



KU

Wonderful Institute for
Sustainable Engineering

Hazardous Waste

Presented by: Jared Bartlett

"I am proud to be an engineer."

- Neil Armstrong



Attendance
Check-In

WEDNESDAY, JULY 22 AT 9:00AM





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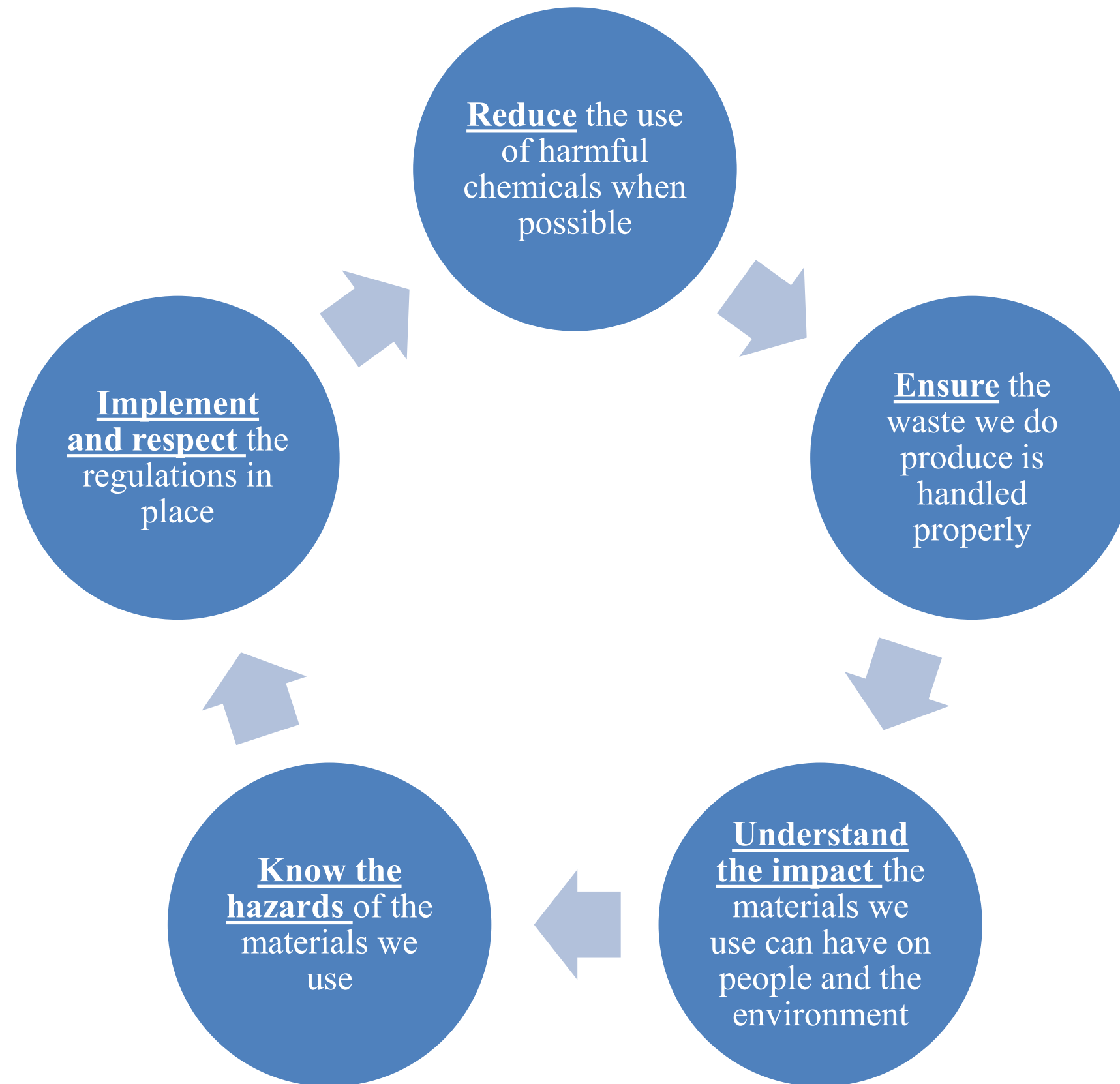
Introduction



Michigan EGLE (Department of Environment, Great
Lakes, and Energy)

<https://www.michigan.gov/egle>

Our Responsibility as Scientists & Engineers



Identifying Hazardous Waste

What is Solid Waste?

Definition

- Solid waste refers to any discarded or unwanted materials. It includes various items such as paper, plastics, glass and food waste. The **Resource Conservation and Recovery Act (RCRA)** also states that solid waste can include sludge from industrial plants or other discarded materials that result from industrial, commercial, mining and agricultural operations.
- While solid waste is often considered a solid state, the RCRA states that this type of waste does not have to be physically solid. In fact, many solid wastes are liquid, semi-solid or contain gaseous material.



What is Hazardous Waste?

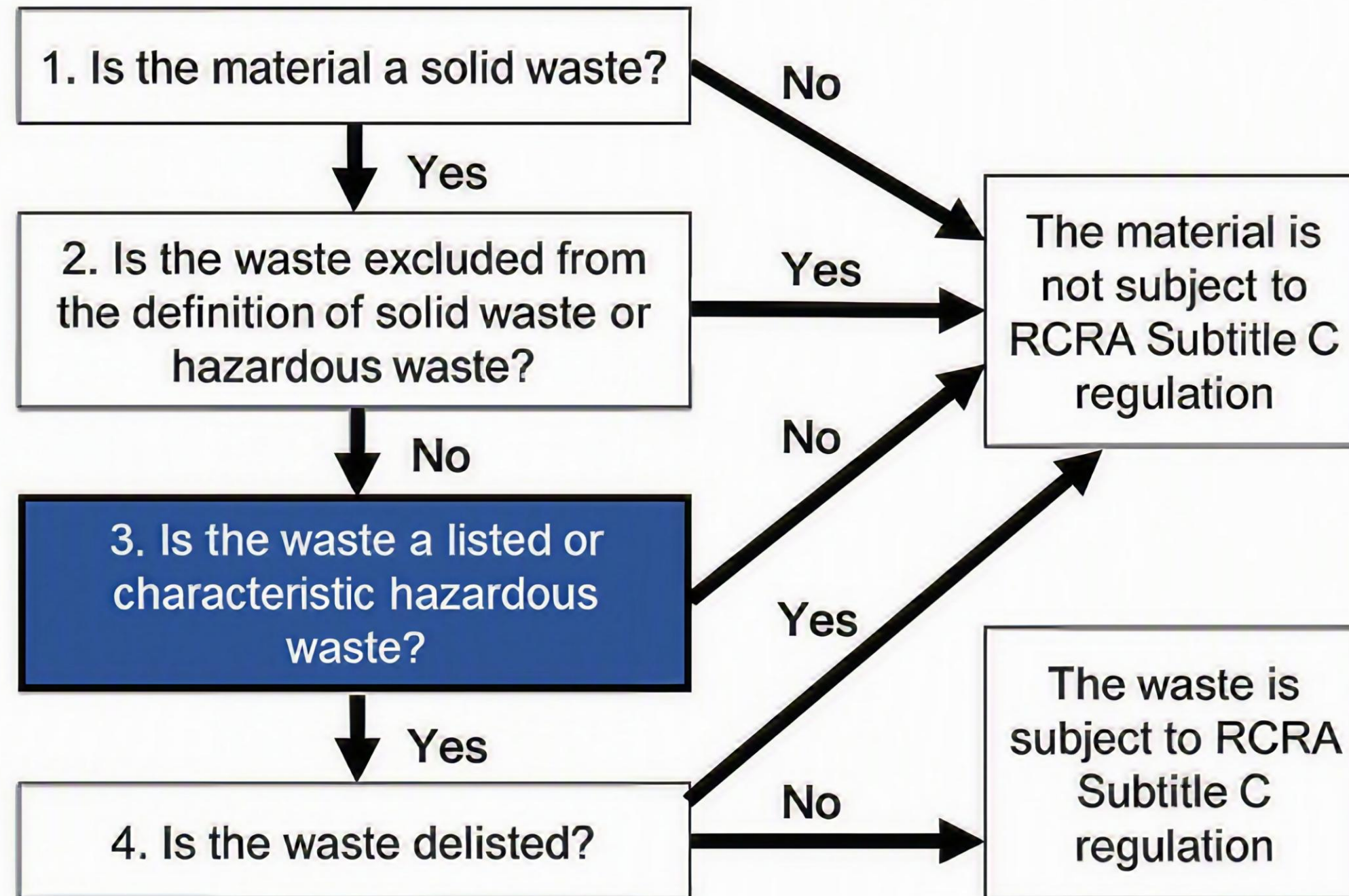
Definition

- Waste that is dangerous or potentially harmful to our health or the environment.
- Hazardous wastes can be liquids, solids, gases, or sludges.
- Before a material can be classified as a hazardous waste, it must first be a solid waste as defined under RCRA.



Hazardous Waste Determination

The Hazardous Waste Identification Process



Hazardous Waste Determination

Used Materials

F List

Non-specific sources

*Examples: spent solvent wastes,
waste from electroplating etc...*

K List

Specific sources

*Examples: organic chemical
manufacturing, petroleum
refining, etc...*

Unused Materials

U List

Commercial chemical
products

P List

Acutely toxic commercial
chemical products & their
containers

*Examples: Warfin, Acetone,
Benzene, Toluene, etc...*

Hazardous Waste Characteristics



Universal Waste

- Lamps
- Batteries
- Mercury-Containing Equipment
 - Including thermostats, but excluding batteries & lamps
- Pesticides
- Aerosol Cans

Regulations govern the collection and management of these widely generated wastes, thus facilitating environmentally sound collection and proper recycling or treatment.

Instructions for managing universal waste can be found through [KU EHS > Resources > Forms](#)



UNIVERSAL WASTE

KU Procedures for the Management of:

- Fluorescent Lamps and many other bulbs,
- Batteries,
- Mercury-Containing Equipment (MCE) including Thermostats, and
- Pesticides

PURPOSE

This document was written to help you comply with the regulations administered by the Kansas Department of Health and Environment (KDHE). It lays out specific rules that must be followed to safely, responsibly and properly manage certain waste as “universal waste”. Some of the information in this document you may already be doing and some material may be new to you.



Hazardous Material and Waste Regulations

Federal Regulations for Hazardous Materials

Hazardous materials are defined and regulated by...

EPA



Protect the
environment

OSHA



Protect
yourself

DOT



Transport hazardous
materials safely

NRC



Protect the
public and the
environment from
radioactive materials

U.S. Environmental Protection Agency

- **Resource Conservation and Recovery Act (RCRA)**
- Atomic Energy Act (AEA)
- Beaches Environmental Assessment and Coastal Health (BEACH) Act
- Chemical Safety Information, Site Security and Fuels Regulatory Relief Act
- Clean Air Act (CAA)
- Oil Pollution Act (OPA)
- Pesticide Registration Improvement Act (PRIA) - See FIFRA
- Pollution Prevention Act (PPA)
- Safe Drinking Water Act (SDWA)
- National Environmental Policy Act (NEPA)
- National Technology Transfer and Advancement Act (NTTAA)
- Clean Water Act (CWA) (original title: Federal Water Pollution Control Amendments of 1972)
- Toxic Substances Control Act (TSCA)

Resource Conservation and Recovery Act

Federal program to manage hazardous wastes from cradle to grave

- EPA works with its federal, state, and tribal regulatory partners to assure compliance with statutes and regulations in the management of hazardous wastes and underground storage tanks
- Most of the **compliance monitoring responsibility** is delegated to the *states and local authorities*

U.S. Occupational Safety and Health Administration

- **Hazcom: Hazard Communication Standard (Right-to-Know)**
- **Hazardous Waste Operations and Emergency Response**
- **Other Standards:**
 - Lead (Pb)
 - Respiratory Protection
 - Asbestos
 - Occupational Exposure to Hazardous Chemicals in Labs, including requirements for Chemical Hygiene Plans
 - Bloodborne Pathogen
 - Formaldehyde, Benzene, and Methylene Chloride



U.S. Department of Transportation

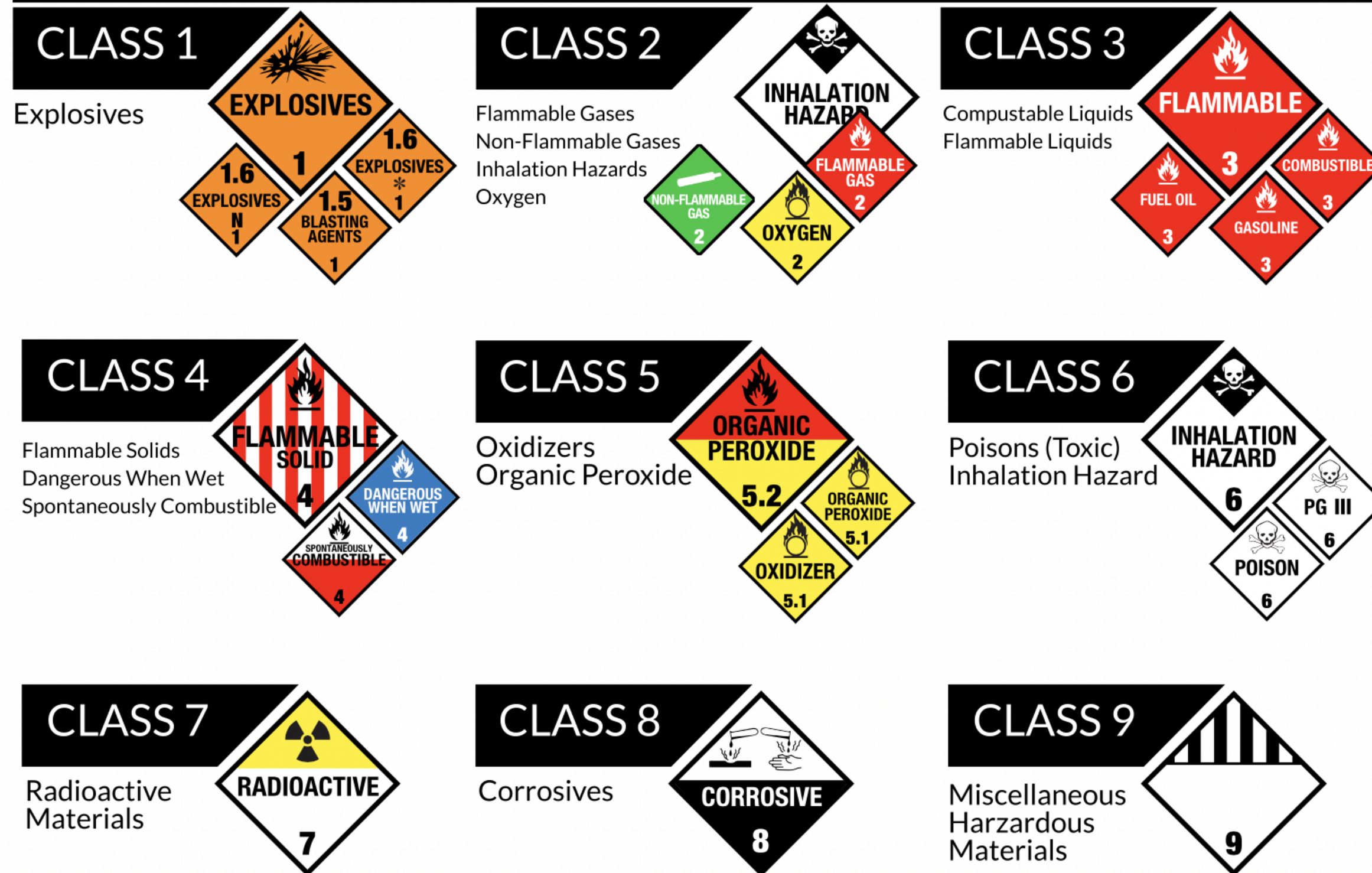
Hazardous Materials Regulations Goals:

1. Ensure that hazardous materials are packaged and handled safely during transportation
2. Provide effective communication to transportation workers and emergency responders of the hazards of the materials being transported
3. Minimize the consequences of an incident should one occur.



U.S. Department of Transportation

Hazardous Material Placards



U.S. Nuclear Regulatory Commission

Responsible for protecting the health and safety of the public and the environment by licensing and regulating the civilian uses of radioactive materials:

Standards for Protection Against Radiation

1. Dose limits for radiation workers and members of the public
2. Exposure limits for individual radionuclides
3. Monitoring and labeling radioactive materials
4. Posting signs in and around radiation areas
5. Reporting the theft or loss of radioactive material
6. Penalties for not complying with NRC regulations

Examples of materials include:

- Source material
i.e. uranium and thorium
- Special nuclear material
i.e. enriched uranium and plutonium
- Byproduct material
i.e. material that is made radioactive in a reactor, and residue from the milling of uranium and thorium

Federal Laws and Regulations

- Resource Conservation and Recovery Act (RCRA) 1976
- Hazardous and Solid Waste Amendments (HSWA) 1984
- 40 CFR Parts 260 – 271
- United States Code (USC); Federal Register (FR); Code of Federal Regulations (CFR)

Kansas Department of Health and Environment

Mission: *To minimize the health and environmental impact associated with the generation, storage, transportation, treatment, and disposal of all solid and hazardous wastes in Kansas.*

RCRA and HSWA are the basis for the current state policy

- Kansas State Laws and Regulations
- Kansas Statutes Annotated (K.S.A. 65-3431)
- Kansas Administrative Regulations (K.A.R. 28 – 31)

Hazardous Waste Generators Classifications

EPA Categories of Generators

- Very small quantity
 - < 100 kg/month hazwaste
 - < 1 kg/month P-Listed
- Small quantity
 - 100 – 1000 kg/month hazwaste
 - < 1 kg/month P-Listed
- Large quantity
 - > 1000 kg/month hazwaste
 - > 1 kg/month P-Listed

KDHE categories of Generators

- Conditionally exempt small quantity
 - Generate < 25 kg/month Hazardous Waste
 - Generate and accumulate < 1 kg/month P-Listed
 - Never exceed 1000 kg Hazardous Waste on-site
- Kansas small quantity
 - Generate ≥ 25 but ≤ 100 kg/month Hazardous Waste
 - Generate and accumulate < 1 kg/month P-Listed
 - Never exceed 1000 kg Hazardous Waste on-site
- Small quantity
 - Generate > 100 but < 1000 kg/month Hazardous Waste
 - Generate and accumulate < 1 kg/month P-Listed
 - Never exceed 6000 kg Hazardous Waste on-site
- Large quantity
 - Generate ≥ 1000 kg/month Hazardous Waste
 - Generate or accumulate ≥ 1 kg/month P-Listed

Hazardous Material and Waste at KU

The University of Kansas

Classified as a Large Quantity Generator (LQG) by KDHE

- *Generate ≥ 1000 kg/month Hazardous Waste*
- *Generate or accumulate ≥ 1 kg/month P-Listed*

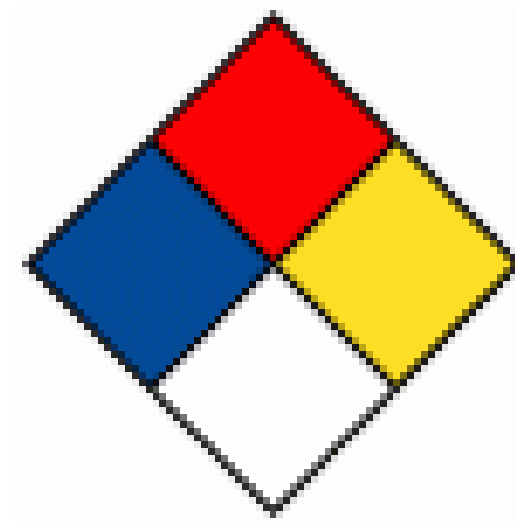
Laboratories are considered Satellite Accumulation Areas.

Waste from labs are transferred to 90-day accumulation areas for their potential reuse, redistribution, reclamation, recycling, or transported to a treatment, storage and disposal facility (TSDF).

KU Department of Environment, Health & Safety



Asbestos & Lead



Hazardous Materials



Environmental
Protection



Laboratory Safety &
Biosafety



Occupational Safety
& Health



Radiation & Laser
Safety

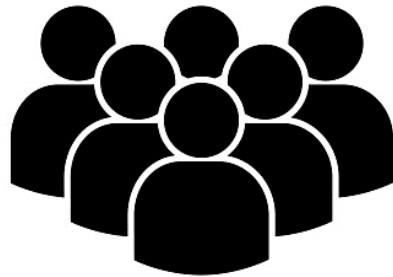
KU-EH&S Hazardous Materials

Waste collection procedures for on-campus personnel:

- Container conditions
- Chemical segregation
- Container labeling
- Container pickup
- Container transport (contiguous property)

KU-EH&S Waste Management Program

Users



- “ALARA” waste generation
- Segregate and identify waste streams
- Secure disposal methods as approved by EHS

Supervisors



- Provide space and conditions for effective waste management
- Require that users know and follow EHS instructions

KU-EH&S



- Administer the waste management program
- Collect and dispose unwanted hazardous waste
- Provide training

KU-EH&S

ID Number	Course Name
<u>EHS000-001</u>	EHS Safety Training Courses
<u>EHS002</u>	ISB EHS Safety Training Course
<u>EHS003</u>	School of Engineering EHS Safety Training Courses
<u>EHS004</u>	School of Pharmacy EHS Safety Training Courses

Hazardous Waste Collection Containers and Spill

You can request waste containers and spill kit from EHS at no charge

Wall mounted spill kit



Solvent safety can
-flammable solvents, no corrosives

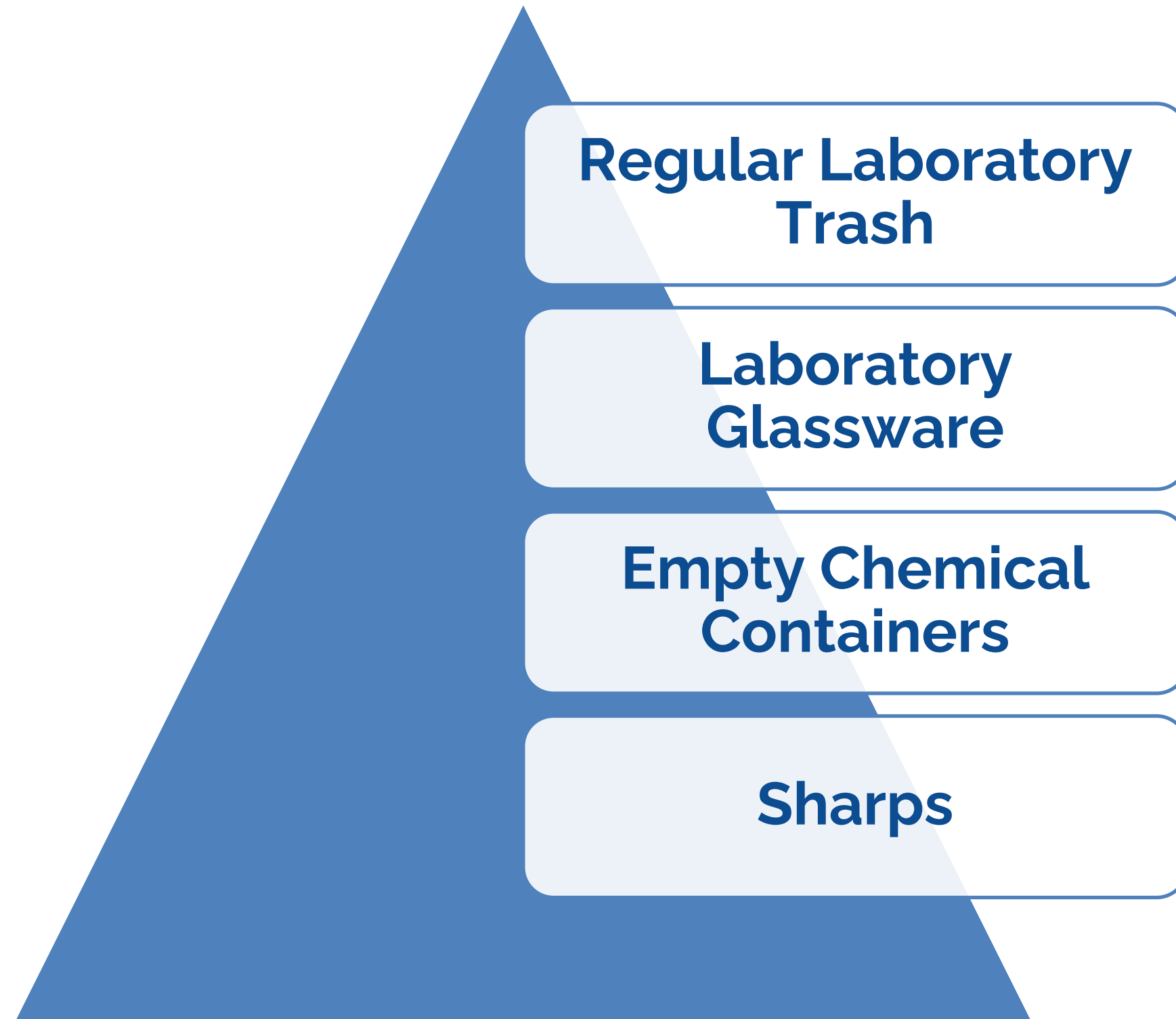


HPLC Safety can
-flammable solvents, no corrosives

Day Accumulation Container
– must be emptied daily into safety can



Types of Waste



Regular Laboratory Trash

Solid waste free of any hazardous components

Examples are non-contaminated:

- Gloves
- Kimwipes
- Paper towels
- Plastic containers



Laboratory Glassware

Appropriate glass container

Examples:

- Unwanted glassware
- Broken glassware
- Pasteur pipettes



'Empty' Chemical Containers

- Wash and remove all labels
- Remove all lids

If the volume is less than 2.5 L

- Use a collection vessel
- If glass and less than 1 L -> glassware container

If the volume is more than 2.5 L

- No need for a container



Sharps

Appropriate sharps container

Examples:

- Needles
- Pipette tips
- Sharp things!



Hazardous Waste

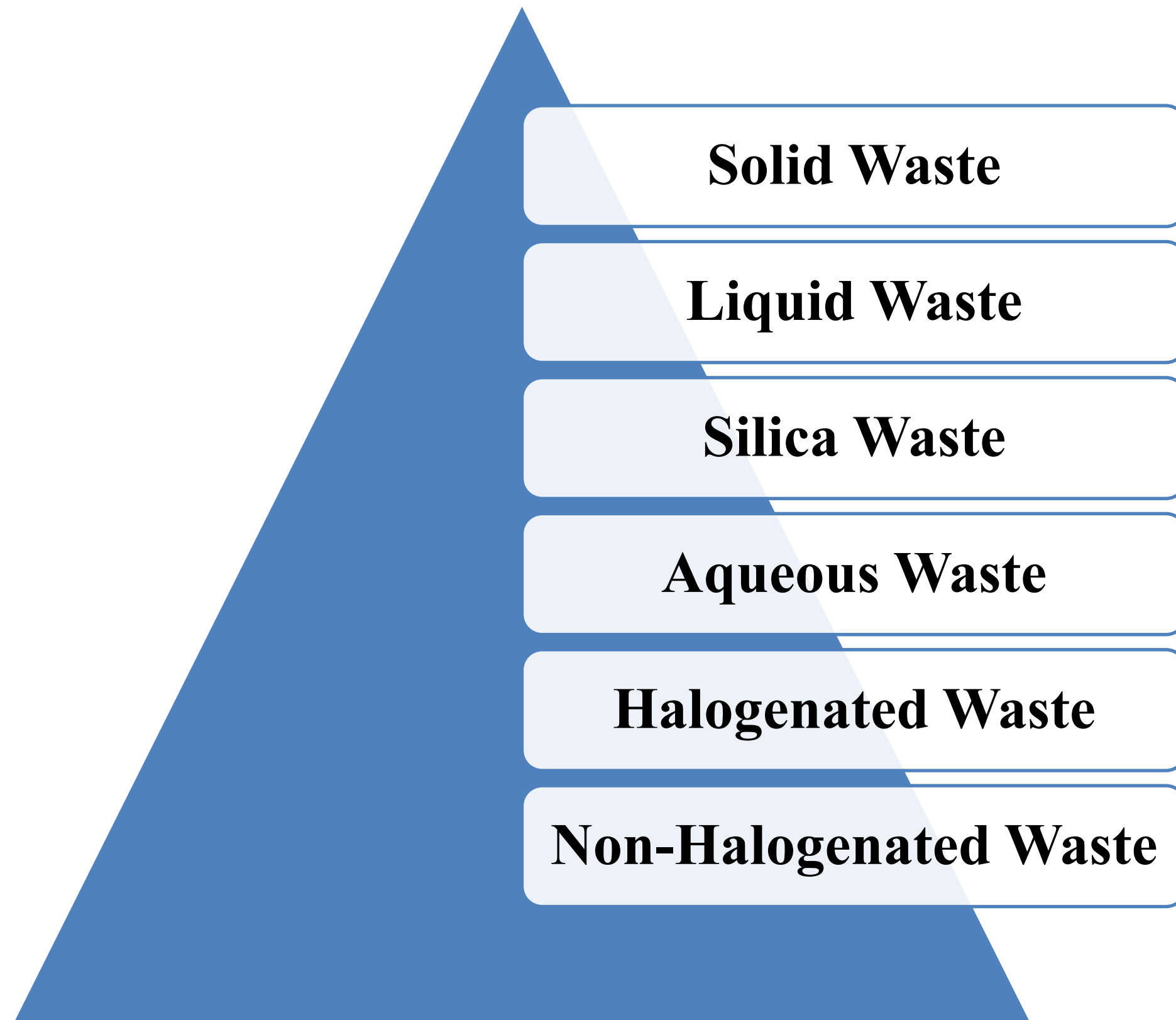
Hazardous waste (as defined by EPA-RCRA) and/or items contaminated with hazardous chemicals must be disposed through EHS.

See "[Laboratory Trash Removal Guide](#)" under EHS Resources > Forms.

Examples

- Hazardous Materials
- Chemicals or Biological Materials (liquids/solids)
- Contaminated "KimWipes", paper towels, rags and/or absorbent pads used to protect benches, wipe up spills, or clean/dry items
- Contaminated Gloves
- Contaminated Pipette tips
- Contaminated Sharps
- Contaminated Containers

Types of Contaminated Waste



- Confirm compatibility between container and waste
- As soon as you start using a waste container, it must be labeled as Hazardous Waste!
- Label all waste containers with the specific label provided by EH&S (seen to the right)
- Keep containers tightly closed
- It is important for disposal and safety purposes that you list ALL chemicals that are present in your waste
- It is important to collect different or incompatible waste chemicals into separate containers

Call EHS for assistance or questions at 785-864-2853

Hazardous Material	
<i>Attach this label and fill out the first two sections when starting any waste container</i>	
Material Identification (check one)	
☐ Unwanted Chemical or Material = Hazardous Waste	
☐ Chemically-contaminated material = Hazardous Waste	
☐ Used Oil	
☐ Used Battery, Lamp, or Mercury-containing Device = Universal Waste	
This container is under the control of:	
Contact Person: _____	
Building & Room: _____	
Phone Number: _____	
Container Number: _____	
Contents	
List • All chemical components • All contaminants of spill cleanup debris	
Chemical(s) (full chemical names-no formulas or abbreviations)	Amount(s) (mL, g, or %)
Total amount in container (volume): _____	
Pickup request date: _____	
<i>You must request a pickup the day the container becomes full</i>	
For EHS use only:	
Date Bulk'd: _____	Job # _____
Volume Bulk'd: _____	Drum # _____
Entry # _____	
☐ RCRA Non-Hazardous Waste (Supersedes above determinations)	
www.ehs.ku.edu or call 864-2853	

Hazardous Waste

Guidelines (con't):

- Collect separately, where possible, waste organic materials from waste inorganic materials.
- Collect separately, waste peroxidizable materials from other waste materials.
- Collect separately, where possible, all known or suspected carcinogenic wastes.
- Where possible, do not mix waste aqueous material with waste organic material.
- Collect waste solvents separately, where possible, as either halogenated or non-halogenated

Call EHS for assistance or questions at 785-864-2853



Wonderful Institute for Sustainable Engineering

Hazardous Material <i>Attach this label and fill out the first two sections when starting any waste container</i>																	
Material Identification (check one) ☐ Unwanted Chemical or Material = Hazardous Waste ☐ Chemically-contaminated material = Hazardous Waste ☐ Used Oil ☐ Used Battery, Lamp, or Mercury-containing Device = Universal Waste																	
This container is under the control of: Contact Person: _____ Building & Room: _____ Phone Number: _____ Container Number: _____																	
Contents List · All chemical components · All contaminants of spill cleanup debris <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; border-bottom: 1px solid black; width: 70%;">Chemical(s) (full chemical names-no formulas or abbreviations)</th> <th style="text-align: center; border-bottom: 1px solid black; width: 30%;">Amount(s) (mL, g, or %)</th> </tr> </thead> <tbody> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> </tbody> </table> Total amount in container (volume): _____ Pickup request date: _____ <i>You must request a pickup the day the container becomes full</i>		Chemical(s) (full chemical names-no formulas or abbreviations)	Amount(s) (mL, g, or %)	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Chemical(s) (full chemical names-no formulas or abbreviations)	Amount(s) (mL, g, or %)																
_____	_____																
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For EHS use only: Job # _____ Date Bulk'd: _____ Drum # _____ Volume Bulk'd: _____ Entry # _____ ☐ RCRA Non-Hazardous Waste (Supersedes above determinations) www.ehs.ku.edu or call 864-2853																	



Contaminated Adsorbents

Reminder: Contaminated adsorbents and waste silica gel require a different label on waste container!

Contaminated Adsorbents	
Contact Person: _____	
Building & Room: _____	
Phone #: _____	
Listed contaminants - check any that apply	
☐ None of these apply	
HAZARDOUS WASTE	
☐ D004 Arsenic	☐ D024 m-Cresol
☐ D005 Barium	☐ D025 p-Cresol
☐ D006 Cadmium	☐ D026 Cresol
☐ D007 Chromium	☐ D027 1,4-Dichlorobenzene
☐ D008 Lead	☐ D028 1,2-Dichloroethane
☐ D009 Mercury	☐ D029 1,1-Dichloroethylene
☐ D010 Selenium	☐ D030 2,4-Dinitrotoluene
☐ D011 Silver	☐ D031 Heptachlor (and its epoxide)
☐ D012 Endrin	☐ D032 Hexachlorobenzene
☐ D013 Lindane	☐ D033 Hexachlorobutadiene
☐ D014 Methoxychlor	☐ D034 Hexachloroethane
☐ D015 Toxaphene	☐ D035 Methyl ethyl ketone
☐ D016 2,4-D	☐ D036 Nitrobenzene
☐ D017 2,4,5-TP (Silvex)	☐ D037 Pentachlorophenol
☐ D018 Benzene	☐ D038 Pyridine
☐ D019 Carbon tetrachloride	☐ D039 Tetrachloroethylene
☐ D020 Chlordane	☐ D040 Trichloroethylene
☐ D021 Chlorobenzene	☐ D041 2,4,5-Trichlorophenol
☐ D022 Chloroform	☐ D042 2,4,6-Trichlorophenol
☐ D023 o-Cresol	☐ D043 Vinyl chloride
<i>* No free liquids allowed. Check your SDS's for the chemicals listed above.</i>	
Date full: _____	
You must notify EHS for pickup on fill date: www.ehs.ku.edu	
For EHS use only:	
Volume _____	Job # _____
Date Bulk'd _____	Drum # _____

Hazardous Material / Waste Pickup Request

As soon as a container is full it should be dated and EHS should be notified so waste container can be removed within 3 days of being full.

1. Submit a completed Internet Waste Pickup Request Form:

Available on the EHS website under Service Requests > [Hazardous Waste Disposal - Pickup Request](#)

2. If the form is not working then you can telephone a pickup request to the Hazardous Materials staff at 785-864-2853.

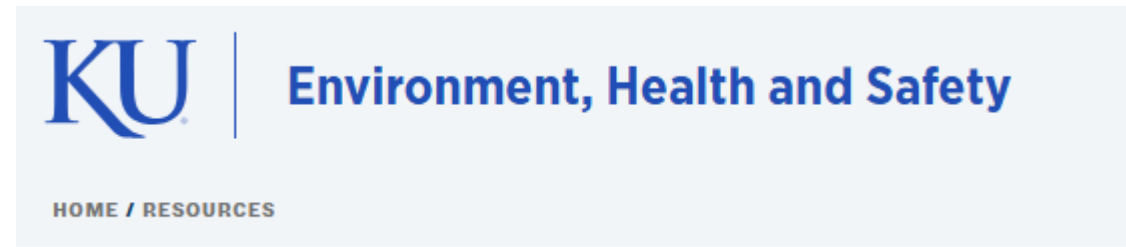
***Note:** Before requesting a hazardous material(s) pickup, please have the official **Hazardous Material Label** already attached with a single piece of tape on each container. *Contaminated Adsorbents/Waste Silica Gel Require a Different Label.*

Instructions for Handling & Disposal of Common Waste Materials

Examples:

- Aerosol Cans
- Animal Research-related Material
- Art Supplies
- Cleaning Supplies
- Computers and Electronics
- Unknown Chemicals
- Spill Clean-up Material

See “[Handling and Disposal of Common Wastes List](#)” under
EHS Resources > Forms.



Hazardous Materials / Environmental Protection

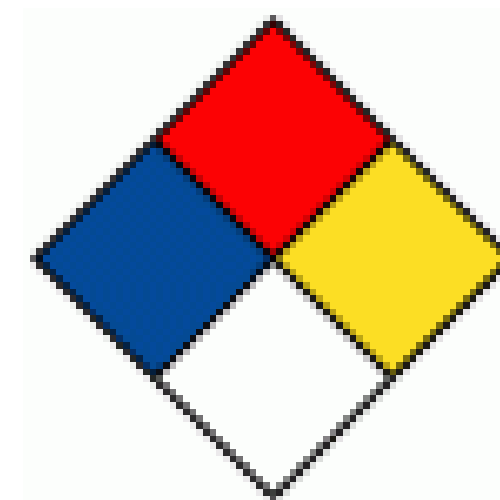
- [Hazardous Chemicals/Materials/Waste Container Label \(pdf\)](#)
- [Contaminated Adsorbents/Waste Silica Gel Label \(pdf\)](#)
- [Handling and Disposal of Common Wastes List \(pdf\)](#) ←
- [Laboratory Trash Removal Guide \(pdf\)](#)
- [Universal Waste Guidance \(Lamps & Bulbs, Batteries, Mercury Containing Equipment & Pesticides\) \(pdf\)](#)
- [EHS Off-Boarding and Space Closeout Procedures \(pdf\)](#)
- [Lab Equipment Removal Checklist \(pdf\)](#)

Laboratory Entrance Postings

Need to be updated if laboratory hazards change or if emergency contacts change!

Information Needed:

- An updated Chemical Inventory.
- An updated Hazard Identification.
- Current Name of lab PI or Supervisor and phone number.
- Two emergency contact names and phone numbers.



On-Campus Transport Form

Never handle on-campus transport of hazardous materials in a personal vehicle!



EHS will transport materials free of charge. They transport from departmental stockrooms, as well as building to building.

To request EHS assistance with transporting hazardous materials across campus, fill out the ["On-Campus Transportation" Service Request Form](#).

Hazardous Materials Shipping Request

All shipping now requires completion of a pre-shipping questionnaire for all compounds, chemicals, biological materials and any other hazardous materials being sent from KU-Lawrence campus.

To request EHS assistance with shipping hazardous materials off-campus, complete the service request form:

["Hazardous Materials Shipping" Service Request Form](#)

Responsible PI/shipper must complete the following:

[Outbound Material Transfer Agreement Decision Tool](#)

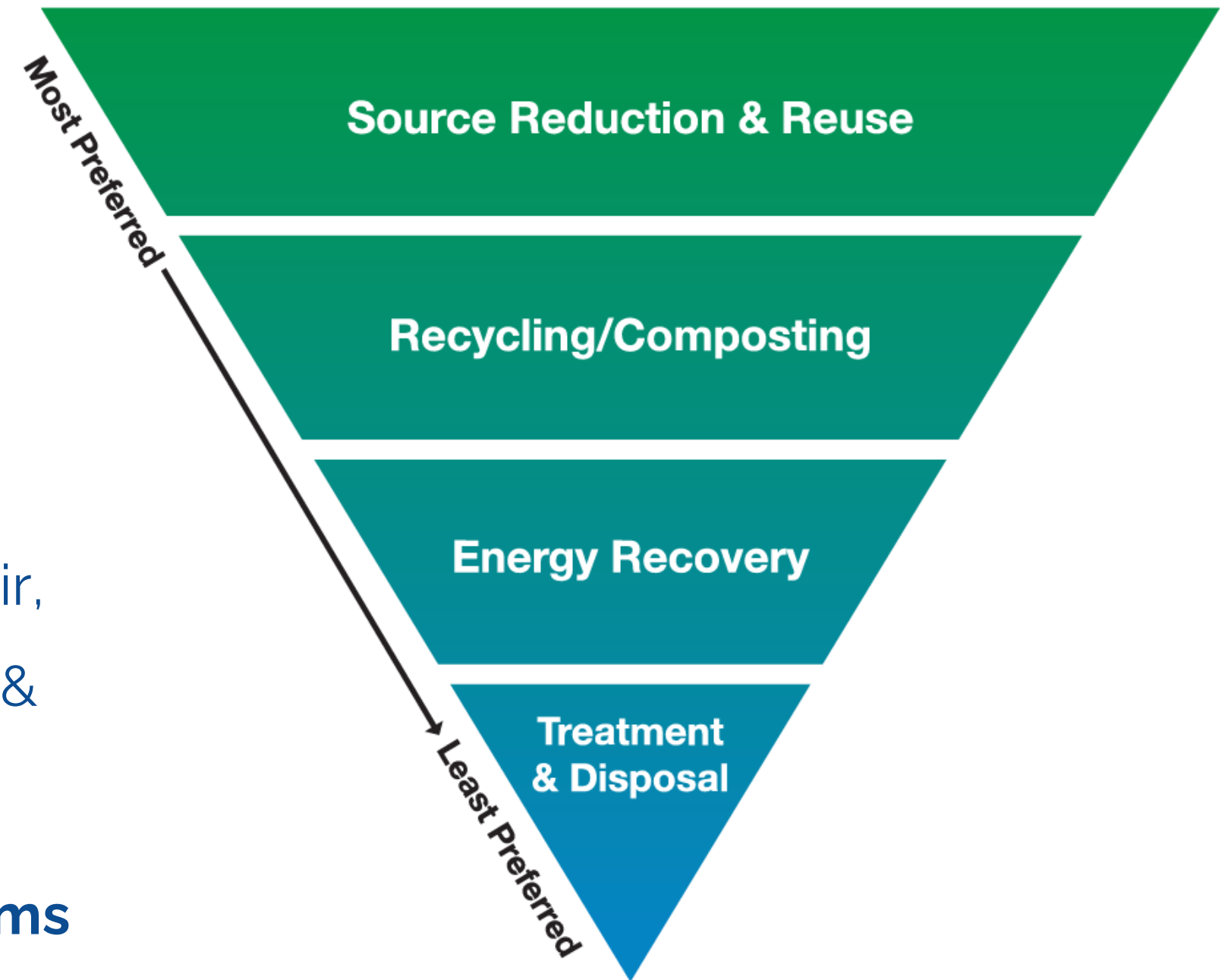


Waste Minimization

How to minimize waste:

- Reduce waste production at the source
- Recover and reuse wastes on-site
(i.e. recycling)
- Recycle off-site
- Treat wastes to reduce volume or toxicity
- Dispose of wastes in a manner that protects air, water quality, land quality, and human health & safety

Always seek to move up the hierarchy in terms of how you manage your waste.



Hazardous Material and Waste Safety

Key Safety Points

Remember...

- Never mix incompatible wastes, if you are unsure if two wastes can be combined ask for help!
- Label everything – beakers, working solutions, hazardous waste containers, etc...
- If you find an unknown chemical work with EHS to identify and dispose the waste appropriately
- If you have a spill and do not feel comfortable cleaning it yourself, ask for help!
- Know the hazards of the chemicals you are working with before you even open the bottle!

Hazardous Waste at Home

Use:

- Use proper PPE
- Be conscientious of not mixing incompatible materials

Storage:

- Keep containers sealed tightly
- Don't mix materials
- Regularly go through your storage and dispose of anything no longer being used, that is very old, etc.

Disposal:

- Use a certified hazardous waste collection service near you!



Hazardous Waste at Home

Examples:

- Drain cleaners
- Oven cleaners
- Metal polish
- Arts and crafts supplies
- Photo chemicals
- Floor cleaners
- Dry cleaning fluid
- Radiator cleaners
- Rust preventatives
- Wood preservatives
- Wood strippers
- Oil based paint
- Paint thinner
- Solvents
- Degreasers
- Sealants
- Gasoline
- Antifreeze
- Brake fluid
- Transmission fluid
- Old chemistry sets
- Pesticides
- Herbicides
- Insect sprays
- Rodent killers
- Pool chemicals
- Hydrochloric acid
- Cesspool cleaners
- Creosote
- Fertilizer
- Batteries
- Kerosene
- Moth balls
- Bleaches
- Ammonia
- Engine and radiator fluids

Household Hazardous Waste Collection Service

Available nearby:

- Universal Waste Programs
- Special Waste Events
- Door-to-Door Collections
- Permanent Collection Facility/Depot
- Temporary One-Day Collection Events
- Agricultural Collection Events
- CESQGs and SQGs
- Mobile Collections
- Consulting



City of Lawrence



[CleanHarbors Household Hazardous Waste Overview](#)



VI ACKNOWLEDGEMENTS



EHS Home Page | <https://ehs.ku.edu/>

the Wonderful company™



Thank you for listening!

Questions?

Contact:

 wise@ku.edu

 wise.ku.edu

All safety presentations are available at <https://wise.ku.edu/2026-presentations>

**Attendance
Check-In**

WEDNESDAY, JULY 22 AT 9:00AM

