

Chemical Hazardous Waste. Introduction

Hazardous waste is waste that, when present in quantities and concentrations that are high enough, pose a threat to human health or the environment if they are improperly stored, transported, treated or disposed. Details on this can be found within the [O. Reg 437: General-Waste Management](#).

As part of the cradle-to-grave management system of the MOECP, hazardous waste requires special handling with respect to how it is collected, stored, transported, treated, recovered and disposed to reduce adverse effects to human health and the environment.

At Brock, Science Stores staff coordinate the chemical hazardous waste collection. An external contactor licensed to haul and dispose of hazardous waste collects said waste from the labs in the company of the Brock staff.

Lab users that cause the generation of hazardous waste shall follow the procedures outlined below in alignment with the safety and environmental protection legislation that apply ([Environmental Protection Act, O. Reg 437: General- Waste Management](#)). In following these procedures, the handling and disposal of hazardous waste can be made safely.

Most questions regarding when and how waste is collected and what type of resources are available can be responded by the sciences stores staff. In addition, staff from HSW who oversee these activities and can also respond any questions or concerns.

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Generation and Labelling

- Minimize volume and hazard upon ordering, when possible.
- Under no circumstances will hazardous chemicals/wastes be disposed of down a sink. Chemical wastes sent to the drain may react and cause significant damage which may result in loss of drains, impeding lab activities until they can be replaced. In addition, they may pollute the environment.
- Plan for weekly waste disposal. Designate a place for the waste. If a fume hood is used for this, that hood cannot accommodate any other activity/work.
- Plan for safe segregation of waste by compatibility and reactivity before beginning an experiment. Incompatible and highly reactive chemicals must always be kept separately.
- Minimum segregation groups include organics vs inorganic, acids vs bases, halogenated vs non-halogenated. Segregate further according to below.



Figure 1. Waste containers for liquid hazardous waste.

- Use safety data sheets to determine segregation groups and/or the [compatibility chart](#) found at the end of this document or the EPA Combability Chart available [online](#).
- Two types of containers (Fig. 1) are available for liquid hazardous waste: red, hard polypropylene (PP) spring-lidded safety containers with flame arrestor; and white, semitransparent, PP containers with screw cap;
 - Use the Red containers are for flammable waste.
 - Use the screw cap plastic white containers for aqueous waste solutions, not for flammable liquid waste, unless the flammable is also very corrosive.
- Check the containers before using them. They must be intact and suitable to contain the chemical, and capable of a tight closure to prevent leaks during transport.
- Discard containers with a deteriorated flame arrestor, without a lid/cap or with a compromised integrity.
- Obtain the Yellow Chemical Waste Label (Fig. 2) sticker from Science Stores (MC E303) and affix it to every waste container prior to start adding wastes in.
 - Fill out all the parameters that asked for on the label.
 - Do not use abbreviations or short forms.
 - Represent the waste properly, i.e. if your mixture results in a product, list the product of the reaction and not individual reactants. This may have significant safety or legal implications.

Brock University CHEMICAL WASTE			
LIQUID	<input type="checkbox"/> Item # 169957		
INORGANIC	<input type="checkbox"/> To correspond with form		
ACID pH	<input type="checkbox"/> SOLID <input type="checkbox"/>		
BASE	<input type="checkbox"/> ORGANIC <input type="checkbox"/>		
SOLVENT	<input type="checkbox"/> HALOGENATED <input type="checkbox"/>		
PESTICIDE FREE	<input type="checkbox"/>		
HERBICIDE FREE	<input type="checkbox"/> MIXTURE YES <input type="checkbox"/> NO <input type="checkbox"/>		
LIST CHEMICAL NAMES			
PERCENTAGE			
Print Clearly			
HAZARDS			
FLAMMABLE	<input type="checkbox"/>	OXIDIZER	<input type="checkbox"/>
EXPLOSIVE	<input type="checkbox"/>	REACTIVE	<input type="checkbox"/>
CORROSIVE	<input type="checkbox"/>	(AIR OR WATER)	<input type="checkbox"/>
TOXIC	<input type="checkbox"/>	CARCINOGENIC	<input type="checkbox"/>
OTHER (Explain)			
NAME OF RESEARCHER:		Building	_____
		Room #	_____
		Tel #	_____
DATE:		_____	MM/DD/YY

Figure 2. The Yellow Chemical Waste Label.

- Containers must be filled to the shoulder only. NEVER fill them completely. It may lead to leaks.
- Always maintain all containers closed except when pouring in, even if they are inside a hood. Vapors or fumes emanating unnecessarily pollute the environment or the lab air depending on where the container is situated.
- While containers must be kept closed, do not seal screw cap closures until the day of collection from the lab to avoid any pressure buildup.
- Screw cap containers must be closed tightly the day of collection from the lab to prevent leakage during its transport.
- When little waste is foreseen for the week, use the smallest container available to avoid carrying waste over to the following week.
- When preparing the waste for pickup, check that containers are not overfilled or overflowing. Containers that are overflowing or filled past the shoulder line will not be collected under regular pickup procedures. Since this may carry a safety implication or cause a spill cleanup surcharge ENSURE proper fill.
- Metal and glass containers are not permitted for hazardous waste, unless extraordinary situations exist. If that is the case, use a secondary container to catch any spill in the event of a breakage.
- When additional or replacement containers are needed, ask the Science Stores staff.
- For silica waste ask the Science Stores staff for a container. White, PP, wide mouthed 20 L pails with a lid (Fig. 3) are available for this type of waste.



Figure 3. PP pail with lid for silica waste.

Hazardous waste registration and pick up from labs

For the waste to be picked up from your lab, the sciences stores staff must be notified.

- Use the **Chemical Waste Disposal Record** form (Fig. 6) to request a pickup. The form is available from Science Stores and can be downloaded at <http://brocku.ca/mathematics-science/departments-and-centres/sciencestores/waste-disposal>
- All containers which are filled to the shoulder level must be disposed every week. This contributes to your lab being compliant with the allowable limit of flammable liquids and to safety by reducing the existence of hazardous products.
- Each container registered for disposal must list the number which corresponds to the item # located on the upper right of the Yellow Chemical Waste Label.
- Submit the completed form to Science Stores by Tuesday at 3:00 pm either in person (MC E303), by fax (905 984 4864), or email (sciencestores@brocku.ca).

- External waste technicians and staff from Science Stores will pick up waste every Wednesday morning from every lab that registered waste.
- Wastes that are not properly labelled will not be picked up.
- Wastes that are overflowing or present any safety problem will not be picked up under regular collection procedures and may be left behind until an arrangement for spill cleanup can be made. Since this carries a surcharge, follow waste procedures strictly to prevent unnecessary expenses.

Excess solvent cans / other metal containers and glass waste

- Excess/unused clean metal containers from labs are collected to prevent clutter and tripping hazards and are recycled.
- Containers which had hazardous materials must be emptied and triple rinsed. Collect the rinsate as hazardous waste.
- Affix the **Safe for Disposal** (Fig. 4) label, which can be obtained from Science Stores.
- Place the labelled container in the hallway by the main entry door to your lab on Mondays during office hours.
- Custodial services will pick up containers that meet the above criteria.
- For the disposal of unused clean glass containers or clean pieces of glass, place them in the cardboard box shown in Fig. 5. Contact Custodial Services (CS) to obtain these boxes.
 - When a container had had hazardous materials, it must be emptied and triple rinsed. Collect the rinsate as hazardous waste.
 - When the box is $\frac{3}{4}$ full, close the plastic liner and the lid and write down **Please Dispose** on the box. CS will collect the box and replace it with a new one.



Figure 4. *Safe for Disposal* label for recycling metal containers.



Figure 5. Cardboard box for disposal of clean glass waste.

Note: wastes from pyrophoric and other reactive materials must follow special precautions which are not covered here. Contact your Principal Investigator for these.

Hydrofluoric Acid waste

Hydrofluoric acid (HF) is a very corrosive and toxic substance, for which special precautions apply. If you are new to work with HF, please contact the Lab Safety Specialist at ext 6179 for an assessment of your fume hood and the especial instructions that apply.

Hydrofluoric acid waste is collected in specific type of containers (UN 3H1/Y) different to the ones used for other chemical hazardous wastes and rated for holding HF waste. They are provided by Science Stores. Two types of containers are available.

- For work with small volumes and a concentration of HF of up to 48%, containers are of 2L capacity, made of PE, with a secure lid.
- For work with large volumes and a concentration of HF up to 48%, containers are of 4 L capacity, made of HDPE, with a secure lid.
- Dispose HF waste according to the schedule and registration protocol used for other hazardous waste at the University.
- Containers may only be filled to the shoulder level.
- Waste containers must always be kept tightly closed and clean from any residues.
- If you apply any solution to neutralize residues of HF that there may be on the container surface, the remains of said solution must be cleaned before the waste is offered for disposal to the waste contractor.
- HF waste must not be mixed with any other material.
- Containers with HF waste may not be reused.

END

Group 1: Inorganic Acids

Chlorosulfonic acid
Hydrochloric acid (aqueous)
Hydrofluoric acid (aqueous)
Hydrogen chloride (anhydrous)
Hydrogen fluoride (anhydrous)
Nitric acid
Oleum Phosphoric acid
Sulfuric acid

Group 2: Organic Acids

Acetic acid
Butyric acid (n-)
Formic acid
Propionic acid

Group 3: Caustics

Potassium hydroxide
Sodium hydroxide
Ammonium hydroxide

Group 4: Amines and Alkanolamines

Aminoethyl ethanolamine
Aniline
Diethanolamine
Diethylenetriamine
Diisopropanolamine
Dimethylamine
Ethylenediamine
Hexamethylene diamine
Methyl-5-ethylpyridine
Monoethanolamine
Monoisopropanolamine
Morpholine
Pyridine
Triethanolamine
Triethylamine
Triethylenetetramine
Trimethylamine

Group 5: Halogenated Compounds

Allyl chloride
Carbon tetrachloride
Chlorobenzene
Chloroform
Chlorohydrines
crude Dichlorobenzene (o-)
Dichlorobenzene (p-)
Dichlorodifluoromethane
Dichloroethyl ether
Dichloropropane
Ethyl chloride
Ethylene dibromide
Ethylene dichloride
Methyl bromide
Methyl chloride
Methylene chloride
Monochlorodifluoromethane
Perchloroethylene
Propylene dichloride
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
Trichloroethylene
Trichlorofluoromethane

Group 6: Alcohols, Glycols and Glycol Ethers

Allyl alcohol
Amyl alcohol
1,4-Butanediol
Butyl alcohol
Butylene glycol
Corn syrup
Cyclohexyl alcohol
Decyl alcohol (n, iso)
Dextrose solution
Diacetone alcohol
Diethylene glycol
Diethylene glycol dimethyl ether
Diethylene glycol monobutyl ether
Diethylene glycol monoethyl ether
Diethylene glycol monomethyl ether
Diisobutyl carbitol
Dipropylene glycol
Dodecanol
Ethoxylated dodecanol
Ethoxylated pentadecanol
Ethoxylated tetradecanol
Ethoxylated tridecanol

Ethoxytriglycol
Ethyl alcohol
Ethyl butanol
2-Ethylbutyl alcohol
2-Ethylhexyl alcohol
Ethylene glycol
Ethylene glycol monobutyl ether
Ethylene glycol monoethyl ether
Ethylene glycol monomethyl ether
Furfuryl alcohol
Glycerine
Heptanol
Hexanol
Hexylene glycol
Isoamyl alcohol
Isooctyl alcohol
Methoxytriglycol
Methyl alcohol
Methylamyl alcohol
Molasses, all
Nonanol
Octanol
Pentadecanol
Polypropylene glycol methyl ether

Propyl alcohols (n, iso)
Propylene glycol
Sorbitol
Tetradecanol
Tetraethylene glycol
Tridecyl alcohol
Triethylene glycol Undecanol

Group 7: Aldehydes

Acetaldehyde
Acrolein (inhibited)
Butyraldehyde (n, iso)
Crotonaldehyde
Decaldehyde (n, iso)
2-Ethyl-3-propylacrolein
Formaldehyde solutions
Furfural
Hexamethylenetetramine
Isooctyl aldehyde
Methyl butyraldehyde
Methyl formal
Paraformaldehyde
Valeraldehyde

Group 8: Ketones

Acetone
Acetophenone
Camphor oil
Cyclohexanone
Diisobutyl ketone
Isophorone
Mesityl oxide
Methyl ethyl ketone
Methyl isobutyl ketone

Group 9: Saturated Hydrocarbons

Butane
Cyclohexane
Ethane
Heptane
Hexane
Isobutane
Liquified natural gas
Liquified petroleum gas
Methane
Nonane
n-Paraffins
Pentane

Group 12: Petroleum Oils

Asphalt
Gasolines
Jet Fuels & kerosene
Mineral spirits
Naphtha
Oils
 Absorption oil
 Clarified oil
 Crude oil
 Diesel oil
 Fuel oil
Lubricating oil
Mineral oil
Mineral seal oil
Motor oil
Penetration oil
Range oil
Road oil
Spindle oil
Spray oil
Transformer oil
Turbine oil

Petrolatum
Petroleum ethers
Petroleum naphtha
Polybutene
Propane
Propylene butylene polymer

Group 10: Aromatic Hydrocarbons

Benzene
Cumene
p-Cymene
Coal tar oil
Diethylbenzene
Dodecyl benzene
Dowtherm
Ethylbenzene
Naphtha, coal tar
Naphthalene (includes molten)
Tetrahydronaphthalene
Toluene
Triethyl benzene
Xylene (m-, o-, p-)

Group 13: Esters

Amyl acetate
Amyl tallate
Butyl acetates (n, iso, sec)
Butyl benzyl phthalate
Castor oil
Croton oil
Dibutyl phthalate
Diethyl carbonate
Dimethyl sulfate
Diocetyl adipate
Diocetyl phthalate
Epoxidized vegetable oils
Ethyl acetate
Ethyl diacetate
Ethylene glycol monoethyl ether acetate
Ethylhexyl tallate
Fish oil
Glycol diacetate
Methyl acetate
Methyl amyl acetate
Neatsfoot oil
Olive oil
Peanut oil
Propyl acetates (n, iso)

Group 11: Olefins

Butylene
1-Decene
Dicyclopentadiene
Diisobuytlene
Dipentene
Dodecene
1-Dodecene
Ethylene
Liquified petroleum gas
1-Heptene
1-Hexane
Isobutylene
Nonene
1-Octene
1-Pentene
Polybutene
Propylene
Propylene butylene polymer
Propylene tetramer (dodecene)
1-Tetradecene
1-Tridecene
Turpentine
1-Undecene

Group 14: Monomers and Polymerizable esters

Resin oil
Soya bean oil
Sperm oil
Tallow
Tanner's oil
Vegetable oil
Wax, carnauba
Acrylic acid (inhibited)
Acrylonitrile
Butadiene (inhibited)
Butyl acrylate (n, iso)
Ethyl acrylate (inhibited)
2-Ethylhexyl acrylate (inhibited)
Isodecyl acrylate (inhibited)
Isoprene (inhibited)
Methyl acrylate (inhibited)
Methyl methacrylate (inhibited)
o-Propiolactone
Styrene (inhibited)
Vinyl acetate (inhibited)
Vinyl chloride (inhibited)
Vinyl toluene
Vinylidene chloride (inhibited)

Group 15: Phenols

Carbolic oil
Creosote, coal tar
Cresols
Nonylphenol
Phenol

Group 16: Alkylene Oxides

Ethylene Oxide
Propylene Oxide

Group 17: Cyanohydrins

Acetone cyanohydrin
Ethylene cyanohydrin

Group 18: Nitriles

Acetonitrile
Adiponitrile

Group 19: Ammonia

Ammonium hydroxide

Group 20: Halogens

Bromine
Chlorine

Group 21: Ethers

Diethyl ether (ethyl ether)
1, 4, Dioxane
Isopropyl ether
Tetrahydrofuran

Group 22: Phosphorus, elemental**Group 23: Sulfur, molten****Group 24: Acid Anhydride**

Acetic anhydride
Propionic anhydride