
Radioactive Source Inventory, Leak Testing, and Control at Field Projects

Revision 0

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1. SCOPE

1.1 Purpose

This procedure provides the minimum requirements for handling, storing, maintaining inventory, leak testing, and shipment of sealed radioactive sources typically used as instrument check sources.

1.2 Applicability

This procedure is for the exclusive use of *EnergySolutions*' Commercial Services Division and contractors at field project sites where *EnergySolutions* maintains control of radioactive sources either owned by or rented by *EnergySolutions*. Requirements herein are applicable to no other operational entities of *EnergySolutions*.

2. REFERENCES

- 2.1 10 CFR 30, General Rules Applicable to Domestic Licensing of Byproduct Material.
- 2.2 10 CFR 20, Standards for Protection Against Radiation.
- 2.3 NUREG-1556, Volume 18, Consolidated Guidance About Materials Licenses, Program-Specific Guidance About Service Provider Licenses.
- 2.4 ES-AD-PR-005, First Notifications.
- 2.5 CS-RS-PG-001, Radiation Protection Program, Commercial Services Projects.
- 2.6 CS-FO-PR-001, General Radiological Survey and Air Sampling Procedure for Field Projects.
- 2.7 CS-AD-PR-001, Broker Program Administration.

3. GENERAL

3.1 Responsibilities

3.1.1 Project Manager

The Project Manger is responsible for ensuring that the proper procedures/programs are implemented on the project site as required by customer agreements and contracts. The Project Manager is responsible for ensuring that these programs and procedures are properly incorporated into project-specific plans and procedures. The Project Manager is responsible for ensuring that Commercial Services and/or client programs/procedures are available for use by field personnel.

3.1.2 Commercial Services Radiation Safety Officer (RSO)

The Commercial Services RSO maintains and oversees implementation of the Commercial Services radiation safety program. This includes ensuring that radiation safety, radioactive materials management, and radiological operations procedures and programs are kept up to date such that they comply with current regulations and incorporate current and relevant industry practices and regulatory guidance.

3.1.3 Radiation Protection Supervisor (RPS)

The Radiation Protection Supervisor (RPS) is responsible for implementing the Commercial Services Radiation Protection Program and project-specific radiological requirements. The RPS manages and oversees technicians performing radiation protection surveys and radiological site monitoring.

At project sites, the RPS is also responsible for:

- Maintaining control of radioactive sources;
- Leak testing sources as necessary; and
- Maintaining an inventory of radioactive sources.

3.2 Precautions & Limitations

3.2.1 During a leak test, do **NOT** smear the active surface of electroplated sources.

3.2.2 During a leak test, do **NOT** smear the mylar covering on sources.

3.3 Definitions

- 3.3.1 *Exempt Quantities* - By-product material in individual quantities, each of which does not exceed the applicable quantity set forth in 10 CFR 30.71, Schedule B (Reference 2.1, Section 18). In accordance with 10 CFR 20.1905, exempt quantities need not be labeled as radioactive material (Reference 2.2).
- 3.3.2 *Licensed Radioactive Material (or Licensed Material) (LRM)* - Source material, special nuclear material, or by-product material received, possessed, used, transferred or disposed of under a general or specific license issued by the Nuclear Regulatory Commission or an Agreement State (Reference 2.1).
- 3.3.3 *Sealed Source* - Any by-product material that is encased in a capsule designed to prevent leakage or escape of the by-product material (Reference 2.1).

3.4 Records

- 3.4.1 Radioactive Source Inventory or computer generated data.
- 3.4.2 Radioactive Source Leak Test Record.
- 3.4.2 Source Certificate or other information validating source.

4. REQUIREMENTS AND GUIDANCE

4.1 Discussion

Radioactive sources are primarily used to response test and calibrate radiation detection instrumentation and equipment. To ensure proper control of radioactive sources, routine inventories are performed to verify the source storage location and to assure the sources have not been lost or misplaced. Sources shall be inventoried and leak tested semiannually. However, sources <100 μ Ci beta-gamma or <10 μ Ci alpha are not required to be leak tested (Reference 2.3).

4.2 Source Receipt

- 4.2.1 Upon receipt of a source, the source container shall be smeared or the container can be surveyed (with the source removed) using an appropriate survey instrument.
- 4.2.2 Verify the source against the source shipping records and/or source certificate.

4.2.3 Enter the source on a Radioactive Source Inventory.

4.2.4 If the source does not require leak testing, the survey results shall be compared to the applicable site contamination limits.

4.2.5 Perform a leak test in accordance with Section 4.6.

4.3 Source Inventory

4.3.1 Following initial mobilization to a project site, the RPS shall compile an inventory of all sealed radioactive sources assigned for use on the project. The inventory will indicate:

- sources ID number,
- isotope(s),
- activity,
- storage location, and
- the custodian of the source.

The inventory will also indicate whether or not the source requires a leak test and the date of the last leak test.

4.3.2 Source certificates, if available, shall be maintained with the inventory.

4.3.3 The RPS shall physically verify the presence, location and condition of each source on the list at least every six months. All inventory findings shall be documented on a Radioactive Source Inventory.

4.3.4 The RPS shall add sources to the inventory as they arrive at the project site and remove them as they are shipped from the project site.

4.4 Damaged or Missing Sources

4.4.1 If a source is missing:

1. Immediately notify the Commercial Services RSO;
2. Initiate a search; and
3. Initiate a First Notification in accordance with Reference 2.4.
4. The Commercial Services RSO will notify regulatory authorities as necessary.

4.4.2 If a source is physically damaged:

1. Remove the source from use;
2. Leak-test the source (regardless of its activity); and
3. Notify the Commercial Services RSO.
4. The Commercial Services RSO will notify regulatory authorities as necessary.

4.5 Source Handling and Control

4.5.1 Sources shall be stored in a location determined by the RPS.

4.5.2 Sources should be secured when leaving an area unattended or at the end of the day.

4.5.3 Sources should be removed from storage only when needed and replaced immediately after use.

4.5.4 Source storage and use locations shall be posted in accordance with Reference 2.2, Reference 2.5, and other applicable state or site-specific requirements.

4.6 Source Leak Test

4.6.1 Leak test intervals are specified by the NRC licenses, Agreement State licenses, or on the source registration sheet/certification. Leak test intervals shall not exceed 6 months.

4.6.2 Leak tests shall be capable of detecting 0.005 microcuries (μCi) or 185 Becquerel (Bq) of radioactivity.

4.6.3 Leak tests shall be performed by qualified personnel such as a senior health physics technician or the RPS based upon their experience and knowledge in radiation detection and measurement.

4.6.4 The minimum detectable concentration of a leak-test sample analysis shall be determined in accordance with Reference 2.6.

4.6.5 The following procedure (from Appendix O of Reference 2.3) shall be followed for performing leak testing and analysis:

- For each source to be tested, list identifying information on the Radioactive Source Leak Test Record.
- Prepare a separate swipe sample for each source.

- Number each swipe to correlate with identifying information for each source.
- Swipe the most accessible area (but NOT directly from the surface of the source) where contamination would accumulate if the sealed source were leaking (e.g., inside the source holder or container).
- Select an instrument that is sensitive enough to detect 0.005 μCi and record the instrument information on the Radioactive Source Leak Test Record.
- Measure the swipe in accordance with Reference 2.6 or other applicable procedure to determine the net activity in disintegrations per minute (dpm), convert dpm to Bq or μCi , and complete the information on the Radioactive Source Leak Test Record.
- Remove the source from service if the activity of the swipe sample is greater than 0.005 μCi or 185 Bq.
- File the swipe test record and provide a copy to the owner of the source when returned.

4.7 Shipping Sources from Project Sites

- 4.7.1 Exempt sources from field projects can be shipped back to the source supplier (such as the *EnergySolutions* instrument shop in Oak Ridge) by the RPS or designee provided they are in the source supplier's inventory.
- 4.7.2 The shipper should notify the recipient prior to shipping the sources and request assistance in shipping the sources as necessary.
- 4.7.3 Sources should be shipped via FEDEX or UPS to help ensure they do not get lost in regular mail. If the shipper is uncertain about the shipping requirements, he/she should request assistance from a Certified Broker, the Broker Supervisor, or the Commercial Services RSO.
- 4.7.4 Training in accordance with Reference 2.7 is required to ship sources that exceed an exempt quantity.

5. ATTACHMENTS

- 5.1 Radioactive Source Inventory
- 5.2 Radioactive Source Leak Test Record

Attachment 5.1
Radioactive Source Inventory (example)

Project Name:

Source ID		Isotope(s)		Activity	
Location		Owner		Leak Test Date	
Source ID		Isotope(s)		Activity	
Location		Owner		Leak Test Date	
Source ID		Isotope(s)		Activity	
Location		Owner		Leak Test Date	
Source ID		Isotope(s)		Activity	
Location		Owner		Leak Test Date	
Source ID		Isotope(s)		Activity	
Location		Owner		Leak Test Date	
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Source ID		Isotope(s)		Activity	
Location		Owner		Leak Test Date	
Source ID		Isotope(s)		Activity	
Location		Owner		Leak Test Date	
Source ID		Isotope(s)		Activity	
Location		Owner		Leak Test Date	

Inventory Date and Initials						
Source ID	Date	Initials		Source ID	Date	Initials

**Attachment 5.2
Radioactive Source Leak Test Record (example)**

Source Information					
Source ID		Isotope		Activity	
Detector Information					
Instrument		Alpha 4-pi efficiency		Surface eff. beta	
Instrument S/N		Beta 4-pi efficiency		MDA alpha (dpm)	
Probe		Bkgnd alpha (cpm)		MDA beta (dpm)	
Probe S/N		Bkgd beta (cpm)		MDA alpha (uCi)	
Calibration Due		Surface eff. alpha		MDA beta (uCi)	
Survey Information					
Survey Date		Activity Type	Alpha or Beta		
Gross cpm		Net cpm			
Activity (dpm)		Activity (uCi)			
Technician (print)					
Technician (signature)			Date:		
Reviewed by (print)					
Reviewed by (Signature)			Date:		