

# Waste Management Guidelines & Procedures

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## **1.0 HAZARDOUS WASTE**

### **1.1 Introduction**

Hazardous chemical wastes are generated as a result of teaching, research, patient care service, and operational activities at The University of Iowa. The University's Environmental Health & Safety Office (EHS) is responsible for proper handling and ultimate disposal of chemical waste. EHS also provides technical assistance and training to individuals and departments who generate waste so they can comply with rules and regulations that direct waste generation activities. Waste management and technical assistance are provided through EHS's Waste Management Program.

The goals of the Hazardous Waste Management Program are to:

- Protect employee health and safety.
- Protect the environment.
- Reduce amount of hazardous waste generated.
- Comply with hazardous waste regulations.

The U.S. Environmental Protection Agency (EPA) regulates waste generation and management activities at the University. Authority for such regulation is provided by the Resource Conservation and Recovery Act (RCRA). RCRA provides for "cradle-to-grave" tracking and management of hazardous waste, i.e., from the generator to transporter to treatment, storage or disposal. Anyone or any facility that generates, treats, stores or disposes of hazardous waste must comply with RCRA. EPA regulations pertaining to hazardous waste are found in Title 40 of the Code of Federal Regulations, Parts 260-270. The U.S. Department of Transportation (DOT) regulates transportation of hazardous waste. DOT regulations pertaining to hazardous waste are found in Title 49 of the Code of Federal Regulations, Parts 171-173.

### **1.2 When is a Waste Hazardous?**

Hazardous waste is a very specific term that is defined by EPA. EPA groups hazardous waste into two categories: characteristic waste (physical properties) and listed waste (specifically identified by technical name). EHS also collects chemical waste that may not be defined by EPA as hazardous, but present a hazard significant enough to warrant handling as a hazardous waste.

## Section 1.0 Hazardous Waste

### *General Characteristic Waste*

Waste exhibiting any of these characteristics is hazardous.

1. Ignitability (EPA code D001)
  - Liquids that have a flash point less than 140° F (60° C.), e.g., xylene, acetonitrile, ethanol, toluene, paint thinner, methyl ethyl ketone.
  - Solids capable of causing fire by friction, absorption of moisture, or spontaneous chemical change and when ignited burn vigorously and persistently to create a hazard, e.g., picric acid, sodium dithionite.
  - Flammable compressed gases, e.g., hydrogen, ethylene, methane.
  - Oxidizers: substances that yield oxygen readily to stimulate combustion, e.g., potassium permanganate, sodium chlorate, sodium nitrate.
  
2. Corrosivity (EPA code D002)
  - Aqueous solutions with pH equal to or less than 2 or greater than 12.5.
  - Liquids capable of corroding steel at a specified rate and temperature.
  
3. Reactivity (EPA code D003)
  - Substances that react with water violently, or produce toxic gases or explosive mixtures with water, e.g., potassium, sodium, and sodium hydride.
  - Substances that are normally unstable or explosive, e.g., phosphorous.
  - Chemicals containing cyanide or sulfide that generate toxic gases when exposed to pH between 2 and 12.5, e.g., potassium cyanide, sodium sulfide.
  
4. Toxicity (EPA code D series D004 thru D043)
  - Materials that contain certain heavy metals above regulated levels, e.g., silver, cadmium, mercury, arsenic. (Appendix I)
  - Materials that contain certain organic constituents, mainly solvents and pesticides, above regulated levels, e.g., benzene, chloroform. (Appendix I)

## Section 1.0 Hazardous Waste

### *Specifically Listed Waste*

EPA specifically lists approximately 500 chemicals as hazardous waste.

- EPA P List (P coded), acutely toxic chemicals (Appendix II).
- EPA U List (U coded), toxic chemicals (Appendix III).
- EPA F List (F coded), wastes from non-specific sources (Appendix IV).
- EPA K list (K coded), wastes from specific sources (Appendix V).

### *Used Oil*

Used oil is an EPA regulated material. Regulations direct that used oil should be recycled.

### *Universal Wastes*

EPA also regulates a group of waste materials that are both hazardous to the environment and commonly found in industry as well as households. Because the materials are common, they are known as Universal Waste. Items that are Universal Waste include:

- Mercury containing instruments such as thermometers, barometers, thermostats.
- Fluorescent lamps that contain mercury vapor.
- Batteries that contain hazardous materials such as NiCad, lithium and lead-acid batteries.

### *Other Chemical Waste*

There are many other chemicals that present a hazard to human health and the environment but are not specifically regulated by EPA under RCRA. Some items that are not hazardous to human health or the environment are simply prohibited from disposal at the local landfill. These include such things as:

- Ethidium bromide and ethidium bromide gels.
- Carcinogens, mutagens, teratogens.
- Pharmaceuticals.
- Pesticides and herbicides.
- Aerosol cans.
- Latex paints.

See Section 1.8 of this manual for more information on disposal of specific types of waste.

## **1.3 EHS Responsibilities**

### *What Does EHS Do?*

- Collects waste chemicals from the place where they are generated.
- Transports and handles waste.



- Stores, manages and disposes of waste.
- Meets regulatory requirements for record keeping.
- Complies with EPA and DOT regulations.

#### *Waste Collected*

EHS collects virtually all types of chemical waste, with a few exceptions.

#### *Waste Not Collected*

This list is not all-inclusive.

1. Empty containers - empties should be disposed of in general waste or recycled (Exception: EHS will collect empty aerosol containers, gas cylinders, and containers that previously held EPA P-listed chemicals.)
2. Fluorescent tubes, light bulbs - collected by maintenance staff and recycled by General Stores.
3. Asbestos.
4. Alkaline batteries.
5. General refuse and recyclable materials. (Exception: EHS will collect recyclable items that are also hazardous.)

#### *Waste Transportation*

Wastes are transported by EHS on a specially designed truck. Wastes are inventoried as they are collected and manifested for transportation to a RCRA permitted facilities on the UI Research Campus for temporary storage.

#### *Management and Record Keeping*

Each waste item collected by EHS is assigned a serial number, tagged, and tracked using a database. This allows EHS to follow the course of waste through the storage, management, and disposal process. Hazardous waste is stored in barrels, cabinets, or shelves in a storage facility located on the UI Research Campus. Subsequently, a contractor is hired to pack and ship waste to a RCRA permitted commercial disposal site for treatment and disposal. All records required by the University's RCRA permit are maintained at the UI facilities.

### **1.4 Generator Responsibilities**

#### *Requirements*

1. Collect waste in a suitable container that is in good condition.
2. Containers must be compatible with waste type.
3. Containers must remain closed except to add or remove waste.
4. Containers must be labeled with the words "Hazardous Waste" and its contents identified. Use labels provided by EHS to comply with this requirement.

5. Contact EHS for waste removal. Filled containers should be removed within 90 days. If more than 55 gallons has accumulated, it must be removed within 3 days.
6. A representative of each waste generating area must receive training in hazardous waste management.
7. Do not mix incompatible chemicals.
8. Waste must be stored at or near the point of generation, in an area controlled by the generator.

#### *Satellite Accumulation Areas (Waste Accumulation Areas)*

EPA rules do not allow for a central accumulation area for collection and storage of waste prior to pickup. EPA views accumulation in a centrally located area as operation of a hazardous waste storage facility. Such operation requires the generator to comply with the full weight of EPA regulations for a treatment and disposal facility. **Waste must accumulate where it is generated.**

#### *Training*

EHS identifies a waste coordinator for each waste generation area. The waste coordinator must receive training in hazardous waste management. Training is available through EHS's Web page. A representative from EHS is also available to present the training program to large groups at your location.

#### *Container Requirements*

Hazardous waste must be collected in a container that is clean, in sound condition and appropriate for the waste type. Collection bottles must not be overfilled and must be capped with a tight fitting screw type cap; bags and boxes must be tightly sealed.

#### *General Specifications*

1. Container and cap/cap liner must be compatible with waste and in sound condition.
2. Cap must be screw type and fit tightly - corks and stoppers are unacceptable.
3. Proper headspace - 1.5 inches for flat top containers, 3 inches for tapered.
4. Outside of container must be clean and uncontaminated.
5. Container must be properly labeled. Use labels available from EHS.

#### *Container Selection*

Acceptable packaging for specific waste types:

1. Flammable liquids - glass bottles, steel cans, high-density plastic containers.
2. Concentrated acids and bases - 2.5-liter "acid" bottle.

NOTE: One gallon glass bottles are generally unacceptable for acids and bases because the high specific gravity of substances and the thinness of one gallon glass containers increases the likelihood of container breakage. Metal containers and caps or cap liners made of cardboard are incompatible with corrosive materials.

3. Trace contaminated solid wastes (contaminated paper, gloves, etc.)  
- double bag using polyethylene bags. Bags should be sealed and placed in sturdy cardboard cartons that are sealed with tape.
4. Aqueous solutions - glass bottles, plastic bottles, plastic cans.  
Plastic milk jugs or similar containers are unacceptable.
5. Broken mercury thermometers - broken thermometers without free flowing mercury may be packaged in the same manner as trace contaminated solid waste. Broken thermometers with mercury should be contained in a glass or plastic bottle with a tight cap.

#### *Proper Liquid Waste Segregation Groups*

If different chemical wastes are mixed together in a single container for disposal (commingled), then to the extent possible:

- Similar types of chemicals should be mixed together to make a common segregation group (see below).
- Only compatible chemicals may be mixed together within segregation groups. ***Be sure commingled chemicals are compatible! Caution: mixing chemicals that are incompatible may result in splattering, heat generation, container pressurization, fire or explosion.*** (See Appendix X for guidance).
- Keep aqueous-based waste separate from organic solvent-based waste.
- Keep paper, gloves, syringes and other solid items separate from liquids.
- Avoid mixing heavy metals, especially mercury, with solvents.

Waste should be commingled within the following general groups, **beware of incompatibilities**:

1. Halogenated, e.g., chloroform, methylene chloride.
2. Hydrocarbon, e.g., xylene, ether, hexane, acetone.
3. Nitrogenous, e.g., triethylamine, diisopropylamine.
4. Sulfurous, e.g., dimethylsulfoxide, dimethylsulfate.
5. Corrosive, e.g., sulfuric acid.
6. Aqueous solutions, e.g., diaminobenzidine, ethidium bromide, heavy metals.
7. Oils, e.g., motor oil.

*Labeling Requirements*

EHS supplies self-adhesive labels that must be applied to each container for pickup. You may also print your own labels from the EHS Web site. If waste is commingled, a label must be put on the container as soon as the waste is first added to the container. This will prevent accidental mixing of incompatible chemicals and satisfy EPA rules.

Why Label Waste?

- Ensure safety.
- Prevent waste from becoming an unknown.
- Comply with EPA regulations.
- Contribute to the efficiency of material handling.
- EHS will not pick up waste that is not properly labeled.

Types of Labels

EHS supplies two types of labels for hazardous waste. Make sure the proper label for waste type is used. The label must be either filled out in pencil or may be printed by a computer printer if you are printing labels using the templates available on the EHS Web site.

<b>Hazardous Waste - Complete Label in Pencil</b>		Label #1
Department:	_____	
Room/Bldg.	_____	
Name:	_____	
Date:	_____	
Office Use Only - EHS Code		

Label #1 (small hazardous waste label) is used on waste that is unused, in original containers, having the original manufacturer's label. It is also used for waste that has been assigned a code by EHS (see Labeling Procedures, item 11 below). Labels must be filled out in pencil. Be sure the hazardous waste label does not cover the original label. If a container is too small to allow this, the label should be placed next to the container for disposal. The label will be applied to an inventory tag attached to each bottle by EHS.

*HAZARDOUS WASTE*		Complete Label in Pencil	
Dept.:	-----	Date:	-----
Room #:	-----	Name:	-----
Contents	%		
		pH If Aqueous	

Label #2

Label #2 (large hazardous waste label) is for commingled wastes, wastes in original containers that are missing original labels, or wastes that are no longer in original containers. Labels must be filled out in pencil or may be

printed by a computer printer if you are printing labels through the EHS Web site. All components of the waste must be listed on the label and must total 100%.

**THE UNIVERSITY OF IOWA** **Universal Waste Batteries**

Initial storage date: \_\_\_\_\_  
 (batteries may not be accumulated for longer than 1 year)

Building: \_\_\_\_\_ Room: \_\_\_\_\_

Car/Automotive	Nickel metal hydride	
Hearing aid	Rechargeable	
Lithium ion	Lead-acid	
Small sealed lead-acid (SSLA)		

Final Count: \_\_\_\_\_

Go to: [ehs.research.uiowa.edu](http://ehs.research.uiowa.edu) for disposal.  
**Attach One Label to Each Box**

Label #3

Label #3 (Universal Waste – Batteries) is to be used on batteries or boxes of batteries that are classified as universal waste.

**THE UNIVERSITY OF IOWA** **Universal Waste Lamps**

First Lamp Date: \_\_\_\_\_  
 (lamps may not be accumulated for longer than 1 year)

Building: \_\_\_\_\_ Room: \_\_\_\_\_

Fluorescent Lamps 4 Foot or Less	Shatter-Shield	
Fluorescent Lamps > 4 Foot	U-Tube/Circular Lamps	
Compact Fluorescent Lamps	Broken Lamps	
HID (Sodium, Metal Halide & Mercury Vapor)	Other:	

Final Count: \_\_\_\_\_

Call General Stores for shipment at 384-3905  
**Attach One Label to Each Box**

Label #4

Label #4 (Universal Waste – Lamps) is to be used on boxes holding fluorescent lamps and other types of mercury containing waste lamps.

**THE UNIVERSITY OF IOWA**

## Universal Waste Mercury Containing Equipment

Initial storage date: \_\_\_\_\_  
(equipment may not be accumulated for longer than 1 year)

Building: \_\_\_\_\_ Room: \_\_\_\_\_

Type of equipment: (check one)

Thermostats	Thermometer	
Mercury containing equipment	Other:	

Final Count: \_\_\_\_\_

Go to: [ehs.research.uiowa.edu](http://ehs.research.uiowa.edu) for disposal.  
Attach One Label to Each Box

Label #5

Label #5 (Mercury Containing Equipment) is to be used on containers holding thermometers, thermostats and other types of mercury containing equipment.

# USED OIL

SLUD LABELMASTER® (800) 621-5808 www.labelmaster.com

PVCF

Label #6

Label #6 (Used Oil) is to be used on all containers of used or waste oil.

### Labeling Procedures

1. Only labels provided by EHS are acceptable. Labels may be obtained free of charge by calling 335-8501. You may also print your own labels using templates available on the EHS Web site.
2. Each container must have a label. The label must be attached to the container when it's initially used for waste. The date should be filled in when the container is full. The exception for this is the Universal Waste labels for which the date must be filled in immediately.
3. Labels must be filled out in pencil or may be printed by a computer printer if you are printing labels through the EHS Web site. Pencil is superior due to its resistance to solvent and acid splashes.
4. Labels must contain name, room number, building, department, and date when required.

5. Wastes that are commingled must list all components in the contents section, including water and all trace materials.
6. Abbreviations are not acceptable, write out the full name of chemical constituents.
7. Aqueous waste should have the pH of the solution recorded.
8. All used oils must also be marked with the words, "used oil."
9. Commingled waste containers must have all other labels removed, covered or defaced to avoid identity confusion.
10. If a container holds only the original contents, the hazardous waste label should be placed so that the original label is not covered. If a container is too small to allow this, the label should be placed next to the container for disposal. The label will be applied to an inventory tag attached to each bottle by EHS.
11. For labs that are generating large amounts of the same waste on a continuous basis, a waste code may be obtained to save time when completing labels. Call EHS at 335-8501 for more information.

## 1.5 Pickup

All hazardous waste is picked up by EHS in the lab or area where it was generated. Waste must be packaged and labeled properly prior to arranging for pickup. Because EHS's transport vehicle has limited space, do not accumulate a large number of containers for pickup. Lab cleanouts involving more than 20 containers must be pre-arranged. EHS's waste pickup schedule is available on the EHS Web site <https://research.uiowa.edu/ehs/> . Each building is visited weekly on the same day, although a few buildings are visited bi-weekly. EHS must be notified at least one day in advance.

### *Arranging for Pickup*

For waste collection notify EHS by using the link on the EHS Web page to submit a waste request online .

### *What if Your Waste is Not Removed?*

If EHS cannot complete a pickup, a note (see below) will be left explaining the reasons. Deficiencies should be corrected and another pickup scheduled.

The University of Iowa Environmental Health & Safety Hazardous Waste Management Program	Date: _____ Time: _____ Location: _____
We were unable to remove your waste because:	
<u>Container Issues</u>	
<input type="checkbox"/> Insufficient head-space in the container.	
<input type="checkbox"/> Container is incompatible with waste type.	
<input type="checkbox"/> Container closure is broken or inappropriate.	
<input type="checkbox"/> Container is contaminated with chemical residue.	
<input type="checkbox"/> EHS does not remove empty containers.	
<u>Labeling Issues</u>	
<input type="checkbox"/> Labels used must be those supplied by EHS.	
<input type="checkbox"/> Labels used must be appropriate for waste types.	
<input type="checkbox"/> Contents of container do not appear to match label.	
<input type="checkbox"/> Label is incomplete. (All ingredients must be listed and total 100%)	
<input type="checkbox"/> Additional information is needed; EHS references do not show what _____ is.	
<input type="checkbox"/> Could not read label.	
<u>Other Issues</u>	
<input type="checkbox"/> The area was locked.	
<input type="checkbox"/> Nobody was present and we could not locate the waste.	
<input type="checkbox"/> There are more items than EHS can remove at this time.	
<input type="checkbox"/> This pickup will be classified as a lab cleanout.	
<input type="checkbox"/> Chemical is a peroxide former and is aged and/or has evidence of peroxide formation.	
<input type="checkbox"/> EHS cannot remove unknowns. (Visit <a href="http://research.uiowa.edu/ehs/">http://research.uiowa.edu/ehs/</a> )	
Other: _____	
_____	
_____	
Please contact the person below for more information or to discuss any questions and to reschedule your pickup.	
Name: _____	Phone: _____

### *Lab Cleanouts*

Lab cleanouts are defined as a large quantity of unused chemicals that need to be disposed of at once. The following guidelines apply to lab cleanouts:

- Special arrangements are required.
- Cleanouts are handled on a first come, first served basis.
- Several trips may be necessary to complete the cleanout.
- Notifying EHS as soon as possible will expedite your cleanout.

### *Unknowns*

An unknown is defined as a chemical of unknown identity in an unlabeled container. Federal regulations prohibit transportation, storage, or disposal of wastes of unknown identity. For this reason and for the safety of personnel, it is important to not create unknowns. With proper management, the generation of unknowns is preventable.

Prevent generating unknowns by:

- **Labeling** all containers properly. This should be done even when creating reagent solutions for temporary use. Labeling will also prevent using the wrong material accidentally.
- **Inspecting** containers and labels periodically. Replace fading or deteriorating labels.



If an unknown is discovered, these steps may help in identification.

- Ask area personnel about the container. Someone may remember its contents.
- Contact groups that previously used the area and see if they can recall the waste's identity.
- Simple tests such as pH may aid in identification.
- Check fresh reagents present; the waste was most likely derived from them. The field of possibilities can be greatly reduced in this manner.
- Review projects currently in progress.

If the identity of the unknown still cannot be determined, EHS provides an identification service. Unknowns are handled on a first come, first served basis. Following is a description of the process for unknown identification and disposal. Please note that this identification process is offered by EHS for the purpose of chemical disposal only, and there is a nominal fee charged to cover the cost of supplies.

1. Complete the “**Request to Test Unknown**” form for each item that needs testing. The form is located on the EHS Web site.
2. Send the completed form(s) to Environmental Health & Safety, 100 EHS, or FAX 335-4919.
3. After receipt of the form(s) a pick-up will be scheduled by EHS and the item will be removed for testing.

## 1.6 Hazardous Waste Minimization

In an average year, The University of Iowa generates 25,000 – 30,000 containers holding approximately 250,000 lbs. of hazardous chemical waste. It is the goal of the University to reduce this amount. Waste minimization is a reduction in both toxicity and volume, thus contributing to increased safety of personnel and benefiting our environment. Waste reduction practices also help control increasing expenditures of hazardous waste disposal. Common techniques include:

### *Product Substitution*

Use less hazardous or non-hazardous materials.

1. Substitute No-Chromix, Alconox, Terg-a-Zyme or other non-toxic detergents and enzymatic cleaners for chromic acid or potassium hydroxide/ethanol cleaning solutions.
2. Substitute non-hazardous biodegradable liquid scintillation cocktails for xylene and toluene-based cocktails.
3. Use soy-based inks instead of solvent-based inks in printing.
4. Use dry instead of wet printing processes.
5. Use non-halogenated solvents in degreasing operations.
6. Use non-mercury and non-sodium azide preservatives.

7. Use spirit, bi-metal, or digital thermometers.
8. Substitute ethanol for formaldehyde in specimen preservation.
9. Use water-based paints instead of oil-based paints.

#### *Scale Down*

Use microscale techniques to reduce or eliminate waste.

#### *Waste Segregation*

- Keep wastes segregated. Certain waste mixtures are more expensive to dispose of than others. For example, disposal of a gallon of xylene contaminated by mercury can cost one hundred times that of xylene alone.
- Keep non-hazardous waste out of hazardous waste streams. This includes water in solvents, or paper and plastic in dry waste.

#### *Waste Recovery*

- Re-distilling solvents is a way to save the cost of purchasing new solvents. There are many lab-scale stills on the market.

#### *Chemical Neutralization*

- Neutralize dilute acids and bases in the lab.
- Deactivate carcinogens.

#### *Good Management*

- Maintain an inventory of chemicals in the area and discard any no longer in use. This will also prevent duplicate purchases.
- Label all materials. Unknown materials are expensive to analyze.
- Use waste generation as a criterion in the selection of new equipment.
- Purchase small quantities - The cost of disposing of excess can easily outweigh initial savings.
- Redistribution - Consult your colleagues; someone else may be able to use surplus.
- Train employees in waste management practices.

### **1.7 Types of Waste That May Be Hazardous**

Many activities at The University of Iowa are likely to generate specific types of waste that may or may not be hazardous. All waste must be examined and a determination made as to whether the waste is hazardous or not. The following is a general breakdown of the various activities and the types of hazardous waste they are likely to generate.

#### *Arts*

Paints, solvents, thinners, inks, acids, glazes, pigments, silver, stains, preservatives, photochemicals, metal dust, and heavy metals.

### *Groundskeeping*

Pesticides, herbicides, rodenticides, fertilizers, oil, oil filters, cleaners.

### *Hospital*

Solvents, acids, bases, stains, heavy metals, pharmaceuticals, mercury, gases, carcinogens, batteries, various reagent chemicals.

### *Housekeeping*

Drain cleaners, toilet bowl cleaners, caustics, aerosol cans, cleaning solvents, disinfectants.

### *Laboratories*

Solvents, acids, bases, stains, heavy metals, pharmaceuticals, aerosol cans, mercury, gases, carcinogens, batteries, various reagent chemicals.

### *Maintenance*

Oil, batteries (lead-acid, NiCad, mercury, lithium, etc.), thermostats/thermocouples (containing mercury), degreasers, muriatic acid, parts cleaning solvents, metal dust, water treatment chemicals, fluorescent bulbs, aerosol cans.

### *Operations and Maintenance*

Solvents, paints, solvent and paint soaked rags/towels, paint booth filters, thinners, strippers, drain cleaners, toilet bowl cleaners, aerosol cans, disinfectants, oil, batteries (lead-acid, NiCad, mercury, lithium, etc.), thermostats/thermocouples (containing mercury), degreasers, parts cleaning solvents, water treatment chemicals, pesticides, herbicides, muriatic acid, caustics, rodenticides, grease, cleaners, fluorescent bulbs, PCB, metal dust.

### *Painting Operations*

Solvent and paint soaked rags/towels, paints, stains, preservatives, paint booth filters, thinners/solvents, strippers, aerosol cans.

### *Printing*

Solvents, inks, solvent and ink soaked rags/towels, oil.

### *Vehicle Maintenance*

Oil, oil filters, fuel filters, parts cleaning solvent, cleaners, caustics, gasoline, brake fluid, transmissions fluid, paint, batteries.

## **1.8 Management of Specific Waste Types**

### *Acids and Bases*

Dilute solutions (10% or less) may be neutralized to pH 7 and sewerred. Concentrated acids should be collected in 2.5 liter concentrated acid bottles for collection by EHS. One-gallon bottles are unacceptable due to thinner glass that cannot support the high specific gravity of concentrated acids. Keep oxidizing acids separate from other acids.

### *Acrylamide Gels*

EHS will collect acrylamide gels that are contaminated with toxic materials such as ethidium bromide or any EPA regulated material. Plain acrylamide gel may be disposed of in red tubs with biohazardous waste.

### *Aerosol Cans*

Whether they have been used or not aerosol cans of paint, lubricants, insecticides, cleaners and other materials are considered to be hazardous waste. Aerosol cans that are apparently non-pressurized may still contain some material. EHS will collect all aerosol cans for disposal.

### *Appliances*

Appliances, also known as white goods, are disposed of through UI Surplus. Appliances should not be disposed of in the regular trash. In many cases they contain hazardous materials. Call UI Surplus at 335- 5001 to make arrangements for disposal.

### *Art Supplies*

Many art supplies contain flammable, corrosive or toxic materials. Dispose of all solvents, solutions, paints, pigments and other unwanted art materials through EHS.

### *Asbestos*

Asbestos containing material is disposed of by FM Environmental Services. If you have asbestos, contact Environmental Services at 5-5500.

### *Ballasts*

EHS disposes of fluorescent light ballasts. Generally Facilities Maintenance (FM) personnel should remove ballasts from light fixtures and accumulate them prior to collection by EHS.

### *Batteries*

Batteries such as nickel-cadmium, mercury, silver, lithium, nickel-metal hydride, and lead-acid are hazardous. Examples of these are rechargeable batteries, computer batteries, phone batteries. EPA classifies such batteries as universal waste and EHS will collect them for recycling. At this time alkaline flashlight and radio batteries are not hazardous and should be disposed of in the regular trash as there is no avenue for recycling. For

more details, refer to the section in this manual that deals with Universal Waste. Please note that EHS will not remove batteries that are inside pieces of equipment, this must be done by the owner of the equipment prior to pickup by EHS.

#### *Biohazardous Waste*

Infectious, medical, and biohazardous waste disposal is managed by EHS. However, in most cases FM custodial staff will transport red tubs of biohazardous waste to collection points, usually located in a dock area. For more details, refer to the section in this manual that deals with Biohazardous Waste. Hospital staff should follow UIHC procedures for biohazardous waste disposal.

#### *Biohazard and Chemical Hazard Mixed*

Infectious agents should be disinfected with biocide to remove the biohazard. If the biohazard cannot be removed, the container must be labeled as both biohazard and chemical waste and disposed of in the chemical waste stream.

#### *Chemicals*

Chemicals in storage past their expiration dates or useful life should be disposed of immediately. EHS will collect all chemicals, used or unused, for disposal. Contact EHS for disposal.

#### *Cleaning Supplies*

Concentrated cleaning chemicals that are no longer useful must not be poured down drains. Contact EHS for disposal.

#### *Computer Equipment and Parts*

Computers and electronic equipment, also known as e-waste, is disposed of through UI Surplus. E-waste must not be disposed of in the regular trash because it contains toxic materials such as lead, mercury and silver. Call UI Surplus at 335-5001 to make arrangements for disposal.

#### *Controlled Substances*

Used, expired, unwanted or partially consumed controlled substances container(s) must be disposed of through DEA-registered reverse distributors only.

Controlled substances waste (used, expired, partially consumed, and synthetic or analytical process) is regulated by the U.S. Drug Enforcement Agency (DEA) and the Iowa Board of Pharmacy Examiners (IBPE). Researchers must treat the controlled substances waste separately and not as a hazardous waste, biological waste or regulated medical waste. Researchers must be aware that the disposal of a mixed waste containing controlled substance(s) and other hazardous chemicals will be expensive and will take longer lead time for DEA/IBPE approval. Reverse Distributors

must be contacted for proper disposal of controlled substances waste and the above described mixed waste.

EHS is not registered with DEA and IBPE as a Reverse Distributor and does not hold an institutional license for storing the controlled substances. It is against DEA regulations to accept, store or dispose of the controlled substances by EHS. However, researchers may contact EHS for specific questions related to registration, purchase, storage and security, and disposal.

#### *Cytotoxic Drugs*

Cytotoxic and antineoplastic waste should be collected for disposal by EHS. Nursing and Pharmacy stations where cytotoxic agents are routinely handled have special containers for this purpose. Hospital personnel should follow UIHC procedures for management.

#### *Drug and Pharmaceuticals*

Depending on form and type of drug waste, it may be collected by EHS, disposed of through our biohazardous waste vendor, or disposed of through a Reverse Distributor. Hospital personnel should follow UIHC procedures. See above for guidance on controlled substance disposal. Call EHS at 335-8501 for additional information.

#### *Electronic Equipment*

Electronic and computer equipment, also known as e-waste, is disposed of through UI Surplus. E-waste must not be disposed of in the regular trash because it contains toxic materials such as lead, mercury and silver. Call UI Surplus at 335-5001 to make arrangements for disposal.

#### *Electric Lamps*

Sodium lamps, mercury vapor lamps, fluorescent tubes, and other similar items contain mercury vapor and are regulated by EPA as universal waste. They are collected by maintenance personnel as recyclable material. Recycling of Universal Waste – Lamps is managed by General Stores. For more details, refer to the section in this manual that deals with Universal Waste.

#### *Empty Containers*

Unbroken empty glass containers, including empty glass chemical containers, and empty plastic containers may be discarded by placing them in a cardboard box, marking the box as “non-contaminated glass/plastic” and placing them near trash containers for custodial staff to discard or placed in a dumpster by the user. An exception for this is that empty containers that previously held acutely toxic p-listed chemicals must be given to EHS for disposal.

### *Ethidium Bromide and Ethidium Bromide Gels*

Gels and other solid, contaminated materials are collected by EHS for disposal. EHS distributes a container to be used for collection of ethidium bromide gels. Ethidium bromide may be removed from solutions using special filters available from Biochem stores for that purpose. Filtered solutions may be disposed of down the drain. The filter and other contaminated dry material are collected by EHS for disposal. Solutions that have not been filtered are collected by EHS for disposal.

### *Expired Date Chemicals*

An expiration date is often listed on the container label. Frequently chemicals that are past their expiration date are no longer safe, or have degraded or reacted so that they are no longer useful. If you have chemicals that are in storage past their expiration dates, they should be disposed of immediately. Contact EHS at 335-8501 to make arrangements for disposal.

### *Fluorescent Light Bulbs*

Fluorescent lamps and other similar bulbs contain mercury vapor and are regulated by EPA as universal waste. They are collected by maintenance personnel as recyclable material. Recycling of Universal Waste – Lamps is managed by General Stores. For more details, refer to the section in this manual that deals with Universal Waste.

### *Formaldehyde*

All unused formalin and formaldehyde reagents that require disposal must be disposed of through EHS. Spent or used formaldehyde solutions will also be collected by EHS.

### *Gas Cylinders*

Non-returnable empty cylinders and bottles may be disposed of in general waste if the valve stem is removed. For gas cylinders with a Praxair label, contact Praxair at 1-800-283-8348. If there is no Praxair label contact Steve Stange at 384-4045. Lecture bottles must be disposed of through EHS.

### *Glass*

Unbroken empty glass containers, including empty glass chemical containers may be discarded by placing them in a cardboard box, marking the box as “non-contaminated glass” and placing them near trash containers for custodial staff to discard or placed in a dumpster by the user. An exception for this is that empty containers that previously held acutely toxic p-listed chemicals must be given to EHS for disposal.

### *Infectious Waste*

Infectious, medical, and biohazardous waste disposal is managed by EHS. However, in most cases FM custodial staff will transport red tubs of biohazardous waste to collection points, usually located in a dock area. For more details, refer to the section in this manual that deals with

Biohazardous Waste. Hospital staff should follow UIHC procedures for biohazardous waste disposal.

#### *Laboratory Equipment*

Unwanted lab equipment must be free of contamination and then disposed of through UI Surplus.

#### *Lead Shielding*

Lead is a toxic hazardous waste. Lead pigs and lead shielding to be discarded must be collected by EHS for disposal.

#### *Medical Waste*

Infectious, medical, and biohazardous waste disposal is managed by EHS. However, in most cases FM custodial staff will transport red tubs of biohazardous waste to collection points, usually located in a dock area. For more details, refer to the section in this manual that deals with Biohazardous Waste. Hospital staff should follow UIHC procedures for biohazardous waste disposal.

#### *Mercury and Broken Mercury Thermometers*

Free flowing mercury and thermometers with mercury must be packaged in a glass or plastic bottle with a screw top and disposed of in the chemical waste stream. Broken thermometers without free flowing mercury and mercury contaminated debris may be double bagged in plastic bags and placed in a sturdy cardboard box. The box should then be sealed with tape.

#### *Mercury-Containing Equipment*

Many common items contain mercury. Some examples are thermometers, manometers, sphygmomanometers or blood pressure cuffs, thermocouples, certain instruments and gauges, and mercury switches. When discarding equipment, always check to see if it contains, or is contaminated by, mercury. Contact EHS at 335-8501 for disposal of all mercury-containing items. For more details, refer to the section in this manual that deals with Universal Waste.

#### *Office Materials*

Some common office materials may contain hazardous materials. Some examples are cements and glues, paints, aerosols, and cleaning materials. Contact EHS at 335-8501 for further information.

#### *Oils*

Oils are collected by EHS in glass, metal or high-density plastic bottles that are free of external contamination. Do not mix solvents or other wastes with oils. Depending upon the oil source, the generator may be responsible for having a PCB or heavy metal analysis performed prior to pickup. Oil filters should be punctured and hot drained prior to being disposed of in the



regular trash. All used oil container must be marked with the words, "used oil."

#### *Oil Contaminated Material*

Any material that is used to clean up oil spills and has become contaminated with oil is picked up by EHS for disposal. Collect material in a bucket with lid or a drum. Small amounts of contaminated material may be double bagged and boxed. Seal the containers, label, and call EHS at 335-8501 for collection.

#### *Oil Filters*

Oil filters must be punctured and hot drained prior to disposal. To hot-drain a filter, remove the filter from the engine when the engine is hot. Then keep the filter above 60°F while it drains for 24 hours. Collect the oil that drains from the filter and manage it as used oil. Any oil filters that are not hot drained must be disposed of as hazardous waste. Iowa law prohibits disposal of oil filters in landfills, they must be recycled. Containers of used oil filters must be marked with the words, "used oil."

#### *Paint Booth Filters*

Paint booth filters contaminated with paint or solvents will be collected by EHS in steel cans.

#### *Paint, Paint Thinner & Paint-Related Material*

Paint shops may collect paints and thinners in drums supplied by EHS. Drums must be labeled using EHS's hazardous waste label #2. Small amounts of thinner may be collected in five-gallon containers. Expired and unused paints must be collected by EHS for disposal.

#### *Paint Rags*

Rags contaminated with paint or solvents will be collected by EHS in steel cans.

#### *Peroxide Forming Chemicals*

Chemicals that form peroxides (Appendix IX) should be dated when received and checked periodically with potassium iodide (KI) paper to detect peroxides. Most peroxide formers have expiration dates printed on the label. Dispose of any peroxide former as soon as it reaches its expiration date if not tested. If peroxides are detected the lab may be required to pay for expensive chemical stabilization prior to disposal. Contact EHS at 335-8501 for more information.

#### *Photographic Chemicals*

Photographic chemicals should be collected by EHS for disposal. Many used photochemicals contain silver, a characteristic hazardous waste. EHS generally discourages use of benchtop recovery system, because of the uncertainty of the efficiency of silver recovery. Without a complete testing

program it is not possible to ensure that silver is not being put down the drain. Please contact EHS at 335-8501 for disposal.

#### *Picric Acid*

Picric acid is normally wet with greater than 10% water and is safe to handle in this condition. However, picric acid may become shock sensitive and explosive if dried or combined with metals.

- Never store in containers with metal caps.
- Check frequently to insure dampness. Add water if necessary.
- Tighten cap and seal with Parafilm to keep moisture in.
- Notify EHS if dry picric acid is found.

Contact EHS for disposal of picric acid.

#### Propane Cylinders

EHS will dispose of all propane cylinders except those that are returned to manufacturers or suppliers. Contact EHS for disposal.

#### *Radioactive and Chemical Waste Mixed*

Keep radioisotopes out of chemical waste whenever possible. For mixed waste, label as both chemical and radioactive and dispose of in the radioactive waste stream. Refer to the section of this manual on radioactive waste disposal for more information.

#### *Sharps Contaminated with Chemicals*

Sharps should always be collected in a sharps container, even if contaminated with chemicals. Remove chemical hazard by evaporation or simple chemical treatment. If not possible, label the sharps container as both sharps and hazardous waste (see Appendix XI for proper management of sharps). Many times chemically contaminated sharps may be disposed of as biohazardous waste. Contact EHS at 335-8501 for more information.

#### Silica Gel

Used/spent silica gel often contains trace material that are toxic. It should be collected for disposal by EHS.

#### *Stench Chemicals*

Chemicals that emit a stench (e.g., thiols and sulfur containing compounds) should be disposed of in containers with tight fitting lids. They can be double sealed with Parafilm, tape, or overpacked in a slightly larger container.

#### *Tollens Reagent*

Tollens reagent, or ammoniacal silver nitrate, may form highly explosive fulminate over a short period of time. Avoid this problem by adding dilute nitric acid after use. Dispose of through EHS.

### *Toner Cartridges*

Toner cartridges found in printers, fax machines, and copiers are recyclable. A used cartridge should be returned in the new cartridge box. Recycle used toner cartridges through General Stores.

### *Trace Contaminated Lab Waste*

This includes gloves, gowns, bench paper, etc., that have been contaminated with carcinogens, mutagens, teratogens, heavy metals or other toxic chemicals. Materials from spill cleanups may be included in this category. Sharps, empty or full reagent bottles, and uncontaminated trash should not be packaged with trace contaminated waste. Trace contaminated debris should be double bagged, with each bag sealed, and placed in a sturdy cardboard box, that is sealed with tape and labeled as hazardous waste. Dispose of through EHS.

### *Unknowns*

An unknown is defined as a chemical of unknown identity in an unlabeled container. Federal regulations specifically prohibit transportation, storage, or disposal of wastes of unknown identity. For this reason and for personnel safety, it is important that unknowns not be generated. Please refer to the section on unknowns in this manual for details. If the identity of the unknown cannot be determined, EHS provides an identification service.

## **1.9 Additional Resources**

- List of hazardous materials and disposal contacts  
<https://research.uiowa.edu/ehs/files/documents/waste/hazmaterialslist.pdf>
- To request a chemical waste pickup, an online form/process can be accessed at:  
<https://research.uiowa.edu/ehs/request-pickup-chemical-waste-0>
- To request a pickup of radioactive waste, an online form/process can be accessed at: <https://research.uiowa.edu/ehs/request-pickup-radioactive-waste-0>
- Waste collection schedule  
<https://research.uiowa.edu/ehs/files/documents/waste/pickupschedule.pdf>
- Request to Test Unknown Chemicals  
[https://research.uiowa.edu/ehs/edocs/labs/waste\\_disposal](https://research.uiowa.edu/ehs/edocs/labs/waste_disposal)
  - Chemical Waste Requirements Poster  
<https://research.uiowa.edu/ehs/files/documents/waste/chemicalwasteposter.pdf>
  - Hazardous Waste Label Instructions  
<https://research.uiowa.edu/ehs/files/documents/waste/wastelblinfo.pdf>
  - Universal Waste Management Program Information  
<https://research.uiowa.edu/ehs/files/documents/waste/universalwastemanagementproc.pdf>
  - Mercury Bearing Waste Disposal  
<https://research.uiowa.edu/ehs/files/documents/waste/disposalmercurybearingwaste.pdf>

- Peroxide Formers  
<https://research.uiowa.edu/ehs/files/documents/waste/managementPeroxideformingchem.pdf>

## 1.10 Appendices

### Appendix I - (D Codes) Maximum Concentrations of Contaminants for Toxicity Characteristic (TCLP)

If waste contains the following heavy metals and/or organic contaminants above the listed regulatory levels, it must be managed as a hazardous waste.

EPA Code	Contaminant	Regulatory Level (mg/L)
D004	Arsenic	05.0
D005	Barium	100.0
D018	Benzene	0.5
D006	Cadmium	1.0
D019	Carbon tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D007	Chromium	5.0
D023	m-Cresol	200.0
D024	o-Cresol	200.0
D025	p-Cresol	200.0
D026	Cresol	200.0
D016	2, 4-D	010.0
D027	1, 4-Dichlorobenzene	7.5
D028	1, 2-Dichloroethane	0.5
D029	1, 1-Dichloroethylene	0.7
D030	2, 4-Dinitrotoluene	0.13
D012	Endrine	0.02
D031	Heptachlor & its epoxide	0.008
D032	Hexachlorobenzene	0.13
D033	Hexachlorobutadiene	0.5
D034	Hexachloroethane	3.0
D008	Lead	5.0
D013	Lindane	0.4
D009	Mercury	0.2
D014	Methoxychlor	10.0
D035	Methyl ethyl ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridine	5.0
D010	Selenium	1.0
D011	Silver	5.0
D039	Tetrachloroethylene	0.7
D015	Toxaphene	0.5
D036	Nitrobenzene	2.0
D040	Trichloroethylene	0.5
D041	2, 4, 5-Trichlorophenol	400.0
D042	2, 4, 6-Trichlorophenol	2.0
D017	2, 4, 5-TP (Silvex)	1.0
D043	Vinyl chloride	0.2

**Appendix II - (P Codes)**  
**Acutely Toxic Hazardous Wastes**  
P-List (Acutely Toxics)

P023	107-20-0	Acetaldehyde, chloro-	P024	106-47-8	p-Chloroaniline
P002	591-08-2	Acetamide, N-(aminothioxomethyl)-	P026	5344-82-1	1-(o-Chlorophenyl) thiourea
P057	640-19-7	Acetamide, 2-fluoro-	P027	542-76-7	3-Chloropropionitrile
P058	62-74-8	Acetic acid, fluoro-, sodium salt	P029	544-92-3	Copper cyanide
P002	591-08-2	1-Acetyl-2-thiourea	P029	544-92-3	Copper cyanide Cu(CN)
P003	107-02-8	Acrolein	P030		Cyanides (soluble cyanide salts), not otherwise specified
P070	116-06-3	Aldicarb	P031	460-19-5	Cyanogen
P004	309-00-2	Aldrin	P033	506-77-4	Cyanogen chloride
P005	107-18-6	Allyl alcohol	P033	506-77-4	Cyanogen chloride (CN)Cl
P006	20859-73-8	Aluminum phosphide (R,T)	P034	131-89-5	2-Cyclohexyl-4, 6-dinitrophenol
P007	2763-96-4	5-(Aminomethyl)-3-isoxazolol	P016	542-88-1	Dichloromethyl ether
P008	504-24-5	4-Aminopyridine	P036	696-28-6	Dichlorophenylarsine
P009	131-74-8	Ammonium pierate (R)	P048	51-28-5	2, 4-Dinitrophenol
P119	7803-55-6	Ammonium vandate	P020	88-85-7	Dinoseb
P099	506-61-6	Argentate (1-), bis(cyano-C)-, potassium	P085	152-16-9	Diphosphoramidate, octamethyl-
P010	7778-39-4	Arsenic acid H3AsO4	P111	107-49-3	Diphosphoric acid, tetraethyl ester
P012	1327-53-3	Arsenic trioxide	P039	298-04-4	Disulfoton
P038	692-42-2	Arsine, diethyl-	P049	541-53-7	Dithiobiuret
P036	696-28-6	Arsonous dichloride, phenyl-	P050	115-29-7	Endosulfan
P054	151-56-4	Aziridine	P088	145-73-3	Endothall
P067	75-55-8	Aziridine, 2-methyl-	P051	72-20-8	Endrin
P013	542-62-1	Barium cyanide	P051	72-20-8	Endrin, & metabolites
P024	106-47-8	Benzenamine, 4-chloro-	P042	51-43-4	Epinephrine
P028	100-44-7	Benzene, (chloromethyl)-	P031	460-19-5	Ethanedinitrile
P042	51-43-4	1, 2-Benzenediol, 4-[1-hydroxy-2-(methylamino) ethyl]-, (R)	P066	16752-77-5	Ethanimidothioic acid, N-[[[(methylamino) carbonyl] oxyl]- methyl ester
P046	122-09-8	Benzeneethanamine, alpha, alpha-dimethyl-	P101	107-12-0	Ethyl cyanide
P014	108-98-5	Benzenethiol	P054	151-56-4	Ethyleneimine
P001	81-81-2	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts, when present at concentrations greater than 0.3%	P097	52-85-7	Famphur
P028	100-44-7	Benzyl chloride	P056	7782-41-4	Fluorine
P015	7440-41-7	Beryllium	P057	640-19-7	Fluoroacetamide
P017	598-31-2	Bromoacetone	P058	62-74-8	Fluoroacetic acid, sodium salt
P018	357-57-3	Brucine	P065	628-86-4	Fulminic acid, mercury (2+) salt (R,T)
P045	39196-18-4	2-Butanone, 3, 3-dimethyl-1-(methylthio)-, O-[methylamino) carbonyl] oxime	P059	76-44-8	Heptachlor
P021	592-01-8	Calcium cyanide	P062	757-58-4	Hexaethyl tetraphosphate
P021	592-01-8	Calcium cyanide Ca(CN)2	P116	79-19-6	Hydrazinecarbothioamide
P022	75-15-0	Carbon disulfide	P068	60-34-4	Hydrazine, methyl-
P095	75-44-5	Carbon dichloride	P063	74-90-8	Hydrocyanic acid
P023	107-20-0	Chloroacetaldehyde	P063	74-90-8	Hydrogen cyanide
			P096	7803-51-2	Hydrogen phosphide

## Appendix II - (P Codes) - Continued

P060	465-73-6	Isodrin	P110	78-00-2	Plumbane, tetraethyl-
P007	2763-96-4	3(2H)-Isoxazolone, 5-(aminomethyl)-	P067	75-55-8	1, 2-Propylenimine
P092	62-38-4	Mercury, (acetato-O) phenyl-	P102	107-19-7	2-Propyn-1-ol
P065	628-86-4	Mercury fulminate (R,T)	P008	504-24-5	4-Pyridinamine
P082	62-75-9	Methanamine, N-methyl-N-nitroso-	P075	54-11-5	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts
P064	624-83-9	Methane, isocyanato-	P114	12039-52-0	Selenious acid, dithallium (1+) salt
P068	60-34-4	Methyl hydrazine	P103	630-10-4	Selenourea
P064	624-83-9	Methyl isocyanate	P104	506-64-9	Silver cyanide
P069	75-86-5	2-Methylacetonitrile	P104	506-64-9	Silver cyanide Ag (CN)
P071	298-00-0	Methyl parathion	P105	26628-22-8	Sodium azide
P072	86-88-4	alpha-Naphthylthiourea	P106	143-33-9	Sodium cyanide
P073	13463-39-3	Nickel carbonyl	P106	143-33-9	Sodium cyanide Na (CN)
P073	13463-39-3	Nickel carbonyl Ni(CO)4, (T-4)-	P107	1314-96-1	Strontium sulfide SrS
P074	557-19-7	Nickel cyanide	P108	57-24-9	Strychnidin-10-one, & salts
P074	557-19-7	Nickel cyanide Ni(CN)2	P018	357-57-3	Strychnidin-10-one, 2, 3-dimethoxy-
P075	54-11-5	Nicotine, & salts	P108	57-24-9	Strychnine, & salts
P076	10102-43-9	Nitric oxide	P115	7446-18-6	Sulfuric acid, dithallium (1+) salt
P077	100-01-6	p-Nitroaniline	P109	3689-24-5	Tetraethylthiopyrophosphate
P078	10102-44-0	Nitrogen dioxide	P110	78-00-2	Tetraethyl lead
P076	10102-43-9	Nitrogen oxide NO	P111	107-49-3	Tetraethyl pyrophosphate
P078	10102-44-0	Nitrogen oxide NO2	P112	509-14-8	Tetranitromethane (R)
P081	55-63-0	Nitroglycerine (R)	P062	757-58-4	Tetraphosphoric acid, hexaethyl ester
P082	62-75-9	N-Nitrosodimethylamine	P113	1314-32-5	Thallic oxide
P084	4549-40-0	N-Nitrosomethylvinylamine	P113	1314-32-5	Thallium oxide T1203
P085	152-16-9	Octamethylpyrophosphoramidate	P114	12039-52-0	Thallium (I) selenite
P087	20816-12-0	Osmium oxide OsO4, (T-4)-	P115	7446-18-6	Thallium (I) sulfate
P087	20816-12-0	Osmium tetroxide	P109	3689-24-5	Thiodiphosphoric acid, tetraethyl ester
P088	145-73-3	7-Oxabicyclo[2.2.1] heptane-2, 3-dicarboxylic acid	P045	39196-18-4	Thiofanox
P089	56-38-2	Parathion	P049	541-53-7	Thioimidodicarbonic diamide [(H2N)C(S)]2NH
P034	131-89-5	Phenol, 2-cyclohexyl-4, 6-dinitro-	P014	108-98-5	Thiophenol
P020	88-85-7	Phenol, 2-(1-methylpropyl)-4, 6-dinitro-	P116	79-19-6	Thiosemicarbazide
P009	131-74-8	Phenol, 2, 4, 6-trinitro-, ammonium salt (R)	P026	5344-82-1	Thiourea, (2-chlorophenyl)-
P092	62-38-4	Phenymercury acetate	P123	8001-35-2	Toxaphene
P093	103-85-5	Phenylthiourea	P118	75-70-7	Trichloromethanethiol
P094	298-02-2	Phorate	P119	7803-55-6	Vanadic acid, ammonium salt
P095	75-44-5	Phosgene	P120	1314-62-1	Vanadium oxide V2O5
P096	7803-51-2	Phosphine	P120	1314-62-1	Vanadium pentoxide
P041	311-45-5	Phosphoric acid, diethyl 4-nitrophenyl ester	P084	4549-40-0	Vinylamine, N-methyl-N-nitroso-
P039	298-04-4	Phosphorodithioic acid, O, O-diethyl S-[2-(ethylthio) ethyl] ester	P001	81-81-2	Warfarin, & salts, when present at concentrations greater than 0.3%
P094	298-02-2	Phosphorodithioic acid, O, O-diethyl S-[(ethylthio) methyl] ester	P121	557-21-1	Zinc cyanide
P044	60-51-5	Phosphorodithioic acid, O, O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	P121	557-21-1	Zinc cyanide Zn(CN)2
P043	55-91-4	Phosphorofluoridic acid, bis (1-methylethyl) ester			
P089	56-38-2	Phosphorothioic acid, O, O-diethyl O-(4-nitrophenyl) ester			
P040	297-97-2	Phosphorothioic acid, O, O-diethyl O-pyrazinyl ester			
P097	52-85-7	Phosphorothioic acid, O-[4-(dimethylamino) sulfonyl] phenyl]O, O-dimethyl ester			
P071	298-00-0	Phosphorothioic acid, O, O, -dimethyl O-(4-nitrophenyl) ester			

**Appendix III - (U Codes)**  
**Toxic Hazardous Wastes**  
U-List (Toxics)

Code	Description	Code	Description
U001	Acetaldehyde (I)	U033	Carbon oxyfluoride (R,T)
U001	Ethanol (I)	U033	Carbonic difluoride
U002	2-Propanone (I)	U034	Acetaldehyde, trichloro-
U002	Acetone (I)	U034	Chloral
U003	Acetonitrile (I,T)	U035	Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-
U004	Acetophenone	U035	Chlorambucil
U004	Ethanone, 1-phenyl-	U036	4,7-Methano-1H-indene,1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-
U005	2-Acetylaminofluorene	U036	Chlordane, alpha & gamma isomers
U005	Acetamide, N-9H-fluoren-2-yl	U037	Benzene, chloro-
U006	Acetyl chloride (C,R,T)	U037	Chlorobenzene
U007	2-Propenamide	U038	Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl-alpha-hydroxy-, ethyl ester
U007	Acrylamide	U038	Chlorobenzilate
U008	2-Propenoic acid (I)	U039	p-Chloro-m-cresol
U008	Acrylic acid (I)	U039	Phenol, 4-chloro-3-methyl
U009	2-Propenenitrile	U041	Epichlorohydrin
U009	Acrylonitrile	U041	Oxirane, (chloromethyl)-
U010	Azirino [2',3':3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[[(aminocarbonyl)oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-,[1aS-(1aalpha,8beta,8aalpha,8balpha)]-	U042	Ethene, (2-chloroethoxy)-
U010	Mitomycin C	U043	Ethene, chloro-
U011	1H-1,2,4-Triazol-3-amine	U043	Vinyl chloride
U011	Amitrole	U044	Chloroform
U012	Aniline (I,T)	U044	Methane, trichloro-
U012	Benzenamine (I,T)	U045	Methane, chloro- (I,T)
U014	Auramine	U045	Methyl chloride (I,T)
U014	Benzenamine, 4,4'-carbonimidoylbis[N,N-dimethyl-	U046	Chloromethyl methyl ether
U015	Azaserine	U046	Methane, chloromethoxy-
U015	L-Serine, diazoacetate (ester)	U047	beta-Chloronaphthalene
U016	Benz[c]acridine	U047	Naphthalene, 2-chloro-
U017	Benzal chloride	U048	o-Chlorophenol
U021	Benidine	U048	Phenol, 2-chloro-
U022	Benzo[a]pyrene	U049	4-Chloro-o-toluidine, hydrochloride
U023	Benzene, (trichloromethyl)-	U049	Benzenamine, 4-chloro-2-methyl-, hydrochloride
U023	Benzotrichloride (C,R,T)	U050	Chrysene
U024	Dichloromethoxy ethane	U051	Creosote
U024	Ethane, 1,1'-[methylenebis(oxy)]bis[2-chloro-	U052	Cresol (Cresylic acid)
U025	Dichloroethyl ether	U052	Phenol, methyl-
U025	Ethane, 1,1'-oxybis[2-chloro-	U053	2-Butenal
U026	Chlornaphazin	U053	Crotonaldehyde
U026	Naphthalenamine, N,N'-bis(2-chloroethyl)-	U055	Benzene, (1-methylethyl)-(I)
U027	Dichloroisopropyl ether	U055	Cumene (I)
U027	Propane, 2,2'-oxybis[2-chloro-	U056	Benzene, hexahydro- (I)
U028	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	U056	Cyclohexane (I)
U028	Diethylhexyl phthalate	U057	Cyclohexanone (I)
U029	Methane, bromo-	U058	2H-1,3,2-Oxazaphosphorin-2-amine,N,N-bis(2-chloroethyl)tetrahydro-,2-oxide
U029	Methyl bromide	U058	Cyclophosphamide
U030	4-Bromophenyl phenyl ether	U059	5,12-Naphthacenedione, 8-acetyl-10-[(3-amino-2,3,6-trideoxy)-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-,(8S-cis)-
U030	Benzene, 1-bromo-4-phenoxy-	U059	Daunomycin
U031	1-Butanol (I)	U060	Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-
U031	n-Butyl alcohol (I)	U060	DDD
U032	Calcium chromate	U061	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-
U032	Chromic acid H2CrO4, calcium salt	U061	DDT



### Appendix III - (U Codes) - Continued Toxic Hazardous Wastes

#### U-List (Toxics)

Code	Description	Code	Description
U062	Carbamoithioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester	U093	Benzenamine, N,N-dimethyl-4-(phenylazo)-
U062	Diallate	U093	p-Dimethylaminoazobenzene
U063	Dibenz[a,h]anthracene	U094	7,12-Dimethylbenz[a]anthracene
U064	Benzo[rs]t]pentaphene	U094	Benz[a]anthracene, 7,12-dimethyl-
U064	Dibenzo[a,i]pyrene	U095	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-
U066	1,2-Dibromo-3-chloropropane	U095	3,3'-Dimethylbenzidine
U066	Propane, 1,2-dibromo-3-chloro	U096	alpha, alpha-Dimethylbenzylhydroperoxide (R)
U067	Ethane, 1,2-dibromo-	U096	Hydroperoxide, 1-methyl-1-phenylethyl (R)
U067	Ethylene dibromide	U097	Carbamic chloride, dimethyl-
U068	Methane, dibromo-	U097	Dimethylcarbonyl chloride
U068	Methylene bromide	U098	1,1-Dimethylhydrazine
U069	1,2-Benzenedicarboxylic acid, dibutyl ester	U098	Hydrazine, 1,1-dimethyl
U069	Dibutyl phthalate	U099	1,2-Dimethylhydrazine
U070	Benzene, 1,2-dichloro-	U099	Hydrazine, 1,1-dimethyl-
U070	o-Dichlorobenzene	U101	2,4-Dimethylphenol
U071	Benzene, 1,3-dichloro-	U101	Phenol, 2,4-dimethyl-
U071	m-Dichlorobenzene	U102	1,2-Benzenedicarboxylic acid, dimethyl ester
U072	Benzene, 1,4-dichloro-	U102	Dimethyl phthalate
U072	p-Dichlorobenzene	U103	Dimethyl sulfate
U073	[1,1'-Biphenyl]-4,4'-diamine,3,3'-dichloro-	U103	Sulfuric acid, dimethyl ester
U073	3,3'-Dichlorobenzidine	U105	2,4-Dinitrotoluene
U074	1,4-Dichloro-2-butene (I,T)	U105	Benzene, 1- methyl-2,4-dinitro-
U074	2-Butene, 1,4-dichloro- (I,T)	U106	2,6-Dinitrotoluene
U075	Dichlorodifluoromethane	U106	Benzene, 2-methyl-1,3-dinitro-
U075	Methane, dichlorodifluoro-	U107	1,2-Benzenedicarboxylic acid, dioctyl ester
U076	Ethane, 1,1-dichloro-	U107	Di-n-octyl phthalate
U076	Ethylidene dichloride	U108	1,4-Diethyleneoxide
U077	Ethane, 1,2- dichloro-	U108	1,4-Dioxane
U077	Ethylene dichloride	U109	1,2-Diphenylhydrazine
U078	1,1-Dichloroethylene	U109	Hydrazine, 1,2-diphenyl-
U078	Ethene, 1,1-dichloro-	U110	1-Propanimine, N-propyl-(I)
U079	1,2-Dichloroethylene	U110	Dipropylamine (I)
U079	Ethene, 1,2-dichloro-, (E)-	U111	1-Propanamine, N-nitroso-N-propyl-
U080	Methane, dichloro-	U111	Di-n-propylnitrosamine
U080	Methylene chloride	U112	Acetic acid ethyl ester (I)
U081	2,4-Dichlorophenol	U112	Ethyl acetate (I)
U081	Phenol, 2,4-dichloro-	U113	2-Propenoic acid, ethyl ester (I)
U082	2,6-Dichlorophenol	U113	Ethyl acrylate (I)
U082	Phenol, 2,6-dichloro-	U114	Carbamodithioic acid, 1,2-ethanediy[bis-, salts & esters
U083	Propane,1 2-dichloro	U114	Ethylenebisdithiocarbamic acid, salts & esters
U083	Propylene dichloride	U115	Ethylene oxide (I,T)
U084	1,3-Dichloropropene	U115	Oxirane (I,T)
U084	1-Propene, 1,3-ichloro-	U116	2-Imidazolidnethione
U085	1,2:3,4-Diepoxybutane (I,T)	U116	Ethylenethiourea
U085	2,2'-Bioxirane	U117	Ethane, 1,1'-oxybis-(I)
U086	Hydrazine, 1,2-diethyl-	U117	Ethyl ether (I)
U086	N,N'-Diethylhydrazine	U118	2-Propenoic acid, 2-methyl-, ethyl ester
U087	O,O-Diethyl S-methyl dithiophosphate	U118	Ethyl methacrylate
U087	Phosphorodithioic acid, O,O-diethyl S-methyl ester	U119	Methanesulfonic acid, ethyl ester
U088	1,2-Bezenedicarboxylic acid, diethyl ester	U119	Ethyl methanesulfonate
U088	Diethyl phthalate	U120	Fluoranthene
U089	Diethylstilbesterol	U121	Methane, trichlorofluoro-
U089	Phenol, 4,4'-(1,2-diethyl-1,2-ethenediy)bis, (E)-	U121	Trichloromonofluoromethane
U090	1,3-Benzodioxole, 5-propyl-	U122	Formaldehyde
U090	Dihydrosafrole	U123	Formic acid (C,T)
U091	[1,1'-Biphenyl]-4,4'-diamine,3,3'-dimethoxy	U124	Furan (I)
U091	3,3'-Dimethoxybenzidine	U124	Furfuran (I)
U092	Dimethylamine (I)	U125	2-Furancarboxaldehyde (I)
U092	Methanamine, N-methyl- (I)		

### Appendix III - (U Codes) - Continued Toxic Hazardous Wastes

#### U-List (Toxics)

Code	Description	Code	Description
U125	Fufural (I)	U156	Methyl chlorocarbonate (I,T)
U126	Glycidylaldehyde	U157	3-Methylchloanthrene
U126	Oxiranecarboxyaldehyde	U157	Benz[ <i>a</i> ]aceanthrylene, 1,2-dihydro-3-methyl-
U127	Benzene, hexachloro-	U158	4,4'-Methylenebis(2-chloroaniline)
U127	Hexachlorobenzene	U158	Benzeneamine, 4,4'-methylenebis[2-chloro-
U128	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	U159	2-Butanone (I,T)
U128	Hexachlorobutadiene	U159	Methyl ethyl ketone (MEK) (I,T)
U129	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1alpha,2alpha,3beta,4alpha,5alpha,6beta)-	U160	2-Butanone, peroxide (R,T)
U129	Lindane	U160	Methyl ethyl ketone peroxide (R,T)
U130	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	U161	4-Methyl-2-pentanone (I)
U130	Hexachlorocyclopentadiene	U161	Methyl isobutyl ketone (I)
U131	Ethane, hexachloro-	U161	Pentanol, 4-methyl-
U131	Hexachloroethane	U162	2-Propenoic acid, 2-methyl-, methyl ester (I,T)
U132	Hexachlorophene	U162	Methyl methacrylate (I,T)
U132	Phenol, 2,2'-methylenebis[3,4,6-trichloro-	U163	Guanidine, N-methyl-N'-nitro-N-nitroso
U133	Hydrazine (R,T)	U163	MNNG
U134	Hydrofluoric acid (C,T)	U164	4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-
U134	Hydrogen fluoride (C,T)	U164	Methylthiouracil
U135	Hydrogen sulfide	U165	Naphthalene
U135	Hydrogen sulfide H2S	U166	1,4-Naphthalenedione
U136	Arsenic acid, dimethyl-	U166	1,4-Naphthoquinone
U136	Cacodylic acid	U167	1-Naphthalenamine
U137	Indeno[1,2,3-cd]pyrene	U167	alpha-Naphthylamine
U138	Methane, iodo-	U168	2-Naphthalenamine
U138	Methyl iodide	U168	beta-Naphthylamine
U140	1-Propanol, 2-methyl- (I,T)	U169	Benzene, nitro-
U140	Isobutyl alcohol (I,T)	U169	Nitrobenzene (I,T)
U141	1,3-Benzodioxole, 5-(1-propenyl)-	U170	p-Nitrophenol
U141	Isosafrole	U170	Phenol, 4-nitro-
U142	1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-	U171	2-Nitropropane (I,T)
U142	Ketone	U171	Propane, 2-nitro- (I,T)
U143	2-Butenoic acid, 2-methyl-, 7-[[2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy]methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl-ester, [1S-[1alpha(Z), 7(2S*,3R*),7aalpha]]-	U172	1-Butanamine, N-butyl-N-nitroso-
U143	Lasiocarpine	U172	N-Nitrosodi-n-butylamine
U144	Acetic acid, lead(2+) salt	U173	Ethanol, 2,2'-(nitrosoimino)bis-
U144	Lead acetate	U173	N-Nitrosodiethanolamine
U145	Lead phosphete	U174	Ethanamine, N-ethyl-N-nitroso-
U145	Phosphoric acid, lead(2+) salt (2:3)	U174	N-Nitrosodiethylamine
U146	Lead subacetate	U176	N-Nitroso-N-ethylurea
U146	Lead, bis(acetato-O)tetrahydroxytri-	U176	Urea, N-ethyl-N-nitroso-
U147	2,5-Furnandione	U177	N-Nitroso-N-methylurea
U147	Maleic anhydride	U177	Urea, N-methyl-N-nitroso-
U148	3,6-Pyridazinedione, 1,2-dihydro-	U178	Carbamic acid, methylnitroso-, ethyl ester
U148	Maleic hydrazide	U178	N-Nitroso-N-methylurethane
U149	Malononitrile	U179	N-Nitropiperidine
U149	Propanedinitrile	U179	Piperidine, 1-nitroso-
U150	L-Phenylalanine, 4-[bis(2-chloroethyl)amino]-	U180	N-Nitrosopyrrolidine
U150	Melaphalan	U180	Pyrrolidine, 1-nitroso-
U151	Mercury	U181	5-Nitro-o-toluidine
U152	2-Propenenitrile, 2-methyl- (I,T)	U181	Benzenamine, 2-methyl-5-nitro
U152	Methacrylonitrile, (I,T)	U182	1,3,5-Trioxane, 2,4,-trimethyl-
U153	Methanethiol (I,T)	U182	Paraldehyde
U153	Thiomethanol (I,T)	U183	Benzene, pentachloro-
U154	Methanol (I)	U183	Pentachlorobezene
U154	Methyl alcohol (I)	U184	Ethane, pentachloro-
U155	1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	U184	Pentachloroethane
U155	Methapyrilene	U185	Benzene, pentachloronitro-
U156	Carbonochloridic acid, methyl ester (I,T)	U185	Pentachloronitrobenzene (PCNB)

Section 1.0 Hazardous Waste

**Appendix III - (U Codes) - Continued**  
**Toxic Hazardous Wastes**  
U-List (Toxics)

Code	Description	Code	Description
U186	1,3-Pentadiene (I)	U217	Nitric acid, thallium(1+) salt
U186	1-Methylbutadiene (I)	U217	Thallium(I) nitrate
U187	Acetamide, N-(4-ethoxyphenyl)-	U218	Ethanethioamide
U187	Phenacetin	U218	Thioacetamide
U188	Phenol	U219	Thiourea
U189	Phosphorus sulfide (R)	U220	Benzene, methyl-
U189	Sulfur phosphide (R)	U220	Toluene
U190	1,3-Isobenzofurandione	U221	Benzenediamine, ar-methyl-
U190	Phthalic anhydride	U221	Toluenediamine
U191	2-Picoline	U222	Benzenamine, 2-methyl-, hydrochloride
U191	Pyridine, 2-methyl-	U222	o-Toluidine hydrochloride
U192	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	U223	Benzene, 1,3-diisocyanatomethyl- (R,T)
U192	Pronamide	U223	Toluene diisocyanate (R,T)
U193	1,2-Oxathiolane, 2,2-dioxide	U225	Bromoform
U193	1,3-Propane sultone	U225	Methane, tribromo-
U194	1-Propanamine (I,T)	U226	Ethane, 1,1,1-trichloro-
U194	n-Propylamine (I,T)	U226	Methyl chloroform
U196	Pyradine	U227	1,1,2-Trichloroethane
U197	2,5-Cyclohexadiene-1,4-dione	U227	Ethane, 1,1,2-trichloro-
U197	p-Benzoquinone	U228	Ethene, trichloro-
U200	Reserpine	U228	Trichloroethylene
U200	Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-,methyl ester, (3beta,16beta,17alpha,18beta,20alpha)-	U234	1,3,5-Trinitrobenzene (R,T)
U201	1,3-Benzenediol	U234	Benzene, 1,3,5-trinitro
U201	Resorcinol	U235	1-Propanol, 2,3-dibromo-, phosphate (3:1)
U202	1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide, & salts	U235	Tris(2,3-dibromopropyl) phosphate
U202	Saccharin, & salts	U236	2,7-Naphthalenedisulfonic acid,3,3'-[(3,3'-dimethyl[1,1'-biphenyl]-4,4'-diyl)bix(azo)bis[5-amino-4-hydroxy]-, tetrasodium salt
U203	1,3-Benzodioxole, 5-(2-propenyl)-	U236	Trypan blue
U203	Safrole	U237	2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]-
U204	Selenious acid	U237	Uracil mustard
U204	Selenium dioxide	U238	Carbamic acid, ethyl ester
U205	Selenium sulfide	U238	Ethyl carbamate (urethane)
U205	Selenium sulfide SeS2 (R,T)	U239	Benzene, dimethyl- (I,T)
U206	D-Glucose, 2-deoxy-2-[[[(methylnitrosoamino)-carbonyl]amino]-	U239	Xylene (I)
U206	Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-,D-	U240	2,4-D, salts & esters
U206	Streptozotocin	U240	Acetic acid, (2,4-dichlorophenoxy)-, salts & esters
U207	1,2,4,5-Tetrachlorobenzene	U243	1-Propene, 1,1,2,3,3,3-hexachloro-
U207	Benzene, 1,2,4,5-tetrachloro-	U243	Hexachloropropene
U208	1,1,1,2-Tetrachloroethane	U244	Thioperoxydicarbonic diamide [(H2N)C(S)]2S2, tetramethyl-
U208	Ethane, 1,1,1,2-tetrachloro-	U244	Thiram
U209	1,1,2,2-Tetrachloroethane	U246	Cyanogen bromide (CN)Br
U209	Ethane, 1,1,2,2-tetrachloro-	U247	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-methoxy-
U210	Ethene, tetrachloro-	U247	Methoxychlor
U210	Tetrachloroethylene	U248	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenyl-butyl)-, & salts, when present at concentrations of 0.3% or less
U211	Carbon tetrachloride	U249	Zinc phosphide Zn3P2, when present at concentrations of 10% or less
U211	Methane, tetrachloro-	U328	Benzenamine, 2-methyl-
U213	Furan, tetrahydro- (I)	U328	o-Toluidine
U213	Tetrahydrofuran (I)	U353	Benzenamine, 4-methyl-
U214	Acetic acid, thallium(1+) salt	U353	p-Toluidine
U214	Thallium(I) acetate	U359	Ethanol, 2-ethoxy-
U215	Carbonic acid, dithallium(1+) salt	U359	Ethylene glycol monoethyl ether
U215	Thallium(I) carbonate		
U216	Thallium chloride TlCl		
U216	Thallium(I) chloride		

Section 1.0 Hazardous Waste

**Appendix IV - (F Codes)**  
**Non-Specific Source Hazardous Wastes**  
*F-List (Spent Solvents)*

F001	The following spent halogenated solvents used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1, 1, 1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F002	The following spent halogenated solvents: Tetrachloroethylene, methylene chloride, trichloroethylene, 1, 1, 1-trichloroethane, chlorobenzene, 1, 1, 2-trichloro-1, 2, 2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1, 1, 2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	
F003	The following spent non-halogenated solvents: Xylene, acetone, ethylacetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T) (I)*
F004	The following spent non-halogenated solvents: Cresols and cresylic acid, and Nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F005	The following spent non-halogenated solvents: Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxy-ethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I,T)
F006	Wastewater treatment sludges from electroplating operations except from the following processes: (1) Sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum.	(T)
F007	Spent cyanide plating bath solutions from electroplating operations	(R,T)
F008	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.	(R,T)
F009	Spent stripping and cleaning bath solution from electroplating operations where cyanides are used in the process.	(R,T)
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.	(R,T)
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations.	(R,T)
F012	Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process.	(T)
F019	Wastewater treatment sludges from the chemical conversion coating of aluminum except from zirconium phosphating in aluminum can wash-ing when such phosphating is an exclusive conversion coating process.	(T)
F020	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of hexachlorophene from highly purified 2, 4, 5-trichlorophenol.)	(H)
F021	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.	(H)
F022	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	(H)
F023	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of Hexachlorophene from highly purified 2, 4, 5-trichlorophenol.)	(H)
F024	Process wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes, from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution. (This listing does not include wastewaters, wastewater treatment sludges, spent catalysts, and wastes listed in § 261.31 or § 261.32.)	(T)
F025	Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.	(T)

**Appendix IV - (F Codes) - Continued**  
**Non-Specific Source Hazardous Wastes**  
**F-List (Spent Solvents)**

F026	Wastes 9except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions.	(H)
F027	Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing Hexachlorophene synthesized from prepurified 2, 4, 5-trichlorophenol as the sole component.)	(H)
F028	Residues resulting from the incineration of thermal treatment of soil contaminated with EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.	(T)
F032 <sup>1</sup>	Wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations (except potentially cross-contaminated wastes that have had the F032 waste code deleted in accordance with § 261.35 of this chapter and where the generator does not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol. (NOTE: The listing of wastewaters that have not come into contact with process contaminants is stayed administratively. The listing for plants that have previously used chlorophenolic formulations is administratively stayed whenever these wastes are covered by the F034 or F035 listings. These stays will remain in effect until further administrative action is taken.)	(T)
F034 <sup>1</sup>	Wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving process generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol. (NOTE: The listing of wastewaters that have not come into contact with process contaminants is stayed administratively. The stay will remain in effect until further administrative action is taken.)	(T)
F035 <sup>1</sup>	Wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving process generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol. (NOTE: The listing of wastewaters that have not come into contact with process contaminants is stayed administratively. The stay will remain in effect until further administrative action is taken.)	(T)
F037	Petroleum refinery primary oil/water/solids separation sludge - Any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to, those generated in: oil/water/solids separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in § 261.31(b)(2) including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and K051 wastes are not included in this listing.	(T)
F038	Petroleum refinery secondary (emulsified) oil/water/solids separation sludge - Any sludge and/or float generated from the physical and/or chemical separation of oil/water/solids in process wastewaters and oily cooling wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in: induced air flotation (IAF) units, tanks and impoundments, and all sludges generated in DAF units. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges and floats generated in aggressive biological treatment units as defined in § 261.31(b)(2) (including sludges and floats generated in one or more additional units) and F037, K048, and K051 wastes are not included in this listing.	(T)
F039	Leachate (liquids that have percolated through land disposed wastes) resulting from the disposal of more than one restricted waste classified as hazardous under subpart D of this part. (Leachate resulting from the disposal of more than one restricted waste classified as hazardous under subpart D of this part. (Leachate resulting from the disposal of one or more of the following EPA Hazardous Wastes and no other Hazardous Wastes retains its EPA Hazardous Waste Number(s): F020, F021, F022, F026, F027, and/or F028.)	(T)

\*(I,T) should be used to specify mixtures containing ignitable and toxic constituents.

**Appendix V - (K Codes)**  
**Specific Source Hazardous Wastes**

Code	Description
K001	Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol.
K002	Wastewater treatment sludge from the production of chrome yellow and orange pigments.
K003	Wastewater treatment sludge from the production of molybdate orange pigments.
K004	Wastewater treatment sludge from the production of zinc yellow pigments
K005	Wastewater treatment sludge from the production of chrome green pigments.
K006	Wastewater treatment sludge from the production of chrome oxide green pigment (anhydrous and hydrated).
K007	Wastewater treatment sludge from the production of iron blue pigments.
K008	Oven residue from the production of chrome oxide green pigments.
K009	Distillation bottoms from the production of acetaldehyde from ethylene.
K010	Distillation side cuts from the production of acetaldehyde from ethylene.
K011	Bottom stream from the wastewater stripper in the production of acrylonitrile.
K013	Bottom streams from the acetonitrile column in the production of acrylonitrile.
K014	Bottoms from the acetonitrile purification column in the production of acrylonitrile.
K015	Still bottoms from the distillation of benzyl chloride.
K016	Heavy ends or distillation residues from the production of carbon tetrachloride.
K017	Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin.
K018	Heavy ends from the fractionation column in ethyl chloride production.
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production.
K020	Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.
K021	Aqueous spent antimony catalyst waste from fluoromethanes production.
K022	Distillation bottom tars from the production of phenol/acetate from cumene.
K023	Distillation light ends from the production of phthalic anhydride from naphthalene.
K024	Distillation bottoms from the production of phthalic anhydride from naphthalene.
K025	Distillation bottoms from the production of nitrobenzene by the nitration of benzene.
K026	Stripping still tails from the production of methyl ethyl pyridines.
K027	Centrifuge and distillation residues from toluene diisocyanate production.
K028	Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane.
K029	Waste from the product steam stripper in the production of 1,1,1-trichloroethane.
K030	Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene.
K031	By-product salts generated in the production of MSMA and cacodylic acid.
K032	Wastewater treatment sludge from the production of chlordane.
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane.
K034	Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane.
K035	Wastewater treatment sludges generated in the production of creosote.
K036	Still bottoms from toluene reclamation distillation in the production of disulfoton.
K037	Wastewater treatment sludges from the production of disulfoton.
K038	Wastewater from the washing and stripping of phorate production.
K039	Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate.
K040	Wastewater treatment sludge from the production of phorate.
K041	Wastewater treatment sludge from the production of toxaphene.
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T.
K043	2,6-dichlorophenol waste from the production of 2,4-D.
K044	Wastewater treatment sludges from the manufacturing and processing of explosives.
K045	Spent carbon from the treatment of wastewater containing explosives.
K046	Wastewater treatment sludges from the manufacturing, formulation, and loading of lead-based initiating compounds.
K047	Pink/red water from TNT operations.
K048	Dissolved air flotation (DAF) float from the petroleum refining industry.
K049	Slop oil emulsion solids from the petroleum refining industry.
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry.
K051	API separator sludge from the petroleum refining industry.
K052	Tank bottoms (leaded) from the petroleum refining industry.
K060	Ammonia still lime sludge from coking operations.
K061	Emission control dust/sludge from the primary production of steel in electric furnaces.
K062	Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332).
K064	Acid plant blowdown slurry/sludge resulting from the thickening of blowdown slurry from primary copper production.
K065	Surface impoundment solids contained in and dredged from surface impoundments at primary lead smelting facilities.
K066	Sludge from treatment of process wastewater and/or acid plant blowdown from primary zinc production.
K071	Brine purification muds from the mercury cell process in chlorine production, in which separately prepurified brine is not used.

### Appendix V - (K Codes) - Continued Specific Source Hazardous Wastes

K073	Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production.
K083	Distillation bottoms from aniline production.
K084	Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.
K085	Distillation or fractionation column bottoms from the production of chlorobenzenes.
K086	Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment use in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead.
K087	Decanter tank tar sludge from coking operations.
K088	Spent potliners from primary aluminum reduction.
K090	Emission control dust or sludge from ferrochromium/silicon production.
K091	Emission control dust or sludge from ferrochromium production.
K093	Distillation light ends from the production of phthalic anhydride from ortho-xylene.
K094	Distillation bottoms from the production of phthalic anhydride from ortho-xylene.
K095	Distillation bottoms from the production of 1,1,1-trichloroethane.
K096	Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane.
K097	Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane.
K098	Untreated process wastewater from the production of toxaphene.
K099	Untreated wastewater from the production of 2,4-D.
K100	Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting.
K101	Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.
K102	Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.
K103	Process residues from aniline extraction from the production of aniline.
K104	Combined wastewater streams generated from nitrobenzene/aniline production.
K105	Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes.
K106	Wastewater treatment sludge from the mercury cell process in chlorine production.
K107	Column bottoms from product separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazines.
K018	Condensed column overheads from product separation and condensed reactor vent gases from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides.
K109	Spent filter cartridges from product purification from the production of 1,1-dimethylhydrazine (UDMH) for carboxylic acid hydrazides.
K110	Condensed column overheads from intermediate separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazides.
K111	Product washwaters from the production of dinitrotoluene via nitration of toluene.
K112	Reaction by-product water from the drying column in the production of toluenediamine via hydrogenation of dinitrotoluene.
K113	Condensed liquid light ends from purification of toluenediamine in production of toluenediamine via hydrogenation of dinitrotoluene.
K114	Vicinals from the purification of toluenediamine in production of toluenediamine via hydrogenation of dinitrotoluene.
K115	Heavy ends from purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitrotoluene.
K116	Organic condensate from the solvent recovery column in the production of toluene diisocyanate via phosgenation of toluenediamine.
K117	Wastewater from the reactor vent gas scrubber in the production of ethylene dibromide via bromination of ethene.
K118	Spent absorbent solids from purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene.
K123	Process wastewater (including supernates, filtrates, and washwaters) from the production of ethylenebisdithiocarbamic acid and its salt.
K124	Reactor vent scrubber water from the production of ethylenebisdithiocarbamic acid and its salt.
K125	Filtration, evaporation, and centrifugation solids from the production of ethylenebisdithiocarbamic acid and its salts.
K126	Baghouse dust and floor sweepings in milling and packaging operations from production or formulation of ethylenebisdithiocarbamic acid and its salts.
K131	Wastewater from the reactor and spent sulfuric acid from the acid dryer from the production of methyl bromide.
K132	Spent absorbent and wastewater separator solids from the production of methyl bromide.
K136	Still bottoms from the purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene.

## **Appendix VI Water Reactive Chemicals**

Some chemicals react with water and produce excessive heat, and flammable or toxic gases. Store under conditions that prevent contact with water. Some examples are listed below.

- Acid anhydrides, e.g., acetic anhydride
- Acid halides, inorganic, e.g., phosphoryl chloride, sulfuryl chloride
- Acid halides, organic, e.g., acetyl chloride
- Alkali metals
- Alkali metal amides
- Alkali metal hydrides
- Anhydrous metal halides, e.g., aluminum trichloride
- Calcium carbide
- Grignard reagents
- Metal alkyls
- Non-metal halides, e.g., boron trifluoride, phosphorous trichloride
- Phosphorous pentoxide
- Sodium dithionite

## **Appendix VII Pyrophoric Chemicals**

Some chemicals react with air and ignite spontaneously. Pyrophorics should be stored in a tight container in an inert atmosphere. Some common examples are listed below.

- Activated zinc
- Butyl lithium
- Diethyl zinc
- Phosphorous
- Raney nickel
- Trimethyl aluminum



## Appendix VIII Explosive/Shock Sensitive Chemicals

Many common laboratory chemicals have the potential for producing a violent explosion when subjected to friction or shock (shock means being struck, vibrated, or agitated). Some examples of shock sensitive chemicals are listed below.

acetylides	fulminating platinum	potassium
aluminum ophorite explosive	gelatinized nitrocellulose	silver acetylide
amatol	guanylidene	silver azide
ammonal	hexanitrostilbene	silver styphnate
ammonium nitrate		silver tetrazene
ammonium perchlorate	mannitol hexanitrate	sodatol
ammonium picrate	mercury oxalate	sodium amatol
ammonium salt lattice	nitroaminotetrazole	sodium dinitro-ortho-cresolate
butyl tetryl	nitrogen tri-iodide	sodium nitrate-potassium
calcium nitrate	nitroglycerin	explosive mixtures
copper acetylide	nitroglycide	sodium picramate
cyanuric triazide	nitroglycol	syphnic acid
cyclotrimethylenetrinitramine	nitroguanidine	tetrazene
dinitroethyleneurea	nitroparaffins	tetranitrocarbazole
dinitroglycerine	nitronium perchlorate	tetrytolhydrazoic acid
dinitrophenol	nitrotoluene	trinitroanisole
dinitrophenolates	nitrourea	trinitrobenzene
dinitrophenyl hydrazine	organic amine nitrates	trinitrobenzoic acid
dinitrotoluene	organic nitramines	trinitrocresol
dipicryl sulfone	organic peroxides	trinitronaphthalene
dipicrylamine	picramic acid	trinitrophenetol
erythritol tetranitrate	picramide	trinitrotoluene
fulminate of mercury	picric acid	tritonol
fulminate of silver	picryl chloride	urea nitrate
fulminating gold	picryl fluoride	
fulminating mercury	polynitro aliphatic compounds	

## Appendix IX Peroxide-Forming Chemicals

Some chemicals react with oxygen to produce potentially unstable chemicals. These chemicals are classified as peroxide formers. Some examples are listed below.

Acrylic acid	4'Ethoxyacetophenone
Allyl ether	p-Ethoxybenzaldehyde
Allyl ethyl ether	o-Ethoxybenzoic acid
Allyl phenyl ether	2-(2-Ethoxyethoxy)ethanol
p-Anisaldehyde	2-(2-Ethoxyethoxy)ethyl acetate
m-Anisaldehyde	p-Ethoxyphenol
m-Anisyl alcohol	Ethylenebis(2-oxyethyl acetate)
Azoxydianisole	Ethyl ether
Benzoin methyl ether	p-Formylphenoxyacetic acid
Benzyl ether	Furan
1,2-Bis(2-chloroethoxy)ethane(pract)	p-Hexyloxybenzaldehyde
Bis(2-ethoxyethyl)adipate	(p-Hydroxyphenoxy)acetic acid
Bis(2-ethoxy ethyl)ether	Isoeugenol
Bis(2-ethoxy ethyl)sebacate	Isopentyl ether
Bis(2-methoxyethoxy)ethane(pract)	Isophorane
Bis(2-methoxyethyl)ether	Isoprene
Bis(pentyloxy)azoxybenzene	Isopropyl ether
p-Bromoanisole	Ligroine
2-Bromoethyl ethyl ether	Methofuran
2-Bromoethyl methyl ether	Methoxyacetic acid
2-Butoxyethanol	p-Methoxybenzylamine
2-(butoxyethoxy)ethyl acetate(pract)	2-Methoxyethanol
t-Butyl ethyl ether	2-(2-Methoxyethoxy)ethanol
t-Butyl methyl ether	2-Methoxyethyl acetate
cyclooctene	2-Methoxyethylamine
Decahydronaphthalene	1-Methoxynaphthalene
1,2-Dichloroethyl ethyl ether	4-Methoxy-2-nitroaniline
2,4-Dichlorophenoxyacetic acid	m-Methoxyphenol
Diethoxymethane	Methoxyphenylacetic acid
2,2-Diethoxypropane	o-Methoxyphenyl isocyanate
Diethyl ethoxymethylene malonate	3-Methoxypropionitrile
2,3-Dihydro2,5dimethoxyfuran(pract)	o-Methoxypropionitrile
Diisobutylene(pract)	o-Nitrophenyl phenylether
2,5-Dimethoxyaniline(pract)	2,5-Norbornadiene
3,4-Dimethoxybenzaldehyde	4,4'-Oxydiphenol
3,3'-Dimethoxy benzidine	p-Pentyloxyaniline
2,4-Dimethoxybenzoic acid	p-Pentyloxybenzaldehyde
4,4-Dimethoxy-2-butanone	p-Pentyloxybenzoylchloride
1,2-Dimethoxyethane	Phenoxyacetic acid
Dimethoxymethane	Phenoxyacetyl chloride
2,2-Dimethoxypropane	m-(m-Phenoxyphenoxy)phenol
2,5-Dimethoxytoluene	Propylether
p-Dioxane	Styrene
1,3-Dioxolane	Tetraethylene glycol
1,2-Epoxy-3-isopropoxypropane	Tetraethyleneglycolmonomethylether
	Trimethoxybenzaldehyde
	Trimethoxypropene
	Vinyl acetate

**Appendix X**  
**Examples of Potentially Incompatible Waste**  
Reference: 40 CFR, Part 264, July 1, 1991.

Many hazardous wastes, when mixed with other waste or materials, can produce effects that are harmful to human health and the environment, such as: (1) heat or pressure, (2) fire or explosion, (3) violent reaction, (4) toxic dusts, mists, fumes, or gases, or (5) flammable fumes or gases.

Below are examples of potentially incompatible wastes, waste components, and materials, along with the harmful consequences that result from mixing materials in one group with materials in another group. The list is intended as a guide to indicate the need for special precautions when managing these potentially incompatible waste materials or components. This list is not intended to be exhaustive.

The generator must adequately analyze wastes to avoid creating uncontrolled substances or reactions of the type listed below, whether they are listed below or not. It is possible for potentially incompatible wastes to be mixed in a way that precludes a reaction (e.g., adding acid to water rather than water to acid), or that neutralizes them (e.g., a strong acid mixed with a strong base), or that controls substances produced (e.g., by generating flammable gases in a closed tank equipped so that ignition cannot occur, and burning the gases in an incinerator). When in doubt, contact EHS for clarification.

In the lists below, the mixing of a Group A material with a Group B material may have the consequence as noted.

**Group 1-A**

Acetylene sludge  
Alkaline caustic liquids  
Alkaline cleaner  
Alkaline corrosive liquids  
Alkaline corrosive battery fluid  
Caustic wastewater  
Lime sludge and other corrosive alkalies  
Lime wastewater  
Lime and water  
Spent caustic

**Group 2-A**

Aluminum  
Beryllium  
Calcium  
Lithium  
Magnesium  
Potassium  
Sodium  
Zinc powder  
Other reactive metals and metal hydrides

**Group 1-B**

Acid sludge  
Acid and water  
Battery acid  
Chemical cleaners  
Electrolyte, acid  
Etching acid liquid or solvent  
Pickling liquor and other corrosive acids  
Spent acid  
Spent mixed acid  
Spent sulfuric acid  
*Potential consequences: Heat generation;  
violent reaction.*

**Group 2-B**

Any waste in Group 1-A or 1-B  
*Potential consequences: Fire or explosion;  
generation of flammable hydrogen gas.*

## Appendix X - Continued Examples of Potentially Incompatible Waste

### **Group 3-A**

Alcohols  
Water

### **Group 3-B**

Any concentrated waste in Groups 1-A or 1-B  
Calcium  
Lithium  
Metal hydrides  
Potassium  
SO<sub>2</sub>Cl<sub>2</sub>, SOCl<sub>2</sub>, PCl<sub>3</sub>, CH<sub>3</sub> SiCl<sub>3</sub>  
Other water reactive waste  
*Potential consequences: Fire, explosion, or heat generation; generation of flammable gases*

### **Group 4-A**

Alcohols  
Aldehydes  
Halogenated hydrocarbons  
Nitrated hydrocarbons  
Unsaturated hydrocarbons  
Other reactive organic compounds  
and solvents

### **Group 4-B**

Concentrated Group 1-A or 1-B wastes  
Group 2-A wastes  
*Potential consequences: Fire, explosion or violent reaction*

### **Group 5-A**

Spent cyanide and sulfide solutions

### **Group 5-B**

Group 1-B wastes  
*Potential consequences: Generation of toxic hydrogen cyanide or hydrogen sulfide gas*

## Appendix XI Sharps Management Chart

The University of Iowa, Environmental Health & Safety

All Sharps must be segregated from other waste. Sharps include contaminated or uncontaminated broken glassware, needles, syringes, scalpel blades, microtome blades, Pasteur pipettes, and razor blades. Special containers, must be used, such as the Winfield Sharps-tainers, in accordance with the type of contamination and needs of the area.

### Management of Sharps Contaminated by a Single Hazard Group

Type of Contamination	Required Container	Required Labeling	Location	Removal by
<b>Uncontaminated</b>				
Glass and/or plastic ware (unbroken or broken)	Kraft cardboard box with liner	Uncontaminated glass or uncontaminated plastic	Wherever convenient; seal when full and place next to regular trash	Custodians
Other uncontaminated sharps	Winfield Sharps-tainer or other red sharps container. Handle as biohazardous waste	Biohazard symbol and the word biohazard	Wherever convenient; seal when full and place next to regular trash	Custodians
<b>Biohazardous only</b>				
Infectious agents/materials, blood, blood products and tissues, recombinant DNA	Winfield Sharps-tainer or other red sharps container	Biohazard symbol	Wherever convenient; seal when full and place next to regular trash	Custodians
<b>Radioactive only</b>				
<90 day half life	Winfield Sharps-tainer or other red sharps container	Radioactive <90 day half life	With other Rad Waste	EHS
>90 day half life	Winfield Sharps-tainer or other red sharps container	Radioactive >90 day half life	With other Rad Waste	EHS
<b>Chemical Hazard only</b>				
Chemical (EPA hazardous waste) sharps, except chemotherapy waste	Winfield Sharps-tainers	Hazardous Waste labels	With other Chemical Waste	EHS
Chemical (Non-EPA hazardous), except chemotherapy waste	Winfield Sharps-tainer or other red sharps container	Biohazard symbol	Wherever convenient; seal when full and place next to regular trash	Custodians
Chemotherapy Waste	White bucket with lid	Hazardous Waste labels and lists	Observe UIHC policy	EHS

### Management of Sharps that have Mixed Hazards

Types of Contamination	Management Methods
Radioactive and Biohazardous	Disinfect with biocide, e.g., bleach, to remove biohazard, then dispose of as radioactive sharps.
Chemical (EPA hazardous waste) and Biohazardous	Disinfect with biocide to remove biohazard, then dispose of as chemical sharps.
Chemical (Non-EPA hazardous) and biohazardous	Dispose of as biohazardous.
Chemical and Radioactive	Package separately in sharps container suitable for long term storage. Label with radioactive waste label and include chemical waste information on back of label. Place package with radioactive waste for removal by EHS.
Chemical, Radioactive and Biohazardous	Disinfect with biocide. See options above for sharps with chemical and radioactive hazards.

## 2.0 UNIVERSAL WASTE – Batteries, Lamps and Mercury Containing Equipment

### 2.1 Introduction

Certain hazardous wastes are regulated by the EPA as universal waste. Universal waste may contain mercury, lead, cadmium, nickel and other hazardous materials. Some examples of universal waste are listed below. The list is not all inclusive. In the State of Iowa, alkaline batteries and incandescent lamps are not considered hazardous or universal waste, and may be thrown away in the regular trash. At this time there is no recycling alternative for alkaline batteries or incandescent bulbs.

### 2.2 Types of Universal Waste

<u>Lamps</u>	<u>Batteries</u>	<u>Mercury Containing Equipment</u>
Compact fluorescent	Car/Automotive	Barometers
Fluorescent	Hearing aid	Blood pressure cuffs
HID	Lead-acid	Mercury switches
High intensity discharge	Lithium ion	Sphygmomanometers
High pressure sodium	NiCad	Thermostats
Mercury vapor	Nickel-cadmium	Thermometers
Metal halide	Nickel metal hydride	
Neon	Rechargeable	
UV lamps	Small sealed lead-acid	

### 2.3 Lamps

#### Containers

- Call General Stores to obtain containers.
- General Stores delivers containers.
- Other containers may be used as long as they are structurally sound and rigid, and can be properly closed so that no lamps can fall out.

#### Labeling and Marking

- Generator of lamps removes or otherwise defaces all existing container labels attached to empty container.
- Generator of lamps attaches a new University of Iowa “Universal Waste-Lamps” label to the container.
- Mark on the label the date the first lamp is placed in the container.
- Mark on the label the name of the building where the lamps container is stored.
- Prior to disposal mark the label with the final lamp count.

- See section 1.4 of this manual for more information on labels. Contact General Stores or EHS to obtain labels. Labels are also available for printing from the EHS Web site.

#### Storage

- Lamps must be placed inside containers.
- All containers must be kept closed at all times, except when adding lamps. Use tape to hold box flaps shut to prevent breakage. New lamp boxes should also be taped shut.
- A tally sheet is used to account for the number of lamps in the container.

#### Disposal

- Containers of lamps must not be stored for longer than 11 months.
- Contact General Stores for pickup not more than 11 months after the date the first lamp is placed in the container, whether the container is full or not.
- General Stores will pick up containers of lamps for disposal.

#### Broken Lamps

- Clean up broken lamps immediately.
- Place broken lamp, and broken lamp parts into a lamp container.

#### Contractors

- A contractor maintaining a piece of equipment that uses a universal waste lamp may take the lamp with them for recycling. The University department contracting the work must ensure that the lamp is properly managed by the contractor.
- Contractors performing demolition and construction work are required to follow University of Iowa procedures for containers, labeling, storage and disposal.
- Contractors that remove lamps during building or equipment maintenance and do not intend to recycle the lamps are required to follow University of Iowa procedures for container labeling, storage and disposal.

## **2.4 Batteries**

#### Containers

- Any structurally sound, rigid container is acceptable.
- Large batteries need not be placed into a container.

#### Labeling and Marking

- Generator of batteries attaches a University of Iowa “Universal Waste-Battery” label to either the container, or directly on large batteries.
- Mark on the label the date the first battery is placed in the container.

- Mark on the label the name of the building where the battery/battery container is stored.
- See section 1.4 of this manual for more information on labels. Contact EHS to obtain labels. Labels are also available for printing from the EHS Web site.

#### Storage

- Small batteries must be placed inside containers.
- Containers must be kept closed at all times, except when adding batteries to container.

#### Disposal

- Containers of batteries must not be stored for longer than 11 months.
- Contact EHS for pickup not more than 11 months after the date the first battery is placed in the container, whether the container is full or not.
- For individual batteries, contact EHS for pickup not more than 11 months after the battery is labeled and dated.
- EHS will pick up batteries/containers of batteries for disposal.

#### Broken/Leaking Batteries

- Clean up broken/leaking batteries immediately.
- Place into a separate container from non-broken/non-leaking batteries.
- Parts and residues of broken/leaking batteries become hazardous waste.
- Label containers with hazardous waste labels supplied by EHS. Labels are also available for printing from the EHS Web site.
- Contact EHS for disposal.

## **2.5 Mercury Containing Equipment**

#### Containers

- Containers are selected based on the type and size of equipment and may vary.
- Small items of mercury containing equipment may be placed in a plastic bag, double bagged, and the bags tied closed.
- Bags must then be placed into a structurally sound, rigid container such as a cardboard box.
- Container must be capable of being closed so that no material can fall out.
- Contact EHS for assistance with selection of containers.

#### Labeling and Marking

- Generator of equipment attaches a University of Iowa "Universal Waste-Mercury Containing Equipment" label to the container.



- Mark on the label the date the first piece of equipment is placed in the container.
- Mark on the label the name of the building where the equipment container is stored.
- See section 1.4 of this manual for more information on labels. Contact EHS to obtain labels. Labels are also available for printing from the EHS Web site.

#### Storage

- Containers must be kept closed at all times, except when adding pieces of equipment to container.
- When appropriate use secondary containment to prevent spills.

#### Disposal

- Containers of equipment must not be stored for longer than 11 months.
- Contact EHS for pickup not more than 11 months after the date the first piece of equipment is placed in the container, whether the container is full or not.
- EHS will pick up mercury containing equipment for disposal.

#### Mercury Spills/Leaking Equipment

- Clean up mercury spills immediately.
- Contact EHS for questions on spill cleanup.
- Place mercury contaminated material into a separate container from non-broken/non-leaking equipment.
- Spill residues are also hazardous waste.
- Label containers with hazardous waste labels supplied by EHS.
- Contact EHS for disposal. Labels are also available for printing from the EHS Web site.

## 3.0 RADIOACTIVE WASTE

### 3.1 Introduction

The University of Iowa generates radioactive wastes as a result of its teaching, research, and patient care activities. The University's Environmental Health & Safety (EHS) manages radioactive isotope use through its Radiation Protection Program, and radioactive waste disposal through its Radiation Waste Management Program. EHS provides technical assistance for generators to comply with regulations and policies.

Radioactive waste disposal is regulated by the Iowa Department of Public Health (IDPH), the Nuclear Regulatory Commission (NRC), and the Environmental Protection Agency (EPA). EPA regulations apply to "mixed waste," i.e., waste that is both radioactive and chemical.

### 3.2 Radioactive Waste Defined

You are required to dispose of all waste that contains or is contaminated with radioactive material as radioactive waste. This means that if a hazardous chemical or biohazardous waste contains or is contaminated with radioactive material, it must be disposed of as radioactive waste.

### 3.3 EHS Responsibilities

#### *Containers*

EHS supplies the following waste container types:

- Dry waste (>90 day half-life)
- Dry waste (<90 day half-life)
- Liquid bottles (1-1/2 gallon)
- LSC Vials
- Bags

#### *Waste Collection*

Radioactive waste is collected in the area where it is generated.

### *Waste Transportation*

Radioactive waste is transported by EHS on a specially designed truck. Waste is inventoried as it is collected and manifested for transportation to storage facilities on the UI Research Campus.

### *Waste Management and Record Keeping*

Each waste item collected by EHS is assigned a serial number, tagged, and tracked in a database. This allows EHS to follow the course of each item through collection, storage, management, and disposal. Waste management methods depend on the waste type and length of the half-life of the radioisotope. Records required by IDPH and EPA are maintained by EHS.

## **3.4 Generator Responsibilities**

### *General Requirements*

The radioactivity in radioactive waste is licensed material, and as such, remains subject to all regulatory requirements. The following guidelines should be observed:

- Keep volumes small; do not let radioactive waste accumulate.
- Place only radioactive waste in radioactive waste containers. Mixing non-radioactive and radioactive waste creates unnecessary hazards and significantly increases disposal cost.
- Label all radioactive waste containers.
- Do not leave radioactive waste in unattended areas. All radioactive wastes must be secured from unauthorized removal.
- Radioactive waste containing biological, pathogenic, or infectious material must be treated to the maximum extent practicable to reduce potential hazards (disinfect with biocide).
- Keep a record of isotope and activity each time waste is placed in waste containers. This will facilitate completing the radioactive waste tag.
- Obtain training – training programs are available through the EHS Web site.

### *Containers*

Collect radioactive waste in the proper containers. Obtain dry waste, LSC vial, and liquid waste containers from EHS. There is no charge for containers supplied by EHS. Sharps containers may be obtained from Biochem Stores and General Stores.

- Keep radioactive waste containers closed unless adding items or materials.
- Radioactive waste must be stored securely at all times to prevent unauthorized removal.

### *Tagging*

Each time you place radioactive waste in its container, enter the radionuclide and activity (in uCi) on the radioactive waste tag provided by EHS. Keep the waste tag attached to the container at all times.

## **3.5 Segregating Radioactive Waste**

Segregate radioactive waste by waste **type** and radioactive **half-life**. Segregation is the responsibility of the generator, and takes place in the work area where the waste is produced.

### *Segregate by Half-Life*

Radioactive waste is separated into two categories based on half-life.

- Short Half-Life = less than 90 days, e.g.,  $I^{125}$ ,  $P^{32}$ ,  $P^{33}$ ,  $S^{35}$
- Long Half-Life = greater than 90 days, e.g.,  $C^{14}$ ,  $Cl^{36}$ ,  $Fe^{55}$ ,  $H^3$

### *Segregate by Waste Type*

There are nine general types of radioactive waste generated at The University of Iowa:

- Aqueous liquid waste
- Animal carcasses
- Dry Waste
- Liquid scintillation vials
- Mixed waste
- Radioactive sharps
- Source vials
- Sealed sources
- Lead shielding

### *Aqueous and Mixed Waste*

When organic solvents or other hazardous chemical wastes are contaminated with radioactive material it is known as mixed waste. Mixed waste must always be segregated from aqueous liquid waste.

- Secondary containment is required.
- Segregate by half-life and, if possible, by radionuclide.
- Keep waste containers closed at all times unless adding or removing waste.
- Do not mix solvents or other chemically hazardous liquid waste with water.
- Do not put solid material in liquid waste containers.
- Avoid overfilling radioactive waste containers – leave at least 3 inches of headspace.
- Do not mark liquid waste containers supplied by EHS. If labeling is necessary, use tape.
- Prior to pickup by EHS, tightly secure container cap, affix a radioactive label to the container, and place the radioactive waste tag under the bottle handle.

### *Animal Carcass Waste*

Animal carcasses also include animal body parts, excreta, and bedding.

- Double-bag using strong polyethylene bags.
- Package in as small a volume as possible.
- Add coagulants or absorbents to reduce liquids.
- Bags should not be punctured and outer bag must be free from blood.
- Securely close and seal bags with tape. Complete the radioactive waste tag prior to pickup by EHS.
- Larger animals may need to be cut into smaller parts.

### *Dry Waste*

Only paper, plastic, and unbroken glass should be placed in dry waste containers. Do not place liquids, lead, needles, razors, broken glass, or other sharps in dry waste containers.

- EHS supplies containers.
- Segregate by half-life. Orange label = <90 days half-life. Red label = >90 days half life.
- Do not overfill containers. Lid must fit snugly to the top of container.
- Deface/obliterate all radioactive symbols and wording on any items placed into a dry waste container.
- Do not put liquids, lead, or sharps into dry waste containers.
- Do not place items in black or colored bags prior to placing inside a dry waste container.

Prior to pickup by EHS, secure the liner and seal with tape. Complete the radioactive waste tag and affix it to the lid of the radioactive waste container.

#### *Liquid Scintillation Vials Waste*

Only LSC vials are to be placed in liquid scintillation vial waste containers. Do not place source vials in liquid scintillation vial waste containers.

- Segregate C<sup>14</sup> and H<sup>3</sup> LSC vials in one container and place all other radionuclide LSC vials in another.
- Use biodegradable liquid scintillation cocktail, such as Econosafe or Ready Safe, whenever possible.
- Avoid overfilling liquid scintillation vial waste containers. Lid must fit snugly on the top of the container.

Prior to pickup by EHS, complete the radioactive waste tag and affix it to the lid of the waste container.

#### *Radioactive Sharps Waste*

Radioactive sharps are to be placed only into sharps containers – not dry waste containers.

- Collect only in containers designed to hold sharps. These are available from Biochem Stores or General Stores.
- Affix a radioactive warning label to any sharps container used to dispose of radioactive waste.
- Do not overfill containers.
- Segregate radioactive sharps by half-life.

Prior to pickup by EHS, tape the lid securely to container, and complete the radioactive waste tag and affix to the sharps container.

#### *Source Vials*

- Vials containing liquid are not to be placed in radioactive waste containers. Attach a tag directly to the source vial and shield, prior to pickup by EHS.
- Empty vials must have the label and markings obliterated, and must be removed from lead shielding. Dispose of empty vials in the radioactive dry waste.

#### *Sealed Sources*

Do not dispose of licensed or generally licensed sealed sources in any EHS radioactive waste container. Sealed sources do not require further packaging if they are not leaking. If a sealed source is leaking, contact the Radiation Protection Section of EHS at 335-8501 for assistance.

#### *Lead Shielding*

Do not place lead shielding in radioactive waste containers. To prepare shielding for pickup by EHS:

- Remove from outer plastic containers, if applicable.
- Perform a contamination survey.
- Complete and attach a radioactive waste tag.

Do not accumulate large quantities of lead in your lab.

### 3.6 Requirements for Waste Pickup

Radioactive waste will **not** be collected until you have performed the following:

- Checked the outer surface of the waste container for contamination.
- Completed a radioactive waste tag for each container or sealed source.
- Sealed all containers appropriately.
- Completed an online radioactive waste pickup request.

#### *Check for Contamination*

Perform a wipe test of the entire surface of the external container.

- Count the wipe in a scintillation counter or gamma counter.
- If the result is  $>22$  dpm/cm<sup>2</sup>, decontaminate, re-wipe and count.
- If the result is  $<22$  dpm/cm<sup>2</sup> check the “yes” box found on the radioactive waste tag.

#### *Completing a Radioactive Waste Tag*

EHS provides tags for identifying the contents of radioactive waste. You will need to know the identity of all radionuclides and their activity in order to complete the waste tag.

- Dry waste activities are estimated by the user and may be based on the general rule that about 10-20% of the activity used in an experiment ends up as solid waste.
- Liquid waste activities should be determined by counting a sample of the waste in a scintillation counter or gamma counter.

The waste tag must be completed in full and in pencil.

### Radioactive Waste Tag Front

The form is yellow and contains the following sections:

- Top corners: "Complete in Pencil" and "Complete in Pencil"
- Center: "CAUTION: RADIOACTIVE MATERIAL" with a radiation symbol.
- Below symbol: "PROPERTY OF THE UNIVERSITY OF ILLINOIS"
- Below property: "Date Application # \_\_\_\_\_" and "Activity (uCi) \_\_\_\_\_"
- Below activity: Four horizontal lines for identifying radionuclides.
- Below lines: "SPECIAL PRECAUTIONS \_\_\_\_\_"
- Below precautions: "External Removable Radioactive Contamination:  YES  NO"
- Below contamination: "Date: \_\_\_\_\_ Dept: \_\_\_\_\_"
- Below date: "Bldg: \_\_\_\_\_ Room#: \_\_\_\_\_"
- Below room: "Name: \_\_\_\_\_"
- Bottom: "For Liquid and Scintillation Fluids Also Complete Reverse Side"

- Enter the PI's authorization number
- Identify each radionuclide and its activity in uCi.
- Complete a wipe test of the outer container and indicate results
- Enter date department, room number, building and your name

### Radioactive Waste Tag Back

The form is yellow and contains the following sections:

- Top left: "CHEMICAL COMPOSITION"
- Top center: "List the chemical constituents and percent composition contained in the liquid or scintillation fluid"
- Table with 4 columns: "Chemicals", "%", "pH", "Aqueous"
- Table with 10 rows.
- Bottom right: "pH of Aqueous \_\_\_\_\_"

It is only necessary to complete the back of the radioactive waste tag if the waste is a liquid.

- Identify each chemical component and its percentage – this must equal 100%.
- Do not abbreviate chemical names.
- Indicate pH if waste is aqueous.
- If waste is a liquid scintillation cocktail – identify the brand name.

### Radioactive Waste Pickup Request

The waste generator must request a waste pickup from EHS. Waste pickup requests are now taken online. Visit the EHS Web site to complete an online radioactive waste pickup request.



*What if Your Waste is Not Removed?*

If EHS cannot complete a pickup, a note (see below) will be left explaining the reasons. Deficiencies should be corrected and another pickup scheduled.

The University of Iowa Environmental Health & Safety Radioactive Waste Management Program	Date: _____ Time: _____ Location: _____
We were unable to remove your waste because:	
<u>Container Issues</u>	
<input type="checkbox"/> Insufficient head-space in the container.	
<input type="checkbox"/> Container is incompatible with waste type.	
<input type="checkbox"/> Container closure is broken or inappropriate.	
<input type="checkbox"/> Container is contaminated with chemical residue.	
<u>Tag Issues</u>	
<input type="checkbox"/> A radioactive waste tag must be attached to each container.	
<input type="checkbox"/> Contents of container do not appear to match label.	
<input type="checkbox"/> Tag is incomplete. (All isotopes/ingredients must be listed. All ingredients must total 100%.)	
<input type="checkbox"/> Please identify the scintillation fluid used.	
<input type="checkbox"/> External Removable Radioactive Contamination box is unchecked.	
<input type="checkbox"/> External Removable Radioactive Contamination box is $>22\text{dpm}/\text{cm}^2$ .	
<input type="checkbox"/> Additional information is needed; EHS references do not show what _____ is.	
<input type="checkbox"/> pH must be listed for aqueous mixtures.	
<input type="checkbox"/> Could not read tag.	
<u>Other Issues</u>	
<input type="checkbox"/> The area was locked.	
<input type="checkbox"/> Nobody was present and we could not locate the waste.	
<input type="checkbox"/> There are more items than EHS can remove at this time.	
<input type="checkbox"/> This pickup will be classified as a lab cleanout.	
<input type="checkbox"/> EHS cannot remove unknowns.	
<input type="checkbox"/> (Visit <a href="http://research.uiowa.edu/ehs/">http://research.uiowa.edu/ehs/</a> )	
<input type="checkbox"/> Other: _____	
Please contact the person below for more information or to discuss any questions and to reschedule your pickup.	
Name: _____ Phone: _____	
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### **3.7 Waste Minimization**

- Avoid ordering and storing more radioactive material than is actually needed.
- Do not place items that are not radioactive or contaminated in radioactive waste containers.
- Replace xylene and toluene based liquid scintillation cocktail with ones that are biodegradable.

Section 3.0 Radioactive Waste

### 3.8 Sharps Management Chart

The University of Iowa, Environmental Health & Safety

All Sharps must be segregated from other waste. Sharps include contaminated or uncontaminated broken glassware, needles, syringes, scalpel blades, microtome blades, Pasteur pipettes, and razor blades. Special containers such as the Winfield Sharps-tainers must be used, in accordance with the type of contamination and needs of the area.

#### Management of Sharps Contaminated by a Single Hazard Group

Type of Contamination	Required Container	Required Labeling	Location	Removal by
<b>Uncontaminated</b>				
Uncontaminated sharps (broken glass or other)	Winfield Sharps-tainer or other red sharps container. Handle as biohazardous waste.	Biohazard symbol and the word biohazard	Seal and place into red plastic biotub in designated building location.	Custodians
<b>Biohazardous only</b>				
Infectious agents/materials, blood, blood products and tissues, recombinant DNA	Winfield Sharps-tainer or other red sharps container	Biohazard symbol	Seal and place into red plastic biotub in designated building location.	Custodians
<b>Radioactive only</b>				
<90 day half life	Winfield Sharps-tainer or other red sharps container	Radioactive <90 day half life	With other Rad Waste	EHS
>90 day half life	Winfield Sharps-tainer or other red sharps container	Radioactive >90 day half life	With other Rad Waste	EHS
<b>Chemical Hazard only</b>				
Chemical (EPA hazardous waste) sharps, except chemotherapy waste	Winfield Sharps-tainers	Hazardous Waste labels	With other Chemical Waste	EHS
Chemical (Non-EPA hazardous), except chemotherapy waste	Winfield Sharps-tainer or other red sharps container	Biohazard symbol	Wherever convenient; seal when full and place next to regular trash	Custodians
Chemotherapy Waste	Observe UIHC policy	Observe UIHC policy	Observe UIHC policy	UIHC

#### Management of Sharps that have Mixed Hazards

Types of Contamination	Management Methods
Radioactive and Biohazardous	Disinfect with biocide, e.g., bleach, to remove biohazard, then dispose of as radioactive sharps.
Chemical (EPA hazardous waste) and Biohazardous	Disinfect with biocide to remove biohazard, then dispose of as chemical sharps.
Chemical (Non-EPA hazardous) and biohazardous	Dispose of as biohazardous.
Chemical and Radioactive	Package separately in sharps container suitable for long term storage. Label with radioactive waste label and include chemical waste information on back of label. Place package with radioactive waste for removal by EHS.
Chemical, Radioactive and Biohazardous	Disinfect with biocide. See options above for sharps with chemical and radioactive hazards.

## **4.0 BIOHAZARDOUS WASTE**

### **4.1 Introduction**

The University of Iowa's Biohazardous Waste Management Plan has been prepared in accordance with DOT, EPA, OSHA and State of Iowa regulations. At The University of Iowa, most biohazardous waste is transported off-site for disposal in red polyethylene Rubbermaid containers.

### **4.2 Biohazardous Waste Defined**

Biohazardous waste typically includes waste containing pathogens with sufficient virulence and quantity so that exposure to the waste by a susceptible host could result in an infectious disease. The University of Iowa also includes other types of waste from medical areas, patient care, and research as described below.

### **4.3 Biohazardous Waste Types**

1. Cultures, stocks of infectious agents and associated biologicals, including but not limited to:
  - Specimens from medical, pathology and research laboratories
  - Disposable culture dishes
  - Devices used to transfer, inoculate, and mix cultures
  - Wastes from the production of biologicals
  - Discarded live and attenuated vaccines
2. Human blood, blood products, and body fluids.
3. All sharps (contaminated and uncontaminated) such as:
  - Needles and syringes
  - Scalpels, razors and microtome blades
  - Pasteur pipettes
  - Slides and cover slips
  - Shards of contaminated broken glass
4. Animal carcasses, body parts, and bedding from animals exposed to pathogens in research.
5. Other laboratory waste including but not limited to:
  - Specimen containers
  - Disposable gloves, lab coats, masks and aprons
  - Disposable pipettes
  - All cell culture materials
  - All microorganisms constructed using recombinant DNA
6. All materials that have been steam sterilized.

Biohazardous waste that is contaminated with radioactive materials must be managed as radioactive waste through EHS. Refer to the section on radioactive waste. Biohazardous waste that is contaminated with chemicals that are EPA hazardous wastes must be disposed of as hazardous waste. Refer to the section on hazardous waste.

#### **4.4 Handling Biohazardous Waste**

Waste must be segregated at the point of origin by the generator. Culture plates and vials containing pathogenic organisms must be autoclaved prior to disposal, using autoclavable bags (orange or red). Place in a redbag-lined biohazard container after autoclaving. Do not use the biohazard box's red liner for autoclaving.

Prior to disposal waste must be placed directly into the redbag-lined Rubbermaid transport containers.

*Contaminated sharps* must be placed in a red sharps container or a Winfield Sharps-tainer.

*Animal carcasses, body parts, and bedding* from animals exposed to pathogens should be disposed of in accordance with the Office of Animal Resources (OAR) procedures. Call OAR for information at 335-7985.

*Human tissues and body parts* are disposed of in the Anatomy crematory. Call the Deeded Body Program of Anatomy Coordinator at 335-7762.

*Human blood, blood products and body fluids* greater than 500 ml must be solidified with a product such as Isolyzer and placed in a biohazard box (white with a red plastic liner). Amounts less than 500 ml may be disinfected with a bleach solution (1:10 final dilution) and sewerred.

#### **4.5 Uncontaminated Waste**

*Uncontaminated sharps* must also be placed in a red sharps container or a Winfield Sharps-tainer.

*Uncontaminated plastics* are discarded in the regular trash, or recycled where that option is available.

*Uncontaminated, unbroken glassware* is discarded by placing it in a sturdy cardboard box and marking it as uncontaminated, unbroken glass. Broken glassware must be managed as sharps.

## 4.6 Preparing for Pickup

Properly packaged and labeled waste will be removed by Custodians. Place containers in the locally designated area for removal.

In order to comply with Dept. of Transportation shipping regulations the laboratory or staff that generates the biohazardous waste must prepare their waste for disposal as follows:

- All biohazardous waste, including white biohazard boxes and sharps containers, must be placed in a red plastic biowaste tub lined with red bag.
- To avoid puncturing the red bag tub liner, do not overfill tub.
- Tie the red bag liner closed using a single “gooseneck” knot (do not use tape or zip ties).
- Attach a fully completed Biohazardous Waste Certification label sticker to the side of the biowaste tub.
- Custodians will not remove biowaste tubs unless a completed Biohazardous Waste Certification label is attached to the tub.

A copy of Biohazardous Waste Generator Procedures is attached which details the required steps for preparing biohazardous waste tubs for disposal. Please share this information with other staff members in your area. If you have any questions please call Jim Pyrz at 335-4625.

### Frequently Asked Questions:

#### *Where Do I Obtain Biohazard Waste Certification Labels?*

- Labels may be obtained at select departmental offices.
- Labels may be obtained at Biochem Stores.
- Labels may be found at locations on dock areas where red tubs are stored.
- Labels may always be obtained by calling EHS at 335-8501 and requesting them.

#### *Where Do I Obtain Red Plastic Biowaste Tubs?*

- Red plastic biowaste tubs are kept in the dock areas of BSB, MEB, BB, Pharmacy, DSB and Chemistry. Large red bags to line the tubs are also available at those locations and must be used for that purpose. For other locations, contact EHS at 335-8501.
- Laboratory staff are responsible for obtaining the above containers, as needed.

#### *Where Do Filled Biowaste Tubs Go? Who Handles Them?*

- Laboratory staff should place properly filled/tied/labeled biowaste tubs in the same location as in the past.

- Custodians will transfer the filled tubs displaying a completed Biohazardous Waste Certification label to an area for removal.

*What Are the Container Labeling Requirements?*

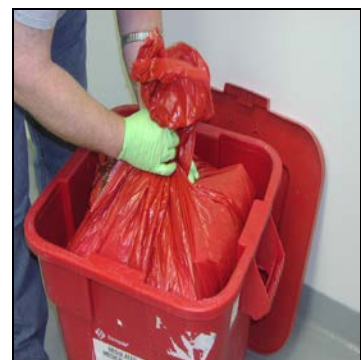
- Laboratory staff must place all biohazardous waste materials in red plastic biowaste tubs, i.e., red bag, biowaste box, sharps container.
- Laboratory staff must complete and attach the Biohazardous Waste Certification label to the side of the biowaste tub, near the handle.
- Custodians will place a bar code on the tubs to identify the building.

#### 4.7 Biohazardous Waste Tub Closing Instructions

It is important to follow these instructions in order to comply with U.S. DOT hazardous material shipping regulations.



**Line biohazardous waste tubs with a red liner.**



**Whether a sharps container, box, or loose waste, all biohazardous waste must be in a red bag. Do not overfill bags.**



All bags must be tied with a single knot, also known as a “goose-neck” knot, so that no waste can fall out of the bag if it is inverted. Bunch up and twist bag at top. Loop twisted bag under and through to complete knot. Pull tight.

**Place lid on biohazardous waste tub before moving.**

#### 4.8 Labeling Instructions



**Biohazardous Waste Certification**

*This sticker must be completed and attached to the side of the biohazardous waste container before the container can be removed for shipment. The contracting company autoclaves the contents prior to final disposal.*

The individual signing below certifies that this contains only biohazardous waste, the red bag liner is tied with a goose-neck knot, and the container is closed appropriately\*:

Printed Name \_\_\_\_\_

Signature \_\_\_\_\_

Room # \_\_\_\_\_ Bldg \_\_\_\_\_ Date \_\_\_\_\_

\*\*\*\*\*

\*See the Biohazard Waste Guidelines: instruction to close biowaste containers, look under: "Preparing for Pickup" at: <https://research.uiowa.edu/ehs/files/documents/waste/biowaste.pdf>. For instructions on the proper way to close biohazardous waste tubs, see <https://research.uiowa.edu/ehs/files/documents/waste/biowastetubclosing.pdf>.

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- Complete the Biohazardous Waste Certification label (requires printed name, signature, room, building, and date).
- Remove one-half of the label-backing only.
- Stick the signed and dated label on the side of the tub next to a handle. Custodians will not remove containers without the completed Biohazardous Waste Certification label.

#### 4.9 Ordering Sharps Containers

Containers are available from Biochem Stores, General Stores and Chemistry Stores.



#### 4.10 Sharps Management Chart

The University of Iowa, Environmental Health & Safety

All Sharps must be segregated from other waste. Sharps include contaminated or uncontaminated broken glassware, needles, syringes, scalpel blades, microtome blades, Pasteur pipettes, and razor blades. Special containers such as the Winfield Sharps-tainers must be used, in accordance with the type of contamination and needs of the area.

##### Management of Sharps Contaminated by a Single Hazard Group

Type of Contamination	Required Container	Required Labeling	Location	Removal by
<b>Uncontaminated</b>				
Uncontaminated sharps (broken glass or other)	Winfield Sharps-tainer or other red sharps container. Handle as biohazardous waste.	Biohazard symbol and the word biohazard	Seal and place into red plastic biotub in designated building location.	Custodians
<b>Biohazardous only</b>				
Infectious agents/materials, blood, blood products and tissues, recombinant DNA	Winfield Sharps-tainer or other red sharps container	Biohazard symbol	Seal and place into red plastic biotub in designated building location.	Custodians
<b>Radioactive only</b>				
<90 day half life	Winfield Sharps-tainer or other red sharps container	Radioactive <90 day half life	With other Rad Waste	EHS
>90 day half life	Winfield Sharps-tainer or other red sharps container	Radioactive >90 day half life	With other Rad Waste	EHS
<b>Chemical Hazard only</b>				
Chemical (EPA hazardous waste) sharps, except chemotherapy waste	Winfield Sharps-tainers	Hazardous Waste labels	With other Chemical Waste	EHS
Chemical (Non-EPA hazardous), except chemotherapy waste	Winfield Sharps-tainer or other red sharps container	Biohazard symbol	Wherever convenient; seal when full and place next to regular trash	Custodians
Chemotherapy Waste	Observe UIHC policy	Observe UIHC policy	Observe UIHC policy	UIHC

##### Management of Sharps that have Mixed Hazards

Types of Contamination	Management Methods
Radioactive and Biohazardous	Disinfect with biocide, e.g., bleach, to remove biohazard, then dispose of as radioactive sharps.
Chemical (EPA hazardous waste) and Biohazardous	Disinfect with biocide to remove biohazard, then dispose of as chemical sharps.
Chemical (Non-EPA hazardous) and biohazardous	Dispose of as biohazardous.
Chemical and Radioactive	Package separately in sharps container suitable for long term storage. Label with radioactive waste label and include chemical waste information on back of label. Place package with radioactive waste for removal by EHS.
Chemical, Radioactive and Biohazardous	Disinfect with biocide. See options above for sharps with chemical and radioactive hazards.