Hazardous Waste Management & Waste Minimization Training

THE UNIVERSITY of TENNESSEE
KNOXVILLE
ENVIRONMENTAL HEALTH & SAFETY

Environmental Health and Safety

- Safety Training
- Building Inspections
- Accident Investigations
- Fire Safety
- Hazardous Materials Management
- Laboratory Safety
- Industrial Hygiene
- Environmental Compliance
- General and Occupational Safety

Resource Conservation and Recovery Act (RCRA)

- Passed by Congress in 1976 to provide a cradle-to-grave management of hazardous waste

- Enforced by the following governmental agencies:
  - Federal - Environmental Protection Agency (EPA)
  - State – Tennessee Department of Environment and Conservation (TDEC)
  - **UT has a Hazardous Waste Policy found on the EHS web-site: http://web.utk.edu/~ehss/**

Training Requirements

- **EPA and TDEC require documented training for individuals who handle and/or generate hazardous waste.**
- **There is initial training, followed by annual refresher training. There is an on-line training module on the EHS web-site.**

What is a Hazardous Waste?

- Hazardous Waste is defined by the EPA as:
  - A material that no longer has an intended value.
  - Exhibits properties that make it dangerous or potentially harmful to human health or the environment.

Fast Facts about Hazardous Waste on Campus

- UT Knoxville generates and disposes of roughly 18 tons of hazardous waste per year.
- UT ships approximately 600-800 containers of hazardous waste for disposal at a cost of roughly 250K each year.
- We typically incinerate or recycle the waste. We don’t landfill the waste.
- EHS punctures the aerosol cans that are collected throughout campus (including the “Rock”, we puncture the can, collect the contents and recycle the steel cans.

4 Categories of Hazardous Waste:

- **Ignitable/Flammable and Oxidizers**
- **Corrosive**
- **Reactive**
- **Toxic**

4 Categories of Hazardous Waste:

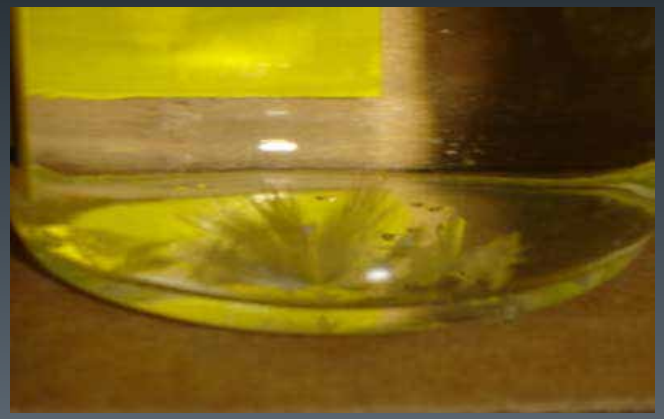
- Ignitable/Flammable and Oxidizers
  - The flashpoint is < 140º F (60º C)
  - It is an oxidizer
  - It is a flammable compressed gas
  - It is a liquid capable of fire through friction, absorption of moisture or spontaneous chemical change.
- Examples include: Acetone, Ethanol, Toluene, Sodium Nitrate

4 Categories of Hazardous Waste:

- **Corrosives**-acids and bases
- It is an aqueous solution with a pH ≤ 2 or ≥ 12.5
- It corrodes steel at 6.35 mm/year at 55º C
- Examples include: Hydrochloric acid, Sulfuric acid, Sodium Hydroxide

4 Categories of Hazardous Waste:

- **Reactive –**
  - It is capable of creating toxic gases when mixed with water
  - It forms explosive mixtures with water
  - It is cyanide or sulfide bearing
  - shock sensitive, water reactive; air reactive; spontaneously combustible; potentially explosive
  - Examples: Ethyl ether, TNT, Dry picric acid, potassium metal



4 Categories of Hazardous Waste:

- **Toxic**
- Includes several metals and their compounds (Mercury, Lead, Silver, Chromium, Cadmium, Selenium, Barium, Arsenic),
- Some organics (Methylene Chloride, Chloroform, Benzene)
- Acutely toxic (Sodium Azide; acrolein); there are a list of these chemicals on the EHS web-site

Examples of Hazardous Waste in Laboratories:

- Spent solvents and non-empty solvent containers.
- Testing Samples
- Unused Reagents
- Reaction Products
- Absorbents and spill cleanup
- Contaminated materials (i.e. glassware, gloves; pipet tips)
- Used Chromatography vials
- Gas Cylinders

Hazardous Waste Exclusions

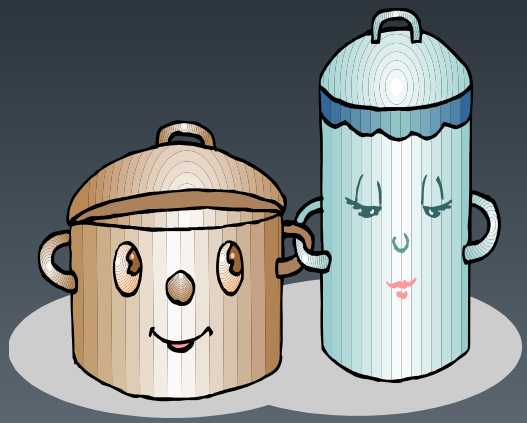
- **The following categories of waste are not considered hazardous waste for this program:**
  1. **Sewage**
  2. **Regular trash**
  3. **Universal waste (fluorescent bulbs, batteries)**
  4. **Radioactive and biohazard**

Steps to Hazardous Waste Management

- Determine if it is a hazardous waste
- Find an appropriate waste container
- Label waste
- Ensure waste is stored properly
- Bring to EHS for disposal

Container Management

- Contents must be compatible with container material
- *The container (lid) must be closed except when adding or removing waste*
- Must be in good condition (no cracks or rust)
- Clean on outside; leakproof
- Use separate waste containers for different wastestreams to avoid unwanted reactions; be careful mixing waste.
- **For large quantities, EHS can provide 30 or 50 gallon drums or 5 gallon plastic containers.**



Empty Containers

- Empty containers (bottles, cans, jars, bags, etc) that once held a hazardous substance may be discarded in the regular trash and are not considered hazardous waste
- Make sure you deface any markings, such as DOT diamonds and other labels from empty containers.

Labels

- Make sure all hazardous waste is labeled with a UT hazardous waste label as soon as waste is added to the container.
- Label Containers with contents and % (if known).
- Don’t use abbreviations, formulas, or trade names. Write out entire chemical name.

UNIVERSITY OF TENNESSEE
HAZARDOUS WASTE

IMPROPER DISPOSAL PROHIBITED BY LAW. IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY.

BUILDING SERF
ROOM # 212
GENERATORS NAME A. Case
PHONE NUMBER 974-5084
DEPARTMENT EHS

CARCINOGEN
EXPLOSIVE
(TOXIC)
IRRITANT

CORROSIVES
(FLAMMABLE)
OXIDIZER
REACTIVE

CONTENTS (LIST ALL CHEMICALS BY NAME)

Acetone (10-20%)
Methanol (1-5%)
Methylene Chloride (1-5%)
Water- Balance

TECHNICAL CONTACT:
(INFORMATION)

DEPARTMENT OF ENVIRONMENTAL HEALTH & SAFETY
(865) 974-5084

Waste Storage

- Satellite Accumulation Area: area in the lab where waste chemicals are stored (near waste generation area).
- Designated with signs – available from EHS
- Should not store more than 55 gallons of waste at one time in the SAA.

HAZARDOUS
WASTE
STORAGE
AREA

Waste Storage and Segregation

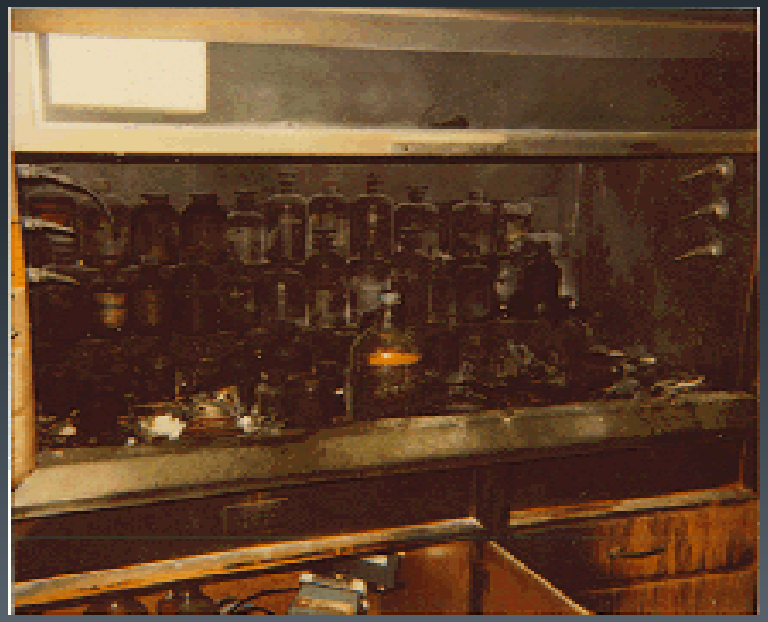
- Segregate by Hazard Categories:
  (i.e. Flammables, Toxics)
  Not alphabetically
- Use Cabinets, dishpans, tubs, or some type of secondary containment.
- Reference the MSDS for specific chemical information
- Call EHS for assistance if needed

Waste Segregation: Common Examples

- Cyanide salts and acid
  - HCN
- Flammables and Oxidizers:
  - Acetone and Sodium Nitrate
- Acids and Bases
  - Hydrochloric Acid and Sodium Hydroxide
- Mercury and mercury compounds
- Unstable just from long shelf life
  - Ethers, Sodium Azide, Picric Acid

Accident at University of Kentucky

- A student added methylene chloride to a waste bottle with unknown contents .
- An explosion occurred blowing glass shrapnel across the laboratory.
- A fire occurred in the hood and the laboratory quickly filled with smoke .



Hazardous Waste Incompatibility Incident

- **Nitric acid waste was added to bottle containing waste solvents**
- **Reacted violently causing explosion under fume hood**

http://www2.umdnj.edu/eohssweb/aiha/accidents/explosion.htm#Incompatible

Hazardous Waste Disposal

- Dispose of all hazardous waste through EHS.
- Do not pour waste down the sink or throw away in the trash.
- “Dilution is NOT the Solution”
- If you are not sure if waste is hazardous, assume worst case and manage as hazardous waste.
- Any questions? Contact EHS.

Waste can be brought to the following locations for disposal:

- Walters Waste Room WLS
  M-209
  Wednesdays 1:00-2:00 p.m.
- SERF Waste Room @ loading dock
  2nd Floor
  Wednesdays 2:00-3:00 p.m.
- **Do not leave waste unattended!!!!**

Spills

Clean-up small spills if you:

- Have materials to absorb and bag the spilled material
- Are familiar with the properties of the spilled materials
- Have the proper personal protective equipment
- Know spilled acids or bases are dilute

Do not clean-up a spill if you:

- Don’t know the identity of the chemical
- Lack the knowledge to safely handle the spill
- Feel the spill is unsafe to clean up
- If a spilled chemical enters the drain, soil or water body

Spills and other Emergencies

- For minor spills, call EHS at 974-5084 if you feel you cannot handle the situation.
- For major spills, or incidents that happen after hours, please call UT Police at 911.
- **Remember that any waste generated from a spill cleanup of a hazardous waste or chemical must be managed as a hazardous waste.**

Transporting Chemicals Safely on Campus

- Be aware of the chemical's hazards.
- Hazardous chemicals must be attended **at all times** during transport.
- Wear appropriate PPE.
- Use Secondary Containment.
- Avoid using passenger elevators.
- Use a cart or bucket if needed.
- Avoid transporting chemicals in vehicles.

Table: Violations Observed Listed with Corresponding Laboratory Room Number

Bldg	Room	Issues	Bldg	Room	Issues
WLS	E308	Open container	SERF	516	
	E206			521	
	E202			616	
	E301			634	
				624	
	D203			621	
	D307			623	
	D313			635	Container with funnel, no lid
	D417			701	
	D413			705	Open jug-type container
	D407			702	
	D401			712	
	C407	Open container, no label		715A	
	C409			716	
	C411	Open hazardous waste box		718	
	B410			723	Open zip-bag of dry plastic parts
	A403			722	
	A413			731	
	A415			732	
Hesler	225			720	
	218			721	
	217			719	
	216			729	
SERF	217	Contaminated oil container open	DBH	101N	
	225			663	
	309			665	
	310			631	Liquid waste container plugged with a beaker, evidence of leakage
	311			531	
	312			502	
	319			558	Open drum, open collection jug, and hole in lid of sharps container
	317			562a	
	316			454	
	335a			458	
	432	Unlidded collection bottles, unlabeled bottle		407	
	433a			402	
	434c			432	
	422			431	
	423			341	
	424			352	
	408			308	
	407			302	
	410			346	
	403			343	
	501			340	
	502			204-F	Oily spill contained, but not cleaned up
	503			204C	
	506			204B	
	508			206	
	510			210	
	512			211	

UTK's Hazardous Waste Minimization Policy

- State regulations require the university write and implement a hazardous waste reduction and waste minimization plan.
- In 2007, UT Knoxville disposed of approximately 60,000 pounds of hazardous waste at a cost of $230,042.05.
- A copy of the plan is found on the EHS web-site
- Contact EHS (x5084) to discuss hazardous waste reduction activities – even activities that have occurred in the past. We must document these efforts in the policy.
- UT has a Mercury Reduction Policy

Hazardous Waste Minimization Ideas

- Substitution with a non-hazardous substance
- EHS Chemical Exchange Program
- Microchemistry or reduced volumes
- Avoid mixing or contamination with non-hazardous substances
- Distillation of solvents
- Buy only the amount of chemicals you need

Summary

- Hazardous waste containers must be kept closed, properly labeled, in good condition, acceptable for the contents and properly stored.
- Labels and regulatory guidance are available from EHS (x5084)
- Strive for hazardous waste reduction and waste minimization
- If you have any questions, please call EHS.

Contact Information

- Hazardous Waste: Steve Crouch; acase3@utk.edu;
- Lab Safety: Pam Koontz; pjkoontz@utk.edu
- Knoxville Fire Department,
  Knoxville Police or Ambulance Service 911
- UT Police 974-3111 (call 911 first)
- Environmental Health & Safety 974-5084
- Radiation Safety Dept. 974–5580
- Bio-safety Dept. 974-1938
- Recycling Coordinator (Jay Price): 974-3480