Part G: Chemical Disposal Procedures

Disposal of waste and unwanted chemicals has become increasingly complicated. The U.S. Environmental Protection Agency (EPA) and the Wisconsin Department of Natural Resources (DNR) regulate the disposal and treatment of hazardous waste, including waste laboratory chemicals. By following the procedures in this part of the Guide, you help UWL comply with these environmental laws and protect health and the environment. For more information about the details of EPA or DNR hazardous waste laws, see Part C and Appendix H.

EPA and DNR laws regulate the generation, transport, treatment, storage and disposal of chemical waste.

Before seeking a disposal method for your chemical waste and when planning your work, consider the pollution prevention and waste minimization methods in Part F. Part F describes ways to generate smaller quantities and less hazardous waste. Another lab can use some unwanted chemicals, if they are in their original containers and in good condition. If you have surplus chemicals, attempt to provide them to a colleague who can use them or contact the Environmental Health and Safety office for assistance with redistribution or on-site removal.

First, try to minimize waste. Part F shows you how.

There are two methods of dealing with chemical products and waste:

- **In-Lab Chemical Management.** In-Lab Management includes simple disposal and treatment methods that can be done in your lab, such as flushing down the sanitary sewer and neutralization. These disposal procedures are described in the remainder of this part. Contact the Environmental Health and Safety office to advise you regarding the disposal of specific chemicals and wastes.

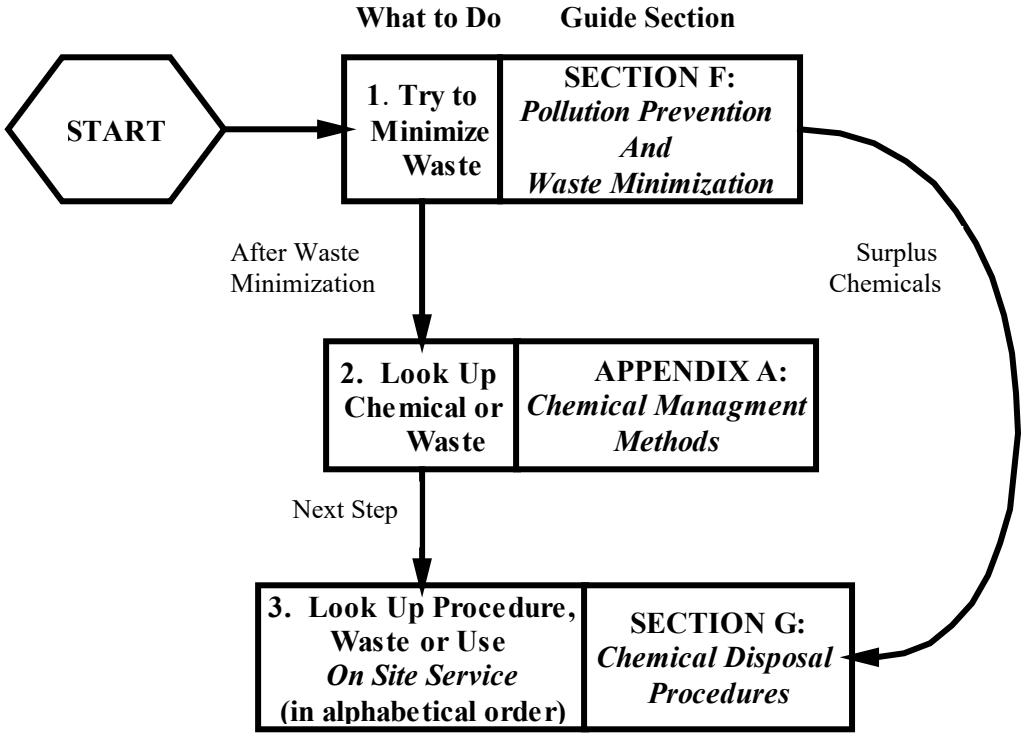
- **Environmental Health and Safety On-Site Hazardous Materials Management Service.** For On-Site Hazardous Materials Management (On-Site Service), Environmental Health and Safety will come to your room to remove those items that can

be recycled, require more complex disposal procedures, or be disposed through a licensed hazardous waste treatment, storage, and disposal facility. Most of UWL's hazardous waste is incinerated in an EPA permitted hazardous waste incinerator or blended with fuel for incineration in a cement kiln to recover its heat energy.

Contact Environmental Health and Safety at 785-6800 if you have any disposal questions or need other services. See the Hazardous Waste Summary at the end of this section for more information.

The following flowchart addresses a broad scope of chemical disposal situations. For customized treatment methods, individual consultation or further information on our services, please contact Environmental Health and Safety. A summary of hazardous waste disposal procedures is included at the end of this section, just preceding the review questions.

THREE STEPS TO CHEMICAL WASTE MANAGEMENT



IN-LAB CHEMICAL MANAGEMENT

Numerous chemicals can be disposed of by discharge into the sanitary sewer, by discharge into the sanitary sewer after neutralization, or directly into the normal trash. Deciding which disposal route is most appropriate for your material depends on the amount of waste, chemical

and toxicological properties of the chemical, its environmental fate, and the capability of your facilities.

Appendix A of this Guide is an alphabetical list of chemicals and their appropriate disposal procedures. If your chemical is not suitable for reuse by another lab (see Part F for suitability criteria), look it up in Appendix A for its disposal procedure. If listed in Appendix A you may legally dispose of the material in your laboratory via the listed procedures.

Sometimes laboratories do not have the facilities for in-lab management or the personnel are uncomfortable using the disposal procedure described here. If so, use the On-Site Service procedures on page 28G.

The specific procedures and waste types are provided alphabetically in the following sections. Contact Environmental Health and Safety with any questions.

ALPHABETICAL LIST OF DISPOSAL PROCEDURES

The following is an alphabetical list of procedures, listed by chemical name, waste type and disposal method.

Acids
Look up chemical in Appendix A, and then see Neutralization Procedures: Strong Acids and Bases on page 10G.

Acrylamide

- Dispose of solid acrylamide powder following procedure On-Site Service 1 on page 29G.
- Acrylamide and other electrophoresis gel solutions can be polymerized and discarded in the normal trash. Acrylamide solutions should be polymerized according to the procedure given by the supplier. Discard the gel in the normal trash following Normal Trash 2 on page 17G. If gelling does not occur, discharge to the sanitary sewer according to Sanitary Sewer 7 on page 27G.
- Dispose of empty acrylamide container following Normal Trash 4 on page 18G.
- Alternatively, follow procedure On-Site Service 1 on page 29G for the disposal of acrylamide solutions.

Aerosol Cans
Refer to procedure Gas 1 on page 7G for disposal of aerosol cans.

Aqueous Solutions

- Most aqueous solutions can be disposed of in the sanitary sewer.
- Aqueous solutions of water miscible flammable organic solvents. Solutions of less than 10% ethanol and methanol can be put down the drain followed by a minimum of 10 volumes of water. See procedure Sanitary Sewer 8 on page 27G for more information.
- Aqueous solutions of more than 10% of the above solvents should be disposed according to Organic Solvent Collection on page 18G.
- Aqueous Solutions of Inorganic Chemicals. Check Appendix A for the appropriate disposal procedure. Aqueous solutions of chemicals for the normal trash should be disposed of according to Sanitary Sewer 6 on page 26G.
- Aqueous Solutions of Organic Chemicals. Check Appendix A for the appropriate disposal procedure. Aqueous solutions of chemicals for the normal trash should be disposed according to Sanitary Sewer 7 on page 27G.

Bases
Look up the chemical in Appendix A, and then see Neutralization Procedures: Strong Acids and Bases on page 10G.

Batteries
- There are several types of rechargeable batteries used at UWL, containing hazardous materials such as lead, cadmium, mercury, and lithium.
- All rechargeable batteries should be disposed following On-Site Service 1 on page 29G. All alkaline batteries can be disposed following Normal Trash 1 on page 16G.

Chemical Carcinogens and Mutagens
Chemical carcinogens or mutagens may be disposed of by following procedure On-Site Service 1 on page 29G.

Cyanide Salts
Simple cyanide salts (e.g., NaCN) may generate deadly hydrogen cyanide gas when combined with acids. Large volumes of solutions, high concentrations, and solid salts are to be disposed following procedure On-Site Service 1 on page 29G.

For smaller quantities of lesser concentration, the following procedure may be used. It describes a method to verify the oxidation of cyanide ions to cyanate. The formation of a coordination compound in step 4 indicates further oxidation is necessary before the waste can safely be disposed into the sanitary sewer. For each chemical or solute, limit daily discharges to 100 grams per principal investigator, supervisor, or laboratory.

Follow this ONLY for small volumes of dilute solutions containing cyanide ion, and only if the cyanide is not the sole active ingredient. If cyanide is the sole active ingredient dispose of the material using the procedure On-Site Service 1 on page 29G.

1. Follow procedures described in Planning For Neutralization of Acids and Bases as listed in Neutralization Procedures on page 10G.
2. Dilute the solution with water to a concentration not to exceed 2% w/v cyanide. Prepare a hot water bath in a fume hood.
3. For each 50 mL cyanide solution, slowly add 5 ml, 10% (2.5 Molar) sodium hydroxide and 70 mL household bleach. Mix thoroughly.
4. Test the solution for residual cyanide as follows:
    a. Place 1 mL reaction mixture in a test tube. Add 2 drops 5% ferrous sulfate solution.
    b. Place in hot water bath and allow to boil for 30 seconds. Cool to room temperature.
    c. Add 2 drops 1% ferric chloride solution. Add 6 Molar hydrochloric acid until the solution is acidic to litmus.
    d. If residual cyanide is present, a deep blue precipitate of sodium ferric ferrocyanide will be formed.
5. If cyanide remains, add more bleach to the reaction mixture and repeat the test for residual cyanide.
6. If no precipitate is formed, wash the solution down the sanitary sewer with 20 volumes water per volume reaction mixture.

(See *Hazardous Laboratory Chemicals Disposal Guide,* Margaret A. Armour, CRC Press, 1991, pp. 120-121).

Ethidium Bromide

Ethidium bromide is a powerful mutagen widely used in biochemical research laboratories for visualizing DNA fragments. Ethidium bromide powder can be disposed following procedure On-Site Service 1 on page 29G.

Ethidium bromide containing solutions can be disposed in the sanitary sewer, poured in a carboy or treated in lab.

Ethidium Bromide 1: Aqueous solutions of ethidium bromide

- Dilute aqueous solutions less than 1 mg/L can be disposed of in the sanitary sewer. See procedure Sanitary Sewer 7 on page 27G.
- Aqueous solutions of more than 1 mg/L ethidium bromide can be placed in a collection container. See procedure Organic Solvents on page 18G.
- Alternatively, you can use bleach to chemically treat ethidium bromide and dispose of the resulting mixture in the sanitary sewer. Follow this procedure to treat ethidium bromide solutions:
    1. Carry out the following steps in a fume hood.
    2. Dilute solutions containing ethidium bromide to concentration: < 0.034 % w/v (34 mg/100 mL).
    3. Add 10 mL fresh bleach for every 1 mg ethidium bromide. (Bleach can deteriorate upon exposure to air.)
    4. Stir at room temperature for 4 hours or over-night.
    5. Rinse the destroyed ethidium bromide solution down the sanitary sewer with 20 parts water.

Ethidium Bromide 2: Acrylamide gels containing ethidium bromide

Because of their low ethidium bromide concentration, acrylamide gels containing ethidium bromide can be disposed in the normal trash following procedure Normal Trash 2 on page 17G.

Ethidium Bromide 3: Cesium chloride/ethidium bromide solutions

Waste aqueous solutions of cesium chloride and ethidium bromide sometimes are generated as a biphasic liquid with an alcohol layer. The following procedures are all appropriate for these wastes:

- Dilute aqueous solutions of less than 1 mg/L ethidium bromide can be disposed of in the sanitary sewer. See procedure Sanitary Sewer 1 on page 24G.
- Aqueous solutions of more than 1 mg/L ethidium bromide are best treated by using bleach to treat ethidium bromide. The resulting mixture should be disposed in the sanitary sewer. Follow this procedure to treat ethidium bromide solutions:
    1. Carry out the following steps in a fume hood.
    2. Dilute solutions containing ethidium bromide to concentration < 0.034% w/v (34 mg/100 mL).
    3. Add 10 mL fresh bleach for every 1 mg ethidium bromide. (Bleach can deteriorate upon exposure to air).
    4. Stir at room temperature for 4 hours or overnight.
    5. Rinse the destroyed ethidium bromide solution down the sanitary sewer with 20 parts water.
- Alternatively, you can dispose of your liquid following On-Site Service 1 on page 29G.

Ethidium Bromide 4: Alcohol solutions of ethidium bromide

Waste alcohol solutions of ethidium bromide commonly contain butanol, n-propanol or amyl alcohol. These alcohol solutions of ethidium, bromide should be placed in a waste collection container according to the procedures for Organic Solvents on page 18G.

Ethidium Bromide 5: Disposable labware contaminated with ethidium bromide

Contaminated labware includes disposable gloves, pipettes, test tubes, etc. that are contaminated with ethidium bromide. Follow the procedure below, depending on your waste type.

- Needles, spatulas and other sharps contaminated with ethidium bromide should be disposed of directly into a sharps container. See Part I for more information about sharps disposal.
- Pipettes and other disposable glassware contaminated with ethidium bromide should be disposed of in the waste container designated for glass disposal. See Part I. Grossly contaminated glassware may be washed in bleach prior to disposal.
- Test tubes and centrifuge tubes contaminated with ethidium bromide should first be emptied, with the liquid disposed according to the appropriate procedure given above. Empty tubes can then be disposed in the normal trash, see Normal Trash 2 on page 17G. Grossly contaminated glassware can be washed in bleach prior to disposal.
- Heat sealed tubes containing ethidium bromide should be given to Environmental Health and Safety for disposal according to procedure On-Site Service 1 on page on page 29G.
- Most other disposable labware contaminated with ethidium bromide can be disposed of in the normal trash according to Normal Trash 2 on page 17G. If you feel your labware contains an unusually high concentration of ethidium bromide, contact Environmental Health and Safety for an evaluation, or follow procedure On-Site Service 1 on page 29G for removal of your contaminated labware.
- Grossly contaminated labware may be washed in bleach prior to disposal.

Explosives and Potential Explosives

Explosive and potentially explosive chemicals may require specific handling procedures to prevent detonation. Read about reactive, explosive and shock-sensitive chemicals in Part B. If you are concerned about the explosivity of a laboratory chemical, contact Environmental Health and Safety for an evaluation by following procedure On-Site Service 3 on page 31G.

Flammable Solvents

Please refer to Organic Solvent Collection from page 18G to 22G for further details.

Gases in Aerosol Cans and Cylinders

As with most hazardous wastes, the best way to manage gas cylinders, canisters, and cartridges is to keep surplus to a minimum. This can best be accomplished by buying only what you need, by using all you buy, by emptying cylinders completely through routine use, and by not purchasing duplicate cylinders for those that are partially full in your inventory. Part D has more information on the safe management of gas cylinders.

Minimization is the <u>best</u> disposal route for gas cylinders.

There are two types of cylinders used on campus:

- Cylinders supplied by our industrial gas vendor (containing argon, helium, nitrogen, carbon dioxide, oxygen, air and other common gases) usually in 50-inch cylinders.
- Specialty gases, supplied by various vendors, usually in lecture bottles (usually 12-inches long).

Gas 1: Aerosol cans

Completely empty aerosol cans can be disposed of in the normal trash. For aerosol cans of hazardous substances that are not completely empty but have no propellant, use On-Site Service 1 on page 29G for disposal.

Gas 2: Return of gas cylinders to local suppliers

Cylinders obtained from suppliers should be returned to suppliers for reuse. The valve protection cap must be in place for transport. Call the local supplier to coordinate cylinder return.

Gas 3: Return of gas cylinders to non-local supplier

Most lecture bottles can be returned to their supplier or manufacturer.

1. Contact the manufacturer or vendor of the gas cylinder in question to see if it can be returned for reuse.
2. Follow the instructions given by the vendor to ship the cylinder. Contact Environmental Health and Safety if you need help.
3. If the manufacturer or vendor will not allow for return, follow procedure Gas 4 on page 7G for atmospheric gases and On-Site Service 3 on page 31G for other gases.

Gas 4: Venting of atmospheric and inert gases

Cylinders of atmospheric and inert gases that are not returnable or emptied may be disposed of by venting in a properly functioning fume hood. Gases suitable for venting include argon (Ar), carbon dioxide (CO_2), helium (He), krypton (Kr), neon (Ne), nitrogen (N_2), and xenon (Xe). Nitrous oxide (N_20) and oxygen (0_2) must be vented slowly. DO NOT vent nitrogen dioxide, as it is an extremely toxic gas.

DO NOT vent nitrogen dioxide (NO_2) as it is an extremely toxic gas.

Do not attempt this procedure unless you are confident that you can do it safely. If you are uncomfortable venting the gas, dispose of cylinder following procedure On-Site Service 3 on page 31G.

Follow this procedure to vent your gas cylinders:

1. Contact Environmental Health and Safety to verify the gas can be vented in your lab.
2. Check your fume hood to make sure that it is functioning properly. See Part D.
3. Slowly vent the cylinder in the back of the hood.
4. Dispose of the empty cylinder following procedure On-Site Service 3 on page 31G.

Inorganic Chemicals

- Look chemical up in Appendix A for specific disposal procedure.
- Solids and reusable solids in their original container can be disposed following procedure On-Site Service 1 on page 29G.
- Gases. See Gases in Aerosol Cans and Cylinders on page 6G.
- For inorganic solutes in an aqueous solution, follow the procedure for Aqueous Solutions on page 3G.
- For a contaminant on labware, see Labware Contaminated With Chemicals on pages 8G to 9G.

LABWARE CONTAMINATED WITH CHEMICALS

Contaminated labware includes disposable gloves, aprons, bench top coverings, centrifuge tubes, pipets, pipet tips, test tubes, unwanted glassware, and other items. This is a very large waste stream. Its hazard depends on the amount, toxicity, and environmental fate of the contaminant.

Many of these items are typically cleaned and reused-and this is the best way to minimize this waste. The vast majority of waste labware that is not reused can safely be disposed of in the normal trash or the appropriate sharps or glass disposal container. To minimize the amount of waste contaminated labware that needs to be disposed, decontaminate grossly contaminated labware whenever possible (see procedure Labware 3 on page 9G). Keep contaminated labware separate from non-contaminated labware whenever possible by using separate waste collection containers.

Most contaminated labware can be washed for reuse.

Toxicity Characteristic Rule

The U. S. Environmental Protection Agency (EPA) regulates disposal of certain toxic chemicals under the Toxicity Characteristic Leaching Procedure (40 CFR 261). This method simulates the ability of a compound to leach out of a landfill into groundwater.

The EPA currently lists the following chemicals with the characteristic of toxicity:

Toxicity Characteristic Chemicals*

Arsenic (5.0)	1,4-Dichlorobenzene (7.5)	Methyl Ethyl Ketone (200.0)
Barium (100.0)	1,2-Dichloroethane (0.5)	Nitrobenzene (2.0)
Benzene (0.5)	1,1-Dichlororethylene (0.7)	Pentachlorophenol (100.0)
Cadmium (1.0)	2,4-Dinitrotoluene (0.13)	Pyridine (5.0)
Carbon Tetrachloride (0.5)	Endrin (0.02)	Selenium (1.0)
Chlordane (0.03)	Heptachlor (and its epoxide) (0.008)	Silver (5.0)
Chlorobenzene (100.0)	Hexachlorobenzene (0.13)	Tetrachloroethylene (0.7)
Chloroform (6.0)	Hexachlorobutadiene (0.5)	Toxaphene (0.5)
Chromium (5.0)	Hexachloroethane (3.0)	Trichloroethylene (0.5)
m-Cresol (200.0)	Lead (5.0)	2,4,5-Trichlorophenol (400.0)
O-Cresol (200.0)	Lindane (0.4)	2,4,6-Trichlorophenol (2.0)
p-Cresol (200.0)	Mercury (0.2)	2,4,5-TP (Silvex) (1.0)
Cresol, total (200.0)	Methoxychlor (10.0)	Vinyl Chloride (0.2)
2,4-D (10.0)		

*** All values are reported in milligrams/liter**

Waste containing chemicals at or exceeding the level in parentheses must not be disposed of in the normal trash. Dilution cannot be used to reduce the chemical concentration. Chemicals equaling or exceeding the listed concentrations require treatment and disposal at a permitted hazardous waste facility. Follow procedure On-Site Service 1 on page 29G to dispose of these materials.

Do all you can to reduce the volume of contaminated labware your laboratory generates.

Labware 1: Decontamination and reuse of chemically contaminated labware

1. Wash, empty or otherwise decontaminate chemically contaminated labware to be reused with the appropriate detergent or solvent. Bleach is an excellent decontaminant for many oxidizable organic chemicals. An overnight soak is sufficient in most cases.
2. Dispose of the wash liquid appropriately. Most wash solutions can be disposed of in the sanitary sewer. Decant organic solvents into the proper waste collection container (see Organic Solvent Collection on pages 18G to 22G).

Labware 2: Decontamination and disposal of chemically contaminated labware

1. Wash, empty or otherwise decontaminate the chemically contaminated labware with the appropriate detergent or solvent. Bleach is an excellent decontaminant for many oxidizable organic chemicals. An overnight soak is sufficient in most cases.
2. Dispose of the wash liquid appropriately. Most wash solutions can be disposed of in the sanitary sewer. Decant organic solvents into the proper waste collection container (see Organic Solvent Collection on pages 18G to 22G).
3. Dispose of the decontaminated wet solids in the normal trash according to the procedure for Normal Trash 2 on page 17G.

Labware 3: Chemically contaminated disposable items

Contaminated labware must be placed in a plastic bag. Liquids should be emptied into the sanitary sewer or an appropriate liquid waste container. Add absorbent material (e.g., paper towels or oil dry) to absorb any remaining liquids in the bag.

1. ***Toxicity characteristic chemicals.*** If the labware is contaminated at levels equal or greater than the amount of the TCLP chemicals listed above, give the waste to the Environmental Health and Safety following procedure On-Site Service 1 on page 29G. Please attach a Waste Collection Container label and provide a reasonable estimate of the amount of chemical in the waste container. Chemically contaminated sharps (see Part I) must be disposed in a sharps container.
2. ***Normal trash chemicals.*** If the chemical contaminant is listed in Appendix A as having a disposal route of normal trash, the labware can safely be disposed of in the normal trash following procedure Normal Trash 3 on page 17G. Follow procedures in Part I if the waste is a sharp.
3. ***Hazard determination.*** Most remaining contaminated labware can be disposed of in the normal trash by following procedure Normal Trash 3 on page 17G. If decontamination of the labware is difficult, or your labware is contaminated with an extremely toxic chemical (e.g., Dioxin), or with gross amounts of a toxic chemical (e.g., gas chromatograph autosampler vials), Environmental Health and Safety can dispose of it according to procedure On-Site Service 1 on page 29G.

Liquids

- Refer to Appendix A for the proper disposal procedure for your chemical.
- For aqueous solutions, see Aqueous Solutions on page 3G.
- For organic solvents, see Organic Solvent Collection on pages 18G to 22G.
- For strong acids or bases, see Neutralization Procedures on pages 10G to 15G.
- For reusable chemicals in their original containers, see On-Site Service 1 on page 29G.

Mercury

Mercury compounds and metallic mercury are very hazardous. Mercury is especially difficult to handle safely because it is fluid and volatile. If spilled, mercury in cracks of lab benches or floor tile may pose an exposure hazard for years until the mercury has evaporated. Environmental

Health and Safety first attempts to recycle free metallic mercury. Few hazardous waste facilities can dispose of mercury. For these reasons, avoid using mercury by substituting with mercury-free liquid thermometers and electronic devices to measure temperature and pressure.

Do not dispose of any mercury-containing waste in the normal trash or sanitary sewer.

Mercury 1: Recycling of free-flowing metallic mercury from thermometers and manometers

Recycle mercury from your unwanted or broken mercury thermometers, manometers, switches, controllers, and other mercury containing equipment. Environmental Health and Safety collects metallic mercury and unwanted, unbroken mercury-containing devices.
For free-flowing mercury from broken items, follow this procedure:

1. Follow Mercury Spill Clean-up procedure in Part E to contain and collect the mercury.
2. If dealing with a broken thermometer preserve all sections containing visible mercury, including the bulb. If the capillary contains none of the metal, it can be discarded in the appropriate sharps container.
3. Package the mercury securely in a small container and cover tightly.
4. Dispose of the material following procedure On-Site Service 1 on page 29G.

Mercury 2: Other mercury-containing materials such as mercury-contaminated labware, mercury salts, and spill clean-up products.

All compounds and materials containing mercury must be disposed following procedure On-Site Service 1 on page 29G. Contact Environmental Health and Safety if you have questions dealing with the disposal of mercury-containing wastes.

Metals That Are Toxic

Toxic metals include beryllium and heavy metals such as arsenic, cadmium, chromium, lead, mercury, osmium, selenium, and silver.

- Disposal procedures for mercury are given above.
- Beryllium and beryllium dust must be given to Environmental Health and Safety following procedure On-Site Service 1 on page 29G.
- Solid compounds containing toxic metals can be disposed following procedure On-Site Service 1 on page 29G.
- Some dilute solutions of toxic metals, below the toxicity characteristics limits in the table on page 8G, may be disposed of in the sanitary sewer using procedure Sanitary Sewer 6 on page 26G.
- Items contaminated with a toxic metal should be managed according to the procedures for Labware Contaminated with Chemicals on pages 8G to 9G.

NEUTRALIZATION PROCEDURES

Strong Acids and Bases

People who use strong acids and bases can use neutralization as a disposal option. However neutralization should not be used if the waste is contaminated with silver, chromium, lead, mercury or other Toxicity Characteristic Chemicals at or above limits provided on Page 8G. Before proceeding with neutralization of a concentrated and strong acid or base assure the work is completed in a safe manner. The cost of neutralizing agent and time may exceed the cost for offsite treatment, so feel free to dispose of strong acids and bases using On-Site Service 1 on page 29G.

This section addresses the neutralization of acids and bases listed in Appendix A. After neutralization, waste liquids can be disposed in the sanitary sewer. The waste liquids can only be sewered if they do not contain levels of chemicals that exceed the toxicity characteristic rule limits provided in the Toxicity Characteristic Chemicals table on page 8G. If the acids or bases contain chemicals that exceed the Toxicity Characteristic Rule Limits prior to neutralization, do not neutralize the waste, use On-Site Service 1 on page 29G to dispose of the waste.

Call Environmental Health and Safety for advice or if you have questions regarding neutralization procedures. Also call if your facilities (e.g., sink or fume hood) are unsatisfactory or if you have large quantities of waste acid or base to neutralize.

Do not neutralize these acids

The following acids are very reactive with water. Do not attempt to neutralize them unless you are expert in handling and using these acids. Dispose of these waste acids following procedure On-Site Service 1 on page 29G.

- Acid anhydrides and chlorides
- Chlorosulfonic Acid
- Fuming Nitric Acid
- Fuming Sulfuric Acid
- Liquid halides of boron, silicon, tin, titanium and vanadium
- Liquid halides and oxyhalides of phosphorus, selenium and sulfur.

Safe Neutralization Requires Care and Proper Equipment.

- Plan your neutralization.
- Perform all steps SLOWLY.
- Take special care when neutralizing strongly oxidizing acids, such as nitric or perchloric.
- Caution: Vapors and heat are generated. Perform procedures in a hood, behind a shield. Wear acid-resistant gloves, chemical goggles, face shield, and lab coat with apron.

Facilities, Personal Protection and Equipment for Neutralization

- Carry out neutralizations in a well-ventilated fume hood. Use the sash or a safety shield for protection against vigorous reactions.
- Wear an apron, splash-proof goggles, a full-face shield and appropriate gloves. Long gloves or gauntlets protect forearms from splashes.
- A five-gallon polyethylene bucket is recommended for neutralizing 1 to 10 liters. A large container is needed to perform the reaction during addition of ice and base.

Strengths of Concentrated Acids

Concentrated Acid	Amount to furnish one mole of acid protons	Maximum Volume per neutralization in 5-gallon Bucket
Acetic Acid (Glacial)	57.1 mL	1.50 L
Formic Acid (88%)	43.6 mL	1.20 L
Hydrochloric Acid	83 mL	2.20 L
Hydrofluoric Acid (50%)	34.6 mL	0.75 L
Nitric Acid	67 mL	1.00 L
Perchloric Acid	83 mL	1.00 L
Phosphoric Acid (85%)	45.6 mL	1.20 L
Sulfuric Acid	27.7 mL	0.75 L
Trichloroacetic Acid (20% Solution)	817 mL	3.00 kg/L (30%)

Planning For Neutralization

- Before starting the procedure, calculate quantities of acid or base needed for neutralization. The relative strengths of commonly used acids and bases are summarized in the adjacent tables.
- Add the maximum amount of concentrated acid or base solution listed in the following tables to 10 liters water in a 5-gallon bucket. A rule of thumb is to dilute up to 20 moles of acid protons per 10 liters of water.
- Try a small batch first. Measure a few milliliters of waste acid into a beaker and gradually add a measured amount of base while testing its pH and observing its reaction. Assess the amount of heat and fumes generated, and the amount of base needed. Use these observations for scaling up your neutralization. Remember, when scaling up, the lower ratio of surface area to volume may make heat dissipation a problem. Ice, going slow, and stirring all help.

Strengths of Bases Used for Neutralizations

Base	Amount needed to furnish one mole of base protons	Notes
Ammonium Hydroxide (15 Molar)	67 mL	Must be used in a fume hood.
Calcium Hydroxide	37 grams	Add as a powder to neutralize acids.
Magnesium Hydroxide	29 grams	Add as a powder to neutralize acids.
Potassium Hydroxide	56 grams	Dissolve 336 grams KOH per liter of water to make 6 N solution.
Sodium Bicarbonate	84 grams	This is best used as a spill neutralizer due to foaming.
Sodium Carbonate	53 grams	This is best used as a spill neutralizer due to foaming.
Sodium Hydroxide	40 grams	Dissolve 240 grams NaOH per liter of water to make 6 N solution.

Neutralize Acid 1: Non-oxidizing acids that may generate heat upon neutralization such as phosphoric and sulfuric acid

1. Follow Facilities, Personal Protection, and Equipment for Neutralization and Planning For Neutralizations on pages 11G and 12G.
2. Pour amount of acid specified above slowly over cubed ice.
3. Neutralize by slowly adding 6 N sodium hydroxide solution, stirring continually.
4. As heat builds up, add more ice.
5. Monitor pH change with a suitable indicator or check periodically with pH paper.
6. When pH >6 and pH <9 is reached, the solution may be washed down the sanitary sewer with 20 parts of water.

Dilution will reduce the hazards of a strong acid, such as concentrated sulfuric acid.

Neutralize Acid 2: Concentrated acids such as formic, hydrochloric, hydrobromic, and lactic acids

1. Follow Facilities, Personal Protection, and Equipment for Neutralization and Planning For Neutralizations on pages 11G and 12G.
2. Pour amount of acid specified above slowly into water.
3. Stir in 6 M sodium or potassium hydroxide solution (or other suitable base) while monitoring the pH change with Universal indicator or check periodically with pH paper.
4. Once a pH of >6 and pH <9 is reached, the solution can be washed down the sanitary sewer using 20 parts water.

Neutralize Acid 3: Fluoride-containing acid solutions such as ammonium bifluoride, hydrofluoric and tetrafluoroboric acids

1. Follow Facilities, Personal Protection, and Equipment for Neutralization and Planning For Neutralizations on pages 11G and 12G.
2. Pour amount of acid specified above slowly into water.
3. Stir in a slurry of calcium hydroxide ($Ca(OH)_2$).
4. Monitor pH changes with pH paper or a suitable indicator.
5. When a pH of >6 and pH <9 is reached, the solution can be washed down the sanitary sewer using 20 parts water to one part acid solution. A precipitate of calcium fluoride may appear. This precipitate may be disposed of in the sanitary sewer with the rest of the solution if no more than about 100 grams of calcium fluoride is formed. Larger amounts should be collected for disposal following procedure On-Site Service 1 on page 29G.

Danger: Hydrofluoric acid is extremely dangerous, avoid contact with eyes or skin.

Neutralize Acid 4: Oxidizing acids, such as nitric and perchloric acids

1. Follow Facilities, Personal Protection, and Equipment for Neutralization and Planning For Neutralizations on pages 11G and 12G.
2. Dilute the acid with 10 parts water.
3. Neutralize with a 6 M solution of potassium or sodium hydroxide. The solution may turn yellow or brown as nitric oxide forms when neutralizing nitric acid. If you use potassium hydroxide, a white precipitate of potassium perchlorate will form when neutralizing perchloric acid. This precipitate may be disposed of in the sanitary sewer with the rest of the solution.
4. Monitor pH with pH paper or other suitable indicator.
5. When a pH>6 and pH<9 is reached, wash solution down the sanitary sewer using 20 parts water.

Neutralize Acid 5: 57% Hydroiodic acid

1. Follow Facilities, Personal Protection, and Equipment for Neutralization and Planning For Neutralizations on pages 11G and 12G.
2. Dilute the dark orange/brown solution with 10 parts water.
3. Rinse bottle with water and add rinsate to rest of solution to be neutralized.
4. If crystallized iodine remains in the bottle, dispose following procedure On-Site Service 1 on page 29G.
5. Add 6 M sodium hydroxide or other suitable base.
6. Monitor pH changes with pH paper as the color of the solution will interfere with most indicators. The solution will become nearly colorless as pH 7 is approached.
7. When a pH>6 and pH<9 is reached, solution can be washed down the sanitary sewer, using approximately 20 parts water.

Always add concentrated acid or base to water to prevent splattering.

Neutralize Acid 6: Chromic acid cleaning solutions and COD wastes

1. Follow Facilities, Personal Protection, and Equipment for Neutralization and Planning For Neutralizations on pages 11G and 12G.
2. Pour the acid (approximately 0.75 liters) into 10 L water.
3. Slowly pour 6 M sodium hydroxide into the solution (Caution: Hissing and spattering may occur).
4. Monitor pH change with pH paper.
5. When pH 4-5 is achieved, reduce the green Cr(VI) to blue Cr(III) by addition of saturated sodium sulfite solution. Caution: Hexavalent chromium [Cr(VI)l is a known carcinogen.
6. Once a homogenous blue color is achieved, the liquid can be washed down the sanitary sewer with approximately 20 parts water. See Sanitary Sewer 6 on page 26G for more details. Collect and properly dispose of the precipitate following procedure On-Site Service 1 on page 29G.

Sample Calculation

Polly Purity generated the following wastes.
300 mL of ammonium hydroxide
1.5 L of hydrochloric acid
250 mL of sulfuric acid
400 mL 20% trichloroacetic acid solution

How many grams of NaOH will Polly need to neutralize all of these items?

Step One: Calculate how many moles of acid protons you have.

hydrochloric acid: 1500 ml / 83.0 mLmole = 18 moles
sulfuric acid: 250 mL / 27.2 mLmole 9 moles
trichloroacetic acid: 400 ml / 871 mLmole = 0.5 moles
~ 28 moles acid

Step Two: Calculate how many moles of base you have:

ammonium hydroxide: 300 mL -- 67 mL/mole = 5 moles base

Step Three: Subtract moles of base from moles of acid:

28 moles acid - 5 moles base = 23 moles base needed

Step Four. Calculate the grams of NaOH you would need to complete the neutralization:

23 moles base x 40 g/mole NaOH = 920 grams NaOH

Therefore, an additional 920 grams NaOH are needed to complete the neutralization.

Neutralize Base 1: General base neutralization such as solutions of potassium and sodium hydroxides and alcoholic sodium or potassium hydroxide cleaning solutions

1. Follow Facilities, Personal Protection, and Equipment for Neutralization and Planning For Neutralizations on pages 11G and 12G.
2. Note that effervescence is common with older base solutions due to carbon dioxide absorption.
3. Add up to 2 L hydroxide solution to 10 liters water.
4. Slowly add 6 N hydrochloric or other suitable acid.
5. Monitor pH changes with pH paper. (Note: Liquid indicators can oxidize rapidly in basic solutions and give false color change).
6. When pH<9 and pH>6 is reached, solution can be washed down sanitary sewer with 20 parts water.

Neutralize Base 2: Amine solutions such as ammonium hydroxide.

1. Follow Facilities, Personal Protection, and Equipment for Neutralization and Planning For Neutralizations on pages 11G and 12G.
2. Add up to 1.5 liters amine with 10 liters water.
3. Slowly add 6 N hydrochloric or other suitable acid.
4. Monitor pH changes with pH paper. (Note: Liquid indicators can oxidize rapidly in basic solutions and give false color change).
5. When pH<9 and pH>6 is reached, solution can be washed down sanitary sewer with 20 parts water.

Do not use nitric or perchloric acids on amine bases.

NORMAL TRASH PROCEDURES

Although certain laboratory wastes can be disposed of in the normal trash, great care must be taken to protect custodians, handlers, haulers and the environment. This section describes the necessary precautions for disposing of laboratory waste in the normal trash.

Precautions For Normal Trash Disposal. Do not discard any chemical in normal trash unless Appendix A specifically lists that as a method of disposal. ***Absolutely no free liquids are allowed in dumpsters or in the landfill.***

Safe and Legal Use of the Normal Trash

Where does it go? When you dispose of waste in a lab trash basket at UWL, your waste is first brought to a trash dumpster outside the building. When the dumpster is emptied, the trash is mixed with other campus trash and transported to the local refuse derived fuel (RDF) facility. At the RDF facility, the trash is sorted to remove noncombustible materials. Sorted discards are recycled or disposed at a local sanitary landfill.

What happens to it? Modern solid waste landfills are designed to reduce precipitation from entering and are managed to prevent liquids and hazardous waste from being disposed at the facility. Leachate (liquids that leach through the waste) captured in the landfill is collected and treated to prevent it from reaching groundwater.

What is the law? You may not dispose of any regulated hazardous waste in the normal trash. Hazardous waste includes chemicals that are:

- ignitable or oxidizers
- corrosive
- reactive, potentially explosive, or capable of generating cyanide or sulfide gas
- contain a toxic characteristic chemical (see *Labware Contaminated with Chemicals*, on pages 8G and 9G)
- listed as an acute, toxic or other process hazardous waste (see Appendix H, EPA's Hazardous Waste Law)

Unless this Guide specifically instructs you to dispose of a waste or chemical in the normal trash, do not dispose of any laboratory chemical or chemically contaminated material in the normal trash.

Think of Others. Only certain wastes (specified in this Guide*)* may be disposed of in the normal trash. To prevent risks to those who empty wastebaskets, you may not dispose of any uncontained chemical in the normal trash. To keep things neat, no liquids can be placed in normal trash and wet wastes need to be absorbed and securely bagged.

Prudent and safe use of the Normal Trash. Accounting for these concerns and restrictions, a wide variety of laboratory waste can be disposed of in the normal trash. Appendix A of this Guide lists those chemicals that are appropriate for the normal trash, and this Part describes the procedures you should use.

Make contact if you have questions. Call Environmental Health and Safety if you have waste not covered in this guide, or if you have questions about normal trash limitation.

Normal Trash 1: Non-hazardous solid chemicals

Use this procedure for non-hazardous solid chemicals that are listed as Normal Trash 1 in Appendix A, such as talc, silica, sulfur, and carbon. Do not dispose of liquids or solutions in the normal trash.

- Normal trash is handled roughly. To prevent exposing handlers to powders, all waste solids should be contained in a tightly closed bag, box, or bottle that is packed *inside* a second box or bag (i.e., an overpack). A box overpack is preferred, especially to prevent breakage if glass is used as an inside container. Mark the overpack with the words "Nonhazardous Waste" so that handlers can be assured that the waste is safe for the normal trash.
- To minimize the chance of breakage from handling, place more than one kilogram of a non-hazardous chemical for the normal trash directly in your building's dumpster.

If you have more than 5 pounds (2.3 kilograms) of any combined chemicals for the normal trash, contact Environmental Health and Safety to remove the material(s).

Normal Trash 2: Non-hazardous waste that is wet

Use the procedure for non-hazardous waste listed as Normal Trash 2 in Appendix A and for other wastes that refer to this procedure, such as gels, precipitates and semi-solids. This procedure can also be used for wet, emptied vials.

- Any waste contaminated with a Toxic Characteristic Chemical must be given to Environmental Health and Safety following procedure On-Site Service 1 on page 29G. See Labware Contaminated with Chemicals on pages 8G and 9G for a list of Toxic Characteristic chemicals.
- Minimize liquids in the waste by emptying vials, decanting any excess liquids, filtering the waste or allowing the aqueous waste to evaporate in a fume hood. Dispose of liquids in the sanitary sewer or in an organic solvent collection carboy or other waste collection container, as appropriate. Absorb any remaining liquids by adding absorbent (e.g., oil dry or absorbent paper) to the waste or in the container.
- Normal trash is handled roughly. To keep the waste contained, waste for the normal trash should be in a tightly closed bag, box, or bottle packed *inside* a second box or bag (i.e., an overpack). A box overpack is preferred, especially to prevent breakage if glass is used as an inside container. Mark the overpack with the words "Nonhazardous Waste" so handlers know the waste is safe for normal trash.
- To minimize the chance of breakage from handling, place more than one kilogram of waste for the normal trash directly in your building's dumpster.
- Do not place any of these wastes in organic solvent collection carboys; carboys are only for the liquid wastes specified in the procedures for Organic Solvent Collection on pages 18G to 22G.

Overpack all chemicals for the normal trash.

Normal Trash 3: Labware contaminated with chemicals

Use this procedure for chemically contaminated labware that can be safely disposed in the normal trash, as referenced in Labware 3 on page 9G. See Labware Contaminated with Chemicals on pages 8G to 9G for more information.

- Any waste contaminated with a Toxicity Characteristic chemical exceeding the limits on the table on page 8G must be disposed following procedure On-Site Service 1 on page 29G.
- Sharps and glass must be disposed of according to the procedures given in Part I: Sharps Disposal.
- Eliminate liquids in the waste by emptying vials, decanting any excess liquids, filtering the waste or allowing the aqueous waste to evaporate in a fume hood. Dispose of the liquids in the sanitary sewer or in an organic solvent collection container, as appropriate. Absorb any remaining liquids by adding absorbent (e.g., oil dry or absorbent paper).
- Normal trash is handled roughly. To keep the waste contained, all waste for the normal trash should be contained in a tightly closed bag or box and packed *inside* a second box or bag (i.e., an overpack). A box overpack is preferred, especially if the waste contains breakable items. Mark the overpack with the words "Nonhazardous Waste" so haulers know the waste is safe for the normal trash.
- To minimize the chance of breakage, place more than one kilogram of waste directly in your building's dumpster.

Normal Trash 4: Disposal of empty containers

- A container is empty if all remaining chemical from the container is removed by normal means (e.g., pouring, draining, aspirating, pumping, etc.)
- Any empty container previously containing a chemical name with a hazardous waste number starting with a P as included in Appendix H, Listed EPA Hazardous Wastes, may need to be discarded as a hazardous waste. If a (P) does not proceed the hazardous waste number, the empty container can be disposed in the normal trash. If the container is a hazardous glass collection container or a sharps container, dispose as directed in Part I of this guide. If a (P) does proceed the hazardous waste number, dispose of the container by following procedure On-Site Service 1 on page 31G. Discard empty containers, with a (P) that proceeds the hazardous waste number, in the normal trash after being triple rinsed with a solvent capable of removing the chemical. However, the rinsate must also be discarded as hazardous waste unless it is used for its originally intended purpose. Do not triple rinse the empty (P) listed containers unless you can use the rinsate for its originally intended purpose.
- Dispose of empty gas cylinders by following procedure On-Site Service 3 on page 31G.

Oils

UWL recycles petroleum-based oils used for lubrication of engines and machinery. This includes centrifuges, diffusion pumps, and vacuum pumps used in laboratories. Do not allow cleaning solvents or other materials to be combined with used oils. Package each type of oil separately in containers of one gallon or less and label contents. Do not place in carboys for solvent collection or mix with other chemicals.

1. Refer to procedure On-Site Service 1 on page 29G for disposal procedure.
2. If the oil could contain polychlorinated biphenyls (PCBs) or any halogens refer to method PCB 1 on page 22G.

Keep used oil separate from solvents and other wastes.

On-Site Hazardous Materials Management

See pages 28G to 31G for the procedures detailing On-Site Hazardous Materials Management.

Organic Chemicals

- Refer to Appendix A for the proper disposal procedure for your chemical.
- For solids and reusable solids in their original containers, see On-Site Service 1 on page 29G.
- For organic solvents, see Organic Solvent Collection on pages 18G to 22G.
- For gases, see Gases in Aerosol Cans and Cylinders on pages 6G and 7G.
- For a solute in aqueous solutions, refer to Appendix A for the proper disposal procedure for that chemical.
- For a contaminant on disposable labware, see Labware 3 on page 9G.

Organic Solvent Collection

Environmental Health and Safety can provide drums, carboys, or other waste compatible containers for collection of waste organic solvents, their solutes, and aqueous solutions of toxic organic chemicals. If you need a container for your waste contact Environmental Health and Safety.

It is important to use an appropriate container for your waste solvents. Consult Appendix A to determine the specific procedure for the solvent in question. If the material is not listed, contact

Environmental Health and Safety for the proper disposal procedure. We distribute multiple types of containers, with the most common for collecting waste solvents.

Organic Solvent/Non-halogenated

Non-halogenated flammable/combustible liquids are collected in labeled flammable storage safety cans provided by Environmental Health and Safety. Typical wastes placed in these containers include acetone, ethyl ether, ethyl acetate, hexane, methanol, and ethanol.

Follow the Guidelines For Using Carboys on page 19G.

Organic Solvent/Halogenated

Halogenated organic solvents can be disposed in compatible and labeled containers. Typical wastes for these containers include chloroform, dichloromethane (methylene chloride), and trichloroethylene.

Follow the Guidelines For Using Carboys on page 19G.

Halogenated and non-halogenated organic solvents are collected separately because there treatment method differs. Halogenated organic solvents are incinerated. Non-halogenated organic solvents are used as a fuels source because of their high BTU content. Separating halogenated and non-halogenated organic solvents saves UWL thousands of dollars per year.

Guidelines For Using Carboys

The following guidelines further discuss the wastes that should not be put in 5-Gallon/20-Liter carboys or bulked in other containers.

- Smaller bottles are best disposed following procedure On-Site Service 1 on page 29G.
- Centrifuge tubes, glassware, gloves, ion exchange resins, paint sludge, pipette tips, solids, syringe needles, or viscous solutions (such as polymers).
- To prevent problems with waste compatibility and handling, and to ensure safe disposal, do not mix or co-mingle the following chemicals in waste collection containers. For materials on this list use procedure On-Site Service 1 on Page 29G.

acetaldehyde	nitrate esters
acid chlorides	nitrite esters
alkynes	nitrosoureas
amines with f.w.< 98 g/mole	nitrosourethanes
anhydrides	non-metal halides and oxyhalides
aziridines	perfluroaliphatic acids
bromine	peroxides
carbon disulfide	phosphines
chloroformate esters	phosphate esters
chloromethylsilanes	polychlorinated biphenyls (PCBs)
chloropicrin	phosphite esters
collodion	polymer solutions
cyanohydrins	polynitro-substituted compounds
dienes	propargyl bromides
formic acid	pyrocarbonate esters
furan	pyrrole
haloalkynes	radioactive materials

alpha-halocarbonyls	reactives in solution such as: alkaline metal alkyls aluminum alkyls and hydrides boron alkyls and hydrides
hydrazines	
hypochlorite esters	
isocyanates	
isocyanides	sulfate esters
metal halides and oxyhalides	sulfite esters
mercaptans	sulfonate esters
mercury and mercury compounds	thallium ethoxide
metal-containing aqueous solutions	thiocarbonyls
mineral acids	thiophene
monomers (polymerizable)	

Obtaining and Storing Carboys

- To obtain a waste solvent collection carboy or safety can, contact Environmental Health and Safety.
- Waste flammable solvents present a fire hazard, so minimize the number of collection containers in your laboratory. No more than 10-gallons of flammable liquids can be kept outside of a flammable storage cabinet within a lab room.
- When not in use, partially full waste collection containers with flammable liquids should be stored in a flammable storage cabinet.

Adding Waste Solvents To Waste Collection Containers

- Organic solvents are toxic, so wear chemical goggles, gloves, and a lab coat when handling waste collection containers or when adding solvents to waste collection containers.
- When in use, keep the waste collection containers in a well-ventilated area.
- Keep the waste collection containers securely capped at all times, except when adding waste to container. There are several reasons that waste collection containers must be capped at all times. 1.) Volatile solvents are toxic and evaporation into your room threatens your health. 2.) If an open waste collection container is accidentally tipped over, the solvent spill risks a fire and the health of you and your colleagues. 3.) Evaporation of organic solvents causes air pollution, and is an illegal disposal method. 4.) It is an EPA law that waste collection containers must always be capped.
- A funnel may help prevent spills, but never leave a funnel in a waste collection container when you are not adding waste.
- Do not fill the waste collection container above the lower end of the handle. Do not fill the waste collection container within 2 inches from the top of the container. This allows sufficient room for expansion and will help to prevent spills during transfer.
- If you put solvent into the wrong type of waste collection container, do not panic. Please note this discrepancy on the waste collection container label.

Keeping your waste collection containers capped is a federal law.

Required Recordkeeping

- Proper disposal of waste requires lab personnel to identify the waste chemicals within the disposal container. All waste collection containers must be labeled. If a waste container has an original manufacturer label attached, and the contents of the container match the label, no additional label is required. For all other containers, there are two types of waste labels, with examples and use guidance as follows.

The ***Unwanted Chemical label is the primary label*** that lab personnel should attach to identify waste chemicals.

UNWANTED CHEMICAL

List container contents by name and identify hazards(s):

Corrosive: ____ Reactive: ____ Oxidizer: ____

Flammable/Combustible: ____ Toxic: _____

1. _____

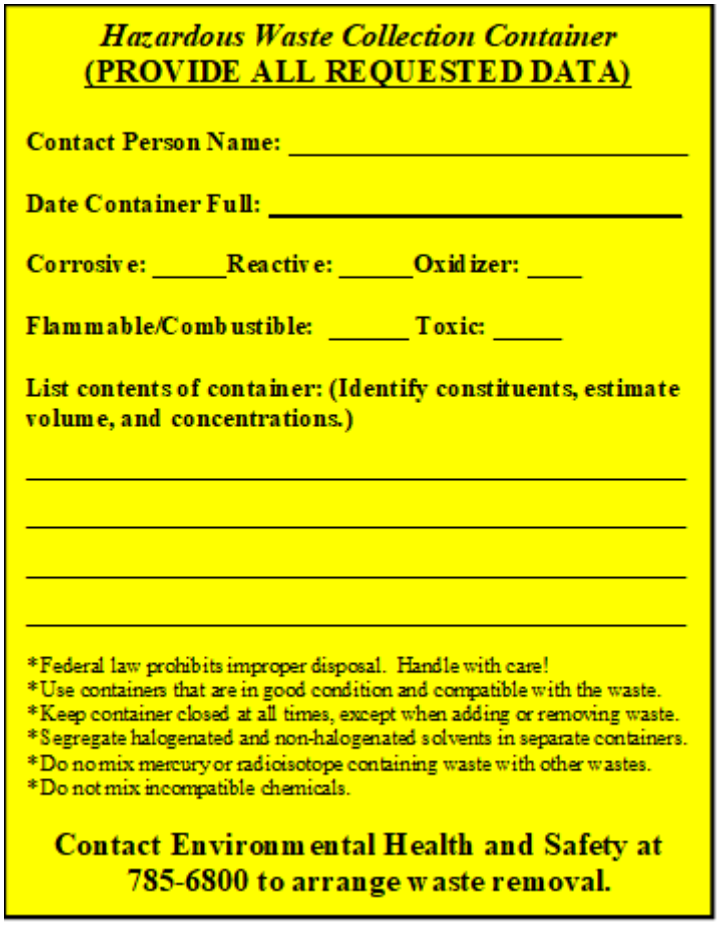
2. _____

3. _____

4. _____

Call 608-785-6800 with questions or to request pickup.

The Hazardous Waste Collection Container label shall only be used after Environmental Health and Safety has verified the waste being generated meets the definition of hazardous waste. Contact Environmental Health and Safety for assistance on label selection.



Hazardous Waste Collection Container
(PROVIDE ALL REQUESTED DATA)

Contact Person Name: _____

Date Container Full: _____

Corrosive: _____ **Reactive:** _____ **Oxidizer:** ____

Flammable/Combustible: _____ **Toxic:** _____

List contents of container: (Identify constituents, estimate volume, and concentrations.)

_____

_____

_____

_____

*Federal law prohibits improper disposal. Handle with care!
*Use containers that are in good condition and compatible with the waste.
*Keep container closed at all times, except when adding or removing waste.
*Segregate halogenated and non-halogenated solvents in separate containers.
*Do no mix mercury or radioisotope containing waste with other wastes.
*Do not mix incompatible chemicals.

Contact Environmental Health and Safety at 785-6800 to arrange waste removal.

- To obtain carboys, safety cans, other waste collection containers, and waste labels contact Environmental Health and Safety. The Chemistry and Microbiology stockrooms have waste collection container labels for distribution.
- It is important to keep an accurate inventory of the solvents placed in every waste collection container. Your lab should assign one person to oversee handling of waste solvents or give large volume users a 5-gallon carboy or safety can for their sole use.
- Record all additions to your waste collection container on the container label.

Removing Carboys For Disposal

- When the carboy is full, immediately call Environmental Health and Safety for removal as specified in On-Site Service 2 on page 31G.

Polychlorinated Biphenyls (PCB's)

The U. S. Environmental Protection Agency (EPA) under the Toxic Substances Control Act (TSCA) regulates PCB-containing materials at concentrations over 50 ppm. The following guidelines must be followed to dispose of PCB's.

Notify Environmental Health and Safety if you have PCB-containing material to dispose. Work with Environmental Health and Safety to verify the PCB concentration.

PCB 1: Liquids containing PCB's

These include PCB's mixed with organic solvents, PCB solutions mixed with polymers, stock solutions, concentrated PCBs and rinsate from equipment.

1. Store in a glass container, preferably 1 gallon or less, with a good cap that does not leak. Do not place PCB materials in solvent carboys or mix with any other waste.
2. Clearly label that the contents are PCB's with a waste label.
3. Keep track of all solvents and approximate PCB concentrations in the container, (e.g., 100 mL of 100 ppm Aroclor 1254 in hexane).
4. When the container is 3/4 full, arrange for disposal following procedure On-Site Service 1 on page 29G.

PCB 2: PCB contaminated equipment such as gloves and labware

1. Keep contaminated materials separated from liquid PCB's.
2. Place the contaminated materials in a heavy plastic bag and seal. Place the bag inside another bag (double bag), seal with tape and place inside a box.
3. Identify PCB concentration of contaminant on the waste label that should be placed on the outer packaging.
4. Arrange for disposal following procedure On-Site Service 1 on page 29G.

PCB 3: Electrical equipment containing PCB (or suspected PCB) oil such as fluid-filled capacitors, transformers, and voltage regulators

1. Fluid-filled electrical equipment manufactured prior to 1980 may contain significant amounts of PCB oil. Suspect electrical items should be stored in plastic trays containing an absorbent to contain and absorb any spills or leaks.
2. Electrical items containing PCB oil must be carefully handled and stored in leakproof and fireproof containment areas. Oil leaking from these items will cause serious contamination necessitating enormous cleanup costs.

3. Disposal of PCB electrical equipment is strictly regulated by the U.S. EPA. Environmental Health and Safety provides sampling and analysis for PCB's, and disposal of oil-filled electrical items. Please contact Environmental Health and Safety for further assistance.

SANITARY SEWER PROCEDURES

As noted in Appendix A, many chemicals can be safely disposed of in the sanitary sewer when flushed down a lab sink drain with copious amounts of water.

Safe and Legal Use of the Sanitary Sewer

Where does it go? When you dispose of any material or wastewater in a laboratory your laboratory effluent is mixed with sanitary sewage and other wastewater that enters the sewage collection system of the City of La Crosse wastewater treatment system. In the collection system, UWL's wastewater is mixed with sewage and wastewater from area households and businesses. The sewage and wastewater travel through underground pipes to the treatment plant on La Crosse's southwest side.

What happens to it? Solutes that are in wastewater are subject to physical degradation in the sewage system. For example, a small quantity of most organophosphate pesticides is hydrolyzed in the sewer. At the treatment plant, the waste is subjected to bacterial degradation. For example, small amounts sodium nitrate (an oxidizer) disposed of in the sanitary sewer will be used as a bacterial nutrient. There is also a tremendous degree of dilution that occurs in the system, which facilitates both of these processes.

Nondegradable chemicals, such as metals, are adsorbed on the sludge or eventually discharged to surface waters. In most cases, the concentration of chemical contaminants are so low that the sewage sludge (which is rich in nutrients) can be disposed of by application to farmland. Land application of treated solids and disposal of treated water to surface waters are regulated by the U.S. Environmental Protection Agency and Wisconsin Department of Natural Resources, which is the basis for the La Crosse Sewer Use Ordinances, on which this Guide is partially based.

What is the law? Only certain liquids and wastes (specified in this Guide*)* may be disposed of in your laboratory sink. To prevent damage to the plumbing, you may not dispose of any undiluted corrosive chemicals in your sink; corrosives must first be neutralized.

Disposal into the sanitary sewer is based on federal, state, and local regulations. To prevent explosions in the sewer system, you may not dispose of any undiluted or non-miscible flammable liquid in a laboratory sink. Many chemicals must not be disposed of in the sanitary sewer because they do not degrade. For example, sewer disposal of toxic metals (such as mercury and cadmium) is limited to small amounts of extremely dilute solutions.

Prudent and safe use of the sanitary sewer. Accounting for these concerns and restrictions, the sanitary sewerage system is capable of handling and treating a wide variety of laboratory waste. Appendix A of this Guide lists those chemicals that are appropriate for the sanitary sewer, and this Part describes the proper procedures you should use. UWL Environmental Health and Safety will communicate with the La Crosse Wastewater Treatment Facility to assist in UWL's compliance with their ordinances. Prudent use of the sanitary sewer balances the vast treatment capabilities of the sewage treatment works with the capabilities of other waste disposal routes.

Call if you have questions. Please call Environmental Health and Safety if you have a waste not covered in this guide, or if you have questions about the City of La Crosse wastewater treatment facility restrictions.

Never put chemicals into storm sewers. Drains outside of buildings are storm sewers that empty directly into a river or marsh without treatment.

Guidelines For Sanitary Sewer Disposal

Discharge compounds to the sewer only if: (1) you are certain of its identity and (2) Appendix A lists the disposal procedure as Sanitary Sewer or (3) you have received permission from Environmental Health and Safety. Follow these steps when discharging compounds to the sanitary sewer.

1. Do not dispose of chemicals in the sanitary sewer unless you are confident that your laboratory's sewer can handle large volumes of water and chemicals. Most laboratory sinks can be used for sanitary sewer disposal, but avoid those sinks with a history of plugging problems.
2. Refer to Appendix A for the specific procedure for your material. Remember that acids and bases must first be neutralized to a pH between 6 and 9.
3. For each chemical or solute, each procedure has a daily limit per laboratory. This limit is in grams, liters, or concentration. Be sure to coordinate your sewer disposal activities with others in your group to stay within the per laboratory limit.
4. Wear a lab coat, chemical goggles, gloves, and avoid other potential contact.
5. Use a hood sink where available. **For procedure Sanitary Sewer 3 on page 26G use of hood is mandatory.**
6. Rinse out the sink to remove any residual debris and to clear the trap.
7. Dispose of a small amount of the material first, noting reactivity and solubility. To increase solubility try warm water. **Do not flush materials that are insoluble**.
8. Dispose of small quantities at a time if possible. Limit discharges to limits set in individual procedures. If you have more than the allowable amount to dispose of, follow procedure On-Site Service 1 on page 29G for disposal.
9. Afterwards, flush the chemicals with large quantities of water (10-20 times the amount).

Always use plenty of water when disposing of chemicals in the sanitary sewer.

Sanitary Sewer 1: Readily soluble solids, solutions and non-volatile liquids

Soluble organic salts, sugars, amino acids, nucleotides, nucleosides, vitamins, acids, amines, surfactants, and the many metabolic intermediates can all be disposed of in the sanitary sewer. In addition, soluble salt combinations of these ions can be discharged to the sanitary sewer system:

Cations	**Anions**
Aluminum	Acetate
Ammonium	Bicarbonate
Bismuth	Bisulfite
Calcium	Borate
Cerium	Bromate

Cations	Anions
Cesium	Bromide
Cobalt	Carbonate
Gold	Chlorate
Iron	Chloride
Lithium	Cyanate
Magnesium	Iodate
Manganese	Iodide
Potassium	Nitrate
Rubidium	Nitrite
Sodium	Perchlorate
Strontium	Periodate
Tin	Permanganate
	Phosphate
	Silicate
	Stannate
	Sulfate
	Sulfite
	Thidocyanate
	Thiosulfate
	Titanate
	Tungstate
	Vanadate

All material deposited in a sanitary sewer is treated prior to release back into the environment.

1. Follow Guidelines For Sanitary Sewer Disposal on page 24G. For each chemical or solute, limit discharges to 1 kilogram per day per laboratory.
2. Look at the label to see if it is an anhydrous aluminum or magnesium salt; if yes, see Sanitary Sewer 3 on page 26G.
3. Slowly pour into stream of running water down drain.
4. Dispose of the rinsed, empty bottle following Normal Trash 4 on page 18G.

Sanitary Sewer 2: Slowly soluble solids

This procedure is optional; you may not have the time or facilities for this. If this is the case, dispose of the material following procedure On-Site Service 1 on page 29G.

1. Follow Guidelines For Sanitary Sewer Disposal on page 24G. For each chemical or solute, limit daily discharges to 100 grams per laboratory.

2a. Dissolve as much as possible in a bucket of hot water, decant and try to dissolve the remainder.

2b. Alternatively, with water running through a colander or strainer, pour in a little of the solid (powder, crystals, etc.) at a time. Use a hood and go slowly with light, fluffy powders that tend to be airborne. Allow a stream of water to run over any undissolved material in the strainer.

3. Dispose of the rinsed, empty bottle following Normal Trash 4 on page 18G.

Sanitary Sewer 3: Slightly water reactive but suitable if dissolved

1. Follow Guidelines For Sanitary Sewer Disposal on page 24G. For each chemical, limit daily discharges to 100 grams per laboratory.
2. Always sewer these materials in a hood sink. If a hood sink is not available, dispose of the material following procedure On-Site Service 1 on page 29G.
3. Pour slowly in a bucket of water or stream of running cold water. Anhydrous halogen salts of Mg, Al, Ca, or Fe may hiss and generate heat as they dissolve in water.
4. Allow the chemical to dissolve completely. Slowly pour into stream of running cold water.
5. Dispose of the rinsed, empty bottle following Normal Trash 4 on page 18G.

Always use plenty of water when disposing of chemicals in the sanitary sewer.

Sanitary Sewer 4: Pretreatment prior to sewer disposal

This Guide describes chemical treatment procedures for acrylamide, cyanide solutions, ethidium bromide, and strong acids and bases. For all chemical treatment procedures, follow Guidelines For Sanitary Sewer Disposal on page 24G.

Sanitary Sewer 5: Malodorous but suitable for sewer disposal

This procedure is suitable for aqueous solutions of acetaldehyde, formaldehyde, glutaraldehyde, mercaptoethanol, low molecular weight amines, and sulfide solutions. In general, this procedure is for neat (has not been mixed with anything else) liquids as well as solutions addressed in Sanitary Sewer 8 on page 27G.

Check Appendix A to be sure you can use this procedure.

1. Follow Guidelines For Sanitary Sewer Disposal on page 24G. For each chemical, limit daily discharges to 100 grams per laboratory.
2. The sink should be in a hood that is performing well. Pour directly into drain with water running. Do not allow the solution to spread in sink. Flush with large volumes of water afterwards.
3. Dispose of the rinsed, empty bottle following Normal Trash 4 on page 18G.

Sanitary Sewer 6: Aqueous solutions of inorganic chemicals

Use this procedure only if you have been referred here from Appendix A or another section of this part.

Follow Guidelines For Sanitary Sewer Disposal on page 24G. The concentrations of the following toxic metals are regulated in the sanitary sewer. Do not exceed the below limits per laboratory.

Do not dilute solutions containing these metals to get below the limits. Any solutions containing these metals above the stated levels must be discarded as described in On-Site Service 1 on page 29G. Concentrations below these limits can be placed into the sanitary drain in the lab sink. Do not dispose of any mercury containing waste in the sanitary sewer without prior approval from Environmental Health and Safety.

Pollutant	Concentration Limit
Arsenic	0.45 mg/L
Barium	100.0 mg/L
Cadmium	0.69 mg/L
Chromium (III)	2.77mg/L
Chromium (VI)	2.77mg/L
Copper	2.07mg/L
Cyanide	0.66 mg/L
Lead	0.60 mg/L
Mercury	0.0002 mg/L
Molybdenum	2.0 mg/L
Nickel	1.91 mg/L
Selenium	1.0 mg/L
Silver	5.0 mg/L
Zinc	2.61 mg/L

Concentrated solutions of these metals can be treated to precipitate and remove metals before discharge to the sanitary sewer. Adjust pH to basic side of neutrality and collect any precipitate that occurs. This will work well with mercury, silver, lead and cadmium. Chromates and dichromates; can be treated with sodium bisulfite or dithionite to reduce them to Cr (III). Dispose of the precipitate via On-Site Service 1 on page 29G. Used fixer from photography labs should be disposed using On-Site Service 1 on page 29G.

Sanitary Sewer 7: Aqueous solutions of organic chemicals

Use this procedure only if you have been referred here from Appendix A or another section of this part. Follow Guidelines For Sanitary Sewer Disposal on page 24G. Aqueous solutions of biodegradable concentrations of 10% or less can be disposed of in the sanitary sewer with copious amounts of water. Contact Environmental Health and Safety for further evaluation if you approach 10 liters of solution daily per laboratory.

Sanitary Sewer 8: Aqueous solutions of organic solvents

Solutions of these biodegradable organic chemicals used as dilute, homogenous aqueous solutions (or as aqueous extract wastes from reaction workups) may be safely disposed of in the sanitary sewer. These include low molecular weight alcohols, aldehydes, ketones, amines, ethers, cellosolves, nitriles, esters and nitroalkanes such as:

Pentanol	butyraldehyde
Nitroethane	Piperidine
propyl amine	propylene oxide
diethyl ether	methyl cellosolve
Hexamethylphosphoramide (HMPA)	dimethylsulfoxide (DMSO)
Nitromethane	dimethy1formamide (DMF)
methyl formate, ethyl cellosolve and methyl acetate	

1. Follow Guidelines For Sanitary Sewer Disposal on page 24G.
2. Limit sewer disposal of dilute aqueous solutions of these solvents to 10 liters daily per laboratory.
3. Follow the solution with approximately 10 volumes of water.

4. Dispose of the rinsed, empty bottle following Normal Trash 4 on page 18G.
5. If the material is malodorous, follow procedure Sanitary Sewer 5 on page 26G.

Solids

Refer to Appendix A for disposal procedure for solid chemicals. Solids and reusable solids in their original container can be disposed following procedure On-Site Service 1 on page 29G.

Double-bag any wet solids to prevent leakage.

ON-SITE HAZARDOUS MATERIALS MANAGEMENT SERVICE

Environmental Health and Safety will work with you to remove surplus chemicals, waste organic solvents, most waste chemicals, and some contaminated labware from your laboratory.

Disposal of Chemical Waste at UWL

Where does it go? When Environmental Health and Safety removes chemicals from your laboratory, it is first brought to a campus storage facility. There, the chemicals are sorted into several routes: on-campus redistribution, neutralization, chemical treatment, recycling, etc. Some of the chemical waste that cannot be managed on campus is shipped for incineration in a commercial hazardous waste incinerator or cement kiln. In some cases, waste containing toxic metals is shipped to a facility to recover the metal or to encapsulate the waste. A variety of other waste treatment, disposal and recycling sites are used depending upon the type of waste generated.

What happens to it? Incineration of hazardous chemical waste is required by law to achieve a 99.99% destruction efficiency and many chemicals are destroyed at even greater efficiency. Although incineration is an acceptable method of hazardous waste disposal, all incinerators emit carbon dioxide (a global greenhouse gas) and other products of combustion, some of which may be toxic. No disposal method is without risk.

Protecting the Environment. Appendix A of this Guide lists those organic solvents that are to be collected in carboys, safety cans, or other waste collection containers for incineration. Many of those chemicals not listed in Appendix A (to be disposed of by On-Site Service) will also be disposed of at a commercial hazardous waste facility. This Part describes procedures you should use for on-site removal of your waste by Environmental Health and Safety. Contact Environmental Health and Safety if you have questions or a waste not covered in this Guide.

General Guidelines for Using Environmental Health and Safety On-Site Hazardous Materials Management Service

This service is only for the removal of surplus chemicals and chemical wastes. For disposal of:

- radioactive waste, contact the Radiation Safety Officer, a faculty/staff member in the College of Science and Health;
- animal tissue, carcasses and bedding, see Part H of this Guide;
- sharps (needles, pipettes and broken glass), see Part I of this Guide;
- biohazardous (infectious) waste. Contact Environmental Health and Safety.

Many chemicals can be managed in your laboratory. Before using one of the procedures below, look up your chemical or waste in Appendix A. In the preceding pages, this Part lists

alphabetically the detailed disposal procedures that Appendix A lists by chemical. For all procedures, please follow these general guidelines:

- Contact Environmental Health and Safety for removal of chemicals or wastes not listed in Appendix A or not described in the preceding pages.
- Prior to removal by Environmental Health and Safety, complete and attach waste labels on collection containers. Additional waste labels are not required for unwanted chemicals in the original container with a manufacturer label. Labels are available in the Microbiology and Chemistry stockrooms or by contacting Environmental Health and Safety.
- Environmental Health and Safety will work with you to coordinate removal of unwanted chemicals.
- Never leave chemicals or waste in a hallway.
- Environmental Health and Safety can provide waste collection containers (carboys and safety cans). You should supply all other containers according to specifications below. Empty containers in which the chemicals are supplied are usually satisfactory for collection.

Waste disposal service is provided at no cost to UWL faculty, staff, and students. Environmental Health and Safety encourages you to minimize the amount of chemicals in storage by promptly calling for removal of surplus or waste chemicals.

Environmental Health and Safety's On-Site Hazardous Materials Management Service can be arranged by following one of the procedures described below, depending on the type of chemical or waste you wish removed. For removal of:

- Carboys containing organic solvents, follow procedure On-Site Service 2 on page 31G.
- Potential explosives, gas cylinders or unknowns, follow procedure On-Site Service 3 on page 31G.
- Unwanted, surplus or waste laboratory chemicals, follow procedure On-Site Service 1 on page 29G.
- More than twenty (20) items of unwanted, surplus or waste laboratory chemicals, follow procedure On-Site Service 4 on page 31G.

On-Site Service 1: Removal of surplus chemicals and chemical wastes

Contact Environmental Health and Safety to schedule removal of surplus chemicals and chemical wastes. All chemicals must be identified with a chemical label. As necessary, use the Unwanted Chemical label, available through Chemistry or Microbiology stockrooms or Environmental Health and Safety.

You can arrange for delivery of empty carboys when you call. Waste organic solvents should be disposed of in carboys according to Organic Solvent Collection on pages 18G through 22G and On-Site Service 2 on page 31G.

Marking of Containers. All containers must be marked legibly with the chemical's identity. See On-Site Service 3 on page 31G for unknowns.

Suitable Containers. Chemical mixtures, aqueous solutions, other liquids and reaction products should be placed in a suitable container. Empty containers in which the chemicals are supplied are usually satisfactory for removal. Make sure all containers are tightly closed and contain the material that they hold. We cannot accept leaking or unclosed containers. Suitable containers for liquids include glass bottles with their original screw caps. Plastic milk jugs are not suitable for waste collection.

- A variety of containers are suitable for solids as long as the container is sturdy, rigid, and can be tightly closed to contain the product. Glass bottles with screw caps work well. Open beakers or flasks are not suitable.
- A suitable container for contaminated labware is a tightly closed plastic bag (folding the bag and taping it works well) inside a cardboard box. Clearly mark the outside of the box with its contents.
- Suitable containers for wet solids include (for small amounts) glass bottles with screw caps and (for larger amounts) tightly closed plastic bags (folding the bag and taping it works well) inside cardboard boxes. Clearly mark the outside of the box with its contents. No free liquid should be present with wet solid wastes; absorb any free liquid with absorbent paper or oil dry (do not use vermiculite for an absorbent).

Waste Chemical Labels

The ***Unwanted Chemical label is the primary label*** that lab personnel should attach to identify waste chemicals.

UNWANTED CHEMICAL

List container contents by name and identify hazards(s):

Corrosive: ____ Reactive: ____ Oxidizer: ____

Flammable/Combustible: ____ Toxic: ____

1. _____

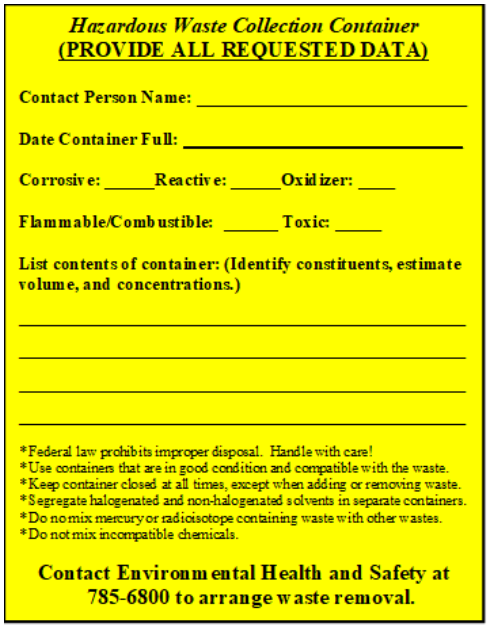
2. _____

3. _____

4. _____

Call 608-785-6800 with questions or to request pickup.

The Hazardous Waste Collection Container label shall only be used after Environmental Health and Safety has verified the waste being generated meets the definition of hazardous waste. Contact Environmental Health and Safety for assistance on label selection.



Hazardous Waste Collection Container
(PROVIDE ALL REQUESTED DATA)

Contact Person Name: _____

Date Container Full: _____

Corrosive: _____**Reactive:** _____**Oxidizer:** ____

Flammable/Combustible: _____ **Toxic:** _____

List contents of container: (Identify constituents, estimate volume, and concentrations.)

_____

_____

_____

_____

*Federal law prohibits improper disposal. Handle with care!
*Use containers that are in good condition and compatible with the waste.
*Keep container closed at all times, except when adding or removing waste.
*Segregate halogenated and non-halogenated solvents in separate containers.
*Do no mix mercury or radioisotope containing waste with other wastes.
*Do not mix incompatible chemicals.

Contact Environmental Health and Safety at 785-6800 to arrange waste removal.

On-Site Service 2: Waste solvent carboy removal and delivery

Removal of carboys of waste solvents. Contact Environmental Health and Safety to coordinate removal of waste solvent carboys from your lab. Prior to removal, attach waste labels.

See Organic Solvent Collection, page 18G through 22 G, for more details.

On-Site Service 3: Evaluation of gas cylinders, unknowns and potential explosives

Contact Environmental Health and Safety to evaluate gas cylinders, unknowns, and material you suspect may be explosive. The material will be evaluated and a determination made on the most appropriate disposal route.

On-Site Service 4: Laboratory and stockroom cleanouts

Environmental Health and Safety encourages regular review of chemical stocks with disposal of unwanted chemicals. For large cleanouts, it is most efficient to process and sort chemicals directly in your laboratory or stockroom. This also minimizes the risk of transporting chemicals.

Environmental Health and Safety role. Environmental Health and Safety will provide the following services.

- Remove chemicals that can be used by others on campus; and
- Remove chemicals for recycling or disposal by State contracted and licensed service providers.

Your role. If you plan to move from a lab, please contact Environmental Health and Safety about two weeks in advance of your move. Your work before waste removal may include:

- assistance in trying to locate a colleague who can use any excess chemicals;
- the guidance of someone who works in your lab to evaluate and identify samples, experimental products, unknowns, gas cylinders and older chemicals; and
- someone from your lab will identify and label all waste collection containers.

This procedure is also appropriate for those labs that have been vacated and a large amount of chemicals has been left. For cleanouts of a small number of chemicals, use procedure On-Site Service 1 on page 29G.

University of Wisconsin – La Crosse
Laboratory Waste Disposal Procedures

Dan Sweetman (Last Updated: January 23, 2019)

This document summarizes proper methods to manage laboratory generated hazardous, universal, and infectious wastes, unwanted chemicals, and other wastes. Please note, your use of this document enhances laboratory safety, protects the environment, safeguards our facilities, and assists in regulatory compliance**.**

If you have questions or require service, contact Dan Sweetman, Environmental Health and Safety (EHS) at 608-785-6800 or dsweetman@uwlax.edu.

How do I arrange for removal of hazardous material/waste?

EHS will pick up hazardous waste and other hazardous materials. Submit your pickup request to dsweetman@uwlax.edu or 785-6800.

What is a waste?

By code, a waste is any liquid, solid, or gaseous material that can no longer be used for its originally intended purpose because it has become contaminated or has been used in some process. A waste is also defined as any material which is still usable for its originally intended purpose but which you decide to discard. Waste also includes spill residues, spill cleanup materials, outdated/off-specification/un-labeled chemicals, and materials stored in an inherently waste-like manner.

The generator of any waste is responsible for properly collecting and initiating disposal or recycling. If a hazardous material is a hazardous waste, it cannot be dumped down the drain or placed into common trash receptacles.

How do I know if my lab waste is or is not a hazardous waste?

There are a large number chemicals used in laboratories that do not meet the definition of hazardous waste. Many of these chemicals may be able to be safely disposed in the normal trash or down a laboratory sink. Some hazardous materials may not be hazardous waste, but they are still toxic or dangerous and should not be disposed in the normal trash or dumped down a lab sink.

To assure proper disposal of all hazardous materials contact EHS to complete a waste determination in your lab(s).

What is a hazardous waste?

Federal and State regulations define hazardous wastes in two ways: listed and characteristic hazardous waste.

Listed Hazardous Wastes

Hazardous waste code includes lists of several hundred chemicals treated as hazardous waste based on their chemical names. One set of lists include discarded commercial chemical products; these lists include specific commercial chemical products in an unused form. These lists are available at: (http://docs.legis.wisconsin.gov/code/admin_code/nr/600/661_viii.pdf. An additional list of non-specific source wastes from common processes is available at http://docs.legis.wisconsin.gov/code/admin_code/nr/600/661.pdf#page=17.

Characteristic Hazardous Waste
If you generate a waste that is not a listed waste, it may be considered hazardous if it exhibits any one of the following four characteristics. Dilution cannot be used to eliminate a characteristic.

> *Ignitable* - a liquid with flash point at or below 140 degrees Fahrenheit, an ignitable compressed gas or oxidizer, or other material that can cause fire through friction, absorption of moisture or spontaneous chemical changes.
>
> *Corrosive* - a water containing liquid with a pH less than or equal to 2.0 or greater than or equal to 12.5, or a liquid that corrodes plain carbon steel at a rate greater than 6.35 mm per year.
>
> *Reactive* - a waste that is normally unstable, readily undergoes violent changes without detonating, reacts violently with water, forms potentially explosive mixtures with water, generates toxic gases or fumes when mixed with water or non-corrosive materials, is capable of detonation or explosive reaction, or is a forbidden Class A or B explosive.

Toxic - a waste is hazardous if it exceeds regulatory levels that are included in parenthesis after the chemical name. All levels are reported in milligrams/liter.

Arsenic (5.0)
Barium (100.0)
Benzene (0.5)
Cadmium (1.0)
Carbon tetrachloride (0.5)
Chlordane (0.03)
Chlorobenzene (100.0)
Chloroform (6.0)
Chromium (5.0)
o-Cresol (200.0)
m-Cresol (200.0)
p-Cresol (200.0)
Cresol (200.0)
2,4-D (10.0)
1,4-Dichlorobenzene (7.5)
1,2-Dichloroethane (0.5)
1,1-Dichloroethylene (0.7)
2,4-Dinitrotoluene (0.13)
Endrin (0.02)
Heptachlor [and its epoxide] (0.008)
Hexachlorobenzene (0.13)
Hexachlorobutadiene (0.5)
Hexachloroethane (3.0)
Lead (5.0)
Lindane (0.4)
Mercury (0.2)
Methoxychlor (10.0)
Methyl ethyl ketone (200.0)
Nitrobenzene (2.0)
Pentachlorophenol (100.0)
Pyridine (5.0)
Selenium (1.0)
Silver (5.0)
Tetrachloroethylene (0.7)
Toxaphene (0.5)
Trichloroethylene (0.5)
2,4,5-Trichlorophenol (400.0)
2,4,6-Trichlorophenol (2.0)
2,4,5-TP [Silvex] (1.0)
Vinyl chloride (0.2)

How do I dispose of hazardous materials that are not hazardous waste?

The regional municipal trash management process in the La Crosse area is unique in that all waste disposed in trash cans or dumpsters is sent to a waste-to-energy facility. This facility mechanically and manually sorts the waste. To that end, if you have hazardous materials that are not hazardous waste, contact EHS to arrange disposal.

How do I label laboratory waste?

Hazardous Waste Collection Container labels should only be attached to containers provided by EHS or attached to containers after a waste determination has been completed by EHS. The waste determination verifies that a material meets the definition of a hazardous waste. All other waste hazardous materials of a chemical nature should be labeled for disposal with the Unwanted Chemical label.

Hazardous Waste Collection Container
(PROVIDE ALL REQUESTED DATA)

Contact Person Name:

Date Container Full: _____

Corrosive: **Reactive:** **Oxidizer:**

Flammable/Combustible: **Toxic:**

List contents of container: (Identify constituents, estimate volume, and concentrations.)

_____

_____

* Federal law prohibits improper disposal. Handle with care!
* Use containers that are in good condition and compatible with the waste.
* Keep container closed at all times, except when adding or removing waste.
* Segregate halogenated and non halogenated solvents in separate containers.
* Do no mix mercury or radioisotope containing waste with other wastes.
* Do not mix incompatible chemicals.

Contact Environmental Health and Safety at 785-6800 to arrange waste removal.

UNWANTED CHEMICAL

List container contents by name and identify hazards(s):

Corrosive: ____ Reactive: ____ Oxidizer: ____

Flammable/Combustible: ____ Toxic: _____

1. _____
2. _____
3. _____
4. _____

Call 608-785-6800 with questions or to request pickup.

What are the hazardous waste collection container requirements?

1. Use only containers that are in good condition and are compatible with the waste being stored.
2. Clearly label waste containers and identify constituents. Labels are available from EHS, or a department laboratory manager.
3. Keep waste containers closed at all time, except when adding or removing waste.
4. Handle and store waste containers properly to prevent rupture or leakage.
5. Do not mix mercury or radioisotope containing wastes with other wastes.
6. Segregate halogenated and non-halogenated organic liquids in separate disposal containers.

How should I manage other laboratory wastes?

Aerosol cans: If the container is empty, place it in a single stream recycling bin. If not empty, provide the container to EHS. Do not intentionally release the contents of the container to meet the empty criteria.

Animal carcasses: Animal carcasses fixed with formaldehyde should be placed in two disposal bags and placed in the trash dumpster adjacent to the building. To arrange for disposal of quantities over 10 gallons or any non-fixed specimens contact Grounds Services at 785-8582. For carcasses contaminated with radioactive materials, contact Kurt Grunwald at 785-6458. Human tissues shall not be disposed in trash dumpsters or receptacles.

Batteries: Dispose alkaline batteries in the normal trash. Provide lithium and rechargeable batteries to EHS for recycling.

Biohazards/Infectious Waste: Potentially infectious microbes or wastes contaminated with these hazardous agents must be treated before disposal. Autoclaving is the usual treatment method. After treatment, place autoclaved materials in an opaque trash bag. Once the materials are treated, they can be placed in the trash dumpster located adjacent to the building. Biohazard/infectious wastes that are also sharps must follow the sharps disposal procedure, described below.

Broken glassware: Broken glass, glass that could potentially break and become a cut or puncture hazard, and plastics that could cut or puncture should be placed in an EHS provided blue five-gallon Hazardous Glass/Plastic Disposal Container. Contact EHS if you require one of these containers. This waste type includes Pasteur pipettes, other pipettes, pipette tips, slides, cover slips, fragile glassware and broken glass.

Compressed gas cylinders: Return all rented cylinders to the vendor. When allowed, return all non-rented cylinders to the vendor. Follow instructions given by the vendor to ship the cylinder. Call EHS for assistance with disposal of non-rented or non-returnable cylinders.

Corrosives: EHS collects corrosives for disposal. You can also neutralize corrosives and dispose in you lab sink based on the following conditions. Corrosives must be neutralized to a pH is between 5.5 and 9 prior to lab sink disposal. In addition, the liquid must not contain other hazardous wastes or exceed toxicity characteristic limits provided on page 2. Contact EHS for disposal of all corrosives that cannot be safely neutralized or that have a contaminant exceeding the toxicity characteristic. Do not neutralize corrosive waste that contain other characteristics of hazardous wastes prior to neutralization.

Electronic scrap, appliances and other equipment: E-scrap is loosely defined as discarded, surplus, obsolete or broken electrical or electronic devices. E-scrap includes, but is not limited to computers, computer accessories, TVs, cell phones, fax machines, VCR/DVD players, and other devices with printed circuit boards. Appliances include, but are not limited to refrigerators and microwaves. Commercial equipment includes, but is not limited to autoclaves or specialty laboratory equipment. To recycle electronic equipment, appliances, or commercial equipment use the procedures outlined in the Surplus Property Program or available through Information Technology at https://www.uwlax.edu/its/client-services-and-support/ewaste/.

Fluorescent and other high intensity bulbs containing mercury: Provide all mercury containing bulbs to your building custodian or EHS.

Laboratory and/or process wastes: As described earlier in this document, disposal decisions are based on waste determinations. Contact EHS for assistance with waste determinations. Refer to Non-hazardous wastes for additional information.

Mercury: Free-flowing metallic mercury is recycled and needs to be kept in durable, small, sealed, and labeled containers prior to EHS pickup. Mercury contaminated lab-ware, broken thermometers, mercury salts, mercury spill clean-up residue, and any other mercury containing materials should be kept in separate sealed and labeled containers. Do not intentionally mix mercury-containing wastes with other wastes.

Non-hazardous wastes: Although certain laboratory wastes can be safely disposed in the normal trash or the sanitary sewer, great care must be taken to protect custodians, handlers, haulers, and the environment. Questions related to proper disposal of materials should be directed to EH&S. **Any hazardous materials being placed into any normal trash receptacle must be placed in another sealed container.** Absolutely no free liquids are allowed in trash receptacles.

Oil: Petroleum and vegetable-based oils and fats shall be placed in labeled containers. Petroleum based oils need to be kept in separate containers. These oils can be recycled and should not be mixed with other materials.

Radioactive materials: Contact Kurt Grunwald at 785-6458 for disposal of radioactive materials.

Sharps: Sharps include waste items that can potentially cut or puncture skin, such as needles, syringes, lancets, scalpels and razor blades. Put sharps in a puncture-resistant, leak-proof and sealed container. Biohazard sharps must be placed in a labeled biohazard container. Label all containers with a visible bio-hazard emblem or with the visible words "bio-hazard", "sharps" or "infectious waste". Provide all sharps containers to EHS for disposal.

Unless broken, autoclaved pipets are not considered sharps waste and can be placed in the normal trash. To reduce the chance for breakage, pipettes should be placed in a cardboard box for disposal. Label the box "Trash" and set next to your normal trash container.

Proper waste management also includes …..

1. Take steps to minimize or prevent generation of wastes. This includes, but is not limited to ordering only what you need, sharing excess chemicals with colleagues, implementing micro-scale procedures, and substituting with less hazardous chemicals.

2. Know what is required of you by our campus emergency response plan, available at https://www.uwlax.edu/police/emergency-management/emergency-response-plan/.

3. Be familiar with the location, contents, and use of hazardous material spill response kits that have been provided to your department.

4. Keep emergency telephone numbers posted in your lab or work area.

5. Share this information with colleagues and students. Please consider posting this bulletin in the lab or work area and keeping it readily available at all times.

6. If you require assistance with managing hazardous materials or wastes, contact EHS at dweetman@uwlax.edu or call 785-6800.

REVIEW QUESTIONS

1. To dispose of an unusable bottle of barium sulfate you refer to Appendix A and:
   a) Normal trash disposal is OK
   b) Discharge it to the sanitary sewer.
   c) Set aside for the Environmental Health and Safety On-Site Hazardous Materials Management service.
   d) Give to another lab for reuse.

2. Waste chemical solutions poured down your laboratory sink go:
   a) Into a reservoir under the building.
   b) Into a storm sewer that leads to the river.
   c) Via the sanitary sewer to the La Crosse Wastewater Treatment Plant.
   d) To the University's wastewater treatment plant.

3. Which of these bases is not suitable for the neutralization of perchloric acid:
   a) Potassium hydroxide.
   b) Sodium hydroxide.
   c) Magnesium hydroxide.
   d) Ethylenediamine.

4. Which of the following personal protective equipment should be worn while neutralizing waste acid or base solutions:
   a) Chemical splash goggles that form a seal against your face all around your eyes, and a face shield.
   b) A full-length (neck to ankles), vinyl or rubberized apron.
   c) Heavy-duty acid-resistant gloves.
   d) All of the above.

5. Your calculator batteries need to be replaced. The packaging indicates that they are lithium batteries. What would be the correct disposal method for them?
   a) Overpack them in a box and place it in the normal trash.
   b) Call for collection by Environmental Health and Safety.
   c) Break the case, recover the lithium, and place the rest in the normal trash.
   d) Normal trash is satisfactory.

6. The five-gallon carboys and safety disposal cans that Environmental Health and Safety provides for campus laboratories are to be used for the disposal of:
   a) Phosphate buffer solutions.
   b) Collection of waste organic solvents and their solutes produced in your lab.
   c) Sharps.
   d) Anything that you should not pour down the drain.

7. Used vacuum pump oil should be:
   a) Discharged in a floor drain.
   b) Set on the loading dock.
   c) Poured into a solvent collection carboy.
   d) Collected in a non-leaking container, labeled properly and disposed of following procedure On-Site Service 1.

8. After running a chloroform /methylene chloride extract through a silica gel column, you should:
   a) Double-bag the silica gel and place in the normal trash.
   b) Spread it out in the hood to evaporate the solvent, then dispose of the dry powder in the trash.
   c) Bag or otherwise contain the wet gel and dispose following procedure On-Site Service 1.
   d) Empty the column into a carboy because it contains solvents.

9. If you break a mercury thermometer, you should:
   a) Recover or pick up the escaped mercury and store in an airtight container for disposal.
   b) Dispose of it in the normal trash.
   c) Replace it with a mercury-free thermometer.
   d) a and c.

10. A 15-pound voltage regulator is found in the back of a stockroom. The instrument it was originally part of was replaced in 1978. What is the primary concern with disposal of this item?
   a) It may contain PCB's. Contact Environmental Health and Safety for evaluation.
   b) There may be asbestos insulation on the wiring.
   c) Nothing; storage of electrical equipment is not regulated.
   d) The equipment's wiring may contain large quantities of mercury.

ANSWERS

1. c) Set aside for Environmental Health and Safety On-Site Hazardous Materials Management service. Barium compounds are regulated under the Toxicity Characteristic Rule.

2. c) via the sanitary sewer to the La Crosse Wastewater Treatment Plant. There the solution is diluted and subject to physical and biological degradation.

3. d) Ethylenediamine. Hydroxide solutions are preferred for neutralization of all acids, and ethylenediamine is only weakly basic.

4. d) All of the above. Acids and bases can cause tissue destruction on contact, are extremely damaging to the skin and especially harmful to the eyes. Don't take any chances; protect yourself.

5. b) Contact Environmental Health and Safety for removal of lithium and other rechargeable batteries. Alkaline batteries are disposed in the normal trash.

6. b) Collection of waste organic solvents and their solutes produced in your lab.

7. d) Collected in non-leaking containers that you provide, and labeled properly. Many types of oil used on campus are recycled, including vacuum pump oil.

8. c) Bag or otherwise contain the wet gel and dispose following procedure On-Site Service 1. Chloroform and methylene chloride are toxicity characteristic chemicals. Allowing solvents to evaporate for the purposes of disposal is illegal. Placing solid materials, such as silica gel, into carboys will makes transfer difficult.

9. d) a and c. Recover the spilled mercury following the spill procedure in Part D of this Guide. Replacing with a mercury-free thermometer or better yet, a thermocouple, will eliminate the need to ever dispose of another broken mercury thermometer.

10. a) Contact Environmental Health and Safety for evaluation. Heavy and older electrical equipment may contain PCB's. Asbestos insulation would not be the primary risk, nor would metals contained in the wiring. Ignoring the equipment may end up causing serious problems if the equipment was involved in a fire or began to leak.