., SAFSTOR or DECON). IMC 2561 contains a discussion of the expected inspection frequency and resource estimates during each phase of decommissioning and should be used when planning resources to conduct this inspection.

86750-05 COMPLETION STATUS

Inspection findings, open items, follow-up items, and conclusions shall be documented in accordance with Inspection Manual Chapter 0610 and other relevant regional or headquarters instructions. Inspections resulting from allegations will be documented and dispositioned in accordance with Management Directive 8.8.

86570-06 REFERENCES

10 CFR Part 71, "Packaging and Transportation of Radioactive Material"

49 CFR Part 172, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communication, Emergency Response Information, Training Requirements, and Security Plans," Subpart H, "Training"

RG 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste"

RG 1.187, "Guidance for Implementation of 10 CFR 50.59, Changes, Tests, and Experiments"

RG 1.181, "Content of the Updated Final Safety Analysis Report in Accordance with 10 CFR 50.71(e)"

RG 4.15, "Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination)"

RG 4.22, "Decommissioning Planning during Operations"

RG 7.7, "Administrative Guide for Verifying Compliance with Packaging Requirements for Shipping and Receiving of Radioactive Material"

RG 7.10, "Establishing Quality Assurance Programs for Packaging Used In Transport Of Radioactive Material", Revision 3

RG 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable"

NRC Bulletin 1979-19, "Packaging of Low-Level Radioactive Waste for Transport and Burial," dated August 10, 1979,

NRC Regulatory Issue Summary 2008-32, "Interim Low Level Radioactive Waste Storage at Reactor Sites"

NRC Regulatory Issue Summary 2015-02, "Reporting Of H-3, C-14, Tc-99, and I-129 On the Uniform Waste Manifest"

NRC Regulatory Issue Summary 2015-15, "Information Regarding a Specific Exemption in the Requirements for the Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material"

NRC Information Notice 1986-20, "Low-Level Radioactive Waste Scaling Factors, 10 CFR Part 61," March 28, 1986

NRC Information Notice 1990-50, "Minimization of Methane Gas in Plant Systems and Radwaste Shipping Containers," August 8, 1990

NUREG-1556, "Consolidated Guidance About Materials Licenses," Volume 18, "Program-Specific Guidance About Service Provider Licenses," August 2017

NUREG-1608, "Categorizing and Transporting Low Specific Activity Materials and Surface Contaminated Objects"

NUREG/BR-0204, "Instructions for Completing NRC's Uniform Low-Level Radioactive Waste Manifest"

NUREG-1660, "U.S.-Specific Schedules for Transport of Specified Types of Radioactive Material Consignments"

NUREG-2155, "Implementation Guidance for 10 CFR Part 37, 'Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material"

NUREG-2166, "Physical Security Best Practices for the Protection of Risk-Significant Radioactive Material"

NRC, "Revised Staff Technical Position on Waste Form (SP-91-13)," dated January 30, 1991, (ML033630746)

NRC, "Concentration Averaging and Encapsulation Branch Technical Position, Vol. 1" February 2015, (ML12254B065)

NRC, "Concentration Averaging and Encapsulation Branch Technical Position, Vol. 2, Response to Stakeholder Comments and Technical Basis," February 2015, (ML12326A611)

NRC, "Changes to the Radioactive Material Packaging and Transportation Regulations," (ML16004A174)

NEI 96-07, Rev.1, "Guidelines for 10 CFR 50.59 Evaluations," (ML003686043)

NEI 98-03, Rev.1, "Guidelines for Updating Final Safety Analysis Reports," (ML003779028)

NEI 07-10A, "Generic FSAR Template Guidance for Process Control Program" (PCP), (ML091460627)

END

ATTACHMENT 1

Revision History for IP
86750

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional, Non-Public Information)
N/A	03/15/1994	Initial issuance.	N/A	N/A
N/A	ML20274A024 10/27/20 CN 20-056	Major revision. Revised to include feedback from inspectors and also for format and editorial changes. The content of this procedure was updated to focus on the inspector's efforts on risk informing the inspection.	N/A	ML20274A025