Hazardous Waste
Hazardous Waste is unwanted material that exhibits at least one of the following characteristics: Ignitability, Corrosivity, Reactivity, and Toxicity.

Specific Disposal Guidelines

- **Acids**
- **Aerosol Cans**
- **Carcasses**
- **Compressed Gases/Gas Cylinders**
- **Controlled Substances**
- **Dioxin & Dioxin Precursors**
- **Reactive Chemicals**
- **Household Hazardous Waste**
- **Lead Containing Articles**
- **Paint**
- **Pharmaceutical Waste**
- **Photographic Fixer**
- **P-Listed Waste**
- **Polychlorinated Biphenyls (PCBs)**

**Acid/Base Disposal**
Some acids and bases can be disposed of through the sanitary sewer. However, these liquids cannot contain other hazardous ingredients (flammables, heavy metals) and must have a pH range between 5 and 9 to ensure safe disposal down the drain. Neutralization can be done by laboratory personnel if they have the appropriate protective equipment and neutralizing agents. If there are any questions about whether a material can be neutralized and disposed of via the drain, please contact the Environmental Protection staff.

If acidic or basic material contains other hazardous constituents such as heavy metals, contact Environmental Protection staff for a **pick up**.

**Aerosol Can Disposal**
Aerosol cans may be considered Hazardous Waste if one or more of the following conditions exist:

- The can is still pressurized.
- The propellant is chlorinated (chlorofluorocarbons, hydrochlorofluorocarbons or chlorinated hydrocarbons).
- The propellant is isobutane, ether or some other flammable gas.
- The material contains lead, pesticides or other hazardous constituent.

**Procedures for Recycling Aerosol Cans at UWM**

Any aerosol can which has one or more of these characteristics must be turned over to the Environmental Protection program for disposal. If you are not currently on a regular waste pick up schedule, please contact Environmental Protection staff at hazwaste@uwm.edu.

**Waste Minimization**

Please minimize the number of aerosol cans that you keep in inventory. Whenever possible, use aerosol cans until empty, rather than storing partially full cans. Many aerosol products are available in other forms without propellants. Please evaluate whether these safer forms could be used in place of the aerosol. Contact Environmental Protection.

**Carcass Disposal**

Carcasses for disposal are generally sent to a rendering firm for reclamation. These items are put into the freezer in the Animal Resource Center until picked up by the rendering service.

Carcasses for disposal that are contaminated with radioactive material or hazardous chemicals may need to be handled differently.

- For carcasses containing radioactive materials, please contact UWM's Radiation Safety Officer at x4275.
- For carcasses contaminated with hazardous chemicals, please contact Environmental Protection. Items must be stored in leak free containers. Identify the contaminant on either the Radioactive Material or Hazardous Waste label.

**Compressed Gas Cylinder Disposal**
Introduction
Containers of compressed gas go by many names, including gas cylinders, lecture bottles and high pressure tanks. The containers of gas, even when empty, are likely to contain a residual of at least one atmosphere of the gas. Poison, flammable and corrosive gases must be properly handled to prevent injury to others or to the environment.

Departments are encouraged to rent rather than purchase gas cylinders. When the cylinder is empty, or the need for the gas is over, the gas supplier will pick up the cylinder for refilling and reuse. Cylinders which are purchased may or may not be returned to the manufacturer, while rented cylinders can be returned.

Small amounts of gas can be purchased in smaller rental cylinders rather than purchasing lecture bottles, which are difficult to dispose. Disposable cylinders are a misnomer. UWM may still need to pay for disposal.

Safe Use and Guidelines
Please follow the safe handling precautions outlined in the Gas Cylinder Safety page.

Please take every effort to maintain the labels and identity of compressed gas cylinders. Outrageous costs are required for disposal of cylinders with unknown contents or unknown origins (i.e., manufacturers).
Return all rented cylinders promptly after their use is over.

Please contact Environmental Protection staff for instructions on disposal of other gas cylinders.

Poison Gases
Poison gases (such as Nitric Oxide or Phosgene) represent a significant hazard. Special precautions not otherwise necessary become prudent when using poison gases:

- Certain poison gases (e.g., Arsine, Phosphine, Ethylene Oxide) can only be used if specific OSHA regulations and safety practices are followed.
- Emergency procedures should be made clear to all involved, including personnel from adjacent labs and building managers.
- Poison gas use after normal working hours require the approval of the Chemical Hygiene Officer for your department.
- Fume hoods and other ventilation need to be tested before use and checked frequently during the project involving poison gas.
- Notify the staff in Environmental Protection before your first use of the poison gas.
- The University Police should also be informed about the locations and types of poison gas in use.
- Document these procedures in your lab's chemical hygiene plan. As with all chemicals, obtain and review the Safety Data Sheet (SDS) for the poison gas. Maintain an extra copy of the SDS in your department's chemical hygiene plan.

Disposal of poison gas cylinders can often cause problems. If the cylinder can not be returned to the manufacturer, UWM can face large disposal costs ($1,000 per cylinder, or more). Even cylinders that can be returned must be shipped on a vehicle which can not simultaneously carry any other hazardous materials or foodstuffs.

Atmospheric or Inert Gases
While atmospheric gases (e.g., nitrogen, argon, etc.) are generally not considered toxic (exceptions: see UWM Diving Safety Manual), these inert gases can still cause dangerous situations to occur if not handled properly. Asphyxiation can occur if too much inert gas displaces the oxygen in the air. Inert gas cylinders still have all the physical hazards associated with other gas cylinders such as high pressure.

Contact staff in UWM's Environmental Protection Program for cylinder disposal as soon as they are no longer needed.

Oxygen and Oxidizers
Oxygen and other oxidizing gases pose additional hazards over usual compressed gas hazards. These gases can enrich an atmosphere so that combustible materials readily ignite or the combustion is accelerated. For example, clothing, paper, and cardboard are very combustible in oxygen enriched atmospheres. Likewise, never use oil, grease or other petroleum products on or near oxidizing gas cylinders.

Lecture Cylinders
Lecture bottles are very small compressed gas cylinders, typically 2-3 inches in diameter and 12-18 inches in height. While most gas suppliers offer lecture bottles for purchase, many will not accept the empty or partially full cylinders back for disposal. Lecture bottle disposal can be very costly, depending on the original contents.

UWM researchers should only purchase lecture bottles that can be returned to the distributor. Most distributors,
including the most commonly used sources at UWM, do offer a returnable cylinder, although in some cases, these cylinders are slightly larger than typical lecture bottles. Also, keep in mind that distributors’ policies toward lecture bottles are subject to change. In order to avoid costly disposal fees and potential hazards involved in emptying and cutting the cylinder, it is worthwhile to purchase a returnable cylinder, even if it is a bit more than what you need.

If you have unneeded lecture bottles, first call the manufacturer or distributor and ask that they pick up the cylinder for return. If they will not take the cylinder back, Environmental Protection can help coordinate the disposal with one of our vendors. **The disposal fee will be charged back to your department.** Also, please indicate whether the cylinder is empty or still contains product above 1 atmosphere of pressure.

### Disposal of Dioxins and Dioxin Precursors

At UWM, dioxin and dioxin precursors are disposed at a different site than the rest of our hazardous waste. Currently, no commercial disposal site is approved by the U.S. Environmental Protection Agency to dispose of dioxins and precursors.

#### What Do You Need to Know?

Please keep all dioxin and dioxin precursor waste separate from other chemical waste and from other non-hazardous waste. Some contamination of disposable labware is inevitable, but the amount of waste should be minimized. Please maintain separate waste containers for dioxin waste.

#### What are Some Examples of Dioxin Precursors?

- hexachlorophene
- pentachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol
- 2,3,4,6-Tetrachlorophenol
- 2,4,5-Trichlorophenoxy-acetic acid (aka 2,4,5-T)
- 2-(2,4,5-Trichlorophenoxy)-propionic acid (aka 2,4,5-TP)

### Reactive Chemicals

Laboratory workers must be able to recognize chemicals that are potentially reactive or explosive. Reactive chemicals are substances which can vigorously or violently give off heat, energy or toxic gases or vapors when in contact with air, water or other common substances. Some of the classes of reactive chemicals include:

- **Air Reactive Chemicals**
- **Explosives**
- **Peroxide Formers**
- **Polymerizing Chemicals**
- **Water Reactive Chemicals**

#### Air Reactives

Air reactive chemicals are chemicals which react violently in contact with air, oxygen or with compounds containing oxygen. Sometimes air reactive chemicals are called spontaneously combustible or pyrophoric materials. These
materials are sometimes sold in gas cylinders, although they may not be gases themselves. They may be sold packaged under nitrogen or some other inert atmosphere, or they may be created by a chemical reaction in your laboratory. The flame of certain pyrophoric materials is clear and not readily visible. Spontaneous combustion means that the material does not need an ignition source to begin combustion, or to burn.

Examples:
- alkali metals (potassium, cesium)
- finely divided metal dusts (nickel, zinc, titanium)
- hydrides (barium hydrides, diborane, diisobutyl aluminum hydride)

**Explosives**
Explosives can release extremely large amounts of thermal or physical energy. Explosives can cause a true detonation, which is defined as a shock wave traveling at supersonic speeds. Please label all potentially explosive and energetic or reactive materials carefully so that people handling your waste will know to take proper precautions.

Examples:
- Acetylanic compounds
- Azides
- Azo compounds
- Chlorite/chlorate/perchlorates
- Fulminates
- Nitro compounds
- Nitro esters
- Other compounds with excess nitrogen
- Picrates
- Peroxides
- Strained ring compounds

**Peroxide Formers**
Certain chemicals can form peroxide either upon aging, or upon contact with air or other substances. Some of the peroxides are shock sensitive and can explode if handled less than gingerly, or upon heating. Sometimes peroxides can be present in a solvent and cause no problem until the solvent is evaporated (during distillation, for example) and the peroxides concentrate.

If you work with peroxide formers:
- Date bottle when material is received
- Test for peroxides before every use or every 3 months
- Write the test results on the bottle with the date tested and your initials
- If the material is greater than or equal to 80ppm, it is considered a peroxide hazard, contact Environmental Protection office

Examples:
- Ethers (isopropyl ether, ethyl ether, diethyl ether)
• 1,4-dioxane
• Tetrahydrofuran

**Polymerizing Chemicals**

Out of the many polymers today, many generate large amounts of heat upon polymerization, and a few can cause runaway polymerization reaction which can explode. Sometimes the heat buildup can cause bumping, over-booking, or rupture of the container, which can also cause explosive-like damage.

Examples:

• acrylic acid
• butadiene
• cyclopentadiene
• ethylene
• styrene
• vinyl chloride

**Water Reactives**

Water reactive materials can react violently or vigorously in contact with water, wet surfaces, or even the moisture in the air. These chemicals may react to give off a flammable gas (such as hydrogen) or a toxic gas, (such as phosgene) or spontaneously burn or explode. Water is obviously NOT a good choice for putting out fires caused by water reactive chemicals. A class D fire extinguisher is designed to be used to fight fires caused by certain water reactive chemicals.

Examples:

• Alkali metals (Sodium metal, lithium metal)
• Anhydrides (acetic anhydrides)
• Carbides (calcium carbide)
• Halides (Acetyl chloride, titanium chloride, stannous chloride)
• Hydrides (sodium hydride)
• Organometallics (tetramethyl aluminum)
• oxides (sodium oxides)
• Peroxides (sodium peroxide)
• Phosphides (aluminum phosphide)
• and others (chlorosulfonic acid, aluminum tribromide)

**Disposal Procedures at UWM**

The usual disposal rules apply to reactive waste chemicals, with these additional precautions:

• Please label completely and carefully
• Mark the received date
• Mark any test results (peroxide or other) and date on the bottle
• Keep waste away from incompatible materials
• Do not keep reactive waste longer than necessary
• Contact staff in [Environmental Affairs](#) as soon as possible to request a [waste pickup](#)
• Additional time will be needed to set up disposal for highly reactive materials, so contacting us early will allow us enough time to make those arrangements

Disposal of Household Hazardous Waste
UWM's Hazardous Waste facility cannot accept household hazardous waste from UWM employees or students. The Metropolitan Milwaukee Sewerage District (MMSD) runs a Household Hazardous Waste Collection Program for area residents. This program encourages Milwaukee residents to rid their homes of unused fuels, paints, oils and fertilizers and other hazardous waste. Information on the MMSD Household Hazardous Waste Program, can be found at MMSD Household Hazardous Waste Program.

Disposal of Lead-Containing Articles
Lead-containing articles may be turned over to the Hazardous Waste program for proper disposal.

Any lead items, especially any with any white corrosion or white powder on the surface, should be handled with disposable gloves. If lead is handled without gloves for any reason, always wash thoroughly with soap and water before handling other items, eating or drinking.

Paint Disposal

Latex Paint
Latex paint is the most popular paint on the market. Commonly called “water-based” paint, it includes such resins as acrylics, vinyls, and epoxies, among others. In addition to the resins, latex paint is made up of solvents, pigments, and additives. Latex paint is easily applied and can be cleaned with soap and water. It is preferred by most do-it-yourselfers because it is easier to use and to clean.

Although it is less detrimental to our environment than oil-based paints because it contains fewer hazardous materials, if the liquid paint is poured down a drain, into a storm sewer, or disposed in regular trash pick-up, it can pollute groundwater and can harm fish and wildlife and contaminate the food chain. Pouring excess paint down the drain disrupts microbes and causes sewage treatment to be less effective and more costly. Latex paint can pollute groundwater if dumped on the ground and if thrown into the trash it can contaminate other recyclable materials, thus wasting valuable resources.

Oil-Based Paint
A John Hopkins University study found 300 toxic chemicals and 150 carcinogens that may be present in oil-based paint. Among them are alkyl resin, kerosene, lead, lithopone, mercury, methylene chloride, methyl ethyl ketone, mineral spirits, toluene, trichloroethane and xylene. The hazardous chemicals can be found in each of the four basic components that make up oil-based paint: resins, solvents, pigments, and additives. While these same components also make up latex paint, the types used in oil-based paint are considerably more hazardous.

Oil-based paint is a hazardous waste. The toxic, dangerous chemicals used in the production of oil-based paint can pose serious threats to human health and the environment. If oil-based paint is thrown into the trash and ends up in a sanitary landfill, there is a potential health hazard of the chemicals seeping into the groundwater and being consumed by people or animals. Additionally, since oil-based paint is flammable, refuse workers may be injured and equipment may be damaged during trash collection.

Disposal
Neither latex nor oil-based paint may be placed in the campus garbage dumpsters. Environmental Protection collects both latex and oil-based paint from campus generators. Oil-based paint is shipped as hazardous waste. Latex paint can be dried out and then thrown out safely as a solid waste in the regular trash. Make sure latex paint is fully solid, leave lid off paint can, then place in regular trash.

Usable, unneeded latex paint is collected and made available to UWM employees. Please contact Environmental Protection staff if you are interested in viewing the supply of unused paint that is available.

Photographic Fixer

Used photographic fixer contains silver and must be disposed of as hazardous waste. Photographic fixer is generated by Photographic Services, Fine Arts Photography, Union Craft Center and various other departmental darkroom operations.

Disposal of Outdated Controlled Substances

- Complete the UW-Milwaukee DEA Controlled Substance Disposal Form
  Please Note: This form must be completed in full. Any missing information will result in Environmental Protections rejection of your material. (The form can be completed on-line and then printed for submission.)
  For an example of a completed disposal form, click here.

- Contact Environmental Protection staff to arrange a time for pick up of the controlled substances. (UW-Milwaukee DEA Controlled Substance Disposal Form and usage log should be available at the time of the pick-up.)

- Environmental Protection personnel will pick up the DEA controlled substance the day before our campus hazardous waste shipment. Because Environmental Protections in not a DEA registrant, the substance can not be stored by Environmental Protection.

- The registrant must be present at the time of pick up in order to sign over custody of the controlled substance to Environmental Protection.

- Once Environmental Protection receives confirmation that the substances have been destroyed, they will note the date on the DEA Controlled Substance Disposal Form. A copy of the completed form will then be sent to the registrant.

Additional Resources:

- For a complete list of DEA Controlled Substances, click here
- US Department of Justice "DEA Form 41"

Some pharmaceuticals have RCRA waste codes and are considered listed hazardous waste. Disposal of these pharmaceuticals must be through Environmental Protection.

RCRA Waste Codes:

P- listed (40 CFR 261.33(e))–commercial chemical products (acutely hazardous)
P- and U- Listed pharmaceuticals are a commercial chemical product which is pure grade, or a formulation in which the chemical is the sole active ingredient.

Sole active ingredient = the listed chemical is the only ingredient performing the intended function. If there is another chemical that is also an active ingredient (even if listed), then that particular drug waste is not a listed HW.

Also, to meet the listing, the commercial chemical product must not have been used for its intended purpose.

Some examples of P-listed wastes:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warfarin &gt;0.3% (P001)</td>
<td></td>
</tr>
<tr>
<td>Arsenic trioxide (P012)</td>
<td></td>
</tr>
<tr>
<td>Epinephrine base (P042)</td>
<td></td>
</tr>
<tr>
<td>Phentermine (P046)</td>
<td></td>
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<tr>
<td>Nicotine (P075)</td>
<td></td>
</tr>
<tr>
<td>Nitroglycerine (P081)</td>
<td></td>
</tr>
<tr>
<td>Physostigmine salicylate (P188)</td>
<td></td>
</tr>
<tr>
<td>Physostigmine (P204)</td>
<td></td>
</tr>
</tbody>
</table>

Some examples of U-Listed waste:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitomycin C (U010)</td>
<td></td>
</tr>
<tr>
<td>Dichlorodifluoromethane (U075)</td>
<td></td>
</tr>
<tr>
<td>Hexachlorophene (U132)</td>
<td></td>
</tr>
<tr>
<td>Reserpine (U200)</td>
<td></td>
</tr>
<tr>
<td>Chloral hydrate (U034)</td>
<td></td>
</tr>
<tr>
<td>Diethylstilbestrol (U089)</td>
<td></td>
</tr>
<tr>
<td>Melphalan (U150)</td>
<td></td>
</tr>
<tr>
<td>Resorcinol (U201)</td>
<td></td>
</tr>
<tr>
<td>Chlorambucil (U035)</td>
<td></td>
</tr>
<tr>
<td>Trichloromonofluoromethane (U121)</td>
<td></td>
</tr>
<tr>
<td>Mercury (U151)</td>
<td></td>
</tr>
<tr>
<td>Selenium sulfide (U205)</td>
<td></td>
</tr>
<tr>
<td>Cyclophosphamide (U058)</td>
<td></td>
</tr>
<tr>
<td>Lindane (U129)</td>
<td></td>
</tr>
<tr>
<td>Paraldehyde (U182)</td>
<td></td>
</tr>
<tr>
<td>Streptozotocin (U206)</td>
<td></td>
</tr>
<tr>
<td>Daunomycin (U059)</td>
<td></td>
</tr>
<tr>
<td>Hexachlorophene (U132)</td>
<td></td>
</tr>
<tr>
<td>Phenol (U188)</td>
<td></td>
</tr>
<tr>
<td>Uracil mustard (U237)</td>
<td></td>
</tr>
</tbody>
</table>

If the pharmaceutical waste is not specifically listed, then it may be a hazardous waste because it exhibits a characteristic of hazardous waste (ignitability, corrosivity, reactivity or toxicity).

4 characteristics of HW:

1. Ignitability (D001) – can create fire under certain conditions, spontaneously combustible, or have flashpoint less than 60°C (40 CFR 261.21)
2. Corrosivity (D002) – acid or bases capable of corroding metal (40 CFR 261.22)
3. Reactivity (D003) – unstable during normal conditions (40 CFR 261.23)
4. Toxicity (D004-D043) – identified via the Toxicity Characteristic Leaching Procedure (TCLP). The TCLP identifies wastes likely to leach concentrations of contaminants that may be harmful (40 CFR 261.24)
Examples of toxic chemicals/heavy metals that have pharmaceutical uses: As, Ba, Cd, Cr, Hg, Se, Ag, Chloroform, Lindane, and M-cresol

For more information: EPA Overview of RCRA and Pharmaceutical Waste

UW-Extension has great resource pages on Pharmaceutical Waste:
http://fyi.uwex.edu/shwec/2014/01/30/new-pharmaceutical-waste-resources-now-available/