Hazardous Waste Manual

Wichita State University
Environmental, Health & Safety Department

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1.0 Introduction

The guidance in this manual has been established to protect the health and safety of all personnel on campus and to meet hazardous waste management regulatory requirements.

The U.S. Environmental Protection Agency (EPA), and Kansas Department of Health and Environment (KDHE), regulate the generation, storage, and disposal of hazardous waste chemicals. These regulations apply to all hazardous waste generated by Wichita State University and impose specific requirements on all waste generators.

The Department of Environmental Health and Safety (EHS) provides the hazardous waste chemical management and disposal services for all Wichita State University main campus operations. Staff at outlying facilities must comply with the same federal and state regulations, and should contact EHS for questions about managing hazardous waste at their facilities.

In order for all campus personnel to properly dispose of hazardous wastes generated in their respective work areas, they must make accurate waste characterizations and disposal determinations. Guidance for making these characterizations, determinations, and their required waste management activities is provided in this document.

2.0 Responsibilities

Every student, staff, and faculty member is morally and legally responsible for ensuring the proper disposal of hazardous waste generated on campus. Various state and federal regulations govern the disposal of chemical wastes. There are also criminal and civil penalties that can result from improper disposal of these wastes. In addition to potential citations, fines, and imprisonment, improper waste disposal can also result in national media attention and damage to the University's reputation.

Willfully and knowingly violating federal or state regulations can result in criminal or civil prosecution of the individual.

University policies for environmental compliance can be found in Chapter 10 of the "Wichita State University Policies and Procedures Manual": https://www.wichita.edu/about/policy/index.php.

2.1 Liability

Individuals who knowingly choose to ignore the regulations may face civil or criminal proceedings by state or federal agencies.

2.2 Penalties

EPA regulators are authorized to fine non-compliances at a rate up to $37,500 per violation per day of occurrence. In general, EPA fines are much larger than any other federal agency.

Waste generators that fail to follow the EHS hazardous waste requirements are liable for the costs created by the disposal of their wastes, in addition to any regulatory fines that may be incurred.

2.3 Waste Generator Responsibilities

Individual investigators, supervisors, workers, students, laboratory staff, visitors, etc. are considered the actual originators (generators) of these regulated materials. Therefore, it is the responsibility of each generator to identify all hazardous wastes that he or she might be producing, and to assure the waste is handled in a manner consistent with the EHS requirements listed in this document.

Where EHS requirements identify solvents that must be collected separately for distillation and reuse, the waste generator must make every effort to segregate those solvents from their regular hazardous waste collection containers.

2.4 Principal Investigators / Functional Supervisors Responsibilities

For laboratories, the principal investigator (PI) or his/her designee, and for other campus work areas, the functional supervisor, have the responsibility to ensure the personnel working under their direction follow all policies and procedures established in this manual. General responsibilities include:

- Attending Chemical Waste Disposal Training
- Proper identification and labeling of chemicals.
- Collecting all chemical wastes in accordance with established guidelines.
- Cleaning up incidental spills (with the proper training and spill equipment).
- Maintaining good housekeeping in waste generation areas.

2.5 Students / Employees Responsibilities

Wichita State University students and other university personnel working with hazardous chemicals must follow the requirements and guidelines presented in this manual. These responsibilities include:

- Attending Chemical Waste Disposal Training - either live or online.
- Proper identification and labeling of chemicals.
- Collecting all chemical wastes in accordance with established guidelines.
- Identifying all spent or surplus materials using the technical knowledge within the department.
- Packaging, labeling, and storing all chemical wastes in accordance with established guidelines.
- Consulting with supervisors and/or EHS regarding the safe handling and proper disposal of hazardous waste
- Chemicals when they are unsure or have questions.

2.6 EHS Responsibilities

Wichita State University is registered with the EPA as a Large Quantity Generator (LQG) of hazardous waste. The Environment, Health & Safety department is responsible for administering WSU's chemical waste management program and establishing policies and procedures for proper chemical waste management.

Elements of the chemical waste management program include:

- Developing a written Hazardous Waste Disposal Manual and an online program detailing university policies related to hazardous waste and material management.
- Developing and maintaining a RCRA Contingency Plan for the campus.
- Providing waste management training to all required campus personnel. Training will be tailored to meet both federal and state requirements. The level of training required for trainees is a direct function of the work related to waste management.
- Acting as an information resource for campus personnel with hazardous waste related questions.
- Providing pickup and transport of chemical hazardous waste from campus Satellite Accumulation Areas to the campus main 90 Day Accumulation Area.
- Providing weekly inspections of campus 90 Day Accumulation Areas.
- Acting as point of contact with all regulatory agencies related to waste management issues.
- Preparing and maintaining records, reports and manifests as required by regulation.
- Acting as Stewards for university hazardous waste contracts, providing quality control and payment approval for waste related invoices.
- Initiating programs and guidance to minimize the generation of hazardous wastes.
- Keeping up-to-date with current regulations and best practices.

2.6.1 EHS Personnel

EHS personnel are available to assist campus personnel in the identification and handling of chemical wastes. These staff members manage the collection and proper disposal of the chemical waste generated at Wichita State.

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3.0 Minimizing Hazardous Waste Generation

Disposal of hazardous waste is regulated by the U.S. Environmental Protection Agency (EPA) and the Kansas Department of Health and Environment (KDHE) under the Resource Conservation and Recovery Act (RCRA). This Act makes it illegal to mismanage hazardous wastes. RCRA's emphasis is on waste reduction and recycling. You can help reduce the expenditure of University funds on waste disposal and material procurement by practicing waste minimization.

3.1 Maintain a Current Inventory

The first step to effectively minimizing the amount of hazardous waste generated is to maintain a current inventory of all chemicals being used and stored in labs and work areas. Check chemical inventories first before ordering any new chemicals. It may also be possible to borrow small amounts of chemicals from other labs. Please take the time to check with your colleagues.

3.2 Purchasing Chemicals

When ordering new chemicals, only order the amount of chemicals needed for the experiment being conducted. Do not order a larger size container for an experiment that will only last a semester or for an experiment that may occur in the future. Although chemicals usually cost less per unit when purchased in larger containers, when the actual usage, storage, and disposal are factored in, the cost savings diminishes significantly and may result in higher costs overall.

In addition, chemicals in large containers that are not used frequently can be rendered useless over time by contamination or degradation. In general, only order the minimum quantity of a chemical needed for the experiment, or one year's worth of stock at the absolute most.

3.3 Nonhazardous Substitutes

There are many nonhazardous substitutes for hazardous chemicals used in laboratories. Hazardous chemicals should be substituted with nonhazardous alternatives whenever possible, in particular those chemicals that are highly toxic, reactive, contain heavy metals, and are known or suspected carcinogens, mutagens, or teratogens.

3.4 Appropriate Storage Practices

Storing chemicals properly promotes safer and healthier working conditions and extends the usefulness of chemicals. Improperly stored chemicals can result in:

- Degraded containers that allow chemicals to become contaminated.
- Degraded containers that can release hazardous vapors that are detrimental to the health of lab workers.
- Degraded containers that can release vapors that can affect the integrity of nearby containers.
- Degraded labels that can result in the generation of unknowns.
- Chemicals becoming unstable and/or potentially explosive.
- Purchasing a chemical that is already in the lab or work area.

3.5 Cylinders and Lecture Bottles

Disposal of cylinders and lecture bottles is expensive, especially if the contents are unknown. Make sure that all cylinders and lecture bottles are labeled and included in chemical inventories. Before placing an order for a cylinder or lecture bottle, determine if the manufacturer will take back the cylinder or lecture bottle when it becomes empty. If possible, only order from manufacturers who will accept cylinders and lecture bottles for return.

3.6 Disposal of Non-hazardous Laboratory Waste Chemicals

Some chemicals can be safely and legally disposed of via the regular trash or down the drain to the sanitary sewer. For more information on disposing of nonhazardous laboratory waste chemicals in the regular trash or down the sanitary sewer, please contact the EHS department for consultation.

Please note that absolutely no waste may be disposed of down storm drains. These are usually located outside and are only meant for rainwater drainage to surface waters.

4.0 Hazardous Waste Generator Requirements

The following describe the various requirements for managing hazardous waste for each of the different types of generators. Generator status is mainly dependent on the quantity of hazardous waste generated in a calendar month. Satellite Accumulation Area (SAA) is the name given to the- location (the lab or work area) where hazardous wastes are generated and stored before being moved to a central storage area.

4.1 Hazardous Waste Generation, Management, and Disposal:

RCRA established a nationwide hazardous waste management law. The EPA promulgates federal regulations governing hazardous waste generation, management and disposal. Federal regulations for hazardous waste are found in 40 CFR 260-279.

KDHE is authorized by the EPA to govern hazardous waste in Kansas. The KDHE regulations are slightly more stringent than the federal standards. When the university is inspected by the EPA under the RCRA regulations, the KDHE regulations are what our compliance is measured against. Kansas requirements for hazardous waste management are found in Kansas Statutes Annotated Chapter 65, Article 34 and Administrative Regulations Article 31.

4.2 Generator Status:

Facilities that create hazardous waste are regulated by their "generator status." This status is divided into four possible categories. Each category is regulated by standards, which relate to the total volume of hazardous waste generated at the facility each calendar month, as well as the total amount of hazardous waste in storage. Requirements for management of hazardous waste can vary greatly depending on the facility's generator status, which can legally change on a month-by-month basis for some facilities.

The KDHE regulate facilities generating hazardous waste in one of the four following categories of generator status: Conditionally Exempt Small Quantity Generator, Kansas Small Quantity Generator, Small Quantity Generator, and Large Quantity Generator.

The amount of waste generated at Wichita State University places the campus in the Large Quantity Generator classification. This requires the most stringent waste management practices and results in an increased frequency of regulatory agency inspections.

4.3 Large Quantity Generator

Containers of hazardous waste generated in any accumulation area at Wichita State should comply with the following requirements:

- Use of the original chemical product container for hazardous waste storage is a good management practice. WSU does not allow hazardous waste to be stored in containers that previously held household products such as bleach, detergents, or any food products.
- It is not permitted to put the following types of solid materials into containers of liquid hazardous waste:
    - Pipettes, magnetic stirrers, vials, test tubes, filters, pH paper.

- Personnel generating hazardous waste must make a conscious effort to prevent chemical contamination of exterior surfaces of waste containers.

Additionally, the following are state and federal regulatory requirements for the management of hazardous waste containers:

- Containers must be compatible with the waste in them.
- Containers must be kept closed except when waste is actually being added.
- Containers must not be leaking, bulging, rusting, damaged, or dented.

4.3.1 90-Day Container Storage:

- Containers of hazardous waste must be marked with the date accumulation began, the words HAZARDOUS WASTE, and with other words that identify the contents of the containers.
    - NOTE: The start date is when the first waste is poured / placed into the waste container at the 90-day accumulation point OR the date when the filled container is moved from the satellite accumulation point to the 90-day central storage area. If more than 55 gallons of waste is generated at a satellite area, the excess of 55 gallons must be dated and moved to the 90-day central storage within 72 hours.
- Weekly inspections must be conducted at 90-day storage area.
- There must be sufficient aisle space to allow unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of the operation.
- Required equipment is easily accessible and in working condition and is tested to ensure it is in working condition.
- There is internal communications or alarm system capable of providing immediate emergency instruction to personnel.
- There is a telephone or hand-held two-way radio capable of contacting local and emergency responders.
- There are portable fire extinguishers and fire control equipment, including special extinguishing equipment (foam, inert gas, or dry chemicals).
- There is spill control equipment.
- There is decontamination equipment.
- There are fire hydrants or other source of water (reservoir, storage tank, etc.) with adequate volume and pressure, foam producing equipment, automatic sprinklers, or water spray systems.
- When waste leaves the 90-day storage area, it either is going for disposal, treatment, or recycling.
- No Smoking signs must be conspicuously placed wherever there is a hazard from ignitable or reactive waste.

4.3.2 Training:

Personnel must be thoroughly familiar with waste handling and emergency procedures relevant to their responsibilities during normal facility operation and emergencies.

4.3.3 Documentation:

- LQGs must have an EPA identification number.
- LQGs must use Uniform Hazardous Waste Manifests when sending waste offsite for disposal or recycling.
- LQGs must maintain a copy of each signed manifest for 3 years or until the LQG receives a signed copy from the designated facility that received the waste. The returned signed copy is retained as a record for at least 3 years from the date the waste was accepted by the initial transporter.
- LQGs are required to keep records of waste analyses, tests, and waste determinations for 3 years.
- If the waste being disposed of is restricted from land disposal, the manifest files should contain a copy of the Land Disposal Restrictions (LDR) notice.
- Documentation of weekly inspections of the 90-day storage area.

4.3.4 Additional requirements:

- Place all volatile organic wastes in containers less than 26 gallons in size or in an applicable DOT container.
- Inspect all 90-day hazardous waste containers for condition and leaks at least weekly.
- Ship all hazardous waste off site within 90 days of the date the waste was first placed into the RCRA 90 Day Storage Area.
- Develop a facility contingency plan for hazardous waste emergencies and ensure the presence of certain emergency equipment.
- Conduct employee training to ensure RCRA compliance and maintain training records.
- Maintain a 50-foot buffer zone from the facility boundary for container storage of ignitable or reactive wastes.

5.0 Managing Hazardous Waste

Materials are classified as hazardous waste based on the manner in which they are disposed and the hazards their disposal will present to human health and safety, as well as potential environmental damage. For a chemical to become a hazardous waste, it must first meet the regulatory definition of "Solid Waste".

The Environmental Protection Agency (EPA) defines a Solid Waste as any “garbage, refuse, sludge and other discarded material” including: solids, liquids, semisolids, contained gaseous materials resulting from industrial, commercial, mining, and agricultural operations.

The definition of Solid Waste has more to do with the disposition of the material, rather than the physical state of the material.

Hazardous Waste: A solid waste is classified as a hazardous waste if it is “listed” or has a “hazardous characteristic” as defined in 40 Code of Federal Regulations (CFR) 261. Hazardous wastes all have their own identification codes. For example, D001 is the code for characteristic Ignitable wastes, while F001 is the code for listed spent solvents used in degreasing operations.

5.1 Listed Hazardous Wastes:

The EPA has four lists of hazardous wastes. Any waste with a contaminant meeting the definition of any of these lists is considered hazardous waste regardless of the hazardous characteristics. The Lists are found in 40 CFR 261 Subpart D.

5.1.1 F-Listed Waste:

These wastes are known as “Non-Specific Source Wastes.” They are mostly spent solvents and wastewaters. Many of WSU’s laboratories generate these spent solvent wastes.

5.1.2 K-Listed Waste:

These wastes are “Specific Source Wastes" Most are from industrial process wastes and are very specific to a particular industrial process. For example; K050…Heat exchanger bundle cleaning sludge from the petroleum refining industry. WSU does not generate any K-Listed Waste.

5.1.3 U and P Listed Waste:

U and P listed wastes are discarded commercial chemical products, off-specification species, container residues, and spill residues thereof. In general, they are unused materials containing only one active ingredient. Wichita State generates many of these wastes during lab cleanouts or disposal of outdated chemicals.

The main differences between U-Listed and P-Listed waste is that the P-Listed wastes are acutely toxic and the empty containers which held their material must be triple rinsed, and the rinsate collected and shipped as hazardous waste. Alternatively, using a Hazardous Waste label, manage the empty bottle as P-listed hazardous waste ensuring the listed chemical is identified on the label

5.2 Characteristic Waste:

In brief, the following are the characteristics that will cause a solid waste to be regulated as “hazardous waste”:

5.2.1 Ignitability:

- A liquid other than an aqueous solution containing less than 24 % alcohol by volume, having a flashpoint of less than 140°F.
- A non-liquid capable under standard temperature and pressure of causing fire through friction, spontaneous combustion, and when ignited, burns so vigorously and persistently that it creates a hazard.
- It is an ignitable compressed gas.
- It is an oxidizer.

5.2.2 Corrosivity:

- It is aqueous and has a pH of less than or equal to 2 or greater than or equal to 12.5.
- It is a liquid and corrodes steel at a rate greater than 0.250 inch per year.

5.2.3 Reactivity:

- It is normally unstable and readily undergoes violent change without detonating.
- It reacts violently or forms potentially explosive mixtures with water.
- When mixed with water, it generates toxic gases, vapors or fumes that present a danger to human health or the environment.
- It is a cyanide or sulfide bearing waste that can generate toxic gases vapors or fumes that present a danger to human health or the environment when exposed to pH conditions between 2 and 12.5.
- It can detonate or explode if subjected to a strong initiating source or if heated under confinement.
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
- It is a forbidden explosive as defined in 49 CFR 173.

5.2.4 Toxicity:

A solid waste exhibits the characteristic of toxicity if, using the EPA's Toxicity Characteristic Leaching Procedure (TCLP) test method, the extract from a representative sample of the waste contains any of the contaminants listed in Table 1 of 40 CFR 261.24 at the concentration equal to or greater than the respective value given in the table. There are 40 contaminants listed in Table 1. Most of these are heavy metals, organic solvents, and pesticides.

5.3 The Mixture Rule:

If you have a characteristic hazardous waste and it is inadvertently mixed with a nonhazardous waste, the mixture will be considered hazardous waste only if it retains the hazardous characteristic.

If you have a nonhazardous waste, e.g. used oil, and you contaminate it with a listed hazardous waste, e.g. F005 spent solvent; the entire waste will be classified as F005 listed hazardous waste.

A few wastes are listed only because they are ignitable or reactive. In these cases, if the resulting mixture is no longer ignitable or reactive, then the mixture is not considered a listed waste.

Examples: Spent solvents (F003), such as methanol or acetone, are listed hazardous wastes and are ignitable. If these solvents are unintentionally mixed with a non-ignitable nonhazardous waste, the mixture will still be considered hazardous, unless the mixture is not ignitable.

Please note that intentional dilution of a hazardous waste is not allowed without a permit.

6.0 Where Hazardous Waste Is Generated:

Satellite Accumulation Area (SAA) is the name given to the location where hazardous wastes are generated and stored before being moved to a campus 90-day central storage area. This includes such facilities as laboratories, shops, and photographic studios.

Requirements for Satellite Accumulation of Hazardous Waste:

- Hazardous waste must be stored at or near the point where the waste is generated, i.e., in the same room. By law, you cannot move hazardous waste containers from one room to another unless you are moving the container to a 180-day or 90-day storage area. Preferably, there is only one SAA per waste stream per room.
- A "Hazardous Waste Satellite Accumulation Area" sign should be posted at the area where the waste is generated and stored.
- Waste containers must be under the control of the operator of the process that generates the waste. This can be a Principal Investigator, supervisor, or the person generating the waste.
- Waste containers must be in good condition, no dents, cracks etc., and lids intact and functional.
- Wastes must be chemically compatible with the container.
- Containers must be closed except when adding or removing waste. Do not leave a funnel in the bottle unless it can be completely closed and sealed.
- Mark containers with the words "hazardous waste" and other words that identify the contents. When more than one chemical waste is stored in a container, the amount or approximate percentage of each constituent must be identified on the label.
- Store hazardous waste chemicals in secondary containment whenever possible. Plastic bins offer the best protection against spills.
- Deface original container labels on reused bottles, except when the waste matches the label.
- Chemical containers that held P-Listed wastes are acutely toxic and must be triple rinsed, and the rinsate collected and shipped as hazardous waste.
- Segregate the waste by chemical hazards.
- No more than 55 gallons of hazardous waste, or one quart of acutely hazardous waste (P-listed), may be accumulated in a Satellite Accumulation Area. Containers of excess waste must be dated at the time 55 gallons is exceeded and moved to a 90 Day Accumulation Area within 72 hours.
- Clean up small spills of hazardous waste if you have the proper training, the proper personal protective equipment (PPE), and feel comfortable doing so. Spill cleanup material of some hazardous waste, specifically P-listed wastes, must also be disposed of as hazardous waste. If you are unsure, then please contact the EHS department.

7.0 Management Procedures for Specific Waste Types:

The following management procedures are for specific types of hazardous wastes. If you generate large quantities of specific types of chemical wastes not listed here, then please contact the EHS department at for assistance.

7.1 Concentrated Solutions of Acids and Bases:

Corrosive acids and bases are common wastes generated in laboratories on campus. Corrosivity is the only hazardous waste characteristic that may be treated by a generator onsite without an EPA permit.

Generators of corrosive wastes that have no other hazardous characteristics should neutralize the wastes to a pH between 5.5 and 9.5. The neutralized non-hazardous waste may then be drain disposed followed with a good water flush (20 parts of water).

Procedures for neutralizing acids and bases are described in the following three sections. Note: Neutralization is recommended only for very small volumes of corrosive acids and bases. You should only perform neutralization of corrosives if you have been trained, you feel confident that you understand the process, you have the proper personal protective equipment, and are comfortable doing it.

7.1.1 General Neutralization Procedures:

- Perform neutralizations in a fume hood behind a safety shield, as vapors and heat may be generated.
- Wear lab coat or apron, gloves and goggles. A face shield in combination with safety goggles is recommended. Please note, a face shield alone is not sufficient, safety goggles must be worn when using a face shield.
- Keep containers cool during process, such as placing a beaker in a bucket with slushy ice.
- Work slowly.
- After neutralization is complete, dispose of down the drain followed by 20 parts water to the neutralized solution.
- Follow the specific neutralization procedures below for the acid or base you are trying to neutralize.

7.1.2 Acid Neutralization:

- While stirring, add acids to large amounts of an ice water solution (1:10) of base such as sodium carbonate, calcium hydroxide, or sodium hydroxide for concentrated acids.
- When a pH of at least 5.5 to 9.0 is achieved, dispose of the solution down the drain followed by 20 parts water to the neutralized solution.

7.1.3 Base Neutralization:

- Add the base to a large vessel containing water (1:10).
- Slowly add a 1M solution of Hydrochloric acid.
- When a pH of 5.5 to 9.0 is achieved, dispose of solution down the drain followed by 20 parts water to the neutralized solution.

7.1.4 Chromic Acid:

Chromic acid is a powerful oxidizing agent that is both toxic and corrosive and can explode on contact with organic materials. Chromium (VI), or hexavalent chromium, is also classified as a carcinogen. Accidents involving chromic acid cleaning solutions can result in burns to both skin and clothing.

Chromic acid cleaning solutions leave a residue of chromium (VI) on the glass surface, which is difficult to remove. This residue has been known to interfere with certain research procedures since the material can leach into solution. EHS highly recommends that you consider using chromic acid alternatives such as “NOCHROMIX”, “Alconox”, or similar type products. Due to the reactive and toxic nature, do not attempt to neutralize chromic acid - dispose of chromic acid waste through the hazardous waste management program.

7.1.5 Hydrofluoric Acid:

Hydrofluoric acid is a strong corrosive and highly toxic chemical that causes severe burns from dilute solutions and can be fatal upon exposure of concentrated solutions. Bench top use of hydrofluoric acid is not permitted; it must only be used in a fume hood.

Anyone using Hydrofluoric acid must purchase a tube of calcium gluconate gel, which is used as an initial response to skin exposure of Hydrofluoric acid. Calcium gluconate gel must be applied to the affected contact area immediately after exposure. Further medical treatment is necessary to prevent serious permanent injury. The quantities of Hydrofluoric acid that are used and stored should be kept to an absolute minimum. All users of hydrofluoric acid must receive hydrofluoric acid training. Contact the EHS department for more information on hydrofluoric acid.

Due to the toxic nature, do not attempt to neutralize hydrofluoric acid. Dispose of hydrofluoric acid waste through the hazardous waste management program. Because of hydrofluoric acid’s ability to etch glass, the chemical and waste must be stored in plastic containers. As a safety precaution, EHS recommends that calcium hydroxide be added to any mixtures or dilute solutions of Hydrofluoric acid waste to help bind the fluoride ions.

7.1.6 Perchloric Acid:

Perchloric acid is a strong oxidizer and corrosive acid. Perchloric acid can react with metal to form shock sensitive metal perchlorates. This can occur when perchloric acid is used in a regular (non-perchloric acid) fume hood. Contact the EHS department for any questions about perchoric acid use. Due to the reactive nature, do not attempt to neutralize perchloric acid. Dispose of perchloric acid waste through the hazardous waste management program.

7.2 Organic Solvents:

Most spent organic solvents will be classified as an F-Listed or Characteristic hazardous waste. Laboratories or other areas generating more than 5 gallons of hazardous waste (spent solvents) per month should accumulate the waste in appropriate containers. EHS will provide containers to generators of solvent hazardous waste on a case-by-case basis. Users of these containers must make sure that the words "Hazardous Waste" and other wording describing the solvents in the waste are clearly marked on the safety can as soon as waste begins to be accumulated. Except when waste is being added to or removed from a safety can containing hazardous waste, its lid needs to be closed at all times.

Do not dispose of organic solvents down the drain. Generators of organic solvents should keep non-halogenated waste solvents separated from halogenated waste solvents to the fullest extent possible. It costs approximately twice as much to dispose of a drum of halogenated waste solvents versus a drum of non-halogenated waste solvents.

Please do your part to help keep waste disposal costs down by:

- Keeping corrosive wastes separated from organic solvents whenever possible.
- Keeping non-halogenated organic solvents separated from halogenated organic solvents whenever possible.

Examples of non-halogenated organic solvents that are acceptable to be accumulated together:

- Acetone
- Acetonitrile
- Ethanol
- Formaldehyde
- Ether
- Ethyl acetate
- Hexane
- Toluene
- Xylenes

Examples of halogenated organic solvents that are acceptable to be accumulated together:

- Methylene chloride
- Chloroform
- Carbon tetrachloride
- Bromoform
- Mixtures containing both halogenated and non-halogenated organic solvents

The following wastes must NOT be co-mingled with organic solvents:

- Strong acid or base solutions (a pH between 5.5 and 9.5 is acceptable)
- Aqueous solutions of toxic organic chemicals
- Heavy metals (Lead, Mercury, Silver, Chromium, Barium, etc.)
- Vacuum pump used oil
- Sulfides or inorganic cyanides
- Strong oxidizers or reducers
- Water reactive substances
- PCB waste
- Unknowns

Please be sure to include approximate percentages of all waste solvents placed waste containers. Do not rely on your memory to label solvents, keep a running list of solvents that you add to the safety disposal can. Hazardous Waste Labels from EHS should be used when collecting hazardous chemical waste. When requesting removal using the online form, it is important to note the size of the container(s) to be removed. For more information on safety disposal cans, please contact the EHS department.

7.3 Aqueous Solutions of Toxic Chemicals:

Aqueous solutions containing heavy metals and/or other RCRA regulated toxic chemicals must be disposed of through the hazardous waste management program. Do not dispose of this type of waste down the drain, dispose of these chemicals through the hazardous waste management program.

7.4 Used Oil:

Uncontaminated used oil is not considered hazardous and should be collected and recycled. Do not mix other chemical wastes with used oil. If a hazardous waste, such as flammable solvents or heavy metals, is added to used oil, then the resulting mixture cannot be recycled and must be handled as hazardous waste. Be sure to note any contaminants on the Hazardous Waste Label when disposing of contaminated used oil.

Uncontaminated used oil to be recycled must be labeled with the identifying words "Used Oil". Oil removed from transformers or other electrical equipment must be sampled and analyzed for PCBs prior to recycling. Contact EHS for sample bottles and submission of samples for laboratory analysis.

7.5 Asbestos:

Asbestos is a fibrous material that was once widely used in a number of products that can still be found in laboratories and throughout other buildings. Products that can contain asbestos include: electrical equipment insulation (ovens, heating mantles, heating pads, and wires), older vinyl floor tiles and mastic, pipe fittings, pipe insulation, caulking compounds, fireproofing, and transite (cement-like) panels such as those found in and under fume hoods.

Asbestos is a known human carcinogen and must be disposed of properly. The hazard of asbestos is greatest when the asbestos product becomes "friable" – able to be pulverized from finger pressure – and when the asbestos becomes airborne. For older vinyl asbestos tile (VAT), an additional slipping hazard occurs when these tiles "pop" out of the floor.

If you find any of the above items deteriorating and suspect they may contain asbestos, or you are considering disposing of old electrical equipment with insulation, or if vinyl tiles have "popped" out of the floor, then please contact the EHS department.

7.6 Silica Gel:

Silica gel contaminated with solvents, heavy metals, or other toxic chemicals must be accumulated in leak proof containers such as one-gallon plastic wide mouth containers or a five-gallon bucket. When labeling Silica gel waste, be sure to list all of the contaminants, including solvents, and the approximate percentages on the Hazardous Waste Label.

7.7 Chemically Contaminated Items / Empty Containers:

In general, Chemically Contaminated Items (CCIs) can only be put into the normal trash if they are non-hazardous, non-ignitable, non-reactive, non-carcinogenic, non-mutagenic, non-infectious, non-radioactive, and the contaminant is not highly toxic. Examples include disposable items such as gloves, benchtop coverings, pipets, test tubes, etc.

If you feel that the normal trash is not an appropriate disposal route for your CCIs, package them in a leak-proof container or plastic bag and label with a Hazardous Waste Label as "Chemically Contaminated Items" and the name and approximate percentage of chemical contaminants.

Chemical containers which have been emptied by all practicable means, i.e., pouring, pumping scraping etc., and there is less than one inch of residue, or no more than 3% of the total weight of the container if it was less than 119 gallons, and the container didn't previously hold a chemical that would be an acutely toxic waste (P-Listed), the container is considered trash. This is the definition of a RCRA empty container.

EHS recommends rinsing RCRA empty containers before putting them into the lab trash cans because of potential odor issues. Labels on containers should be defaced or removed before disposal in a trash can or dumpster.

If the empty container did not hold a waste solvent or a P-Listed liquid and is truly "RCRA Empty", as described in the third paragraph of this section, then letting it air out under a hood would be permissible. It is not permitted to allow a hazardous waste to evaporate in lieu of disposal.

You may use soap and water to rinse containers that once held solvents, whether they were non-miscible or not. Do not use a solvent to rinse an empty container because it generates more waste. If an empty container requiring disposal has a strong odor, non-miscible (and not P-Listed) the easiest solution is putting it into a plastic bag and placing it in the dumpster. Please be aware that some campus facilities, custodial personnel may not be permitted to dispose of questionable chemical containers in the trash. This may require you to personally bag or box your waste containers and dispose of them in the facility dumpster.

If you have any questions concerning management of chemically contaminated items or containers, please contact the EHS department.

7.8 Mercury:

Metallic mercury is collected and recycled. It should be packaged in a tightly sealed and leak free container such as a bottle or vial with a screw top lid. Place broken mercury thermometers in a leak proof container or a secured plastic bag. When collecting metallic mercury, DO NOT mix with other chemicals or waste if possible.

Do not use the past practice of adding sulfur, nitric acid, or water in an attempt to contain vapors. This only results in more hazardous waste being generated and rendering the metallic mercury as non-recyclable. However, the use of commercial 'Hg Absorb' powder found in mercury spill kits is acceptable. Commercial mercury spill kits are available from the EHS department.

Mercury is a highly toxic chemical, any mercury spills, including broken thermometers, must be cleaned up, and the spill debris disposed through the hazardous waste management program. If you have a spill of mercury outside of the fume hood, leave the room and call 911 to report the spill information.

Never use a regular vacuum cleaner to clean up a mercury spill, this will only cause the mercury to vaporize and disperse into the air. EHS has a special mercury vacuum designed for cleaning up mercury spills and a mercury detection meter to determine if all mercury has been cleaned up from a spill.

For more information on mercury and management of mercury at WSU, please contact the EHS department.

7.9 Fluorescent Tubes (Universal Waste Lamps):

Fluorescent bulbs and other hazardous lamps such as mercury vapor, high-pressure sodium lamps, high intensity discharge (HID), neon, and metal halide lamps are regulated as Universal Waste Lamps and must be disposed of properly. These items (including "green tip" bulbs) cannot be placed in the normal trash. Broken fluorescent tubes must be handled as hazardous waste. Every attempt should be made to keep these items intact and to prevent breakage.

7.10 Batteries (Universal Waste Batteries):

There is a program in place to recycle batteries (Ni-Cad, Lithium, Lead-acid, Mercury, and button batteries). There are a number of battery collection containers around campus for Universal Waste Batteries. Contact the EHS department if you would like to request a battery collection container for your building/work area, or if a battery collection container is full.

7.11 Aerosol Cans and Propane Cylinders:

Aerosol cans and small Propane cylinders can contain flammable, corrosive, and toxic chemicals and propellants. These items can be collected, emptied of their contents, depressurized, and recycled for scrap metal. Aerosol cans and small Propane cylinders are collected during regular hazardous waste pickups.

If you have a large (2 or 4 foot) high-pressure gas cylinder and would like to have it removed, then please contact AIRGAS or EHS assistance.

7.12 Paint, Paint Thinner, Adhesives, and Print shop Chemicals:

Paint (oil-based), Paint thinner, Adhesives, and many Print shop chemicals are flammable and regulated as hazardous waste. These items cannot be poured down the drain or left out to evaporate. They must be disposed of through the hazardous waste management program. Latex paint that has solidified completely can be placed in the normal trash. You can speed up the solidification of latex paint by adding sawdust or vermiculite and leaving it out to evaporate.

7.13 Photographic Chemicals:

Some photographic chemicals contain heavy metals such as Silver, Chromium, and Selenium that may be above regulatory levels and must be handled as hazardous waste.

Certain used photographic fixers contain silver above regulatory levels and cannot be poured down the drain; however, some photographic developers and other chemicals may be disposed of down the drain depending on the chemical constituents. If you are unsure whether a photographic chemical is acceptable for drain disposal, then please contact the EHS department for assistance.

Negatives from x-ray units, old or expired photographic paper and film, and other photography are collected and shipped offsite for silver recovery.

7.14 Reactive and Potentially Explosive Chemicals:

Reactive chemicals such as strong oxidizers and reducers, and air/water reactive chemicals must be disposed of through the hazardous waste management program. Because of their reactive nature, it is important to minimize the quantity of reactive chemicals in storage. If the integrity of the container appears to be compromised, then dispose of the chemicals as hazardous waste promptly. Never dispose of reactive chemicals, such as Sodium metal, regardless of the quantity, down the drain or in the normal trash. Such practices can result in fires, toxic vapors and gases being released, and injury to people. When disposing of these compounds, please note any special hazards on the Hazardous Waste Label.

Some of these compounds can become unstable and potentially explosive over time due to contamination with air, water, other material, or when the chemical dries out. If you come across any chemical that you suspect could be potentially explosive, do not attempt to move the container as some of these compounds are shock, heat, and friction sensitive. Be sure to let others in the lab or work area know the chemical exists and the potential explosion hazard. If you feel that there is an immediate potential hazard, please contact EHS at 316-978-7904 or 316-978-3347 for assistance.

Examples of potentially explosive chemicals include:

- Benzoyl peroxide (dry)
- Peroxide forming compounds
- Diazo compounds
- Picric acid (dry)
- 2,4-Dinitrophenyl hydrazine (dry)
- Sodium amide
- Nitrocellulose
- Trinitro-compounds

7.15 Peroxide Forming Chemicals:

Many commonly used chemicals, organic solvents in particular, can form shock, heat, and friction sensitive peroxides upon exposure to oxygen through concentration, evaporation, and distillation.

Compounds that are suspected of having very high peroxide levels because of age, unusual viscosity, discoloration, or crystal formation should be considered extremely dangerous. If you discover a container that meets this description, DO NOT attempt to open or move the container. Make other people working in your area aware of the potential explosion hazard and contact EHS immediately.

7.16 Unknowns:

You must make every effort to provide an accurate description of all chemicals that you dispose of through the hazardous waste management program. Without an accurate description, the chemical cannot be handled or disposed

of safely. Waste disposal companies will not accept unknown chemical waste without the generator providing a sample analysis that can be very expensive.

Many unknown chemicals are generated due to a lack of good housekeeping and good laboratory safety practices. ALL containers used to store chemicals must be labeled. Containers in which the labels are degrading or falling off should be given a new label. There are numerous reference materials with methods and procedures that can be used in identifying unknown chemicals.

It is the responsibility of the generator of the waste to field test the material before it is sent in to be analyzed so that the testing lab has as much information on the unknown material as possible. For example, if you know the pH, or the water and solvent solubility of the material, or the history and use of the material is known.

7.17 Household Hazardous Waste:

Wichita State University cannot accept household hazardous waste for disposal. However, most local communities and/or counties have programs for collection of household hazardous waste. Typical wastes accepted (not all are listed here) include:

- Adhesives, coatings, and sealers
- Auto fluids and oil filters
- Cleaners and aerosols
- Concrete and driveway sealants
- Fluorescent bulbs
- Household batteries
- Paints and solvents
- Pesticides and fertilizers
- Photographic, pool, and lab chemicals
- Various electronics, computers, phones, etc.
- Varnishes, shellacs, and stains

Many of these programs are free of charge but residency for that locality or county is normally required. Please check the following sites to see when a Household Hazardous Waste Program is available for your area.

Sedgwick County Household Hazardous Waste
801 Stillwell St
Wichita, KS 67213
316-660-7464

7.18 Ethidium Bromide:

Mutagenic chemicals, such as ethidium bromide, pose a threat to organic life due to their ability to modify an organism's genetic material that may be passed along to future generations.

Active ethidium bromide wastes may not be disposed of via the sanitary sewer or municipal trash without first being deactivated. Ethidium bromide wastes that do not fluoresce are considered to be inactive and could be acceptable for drain or trash disposal depending on the chemical constituents of the dye. There is a variety of options for disposal depending on the type of waste.

7.18.1 Ethidium Bromide Wastes:

- Materials that do not fluoresce under UV light may be disposed of directly in the trash.
  - Deactivate the dye, dry the solids, and dispose via normal trash, OR
  - Submit for Chemical Waste Collection and identify the materials as “Ethidium Bromide”.
- Ethidium Bromide Gels
  - Gels that do not fluoresce under UV light may be disposed of directly in the trash.
  - Deactivate the dye, dry the gel, and dispose via trash, OR
  - Dry and submit request to EHS for disposal
- Liquids (non-flammable)
  - Aqueous dye solutions that do not fluoresce under UV light may be disposed of down the drain.
  - Deactivate and dispose down the drain.
  - Absorb the ethidium bromide waste on filter media (activated carbon) and submit request to EHS for disposal. Options for this method include:
    - Carbon ‘tea’ bags
    - BondEX Maxi Ethidium Bromide Detoxification Cartridges
- Liquids (flammable)
  - Any ethidium bromide waste that contains a flammable liquid (such as butanol) should be submitted for Hazardous Waste disposal.
- Concentrated Mutagenic Dyes
  - Concentrated mutagenic dyes that are unusable may be submitted for Hazardous Waste disposal. This includes mutagenic dyes that are concentrated by absorption onto a filter media.

7.18.2 Deactivation Procedures:

Deactivation is managed by breaking the chemical bonds of ethidium bromide. Within a laboratory setting, these bonds can be broken in several ways, including oxidization and UV radiation. Deactivation of ethidium bromide waste materials must be incorporated as a last step in the research protocol. The methods described here oxidize the mutagen to remove the risk.

Household Bleach

The following is from Network News, Volume 8 No. 2, September 1994. Network News is a tri-annual publication of the ACS Department of Government Relations and Science Policy's Office of Legislative and Regulatory Programs. Margaret-Ann Armour is a professor in the Department of Chemistry at the University of Alberta.

Begin by wearing the proper personal protective equipment such as a lab coat, safety glasses, and gloves. To convert ethidium bromide (EtBr) to the physiologically inactive product 2-carboxybenzophenone, stir a solution of 34 mg of ethidium bromide in 100 mL of water (at room temperature) with 300 mL of household bleach for 2 hours. When

ethidium bromide solutions of this dilute concentration are used, the product solution does not show excess mutagenicity over standards in the Ames test.

Note: To extrapolate this method to various concentrations of ethidium bromide, you want to add ~ 10mL of household bleach for every mg of ethidium bromide.

You should check the extent of completion of this process with a Ultra-Violet (UV) lamp. EtBr glows bright orange under UV. If you see no orange fluorescence under the correct wavelength of UV in the detoxified material, then it has effectively been degraded.

8.0 Hazardous Waste Disposal Procedures:

The following information must be included on each Hazardous Waste Disposal Request:

- Building & Room: Indicates the area where the hazardous waste is generated and stored.
- Name and Telephone Number: Identifies the individual faculty, staff, or student generating the hazardous waste and assuming responsibility for its description. This information is important if subsequent questions arise related to the waste.
- Date: At Satellite Accumulation Areas in the lab or work area when the container is ready for removal to a 90 Day Accumulation Area, the date should be added to the label and an online Waste Pickup Request Form submitted. For 90 Day Accumulation Areas, the date the hazardous waste is first placed in the container must be written in this section.
- Type: Identifies the general characteristics of the hazardous waste chemicals and indicates which classes of waste should not be mixed or packaged together to facilitate disposal procedures.
- Chemical Name: Precisely identify the exact composition of the hazardous waste in each container. You must use words describing the waste e.g., “methanol” or “acetic acid”, etc. Hazardous waste consisting of multiple elements or compounds requires the identification of each constituent, and the approximate percentage by weight or volume it occupies in the container, if known. Note: The weight (in grams) or volume (in milliliters) of all ingredients in each container is helpful to be listed in this section, along with the chemical name and percent composition.

While you should use a fume hood while adding hazardous waste to a container, please remember to store your hazardous waste containers in the fume hood, base cabinet or another secure storage area with secondary containment such as a plastic tray.

Use only screw top chemical glassware or plastic ware that is compatible with the hazardous waste. Soda pop, glass or plastic milk bottles, Clorox bleach bottles or rubber/glass stoppered containers will not be allowed for waste disposal. Any waste bottle/container that emits a noxious smell or is cracked or damaged in any way must be placed in an over pack container, such as a wide mouth container or bucket, or transferred to a new bottle/container. If an over pack container is used, then a Hazardous Waste label must be on both the inner and outer container.

9.0 Contact Information:

EHS Department:

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EHS Director
316-978-7904
andrew.clem@wichita.edu

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316-978-7914
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