

# Laboratory Safety at CUNY York College

Presented by:  
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# Overview of Training

- Introduction to OSHA's Lab Standard
  - Chemical Hygiene Plan
- Globally Harmonized System
  - Safety Datasheets
  - Chemical bottle labeling requirements
- **General Lab Safety/Housekeeping**
- Different Kinds of Waste Generated in Laboratories
  - Hazardous Waste
  - Bio-Hazardous Waste
  - Universal Waste
- Emergency Awareness

# Purpose

- Keep Everyone **SAFE!**
  - 1997 Dartmouth College Dimethyl Mercury Death
  - 2008 UCLA tert-Butyllithium Death
- Good laboratory practices is **everyone's responsibility.**
  - **Housekeeping is a priority!**
  - Compliance during random inspections from CUNY, OSHA, EPA, DOT, FDNY.
  - Fines can reach as much as \$70,117 (\$175,000 if death results).

# Chemical Hygiene Plan

OSHA (29 CFR 1910.1450)

# Chemical Hygiene Plan (CHP)

- Employer/Employee Responsibilities.
- General laboratory procedures and equipment.
  - Standard SOP's.
  - Lab supplements more specific details.
- Chemical procurement, distribution and storage.
- Waste management.
- Emergency response.
- Medical surveillance.

# Employer Responsibilities

- Prepare, implement and maintain a written Chemical Hygiene Plan (CHP).
- Provide Information and Training.
- Provide Personal Protective Equipment (PPE).
- Provide monitoring of hazardous chemicals (if applicable).
- Provide for medical consultations\exams (if applicable).
- Maintain records of employee exposures to regulated hazardous chemicals.
- Recordkeeping.

# Employee Responsibilities

- Follow established safety procedures.
- Attend training required trainings.
  - Keep track of trainings.
- Familiarization with:
  - Chemical hygiene plan.
  - Laboratory specific SOP's.
  - Chemical hazards/SDS information and location within your laboratory.
- Up to date chemical inventories and SDS's.
- Proper chemical bottle labeling following the Globally Harmonized System.

# Globally Harmonized System



# Globally Harmonized System

- Developed by the United Nations to streamline chemical regulations internationally.
  - Main purpose is to help communicate chemical hazard information in a uniform way on labels and safety datasheets.
- Adopted in the U.S in 2012 (HazCom 2012).
  - OSHA's revision to the Hazard Communication Standard (29 CFR 1910.1200).
- Enforced by OSHA, the EPA, DOT and CPSC (Consumer Product Safety Commission).

# Safety Data Sheets

- All sections of SDS's have become standardized and must follow this format:

## **New Safety Data Sheet (SDS) Format**

- Section 1, Identification
- Section 2, Hazard(s) Identification
- Section 3, Composition/Information on Ingredients
- Section 4, First Aid Measures
- Section 5, Fire Fighting Measures
- Section 6, Accidental Release Measures
- Section 7, Handling and Storage
- Section 8, Exposure Controls/Personal Protection
- Section 9, Physical and Chemical Properties
- Section 10, Stability and Reactivity
- Section 11, Toxicological Information
- Section 12, Ecological Information
- Section 13, Disposal Considerations
- Section 14, Transport Information
- Section 15, Regulatory Information
- Section 16, Other Information

# Globally Harmonized System: Labeling

- All primary and secondary containers must be labeled with the proper identity of the chemical(s) inside.
- These labels must include:
  - The name of the chemical(s).
  - Information about the chemical manufacturer (including name and address).
  - Appropriate hazard warnings/dangers (what PPE to wear while handling/route of exposure).
  - Associated pictograms/warning.
- Labels should be legible (preferable typed) and may not be defaced.

# GHS Labeling Example

## Components Of A GHS-Compliant Label

product  
identifier

**AMMONIA**

signal  
word

**DANGER**

hazard  
statement

**TOXIC IF INGESTED**

precautionary  
statements

Wash hands thoroughly after handling. Keep container tightly closed when not in use. Keep away from heat, sparks and open flames - may explode when exposed to high heat. Use in an open area that is well-ventilated. Breathing in ammonia is irritating and corrosive. Wear protective gloves and safety goggles to prevent burns and irritation.

supplier  
information

If swallowed: Immediately call Poison Control or doctor/physician. Drink water or milk to dilute ammonia.










**ABC Chemicals - 123 Main Street - Cincinnati, OH - [www.abcchem.com](http://www.abcchem.com) - 800-733-5252**



pictograms

See Safety Data Sheet (SDS) for further details regarding safe use of this product.

# GHS Standardized Pictograms

<p><b>Health Hazard</b></p>  <ul style="list-style-type: none"> <li>• Carcinogen</li> <li>• Mutagenicity</li> <li>• Reproductive Toxicity</li> <li>• Respiratory Sensitizer</li> <li>• Target Organ Toxicity</li> <li>• Aspiration Toxicity</li> </ul>	<p><b>Flame</b></p>  <ul style="list-style-type: none"> <li>• Flammables</li> <li>• Pyrophorics</li> <li>• Self-Heating</li> <li>• Emits Flammable Gas</li> <li>• Self-Reactives</li> <li>• Organic Peroxides</li> </ul>	<p><b>Exclamation Mark</b></p>  <ul style="list-style-type: none"> <li>• Irritant (skin and eye)</li> <li>• Skin Sensitizer</li> <li>• Acute Toxicity (harmful)</li> <li>• Narcotic Effects</li> <li>• Respiratory Tract Irritant</li> <li>• Hazardous to Ozone Layer (Non-Mandatory)</li> </ul>
<p><b>Gas Cylinder</b></p>  <ul style="list-style-type: none"> <li>• Gases Under Pressure</li> </ul>	<p><b>Corrosion</b></p>  <ul style="list-style-type: none"> <li>• Skin Corrosion/ Burns</li> <li>• Eye Damage</li> <li>• Corrosive to Metals</li> </ul>	<p><b>Exploding Bomb</b></p>  <ul style="list-style-type: none"> <li>• Explosives</li> <li>• Self-Reactives</li> <li>• Organic Peroxides</li> </ul>
<p><b>Flame Over Circle</b></p>  <ul style="list-style-type: none"> <li>• Oxidizers</li> </ul>	<p><b>Environment (Non-Mandatory)</b></p>  <ul style="list-style-type: none"> <li>• Aquatic Toxicity</li> </ul>	<p><b>Skull and Crossbones</b></p>  <ul style="list-style-type: none"> <li>• Acute Toxicity (fatal or toxic)</li> </ul>

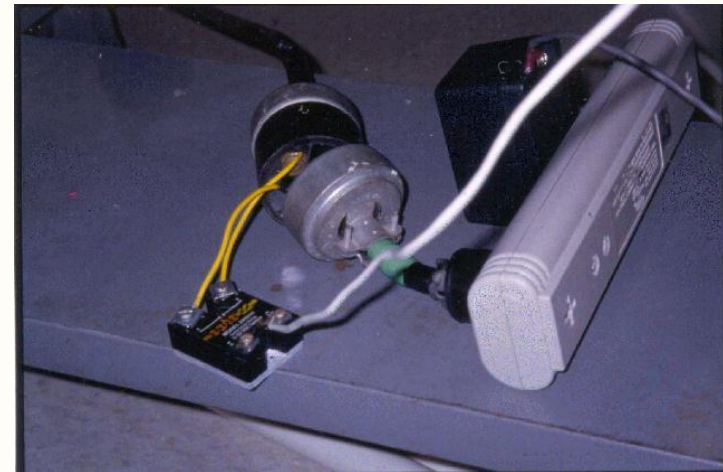
# Recognizing Laboratory Hazards

Physical Hazards



# Electrical Wiring

- Prohibited on top of stationary equipment.
- Do not run across floors, major walkways or near water sources.
- Check for tears/damage.
- **HOUSEKEEPING:**
  - Unplug all potential fire hazards before leaving work area.
  - Alert PI/EHS/Engineering of electrical malfunctions and needed repairs.



# Gas Cylinders

- All cylinders not in use must be secured to a permanent fixture by a strap or chain.
- All cylinders not in daily use must be secured and capped at all times.
- All regulators must be removed and caps used when moving a cylinder.
- Ensure all cylinders have been hydrostatically tested within the last ten years and has a label/tag.
- **HOUSEKEEPING**
  - Manage inventory appropriately.
  - Remove empty cylinders.
  - Ensure all incompatible materials are separated.





# Liquid Nitrogen/Cryogenics

- Asphyxiation hazard if leaking.
  - Store in a well ventilated area.
- Storage of over 60 gallons in one room requires the installation of an O2 sensor.
  - Common FDNY violation.
- Proper PPE when handling:
  - Cold resistant gloves
  - Lab coat
  - Long pants
  - Safety glasses/face shield.
- **HOUSEKEEPING:**
  - Manage inventory appropriately.
  - Remove all empty containers for replacement/disposal.



# Fume Hoods & Bio-Safety Cabinet's

- Ensure all fume hoods and bio-safety cabinets have been tested within the last year.
  - Face velocity must be between 80 – 120 fpm.
  - Contact EHS if you need yours tested.
- **DO NOT** use material not intended for either.
- **HOUSEKEEPING:**
  - Do not over clutter with materials and debris.
  - Keep all materials 6 inches from the sash, but do not block the baffle.
  - Remove all materials and disinfect once work is complete.



# Recognizing Laboratory Hazards

Chemical Hazards

# OSHA's Particularly Hazardous Substances

- Chemical's that are:
  - Carcinogens
  - Reproductive toxins
    - mutagens, teratogens and materials that may affect fetuses.
  - Substances with a high acute toxicity (LD50 < 50 mg/kg)
    - Also EPA P-coded waste chemicals.
  - Water reactive
    - Produce a flammable or poisonous gas when in contact with water.
  - Pyrophoric
    - Ignite upon exposure to air

# OSHA's Particularly Hazardous Substances

- **ALL** must have a SOP.
  - Handled by PI/senior staff only.
  - Procedures for removing waste/decontamination.
- **HOUSEKEEPING:**
  - Must have established area with signage describing:
    - Proper PPE and precautions
    - Restricted access to trained/approved personnel.
  - Review SDS/contact EHS for more specific information if needed.

# Chemical Storage

- All chemicals must be stored based upon their physical properties.
- Separate all incompatible materials.
  - Flammables away from oxidizers.
  - Acids away from bases.
  - Organic acids away from inorganic acids.
  - Water reactive away from water based.
- Store all liquids and hazardous chemicals below eye level.
- **HOUSEKEEPING:**
  - Maintain up to date chemical inventory.
  - **Do not** store an abundance of chemicals on bench tops.
  - ALL flammables must be stored in flammable proof cabinets (**below permitted FDNY level**). **This includes flammable waste!**
  - All acids and bases must be stored in approved corrosive cabinets or in plastic secondary containment in cabinets.

# Chemical Storage

- Refrigerators/Freezers storing chemicals must:
  - Have a “Store No Flammables Flashing Below 100 Degrees” sign. (unless specifically made explosion proof).
  - Only store appropriate chemicals.
    - **NO** water reactives or peroxide formers!
  - Common FDNY violations.
- **HOUSEKEEPING:**
  - Ensure all refrigerators are properly labeled.
  - Ensure all chemicals stored are appropriate.



# Controlling the Hazards



# Controlling the Hazards

- Hierarchy of controls:
  1. Substitution:
    - Whenever possible, replace highly hazardous materials with safer materials.
  2. Engineering:
    - Equipment designed to protect you from exposure (Fume hoods, bio-safety cabinets, glove boxes, etc.)
  3. Administrative/Work Practices:
    - Chemical Hygiene Plan, SOP's, training's, etc.
  4. Personal Protective Equipment.

# Administrative Controls

- No food or drink allowed in laboratories under any circumstances.
- Limit cell phone, laptop, and personal item use.
  - Can become sources of exposure if on work benches and in fume hoods.
- All SDS's, SOP's, and the chemical hygiene plan must be available to everyone 24/7.
  - Maintain a lab safety binder with all required documentation.

# Personal Protective Equipment

- Gloves, safety glasses/goggles, lab coats **REQUIRED ATTIRE** for working with hazardous materials.
- Provided at no cost to employees.
- Contact EHS for concerns with PPE or general questions.

# PPE - Gloves

- No “universal” glove.
  - Latex gloves provide infectious protection, but no chemical protection.
  - Nitrile gloves provide chemical protection, but no infectious protection.
  - Certain chemicals require specific gloves (mercury needs silver shield).
- Consult SDS and EHS for proper glove selection.
- Change gloves frequently.
- Never touch public surfaces (door knobs, handles, elevator buttons, etc.) with gloves on.
- Dispose of gloves as biohazard waste (in red bins) if you are working with infectious materials.



# PPE – Eye Protection

- Among the most avoidable and frequent exposure accidents in laboratories.
- Safety glasses are required for all work in laboratories.
- If you wear glasses, you must wear goggles.
  - Can have your personal glasses fitted to be ANSI rated safety glasses.
- Face shields are required in combination with safety glasses if there is a potential splash hazard.
- Specific laser/light safety glasses required if you are working with these materials.



# Lab Coats

- Must be worn at all times in laboratories.
- Do not take them home/remove them from the lab.
- Must be worn when transferring materials between labs and handling material.
- If you are working with infectious material, use disposable gowns.
  - Dispose of in biohazard red bins.



# Good Laboratory Work Practices

- Recognize **ALL** unsafe conditions.
  - **REPORT** unsafe conditions.
- Always wear your PPE!
- When in doubt, reference SOP's, SDS's, ask questions!
- Do not walk away from your work area before:
  - Closing all chemical containers/storing them in their proper designated areas.
  - Ensuring all non-manufactured chemical containers are compliantly labeled via the GHS and closed.
  - All hazardous waste's are disposed of properly.
    - All trash and debris have been removed from the lab (**abundance of cardboard boxes common FDNY violation**).
  - All surface's have been adequately cleaned/disinfected.
  - All work tools are put away safely, unplugged.
- **HOUSEKEEPING IS EVERYONE'S RESPONSIBILITY!**

# Hazardous Waste

Proper Handling, Storing and Disposal



# What is a Hazardous Waste

- EPA definition:
  - Any waste (other than nuclear) that can
    1. Cause or contribute to an increase in mortality or an increase in irreversible or incapacitating reversible illness or
    2. Pose a threat to human health or the environment when improperly treated, stored, transported, disposed of or otherwise mismanaged.

# EPA Hazardous Waste Lists

- The waste lists determine what waste codes will be applied when you are disposing of your waste:
  1. The F List –
    - By-products from specific processes.
    - Spent solvents.
    - Wastes contaminated with specific compounds.
  2. The D List –
    - Wastes with certain characteristics (Flammable, corrosive, reactive, toxic).
  3. The U List –
    - Specifically listed unused chemicals.
  4. The P List –
    - Specifically listed acutely toxic unused chemicals (LD 50 > 50 mg/kg).
- Some waste can fall under more than one list at a time.

# Other Hazardous Chemicals

- EPA criteria and definitions based upon industries and common waste streams.
  - New chemical compounds developed since the lists were created in the 1960's and 70's
  - Some chemicals are unclear (ethidium bromide).
- When in doubt treat all waste as hazardous.
  - Call EHS for clarification before disposing.

# Satellite Accumulation Areas

- Must follow this basic criteria:
- Must be designated by a sign in a defined area.
  - **Can not** store stock chemicals with/near hazardous waste without obvious designation.
- All hazardous waste must be stored in:
  - Secondary containment that can hold 110% of the total volume of the waste containers.
  - Be compatible with the container material.
  - Separated from incompatible material/waste streams.
  - No more than 55 gallons of non-acutely hazardous waste and 1 quart of acutely hazardous waste may be stored at one time.
  - No chemical residue in secondary containment or on the waste containers.

# Satellite Accumulation Areas

- All waste containers must be labeled with:
  - The words “Hazardous Waste”.
  - The chemical constituents in plain English.
  - The potential hazards indicated somehow (flammable, corrosive, toxic, etc.)
  - A “full” date if applicable.
    - If container dated, must be moved to the central accumulation area for long term storage within three calendar days (common EPA violation).
- All containers must be closed if waste is not being actively added.
- **Contact EHS for proper disposal.**

# Hazardous Waste Label

## HAZARDOUS WASTE

Contents: (No Formulas or Abbreviations)

Ethanol	70%
Sulfuric Acid	30%

**HAZARDS** (CHECK THE HAZARD THAT BEST DESCRIBES THE CONTENTS OF THE CONTAINER)

IGNITABLE TOXIC CORROSIVE REACTIVE

OXIDIZER OTHER: \_\_\_\_\_

DATE CONTAINER WHEN FULL OR READY FOR PICKUP

\_\_\_\_\_|\_\_\_\_\_|\_\_\_\_\_ BLD. \_\_\_\_\_ DEPT. \_\_\_\_\_ RM \_\_\_\_\_

MANAGER: \_\_\_\_\_ TEL. \_\_\_\_\_

# Bio-Hazardous Waste

- OSHA Definition:
  - Liquid or semi liquid blood or other potentially infectious material (OPIM).
  - Contaminated items that may release fluids if compressed.
  - Items caked with dried blood or OPIM.
  - Contaminated sharps (NYS includes unused sharps).
  - Pathological and microbiological wastes containing blood or OPIM.
- All considered regulated medical waste (RMW).

# Regulated Medical Waste Containers

- Bio Boxes (Corrugated Cardboard).
  - Double line with red bio-hazardous waste bag.
- Reusable Rigid Containers.
  - Line with red bio-hazardous waste bag.
- Sharps Containers.
  - For all needles, pipette tips, glass slides, blades and other potential stick/poke hazards.
- **HOUSEKEEPING:**
  - DO NOT overfill containers.
  - Close all containers when waste is not being added.
  - Remove all full containers for disposal.





# Universal Waste

- Used batteries and lamps contain heavy metals and can not be thrown away in the regular garbage.
  - Lead acid, lithium, alkaline, nickel metal hydride, nickel cadmium.
- Used lamps and mercury containing devices that are **not broken**.

# Universal Waste Containers

- All materials must be collected in a sturdy cardboard box or plastic container.
  - Batteries, lamps and mercury devices all must be separated in different containers.
- All containers must be labeled with:
  - The words “Universal Waste”.
  - The contents.
    - Used lamps, alkaline batteries, etc.
  - The start accumulation date.
    - Can store materials for up to one year.

# Universal Waste Label

**UNIVERSAL  
WASTE**

CONTENTS Used Lamps

**ACCUMULATION START DATE** 9/12/2017

SHIPPER \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY, STATE, ZIP \_\_\_\_\_

# Emergency Awareness

Fires, Emergency Equipment,  
Chemical Spills

# Fire Safety

- Be prepared!
- Know your emergency exit stairwells/hallways and rally point.
- Practice drills with your laboratory staff.
- Know the location of all fire extinguishers (inside your laboratory and hallways).
- Have the emergency numbers posted near telephones.
- Report all unsafe conditions immediately.

# In the Event of a Fire

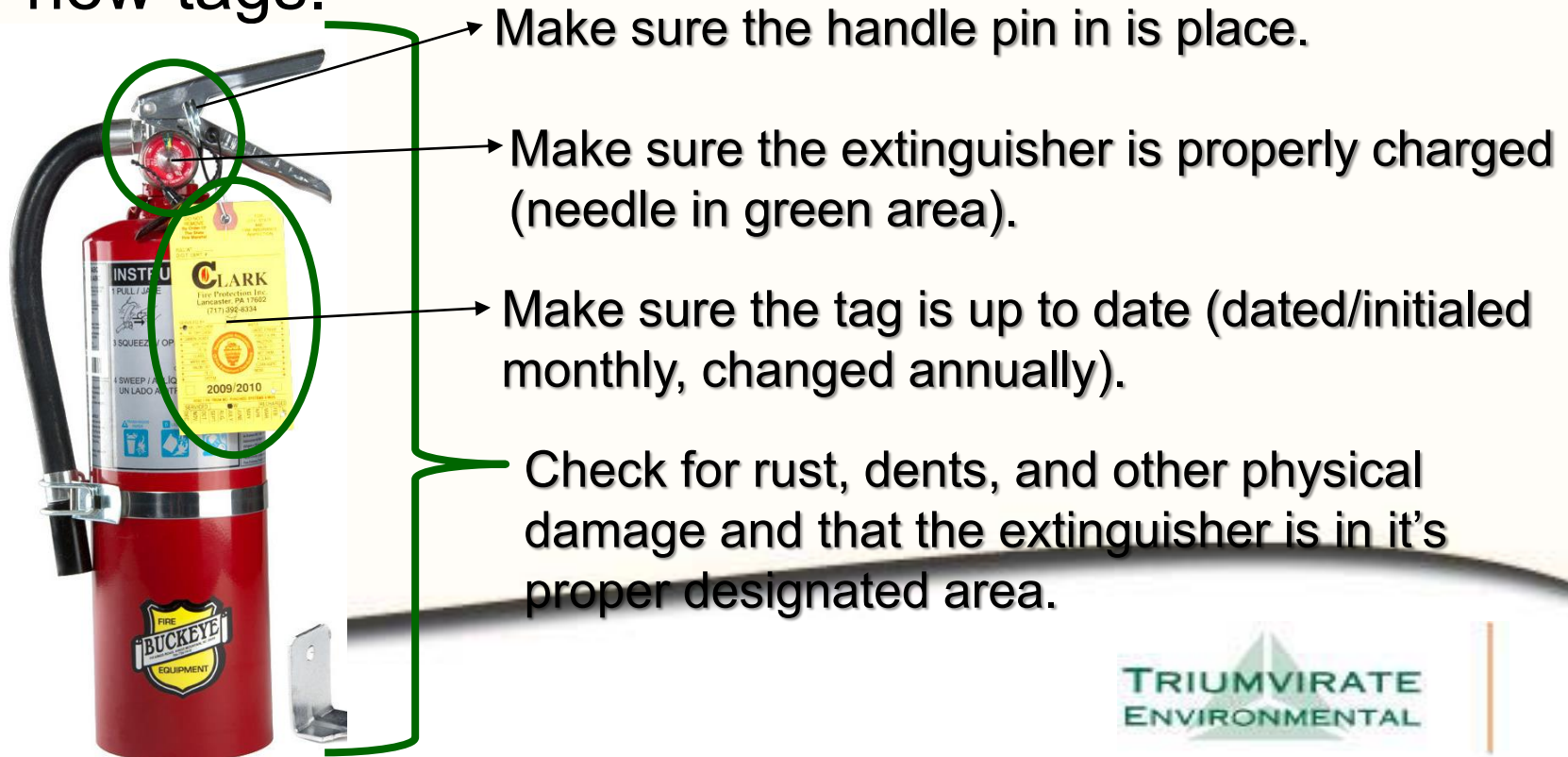
- Never use elevators.
- Feel door knobs for heat before opening doors.
- Know your evacuation route/secondary evacuation route and rally point.
- NEVER go back for personal belongings.
- Use fire extinguishers only if you are trained, feel comfortable and the fire is controllable.
- When in doubt, pull the fire alarm and evacuate the building.

# Fire Extinguishers

- Most common is the ABC extinguisher.
  - Can contain fires due to ordinary combustibles (paper) (A), flammable liquids (solvents) (B) and electrical fires (C).
- Posted throughout the hallways and laboratories.
  - Be aware of the closest one to your area.

# Fire Extinguisher Inspections

- Very quick overview done monthly.
- Must be inspected by fire inspectors annually for new tags.





# Laboratory Emergency Equipment

- All laboratories have eyewash stations/safety shower's.
  - Can also be nearby in the hallways.
- Safety showers must be flushed (15 minutes) and inspected annually.
  - Date and initial inspection tag.
- Eyewashes must be flushed (5 minutes) and inspected **weekly**.
  - Date and initial inspection log.



TRIUM  
ENVIRO

# Chemical Spill Kits

- Vary in shapes, sizes and the chemicals they are intended for.
- Know the location of laboratory spill kits in the event of an accidental spill.
- Always Alert EHS of a spill.
- Do not clean a chemical spill if you are uncomfortable or not trained.

# “Universal” Spill Kit

- The most common laboratory spill kit.
- Are used for water-based chemicals.
  - Can purchase chemical specific spill kits.
- Come with:
  - universal chemical spill pads and socks.
  - Nitrile gloves
  - Goggles or rubber booties.
  - Hazardous waste debris bag.
- Can purchase neutralizing absorbents or universal absorbents.



# In the Event of a Chemical Spill

- Alert EHS
  - Evacuate the lab if necessary.
  - EHS will have an outside remediation team respond to the spill.
- If you are comfortable with/trained to do so:
  - Contain the material using the spill socks.
  - Sprinkle neutralizing absorbent (if applicable) onto material.
  - Use the spill pads to absorb any residual liquid.
  - Sweep materials into the hazardous waste bag.
  - Place all materials into spill kit bucket for disposal.



# Additional Compliance Resources

# Regulatory Bodies

- EPA: RCRA
  - <https://www.epa.gov/rcra/resource-conservation-and-recovery-act-rcra-tools-and-resources>
- OSHA
  - HazCom 2012: <https://www.osha.gov/dsg/hazcom/ghs-final-rule.html>
  - Lab Standard:  
[https://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_id=10106&p\\_table=STANDARDS](https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=10106&p_table=STANDARDS)
- DOT: Transporting Hazardous Materials
  - [https://hazmatonline.phmsa.dot.gov/services/publication\\_documents/hotouse0507.pdf](https://hazmatonline.phmsa.dot.gov/services/publication_documents/hotouse0507.pdf)
- FDNY
  - <https://www1.nyc.gov/assets/fdny/downloads/pdf/about/fdny-rules-7-01-15.pdf>
- DEC: NYS Hazardous Waste Management
  - <http://www.dec.ny.gov/chemical/8486.html>

# Triumvirate Environmental

[www.triumvirate.com](http://www.triumvirate.com)

# THANK YOU

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