



Technical Safety



RADIATION PROCEDURES MANUAL

Procedure Cover Sheet

Procedure Title: Radionuclide Laboratory Safety

Procedure Number: TSO-08-07-REV 1

Effective Date: September 1, 2008

Approved By: _____
Technical Safety Office Director

Date: _____



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A. INTRODUCTION

The NRC requires all licensees to conduct contamination surveys to monitor and prevent radioactive contamination. Application of the ALARA principle dictates that no removable contamination shall be tolerated indefinitely. Whenever contamination is detected, it must be removed promptly to prevent its spread and the possible exposure of other individuals.

The frequency of routine contamination surveys performed by TSO personnel is based on the total number of ALIs in the Responsible User's possession at any one time. The survey frequency plan is given in Table 1.

Table 1. Contamination survey frequencies

Laboratory Classification	TSO-performed Surveys
<1 ALI	Semi-annually
1-30 ALIs	Quarterly
>30 ALIs	Monthly
Sealed sources only	Semi-annually (leak tests)

The total number of ALIs are determined when radionuclides are ordered or received.

The nominal survey frequencies shown in Table 1 are to be interpreted as guidelines. In cases where contamination occurs regularly, the interval between surveys should be shortened.

B. PURPOSE

This procedure provides criteria, reference data, and specific instructions for safe handling of radionuclides in unsealed or dispersible forms, including contamination control and monitoring of exposures. It also specifies the requirements for monitoring records to be maintained by the users.

C. REQUIRED MATERIAL(S)

Thermoluminescent Dosimeter (TLD)
Pen
Portable survey instrument
 GM frisk instrument
 Ion chamber
Dry filter paper swipes
Gloves
RPR 11 Form
Map of area

D. PROCEDURE

LABORATORY CONTAMINATION SURVEY PROCEDURE (FORMS RPR 11)

1. Draw a map of the laboratory layout. If radioactive materials are only used in a designated area of the lab, the map need only reflect this portion of the room.
2. Fill in the date, surveyor name, building location or room number and the corresponding radioactive material program number on the RPR 11 form.
3. For each portable survey instrument and analysis instrument used, record the make, model, serial number and calibration due date on RPR 11.
4. Unless the only nuclides used are tritium or small quantities (<1 ALI) of other low-energy beta emitters, a direct survey should be made with a portable GM frisk instrument. With the audible response turned on, move the detector slowly over all surfaces that might be contaminated, holding the detector 1-2 cm from the surface. Plot the locations and objects surveyed on the RPR 11 form using a number symbol (#) followed by a number in chronological order. Direct contamination survey results are recorded in the table on RPR 11 in sequential order. Keep in mind that negative results are as important to record as

positive results. Units are ccpm/frisk, which is gross counts minus the BKG.

5. Radiation exposure levels are measured using an ion chamber (in mR/hr) or a scintillator (in $\mu\text{rem/hr}$) and are annotated on the survey map as a box (\square) for gamma exposures and as a triangle (Δ) for neutron exposures. Place a number inside the symbol to indicate the chronological sequence of measurements. Corresponding exposure levels as well as a background reading are written in the RPR 11 table.
6. At locations with positive results from contamination, or surfaces that are not accessible for a direct measurement, use a dry filter paper to take a swipe of 100 cm^2 . (A 100 cm^2 area is any equivalent of a 4-inch square or a strip 1 cm wide and 1 meter long.) All swipes taken will be plotted on the RPR 11A survey map as a circle with a number written in chronological order inside the circle. Units are $\text{dpm}/100\text{cm}^2$. Using the portable survey instrument in a low-background location, make a direct measurement of the contamination on the filter paper, or have the swipe analyzed in a liquid scintillation counter. Record the results in the table provided on the RPR 11 form.
7. In laboratories using low energy beta emitters e.g. C-14, H-3, or S-35 swipes must be used and analyzed in a liquid scintillation counter for determination of removable surface contamination since portable instruments cannot adequately detect these particles.
8. If an LSC is used in swipe analysis, fill in the minimum detectable activity (MDA) in dpm on RPR 11. This value is unique to each LSC batch analyzed and indicated the activity that the LSC is capable of detecting.
9. Conduct a survey results analysis to determine whether or not additional steps, such as decontamination, need to be taken (see below).
10. Obtain an RSO review signature upon completion of the survey and file the RPR 11 in the appropriate program records.

SURVEY RESULTS ANALYSIS

It is not sufficient to merely conduct a radioactive materials laboratory contamination survey. The results must also be reviewed to ensure that no contamination exists.

1. Exposure rate survey and direct survey results should be compared to the background rates taken outside the laboratory. At locations with

results above background, first ascertain whether the reading could be penetrating radiation coming through the surface, rather than from contamination on the surface. If significant penetrating radiation is detected, i.e. more than 10 times the background, the reading could be the result of a source stored in the vicinity. It is important to know source storage locations prior to conducting a contamination survey.

2. Direct reading survey results should be compared to the critical limit (L_C in cpm) calculated from the background. If a location is consistently above the L_C and no source is nearby, a swipe should be taken of the area and counted in an LSC to verify that contamination exists.
3. Swipe survey results analyzed by an LSC should be compared to the L_C calculated from the LSC background value. If any of the swipe results are higher than the L_C , the swipes should be reanalyzed in the LSC. If these second-run results are still above L_C , the lab area should be resurveyed. If the second set of swipes also register a dpm above the L_C , it is likely that contamination is present and the RSO must be notified, followed by a decontamination of the lab area.
4. When decontamination is conducted, the results should be noted in the comments area of RPR 11. Decontamination is considered successful when the swipe results are reduced to below L_C . Multiple decontamination efforts might be necessary. The survey forms should not be filed until decontamination is complete.

RECORDS

All radionuclide disposition records must be kept up to date and returned to the TSO when the waste is picked up. Refer to "RADIONUCLIDE ACQUISITION AND DISPOSITION" (RPR 13) for instructions.

1. The results of radiation surveys are to be recorded and retained for a minimum of three years. They are to be made available for review and evaluation by the RSO and the appropriate licensing agency. Suitable forms for recording survey results are attached to this procedure.
2. Personal surveys should indicate the name of the individual surveyed and, if any contamination was found, the location on the body or on the clothing.

REFERENCES

Idaho Department of Health and Welfare, Rules and Regulations, *Idaho Radiation Control Regulations, Title 1, Chapter 9.*

U. S. Nuclear Regulatory Commission, *Standards for Protection Against Radiation*, 10 CFR 20.

U.S. Nuclear Regulatory Commission, *Rules of General Applicability to Domestic Licensing of Byproduct Material*, 10 CFR 30.

RADLAB CONTAMINATION AND RADIATION SURVEY – RPR 11

Performed By: _____ **Date:** _____
Bldg: _____ **Rm #:** _____ **Program #:** _____

<input type="checkbox"/>	Dose Rate (μ Rem/hr)	<input type="checkbox"/>	Neutron Dose Rate (mRem/hr)	<input type="checkbox"/>	Swipe (dpm/100cm ²)	#	Direct Survey (ccpm/frisk)
	bkg						

Comments: _____

Radionuclides Used: _____

Instrument Used	Serial #	Calibration Due Date

Instrument Source Check: Prior to Survey and After Survey

Liquid Scintillation Counter Used	Serial #	MDA (dpm)

Action Level¹: _____ (dpm/100cm²) Are survey results > Action Level?
 Y² / N
 Critical Level Lc: _____ (dpm/100cm²) Are survey results > Lc?
 Y* / N

RSO Review: _____ **Date:** _____

¹Action level is 70 dpm/100cm² $\beta\gamma$ and 7 dpm/100cm² α . ²If swipes are > action level after 2nd analysis notify RSO and decon lab. *If swipes are > Lc after 2nd analysis notify RSO.



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REVISION TRACKER

Revision 1	September 1, 2008	Original Procedure
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