1. **Purpose:** The purpose of this SOP is to provide guidance for the required leak testing and inventorying of medical and non-medical sealed sources, including GLDs, and managing the associated documentation.

2. **Scope:** EHS staff should use this SOP to review the requirements for leak testing sealed sources.

3. **Definitions:**

   3.1 GLD – Generally Licensed Devices (GLDs) are devices containing radioactive material and are typically used to detect, measure, gauge, or control the thickness, density, level, or chemical composition of various items. Examples of such devices are gas chromatographs (detector cells), density gauges, fill-level gauges, and static elimination devices [10 CFR 31.5].

   3.2 MDA – Minimum Detectable Activity (MDA) is the minimum detectable (quantifiable) activity in dpm at a specified confidence level. Conversion factors may be applied to convert dpm to other activity units (µCi, Bq, etc).

   3.3 RML – Radioactive Materials License issued by the Nuclear Regulatory Commission (NRC).

   3.4 Sealed Source - any byproduct material that is encased in a capsule designed to prevent leakage or escape of the byproduct material [10 CFR 35.2].

4. **Procedure Details:**

   4.1 All individuals performing leak tests must have sufficient training, including approval as a Radiation Worker and function specific training for performing leak tests.

   4.2 Leak tests should be conducted at 6-month intervals unless Sealed Source and Device Registration certificates or license tie-downs indicate a different frequency [10 CFR 35.67] [NRC RML Condition 14A].

   4.2.1 In the absence of a certificate, a sealed source should be leak tested before use and at 6-month intervals.

   4.2.2 Sealed sources that are designed to primarily emit alpha particles must be tested for leakage and/or contamination at intervals not to exceed 3 months [NRC RML condition 14B]. This does not apply to medical sealed sources described in 10 CFR 35.

   4.2.3 GLDs should be leak tested at 6-month intervals unless the device label indicates a different frequency [10 CFR 31.5(c)(2)].

   4.3 Prepare a wipe sample (cotton swab, filter paper, etc.) for each sealed source.

4.4 Wipe the most accessible area where contamination would accumulate if the sealed source were leaking,

4.4.1 Do not wipe the surface of a plated or foil source, as this could cause the removal of source material.

4.5 Use the proper equipment when analyzing leak test samples:

4.5.1 Analyze in a low-background area.

4.5.2 Determine the sensitivity of the instrument (from documentation or by calculating the MDA). MDA should be <0.005 µCi in order to detect removable contamination above regulatory limits [10 CFR 35.67(c)] [NRC RML Condition 14G].

4.5.3 Use an instrument that is appropriate for the type of radiation to be measured. In general, photon emissions are best counted on a NaI or other gamma counter. Beta and alpha emissions are best counted on a liquid scintillation counter; however, a proportional counter may have appropriate counting efficiencies for certain radionuclides.

4.6 Count each sample and determine the net count rate for each sample.

4.7 Use the counting efficiency of the instrument to calculate the estimated activity of each sample.

4.8 If the activity of a sample is greater than 0.005 µCi, notify the Radiation Safety Officer so that the NRC can be notified and the source can be withdrawn from use and disposed of properly [10 CFR 35.67(e)(2)] [NRC RML Condition 14G].

4.9 Keep a record of the leak tests results (in units of activity) for 3 years. The leak test record must include the following information [10 CFR 35.2067] [NRC RML Condition 14I]:

4.9.1 Manufacturer's name and model number.

4.9.2 Serial number if one has been assigned.

4.9.3 Identity of each source by radionuclide and estimated activity.

4.9.4 Results of the leak test.

4.9.5 Date of the leak test.

4.9.6 Name of individual who performed the test.

4.10 The following sealed sources are exempt from leak testing [10 CFR 35.67(f)] [NRC RML Condition 14E]:

4.10.1 Sources containing only H-3. This does not apply to medical sealed sources describe in 10 CFR 35.

4.10.2 Sources containing only byproduct material with a half-life of less than 30 days.

4.10.3 Sources containing only byproduct material as a gas.

4.10.4 Sources containing 100 µCi or less of beta or gamma-emitting material or 10 µCi or less of alpha-emitting material.

4.10.5 Seeds of Ir-192 encased in nylon ribbon [10 CFR 35.67(f)(4)].

4.10.6 Sources stored and not being used (sources must be tested for leakage before any use or transfer unless it has been leak tested within 6 months before the date of use or transfer – this includes sources that are being shipped back to a vendor). Sources stored for a period of more than 10 years must be tested for leakage and/or contamination (excluding medical sources used under 10 CFR 35).

4.11 In addition to leak testing, the licensee shall conduct a physical inventory every 6 months to account for all sealed sources and/or devices received and possessed under the license. A leak test counts as inventorying for purposes of this requirement. Records of physical inventory must be retained for three years and must include the following [NRC RML Condition 17] [10 CFR 35.2067(b)]:

4.11.1 Manufacturer's name and model number.

4.11.2 Serial number if one has been assigned.

4.11.3 Identity of each source by radionuclide and estimated activity.

4.11.4 Date of the inventory.

4.11.5 Name of individual who performed the inventory.

4.12 NRC exempt sources of radioactive material do not need to be leak tested or inventoried.

5. References:

5.1 10 CFR 35.67 – Requirement for Possession of Sealed Sources and Brachytherapy Sources.

5.2 10 CFR 35.2067 – Records of Leak Tests and Inventory of Sealed Sources and Brachytherapy Sources.

5.3 NUREG-1556, Volume 11, Revision 1, Appendix M – Model Leak Test Program (2017).

5.4 NRC RML #24-00513-32 Amendment 128 (can be superseded by more current amendments)

5.5 NRC tie-down document

6. Revisions

6.1 Rev 01 – 2023-4-1 – New SOP.

6.2 Rev 02 – 2024-1-25 – Added item 4.12 and changed the title of the SOP.