



DOCUMENT NO.: FBP-RP-PRO-00028	REV. NO. 11	EFFECTIVE DATE: <u>12/19/2022</u>
TITLE: Radioactive Source Control	<u>5</u> YR PERIODIC REVIEW DATE: <u>8/3/2026</u>	
	APPROVED BY: DATE: 12/8/2022	Steve Lummer (Signature on File)

USE CATEGORY:	INFORMATION USE	Page 1 of 38
SME: Rob Litten	Writer: Jack Stinson	

Level 2 Administrative Procedure

Revision	Record of Issue/Revision	Affected Pages
11	Revision: Addressed FBP-PR-FY22-2132, FBP-PR-FY23-0066, FBP-PR-FY23-0067 and FBP-PR-FY23-0069. Revised forms F03, F04, and F05.	4-5, 7-8, 11, 17-20, 25, 35-37

Previous Record of Issue/Revision information is available from the history files.

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1.0 PURPOSE

- 1.1** This procedure provides direction and guidance for controlling sealed radioactive sources and sealed radioactive standards that are utilized as sealed sources under the Fluor-BWXT Portsmouth LLC (FBP) Radiation Protection Program where FBP conducts radiological operations for the U.S. Department of Energy (DOE).
- 1.2** As specified in FBP-RP-PL-00002, *Radiation Protection Plan Portsmouth Gaseous Diffusion Plant Piketon, Ohio*, this procedure has been developed to implement applicable requirements from the following:
- Title 10, *Code of Federal Regulations (CFR)*, Part 835, *Occupational Radiation Protection* (10 CFR 835)
 - DOE G 441.1-1C Admin Chg. 1, *Radiation Protection Programs Guide for Use with Title 10, Code of Federal Regulations, Part 835, Occupational Radiation Protection*
- 1.3** This document implements applicable regulatory requirements. They are listed in Appendix A, *Regulatory Requirements Flow Down*.

2.0 SCOPE AND APPLICABILITY

- 2.1** This Level 2 procedure applies to FBP employees and contracted labor resource radioactive source custodians and users.
- 2.2** This procedure does not apply to devices containing radioactive material as an integral part of their function (e.g., smoke detectors, emergency exit markers, welding rods, and other items that are generally licensed by the Nuclear Regulatory Commission) or radioactive material and analytical samples.
- 2.3 Exceptions:**
- Measuring, gauging, or controlling devices
 - This procedure does not apply to radioactive lab standards that are reduced and distributed for other lab uses.
 - This procedure does not apply to sealed radioactive sources belonging to subcontractors except in regards to gaining authorization to bring radioactive sealed sources onsite and reporting the presence of such sources on-site.

3.0 GENERAL INFORMATION

- All sealed radioactive sources utilized by FBP at the site are the property of DOE.
- Within the scope of this procedure, the term “source” will be used interchangeably to describe both traditional sources and radioactive sealed standards that are being utilized as a source.
- All requirements specified in NCSA-PLANT091 are to be followed while storing, handling, or moving radioactive sources.

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- Transporting of accountable sealed sources owned by a contracted labor resource while on-site shall be completed in accordance with FBP-WM-PRO-00272, *On-Site Transportation of Hazardous Materials*, and FBP-RP-PRO-00004, *Release of Material and Equipment from Department of Energy Control*.
- Sealed radioactive sources shall be used, handled, and stored in a manner commensurate with the hazards associated with operations involving the sources.

[10CFR835.1201]

- The Source Custodian and Source Control Coordinator are appointed functional roles and not organizational chart positions or job titles.
- All source storage locations are required to be lockable and are required to be locked when left unattended during non-working hours (off-shift, weekend, etc.).
- All source storage containers that store accountable sources outside the Limited Area (LA) must be locked at all times except when moving sources in or out of the source storage container.
- All accountable source moves in or out of source containers outside the LA must be tracked/logged to document their movement. This log should include source ID, date/time, user, and location.
- To support easier, faster, and clearer forms, source control database report generation is preferred (usually). All forms generated by the database with pre-filled information are identified as “equivalent”.

4.0 USE REFERENCES

- A. 10 CFR 835 Appendix E, *Values for Establishing Sealed Radioactive Source Accountability and Radioactive Material Posting and Labeling Requirements*
- B. FBP-BS-PRO-00062, *Records Management Process*
- C. FBP-QP-PRO-00020, *Problem Reporting and Issues Management*
- D. FBP-RP-PRO-00004, *Release of Material and Equipment from Department of Energy Control*
- E. FBP-RP-PRO-00022, *Posting and Labeling*
- F. FBP-RP-PRO-00023, *Radiation Protection Program Records*
- G. FBP-RP-PRO-00036, *Radiological Surveys for the Receipt, Transport, and Movement of Radioactive Materials*
- H. FBP-WM-PRO-00090, *Waste Generation*
- I. FBP-WM-PRO-00272, *On-Site Transportation of Hazardous Materials*

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5.0 RESPONSIBILITIES

5.1 Radiation Protection Manager (RPM)

- 5.1.1 Makes regulatory notifications of missing or leaking accountable radioactive sources.
- 5.1.2 Allows only FBP or those holding a valid nuclear materials license to purchase a radioactive source for use at FBP-managed projects on behalf of the DOE.
- 5.1.3 Reviews for approval all requests for source storage locations outside the LA.

5.2 Source Control Coordinator (SCC)

- 5.2.1 Reviews and approves acquisitions and uses of sealed radioactive sources.
- 5.2.2 Coordinates the acquisition of sealed sources that are addressed by the criteria of Appendix C, *NCSA-PLANT091 Special Nuclear Material Limits*, Table 1 and Table 2 of Limits to be maintained in accordance with Nuclear Criticality Safety Approval (NCSA) PLANT091 requirements.
- 5.2.3 Evaluates the licensee's procedures for the use and control of radioactive sources.
- 5.2.4 Supports the Radioactive Source Registry Tracking System (RSRTS).
- 5.2.5 Coordinates the database, inventory tracking, leak testing, and overall disposition of all radioactive sealed sources under FBP control.
- 5.2.6 Reviews information supplied by the respective source vendor to determine if source leak checking requirements are above and beyond 10 CFR 835 are requirements specified in this procedure.

5.3 Radiation Protection Supervisor

- 5.3.1 Directs the performance of radioactive source receipt surveys.
- 5.3.2 Directs the performance of radioactive source leak checks.
- 5.3.3 Notifies the RPM of leaking or missing sources.
- 5.3.4 Assists the SCC with identifying information for all survey documents associated with source receipt and leak checking activities.
- 5.3.5 Reviews new source storage locations and provides suitability determination to the SCC.

5.4 Radiological Control Technician (RCT)

- 5.4.1 Performs source receipt surveys.
- 5.4.2 Performs source leak tests.

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5.4.3 Performs source storage location assessment surveys.

5.5 Contract Technical Representative (CTR)

5.5.1 Requests approval from Radiation Protection before vendors or contractors bring radioactive sources onsite.

5.5.2 Requests approval from Nuclear Criticality Safety (NCS) before vendors or contractors bring radioactive special nuclear material onsite.

5.5.3 Ensures Radiation Protection Section Manager (RPSM) is informed of all radioactive sealed source disposition changes associated with the project.

5.6 Purchasing

5.6.1 Notifies the SCC of the shipping date and, if known, the shipping company's tracking number for the purchase of any sealed radioactive source.

5.6.2 Notifies Radiation Protection and Transportation if source shipments will be placarded Radioactive Material as described in FBP-RP-PRO-00036, *Radiological Surveys for the Receipt, Transport, and Movement of Radioactive Materials*.

5.7 Shipping and Receiving

5.7.1 Takes possession of the radioactive source packages when the carrier offers it for delivery.

5.7.2 Notifies the Radiation Protection Supervisor of the delivery for the initiation of a receipt survey.

5.7.3 Stores radioactive sources appropriately (e.g., radioactive material area [RMA]) until they can be delivered to the Source Custodian.

5.7.4 Arranges delivery of radioactive sources to the requestor source custodian.

5.7.5 Supports the radioactive source disposal process when requested by Source Custodians.

5.8 Waste Management

5.8.1 Disposes properly of radioactive sealed sources according to applicable site procedures.

5.8.2 Provides the SCC with documentation of final disposition of all disposed of sources.

5.9 Source Custodian

5.9.1 Maintains required qualifications.

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- 5.9.2** Ensures proper control and security is maintained for radioactive sources in their custody.
- 5.9.3** Ensures all assigned radioactive sources are labeled with proper information to facilitate source tracking and inventory as specified by this procedure (this includes on initial arrival and also on an ongoing basis).
- 5.9.4** Maintains and completes inventories of assigned radioactive sources as required.
- 5.9.5** Coordinates with Radiation Protection to ensure required integrity (leak) tests of assigned radioactive sources are conducted.
- 5.9.6** Requests radiological work permits (RWPs) when applicable.
- 5.9.7** Notifies the SCC if source information supplied by the source vendor specifies source leak checking requirements that are above and beyond 10 CFR 835 guidance specified in this procedure.

5.10 NCS

Approves source storage locations for sources controlled by NCSA-PLANT091.

5.11 Source User

- 5.11.1** Maintains required qualifications.
- 5.11.2** Ensures proper control and security is maintained for radioactive sources in their custody.

5.12 Transportation Specialist

Evaluates sources as regulated or unregulated and provides movement and/or shipment guidance in accordance with Transportation procedures.

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6.0 ACTIONS

6.1 Notifications and Documentation

Source Custodian

6.1.1 Notify Radiation Protection **prior** to any of the following:

- Major changes in radiological conditions (e.g., that could cause an RWP change in the use of a sealed radioactive source)
- Transfer to a new permanent storage location
- Modification of a device containing a sealed radioactive source
- Disposal or offsite transfer of a radioactive source
- Any procurement or acquisition of additional radioactive sources
- Transfer of a radioactive source to a new source custodian

6.1.2 Notify Radiation Protection of lost, damaged, or potentially leaking sealed radioactive sources.

6.1.3 Notify and provide a copy of all source documentation to Radiation Protection for any new sealed source.

6.1.4 Request source labels from Radiation Protection for newly acquired sources and sources needing a label replacement.

CTR (or Designee)

6.1.5 Request approval from Radiation Protection **before** vendors or contractors bring radioactive sources onsite.

6.1.6 Request approval from NCS **before** vendors or contractors bring radioactive special nuclear material onsite.

6.1.7 Do not bring sources on the Portsmouth Gaseous Diffusion Plant (PORTS) controlled by NCSA-PLANT091 if the source exceeds the mass control limits for the nuclides listed in Appendix C, Table 2, unless the sources are covered by a different NCSA.

NCSA-PLANT091

6.1.8 Ensure cognizant RPSM is notified of all radioactive sealed source relocations on site (greater than one shift) and before their removal from site.

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6.2 Approval of Acquisition and Receipt of Sealed Radioactive Sources

Source Custodian

- 6.2.1** Complete and submit FBP-RP-PRO-00028-F01, *Approval for Radioactive Sources*, to the SCC and receive written approval for contract labor resource personnel to bring a radioactive source onsite.
- 6.2.2** Document on the requisition whether the item contains a sealed source that is above the quantities listed in 10 CFR 835 Appendix E, *Values for Establishing Sealed Radioactive Source Accountability and Radioactive Material Posting and Labeling Requirements*.

NOTE

Sources containing more than one nuclide shall be limited to twice the lowest applicable mass for the nuclides present.

NCSA-PLANT091

- 6.2.3** Do not purchase sources controlled by NCSA-PLANT091 or brought on site that exceed twice the mass control limit stated in Appendix C, Table 2.
NCSA-PLANT091
- 6.2.4** Arrange for and track training for the source(s) if required.
- 6.2.5** Contact the RPSM to determine the need for the creation of a Radiological Evaluation and/or RWP for accountable sources.
- 6.2.6** Ensure that radioactive source controls in the technical work documents associated with the work (e.g., As Low as Reasonable Achievable [ALARA] Review and nuclear soil density/moisture testing procedure) are included.
- 6.2.7** Arrange for proper labeling, storage, inventory, and leak testing for the source(s).
- 6.2.8** Route the approval form and the purchase requisition (if applicable) for sealed radioactive sources through the SCC. Include a statement in the purchase requisition that sources delivered without prior notice of shipment will be refused and returned to the shipper at the shipper's expense.

SCC

- 6.2.9** Review and approve all acquisitions and uses of sealed radioactive sources that are subject to this procedure.
- 6.2.10** Evaluate the procedures for the use and control of approved radioactive sources and designate additional radiological controls specified by the respective RPSM or Radiation Protection Supervisor that may be required to ensure compatibility with site emergency procedures (e.g., criticality warnings and hung sources) before allowing subcontractors to bring radioactive sources onsite.

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6.2.11 Review specific source information supplied by the source vendor to determine if there are source leak checking requirements that are above and beyond 10 CFR 835 guidance specified in this procedure.

6.2.12 Have the capability of printing an inventory of source storage areas containing sources controlled by NCSA-PLANT091.

NCSA-PLANT091

6.2.13 Obtain an NCS review and approval to designate and approve special nuclear material source storage areas.

NOTE

Commensurate training must be completed before any sources are delivered to the custodian(s).

6.2.14 Verify completion of training for the source custodian.

Purchasing

6.2.15 Notify the SCC and the requesting source custodian of the shipping date and, if known, the shipping company's tracking number.

6.2.16 Notify Radiation Protection and Transportation if source shipments will be placarded Radioactive Material as described in FBP-RP-PRO-00036.

Radiation Protection

6.2.17 **IF** shipment is placarded as Radioactive Material, **THEN** perform receipt surveys as specified in FBP-RP-PRO-00036 including a neutron survey for sources that contain a neutron emitter (e.g., Cf-252 and Am-Be).

Shipping and Receiving

6.2.18 Take possession of the package when the carrier offers it for delivery and immediately notify the SCC and the cognizant Radiation Protection Supervisor of the delivery.

6.2.19 Arrange for the completion of a receipt radiation survey of the package(s) containing the source shipment.

NOTE

Sources do not require RAM labeling in Shipping & Receiving. They will be labelled individually as sealed sources according to this procedure.

6.2.20 Arrange for the proper temporary storage of source packages that require storage in an RMA.

6.2.21 Arrange for delivery of all radioactive sources after the receipt survey is complete.

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6.2.22 Notify the requesting source custodian of the delivery schedule of the source(s).

NOTE

When sources controlled by NCSA-PLANT091 are removed from a storage area they are not required to be logged out or back in unless moved to a new storage area.

NCSA-PLANT091

Source Custodian

- 6.2.23** Obtain a source control number from Radiation Protection, and label the source and container if not previously labeled.
- 6.2.24** Complete FBP-RP-PRO-00028-F02, *Radiation Protection Radioactive Source Receipt*, when new sources are purchased and if the pertinent information cannot be derived from the source certificate.

6.3 Labeling Radioactive Sources

Source Custodian

- 6.3.1** Label all radioactive sources to avoid loss or unauthorized usage. **IF** the source is too small or the dose rate too high to handle safely, **THEN** coordinate labeling the source container with the SCC.
- 6.3.2** Label all sealed radioactive sources that have activities greater than 10 percent of those listed in 10 CFR 835 Appendix E.

[10CFR835.606(a)(2)]

NOTE

Radioactive material labels applied to sealed radioactive sources may be excepted from the color specifications of 10 CFR 835.601(a), i.e., trefoil in black or magenta imposed upon yellow background.

[10CFR835.606(b)]

6.3.3 Ensure the labels are consistent with the requirements in FBP-RP-PRO-00022, *Posting and Labeling*, and contain the following information:

[10CFR835.605]

- The words “CAUTION RADIOACTIVE MATERIAL” or a standard radiation symbol
- Radionuclide
- Source activity
- Date of assay (when available)
- Serial number of the source (when available)

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- 6.3.4** Label the case or shield of sources that are sealed into a capsule or disk form and are mounted in a lead case or shielded holder with the words, “Radiological Controls Required Prior to Opening,” or equivalent.

6.4 Storing Accountable Radioactive Sources

Source Custodian

NOTE

All source storage locations are required to be lockable and are required to be locked when left unattended during non-working hours (off-shift, weekend, etc.).

All source storage containers that store accountable sources outside the LA must be locked at all times except when moving sources in or out of the source storage container.

All accountable source moves in or out of source containers outside the LA must be tracked/logged to document their movement. This log should include source ID, date/time, user, and location.

- 6.4.1** Designate and obtain Radiation Protection and SCC approval for accountable radioactive source storage locations.
- 6.4.2** Designate and obtain RPM and SCC approval for accountable radioactive source storage locations outside the Limited Area.
- 6.4.3** Select storage locations such that:
- The radiation level does not exceed an average of 50 $\mu\text{rem/hr}$ general area in continuously occupied areas.
 - Individual exposures are not unnecessarily increased and ALARA practices are employed.
 - Meet the spacing requirement as specified in Step 6.4.18.
- 6.4.4** Store each plutonium source when not in use in a closed container designed and constructed to contain plutonium that might otherwise be released during storage.
- 6.4.5** Post source storage containers in accordance with FBP-RP-PRO-00022.
- 6.4.6** Label the storage cabinet, “CAUTION RADIOACTIVE MATERIAL,” as applicable.
- 6.4.7** Ensure storage rooms or cabinets containing sealed radioactive sources are lockable, monitored routinely, locked when outside the Limited Area, and posted properly.

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NOTE

Concurrence must occur before the source relocation. Email concurrence with the SCC is acceptable with follow-up FBP-RP-PRO-00028-F03, *Notification of Custodial or Storage Location Transfer of Radioactive Sources*.

- 6.4.8 Obtain concurrence from the SCC to relocate a source prior to a new permanent storage location, and complete FBP-RP-PRO-00028-F03 at the time of relocation.
- 6.4.9 Arrange for an RCT to survey source storage locations prior to their initial use and whenever changes of status (additional sources added to location, personnel moved in closer proximity to cabinet, etc.) could affect the radiological conditions for the presence of surface contamination and for radiation levels that have changed significantly or that exceed postings.
- 6.4.10 **IF** the storage area contains fissile material, **THEN** post the area in accordance with NCSA-PLANT091 posting.
NCSA-PLANT091
- 6.4.11 Ensure Radioactive source storage locations with sources controlled by NCSA-PLANT091 are approved by NCS.
- 6.4.12 Handle or transport/use individual sources or groups of sources controlled by NCSA-PLANT091 that equal or exceed the mass control limits specified in Appendix C, Table 2, as fissile material.
NCSA-PLANT091
- 6.4.13 Ensure source storage areas containing sources controlled by NCSA-PLANT091 and greater than the limits specified in Appendix C, Table 2, have a sign posted on or near the source storage area with wording similar to that shown in Appendix D, *NCSA-PLANT091 Posting*.
NCSA-PLANT091

NOTE

Criticality Accident Alarm System coverage is required for source storage areas containing sources controlled by NCSA-PLANT091 and greater than the limits specified in Appendix C, Table 2.

NCSA-PLANT091

- 6.4.14 Ensure the total mass of an individual source containing nuclides controlled by NCSA-PLANT091 does not exceed twice the mass control limit for the applicable nuclide listed in Appendix C, Table 2.

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- 6.4.15** Ensure individual sources containing more than one nuclide (as defined in Appendix C, Table 2) are limited to twice the lowest applicable mass for the nuclides present.

NCSA-PLANT091

NOTE

Individual or groups of sources less than the mass control limits (sealed or unsealed) stated in Appendix C, Table 2, are not required to be stored as fissile material.

- 6.4.16** Store individual sources or groups of sources controlled by NCSA-PLANT091 that equal or exceed the mass control limits specified in Appendix C, Table 2, as fissile material.

NCSA-PLANT091

- 6.4.17** **IF** sources controlled by NCSA-PLANT091 are grouped together, **THEN** limit individual sources or groups of sources in mass such that the lowest mass limit given in Appendix C, Table 1, for the nuclides present is not exceeded.

NCSA-PLANT091

- 6.4.18** Space sources or groups of sources (sealed or unsealed) as allowed in Appendix C, Table 1, with mass above the control limit specified in Appendix C, Table 2, at least 2 feet (24 inches) from each other and all other fissile material (except for sources being added or removed from a group).

NCSA-PLANT091

- 6.4.19** **WHEN** sources controlled by NCSA-PLANT091 are removed from a storage area, **THEN** do not require them to be logged out or back in unless moved to a new storage area.

NCSA-PLANT091

- 6.4.20** **IF** left unattended, **THEN** keep radioactive sources in a locked cabinet or secured storage area unless the source is contained in an instrument or other equipment.

WARNING

Do not store flammable material in radioactive source storage cabinets. A storage location should not unnecessarily increase exposures to individuals in the area.

- 6.4.21** Select storage locations for radioactive sources such that in continuously occupied controlled areas the radiation level shall not create radiation areas.

- 6.4.22** Store radioactive sources only in areas designated by the radioactive source custodian responsible for the sources and approved by Radiation Protection.

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SCC

- 6.4.23** IF a new radioactive source is placed in an approved permanent radioactive source storage location, or an old source is transferred or removed for disposal, **THEN** update the source inventory list with information supplied by the Source Custodian.

NOTE

FBP-RP-PRO-00028-F03 is shown in Attachment C.
 FBP-RP-PRO-00028-F03 is typically a computer generated form generated by the Radiation Protection Source Control Data Base.

Source Custodian

- 6.4.24** IF a radioactive source is to be transferred to another storage location or radioactive source custodian, **THEN** complete FBP-RP-PRO-00028-F03.

SCC

- 6.4.25** Maintain a list of current radioactive source storage locations.
- 6.4.26** Maintain an inventory of NCS approved storage locations for sources controlled by NCSA-PLANT091.

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6.5 Source Leak Testing

Radiation Protection Supervisor/RCT

NOTE

Non-accountable (exempt) sealed radioactive sources need not be leak tested. However, exempt sealed radioactive sources and the individuals using them are still subject to all other applicable requirements of 10 CFR 835 (radioactive material control, posting and labeling, radiation safety training, etc.).

Accountable (non-exempt) sealed radioactive sources are not subject to periodic source leak testing if they have been removed from service. However, unless leak testing is precluded by other radiological safety considerations, these sources should be leak tested periodically to determine the condition of the source. Such sources shall be stored in a controlled location, subject to periodic inventory, and subject to source leak testing prior to being returned to service.

[10CFR835.1202(c)]

The SCC will review specific source information supplied by the source vendor to determine if there are source leak check requirements that are above and beyond 10 CFR 835 guidance specified in this procedure.

- 6.5.1** Perform leak testing using the dry swipe method unless a wet swipe or immersion testing is approved by the RPM or delegable authority.

NOTE

The six-month time interval may be extended by a period not to exceed 30 days to accommodate scheduling needs with written approval (e.g., email) from the SCC.

[10CFR835.3(e)]

- 6.5.2** Perform leak testing on accountable sealed radioactive sources/standards upon receipt, when damage is suspected, at least once every six months, when transferring offsite, as recommended by the vendor, and before disposition except for the following sources:

[10CFR835.1202(b)]

- Containing Tritium
- Gaseous radioactive material
- Sources are located in an area that is unsafe for human entry or are otherwise inaccessible

[10CFR835.1202(d)]

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- Sources that have been taken out of service or dispositioned for disposal and are stored in approved storage locations (such sources shall be leak tested prior to being returned to service)

NOTE

Sources/standards containing Tritium (H-3), require additional Radiation Protection controls and the issuance of a RWP for the work evolution.

- 6.5.3** Confirm source leak tests are capable of detecting radioactive material leakage of $\geq 0.005 \mu\text{Ci}$ (11,100 dpm). [10CFR835.1202(b)]
- 6.5.4** **IF** any of the following is suspected, **THEN** immediately perform a leak test:
- Source damage or leakage
 - Any abuse that may have compromised integrity
 - Abnormal source check readings
 - Elevated contamination levels detected when handling equipment or storage areas that are not attributed to another radiation source
- 6.5.5** Swipe the area of the holder where the contamination would be most likely to occur for sources that are mounted and enclosed in a shielded holder and that would require disassembly to access the source for leak testing.
- 6.5.6** **IF** a source isotope in Appendix B, *Nuclides Difficult to Measure with Survey Instruments*, is to be tested, **THEN** consider using a low background high-efficiency counting system to analyze smears.
- 6.5.7** Perform source leak checks as follows for plutonium sources:
- Obtain a standard smear paper and wet it with water.
 - Smear the external surfaces of the source holder.
 - Dry the smear.
 - Count the smear for alpha contamination.
- 6.5.8** **DO NOT** directly wipe the active surface of electroplated sources when testing for leakage. Dry swipe the area directly around the active area of the source instead.
- 6.5.9** Complete the leak test form FBP-RP-PRO-00028-F04, *Leak Checks Due*, and attach all supporting survey data.
- 6.5.10** Provide associated survey information and leak test form to the SCC for database updating and filing.

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Source Custodian

6.5.11 Coordinate with Radiation Protection to ensure all scheduled source leak checks are performed as required.

6.6 Handling Leaking Sources

Source Custodian/User

6.6.1 IF a source is suspected to be leaking, **THEN** discontinue using the source and control it in a manner that minimizes the spread of radioactive contamination.
[10CFR835.1202(e)]

6.6.2 Notify the Radiation Protection Supervisor and the source custodian immediately for evaluation.

Radiation Protection Supervisor

6.6.3 Notify the SCC and the RPM of the details of the leaking source including all leak checking results surveys.

6.7 Exempt and Accountable Source Inventory

Source Custodian/User

NOTES

The six-month time interval may be extended by a period not to exceed 30 days to accommodate scheduling needs when approved by the SCC.
[10CFR835.3(e)]

An accountable sealed radioactive source is not subject to periodic inventory if that source is located in an area unsafe for human entry or otherwise inaccessible.
[10CFR835.1202(d)]

Accountable sealed radioactive sources taken out of service and secured in long term storage in a fixed location are required to be inventoried. If these sources are sealed in a container with a tamper indicating device or similar, the inventory can be completed based on the container inventory.
[10CFR835.1202(c)]

Non-accountable (exempt) sealed radioactive sources taken out of service and secured in long term storage in a fixed location including being identified for disposal are NOT required to be inventoried.

6.7.1 Using a current list of sources required for inventory, perform a physical inventory every six months; check each source for the following:
[10CFR835.1202(a)]

- Source control ID number

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- Physical location of source
- Adequacy of storage locations, containers, and devices
- Presence and adequacy of postings and labels
- General condition of the source

6.7.2 Immediately report any discrepancies to the SCC for resolution.

NOTE

Source inventory can be delegated by the source custodian. The delegate must sign the “Inventoried By:” block on the inventory form. The source custodian must sign as source custodian. If source custodian completes the inventory, “N/A” can be recorded in the “Inventoried By:” block, and signed as source custodian.

6.7.3 Check each source on FBP-RP-PRO-00028-F05, *Radioactive Sealed Source Inventory*, “SAT (Y/N)”.

6.7.4 Return the completed inventory to the SCC as soon as practicable during the month the inventory is due.

NOTE

Sources are not considered to be lost if they are recovered within one work shift (10 hours), and therefore are not considered to be reportable.

6.7.5 **IF** a source is missing, **THEN** initiate a search for the lost source.

- A.** Notify the Radiation Protection Supervisor.
- B.** Initiate a search for the lost source.
- C.** Contact all source users as necessary.
- D.** **IF** source is not located within 10 hours of the initial loss or within the current shift, **THEN** generate a Problem Report according to FBP-QP-PRO-00020, *Problem Reporting and Issues Management*.

RPM

6.7.6 **WHEN** notified that an accountable source cannot be found or is leaking, **THEN** initiate the required regulatory notifications.

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NOTE

When the source storage areas contain sources controlled by NCSA-PLANT091 the database will maintain the following:

- Source ID
- Controlled nuclides
- Fissile mass (including uncertainty)

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6.8 Source Use and Handling

Source Custodian

NOTE

All single accountable radioactive sources or collections of sources that have a cumulative activity that exceeds 10 CFR 835, Appendix E exemption levels are to be transported in accordance with FBP-WM-PRO-00272.

To reduce the possibility of loss or damage during transport, sources should be carried in a larger secure container such as a lock box, zip-loc bag, etc.

- 6.8.1 DO NOT** transport accountable sealed radioactive sources outside the limited area without approval by Site Transportation.

NOTE

The X-752 Scrapyard and X-326 are examples of Property Protection Areas where radioactive sources may be utilized outside the LA.

- 6.8.2 IF** accountable radioactive sources are to be moved and/or used outside the LA, **THEN:**

- A. Coordinate with the SCC.
- B. Acquire documented approval, (e.g., email), from Radiation Protection and Transportation.
- C. Ensure that an approved storage location is in place with proper postings and security.

- 6.8.3 DO NOT** transport sources on or offsite utilizing a personal vehicle.

- 6.8.4 DO NOT** transport fissile material (including other groups of sources) with a safe group of sources (as allowed by Table 1, Appendix C).

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Source User

- 6.8.5** Use, handle, and store radioactive sources in a manner that is commensurate with the hazards associated with the operations involving the sources.
[10CFR835.1201]
- 6.8.6** **DO NOT** touch or abrade the active area of any sealed source.
- 6.8.7** **DO NOT** clean the active area of any sealed source without Radiation Protection approval.
- 6.8.8** Verify all accountable sources are physically present by radiation readings or visually present before and after transport to storage locations.
- 6.8.9** Ensure sources transported over public highways are controlled in accordance with FBP-RP-PRO-00036.
- 6.8.10** Return sources to their designated storage areas and containers by the end of each work shift.
- 6.8.11** Store accountable sources that are removed from service in an approved location, inventoried every six months, and subject to leak testing prior to being returned to service.
[10CFR835.1202(c)]

6.9 Radioactive Source Registry Tracking System (RSRTS)

SCC

- 6.9.1** List International Atomic Energy Agency Category 1 and Category 2 sources in the RSRTS.
- 6.9.2** Provide reconciliation information for any transactions of Category 1 or Category 2 sources to the respective DOE officer within the first three weeks of the calendar year.

6.10 Source Disposal

Source Custodian

- 6.10.1** Coordinate the disposal of radioactive sources with Waste Management.
- 6.10.2** Notify the SCC of source disposal arrangements to coordinate source inventory reconciliation.
- 6.10.3** Dispose of source in accordance with FBP-WM-PRO-00090, *Waste Generation*, or FBP-WM-PRO-00329, *Waste Generation Under Activities Governed by Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)*, as applicable.

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- 6.10.4 Retain accountable sources on the source inventory until they leave the site.
- 6.10.5 Obtain SCC concurrence for disposal and/or offsite removal of all radioactive sources ensuring that those actions are in accordance with site requirements.

Waste Management

- 6.10.6 Facilitate the process to dispose of sources with source custodians.
- 6.10.7 Provide the SCC with documentation of final disposition of all disposed of sources.

6.11 Relocating Radioactive Sealed Source

Source Custodian

NOTE

To reduce the possibility of loss or damage during transport, sources should be carried in a larger secure container such as a lock box, Zip-loc bag, etc.

- 6.11.1 Transport all single accountable radioactive sources or collections of sources that have a cumulative activity that exceeds 10 CFR 835, Appendix E exemption levels in accordance with FBP-WM-PRO-00272.
- 6.11.2 **DO NOT** transport accountable sealed radioactive source outside the LA without approval by Site Transportation. See Step 6.8.2 for use and/or storage of sources outside the LA.
- 6.11.3 **DO NOT** transport sources on or offsite utilizing a personal vehicle.
- 6.11.4 Store sources in approved locations at all times when not in use.

NOTE

Source storage locations must be approved by the SCC or Radiation Protection management.

- 6.11.5 **WHEN** transferring sources to another location, **THEN** confirm the location is an approved source storage location and is appropriately marked.

NOTE

The source transfer form (FBP-RP-PRO-00028-F03 or equivalent) and the actual transfer must be completed on the same shift. A pre-printed transfer form can be supplied by the SCC for a source or group of sources that requires only a signature.

- 6.11.6 **WHEN** sources are relocated for longer than one work shift, **THEN** complete FBP-RP-PRO-00028-F03 and supply the information to the SCC.

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6.11.7 **WHEN** transporting sources or groups of sources, **THEN do not** transport other fissile material (including other groups of sources) with a safe group of sources (as allowed by Table 1, Appendix C).

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6.11.8 Ensure all relocation of sources off site are processed according to the guidance of FBP-RP-PRO-00004.

6.12 Transferring Radioactive Sealed Sources to Another Custodian

Source Custodian

NOTE

A pre-printed transfer form can be supplied by the SCC for a source or group of sources that requires only the Source Custodian's signature. Sources remain the responsibility of the original custodian until FBP-RP-PRO-00028-F03 is signed by both the receiving custodian and the SCC.

Transfer sources between custodians using FBP-RP-PRO-00028-F03.

6.13 Source Custodian/User Training

Source Users

6.13.1 Complete and maintain Radiological Worker training before using sealed radioactive sources.

Source Custodian

6.13.2 Complete the following requirements prior to working as a source custodian:

- Complete and maintain Radiological Worker training or equivalent.
- Confirm you have read and understand this procedure.
- Confirm you have read and understand NCSA-PLANT 091.
- Complete FBP-RP-PRO-00028-F06, *Radioactive Source Custodian Required Reading*, and return to SCC for approval.

7.0 RECORDS

7.1 Records Generated

- A. FBP-RP-PRO-00028-F01, *Approval for Radioactive Sources*
- B. FBP-RP-PRO-00028-F02, *Radiation Protection Radioactive Source Receipt*

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- C. FBP-RP-PRO-00028-F03, *Notification of Custodial or Storage Location Transfer of Radioactive Sources*
- D. FBP-RP-PRO-00028-F04, *Leak Checks Due*
- E. FBP-RP-PRO-00028-F05, *Radioactive Sealed Source Inventory*
- F. FBP-RP-PRO-00028-F06, *Radioactive Source Custodian Required Reading*
- G. Radiological surveys other than those that are documented through the Radioactive Check/Calibration Source Sign-Out sheets

7.2 Requirements

- 7.2.1 Manage records generated or received as a result of performing this procedure in accordance with FBP-BS-PRO-00062, *Records Management Process*.
- 7.2.2 Maintain records generated by this procedure in accordance with FBP-RP-PRO-00023, *Radiation Protection Program Records*.

[10CFR835.704(f)]

8.0 DEFINITIONS/ACRONYMS

8.1 Definitions

- A. **Accountable (Non-Exempt) 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 E of 10 CFR 835.
- B. **Non-Accountable (Exempt) Sealed Radioactive Source** - A sealed radioactive source that does not meet the accountability criteria established in the definition of the term “Accountable Sealed Radioactive Source” provided in 10 CFR 835.2.
 - **IF** a sealed radioactive source contains more than one radionuclide, **THEN** the sum-of-the-fractions rule (i.e., $A_1/Q_1 + A_2/Q_2 + \dots \leq 1$; where A is source activity and Q is the accountability value for the radionuclide) shall be used to determine if the source is accountable (10 CFR 835, Appendix E, Footnote 1). For radionuclides that are not listed in Appendix E, 10 CFR 835 provides values of 10 microCuries for alpha emitters and 100 microCuries for all other radionuclides.
- C. **Sealed Radioactive Source** - A radioactive source consisting of a known or estimated quantity of radioactive material contained within a sealed capsule, sealed between layer(s) of non-radioactive material, or firmly fixed to a non-radioactive surface by electroplating or other means intended to prevent leakage or escape of the radioactive material. Lab Standards are not considered Sealed Radioactive Sources.

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- D. Sealed Radioactive Standard** - A radioactive lab standard consisting of a known or estimated quantity of radioactive material within a securely sealed container that is to be utilized as a sealed reference source. Lab standards that are permanently sealed and are to be utilized as sealed radioactive sources are within the scope of this procedure.
- E. Source Custodian** - Radiological Workers who are responsible for physical control and physical inventory of the assigned radioactive sources.
- F. Source Users** - Radiological Workers who use radioactive sources in the course of their work and typically work under the direction of a source custodian.
- G. Special Nuclear Material** - Plutonium, uranium-233, uranium enriched in the isotope 235 and any other material which pursuant to 42 U.S.C. 2071 (section 51 as amended of the Atomic Energy Act of 1954) that has been determined to be special nuclear material but does not include source material or any material artificially enriched by any of the forgoing not including source material (DOE O 410.2).

8.2 Acronyms

- A. ALARA** – As Low as Reasonably Achievable
- B. CFR** – Code of Federal Regulations
- C. CTR** – Contract Technical Representative
- D. DOE** – Department of Energy
- E. FBP** – Fluor-BWXT LLC Portsmouth
- F. LA** – Limited Area
- G. NCS** – Nuclear Criticality Safety
- H. NCSA** – Nuclear Criticality Safety Approval
- I. RCT** – Radiation Control Technician
- J. RMA** – Radioactive Material Area
- K. RPM**– Radiation Protection Manager
- L. RPSM** – Radiation Protection Section Manager
- M. RSRTS**– Radioactive Source Registry Tracking System
- N. RWP** – Radiological Work Permit
- O. SCC**– Source Control Coordinator

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9.0 SOURCE REFERENCES

- A. 10 CFR 835, *Occupational Radiation Protection*
- B. DOE G 441.1-1C Admin Chg 1, *Radiation Protection Programs Guide for Use with Title 10, Code of Federal Regulations, Part 835, Occupational Radiation Protection*
- C. DOE O 231.1B Chg. 1, *Environment, Safety and Health Reporting*
- D. DOE O 410.2, *Management of Nuclear Materials*
- E. FBP-RP-PL-00002, *Radiation Protection Plan Portsmouth Gaseous Diffusion Plant Piketon, Ohio*
- F. NCSA-PLANT 091, *Handling and Storing of Sources and Standards*
- G. POEF-FBP-010, *Transportation Safety Document for the On-Site Transport of Hazardous Material at the Portsmouth Gaseous Diffusion Plant Piketon, Ohio*

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Appendix A
REGULATORY REQUIREMENTS FLOW DOWN

1. 10 CFR 835 Appendix E, *Values for Establishing Sealed Radioactive Source Accountability and Radioactive Material Posting and Labeling Requirements*
2. 10 CFR 835 Subpart M, *Sealed Radioactive Source Control*
3. DOE O 231.1B, Chg 1. *Environment, Safety and Health Reporting*
4. DOE O 410.2, *Management of Nuclear Materials*

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Appendix B
NUCLIDES DIFFICULT TO MEASURE WITH SURVEY INSTRUMENTS

Nuclide	$T_{1/2}$	Decay	Field Measurement Problem	Recommended Analysis
C-14	5730 y	β^-	Weak β	PC ⁽¹⁾
S-35	87.4 y	β^-	Weak β	PC
Mn-54	313 d	EC ⁽²⁾ , γ	Weak e^- ⁽³⁾	γ spec
Fe-55	2.7 y	EC	Weak e^-	γ spec
Co-57	271 d	EC, β^+ , γ	Weak e^-	γ spec
Co-58	70.8 d	EC, β^+ , γ	Weak e^- , few β ⁽⁴⁾	γ spec
Ni-63	100 y	β^-	Weak β	PC
Zn-65	244 d	EC, β^+ , γ	Weak e^- , few β	γ spec
Cd-109	464 d	EC, γ	Weak e^- , few γ	γ spec
Ag-110m	250 d	β ⁽⁵⁾ , γ	Few β	γ spec
I-129	1.57E7 y	β , γ	Weak β	PC
Ba-133	10.5 y	EC, γ	Weak e^-	γ spec
Pm-147	2.62 y	β^-	Weak β	PC
Gd-148	97.5 y	α	Weak α	PC
Gd-150	1.78E8 y	α	Weak α	PC
Gd-152	1.1E14 y	α	Weak α	PC
Eu-152	13.6 y	EC, γ	Weak e^- , few β	γ spec or PC
Yb-169	32 d	EC, γ	Weak e^-	γ spec or PC

1. Proportional counter; liquid scintillation may be used for radionuclides emitting weak β
2. Electron capture
3. Low energy mono-energetic Auger or conversion electrons
4. Infrequent (<0.5) betas per disintegration
5. EC and β^- decay nuclides accompanied by weak or infrequent electron or beta emissions; also low energy alpha emitters

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Appendix C
NCSA-PLANT091 SPECIAL NUCLEAR MATERIAL LIMITS

Table 1

Nuclide	Maximum Allowed Mass Limit (g) (including uncertainty)	Activity μ Curies
²³³ U	248.67	2.41e6
²³⁵ U	350.00	7.56e2
²³⁹ Pu	207.23	1.28e7
²⁴¹ Pu	92.10	9.48e9
^{242m} Am	5.99	5.82e7
²⁴³ Cm	41.45	2.14e9
²⁴⁵ Cm	13.82	2.37e6
²⁴⁷ Cm	414.45	3.84e4
²⁴⁹ Cf	4.61	1.89e7
²⁵¹ Cf	2.3	5.22e6

Note: For sources or groups of sources, containing more than one nuclide the most restrictive mass shall be used.

Table 2

Nuclide	Mass Control Limit (g) (including uncertainty)	Activity μ Curies
²³³ U	8.64	8.36e4
²³⁵ U	15.00	3.24e1
²³⁹ Pu	7.20	4.46e5
²⁴¹ Pu	3.20	3.30e8
^{242m} Am	0.20	1.94e6
²⁴³ Cm	1.44	7.43e7
²⁴⁵ Cm	0.48	8.24e4
²⁴⁷ Cm	14.40	1.34e3
²⁴⁹ Cf	0.16	6.55e5
²⁵¹ Cf	0.08	1.27e5

Note: For sources or groups of sources, containing more than one nuclide the most restrictive mass shall be used.
For uranium sources containing ²³⁵U to be controlled, it must also have an enrichment of at least 1% wt% ²³⁵U.

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**Appendix D
NCSA-PLANT091 POSTING**

Post a sign containing similar wording near or on the source storage area if the storage area contains fissile material.

FISSILE SOURCE STORAGE AREA

Nuclide	Maximum Allowed Mass Limit (g) (including Uncertainty)
^{233}U	248.67
$^{235}\text{U}^*$	350.00
^{239}Pu	207.23
^{241}Pu	92.10
$^{242\text{m}}\text{Am}$	5.99
^{243}Cm	41.45
^{245}Cm	13.82
^{247}Cm	414.45
^{249}Cf	4.61
^{251}Cf	2.30

*For sources containing ^{235}U to be controlled, it must also have an enrichment of at least 1 wt% ^{235}U .

Note: For sources or groups of sources, containing more than one nuclide the most restrictive mass shall be used to determine the maximum allowed mass.

Maintain at least 2 foot (24 inches) spacing between safe groups of sources and all other fissile material (except when adding/removing sources from a group).

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**Attachment A
APPROVAL FOR RADIOACTIVE SOURCES**



APPROVAL FOR RADIOACTIVE SOURCES

Source Information			
Source Description:			
Intended Use:			
10 CFR 835 Appendix E Accountable?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Vendor:		Vendor Contact #	
Expected Arrival Date:		Procurement (PR#):	
Physical Form:	<input type="checkbox"/> Solid	<input type="checkbox"/> Liquid	<input type="checkbox"/> Gas
Storage Location:			
Describe Storage Container:			
Comments:			
Source Custodian			
Source Custodian Name:		Badge No.	
Organization:		Phone:	
Approval			
Source Control Coordinator Signature:		Date:	

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APPROVAL FOR RADIOACTIVE SOURCES
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APPROVAL FOR RADIOACTIVE SOURCES

This form is submitted to the source control coordinator for approval by the project that is receiving the source, at least 24 hours prior to the expected date of arrival of a subcontractor's source onsite, and prior to initiating procurement of any FBP radioactive source. Use the following information as a guide in completing the form. Completed forms can be delivered or faxed to the appropriate source custodian.

Source Description: Identify the size (e.g., 1/4-in. diameter × 2-in. long), shape, (e.g., disk, cylinder, foil), and construction (e.g., stainless steel, aluminum, epoxy, electroplate) of the source.

Intended Use: List the planned use for the source while it is onsite (e.g., calibrate instrumentation, radiography, re-assay).

Isotope: List the source's isotope. If the source is a mixed source, include all of the isotopes, e.g., 137Cs, 241Am.

Activity/Date: Provide the source activity at the time of assay, in units of μCi , and the date of assay.

Serial Number(S/N): List the serial number of the source, as provided by the manufacturer.

Source ID: Leave blank; the source custodian will fill this in.

Vendor: List the vendor and/or manufacturer that is supplying the source.

Procurement (PR#): List the Purchase Requisition and/or Purchase Order associated with the source(s).

10 CFR 835 Appendix E Accountable: Are the source(s) at or above the respective isotopic threshold listed in 19835 appendix E.

Expected Arrival Date: Identify the date that the source(s) is expected to arrive on site.

Source Custodian/Badge No.: Identify the name and badge number of the qualified individual who is responsible for the source while it is onsite. Note that the custodian **MUST** be a qualified source custodian identified by the site Source control Coordinator.

Organization/Phone: Include this information for the individual who is identified as source custodian.

Physical Form: Check the box that indicates the physical state of the radioactive material.

Storage Location: List the building and the room where the source will be stored. **NOTE:** The storage location **MUST** be a valid storage location approved by the Source Control Coordinator.

Describe Storage Container: Identify the container that houses the source during storage (e.g., drum, cask, pig, cabinet, safe). If the source is a component of a device or an analytical instrument, identify the device or instrument, including the model design.

Comments: Provide any additional information that may prove beneficial in approving the source(s). Attach any vendor information and/or certificates for the respective sources.

Approval: The signature of the Source Control Coordinator or RPM is required prior to bringing any radioactive source onto any FBP project or site.

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**Attachment B
RADIATION PROTECTION RADIOACTIVE SOURCE RECEIPT**



Radiation Protection Radioactive Source Receipt

General Information							
Purchase Order Number (if new source):							
Source Control Tracking No.:			HP Tracking No.:				
Date Received:		Time Received:		Receipt HP Survey No.			
Surveyor's Name:			Surveyor's Badge No.:				
Manufacturer:		Manufacturer Serial No.:		Manufacturer Model No.			
Are the shipping papers attached? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> See Section 3 Notes							
Shipping Company: <input type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> RPS <input type="checkbox"/> Other							
Visible Signs of Damage to Package? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> See Section 3 Notes							
Manufacturer Leak Test Certificate Included? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> See Section 3 Notes							
Date of Manufacturer Leak Test Certificate:			Dept./Contractor Using Source:				
Dept./Contractor Contact (Source Custodian)			Telephone:				
Estimated Time Onsite:	<input type="checkbox"/> < 60 Days <input type="checkbox"/> > 60 Days Specify:						
Source Information							
Isotope		Quantity (μCi):		Isotope:		Quantity (Quantity (μCi):	
Isotope		Quantity (μCi):		Isotope:		Quantity (Quantity (μCi):	
Isotope		Quantity (μCi):		Isotope:		Quantity (Quantity (μCi):	
Total Radioactive Quantity (μCi):			Assay Date:				
If sealed, is semi-annual leak test required? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> See Notes Section							
Is the source accountable? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> See Section 3 Notes							
Is source NIST traceable? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> See Section 3 Notes							
Physical Form: <input type="checkbox"/> Solid <input type="checkbox"/> Liquid <input type="checkbox"/> Gas <input type="checkbox"/> Electroplated <input type="checkbox"/> Anodized <input type="checkbox"/> Other (<i>specify</i>)							
Notes							
Signatures							
Form Completed By:				Badge No.		Date:	
Reviewed by Source Custodian				Badge No.		Date:	
Received by Source Coordinator				Badge No.		Date:	

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**Attachment F
RADIOACTIVE SOURCE CUSTODIAN REQUIRED READING**



Radioactive Source Custodian Required Reading

Acceptance Statement			
I _____ <i>(Print Name)</i>	Badge:		
Have read and understand(check each):			
<input type="checkbox"/> FBP-RP-PRO-00028, "Radioactive Source Control"			
<input type="checkbox"/> NCSA PLANT091.A00, "Handling and Storing of Sources and Standards"			
<input type="checkbox"/> Have completed and will maintain Radiological Worker Training			
New Custodian Information			
Name:			
Badge:	Phone:		
Cell:	Organization:		
Signatures			
Signature:	Date:		
Source Control Coordinator:	Date:		