

BASIC SAFETY

Contren Learning Series # 00101-09

1.0.0 INTRODUCTION

- On the job, you have a safety obligation to your employer, co-workers, family, and yourself.
- Your employer is obligated to maintain a safe workplace.
- Follow safe work practices.
- Inspect safety (and all) equipment before use.
- Use safety (and all) equipment properly.

DID YOU KNOW ?

- Safety training is required for all activities.
- Do not operate tools, machinery, or equipment without proper training.

2.0.0 Importance of Safety

- Throughout the day, workers are performing different tasks.
- Many of which are performed routinely with little constant thought, creating a dull alertness.
- Safety training is done to keep safety as the most important aspect of your conscious and unconscious thinking.

2.1.0 Safety Culture

- **Safety Culture** – is created when the whole company sees the value of a safe work environment. This is an on-going process that includes structure and attitude for companies and individuals.
 - Fewer at-risk behaviors
 - Lower accident rates
 - Less turnover
 - Lower absenteeism
 - Higher productivity

- Experience Modification Rate (EMR) – can be lowered by a strong safety culture. Contractors with a high EMR can be excluded from bidding on certain projects.

3.0.0 Accidents: Causes and Results

- ❑ Safety is a learned behavior and attitude.
- ❑ Safety is a way of life.
- ❑ Poor behavior and poor working conditions contribute to accidents.

- ❑ **Near-Miss**: an unplanned event in which no one was injured and no property damage occurred; but either could have happened.
- ❑ **Property Damage**: an unplanned event that damaged tools, materials, or equipment; but no injuries.
- ❑ **Minor Injuries**: an unplanned event in which a worker received minor cuts, bruises, or strains; but returned to work the next day.
- ❑ **Serious (or Disabling) Injuries**: an unplanned event in which a worker received injuries that resulted in a temporary or permanent disability.
- ❑ **Fatalities**: an unplanned event in which a worker died.



3.1.0 Accident Costs

- Everyone loses when an accident happens.
- National Safety Council – has saved over 4.2 million lives since it began in 1913.

- Direct Cost –
 - medical bills
 - other worker's compensation benefits

- Indirect Costs –
 - replacement training
 - investigation and corrective measures
 - production scheduling and lost productivity
 - equipment and property repairs
 - absenteeism
 - 2 to 7 times the direct cost
 - (the employer losses a lot, also)

3.2.0 What Causes Accidents ?

- We will look at each of the following causes:
 - Failure to Communicate
 - Poor Work Habits
 - Alcohol or Drug Abuse
 - Lack of Skill
 - Intentional Acts
 - Unsafe Acts
 - Rationalizing Risks
 - Unsafe Conditions
 - Management System Failure

3.2.1 Failure to Communicate

- Different people companies, and job sites do things in different ways.
- Communication is a two-way discussion:
 - Do you know how they do a particular job?
 - Do they know how you do a particular job?

3.2.1 Failure to Communicate

INFORMATIONAL SIGNS

- ❑ Sign color is **BLUE**
- ❑ These signs relay general information.



3.2.1 Failure to Communicate

SAFETY SIGNS

- ❑ Sign color is a **GREEN** panel with **WHITE** letters
- ❑ These signs relay information about safety.



3.2.1 Failure to Communicate

CAUTION SIGNS

- ❑ Sign color is **YELLOW** with a **BLACK** panel and **YELLOW** letters
- ❑ These signs relay information about safety



3.2.1 Failure to Communicate

DANGER SIGNS

- ❑ Sign color is **RED**, **BLACK**, and **WHITE**
- ❑ These signs relay information about an immediate danger in the area.





3.2.2 Poor Work Habits

- Your safety is affected not only by your ability to do your job, but also by how you act on your job.
- Improper use of tools can get you hurt.
- Horseplay can get you and your co-workers hurt.
- Not following directions and warnings can have serious consequences.

3.2.3 Alcohol and Drug Abuse

- Using alcohol or drugs creates a risk of injury or even death to everyone on the jobsite.
- You must stay focused and in control when using tools and/or working on equipment that is potentially dangerous.
- Alcohol and drugs alter your ability to stay focused on the job at hand.

3.2.4 Lack of Skill

- ❑ Never operate any power tool unless you have been properly trained to use it.
- ❑ Knowing how to use a tool properly greatly reduces your chances of injury.
- ❑ Knowing how to perform a task properly also greatly reduces your chances of injury.
- ❑ Practice, Practice, Practice.

3.2.5 Intentional Acts

- Purposely doing anything that causes an accident.
- Anger, dissatisfaction, or jealousy drive some people to intentionally try to hurt co-workers and/or damage company property.
- If you recognize this behavior, report it. You may be saving your own life.

3.2.6 Unsafe Acts

- Any action you do that is different from the accepted, normal, or correct procedure.
- An accident caused by an unsafe act is not the fault of the tool or equipment.
- An unsafe act is an act that you do.

3.2.6 Unsafe Acts



3.2.7 Rationalizing Risk

- Not taking the risk potential seriously.
- All jobs have some element of risk.
- Excusing a risk could cost you your life.
- Famous last words:

“Hey boys, watch this!”.

3.2.8 Unsafe Conditions

- Any physical state of the tool or equipment that is different from the accepted, normal, or correct condition.
 - Poor housekeeping
 - Excessive noise
 - Inadequate guards

- An accident caused by an unsafe condition is not the fault of you.

- An unsafe condition is a condition of the tool or equipment.

3.2.8 Unsafe Conditions



**Unsafe condition -
bulge in stainless steel pipe**



3.2.9 Management System Failure

- Company management strives to prevent and/or correct acts and conditions that may cause accidents.
- No system is perfect.
- Be on the lookout for unsafe acts and conditions.
- Report unsafe acts and conditions to your supervisor before you have to report it to the emergency room doctor.

3.3.0 Housekeeping

- ❑ Keep your work area clean and free of debris.
- ❑ Keep your tools clean and organized.
- ❑ The goal of good housekeeping habits is to prevent accidents.
- ❑ Piles of scrap, spills on the floor, and tools laying around haphazardly are all unsafe conditions that can cause accidents.





3.4.0 Safety Policies and OSHA

- The mission of OSHA (Occupational Safety and Health Administration) is to save lives, prevent injuries, and protect the health of America's workers.
- Now we will look at:
 - The Code of Federal Regulations (CFR).
 - Violations.
 - Compliance.

3.4.1 The Code of Federal Regulations

- CFR 1910 is the OSHA standards for industry.
- CFR 1926 is the OSHA standards for construction.

- 29 CFR 1926.501 (a)(1)(i)(A)
 - 29 = Title (Labor)
 - CFR = Code of Federal Regulations
 - 1926 = Part (Construction)
 - a = paragraph
 - 1 = sub-paragraph
 - i = sub-paragraph
 - A = sub-paragraph

3.4.2 The General Duty Clause

- “Each employer shall furnish to each of his employees employment and a place of employment which is free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees” .
- Will be invoked when there is not a specific CFR standard addressing a hazard.
- A General Duty Clause citation may be issued for:
 - ▣ Employer failed to keep the workplace free of hazards.
 - ▣ The hazard was recognized.
 - ▣ The hazard caused, or was likely to cause, death or serious harm.
 - ▣ There was a feasible and useful method to correct the hazard.

3.4.3 Employee Rights and Responsibilities

- Employee must follow all safety rules.
- Wear all personal protective equipment.
- Inform supervisor about health and safety concerns.
- Employers must maintain worker medical records for 30 years after the worker leaves the job.
- OSH act, Section 11(c) – employers cannot discipline or discriminate against workers for practicing their rights under OSHA, including filing a complaint.
- Employees who have been discriminated for exercising this right can file a complaint within 30 days.

3.4.4 Inspections

- OSHA conducts 6 types of inspections:
- Imminent Danger Inspections
 - Top priority – workers face an immediate risk
- Catastrophe Inspections
 - After an accident that causes death or hospitalizes 3 or more workers
- Worker Complaint and Referral Inspections
 - Investigation of complaint of worker or referral of professional
- Programmed Inspections
 - High-risk areas
- Follow-up Inspections
 - After citations to verify correction of violations
- Monitoring Inspections
 - Long-term abatement follow-up to assure compliance with variances

3.4.5 Violations

- Employers who violate OSHA regulations can be fined.
- Serious safety violations can be fined up to \$7,000.
- Serious willful violations can be fined as high as \$70,000 per violation.
- In 2002, 78,000 fines were levied at a cost of \$70,000 per violation.

3.4.6 Compliance

- Employees must comply with the company's safety policies and rules.
- Competent Person: one who can identify unsafe acts or conditions, and can correct condition if given authorization.
- Qualified Person: one who has training and experience to correct unsafe acts or conditions.

3.4.7 Record Keeping

- OSHA 29 CFR 1904 details the recording and reporting requirements.
- This regulation establishes a guideline for proper recording and reporting.
- Employers are required to report fatalities and catastrophes to OSHA within 8 hours.

3.5.0 Reporting Injuries, Accidents, and Incidents

- You must report all injuries, accidents, and incidents to your supervisor.
- **Injury**: anything that requires treatment.
- **Accident**: anything that causes an injury or property damage.
- **Incident**: anything that could have caused an injury or property damage, but was avoided.

3.5.0 Reporting Injuries, Accidents, and Incidents

- OSHA web-site:
- <http://www.osha.gov>

- To report an emergency, fatality, or imminent life-threatening situation, call:
- 1-800-321-OSHA (6742)

- To file a complaint on-line:
- <http://www.osha.gov/pls/osha7/eComplaintForm.html>

3.6.0 The Four High-Hazard Areas

- Falls from elevation.
 - ▣ Improper use or failure to use fall protection.

- Struck-By Accidents.
 - ▣ Involves moving machinery, equipment, or vehicles.

- Caught-In or Caught-Between Accidents.
 - ▣ Involves moving machinery, equipment, or vehicles.
 - ▣ Improper safety at trench sites or confined spaces.

- Electrical Shock.
 - ▣ Improper handling of electrical tools or wiring.
 - ▣ Improper ground fault protection.

3.6.0 The Four High-Hazard Areas

- Falls from elevation.
 - 36% of all accidents.

- Struck-By Accidents.
 - 18% of all accidents.

- Caught-In or Caught-Between Accidents.
 - 18% of all accidents.

- Electrical Shock.
 - 10% of all accidents.

- Other.
 - 18% of all accidents.

3.7.0 Evacuation Procedures

- The procedure to remove the employees from an area when dangerous situations arise.

- Signal: usually a horn, siren, or bell.
- Route: a pre-planned path to safety.
- Triage: pre-planned gathering place of safety.

- For TCCTC shops:

- Tornado: One (1) long ring of the bell.
- Triage: Women's Restroom.

- Fire: Buzzing and flashing red light of fire alarms.
- Fire (alternate): Three (3) short rings of the bell.
- Triage: Front lawn near trees (toward highway).

4.0.0 Hazard Recognition, Evaluation, and Control

- This is the foundation to an effective safety program.
- Every one needs to recognize a safety hazard.
- Once recognized, a hazard can be corrected.
- The more aware of your surrounding you are, the safer you will be.

4.1.0 Hazard Recognition

- As you approach a job, ask yourself:
 - How can this situation cause harm?
 - What types of energy sources are present?
 - What is the magnitude of the energy?
 - What could go wrong to release the energy?
 - How can the energy be eliminated or controlled?
 - Will I be exposed to any hazardous materials?

4.2.0 Job Safety Analysis (JSA) and Task Safety Analysis (TSA)

- Both of these are approaches to recognition of hazards.
- The overall job or each individual task is broken down into its individual steps.
- Each simple step is then analyzed for hazards.



4.3.0 Risk Assessment

- RISK is a measure of the probability, consequences, and exposure related to an event.
- Probability: the chance that a given event will occur.
- Consequence: results of the action, condition, or event.
- Exposure: the amount of time and/or the degree to which someone is exposed to an unsafe condition.

5.0.0 Elevated Work and Fall Protection

- ❑ Falls from elevated areas are the leading cause of fatalities among construction workers.
- ❑ Falls account for 1 / 3 (33%) of construction deaths.
- ❑ Use personal protective equipment.
- ❑ Follow all safety procedures.
- ❑ Practice good housekeeping habits.
- ❑ Stay alert at all times.

5.1.0 Fall Hazards

- Falls from an elevation:
- Working on scaffolds or ladders.
- Working on elevated work platforms.
- Working near excavations.
- These falls often result in death.

- Falls from same level:
- Tripping or slipping.
- Falling onto sharp or very hard objects.
- Head injuries are the most common result.

- Six-Foot Rule: working at 6-ft, or higher, requires appropriate fall protection.

5.2.0 Walking and Working Surfaces

- Slips, trips, and falls account for 15% of all accidental deaths in the industry.

- Environmental conditions:
 - Snow, ice, water.

- Poor housekeeping:
 - Tools, equipment, scrap material, oil left on floor.

- Always pay attention to your work area.

5.3.0 Unprotected Sides, Wall Openings, and Floor Holes

- Any opening in a wall or floor is a potential hazard.
- For worker protection, these openings must be:
 - Guarded, or Covered
- Cover holes in floors, if possible.
If not, place barricades around the hole.
- For wall openings: If the hole is 39" above the floor and someone can fall 6' or more, the opening must be barricaded.
- **NEVER remove a barrier or barricade without authorization!**

5.3.0 Unprotected Sides, Wall Openings, and Floor Holes

- RAILINGS:

- Used as barriers to openings.



5.3.0 Unprotected Sides, Wall Openings, and Floor Holes

□ WARNING BARRICADES:

- Warn workers, but provides no protection.
- Typical warning barricade material:
 - plastic color-coded tape
 - color-coded rope
- Typical warning barricade colors:
 - RED** = danger (do not enter)
 - YELLOW** = caution (enter carefully)
 - YELLOW/PURPLE** = radiation (do not enter)



5.3.0 Unprotected Sides, Wall Openings, and Floor Holes

- PROTECTIVE BARRICADES:
- Typical protective barricade material:
 - wooden posts and rails
 - posts and chains
 - posts and steel cables
- Typical protective barricade colors:
 - RED = danger** (do not enter)
 - imminent danger or overhead lifting
 - YELLOW = caution** (enter carefully)



5.4.0 Personal Fall Arrest Systems (PFAS)

- PPE used to prevent falls and to protect workers who do fall.

- Components include:
 - Body harness
 - Lanyard
 - Lifeline
 - Connecting devices
 - Anchor points

5.4.0 Personal Fall Arrest Systems (PFAS)

□ Body Harness:



5.4.0 Personal Fall Arrest Systems (PFAS)

- Lanyard: maximum length of 6'
- Lifelines:



5.4.0 Personal Fall Arrest Systems (PFAS)

- Connecting devices
- Anchor points



5.4.1 PFAS Inspection

- Your life depends on your Fall Protection Arrest System working properly.
- Inspect your PFAS equipment regularly.
- Your PFAS must be inspected monthly by a competent person.

5.4.2 Donning a Harness

- Buckle around your body with leg, shoulder, chest, and pelvic straps.
- A D-ring at your back, between the shoulder blades, attaches to the lanyard.
- You will be trained extensively before you put one on.



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6.0.0 Ladders and Stairs

- Ladders are used to perform work in elevated locations.

- Ladder Duty Ratings

 - Type IIA – 375# extra heavy duty / professional use

 - Type IA – 300# extra heavy duty / professional use

 - Type I - 250# heavy duty / industrial use

 - Type II - 225# medium duty / commercial use

 - Type III – 200# light duty / household use

6.1.0 Portable Straight Ladders

- Consists of two rails, rungs between the rails, and safety feet at the bottom.
- Made of wood, fiberglass, and metal.
- Do not use metal ladders near electricity.
- Do not paint wooden ladders.



6.1.1 Inspecting Straight Ladders

- Check rails and rungs for cracks and splits.
- Check for loose rungs.
- Check safety feet for proper operation.

6.1.2 Using Straight Ladders

- Place on level ground with feet secure.
- Place feet 1 foot out from wall for every 4 feet of wall height.
- Top of ladder must extend at least 3 feet above wall top, if ladder extends above wall.

6.2.0 Extension Ladders

- Two straight ladders secured together for easy portability.
- Same basic rules apply as with straight ladders.



6.2.1 Inspecting Extension Ladders

- Check rails and rungs for cracks and splits.
- Check for loose rungs.
- Check safety feet for proper operation.
- Check rope for worn spots or cuts and tackle for damage.

6.2.2 Using Extension Ladders

- Place on level ground with feet secure.
- Pull rope to adjust height. Be sure locking mechanism functions properly.
- Place feet 1 foot out from wall for every 4 feet of wall height.
- Top of ladder must extend at least 3 feet above wall top, if ladder extends above wall.
- The highest safe working height is the **fourth** rung from the top.



6.3.0 Stepladders

- Self-supporting ladder.
- Consist of a ladder section and a support section hinged together at the top.



6.3.1 Inspecting Stepladders

- Check rails and rungs for cracks and splits.
- Check for loose rungs.
- Check safety feet for proper operation.
- Check hinges and spreader bars for damage.

6.3.2 Using Stepladders

- Place on level ground with all feet secure.
- Open fully and lock the spreader bars.
- Do not climb on the rear braces.
- The highest step you can safely stand on is the step that places your mid-thigh even with the top of the ladder.

6.4.0 Stairways

- Stairs are routinely used in construction and maintenance.
- Stairs with 4 or more steps or rising more than 30” (whichever is less) must have at least 1 handrail and stair railing system along each unprotected side.



6.4.1 Stairway Maintenance and Housekeeping

- Keep stairways clean and free of debris.
- Must have 5 foot-candles of lighting.

7.0.0 Scaffolds

- Provides safe elevated work platforms for workers and material.
- Types of scaffolds:

Manufactured (stationary) scaffolds

Rolling scaffolds

7.1.1 Manufactured Scaffolds

- Manufactured as panels.
- Assembled on site.
- Made of steel, stainless steel, or aluminum.



7.1.2 Rolling Scaffolds

- Manufactured as panels.
- Assembled on site.
- Made of steel, stainless steel, or aluminum.
- Has wheels with brakes on each leg so that it can be easily moved.

7.2.0 Inspecting Scaffolds

- Check for bent, broken, or rusty tubes.
- Check for loose joints at each connection.
- Scaffold tags:
 - Green – safe to use
 - Yellow – does not meet OSHA standards
 - Red – scaffold is being assembled or disassembled

7.2.4 Using Scaffolds

- Inspect the scaffold before using it.
- Use only the ladder to enter or exit the scaffold.
- For rolling scaffolds, lock the wheel brakes before using it.

8.0.0 Struck-By Hazards

- Struck-by accidents accounted for 18% of construction fatalities between 2003 and 2004.
- Approximately 75% of these fatalities involved heavy equipment (trucks and cranes).
- Primary causes were strikes, falling objects, and flying objects.

PHOTO

BREAK

8.1.0 Vehicle and Roadway Hazards

- When working around mobile equipment:
 - Stay alert and keep a safe distance.
 - Maintain eye contact with operator.
 - Never get into blind spots.
 - Keep off equipment unless authorized.
 - Wear reflective vest.
 - Never stand between pieces of equipment.
 - Never stand under or near loads.

8.1.0 Vehicle and Roadway Hazards

- When operating mobile equipment:
 - Wear seat belt.
 - Obey speed limits. Slower in crowded areas.
 - Look to rear and sound horn when backing up.
 - Use a **signaler** to direct backing up.
 - Make sure back-up alarm is working.
 - Turn off engine when fueling.
 - Turn off engine and set brakes before exiting.
 - Never stay in/on equipment being loaded.
 - Keep windshields, mirrors, and lights clean.
 - Carry flares, extinguishers, and other safety equipment.

8.2.0 Falling Objects

- Do not stand under or near overhead loads.
- Do not stand under any overhead work area.
- Always keep your hard hat on at all times.
- Barricade hazard areas when rigging.
- Do not stack material higher than a 4:1 ratio.
 - (4:height – 1:base depth)
- When working overhead from ladders, scaffolds, or elevated work platforms:
 - Secure all tools and equipment.
 - Use toeboards, debris nets, canopies, etc.

8.3.0 Flying Objects

- Power tools push, pull, pry, grind, and cut.
- Hand tools turn, chip, brush, and hit.
- All of which cause large and small flying objects.

- Always wear:
 - Safety glasses
 - Face shields
 - Hard hats
 - Other appropriate PPE

9.0.0 Caught-In-Between Hazards

- Construction sites and industrial facilities will have congested work areas.
- The more congested the work area, the more attention must be given to wall/equipment collapse, moving/rotating parts, etc.
- Primary causes of caught-in-between hazards:
 - Trench/excavation collapse,
 - Rotating equipment,
 - Unguarded parts.

9.1.0 Trenching and Excavation

□ Trench:

- A cut in the earth that is deeper than it is wide.
- Shortest width is no more than 15 feet wide.
- Entrapment is likely if a collapse occurs.

□ Excavation:

- A cut in the earth that is wider than it is deep, or its shortest width is over 15 feet.
- Usually, entrapment may occur only near the slopes.

9.1.0 Trenching and Excavation

- Hazards include:
 - Cave-ins,
 - Water accumulation,
 - Falling objects,
 - Collapse of nearby structures,
 - Toxic gases in the soil.



9.1.1 Cave-Ins

- Most common hazard at excavation sites.
- Most occur in trenches between 5' and 15' wide.
- Happens suddenly with no warning.
- Until proven otherwise, assume all soil is Type C.
- Over 100 people are killed each year due to cave-ins.



9.1.2 Inspections

- Excavation sites must be inspected daily by a competent person.
 - Cracks and spalls in the sides,
 - Existing underground utilities and structures,
 - Previously disturbed soil around the site,
 - Sources of vibration,
 - Surface/seeping water,
 - Soil layers in the excavation.

9.1.3 Protective Systems

- Sloping:
 - Cutting the side walls on a smooth incline that makes it safe from caving in.

- Benching:
 - Cutting the side walls in the shape of steps that make it safe from caving in.

- Shoring (or, Shielding):
 - Used when area is too narrow for angled sides.
 - Support walls, made of metal or wood, placed against trench sides and braced side to side.

- If the excavation is more than 20' deep, the protective system must be designed by a licensed professional engineer.

9.1.3 Maximum Allowable Slope (MAS)

□ Sloping and Benching:

□ Solid Rock:

- Incline angle: straight up.

□ Type A soil:

- Soil: Fine-grained, cohesive: clay, hardpan, and caliche. Particles too small to see with naked eye.
- Incline angle: $\frac{3}{4}$ (run) : 1 (rise)

□ Type B soil:

- Soil: Angular rock, silt, other similar soil.
- Incline angle: 1 (run) : 1 (rise)

□ Type C soil:

- Soil: Coarse-grained, granular: sand, gravel, and loamy soil. Particles visible to the naked eye.
- Incline angle: 1-1/2 (run) : 1 (rise)
- Benching can not be used with Type C soil.

9.1.4 Spoil Pile and Material Hazards

- ❑ Excavated material and equipment can roll or fall in the excavated area.
- ❑ Excessive weight can cause the side walls to collapse.
- ❑ Keep spoil, materials, and equipment at least 2 feet away from the edge of the excavation.
- ❑ Barricade excavations to maintain the 2' barrier.

9.1.5 Access and Egress

- There must be a safe means of entry and exit.
- Stairway, ladder, or ramp.
- Never jump into, or across, an excavation.
- There must be an exit every 25' for trenches that are over 4' deep.

- 
- First wave

9.1.6 Emergency Response

- WHEN IN DOUBT, GET OUT.
- Know where the exits are.
- Before you enter, know the company's Emergency Action Plan (EAP).
- Do not be afraid to ask questions.

9.2.0 Tool and Machine Guarding

- All tools and machines have hazardous components, and must have guards covering the hazard.
- All guards must be maintained and kept in good working order.
- DO NOT REMOVE A GUARD.
 - Guards are in place to protect worker from rotating and moving parts.
- Remove a guard only to replace tooling or service.
- Replace the guard immediately when complete.



10.0.0 Electrical Hazards

- Even if you are not an electrician, electrical safety is highly important to you.
- Almost every machine you work on will have some level of electricity.
- Electrical accidents:
 - Burns,
 - Shock,
 - Explosions,
 - Falls (due to shocks),
 - Fires.



10.1.0 Basics of Electricity

- Conductor – anything that current will flow through, including your body.
- Insulator– anything that current will not flow through.
- Less than 1 amp can kill you.

10.2.0 Electrical Safety Guidelines

- Use only undamaged 3-wire extension cords.
 - ▣ Three-wire grounding is the most common system.
- Never exceed the UL (Underwriter's Laboratory) wattage of a power cord.
- Make sure all components are grounded.
- Never use metal ladders or hard hats.
- Use only double insulated power tools.
- Inspect power tools before use.

10.2.0 Electrical Safety Guidelines

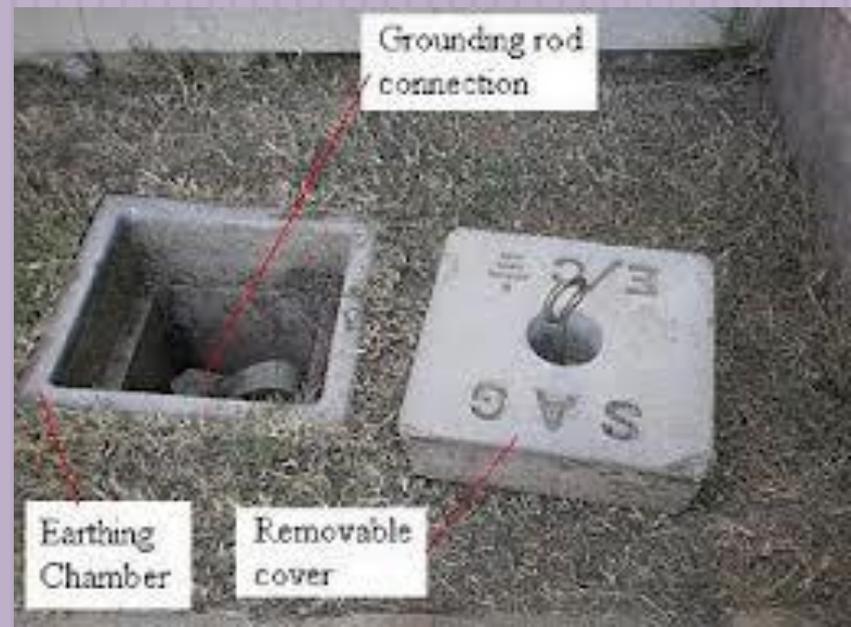
- Make sure light bulbs have protective guards.
- Do not pull on power cords to unplug a power tool.
- Plug into “concealed receptacles” only.
- Plug power tools into GFCI outlet only.
- GFCI – Ground Fault Circuit Interrupter.

10.3.0 Electrical Power Systems

- To often, workers must work near, on, or in equipment that has energized electrical components.
- Know the company's policy for safe working distances.
- Pay Attention, Pay Attention, Pay Attention.
- Ground – a low-resistance conductive connection that allows current to easily flow to the earth or a grounding plane. A secondary safety measure to protect the worker. If this measure fails, the worker can become the ground.

10.3.1 Assured Equipment Grounding Programs

- Most companies have an assured equipment grounding conductor program.
- This program covers all cords, receptacles that are not part of the building, and equipment that is connected by cord and plug.



10.3.2 Ground Fault Circuit Interrupters (GFCI)

- Designed to shut off electrical power within as little as $1/40$ of a second.
- Compares the current going to and the current returning from the equipment. If the difference exceeds 5 mA, the GFCI breaks the circuit.
- Used in high-risk (wet) areas, all receptacles that are not permanent structure wiring, all portable power tools.
- All portable power tools must be connected to a GFCI.

10.4.0 Lockout/Tagout

- **A system that safeguards workers from hazardous energy while working on equipment.**
- **STEP 1:** A worker disconnects the power source (electrical, hydraulic, etc.).
- **STEP 2:** He places a clamp with his name on it (this is the “tagout”) on the disconnect.
- **STEP 3:** He places his personal lock (this is the “lockout”) on the tag.
- **STEP 4:** When the job is finished, he removes his lock and tag. Nobody else is allowed to remove it.

10.4.0 Lockout/Tagout



10.5.0 Working Near Energized Electrical Equipment

- **PROXIMITY WORK:**
- Work that is being done close to, but not in direct contact with, a hazard.
- Hazard may be:
 - Energized electrical equipment or wires
(distribution panels, switch enclosures)
 - Hot pipes
 - Running motors or equipment
 - Overhead lifting operations
(and many more)



10.6.0 If Someone Is Shocked

- Disconnect the circuit.
- Call an ambulance.
- Give first aid.

- If you cannot disconnect the circuit:
 - **DO NOT TOUCH THE VICTIM WITH ANYTHING!**
 - Call an ambulance.

Unregistered HyperCam 2



1 1.0.0 Personal Protective Equipment

- PPE is designed to protect you from injury.
- You must keep it in good condition and use it when you need to.
- Many workers are injured on the job because they are not using their PPE.

11.1.0 Personal Protective Equipment Needs

- You will not see all the potential dangers on the job simply by looking around.
- Consider the possible hazards before starting the job.
- Use common sense.
- Knowing how to use your PPE can greatly reduce your chance of getting hurt.

11.2.0 Personal Protective Equipment Use and Care

- The best PPE is of no use to you unless you:

Regularly inspect it

Properly care for it

Use it properly when you need it

NEVER ALTER OR MODIFY IT IN ANY WAY

11.3.0 Clothing and Jewelry

- Your clothing must comply with good general work and safety practices.
- Do not wear loose clothing or jewelry that can get caught in machinery.

11.4.0 Hard Hat

- Outer shell: protects your head from hard blow.
- Webbing: maintains space between the outer shell and your head.
- Every time you put it on, inspect it for cracks, dents, and frayed or torn webbing.



11.5.0 Eye and Face Protection

- Safety glasses: protects your eyes from flying objects.
- Goggles: gives the best protection for your eyes from all directions.
- Face shield: protects your entire face.
- Tinted lens: protects your eyes from intense light.
- ANSI (American National Standards Institute):
 - Standard Z87.1-1968



11.6.0 Gloves

- Protects hands from cuts, scrapes, and burns.
- Use the correct gloves for the job.
 - Welding – insulated heat-resistant
 - Electrical – non-conductive rubber insulated
 - Chemical – resistant to specific chemical
 - General protection – leather or cotton
- Replace gloves when they become torn, worn, or soaked with oil or chemicals.



11.6.0 Gloves

- Electrician's rubber gloves must be inspected regularly:
 - Stretch the glove,
 - Trap air inside the glove,
 - Hold the gauntlet closed with one hand while squeezing all areas for weakness and defects,
 - Listen for escaping air.



11.7.0 Leg Protection

- ❑ Pants should not have loose, torn, or dragging fabric.
- ❑ Pant legs must not have cuffs.
- ❑ Never wear shorts.
- ❑ Never carry pointed or sharp tools in pockets.
- ❑ Wear shin guards for extra protection.
- ❑ Tape pant legs into rubber boots when working with concrete and other chemicals.



11.8.0 Foot Protection

- Protects feet from injury.
- Steel toe shoes protects toes from dropped or rolling objects.
- Steel shank protects bottom of foot from sharp objects.
- Metatarsal caps protect the entire top of the foot.
- Replace shoes when they become torn, worn, or soaked with oil or chemicals.



11.9.0 Skin Protection

- Exposure to many chemicals strip oil from your skin causing dermatitis.
- Skin can be burned due to exposure to the sun, welding/cutting, and chemicals.
- Wear the proper PPE.
- Use skin creams as soon as you notice your skin drying.



11.10.0 Hearing Protection

- Protects ears from loud noises.
- Earplugs fit inside the ear canal.
- Earmuffs fit over the entire ear.
- Earmuffs provide better protection than earplugs.
- Throw away disposable earplugs when removed.
- Wash reusable earplugs with soap and water each time removed.



11.11.0 Respiratory Protection

- Protects lungs from inhalation hazards.
- SCBA – Self Contained Breathing Apparatus
- Full facepiece with chemical canister
Protects lungs and eyes
- Half mask with mechanical filter.
Protects lungs only

11.11.1 Respirator Requirements

- Extra training is required before you are assigned a job that requires respirators.

- You must be medically able to wear a respirator:
 - SCBAs are heavy,
 - Negative-pressure respirators restrict breathing,
 - Most respirators cause claustrophobia.

11.11.2 Selecting Respirators

- Dust (or Particle) Mask:
 - General use for large dust particles.
 - Minor protection for the lungs.



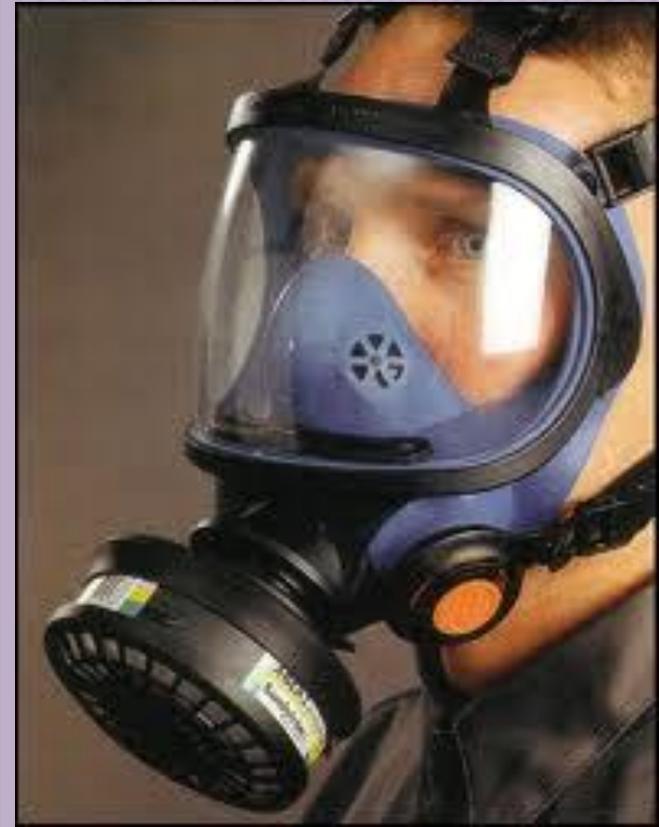
11.11.2 Selecting Respirators

- Half Mask with mechanical filter:
 - Brief exposure to fine dust or dry chemical powder.
 - Protects the lungs only.



11.11.2 Selecting Respirators

- Full Facepiece Mask with chemical filters:
 - Brief exposure to dangerous gases and fumes.



11.11.2 Selecting Respirators

- Supplied Air Mask:
 - Full Face Mask connected to a remote compressor via a hose.
 - Used when there is an oxygen-deficient environment.
 - Limited by the length of the hose.



11.11.2 Selecting Respirators

□ SCBA:

- Full Face Mask connected to a compressed air cylinder carried on the back of the user.
- Used when there is an oxygen-deficient environment.



11.11.3 Testing Respirators

- Adjust straps for a snug fit.

- Positive Pressure Check:
 - ▣ Block exhalation valve and exhale.
 - ▣ Mask should puff out with no leakage.

- Negative Pressure Check:
 - ▣ Block inhalation valve and inhale.
 - ▣ Mask should pull in with no leakage.

11.11.3 Testing Respirators

- Following will interfere with a respirator's seal:
 - Facial hair,
 - Skullcaps under the facepiece,
 - Temple bars on glasses,
 - Absence of some, or all, teeth,
 - Absence of dentures,
 - Chewing.

11.11.4 Inspecting Respirators

- Respirators must be checked before and after each use.

- Check each component for:
 - Function,
 - Flexibility,
 - Tightness of connections,
 - Cracks or tears,
 - Holes,
 - Deterioration,
 - Foreign particles.

11.11.5 Maintaining Respirators

- Respirators must be cleaned at least once per day:
 - Remove filters or cartridges if attached.
 - Hand wash with water and mild soap using a soft brush.
 - Let dry overnight.

- Sanitize at least once per week:
 - Remove filters or cartridges if attached.
 - Soak respirator in a sanitizing solution for 2 minutes.
 - Rinse in warm water.
 - Let dry overnight.

12.0.0 Hazard Communication Standard (HazCom)

- This OSHA standard requires all employers to educate their employees about the hazardous chemicals they may be exposed to on the job site.
- Sometimes referred to as the “Right to Know” standard.

12.1.0 Material Safety Data Sheet

- An MSDS must accompany every shipment of a hazardous substance.
- The MSDS must be available to everyone on the job site.
- Information found on the MSDS:
 - Identity of each chemical in the substance
 - Exposure limits
 - Physical characteristics
 - Chemical characteristics
 - first-aid procedures
 - Manufacturer's contact information

1 2.2.0 Your Responsibilities Under HazCom

- Employee Responsibilities:
 - Know where the MSDS are located on site.
 - Report hazards to supervisor.
 - Know the hazardous material properties on site.
 - Know the precautions and PPE required.
 - Know what to do in an emergency.
 - Understand and know location of the company's written Hazardous Communication Program.

13.0.0 Other Job-Site Hazards

- It is impossible to list all the hazards that could exist on all job sites.
- For your own safety, understand the hazards associated with the specific job site you are on.

13.1.0 Job-Site Exposures

- Exposure – contact with a chemical, biological, or physical hazard.

- Routes of exposure:
 - Inhalation (breathing),
 - Ingestion (eating or drinking),
 - Absorption (skin contact).

- PEL – Permissible Exposure Limit:
 - The maximum concentration of a substance that a worker can be exposed to in an 8-hour shift.

13.1.1 Lead

- A naturally occurring common metal in the earth,
- Has no distinctive taste or smell (hard to detect),
- A basic element; does not break down,
- Exposure by inhalation, ingestion, and absorption,
- Toxic – any waste containing lead is considered hazardous.
- Lead-based paint was common until 1978.



118 7 [Kr]4d ¹⁰ 5s ² 5p ⁶ 7.3439	82 Pb Lead 207.2 [Hg]6p ² 7.4167	83 Bi Bismuth 208.980 [Hg]6p ³ 7.2
81 Tl Thallium 204.3833 16p		



13.1.2 Asbestos

- Exposure – inhalation,
- Hazards – lung cancer, asbestosis, mesothelioma, (it may take 20 years or more for the diseases to develop),
- Common locations – building and pipe insulations, floor tile, drywall compounds, plasters, and roofing,
- Production banned in the 1970s.



13.1.3 Silica

- A mineral found in concrete, masonry, and rock.
- Exposure – inhalation,
- Hazards – lung cancer, silicosis (an incurable lung disease).



13.1.4 Bloodborne Pathogens

- Transmitted by contact with an infectious person's blood.
- The most common BPs today are:
 - HIV (virus causes AIDS)
 - Hepatitis B (inflammation of the liver)
 - Hepatitis C (inflammation of the liver, leading to cirrhosis)
- Of these, Hepatitis B is the only one that is preventable by vaccination and will go dormant.

13.1.5 Chemical Splashes

- If you get splashed with hazardous chemicals:
 - Body/Clothing:
 - Go to nearest shower,
 - Remove affected clothing,
 - Rinse for 15 minutes,
 - Get medical attention.
 - Eyes/Face:
 - Go to nearest eye-wash station,
 - Rinse for several minutes,
 - Get medical attention.

13.2.0 Proximity Work

- Work that is done near a hazard, but not in direct contact with the hazard.
- Requires extra precaution and awareness.
- Includes working near:
 - Hot or pressurized piping,
 - Energized electrical equipment,
 - Running motors or equipment.

13.2.1 Pressurized or High-Temperature Systems

- Pressurized systems can explode if damaged, which can be painful or fatal to workers.
- High-temperature systems can painfully, even fatally, burn workers if contact is made.

13.3.0 Heat Stress

- Occurs when abnormally hot air, high humidity, or extremely heavy exertion prevents your body from cooling itself fast enough.
- May cause heat stroke, heat exhaustion, or heat cramps.
- Prevention:
 - ▣ Drink plenty of water,
 - ▣ Avoid alcohol and caffeinated drinks,
 - ▣ Do not overexert yourself,
 - ▣ Wear lightweight, light-colored clothing,
 - ▣ Wear loose clothing, if possible.
 - ▣ Keep head covered and face shaded,
 - ▣ Take frequent short breaks,
 - ▣ Rest in shade, if possible.

13.3.1 Heat Cramps

- Muscular pain and spasms.

- Symptoms:
 - Painful muscle spasms and cramping,
 - Pale, sweaty skin,
 - Abnormal body temperature,
 - Abdominal pain,
 - Nausea.

- First Aid:
 - Sit or lie down in a cool area.
 - Drink ½ glass water every 15 minutes.
 - Stretch and massage affected muscles.

13.3.2 Heat Exhaustion

- Symptoms:
 - Cool, pale, and moist skin,
 - Heavy sweating,
 - Headache, nausea, vomiting,
 - Dilated pupils (very large pupils),
 - Dizziness,
 - Possible fainting,
 - Fast, weak pulse,
 - Slightly elevated body temperature.

13.3.2 Heat Exhaustion

- First Aid:
 - Lay victim down with legs elevated 6-8",
 - Remove heavy clothing and apply cool, wet towels,
 - Fan victim, but stop if goose bumps or shivers develop,
 - Give ½ glass water every 15 minutes,
 - If victim does not continually improve, call 911.

13.3.3 Heat Stroke

- HEAT STROKE IS LIFE-THREATENING.
- The body stops sweating. (Sweating is the body's temperature control mechanism.)
- Body temp can rise high enough to cause:
 - Brain damage,
 - Death.

13.3.3 Heat Stroke

- Symptoms:
 - Hot, dry, or spotted skin,
 - Extremely high body temperature,
 - Very small pupils,
 - Mental confusion,
 - Headache,
 - Vision impairment,
 - Convulsions, (uncontrolled shaking)
 - Loss of consciousness.

13.3.3 Heat Stroke

- First Aid:
 - CALL 911 IMMEDIATELY,
 - Lay victim on back,
 - If nauseous, lay victim on side,
 - Remove all nearby objects,
 - Cool victim (fanning, water spray, wet sheets or towels,
 - If victim is alert, give 1 cup water every 15 minutes,
 - Place ice packs under armpits and groin.

13.4.0 Cold Stress

- Hypothermia (cold stress):
 - Occurs when your body temperature drops below 98.6[^] (normal)

- Progressive Symptoms:
 - Shiver uncontrollably,
 - Weak and drowsy,
 - Disoriented,
 - Unconsciousness,
 - Death

- Always dress in waterproof and wind-resistant clothes.
- Always wear head covering (a lot of heat is lost from head).
- Always have spare clothes to keep dry (water chills quickly).

13.4.1 Frostbite

- Dangerous lifelong effects, usually to the hands, fingers, feet, toes, ears, and nose.

- Symptoms:
 - Pale, waxy-white skin color,
 - Hard, numb skin.

- First Aid:
 - Move victim to warm, dry area.
 - Remove wet or tight clothing.
 - Place affected area in water.
 - Add warm water until bath is 105°F.
 - Maintain temperature, but do not pour directly on affected area.
 - Warming will take at least 25 minutes.
 - NEVER rub the affected area.



13.4.2 Hypothermia

- A serious, potentially fatal, lowering of the body temperature.
- Can occur in above-freezing ambient temperatures.
- Effects are gradual and often go unnoticed until it is too late.
- If you are going to be outside for an extended time, let someone know where you are going and when you expect to return.
- Symptoms:
 - ▣ Lowering of body temperature,
 - ▣ Fatigue or drowsiness,
 - ▣ Slurred speech,
 - ▣ Clumsy movements,
 - ▣ Irritable, irrational, confused behavior.

13.4.2 Hypothermia

- First Aid on land:
 - Call 911 immediately,
 - Move victim to a warm, dry area,
 - Replace wet clothing with dry, cover with blankets,
 - For alert victim, give warm, sweet liquids (no alcohol or caffeine),
 - For alert victim, have victim move arms and legs (muscle heat),
 - If not alert, place warm water bottles at underarms, groin, neck, and head.

- Do not rub victim's body (may cause heart attack).
- Do not place victim in warm bath (may cause heart attack).

13.4.2 Hypothermia

- First Aid in water:
 - Call 911 immediately,
 - Body heat is lost 25 times faster in water than on land.
- If can get out of water:
 - Get out of water as quickly as possible.
 - Do not remove clothing.
 - Tighten and/or close up all clothing.
 - (Trapped water will help insulate.)
 - Cover head, but keep head out of water.
 - Do not swim, except for a very short distance.
 - (Swimming uses body heat, reduces survival time by 50%.)
- If cannot get out of water:
 - Fold arms together,
 - Keep thighs together, bend knees, and cross ankles,
 - If more than 1 person, huddle with chest tight together.

13.5.0 Welding and Cutting Hazards

- Always wear proper PPE.
- Keep work area clean.
- Never look at welding/ cutting operations without eye protection.
- If other workers are present, use welding shields.
- Never wear contacts when welding.
 - ▣ Ultraviolet (UV) rays can stick contacts to eye.

13.5.0 Welding and Cutting Hazards

□ Hazards to worker and co-workers:

- Hot metal.
- Sparks,
- Dross,
- Flames,
- Intense light and UV light.
- Limited vision,
- Flash burns:



13.5.0 Welding and Cutting Hazards

- Flash Burns:
 - Painful inflammation (swelling/blistering) of the cornea (white part) of the eye.
 - Caused by exposure to UV light.
 - Can lead to infection if not treated.

- Symptoms:
 - Headache,
 - Gritty feeling in eyes,
 - Red or tearing eyes,
 - Trouble opening eyes,
 - Impaired vision,
 - Swollen eyes.

- First Aid:
 - Get medical attention immediately.



13.5.0 Welding and Cutting Hazards

- Personal Protective Equipment (PPE):
 - Helmet (proper shade lens) or Full-Face Shield (shaded/clear lens).
 - ▣ For gas cutting : filter lens no less than a No. 4 shade.
 - ▣ For welding: filter lens with no less than a No. 10 shade.
 - Cap.
 - Safety glasses.
 - Ear plugs.
 - Gauntlet-type welding gloves.
 - Cotton or wool outer garments:
 - ▣ Long sleeves.
 - ▣ Long pants (no cuffs).
 - Leather work boots (steel-toe, 8" high minimum).
 - Respirator.
 - Equipment training.

13.5.1 Flame Cutting

- Wear proper PPE.
- Keep cylinders upright.
- If acetylene cylinder tips over:
 - Stand upright, wait 30 minutes before using.
- Store oxygen and acetylene separately.
- Separation must be:
 - At least 20 feet apart, or
 - A 5 foot high, 1/2-hour burn rated barrier.
- Keep combustibles and petroleum clear of work area.
- Never use petroleum-based products on fittings.
 - Compressed oxygen and petroleum will explode.
- Never cut galvanized metal without ventilation.

13.5.2 Hoses and Regulators

- Fuel gas hose:

Red

Left-hand threaded (and notched) nut at torch head

- Oxygen hose:

Green

Right-hand threaded nut at torch head

- Check equipment regularly.

- If torch goes out and begins to hiss:

- Shut off fuel supply immediately. (flashback could occur)

- **Flashback**: burning of fuel in the torch mixing chamber and can proceed through the hose to the cylinder. Will cause charring of hose near the torch.



13.5.3 Work Area

- ❑ Remove flammable materials before cutting or welding.
- ❑ Have fire extinguisher available.
- ❑ Sparks and slag can fly 30 feet away.
- ❑ Have good ventilation.
- ❑ Clean up when finished.
- ❑ Properly store equipment when finished.

13.6.0 Confined Spaces

- Must have a permit to enter a confined space.
- Special safety procedures are required:
 - Ventilation
 - Flammable or explosive gases or dust
 - Safety attendant guarding entrance or exit
 - Safety attendant watching work



13.7.0 Construction Ergonomics

- Ergonomics is a critical factor in your long-term health.
- Back injuries and repetitive-motion illnesses are a major concern for the construction industry.
- Take a 15-minute break every 2 hours.
- Break routine frequently (i.e.: flexing hands/ legs).
- Rotate with co-worker, if possible.
- Wear anti-vibration gloves and boots.

13.7.0 Construction Ergonomics

- Get close to the object.
- Bend with your knees, keeping back straight.
- Get a firm grip on the object.
- Lift slowly with your legs.
- Never twist or turn with a load.

13.8.0 Fire Hazards

- Fire is a common hazard at almost all construction sites and industrial facilities.
- This is due to dust, oil, grease combined with welding, flame cutting, grinding, and hot equipment.



13.8.1 How Fires Start

- Three components of a fire.

Fuel – anything that will burn in the presence of heat and oxygen

Heat – anything that raises the fuel's temperature to its flashpoint

Oxygen – the oxidizer that is present in the air

- **Flash point** - the temperature at which a fuel gives off enough gas (vapor) to burn.

13.8.2 Fire Prevention

- The best fire safety procedure is to not let the fire start.
- Work in a well-ventilated area.
- Keep flames (and matches) away from flammable gases and liquids.
- Keep oily rags in an approved self-closing container.
- Store combustible materials in approved containers and at the designated area.

13.8.3 Types of Combustibles

□ Ordinary Combustibles:

- Any common material that easily burns, such as paper, wood, cloth, etc.
- Good housekeeping is the best way to prevent ordinary combustible fires.



13.8.3 Types of Combustibles

□ Liquids:

- Liquids can be flammable or combustible.
- Flammable Liquids – a liquid that has a flashpoint below 100 F.
- Combustible Liquids – a liquid that has a flashpoint at or above 100 F.



13.8.3 Types of Combustibles

□ Gases:

- Flammable gases are compressed in bottles for use.
- The most common being acetylene (cutting torch) and propane (forklifts).
- NEVER allow oil or grease to contact anything that is associated with compressed oxygen.
- THIS INCLUDES THE CUTTING TORCH.



13.8.4 Firefighting

- Do not expect to be an expert firefighter.
- Know your evacuation route.
- Know how to use a fire extinguisher.
- Learn your company's fire safety procedures.

13.8.4 Firefighting

□ **FIRE CLASSIFICATION:**

- Class A – ordinary combustibles
(paper, wood, cloth)
- Class B – flammable liquids
(oil, grease)
- Class C – electrical equipment
(on or near electricity)
- Class D – flammable metals
(not common, but does happen)

13.8.4 Firefighting

□ How to use a fire extinguisher:

Hold extinguisher upright

Pull pin (breaking plastic seal)

Stand 8 to 10 feet from the fire

Aim nozzle at the base of the fire

Squeeze handle together

Sweep nozzle side to side