



Waste Management

Waste handling, transportation and storage

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Identifying Hazardous Waste

- There are several mechanisms for identifying hazardous waste in the workplace
 1. The first step should be to review the Material Safety Data Sheet (MSDS).
 - The MSDS will provide health, safety and emergency response information.
 - These sheets should be available to all employees and be located near the product of concern.
 2. If the MSDS is insufficient or not available, hazardous waste information can be obtained from the product label or from the product supplier or manufacturer.
 3. Other sources such as comparing products with the hazardous waste characteristics and listed waste in the federal regulations or referring to a typical hazardous waste table could be used in determining hazardous waste.
 4. If a problem still exists in the hazardous waste determination then laboratory testing should be performed.

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Identifying Hazardous Waste

- There are several references used to find additional information about hazardous chemicals and products.
 - [Material Safety Data Sheets \(MSDS\)](#)
 - Are a requirement from OSHA to the manufacturers to provide detailed health, safety and emergency response information for products that contain a chemical or physical hazard (Figure 1).
 - The format of MSDS is consistent, but the layout may vary between manufacturers.
 - MSDS are divided into nine sections.

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MATERIAL SAFETY DATA SHEET		U.S. Department of Labor Occupational Safety and Health Administration (Non-Mandatory Form)	
<small>May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1919.1200. Standard must be consulted for specific requirements.</small>			
IDENTITY		<small>Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.</small>	
Section I			
Manufacturer's Name	Emergency Telephone Number		
Address (Number, Street, City, and ZIP Code)	Telephone Number for Information		
	Date Prepared		
	Signature of Preparer (optional)		
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended
Section III - Physical/Chemical Characteristics			
Boiling Point	Specific Gravity (H ₂ O = 1)		
Vapor Pressure (mm Hg)	Melting Point		
Vapor Density (AIR = 1)	Evaporation Rate		
Solubility in Water	(Butyl Acetate = 1)		
Appearance and Odor			
Section IV - Fire and Explosion Hazard Data			
Flash Point (Method Used)	Flammable Limits	LEL	UEL
Extinguishing Media			
Special Fire Fighting Procedures			
Unusual Fire and Explosion Hazards			

Section V - Reactivity Data			
Stability	Unstable	Conditions To Avoid	
	Stable		
Incompatibility (Materials to Avoid)			
Hazardous Decomposition or Byproducts			
Hazardous Polymerization	May Occur	Conditions To Avoid	
	Will Not Occur		
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? Skin? Ingestion?			
Health Hazards (Acute or Chronic)			
Carcinogenicity: NTP? IARC Monographs? OSHA Regulated?			
Signs and Symptoms of Exposure			
Medical Conditions Generally Aggravated by Exposure			
Emergency and First Aid Procedures			
Section VII - Precautions for Safe Handling and Use			
Steps to Be Taken in Case Material is Released or Spilled			
Waste Disposal Method			
Precautions to Be Taken in Handling and Storing			
Other Precautions			
Section VIII - Control Measures			
Respiratory Protection (Specify Type)			
Ventilation	Local Exhaust	Special	
	Mechanical (General)		Other
Protective Gloves		Eye Protection	
Other Protective Clothing or Equipment			
Work/Hygienic Practices			

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Material Safety Data Sheets

Product Identification

- This section provides product information that is used by the manufacturer to identify the following:
 - Manufacturer's name, address and telephone number
 - Emergency contact
 - Chemical name and synonyms
 - Trade name and synonyms
 - Chemical family and/or formula
 - Chemical Abstract Service (CAS) number, if the material is pure.

Hazardous Ingredients

- This section describes various hazardous ingredients of a product that are more than 1% of the total or 0.1% of the total if the ingredients are carcinogens.
- It will also provide percentages of hazardous ingredients, exposure limits and information on hazardous mixtures with other solids, liquids or gases



Material Safety Data Sheets

Physical Data

- This section describes the physical properties of the product
 - Boiling Point
 - Vapor Pressure
 - Vapor Density
 - Solubility in Water
 - Specific Gravity
 - Percent Volatile
 - Evaporation Rate
 - Appearance and Odor

Fire and Explosive Data

- This section describe fire and explosion hazards based upon flash point and other data.
- Appropriate extinguishing agent for a fire, the flash point (the lowest temperature at which a flammable liquid gives off enough vapor to burn), and the explosive limits (LEL/UEL) are included.
- Information on special fire-fighting procedures and any unusual fire hazards is also provided.

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Material Safety Data Sheets

Reactivity Data

- This section describes how the product will react under specific conditions.
- It includes information on the stability, incompatibilities, hazardous decomposition and polymerizations of the product.

Health Hazard Information

- This section provides information for employees and medical personnel to identify health hazards and overexposure risks.
- It includes primary means of exposure (such as inhalation or skin irritation), threshold limits and effects of overexposure (such as headache, nausea, narcosis and irritation).
- This section also provides emergency and first-aid procedures, risks of cancer and any other health hazards.

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Material Safety Data Sheets

[Spill, Leak and Disposal Procedures](#)

- This section describes general containment, evacuation and disposal procedures for accidental spills of the product.

[Special Protection](#)

- This section provides special equipment needs for personal protection in the worst case exposure condition of the product.
- The equipment that might include ventilation, respiratory equipment, special clothing, gloves and eye protection.

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Identifying Hazardous Waste

[The Chemical Hazardous Response Information System \(CHRIS\)—](#)

- *The Hazardous Chemical Data Book* was developed for the U.S. Coast Guard for water transportation emergencies.
- This book provides information about hazardous chemicals with a format similar to the MSDS.
- There are four volumes of CHRIS available from the U.S. Printing Office or through the local library.

[The Fire Protection Guide on Hazardous Materials](#)

- Was designed by the National Fire Protection Association (NFPA) and contains information on hazardous chemical properties.
- This guide can also be used in fire prevention and other emergencies.

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Identifying Hazardous Waste

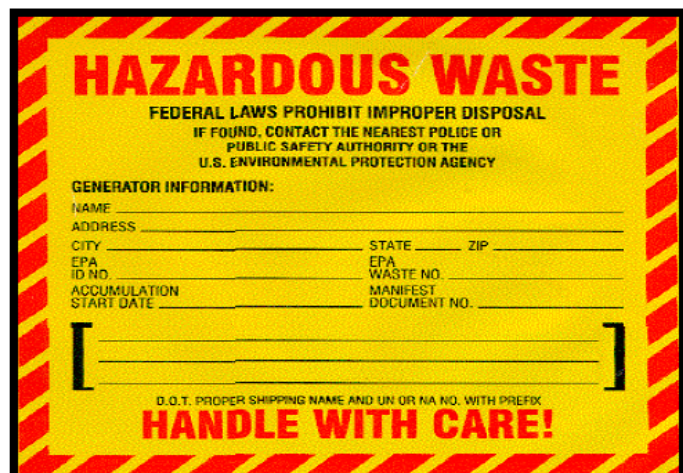
- [The NIOSH Pocket Guide to Chemical Hazards](#)
- Contains information on hazardous chemicals including the chemical names, formulas, synonyms, exposure limits, physical descriptions, chemical and physical properties, incompatibilities, personal protective equipment and health hazards.
- This guide is set up in a tabular form for quick and easy reference.

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Hazardous Waste labeling

- All hazardous materials and waste should be clearly labeled with the correct information
- Hazardous shipping names, hazardous classes and ID numbers can be found in 49 CFR part 172.101 in the Hazardous Material Table.
- Labels should never be removed and should contain the following information:
 - Complete chemical name (chemical formula may be added as an option)
 - Concentration and units
 - Federal waste code numbers
 - Beginning date of accumulation
 - Indication of hazards
 - Business name and address.
- It is important to note that all hazardous waste containers must be labeled regardless of the length of storage

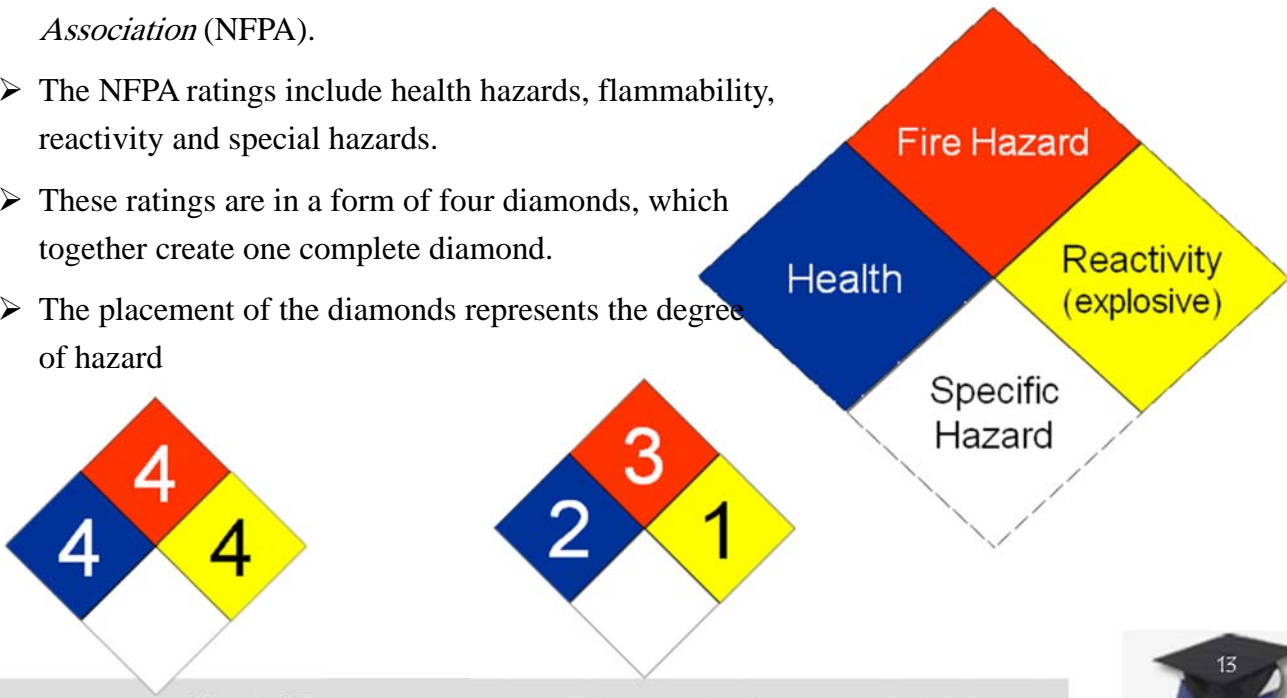


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Hazardous Waste labeling

- There are several different labeling systems.
- One of the most common labeling systems used is from the *National Fire Protection Association* (NFPA).
- The NFPA ratings include health hazards, flammability, reactivity and special hazards.
- These ratings are in a form of four diamonds, which together create one complete diamond.
- The placement of the diamonds represents the degree of hazard



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Hazardous Waste labeling

HEALTH HAZARD

- 4 - Deadly
- 3 - Extreme danger
- 2 - Hazardous
- 1 - Slightly hazardous
- 0 - Normal material

FIRE HAZARD

- Flash Point
- 4 - Below 73° F
 - 3 - Below 100° F
 - 2 - Below 200° F
 - 1 - Above 200° F
 - 0 - Will not burn

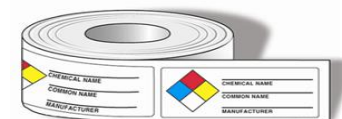
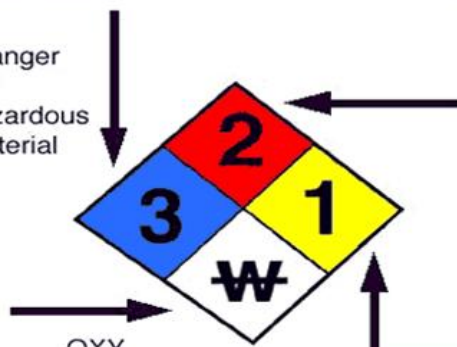
SPECIFIC HAZARD

- Oxidizer
- Acid
- Alkali
- Corrosive
- Use NO WATER
- Radiation Hazard

- OXY
- ACID
- ALK
- COR
- W
- Radiation symbol

REACTIVITY

- 4 - May detonate
- 3 - Shock and heat may detonate
- 2 - Violent Chemical change
- 1 - Unstable if heated
- 0 - Stable



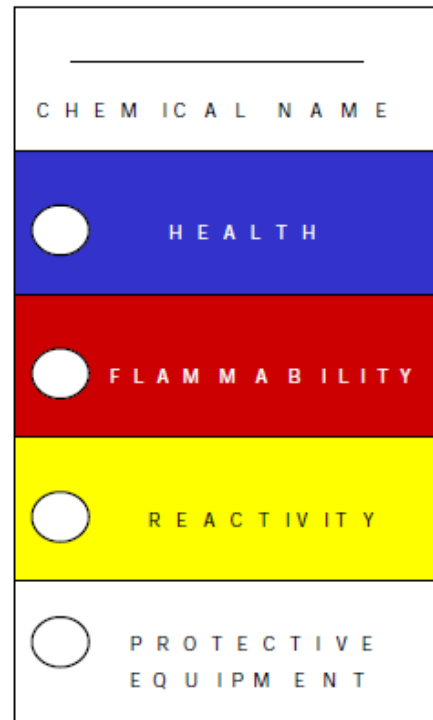
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Hazardous Waste labeling




The Hazardous Material Information System (HMIS)

- Was developed by paint manufacturers and is a visual display of the nature and degree of potential exposure hazards.
- It is similar to the NFPA diamonds by having a numeric rating system. However it differs from NFPA by using a color bar system instead of a diamond.
- HMIS contains four color bars including: Health, Flammability, Reactivity and Personal Protection.
- A numeric rating system is used for the health, flammability and reactivity bars to display the severity of the hazard (0 for least severe to 4 for most severe).



Hazardous Waste labeling

- Personal protection bar does not use a numerical system but is represented by a letter which specifies the different levels of protection. Below is an example of letters representing different levels of safety equipment.

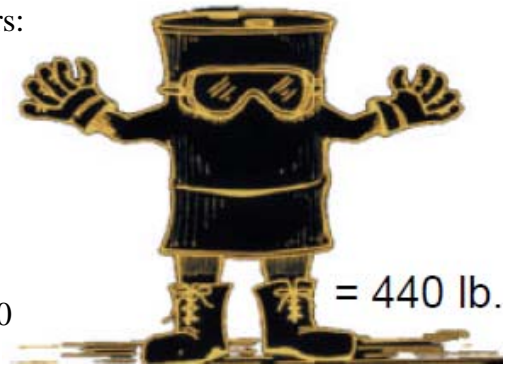
<u>Letter</u>	<u>Equipment</u>
A	safety glasses 
B	safety glasses and gloves 
C	safety glasses, gloves and apron 

- Hazardous Waste Labels have been approved by Department of Transportation (DOT) and the EPA for shipping hazardous waste.
- These labels display proper shipping name and the EPA waste classification.
- Labels could also contain information on recommended personal protection equipment or display additional hazardous warnings (such as explosives, blasting agent, poison gas, biomedical, chlorine or oxygen)



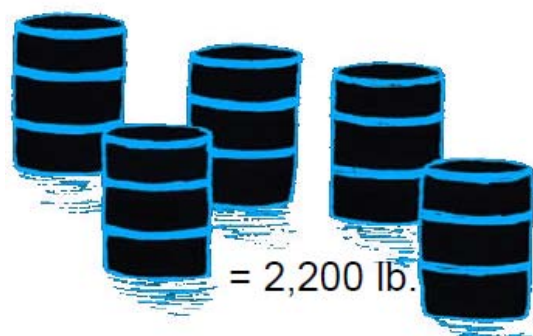
Hazardous Waste Storage

- The storage of hazardous waste is regulated by EPA and state agencies by the amount of waste generated.
- There are three categories of hazardous waste generators:
 - Conditionally Exempt Small Quantity Generators (CESQG),
 - Small Quantity Generators (SQG)
 - Large Quantity Generators (LQG).
- Generally, one drum is equivalent to approximately 440 pounds of hazardous waste
- A CESQG generates no more than 220 lb_m (approximately half of a drum) of hazardous waste per month and are exempt from hazardous waste management regulations if they follow the fundamental requirements of the EPA.



Hazardous Waste Storage

- However, hazardous waste management regulations do apply to SCG which generates between 220 to 2,000 lb_m (less than five drums) of hazardous waste per month and LQG that produce more than 2,200 pounds of waste (more than 5 drums) per month.
- These regulations are stricter for large quantity generators than small quantity or conditionally exempt generators.
- The regulations that would apply to you would be dependent upon your place of employment and it's generation of hazardous waste.



Recommendations for Proper Storage of Hazardous Waste

- All hazardous waste must be stored in approved containers with closed lids at all times.
- Containers must be stored out of the elements (away from rain, high temperatures, lightning or humidity) and separated by a berm, dike, or wall to prevent reactions among waste.
- All waste containers be closed while not in use. Storing an open waste container in a hood or anywhere in your work area is a violation.
- Label containers as “hazardous waste” and list contents of the container on the Hazardous Chemical Waste Tag during accumulation. Alternatively, a “hazardous waste” sticker with contents listed may be used until the waste is delivered for disposal.
- Also cooling and ventilation systems must be provided were appropriate.



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Recommendations for Proper Storage of Hazardous Waste

- Proper signs such as “No Smoking, Fire Hazard and Hazardous Waste Storage” should be placed at the hazardous waste storage area and all containers should be inspected weekly.
- Hazardous waste storage areas should have adequate aisle space and hazardous waste spill response materials (such as absorbents and personal protective equipment).
- Hazardous waste should not be disposed of in trash dumpsters or outside
- There should be no mixing of dissimilar waste streams (such as organic solvents and aqueous solutions) into one container, i.e. different wastes (solids vs. liquid, solvents vs. aqueous) should be accumulated in separate waste containers.
- This simplifies cataloging of waste constituents in a particular container, reduces the risk of reaction between incompatible wastes and avoids the costly disposal of complex mixtures.
- If non-compatible waste are mixed, it could cause dangerous chemical reactions. Furthermore, mixed waste cannot be economically recycled.

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Recommendations for Proper Storage of Hazardous Waste



- Nonhazardous waste should not be mixed with hazardous waste. If mixed, the whole batch becomes hazardous and the cost of disposal increases.
- Do not put liquid waste in plastic containers, as the containers tend to degrade and leak.
- Separate and protect ignitable waste from ignition sources.
- Once a container is used for hazardous waste, it should not be used for another waste.
- Even empty hazardous waste containers are often considered hazardous waste.
- Due to the extra expense of legal hazardous waste disposal, the cost of solid waste disposal rises substantially if mixed with hazardous waste.

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Hazardous Waste Disposal



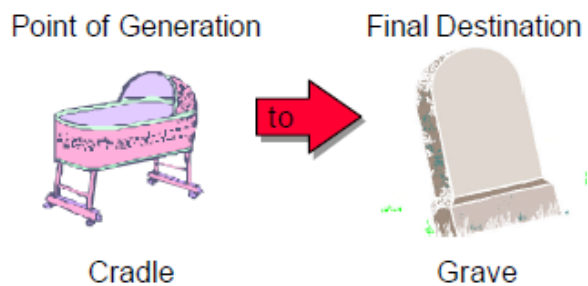
- Hazardous waste disposal cannot occur on site without a disposal permit.
- Procedures for obtaining a permit can be found in 40 CFR Part 270.
- Depending on the amount of waste generated, a facility may retain waste for a certain time period before disposal.
- All hazardous waste must be shipped in acceptable containers for transportation and properly labeled.
- Requirements pertaining to preparing hazardous waste for shipment can be found in 49 CFR Part 172.
- Important requirements of hazardous waste transportation include
 - a licensed transporter with EPA identification numbers (available from FDEP),
 - Manifest (shipping papers)
 - Proper placarding, packaging
 - Container specifications.

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Hazardous Waste Disposal

- A hazardous waste manifest is a multi-copy shipping paper that accompanies the package and must be signed by the generator, carrier and receiver.
- The shipper should receive the manifest after the materials have reached their proper destination to a permitted facility and keep the papers on file for three years.
- The generator of the hazardous waste is responsible for the waste from the point of generation (cradle) to the final destination (grave). The liability never leaves the generator of the hazardous waste.



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Waste Minimization

- Waste minimization is any process that reduces or eliminates the amount of waste generated.
- As a result, it lowers treatment and disposal costs, reduces health hazards, reduces liability and protects the environment.
- Basically, there are two main techniques to accomplish hazardous waste minimization: pollution prevention and recycling

Pollution prevention

- Pollution prevention consists of product changes and source reduction.
- By substituting hazardous products with non-hazardous products and by using only the amount necessary to perform the task would be examples of product changes.
- Source control would consist of material changes such as material purification and substitution, technology changes and good operating practices.
- For example, good operating practices would consist of properly managing the hazardous materials inventory, and keeping lids tightly sealed (especially volatile hazardous materials)

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Waste Minimization

- Recycling consists of reusing and reclaiming used materials.
- This not only reduces waste but it also lowers disposal and raw material costs.
- Recycling programs can work with a variety of waste products.
- The most common recycled hazardous waste is organic solvent.
- This waste can be recycled by distillation, and small recovery units.
- Filtration can also be used to remove oils from metal shavings or for recycling antifreeze.



Waste Minimization

