



Technical Safety



RADIATION PROCEDURES MANUAL

Procedure Cover Sheet

Procedure Title: Sealed Source Leak Tests

Procedure Number: TSO-08-04-REV 1

Effective Date: September 1, 2008

Approved By: Richard R. Bey Date: 19 May, 2009
Technical Safety Office Director



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A. INTRODUCTION

The ISU Broad-scope radioactive material license requires that sealed sources of radioactive material be tested for leakage at regular intervals to verify the integrity of the source containment and, in the unlikely event of failure, to detect the escape of radioactive material before serious contamination of facilities, equipment, or personnel occurs. Leak tests are performed by the Technical Safety Office on a semi-annual basis (June and December).

Sealed sources **do not** need to be leak checked only if 1) they are composed of only ^3H or a radioactive gas, 2) they have a half-life less than or equal to 30 days, 3) they contain less than 100 μCi of beta and/or gamma emitting material, or 4) they contain less than 10 μCi of alpha emitting material. A leak test shall be capable of detecting the presence of 0.005 μCi of radioactive material on the swipe paper. If swipe analysis reveals the presence of 0.005 μCi or more of removable contamination, a report shall be filed with the NRC in accordance with 10 CFR 30.50(c)(2), and the source shall be removed immediately from service and decontaminated, disposed of or repaired.

B. PURPOSE

This procedure specifies criteria and methods for performing leak tests of sealed sources in accordance with regulatory requirements and ISU Broad-scope license conditions.

C. REQUIRED MATERIAL(S)

Previous leak test inventory worksheet
Transportation forms for the previous 6 months
Radionuclide package arrival reports for the previous 6 months
Contamination swipes and related equipment
Ring badge

D. PROCEDURE

Leak tests at ISU consist of 4 steps: preparation, taking contamination swipes, swipe analysis and completing the worksheet.

Preparation:

1. Open the previous leak test inventory worksheet found in the “Leak Tests” folder of *tsoshare*.
2. Save the inventory worksheet under a new name using the format: “Leaks” + first 3 letters of month + last 2 digits of year.
3. Ensure that the information regarding the liquid scintillation counter serial number and efficiency at the bottom of the worksheet is correct.
4. Delete the data in the last 4 columns of the spreadsheet. These columns will be filled with the new swipe analysis information once the sealed sources have been tested.
5. Look through the transportation records for the previous 6 months to determine whether any of the sources have been moved to a different location. Update the “location” column accordingly.
6. Look through the Radionuclide Package Arrival Reports for the previous 6 months. Add any new sources to the spreadsheet that meet the leak test criteria. Be sure to include serial numbers, dates, activities etc.

Contamination Swipes:

1. Gather the necessary items for taking contamination swipes. These items include gloves, swipe papers, Ziploc bags, a permanent marker, etc.
2. Obtain a ring badge from dosimetry. Ring badges should be worn inside the gloves with the serial number facing toward the palm.
3. Prepare and label a swipe paper for each of the sealed sources to be tested when you arrive at the source storage location. Include the radionuclide, serial number, current date, and location.
4. Directly swipe the source when possible. If the source is housed in shrink-wrap or another type of closed container, swipe the outside of the container rather than the source itself. Sealed sources with activities in

the microcurie range can be safely swiped directly. Use forceps for sources in the millicurie range to minimize exposure to the hands.

5. Bag the finished swipes and return them to the TSO lab for analysis.
6. Repeat this procedure for all of the locations where sealed sources on the leak test spreadsheet are stored.

Swipe Analysis:

Leak test analysis instrumentation must be capable of detecting 5 nanocuries of activity on the outside of the source housing. A non-leaking source will exhibit background activity levels, so levels above background will indicate the presence of external contamination. For this reason, leak test swipes are analyzed in the TSO Wallace 1410 liquid scintillation counter (currently capable of detecting about 10 picocuries of activity).

The procedure for leak test swipe LSC analysis is the same as the procedure for contamination swipe LSC analysis.

Leak Test Worksheet:

1. Record the background counts (cpm) from the LSC swipe analysis worksheet in the "Bkg" column of the leak test worksheet for each source. Note: each LSC batch has a different background so it is important to keep track of the batch to which each source belongs.
2. Enter the gross counts (cpm) for each source into the "Gross" column. Gross counts are in the "CPM" column on the LSC swipe analysis worksheet.
3. The "DPM" column of the leak test worksheet is automatically calculated by a formula. It is important to ensure that the LSC efficiency entered into the formula (the denominator value) is current.
4. The activity is also automatically calculated with a formula in the "nCi" column. Any negative values may be changed to zero.
5. Verify that the formulas and values are correct.
6. Check for high activities. If the activity of a source's test exceeds 5 nanocuries, the source must be safely contained, taken out of service, and assumed defective. A source that shows evidence of leaking must be reported to the NRC within 5 days.

7. Save the worksheet into the tsoshare "Leak Tests" folder.
8. Print out a copy of the leak test worksheet.
9. Make a cover sheet for the leak tests using Word. The cover sheet should include the month and year, your name and a line for the RSO's signature. A cover sheet template is available in the tsoshare "Leak Tests" folder.
10. Bring the leak tests to the RSO for review.
11. Create a file folder for the leak test worksheet and file the signed document in the appropriate cabinet of TSO office room 101A.

Note: It is important to always verify that the serial number of the source being leak tested is the same as that on the leak test worksheet. There are many sealed sources for each radionuclide at ISU, so it is easy to confuse sources if serial numbers are not carefully corroborated before swipes are taken.

REFERENCES

10 CFR 30



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REVISION TRACKER

Revision 1	September 1, 2008	Original Procedure
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