LABORATORY SAFETY AND USE OF RADIONUCLIDES

Presented By:
Idaho State University
Technical Safety Office

Authorized User

- **Criteria:** Authorized users (AUs) must have adequate training and experience with the types and quantities of licensed material that they propose to use.
- AUs must have adequate and appropriate training to provide reasonable assurance that they will use licensed material safely, including maintaining security of, and access to, licensed material, and respond appropriately to events or accidents involving licensed material to prevent the spread of contamination.

Authorized User

- An AU is considered to be supervising the use of radioactive materials when he/she directs personnel in operations involving the licensed material and is responsible for the safe use of radioactive material to assure that areas are not contaminated.
- The AU may be given limitations, by the Radiation Safety Officer (RSO), on the quantity of radioactive material to be handled.

Authorized User

- **Response from Applicant:** Provide the following:
  - Name of each proposed AU with the types and quantities of licensed material to be used.
  - Information demonstrating that each proposed AU is qualified by training and experience to use the requested licensed materials.

  Applicants should provide information about the proposed AU's training and experience relative to the licensed material requested in the application. Applicants should not submit extraneous information, such as unrelated lists of publications, research grants, committee and society memberships, etc. Submittal of unrelated material serves only to slow the review process.

  10 CFR 20.1101 (b), 10 CFR 30.33(a)(3)., NUREG 1556 vol. 7

Personnel Dosimetry

- TSO-08-02-REV 2
- All radiation users who are subject to general whole-body exposures are issued "whole body dosimeters" and are classified as badged personnel by the Technical Safety Office.
- Extremity dosimeters will be employed when the anticipated extremity dose is two times greater than the anticipated whole body dose or when there is a potential for an abnormally large extremity dose.

Training

- The amount of training and experience needed will depend upon the type, form, quantity and proposed use of the licensed material requested, but it should cover the subjects stated:
  - Radiation Protection Principles
  - Characteristics of Ionizing Radiation
  - Units of Radiation Dose and Quantities
  - Radiation Detection Instrumentation
  - Biological Hazards of Exposure to Radiation (appropriate to the types and forms of byproduct material to be used)
  - Hands-on Use of Radioactive Materials

Training

- Licensees should not assume that safety instruction has been adequately covered by prior employment or academic training. Practical, site-specific training should be provided for all individuals prior to beginning work with or in the vicinity of licensed material. Periodic refresher training should also be provided.

Contamination Control

Each laboratory or area where radioactive material is used or stored should have general rules, so that workers know what is required. Typical instructions should include:

- Wear a laboratory coat or other protective clothing at all times in areas where licensed materials are used.
- Wear disposable gloves at all times when handling licensed materials.
- Change gloves often to avoid cross contamination.
- After each procedure or before leaving the area, monitor hands, shoes, and clothing for contamination in a low-background area.
- Do not eat, drink, smoke or apply cosmetics in any area where licensed material is stored or used.
- Do not store food, drink or personal effects in areas where licensed material is stored or used.

Contamination Control

- Wear personnel monitoring devices, if required, at all times while in areas where licensed materials are used or stored.
- Dispose of radioactive waste only in designated, labeled and properly shielded receptacles.
- Never pipette by mouth.
- Store radioactive solutions in clearly labeled containers.
- Secure all licensed material when it is not under the constant surveillance and immediate control of the user(s).
- Use engineered control methods along with disposable or decon. friendly surfaces(nonporous, nonpainted).
- Maintain good housekeeping.

Contamination Control

Engineered controls:

- Fume hood
  a) Hoods are used for gases, for unsealed volatile licensed materials, and for processes such as evaporation that may release gases and vapors.

Contamination Control

Engineered Controls:

- Glovebag/Glovebox
  a) Glove boxes are sealed boxes with transparent viewing windows, sealable ports or doors for transferring materials and equipment, and gloves sealed to the box through which licensed materials are handled.
  b) Glove boxes are used for the containment during storage and use of liquids and solids that can become airborne particulates or aerosols.
  c) Glove boxes can be closed or exhausted, with filtration systems if appropriate, to prevent contamination.

Contamination Control

- The AU will discuss with the RSO the Limitations and conditions relative to handling unsealed licensed material and what laboratory equipment to use when working with such material. As an example, discuss which licensed materials and what procedures should be confined to radiochemical fume hoods or glove boxes. Explain what shielding or remote handling equipment is to be used when beta and/or gamma emitting licensed materials are handled.

Surveys

- Routine survey and monitoring procedures to be followed for contamination control. Include where and how contaminated articles and glassware are to be handled and stored.
  - Contamination surveys
  - Airborne surveys

Contamination Surveys

- Licensees' contamination surveys should be sufficient to identify areas of contamination that might result in doses to workers or to the public. Combined removable and fixed contamination should be surveyed using appropriate radiation detection equipment. Removable contamination can be detected and measured through a wipe test of the surface, which is counted in an appropriate counting instrument, such as a liquid scintillation counter, a sodium iodide or germanium gamma counter, or a proportional alpha/beta counter.

Contamination Surveys

Contamination surveys should be performed:

- To evaluate radioactive contamination that could be present on surfaces of floors, walls, laboratory furniture, and equipment.
- After any spill or contamination event.
- When procedures or processes have changed.
- To evaluate contamination of users and the immediate work area, at the end of the day, when licensed material is used.
- In unrestricted areas at frequencies consistent with the types and quantities of materials in use but not less frequently than quarterly.
- In areas adjacent to restricted areas and in all areas through which licensed materials are transferred and temporarily stored before shipment.

Contamination Surveys

Each survey record should include the following:

- A diagram of the area surveyed.
- A list of items and equipment surveyed.
- Specific locations on the survey diagram where wipe test was taken.
- Ambient radiation levels with appropriate units.
- Contamination levels with appropriate units.
- Make and model number of instruments used.
- Background levels.
- Name of the person making the evaluation and recording the results and date.

Contamination survey frequency

- Personnel should survey for contamination in locations where individuals are working with an unsealed form of radioactive material in an amount greater than or equal to 10% of the smallest annual limit on intake (ALI) (either the inhalation or ingestion ALI) listed for that Radioisotope in 10 CFR Part 20 Appendix B, Table 1 occupational. These surveys should be done at a frequency appropriate to the types and quantities of radioactive materials in use, but at a minimum quarterly. If amounts are used that are greater than or equal to the smallest ALI listed for that Radionuclides in 10 CFR Part 20, detailed, documented surveys should be performed at least monthly.

Contamination survey frequency

- **Use the following guides to determine survey frequency:**
- **NUREG 1556, Vol. 11, Appendix S, Contamination survey frequency.**
- **10 CFR Part 20 Appendix B, Table 1 occupational(ALI's).**

Airborne Survey

Air monitoring can be used to do the following:

- Determine whether the confinement of radioactive materials is effective.
- Measure airborne radioactive material concentrations in the workplace.
- Estimate worker intakes of radioactive material.
- Determine posting requirements.
- Determine what protective equipment and measures are appropriate.
- Warn of significantly elevated levels of airborne radioactive materials.

RAM Storage

10 CFR 20.1801 Security of stored material.

- The licensee shall secure from unauthorized removal or access licensed materials that are stored in controlled or unrestricted areas.

10 CFR 20.1802 Control of material not in storage.

- The licensee shall control and maintain constant surveillance of licensed material that is in a controlled or unrestricted area and that is not in storage.

RAM Storage

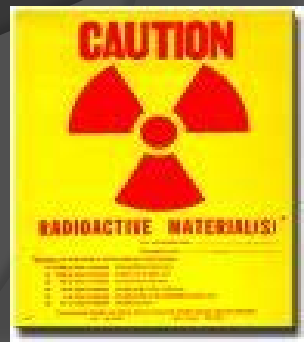
10 CFR 20.1901 Caution signs.

- (a) *Standard radiation symbol*. Unless otherwise authorized by the Commission, the symbol prescribed by this part shall use the colors magenta, or purple, or black on yellow background. The symbol prescribed by this part is the three-bladed design.

RAM Storage

10 CFR 20.1902 Posting requirements.

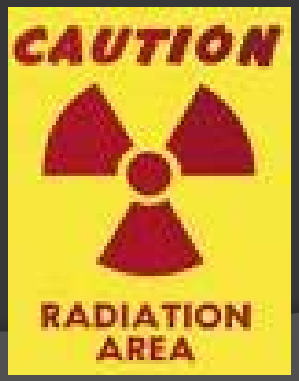
e) *Posting of areas or rooms in which licensed material is used or stored*. The licensee shall post each area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in appendix C to part 20 with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)."



RAM Storage

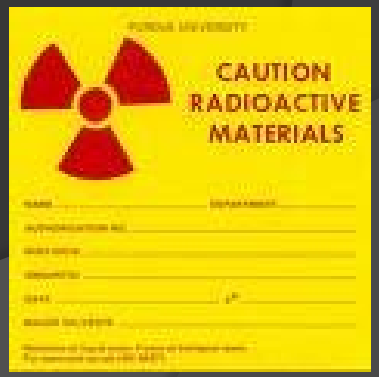
10 CFR 20.1902 Posting requirements.

a) *Posting of radiation areas*. The licensee shall post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA."



RAM Storage

- **NUREG 1556 vol. 7, 8.11 Item 11:Waste Management**
- All radioactive waste must be stored in appropriate containers until its disposal and the integrity of the waste containers must be assured.
- Radioactive waste containers must be appropriately labeled.
- All radioactive waste must be secured against unauthorized access or removal.



Waste Disposal

- Contact Idaho State University – Technical Safety Office with any matters dealing with radioactive or otherwise hazardous waste
- **(208) 282- 2310**

Emergency Response

- SWIM
  - **S**top/Secure the spill
  - **W**arn others in the immediate and adjacent areas.
  - **I**solate the spill.
  - **M**inimize the spread of contamination.
- **Perform or delegate the responsibility of notifying proper spill response personnel as soon as possible while avoiding the spread of contamination.**

General Safety Procedures to Handle Spills

- Name and telephone number of RSO or an alternate person(s) should be posted conspicuously in areas of use, so that it is readily available to workers in case of emergencies. Licensee should have emergency equipment readily available for handling spills.
- (208) 282-2667 – Office
- (208) 220-2735 – Cell

Emergency Response

- The decision to implement a major spill procedure instead of a minor spill procedure depends on many incident specific variables, such as the number of individuals affected; other hazards present; the likelihood of spread of contamination; and types of surfaces contaminated as well as the radiotoxicity of the spilled material. For some spills of short-lived radionuclides, the best spill procedure may be restricted access pending complete decay. The applicant should establish criteria for determining when the major spill procedure and minor spill procedure should be utilized.

Minor Spill

- Notify personnel in the effected area.
- Prevent spread of spill by covering with absorbents.
- Clean up the spill, wearing disposable gloves. Control generated waste.
- Use the wipe and fold method, wiping from lowest to highest levels of expected contamination.
- Perform surveys of spill area and whole body frisks of involved personnel.
- Report spill to RSO promptly. Cooperate with the RSO and TSO staff.
- Isolate the area until RSO approval.

Major Spill

- Stop/secure the spill
- Warn personnel in the spill area
- Isolate the spill area. Close the door and guard the area at a safe distance. Post signs to inform personnel of radioactive spill.
- Minimize the spread of contamination and radiation exposure. Perform whole body frisks on all personnel that might have been contaminated.
- Notify the RSO immediately.
- Cooperate with RSO and RSO's staff and follow all instructions.
- Do not return to the room without RSO approval.

Minor Fires

- Warn personnel in the area
- By approved methods attempt to extinguish the fire.
- Once the fire is out, isolate the area, prevent the spread of contamination, perform whole body frisks, and notify RSO.
- Do not return to the area without RSO approval.
- Cooperate with RSO and RSO's staff. Follow all instructions given.

Major Incidents

Fire, Explosions, or Major Emergencies

- Notify all personnel in the area and vacate immediately.
- Notify the fire department.
- Notify the RSO and other facility safety personnel.
- Upon arrival of firefighters, inform them where radioactive materials are stored or where radioisotopes were being used.

Major Airborne Spill

- Notify all personnel to vacate the room immediately.
- Shut down ventilation system, if possible, unless it is determined that the room ventilation system needs to be used to clear the air for access purposes.
- Vacate the room. Seal the area, if possible.
- Notify the RSO immediately.
- Avoid the spread of contamination and follow RSO instructions.

Spill Kits

- Disposable gloves
- Housekeeping gloves
- Disposable lab coats
- Disposable head coverings
- Disposable shoe covers
- Roll of absorbent paper with plastic backing
- Masking tape
- Appropriate survey instruments, including batteries
- Plastic trash bags with twist ties
- “Radioactive Material" labeling tape
- Marking pen and pencil
- Pre-strung "Radioactive Material" labeling tags
- Box of Wipes
- Instructions for "Emergency Procedures"
- Clipboard with a copy of the Radioactive Spill Report Form for the facility

Spill Kits

- Spill kits should be easily accessible and materials should be in quantities sufficient to combat minor to major spills.
- Periodical checks and inventories should be performed on the spill kits to verify that they are fully stocked and that the material contained within is in working order.

Questions?

References

- NUREG 1556
- 10 CFR 20, 19
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