

Disposal of Radioactive Waste

1.0 Statement

The purpose of this procedure is to outline procedures for safe and secure storage of radioactive waste and safe disposal of nuclear substances and radiation devices in order to ensure the safety of faculty, staff, students, visitors and the environment. All wastes generated from the use of nuclear substances and radiation devices shall be handled in a manner to ensure:

- a) Disposal limits stated by the CNSC regulations as regulatory quantities are not exceeded.
- b) Exposures from nuclear substances and radiation devices to the public and environment are As Low As Reasonably Achievable.
- c) Waste is disposed of in accordance with Memorial University's hazardous waste disposal guidelines.
- d) Radioactive waste will be stored securely, inaccessible to unauthorized workers.

Radioactive waste disposal by the lab personnel to the regular garbage/sewer is strictly prohibited unless pre-authorized by the RSO.

2.0 Definitions

Open Source Nuclear Substances (unsealed)

An unsealed source is a radioactive liquid, powder or gas that can be absorbed ingested or inhaled into the body presenting both an internal and an external radiation hazard.

Radioactive waste

Any waste generated during the use of nuclear substances and radiation devices.

Organic radioactive liquid waste

Liquid that comes in contact with and/or contains an open radioactive source and is of organic nature. This includes ALL liquid scintillation fluid waste.

Inorganic radioactive liquid waste

Water-based liquid that comes in contact with and/or contains an open radioactive source and is of inorganic origin.

Radioactive dry solid waste

Any solid waste that comes in contact with and/or contains an open radioactive source and doesn't contain enough liquid to risk leakage.

Radioactive wet solid waste

Any solid waste that comes in contact with and/or contains an open radioactive source and contains considerable amount of liquid, which might cause leakage, e.g. emptied scintillation vials, materials used for spill clean-up.

Regulatory disposal quantities

Disposal limits, specific by radioisotope and listed in CNSC license.

Incidental release

Water used to wash glassware and hands containing trace amounts of nuclear substances.

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Radiological-Biological Waste

Radioactive waste contaminated with blood, urine or other bio-hazardous agent, includes animal carcasses and bedding.

3.0 Responsibility

3.1 Permit Holder

The permit holder is ultimately responsible for:

- a) Safe and secure storage of radioactive waste in the lab.
- b) Proper waste labeling and sorting.
- c) Timely notification of radioactive waste disposal requests to the RSO.
- d) Ensuring that the waste disposal rules described in this section are followed.

3.2 Environmental Health & Safety (EHS)

The RSO shall be responsible for the radioactive waste disposal by ensuring that:

- a) Disposal limits are not exceeded.
- b) Exposures from nuclear substances and radiation devices to the public and environment are As Low As Reasonably Achievable.
- c) Waste is disposed of in accordance with Memorial University's hazardous waste disposal guidelines.
- d) Waste is stored securely.
- e) Required records are maintained.

4.0 Procedure

Disposal of radioactive waste shall conform to the disposal limits outlined in Memorial University's CNSC license. All radioactive waste disposals shall be processed and approved by the Radiation Safety Officer before disposal. Incidental release of nuclear substances to municipal sewer is exempt.

4.1 Waste Sorting

Sort according to the nature of the waste. Sort separately: dry solid waste, wet solid waste, liquid organic and liquid inorganic waste, sharps and glass, lead pigs, stock vials and Radiological-Biological Waste.

- Broken glass might be combined with dry solid waste if they did not come in contact with blood or other bio-hazardous agent(s) and if the waste container is puncture proof.
- For Radiological-Biological waste disposal approved waste disposal procedures will be referenced on the current internal Radioisotope User Permit. **Do not initiate a project that might generate radiological-biological waste prior to receiving this approval.**
- Radioisotope contaminated carcasses and bedding are transported to the Animal Care & Veterinary Resources (ACVR) carcass freezer prior to incineration. Carcasses must be double bagged in clear bags labeled with the Radioactive and biohazardous Waste Tags. The permit holder must maintain an accurate inventory

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of all radioisotope contaminated carcasses sent for disposal. For more information contact the Radiation Safety Officer, rso@mun.ca.

- **Do not use red or orange biohazard bags. DO NOT autoclave radioactive waste. Use chemicals such as bleach for biological decontamination if possible. Please refer to Memorial University Biosafety manual.**
- When collecting the liquid waste limit the amount of solid objects such as filter papers or pipette tips. The use of funnels and screens is recommended.
- Shield non-empty stock vials in their original containers and package securely in a small box properly labeled on the exterior. A copy of the corresponding inventory sheets shall be attached and visible.
- Consider attaching an envelope containing the inventory sheets to the box. **Do not empty the unwanted contents of stock vials into liquid radioactive waste containers. Deface/remove radiation warning labels/symbols from empty stock vials prior to disposal into a solid waste container.**
- Halogenated organic compound shall not be mixed with liquid scintillation fluid.

Generally, different radionuclides should not be mixed. Where this creates a problem, the following isotopes may be mixed:

- a) H-3 and C-14
- b) I-125 and S-35
- c) P-32 and Cr-51
- d) Liquid scintillation fluid used for swipe testing for a variety of radionuclides can be combined in one container.

4.2 Waste containers and storage

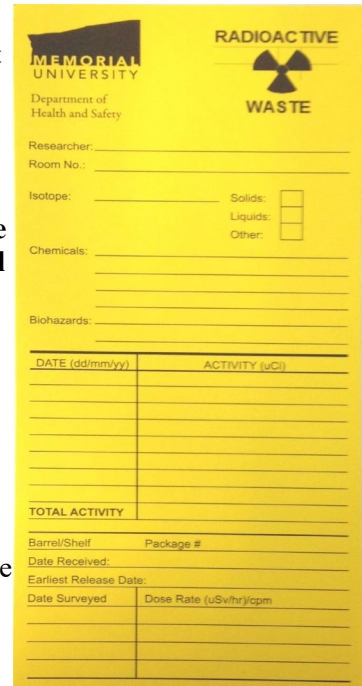
The RSO will either provide or prescribe approved radioactive waste containers. The use of alternative containers is only permitted when approval has been granted by the RSO. Containers shall be labeled with the EHS Assistant generated waste container number prior to use.

Radioactive waste shall be stored in a secured area, inaccessible to unauthorized persons and shielded when appropriate to ensure a dose rate of less than 2.5 uSv/hr. Plastic is required for P-32 waste. I-125, Cr-51, Na-22 and I-131 waste shall be shielded with lead of sufficient thickness. For assistance in determining suitable shielding thicknesses, contact the RSO.

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4.3 Waste Labeling

- All waste containers must be numbered with the EHS Assistant generated waste container number and labeled with the radioactive waste tag (Figure 1).
- **Before collecting any type of waste, create a new waste container on EHS Assistant and label the container with the EHS Assistant generated container number. In addition, fill out the upper part of the radioactive waste tag and keep it with the container.** The information required is: Researcher, Room number, Isotope, type of waste (solid, liquid or other) and chemical or biological components. Enter the container number generated by EHS Assistant under “Package #” on tag. **(DO NOT attach tag to container at this time).**
- The bottom part of the tag is filled out by the RSO prior to transfer to the Environmental Health & Safety radioactive waste storage facility. This includes the information on volume or weight and the activity of each isotope in the container. The activity will be obtained from the EHS Assistant waste request report and entered by the RSO during waste pick-up.




The form is yellow with a black radiation symbol and the text 'RADIOACTIVE WASTE'. It includes fields for:

- MEMORIAL UNIVERSITY logo and Department of Health and Safety
- Researcher: _____
- Room No.: _____
- Isotope: _____
- Waste type checkboxes: Solids: , Liquids: , Other:
- Chemicals: _____
- Biohazards: _____
- Table with columns: DATE (dd/mm/yy) and ACTIVITY (µCi)
- TOTAL ACTIVITY: _____
- Barrel/Shelf: _____ Package #: _____
- Date Received: _____
- Earliest Release Date: _____
- Date Surveyed: _____ Dose Rate (µSv/hr)/cpm: _____

Figure 1: Radioactive Waste Tag

4.4 Waste transfer to the radiation waste storage facility

Prior to waste being removed from your lab for disposal by Environmental Health and Safety.

- Ensure that a radioactive warning symbol  is clearly visible.
- Ensure that the radioactive waste tag is securely attached. Do Not Use Radioactive Warning Tape.
- All waste containers must be wipe-tested prior the transfer to the decay room.
- Initiate a waste-pick-up request via EHS Assistant under “Waste Pickup.” An automatically generated email will be sent to the RSO outlining the details of the waste pick-up request.

4.5 Waste disposal from RAM decay areas

Radioactive waste is held in Memorial’s radioactive waste storage (decay) facility for until it has decayed below the CNSC disposal limits for a particular isotope. Once waste has decayed below disposal limits, it is monitored using a calibrated survey meter to verify that dose rates are not above background levels. All radioactive warning labels are removed prior to ultimate disposal via landfill, sewer or hazardous waste disposal.