RADIATION PROCEDURES MANUAL

Procedure Cover Sheet

Procedure Title: Radionuclide Laboratory Evaluations

Procedure Number: TSO-08-08-REV 1

Effective Date: September 1, 2008

Approved By:_____ Date: _____19 May, 2009_____
Technical Safety Office Director

A. INTRODUCTION

A radiation safety audit is a systematic review of all operational and administrative radiation protection requirements in addition to a survey for exposure rates and removable contamination. The "LABORATORY EVALUATION CHECKLISTS" (RPRs 50A, B, and C) are used as documentation for items evaluated and are retained in the TSO's files. These forms are divided into three sections: Safety and Surveys, Self Monitoring Records, and RAM Inventory.

Safety and Surveys (RPR 50A)

The Safety and Surveys section includes the physical aspects of lab safety including hoods, signs and waste bins, as well as lab worker safety responsibilities such as dosimeter use and working habits. A contamination survey of the radiation lab is integral to this portion of the laboratory evaluation. Contamination surveys should be conducted as per the instructions in RPR 11 (refer to Radionuclide Laboratory Safety procedure, TSO-08-07-REV 1) using form RPR 110.
, and should be attached to the evaluation form.

Self Monitoring Records (RPR 50B)

The Self Monitoring Records section of the laboratory evaluation involves checking the lab's survey equipment and documentation of survey meter calibrations, training records and user contamination surveys. In order to ensure that the responsible user is performing self-surveys at the appropriate frequency, the evaluator should consult the chart included in form RPR 50B.

RAM Inventory (RPR 50C)

The RAM Inventory section involves a thorough evaluation of the radiation laboratory's RAM inventory, including on-hand inventory, corresponding ALIs and RAM security. ALIs are calculated in order

to determine whether or not bioassays are required (refer to Bioassay procedure, TSO-08-10-REV 0).

Each year, the TSO will evaluate a section every 2 months on a rotational basis such that every section is completed twice a year, and a total evaluation is completed every 6 months. Table 2 reflects the ideal routine lab evaluation schedule.

Table 2. Routine Radioactive Lab Evaluation Schedule.

	Jan/Feb	Mar/Apr	May/Jun	July/Aug	Sept/Oct	Nov/Dec
Safety	X			X		
Records		X			X	
Inventory			X			X

B. PURPOSE

This procedure provides instructions to Technical Safety Office personnel for performing radiological evaluations of radionuclide laboratories. It also contains instructions and forms for recording and reporting the results of such evaluations.

C. REQUIRED MATERIAL(S)

RPR 50A - Safety and Surveys

Contamination survey materials (RPR 11)
Ion chamber

RPR 50B - Self Monitoring Records

Responsible user's RAM inventory forms
Responsible user's contamination survey records

RPR 50C – RAM Inventory

Responsible user's possession limit from TSO records
TSO's shipping logs and RAM requisition forms
Federal Guidance Report No. 11 Table 1 (attached)
10 CFR 30 Schedule B values for each radionuclide
10 CFR 20 Appendix C values for each radionuclide

D. PROCEDURE

Prior to conducting a radiation laboratory evaluation, the evaluator should be aware of the lab's status with regard to radioactive material or radiation producing machines.

1. Review the emissions, energies and ALIs of the radionuclides used.

2. Review the user's current radionuclide inventory. Which nuclides are significant for contamination or exposure potential?

3. Review the previous survey results. Were there any problems? Were there recommendations that should be followed up on this time?

A full, semi-annual routine radiation laboratory evaluation includes the following 3 forms:

RPR 50A - Safety and Surveys

1. Uses

    a. Fill out the uses section of this form

2. Fume Hoods (Refer to Fume Hoods procedure, TSO-08-03-REV 1)

    a. Visually inspect the fume hood to ensure it is free of obstructions and record this on the form.
    b. Measure and record the face velocity in the fume hood.

3. Contamination Control

    a. Verify that gloves, lab coats, closed toed shoes, and other protective clothing are available and worn in the laboratory.
    b. Make sure all liquids have secondary containment in plastic trays or bus pans and that clean absorbent paper is being used.
    c. Verify that there is no evidence of mouth or skin contact with objects used in the radionuclide work areas. Signs of eating, drinking, smoking or mouth pipetting in the lab are considered de facto evidence of violation of this safety requirement. However, it is important to watch for other personal contacts in the laboratory, e.g. pencils in the mouth, application of makeup, etc.
    d. Enter the results on the form.

4. Exposure Control: If radionuclides that emit penetrating radiation are used, the appropriate use of shielding and distance should be reviewed.

    a. P-32 should be shielded with at least 8 mm (3/8") of any low atomic number material, e.g. plastic or wood.
    b. I-125 should be shielded with at least 3 mm (1/8") of lead.
    c. Other nuclides that emit high energy gamma rays may require 5 cm (2") or more of lead.
    d. Make sure that the shielding extends entirely around the source by making measurements of exposure rates above, below, in back and at the sides of storage locations.
    e. Verify that adjacent locations with elevated exposure rates are not being regularly occupied.
    f. Record the results of this section on the form.

5. Dosimetry

    a. If doses to the head or trunk could exceed 100 mrem in a calendar year, whole body badges should be issued. Review handling techniques and the use of tongs with the user.
    b. If doses exceeding 1,000 mrem per calendar year to the hands are possible, ring badges should be issued.
    c. Ensure that issued dosimeters are in use when necessary and record that information on the form.

6. Waste Containers and Storage Areas

    a. Verify that radioactive wastes are being segregated properly and placed in appropriate containers. Wastes must be segregated by material categories, e.g. dry, animals, scintillation vials, bulk liquids, etc.
    b. Verify that waste containers are conspicuously labeled and stored in locations that do not create unnecessary exposures to nearby personnel.
    c. Dry waste containing radionuclides with half-lives of less than 120 days and containing no "RADIOACTIVE MATERIAL" labels should be separated from other dry waste.
    d. Scintillation vials containing only H-3, C-14 and/or nuclides with half-lives less than 120 days, in environmentally safe (NHNT) fluors, and with no "RADIOACTIVE MATERIALS" labels should be segregated from other vials.
    e. Bulk liquids containing radioiodines should be separated from other radionuclides.
    f. Record all observations on the form.

7. Contamination Survey (Refer to Radionuclide Laboratory Safety procedure, TSO-08-07-REV 1)

    a. Conduct a contamination survey and enter the results in the “Survey Notes” section of the laboratory evaluation form.
    b. Attach the RPR 11 form.

8. Signs and Labels:

    a. Each room containing radioactive materials must be labeled with a "RADIOACTIVE MATERIALS" sign, an NRC Form 3 sign, an ISU “NOTICE” sign regarding document availability and an “INSTRUCTIONS FOR CONTACTING ISU TSO PERSONNEL” sign.
    b. If any dose rate exceeds 5 mrem/hour at 30 cm from a source or a surface, the room must be labeled with a "CAUTION RADIATION AREA" sign.
    c. All pigs and containers with radioactive material must be labeled with a “RADIOACTIVE MATERIALS” sticker. This label should indicate the radionuclides present, the assay date and the activity of the source(s).
    d. Record all observation and any comments on the form.

RPR 50B - Self Monitoring Records

1. Inventory

    a. Review the inventory maintained by the responsible user and compare it with the inventory on file in the TSO. All inventory forms should be current and forwarded to the TSO as soon as the inventory item is used up.
    b. Verify the dates of use specified in the inventory.
    c. Verify the quantities and deposition of waste.
    d. Record these results on the form.
    e. If the inventory is not complete and up-to-date, notify the responsible user and the RSO.

2. Surveys

    a. Verify the survey frequencies based on the laboratory classification given on the form.

b. Note whether or not work with radionuclides were performed and if so, whether or not the appropriate number of self-surveys were conducted.
c. Verify that personnel surveys were conducted and work with radionuclides were logged as required if work with radionuclides were performed.
d. Record this information on the form.
e. If contamination survey records are not complete and up-to-date, notify the responsible user and the RSO.

3. Training Records

a. Note the type of laboratory on the form.
b. Verify from TSO records whether or not the required training for laboratory personnel is on file.
c. Record this information and any comments on the form.

4. Instruments

a. Verify that appropriate survey instruments are available, operable and in use, and that no repairs or modifications have been made since the instrument was calibrated.
b. Verify that the calibration date is not overdue.
c. If the user has a sample counting instrument used for swipe tests or urine samples, ensure that its efficiency is known and used in sample activity calculations.
d. Enter the required information and any comments on the form.

RPR 50C – RAM Inventory

1. Inventory

a. Note the responsible user's possession limits for each radionuclide as listed in the program's radioactive material permit.
b. Note the active inventory by reconciling sources in the TSO's shipping logs and radioactive material requisition forms.
c. Ensure that the responsible user's inventory matches the possession limits listed on the permit.
d. If there is a discrepancy, notify the RSO.

2. ALI

a. Calculate the sum of fractions of ALI by totaling the quotient of the activity in possession by the ALI limit for each radionuclide.

i. The inhalation and ingestion ALI activities for each radionuclide are located in the Federal Guidance Report No. 11 Table 1.

b. Mark the appropriate box on the form.
c. Note whether or not bioassays are required for the laboratory.

3. Storage and Security

a. Note the storage location of the radionuclides on the form.
b. Note whether or not the room was attended.
c. If not, note whether or not the door was locked.
    i. It is permissible for radiation laboratory doors to be left unlocked **only** when the laboratory is constantly attended.
d. Calculate the required number of barriers required.
    i. The regulations governing the use of radioactive materials require that they be secured from unauthorized removal by one or two barriers, depending on source activity (10 CFR 30 Schedule B and 10 CFR 20 Appendix C).
    ii. Sources above the 10 CFR 30 Schedule B activity level must be secured behind one barrier, and sources above 100 times the 10 CFR 20 Appendix C activity limit must be secured behind two barriers.
e. Note whether or not the required number of barriers are in place and being used.
    i. Appropriate barriers include the locked lab entrance door and any locks on cabinets, refrigerators or freezers in which radionuclides are stored.
f. Record any comments and observations on the form.

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.

ATTACHMENTS

RPR 50A LABORATORY EVALUATION CHECKLIST

RPR 50B LABORATORY EVALUATION CHECKLIST

RPR 50C LABORATORY EVALUATION CHECKLIST

RPR 50B RADIOISOTOPE LABORATORY EVALUATION REPORT

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Approval Date:	May 19, 2009
Effective Date:	September 1, 2008

REVISION TRACKER

Revision 1	September 1, 2008	Original Procedure