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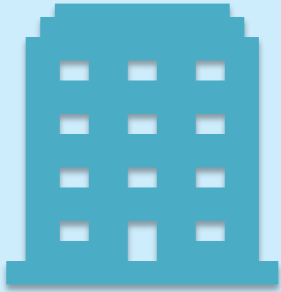
TM

MPCA - HHW Health & Safety Refresher

March 2023

Helping Make Life Safer

Admin



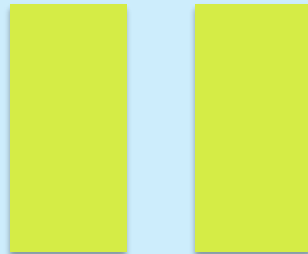
Facilities



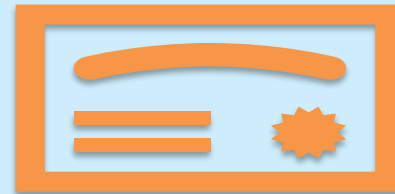
Emergency



Tech Issues



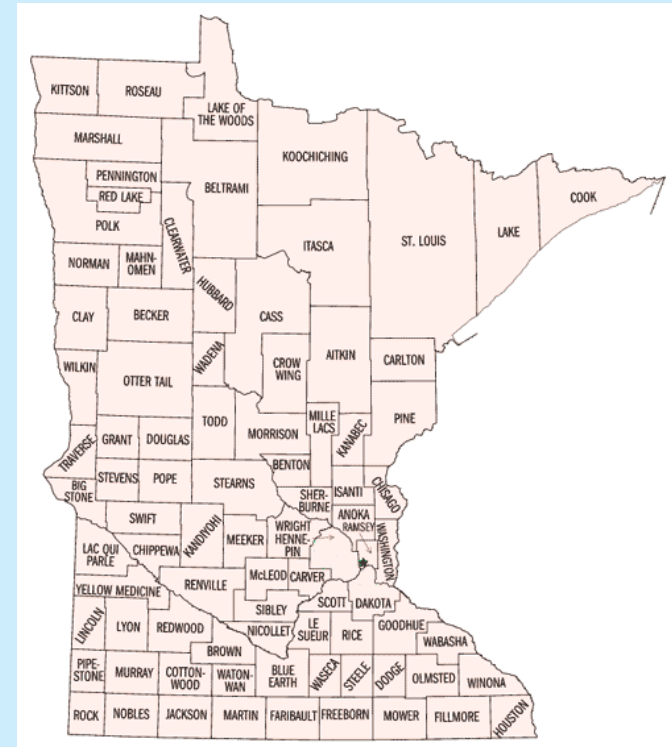
Breaks



Certificates

Introductions

- Dave Sublette - Instructor
 - MN Safety Council
- Teresa Gilbertson - Moderator
 - MPCA (HHW)



Course Objectives

- Reinforce safe work practices, PPE, significance of site-specific safety and health plan
- Improve knowledge of basic hazard and risk assessment techniques
- Improve knowledge of the basic hazard risk management/control techniques
- Determine how to select and use appropriate personal protective equipment/respiratory protection
- Engage in learning and problem solving

Daily Work Goal

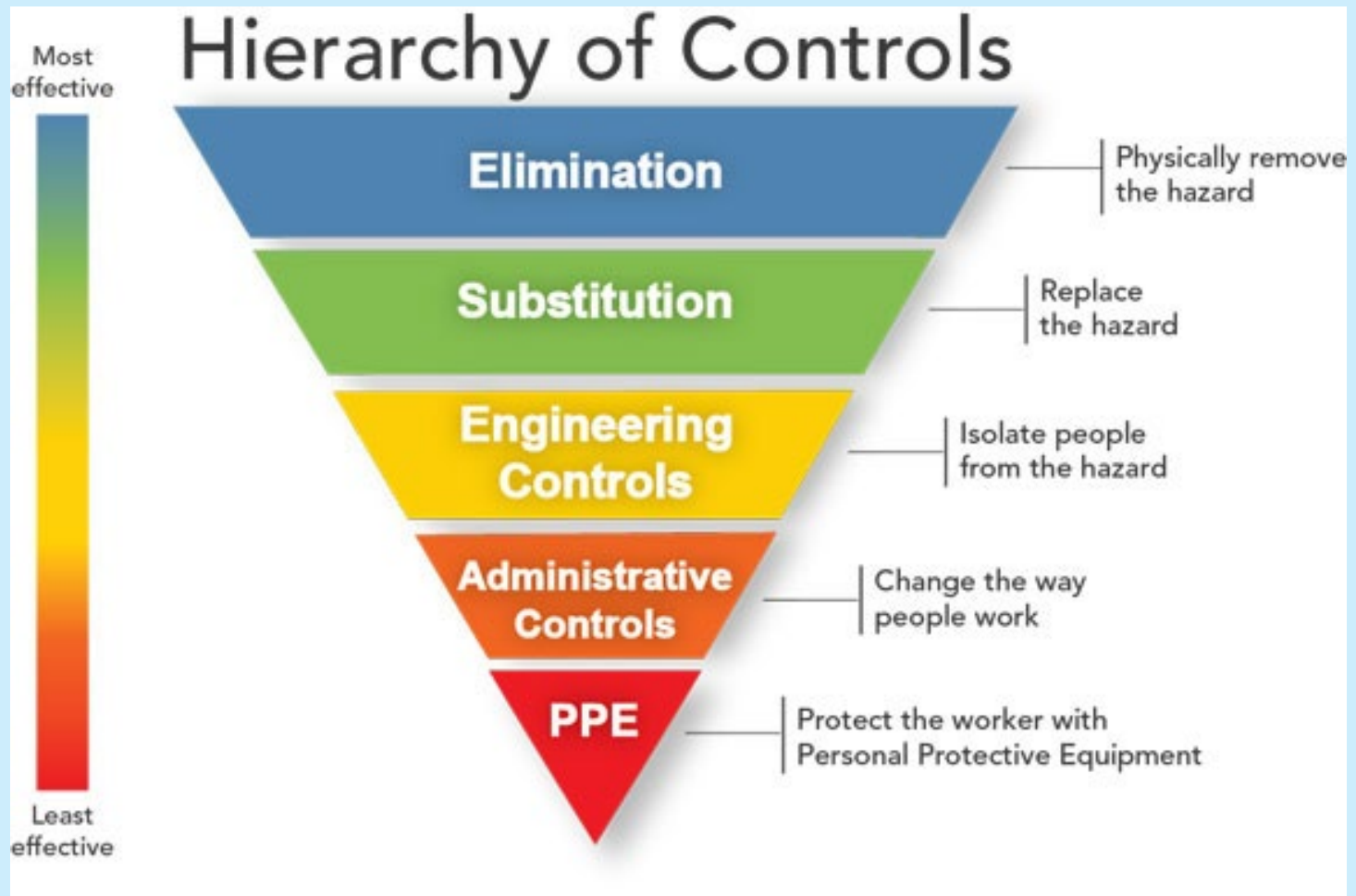
The Job Gets Done
and
No One Gets Hurt or Sick



Safety Definitions

- A **Hazard** is a condition that can cause harm, e.g. electricity, chemicals, working on a ladder, noise, a poorly placed keyboard, heat, stress, etc.
- A **Risk** is the likelihood that the negative event associated with that hazard will occur when employees are exposed the hazard
- An **Exposure** is when an employee is subjected to a hazardous condition in the course of employment
- A **Control** is a type of intervention used to manage, direct, or mitigate a workplace hazard.

How do employers Control Hazards?



OSHA Overview

- Worker Rights
- Worker Responsibilities
- Employer Responsibilities



Workers Have a Right to:

- A safe and healthful workplace
- Know about hazardous chemicals
- Report injury/illness to employer
- Request hazard correction from employer
- Training



Workers Have a Right to:

- Their exposure and medical records
- File a complaint with OSHA
- Participate in an OSHA inspection
- Be free from retaliation for exercising safety and health rights (whistleblower)



Worker Responsibilities

- Abide by safety rules
- Use safety equipment/PPE
- Seek prompt medical attention
- Bring safety and health concerns to attention of management



Employer Responsibilities

- Provide a workplace free from recognized hazards and comply with OSHA standards
- Provide training required by OSHA standards
- Keep records of injuries and illnesses
- Provide medical exams when required by OSHA standards
- Provide workers access to their exposure and medical records

Employer Responsibilities

- Not discriminate against workers who exercise their rights under the Act (Section 11(c))
- Post OSHA citations and hazard correction notices
- Provide and pay for most PPE



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Written Emergency Response Plan (ERP)

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Emergency Response Planning

- A written Emergency Response Plan (ERP) must be developed to handle ***anticipated*** emergencies.
- Each facility must establish *procedures* for handling emergency response, including a site-specific Incident Command System (ICS)



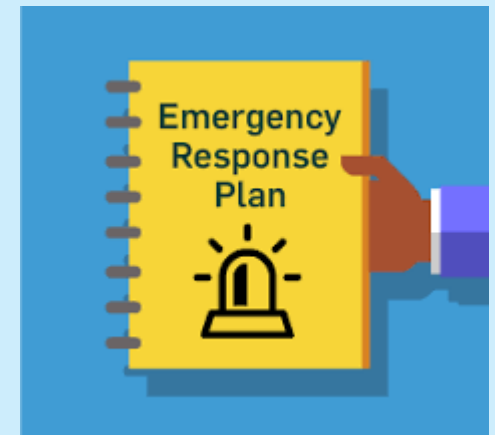
Emergency Response Plan

- An **Emergency Response Plan (ERP)** shall be developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations.
- The plan shall be in **writing** and available for inspection and copying by employees, their representatives and OSHA personnel.



Emergency Response Plan Elements

1. Pre-emergency planning and coordination with outside parties.
2. Personnel roles, lines of authority, training, and communication.
3. Emergency recognition and prevention.
4. Emergency alerting and response procedures.
5. Evacuation routes and procedures.
6. Emergency medical treatment and first aid.
7. Safe distances and places of refuge.
8. Site security and control.
9. PPE and emergency equipment.
10. Decontamination.
11. Critique of response and follow-up.



Do you know your plan?



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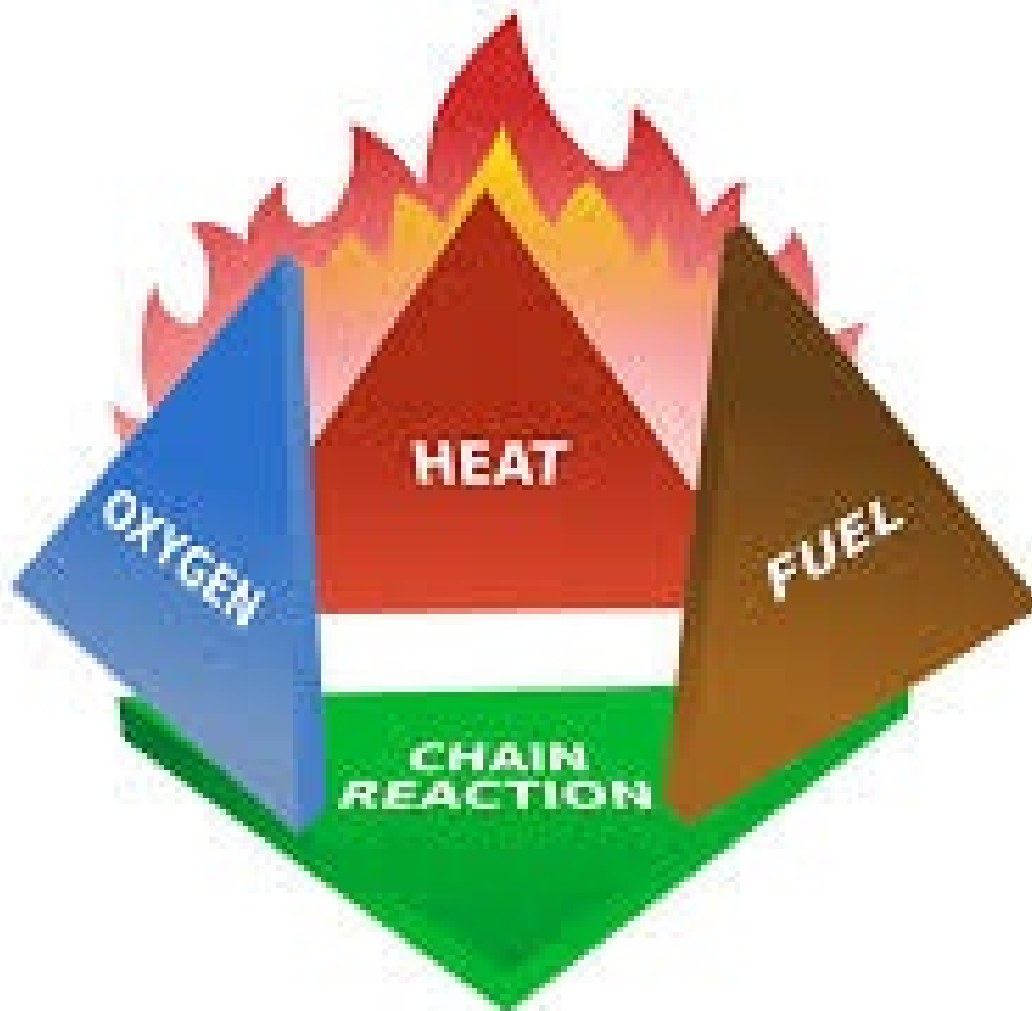
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Fire Safety

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THE FIRE TETRAHEDRON



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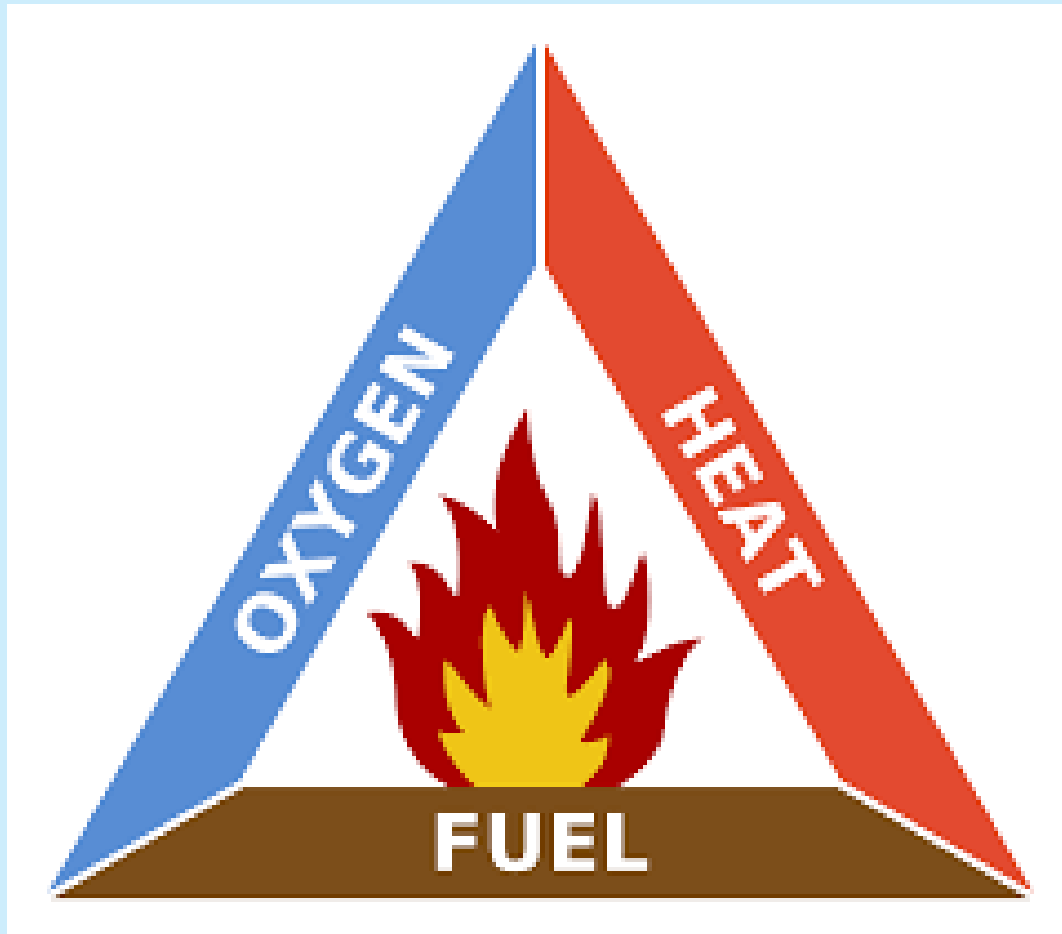
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The Fire Triangle



Fire Classes

A Trash Wood Paper



- wood
- cloth
- paper
- rubber
- many plastics

C Electrical Equipment



- energized electrical equipment

B Liquids Grease



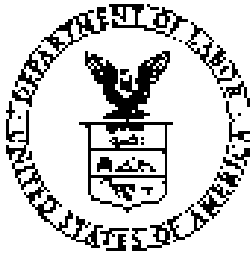












- gasoline
- oil
- grease
- tar
- oil-based paint
- lacquer
- flammable gases

D COMBUSTIBLE



- magnesium
- sodium
- potassium
- titanium
- zirconium
- other flammable metals

Table F-1 FIRE EXTINGUISHERS DATA

	WATER TYPE				FOAM	CARBON DIOXIDE	DRY CHEMICAL			
							SODIUM OR POTASSIUM BICARBONATE		MULTI-PURPOSE ABC	
										
CLASS A FIRES WOOD, PAPER, TRASH HAVING GLOWING EMBERS 	YES	YES	YES	YES	YES	NO (BUT WILL CONTROL SMALL SURFACE FIRES)	NO (BUT WILL CONTROL SMALL SURFACE FIRES)	NO (BUT WILL CONTROL SMALL SURFACE FIRES)	YES	YES
CLASS B FIRES FLAMMABLE LIQUIDS GASOLINE, OIL, PAINTS, GREASE, ETC. 	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
CLASS C FIRES ELECTRICAL EQUIPMENT 	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
CLASS D FIRES COMBUSTIBLE METALS 	SPECIAL EXTINGUISHING AGENTS APPROVED BY RECOGNIZED TESTING									
METHOD OF OPERATION	PULL PIN, SQUEEZE HANDLE	TURN UPSIDE DOWN AND BUMP	PUMP HANDLE	TURN UPSIDE DOWN	TURN UPSIDE DOWN	PULL PIN, SQUEEZE LEVER	RUPTURE CARTRIDGE SQUEEZE LEVER	PULL PIN, SQUEEZE HANDLE	PULL PIN, SQUEEZE HANDLE	RUPTURE CARTRIDGE- SQUEEZE LEVER
RANGE	30' - 40'	30' - 40'	30' - 40'	30' - 40'	30' - 40'	3' - 8'	5' - 30'	5' - 30'	5' - 30'	5' - 30'
MAINTENANCE	CHECK AIR PRESSURE GAUGE MONTHLY	WEIGH GAS CARTRIDGE ADD WATER IF REQUIRED ANNUALLY	DISCHARGE AND FILL WITH WATER ANNUALLY	DISCHARGE ANNUALLY RECHARGE	DISCHARGE ANNUALLY RECHARGE	WEIGH SEAL ANNUALLY	WEIGH GAS CARTRIDGE- CHECK CONDITION OF DRY CHEMICAL ANNUALLY	CHECK GAS PRESSURE GAUGE AND CONDITION OF DRY CHEMICAL ANNUALLY	CHECK GAS PRESSURE GAUGE AND CONDITION OF DRY CHEMICAL ANNUALLY	WEIGH GAS CARTRIDGE- CHECK CONDITION OF DRY CHEMICAL ANNUALLY

Combustion Products

- The flame is caused by burning pyrolysis products
 - The solid is not burning, it's the gases and vapors that the solid gives off.
- Products of incomplete combustion of a material
- Different products can reasonably be expected from different materials:
 - Smoke
 - Soot
 - Toxic Gases



Extinguisher Requirements

- Employer shall provide extinguishers and:
 - Mount
 - Locate
 - Identify
- Readily accessible w/o subjecting employees to possible injury



General Requirements

- The employer shall assure that portable fire extinguishers are maintained in a **fully charged and operable condition**
- Kept in their designated places at all times except during use.



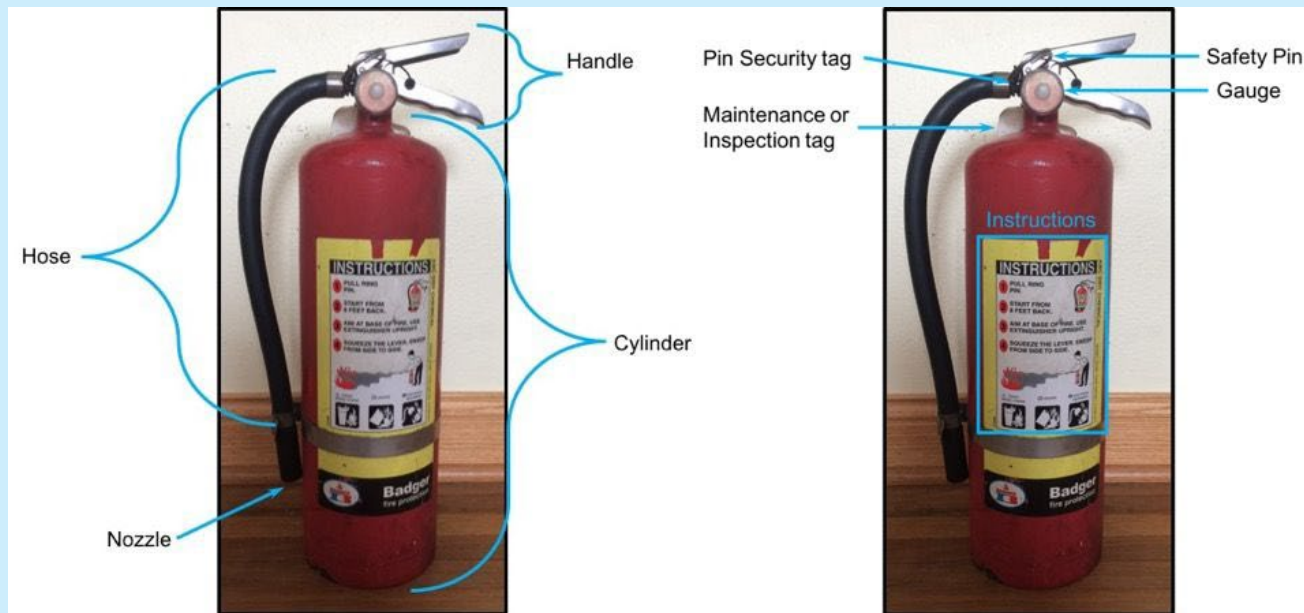
Inspections

- Know what to look for when inspecting!
 - Type of extinguisher
 - Labeling
 - Pins in place?
 - Charged?
 - Heft test
 - Annual Hydrostatic test



Inspection, Maintenance and Testing

- Visually inspected **monthly**
- Annual maintenance check



Service and Distribution

- Locations dependent on classes of **anticipated** fires
 - Class A (combustibles) – 75 ft or less
 - Class B (flammable liquids) – 50 ft or less
 - Class C (electric) – appropriate pattern for existing Class A or B hazards
 - Class D (combustible metals) – 75 ft or less



Training and Education

- Employer provided fire extinguishers:
 - Designate employees to use
 - Provide an educational program
 - General principles of use
 - Hazards involved with incipient stage fire fighting
 - Initial employment; annually thereafter



Fire Extinguisher Use



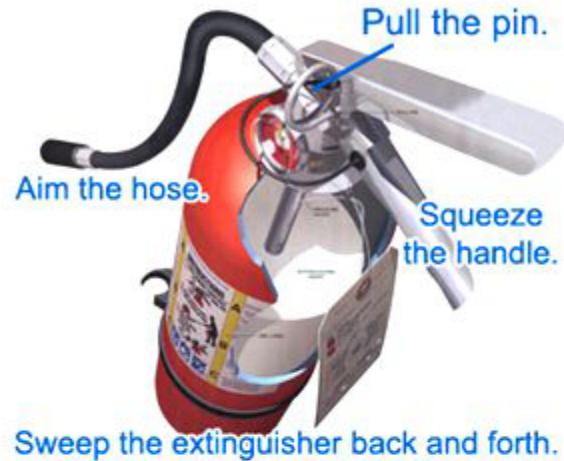
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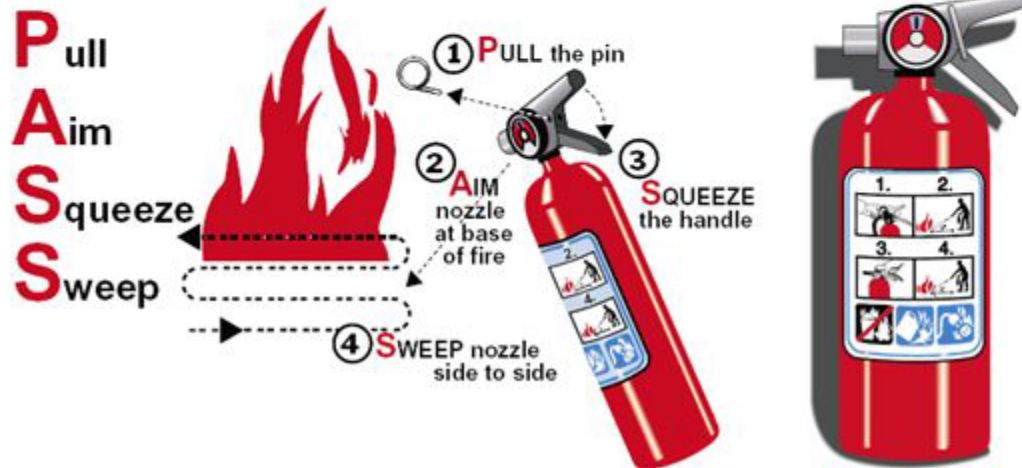
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To operate an extinguisher: (Check your own extinguisher's label for detailed instructions.)



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Hazardous Materials: Properties and Effects (Chemistry)

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To Recognize Chemical Hazards

- Understand the nature of the chemical
 - Physical State
 - pH
 - Flammability
 - Density
 - Solubility
 - Other



Physical and Chemical Properties

- Workers/Responders need to understand characteristics and properties:
 - To prepare to deal with HazMat incident/release
 - To make good response decisions



Physical State

- Solid
 - Maintains its shape no matter what the container
- Liquid
 - Takes the shape of the container, to the volume of the liquid
- Gas/Vapor
 - Expands to the full volume of the container



State of Matter

- Predicts behavior
 - How did it escape?
 - Why did container fail?
- May impact duration of incident/release



Danger Signs Include:

- Rotting containers
- Bulging containers
- Missing or poor fitting lids
- Old military containers
- Reactions in the container
- Crystals in or around the container
 - May indicate the presence of an unstable or explosive chemical



Other Measurable Characteristics

- pH
- Specific Gravity
- Vapor Density
- Ignitability/Flammability
- Corrosivity
- Water/Air Reactivity

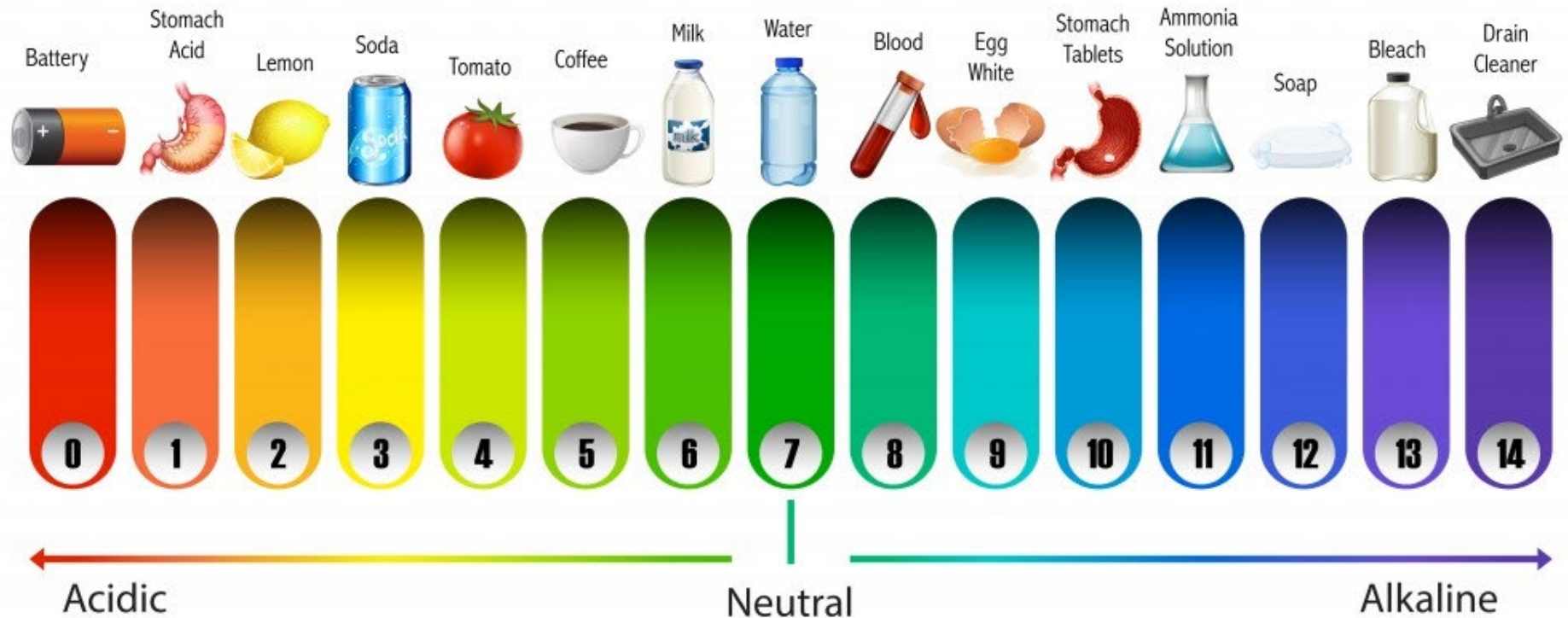


pH

- The chemical property that indicates the corrosive nature of the liquid
- Scale from 0 to 14
- Acid is below 7 (acetic acid, sulfuric acid)
- Base is above 7 (baking soda, sodium hydroxide)
- 7 is neutral (rain water?)



The pH Scale



Corrosivity

- Compound with low or high pH
 - 2 and below
 - 12.5 and higher
- Capable of rapid damage to tissue
- Acids, lime, lye, others
- Will require specific PPE
- Will require specific storage



Identifying Acids

- Have pH less than 7
 - Hazardous waste is ≤ 2
 - Practical < 4
- Turns pH paper red
- React with metal to form hydrogen gas
- Often have “acid” in the name
- Often have a chemical formula that begins with “H”



Acid Containers Caps

- Nitric Acid-----Red
- Acetic Acid-----Brown
- Hydrochloric Acid-----Blue
- Phosphoric Acid-----White
- Sulfuric Acid-----Yellow



Identifying Bases

- Have a pH greater than 7
 - Hazardous waste is ≥ 12.5
 - Practical > 10
- Turn pH paper blue
- Have a slippery, soapy feel
- May have “hydroxide”, or “alkali”, or “caustic” in the name
- Often has “OH” in the chemical formula



Specific Gravity

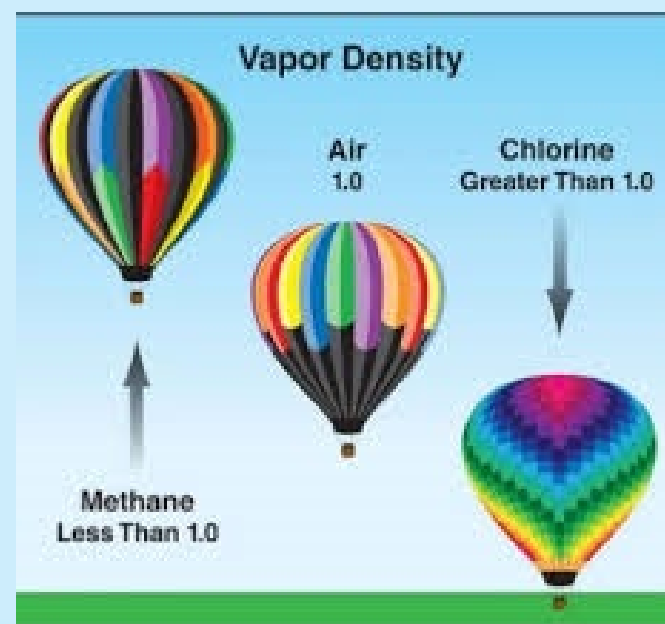
- The weight of a volume of liquid compared to an equal volume of water (Water = 1)
 - Toluene 0.87
 - Benzene 0.88
 - MeCl_2 1.33
 - Cadmium 8.65
- What is the significance?



Vapor Density

- The weight of a gas relative to air
- Helps understand where the gas will go (up or down)

– Ammonia	0.59
– Ethylene	0.97
– Trichloroethylene	4.50
– Hydrogen Sulfide	1.19
– Gasoline	4.40



Vapor Pressure (Volatility)

- The tendency for a solid or liquid to evaporate into air.
 - The higher the vapor pressure, the more rapid the evaporation
 - The higher the vapor pressure, the lower the boiling point.
- What is the significance?

Flash Point

- The lowest temperature at which a liquid will give off enough vapor to sustain combustion
 - If there is a direct source of ignition
 - Cresol 178F
 - Diesel 126F
 - Acetone 0F
 - Gasoline -45F
- The lower the flash point, the more flammable the material



Flammable Liquids

Flashpoint: The minimum temperature at which a liquid gives off enough ***vapor*** within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Remember, it is the vapors (not the liquid) that Burns!

A chemical's flashpoint is listed on the SDS under the Fire and Explosion section.

Auto Ignition Temperature

- The lowest temperature at which a flammable gas/vapor-air mixture will ignite from its own heat source or contact with a heated surface
 - **Without** needing a spark or flame
- Auto ignition temperatures may be **lowered** by combining with other materials

Fuel	Flash point	Autoignition temperature
Ethanol (70%)	16.6 °C (61.9 °F) ^[5]	363 °C (685 °F) ^[5]
Gasoline (petrol)	-43 °C (-45 °F) ^[6]	280 °C (536 °F) ^[7]
Diesel (2-D)	>52 °C (126 °F) ^[6]	256 °C (493 °F) ^[7]
Jet fuel (A/A-1)	>38 °C (100 °F)	210 °C (410 °F)
Kerosene	>38–72 °C (100–162 °F)	220 °C (428 °F)
Vegetable oil (canola)	327 °C (621 °F)	424 °C (795 °F) ^[8]
Biodiesel	>130 °C (266 °F)	

Incompatible Chemicals

- Must be stored separately
- Reactions of incompatible chemicals
 - Heat
 - Fire
 - Explosion
 - Release of toxic gas
- Acids and Bases
- Acids and Acids



Oxidizer

- A chemical that supplies its own oxygen for combustion
 - Perchloric acid
 - Hydrogen peroxide
 - Bleach
- Oxidizers and Flammables are considered incompatible. Storage of these two materials in the same place increases the likelihood of fire.



Water Reactive Chemicals

- Strong Acids
 - Lemonade?
- Strong Bases
 - Alka-Seltzer?
- Carbides
- Halogens
- Sodium / Lithium
- Many others



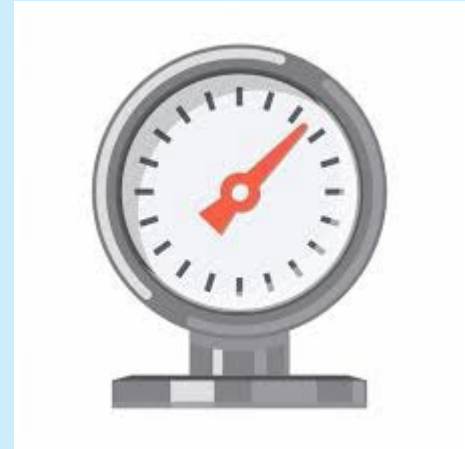
Water and Air Reactive Chemicals

- Water Reactive
 - Acids
 - Sodium
- Air Reactive
 - Ignite when exposed to air
 - Also called pyrophoric
 - Potassium
 - Phosphorous



Physical Changes to a Substance

- Temperature (Melt/Boil)
- Pressure
- Expansion ratio
- Chemical reactivity
 - Also known as chemical change
 - The ability to transform at molecular level
 - Usually releases some form of energy



Freezing Point

- Temperature at which gas or liquid becomes a solid
- Water changes to ice
 - Helps determine what form the compound will be in when encountered



Sublimation

- A process in which a material passes directly from a solid into a gaseous state and condenses to form solid crystals without passing through the liquid form.
- Carbon Dioxide at Room (Normal) Temperature
- Sun Dogs



Melting Point

- Temperature at which a solid becomes a liquid or a gas
- Ice changes to water



Boiling Point

- The temperature at which a liquid changes into a vapor or gas at a given atmospheric pressure
 - Water 212°F
 - Cadmium 1409°F
 - Acetone 133°F
 - Chlorine -29°F



Summary for Chemistry


- Chemical and physical properties help you anticipate the behavior of hazards
 - Boiling point
 - Relative Densities
 - Flash Point
 - pH
 - Flammability
 - Vapor Pressure

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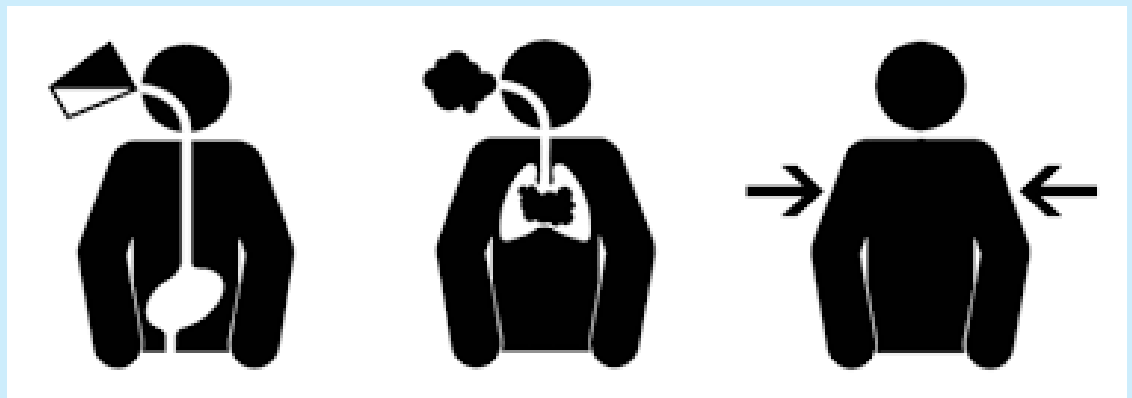
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HEALTH EFFECTS

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Health Effects

- Routes of Entry
 - Skin absorption
 - Inhalation
 - Ingestion
 - Injection



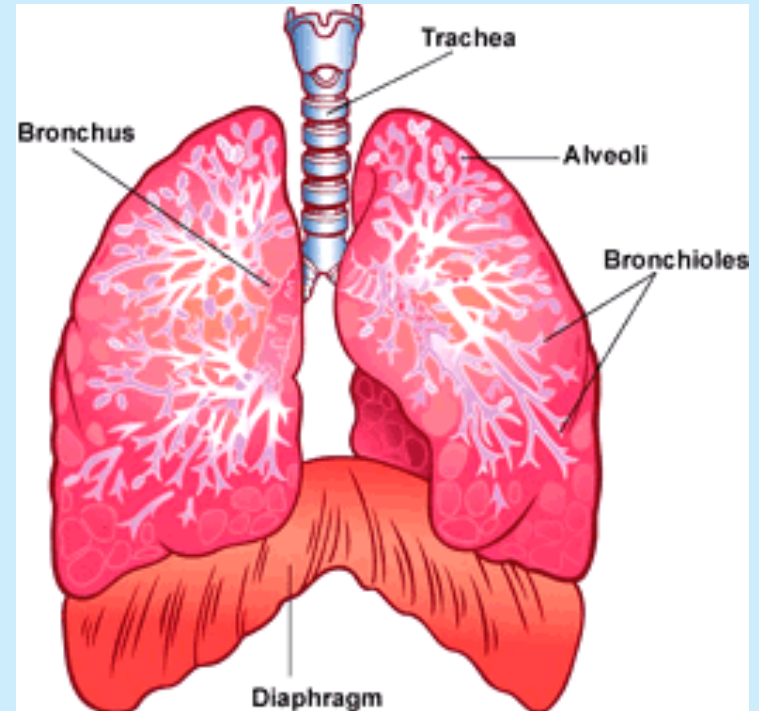
Skin Absorption

- Chemicals can move through intact skin
 - Solvents
 - Pharmaceuticals
- Very porous areas
 - Tops of Hands/Feet
 - Groin
 - Forehead
 - Around the Ears



Inhalation

- Target organ is the respiratory tract
- Contaminant passed through the lungs, into the blood stream, and toward a target organ
 - Gases, Vapors, Aerosols



Surface Area of the Skin and Lungs

Skin

20 Square Feet

Lungs

300 Square Feet at Rest

1000 Square Feet at Inspiration

* During a moderate workday, a person
breathes about 300 cubic feet of air

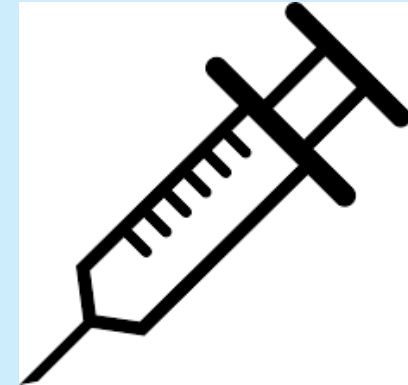
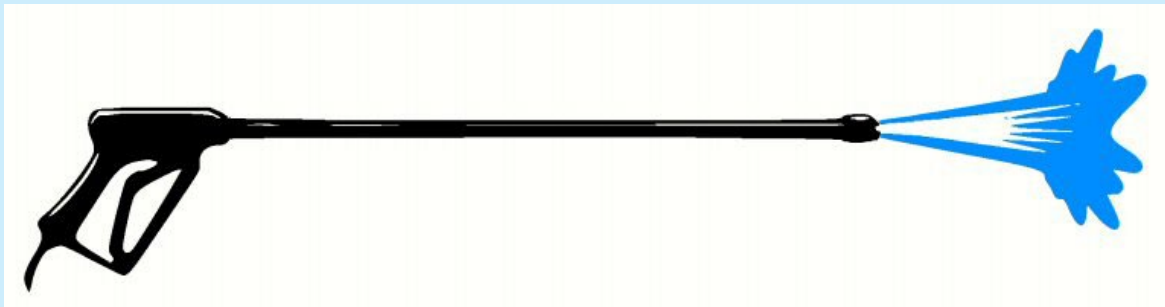
Ingestion

- Personal hygiene factors to consider
- Occasionally intentional, sometimes not



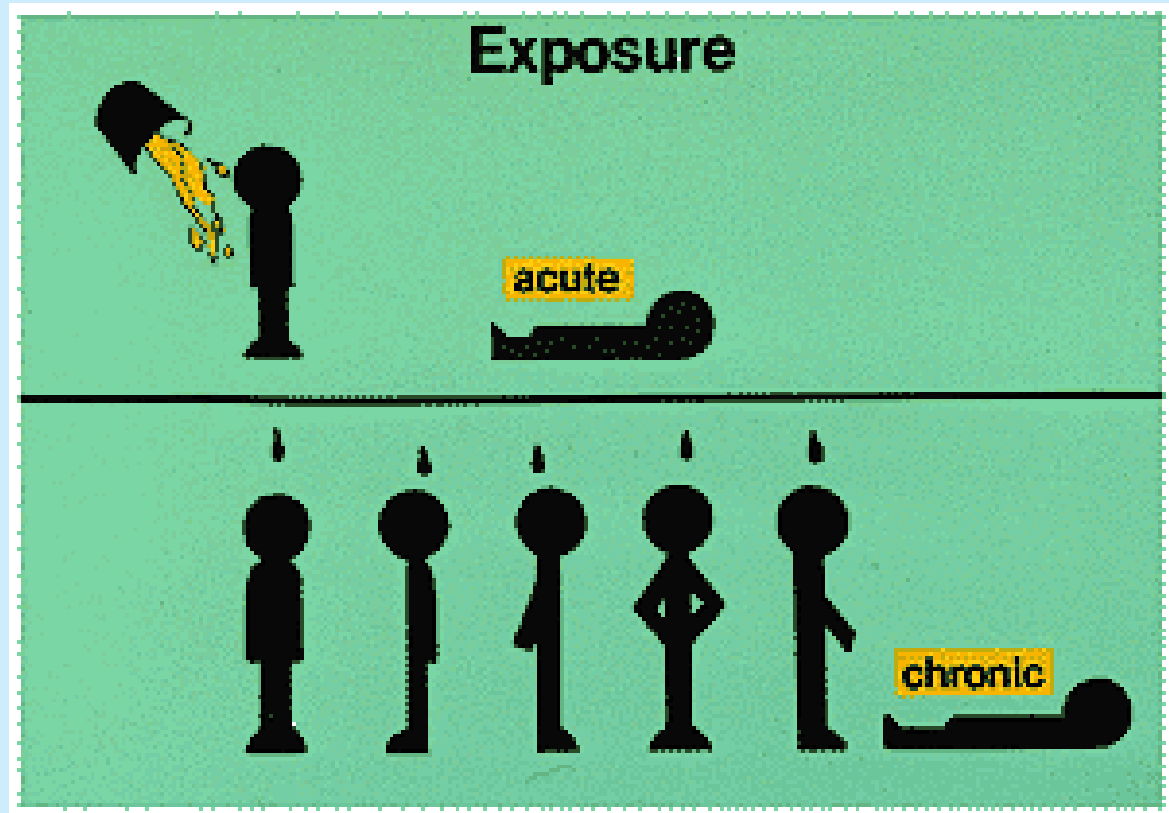
Injection

- Through a cut or tear in skin
 - More than solvents



Types of Exposures

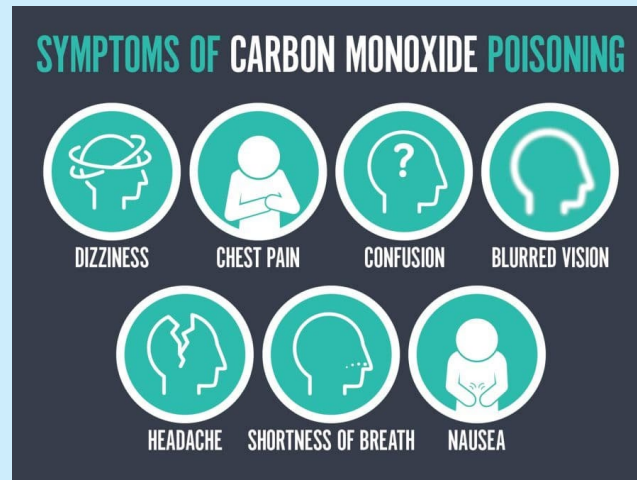
- Acute



- Chronic

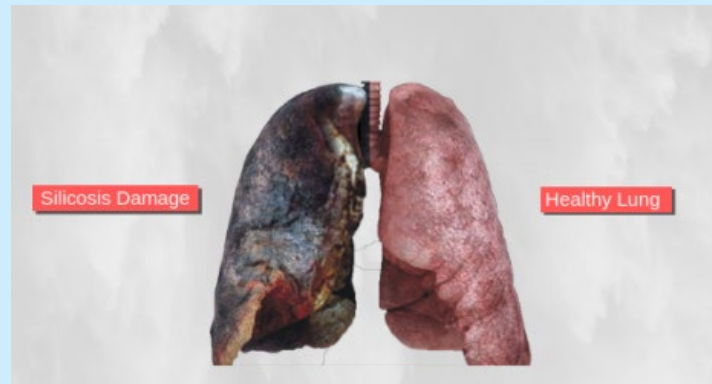
Acute Health Effects

- Typical Exposure over a **short** period of time
- When the exposure goes away, so does the health effect
- Typically involves relatively **higher** concentrations



Chronic Health Effects

- Typical Exposure over a **long** period of time - months or years
 - Silica
 - Lead
 - Asbestos
- The health effect outlasts the exposure
- Typically involves relatively **lower** concentrations



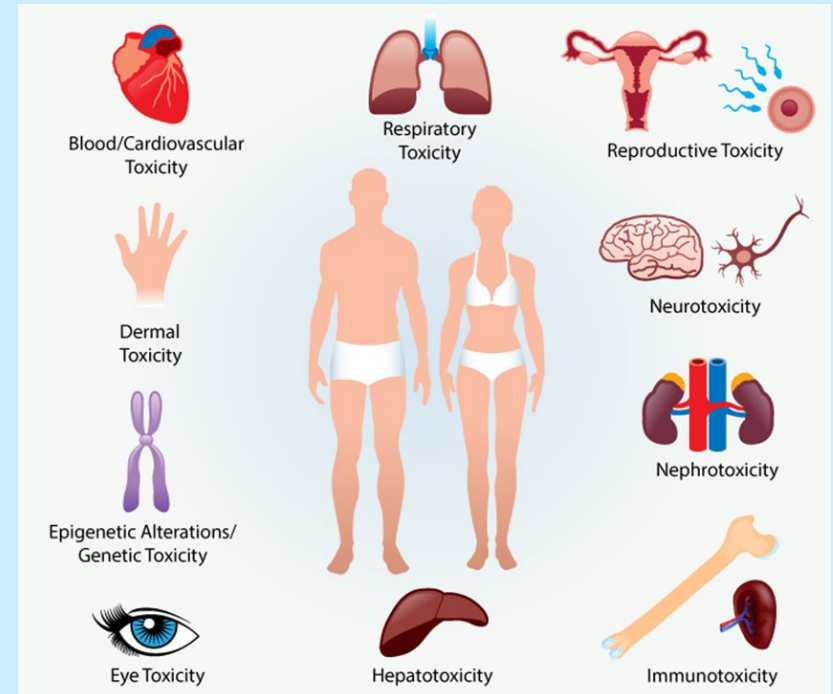
Local Health Effects

- Happen at point of contact
 - Irritation
 - Chemical Burns
 - Lung Damage



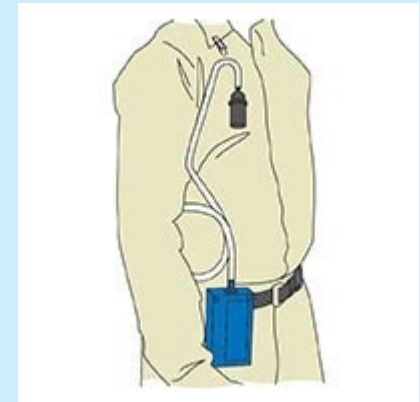
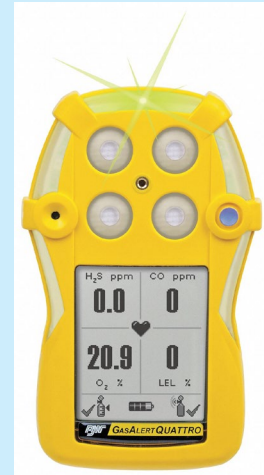
Systemic Health Effects

- Exposure of chemical targets specific organs
 - In general, solvents target skin (local effect) and also liver (systemic effect).



Units of Concentration (Exposure)

- Percentages (Gas/Vapor)
 - PPM – Parts per million
 - PPB – Parts per billion
- Solids (Dusts/Fumes)
- mg/m^3 – milligrams per cubic meter
- $\mu\text{g}/\text{m}^3$ – micrograms per cubic meter
- Fibers
 - f/cc fibers per cubic centimeter



Atmospheric Hazards

Oxygen

- Deficiency – Less than 19.5 %
- Enrichment – More than 23.5%

Hydrogen Sulfide

- Toxic, PEL 10 ppm

Carbon Monoxide

- Asphyxiant, PEL 35 ppm

Flammable Gas

- 10 percent Lower Explosive Limit (LEL)
- Methane gas

Carbon Monoxide (CO)

- Byproduct of combustion
- No odor
- No color
- No taste
- Evenly Distributed
- Sometimes no symptoms

Carbon Monoxide

- Odorless, Colorless Gas
- Combustion By-Product
- Quickly collapse at high concentrations

<u>PPM</u>	<u>Effect</u>	<u>Time</u>
35	Permissible Exposure Level	8 Hours
200	Slight headache, discomfort	3 Hours
600	Headache, discomfort	1 Hour
1000-2000	Confusion, nausea, headache	2 Hours
1000-2000	Tendency to stagger	1 1/2 Hours
1000-2000	Slight heart palpitation	30 Min.
2000-2500	Unconsciousness	30 Min.

CO Exposure Symptoms

- Weakness
- Fatigue
- Nausea
- Headaches
- Dizziness
- Rapid breathing



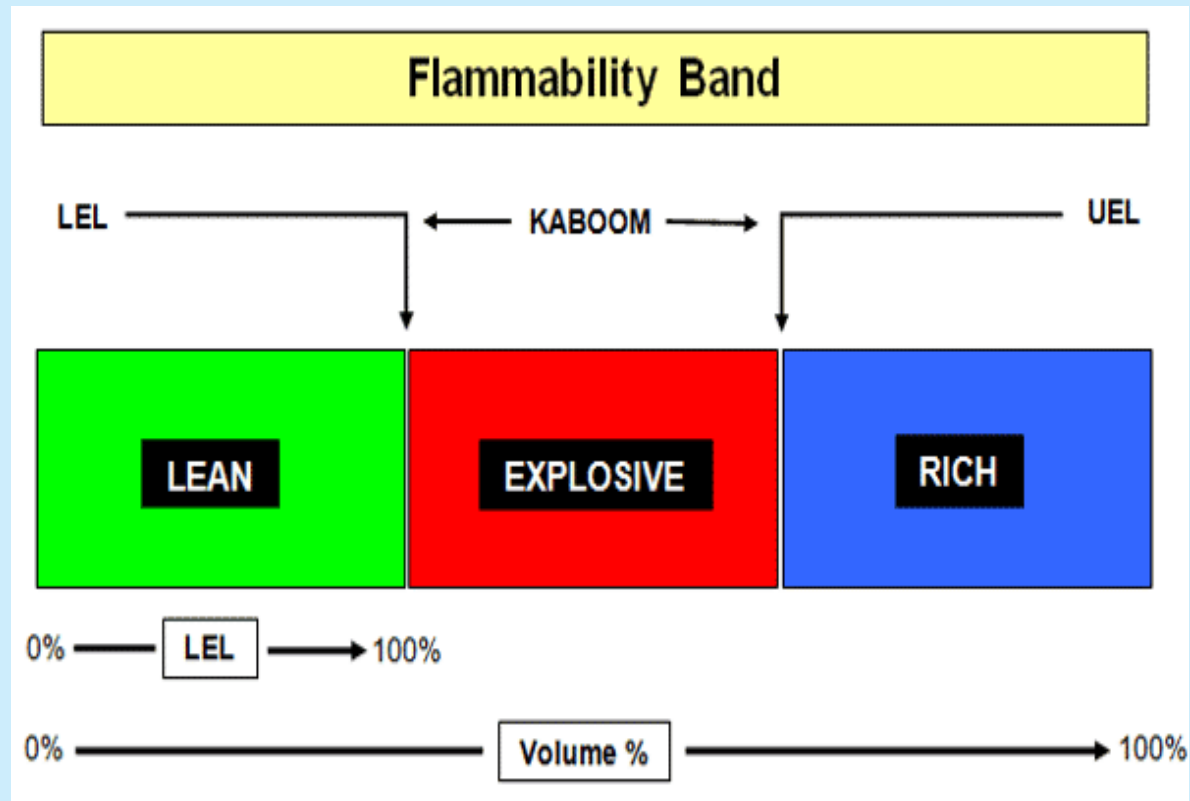
- Confusion
- Hallucinations
- Vomiting
- Severe pain
- Bluish discoloration
- Fainting

Flammable Atmospheres

- Flammable and combustible gases or vapors are present
- Proper air/gas mixture can lead to explosion
- Typical Ignition Sources:
 - Sparking or electric tool
 - Welding / cutting operations
 - Smoking



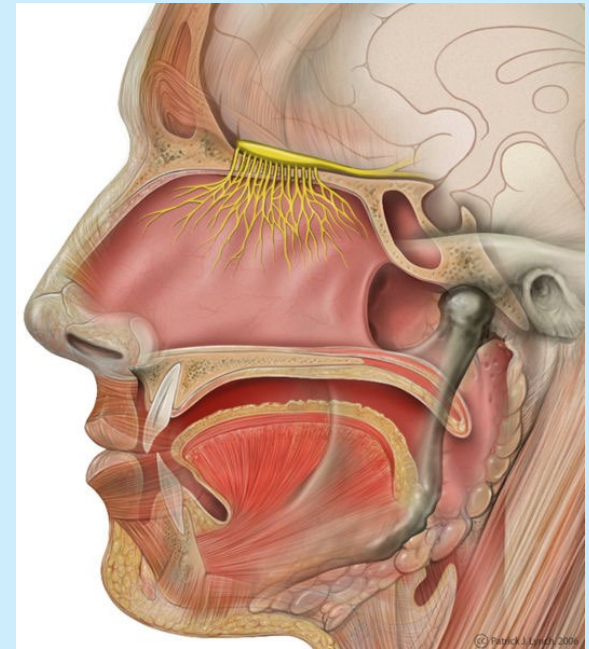
10% Lower Explosive Limit (LEL)



Hydrogen Sulfide (H₂S)

Exposure Symptoms

- Sense of smell gets rapidly fatigued
 - Cannot be relied upon
- Low blood pressure and slow respiration
- Eye, nose and throat irritation
- Nausea, Dizziness, Headaches
- Loss of consciousness

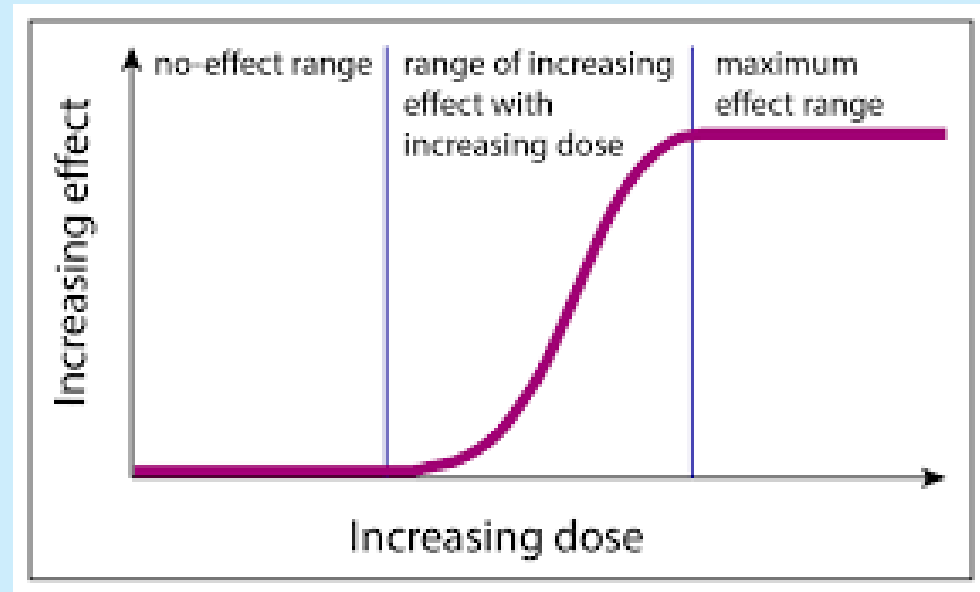


Effect of Various H₂S Levels

H ₂ S	Effects of human
0.13	Odor threshold
10	PEL
100	Coughing, eye irritation, loss of sense of smell after 2 to 5 minutes.
500-700	Loss of consciousness and possible death in 30 minutes to one hour.
1000-2000	Unconsciousness at once and death in a few minutes. <u>Death</u> may occur even if individual is moved to fresh air.

Dose / Response

- The higher the dose, The more the response
- Other Factors:
 - Body Weight
 - Gender
 - Physical Condition
 - Personal Habits
 - Heredity
 - Age
 - Heath Status



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Material Identification (SDS & Labeling Systems)

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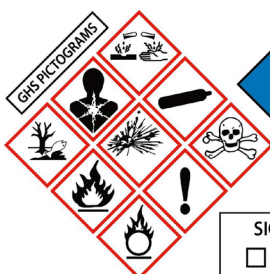

Importance of Labeling (Be Informed)

- Understand Hazard
- Assess Risk
- Take Steps to Control Risk



Labeling Systems

- GHS
- NFPA
- HMIS
- DOT

PRODUCT IDENTIFIER:																	
																	
HAZARD/PRECAUTIONARY INFO.	<table><tr><td colspan="2">SIGNAL WORD</td></tr><tr><td><input type="checkbox"/> DANGER</td><td></td></tr><tr><td><input type="checkbox"/> WARNING</td><td></td></tr><tr><td colspan="2">HMIS</td></tr><tr><td>HEALTH</td><td><input type="checkbox"/></td></tr><tr><td>FLAMMABILITY</td><td><input type="checkbox"/></td></tr><tr><td>REACTIVITY</td><td><input type="checkbox"/></td></tr><tr><td>PERSONAL PROTECTION</td><td><input type="checkbox"/></td></tr></table>	SIGNAL WORD		<input type="checkbox"/> DANGER		<input type="checkbox"/> WARNING		HMIS		HEALTH	<input type="checkbox"/>	FLAMMABILITY	<input type="checkbox"/>	REACTIVITY	<input type="checkbox"/>	PERSONAL PROTECTION	<input type="checkbox"/>
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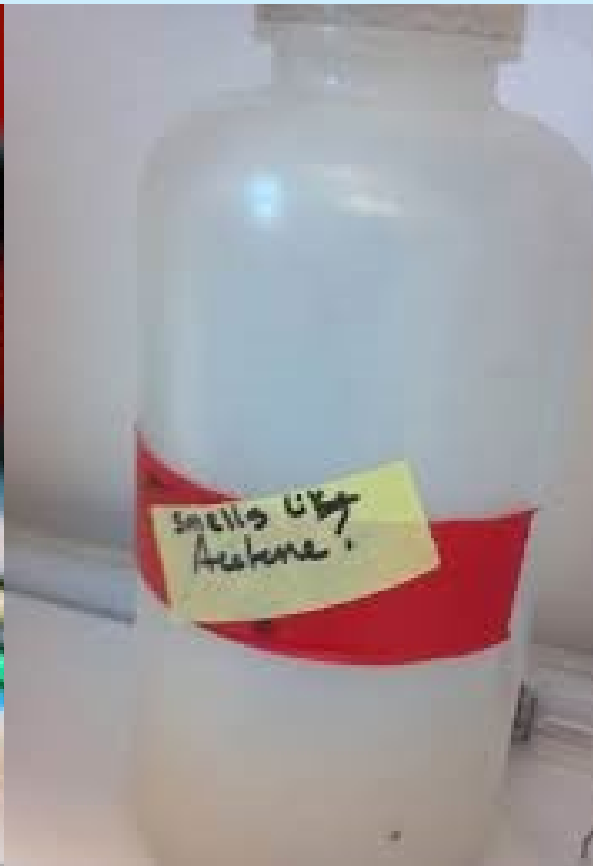


Global Harmonized System (GHS) 2012

- The development of a harmonized hazard communication system, including: **Labeling, Safety Data Sheets, and easily understandable Symbols**, based on the classification criteria developed for the GHS.



Properly Labeled?



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GHS Labeling

- Product Identifier
- Pictogram
- Signal Words – “Danger” or “Warning”
- Hazard Statements – standard phrases assigned to a hazard class and category
- Precautionary statement(s) – 4 kinds
- Supplier Information – name, address, phone

The Basic Parts of A GHS-Compliant Label

1 →

n-Propyl Alcohol

UN No. 1274

CAS No. 71-23-8

2 →

DANGER

3 →

Highly flammable liquid and vapor. Causes serious eye damage.
May cause drowsiness and dizziness.

4 →

Keep away from heat/sparks/open flames/hot surfaces. No smoking. Avoid breathing fumes/mist/vapours/spray. Wear protective gloves/protective clothing/eye protection/face protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present. Continue rinsing.

Fill Weight: 18.65 lbs.

Lot Number: B56754434

Gross Weight: 20 lbs.

Fill Date: 6/21/2013

Expiration Date: 6/21/2020

See SDS for further information.

5 →

Acme Chemical Company • 711 Roadrunner St. • Chicago, IL 60601 USA • www.acmechem.com • 123-444-5567



6

1. **Product Identifier** - Should match the product identifier on the Safety Data Sheet.
2. **Signal Word** - Either use "Danger" (severe) or "Warning" (less severe)
3. **Hazard Statements** - A phrase assigned to a hazard class that describes the nature of the product's hazards
4. **Precautionary Statements** - Describes recommended measures to minimize or prevent adverse effects resulting from exposure.
5. **Supplier Identification** - The name, address and telephone number of the manufacturer or supplier.
6. **Pictograms** - Graphical symbols intended to convey specific hazard information visually.

Sample label courtesy of Weber Packaging Solutions • www.weberpackaging.com

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Label - Signal Words

- The signal word indicates the relative danger or severity of a hazard. The signal words used in GHS are
- “Danger” for the **more** severe hazards, and
- “Warning” for the **less** severe hazards.

Label - Hazard Statements

- A statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical; including, where appropriate, the degree of hazards
 - Fatal if swallowed
 - Toxic if swallowed
 - Harmful if swallowed
 - May be harmful if swallowed
 - Highly flammable liquid and vapor

Label - Precautionary Statements

- A phrase that describes recommended measures to be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical or improper storage or handling.
 - wear protective gloves
 - wear splash protection for face
 - keep away from heat/sparks/open flame
 - use explosion-proof electrical equipment

Safety Data Sheets (SDS)

- An important resource for responders
- Provides detailed profile of chemical/mixture
- Is provided by manufacturer/distributor



Safety Data Sheets (SDS)

- Contains information on chemical composition
- Describes physical and chemical properties
- Provides health and safety information, including first aid
- Gives toxicological data
- Indicates actions to be taken during emergency response
- Hazard Categories

Safety Data Sheets (SDS)

- Hazard Categories
 - Ranked 1-5
 - 1 is the highest (severe)
 - 5 is the lowest (least severe)
 - It's important to note, the HazCom 2012 categories are similar yet contradictory to the HMIS/NFPA ratings:
 - Ex: NFPA's rank of 4 is most severe.

SDSs have 16 Sections

1. Identification of the Substance or mixture, and of the supplier
2. Hazard identification
3. Composition/ingredients
4. First-aid measures
5. Fire-fighting measures
6. Accidental release measures

Safety Data Sheets - Cont

- 7. Handling and storage
- 8. Exposure controls/personal protection
- 9. Physical and chemical properties
- 10. Stability and reactivity
- 11. Toxicological information

Safety Data Sheets - Cont

- 12. Ecological information ←new
- 13. Disposal considerations
- 14. Transportation information
- 15. Regulatory information
- 16. Other information dates/revision

GHS Symbols

(Pictograms adopted by OSHA)



Exploding Bomb



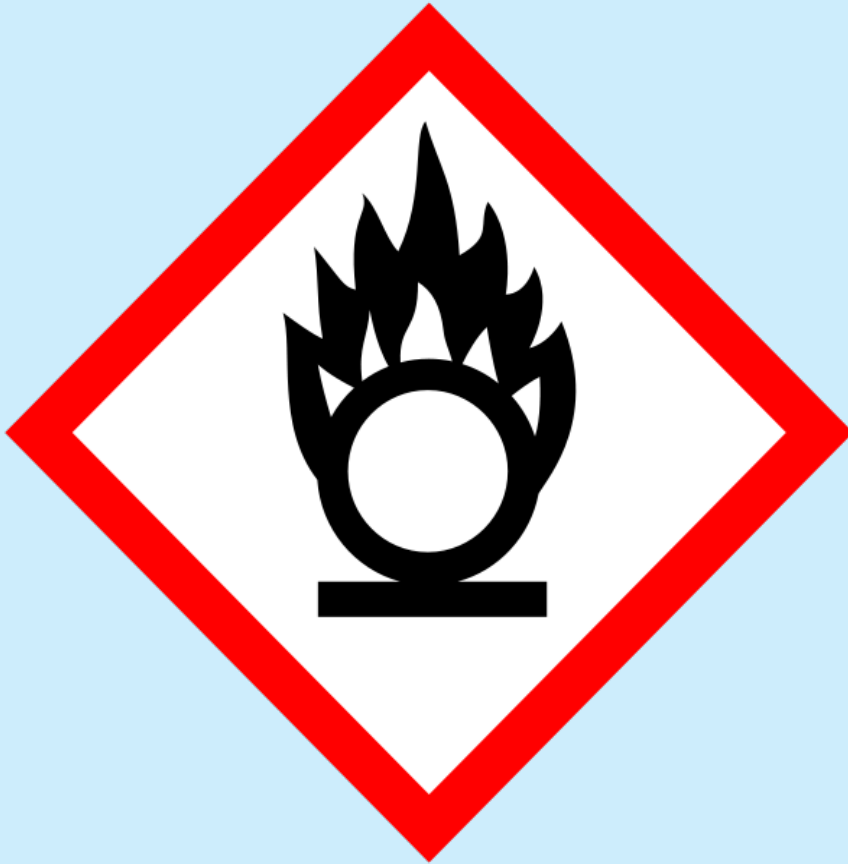
- Explosives
- Self-reactive substances
- Organic peroxides

Flame

- Flammables
- Emits flammable gas
- Self-reactive substances
- Pyrophorics (spontaneously igniting in air)
- Self-heating substances
- Organic peroxides



Flame Over Circle



- Oxidizers (removes electrons)

Gas Cylinder

- Compressed gases
- Liquefied gases
- Dissolved gases



Corrosion



- Skin corrosion
- Eye damage
- Corrosive to metals

Skull and crossbones

- Acute toxicity (fatal or toxic)



Exclamation Mark



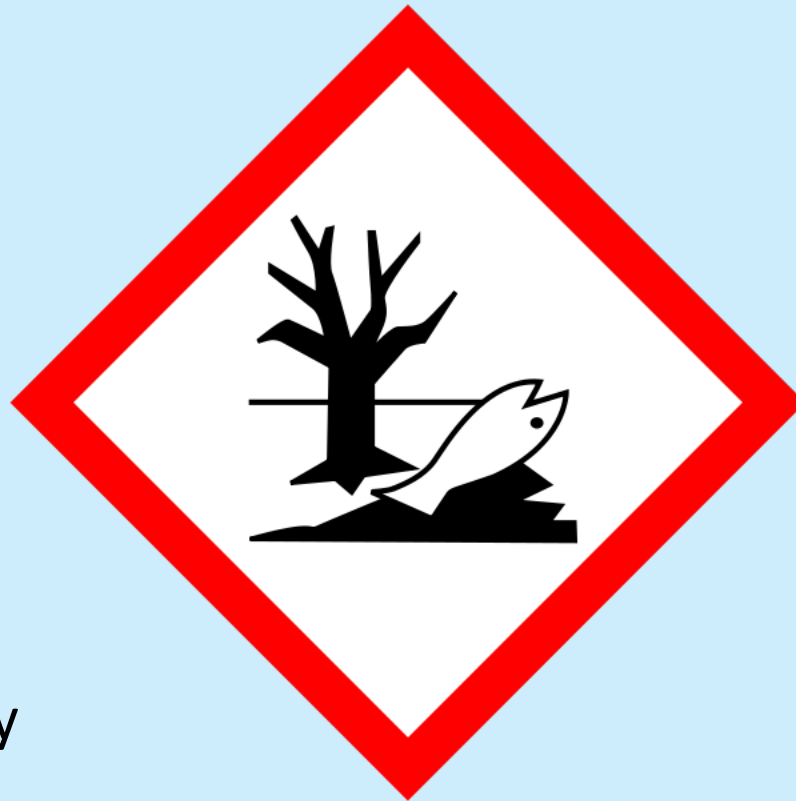
- Acute toxicity
- Irritant
- Skin sensitizer
- Narcotic effects
- Target organ toxicity
- Hazard to ozone layer (non-mandatory)

Health Hazard

- Carcinogen
- Mutagen
- Reproductive toxicity
- Respiratory sensitizer
- Target organ toxicity
- Aspiration hazard



9th Pictogram, not adopted by OSHA **Environmental Toxicity**



Aquatic Toxicity

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National Fire Protection Association (NFPA 704) Labeling System

Color

red

blue

yellow

white

Hazard

flammability

health

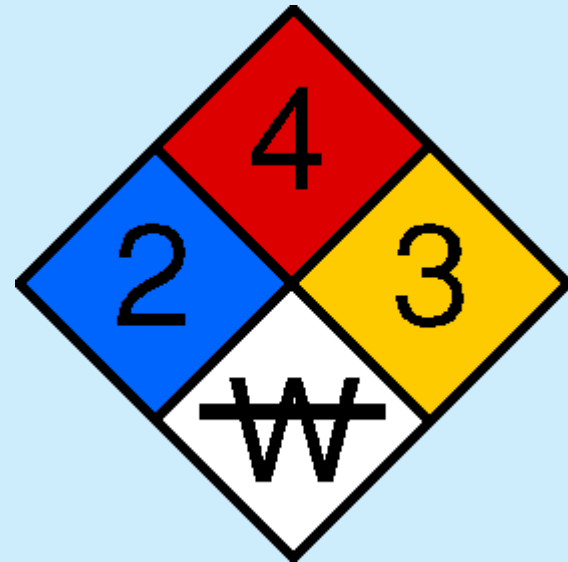
reactivity

special:

no water, biohazard,
oxidizer, radiation

0 – 4

least hazard to worst



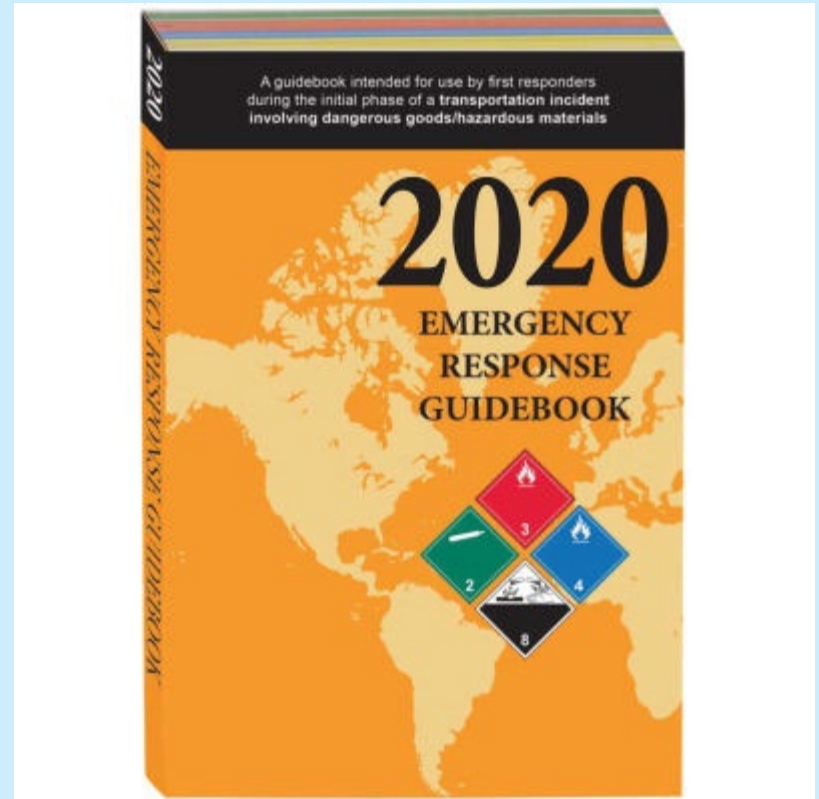
Hazardous Materials Information System (HMIS)

- A rectangular label
- Color Coded
- Number Coded
- Letter Coded
- Rated on a scale from 4 - 0
 - 4 is most severe
 - 0 is less severe

CHEMICAL NAME	
HEALTH	1
FLAMMABILITY	2
REACTIVITY	3
PERSONAL PROTECTION	A
HEALTH HAZARDS:	

DOT System

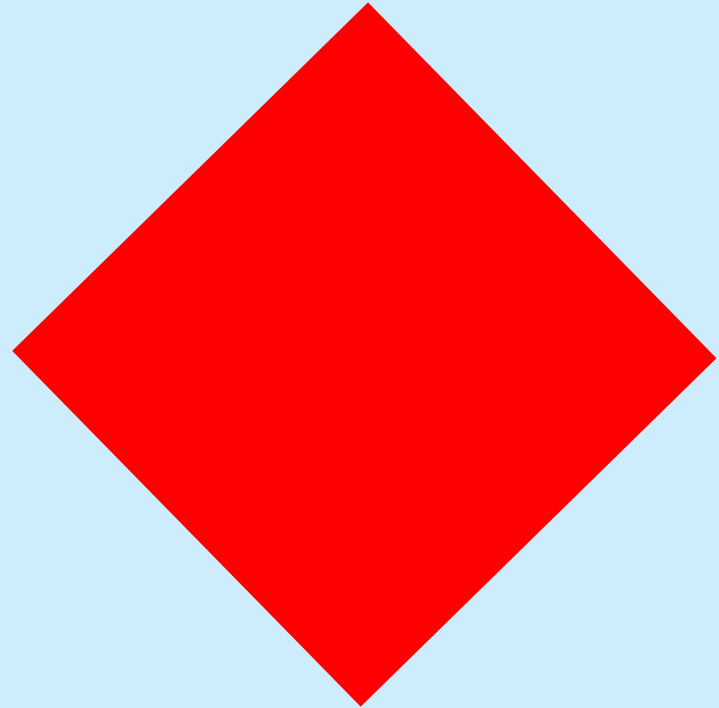
- Diamond Shaped
- Color Coded
- Word Coded
- Number Coded
- Icon Coded
- UN Hazard Class Coded



DOT System of Labels and Placards

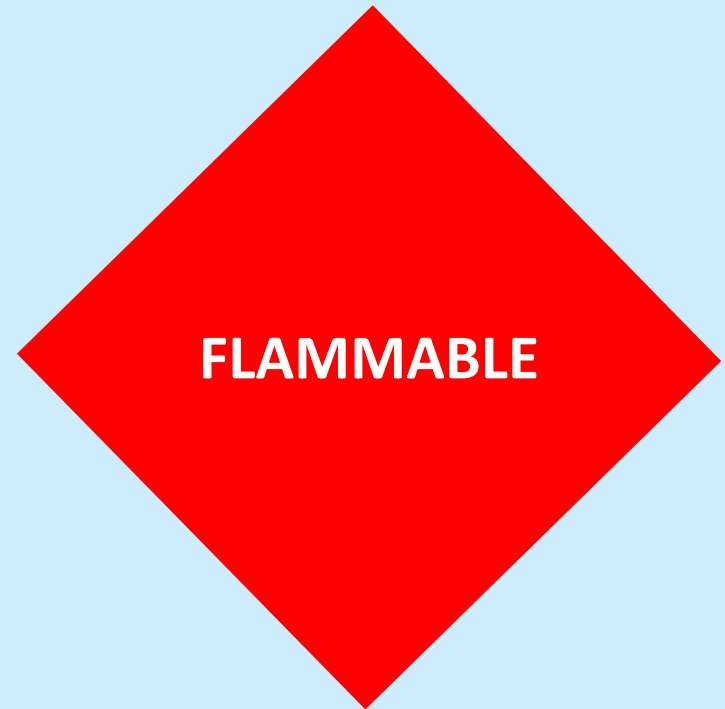
- **Color-coded**

Red	flammable
Orange	explosive
Green	nonflammable
Yellow	oxidizer
White	poisonous
White/ red stripes	flammable
Solid white	
top/black bottom	corrosive
Two colors	two hazards



DOT System of Labels and Placards

- Word-coded
 - Hazard Class Name
 - Explosive
 - Flammable
 - Dangerous



DOT System of Labels and Placards

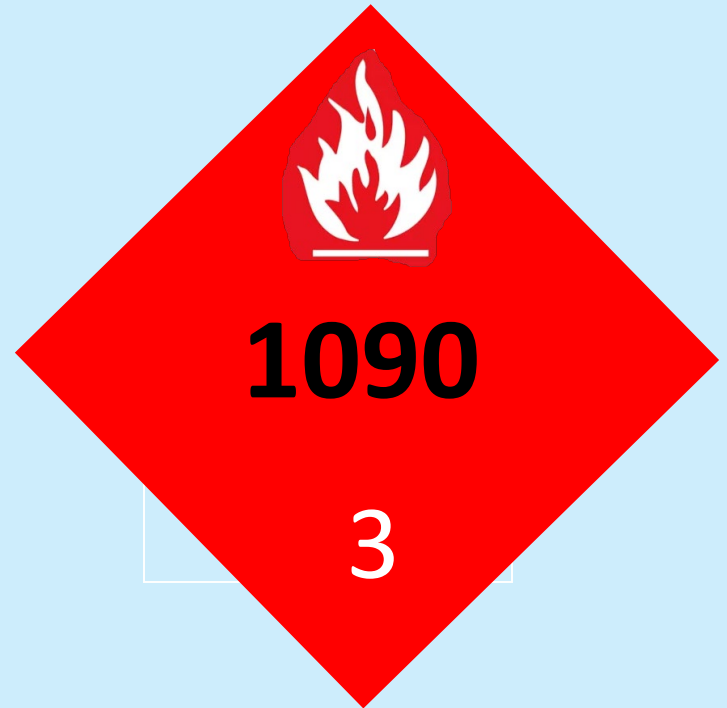
- **Symbol-coded**
 - Bursting Ball: Explosive
 - Flame:
Flammable/combustible
 - Skull/crossbones: Poison
 - Circle w/flame: Oxidizer
 - Propeller: Radioactive



DOT System of Labels and Placards

Number –coded

- 1 Explosives
- 2 Gases
- 3 Flammable/combustible liquids
- 4 Flammable solids
- 5 Oxidizers and peroxides
- 6 Poisonous and infectious
- 7 Radioactive
- 8 Corrosives
- 9 Misc.



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Personal Protective Equipment (PPE)

Helping Make Life Safer

PPE Program

- Hazard Assessment & Equipment Selection
- Employee Training
- Protective Devices
- Eye and Face Protection
- Foot Protection
- Hand and Arm Protection
- Head Protection
- Cleaning and Maintenance
- Record Keeping



Criteria for PPE

- All PPE shall be maintained in a **sanitary and reliable** condition
- The employer shall assure that PPE provided by employer is adequate for the protection of the worker

What is mandatory PPE

- Safety glasses, goggles, or equivalent eye protection
- Footwear with reinforced toe or toe caps or equivalent foot protection
- Appropriate protective gloves
- Long-sleeved shirt and long pants, or equivalent, Tyvek or equivalent
- Respirator use (only if facility has respirator program, see *SOP 2.5 Respirator Program*).

What PPE do I need for: Traffic Control?

- Reflective vests for staff in traffic hazard areas - Class 2 High Visibility Vest
- Footwear with reinforced toe or toe caps or equivalent foot protection



What PPE do I need for: Receiving or Sorting Wastes?

- Safety glasses with side shields or goggles
- Footwear with reinforced toe protection or protective toe caps
- Protective gloves
- Long-sleeved shirt and pants or the equivalent
- Protective apron or equivalent
- Reflective vests for event collections
- Respirator (if facility has written respirator plan)

What PPE do I need for: Bulking flammables, solvents or Aerosols?

- Poly-coated tyvek coverall or apron
- Safety glasses with side shields or goggles
- Latex or nitrile gloves
- Footwear protection
- Chemically resistant gloves (if bulking flammables or aerosols)
- Respiratory protection according to respiratory protection plan (if bulking flammables or aerosols).

What PPE do I need for: Bulking Latex Paint?

- Long sleeves
- Long pants
- Safety Toed shoes/boots
- Apron or coveralls
- Safety glasses



What PPE do I need for: Lab Packing?

- Safety glasses, goggles, or equivalent eye protection
- Footwear with reinforced toe or toe caps or equivalent foot protection
- Appropriate protective gloves
- Long-sleeved shirt and long pants, or equivalent, Tyvek or equivalent
- Respirator use (only if facility has respirator program, see *SOP 2.5 Respirator Program*).



What PPE do I need for: Unknown Chemicals/Contents?

- Safety glasses with side shields, goggles, or equivalent
- Foot protection
- Protective gloves
- Long-sleeved shirt and long pants or equivalent
- Protective apron or equivalent
- Respirator (if facility has written respirator plan)

What PPE do I need for: INCIDENTAL Spill Clean up?

- Poly-coated Tyvek coverall or equivalent
- Safety glasses or goggles
- Chemical resistant gloves
- Chemical resistant boot covers
- Respiratory protection according to facility respiratory protection plan

Other Optional PPE

- Tyvek suit
- Chemical resistant suit
- Face shields
- Tyvek boot covers
- Chemical resistant boots/covers
- Hard hats



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RESPIRATORY PROTECTION

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Filtering Facepiece Respirator

- A negative pressure particulate respirator with the entire facepiece composed of the filtering medium.



Half Mask Respirator w/ cartridges



Selection of Respirators

- Employer must select and provide an appropriate respirator based on the respiratory hazards to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.



Medical Evaluation

- Must provide a medical evaluation to determine employee's ability to use a respirator, **before fit testing and use**
- Must identify a PLHCP to perform medical evaluations using a medical questionnaire or an initial medical examination that obtains the same information

“To beard, or not to beard?”



Credit: NIOSH

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Fit Testing

- Before an employee uses any respirator with a **negative or positive pressure tight-fitting facepiece**, the employee must be fit tested with the same make, model, style, and size of respirator that will be used.



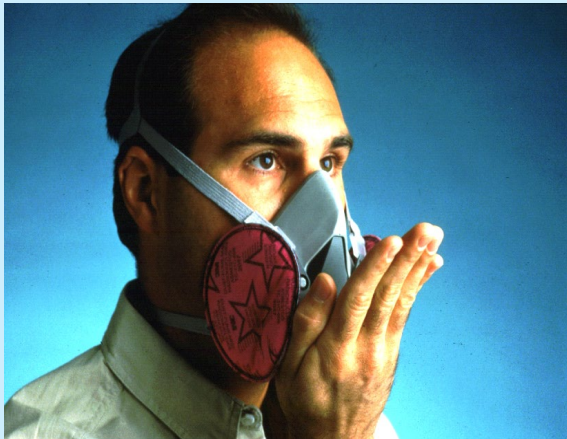
Qualitative Fit Test (QLFT)

- A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.
- Performed annually or as needed.



Pre-Use (User) Seal Pressure Check

- An action conducted by the respirator user to determine if the respirator is properly seated to the face.



Positive Pressure Check



Negative Pressure Check

Training and Information

- Employers must provide effective training to employees who are required to use respirators.



Training and Information

- Employees who are required to use respirators must be **trained such that they can demonstrate knowledge of at least:**
 - Why the respirator is necessary and how improper fit, use, or maintenance can compromise its protective effect
 - Limitations and capabilities of the respirator
 - Effective use in emergency situations

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Spill Response

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What Is HAZWOPER?

- Hazardous Waste Operations and Emergency Response
- Required for facilities storing and using hazardous chemicals
- Defines emergency response procedures



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HAZWOPER Basics

- Even a small spill can be dangerous
- Fires, explosions, and contamination can result
- Only trained workers clean spills
- Everyone must understand potential spill hazards and their role in an emergency

Spill Prevention

- Understand chemical hazards
- Follow safe storage and handling procedures
- Read and follow the instructions on labels and safety data sheets
- Don't use chemicals in unlabeled containers



Spill Prevention

- Inspect chemical containers for damage or leaks
- Don't handle or open chemical containers without PPE
- Don't leave containers open
- Report potential hazards to your supervisor



Emergency Response Plan

- Pre-emergency planning and training
- Emergency recognition
- Evacuation procedures
- Emergency alerting and response
- PPE and emergency equipment
- Decontamination and medical treatment

Levels of Training

- First responder: Awareness Level
- First responder: Operations Level
 - Defensive Posture
- Hazardous Materials Technician
 - Offensive Posture
- Hazardous Materials Specialist
- Incident Commander

Hazardous Substance?

- Includes pure or mixed chemicals and hazardous wastes
- Potential health hazards
- Could damage the environment



Recognize Chemical Substances

- Danger, warning signs
- NFPA or HMIS labels
- DOT placards
- SDS Info

OIL-BASED PAINT			
HEALTH	★	4	
FLAMMABILITY		2	
PHYSICAL HAZARD		0	
PERSONAL PROTECTION	H		



Hazardous Materials

- Characteristics:
 - **Corrosivity**, or something that can corrode or decompose
 - **Ignitability**, or something flammable
 - **Reactivity**, or something explosive
 - **Toxicity**, or something poisonous



Dangers of a Release

- Flammable liquids or gases
- Toxic cloud
- Reaction with nearby chemicals
- Heat
- Energy Release
- Irritants
- Burns

Chemical Exposure

- Skin or eye contact
- Inhalation
- Swallowing
- Avoid contact and evacuate immediately

Awareness Level Role

- Recognize a chemical release
- Determine chemical's identity
- Self-protection and protection of others
- Know how to get assistance
- Secure the area



Recognizing a Chemical Release

- Dripping or pool of liquid
- Unusual smell
- Unusual sound
- Loss of pressure or flow

Non-Hazardous Spills

- Incidental or small
- Handled by the employees in immediate area
- Get help if you're unsure

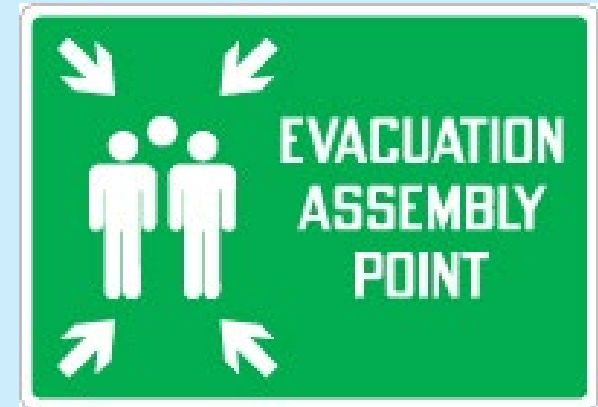
Identifying the Chemical

- Where is it coming from?
- Is the container labeled?
- Is it a liquid, gas, or solid?
- What does it smell like?
- What color is it?



Protect Yourself and Others

- Report the release to others in the immediate area
- Retreat to a safe distance, place of refuge, or evacuation assembly area



Reporting the Spill

- Contact the emergency response coordinator
- Provide information:
 - Location of release
 - Identity and quantity of spilled material
 - Evacuation status
- Ask for instructions

Secure the Area

- Keep people a safe distance from the spill
- Use caution tape, rope, cones, etc.
- Stand guard of the controlled area



Response Personnel

- Analyze the incident
- Use proper PPE and equipment
- Contain the spill
- Stop the leak
- Clean up the spill
- Decontaminate
- Report the incident

Summary

- HAZWOPER is for facilities storing or using hazardous chemicals
- Practice spill prevention techniques
- Recognize the chemicals used at your facility and know their hazards
- Awareness Level personnel must:
 - Recognize a spill or release
 - Know how to initiate a response

QUESTIONS?



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