

Duquesne University Office of Environmental Health and Safety has developed the following brochure to outline guidelines for the disposal of hazardous waste.

The objectives of these guidelines are as follows:

- Maintain a safe work environment
- Contribute to ensuring the health and safety of the local communities.
- Reduce the cost of disposal through waste minimization.
- Prevent violations of numerous environmental regulations.

What is a Hazardous Waste?

The Environmental Protection Agency (EPA) divides hazardous waste into two broad categories: *Listed Hazardous Wastes* and *Characteristic Hazardous Wastes*. The listed wastes are defined in the Code of Federal Regulations (40CFR261.31-261.33). The Characteristic hazardous wastes include ignitability, corrosivity, reactivity, and toxicity. A more concise definition of these terms is provided on beginning on page 2. Additionally, labs may occasionally generate wastes that are neither EPA Listed nor Characteristic but are known to pose a hazard such as carcinogenicity or mutagenicity and should be turned over to EH&S for proper disposal.

Types of Hazardous Waste Generated at Duquesne University

The following types of hazardous wastes typically encountered at Duquesne:

- Laboratory Chemicals
- Gas Cylinders
- Contaminated Lab Glassware
- Sharps
- Radioactive Solid Waste
- Radioactive Liquid Waste
- Biomedical Waste
- Mercury Thermometers
- Ni-Cd Batteries
- Animal Carcass
- Computer Monitors

Characteristic Wastes as Defined By EPA

The EPA in 40CFR Sections 261.21 – 261.24, defines characteristic wastes.

Ignitable

A solid waste exhibits the characteristic of ignitability if the waste exists in any of the following forms:

- A liquid, other than an aqueous solution containing less than 24 % alcohols by volume,

with a flash point below 60 degrees C (140 degrees' F);

- A non-liquid, which under standard conditions is capable of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burns in a manner that creates a hazard;
- An ignitable compressed gas (refer to 49CFR section 173.300), which includes gases that form flammable mixtures at concentration of 13% or less in air; or
- An oxidizer, such as permanganate, inorganic peroxide, or nitrate, that readily stimulates combustion of organic materials (refer to CFR Section 173.151 for definition).

Reactive

A solid waste exhibits the characteristics of reactivity if the waste:

- Is normally unstable and readily undergo violent change without detonation;
- Reacts violently with water;
- Forms potentially explosive mixtures with water.

- Generates, when mixed with water, toxic gases, vapor, or fumes in a quantity sufficient to present a danger;
- Is a cyanide or sulfide – bearing waste that generates toxic gases, vapors, or fumes at a pH between 2 and 12.5;
- Is capable of detonation or explosive reactions when subject to a strong initiating source or if heated in confinement;
- Is readily capable of detonation, explosive decomposition, or reaction at standard temperature and pressure; or
- Is an explosive, as defined in 49 CFR Section 173.51, 173.53, or 173.88.

Corrosive

A solid waste exhibits the characteristic of corrosivity if the waste:

- Is aqueous and has a pH less than or equal to 2, or greater than or equal to 12.5, using EPA – specific or approved test methods; or
- Is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 millimeters (0.250 inches) per year at a test temperature of 55 degrees c (130°F).

Toxic

A solid waste exhibits the characteristic of toxicity when EPA – defined test procedures indicate that an extract derived from the waste contains certain toxicants. EPA requires toxicity to be tested using the Toxicity Characteristic Leaching Procedure (TCLP), which simulates the leaching of materials in a land-fill into the surrounding groundwater. The toxicants to be tested for are:

Arsenic	Hexachlorobutadiene
Barium	Hexachloroethane
Benzene	Lead
Cadmium	Lindane
Carbon Tetrachloride	
Chlordane	Mercury
Chlorobenzene	Methoxychlor
Chloroform	Methyl Ethyl Ketone
Chromium	Nitrobenzene
o-,m-, & p-Cresol	Pentachlorophenol
2,4-D	Pyridine
1,4-Dichlorobenzene	
1,2-Dichloroethane	
1,1-Dichloroethylene	
2,4-Dinitrotoluene	
Endrin	Selenium

Heptachlor

Silver

Hexachlorobenzene

Tetrachloroethylene

Toxaphene

Trichloroethylene

2,4,5-trichlorophenol

2,4,5-TP (silvex)

Hazardous Waste Minimization

Disposal of hazardous wastes is time consuming and expensive. Every effort should be made to limit the amount of hazardous waste generated. The following items are suggested methods for minimizing laboratory waste:

1. Plan experiments carefully

When planning experiments, consider the leftover materials, products, and by-products that will be generated. Ask yourself the following five questions.

2. Micro scale the experiment

Using micro technology in experiments can lead to significant saving in chemicals, energy, and space. Also, the waste produced from these types of experiments is greatly reduced.

3. Check other laboratories Inventories

Each individual lab should maintain an updated inventory. Other labs may have

excess chemicals they are not using and may be donated to another lab's experiment.

Handling Chemical Waste

Every chemical should be treated, as hazardous waste and the appropriate type of protective equipment should be worn when handling the waste. All waste containers should be labeled immediately upon placing waste in the container.

Packaging, Transporting, & Collecting Waste

Hazardous chemicals must be packaged for disposal as follows:

1. Container must be suitable for contents
Examples: Hydrofluoric acid in plastic bottles and solvents in glass bottles.
2. Containers must be tightly closed
Stoppered bottles are not acceptable.
3. Do not overfill containers, expanding vapors may cause containers to break.
4. Containers must not be damaged
Severely damaged containers must be placed in a second container and properly labeled.
4. All waste containers must be labeled with the EH&S Hazardous Waste Label.

***Labels that read "Chemical Waste" will not be accepted.

5. Each section of the label must be filled out completely. The following information must be provided:
 - Department Name
 - Phone Number
 - Generator's Name
 - Date container is filled
 - Complete chemical name
 - Solid or liquid
 - Chemical Classification
6. Waste must be transported using a 3-inch deep cart to make travel safe.
7. Waste can then be transported to the Mellon Hall Hazardous Waste Accumulation area (B-12) every Wednesday from 1p.m. to 3:30 p.m.

Special Precautions: Handling Peroxides, Organic Solvents, and Unknown Chemicals

Peroxides

Many common laboratory chemicals can form peroxides when exposed, over time, to air. Peroxide forming chemicals should be stored for a limited amount of time and the opening date should always be marked on the original container. Peroxides can be violently explosive, therefore DO NOT MOVE a chemical if the liquid is discolored or if crystals have formed around the cap or in the bottle. Contact EH&S at 4763 immediately for assistance.

The following chemicals poses severe peroxide hazards on storage with exposure to air and should be discarded within three months:

- Diisopropyl Ethel (isopropyl ether)
- Divinylacetylene (DVA)
- Potassium Metal
- Potassium Amide
- Sodium Amide (Sodamide)
- Vinylidene Chloride (1,1-dichloroethylene)

The following chemicals pose peroxide hazards on concentration and should not be distilled or

evaporated without first testing for the presence of peroxides. These chemicals should be discarded or tested after six months.

- Acetaldehyde diethyl acetal (acetal)
- Cumene (isopropyl benzene)
- Cyclohexane
- Cyclopentene
- Decalin (decahydronaphthalene)
- Diacetylene (butadiene)
- Dicyclopentadiene
- Diethyl ether (ether)
- Diethylene glycol dimethyl ether (digylme)
- Dioxane
- Ethylene glycol dimethyl ether (diglyme)
- Ethylene glycol ether acetates
- Ethylene glycol monoethers (cello solves)
- Furan
- Methyl Acetylene
- Methylcyclopentane
- Methyl Isobutyl Ketone
- Tetralin (Tetrahydronaphthalene)
- Vinyl Ethers

* Committee on Hazardous Substances in the Laboratory, *Prudent Practices for Disposal of*

Chemicals from Laboratories, National Academy Press, Washington, D.C., 1983 pp.245-246

Organic Solvents

Waste organic solvents must be segregated into separate nonhalogenated waste containers. Segregated wastes are easier and less expensive to dispose of. Organic wastes with high halogen levels are heavily surcharged; therefore it is necessary to show approximate halogen levels in all organic wastes. Pure non-halogenated waste solvents and mixtures with less than 1000 ppm halogen solvents should be placed in containers labeled non-halogenated waste. Pure halogenated waste solvents and mixtures with greater than 1000 ppm halogen solvents should be placed in containers labeled halogenated waste.

Substances NOT to be placed in Waste Organic Solvent containers:

1. Solutions of acids or bases
2. Aqueous solutions of toxic organics
3. Metals
4. Strong oxidizers or reducers
5. Water reactive substances
6. Unknowns
7. Large amounts of water

Unknown Chemicals

EPA requires all hazardous waste to be identified before disposal therefore every attempt should be made to identify unknown chemicals. Proper labeling and tracking of chemicals in individual labs can help reduce the number of unknowns. If a lab encounters an unknown and is unable to identify the compound, EH&S must be contacted at x4763 for further assistance.

Disposing of Compressed Gas Cylinders

Returnable Cylinders

Remove the regulator, replace the cap, and mark the cylinder "MT". Once the cap is secured, move the cylinder to the general stores area (B-12) using a cart specifically designed for moving cylinders.

Nonreturnable Cylinders

Nonreturnable cylinders or cylinders with unknown contents are to be taken to the waste accumulation area for disposal and labeled according to the hazardous waste instructions.

Broken Glass Boxes

Broken glass should be placed in the blue and white broken glass boxes. Once the box is full, laboratory personnel are responsible for taping the box lid closed and placing the sealed box in the hallway.

Housekeeping will then remove the sealed boxes for disposal. New containers can be obtained from housekeeping.

Sharps and BioHazardous Waste

Contaminated sharps should be placed in sharps containers and full containers should be turned over to EH&S for disposal. Individual departments are responsible for purchasing their own sharps containers.

Large cardboard Biohazard boxes will be provided by EH&S for disposal of contaminated gloves and other non-sharps material. These boxes must be lined with red bags and must weigh less than 40 lb. Boxes should be constructed using two inch wide packing tape, placing one strip down the middle and one strip down each side. Disposal arrangement can be made by contact EH&S at x4763.

TA Orientation
August 22, 2001
8:30 am – 9:30 am



Environmental Health & Safety