Fermilab	ES&H Section Procedures	
Procedure Number/Name ESH-RPO-SOURCE-05 Radioactive Source Leak Testing and Inventory Verification Procedure		**Effective Date:** 2/18/2021
Written by: Kathy Graden	**Reviewed and Updated By:** Kathy Graden	**Revision:** 2

Radioactive Source Leak Testing and Inventory Verification Procedure

Approvals

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Revision History

Author	Description of Change	Revision Number	Revision Date
K. Graden	Editorial changes	0	2/25/2016
K. Graden	Changes include incorporation of ESH&Q Section procedure template, new numbering system, and editorial changes	1	1/10/2017
K. Graden	Incorporation of procedure into ESH RPO template. Editorial changes	2	2/18/2021

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Procedure

1.0 Purpose

This procedure describes how to conduct monthly and semi-annual radioactive source leak testing and inventory Verification.

2.0 Scope

This procedure is limited to leak testing and inventory verification of radioactive sources only.

3.0 Summary

10 CFR Part 835, Subpart M, Sealed Radioactive Source Control and FRCM Chapter, Part 3, Radioactive Source Controls specify the requirements for radioactive source leak testing and inventory verification. This procedure provides step by steps procedures.

4.0 Definitions

N/A

5.0 Responsibilities

5.1 The ES&H Section RPO Department Program Coordinator/Source Physicist is responsible to complete the updates to Oracle APEX database, create and distribute inventory reports, and complete the monthly accountability report.

5.2 The ES&H Section Hazard Control Technology Team (HCTT) Source Technician and Source Technician Backup are responsible to conduct routine leak testing and inventory verification of sealed radioactive sources in source boxes and on loan (except sources that are installed in detector apparatus or otherwise inaccessible).

6.0 Health and Safety Warnings

Personnel performing steps of this procedure may come into contact with contaminated and/or potentially contaminated radioactive sources. As such, proper precautions should be taken to reduce the spread of radioactive contamination and prevent personnel contamination.

7.0 Material, Equipment & Training Needed

7.1 Material & Equipment Required

- Copies of Radiation Physics (R.P.) Form #67, Sealed Source Inventory Log Sheet. A blank form is located on DocDB here: https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=1313
- Gloves
- Writing utensils
- Contamination wipes and envelopes
- Dosimetry badge and ring badge

7.2 Training Required

- Radiological Worker Training (FN000470 and FN000471) or DOE Core Academics for RCTs (FN000277) and RCT Continuing Training and Requalification (FN000300)
- Radioactive Source Training (FN000048)
- Sealed Source Leak Testing and Inventory Verification (ES000270)

8.0 Procedural Steps

8.1 Generate and Provide Field Copy Inventory List

8.1.1 Generate an Oracle APEX Field Copy Inventory List. See ESH-RPO-SOURCE-02, Fermilab Radioactive Sources Database Entry Procedure, Inventory Lists, and Accountability Report, Section 8.9.5 to generate a Field Copy inventory list. This procedure is located on DocDB here: https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=2139.

8.2 Radioactive Source Leak Testing and Inventory Frequency

8.2.1 Leak testing and inventory verification of sealed radioactive sources located source boxes, RCT sources, and source check stations are inventoried monthly. Sources that are installed in detector apparatus or otherwise inaccessible are not leak tested.

8.2.2 Sealed neutron sources located at Cave 1 of the Radiation Physics Calibration Facility (RPCF) are inventoried and leak tested and inventoried monthly.

8.2.3 Radioactive sources in storage at Site 40 source room safe, sources located at RPCF, and sources at the Radionuclide Analysis Facility (RAF) are leak tested and inventoried every six months. Site 40, RPCF, and RAF locations comprise Radiation Physics Storage (RPS) sources.

8.3 Radioactive Source Leak Testing and Inventory Step By Step Instructions

Sealed radioactive source leak tests are performed using a cotton disk called a wipe. In most cases, leak testing consists of wiping the outside of a holder or capsule containing the source material. Alpha-emitting sources are very delicate, and the foil surface of the source capsule can be easily torn or damaged by an ordinary cotton wipe. Therefore, care must be taken to wipe only the surface around the alpha-emitting source material or the holder containing the source capsule.

8.3.1 Prepare two sets of wipes. One set is for alpha sources and one set is for beta-gamma sources.

8.3.2 Number the wipes in each set in sequential order. Alpha wipes should be designated with an “A” such as 1A, 2A, 3A, etc.

8.3.3 Obtain an up-to-date FIELD COPY inventory printout from the Source Physicist.

8.3.4 Obtain several blank Sealed Source Inventory Log sheets (R.P. Form # 67). This blank form is located on DocDB here: https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=1313

8.3.5 Obtain a source box master override key.

8.3.6 Wear both a dosimetry badge and a TLD finger ring when leak testing radioactive sources.

8.3.7 The person conducting the leak testing must put on gloves when leak testing alpha sources.

8.3.8 Segregate the sources into two groups - alpha sources and beta-gamma sources.

8.3.9 Visually inspect each source for damage and improper labeling. If a source appears damaged, is improperly labeled, or if the metal tag connected to the source is damaged, collect the source and document this on the Sealed Source Access Log (R.P. form # 37). The blank form is located on DocDB here: https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=1302

8.3.10 Use a new wipe at each source storage location. Change wipes after leak testing about 5 beta-gamma sources. If any set of five beta-gamma source wipe results show contamination, re-wipe each source with the group with one wipe per source. Submit individual wipes to the RAF. In this way, the leaking source will be identified.

8.3.11 Use a separate alpha wipe for each alpha source. Do not wipe the foil surface. Wipe the source holder only.

8.3.12 Indicate whether the wipes being taken are for beta-gamma or alpha on the source inventory log. Record alpha source wipes on a separate source inventory log sheet.

8.3.13 Record the wipe number, source ID, and source location on the source inventory log. As applicable, draw an arrow under each location to indicate all other sources that are being leak tested and inventoried at that same location.

8.3.14 Check the box on the sealed source inventory log to indicate if a source is on loan, in Radiation Physics Storage, or inventoried and not wiped because it is installed in detector apparatus or otherwise inaccessible.

8.3.15 Verify that area postings where sealed sources are used and stored are correct. All access points where sealed sources are used and stored must be posted with "Caution, Radioactive Material" and "Caution, Controlled Area." Source boxes containing sealed sources must be labeled "Caution, Radioactive Materials." Note whether or not postings are correct on the source inventory log.

8.3.16 Verify that sealed source storage locations, source boxes, and sealed source storage devices comply with Fermilab source program policies. Note this on the source inventory log.

8.3.17 The logger prints his/her initials in the last column of the source inventory log.

8.3.18 Upon completion of leak testing at each location, conduct a hand frisk using a portable GM instrument with a thin window such as a Frisker or a Minimeter.

8.3.19 Remove and discard gloves.

8.3.20 Print and sign names at the bottom of the source inventory log.

8.3.21 Complete RAF Wipe Count Request Form (R.P. Form # 43) and turn in wipes for counting. The blank form is located on DocDB here: https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=1305. I

8.4 RAF Wipe Results that Indicate Leaking Source(s)

8.4.1 If any radioactive sources are flagged or exceed limits on RAF wipe results report, all sources within the group of beta-gamma wipes or individual alpha sources must be re-wiped and re-submitted to the RAF.

8.4.2 Under the direction of the Source Physicist, source decontamination may be attempted. Source decontamination is conducted in accordance with the Site 40 Source Room general RWP.

8.4.3 Any sources found leaking after the second RAF wipe result will be removed from service. Leaking sources are placed in a dedicated disposal container.

8.4.4 The Source Physicist designates leaking sources as "Disposed" in the Oracle APEX database.

9.0 Data and Records Management

ESH-RPO-SOURCE-05, Sealed Radioactive Source Leak Testing and Inventory Verification Procedure, https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=155.

Completed source inventory log sheets are saved electronically with RAF wipe results.

10.0 Quality Assurance/Quality Control

This procedure is subject to a review/update frequency requirement of five years and is due 2/2026.

11.0 References

Fermilab Radioactive Sources Database Entry Procedure, Inventory Lists, and Accountability Report https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=2139.

Radiation Physics Form #37, Fermilab Radioactive Source Access Log, https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=1302

Radiation Physics Form #43, RAF Wipe Count Request Form, https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=1305

Radiation Physics Form #67, Source Inventory Log, https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=1313

12.0 SOP Signature Sheet

N/A. Training described in section 7.2 is tracked in TRAIN.

13.0 Procedure Specific Training Checklist

N/A. Training described in section 7.2 is tracked in TRAIN.

14.0 Attachments

N/A