MOUNT ROYAL
UNIVERSITY
1910

Chemical and Biological Waste Manual

Environmental Health & Safety Department

TABLE OF CONTENTS

OVERVIEW

Mount Royal University is home to over 20 laboratories, maintenance workshops, and swimming pool facilities. Many of these laboratories and workspaces generate hazardous or biohazardous waste that must be disposed of properly to protect people and the environment.

This manual is a reference for all faculty and staff of Mount Royal University that generate hazardous or biohazardous waste materials in the course of their work, studies, research, or operations. This manual provides the procedures for collection and disposal of unused, leftover, unwanted, or waste chemical and biohazardous materials.

This manual describes the specific packaging, labelling, and documentation required to facilitate the safe transportation and disposal of hazardous and biohazardous materials. The specific requirements are identified within various Acts and Regulations, including but not limited to, the Transportation of Dangerous Goods Act and Regulations, Alberta Environmental Protection and Enhancement Act, and Alberta Fire Code.

If you have any questions regarding disposal of hazardous or biohazardous waste that are not answered in this manual, please contact ehs@mtroyal.ca.

ROLES & RESPONSIBILITIES

ENVIRONMENTAL HEALTH & SAFETY

Environmental Health & Safety (EH&S) is responsible for the safe and timely oversight of consolidation, transportation, and disposal of all chemical, biological, and radiological hazardous materials generated by Mount Royal University laboratories, facilities, and operations.

The processing of hazardous and biohazardous wastes is performed by an external waste management company. This is done in accordance with Occupational Health and Safety, Transportation, and Environmental laws and regulations for hazardous and biohazardous waste disposal requirements.

EH&S acts as a resource on issues and questions around hazardous and biohazardous materials and Transportation of Dangerous Goods (TDG).

WASTE GENERATORS

Waste generators (faculty and staff who conduct or oversee activities that produce chemical and biological waste) are required to abide by this manual and the instructions herein when preparing, handling, and storing hazardous and biohazardous waste prior to disposal.

Personnel at MRU are required to store, use, and dispose of hazardous and biohazardous materials in a manner that protects people, property, and the environment. Hazardous and biohazardous materials are NOT to be disposed of into the sanitary sewer (sinks or toilets) or into the regular garbage. All hazardous and biohazardous materials are to be disposed of through EH&S as described in this manual.

Spill Response

All spills *must* be reported to EH&S through the Incident Reporting System as either a Hazardous Condition (no release to the environment/sewer and no bodily contamination) or Injury/Illness/Environmental Damage (release into environment/sewer or bodily contamination).

Laboratories (or other areas storing and using chemicals or pathogens) must have a suitable spill response kit available. Hazardous and biohazardous material spills must be handled by a competent person (understands the hazards associated with spills and the proper cleanup procedure). Refer to the Safety Data Sheet or Pathogen Safety Data Sheet for more information on specific spill response procedures prior to commencing lab activities or starting a spill cleanup with chemical or biological hazards. All waste generated during cleanup must be disposed of properly as chemical or biohazardous waste.

Refer to *Appendix D – Chemical Spill Response Checklist* for further information. Refer to the MRU Biosafety Manual for more information about biohazardous spill response.

Waste Minimization Practices

The goal of the MRU waste disposal program is to minimize the output of hazardous and biohazardous waste in order to maintain a healthy and sustainable future, and reduce the cost of waste disposal.

The following practices are encouraged to reduce the quantities of waste materials in the course of activities at MRU.

- Review protocols regularly to ensure hazardous substances are used efficiently.
- Minimize excess purchasing of pure chemicals.
- Conduct microscale experiments to decrease quantities of waste generated.
- Use less hazardous substitutes where feasible.
- Choose appropriately sized containers. Store smaller quantities in smaller containers. It is not cost effective to dispose of 50 milliliters of waste in a 4-litre container.

NOT ACCEPTED FOR DISPOSAL

There are some instances where EH&S cannot accept materials for disposal.

Unknowns

EH&S cannot accept unknown chemicals of any kind. The waste generator is required to identify unknown waste material they have produced. The Faculty/Department is responsible for identification where the owner is unknown or no longer with MRU. This identification can take the form of laboratory analysis using on-site technical resources or by an external commercial laboratory. All costs incurred for identification of the unknown material are the responsibility of the Faculty/Department involved.

Please store unknown chemicals and waste separately from other chemicals in a cool, dry place within spill containment with 110% of total stored volume until the chemical or waste has been identified.

Forbidden for Transport

The Transportation of Dangerous Goods regulations outline 'Forbidden' chemicals. (Refer to Section 14 of the chemical's SDS for TDG information.) EH&S cannot accept these chemical wastes since the materials cannot be transported or consigned for transport.

Potentially Explosive Chemicals (PECs)

There are chemicals that can become very highly reactive or potentially explosive when they are left to deteriorate over time. EH&S cannot accept chemicals believed to have deteriorated into PECs (e.g., dry picric acid). Please refer to the chemical Safety Data Sheets (SDS) for information about PEC hazards. *Responsibility for rendering PECs safe rests with the owner of the chemical or, where the owner is not known or no longer at MRU, the Department responsible for the laboratory space.*

To prevent the development of PECs, there are a few precautions that can be taken to minimize the risk.

- Identify all chemicals that have the potential to form PECs in your laboratory/workspace.
- Record the opening date and expiry date on the label.
- Dispose of chemicals *before* the expiry date.
- Check the state of these chemical containers monthly.
- Train laboratory personnel in the safe storage methods, conditions to avoid, the hazards of the chemicals, and disposal procedures.

CHEMICAL WASTE

Chemical waste may be harmful or non-harmful chemicals. It can be subject to regulatory compliance, and must be handled, stored, and disposed of appropriately.

External contamination of chemical containers is always a safety concern. Any containers used for waste disposal must be free of visible external contamination (i.e., accumulated dust, dried liquids).

PURE CHEMICALS

Pure chemical waste is single chemical compound. It has not been mixed with other chemicals. Pure chemicals may be partially used or unused chemical. Pure chemicals mixed with water are considered pure chemicals. Compressed gases are considered pure chemicals.

Pure chemicals are typically disposed of if:

a. the chemical has degraded; or
b. the chemical has expired; or
c. the chemical is no longer required for use.

Pure chemical waste must be stored:

1. in the original supplier container or approved compatible waste container with proper WHMIS label;
2. in a separate area from the non-waste chemicals; and
3. in a secure and dry location.

Refer to the Safety Data Sheet (SDS) for proper handling and disposal of pure chemicals.

MIXED CHEMICALS

Mixed chemicals are any mixture of two or more chemicals, not including water. Mixed chemicals should contain like states of either liquid or solid.

COMPATIBILITY

All chemical waste must be segregated according to chemical compatibilities. Not all chemicals are compatible and can result in severe consequences if mixed.

Always separate liquids and solids.

Always separate acids and bases.

Refer to these Chemical Compatibility Guidelines for more detailed information.

Some categories to consider when segregating your chemicals include:

- Corrosives – Acids
- Corrosives – Bases
- Oxidizers
- Organic peroxides
- Compressed gases (non-returnable)
- Flammable liquids – halogenated
- Flammable liquids – non-halogenated
- Toxic materials
- Environmentally hazardous materials

SELECTING WASTE CONTAINERS

For pure chemicals an appropriate waste container is:

- the original supplier container,
- compatible container for aqueous pure chemicals, or
- contact EH&S for directions if the supplier container is physically compromised.

For mixed chemical wastes, choose a container **chemically compatible** with the material it will hold. Chemicals must not react with, weaken, or dissolve the container or lid.

Follow these basic compatibility guidelines:

- Acids or bases: Do not store in metal.
- Hydrofluoric acid: Do not store in glass.
- Gasoline (solvents): Do not store or transport in lightweight polyethylene containers such as milk jugs.

Use waste containers with leak-proof, screw-on caps so contents can't leak if a container tips over. Corks, parafilm, and bungs are *not acceptable*. If necessary, transfer waste material to a container that can be securely closed. Label the new container.

Keep waste containers closed except when adding waste.

Refer to *Appendix A – Waste Container Photo Reference* for further information.

LABELLING WASTE CONTAINERS

Each pure waste container must be clearly labeled with WHMIS hazard symbols according to the chemical's SDS. WHMIS labels are available in B232 for the Faculty of Science & Technology, and all other departments should contact EH&S via email to request suitable labels.

Each mixed waste container must be labeled with EH&S provided hazardous waste label (show right). These labels are available in B232 for the Faculty of Science & Technology, and all other departments should contact EH&S via email to request a sheet of labels.

STORING WASTE CONTAINERS

Store the waste in a designated location that is well ventilated and provides spill containment, or within a designated storage cabinet (flammable or corrosive), prior to disposal. Chemical waste must be stored separate from the chemical inventory and in an area that controls the hazards present with each waste class.

Always place your waste container in secondary containment if its location does not provide spill containment. A secondary container must be chemically compatible and able to hold 110% of the volume of waste stored in the primary container(s).

Regularly remove exterior contamination and dust from containers to prevent contamination of the work area, students, staff, and surface reactions with other chemicals.

Faculty and staff working in laboratories and workshops should log by quantity the chemical wastes added to a waste container to the best of their ability. This information is important to collect for disposal, and know what is present in case of a reaction, spill, or release. For a student lab section, this could be recorded based on a reasonable estimation of what is being added during the lab session. Refer to Appendix E – Chemical Container Inventory Form.

Chemical waste must be stored in appropriate compatibility groups with like hazards as defined in the Transportation of Dangerous Goods regulations.

- Flammable
- Toxic
- Oxidizers
- Acids
- Bases

If you have questions about where to store your waste containers, please contact EH&S for assistance.

CHEMICAL WASTE DISPOSAL

Pouring liquid chemical waste down the sink or sanitary sewers is strictly prohibited. Disposal of solid chemical waste to landfill is strictly prohibited. Any accidental release must be reported to EH&S immediately upon occurrence to ensure the City of Calgary is notified.

All containers should have approximately 20% empty head space to allow for expansion and gas formation.

Liquid chemical waste must be separated from solid chemical waste. Wastes that may form precipitates (or may react in other ways) when mixed should be segregated into different containers. Precipitates that do form should not be separated from the liquid phase.

All liquid or solid chemical waste must:

- be stored in a clean, compatible container with a tight, secure lid, in a designated space (refer to 'Storing Chemical Waste' above), and
- have a Chemical Waste Disposal Form (refer to 'Appendix B – *Chemical Waste Disposal Form* Completion' for detailed instructions).

Minimization of liquid waste is strongly recommended as best practice by EH&S to reduce the hazards associated with hazardous waste management and the impacts of spills.

CHEMICALLY CONTAMINATED DEBRIS

Anything that *is not an empty chemical container (next page), syringe, or other sharp (broken glass, slides)*, and has come into contact with chemicals (i.e., paper towel, lab coat, weigh boat, gloves, etc.) that cannot be cleaned, must be disposed of as chemically contaminated solid waste.

Faculty of Science and Technology labs have white garbage cans (refer to *Appendix A – Waste Container Photo Reference)* designated for this kind of waste. Lab technicians or instructors may close these bags as needed and bring them to B232 for processing and disposal. If you are in another MRU department, please contact EH&S to discuss options.

If you have questions about whether it is appropriate to dispose of certain items as chemically contaminated debris, please contact EH&S.

CHEMICALLY CONTAMINATED GLASS/SHARPS

Chemically contaminated glass and sharps (e.g., broken glass, blades), **but not syringes**, are disposed of in black 20L plastic buckets.

Chemically contaminated syringes are disposed in biohazardous sharps containers, but the biohazardous symbol **must** be completely and permanently defaced or covered in some way. (*Non-biohazardous sharp containers are overly large and not always available, so please take care to remove the symbol to avoid confusion.*)

Departments outside of the Faculty of Science and Technology may request appropriate containers through EH&S.

Refer to *Appendix A – Waste Container Photo Reference* for further information.

CLEAN GLASS & PLASTIC

Where appropriate, clean glass (washed/rinsed and labels defaced) can be collected for disposal in white glass disposal boxes. Refer to *Appendix A – Waste Container Photo Reference* for further information. Departments outside of the Faculty of Science and Technology may request appropriate containers through EH&S.

Where appropriate, clean, recyclable plastic (with labels defaced) can be collected and disposed of through MRU Environmental Services in the Mixed Recycling bins.

EMPTY CHEMICAL CONTAINERS

There are two options for disposing of empty chemical containers. Please contact EH&S if assistance is required with deciding which option is better for you.

Option 1

This is the preferred method if you have the training and experience to do so safely.

Rinse the container thoroughly with a small quantity of water or appropriate solvent. Disposed of the rinse liquid with your compatible liquid chemical waste. Deface the container label and dispose of as clean glass and plastic.

Containers that would generate a significant amount of contaminated liquid waste to clean the container should be disposed of using Option 2.

Option 2

Dispose the container as Chemically Contaminated Solid Waste or Glass/Sharps. For laboratories, empty chemical containers should be kept separate from the white garbage cans. Collect in a box lined with plastic bag or poly bucket.

COMMON WASTE CONTAINER ISSUES

No Waste Disposal Form – A completed waste disposal form is required for collection and disposal.

Waste Form Incomplete or Completed Incorrectly - Accurate and complete information about the contents of a waste container are required for collection and disposal.

Chemical Name Not Written in Plain English - Ensure proper English chemical names are provided for accurate and complete information for transportation and disposal.

Waste Container Overfilled – Overfilled containers cannot be collected and/or for reasons related to safe transportation, handling, and storage. Please contact labsafety@mtroyal.ca to consult on options for handling.

Improper Container for Waste Type - Containers that are not compatible with the type of waste cannot be collected for reasons related to safe transportation, handling, and storage. Please contact labsafety@mtroyal.ca to consult on options for handling.

Waste Container Leaking or Improperly Sealed – Ensure waste containers are properly sealed. Leaking or improperly sealed containers have the potential to contaminate common areas presenting an unacceptable hazard to building occupants and EH&S staff. Ask for assistance if you are unsure of how to proceed.

Waste Container External Contamination – Any container that has external contamination may pose a safety risk. External contamination is anything that is not part of the physical container excepting for labels or added markings.

SPECIALTY WASTES

Some wastes require special handling to safely store, collect, and dispose.

MERCURY

Mercury may be found in thermometers, thermostats, and older equipment around MRU. Mercury waste is disposed of based on how well the mercury is contained. Please contact EH&S if you have questions about disposing of mercury waste.

CONTAINED MERCURY

Plastic or Glass Containers

Plastic containers containing mercury do not require any special preparation.

Glass containers must be placed in a clear plastic bag, inside a box appropriate for the size of the glass container. The box must be labeled with wording “mercury containing items”.

Intact Instruments & Sealed Equipment

Intact instruments and sealed equipment containing mercury must be stored in a position that prevents spillage during transport if it is not sealed. Breakable instruments (i.e., thermometers) must be placed in a clear plastic bag, inside a box appropriate for the size of the item.

MERCURY CONTAMINATED MATERIALS

Materials are most often contaminated with mercury as a result of a mercury spill.

In the event of a mercury spill cleanup:

1. Clean the spill area with a vacuum apparatus and/or mercury appropriate absorbent or chemical agent. (*Hint: Turn off light sources and used a flashlight to find stray beads of mercury.*)
2. Collect contaminated and spill cleanup materials in a heavy plastic bag or double garbage bag.
3. Seal the bag.
4. Place bag in a box.
5. Label the box with wording “mercury contaminated waste”.

Any instrument or equipment drained of mercury is considered mercury contaminated waste. Please consult with EH&S when requiring removal of the instrument or equipment.

COMPRESSED GASES

EH&S will assist with disposal of small compressed gas cylinders (i.e., propane) and aerosol spray cans. Cylinders of technical gases are returned to vendors for refill.

Please contact EH&S to arrange compressed gas disposal.

BIOHAZARDOUS WASTE

Please consult the MRU *Biosafety Manual* for further details about handling and storing biohazardous and biomedical materials and waste.

EH&S will coordinate the disposal of biohazardous waste generated by most MRU work or learning activities. It is the responsibility of the Waste Generators to follow the disposal procedure to ensure waste is accepted for disposal. EH&S cannot accept biohazardous waste for disposal until the error is corrected.

You can access the Google Sheet detailing which disposal method is the correct one for your MRU biohazardous waste by clicking this link.

External contamination of chemical containers is always a safety concern. Any containers used for waste disposal must be free of visible external contamination (i.e., accumulated dust, dried liquids, blood).

AUTOCLAVE WASTE

Biohazardous solid waste and materials can be autoclaved for disposal to municipal landfill. Place the autoclave bag into a normal garbage bag and place the bag into the designated disposal bin(s).

Biohazardous liquid waste that is autoclaved should be disposed in polyethylene containers as mixed chemical waste due to known or potential chemical contaminates.

BIOHAZARDOUS WASTE BUCKET

Biohazardous waste buckets are used for items that cannot be autoclaved, excluding sharps (see below).

Each bucket must have a completed Biohazardous Container Disposal Form. Refer to 'Appendix C – *Biohazardous Container Disposal Form* Completion' for detailed instructions.

BIOHAZARDOUS SHARPS CONTAINER

Laboratories at MRU use a variety of sizes and types of biohazardous sharps containers. Biohazardous sharps are any blades, syringes, slides, or broken glass contaminated with blood, other bodily fluids, or media with known or suspected RG1 or RG2 pathogens.

Each biohazardous sharps container must have a completed Biohazardous Container Disposal Form. Refer to 'Appendix C – *Biohazardous Container Disposal Form* Completion' for detailed instructions.

WASTE COLLECTION AND DISPOSAL

Waste collection is managed by, and disposal is organized through, the EH&S Department.

WASTE CHECKLIST

- □ Each container must have a properly completed disposal form.
  - Biohazardous Container Disposal Form
  - Chemical Waste Disposal Form
- □ The container exterior is clean (i.e., free of contamination and dust).
- □ The container is not overfilled.
- □ The container is appropriate for the type of waste it contains.

COLLECTION AND STORAGE LOCATIONS

Faculty of Science and Technology

Technologists and instructors can bring waste containers to the B232 waste area at any time.

Facilities Management

Facilities Management staff can bring waste containers to the Main Loading Dock Waste Cage.

All Other Departments and Programs

For all other MRU departments and programs, a suitable collection area/room needs to be selected and maintained. Please consult with EH&S to ensure the designated area/room meets the applicable Building and Fire Codes for waste storage and safe storage.

REQUEST FOR COLLECTION OR DISPOSAL

Collections or disposals from MRU collection locations may be scheduled by EH&S for a mutually agreeable date and time. In some cases, this will require transportation of waste between campus locations to consolidate smaller containers.

Please email labsafety@mtroyal.ca with the following information.

- □ Room Number
- □ Number and types of chemical and/or biohazardous waste containers to pickup

REVISION HISTORY

Date	Revision	Notes
June 2020	01	Creation of Chemical and Biological Waste Manual by EH&S

APPENDIX A – WASTE CONTAINER PHOTO REFERENCE

The following containers are available to the Faculty of Science and Technology in the LRC. Other Departments may request these examples through EH&S.

LIQUID WASTE CONTAINERS

10 litre

4 litre

1 litre

Note: Red line indicates max fill level.

EXAMPLES OF UNACCEPTABLE CONTAINER FILLS

10 litre

4 litre

1 litre

(also, visible contamination)

GLASS DISPOSAL CONTAINERS

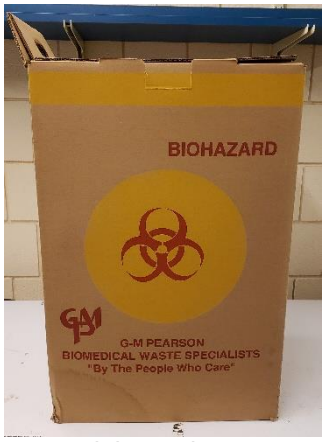
Contaminated Glass Only

Clean Glass Only

BIOHAZARDOUS WASTE CONTAINERS

The colours and markings of these containers may vary depending on the supplier.

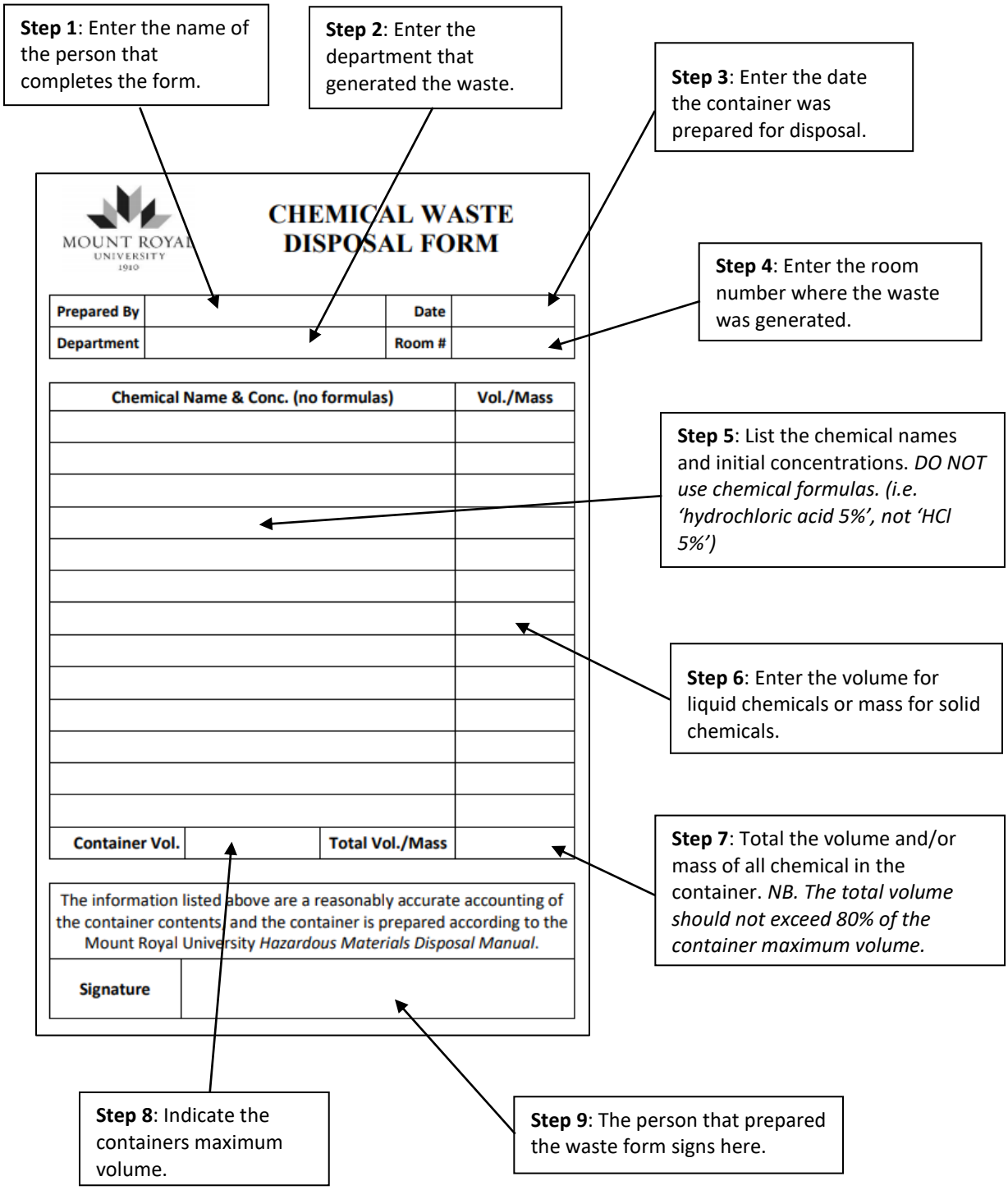
Biohazard Bucket



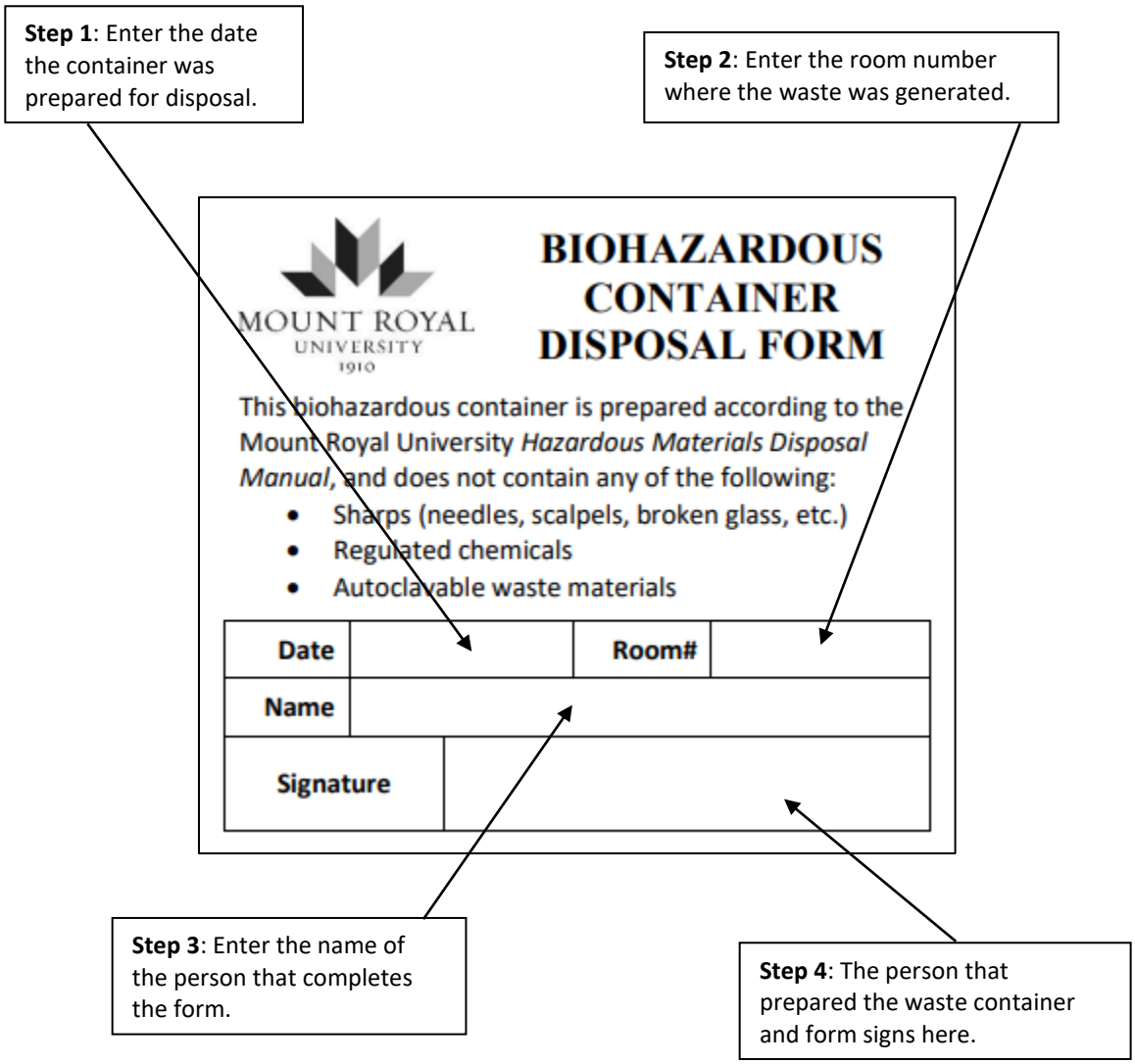
Biohazard Box

Biohazard Sharps Containers (smallest to largest)

APPENDIX B – *CHEMICAL WASTE DISPOSAL* FORM COMPLETION



APPENDIX C – *BIOHAZARDOUS CONTAINER DISPOSAL* FORM COMPLETION



APPENDIX D – CHEMICAL SPILL RESPONSE CHECKLIST

Personal Safety

- □ Avoid breathing vapors from spill.
- □ If possible, open outside windows.
- □ Put on protective equipment, including safety goggles, gloves, a long-sleeve lab coat, and a face mask or respirator, if necessary.

Containing the Spill

- □ If spilled material is flammable, turn off ignition and heat sources
  WARNING: Do not light Bunsen burners or turn on other switches.
- □ For major spills or significant areas of contamination, call 9-1-1.
- □ Remove injured or contaminated personnel to a safe place before assisting with first aid.
- □ Notify all individuals in the general vicinity that a spill has occurred.
- □ Notify area supervisor.
- □ Evacuate or isolate the area and keep other personnel out of the contaminated area.
- □ Close doors to affected areas.
- □ Post warnings to keep personnel from entering the area.
- □ Have a person with knowledge of the incident and area available to assist Security/EHS or emergency personnel.

Responding to the Spill

- □ If personnel are capable (trained and has the equipment) of cleaning up the spill safely without the assistance of EHS and emergency personnel, then:
- □ Confine spill to as small an area as possible.
  CAUTION: Do not wash spill down the drain.
- □ Use appropriate spill kits or sorbents to neutralize corrosives, absorb the spill, or both.
  NOTE: For powdered chemicals, use one of the following methods to clean up the spill:
  - Sweep carefully to avoid generation of dust.
  - Use moist sorbent pads.
  - Wet the powder with a suitable solvent and then wipe with a dry cloth.
- □ Collect contaminated materials and residues, and place in a waste container.
  - Dispose of the waste container according to the instructions in the appropriate section(s) of the MRU *Hazardous Materials Disposal Manual*.
- □ Clean the spill area with water.

Reporting Injuries and the Spill

- □ To report the spill, complete and submit the Injury/Incident Report Form.
- □ For personnel becoming sick or injured as a result of the spill, also indicate within the same report.

APPENDIX E – CHEMICAL WASTE CONTAINER INVENTORY FORM

Chemical Name	Quantities Added (L/mL or kg/g)				