

# NRC INSPECTION MANUAL

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## INSPECTION PROCEDURE 71124 ATTACHMENT 08

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### RADIOACTIVE SOLID WASTE PROCESSING AND RADIOACTIVE MATERIAL HANDLING, STORAGE, AND TRANSPORTATION

Effective Date: March 30, 2020

PROGRAM APPLICABILITY: IMC 2515 App A

CORNERSTONES: Public Radiation Safety (80 percent)  
Occupational Radiation Safety (20 percent)

INSPECTION BASES: See IMC 0308 Attachment 2

SAMPLE REQUIREMENTS:

Sample Requirements		Minimum Baseline Sample Completion Requirements		Budgeted Range	
Sample Type	Section(s)	Frequency	Sample Size	Samples	Hours
Radioactive Material Storage and Control	03.01	Biennial	1 per site	1-3 per site	34 +/- 4 per site
Solid Radioactive Waste System Walkdown	03.02	Biennial	1 per site	1-3 per site	
Waste Characterization and Classification	03.03	Biennial	2 per site	2-3 per site	
Shipment Preparation	03.04	Biennial	1 per site	1 per site	
Shipping Records	03.05	Biennial	3 per site	3-5 per site	

#### 71124.08-01 INSPECTION OBJECTIVES

- 01.01 To verify the effectiveness of the licensee's programs for processing, handling, storage, and transportation of radioactive material.
- 01.02 To conduct a routine review of problem identification and resolution activities per Inspection Procedure (IP) 71152, "Problem Identification and Resolution."

## 71124.08-02 GENERAL GUIDANCE

Whenever possible, inspectors should coordinate the inspection schedule with the licensee to coincide with risk-significant activities so that licensee performance can be directly observed.

Inspectors should review the solid radioactive waste system description in the Final Safety Analysis Report (FSAR), the Process Control Program (PCP), and the most recent Annual Radiological Effluent Release Report (ARERR) for information on the types and amounts of radioactive waste disposed.

Inspectors should review results of radiation protection program audits related to this area (e.g., licensee's quality assurance (QA) audits, self-assessments, access authorization program reviews, Part 37 security program reviews or independent audits) since the last inspection. The reviews of these audits should be used to gain insights into overall licensee performance and focus the inspector's activities consistent with the principle of "smart sampling."

Inspectors should review the radioactive waste and radioactive shipment records since the last inspection. These records should be used to gain insights into the radioactive material shipments made and the type of transport packages used.

For each sample, conduct a routine review of problem identification and resolution activities using Inspection Procedure (IP) 71152, "Problem Identification and Resolution." Per IP 71152, it is expected that routine reviews of Problem Identification and Resolution (PI&R) activities should equate to approximately 10 to 15 percent of the resources estimated for the associated baseline cornerstone procedures, this is a general estimate only based on the overall effort expected to be expended in each strategic performance area. It is anticipated that the actual hours required to be expended may vary significantly from attachment to attachment, depending on the nature and complexity of the issues that arise at the particular facility. Overall, an effort should be made to remain within the 10 to 15 percent estimate on a strategic performance area basis. Inspection time spent assessing PI&R as part of the baseline procedure attachments should be charged to the corresponding baseline procedure.

## 71124.08-03 INSPECTION SAMPLES

### 03.01 Radioactive Material Storage and Control Sample

**Verify radioactive materials are controlled, labelled and secured against unauthorized removal.**

#### Specific Guidance

Note: Consult regional security inspection staff to determine how to disposition 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.

Note: 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 0611, section 0611-12, 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.

- a. Consider inspection of temporary radioactive material storage areas that are established to support plant outage activities as well as long-term storage facilities that can be inspected during non-outage periods.
- b. Consider if the licensee is performing periodic container inspections sufficient to meet applicable requirements.
- c. Select a representative sample of containers of stored radioactive materials, and observe for signs of swelling, leakage, and deformation. Consider if buildup of any gases produced by waste decomposition or chemical reactions results in container deformation or loss of container integrity.
- d. For radioactive materials in controlled or unrestricted areas consider if they are secured against unauthorized removal or access; if they are controlled and maintained under constant surveillance; and if they are physically protected, as required.
- e. 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.
- f. Review 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.
- g. Consider if the personnel who implement the 10 CFR Part 37 security plan (e.g., security staff and health physics staff) are trained and receive refresher training.
- h. 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.
- i. Select sealed sources from the licensee's inventory that present the greatest radiological risk. Consider if the sources are accounted for and have been verified to be intact (i.e., they are not leaking their radioactive content).

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. For example, if that licensee's TS contains a provision that generically states that sources above a certain level require leak testing.

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. 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.

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.

- j. Determine if any transactions since the last inspection involving nationally tracked sources were reported in accordance with 10 CFR 20.2207.

### 03.02 Solid Radioactive Waste System Walk-Down Sample

**Walkdown accessible portions of a solid radioactive waste system and verify that the selected system is correctly configured and able to perform its intended function.**

#### Specific Guidance

- a. Consider radioactive waste processing equipment that is abandoned in place and evaluate licensee controls to ensure that the equipment will not contribute to an unmonitored release path and is isolated from operating systems.
- b. Consider radioactive waste processing equipment that is not operational and has not been abandoned in place and evaluate licensee actions to repair and return the equipment to service. Consider if the licensee is meeting TS requirements on the use of radioactive waste processing equipment to ensure that appropriate portions of these systems are used to reduce releases of radioactivity when the projected doses in a period of 31 days would exceed 2% of the guidelines for the annual dose or dose commitment, conforming to 10 CFR Part 50, Appendix I.
- c. Review any changes made to the radioactive waste processing system. Consider if changes from what is described in the FSAR were reviewed and documented as required, and, if applicable, that the licensee has reviewed the safety significance of equipment abandoned in place. If the licensee uses a vendor to perform onsite waste handling or processing, consider if any changes in the system configuration were made in accordance with vendor manuals, diagrams and procedures.
- d. Consider if solid radioactive waste is processed consistent with the PCP and licensee procedures.
- e. 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.
- f. The licensee's PCP should correctly describe 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.

### 03.03 Waste Characterization and Classification Sample

#### **Verify the licensee characterizes and classifies radioactive waste.**

##### Specific Guidance

- a. 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.
- b. 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.
- c. Consider if changes to plant operational parameters (changes in reactor coolant chemistry (e.g., fuel integrity or corrosion film morphology)) are accounted for (1) to maintain the validity of the waste stream composition data with respect to the sample analysis update, and (2) to verify that waste shipments continue to meet the requirements of 10 CFR 20.2006 and 10 CFR Part 20, Appendix G.

Note: The frequency of sample analysis update may be increased or decreased based on consideration of the waste stream. Scaling factors may be used for H-3, C-14, Tc-99 and I-129 – see RIS 2015-02, "Reporting of H-3, C-14, Tc-99 and I-129 on the Uniform Waste Manifest." Licensee staff may monitor reactor coolant radiochemistry as a method of determining if the waste stream composition has changed.

- d. Consider if the licensee maintains an adequate QA program to ensure compliance with the waste classification and characterization requirements of 10 CFR 20.2006 and 10 CFR Part 20, Appendix G.
- e. 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.

### 03.04 Shipment Preparation Sample

#### **Observe that a shipment containing radioactive material is prepared according to requirements.**

##### Specific Guidance

- a. Observe plant workers conducting radioactive material shipment preparation. When observations are not available document the inability to complete this sample in accordance with IMC 0306.

- b. Consider 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 recipient readiness), as applicable.
- c. Consider how the licensee meets requirements for highway route control quantities (HRCQs) of materials in transport, if applicable.

#### 03.05 Shipping Records Sample

#### **Verify the adequacy of a non-excepted package shipment through record review.**

##### Specific Guidance

- a. Consider if the licensee selected the correct package for shipment.
- b. Consider reviewing non-excepted package shipment (LSA I, II, III; SCO I, II; Type A or Type B) records. As 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. Also consider if the shipment marking, labeling, and placarding is consistent with the information in the shipping documentation.
- c. Inspectors should focus on the most important parameters such as waste volume, waste weight, allowable void space and radiological survey information, and isotopic analysis (including hard-to-detects).
- d. For packages characterized using specific activity calculations, the inspectors should focus on the representativeness of the sample used (e.g., was the waste mixed adequately prior to obtaining a sample); see ASTM D3370-10. For packages characterized by dose-to-curie methodology, the inspectors should focus on the adequacy of the radiological survey information used (e.g., were measurements taken at the appropriate distance and was a current survey date used).
- e. Consider if site personnel involved in the preparation and shipment of radioactive material are trained and qualified in accordance with licensee procedures and applicable regulations.
- f. Consider how the licensee meets requirements for HRCQs of materials in transport, if applicable.
- g. 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.
- h. For non-Type B shipments (Type A, Industrial Package, General Design packages), consider if the shipment is made in accordance with the package quality documents.

- i. Consider if the licensee's procedures for package loading and closure procedures are followed and are consistent with the vendor's current approved procedures.
- j. For shipments of category 1 or category 2 material, consider if the licensee met the requirements for recipient's license verification.
- k. For shipments of category 1 or category 2 material, review documentation describing preplanning and coordination activities as follows.
  - 1. 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.
  - 2. 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.
- l. Consider if the licensee satisfied the advanced notification requirements applicable to category 1 material shipments.

#### 71124.08-04 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 71124 Attachment 08

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	12/02/09 CN 09-030	<p>Conducted four year search for commitments and found none.</p> <p>This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and IP 71122.</p>	YES 09/09/2009	ML092810433
N/A	ML15345A075 01/26/16 CN 16-003	<p>Major revisions to the IP 71124 Attachment 08 were made in response to the 2013 ROP Enhancement Project.</p> <p>The revisions clarified the existing inspection requirements and enhanced the inspection guidance section. The revision also changed how samples are counted.</p>	N/A	ML15345081

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	ML17286A292 12/21/17 CN 17-031	<p>Major editorial revision of IP 71124.08 to accommodate the launch of the new RRPS system.</p> <p>Added guidance to 03.05 concerning evaluation of shipping records.</p> <p>Section 02 was audited and modified to move guidance to Section 03 and concisely state actions necessary to complete each requirement</p> <p>PI&amp;R was transitioned from an independent sample to a requirement that would be completed as part of each sample.</p> <p>Guidance section updated to reflect resource estimates for routine review of PI&amp;R activities per IP 71152 Section 04.01.</p>	Verbal discussion of changes during 2017 HP Counterpart meeting, 09/06/2017	ML17300A477
N/A	ML19325D777 PUBLIC CN	Made draft IP publicly available to support discussions at December 18, 2019 public meeting	N/A	N/A

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	ML19253A072 03/04/20 CN 20-014	<p>Major editorial revisions of IP 71124.08 to conform with IMC 0040 formatting guidance.</p> <p>Addition of specific guidance to provide oversight of Part 37-related performance in sections 03.01 and 03.05. Notified the Commission of this change in accordance with Management Directive 8.13, "Reactor Oversight Process" January 31, 2020 (ML19317D673 [Non-public])</p> <p>Moved inspection guidance for sealed sources from IP 71124.01 to IP 71124.08 as reflected in section 03.01.j.</p>	<p>Verbal discussion of changes during 2019 HP Counterpart Meeting, 09/04/2019</p> <p>Dedicated Part 37 training during calendar year 2020.</p>	<p>ML19253A078</p> <p>Closed FBFs:</p> <p>71124.01-2096 ML19270F289</p> <p>71124.08-2095 ML19270F290</p>