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1. OVERVIEW

The University of Calgary has over 1000 laboratories and workshops across multiple buildings on multiple campuses. Many of the laboratories and workshops use or generate hazardous materials that must be disposed of properly to protect people, property and the environment. The information provided in this manual is a resource to accomplishing that goal.

If you have questions about anything related to hazardous materials not directly addressed by this manual, please contact Hazardous Materials Services (hazmat@ucalgary.ca) before taking any action.

1.1. Purpose

This manual is a reference for all faculty, students and staff of the University of Calgary who generate or use hazardous materials in the course of their work, studies or operations. This manual addresses the procedures for the collection and disposal of unused, leftover, unwanted or waste hazardous materials.

This manual lists the specific packaging, labelling and documentation requirements to facilitate the transportation and disposal of hazardous materials. The specific requirements are identified within various Acts and Regulations, including but not limited to: WHMIS, Human Pathogens and Toxins Act and Regulations, Canadian Nuclear Safety and Control Act & Regulations, Transportation of Dangerous Goods Act & Regulations, Alberta Environmental Protection & Enhancement Act, Alberta Fire Code, and other applicable federal and provincial acts, regulations, standards and municipal bylaws.

1.2. Hazardous Materials Services

Hazardous Materials Services (HMS) is a division of the Department of Environment, Health and Safety.

1.2.1. Responsibilities

HMS is responsible for the safe and timely collection, transportation, consolidation, and disposal of all chemical, biological and radiological hazardous materials generated by University of Calgary laboratories, facilities and operations. This is done in accordance with occupational health and safety, transportation, and environmental laws and regulations for hazardous materials.

HMS acts as a resource on issues encompassing hazardous materials and Transportation of Dangerous Goods (TDG).

HMS also recycles chemicals and other materials through our external recycling companies.

1.2.2. Contacting Hazardous Materials Services

You can contact HMS with questions via email at hazmat@ucalgary.ca. Someone will respond by the end of the next business day.

Please do not use the hazardous materials collection telephone line for inquiries as these are typically only reviewed just prior to waste collection.

1.3. University Staff Responsibilities

Personnel at the University of Calgary are required to store, use, and dispose of hazardous materials in a manner that protects people, property and the environment. Hazardous materials are not to be disposed of into the sanitary sewer (sinks or toilets) or into the regular garbage. This is to ensure the university is in compliance with federal and provincial acts, regulations, standards and Municipal bylaws. All hazardous materials are to be prepared and disposed of through HMS as described in this manual.

1.3.1. Adherence for successful disposal

To prevent accumulating of chemical waste, lab users should regularly submit chemical waste pickup request via Chematix. If the processes described in this section are not followed, HMS cannot accept hazardous materials for removal and disposal until errors are corrected.

1.3.2. Waste rejection

When hazardous waste is rejected, HMS will advise laboratory occupants (if available) about correcting the error. HMS will collect the waste if the error can be corrected immediately. If the error cannot be corrected at that time, a white waste rejection form detailing the reason for rejection will be placed with the waste container. An electronic rejection will also be issued for waste submitted via Chematix. Correct the error and resubmit the collection request for the next waste collection day according to Section 6.2. If you have questions about the waste rejection or require further assistance, please refer to Appendix C. Waste Rejection Reference or contact HMS via email. (hazmat@ucalgary.ca)

1.3.3. Hazardous Material Spills

It is expected that laboratory and workshop personnel will manage minor spills appropriately within their work areas.

If you are involved in the spill of a hazardous material, please follow the steps that are outlined on the Spill Response Procedures in the Laboratory Safety Manual. In the event of a major spill, Campus Security must be notified at 403-220-5333.

1.3.4. Hazardous Material Minimization Practices

HMS encourages the following practices for reducing the quantities of hazardous materials:

- Check departmental inventory before ordering your chemicals.
- Use less hazardous substitutes when feasible.
- Borrow from another lab
- Order only that amount needed.
- Conduct microscale experiments to minimize the amount of hazardous materials used and generated.
- Regularly dispose of expired or old chemical inventory.

1.3.5. Materials Not Accepted for Disposal

In some cases HMS cannot accept certain types of material for disposal.

- Unknowns

HMS cannot accept unknown chemicals of any kind. Identification of the material is the responsibility of the lab/department. The lab may request chemical classifiers strips (contact hazmat@ucalgary.ca for free strips) or use a commercial laboratory to perform identification. All costs incurred by using a commercial laboratory for identification are the responsibility of the lab/department involved. Please store unknown chemicals in a safe manner until such time as the chemical is identified.

- Forbidden for Transport

Some chemicals (e.g. 2,4-dinitrophenylhydrazine) may require further determination by HazMat to deem if acceptable for collection based on TDG Regulations and capability of specialized waste disposal vendors. Chemically reacting these specific materials in the laboratory to form a less hazardous, acceptable compound is recommended. To determine if a chemical is forbidden for transport, please refer to the TDG Regulations column 2 of Schedule 3 or contact hazmat@ucalgary.ca for consultation.

- Time-sensitive and Potentially Explosive Chemicals (PECs)

Some chemicals such as peroxidizable organic chemicals or desensitized explosives can deteriorate over time to become very highly reactive or potentially explosive. They are particularly dangerous because they may explode if they are subjected to heat, light, friction, or mechanical shock. Examples of PECs include diisopropyl ether, sodium amide, and picric acid. Please refer to the chemical Safety Data Sheet (SDS) for information about PEC hazards.

HMS cannot accept any chemical believed to have deteriorated into a PEC (e.g. dry picric acid, diethyl ether with crystalized peroxides).

Responsibility for rendering PECs safe rests with the lab/department.

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

- 1) Identify all time-sensitive chemicals in your inventory that have the potential to become potentially explosive. Commonly found PECs have been flagged in Chematix to assist with identification.
- 2) Record the date received and the date opened on the container label and/or a lab log book. Expiry dates must be recorded in Chematix for automated reminders. Always dispose of chemicals before the expiry date.
- 3) Visually inspect time-sensitive chemical containers regularly for the formation of crystals, discoloration, or layering.

Note: **Do not** inspect containers with time-sensitive chemicals/PECs of unknown age, origin or in unknown condition. Such containers and those with a failed visual inspection should not be touched, moved or opened – special precautions for extra protection are required. Secure area and post appropriate warning signs (e.g. “Do not move, touch, or open chemical container”) if safe to do so. Contact EHS (ucsafety@ucalgary.ca) or HazMat (hazmat@ucalgary.ca) without delay.

- 4) Train laboratory personnel regarding the safe storage methods, conditions to avoid, the hazards of the chemical, and disposal procedures.

Refer to the **UCalgary Chemical Storage and Waste Handling Standard** and **UCalgary Chematix Chemical Inventory Instructions** for information on hazards associated with time-sensitive and potentially explosive chemicals, guidance on the identification of common PECs, inspection criteria and frequency, disposal guidelines, and instructions to update expiry dates.

1.3.6. Clean Glass and Plastic Disposal

Clean glass and plastics with pointy edges must be disposed via the Blue Bucket Lab Waste Program. These materials must be free of visible contamination that has been triple rinsed with an appropriate surfactant or solvent to remove chemical residue or biohazard contamination. Labels on the container must be defaced with a marker or similar, have lids removed, and then put into a blue glass and plastic disposal bucket provided by Caretaking.

For more information on the Blue Bucket Lab Waste Program, please visit University of Calgary Sustainability.

Provision of blue buckets for collection and removal of clean glass and plastic disposal is the responsibility of Facilities Management & Development. Please submit an ARCHIBUS request for an extra collection or additional buckets.

2. CHEMICAL WASTE

To prevent accumulating of chemical waste, lab users should regularly submit chemical waste pickup request via Chematix. If the processes described in this section are not followed, HMS cannot accept hazardous materials for removal and disposal until errors are corrected.

2.1. Mixed Chemicals

Pure Chemicals are any partially used or unused chemical with a single chemical constituent. Aqueous solutions of pure chemicals are also considered pure chemicals. Compressed gases are considered pure chemicals.

Mixed Chemicals are any mixture of two or more chemicals including water. Mixed chemicals should contain like states of either liquid or solid chemicals. Some precipitate due to mixing of chemicals is allowable, but HMS may request that some mixed phase chemicals be separated if there are concerns about the mixture.

2.2. Compatibility

All chemical waste must be segregated according to chemical compatibilities. *Whenever possible keep solids and liquids separate.* Some of the categories to consider when segregating your hazardous materials include:

- Acids
- Bases
- Oxidizers
- Organic Peroxides
- Compressed Gases (collected by HMS if non-returnable, disposal fee may apply)
- Flammable Liquids – Halogenated/Non-halogenated
- Flammable Solids
- Toxic Materials
- Environmentally Hazardous Materials

Personnel must properly deactivate any waste that could be potentially reactive before disposal, such as quenching of pyrophorics or oxidizers. The SDS must always be referred to prior to mixing any chemical wastes in a container. If you have any questions about segregating your chemical wastes for disposal, contact HMS for assistance.

Figures 1 & 2 demonstrate the result of a reaction between incompatible chemical wastes. The 210L drum became pressurized and burst with enough force to crush ½” drywall and metal wall studs.



Figure 1



Figure 2

2.3. Documenting Chemical Waste Accumulation

Laboratories and workshops are required by the Alberta Fire Code to identify the chemical wastes stored in individual containers by quantity.

If you are collecting more than one type of chemical hazardous material in similar containers, each container must have a chemical waste log sheet with name and quantities of all chemicals being stored in each container. This is for the purpose of disposing chemical waste and for preventing a reaction between incompatible chemical waste.

A Chemical Waste Log Sheet is provided in Appendix B. Tracking volumes will also help avoid overfilling a container.

2.4. Selecting Chemical Waste Containers

Laboratories and workshops should select waste containers which are compatible with the chemical waste and the volumes of chemical waste generated by experiments. In some cases, HMS is able to provide select waste containers for certain waste purposes (see Appendix A).

Whenever there are distinct solid and liquid phases in a container, it is always preferable to separate them into liquid and solid components for disposal as a single phase.

HMS is also available to advise on appropriate waste containers laboratories or workshops may use.

2.4.1. Chemical Waste Storage

Chemical waste must be stored separately from other chemicals and in a location that controls the hazards present. For example, flammable wastes must be stored in a flammable cabinet.

If you have questions about where to store your chemical waste container, you can contact a Specialist, Laboratory Safety for assistance.

2.4.2. Reusable Waste Containers

There are 4 different reusable waste containers that are provided by HMS. Please do not write on or mark these containers directly.

If there is need to label the container for any reason, please use a piece of tape or paper attached with a small piece of tape.

All of these containers are provided to laboratories with a demonstrated need for regular disposal of large quantities of wastes. HMS prefers to issue these containers where they are collected every 1-3 weeks (with the exception of chemically contaminated gels). Reusable containers will not normally be issued to locations where collection does not occur on a routine basis (at least monthly). Due to cost and safety considerations HMS may discontinue the use of these containers in locations that do not follow these guidelines.

All reusable containers have an identifying code for the laboratory it is assigned to. If your laboratory is moving and has reusable containers, please contact HMS prior to the move so that your laboratory has correctly labelled containers.

Each mixed waste container must have a list of contents as per the requirement of Section 2.3.

18 litre Red Liquid Flammable Waste Containers

HMS provides 18 litre red liquid chemical waste containers (See Appendix A) to laboratories generating flammable liquid chemical waste in large quantities. These waste containers are opaque and there is a metal spark arrestor inside. The lid is spring loaded to allow for the release of any excess pressure.

The spark arrestor prevents direct visual inspection of the liquid level. If liquid is visible within the spark arrestor, the waste container is overfilled, and some of the contents will

need to be removed before HMS can collect the waste. Overfilling the waste container reduces head space in case of gas generation and increases the chances of spillage if the container is tipped since the lid is not a liquid tight seal.

To prevent corrosion of the spark arrestor, it is recommended not to pour acid or base into the red liquid flammable waste container. If the spark arrestor is corroded, please contact hazmat@ucalgary.ca for a replacement.

Attempt to make an accounting of the waste contents removed from an overfilled container as accurate as possible.

20 litre White Poly Liquid Chemical Waste Containers

HMS provides 20 litre white poly liquid chemical waste containers (See Appendix A) to laboratories that generate aqueous or low-volatility organic waste (with exceptions as determined by HMS) in quantity.

10 litre White Poly Liquid Chemical Waste Containers

HMS provides 10 litre white liquid chemical waste containers (See Appendix A) to Laboratories that generate smaller quantities of aqueous or low-volatility organic waste (with exceptions as determined by HMS) where larger or smaller container options may not be appropriate. HMS may also issue these containers where there are no smaller containers suitable for the chemical waste being collected.

White Chemically Contaminated Gel Waste Container

HMS provides a white waste container (See Appendix A) to laboratories for disposal of gels contaminated with ethidium bromide or other chemicals. These are lined with a clear plastic bag and come with a cable tie to seal the bag when full.

Drain excess liquid from the gels prior to placing them in the bag in the gel waste container. Prior to submitting a collection request, seal the bag with the cable tie and securely close the lid. If there is any solid waste other than gels in the container, it will be rejected. Ethidium bromide liquids are toxic, and can be disposed with other toxic liquid waste.

Any non-gel solid waste (e.g. gloves, paper, pipette tips, etc.) contaminated with ethidium bromide must be segregated and prepared as chemically contaminated solid waste (Section 2.6.1).

2.4.3. Single Use Containers

Laboratories are permitted to use other containers for collecting liquid and solid chemical wastes. All containers must have at least 10% head space to allow for expansion and gas production. The containers must be capable of sealing completely to prevent leakage of the contents.

Each mixed waste container must have a list of contents as per the requirement of Section 2.3.

4 litre Glass Winchester Bottles

Laboratories that use solvents or other chemicals from 4 litre glass Winchester bottles can reuse these bottles to collect liquid or solid chemical waste that is *compatible with the bottle's original content, or the bottle is thoroughly cleaned before use*. Ensure that the original label is defaced to prevent confusion about the bottle's contents, even if the waste content is the same chemical as original product.

For laboratories that do not have access to 4 litre bottles, HMS can provide bottles upon request. Please remember to request replacement bottles when contacting HMS for collection.

The maximum liquid volume for 4 litre glass bottles is 3.5 litres.
HMS will not accept more than 12 litres of similar mixed waste per collection day.

20 litre White Polyethylene Pails

HMS can provide 20 litre UN rated white polyethylene pails for certain types of liquid or solid waste. Please contact hazmat@ucalgary.ca for a consultation.

Polyethylene Drums

In some cases, HMS can provide polyethylene drums for large quantities of liquid chemicals. Please contact hazmat@ucalgary.ca for a consultation.

Steel Drums

In some cases HMS can provide steel drums for large quantities of solid chemicals or contaminated materials. Please contact HMS for a consultation.

Other Containers

There are a wide range of potential new or used containers that could be used to store liquid or solid chemical waste. Whether it is an empty chemical bottle, a new glass bottle or a small plastic container, in all cases check the chemical SDS to ensure that the container material is compatible for the safe storage of the chemical.

Containers must be in good physical condition – not cracked, brittle or have a loose fitting lid. It is unsafe and not recommended to use solid chemical containers to store liquid chemicals, as solid chemical containers do not have proper seals/caps to prevent leakage. Do not store any chemical waste in metal containers.

If you have any questions or concerns about appropriate containers for chemical waste, please contact HMS for a consultation.

Liquid or solid waste should fill a waste container no higher than the shoulder of the bottle as seen in Figure 3.



Figure 3

2.5. Liquid Chemicals

HMS will issue containers to laboratories that produce enough waste to consistently fill a container every one to three weeks. For safety reasons, HMS encourages laboratories that do

not generate more than 10 litre or 20 litre of waste during a 1-3 weeks period to use a smaller container and dispose of it regularly to reduce the potential of adverse chemical reactions or releases taking place, and to reduce the chances of the materials becoming improperly identified over time.

If the laboratory generates large volumes of liquid chemical waste on a seasonal or occasional basis, HMS can provide temporary reusable chemical waste containers on a short term basis for the collection of chemical waste.

If the laboratory is producing two or more compatibility categories of waste (See Section 2.2), please inform HMS so that HMS can issue your laboratory the appropriate containers for the volume and type of waste generated. Please contact HMS if you are unsure of what kind of container is compatible with the waste your laboratory is producing.

Each mixed waste container must have a list of contents as per the requirement of Section 2.3.

2.6. Solid Chemicals

Any waste that is predominately solid matter is disposed of as solid chemical waste. This could include chemically contaminated gloves, gas filter cartridge, wipes, pipette tips, silica gel, glass or plastic that cannot be decontaminated. If you have questions about whether it is appropriate to dispose of certain items as solid chemical waste, please contact HMS for consultation.

For disposing a piece of equipment or instruments, a description of its hazardous contents is required.

Each mixed waste container must have a list of contents as per the requirement of Section 2.3.

2.6.1. Chemically Contaminated Solid Materials

Anything that is not a syringe needle or other sharp and has been contaminated by chemicals which cannot be cleaned, is considered chemically contaminated solid material. Items may include; paper towel, bench coat, weighing boats, gloves, etc. Collect chemically compatible solid waste (i.e. non-reactive or must be fully quenched) in a clear plastic bag. The filled clear plastic bag must be sealed, then place it in a cardboard box sealed with tape for collection by HMS.

Please indicate the presence of any glass (intact or broken) on the Chematix Waste Card or the Non-Chematix Authorization Form.

HMS will only accept 3 boxes containing similar mixed waste per visit.

Only boxes with a maximum total size of 122 centimetres/48 inches in all three dimensions, and that weigh a maximum of 12 kilograms/25 pounds will be accepted.

Chemically Contaminated Syringe needles and Sharps

Chemically contaminated needles and other sharps (e.g. blades) are disposed of in 20 litre yellow biomedical waste containers if they are used in large quantities. Refer to Section 3 for information on disposing of biomedical waste containers. For small quantities of sharps, purchase an approved sharps container of an appropriate size.

2.6.2. Contaminated Silica Gel

Contaminated silica gel must be collected separately from other debris. A list of liquid chemicals used with the media is required on the disposal paperwork. Solvents must be collected separately as liquid chemical waste. A single use container (Section 2.3.2) is the best choice for collecting contaminated silica gel.

2.6.3. Empty Chemical Containers

Triple rinse the container thoroughly with a small quantity of an appropriate cleaner, such as water, solvent, or surfactant. Dispose of the rinse liquid with your compatible liquid chemical waste. Deface the container label and dispose as clean glass and plastic. (Refer to Section 1.3.6) Containers that would generate a significant amount of contaminated liquid to clean, should be disposed of as Chemically Contaminated Solid Materials. (Refer to Section 2.6.1 above.)

2.7. Elemental Mercury

Mercury waste is disposed based on how well the mercury is contained. Please contact HMS if you would like assistance in determining how to best package mercury wastes for disposal.

2.7.1. Contained Liquid Mercury

Mercury contained within an *intact* plastic (preferred) or glass container, *intact* instruments (such as a thermometer or manometer) or *sealed* equipment can be disposed of as contained liquid mercury.

Plastic or Glass Containers

Plastic containers do not require any special preparation.

Glass containers must be placed in a clear plastic bag and then put into a box of sufficient size to enclose the item. Label the box with the wording "mercury items".

Chematrix users must use the *Pure Chemicals in Individual Containers* Waste Card when disposing mercury in containers.

Intact Instruments

Intact instruments containing mercury must be stored in a position that prevents spillage during transport if it is not sealed. Breakable instruments (such as thermometers) must be placed in a clear plastic bag. The plastic bag must be sealed, then put into a box of sufficient size to enclose the item.

Use the *Contaminated Materials* Waste Card when submitting instruments containing mercury.

Sealed Equipment

Instruments containing mercury must be stored in an upright position or in an orientation that will allow easy transport.

Use the *Contaminated Materials* Waste Card when submitting sealed instruments containing mercury.

2.7.2. Mercury Contaminated Materials

Materials are most often contaminated as a result of a mercury spill. Collect any materials contaminated by mercury in a heavy weight plastic bag (or double bag with garbage bags) and seal it. Place the sealed bag into a box sealed with tape and label the box with the wording “mercury waste”.

Any instrument or equipment drained of mercury is considered mercury contaminated waste. Please contact HMS to make arrangements for the removal of the instrument or equipment.

Use the *Contaminated Materials Waste Card* when submitting mercury contaminated materials.

2.8. Batteries

Designated bins are located in various locations on campuses for collecting all types of batteries (alkaline, lithium and nickel-metal hydride, etc.) for recycling or disposal. Bin locations can be found on UCalgary Sustainability website.

Terminals on 9V batteries must be taped or have terminal covers installed to prevent an electrical short that could cause a fire.

For uninterruptible power supply (UPS) and large battery such as lead-acid from laboratories, workshops and offices, please contact hazmat@ucalgary.ca.

2.9. Compressed Gases

HMS collects small compressed gas cylinders (e.g. lecture bottles, propane tanks) and aerosol cans for disposal.

Aerosol cans must be segregated into paint or non-paint aerosols (e.g. spray adhesives, penetrating oils, lubricants, etc.)

Researchers are encouraged to consider alternatives to lecture bottles whenever possible, as they can be costly to dispose of and, in some cases, are not accepted by Hazardous Materials Services due to Transportation of Dangerous Goods constraints. Connect with supplier for options on small refillable cylinders.

Charges may apply for the disposal of all non-returnable gas cylinders (lecture bottles, bottles from out of business companies, etc.). These charges will reflect only the actual expense incurred for disposal of the cylinders. There will be no mark up or handling charges added to the cost. This is necessary due to the escalating cost of disposal for these items.

EXCEPTION: Propane tanks, torch gas cylinders and calibration gas cylinders will continue to be collected without charge.

Please contact HMS with questions about whether or not your compressed gas cylinder may be subject to cost recovery.

3. REQUIREMENTS FOR CHEMICAL WASTE COLLECTION

When HMS collects the hazardous materials ensure that:

- The waste location is accessible to HMS, or HMS has the contact information of someone who can open the room or lab.
- The paperwork is completed accurately and attached to the waste with a small piece of tape, approximately the length of 5cm. All chemical containers must have a properly completed Chematix waste card or Chemical Waste Disposal Authorization as described in Section 5.1.
- Waste card is printed on a letter size paper (8.5" x 11"). Trimming of the waste card is not necessary.
- The Chematix waste card number is required to be written on single-use container as identification.
- All reusable waste containers listed on section 2.4.2 above have HMS assigned container codes (i.e. HMRB-B19-T105) This code must be written onto the Chematix waste card as identification.
- Reusable container code must be provided in the Chematix Pickup Request 'Instructions' field.
- The containers are free of external contamination.
- The containers are not overfilled.
- The containers are appropriate for the type of waste contained.

Refer to Section for details on contacting HMS for collection when the chemical waste is ready.

3.1. Large Quantity Disposals

When disposing of large numbers of *pure chemicals* (more than 10), there are some preparatory steps that will ensure efficient collection of your waste. If your laboratory or workshop is closing, please ensure that there is sufficient time for all the steps below to be completed before closing.

HMS may visit the laboratory to determine the number of overpacks needed for transportation, and to check that segregation and paperwork are properly completed prior to performing the actual collection.

3.1.1. Chematix Users

1. Download the laboratory Chematix inventory file. (The file can be exported as an Excel spreadsheet by selecting in Chematix, **Inventory** → **Manage My Inventory** → **select the room** → **select Email Active Lab Inventory**)
2. Delete the items from the file that are not being disposed.
3. Submit the spreadsheet to HMS via email. (hazmat@ucalgary.ca)
4. HMS will classify the chemicals according to TDG regulations, physical state, and chemical compatibility before returning the spreadsheet to the person that submitted it. HMS will return the classified spreadsheet within 10 working days.

5. The edited spreadsheet will be subdivided into individual pages that indicate the classification group (e.g. 3, 4.1, 6.1, 9) of each chemical. Segregate the chemicals according to these spreadsheets.
6. Create a pure chemical waste card for each chemical on the spreadsheet. Assistance on preparing waste cards is available in the Hazardous Waste Disposal Instructions on the Lab Safety Program webpage. To access the Hazardous Waste Disposal Instructions, go to the Environment, Health & Safety website → Laboratory Safety→ Chematix Instructions.

3.1.2. Non-Chematix Users

1. Download the Large Quantity Waste Excel spreadsheet from the Hazardous Materials Services website.
2. Inventory the chemicals for disposal and enter the information for the chemical name, CAS #, container size, quantity remaining and physical state into the spreadsheet.
3. Submit the spreadsheet to HMS via email. (hazmat@ucalgary.ca)
4. HMS will classify the chemicals according to TDG regulations, physical state, and chemical compatibility before returning the spreadsheet along with the Chemical Waste Authorization form to the person that submitted it. HMS will return the classified spreadsheet within 10 working days or less depending on HMS work load.
5. The edited spreadsheet will have additional worksheets that indicate the classification group (e.g. 3, 4.1, 6.1, 9) of each chemical. Segregate the chemicals according to this information.
6. Print off two copies of the worksheet for each group of chemicals, and place with the segregated chemicals.
7. Complete and print off two copies of the Chemical Waste Authorization form indicating the attached list of chemicals and place with each group of segregated chemicals.
8. Contact HMS when the segregation and paperwork is complete to arrange a mutually agreeable time and date for the collection.

4. BIOHAZARD AND BIOMEDICAL WASTE

HMS will collect and dispose of biohazard and biomedical waste generated by University of Calgary teaching, research or operations. To prevent accumulating of biohazard and biomedical waste, lab users should regularly submit biohazardous waste pickup request via Chematix.

If the processes described in this section are not followed, HMS cannot accept your hazardous materials for removal and disposal until any errors are corrected.

4.1. Biohazard and Biomedical Waste Containers

HMS will only provide 20 litre yellow biomedical waste containers and biomedical waste boxes to laboratories. Pickup of biomedical waste is requested online via Chematix. All biohazards waste must be prepared and disposed as outlined below. Please refer to the Biosafety and Procedures Manual for further details about handling and storing biohazardous and biomedical waste.

4.1.1. Clear Plastic Autoclave Bags for Biohazard Waste

Biohazard waste includes biohazard-contaminated items such as absorbent materials (e.g. paper towels), gloves, and/or plastics (e.g. microcentrifuge tubes, petri plates and tissue culture flasks containing small volumes of biohazards).

Biohazard waste must be placed in a clear plastic autoclave bag with dimensions no larger than 62x76 centimetres or 24x20 inches (See Appendix A). Place biohazards into the bag; do not fill more than 2/3 the capacity of the bag. Secure the neck of the bag with tape allowing an opening for steam to penetrate the bag. Transport the bag in a tray on a cart to the nearest autoclave. Once autoclaved, place the autoclave bag inside a garbage bag for disposal with regular garbage.

Large volumes of liquid biohazard waste in glass or plastic containers must not be placed in an autoclave bag; these glass or plastic containers must be placed directly in the autoclave.

Syringes needles/sharps, glass, blood, items visibly contaminated with blood, biohazards symbols, radioactive waste and symbols, chlorine-treated items, and chemical waste are prohibited from clear plastic autoclave bags.

4.1.2. 20 litres Yellow Biomedical Waste Container

20 litres yellow biomedical waste containers (See Appendix A) are provided for the disposal of:

- All metal sharps;
- All blood or items visibly contaminated with blood;
- Glass sharps, glass pasteur pipettes and broken glass contaminated with a biohazard if chemical decontamination is impossible.

Personnel must not fill the yellow biomedical waste container past the first ring on the container. HMS will reject containers weighing more than 15 kilograms. Remove any external contaminants including excess dust and visible liquid residue from container's exterior with a damp paper towel. Please ensure there is an accurate description of the contents including materials and contaminants as this may influence the method of disposal.

20 litre yellow biomedical waste containers are exchanged on a one-for-one basis or by special arrangement dependent on the department or location of the laboratory. If the laboratory requires additional 20 litre yellow biomedical waste containers due to

increased waste generation, contact hazmat@ucalgary.ca to arrange for the delivery of additional containers.

The preferred method for closing a yellow biomedical waste container is to use a rubber mallet. Hold lid in place with your hand at the 9 o'clock position and strike the edge of the lid at the 3 o'clock position. The blow must be quite forceful to properly seal the lid. Rotate the container 60 degrees and repeat until the lid is secured. When the yellow biomedical waste container is properly closed, there should be no more than 2 milliliters gap between the lid and the container.

4.1.3. Biomedical Waste Boxes

Biomedical waste boxes (See Appendix A) are provided for the disposal of:

- Metal sharps contained in a smaller sharps container (See Appendix A); and
- Non-sharp items visibly contaminated with dry blood (e.g. absorbent materials or dried tissue).

HMS will deliver biomedical waste boxes flat packed upon consultation regarding use. Users that have made prior arrangements with HMS will receive new boxes when HMS collects the full boxes.

To assemble the biomedical box, pull the box open and turn it upside down. Fold in the two shortest flaps opposite each other, then fold in the remaining two flaps. Seal the flaps with packing tape.

Turn the box right side up and line the box with yellow biomedical bag. When the box is 3/4 full, it is time to prepare it for pick up. Gather the four edges of the yellow bag from the side of the box. Twist the top of the bag to secure contents. Secure the seal with packing tape or gooseneck knot to prevent any leakage if inverted. To close the top of the box, fold down the narrowest flaps on both sides to produce handles for carrying, then engage the remaining flaps and seal the flaps with packing tape.

HMS will reject boxes weighing more than 12 kilograms. Overloading a box may cause it to tear or fail. Please ensure there is an accurate description of the contents as this may influence the method of disposal.

4.1.4. Small Sharps Containers

Laboratories are encouraged to purchase small (less than 5 litres), commercially-available sharps containers for disposing of sharps(See Appendix A). HMS will collect and dispose of these sharps containers. Please ensure that the outside of the container is free of external contamination.

4.2. Biomedical Waste Collection

When HMS collects the biomedical waste containers please ensure that:

- Each container has a Chematix Bio Hazardous Waste Card with the last four digits of the waste card barcode written onto the lid of the container, or a Biomedical Waste Label for approved Non-Chematix submissions.

- The waste location is accessible to HMS, or HMS has the contact information of someone who can open the room or lab.
- The paperwork is completed accurately and attached to the waste with a small piece of tape, approximately the length of 5cm.
- Waste card is printed on a letter size paper (8.5" x 11"). Trimming of the waste card is not necessary.
- The Chematix waste card number is required to be written on single-use container as identification.
- The container is free of external contamination or dust.
- The containers are not filled past the first ring on the 20 litres biomedical waste bucket.

Refer to Section 6 for details on contacting HMS for collection when the biomedical waste is ready.

5. RADIOACTIVE WASTE

The University of Calgary must dispose of all radioactive materials according to the Canadian Nuclear Safety, as described in the Radiation Safety Manual procedures.

Materials contaminated with or containing radioactive materials will be considered radioactive waste. This includes solids, liquids, animal carcasses, animal tissue, and equipment. Radioactive sealed sources for disposal are also considered radioactive waste.

If the processes described in this section and the *Radiation Safety Manual* are not followed, HMS cannot accept your waste for removal and disposal until the error is corrected.

Additional information about handling radioactive material is available in the University of Calgary Radiation Safety Manual.

5.1. Documenting Waste Accumulation

Document the disposal of radioactive materials on the radioactive inventory sheet as wastes are placed in the radioactive waste containers. Then, fill in the Radioactive Waste Disposal Authorization form. Refer to the Radiation Safety Manual Section EHS-RAD-1013.

5.2. Radioactive Waste Containers

HMS provides radioactive waste containers to laboratories that have a valid radioisotope permit and are actively conducting research using radioisotopes. Laboratories that are not actively using radioisotopes should contact HMS to have their radioactive waste containers removed. HMS will provide or supply new radioactive waste containers and spill trays when the laboratory resumes radioisotope experiments. The liquid and solid radioactive waste containers must be placed in the available spill trays.

When a laboratory contacts HMS for radioactive waste collection, HMS will provide replacement containers.

Waste containers other than those provided by HMS must not be used for radioactive waste unless approved in writing by the Radiation Safety Officer.

Glass containers are not acceptable for disposal of radioactive liquid waste.

ALL waste containers used for the collection of radioactive waste are LABELLED with a "CAUTION RADIOACTIVE MATERIAL" sticker.

5.2.1. Radioactive Liquid Waste Container

HMS issues liquid waste containers (See Appendix A) to laboratories for the collection of radioactive liquid waste. The liquid waste containers are red and labelled with a "CAUTION RADIOACTIVE MATERIAL" sticker. The lid is spring loaded to allow for the release of any excess pressure.

The maximum liquid volume for the radioactive liquid safety cans is 18 litres.

5.2.2. Radioactive Solid Waste Container

HMS issues solid waste containers (See Appendix A) to laboratories for the collection of radioactive solid wastes. The solid radioactive container is a yellow garbage can with the radiation warning symbol with the wording "CAUTION RADIOACTIVE MATERIAL" on the can. The container may not appear exactly as depicted in Appendix A. The radioactive solid waste container includes an inner white plastic liner and a black garbage bag.

DO NOT place animal carcasses or tissues in the solid waste container.

5.2.3. Radioactive Liquid Scintillation Vial Container

HMS issues liquid scintillation vial containers (See Appendix A) for laboratories to collect liquid scintillation vials used for swipe checks and counting radioactive samples. The container is a black 20 liters plastic pail, lined with a heavy weight, clear plastic bag. Additional plastic bags and cable ties are provided to the laboratory when the container is issued or by request to HMS.

5.3. Radioactive Waste Segregation

Please ensure that radioactive waste is segregated by type (Solid, Liquid, Liquid Scintillation Vials, Stock vials, Carcasses) according to the directions in the following sections. Failure to do so may result in rejection of your waste being collected from the lab.

5.3.1. Radioactive Materials that contain Biohazardous Materials

Any radioactive waste which also contains a *biohazardous material* as defined by Public Health Agency of Canada or Canadian Food Inspection Agency is required to be chemically disinfected (with a chemical appropriate for the biohazard - e.g. Virkon, bleach, etc.) before disposing as radioactive waste.

5.3.2. Radioactive Liquid Waste

Liquid waste must be poured into the radioactive liquid waste container. The radioactive liquid waste container must not be filled above the maximum capacity of 18 litres. The chemical constituents, including all buffers, must be recorded on the disposal form which can be found in the Radiation Safety Manual Section EHS-RAD-1013.

Keep a log of the chemical constituents and volumes, isotopes and activity added to the safety can to prevent overfilling.

5.3.3. Radioactive Solid Waste

Refer to the Radiation Safety Manual EHS-RAD-1001 Section 3 for the instructions on disposing of radioactive solid waste.

5.3.4. Radioactive Contaminated Sharps

Refer to the Radiation Safety Manual EHS-RAD-1001 Section 3 for the instructions on disposing of Radioactive contaminated sharps (syringes, needles, scalpels, and blades).

5.3.5. Radioiodine Liquid Waste

Refer to the Radiation Safety Manual EHS-RAD-1001 Section 3 for the instructions on disposing of radioiodine liquid waste.

5.3.6. Stock Vials

Refer to the Radiation Safety Manual EHS-RAD-1001 Section 3 for the instructions on disposing of stock vials.

5.3.7. Liquid Scintillation Vials

Liquid scintillation (LS) vials are segregated by the type of vial. Ensure the lids on liquid scintillation vials are on tight to prevent leakage.

Refer to the Radiation Safety Manual EHS-RAD-1001 Section 3 for the instructions on disposing of the following types of liquid scintillation vials:

- Plastic liquid scintillation vials
- Glass liquid scintillation vials
- I-125 contaminated liquid scintillation vials

5.3.8. Radioactive Gases

Radioactive gases collected or generated during an experimental procedure must be released into a fume hood.

5.3.9. Radioactive Carcasses

Refer to the Radiation Safety Manual EHS-RAD-1001 Section 3 for the instructions on disposing of radioactive carcasses.

5.3.10. Disposal of Shipping Containers and Packaging

Refer to the Radiation Safety Manual EHS-RAD-1001 Section 3 for the instructions on disposing of shipping containers and packaging. Plastic wrapping around the stock vial and contaminated packaging must be disposed of into the solid radioactive waste container.

5.4. Radioactive Waste Collection

Samples of how to complete the disposal forms for different types of waste are online in the Radiation Safety Manual (EHS-RAD-1014, EHS-RAD-1015, EHS-RAD-1016).

5.4.1. Prior to Collection

Refer to the Radiation Safety Manual EHS-RAD-1001 Section 4 for the instructions on preparing radioactive waste for pickup.

5.4.2. Contact HMS for collection

Refer to Section 6.2 (see below) for details on contacting HMS for collection when the radioactive waste is ready

6. HAZARDOUS WASTE COLLECTION

Hazardous Materials Services conducts regular waste collection on Main, Foothills, and Spyhill campuses. Other locations are collected when required. All hazardous materials require completed waste documentation as dictated by your location.

6.1. Which System to Use

Chemical and Biohazardous Waste

A current list of University departments and locations required to use Chematix for submitting waste collection requests to HMS is listed on the Hazardous Materials Services website.

If your lab, workshop or office is not registered in Chematix, please contact HMS via email at hazmat@ucalgary.ca to receive a copy of the instructions and forms for your waste type.

Radioactive Waste

Complete instructions for disposal of radioactive waste that are found on the Radiation Safety Manual.

6.2. Collection Schedule

The HMS collection schedule and collection contact phone number is posted on the Hazardous Materials Services website.

Any variation to this schedule dictated by Statutory Holidays or other unforeseen circumstances will be posted to the Chematix homepage as soon as possible.

7. RELATED DOCUMENTS

University of Calgary:

- Biosafety Program and Manual
- Hazardous Materials Disposal Guidelines
- Laboratory Safety Program and Manual
- Radiation Safety Manual

8. ADDITIONAL RESOURCES

University of Calgary:

- Sustainability (Waste and Recycling)
- Facilities Customer Care (ARCHIBUS)

Outside University of Calgary:

- Alberta Environmental Protection & Enhancement Act
- Alberta Fire Code
- Alberta Occupational Health and Safety Code
- Canadian Nuclear Safety and Control Act & Regulations
- Health of Animals Act and Regulations
- Human Pathogens and Toxins Act & Regulations
- Workplace Hazardous Materials Information System (WHMIS)

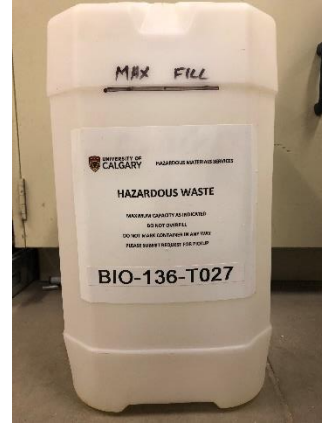
9. APPENDIX

Appendix A – Waste Container Photo Reference

18 LITRE RED LIQUID CHEMICAL WASTE CONTAINER



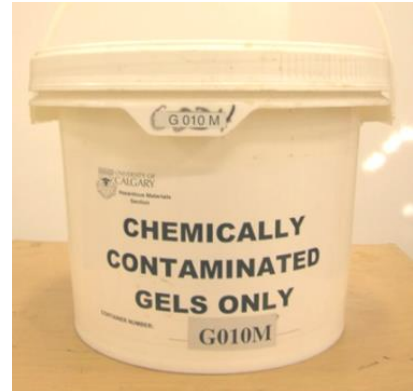
20 LITRE WHITE LIQUID CHEMICAL WASTE CONTAINER



10L WHITE LIQUID CHEMICAL WASTE CONTAINER



CHEMICALLY CONTAMINATED GEL WASTE CONTAINER



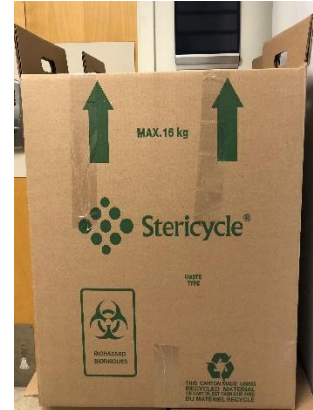
CLEAR PLASTIC AUTOCLAVE BAG WITH BIOHAZARD WASTE



20 LITRE YELLOW BIOMEDICAL WASTE CONTAINER



BIOMEDICAL WASTE BOX BIOMEDICAL BOX PICTURE



SMALL SHARPS CONTAINERS



RADIOACTIVE LIQUID WASTE CONTAINER



RADIOACTIVE SOLID WASTE CONTAINER



RADIOACTIVE SCINTILLATION VIAL CONTAINER



IODINE LIQUID WASTE CONTAINER



Appendix B—Chemical Waste Log Sheet

Chemical Name (printed) (No symbols or diagrams)	Quantity (mL)					

Appendix C – Waste Rejection Reference

The following are some of the reasons that HMS will reject waste.

- **Door Locked** - HMS does not possess master keys to access locked laboratories. Note: Hazardous materials must never be left unsecured in hallways
- **Waste Documentation Incomplete or Completed Incorrectly** - HMS requires accurate and complete information about the waste such as chemical name, quantity, and physical state for proper transportation and disposal.
- **Waste Container Overfilled or Oversized**- HMS will not accept containers which are overfilled or oversized for reasons related to safe transportation, handling, and storage. Liquid chemical waste container must have approximately 10 percent headspace. Box that contains chemically contaminated solid materials must not exceed a maximum total size of 122 centimeters/48 inches in all three dimensions and must not weigh over a maximum of 12 kilograms/25 pounds
- **Improper Container for This Waste Type** - HMS will not accept containers that are not compatible with the type of waste being offered for disposal for reasons related to safe transportation, handling and storage.
- **Waste Container Leaking or Improperly Sealed** - HMS will not accept waste containers that are leaking or improperly sealed. Leaking or improperly sealed containers have the potential to contaminate common areas and the transport vehicle, thereby presenting an unacceptable hazard to other building occupants and HMS staff. Contact HMS for assistance if you are unsure of how to proceed.
- **Exceeds 12 Litres of Similar Mixed Waste** - Minimizing the quantity of waste accumulated and retained in the lab for extended periods is an integral part of safe storage. Submit waste pickup request for pickup whenever you have filled the container you are using for your liquid waste. This does not apply to HMS issued reusable container.
- **Exceeds 3 Boxes of Similar Mixed Waste** - Minimizing the quantity of waste accumulated and retained in the lab for extended periods is an integral part of safe storage. Submit waste pickup request for pickup whenever you have filled the container you are using for your contaminated debris waste.
- **Waste Container Has External Contamination** - HMS will not accept any container that has external contamination that may or may not pose an actual safety risk. External contamination is anything that is not part of the container except for labels or added markings.
- **Chemical Name Written in Abbreviation** - Proper English chemical names must be provided for accurate and complete information for transportation and disposal. Acronyms, abbreviations, or trade names will not be accepted.