

# LABORATORY SAFETY TRAINING



# Topics

- Chemical hygiene (general lab safety intro)
- Electrical Safety
- Bunsen Burner Safety
- RCRA Hazardous Waste



# Purpose

- Labs are hazardous places to work.
- Most regulations are promulgated by the Occupational Safety and Health Administration (OSHA)
  - Agency of the Department of Labor



# Individual Responsibilities: OSHA Lab Standard 29 CFR 1910.1450

- Follow established safety procedures
- Attend training
- Familiarization with materials, procedures and equipment (laboratory-specific aspect)
  - Includes knowledge about particular hazard classifications (acids/bases, flammables, reactives, etc.)
- Report any unsafe conditions or practices
- Ask questions

# Common Accident Causes

- Taking Shortcuts
- Ignoring Safety Procedures
  - “it doesn’t matter”
- Poor Housekeeping
  - Indicator of safety attitude.
  - Creates many hazards
- Mental Distraction
  - Lack of focus, talking to co-workers
- Being Over Confident
  - “it can never happen to me”
- Starting with Incomplete Instructions
  - Ask questions if you are unsure
- Failure to Pre Plan
  - Job hazard analysis
  - Plan things through
- Failure to follow established procedures

# Electrical Hazards



- All electrical plugs must have three prongs, but not two prongs.

# Electrical Hazards



**Electronic equipment cords must be in good condition (cannot be frayed);**



# Electrical Hazards



**All outlets must  
have GFCI  
(Ground Fault  
Circuit  
Interrupters);**



# Electrical Hazards



- **Electrical cords must covered with a safety mesh.**  
**They should not be placed on floor across in walking way as it present a tripping hazard.**

# Bunsen Burner Safety

- **IN COMPLIANCE to NFPA 45, 12.2.3.3**

Burners, induction heaters, ovens, furnaces, and other heat-producing equipment shall be located a safe distance from areas where temperature-sensitive and flammable materials and compressed gases are handled.

- **PLACE** the Bunsen burner away from any overhead shelving, equipment, or light fixtures.



# Bunsen Burner Safety

- **INFORM** people in laboratory that Bunsen burner will be used.
- **TIE-BACK** any long hair, dangling jewelry, or loose clothing.



# Bunsen Burner Safety

**INSPECT** hose for cracks, holes, pinched points, or any other defect, and ensure that the hose fits securely on the gas valve and the Bunsen burner. **Replace** all hoses found to have a defect before using.

**UTILIZE** a sparker/lighter with an extended nozzle to ignite the Bunsen burner. Never use a match to ignite burner. **Have** the sparker/lighter available before turning on gas.



# Bunsen Burner Safety

**DO NOT** leave open flames unattended and never leave laboratory while burner is on and do not use Bunsen burners in biological safety cabinets.

· **ADJUST** the flame by turning the collar to regulate air flow and produce an appropriate flame for the experiment (typically a medium blue flame).



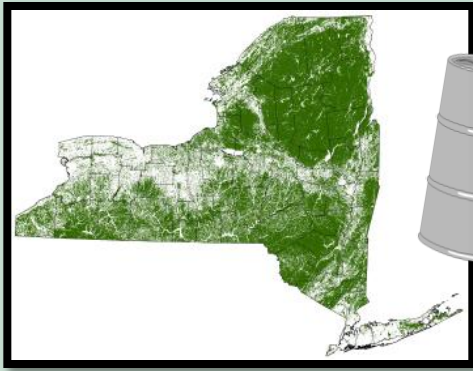
# Bunsen Burner Safety

- **SHUT-OFF** the gas when its use is complete.
- **ALLOW** the burner to cool before handling.
- **ENSURE** that the main gas valve is off before leaving the laboratory.

**NOTIFY** In case of a fire, activate the nearest fire alarm pull station, notify Public Safety at x2222







# RCRA HAZARDOUS WASTE MANAGEMENT

Training Program for New York Generators

# RCRA

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## The Resource Conservation and Recovery Act of 1976

Originally conceived as a law addressing municipal trash disposal, Subtitle C of RCRA was included to give the U.S. Environmental Protection Agency (EPA) the authority to regulate hazardous waste.

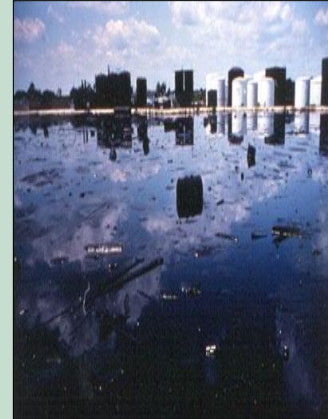
This includes the generation, transportation, treatment, storage, and disposal of hazardous waste.

# Why the Need for Legislation?

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In the late 20<sup>th</sup> century there emerged a need for a federal waste program due to:

- A dramatic increase in waste generation rates
- Inconsistent state and local programs
- Increasing focus on environmental laws
- Increasing public awareness



# Why the Need for Legislation?

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**Prior to  
Comprehensive  
Federal Waste  
Laws**



**Improperly disposed toxic wastes were  
resulting in grossly contaminated sites  
threatening public health and the environment**

# Why the Need for Legislation?

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**The lack of strict accountability, including an effective paper trail and a “cradle-to-grave” liability, had resulted in too many instances of abandoned disposal sites, unscrupulous disposal methods, and other abuses.**

# Love Canal Niagara Falls, NY

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**During the 1940s and 50s, the Hooker Chemical Company filled the canal with about 42 million pounds of hazardous chemicals. President Carter's declaration of the site as a federal emergency would provide funds to permanently relocate 239 families living near the landfill. To date, approximately \$280 million have been spent on relocation and clean-up.**



# What Regulations Came Out of RCRA?

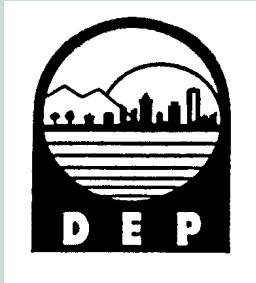
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**Federal Hazardous Waste  
Regulations promulgated  
by the US Environmental  
Protection Agency (EPA)  
under 40 CFR**



**. . . . . and**

# Additional Hazardous Waste Regulations Imposed by your State



# Who's Regulated under State & Federal RCRA Regulations?

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- **Generators**
- **Transporters**
- **Treatment, Storage and Disposal Facilities (TSDFs)**

# Violations

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## Failure to Comply with RCRA Regulations

### ***Compliance Orders –***

*The regional EPA Administrator has the authority to issue a "compliance order" whenever he determines there has been, or is in existence, a violation of any requirement of RCRA. The order can require compliance immediately or within a specified time period, or both.*

# Violations

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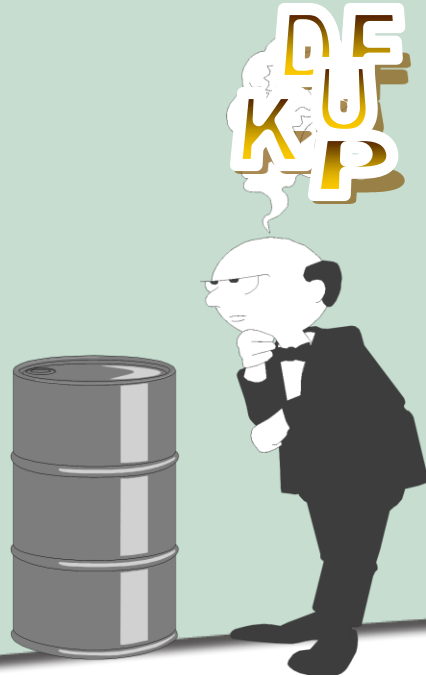
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## ***Civil Penalties-***

*The Administrator is also authorized to issue penalties up to **\$27,500** for each day of noncompliance for each violation of a RCRA requirement.*

# Waste Identification

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## RCRA regulates the proper management of waste; RCRA does not regulate products



# Is a recycled material a waste?

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- Potentially; depends on what it is and how it is going to be recycled
- If unknown, assume it is a waste and act accordingly

## **Some material is excluded from the definition of hazardous waste**

- Household waste, some scrap metal, some empty containers with residue

# What's a Hazardous Waste?

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***“Hazardous waste” is an EPA term used to describe a waste, other than a nuclear waste, that is considered by EPA or a state environmental authority to either:***

- 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.***

# What's a Hazardous Waste?

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***Based on this criteria, EPA has listed hundreds of hazardous wastes, including-***

- by-products from specific processes***
- wastes exhibiting certain characteristics; and***
- specifically-listed unused chemicals***

# Hazardous wastes are organized into lists

Characteristic Wastes (D-List)

**Characteristic**

Listed Wastes from Non-Specific Sources (F-List)

**Specific Processes**

Listed Wastes from Specific Sources (K-List)

**Specific Industries**

Specifically-Listed Unused Chemicals (U-List)

**UNUSED**

Acutely Hazardous Unused Chemicals (P-List)

**UNUSED**

**New York-Listed** Hazardous Wastes (B-List)

# Characteristic Wastes (D-List)

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## **D001** Ignitability

Includes:

Flammable liquids (with flash points < 140 F)

Solids capable of causing fire through friction, moisture absorption, or spontaneous chemical change

Flammable gases as defined by DOT

Oxidizers as defined by DOT





# Characteristic Wastes (D Wastes)

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## Anything ignitable:

- Solvents
- Gasoline
- Alcohol-based hand sanitizer
- Aerosol cans
- Flammable gas cylinders (acetylene, butane, hydrogen)
- Oxygen cylinders
- Unused alcohol wipes
- Oxidizing chemicals



# Characteristic Wastes (D-List)

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## D002 Corrosivity

Includes:

Acids with  $\text{pH} \leq 2$ ;

Bases with  $\text{pH} \geq 12.5$ ; or

Materials Otherwise Capable of  
Steel Corrosion ( $> \frac{1}{4}$  inch per year)



# Characteristic Wastes (D-List)

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## Anything corrosive:

- Hydroxides/alkalines
- Any acid or acid-based cleaner
- High concentration bleach
- Ammonia



# Characteristic Wastes (D-List)

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## D003 Reactivity



Includes:

**Unstable Compounds Capable of Violent Chemical Change,  
Dangerous When Wet Materials, Explosives, and Certain  
Cyanide or Sulfide-Bearing Wastes Capable of Liberating Toxic  
Gases When Subject to High or Low pH Conditions**

# Characteristic Wastes (D-List)

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## Anything reactive:

- Explosive
- Reacts with water to generate a toxic gas
- Cyanides
- Organometallics



# Characteristic Wastes (D-List)

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## D004 - D043 TCLP Toxicity

40 specific contaminants known to be toxic to aquifers supplying drinking water. These contaminants are considered hazardous waste when they leach concentrations above a particular concentration threshold. The test that determines these concentrations is known as the Toxic Characteristic Leaching Procedure (TCLP)



# Characteristic Wastes (D-List)

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## 40 specific contaminants:

- Heavy metals
  - Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver
- Discontinued pesticides (6)
- Certain organic chemicals (26)
  - Benzene, Methyl Ethyl Ketone, Chloroform, Tetrachloroethylene, others



# F and K Wastes

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## Spent/used solutions of solvents:

- Most spent HPLC or GC waste solutions from lab
- Any kind of paint thinner or used degreaser
- Can include halogenated or non-halogenated solvents
  - Acetone
  - Methylene chloride
  - Toluene
  - Perchloroethylene
  - Many more

A large, stylized letter 'K' with a white outline and a yellow-to-brown gradient fill. It is positioned in the upper right quadrant of the slide.A large, stylized letter 'F' with a white outline and a yellow-to-brown gradient fill. It is positioned in the lower right quadrant of the slide.



# Listed Wastes (U and P Wastes)

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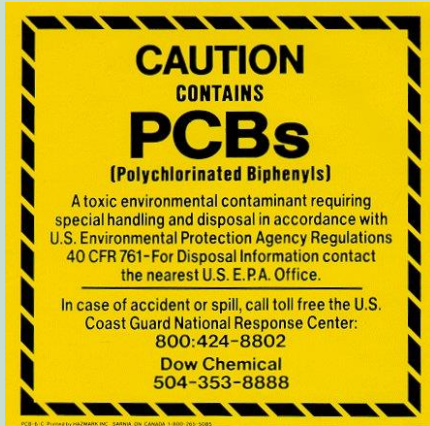
## Unused Chemicals

A long list of individual unused chemicals, which if discarded are considered hazardous waste. Includes many common industrial chemicals that are either ignitable, corrosive, reactive, or toxic properties.

- UNUSED CHEMICALS (THINK: LAB CLEANOUT)



# New York-Listed Hazardous Wastes



## Polychlorinated Biphenyls (PCBs)

Disposal is regulated under the Toxic Substances Control Act (TSCA) because of the chronic health effects and history of environmental contamination.

## B-Codes

# Empty Container Rule

## RCRA-Empty Definitions

Containers with releaseable residues are often considered hazardous waste because they either have a characteristic or they are U- or P- listed chemicals with waste definitions that include container residues .

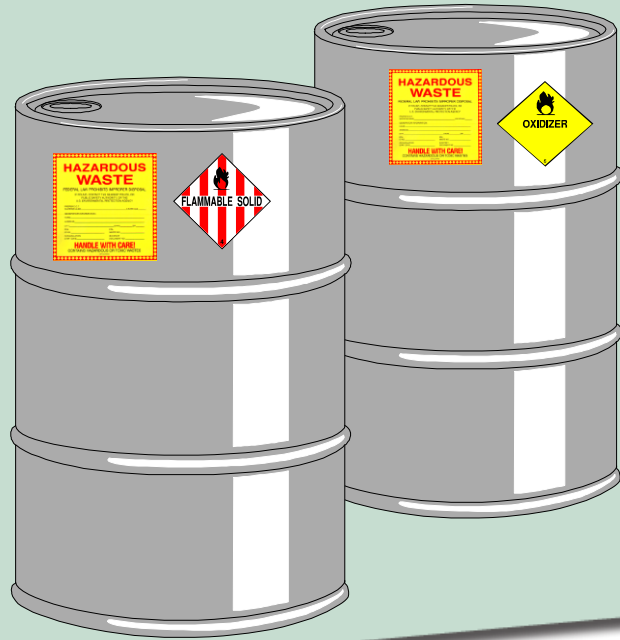


To be considered exempt, residues of D, F, K, and U wastes must be non-releasable by normal emptying means and have a non-releasable residue of less than 3%.

*Residue containers of P wastes must be triple-rinsed\* to be considered empty.*

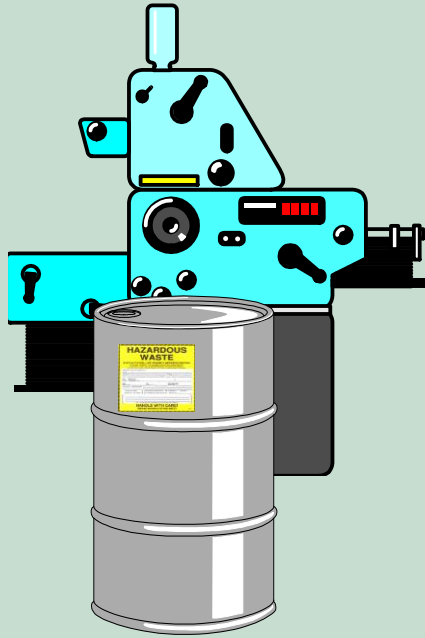
# Operating Standards

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# Satellite Storage Provision

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The purpose of the satellite storage provision is to provide a means by which generators may accumulate hazardous waste in containers without an accumulation time limit while those containers are being slowly filled.

# Satellite Storage Provision

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The satellite container must be under the control of a trained key staff individual who is directly responsible for the process that is generating the waste.

The provision allows a maximum of 55 gallons (non-acute) or 1 quart (acute) to accumulate while being filled at or near the point of generation without an accumulation time limit.

The containers must be on an impermeable surface (often secondary containment tubs, skids, etc.) and the labels are clearly visible.

# Container Standards

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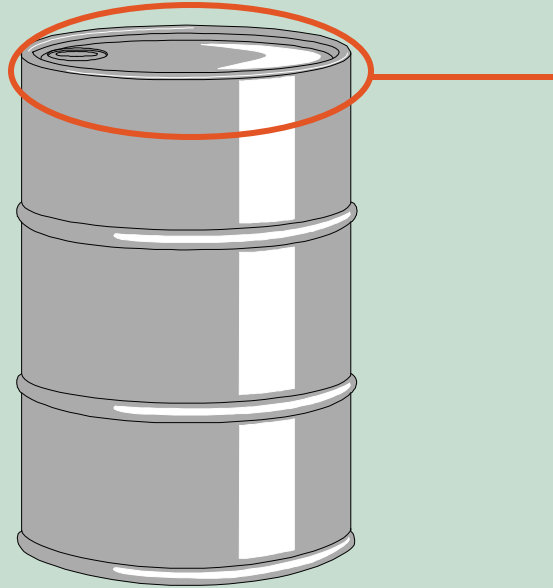
## Labeling

While in Satellite Storage, Containers Must, at a Minimum, be Labeled with the Following:

1. **The words, “HAZARDOUS WASTE”;**
2. **other words that describe the contents**
3. **NEW: indicate the hazards of the contents of the container**

# Container Standards

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**Closed at all times-**

**(Bung and vent caps  
screwed in, covers  
placed squarely on  
top)**



# Container Standards

Containers must always remain closed unless waste is being added or removed. Funnels must be removed or have closures. Covers should create a positive seal.

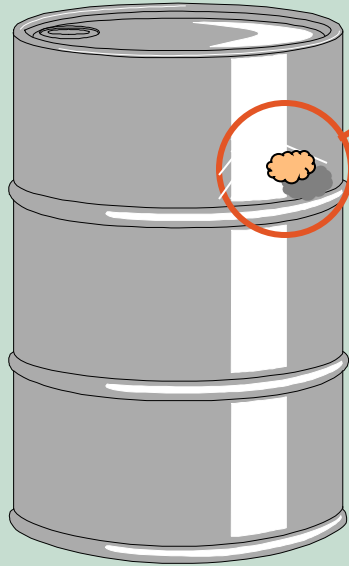


# Container Standards

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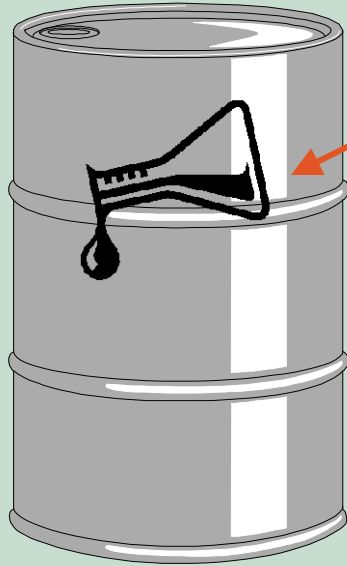
## Good Condition

(No leaking, dents, pitting, rusting, or damaged closures or seams)



# Container Standards

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## **Chemically- Compatible**

**(Contents will not corrode, embrittle, prematurely age, or otherwise compromise the packaging)**

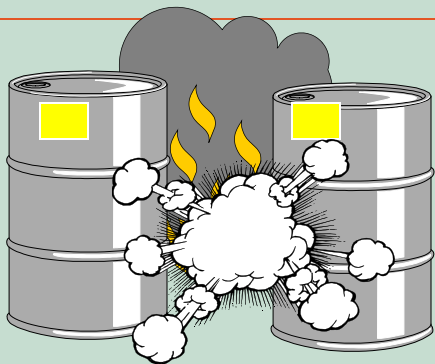
# Container Standards

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# Container Standards

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## Separating Incompatibles

**Containers or tanks holding incompatible hazardous wastes must not be stored in the same enclosure, building or structure unless they are segregated in a manner that prevents the waste from coming into contact with one another under any circumstances (such as spillage or simultaneous leakage).**

**The use of berms, dikes, fire cabinets, and separate storage areas are examples of ways to keep these materials apart.**

# Short Term Storage Area

**VIOLATION**



# Universal Waste



# Universal Waste: Subpart 374-3

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The Universal Waste Rule provides alternative management standards for these wastes so that they are not subject to the full range of the hazardous waste regulations



# Universal Waste

The DEC identifies four categories of Universal Waste



1. **Mercury-containing lamps** (e.g., fluorescent, UV, metal halide, sodium);  
**BROKEN BULBS MUST BE CONSIDERED HAZARDOUS WASTE**

2. **Dry cell and sealed batteries** (e.g., gel-cell lead acid, lithium, mercury, button batteries silver oxide, nickel-cadmium);

3. **Mercury-containing devices;** and

4. **Pesticides** collected as part of a pesticide collection program

# Universal Waste

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- Must be in CLOSED containers
- Must be labeled as “UNIVERSAL WASTE” and what it is
- Must be DATED when the first material began accumulating (or able to prove that it hasn’t accumulated more than a year)

# Preparedness & Prevention

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## Emergency Planning and Spill Reporting

Generators are required to operate and maintain their facility in a manner that minimizes the possibility of an emergency involving hazardous waste. Such emergencies may include fires, explosions, or unplanned sudden or non-sudden releases of hazardous waste constituents to the air, soil or surface waters.

# Contingency Plan

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## In the event of a spill:

- Safety:** Ensure personal safety and the safety of others
- Isolate:** Isolate and secure the area to minimize spreading and the risk of exposure. Evacuate if appropriate.
- Notify:** Notify departmental supervisor to ensure proper spill clean-up procedures are followed—refer to the Safety Data Sheet for proper handling, disposal and clean-up procedures



# Triumvirate Environmental

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

## THANK YOU

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