

Laboratory-wide Procedure

Radioactive Source Control



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RADIOACTIVE SOURCE CONTROL

REVISION LOG

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Manual: 15B – Radiation Protection Procedures

1. PURPOSE

This procedure defines and implements the Idaho National Laboratory (INL) exempt and accountable sealed radioactive source accountability and control program requirements and describes the training, acquisition, receipt, registration, labeling, storage, inventory, *source leak testing* (see def.), usage, *transfer* (see def.), *movement* (see def.), disposal, and record keeping requirements associated with sealed radioactive sources.

2. APPLICABILITY

All *accountable sealed radioactive sources* (see def.) and *exempt sealed radioactive sources* (see def.) are subject to accountability and control requirements, and are used, handled, and stored in a manner commensurate with the hazards associated with operations involving the sources.

All sealed radioactive sources are stored in accordance with Laboratory Wide Procedure (LWP)-15011, “Radioactive Material Areas and Radioactive Storage Areas.”

Class I consumer products (see def.) are defined in 10 CFR 30 and are exempt from the requirements of this procedure. Radioactive sources that do not meet the definition of a sealed radioactive source are exempt from the requirements of this procedure and are handled in accordance with the “INL Radiological Control Manual,” LRD-15001.

Sealed radioactive sources (see def.) may also be classified as:

- A. *Radiation generating devices* (see def.) have additional controls administered by LWP-15005, [R1] “Control and Registration of Radiation Generating Devices”
- B. *Nuclear material* (see def.) have additional controls administered by MCP-2752, “Shipments, Receipts, and Transfers of Nuclear Materials,” MCP-2753, “Material Balance Area Custodian Records and Labeling,” MFC Nuclear Material Control Plans and LRD-11500, “Nuclear Materials Management, Control, and Accountability Plan.”

2.1 Prerequisites

- 2.1.1 Radiological Worker I training, Radiological Worker II training, or Health Physics Technician/Radiological Control Technician qualification is required to work with and handle sealed radioactive sources.
- 2.1.2 Prior to accepting responsibility as a Source Custodian for sealed radioactive sources, the individual is required to complete INL Source Custodian training [R2] (00INL171).

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3. ALL EMPLOYEE KEY ACTIONS

Key Actions	Section	Tools
Procurement of Sealed Radioactive Sources a) Person responsible for requesting the sealed radioactive source shall ensure that all applicable fields are filled out in Ibuy, Asset Suite, or other company approved procurement process to ensure proper electronic notifications are made to the Radiological Control Organization.	4.3	Asset Suite, Ibuy procurement system

4. INSTRUCTIONS

4.1 General

4.1.1 Radiological Support Manager: Provide overall coordination and implementation of the INL sealed radioactive source program to meet the requirements of existing state and federal regulations and directives.

4.1.1.1 Designate, in writing to the Radiological Control Director, the Radioactive Source Coordinator and an alternate who will coordinate the INL sealed radioactive source program.

4.1.2 Radioactive Source Coordinator: Assist the Radiological Support Manager with the overall coordination and implementation of the INL sealed radioactive source program.

4.1.3 Facility Radiological Control Management: Ensure qualified health physics technician (HPT)/radiological control technician (RCT) performs and documents radiological surveys in support of *sealed source custodians* (see def.) at the receipt of sources and for semiannual inventories/leak test of accountable sealed radioactive sources at INL facilities.

4.1.4 Line/Program Management: Retain ultimate responsibility for accountability and control of sealed radioactive sources used within their organization.

4.1.4.1 Designate a qualified sealed source custodian(s) in writing to the facility Radiological Control management and the Radioactive Source Coordinator for accountable sealed radioactive sources.

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4.1.4.2 Contact and obtain approval from facility radiological control management and the Radioactive Source Coordinator when planning to bring an accountable sealed radioactive source(s) to an INL facility by a subcontractor, vendor, or visiting scientist. Discuss personnel training, source handling, and source storage plans with the Radioactive Source Coordinator and/or the facility Radiological Control Manager.

4.1.4.3 Ensure personnel involved in the procurement, transfer, and disposal of sealed radioactive sources follow the instructions and complete their responsibilities specified in pertinent sections of this and referenced procedures.

4.1.5 Sealed Source Custodian: Control assigned sealed radioactive sources within the organization, and ensure each semiannual inventory/leak test for accountable sources are completed within the established time frame as directed by the Radioactive Source Coordinator.

4.2 Training

4.2.1 Training Organization: Provide "Source Custodian" training to new sealed source custodians prior to their assuming the duties of source custodian.

4.2.2 Source User: Personnel using or handling sealed radioactive sources are required to have Radiological Worker I or II training or be qualified as a Health Physics Technician or Radiological Control Technician.

4.3 Procurement/Acquisition of Sealed Radioactive Sources

NOTE 1: *Prior to the procurement or acquisition of accountable or exempt quantity sealed radioactive sources, the requestor shall obtain approval from the facility manager and/or the individual responsible for radioactive material inventory for the facility to ensure that a hazard categorization for the facility will be or has been performed per LWP-18002, "INL Facility Categorization," and that the addition of the requested radioactive source will not cause the facility to exceed its categorization.*

NOTE 2: *The sealed source requestor shall notify the INL Radioactive Source Coordinator or alternate source coordinator [R3] in writing prior to the procurement/acquisition of accountable sealed radioactive sources.*

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NOTE 3: *To ensure proper notifications and approvals are made, the sealed source requestor shall verify all applicable fields are completed in Asset Suite, Ibuy, or other company approved procurement process to ensure the proper electronic notifications and approvals are obtained for each source.*

4.3.1 Sealed Source Requestor: Initiate the acquisition (purchase/manufacture or transfers from a NRC licensee or other DOE *complexes* [see def.]) of a sealed radioactive source or equipment containing a sealed radioactive source in accordance with LWP-4001, "Material Acquisitions."

4.3.1.1 Contact the Radioactive Source Coordinator or sealed source custodian for sealed source accountability determination.

4.3.1.2 Determine where the sealed radioactive source will be stored and how it will be controlled.

4.3.1.3 Consider the eventual disposal of the sealed radioactive source (for example, returned to the vendor or placed in radioactive waste).

NOTE: *The actions of the Radioactive Source Coordinator in the next step may be performed by the Radioactive Source Coordinator, the Radioactive Source Coordinator alternate, or the Radiological Support Manager.*

4.3.2 Radioactive Source Coordinator: Review and approve or disapprove the acquisition (purchase/manufacture or transfers from an NRC licensee or other DOE Complexes) of all sealed radioactive sources.

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4.4 Receipt of Sealed Radioactive Sources

WARNING

The contents of damaged packages may be leaking radioactive material.

NOTE: *Prior to bringing a sealed radioactive source into a complex, the requestor shall obtain approval from the complex and or facility manager and the individual responsible for radioactive material inventory for the facility to ensure that a hazard categorization for the facility will be or has been performed per LWP-18002, and the addition of the requested radioactive source will not cause the facility to exceed the categorization.*

4.4.1 Sealed Source Custodian: Notify facility Radiological Control Management and the Radioactive Source Coordinator upon receiving radioactive source(s) and request a *receipt survey* (see def.).

4.4.2 Health Physics Technician/Radiological Control Technician: Survey the packaging of a sealed radioactive source upon receipt of the package. The receipt surveys are completed as soon as the package arrives, not to exceed 8 hours after the beginning of the workday following receipt of the package as detailed in MCP-139[R4], “Radiological Surveys”).

NOTE: *Certain sources may have activities that prohibit a leak test until various permits and approvals are obtained to allow the source to be removed from the packaging. In the event this occurs, the leak test will be obtained when the approvals are given and the source is removed from the shipping container.*

4.4.2.1 Perform a leak test and document on Form 441.87, “Sealed Radioactive Source Leak Test,” as directed in Section 4.11

4.4.3 Sealed Source Custodian: Place the new source, whether exempt or accountable, into a proper storage location and add the new source to the sealed source inventory.

4.4.4 For accountable sealed sources, forward the original Form 441.87, a copy of the shipping papers, and the manufacturers’ source certificate to the INL Source Coordinator.

4.5 Labeling of Sealed Radioactive Sources

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4.5.1 Sealed Source Custodian: With assistance from Radiological Control, ensure all sealed radioactive sources are identified with labels bearing the standard radiation trefoil and the words "Caution, Radioactive Material." Update sealed source labeling to reflect current custodian if custodian ownership changes.

4.5.2 If a sealed radioactive source(s) is located in an area unsafe for human entry or otherwise inaccessible (for example, behind a locked door), indicate the presence of the sealed radioactive source(s) at the posted access points.

NOTE: *Radioactive sources with activity levels less than Appendix B, "Accountable Sealed Radioactive Source Values," shall be labeled as "Exempt Radioactive Source" and do not require the same labeling requirements as an "Accountable Radioactive Source." (See Figure D-8 in Appendix D, "Sealed Radioactive Source Labels," for example of an exempt source label.)*

4.5.3 Sealed Source Custodian: In addition to performing Step 4.5.1 and with assistance from Radiological Control, label all sealed radioactive sources with activity greater than or equal to 10% of Appendix B values and those with activity greater than or equal to 0.1 curies with the following information (see Appendix D), as a minimum:

- A. Unique INL ID number for accountable sources, or "N/A"
- B. Radionuclide(s)
- C. Total activity
- D. Assay date
- E. Manufacturer model and serial numbers of the sealed radioactive source or device (where available)
- F. Sealed source custodian name and telephone number.
- G. Contact radiation levels (taken in the configuration that will result in the most reproducible and measurable radiation levels)
- H. Beta-gamma and alpha removable contamination levels
- I. Date surveyed
- J. HPT/RCT signature.

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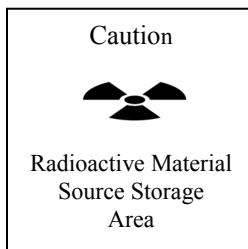
- 4.5.4 If the sealed radioactive source is too small to label, ensure the storage container is labeled with the required information from Step 4.5.3.
- 4.5.5 If the sealed radioactive source is an integral part of a larger piece of equipment, ensure the equipment is labeled in lieu of the radioactive source with label D-2 found in Appendix D, which states: "Installed Radioactive Source, Contact Radiological Control before Opening."
- 4.5.6 If a sealed radioactive source is in storage (removed from service), ensure a "Caution: Integrity Test Required before Use" (see Appendix D, Figure D-5) label is completed and attached on/near the sealed radioactive source or source container.
- 4.5.7 If due to special circumstances, the labeling requirements specified above are not suitable, contact the Radioactive Source Coordinator for assistance.
- 4.5.8 Ensure each source label is properly filled out and updated to reflect the radiological survey date, current source custodian, current radiological data and HPT/RCT signature after each semi-annual leak test.

4.6 Storage of Sealed Radioactive Sources

- 4.6.1 Sealed Source Custodian: Select a suitable sealed radioactive source storage area, and ensure the sealed source storage area is established and posted in accordance with LWP-15011 and MCP-187, "Radiological Control Posting and Labeling."

NOTE: *If the sealed radioactive source is an integral part of a larger piece of equipment, the requirements in 4.6.2 and 4.6.3 do not apply.*

- 4.6.2 As a minimum, all areas where sealed radioactive sources are stored shall be posted as follows:



- 4.6.3 Lock the sealed radioactive source storage area to minimize access.

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- 4.6.4 As a minimum, review Form 441.65, "INL Source Checkout Log," monthly to ensure all sources are accounted for.

4.7 Usage of Sealed Radioactive Sources

- 4.7.1 Sealed Source User (see def.): Follow procedures, radiological work permits, and established radiological controls as required when using sealed radioactive sources.

NOTE: *The loss or damage of any radioactive sources, whether exempt or accountable, shall be reported to the INL Radioactive Source Coordinator or alternate, the Facility Manager and the Facility Radiological Control Manager as soon as it is discovered that the source is missing or damaged.*

- 4.7.2 Sealed Source Custodian: Report to the Radioactive Source Coordinator any change in the status of each accountable sealed radioactive source, such as:

- A. Relocation
- B. Disposal
- C. Loss
- D. Damage
- E. Custodian change
- F. In storage or inaccessible to active status.

- 4.7.3 Sealed Source Custodian: Maintain a current inventory of all sealed radioactive sources. Include the following information, at a minimum:

- A. Identification number
- B. Radionuclide(s) and activity(ies)
- C. Assay date of the activity(ies)
- D. Storage location
- E. Date of last physical inventory
- F. Date of last source leak test (if applicable for accountable sources).

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NOTE: *A barcode system may be used instead of a Source Checkout Log Sheet if the barcode system can provide equivalent information listed below.*

4.7.4 Sealed Source Custodian: Provide a Source Checkout Log Sheet (Form 441.65 or Radioactive Source Coordinator approved equivalent form) at/near each sealed radioactive source storage area.

4.7.5 Sealed Source User: Record information on Form 441.65 or equivalent Source Checkout Log Sheet each time you remove a sealed radioactive source from or return it to its storage area.

NOTE: *Sources being used in a counting instrument may be left unattended for extended periods provided the room with the instrument is locked and properly posted and access to the room is controlled.*

4.7.6 Sealed Source User: If a sealed source is used in an instrument or test configuration for an extended period in which direct custody would be impractical (such as an extended efficiency test), complete the following:

4.7.6.1 Notify the sealed source custodian.

4.7.6.2 Ensure the correct location is identified on the Source Checkout Log Sheet.

4.7.6.3 Maintain responsibility for the sealed source during the extended period.

4.7.7 Sealed Source User: Maintain positive (in your possession or locked up) control of sealed radioactive sources while the sealed sources are checked out.

NOTE: *The responsibility and liability remains with the user taking possession of the sealed source while it is checked out.*

4.7.7.1 If the work area must be evacuated while a sealed source is checked out and it is safe to do so, return the sealed source to its storage area. Do not delay emergency response to return a sealed source to its storage area, unless allowed to by the evacuation order.

4.7.7.2 If you cannot return the sealed source to its storage area during an evacuation, decide whether it is safe to maintain possession of the sealed source or leave the sealed source behind. In either case, minimize radiation exposure to yourself and surrounding personnel and notify the

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Emergency Response Organization of the location and condition of the sealed source.

- 4.7.8 If it is necessary to hand off a sealed source to another sealed source user to meet operational requirements, complete the following:
 - 4.7.8.1 Verify the next sealed source user is currently trained as a Radiological Worker I or Radiological Worker II, or qualified as a Health Physics Technician or Radiological Control Technician.
 - 4.7.8.2 Ensure the person that is accepting responsibility for the sealed source understands the requirements for accountability and control, and for completing the source checkout log when returning the source to the storage area.
- 4.7.9 Sealed Source Custodian/Source User: Close out the current Form 441.65 and initiate a new Source Checkout Log Sheet entry once the last line of the form is completed.
- 4.7.10 Sealed Source Custodian: Review the completed Form 441.65 or equivalent for correctness and sign the completed log pages.
- 4.7.11 Retain completed Form 441.65 or equivalent Source Checkout Log Sheets per section 5.

4.8 Disposal of Sealed Radioactive Sources

NOTE: *Disposal options include (a) permanent offsite transfer, (b) return to the vendor or manufacturer, (c) placement in an appropriate waste stream, (d) method agreed upon by the source custodian, facility radiological control management and the Radioactive Source Coordinator.*

- 4.8.1 Sealed Source Custodian: Initiate the disposal of all sealed radioactive sources that are no longer needed.
 - 4.8.1.1 Notify the Radioactive Source Coordinator if the sealed radioactive source is of value and could be used by others at the INL.
 - 4.8.1.2 Contact the area or facility Waste Generating Services for assistance in determining if a waste stream exists or can be created for the sealed radioactive source.
 - 4.8.1.3 Contact the Radioactive Source Coordinator for assistance in identifying disposal options for sealed radioactive sources

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that cannot be disposed of by the area or facility Waste Generating Services.

- 4.8.2 Notify the Radioactive Source Coordinator in writing (e-mail) of the planned disposal of an Accountable Sealed Radioactive Source. Include the unique identification number of the sealed source identified for disposal and the proposed disposal method.
- 4.8.3 Upon disposal of Accountable Sealed Radioactive Source, complete the source transfer section of Form 441.60, "INL Accountable Radioactive Source Registration or Transfer," and include any pertinent information in the comments section (for example, waste stream, waste container, vendor name, shipping date).
- 4.8.4 For accountable sources, submit the original Form 441.60 to the Radioactive Source Coordinator.
- 4.8.5 Radioactive Source Coordinator: Update the INL Accountable Sealed Radioactive Source Database.
- 4.8.6 Sealed Source Custodian: Update the source inventory to reflect the source disposal.

4.9 Registration of Accountable Sealed Sources

- 4.9.1 Sealed Source Custodian: Complete the registration section (top portion) of Form 441.60 for all accountable sealed radioactive sources.
- 4.9.2 Within 1 month of receiving an accountable sealed radioactive source submit the following to the Radioactive Source Coordinator: **NOTE:**
*Certain sources may have activities that prohibit a leak test until various permits and approvals are obtained to allow the source to be removed from **the** packaging. In the event this occurs, the leak test will be obtained when the approvals are given and the source is removed from the shipping container.*
 - A. The original Form 441.60
 - B. The completed original Form 441.87 (see Section 4.11)
 - C. A copy of the manufacturer's calibration certificate, if available
 - D. A copy of the shipping papers, if available
 - E. A copy of any other manufacturer information, if available.

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NOTE: *Certain sources may have activities that prohibit a leak test until various permits and approvals are obtained to allow the source to be removed from the packaging. In the event this occurs, the leak test will be obtained when the approvals are given and the source is removed from the shipping container.*

4.9.3 Radioactive Source Coordinator: Assign a unique INL number to each accountable sealed radioactive source and notify the sealed source custodian of each number.

NOTE: *Unique INL numbers are not assigned to new exempt quantity sources entering INL. Exempt sources may be identified by the manufactures number or by the source custodian designation.*

4.9.4 Radioactive Source Coordinator: Enter the information for each registered accountable sealed source into the radioactive accountable sealed source database.

4.9.5 Sealed Source Custodian: Update the sealed source inventory with the added accountable sealed radioactive source(s), and ensure the sealed source(s) is labeled in accordance with Step 4.5.

4.10 Accountable Source Semi-Annual Inventory

NOTE: *Although there is no regulatory requirement to perform exempt source inventories, it is recommended that this be performed at least annually to ensure all exempt sources are accounted for.*

4.10.1 Radioactive Source Coordinator: Provide each sealed source custodian with a semiannual inventory notification memo of assigned accountable sealed radioactive sources typically by the first working day of the month in which the inventory is due.

4.10.2 Sealed Source Custodian: Exclude sealed radioactive sources located in areas unsafe for human entry or otherwise inaccessible from the physical inventory.

4.10.3 Verify, with radiological control assistance, required area radiological postings and sealed source labels are in place and are adequate in accordance with Sections 4.5.

4.10.4 Verify that storage locations, containers, and devices are adequate and are appropriate for the type of radiation emitted (for example, borated polyethylene for a neutron sealed source).

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- 4.10.5 Visually verify the physical location and condition of each sealed radioactive source, or use one of the following methods to verify the physical location of a source:
- A. positive reading with a radiation detection instrument near an in-storage sealed source
 - B. verification that no entry was made into the area where the sealed source is in storage
 - C. verification that the tamper-proof seal on a container is unbroken and the seal number is unchanged for an in-storage source.
- 4.10.6 Notify line/program management, facility radiological control management, and the Radioactive Source Coordinator immediately upon determining that a sealed radioactive source is missing, and initiate comprehensive efforts to locate the missing sealed source.
- 4.10.6.1 Line/Program Management: If a sealed radioactive source is reported missing, refer to LWP-9301, "Event Investigation and Occurrence Reporting," for the appropriate investigation, notification, and reporting instructions.
- 4.10.7 Update the data on Form 441.87.
- 4.10.8 Ensure each source label is properly filled out and updated to reflect the leak test date, source custodian, current radiological data and HPT/RCT signature.
- 4.10.9 Update source labels if custodian ownership changes.
- 4.10.10 Sealed Source Custodian: Ensure the following information is recorded on Form 441.87.
- A. HPT/RCT signature(s) and/or initials, radiological control review signature(s), and date(s)
 - B. sealed source information, including location and status
 - C. inventory date and (where applicable) leak test date.
- 4.10.11 Review the inventory cover page statements, and circle responses accordingly. Sign and date every page of Form 441.87 to indicate that the assigned accountable sealed radioactive sources are accounted for and that the accountable sealed source leak testing requirements were met.

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4.10.12 Submit the original inventory cover page and Form 441.87 to the Radioactive Source Coordinator by the due date and retain a copy for reference.

4.10.13 Radioactive Source Coordinator: If any inventory cover pages and Form 441.87 are not received in a timely manner, contact the line/program management for resolution.

4.10.14 Review the inventory results, and update the accountable sealed radioactive source database.

4.11 Source Leak Testing of Accountable Sealed Radioactive Sources

NOTE 1: *Although there is no regulatory requirement to perform leak testing on exempt quantity sources, it is recommended that this be performed at least annually to ensure the integrity of the sealed source.*

NOTE 2: *Certain sources may have activities that prohibit a leak test until various permits and approvals are obtained to allow the source to be removed from the packaging. In the event this occurs, the leak test will be obtained when the approvals are given and the source is removed from the shipping container.*

4.11.1 Sealed Source Custodian: Exclude from this section the following:

- A. Sealed radioactive sources consisting solely of gaseous radioactive material or tritium
- B. Sealed sources located in areas that are unsafe for human entry or otherwise inaccessible
- C. Sealed sources that are “in storage” (removed from service) if the sealed sources are one of the following:
 - 1. Isolated from active sealed sources
 - 2. Adequately packaged to prevent the spread of contamination and stored in a controlled location (see Section 4.6)
 - 3. Labeled “Caution: Integrity Test Required Before Use” (see Appendix D).

4.11.2 Sealed Source Custodian: Ensure accountable sealed radioactive sources are source leak tested at the following times:

- A. After initial receipt at complex or facility

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- B. Before initial use, or when changed from “in storage” (removed from service) to “active” status
- C. At intervals not to exceed 6 months
- D. If dropped and damage is suspected, or other damage may have occurred
- E. If any unexpected measurable radioactive contamination is detected on the sealed source storage container or equipment
- F. If removed from an installed system or instrument
- G. If requested by the Radioactive Source Coordinator or Radiological Control Management.

4.11.3 Assist the HPT/RCT performing the source leak tests.

- 4.11.3.1 Ensure each source label is properly filled out and updated to reflect the radiological survey date, current source custodian, current radiological data and HPT/RCT signature after each semi-annual leak test.

4.11.4 HPT/RCT: Follow the instructions in Appendix E, “Source Leak Test and Dimension Check Methods,” and record the results on Form 441.87.

NOTE: *Although 10 CFR 835 uses a leak test value of 0.005 μCi (11,100 dpm) for a detection level, the Radiological Control Organization has chosen to use more conservative values (LRD-15001, Table 2-2 values).*

4.11.5 Sealed Source Custodian and HPT/RCT: If the removable contamination on the accountable sealed radioactive source exceeds the values in Table 2-2 in LRD-15001, perform the following:

NOTE 1: *In the event that an exempt source is found to be leaking, perform the Steps in 4.11.5.1 through 4.11.5.5 to control the leaking source.*

NOTE 2: *A Radiological Work Permit may be required to perform the following steps.*

- 4.11.5.1 Wear protective gloves when surveying or handling leaking sealed sources.
- 4.11.5.2 Remove the leaking sealed source from service.

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4.11.5.3 Control the sealed source in a manner that prevents the escape of radioactive material to the workplace (such as, wrapping).

4.11.5.4 Notify facility radiological control management and the Radioactive Source Coordinator.

4.11.5.5 Determine whether to decontaminate, repair, or dispose of the sealed source, with Radioactive Source Coordinator concurrence.

4.11.6 Facility Radiological Control Management: Review the leak test results from the semiannual accountable radioactive source inventory sheet to ensure it is correctly recorded and sign for a completed Radiological Control review.

4.11.7 Sealed Source Custodian: Review the semiannual accountable radioactive source inventory sheet leak test results to ensure that the sealed source leak testing requirements have been met, and sign the form.

4.11.8 Submit the original Form 441.87 or accountable semiannual radioactive source inventory sheet to the Radioactive Source Coordinator, and retain a copy.

4.11.9 Radioactive Source Coordinator: Review the sealed source leak test results, and update the accountable sealed radioactive source database.

4.12 Transfer of Accountable Sealed Radioactive Sources

NOTE: *This section applies to sources where the responsibility for the source is permanently transferred to another source custodian.*

4.12.1 Sealed Source Custodian (current): Prior to transferring an accountable source to another custodian, ensure the sealed radioactive source is leak tested (see Section 4.11) prior to transfer.

4.12.2 Sealed Source Custodian (current): Complete the source transfer section (bottom portion) of Form 441.60.

4.12.3 Submit Form 441.60 to the new sealed source custodian for signature along with any paperwork pertaining to each sealed radioactive source (for example, the calibration certificate and original shipping papers).

4.12.4 If the sealed source is being transferred to a new storage area outside the complex boundary, contact Packaging and Transportation (P&T) to initiate the shipment.

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- 4.12.5 Sealed Source Custodian (new): If the sealed source has physically changed locations, notify facility radiological control management upon receiving the sealed source(s) and request a leak test survey.
- 4.12.6 Sign the new sealed source custodian part of Form 441.60, and submit the original Forms (441.60, and 441.87 [if applicable]) to the Radioactive Source Coordinator.
- 4.12.7 Sealed Source Custodians (current and new): Update the accountable sealed radioactive source custodian inventories to reflect the transfer of sources.
- 4.12.8 Radioactive Source Coordinator: Update the accountable sealed radioactive source database.

4.13 Movement of Accountable Radioactive Sealed Sources

NOTE: *This section applies to accountable sealed radioactive sources being sent away for calibration (for example, to the Health Physics Instrument Laboratory [HPIL], vendor, or NIST) for training purposes or on temporary loan (less than 60 calendar days) to another site, facility, or storage area. The sealed source custodian retains ultimate responsibility for controlling accountable sealed sources.*

4.13.1 Offsite Source Movement

- 4.13.1.1 Sealed Source Custodian: Check the sealed source out on Form 441.65 identifying the destination.
- 4.13.1.1.1 If the sealed source is moved for 60 or more calendar days, complete a sealed source transfer (see Section 4.12).
- 4.13.1.1.2 Prior to all accountable sealed radioactive *offsite source movements* (see def.), coordinate or conduct a source leak test (see Section 4.11).
- 4.13.1.2 Sealed Source Custodian: Move the accountable sealed radioactive source to the temporary destination coordinating with Packaging and Transportation (P&T).
- 4.13.1.2.1 Ensure the accountable sealed radioactive source is positively controlled until it leaves the complex boundary.

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4.13.1.2.2 Notify the Radioactive Source Coordinator in writing, of the accountable source movement.

4.13.2 INL Complex Source Movement

- 4.13.2.1 Sealed Source Custodian: Prior to all [R7] INL Complex source movements (see def.) of accountable sealed radioactive source, coordinate or conduct a source leak test (see Section 4.11).
- 4.13.2.2 Sealed Source Custodian (temporary): Check the sealed source out on Form 441.65 identifying the destination.
- 4.13.2.3 Sealed Source Custodian: Coordinate with P&T the shipment of the sealed source (if required).
- 4.13.2.4 Sealed Source Custodian(temporary): Request Radiological Control to perform a receipt and a leak test survey upon arrival.
- 4.13.2.5 Sealed Source Custodian (temporary): Enter the sealed source information on Form 441.65 and update the inventory.
- 4.13.2.6 Sealed Source Custodian (temporary): Return the sealed source to the original sealed source custodian coordinating the shipment with P&T.
- 4.13.2.7 Sealed Source Custodian (temporary): Complete Form 441.65 entry by identifying the accountable sealed radioactive source was returned to the original custodian, and update the inventory.
- 4.13.2.8 Sealed Source Custodian: Upon return of the sealed source, complete the receipt entry on Form 441.65 and update the inventory.

4.13.3 Facility Source Movement [R8]

- 4.13.3.1 Sealed Source Custodian (temporary): Check the sealed source out on Form 441.65 identifying the destination.
- 4.13.3.2 Sealed Source Custodian (temporary): Coordinate with P&T the movement of the sealed source (if required).
- 4.13.3.3 Sealed Source Custodian (temporary): Request Radiological Control to perform a receipt survey.

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- 4.13.3.4 Sealed Source Custodian (temporary): Enter the sealed source information on Form 441.65 and update the inventory.
- 4.13.3.5 Sealed Source Custodian (temporary): Return the sealed source to the original sealed source custodian coordinating the movement with P&T (if required).
- 4.13.3.6 Sealed Source Custodian (temporary): Complete Form 441.65 entry by identifying the accountable sealed radioactive source was returned to the original custodian, and update the inventory.
- 4.13.3.7 Sealed Source Custodian: Upon return of the sealed source, complete the receipt entry on Form 441.65 and update the inventory.

5. RECORDS

Form 441.60, INL Accountable Radioactive Source Registration and Transfer

Form 441.65, INL Source Checkout Log Sheet

Form 441.87, Sealed Radioactive Source Leak Test

Semiannual Inventory Paperwork

NOTE: [*LWP-1202, "Records Management," the INL Records Schedule Matrix, and associated record types list\(s\) provide current information on the retention, quality assurance, and/or destruction moratorium requirements for these records. Contact a Records Coordinator for assistance if needed.*](#)

[LC9][R10]

6. DEFINITIONS

Accountable Sealed Radioactive Source. A sealed radioactive source having a half-life equal to or greater than 30 days and an isotopic activity equal to or greater than the corresponding value provided in Appendix B.

Class I Consumer Products. Consumer products (see def.) consisting of static elimination devices, ion generation tubes, smoke detectors, and other consumer products not listed in *Class II consumer products* (see def.).

Class II Consumer Products. Consumer products consisting of gas chromatographs and other instruments containing byproduct material used for gauging or controlling

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thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.

Complex. Area at INL consisting of a facility or facilities (ATR Complex, MFC etc.).

Consumer Products. For the purposes of this procedure, products that are covered by Nuclear Regulatory Commission (NRC) licenses issued according to 10 CFR 31 (Sections 3 and 5), General Domestic Licenses for Byproduct Material.

Exempt Sealed Radioactive Source. A sealed radioactive source with a half-life less than 30 days or with activity less than the corresponding value provided in Appendix B.

Facility Source Movement. Movement of a sealed radioactive source between facilities located within a complex, where the source does not change custodianship.

INL Complex Source Movement. Sealed radioactive source movement between any complex at INL operated by a single contractor. Example: Moving a source from ATR Complex to MFC. Movement of sealed radioactive sources between operating contractors is not considered to be an INL Complex Source Movement.

Movement. The sealed source is sent to another location without a change in sealed source custodianship. Examples include, sending the sealed source to a calibration laboratory or loaning a source to another custodian temporarily.

Nuclear Material. Material defined by DOE Order that requires safeguards accountability and reporting to the Nuclear Material Management and Safeguards System (NMMSS), which includes americium-241 (Am-241), curium (Cm), berkelium (Bk), californium (Cf-252), deuterium (D), tritium (H-3), lithium-6 (Li-6), neptunium-237 (Np-237), plutonium-238 ... 242 (Pu-238 ... Pu-242), thorium (Th), uranium-233 (U-233), depleted uranium (DU), enriched uranium (U-235), or natural uranium (U).

Offsite Source Movement. The sealed radioactive source is sent to an offsite location (leaves INL boundary) without a change in custodianship. Example: sending the source for calibrations or use in training exercises.

Radiation Generating Device. For the purposes of categorizing a sealed radioactive source as a radiation generating device, the radiation intensity of the unshielded source must equal or exceed 1 rem (10 mSv) in 1 hour when measured at 30 centimeters from the source.

Receipt Survey. Radiological surveys performed on the packaging of a sealed radioactive source upon receipt of the package. The radiological surveys are completed as soon as the package arrives, not to exceed 8 hours after the beginning of the work day following receipt of the package (see 10 CFR 835.405). Receipt surveys are not "Leak Test" surveys.

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Sealed Radioactive Sources. Radioactive sources manufactured, obtained, or retained for the purpose of utilizing the emitted radiation. The sealed radioactive source consists of a known or estimated quantity of radioactive material contained within a sealed capsule, sealed between layer(s) of nonradioactive material, or firmly fixed to a nonradioactive surface by electroplating or other means intended to prevent leakage or escape of the radioactive material. Sealed radioactive sources do not include reactor fuel elements, nuclear explosive devices, and radioisotope thermoelectric generators.

Sealed Source Custodian. An individual who is trained and designated by line/program management to maintain control of assigned sealed radioactive sources.

Sealed Source Users. Personnel that physically handle accountable sealed radioactive sources or portable equipment or devices containing accountable sources. Personnel operating fixed consumer products in non-radiological areas in accordance with the manufacturer's instructions are exempt from source user training.

Site. INL boundary. [R11]

Source Leak Test. Radiological surveys performed to verify the integrity of a sealed radioactive source. Source leak tests should be completed as soon as possible after receipt of the source. Source leak testing of accountable sealed radioactive sources are completed at intervals not to exceed 6 months (see 10 CFR835.1202 (b)).

Transfer. Source custodianship changes, whether or not the sealed source is physically moved.

7. REFERENCES

10 CFR 30

10 CFR 835, Subpart M-Sealed Radioactive Source Control

ANSI N43.6-1997, "Sealed Radioactive Sources - Classification"

Form 441.60, "INL Accountable Radioactive Source Registration or Transfer"

Form 441.65, "INL Source Checkout Log"

Form 441.87, "Sealed Radioactive Source Leak Test"

LRD-11500, "Nuclear Materials Management, Control and Accountability Plan"

LRD-15001, "INL Radiological Control Manual"

LWP-4001, "Material Acquisition"

LWP-9301, "Event Investigation and Occurrence Reporting"

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LWP-15005, "Control and Registration of Radiation Generating Devices"

LWP-15011, "Radioactive Material Areas and Radioactive Storage Areas"

LWP-18002, "INL Facility Categorization"

MCP-187, "Radiological Control Posting and Labeling"

MCP-139, "Radiological Surveys"

MCP-2752, "Shipments, Receipts and Transfers of Nuclear Materials"

MCP-2753, "Nuclear Material Custodian Records and Labeling"

MFC Nuclear Material Control Plans

8. APPENDIXES

Appendix A, Responsibilities

Appendix B, Accountable Sealed Radioactive Source Values

Appendix C, Sealed Radioactive Source Numbering System

Appendix D, Sealed Radioactive Source Labels

Appendix E, Source Leak Test and Dimension Check Methods

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Appendix A**Responsibilities**

NOTE: *The title “Line/Program Management,” as used in this procedure, refers to the individual who is responsible for the program or project in which a sealed radioactive source(s) is used.*

Performer	Responsibilities
Radiological Control Support Manager	Ensure the INL sealed radioactive source program complies with all applicable requirements, and designate the radioactive source coordinator and alternate to coordinate the sealed radioactive source program implementation.
Radioactive Source Coordinator	Coordinate the implementation of the sealed radioactive source program. Maintains the official INL Accountable Source Database.
Line/Program Management	Retain ultimate responsibility for accountability and control of sealed radioactive sources used within the organization.
Facility Radiological Control Management	Provide Health Physics Technician/Radiological Control Technician (HPT/RCT) assistance to sealed source custodians for sealed radioactive source receipt, shipments, and semiannual inventories/leak tests.
Training Organization	Provide qualification training to sealed source custodians and sealed source users, maintain auditable training records, and evaluate training exemptions.
Sealed Source Custodian	Maintain accountability and control of assigned sealed sources, and ensure the semiannual accountable sealed source inventory and leak test is performed and documented.
Sealed Source Requestor	Ensure Radioactive Source Coordinator approval is obtained for new sealed source acquisitions.
Sealed Source User	Check out, use, control and return sealed sources.
Health Physics Technician/Radiological Control Technician	Survey and label sealed radioactive sources. Complete all required documentation.

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Appendix B**Accountable Sealed Radioactive Source Values**

Nuclide	Activity (μCi)	Nuclide	Activity (μCi)	Nuclide	Activity (μCi)
H-3	1.5E+08	Y-88	3.3E+01	Sb-125	6.7E+01
Be-7	3.1E+03	Y-91	5.0E+04	Te-121m	1.8E+02
Be-10	1.4E+05	Zr-88	1.1E+02	Te-123m	2.8E+02
C-14	4.6E+06	Zr-93	9.3E+04	Te-125m	4.4E+02
Na-22	1.9E+01	Zr-95	1.9E+02	Te-127m	8.0E+02
Al-26	1.5E+01	Nb-91	6.9E+01	Te-129m	2.3E+03
Si-32	4.9E+04	Nb-91m	3.6E+02	I-125	3.5E+02
S-35	2.4E+06	Nb-92	1.8E+01	I-129	1.8E+02
Cl-36	5.2E+05	Nb-93m	4.4E+02	Cs-134	2.6E+01
K-40	2.7E+02	Nb-94	2.3E+01	Cs-135	1.3E+06
Ca-41	9.3E+06	Nb-95	3.4E+02	Cs-137	6.0E+01
Ca-45	1.1E+06	Mo-93	7.7E+01	Ba-133	5.1E+01
Sc-46	6.2E+01	Tc-95m	1.3E+02	La-137	2.7E+05
Ti-44	1.5E+02	Tc-97	8.1E+01	Ce-139	2.4E+02
V-49	1.0E+08	Tc-97m	3.5E+02	Ce-141	2.4E+03
Mn-53	7.5E+07	Tc-98	2.5E+01	Ce-144	1.4E+03
Mn-54	6.5E+01	Tc-99	8.4E+05	Pm-143	1.3E+02
Fe-55	2.9E+06	Ru-103	4.4E+02	Pm-144	2.9E+01
Fe-59	1.9E+02	Ru-106	2.5E+02	Pm-145	2.6E+02
Fe-60	8.1E+03	Rh-101	8.7E+05	Pm-146	4.4E+01
Co-56	3.9E+01	Rh-102	3.0E+05	Pm-147	7.7E+05
Co-57	2.3E+02	Rh-102m	6.4E+05	Pm-148m	1.0E+02
Co-58	1.3E+02	Pd-107	9.3E+06	Sm-145	2.4E+06
Co-60	1.7E+01	Ag-105	3.3E+06	Sm-146	4.0E+02
Ni-59	3.2E+06	Ag-108m	1.8E+01	Sm-151	2.5E+05

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Nuclide	Activity (μCi)	Nuclide	Activity (μCi)	Nuclide	Activity (μCi)
Ni-63	1.3E+06	Ag-110m	2.2E+01	Eu-148	1.1E+06
Zn-65	1.1E+02	Cd-109	1.6E+02	Eu-149	1.1E+07
Ge-68	5.6E+02	Cd-113m	2.0E+04	Eu-152	3.1E+01
As-73	5.3E+02	Cd-115m	1.0E+04	Eu-154	3.1E+01
Se-75	6.3E+01	In-114m	7.7E+02	Eu-155	3.6E+02
Se-79	8.7E+05	Sn-113	3.1E+02	Gd-146	5.1E+05
Rb-83	9.1E+01	Sn-119m	3.3E+02	Gd-148	9.0E+01
Rb-84	2.0E+02	Sn-121m	8.1E+05	Gd-151	2.9E+06
Sr-85	1.2E+02	Sn-123	1.3E+04	Gd-153	2.1E+02
Sr-89	4.8E+05	Sn-126	1.8E+02	Tb-157	2.5E+03
Sr-90	3.5E+04	Sb-124	9.1E+01	Tb-158	9.0E+04
Tb-160	1.2E+02	Pb-202	1.9E+05	Am-242m	1.1E+02
Dy-159	1.0E+07	Pb-205	9.0E+01	Am-243	7.3E+01
Ho-166m	2.1E+01	Pb-210	9.2E+01	Cm-241	1.0E+05
Tm-170	8.4E+03	Ra-226	2.2E+02	Cm-242	6.2E+02
Tm-171	2.8E+04	Bi-207	1.7E+01	Cm-243	4.8E+01
Yb-169	5.5E+02	Bi-208	1.5E+01	Cm-244	1.5E+02
Lu-173	1.8E+06	Bi-210m	1.2E+03	Cm-245	5.0E+01
Lu-174	9.3E+05	Po-209	6.3E+03	Cm-246	1.0E+02
Lu-174m	1.0E+06	Po-210	1.2E+03	Cm-247	8.5E+01
Lu-177m	5.8E+01	Ra-228	1.5E+03	Cm-248	2.8E+01
Hf-172	7.3E+04	Ac-227	4.2E+00	Cm-250	5.4E+00
Hf-175	3.0E+06	Th-228	8.4E+01	Bk-247	6.0E+01
Hf-178m	8.7E+03	Th-229	3.1E+01	Bk-249	2.7E+04
Hf-181	3.4E+02	Th-230	5.4E+00	Cf-248	4.4E+02
Hf-182	7.5E+03	Th-232	9.3E+01	Cf-249	5.5E+01
Ta-179	9.3E+06	Pa-231	3.0E+01	Cf-250	1.2E+02
Ta-182	7.3E+01	U-232	1.0E+02	Cf-251	5.3E+01
W-181	1.0E+03	U-233	3.9E+02	Cf-252	5.2E+00
W-185	3.9E+06	U-234	2.9E+02	Cf-254	1.2E+02
W-188	6.3E+04	U-235	6.7E+01	Es-254	6.3E+01

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Nuclide	Activity (μCi)	Nuclide	Activity (μCi)	Nuclide	Activity (μCi)
Re-183	5.3E+02	U-236	3.1E+02	Es-255	8.8E+03
Re-184	2.6E+02	U-238	3.5E+02	Fm-257	5.1E+02
Re-184m	1.5E+02	Np-235	1.1E+02	Md-258	6.1E+02
Re-186m	3.4E+05	Np-236	2.1E+01		
Os-185	1.3E+02	Np-237	4.9E+01		
Os-194	6.4E+04	Pu-236	2.0E+02		
Ir-192	1.3E+02	Pu-237	3.3E+02		
Ir-192m	1.4E+05	Pu-238	9.0E+01		
Ir-194m	2.7E+01	Pu-239	8.4E+01		
Pt-193	8.7E+07	Pu-240	8.4E+01		
Au-195	4.8E+02	Pu-241	4.6E+03		
Hg-194	5.2E+04	Pu-242	8.7E+01		
Hg-203	4.9E+02	Pu-244	9.0E+01		
Tl-204	2.2E+04	Am-241	7.2E+01		

Notes:

The value for any alpha-emitting nuclide not listed above and for mixtures of unknown alpha emitters is 10 μCi .

With the exception of any type of special tritium compound, the value for any non-alpha-emitting nuclide not listed above, and for mixtures of beta emitters of unknown composition, is 100 μCi .

Where there is involved a combination of radionuclides in known amounts, derive the value for the combination as follows: determine, for each radionuclide in the combination, the ratio between the quantity present in the combination and the value otherwise established for the specific radionuclide when not in combination. If the sum of such ratios for all radionuclides in the combination exceeds unity (1), then the accountability criterion has been exceeded. (see 10 CFR 835, Appendix E).

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Appendix C

Sealed Radioactive Source Numbering System

Each accountable sealed radioactive source is identified by a Manufacturer's ID number and a INL unique identification number. This number may consist of an alphabetic letter(s) for the area identification, a number for the source type, the symbol of the primary or most restrictive radionuclide, and up to four additional numbers for identification of the sealed source within its nuclide classification (for example, INL-Am-031 or I-3Ni032). The unique identification number is provided by the Radioactive Source Coordinator. Transferring a sealed source to another facility does not require issuing a new sealed source number (the only requirement is that the identification number be unique). All new accountable sources coming to INL will use (INL) as the prefix for the unique INL number. New exempt sources will use the manufactures number or a number designated by the source custodian for accountability. Sources assigned numbers under a previous numbering system may retain their numbers until further notice.

Area ID Letters ^a		Source Type Numbers ^b	
A	RTC	1	Laboratory Standard ^c
C	CFA	2	Working Standard ^d
H	HPIL	3	Installed/Inaccessible
I	IRC	4	Neutron
MFC	MFC	5	Gamma Radiography
S	SMC	6	Mixed Radionuclide
INL	INL	7	Performance Check/Misc.

a. Additional area ID letters not listed may be used as the need arises.

b. If a source falls into more than one source type, the Radioactive Source Coordinator will decide which type is most appropriate from the information received.

c. A "Laboratory Standard" is a source calibrated by a comparison directly to a national standard.

d. A "Working Standard" is a source calibrated by comparison to a source or standard other than a national standard.

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Appendix D

Sealed Radioactive Source Labels

Labels for sealed radioactive sources are shown below and are available electronically from the Radioactive Source Coordinator. The color scheme is black lettering on a yellow background except for Figure D-5, which has a white background. Other labels (for example, designed to fit source dimensions/area, or an industry standard design) having equivalent information and approved by the Radioactive Source Coordinator may be used.


	CAUTION:
	Radioactive Material
INL ID #: _____	
Radionuclide(s): _____	
Total Activity: _____	
Assay Date: _____	
Mfgr. Model #: _____	
Mfgr. Serial #: _____	
Source Custodian: _____	
Telephone #: _____	
Contact Rad. Level: _____	
Beta/Gamma dpm: _____	
Alpha dpm: _____	
Survey Date: _____	
RCT Sig.: _____	

Figure D-1. Large label.


	CAUTION:
	Radioactive Material
Installed Radioactive Source, Contact RadCon Before Opening	
INL ID #: _____	
Radionuclide(s): _____	
Total Activity: _____	
Assay Date: _____	
Mfgr. Model #: _____	
Mfgr. Serial #: _____	
Source Custodian: _____	
Telephone #: _____	
Contact Rad. Level: _____	
Beta/Gamma dpm: _____	
Alpha dpm: _____	
Survey Date: _____	
RCT Sig.: _____	

Figure D-2. Installed source label.

Contact Rad. Level: _____
Beta/Gamma dpm: _____
Alpha dpm: _____
Survey Date: _____
RCT Sig.: _____

Figure D-3. Large survey update label.



Figure D-4. Trefoil label.

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CAUTION:

Integrity Test Required Before Use

Source Custodian: _____

Telephone #: _____

Figure D-5. Integrity test required label.

 **CAUTION, Radioactive Material**

INL ID #: _____ Nuclide(s): _____

Activity: _____ Assay Date: _____

Mfgr Model #: _____ Mfgr Serial #: _____

Source Custodian: _____ Phone #: _____

Contact Rad. Level: _____

Beta/Gamma dpm: _____ Alpha dpm: _____

Date Surveyed: _____ RCT Sig.: _____


Figure D-6. Small source label.

Contact Rad. Level: _____

Beta/Gamma dpm: _____ Alpha dpm: _____

Date Surveyed: _____ RCT Sig.: _____

Figure D-7. Small survey update label.

 **CAUTION, Radioactive Material**

Exempt Radioactive Source

Nuclide(s): _____

Activity: _____ Assay Date: _____

Mfgr Model #: _____ Mfgr Serial #: _____

Source Custodian: _____ Phone #: _____

Contact Rad. Level: _____

Figure D-8. Exempt radioactive source

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Appendix E

Source Leak Test

1. GENERAL INSTRUCTIONS

- 1.1 Use special care when sealed source leak testing electroplated sources. Damage could occur to the source and/or activity removed due to rough handling. For these sealed sources, a wipe test may be made of the interior of the container and/or around the perimeter of the active source surface.
- 1.2 Use indirect test methods (such as, swiping the exhaust port or sample pathway) for accountable sealed radioactive sources that exceed:
 - A. 100 mrem/hr whole body radiation dose rate
 - B. 500 mrem/hr extremity radiation dose rate.
- 1.3 For sealed radioactive sources located in an inactive sealed source container, shield, or device, perform the source leak test where the contamination is most likely to occur from a failure of the sealed source (for example, exhaust ports of gas chromatography devices).
- 1.4 Do not disassemble an inactive sealed source container, complex device, or instrument for the sole purpose of source leak testing.
- 1.5 Perform a leak test of the sealed radioactive source when the sealed container, instrument, or device is next opened.

NOTE: *Although 10 CFR 835 uses a leak test value of 0.005 μ Ci (11,100 dpm) for a detection level, the Radiological Control Organization has chosen to use more conservative values (RCM Table 2-2 values).*

- 1.6 Ensure the counting instrument used for the source leak test is capable of verifying removable contamination less than the values specified in Table 2-2 of the RCM.
- 1.7 If the removable activity exceeds the values specified in Table 2-2 of the RCM, contain the sealed source and notify the sealed source custodian, facility Radiological Control management, and the Radioactive Source Coordinator immediately.
- 1.8 Record the sealed source leak test results (in net counts per minute) and the counter information on Form 441.87, "Sealed Radioactive Source Leak Test," or the semiannual inventory paperwork provided by the Radioactive Source Coordinator. Include the following items on the semiannual inventory paperwork:
 - A. Source leak test date

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B. “N/A” in the leak test date and in the leak test results when the source is inaccessible or in storage because it has been removed from service.

- 1.9 When two swipe counters are listed on the semiannual inventory paperwork, record the counter used (“A” or “B”) with the source leak test results.
- 1.10 Sign and date Form 441.87.
- 1.11 Have Radiological Control management review the radiological information on Form 441.87 or the semiannual inventory paperwork, and sign and date the paperwork if it is completed correctly.
- 1.12 Update and record radiological information on the sealed radioactive source label after completion of the leak test.
- 1.13 If a sealed source is inaccessible or the sealed source was removed from service, ensure an “Integrity Test Required Before Use” label is attached on/near each sealed source or sealed source location.
- 1.14 If the sealed source leak test methods discussed in this appendix do not apply to a particular sealed source, contact the Radioactive Source Coordinator for direction.

NOTE: *Appendix A of ANSI N43.6-1997, “Sealed Radioactive Sources – Classification,” contains additional source leak test methods.*

2. DIMENSION CHECKS

- 2.1 If a dimension check is to be performed, pass the sealed source through its “test ring” (this metal ring should be kept in the sealed source storage container). Passing through the “test ring” indicates no appreciable swelling.
- 2.2 Notify the sealed source custodian, Radiological Control Management, and Radioactive Source Coordinator when the sealed source does not pass through the “test ring.”

3. RADIUM SEALED SOURCES

- 3.1 When practical, keep a “Microsorban” filter in the sealed source storage container next to the sealed source.
- 3.2 If it is not possible to leave the “Microsorban” filter and the radium sealed source in contact, swiping the sealed source with the filter will suffice, (unless the sealed source is electroplated and should not be contacted directly).
- 3.3 At the time of the leak test, remove the filter and count it with an alpha counter. Place a fresh “Microsorban” filter in the sealed source storage container.

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4. PLUTONIUM-BERYLLIUM, AMERICIUM-BERYLLIUM, AND POLONIUM BERYLLIUM SEALED SOURCES

- 4.1 Swipe the inside of the sealed source storage container and the barrel (sealed source path) with the same swipe material. Use a separate swipe to wipe the sealed source (where accessible).
- 4.2 Count the swipes with an alpha counter.

5. GAMMA RADIOGRAPHY SOURCES

WARNING

Gamma radiography sources produce high radiation fields.

- 5.1 Swipe the inside of the guide tubes and the ends of the cameras using a cotton-tipped swab.

NOTE: *Guide tubes and cameras are often used interchangeably with different sources. Contamination in the guide tube or camera could be from any leaking source or from a contaminated area in which the equipment was used.*

- 5.2 If contamination is present on the swipe, submit the swipe for gamma spectrum analysis to identify the radionuclides.

6. ELECTRON CAPTURE DETECTORS (ECDs)

- 6.1 HPT/RCT: Notify the operator of the intent to perform the sealed source leak test, and obtain assistance from the operator, if necessary.

WARNING

Swiping the active surface of the ECD will spread contamination.

- 6.2 Swipe the accessible portions (inlet and outlet lines) of the ECD housing using swipes and/or cotton swabs.
- 6.3 Submit the sample(s) for analysis by liquid scintillation (or equivalent) low-energy beta sensitivity techniques.