

**Radiological Controls Office
Standard Operating Procedure (RCO-SOP-01):
Leak Test Collection and Analysis Procedure**

1.0 Purpose. This SOP provides instructions for receipt, analysis, record retention, and reporting for annual CAM leak test samples, and ACADA leak test samples taken during maintenance.

2.0 Information. The CAM contains a 15 mCi Ni-63 source its drift tube. NRMP 10-67004-T1NP requires strict observance of requirements to conduct wipe tests to detect possible leakage of the radioactive material (RAM).

The ACADA contains two 15 mCi Ni-63 sources within its detector cell module. Observe Sealed Source and Device Registration requirements for conducting wipe tests of the detector cell module after performing internal maintenance on the ACADA.

CRSOs and their appointed RPAs are responsible for ensuring leak tests are performed when required; the LRSO is fully responsible for the CAM and ACADA leak test programs.

3.0 Equipment Items Affected.

<u>Description</u>	<u>NSN</u>	<u>TAM No.</u>	<u>I. D. No.</u>
Chemical Agent Alarm, Automatic, M22	6665-01-438-6963	C21087B	10434A
Chemical Agent Monitor, (CAM 1.5)	6665-01-359-9006	C20327A	09717A
Chemical Agent Monitor, (CAM 2.0)	6665-99-725-9996	C20327A	09717C

4.0 Applicable Documents.

NRMP, 10-67004-T1NP (CAMs).

SI-6665-15/1C

MCO 5104.3A

5.0 Leak Test Sample Receipt

5.1 Only specific individuals within the RCO (L10) and the Supply Chain Management Center (577-3) who are designated in writing by their section manager are authorized to receive leak test samples.

1. Sample pick up is at the MCLB Albany mailroom, Bldg. 3600.
2. Sample pick up will occur daily during the annual leak test cycle, otherwise samples will be picked up as necessary.
3. A visual inspection of mail packaging/envelopes to detect holes, punctures, evidence of tampering, or unsealed envelopes shall be performed.
4. Leak test sample receipt is verified by signature in a logbook maintained by the RCO.
5. All wipe envelopes/packages received shall be transferred directly to the RCO radiochemistry lab, Bldg. 1556.

6.0 Sample Preparation and Analysis

This section provides specific guidelines to be used in sample preparation, sample analysis, and data evaluation for Ni-63 leak test samples.

6.1 Leak test samples should be sorted by owning unit RUC, assigned a unique analysis control number, and entered into a wipe test analysis record book with associated identifying information. For example, the first set of samples analyzed in the year 2000 would be assigned an analysis control number of 00-001, the second set would be 00-002, etc. The first set in the year 2001 would then be 01-001 and so on.

NOTE: EACH SAMPLE SET (EACH RUC) SHOULD BE ASSIGNED A SEPARATE ANALYSIS CONTROL NUMBER AND ANALYZED INDIVIDUALLY.

6.2 The identifying information is provided by the customer and can be found on pre-labeled, self-sealing envelopes bearing a wipe test label. Required information includes:

1. Customer name (person submitting samples).
2. Owning unit (including address, telephone number, fax number, and RUC)
3. Name of person performing wipe test (including address, telephone number, fax number, and RUC if different from that of the owning unit)
4. Date wipe test was performed.
5. Equipment/item serial number(s)
6. Radionuclide of interest.
7. Purpose of the wipe test (Annual leak test, pre-shipment, etc.).
8. Name of person receiving wipe(s).
9. Date wipe(s) were received.

6.3 The analysis control number and associated identifying information shall be recorded in the wipe test analysis record book and entered into an electronic database for tracking purposes.

6.4 Identify each sample vial by annotating the analysis control number and sample number on the cap using a permanent fine-tip marker. No markings should be made on the sides of the scintillation vial.

6.5 Sample Preparation.

1. Wear disposable rubber or plastic surgical gloves. Change gloves as necessary to prevent the inadvertent spread of contamination.
2. Using tweezers, remove the wipe from its mailing envelope and place in an appropriately sized plastic scintillation vial.
3. Add approximately 15 ml of liquid scintillation cocktail to each vial.
4. Place each vial cap on the appropriate corresponding vial and seal tightly.
5. Using absorbent, disposable cloths, wipe the outside of each vial carefully to remove residual scintillation cocktail or other contaminants such as dust or glove powder that may otherwise interfere with the analysis.
6. Remove gloves and discard as radioactive waste.

Note: Standard vial size is 20 ml but can vary based on the manufacturer and type of vial used. All vial types and sizes approved for use by the system manufacturer are authorized providing the LSC is calibrated using similar vials (i.e., the same size and constructed of the same material as the sample vials).

6.6 Sample Analysis.

1. Prepare a blank sample (background sample prepared with cocktail from the same source used for preparing the wipe samples) and load the vial into the LSC tray in the first position.
2. Load the wipe test sample(s) into the LSC tray in numerical order following the background vial.
3. Select the appropriate protocol number and attach its corresponding flag to the tray.
4. Place the loaded LSC tray onto the counter. (The daily standards and background analysis shall be performed first if this is the initial sample set for the day.)
5. Begin count.

6.7 Data Evaluation.

1. When the count is complete, remove the data printout from the printer and using the measured background count, calculate the minimum detectable activity (MDA) using the following equation:

$$\text{MDA} = [(4.66(C_b/t_b)^{1/2}) + 2.71] / \% \text{Eff}$$

Reference: Packard Instruments Handbook of Environmental Liquid Scintillation Spectrometry

Where: MDA is the minimum detectable activity in dpm.

C_b is the background count rate in counts per minute (cpm).

t_b is the background count time in minutes.

%Eff is the instrument efficiency for Ni-63

2. Record the calculated MDA on the Wipe Test Result Data Sheet.
3. For each sample counted, evaluate sample results against the calculated MDA and enter the count results in the corresponding table found on the Wipe Test Results Data Sheet.
4. For count results less than the calculated MDA:
 - a. The leak test is satisfactory.
 - b. Enter <MDA in the activity column.
 - c. Update the leak test due date.
5. For count results greater than or equal to the calculated MDA, but less than 100 dpm/100cm²:
 - a. The leak test is satisfactory.
 - b. Enter sample results in the activity column.
 - c. Update the leak test due date.
6. For count results greater than or equal to 100 dpm/100cm², but less than 1000 dpm/100cm²:
 - a. Recount the suspect wipe(s) to verify the results.
 - b. If the recount remains greater than 100 dpm/100cm²:
 - (1) Enter sample results in the activity column.
 - (2) Contact the LRSO for further instructions.
7. For count results greater than or equal to 1000 dpm/100cm²:
 - a. Initiate an immediate recount of the suspect sample to verify the results.
 - b. If the recount remains greater than 1000 dpm/100cm²:
 - (1) Enter sample results in the activity column.
 - (2) Contact the LRSO for further instructions.
8. For count results greater than or equal to 11,000 dpm/100cm² (0.005 μ Ci):
 - a. Initiate an immediate recount of the suspect sample to verify the results.
 - b. Make the following immediate notifications:
 - (1) LRSO
 - (2) Owning unit.
 - (3) Inventory Manager
 - (4) Enter sample results in the activity column.
9. Leak test results shall be recorded and reported in microcuries, (μ Ci).
 - a. $C_s/2.22E6 \text{ dpm}/\mu\text{Ci} = \text{Activity in } \mu\text{Ci}$ (C_s is sample counts in dpm)
 - b. All other wipe test results shall be reported as dpm/100 cm² or dpm/wipe.
10. Retain wipes for follow-up analysis as directed by the LRSO.

7.0 Records

- 7.1 The individual performing the analysis shall review the Wipe Test Result Data Sheet and LSC data printout, and sign each sheet.
 1. The reviewer's signature and the date of review shall be annotated on both documents indicating the data is complete and accurate.
 2. Both forms will be forwarded to the Radiological Controls Office for verification.
- 7.2 The LRSO or ALRSO shall review all Wipe Test Result Data Sheets and LSC data printouts for completeness and accuracy.
 1. A verification signature and date shall be made on both documents, indicating the data is complete and accurate.
 2. Copies of both forms will be retained by the LRSO, with the originals being returned to the laboratory for reporting as indicated in paragraph 8.0 below.
- 7.3 The radiochemistry lab shall retain the original Wipe Test Result Data Sheets and the original LSC data printouts for a minimum of three years in accordance with RAD-010 requirements.

1. Records shall be filed by survey type, date (mm/yyyy), analysis number, and unit RUC/AAC.

8.0 Reporting

1. Reports of leak test analysis results shall be made to the following:
 - a. Owning unit.
 - b. Inventory Manager.

Copies of the Wipe Test Result Data Sheet are forwarded to the customer via fax or mail. Preliminary reports may be made via electronic mail, but must be followed up with a hard copy report