

Radioactive Waste Packaging Guidelines

SOP NUMBER		SUPERCEDES SOP (IF APPLICABLE)	
EHS-WG-RAD-100.01		N/A	
Latest Version Prepared By		APPROVAL	EFFECTIVE DATE
Rachel Nichols, ARSO		Cade Register, RSO	11/08/2023
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1. **Purpose:** This guide will provide instructions for the proper storage and packaging of radioactive waste materials. If there are questions regarding this procedure, please get in touch with EHS at (573) 882-7018.
2. **Scope:** All Radiation Workers (RWs) who use radioactive materials (RAM) should follow this guide when handling and packaging RAM waste.
3. **Definitions:**
 - 3.1 None
4. **Procedure Details:**
 - 4.1 General information for radioactive waste storage and segregation in the lab:
 - 4.1.1 Always wear appropriate PPE when handling and packaging radioactive waste.
 - 4.1.2 All waste storage areas should be appropriately labeled to ensure that persons in the lab can easily identify the hazard area.
 - 4.1.3 Except for sharps containers, only EHS-provided containers should be used for radioactive waste.
 - 4.1.4 EHS-provided radioactive waste containers (as shown below) are:
 - 4.1.4.1 Cardboard boxes available in three sizes: **1 ft³**, **1.5 ft³**, and **2 ft³**. These are for storage and packaging of Solids, LSV, or Swipe vials.
 - 4.1.4.2 1 Gallon plastic bottles for Liquids.
 - 4.1.4.3 1 Gallon plastic bottles for contaminated puncture hazards/sharps.
 - 4.1.4.4 Plastic bags/liners for animal carcasses and tissue.




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- 4.1.5 Waste containers not provided by EHS include biohazardous sharps containers which should be puncture-proof and appropriately labeled for all hazards.
- 4.1.6 Radioactive waste material cannot be in the lab more than 12 months. Waste pickup requests must be submitted prior to 12 months and can be submitted as often as necessary to reduce the amount of waste in a lab.
- 4.1.7 When possible, segregate radionuclides so that each radionuclide has a separate container. Some reactions do not allow for this. In those cases, exceptions are allowed.
- 4.1.8 All waste forms should be kept separate. Waste forms will include:
 - 4.1.8.1 Solid (including sharps)
 - 4.1.8.2 Liquid
 - 4.1.8.3 LSV (Liquid Scintillation Vials)
 - 4.1.8.4 Animal (including tissue)
 - 4.1.8.5 Swipes (determined clean after liquid scintillation analysis)
- 4.1.9 Radioactive waste containers should be labeled with Radioactive Hazardous Material Labels (HML-R) except where noted. These HML-R labels are provided by EHS. HML-Rs should be filled in with the following information:
 - 4.1.9.1 Container start date
 - 4.1.9.2 Building and room number
 - 4.1.9.3 PI last name
 - 4.1.9.4 Radionuclide and activity using the reference date of the container was sealed
 - 4.1.9.5 Components/contents. For example: Types of solid materials. Chemical name, if mixture, list all components of the mixture (including water), providing concentrations where possible, etc.

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RADIOACTIVE MATERIAL	
CONTAINER START DATE: <small>(Schedule pick up within 6 months)</small>	12, 14, 2018 <small>Month Day Year</small>
LOCATION:	174, GSB <small>Room Building</small>
ISOTOPE(S):	P-32 0.015 mCi
COMPONENTS:	40% Methanol 10% EDTA 1% SSC 1% SDS 48% Water
PI ID: PI Name HAZARD COMMUNICATION <input type="checkbox"/> IGNITABLE <input type="checkbox"/> CORROSIVE (pH _____) <input type="checkbox"/> REACTIVE <input type="checkbox"/> TOXIC <input type="checkbox"/> BIOHAZARD <input checked="" type="checkbox"/> RADIOACTIVE MATERIAL OTHER _____ <small>Describe</small>	
AFFIX LABEL(S) TO EACH COLLECTION CONTAINER EHS HML-R 6/15	

- 4.1.10 If additional boxes, bottles, liners, zip ties or HML-Rs are needed, an EHSA tutorial video titled “Supply Request Form” is available on the EHS website: https://ehs.missouri.edu/ehsa_tutorial.
- 4.1.11 You can also put a request for supplies in the comments section when submitting a Waste Pickup Request.
- 4.2 Storage of solid RAM waste in the lab.**
 - 4.2.1 Use only EHS provided cardboard boxes and liners
 - 4.2.2 Solid RAM waste materials include: paper, plastic, used PPE, empty stock vials, etc.
 - 4.2.3 The bottom of the box should be secured with strong packaging tape in an “H” pattern to prevent gapping at box fold and edges. No masking or other less substantial tape may be used.

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4.2.4 Place an EHS provided liner inside the box.



4.2.5 Place the EHS provided Radioactive Hazardous Material Label (HML-R) on the side of the box so that it is clearly visible.

4.2.6 Before filling the storage container, an HML-R should be placed on the box.

4.2.7 Emptied stock containers may be placed in solid waste container, provided there is only one milliliter or less of liquid in the stock. Quantities greater than 1 milliliter of liquid should be bulked into one of the EHS provided plastic bottles.

4.3 Storage of RAM contaminated sharps or puncture hazards with radiologically contaminated biological hazards.

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- 4.3.1 Includes radioactively and biologically contaminated needles, sharp objects, pipet tips, etc.
- 4.3.2 A strong puncture-proof container must be used for these hazards. These will not be provided by EHS.
- 4.3.3 The containers should be appropriately labeled for both hazards, as shown in the picture below.
- 4.3.4 An HML-R will not need to be placed on these containers because they will be packaged for waste pickup inside an EHS-provided cardboard box that will require the HML-R.



4.4 Storage of LSC and swipes waste in the lab.

- 4.4.1 Only use small size boxes (1 ft³) for LSC and Swipe vial waste.
- 4.4.2 LSC assay vials with activity must be kept in separate containers from zero activity swipes.
- 4.4.3 Assemble the box the same as with regular solid waste.
- 4.4.4 Place a completed HML-R on the box. No waste may be placed in the container until the HML-R is in place.
- 4.4.5 Place two liners inside the box to help prevent leakage.
- 4.4.6 Ensure vial lids are closed before placing them in the container.

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4.5 Storage of liquid containers in the lab.

- 4.5.1 Before beginning to use an EHS provided liquid waste container, it should have a completely filled out HML-R on it.
- 4.5.2 Liquids containers should be in secondary containment that is equal to or greater than the volume of the EHS provided 1 gallon bottle.
- 4.5.3 The PI is responsible for obtaining appropriate secondary containment for their liquid waste.
- 4.5.4 Keep liquid waste containers closed when not in use.
- 4.5.5 pH should be in the range of 5.5 to 9.5.
- 4.5.6 Do not store liquid radioactive material waste in a fume hood.



4.6 Storage of radioactive animal or tissue wastes in the lab.

- 4.6.1 Deceased animals or tissues containing radioactive material should be kept in an EHS provided plastic bag.
 - 4.6.2 The bag should have an HML-R adhered to it.
 - 4.6.3 The animal or tissue should be kept frozen until picked up by EHS.
- 4.7** Use appropriate shielding when dose rates from waste containers exceed 0.3 mR/hr at 1 cm from the surface or 0.2 mR/hr at 30 cm from the surface of the container.
- 4.7.1 For beta emitters, use plastic, Plexiglas, or Lucite.
 - 4.7.2 For gamma emitters, use lead.

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4.8 Closure procedure for plastic liners and cardboard boxes. Use ALARA philosophy to avoid contaminating yourself or the lab when closing waste containers. Use the EHS provided Zip ties to secure the plastic liners in the following way:

4.8.1 Boxes should be closed before they are completely full.

4.8.2 Twist each bag closed being careful not to force air or particles of contamination into your face. Fold the neck over and zip tie the bend in the neck closed as shown in the pictures below. Do this for both the inner and outer bag when applicable.



4.8.3 Boxes should be closed before they are completely full. Fold down the flaps of the box and securely tape them shut with strong packaging tape.

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- 4.8.4 Survey and swipe the outside of the box for external contamination. The dose rate and removable contamination results will be used when submitting a Waste Pickup Request. This step is required for all waste containers when submitting a Waste Pickup Request.



- 4.9** Closure procedure for RAM contaminated sharp objects or puncture hazards.
- 4.9.1 With boxes being only $\frac{3}{4}$ full, plastic liners should be zip-tied closed. Do not press liner bag down.
 - 4.9.2 The top of the box must be secured with strong packaging tape in an “H” pattern to prevent gapping at the box fold and edges. No masking tape, duct tape, or other less substantial tape may be used.
- 4.10** Packaging procedure for LSV and swipes.

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4.10.1 Use small boxes only for LSC and swipe vials.

4.10.2 Both the inner and outer liner as well as the box, should be closed with the previously listed methods in Section 10.

4.11 Closure and survey of liquid RAM waste bottles.

4.11.1 Ensure the lid is fully closed and secured on the bottle.

4.11.2 Bottles must remain in secondary containment until picked up by EHS.

4.11.3 Survey and swipe the outside of the bottle for external contamination. The dose rate and removable contamination results will be used to submit a Waste Pickup Request.

4.12 Packaging of animal or tissue for pick up.

4.12.1 All animal or tissue being stored for Rad waste pick up should be kept in a freezer until time of pick up.

4.12.2 Survey and swipe the outside of the bag for external contamination. The dose rate and removable contamination results will be used to submit a Waste Pickup Request.

5. References:

5.1 Radiation Safety Manual

6. Revisions

6.1 Rev 01: 11/23

6.1.1 Updated format, updated 6 to 12 month waste disposal rule.