
# HAZWOPER 40

## study guide

Hazardous Waste Operations and Emergency Response

Prepared by 2nd Nature Safety

2ND NATURE SAFETY

A+

# Glossary

4 Gas Monitor: LEL, H2S, O2, CO2

DOT: Department of Transportation

EPA: Environmental Protection Agency

HAZWOPER: Hazardous Waste Operations and Emergency Response

IDLH: Immediately Dangerous to Life and Health PEL: Permissible Exposure Limit

MSDS/ SDS: Material Safety Data Sheet/ Safety Data Sheet OSHA: Occupational Safety and Health Administration FRC: Fire Resistant Clothing

NIOSH: National Institute for Occupational Safety and Health DOE: Department of Energy

OEL: Occupational Exposure Limit

SCBA: Self Contained Breathing Apparatus

Flashpoint: The minimum temperature at which a liquid will give off enough flammable vapor just above the surface too ignite in the presence of an ignition source

LOWER EXPLOSIVE LIMIT (LEL)
The lowest concentration of a substance that will produce a fire or flash when an ignition source is present. It is expressed as a percent of vapor or gas in the air by volume. At concentrations below the LEL, the mixture is to "lean“to burn.

PARTS PER MILLION (PPM): A unit for measuring the concentration of a gas or vapor in contaminated air. Also used to indicate the concentration of a particular substance in a liquid or solid.

THRESHOLD LIMIT VALUE (TLV): A term used by the ACGIH to express the airborne concentration of a material to which nearly all persons can be exposed day after day without adverse effects.

*CHEMTREC ( 1-800-424-9300 ):* Chemical Transportation Emergency Center; a national center established by the Chemical Manufacturers Association (CMA) in Washington, DC in 1970, to relay emergency information concerning specific chemicals on request.
FLAMMABLE LIQUID: As defined by NFPA and DOT, any liquid with a flash point below 140oF (37.8oC).

MSHA: The Mine Safety and Health Administration of the U.S. Department of the Interior; Federal agency with safety and health regulatory and enforcement authorities for the mini industry.

# Government Agencies that Regulate Safety and Health

OSHA: The Occupational Safety and Health Administration is the federal agency that enforces safety and health standards to protect workers on the job in 26 states there are state safety and health agencies that do this job instead of federal OSHA. (CFR)

DOT: The Department of Transportation is the federal agency that enforces regulations for safe transportation of hazardous materials. Most state have a state agency that also enforces transportation regulations. (Transportation)

EPA: The Environmental Protection Agency is the federal agency enforces regulations to protect the environment. Most states have a state agency that also enforces environmental regulations. (CWA, CAA, CERCLA)

NIOSH: The National Institute for Occupational Safety and Health is a federal agency that studies safety and health problems, recommends standards, and gives advice to workers and employers. (Testing of PPE)

DOE: The Department of Energy is the federal agency that controls the facilities used to make nuclear weapons. Clean-up of hazardous and radioactive waste is a major project at these sites.

# CAA, CWA, CERCLA, RCRA

## RCRA

- Regulations: The EPA makes regulations for those who generate hazardous waste, or sto ship, recycle, treat or dispose of hazardous waste.
- Cradle to grave tracking: Keeping records of what happens to hazardous waste from when i created to when it is disposed of.
- Uniform Hazardous Waste Manifest: A special shipping paper for transporting hazardous was
- Registration: for generator, licenses for transporters and permits for recyclers and dispo facilities.

•Requirements for Underground Storage Tanks

## CAA

The enactment of the **Clean Air Act of 1970** (**1970** CAA) resulted in a major shift in the federal government's role in **air pollution** control. This legislation authorized the development of comprehensive federal and state regulations to limit emissions from both stationary (industrial) sources and mobile sources.

## CWA

The clean water act is a federal law that applies to jurisdictional bodies of water and protects all surface waters.

- Any discharge into a body of water must be permitted. These permits are known as NPDES permits, for the National Pollutant Discharge Elimination System
- The first 2 sections of the CWA apply to companies that have a fixed pipe discharge is known as a point source and must have a permit.
- The CWA also covers storm water run-off. Storm water that carries any pollutants from a construction site to a body of water requires a permit.
- Construction sites that disturb more than one acre of land must obtain NDPES permit and must have a storm water pollution prevention plan. This plan must include erosion and sediment control, site management and housekeeping practices.

## CERCLA

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was created in 1980 to clean up these areas.

- The government can force private parties to clean up contaminated areas
- Requires all spills to be reported

- Mainly used to hold companies responsible for spills. The penalty will hold the owner responsible for all spills on their property.

# Air Contaminants

| *Acute Effect* | *Chronic Effect* |
|---|---|
| Occurs immediately or soon after exposure<br>Often involves a high exposure in a short time<br>Often reversible (you recover) after exposure stops<br>Often it's obvious what caused the effect | Develops slowly over a long time, (latency period)<br>Often involves a low exposure over a long period of time<br>Many chronic effects are irreversible (permanent<br>Difficult to establish what exposure caused |

## Examples of Acute and Chronic Health Effects

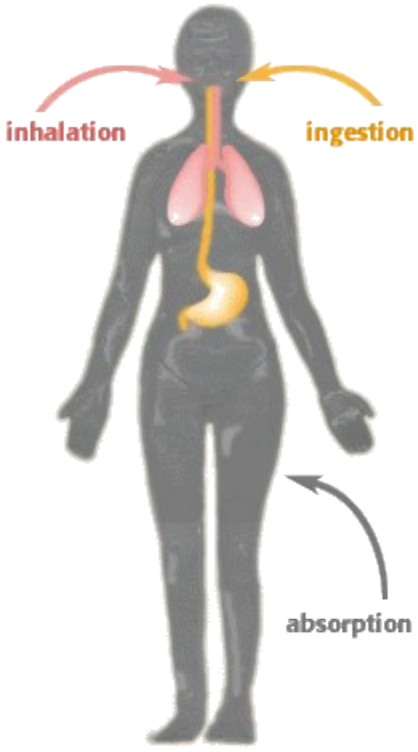
| Hazard | Acute Effect | Chronic Effect |
|---|---|---|
| Asbestos | None | Asbestosis (Scarring of the lung)<br>Lung cancer<br>Mesothelioma (cancer of Lining around the lung) |
| Acid Mist | Irritation of the eyes, Nose and throat, Cough, Sore throat, Chest pain | Chronic bronchitis<br>Emphysema |
| Carbon-Monoxide | Drowsiness, Headache, Confusion, Unconsciousness<br>Death | Heart Attack, Stroke<br>Death |

# Routes of Entry

In order for a hazardous material to affect your health, it has to get into your body. The different ways that chemicals do this are called **routes of entry.**

1. **Inhalation** is breathing in a hazardous material. It may damage the lungs, and it may be absorbed in the blood and carried to other parts of your body.
2. **Absorption** is when is a hazardous material gets on your skin or eye and soaks through. It then enters the blood and is carried to other parts of your body.
3. **Ingestion** is when you accidently swallow a material. This might happen if the material gets on your hands, and then on the sandwich you eat.
4. **Injection** is when a sharp object punctures the skin, allowing a chemical or infectious agent to enter.

Chemicals can use more than one route of entry. For example, if you handle a leaking container of solvent, you may get some on your hands and it can irritate your skin. It can also soak through into your blood and reach your liver and other organs, or it can evaporate and you will inhale it. The solvent affects you by skin contact, skin absorption and inhalation.



# Asbestos

OSHA records shows that almost all asbestos products may in time become hazardous, especially if their bonding material- or matrix- is disturbed.

Although all ACM may release fibers when their matrixes are disturbed, certain minerals are known to be more easily damaged or to suffer more deterioration, and thus cause higher airborne fiber levels than others.

OSHA exposures standards are based on the kind of asbestos work you do, the type of ACM and the likelihood that its fibers will break loose and become airborne known as friability.

- Friable asbestos can be reduced to powder by hand pressure when it is dry. Sprayed on asbestos insulation falls into this category.

Non-friable asbestos is usually found bonded into other materials. Its fiber are harder to break down into powder but can still be released by cutting, grinding or sanding

# Blood Bourne Pathogens

**Hantavirus** is transmitted to humans from the dried droppings, urine, or saliva of mice and rats.

**Molds and fungus** release millions of small spores into the air. Some cause allergic or asthma- like reactions as well as other respiratory symptoms.

**Blood Bourne pathogens** include human immune-deficiency virus (HIV), hepatitis B, and hepatitis C.

These hazards might be found in waste from hospitals and clinics, especially if the waste contains used needles. Used needled abandoned by drug users are also a potential hazard.

You might also be exposed to blood bourne pathogens from a worker who is injured.

If you are stuck by a needle or other sharp object, or get blood in your eyes, nose, mouth, or on broken skin:

- Immediately flood the exposed area with water and clean any wound with soap and water or a skin disinfectant if available.
- Report immediately to your supervisor.
- Seek medical attention.

# Weather Hazards & PPE

***Heat Exhaustion***

- Cool, pale, moist skin
- Heavy sweating
- Headache, nausea, vomiting
- Dilated pupils (bigger pupils)
- Slight elevation in body temperature

***Heat Stroke***

- Hot, dry, spotted skin
- Extremely high body temperature
- Very small pupils
- Mental confusion
- *Life threatening*

***Frostbite***

- Pale, waxy-white skin
- Hard, numb skin

***Hypothermia***

When body drops even a few degrees below normal

- Drop in body temperature (98.6)
- Fatigue, drowsiness
- Uncontrollable shivering

# HAZWOPER PPE

## *BASIC PPE*

**Hardhat**

**Safety Glasses**

**Gloves**

**Googles**

**Steel Toe Boots**

**Chemical Resistant Suit**

**Earplugs**

*Hearing is measured in decibels*

*85 db = earplugs*

*120 db = double hearing protection*

## ***4 HAZWOPER Levels***

***LEVEL D***

***LEVEL C***

***LEVEL B***

***LEVEL A***

# Which Level of Protection Should I Use?

To select the right level of protection, the first question is. What category of respiratory protection is necessary?

**Level D.** *This is the lowest level of protection.* If it is safe to breathe the air without respiratory protection, then you will work in Level D, Even if you wear a protective suit to keep from getting splashed with chemicals. It's still considered Level D because you have no respirator.

**Level C.** If the following conditions exist, you can use an air purifying respirator:

- Sufficient oxygen- at least 19.5%
- Air contaminants are known
- Concentrations are known
- Concentrations are NOT IDLH
- There is a filter or cartridge available for the contaminants at the concentrations that exist.

If all of the above conditions exist, you can use Level C- the only level of protection with an air purifying respirator.

**Level A or B.** If any of these conditions exist, you need to use an atmosphere supplying-respirator.

- Oxygen deficiency

- IDLH concentration
- Unknown contaminants
- Unknown concentrations
- No appropriate filter or cartridge

*These are the highest levels of protection*

**Level D** means ordinary work clothes

- Hard hat
- Work boots
- No respirator
- Chemical Resistance Suit

Level D is what workers wear when there is no air contamination hazard, and when there is very little chance of skin contact with hazardous chemicals.

**Level C** provides moderate respiratory protection and good skin protection:

- Air purifying respirator (APR)
- Chemical resistant suit that protects the skin against splashes
- Chemical resistant gloves
- Chemical resistant boots
- Hard hat

Level C is what workers wear when there is low levels of air contamination and possible skin contact with splashes of solid or liquid chemicals.


***Lev*** ...od skin prot...

- Atmosphere supplying respirator
- SCBA or SABA
- Chemical Resistant Suit that protects skin against splashes
- Chemical Resistant gloves
- Chemical resistant boots
- Hard Hat

*Level B is what workers use when there are high levels of contaminates and possible skin exposure to splashes of solid or liquid chemicals*

***Level A*** provides the maximum respiratory protection and the maximum skin protection

- Atmosphere supplying respirator  (SCBA or SABA)
- Fully encapsulated suit that keeps out hazardous solids, liquids or vapors
- Chemical resistance suit
- Chemical resistant boots
- Hard Hat ( inside of the suit)

*Workers wear Level A when there are high levels of air contaminants and possible skin contact with splashes and skin contact with vapors, gases or particulates is hazardous.*

# *Electrical Hazards*

Most people do not realize how little current it takes to kill if the current passes through the heart.

50 milliamps (1/20 of an amp) can be fatal

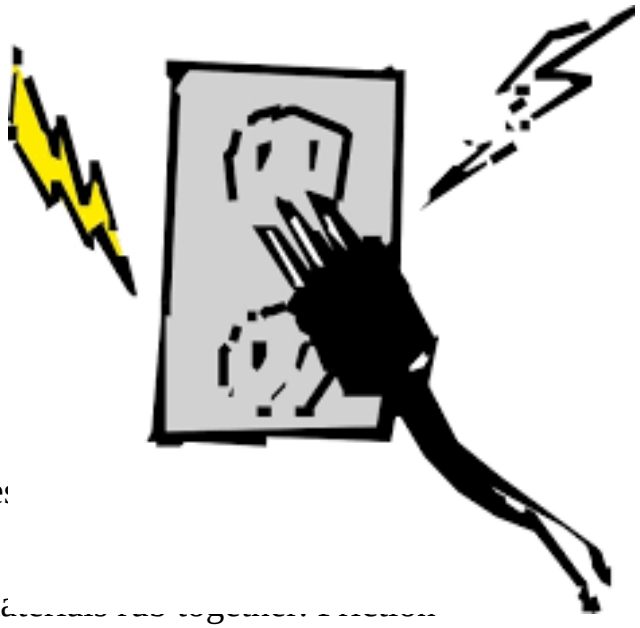
A typical circuit provides 20 amps. That's 400 times what it takes to kill. If only a small part of the available current reaches your heart, you might die.

The heart uses tiny electrical signals to regulate its beat. A small current can disrupt these signals causing rapid, useless beating. This condition is called **ventricular fibrillation.** The heart no longer pumps blood efficiently. Death follows in minutes unless the fibrillation is stopped. (This is why emergency medical personnel use a device called a defibrillator)

The best way to prevent electrocution and death is to make sure that you never come in contact with wires or equipment that carry electricity.

A **ground fault circuit interrupter (GFCI)** senses flow in the black and white wires. If it's not the same, the GFCI shuts off the circuit. If some current is

flowing through the body the GFCI will sense less current in the white wire. The GFCI can sense a difference as small as 5 milliampere and can shut off in a fraction of a second before there's enough current to cause ventricular fibrillation.



Because a tiny spark can ignite the vapors. It is e
**when handling flammable liquids.**

**Static electricity** is produced when dissimilar m
transfers electrons from one object to other. If the extra electrons have no way to leave, they just sit there. That's what "static" means.

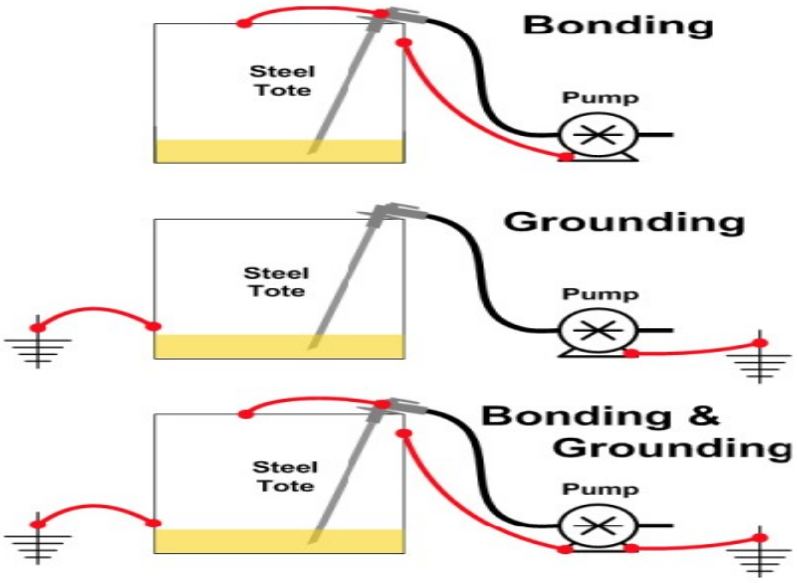
A **spark** occurs when the object with the extra electrons get close to another object that can conduct electricity. The electrons jump through the air on the conductor. When you walk across a nylon carpet wearing rubber soles, electrons transfer from the carpet to your body. When you are about to touch a door knob, the electrons jump to your knob.

When liquid flows through a hose, or pours out a container, friction causes electrons to transfer from the liquid to the container. When the spout touches another container, there could be a spark which ignites the vapors coming from the liquid.

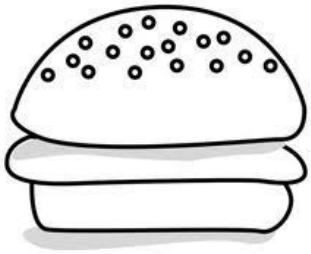
**Bonding** is connecting a good conductor (such as a copper wire) between two containers so that any extra electrons on one container can flow easily to the other container without causing a spark.

**Grounding** is connecting a good conductor (such as a copper wire) between a container and the earth. This prevents a spark from jumping between the container and a metal object that is in contact with the earth.

Not just any old wire will do. Use heavy gauge copper wire with special connectors that are designed for this purpose. These connectors are either clamps with sharp pointed screws, or special heavy duty clips. The connector has to make good contact with the container piercing the rust and paint.




***The***



© Can Stock Photo

The OSHA standard that has safety and health rules for hazardous waste workers is called HAZWOPER (Hazardous Waste Operations and Emergency Response)

OSHA calls hazardous waste clean-up sites uncontrolled sites.

Uncontrolled means that hazardous waste was put on the site without complying with current safety requirements. The hazardous waste creates a threat to the health and safety of people or the environment.

Some examples of uncontrolled sites include:

- A construction or demolition site where hazardous waste was left from previous activities.

- A landfill where chemicals were dumped without safeguards to prevent contaminating the water or the air. This may have been legal at the time, but does not comply with current requirements.
- A site where hazardous waste were illegally dumped without any regard for the environment
- The scene of an emergency release of hazardous materials after the emergency has been resolved but where chemicals still remain to be cleaned up.

If you work at a hazardous waste clean-up site, then you need to have eight (8) hours of refresher training each year. That is why you are taking this course.

# HAZWOPER

## *The Buddy System*

It is not safe to work alone when handling hazardous waste. If you are injured or overcome you need someone there to help and to call for assistance.

Your co-worker can also tell you if you're showing signs of heat stress, or warn you of other hazards that you might not have noticed.

When you work in the hot zone, and at other times as specified in the Safety and Health Plan, you must work with one or more other workers. This is called the buddy system.

Buddies stick together and look out for one another. If one person has to leave the area, for example to refill his or her air supply, then all "buddies" leave together.

### Communication Systems and Alarms

There must be good communication among the personnel on the site. This is especially important in case of an emergency, often there are radios, and/or a system of hand signals that everyone understands.

In case of an emergency there must be signals to warn workers and announce evacuation. This could be a bell, horn or other device. The important thing is that the signals are easy to understand and workers are trained to know what they mean.

## *Emergency Guidebook References*

**Yellow** – If you find yourself saying, “I only know the 4-digit UN number for this material,” then the yellow section will help you with your response. All you need is the UN number and you can look up the physical name and corresponding guide number for the material in the yellow section.

**Blue** – The blue section lists chemicals by name in alphabetical order. The blue section also will give you the cross reference to the UN number of a material and most importantly, the guide number associated with the material. Take care matching the spelling of the chemical name; there are several names that have similar spelling.

**Orange** – All other sections lead to the orange section. This section is the “meat and potatoes” of the ERG. The orange section gives the information on primary hazards and emergency response actions.

Find the important information on PPE, evacuation distances, spill control, fire control and first aid measures in this section.

**Green** – Chemicals highlighted in green in the blue section or the yellow section shows they are toxic inhalation materials (TIH). TIH have specific initial isolation distance and protective action distance information. Be sure to keep in mind the location of the hazard. If the hazard is confined to a building, the evacuation distances will be different.

**White** – There is a host of specialized information in the ERG. The white section in front includes many of the specialized items that could be of interest to industry. It shows information on rail cars, trailer identification, placards and pipeline information. The white pages in the back of the book provide information on explosives, boiling liquid expanding vapor explosions and a glossary.

# Decontamination

2 stations should be assigned: 1 for personnel and 1 for equipment

Decontamination stations or facilities should be located in the CRZ zone

(Contamination Reduction Zone)

# Decon Methods:

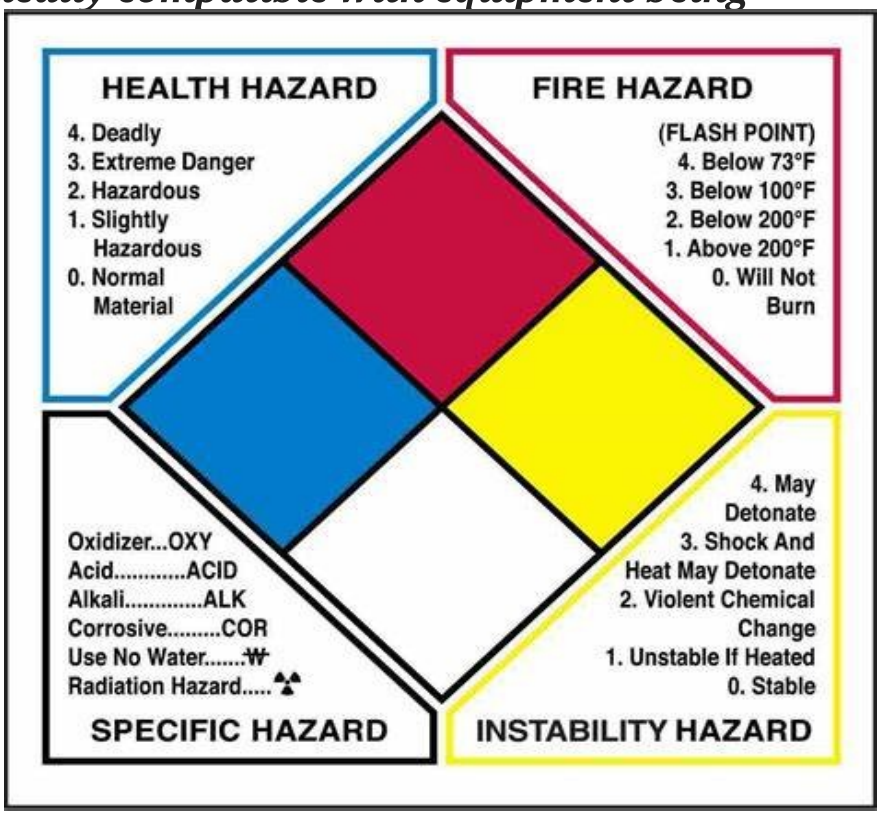
Physical Removal: Water rinse, scrubbing/scraping, dislodging

Chemical Removal: Dissolving, solidification, sterilization*

Physical & Chemical Means: Chemical solution/water rinse scrub down.

***Solvents must be chemically compatible with equipment being cleaned***

## NFPA Diamond




# DOT Placards for Transportation

1. Explosives
2. Non-Flammable compressed gases
3. Flammable
4. Dangerous when wet
5. Oxidizer
6. Poison-Death

7. Radiation
8. Corrosive
9. Miscellaneous Dangerous Goods


# Fire Hazards

Class A (ASH): Plastics, papers, rubber

Class B (BOOM): Flammable gases

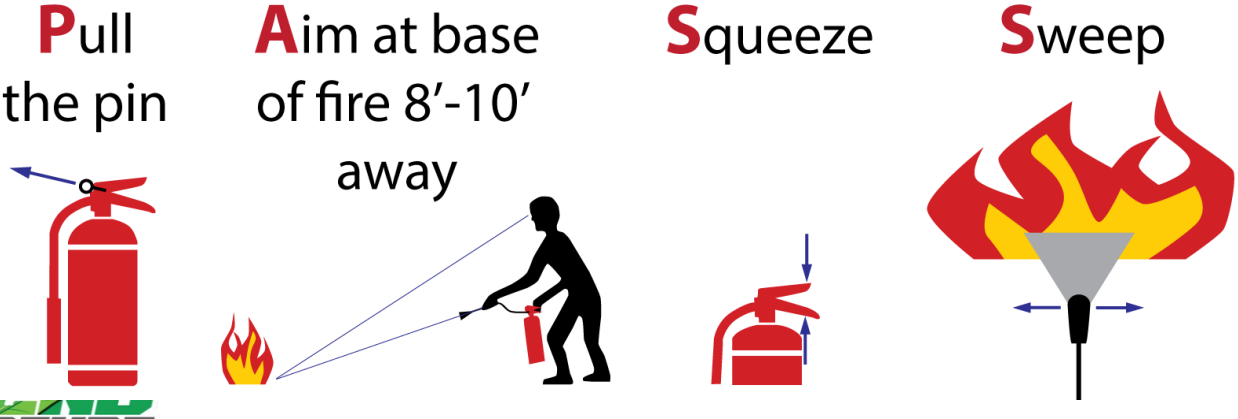
Class C (CONDUIT): Electrical

Class D (METALS): Flammable Metals

Stages of Fire

1. Incipient
2. Steady Stare/ Free Burning
3. Flashover
4. Hot smoldering

**P.A.S.S Method**



# Confined Spaces

- A confined space is a space that:
- Is large enough and so confined that employee ca bodily enter & perform assigned work
- Has limited pr restricted means of entry and exit  (i.e tanks, vessels, silos, pits, vaults)
- Is not designed for continuous employee occupancy

## *OSHA Classifications*

### Level 1: IDLH/PPBA *(immediately dangerous to life or health)*

- *Less than 19.5% or more than 23% oxygen content*
- *Flammable concentration between 10% and 20% LEL*
- *No Respirator or you WILL die*

### Level 2: Respirator

- Oxygen Levels in between 19.5%-23%
- Flammable atmosphere between 1% and 10%
- OEL(Occupational Exposure Limit) exceeds 50%

### Level 3: Regular PPE

# Positive Pressure Breathing Apparatus

## Worker Exposure to Harmful Substance

Occupational exposure limit is DEADLY The worker must use the appropriate PPE and wear properly. Respiratory protective equipment is needed when, a worker may be exposed to airborne contaminants exceeding their Occupational Exposure Limits (OE L's) or the atmosphere has an oxygen concentration of less then 19.5 percent by volume.

***Respiratory Protective Equipment***

- NIOSH Approved

- OSHA 1910.134 Standard and Manufacturers Standards
- Compressed Breathing Air 'OSHA 1910.134 (i)
- Trained and Fit Tested
- SCBA & SABA provide maximum protection against airborne contaminants
- Must be clean shaven
- Custom frames required for use with prescription eye wear
- Contact lenses are discouraged
- Respiratory equipment in proper working condition
- Use safely to prevent equipment damage

# COMPONENT

**HARNESS**

SCBA - Backpack style harness.
SABA - Sling type harness.

**AIR SUPPLY**

SCBA - Minimum 30 minute supply. OSHA standards apply to air quality.
SABA - Air may be supplied from a compressor, or cylinders, air supply is virtually unlimited. Minimum 5 minute escape supply, this is usually attached to harness at waist.

SCBA - Generally consists of a high and low pressure regulator

# BREATHING APPARATUS SELECTION

- Self contained breathing apparatus and supplied air breathing apparatus, each have their own distinctive uses and limitations. Selection and use will depend on the job task and hazard assessment, for example the hazards routine operations, emergency escape, access and egress entry into an IDLH atmosphere or confined space.

The Supplied Air Breathing Apparatus unit accepts air from the air line and regulates it further to maintain a positive pressure in the face piece. Additionally the system must have an emergency escape or egress cylinder in case the air line pressure fails. Escape cylinders range from 5 to 20 minutes. These units do not have a low air warning alarm.

3 Types of PPBA

- SCBA
- SABA
- 5 minute pack

## Heavy Work Load Consumption Rate

(Per Person).....100 cu/ft/hour

Air Trailer Cylinder Capacity (1 cylinder).....300 cu ft

Air Trailer Cylinder Capacity (12 x 300).....3600 cu ft

SCBA Cylinder

Capacity.....45 cu ft

SABA Cylinder Capacity/ 5 minute pack

(escape only).....7 cu ft