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RESEARCH AND TRAINING

Hazard Communication Training

4-hour course in accordance with 29 CFR1910.1200

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This course is delivered in 10 sections

1. Course introduction
2. Hazard Communication (Hazcom) standard overview
3. Training requirements
4. Chemical overview
5. Review of common health effects
6. Measurement and exposure limits
7. Hazard communication systems
8. Controls
9. Spill response
10. GHS and REACH

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Section 1

Course Introduction

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After completing this course you will be able to:

- Provide a definition of hazard communication
- List three rights workers have under Hazcom
- List three hazardous chemical categories
- List three routes of entry for chemicals
- Give three methods for finding information on chemicals with which you work
- List three methods for chemical hazard control
- Contrast an incidental spill vs. an emergency response
- Define GHS and REACH and list one benefit for workers

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The primary objective of this course is for you to know why, how and where to find specific hazard information to help you protect yourself from chemical hazards



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What this course will not do!



This course will not train you to act as an emergency responder to clean up emergency spills and releases



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Hazcom training will qualify you to find information about chemicals you work with or around



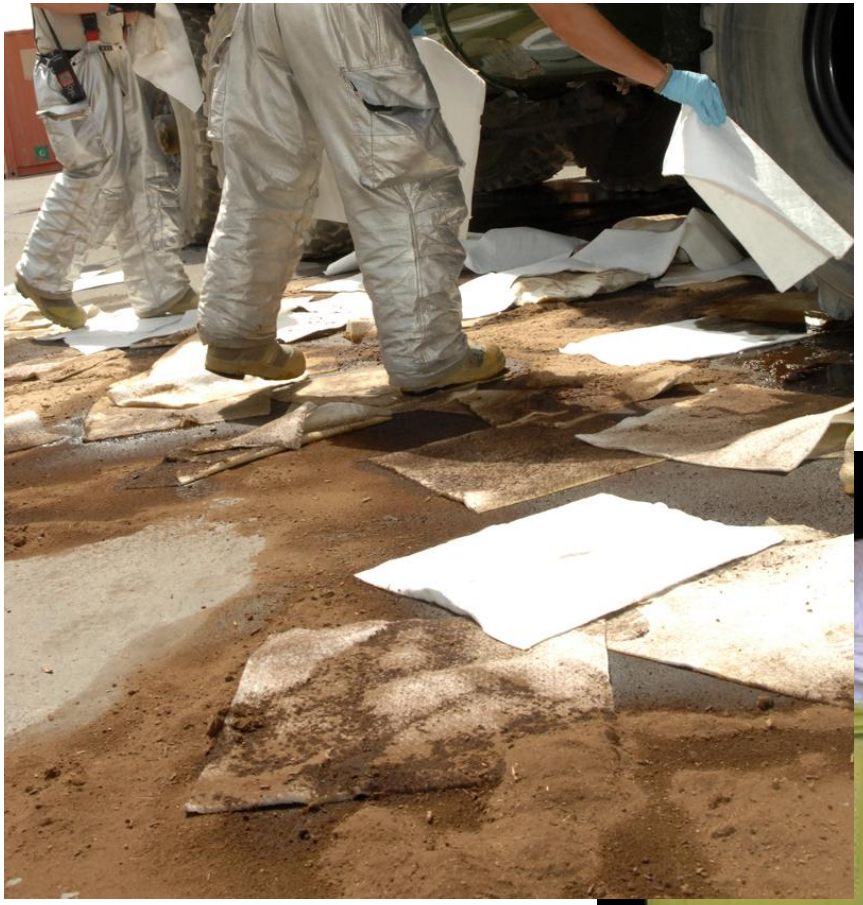
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Hazcom training will train you to identify spills and releases of hazardous chemicals and report them to qualified response personnel



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If authorized by your employer, you will be qualified to clean up "incidental" spills in your work area





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"I develop a cost-benefit model to estimate the efficient level of disabling injuries across Class 1 [rail] carriers."

-French, M.T. (1988). An efficiency test for occupational safety regulation. Journal of Policy Analysis and Management, 7, 675-693.

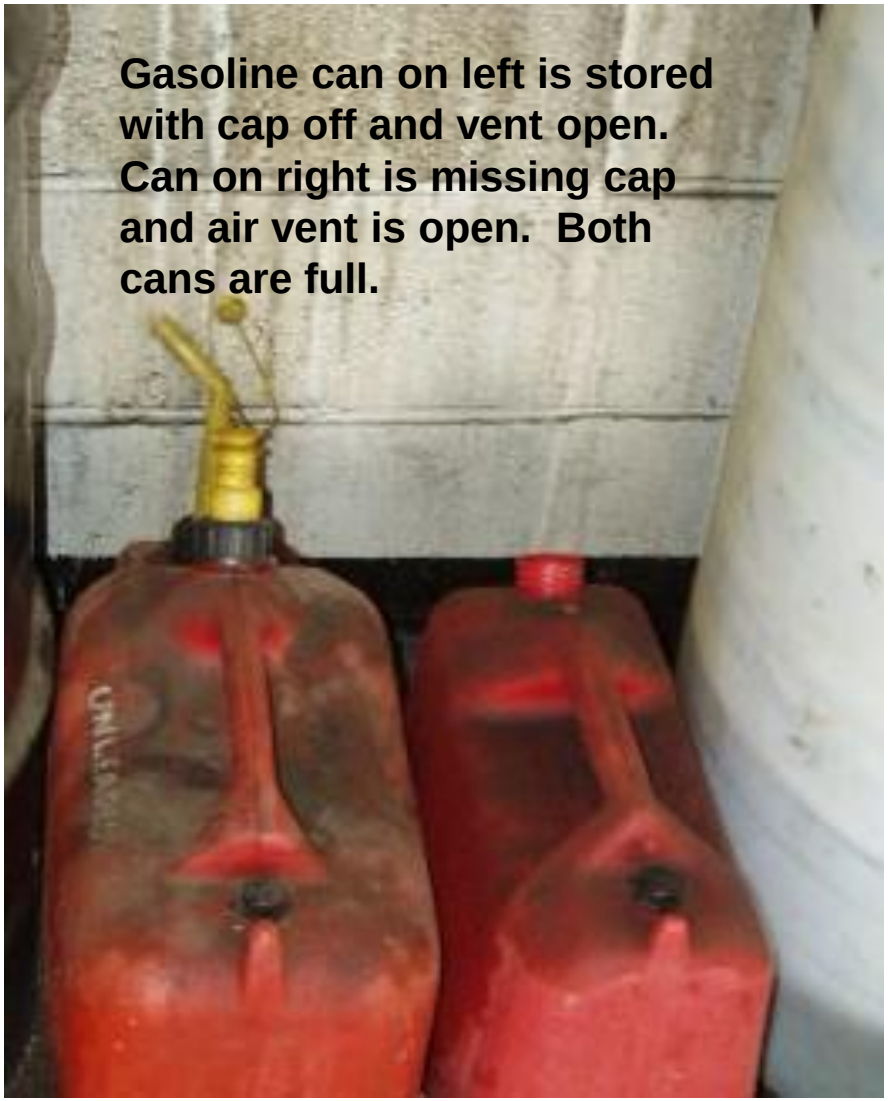


What risk will you accept?

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Let's ask ourselves some questions about health and safety and risk

Anything wrong with this photo?



Let's do Activity 1

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Section 2

Hazard Communication Standard Overview

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What is hazard communication?



Hazard Communication is the communication of chemical hazards to workers

Why is this important?

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Why have a Hazcom standard?



32 million workers work with, and are potentially exposed to, one or more chemical hazards - OSHA

54,046,543 chemicals are commercially available-CHEMCATS®

- **Over 600 new chemicals** are introduced every year-CAS
- **Only 282,904 substances** are inventoried or regulated-CHEMLIST®
- **Roughly 22%** of workplace diseases and injuries are caused by chemicals-International Labor Organization

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The Hazard Communication Standard is also known as:

- "Hazcom", also known as:

"RIGHT TO KNOW"

- OSHA 29 CFR 1910.1200

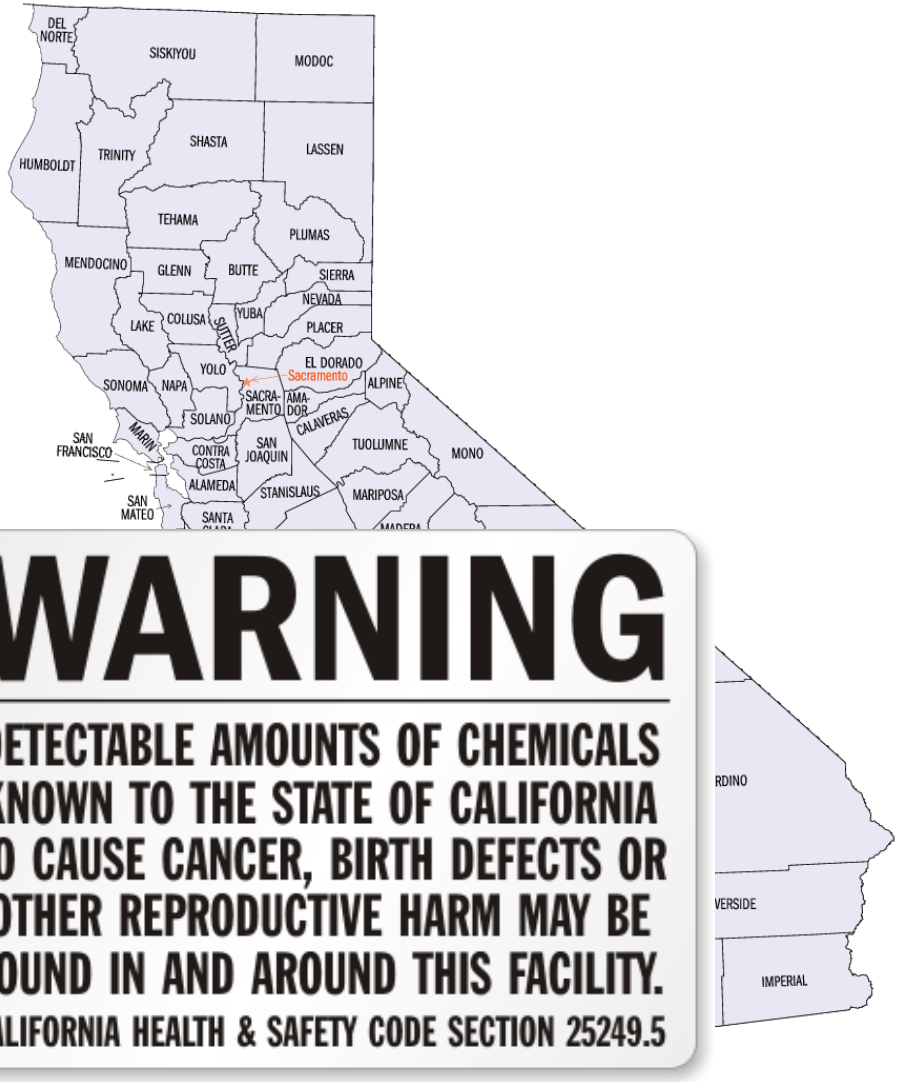


Good spot for this phone?

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Some states have increased protective hazard communication regulations, e.g., California

- Title 22 CCR §12000(b)
- Proposition 65
- Effective 1986
- Private employer requirements for reproductive dangers and carcinogens



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Requirements in the Hazcom regulation protect workers

- MSDSs available for hazardous substances in the workplace
- Labeling of hazardous chemicals
- Training workers
- Written Hazcom Program
- Chemical inventory and control
- Make required information available

Not having a written Hazcom program can cost employers and harm workers

Failure to have a written Hazcom program was the #1 OSHA cited violation in 2010 !

- **1910.1200(e)(1)**
- **4,853 citations**
- **$578,753**

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What is a Hazcom Program?

- **Employers must develop, implement, and maintain a written, comprehensive Hazcom program at the workplace**
- **A program is the employer's procedure for meeting the requirements of a particular regulation**

Workers have the right to review the Hazcom program on work time!

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Workers have rights under Hazcom!

- Information regarding hazardous substances
- Physician or collective bargaining agent to receive information
- Against discharge or other discrimination due to the employee's exercise of rights



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Whenever the employer receives a new or revised MSDS

"…such information shall be provided to employees on a timely basis not to exceed 30 days after receipt, if the new information indicates significantly increased risks to, or measures necessary to protect, employee health as compared to those stated on a material safety data sheet previously provided."



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Whenever the employer receives a new or revised MSDS

If it is found that a chemical in use is now shown to cause cancer, how long should it take for the employer to inform workers?



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Let's do Activity 2

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Training Requirements

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Training workers is mandatory yet it is often overlooked!

Failure of adequate Hazcom information and training was the #6 OSHA cited violation in 2010 !

- **1910.1200(h)(1)**
- **2,501 citations**
- **$219,479**

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Employers shall provide workers with effective information and training on hazardous substances in their work area at the time of their initial assignment, and whenever a new hazard is introduced into their work area



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Workers must be trained on:

- Training requirements of the Hazcom standard
- Operations in their work area where hazardous substances are present
- Methods and observations that may be used to detect the presence or release of a hazardous substance in the work area

Employees must be trained on:

- Physical and health hazards of the substances in their work area
- Protective measures
- The details, location and availability of their employer's written Hazcom program
- Special employee rights under the Hazcom standard



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Training must also cover:

- Hazardous chemicals used in the workplace (general hazard categories)
- Location and availability of MSDSs
- Labeling systems



Do you know where MSDSs are at your site?

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Chemical Overview

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All chemicals are found in one of three forms

- Solid
- Liquid
- Gas

Each form can have different "types" or categories. Can anyone name some of the categories?

- Solid (aerosol, dust, fiber, fume)
- Liquid (aerosol, mist, gels, adhesives)
- Gas (acetylene, oxygen, carbon monoxide, nitrogen)

If solids get into the air they could get into your body and harm you!





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Liquids can come into contact with the skin or eyes and harm that area and/or be absorbed into the body





Gases and vapors enter the body by inhalation and can reach the lungs



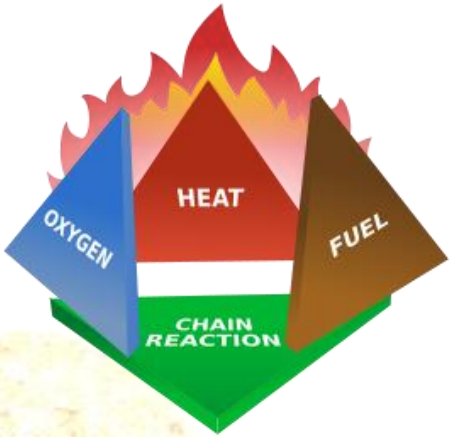


Work with liquids that have a high vapor pressure could pose an inhalation hazard!

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Some Physical properties of chemicals

- pH (corrosive power)
- Vapor pressure (VP) (chemical's volatility)
- Ingredients for a fire (Fire Tetrahedron)



- Flash Point (Fl.P.) (temperature at which it can burn)
- Explosive limits (fuel in the air required for fire)
- Vapor Density (VD) (where it will be in the air)

Why is it important to understand physical properties of chemicals?



Let's look at a spill of sulfuric acid (VP of 0.001 mmHg) considered very low

How about a Gasoline spill (Fl.P. of - 45°F) and it's July in Hanford, WA!



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What is a "hazardous chemical"?

- A hazardous chemical is any chemical that can do harm to your body
- Most industrial chemicals can harm you at some exposure and dose

What is the difference between exposure and dose? Are they the same?

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"Dosis facit venenum" - the dose makes the poison

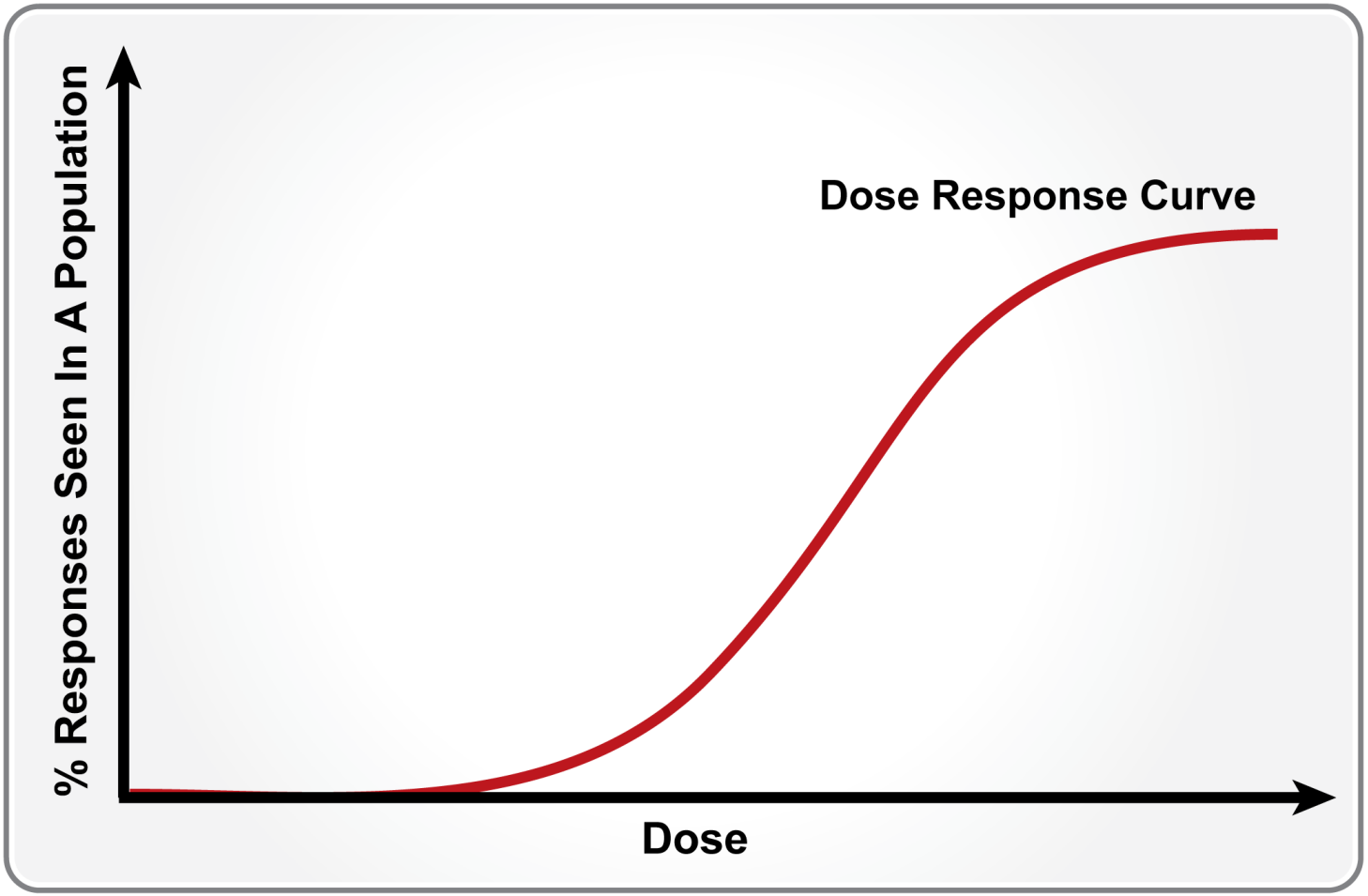
All substances are poisons; there is none which is not a poison. The right dose differentiates a poison…."

- Paracelsus (1493-1541)



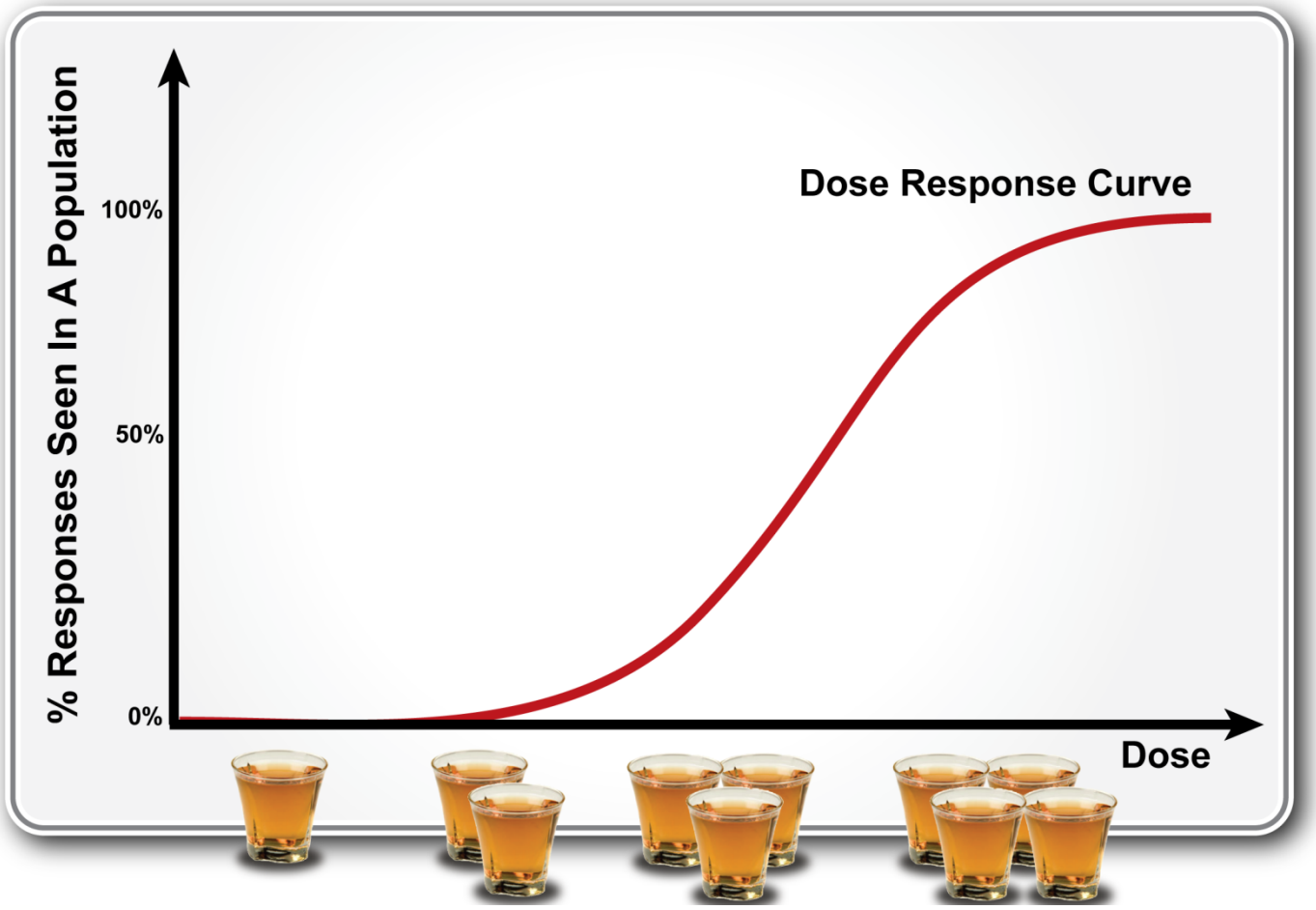
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The dose response curve shows us how populations respond to toxic chemicals



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Let's look at the dose response curve for liquor vs. drunkenness



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That stuff will kill ya!

- **10,000 mg caffeine is usually fatal**
- **150 mg will stimulate entire spinal cord**
- **65 to 350 mg in 8 oz. of coffee**
- **55 mg in 12 oz. can of Mountain Dew®**

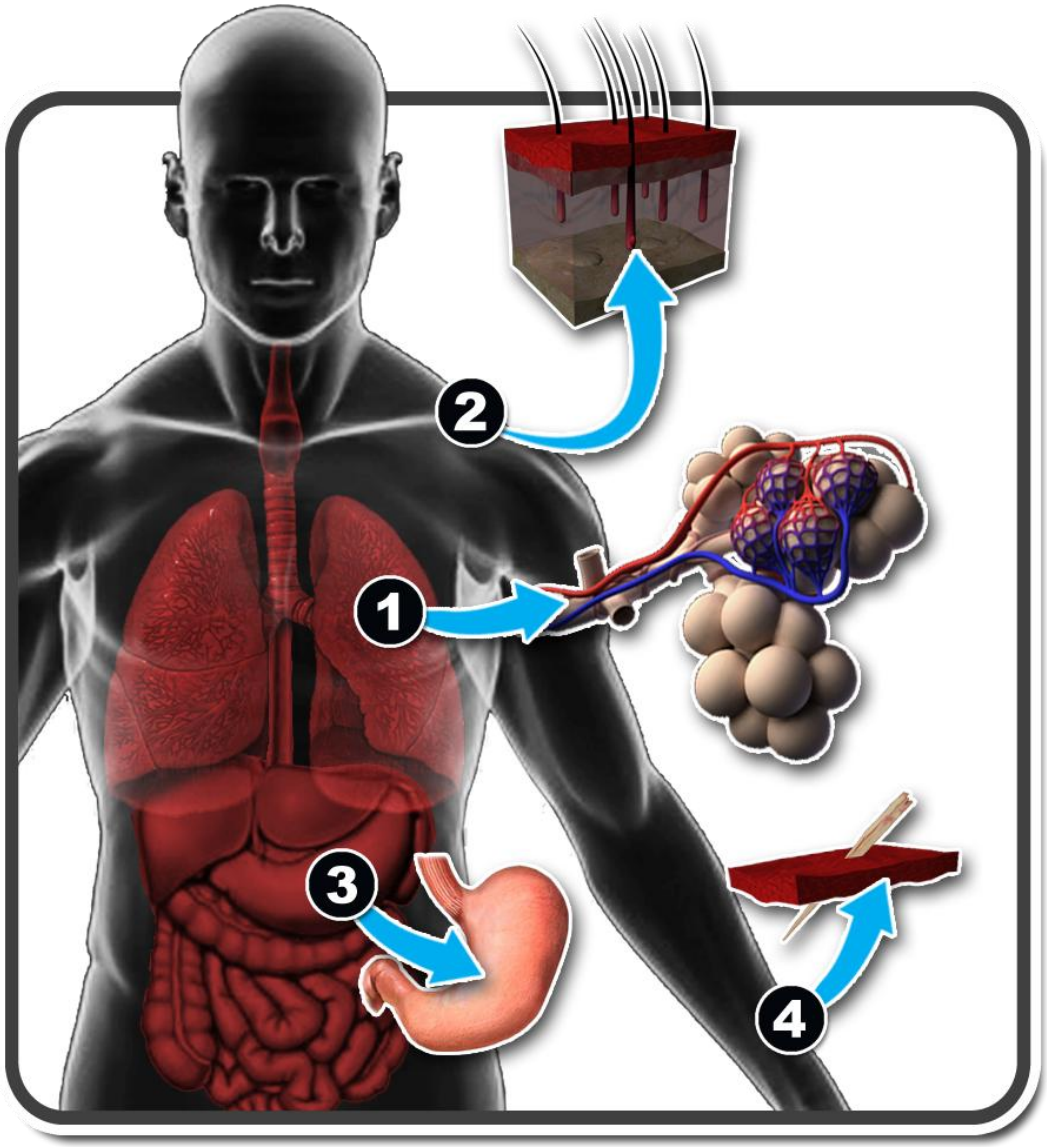


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How do chemicals enter your body?

1. Inhalation
2. Absorption
3. Ingestion
4. Injection

Which one is the worst for you? Why?



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1. Absorption

- If chemicals get onto the outside of your body they may be able to pass through to your bloodstream
- Some areas are more at risk than others (eye, reproductive area, forehead)
- Open wounds can increase absorption
- Chemical properties affect absorption

2. Inhalation

- Airborne chemicals are breathed in through the mouth or nose
- Gases and vapors can reach the deep lungs
- Particle and droplet size affects where the chemical settles in the respiratory tract
- Where the chemical settles in the respiratory tract influences symptoms and diseases

3. Ingestion

Chemicals that are swallowed are absorbed in the digestive tract

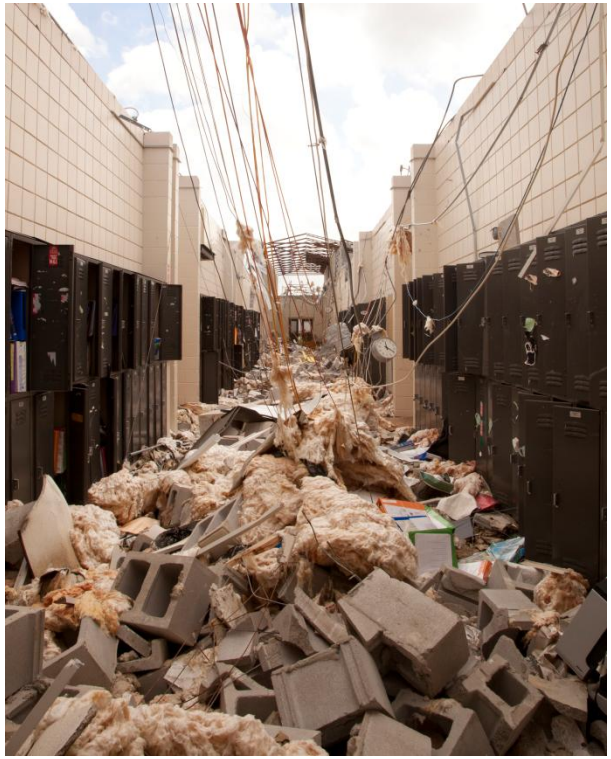


Chemicals in the air can settle on food or drink and be swallowed!

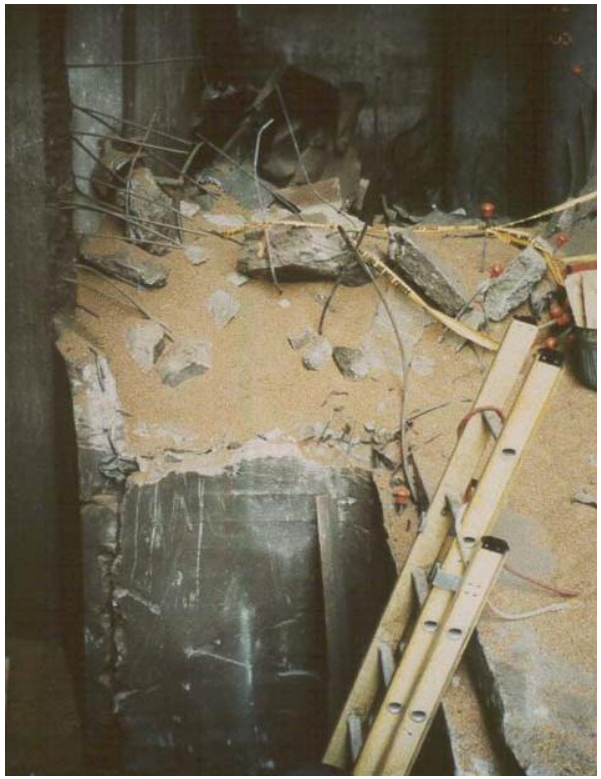
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4. Injection

Implements that pierce your skin (stepping on a nail) allow chemicals to enter your bloodstream immediately!



Construction and disaster cleanup work have many injection hazards



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Types of chemical exposures

- Acute
  - High exposure over a short time period (instantaneous to a few days)
  - After exposure stops, damage may reverse…or not
- Chronic
  - Low exposure over a long time period (years)
  - Can cause disease or other irreversible effects

If you are exposed to a chemical, will you know right away?

- Immediate reactions show up within minutes to a few hours
- Delayed reactions will manifest within up to 48 hours
- With most chronic exposures, you may have NO reaction until the disease has started to develop

Disease, now or later?

Have you heard of latency period?

Example: Asbestosis and mesothelioma can take up to 25 years from initial exposure to appear



A radiologist prepares a potential asbestos victim for an X-ray

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Permanent vs. Reversible

- Some tissue and systems can reverse damage if the effect was not too bad
  - Examples:
    - Skeletal system and liver
- Some tissues can not mend
  - Examples:
    - The nervous system and kidney
- This can also depend on individual issues and the type of exposure

Local and systemic harm

- **Some chemicals harm the body at the site of their exposure, such as an acid burn**
- **Other chemicals can affect entire body systems, such as lead and alcohol**
- **Some can do both, such as alcohol and organic solvents you may use at work**

Multiple chemicals may have unique effects when combined in your body

- Additive effects (4+4=8)
- Synergistic effects (4+4=13)
- Antagonistic effects (4+4=5)
- Potentiating effects (4+0>4)

- Additive effects (alcohol and organic solvents)
- Synergistic effects (asbestos and cigarette smoke)
- Antagonistic effects (some antibiotics and alcohol)
- Potentiating effects (alcohol and chlorinated hydrocarbons)

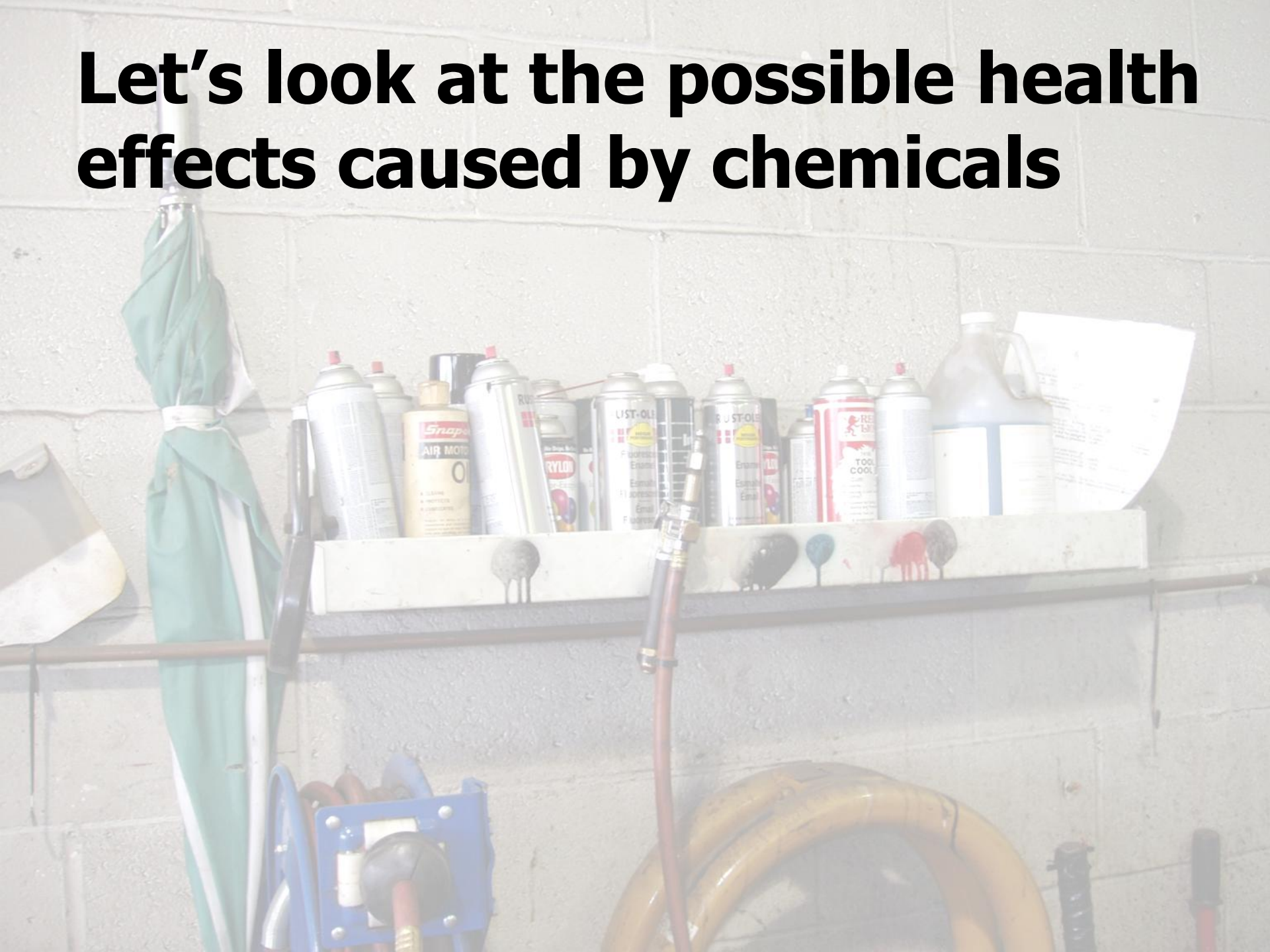
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Section 5

Review of Common Health Effects



Let's look at the possible health effects caused by chemicals



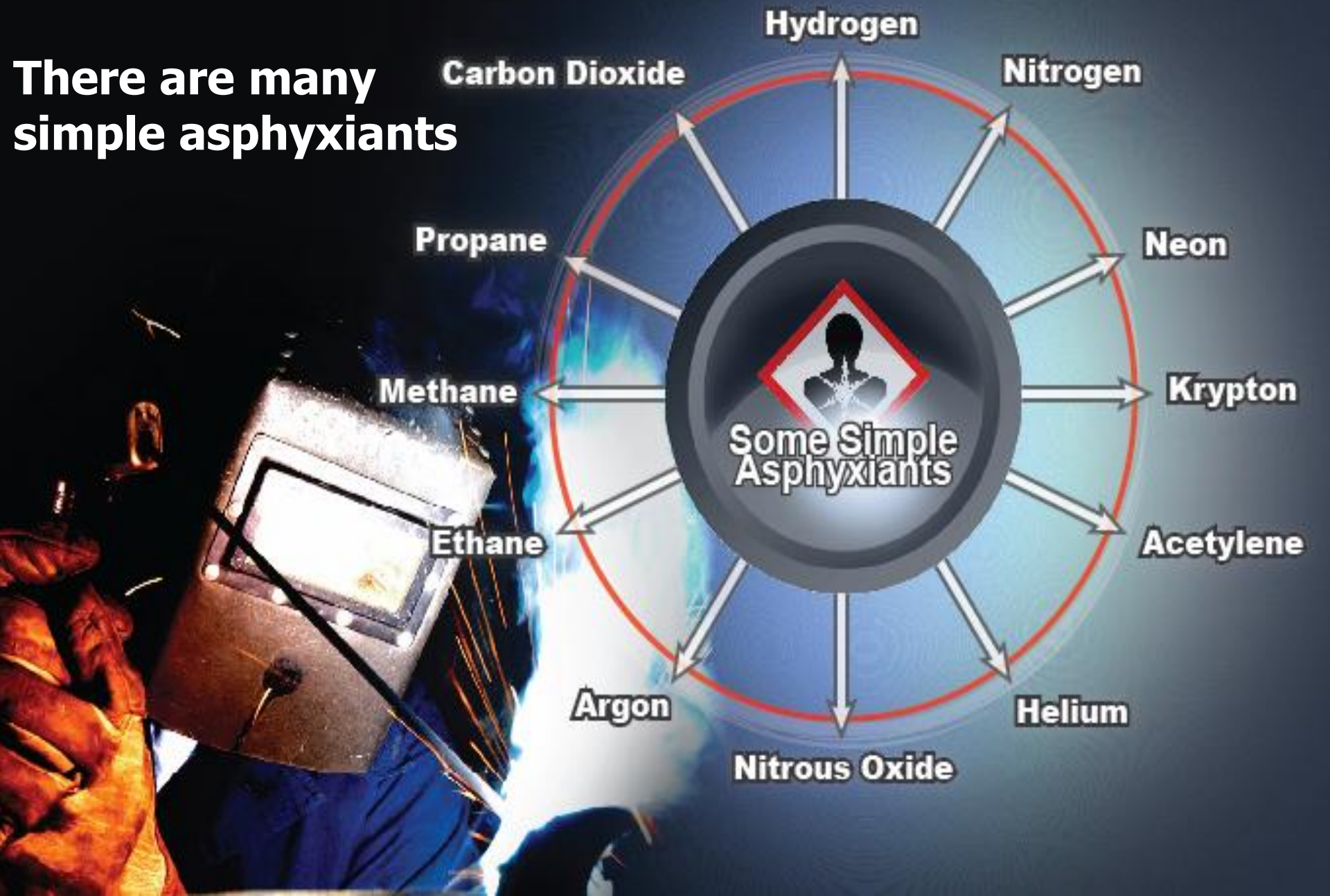
If too much air is displaced, suffocation can occur through Simple Asphyxiation





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There are many simple asphyxiants



Chemical asphyxiants reduce the blood's ability to carry oxygen which can lead to suffocation

Examples?

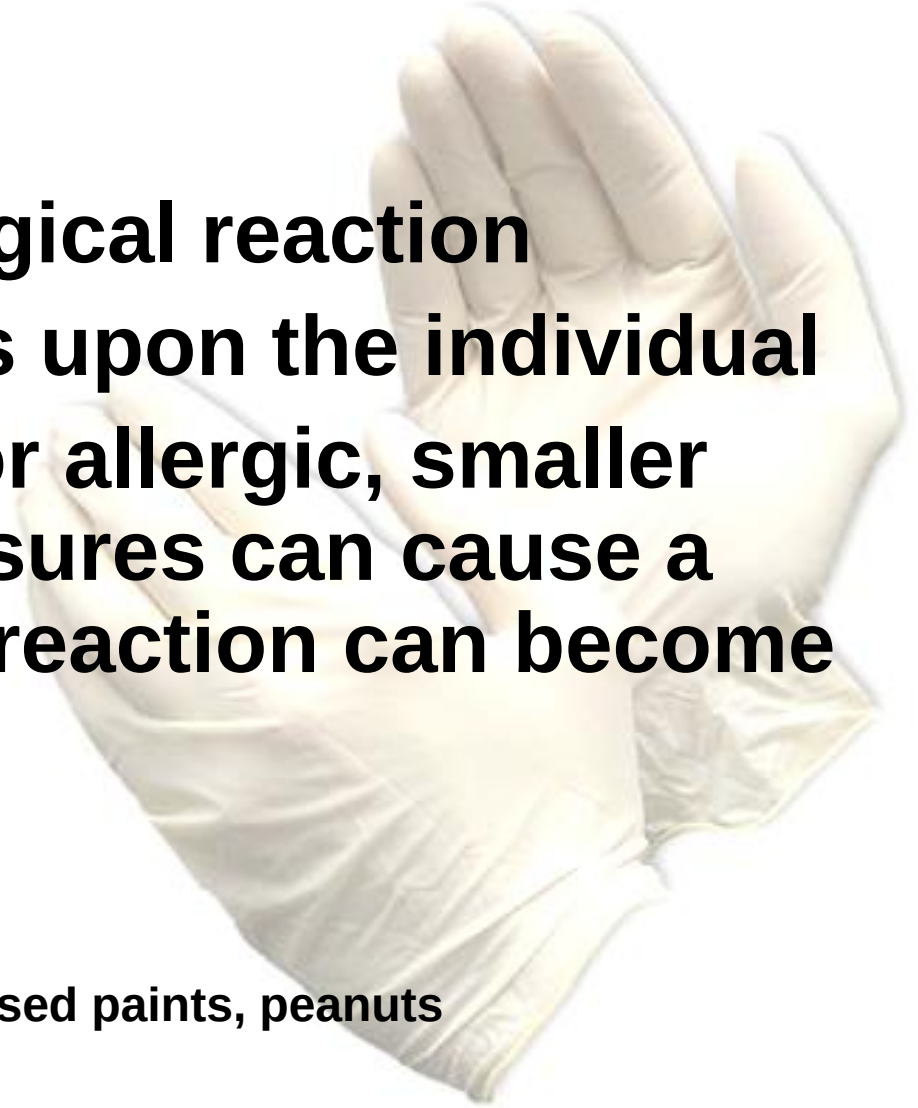
- Diethyl ether
- Hydrogen sulfide
- Carbon monoxide
- Hydrogen cyanide





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What do sensitizers and allergens do?



- Cause a physiological reaction
- Reaction depends upon the individual
- Once sensitized or allergic, smaller and smaller exposures can cause a reaction, and the reaction can become more severe

Examples?

Latex, oil based paints, peanuts

Corrosives

- Corrosives can severely damage the body
- The extent of skin damage depends on how long the corrosive is on the skin and the toxicity of the corrosive
- Especially damaging to the eyes and lungs





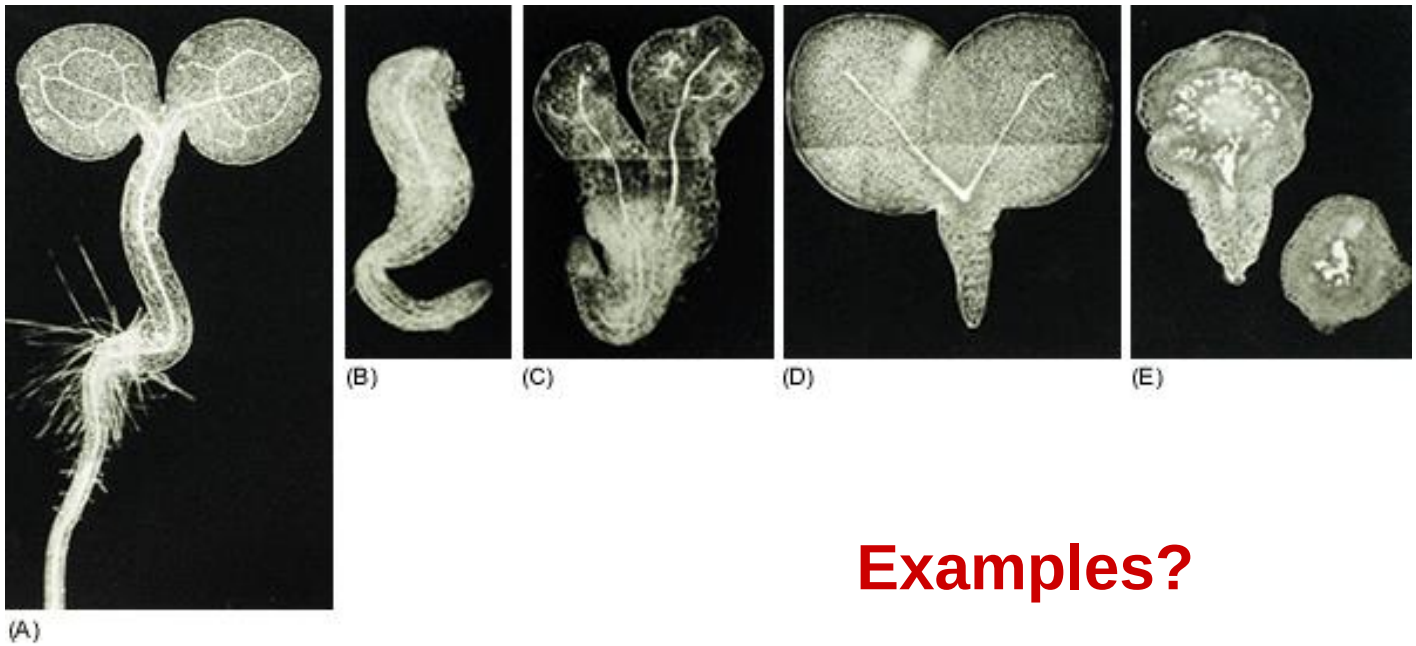
Examples?

Sulfuric Acid, Hydrofluoric Acid, Ammonia, Chromic Acid, Phenol, Acetic Acid, Chlorine

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Mutagens cause genetic mutations or changes

These mutations can cause birth defects or other problems in following generations or may lead to cancer in the exposed person



Examples?

Ionizing radiation,
Sodium Azide, Bromine

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What are teratogens?

Teratogens are compounds that can harm the developing fetus, causing birth defects or death

Let no harm befall your children!



Examples:

Methyl Mercury, Phenytoin (Dilantin)

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What about cancer?

- Carcinogens cause cancer
- Some chemicals are known human carcinogens, others are suspected carcinogens

There are no known "safe" exposure levels for carcinogenic chemicals. So what does this mean for you? What should you do?

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Here are a few known and suspected human carcinogens

- Asbestos
- Benzene
- Beryllium
- Cadmium
- Cigarette Smoke
- Vinyl Chloride







Let's stop here since, as of 2011, there are too many to list on this slide, and the next slide, and the next…!

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Chemical effects on the body depend on several things

- The physical form of the chemical
- Route of entry
- The dose
- Chemical toxicity
- Individual (age, sex, race, weight, etc.)
- Chemicals can produce different health effects and sometimes can produce more than one

Section 6

Measurement and Exposure Limits

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Different equipment can measure chemical exposures

- Photo Ionization Detector (PID)
- Colorimetric tubes
- Combustible Gas Indicator (CGI)
- Oxygen Meter
- Multi-Gas Meter
- Personal monitoring



Multi-Gas Meter



PID

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Units of measure you may see on the job

- Parts Per Million (ppm)
- Milligrams per cubic meter (mg/m^3)
- Percent (%)
- Fibers per cubic centimeter (fibers/cc)

Understanding these units will help you recognize monitoring results and allow you to apply exposure limits

Match the following substances to the appropriate unit of measure: Organic Solvents, Oxygen, Asbestos, Dust

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Chemical exposure limits

- Few chemicals have exposure limits…most do not
- What are the main exposure limits to be concerned with and why?
- OHSA Permissible Exposure Limits (PEL's) –LAW!!!
- ACGIH Threshold Limit Values (TLVs)
- NIOSH Recommended Exposure Limits (RELs)

More on exposure limits

- Based on 8-hour or 10-hour average, ceiling, or 15-minute peak exposures
- Exposures must be kept below which limits?

– OSHA Limits!

- Most exposure limits are inhalation exposures



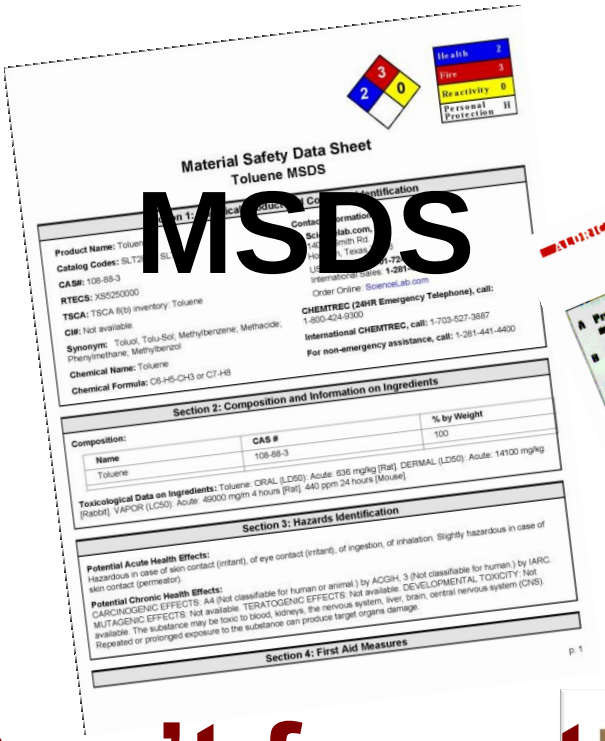
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Section 7

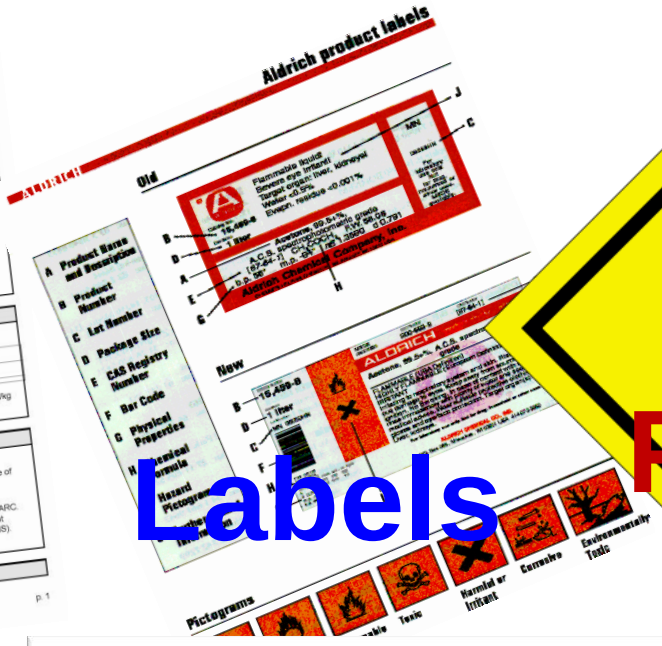
Hazard Communication Systems

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How do you get information about hazardous chemicals?



MSDS



Labels



Placards

Don’t forget training!



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What is a Material Safety Data Sheet?

- Material safety data sheets or “MSDSs” are information sheets on products
  - Lists chemical ingredients
  - Chemical hazards
  - How to protect yourself from the hazards
  - How to clean up spills

Wait, there’s more…

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What's on a MSDS anyway?

- **Section I** Identification of Product
- **Section II** Hazardous Ingredients
- **Section III** Physical Data
- **Section IV** Fire and Explosion Hazard
- **Section V** Health Hazard

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More MSDS sections

- **Section VI** **Reactivity Data**
- **Section VII** **Spill and Disposal Procedures**
- **Section VIII** **Protection Information**
- **Section IX** **Handling and Storage**
- **Section X** **Miscellaneous Information**

Where are MSDSs located at your site?



You must be informed where the MSDS sheets are at your work site

- Allowed access to them
- Allowed to review them on work time
- Allowed to ask questions pertaining to MSDSs and chemicals that you work with

Let's do activity 3



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Labeling also effectively communicates chemical hazards



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Types of labeling systems

- Hazardous Material Information System (HMIS)
- National Fire Protection Association (NFPA) 704 M
- Department of Transportation (DOT) placards
- Product labels

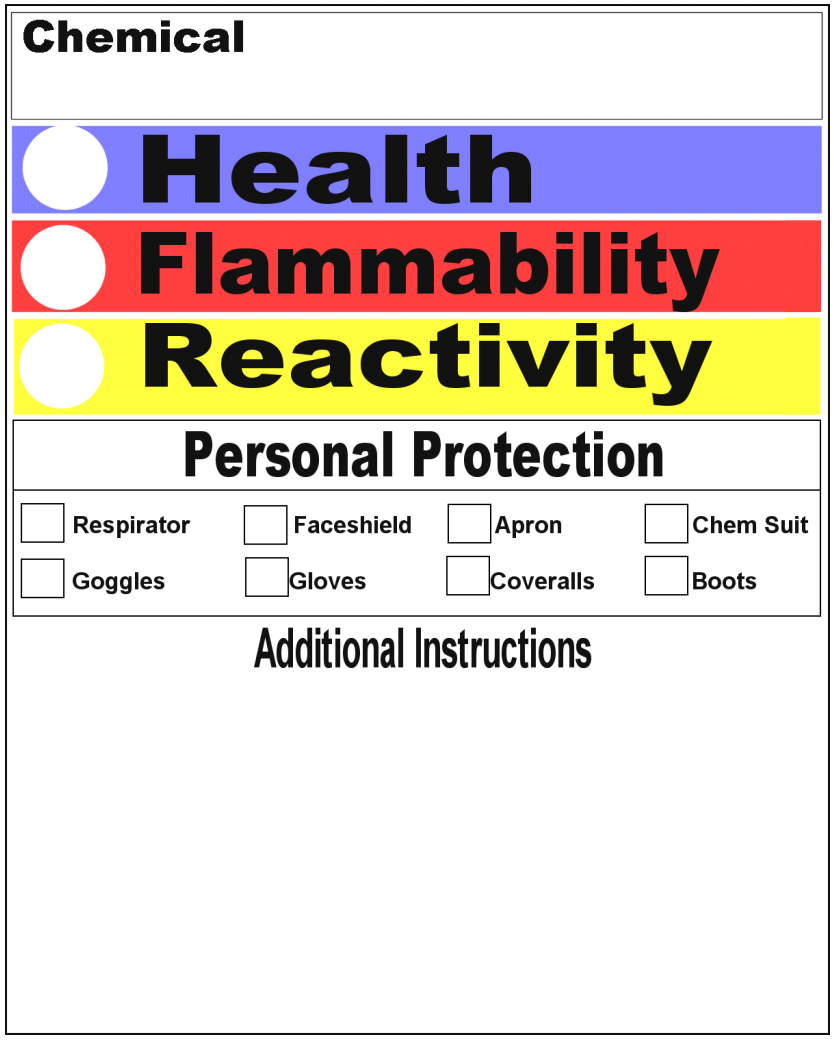


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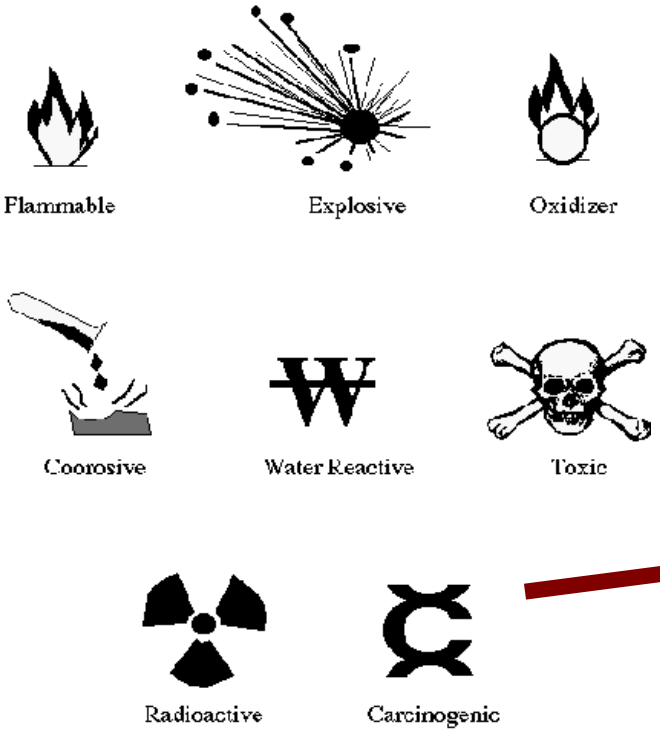
HMIS

- Color codes
- Ranks
- PPE
- Additional info





NFPA 704 M Diamond





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DOT Placards - 49 CFR 172 (D, E, F, G)

- For shipping
- Weight of material in containers and specific material
- Not for fixed structures



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There are many DOT sub-categories





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Product labels

- Transferred chemical containers must be labeled
- Excludes immediate, sole use
- The label must have the following:
  - The chemical's name
  - Hazards of the chemicals
  - The manufacturer's name and address



Is this a good label?

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What is on a product label?

The manufacturer

The name of the product

A hazard warning

A list of hazardous ingredients (on back)



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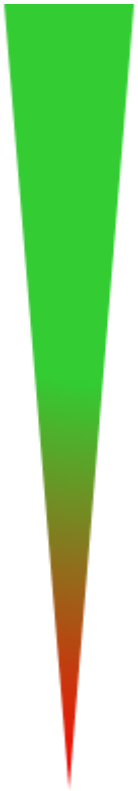
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Controls

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The hierarchy of controls can protect you from hazardous chemicals

Most Effective



Least Effective

- Elimination
- Substitution
- Engineering Controls
- Administrative Controls
- PPE

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Eliminate or substitute chemicals you currently use with less harmful ones

Think Pollution Prevention (P^2), Toxic Use Reduction, Green Chemistry

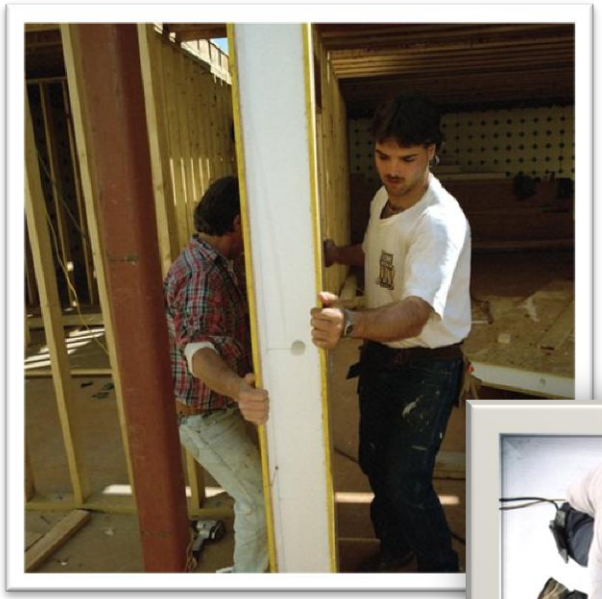
What chemicals could you eliminate or replace in your job?



Jobcorps student practices applying soy-based foam insulation

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NOTE: Just because it is "green" does not always mean it is safe!







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Some green materials, like fiber-cement board potentially hazardous to workers

- Hardiplank [10-50%] crystalline silica
- Weatherboard [45-55%] crystalline silica



Hardiplank siding material

***WISHA inspection data*: 5 of 7 workers using circular saws outdoors on fiber-cement siding were exposed above ACGIH-TLV for silica**

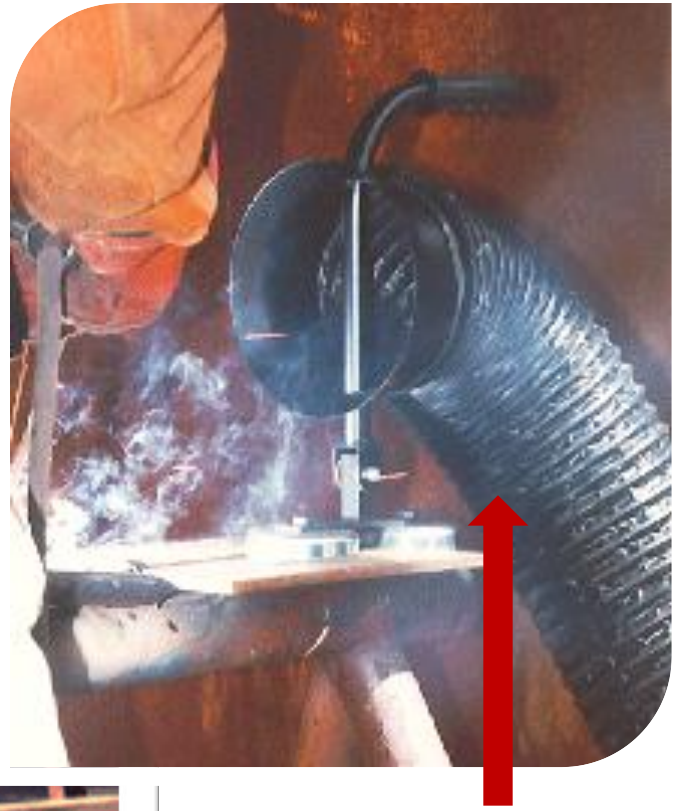
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Use engineering controls to reduce chemical exposures

- Ventilation
- Isolate process



Portable local exhaust ventilation for woodworking



Local exhaust ventilation captures welding fumes before they reach the worker

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Vacuum captures concrete dust as it exits the saw



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This artist is shaping bluestone; it is an excellent opportunity for vacuum capture

Administrative controls can also reduce chemical exposures

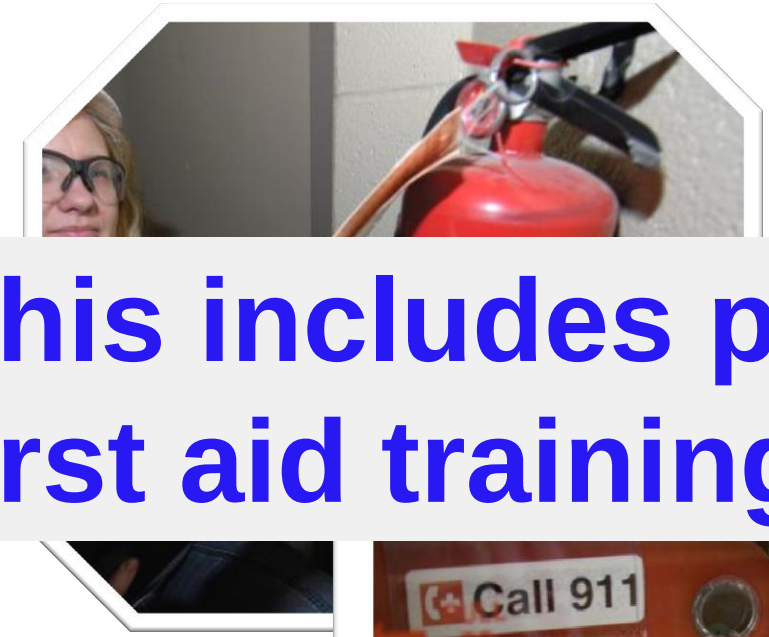
- Training and information
- Signage
- Maintain equipment to prevent leaks and releases
- Standard Operating Procedures (SOPs)
- Worker rotation
- Scheduling tasks when chemical use is low





When working with chemicals, it is a good idea to know how to take first aid measures if exposed





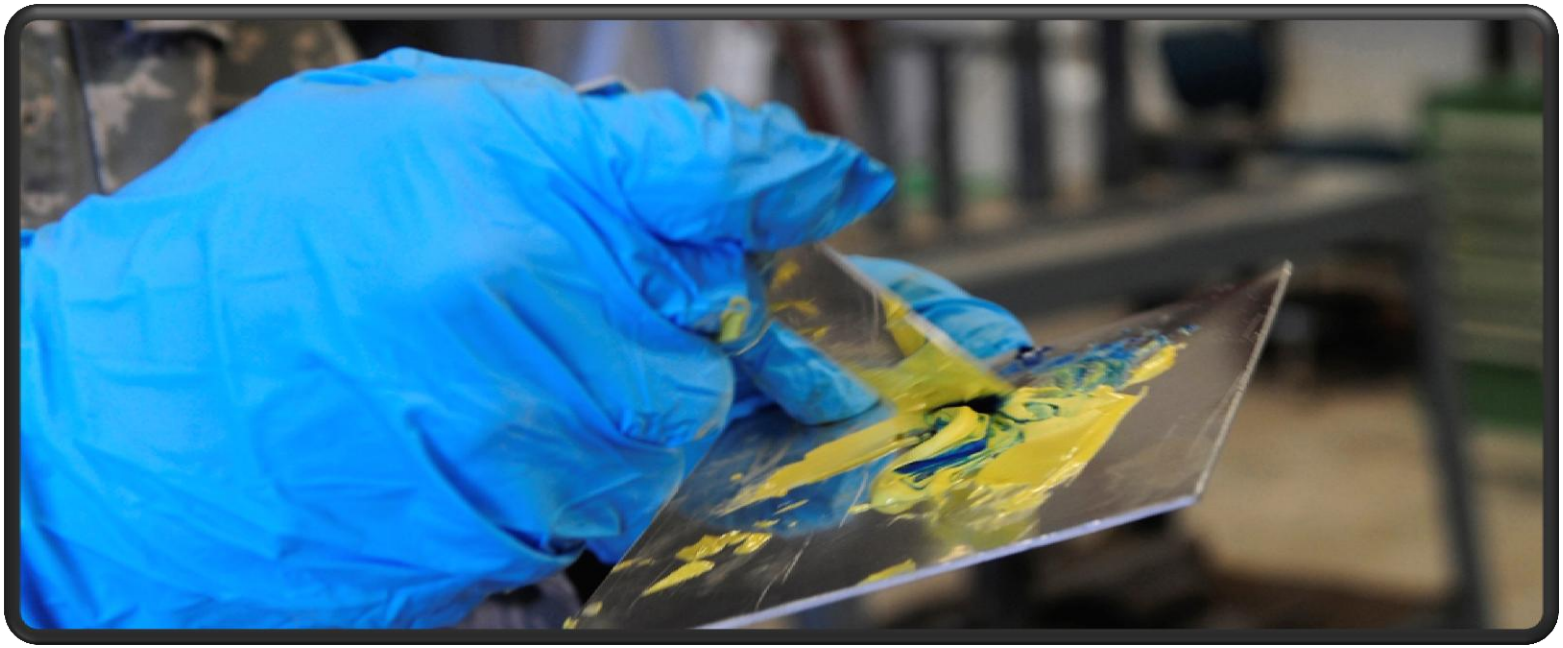


This includes proper first aid training!!!!



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Use Personal Protective Equipment (PPE) as a last option to prevent chemical exposures



PPE is a required component of training for the Hazcom standard; 29 CFR 1910.1200(h)(3)(iii)

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There are four levels of PPE

- Level A
- Level B
- Level C
- **Level D**



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Level A

- Supplied air respirator
- Encapsulating suit
- Inner and outer gloves (outer gloves are part of the suite)
- Boots (may be part of the suite)
- May have head protection

Level B

- Supplied air respirator
- Splash suit (may cover SCBA)
- Inner and outer gloves
- Boots
- May have head protection



Level C

- APR (full or ½ face) or PAPR
- Splash suit
- Inner and outer gloves
- Eye Protection if ½ face APR
- Boots
- May have head protection



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Level D PPE will help prevent basic day-to-day skin exposures with chemicals but it will not prevent inhalation hazards

- May include:
  - Apron
  - Gloves
  - Hard hat
  - Eye Protection
  - Boots
  - (Basic work PPE)









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You should ALWAYS ask if a respirator is required. However, you may only need protective clothing to cover hands, arms, face, etc.





You have a right to wear a respirator even when one is not required

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Respirators will protect your lungs from chemical exposure



SCBA



PAPR



Air Line SAR w/escape

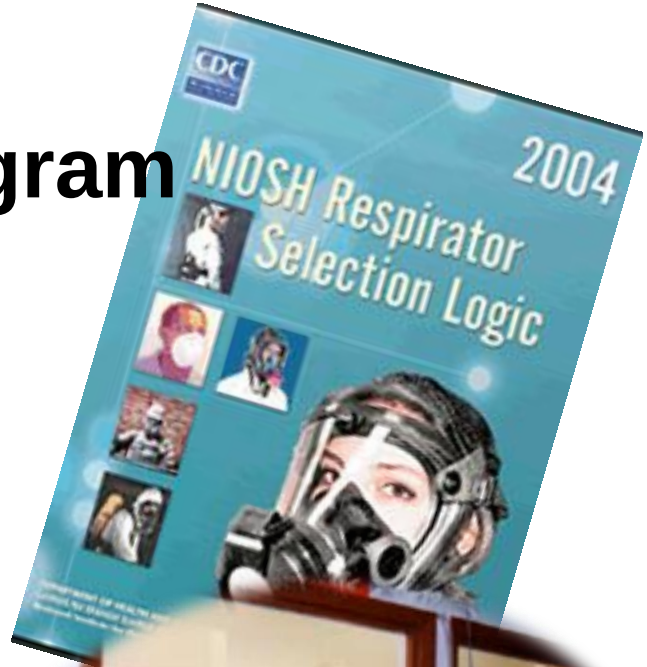


APR

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Respirators require extra steps before a worker can use them

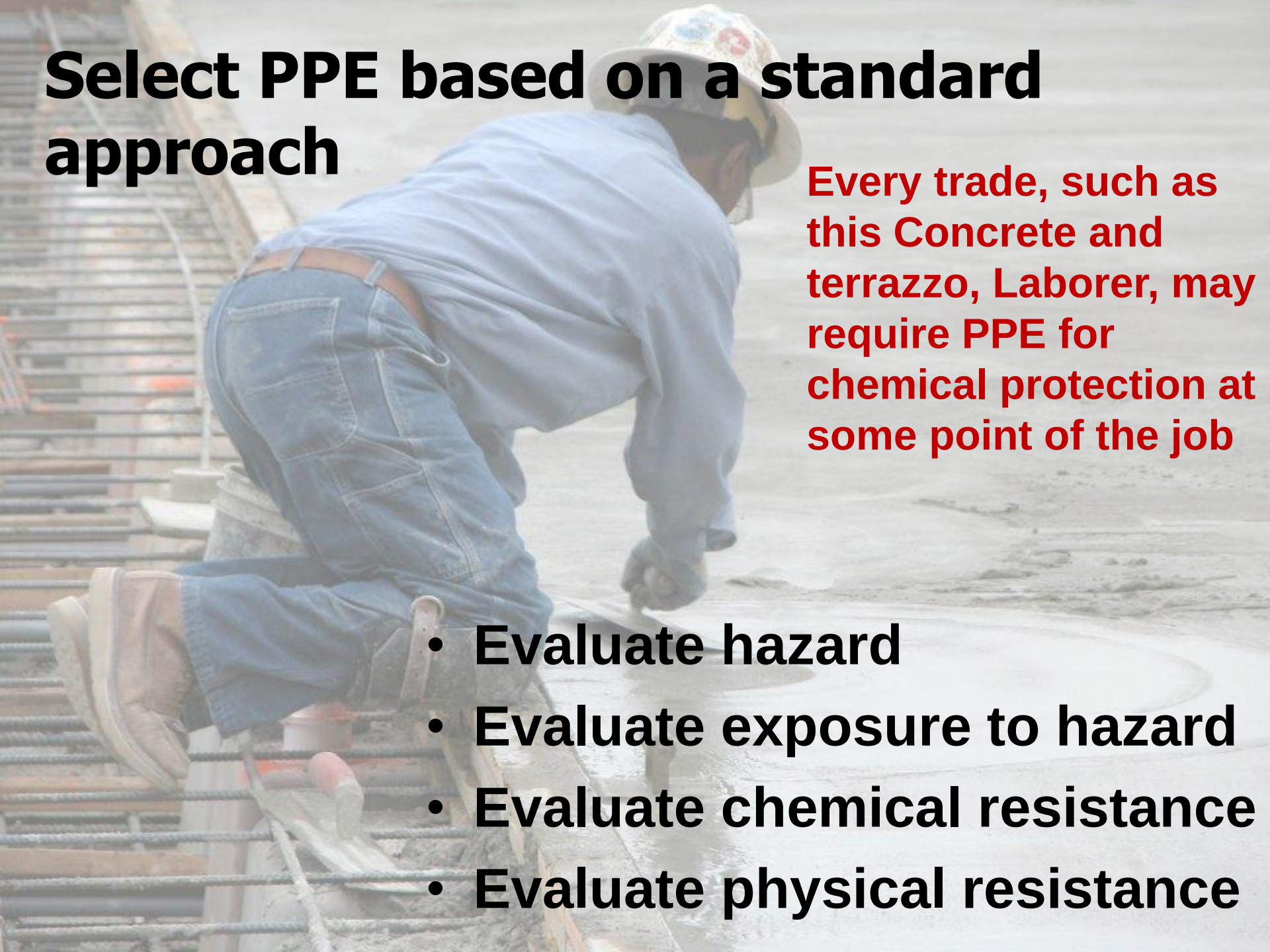
- Respiratory protection program
- Medical clearance
- Fit testing
- Proper selection
  - Evaluate O_2
  - Evaluate chemical hazard
  - If APR, is there a cartridge?
  - Governing standard?





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Select PPE based on a standard approach

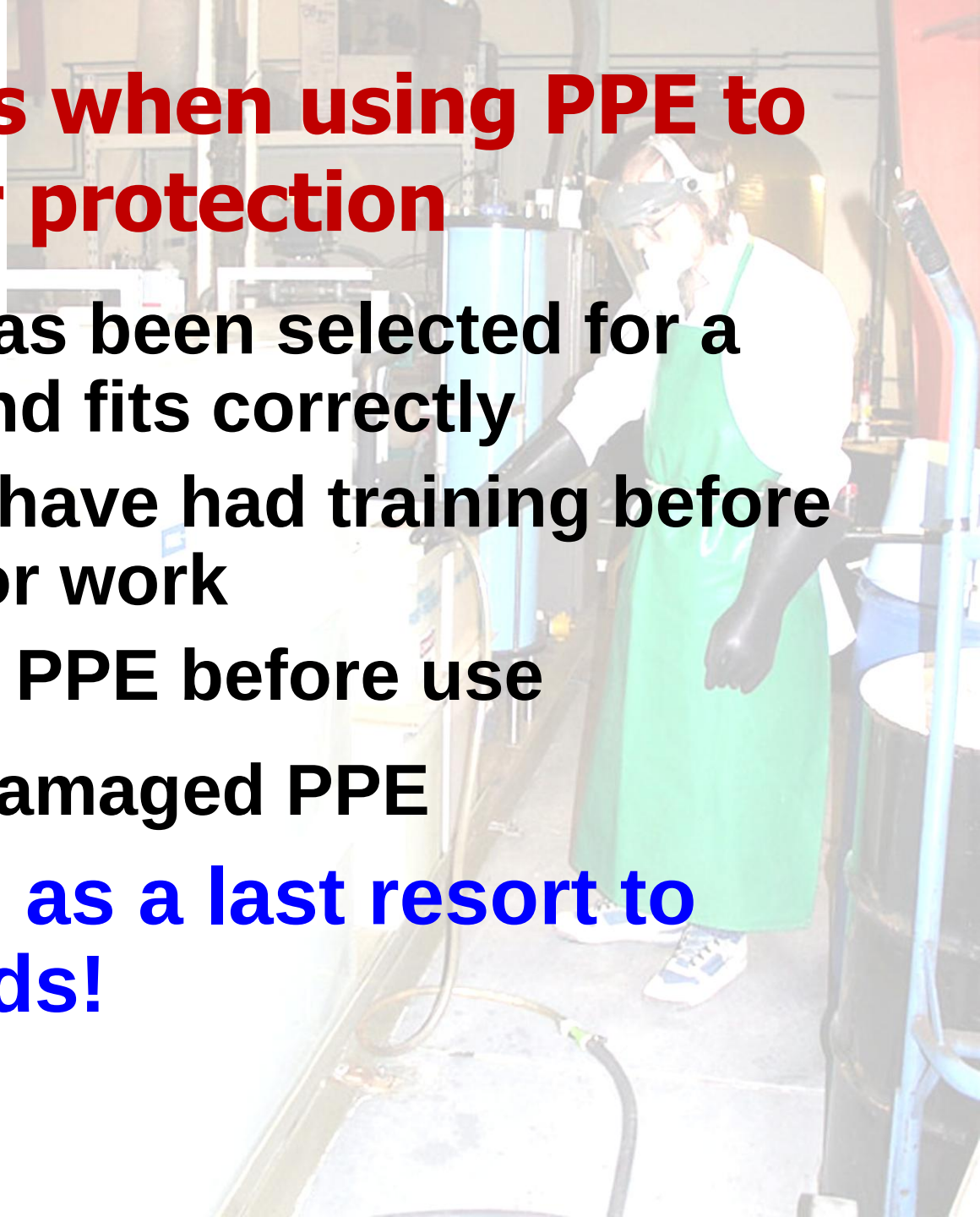


Every trade, such as this Concrete and terrazzo, Laborer, may require PPE for chemical protection at some point of the job

- Evaluate hazard
- Evaluate exposure to hazard
- Evaluate chemical resistance
- Evaluate physical resistance

Use these tips when using PPE to increase your protection

- Use PPE that has been selected for a given hazard and fits correctly
- Make sure you have had training before donning PPE for work
- Always inspect PPE before use
- **NEVER** use damaged PPE
- **Only use PPE as a last resort to control hazards!**



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Are there any health and safety issues from wearing PPE?

- **Last on the Hierarchy of Controls!**
- **Heat stress**
- **Limited agility and dexterity**
- **Limited vision**
- **Limited hearing**
- **Claustrophobia**



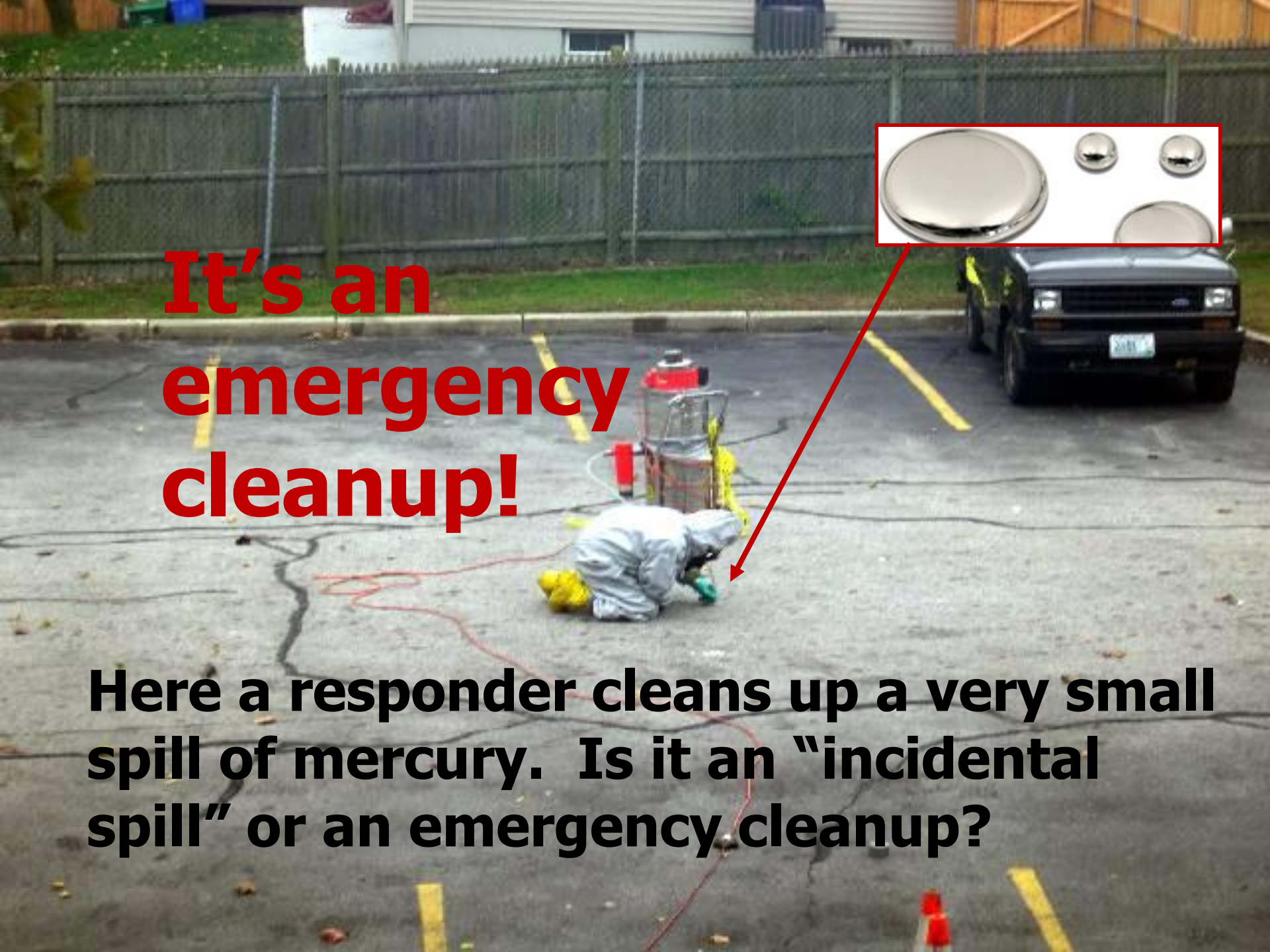
A responder working at the Pentagon after the 9/11 disaster takes a much-needed break

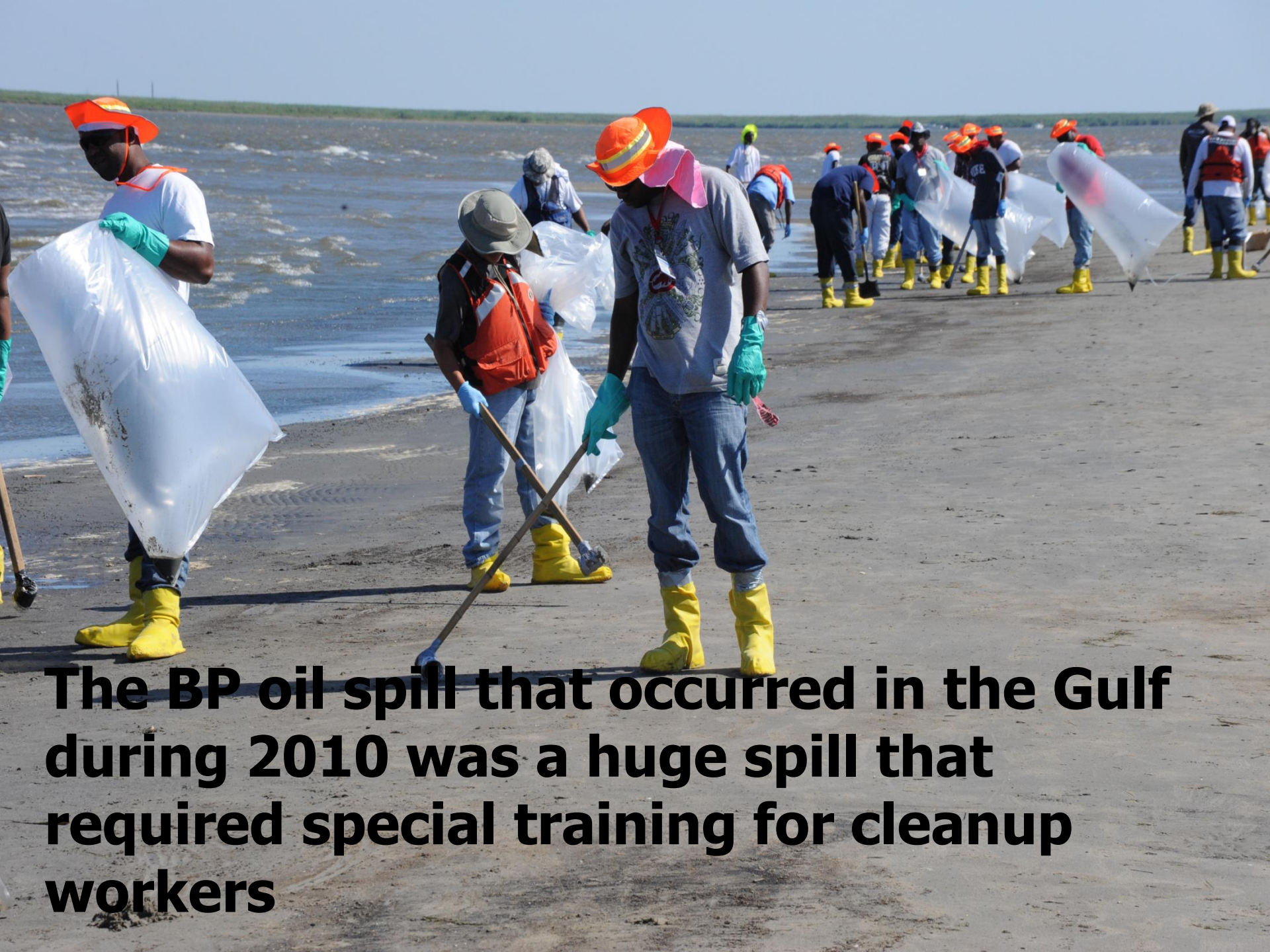
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Section 9

Spill Response

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It's an emergency cleanup!
Here a responder cleans up a very small spill of mercury. Is it an "incidental spill" or an emergency cleanup?



The BP oil spill that occurred in the Gulf during 2010 was a huge spill that required special training for cleanup workers

The difference between an emergency and a “incidental spill” is the level of hazard, risk, familiarity and training





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What happens if you encounter a spill or a leak?

- **REMEMBER: Hazcom training is not emergency response training**
- **Inform supervisor**
- **Inform coworkers, leave area of a large spill**
- **Follow employers spill response program**

Let's do activity 4

To clean up incidental spills in your work area



- Notify supervisor
- Follow spill response plan
- Follow guidelines in MSDS
- Only clean up incidental spills in your work area
- Only clean up chemicals with which you are familiar

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If you have been exposed to a chemical take these actions

- Let your supervisor and Union know
- Identify the chemical(s) involved
- Follow MSDS first aid directions
- Get medical attention as needed
- Call health and safety to evaluate situation and cause of exposure before returning to work

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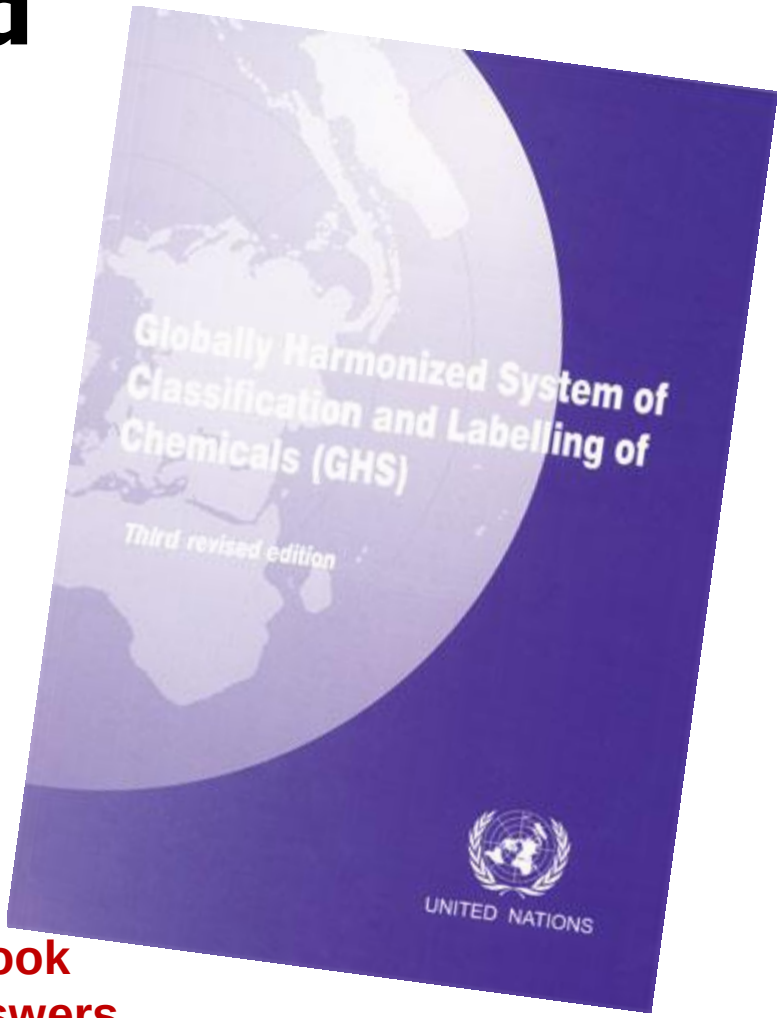
Section 10

GHS and REACH

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Global Harmonization System (GHS) is a worldwide system for standardized, hazard communication

- Hazard classification
- Safety data sheets
- Labeling



GHS purple book has all the answers

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Globally, Hazcom systems are different and use multiple labels and safety data sheets for the same product in international trade

Benefits of using GHS include:

- Enhanced protection for workers
- Facilitates safe international trade in chemicals
- Reduced testing and evaluation
- Facilitates globally sound management of chemicals



Why was it created?

This compared to…



This!

U.S. agencies with requirements for labels and MSDSs are involved in the GHS development process











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GHS increases worker protection over OSHA Hazcom

- Covers all hazardous chemical substances, dilute solutions and mixtures
- Pharmaceuticals, food additives, cosmetics and pesticide residues in food are covered for worker exposure and transport

GHS uses classification criteria for hazards and a hazard communication system to protect workers

WARNING

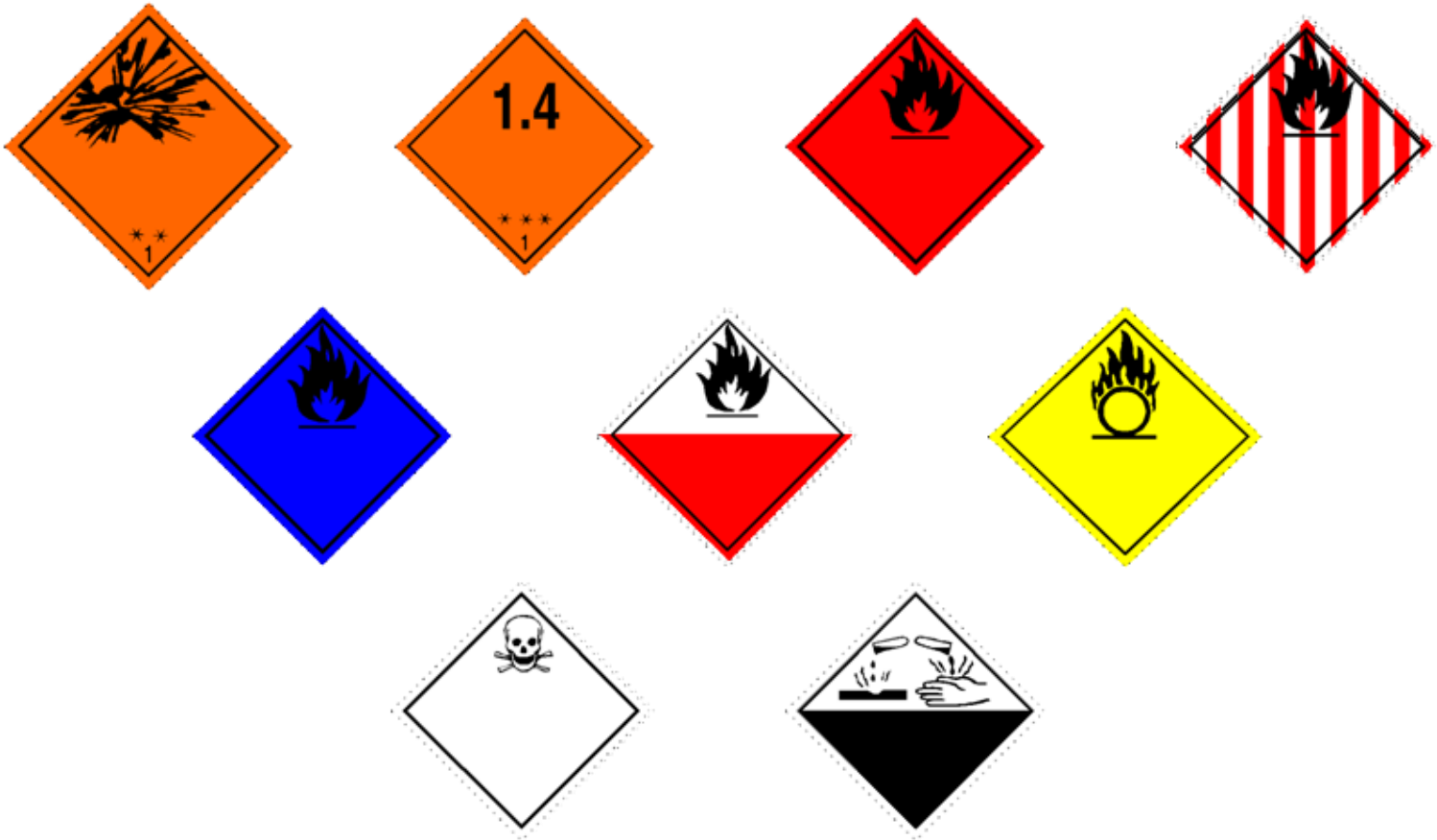
Causes Skin And Eye Irritation





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For transportation, pictograms will have the background and symbol colors currently used



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Other sectors' pictograms will have a black symbol on a white background with a red diamond frame



Exploding bomb



Flame



Flame Over Circle



Gas Cylinder



Corrosion



Skull & Crossbones



Health Hazard



Exclamation Mark



Environment

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Single words are used to emphasize hazard and to discriminate between levels of hazard

“Danger” or “Warning”

A single harmonized hazard statement for each level of hazard within each hazard class

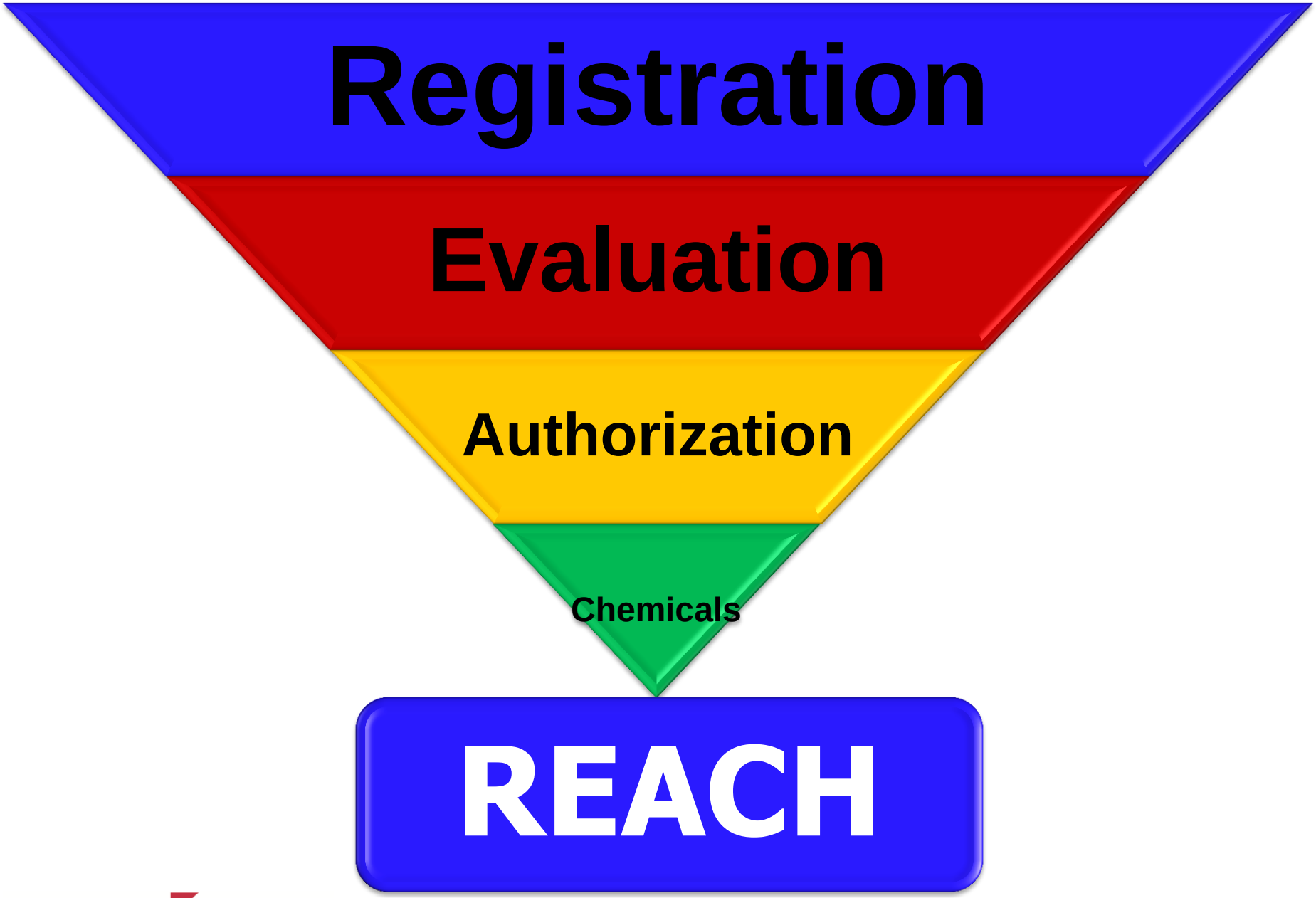
Take the example of Flammable Liquids

Category 1: Extremely flammable liquid and vapour
Category 2: Highly flammable liquid and vapour
Category 3: Flammable liquid and vapour
Category 4: Combustible liquid

GHS Safety Data Sheets (SDSs) will provide comprehensive chemical information for workers

- Identification
- Hazard(s) identification
- Composition/information on ingredients
- First aid measures
- Fire fighting measures
- Accidental release measures
- Handling and storage
- Exposure control/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Transport information
- Regulatory information
- Other information

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REACH Shifts the burden of proof to manufacturers of chemicals

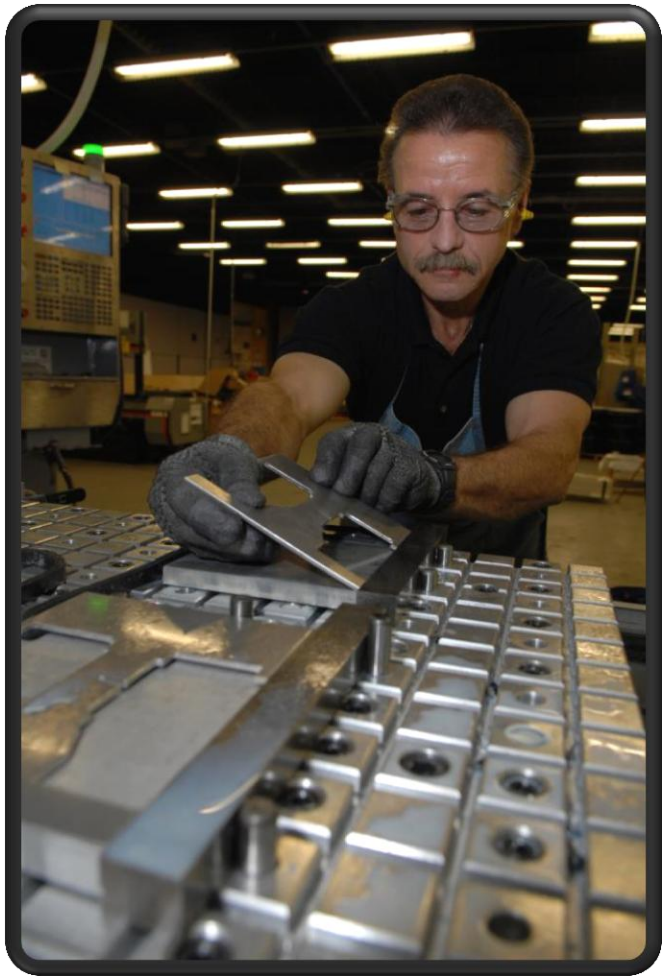


They will have to prove that their substances can be used safely

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The goal in the EU is to Register 30,000 chemicals

- Science based
- Information sharing
- Communication up and down supply chains
- Cost sharing
- 12-year availability access
- Sanctions
- May mean no more workers as test subjects!



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Summary

- **You have the right under the Hazcom standard to receive information and training about hazardous chemicals that you use**
- **GHS will bring a new, standardized system of hazard communication**
- **You are not trained for emergency response**

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Comments or Questions?



Carpet layer use a knee kicker to install carpet.
Courtesy eLOSH Images.com, Earl Dotter.

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