HAZARDOUS WASTE DISPOSAL PROCEDURES

These guidelines are intended to ensure that hazardous wastes generated on campus are properly disposed and managed according to federal regulations.

The United States Environmental Protection Agency (US EPA) regulates hazardous waste management with statutes found in 40 CFR 260-270. Environmental Health and Safety (EH&S) coordinates disposal of chemical waste from University facilities and operations. EH&S provides waste disposal services to the University community at no cost to the waste generator. Therefore, waste generators are encouraged to properly manage all of their chemical waste and should not accumulate waste in the laboratory for more than six months.

Some common wastes generated on campus include (but not limited to):

- Unused chemicals that are no longer needed
- Expired chemicals
- Process wastes
- Broken mercury thermometers, mercury containing devices, heavy metals
- Spent acids, bases, and solvents which are used in laboratory procedures
- Oil based paints, aerosol cans, pesticides
- Oils (motor, cutting, pump, lubricating, etc.)

The following guidelines apply to chemical wastes generated by University operations. These guidelines do not apply to biohazardous/red bag waste or radioactive wastes.

In order to properly manage waste chemicals, the waste generator should be familiar with:

1. **Hazardous waste characterization**
2. **Waste container management**
3. **Waste packaging**
4. **Proper labeling**
5. **University chemical waste pick up procedures**

1. Hazardous Waste Characterization

1.1 Characteristic Hazardous Wastes

Wastes exhibiting any of the characteristics listed below are hazardous:

1.1.1 Ignitability (EPA Waste Code – D001)

- liquids with a flashpoint below 140° F
- solids capable under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard
- ignitable compressed gases
- oxidizers

1.1.2 Corrosivity (EPA Waste Code - D002)

- aqueous solutions with a pH ≤ 2 or pH ≥12.5
- liquids that corrode steel at a rate > ¼" per year at 130°F

1.1.3 Reactivity (EPA Waste Code – D003)

- a substance that is normally unstable and readily undergoes violent change without detonating
- a substance that reacts violently with water
- a substance that forms potentially explosive mixtures with water
- a substance, when mixed with water generates toxic gases, vapors or fumes
- a cyanide or sulfide bearing waste which generates toxic gases or vapors when exposed to pH conditions between 2 and 12.5
- a substance capable of detonation if heated under confinement
- a substance readily capable of detonation or decomposition at standard temperature and pressure
- a forbidden explosive

1.1.4 Toxicity (EPA Waste Codes D004 – D043)

- a waste that exhibits the characteristic of toxicity using the Toxicity Characteristic Leaching Procedure (TCLP) test. This characteristic group includes certain heavy metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver) and/or one or more of 23 organics and eight pesticides.

1.2 Listed Hazardous Waste

There are over 500 individual materials that are specifically listed by the US EPA as listed hazardous waste.

1.2.1 F–Listed Hazardous Waste

- hazardous wastes from non-specific sources, including spent solvents

1.2.2 K–Listed Hazardous Waste

- hazardous wastes from specific sources

1.2.3 P–Listed (Acute) Hazardous Waste

- discarded commercial chemical products, off specification products, certain container residues and spill residues

1.2.4 U-Listed (Toxic) Hazardous Waste

- off-specification commercial chemical products, chemical intermediates, commercial chemical products

Once a material has no further use, it typically becomes subject to the hazardous waste regulations. Discharging wastes and chemicals to the sanitary sewer is strictly prohibited. Please contact EH&S (412-624-9505) to make a waste determination prior to discharging any chemicals to the sewer system.

1.3 Mixed Wastes

Mixed wastes are biological and/or radioactive wastes that are also hazardous chemical wastes. Biological and radioactive waste regulations differ from the regulations associated with hazardous wastes. Therefore, disposal of mixed wastes presents EH&S with a variety of disposal issues including more stringent regulations and substantial increases in disposal costs. Every effort should be made to avoid generating mixed wastes. If a mixed waste is generated, both EH&S and Radiation Safety should be contacted to determine appropriate disposal procedures.

2. Waste Container Management

All waste should be collected in a container that is in good condition and appropriate for the waste type. Containers which show signs of rust, dents, or deterioration should not be used. The container must be compatible with the material stored in it, and it should be capped at all times, except when adding wastes. Funnels should never be left in a waste container. Containers should be dated with the appropriate Start Date immediately upon adding waste to the container. Full containers should not be stored in the laboratory for excessive periods of time.

Generally, the original container is acceptable to be used to collect waste. If you generate large quantities of waste, a five-gallon container may be used to collect the waste.

Containers should be closed at all times. Do not leave funnels in waste containers.

2.1 General Container Specifications

- the container should be in sound condition
- the outside of the container should be clean and uncontaminated
- the container and cap should be compatible with the waste
- the container should allow for proper headspace expansion; 1.5 inches for flat top containers, 3 inches for tapered containers
- the container should be labeled properly

2.2 Container Selection

- Flammable liquids: glass bottles, high density plastic containers
- Acids and bases: original “acid” or “base” bottles, no metal containers
- Aqueous solutions: glass bottles, high density plastic containers
- Trace contaminated solid waste: 4-6 mil polyethylene bags (double bagged)
- Hydrofluoric acid: plastic, polyethylene, Teflon bottle with plastic screw-on cap

3. Packaging

3.1 Packaging

- Waste chemicals should be segregated and packed in sturdy cardboard boxes
- Five-gallon solvent containers do not need to be overpacked
- Packaging should be done to minimize the possibility of breakage or leakage during handling (all bottles should be tightly capped)
- Bottles should be placed upright in the box
- The space between the bottles should be filled with a cushioning material to prevent movement during handling (paper towels, newspaper, vermiculite)
- Do not place any Chemical Waste in Biological Waste containers (bags, boxes, etc.)
- All bottles, containers, or bags of waste should be individually labeled
- Total weight of each individual box should not exceed 35 pounds

4. Proper Labeling

All chemicals should be labeled and identified. Wastes should be accurately labeled to ensure safety, to prevent waste from becoming an unknown, for regulatory compliance, and to improve the efficiency of handling. An orange "WASTE CHEMICALS" label should be filled out completely and placed on the bottle (do not cover the original label, where applicable). The completed label must be placed on the bottle when starting to accumulate waste.

4.1 Label Contents

The label should include the following:

- the common chemical name (no formulas, abbreviations, or nomenclature)
- quantity of material
- the major hazard of the material
- name of person preparing the chemical for disposal, department name, and telephone number in case there are questions associated with the material
- the start date when waste is first added to the container

Be sure to list all known individual chemical constituents for each container (do not label as "solvent waste", "halogenated waste", "solid waste", "aqueous waste", etc.).

4.2 Unknowns

Try to avoid generating "unknown" wastes by adhering to proper labeling procedures. If unknowns are discovered, it may be possible to determine the identity by:

- reviewing past and current projects being worked on in the laboratory
- asking questions to co-workers
- identifying the pH
- contacting EH&S for assistance with identification

5. University Waste Pick-up Procedures

The University is classified as a Large Quantity Generator (LQG) and EH&S is required to remove all generated wastes within 90 days of receipt.

Waste chemicals are picked up from University buildings on a bi-weekly schedule. The schedule of pick-ups is every second Friday, starting at approximately 8:00 AM and proceeding until completion. In the event of a University holiday falling upon a pick-up day, the pick-up will be rescheduled for another date. See EH&S website for the current chemical waste pick-up schedule.

Waste should be taken to the collection points prior to the scheduled pick-up. Contact EH&S for locations of designated collection points. If your building does not have a designated collection point, pick-up arrangements can be made by contacting EH&S.

6. Source Reduction/Waste Minimization

These guidelines are intended to ensure that chemical users on campus are aware of the importance of source reduction and waste minimization. Benefits of source reduction/waste minimization include increased safety of personnel, reduced risk of environmental contamination, and a decrease in waste disposal expenditures.

The University generates a significant quantity of chemical waste. EH&S has prepared and implemented a source reduction strategy which describes ways to reduce or eliminate the amount or toxicity of waste.

The following minimization activities are utilized to help reduce the amount and/or toxicity of wastes:

- **Product Substitution –** EH&S advocates the use of less hazardous or non-hazardous materials. Examples include substitution of enzymatic cleaners and detergents in place of chromic acid cleaning solutions; replacement of flammable and/or toxic solvents with water-based materials; exchanging mercury thermometers for spirit-filled, glycol-filled, or electronic thermometers; the use of latex paints in place of oil-based paints; the use of non-halogenated solutions in degreasing operations; the substitution of non-mutagenic, less toxic DNA stains (e.g. SYBR Safe, GelRed, etc.) for ethidium bromide-based stains; and the procurement/use of disinfectants and cleaners in reduced concentrations.
- **Microscale Chemistry –** Experimental techniques can be scaled down when possible to reduce or eliminate waste.
- **One More Step –** When possible, reactions are taken one more step, if the additional step will result in a less hazardous material without an increased safety risk. [Refer to *Destruction of Hazardous Chemicals in the Laboratory* by George Lunn & Eric Sansone, 3rd Edition, 2012 (Wiley) or *Hazardous Laboratory Chemicals Disposal Guide* by Margaret-Ann Armour, 3rd Edition, 2003 (CRC Press)].

- **Waste Segregation –** Appropriate waste segregation is encouraged. Mixed wastes are costly and sometimes difficult to dispose (e.g., small amounts of mercury contamination within a waste solution may necessitate handling the entire solution as mercury contaminated waste). The same principle applies to keeping hazardous waste streams separate from non-hazardous waste streams.
- **Education** – All chemical users are required to attend Chemical Hygiene training upon initial employment and at least once every three (3) years thereafter. EH&S provides continuously updated guidance on how to minimize or eliminate the volumes of wastes which are produced in laboratories.
- **Inventory** – Maintain a current, accurate inventory of chemicals. Ensure that all containers are accurately labeled to ensure that unknown chemical wastes are not generated.
- **Chemical Sharing** – Share chemicals and costs for large-volume chemical orders within the same respective department or building to avoid the potential for excess chemical ordering by individual laboratories. Obtain unexpired chemicals from other departmental labs that no longer have use for them.
- **Chemical Redistribution** – The EH&S Chemical Redistribution Program is provided for the donation/acquisition of unused surplus chemicals.
- **Chemical Usage** – Use older chemicals first (unless expired) prior to using newer ones to avoid chemical accumulation in the laboratory and the potential for future chemical waste generation via out-of-date chemical disposal.
- **Purchasing Practices** – To avoid the generation of excess, unused chemicals, faculty and staff are advised to only purchase the amounts of chemicals needed. Shipments from University-preferred vendors (e.g. Fisher Scientific, Sigma-Aldrich, etc.) are expedited to ensure fast delivery/receipt so labs do not have to maintain large chemical quantities.
- **Silver Recovery** – Encourage staff utilizing photographic processing to employ the use and continuous maintenance of silver recovery units, thereby eliminating the generation and collection of silver-containing fixer waste.
- **Other Techniques –** Elementary chemical neutralization, solvent redistillation, improved inventory control practices, and good management and training are all techniques which can be utilized to minimize waste.