Hazardous Waste Program

Hazardous waste regulations are governed by the Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA) as well as the Texas Commission on Environmental Quality (TCEQ) formerly known as TNRCC.

Southwestern University has developed this written hazardous waste program to effectively:
• manage our chemical inventory
• protect human health and safety
• reduce the impact of hazardous chemicals on the environment
• reduce our hazardous waste disposal costs
• enhance regulatory compliance

Our hazardous waste program is based on the following best practices:
• management commitment & support
• departmental and individual responsibility and participation
• written waste minimization policy & specific procedures
• providing information & training
• audits and continuous improvement process

Departments (individual waste generators) are responsible for becoming familiar with and implementing the hazardous waste program requirements. Individual waste generators are responsible to provide information and training regarding this program to any affected member who may be involved in laboratory or non-laboratory hazardous waste generation. This includes students, guests, visitors, new employee’s, etc. Introductory information sessions will be conducted by the Safety Office.

Inspections may be conducted by Federal / State Agencies and can result in substantial fines, penalties and negative publicity for the University. In order to help ensure that the components of our hazardous waste program are being met, formal lab audits and inspections will be conducted on a periodic basis. Non-compliance issues identified must be promptly corrected by the Department. Your full participation is essential to our success.
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Glossary of Terms

• OSHA - Occupational Safety and Health Administration - Federal Promulgated Regulations (Law)

• EPA - Environmental Protection Agency - Federal regulatory agency governing emissions to land, water and air and hazardous waste operations

• RCRA - Resource Conservation and Recovery Act - Federal act governing the generation, handling, and disposal of hazardous chemicals

• DOT - Department of Transportation - Federal regulatory department governing such things as the transportation, labeling and manifesting of hazardous chemicals

• TCEQ - Texas Commission on Environmental Quality (formerly TNRCC) - state agency with many regulations that are designed to reduce or prevent pollution and protect public health.

• CHP - Chemical Hygiene Plan - required under OSHA’s Laboratory Standard, a written plan developed by employer that identifies specific procedures, operations, equipment, personal protective equipment and work practices that will protect employees from the health hazards presented by hazardous chemicals used in specific workplaces.

• Inherently waste-like - the EPA considers hazardous chemicals that are beyond their expiration date, have been in storage but not in use for years (accumulated dust), containers with broken/cracked caps, rusted or corroded containers to be “inherently waste-like” and expect them to be disposed of as hazardous waste. Many Universities have been inspected by EPA and fined for chemicals/containers in these conditions.

• Central Accumulation Area - Room 305 is considered the central storage area where hazardous wastes from satellite areas will be stored prior to shipment to permitted disposal facilities by our hazardous waste vendor.
Determining if your waste is a “Hazardous Waste”

Determination of “hazardous waste” is the responsibility of the department/generator.

Copies of EPA Listed Wastes are available from the Safety Office

Contact the Safety Office for assistance if you need help to make a determination of “hazardous waste”

Defined under RCRA Regulations as having one or more of the following characteristics:

- **EPA List Wastes**
  - F list - nonspecific wastes (spent solvent wastes)
  - P list - acutely hazardous chemical products - unused/surplus materials
  - U list - unused/surplus chemical products

- **Characterisitc Waste:**
  - ignitabe - wastes that can ignite and create fires: flash point less than 140 °F
  - reactive - wastes that can cause fires, explosions, gases, fumes when mixed with water, air or other chemicals or when heated or struck (shock sensitive)
  - corrosive - strong acids or bases that are capable of corroding metal
  - toxic - wastes that may be harmful, toxic if ingested or absorbed or wastes that can cause environmental damage from leaching into the ground at disposal sites (heavy metals, benzene, vinyl chloride, etc)
  - inherently wastelike - unused stock surplus chemicals that have been in inventory for years, may be outdated/ expired, corroded, loose lids, evidence of nonuse for years (dust)….

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List of Departmental Generators of Hazardous Waste

- Chemistry
  - most chemicals in use in labs, spent solvents, corrosives, oxidizers, reactives, etc
- Biology
  - hazardous chemicals and state regulated biological waste
- Fine Arts - art studios, art lab, ceramic lab, theater shop, photography lab
  - oil-based paint, solvents, cleaners, acids used for etching, fixer, glues, etc
- Physical Plant - grounds, maintenance, paint shop, boiler plant
  - cleaning solvents, glue/adhesives, pesticides, waste oil, oil-based paints, fluorescent bulbs, HID bulbs, PCB ballasts, thermostats, etc...
- Student Photography Lab
  - photo fixers
The safe storage and segregation of hazardous chemicals and hazardous waste is the responsibility of each generator/department. The following is suggested practices for proper storage of hazardous waste streams/types. Individuals/departments should refer to Prudent Practices in Laboratories, National Research Council, and/or Safety in Academic Chemical Laboratories, American Chemical Society, to implement safe chemical storage practices.

- **Flammables/Solvents**
  - store in flammable storage cabinet
  - separate and label as halogenated vs. non-halogenated (solvents).
  - halogenated: methylene chloride, chloroform, carbon tetrachloride
  - non-halogenated: xylene, toluene, alcohol
  - combine compatible solvents (do not combine halogenated with non-halogenated) in drums after delivery to the hazardous waste storage area. List individual solvents and % of solution.

- **Chloroform**
  - accumulate this solvent and transfer to a bulk drum, record individual quantity and dates from each lab.

- **Acids**
  - as a general rule, separate oxidizing acids[nitric/chromic] and hydrocyanic acid from all other acids - use secondary containers. Most acids not contaminated with heavy metals should be neutralized and drain disposed.

- **Bases**
  - separate from acid storage. Most bases not contaminated with heavy metals should be neutralized and drain disposed.

- **Oxidizers**
  - separate from flammables by use of oxidizer cabinet
  - liquid oxidizers
    - hydrogen peroxide, nitric acid, perchloric acid, bromine, sulfuric acid, chromic acid, water
  - solid oxidizers
    - nitrates, nitrites, perchlorates, peroxides, chromates, picrates, permanganates, hypochlorites, bromates, chlorites, chlorates

- **Metals (toxic land ban) & Poisons**
  - soluble compounds / solutions of: arsenic, barium, cadmium, chromium, copper, lead, zinc, molybdenum, nickel, selenium, silver, thallium, etc. Separate mercury alone……. 

- **Reactives** - explosive, unstable, very reactive with water or other materials [heat/shock]
  - chromic acid, cyanides, sulfides, hypochlorites, organic peroxides, perchlorates, calcium/sodium oxide, sodium amide, fluorine, hydrides, calcium carbide, aluminum alkyls, calcium oxide, fluorine, picric acid, arsine, silane,
    - separate reactive acids (chromic) from perchlorates and peroxides
    - separate peroxide formers - ethers and picric acid - explosive hazards - remove all expired stock
    - separate cyanides and hypochlorites from acids Metals
Chemical Storage & Transportation

• **Use Secondary Containment**

• All EPA “P” list acutely toxic chemicals (not just hazardous waste containers) **must be stored and transported** in secondary containers suitable to contain contents in the event of a spill/leak.

• All hazardous waste containers must be packed securely by the generator (prevent breakage) with use of suitable secondary containment for transportation to the central hazardous waste storage area (305 Fondren-Jones).

• All hazardous chemicals in glass containers should be stored/transported in secondary containers.

Acceptable secondary containment for both storage and transporting …
Both the chemical container and the secondary plastic container should be labeled.

Acceptable secondary containment for storage but not for transporting…. Labeling of chemical container only is acceptable
Federal Regulations (Waste Reduction Policy Act / Pollution Prevention Act) and State Agencies require hazardous waste generators to adopt and certify a waste minimization policy.

Our policy requires all generators of hazardous waste to minimize their initial consumption, effectively manage their chemical purchasing & inventory system, safely use and store hazardous chemicals and significantly reduce their hazardous waste disposal volume by implementing the following chemical management practices:

### Procedures to Implement

- estimate the type and quantity of hazardous waste chemicals you expect to generate for the academic year at the beginning of each fall semester

- create an effective written purchasing procedure that will verify use of all existing departmental inventory before ordering the same chemical and that ensures dating upon receipt and inventory of all chemicals & locations

- inform all individual generators of hazardous waste to implement the procedures in our waste minimization policy and hazardous waste program

- develop a departmental process to ensure the identification and clean-out of all hazardous chemicals and/or hazardous waste prior to faculty/staff leaving the University for sabbatical or permanently.

- review current uses and substitute for non-hazardous chemicals/materials whenever feasible

- review the quantity used for experiments/processes and reduce chemical volume to micro-scale whenever feasible - change lab manuals/procedures

- participate in audit process: self-audits and formal audits/inspections
Required Practices

- offer and transfer unused/unwanted stock chemicals to other organizations (follow external transfer procedures)
- order and stock a maximum of one year’s supply of chemicals/materials, buy the smallest quantity possible for intended use - do not order in bulk quantities to obtain bulk pricing - the increased cost of chemical storage, increased cost of haz. waste disposal and increased risk of storing large volumes of chemicals far outweigh the small savings in unit volume.
- designate your hazardous waste collection area - label and maintain with good chemical hygiene practices
- date all chemicals/materials upon receipt of order [indelible ink]
- properly label all chemical containers including secondary containers and transfers
- add “first opened date” on all explosive/peroxide forming chemical containers (ethers, dioxane, etc). Test for peroxides during storage periods and transfer to waste disposal area within manufacturer’s expiration date or recommended safe storage periods listed in Prudent Practices in the Laboratory, National Research Council. Add warning label to peroxide forming chemical containers - if peroxides are found and the container is unsafe for use carefully transfer to disposal area & apply warning label.
- keep haz. waste streams separated into the following hazard classes:
  - halogenated solvents - transfer to bulk drum
  - non-halogenated solvents - transfer to bulk drum
  - chloroform - transfer containers to bulk drum
  - acids
  - bases
  - heavy metals
  - poisons
  - reagents / oxidizers
- treat/recycle hazardous materials to non-hazardous status whenever feasible
  - neutralize and drain dispose acids/bases that are not contaminated with toxic materials (metals prohibited from drain disposal & land bans)
  - decontaminate empty chemical containers - triple rinse
  - recycle/reclaim acids or solvents for reuse if feasible (review treatment alternatives)
  - precipitate and remove toxic land ban metals (filtering) from aqueous wastes/salts
Summary Guidelines for Managing Your Hazardous Waste

• apply & complete proper hazardous waste label

• use a start date and end date on haz. waste containers: [end date is when waste is full/delivered to haz. waste storage area: this end date is the haz. waste accumulation date under RCRA]

• full chemical name(s) - clearly legible to others, chemical abbreviations not acceptable

• if waste is a mixture you must estimate and list % for each component

• waste containers must be tightly capped [closed] at all times (except when actively pouring waste)

• must keep label and container maintained in very good clean condition - no leaks or residue

• leave 2 - 3 inches of head space in waste container when full and ready for waste pick-up

• hazardous waste disposal form completed by department showing waste from each lab/area by generator (professor, staff member) prior to pick-up each May 31st

• designate your hazardous waste accumulation area – use satellite storage signage

• waste containers safely transported in secondary containers and placed inside of proper waste cabinet - segregated by waste class and compatibility
Drain Disposal for Liquids

CHEMISTRY:
• Properly neutralized acids/bases to a pH of approximately 6.0 to 8.0, that are not contaminated with metals
• A maximum of 1 gal of neutralized acid/base can be drain disposed per day followed by a minimum of 5 minutes of flushing with tap water.
  – Neutralize slowly in a fume hood with sash lowered, wear appropriate personal protective equipment.
  – Acids - slowly stir/add acid to larger water solution containing base
  – suggestion: (calcium hydroxide)
  – Base - add base to larger container containing cool water, slowly add acid
    suggestion: (hydrochloric acid) to neutralize

BIOLOGY:
• Holding solutions [preservatives] propylene glycol solution and methanol solution (Wardsafe and Carosafe) may be drain disposed of in sanitary sewer at a rate of 2 gals per day with a minimum of 5 minutes of flushing with tap water.

PHOTOGRAPHY:
• Photo developers mixed with stop bath solution can be drain disposed and flushed with tap water for 5 minutes. Toner solutions can be drain disposed with a 5 minute flush – two part solutions must be neutralized prior to drain disposal.

*Drain disposal is intended for sanitary sewer lines only.*

See disposal lists of non-hazardous chemicals in appendix section for detailed information
Disposal of “Empty Chemical Containers”

- lab/generator is responsible for **triple rinsing** empty containers of hazardous chemicals with water (water soluble) or appropriate solvent (solvent must be collected as hazardous waste)
- cross out original label with black marker place your initials legibly on container
- remove and discard caps
- place container in cardboard box - label box with “Empty & Triple Rinsed” label.

All containers must be “**completely dry**” prior to packaging for disposal.

Labels available from the Safety Web Site:

[www.southwestern.edu/safety](http://www.southwestern.edu/safety)

hazardous waste – laboratory section

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Disposal of Non-Regulated Solid Chemicals

- each lab/generator is responsible for packaging non-hazardous (non-regulated) solid chemicals in a cardboard box
- seal box when ready for pick-up on top and bottom with secure tape
- label box with “Non-Regulated Solid Waste” label.

Packaging that does not meet these criteria cannot be accepted for pick-up/disposal and will be returned to the Department/Lab.

Labels available from the Safety Web Site.

See Appendix Section for list of non-regulated chemicals to make a hazardous waste determination.
Hazardous Waste Label

All hazardous waste must have this label

Labels are available at the Safety Web Site: www.southwestern.edu/safety

Complete the data shown in blue on this example using indelible ink

Labels will be available in small and large sizes using Avery Labels

# 8164 = 4” x 3” or # 8165 = 8.5” x 5”

Room #: 315, FJS
Instructor: Dr. Dan Doogood

Hazardous Waste

Start Date: 9/1/02   End Date: 5/10/03

Waste Components and %

Chloroform  80%
Methylene Chloride  20%

Note: The outside of the container must be in good clean condition - no evidence of chemical residue or contamination can be present. The label must be in good clean legible condition. Waste containers that do not meet this criteria cannot be picked-up or accepted for disposal.
Unlabeled Containers - “Unknowns”

Common causes of unlabeled/unknown chemicals:

- label has fallen off from age
- label is illegible due to:
  - chemical residue
  - ink has worn out
  - physician’s handwriting syndrome
- container was never labeled
- outer label has fallen off & original label was not defaced
- I’ll label it later ….
- I know what it is …….

Cost of disposal for “unknowns” is up to 10 X the cost of disposal of known waste

Please make certain there are no unlabeled or illegible labeled containers

Cost of disposal of “unknowns” may be charged back to the department and the container returned to the generator.
Closed Container Rule & Control of Hazardous Waste

Each lab/generator is responsible for having control of all hazardous waste and ensuring proper procedures are used in their lab/area by students/assistants, visitors, etc.

- safe storage
- clean uncontaminated container
- properly labeled & legible
- tightly capped at all times except when pouring waste
- waste must be at or near the point of generation and under control of the “generator”

Waste containers venting to atmosphere is prohibited by law

Waste containers must be tightly capped at all times except when you are actively pouring! Never leave the lab/area with a waste container left open. Never leave a funnel in a waste container.

NOTE: Potential EPA Violations

EPA citation potential is $7000.00 - $15,000.00 per occurrence, per day.

Laboratories/Departments that do not follow the requirements of the hazardous waste program may be held financially responsible for EPA/OSHA fines.
UNIVERSAL WASTE
(considered hazardous waste)

DISPOSAL & RECYCLING

Paints:

LATEX:

Water-based paints that are left over may be converted to a non-hazardous solid waste by adding a suitable filler material (vermiculite, cat litter) to completely solidify all paint – leave paint lid off can and dispose of completely solid and dry paint waste in the dumpster.

Preferred method is to store all latex paint in good condition and transport paint cans to a local recycler for re-processing the paint and placing it back on the market to be reused. “RECYCLE PLEASE”

Wet latex paint should never be placed in the dumpster/trash.

OIL-BASE:

Oil-based paints that are left over or unwanted must be collected and disposed of as hazardous waste. Store in designated UNIVERSAL WASTE STORAGE AREA, label cans or pour into designated and labeled 55 gal waste drum. DANGER !! - Do not mix in any two part or epoxy type paints!

Whenever possible, our waste minimization policy requires the minimization of hazardous wastes. This can be accomplished by the use of substitutes (water-based paints) whenever possible or by the practice of applying all of the oil-based paint on the intended surfaces (add an extra coat and use it up!!).

DRY PAINT: completely empty and dry cans (oil or water based) can be disposed of in the dumpster only if cap/cover is removed.

BULBS / LAMPS / Thermostats

All fluorescent bulbs/lamps and HID bulbs, thermostats should be disposed of as UNIVERSAL WASTE and sent to a certified recycler. Label storage area and boxes of used bulbs. Bulbs / thermostats contain mercury.

See special hazardous waste labels for UNIVERSAL WASTE and our hazardous waste disposal reference chart for more information at www.southwestern.edu/safety

Glues / Adhesive Cements / Caulking

Store in labeled cardboard box for collection as UNIVERSAL WASTE. Label/sign storage area.
Compressed Gas Cylinders

INTRODUCTION

Hazardous waste disposal of compressed gas cylinders that cannot be returned to the supplier or manufacturer can cost from $100 per cylinder for inert gases, to over $1,000 each for unusual or toxic gases. Researchers and other users are asked to only purchase cylinders from companies that accept them for return. Larger cylinders purchased from our current cylinder vendor are generally not a problem, however certain specialty gasses purchased as lecture bottles have been. Your cooperation in following these procedures will be helpful in managing compressed gasses and avoiding the overwhelming costs for disposal.

1. PURCHASING GUIDELINES. Please purchase your compressed gas in a returnable and/or refillable lecture bottle or cylinder. Many vendors have developed alternatives to lecture bottles - contact your sales representative to learn more about these alternatives.

2. GAS CYLINDER RETURNS. Each user/department is asked to contact the manufacturer or vendor of the lecture bottle to confirm their policy on returns. Follow the instructions given by the vendor to ship or return the lecture bottle to a local representative. They will be able to provide required shipping information. The following companies are currently known to take back their lecture bottles: Air Products, Aldrich, American Environmental Instruments, Cambridge Isotope Labs, Farchan Laboratories, Matheson, MG Industries, Morton International, Ozark Mahoning, PCR Research Chemicals, Pfaltz and Bauer, Scott Specialty Gases and Spectra Gases. Each of these companies has special requirements for accepting lecture bottles for return so it will be necessary for you to contact them to follow their specific procedure.

3. HAZARDOUS WASTE DISPOSAL. Any lecture bottle that is not returnable will require management as a hazardous waste. The chemical gas mixture must be clearly identified on the "hazardous waste" label. The approximate pressure (psi) must also be noted on the label.

4. WASTE MINIMIZATION. We are required to have a waste minimization policy. Please make every effort available to minimize or eliminate the amount of gas that must be managed as a hazardous waste. Waste minimization has many environmental and economic benefits and includes such things as changing procedures, changing vendors and substituting materials. We appreciate your efforts at helping to manage our hazardous waste stream.
Biological Waste

Regulated by state regulations (TCEQ).
These wastes should be disposed of in permitted landfills.

- infectious agents/cultures, blood, human pathological waste, blood products, uncontaminated sharps (needles, syringes, scalpels, razor blades, glass pipettes) or contaminated sharps (all glassware, tubes, slides, etc) should be handled as hazardous or bio-hazardous waste.

Some chemicals designated as hazardous waste by EPA (RCRA):
- Ethidium bromide
- Nicotine
- Caffeine

Other chemicals / drugs that could cause adverse human health effects upon contact/exposure or environmental damage upon landfill disposal should be disposed of as hazardous waste.

- **ANIMAL CARCASSES**: Flushed and very well drained carcasses with low formaldehyde content or low level research drug injections can be disposed of at Animal Services in Georgetown – carcasses should be very well rinsed and bagged and sealed. The preferred disposal method is to bring frozen specimens to the collection dumpster.

- Contact Animal Services prior to delivering for disposal ( 930-3592 ).

- Carcasses or specimens that are not fixed can be disposed of at Georgetown Animal Services.

- Carosafe and Wardsafe holding solutions can be drain disposed in sanitary sewer with a minimum of 5 minutes of flushing at a disposal rate of 2 gals per day.

- See our hazardous waste and waste disposal reference chart at [www.southwestern.edu/safety](http://www.southwestern.edu/safety) ( hazardous waste section )
Photography Disposal

- Mix developer and stop bath then drain dispose
- Toner Solutions: see photography waste disposal guide for specifics. In general, drain dispose with five minute flush. Some two part solutions will need to be neutralized prior to drain disposal.
- Fixer: collect as hazardous waste for silver contamination. Fixer, speed fix, fixer remover and washing agent are contaminated with silver – collect as hazardous waste.
Hazardous Waste Program
Attachments

• Self-audit questionnaire
• Reference list of non-hazardous (non-regulated) chemicals that can be disposed of in normal trash
• Reference list of chemicals that can be drain disposed (liquids)
Hazardous Waste Program Self-Audit

1. Do you have an effective purchasing process that meets the requirements of our waste minimization policy?

2. Can you justify the quantity and waste you generate?
   • Can you substitute to a non-hazardous chemical?
   • Have you reviewed and reduced your experiments/processes to micro-scale quantities?
   • Have you treated or recycled your hazardous waste if feasible?

3. Have you estimated the quantity of hazardous waste you expect to generate this academic year: forward to department chair?

4. Have you informed/trained all new generators of waste about the details of our hazardous waste program?

5. Is there a departmental process to ensure all labs are cleaned-out prior to the departure of any faculty/staff waste generator?

6. Do you order and maintain a maximum of one year’s supply of hazardous chemicals?

7. Is your hazardous waste stream properly segregated in each class according to our waste minimization policy?

8. Are all your chemical containers labeled & in good clean condition?

9. Are all peroxide forming/explosive chemical containers “open dated” and hazard warning labeled?

10. Is your hazardous waste satellite accumulation area designated and labeled?

11. Do you store and transport all hazardous chemicals in secondary containment?

Mark each question yes/no - comment if necessary
(10 points for each yes answer)
Forward to Department Chair

Department: Building/Room:

Generator:

Self-Audit Score:
Date: