

MCAA

Mechanical Contractors Association of America

MCAA Safety Manual for Mechanical Fabrication Shop Workers

Second Edition – 2021



MCAA

Mechanical Contractors Association of America

MSCA

Mechanical Service Contractors of America

PCA

Plumbing Contractors of America

NCPWB

National Certified Pipe Welding Bureau

MCAA

MANUFACTURING SUPPLY COALITION
Adding Value to Your Supply Chain

Emergency Response/First Aid

(Use a fine point permanent marker)

Company Name _____

Street Address _____

Fire/EMS Emergency Response # _____

Local Hospital # _____

Poison Control # _____

Name of Company
OCC-Med Provider _____

OCC-Med Provider # _____

Name of Emergency
Action Plan Leader _____

Emergency Action Plan Leader # _____

Police # _____

AED Location _____

Disclaimer

The material in this manual is not intended to provide exhaustive treatment about mechanical fabrication shop safety and health. It should not be used as a substitute for reading and interpreting federal and/or state standards, regulations, or any other pertinent state or local laws, rules, regulations, or standards. Further, it is not intended to provide legal advice. Employers must make independent determinations regarding the need for legal assistance.

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Emergency Response/First Aid

1. Carefully survey the scene and call for help.

- Look for hazards that could harm you and other responders, such as energized electrical conductors, sources of respiratory hazards, fires, or traffic.



2. Do not approach the victim unless it is safe to do so.

3. Send someone to call Emergency Medical Services (EMS) immediately.

- Send a second person to call directly after the first.

4. Protect yourself with medical exam gloves and safety goggles before approaching the victim.

- This equipment, as well as a CPR breathing barrier, can be found in first aid kits for bloodborne pathogen protection.
- A CPR breathing barrier contains a one-way valve and is designed to prevent the rescuer from encountering the victim's bodily fluids.



5. Do not move the victim unless necessary.

- Moving the victim can cause additional harm. Move the victim only if you cannot provide care in the current position/location or if the scene is unsafe.

6. Check the victim for consciousness and breathing.

- Open the victim's airway by tilting the head back and lifting the chin.
- Bend down over the victim's mouth, facing his chest. Look, listen and feel for breathing for 5 to 10 seconds.

7. If the victim is not breathing, begin CPR (see next page for CPR instructions).

- Continue CPR until an automated external defibrillator (AED) and trained operator arrive, the victim begins to move, or EMS responders arrive.

8. If the victim is breathing, check for severe bleeding.

- Scan the victim from head to toe, looking for signs of severe bleeding.

9. Apply direct pressure to wounds to slow the loss of blood.

- Apply direct pressure with a clean dressing or any clean material until bleeding stops, then wrap with a bandage to keep dressing in place.

10. Treat for shock.

- Lay the victim flat on his back and keep his body temperature in the normal range. You may have to cover the person with a coat or jacket.
- Keep the victim comfortable and do not give him anything to eat or drink.

Adult CPR/AED

If You Are NOT Trained in CPR

- 1. Make sure the area around the victim is safe.**
- 2. Check the victim for responsiveness.**
- 3. If the victim is not responsive, call 911 for help.**
 - Specifically request an AED.
- 4. Check for signs of breathing.**
- 5. If the victim is not breathing normally or is just gasping:**
 - Send someone for an AED if one is available.
 - Open clothing.
 - Place the heel of one hand in the center of the chest and the heel of the other hand on top of and parallel to the first hand.
- 6. Give 30 chest compressions**
 - Press down at least 2 inches with each one at the rate of 100 to 120 compressions per minute (just more than 1½ compressions per second).
- 7. Continue compressions until the AED arrives.**
 - 100 to 120 compressions per minute (just more than 1½ compressions per second).
- 8. Turn on the AED and follow the instructions carefully.**

If You Are Trained in CPR

- 1. Make sure the area around the victim is safe.**
- 2. Check the victim for responsiveness.**
- 3. If the victim is not responsive, call 911 for help.**
 - Specifically request an AED.
- 4. Check for signs of breathing.**
- 5. If the victim is not breathing normally.**
 - Send someone for an AED if one is available.
 - Open clothing and give 30 chest compressions, pressing down at least 2 inches with each one at the rate of 100 to 120 compressions per minute (just more than 1½ compressions per second).
- 6. Tilt the head back to open the airway.**
 - Look in the mouth to see if there is an object that can be safely removed. If so, remove the object.
 - Give two breaths watching for the chest to rise and resume compressions.
- 7. Give 30 more chest compressions.**
- 8. Continue with two breaths and 30 compressions until the AED arrives.**
- 9. Turn on the AED and follow the instructions carefully.**

Conscious Choking



1. Call Emergency Medical Services (EMS).

- Send someone to call EMS immediately.

2. Approach the victim.

- Ask the victim if he is choking. If the victim nods “yes” or cannot speak, take immediate action.

3. Prepare to give abdominal thrusts.

- If the victim cannot speak or cough, stand behind him with one foot between his legs.
- Reach around the victim’s abdomen and place your fist, thumb inside, just above the navel but below the ribs. Cover your fist with your opposite hand. (If the victim is pregnant or obese, place your hands in the center of the chest, rather than the abdomen.)

4. Administer abdominal thrusts.

- Thrust inward and upward firmly and quickly. This puts pressure on the victim's diaphragm, helping to force the obstruction out.

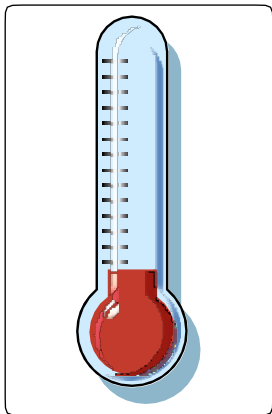
5. Continue abdominal thrusts.

- Continue giving abdominal thrusts until the object is expelled or the victim loses consciousness.

6. Begin CPR.

- If the victim loses consciousness, begin CPR immediately.

Hypothermia



Hypothermia occurs when a person's core body temperature drops well below normal. Symptoms may include uncontrolled shivering, slowed speech, slurred speech, memory lapse and blue lips.

1. Call Emergency Medical Services (EMS).

- As soon as you notice these symptoms, immediately call EMS.

2. Begin warming the victim.

- Take the victim to a sheltered area and remove any wet clothing. Cover the victim with dry clothing, blankets, or other insulating materials.

3. Maintain warmth.

- Insulate the victim's head, underarms, and groin. If available, place a warm hat on the victim's head.

4. Give the victim liquids.

- If the victim is conscious, sitting up and able to drink, give him warm, non-alcoholic liquids.

5. Monitor the victim.

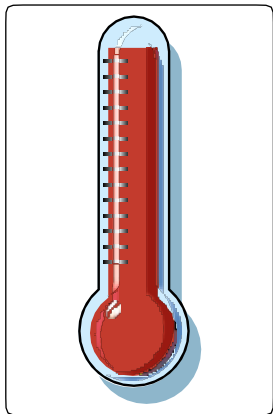
- Carefully monitor the victim's breathing and be prepared to administer CPR.

Heat Stroke

Heat stroke occurs when the body becomes so overheated that it can no longer function properly. Symptoms may include hot, dry, red skin; a strong pulse; or complete lack of perspiration.

1. Call Emergency Medical Services (EMS).

- As soon as you notice these symptoms, send someone to call EMS. **Heat stroke is immediately life threatening.**



2. Begin cooling the victim.

- Move the victim to the coolest available location and remove his outer clothing.

3. Cool with water.

- Cool the victim by sponging him with cold water, wrapping him in cool, wet clothes, and/or placing ice packs near his neck, underarms, and groin.

4. Continue cooling.

- Continue cooling the victim until EMS arrives or the victim's body temperature drops to 100 degrees Fahrenheit.

Heat Exhaustion

Heat exhaustion occurs when an individual is extremely overheated but does not yet have heat stroke. Symptoms may include: heavy perspiration, pale clammy skin, weakness, nausea and headache. If not cared for early, heat exhaustion can lead to heat stroke.

1. Begin cooling the victim.

- Move the victim to a shady, cool place and loosen any tight clothing. Apply cool, wet cloths to the skin. If available, place ice packs in the underarms and groin area.

2. Continue cooling.

- Fan the victim; if he is conscious and upright, give him cool water to drink.

3. Monitor the victim.

- Watch the victim closely and be prepared to call Emergency Medical Services (EMS) if his condition does not quickly improve.

Burns

First-degree Burn

The least serious burn, similar to a sunburn.

- No emergency medical treatment required.

Second-degree Burn

Skin is swollen, intensely red, and may have blotches or weeping blisters. Significantly painful.

- Cool burned skin with room-temperature water for about 10 minutes.
- If necessary, place a wet cloth over the burned skin.
- Promptly remove items such as jewelry and tight clothing that may constrict the area when it starts to swell.
- Cover the burn with a loose dressing.
- Get medical treatment for large burn areas or burns on the face, genitals, hands, or feet.

Third-degree Burn

Charred or white, leather-like skin. Victim may show symptoms of shock.

- Call Emergency Medical Services (EMS). Promptly remove items such as jewelry or tight clothing that may constrict the area when it starts to swell.
- Watch for signs of shock.
- Monitor the victim's breathing and be prepared to administer CPR.

Chemical Burn

Chemical substance on victim's skin causes a burning sensation.

- Wear gloves to protect yourself from contact with the substance.
- Brush dry chemicals off the skin surface.
- Move the victim away from the spill and wash the burned areas with running water for at least 20 minutes.
- Remove any jewelry or tight clothing that may constrict the area.
- Call for EMS if the victim has signs of shock or the burn occurred on the eyes, hands, feet, face, groin, or buttocks.

OSHA

In 1970, Congress passed the Occupational Safety and Health Act to protect workers from occupational safety and health hazards. The Act created the Occupational Safety and Health Administration (OSHA), a federal agency established to create and enforce safety and health standards and regulations. The Act also gave employers and employees certain rights and responsibilities regarding workplace safety and health.

Twenty-six states and two U.S. territories have obtained approval from OSHA to establish their own occupational safety and health enforcement agencies. These states are referred to as state plan states, and they are required to establish standards and regulations that are at least as stringent as those established by federal OSHA. Several of these states have implemented standards and regulations that are even more stringent than those established by federal OSHA. The states with OSHA- approved state plans are listed below (CT, IL, ME, NJ, NY, and Virgin Island plans cover state and local governments only). All other states fall under federal OSHA jurisdiction.

Alaska	Iowa	New Jersey	Tennessee
Arizona	Kentucky	New Mexico	Utah
California	Maine	New York	Vermont
Connecticut	Maryland	North Carolina	Virgin Islands
Hawaii	Michigan	Oregon	Virginia
Illinois	Minnesota	Puerto Rico	Washington
Indiana	Nevada	South Carolina	Wyoming

“Competent Person” Definition

The OSHA “competent person” is an individual who is knowledgeable of applicable standards, able to identify workplace hazards related to the specific operation and has the authority to take appropriate corrective action when necessary.

OSHA Job Safety & Health Protection Poster



Job Safety and Health IT'S THE LAW!

All workers have the right to:

- A safe workplace.
- Raise a safety or health concern with your employer or OSHA, or report a work-related injury or illness, without being retaliated against.
- Receive information and training on job hazards, including all hazardous substances in your workplace.
- Request an OSHA inspection of your workplace if you believe there are unsafe or unhealthy conditions. OSHA will keep your name confidential. You have the right to have a representative contact OSHA on your behalf.
- Participate (or have your representative participate) in an OSHA inspection and speak in private to the inspector.
- File a complaint with OSHA within 30 days (by phone, online or by mail) if you have been retaliated against for using your rights.
- See any OSHA citations issued to your employer.
- Request copies of your medical records, tests that measure hazards in the workplace, and the workplace injury and illness log.

This poster is available free from OSHA.

Contact OSHA. We can help.

Employers must:

- Provide employees a workplace free from recognized hazards. It is illegal to retaliate against an employee for using any of their rights under the law, including raising a health and safety concern with you or with OSHA, or reporting a work-related injury or illness.
- Comply with all applicable OSHA standards.
- Report to OSHA all work-related fatalities within 8 hours, and all inpatient hospitalizations, amputations, and losses of an eye within 24 hours.
- Provide required training to all workers in a language and vocabulary they can understand.
- Prominently display this poster in the workplace.
- Post OSHA citations at or near the place of the alleged violations.

FREE ASSISTANCE to identify and correct hazards is available to small and medium-sized employers, without citation or penalty, through OSHA-supported consultation programs in every state.



1-800-321-OSHA (6742) • TTY 1-877-889-5627 • www.osha.gov

OSHA 3369-10-07

Fabrication Shop Worker Responsibilities

- 1. Comply with all applicable occupational safety and health standards, rules, regulations, and orders established by law, collective bargaining agreements and employers' policies.**
 - This includes safety and health rules and safe work practices established by your employer and applicable federal and state occupational safety and health requirements.
- 2. Avoid exposing yourself to conditions or situations that are hazardous.**
 - If you observe unsafe conditions, report them to your supervisor immediately.
- 3. Report any job-related injury or illness to your supervisor as soon as possible after first aid treatment.**
- 4. Keep your work area clean.**
 - Remove scrap material and trash regularly.
- 5. Store materials and equipment in their designated areas.**
 - Use chocks and blocks to keep pipe and other materials from rolling or falling.
- 6. Keep stairways and walkways clear of trip hazards such as tools, equipment, materials, welding hoses and extension cords.**
- 7. Come to work fully rested and never under the influence of alcohol or illegal drugs.**

8. If you intend to work while under the influence of prescription drugs, inform your supervisor before starting work.

- Working while under the influence of prescription drugs is acceptable only if:
 - Your health care provider is fully aware of the potential job hazards you will face and authorizes you to perform the work while under the influence of the drug(s).
 - Your supervisor authorizes you to work under these conditions. You must provide your supervisor with written authorization from your health care provider.

Fabrication Shop Worker Orientation Statement

Company Name _____

I _____ **(Print Employee Name)** have received the *MCAA Safety Manual for Fabrication Shop Workers* and agree to:

- Read the *MCAA Safety Manual for Fabrication Shop Workers* in its entirety
- Ask my supervisor about anything in the manual that is confusing or unclear
- Comply with all safety and health work practices referenced in the manual
- Immediately report any unsafe and/or unhealthful jobsite work practices, conditions, or situations to my supervisor
- Immediately inform my supervisor of any workplace injuries that I sustain

I understand that this manual does not cover every conceivable workplace hazard and occupational safety and health rule, standard or regulation. Therefore, I agree to comply with occupational safety and health work practices and applicable safety and health rules, standards and/or regulations that are not addressed in this manual to protect myself from workplace hazards.

Employee Signature _____

Date _____

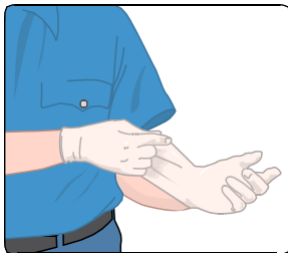
Bloodborne Pathogens

Bloodborne pathogens are microorganisms in human blood and other body fluids that cause diseases such as hepatitis B (HBV) and acquired immunodeficiency syndrome (AIDS).

Safe Work Practices

General:

- Be aware of bloodborne pathogen hazards when responding to an injury.
- Use the appropriate personal protective equipment (PPE) to prevent human blood and body fluids from contacting your eyes, nose, mouth, or open cuts, punctures, or abrasions in the skin.



Wear:

- Safety glasses or goggles.
- Medical exam gloves (use latex-free gloves if you have a latex allergy).
- A surgical mask that covers your nose and mouth, or a face shield.
- Thoroughly wash your hands and face with warm, soapy water immediately after exposure to human blood or body fluids.

Carbon Monoxide

Carbon monoxide is a colorless, odorless, tasteless gas generated by internal combustion gasoline and diesel engines and some hot work operations such as welding.

General:

- When working around sources of carbon monoxide, ensure that the area is well ventilated.
- If the area does not appear to be well ventilated, leave it immediately and seek fresh air. Your body's senses cannot help you determine whether carbon monoxide is present.

Common Chemical Substances

Chemical substances, such as caustics, solvents, paints, glues, adhesives and cements are used for a variety of fabrication shop work tasks.

General:

- Protect yourself from these substances by ensuring that they do not enter your body.
- Use the proper personal protective equipment such as gloves, goggles, face shields, aprons and, when necessary, respirators to keep from inhaling, ingesting, injecting, or absorbing chemical substances into your body.

Compressed Air

Compressed air is air forced into containers under extreme pressure.

General:

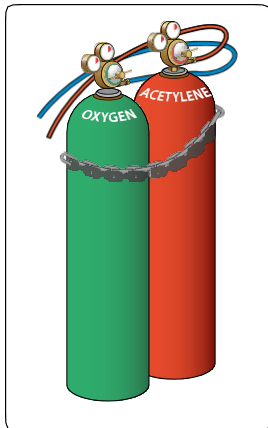
- Before using compressed air for cleaning, ensure there are no hazardous substances that could become airborne when compressed air is released.
- Reduce the pressure to less than 30 pounds per square inch (psi) before using compressed air for cleaning.
- Wear chip guarding and safety glasses when using compressed air for cleaning.

Compressed Gas Cylinders

Compressed gas cylinders are containers of gases that have been reduced in volume by pressure. Some common compressed gases in the mechanical construction industry are acetylene, oxygen, nitrogen and propane.

General:

- Protect yourself and others from fire, explosion and struck-by hazards caused by inappropriate use or treatment of compressed gas cylinders.
- Keep compressed gas cylinders secured in an upright position always.
- Close the cylinder valves as soon as work is completed, when cylinders are empty, and before transporting, moving, or storing the cylinders.
- Before transporting, moving, or storing compressed gas cylinders, make sure that the valve protection caps are in place.



Storage:

- Store cylinders in a dry, well-ventilated area at least 20 feet from combustible materials.
- Store oxygen cylinders at least 20 feet from fuel gas cylinders such as acetylene or separate them with a ½-hour noncombustible barrier at least 5 feet high.

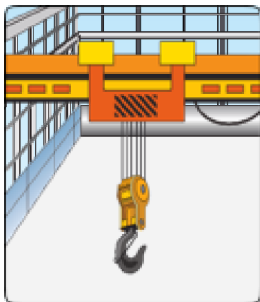
- Never store cylinders in gang boxes, lockers, or other poorly ventilated areas.
- Store gas hoses in dry, well-ventilated areas.

Operational Use:

- Keep cylinders away from ignition sources such as sparks, hot slag, and flames, or isolate them with fire-resistant shields.
- Also keep cylinders away from all sources of electricity, so they will never become part of an electrical circuit.
- Keep cylinder valve wrenches in place while the valves are open so they can be shut off quickly if necessary.
- Inspect regulators and torches before each use. Do not use them if they appear damaged.
- Do not use regulators or torches that appear to be malfunctioning. Immediately follow your company's procedure for taking defective equipment out of service.
- Use only friction lighters to ignite torches.

Cranes (Overhead & Gantry)

Mechanical fabrication shop overhead and gantry cranes are bridge-like structures designed for lifting and moving heavy materials.



General:

- Never operate a crane or derrick without the proper qualifications/certifications.

Prior to Operation:

- Ensure that a qualified person has inspected the crane and rendered it safe for operation.
- Verify that the rated load capacity is posted and visible on each side of the crane.
- Clear the pathway to the drop location.

Operation:

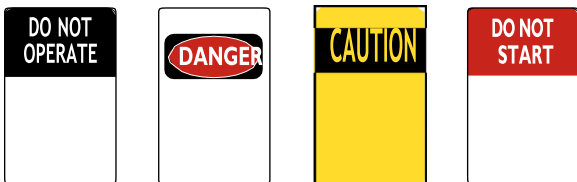
- Never exceed the load capacity.
- Alert all affected persons that the load is prepared for lifting/moving.
- Confirm that the pathway to the drop location is clear.
- Control the load when lifting, moving, and lowering it.

Damaged Equipment

Damaged equipment is any equipment that is damaged to the extent that it could cause worker injury or property damage.

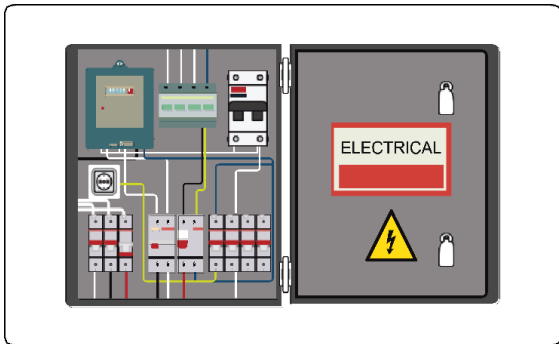
General:

- Carefully inspect all equipment before each use.
- If you do not see damage, test the equipment to determine whether it is functioning properly.
- If you do see damage, or if the equipment is not functioning properly, immediately follow your company's procedure for taking defective equipment out of service.
- Identify it as unsafe to use by locking or tagging out the controls, or by tagging and physically removing the equipment from the jobsite.



Damaged Equipment Tags

Electrical Safe Work Practices



Electrical safe work practices are procedures established to protect workers from electrical shock and arc flash hazards when working with or near sources of electricity, or tools and equipment powered by electricity.

General:

- Implement all safe work practices necessary to protect yourself from electrocution, shock, burns, arc flashes and arc blasts.
- Never work on or near exposed energized electrical conductors or circuit parts.
- Avoid all unprotected high-voltage sources.

Before Starting Work:

- Verify that the extension cord you will be using is rated to accept the maximum current (amps) pulled by the portable power tool you will be operating.
- Carefully inspect all tool and equipment cords, extension cords and plugs for damage and

excessive wear such as broken or exposed wires and missing ground terminals.

- When you come across damaged electrical cords, tools, or equipment, immediately follow your company's procedure for taking defective equipment out of service.
- Never attempt to repair a damaged cord with electrical tape or any other materials.

While Working:

- Protect extension cords and tool and equipment cords from damage due to vehicle traffic, sharp building materials, pinch points such as doorways, and other potential sources of damage.

Emergency Action Plans

An emergency action plan is a set of written procedures for responding to emergencies that could occur at a workplace.

General:

- Make sure that you are familiar with your company's fabrication shop emergency action plan.

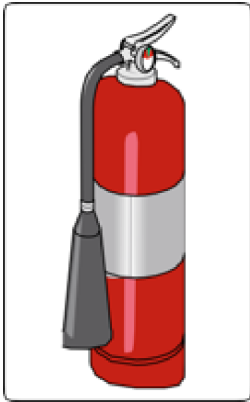


Specifics:

- Understand who to report to and how to report fires, chemical spills, work-related injuries and illness, and other fabrication shop emergencies.
- Learn the established emergency evacuation routes and procedures.
- Know the name of the person who will account for the building's workers and other occupants and where to meet that person if an emergency occurs.
- Be sure you can always quickly access a telephone and emergency telephone numbers.
- Know the address of the facility and how to guide emergency medical or rescue personnel to an incident using easily identifiable, established landmarks.
- Never attempt a rescue in any potentially hazardous area. Instead, contact emergency medical and rescue services and direct them to the incident.

Fire Prevention & Protection





Fire prevention and protection are safe work practices and procedures to help prevent fires from occurring, and to protect workers and property from unnecessary damage if a fire does occur.















General:

- Smoke only in designated smoking areas.
 - Be familiar with all fire exits and fire alarms.
 - Remove combustible items from your work area frequently.
 - Dispose of oily, greasy, or paint-soaked rags or towels only in approved metal containers with self-closing lids.
-
- Keep solvents and other flammable/combustible materials in approved, properly labeled containers, and store them in a proper location.
 - Keep ignition sources such as sparks, flames, and excessive heat away from solvents and other flammable/combustible materials.
 - Turn off internal combustion engines used to power vehicles, generators, or other equipment before refueling.
 - Report fire hazards to your supervisor immediately.
 - Know how to quickly access emergency telephone numbers and the nearest telephone.

Fire Protection Equipment:

Letter	Symbol	Type of Material	Examples of Materials
A		Common Combustibles	Wood, Paper, Cloth, etc.
B		Flammable Liquids and Gases	Gasoline, Propane and Solvents
C		Live Electrical Equipment	Computers, Fax Machines, etc.
D		Combustible Metals	Magnesium, Lithium, Titanium, Sodium, Aluminum Powder

- Make sure that firefighting equipment is easy to locate and readily accessible.
- Ensure that you can quickly and easily access a Class ABC fire extinguisher from all work areas.
- Keep a Class ABC fire extinguisher readily accessible when welding, torch cutting, brazing, soldering, grinding and in other hot work areas.
- Keep a Class ABC fire extinguisher readily accessible when welding, torch cutting, brazing, soldering, grinding and in other hot work areas.

Multi-Class Fire Extinguishers			
AB			
AC			
BC			
ABC			

In Case of Fire:

- Warn others in the area about the fire.
- Attempt to extinguish smaller fires with the proper fire extinguisher.
- If the fire is large, sound the fire alarm immediately and evacuate the building or structure.
- Call the fire department and give accurate directions to the fire.
- Post someone to meet the fire department and direct them to the fire.
- Cut off electrical power, but only if it is safe to do so.

Flammable/Combustible Liquids/Materials

Flammable/combustible materials are materials with low flash points that can easily ignite if exposed to an ignition source.

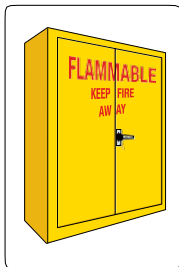
General:

- Store flammable/combustible liquids in approved, properly labeled containers with self-closing lids.
- Never use flammable liquids within 50 feet of an ignition source.
- Never store more than 25 gallons of a flammable/combustible liquid in a room outside of an approved storage cabinet, and never allow more than three storage cabinets in a single storage area.
- Keep flammable/combustible liquids in closed containers when not in use.
- Store flammable/combustible waste materials in approved containers with self-closing lids and properly dispose of the waste regularly.



Storage Cabinets:

- Use only approved storage cabinets designed specifically for flammable/combustible liquid storage.
- Make sure that storage cabinets for flammable/combustible liquids are labeled as follows: "FLAMMABLE – KEEP FIRE AWAY."



- Check the Safety Data Sheets (SDS) to determine whether liquids are potentially flammable or combustible.
- Ensure that no more than 60 gallons of a flammable liquid or 120 gallons of a combustible liquid are stored in a single cabinet.

Inside Storage:

- Do not smoke around flammable materials storage areas.
- Before storing flammable/combustible materials inside a building, make sure the building is fire resistant, has self-closing doors at all openings, and has at least 4-inch-high sills or depressed floors. Also, be sure the electrical wiring and equipment are approved for flammable materials storage areas.
- Make sure the ventilation system is providing complete air exchanges at least 6 times an hour.

Outside Storage:

- Ensure that flammable/combustible materials are stored to allow a 12-foot-wide access way for emergency fire control equipment.
- Do not store flammable/combustible materials near areas used for exits or near stairways.
- Stack combustible materials in piles no more than 20 feet high.
- Make sure outdoor storage containers contain no more than 60 gallons of flammable/combustible liquids and that no more than 1,100 gallons are stored in any one area.
- Ensure that stacks of flammable/combustible materials are separated by at least 5 feet and are

stored at least 20 feet from a building.

- Make sure that outside storage areas for flammable/combustible liquids are graded or diked so that a spill would be diverted away from the building.
- Do not smoke in outside flammable/combustible storage areas.

Liquefied Petroleum (LP) Gas Storage:

- Ensure that “NO SMOKING” signs are displayed on LP storage tanks.
- Turn off equipment before fueling.
- Protect LP gas tanks from vehicular traffic.
- Ensure that all electrical connections including pumps and switches are vapor- and explosion-proof.

Forklifts & Other Powered Industrial Trucks

General:

- Be sure that you receive the proper training and are authorized by your company to operate the forklift or other powered industrial truck.
- Always turn off the motor or engine before fueling or recharging the vehicle.



Operation:

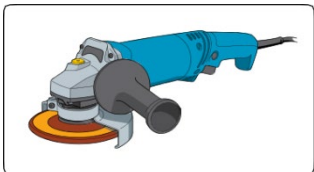
- Never allow the load to obstruct your view.
- Operate the vehicle only at safe speeds.
- Start and stop slowly so the load will not shift.
- Make your turns slowly, smoothly, and gradually.
- Adjust your speed and driving behavior based on the surface conditions.
- If conditions are wet or muddy, slow down even more than you would on a dry surface and allow more time and distance for stopping.
- Maintain at least three vehicle lengths behind the vehicle ahead of you when the surface is dry. Increase this distance on wet or muddy surfaces.
- Use the horn when approaching an intersection, blind spot, or other potentially hazardous location.
- In hazardous locations, mount mirrors to see pedestrians and oncoming traffic.
- Never allow anyone to ride as a passenger on the vehicle.
- Never raise or lower the load while the vehicle is

moving.

- Do not exceed the rated load capacity of the vehicle.
- Watch constantly for overhead obstructions.
- Keep well away from overhead power lines.
- Never use a vehicle as an elevator.
- Always turn off the motor or engine if you intend to leave the seat.
- Keep the vehicle going straight up or straight down ramps. Never turn it sideways on an incline.
- If you must leave a vehicle on an incline, block or chock the wheels.
- Always keep the load on the uphill side. Drive forward when going uphill and backwards when going downhill.
- Never allow a vehicle with an internal combustion engine to operate or idle in an enclosed area.
- Always drive with the load tilted back and the forks raised just enough to clear the load, but not more than necessary.
- Tie or block round materials that could otherwise roll off.
- Transport compressed cylinders in specially designed racks to protect them and keep them upright.
- Never allow anyone under the elevated portion of a vehicle, even when there is no load.

Grinding

Grinding is the process of removing particles from an object with a powered, rotating abrasive wheel.



General:

- Verify that there are guards in place on your bench and stand grinders before using them.
- Ensure that the adjustable work rest is in place on bench and stand grinders, and the rest adjustment does not exceed a clearance of 1/8-inch from the surface of the abrasive wheel.
- Ensure that your portable grinder has guards in place unless the grinding wheel is 2 inches or less or is completely inside the work.
- Ensure that the guards cover spindle ends, nuts, and flange projections.
- Make sure the guards are strong enough to withstand the force of a bursting abrasive wheel by using only those guards provided by the manufacturers.
- Never operate an angle grinder without the handle secured in place. The handle can be adjusted as needed but should never be removed.
- Before mounting any abrasive wheel, inspect it carefully and ring test it to ensure that it is not defective.
- Check that abrasive wheels are properly matched to the RPM rating of the grinder, so the wheel or disk does not shatter.
- Wear safety glasses and a face shield when grinding.
- Turn off portable grinders and let the moving parts stop before putting the grinder down.

Hand & Power Tools


Hand and power tools are implements and machines used by workers to complete work tasks.

General:

- Never bypass a tool manufacturer's safety guard or device.
- Carefully follow the tool manufacturer's instructions for maintenance and tool repair.
- Keep all tools clean and in good condition.
- Carefully inspect all tools before using them.
- If you see damage, immediately follow your company's procedure for taking defective equipment out of service.
- Use only the proper size and type of tool for each job.
- Never use impact tools such as drift pins, wedges, and chisels if they have mushroomed heads.

Power Tools:

- Before servicing power tools, make sure to unplug or otherwise de-energize them.
- Do not use electrical cords to raise or lower tools from one level to another.
- Never yank on an electrical cord to unplug it. Grasp the plug and carefully remove it from the receptacle.
- Ensure that point of operation guards are properly in place before using the tool.

- Make sure your tools are properly grounded or double insulated before using them. To determine whether a tool is double insulated, look for the words “Double Insulated” or look for the double insulation symbol, which is a small square inside a larger square. 
- Check that the on/off switch is in the “off” position before plugging in any tool.
- Carefully inspect the insulation on electrical cords, including extension cords and welding leads. If insulation is damaged, immediately follow your company’s procedure for taking defective items out of service.
- Use a ground fault circuit interrupter (GFCI) when operating power tools in damp locations.
- Keep moving parts away from your body.
- Ensure that your power tool is off and moving parts have stopped before putting it down.

Hazard Communication

Hazard communication, also referred to as “Worker’s Right to Know,” is a system established to protect workers from inhaling, swallowing, injecting and absorbing harmful chemicals into their bodies.

General:

- Understand that you have the right to know about hazardous chemicals that you could be exposed to on a jobsite.
- Pay close attention to your hazard communication training so you will know how to work safely around hazardous chemicals.
- Request a copy of your company’s written hazard communication program and read it carefully. Make sure you know where the program is filed on the jobsite and how to access it quickly.
- Know where to quickly access Safety Data Sheets (SDS) on the jobsite and be sure you can find them quickly.
- Learn how to read an SDS. The most important parts of an SDS:
 - Identify the substance (section 1).
 - Describe the hazards associated with the substance (section 2).
 - Describe first aid procedures in case of exposure (section 4).
 - Describe how to protect yourself from the hazards (section 8).
- Learn how to read hazard warning labels.

Labeling:

- Make sure that all containers are properly labeled. The only exception to this rule is when you transfer a chemical substance into a secondary container and the substance will be used immediately and entirely. When in doubt, label the container.

Required Label Safety Components:

- **Hazard Statement**—A hazard statement is a statement assigned to a specific hazard class and category that describes the nature of the hazard.
- **Precautionary Statement**—A precautionary statement is a phrase that describes the recommended measures to be taken to minimize or prevent adverse effects resulting from exposure to a chemical, or improper storage or handling of a hazardous chemical.
- **Signal Words**—A signal word is one word used to indicate the severity of hazard and alert the reader to a potential hazard. The required signal words are “Danger” or “Warning.” “Danger” is used for the more severe hazards. “Warning” is used for less severe hazards.
- **Pictograms**—A pictogram is a symbol and other graphic elements intended to convey specific information about the hazards of a chemical. There are a total of eight pictograms required for labels by OSHA. The environment pictogram is not required since environmental issues do not fall under OSHA’s jurisdiction.

HAZARD COMMUNICATION

GHS - Pictograms and Hazards

Health Hazards

Prolonged exposure to these chemicals may cause health problems like cancer and birth defects.



- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity

Flame

Flammable chemicals that can burst into flame.



- Flammables
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides

Exclamation Mark

Chemicals that can cause immediate health effects like skin rashes or respiratory irritation.



- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity
- Narcotic Effects
- Respiratory Tract Irritation
- Hazards to Ozone Layer (Non-Mandatory)

Gas Cylinder

Gases under pressure which can explode or propel the cylinder if it is heated, ruptured or leaking.



- Gases Under Pressure

Corrosion

Chemicals that can seriously damage skin and eyes.



- Skin Corrosion/Burns
- Eye Damage
- Corrosive to Metals

Exploding Bomb

Chemicals that can blow up.



- Explosives
- Self-Reactives
- Organic Peroxides

Flame Over Circle

Chemicals that cause other materials to catch fire or explode.



- Oxidizers

Skull and Crossbones

Chemicals with acute toxicity which could be fatal or toxic.



- Acute Toxicity (fatal or toxic)

Hexavalent Chromium

Chromium is a heavy metal component of stainless steel. When it's heated to a certain point during welding or torch cutting operations, it converts to its hexavalent state and becomes airborne where it can be inhaled. Hexavalent chromium can increase the risk of lung cancer if inhaled in significant concentrations over a long enough period of time.

General:

- When performing hot work on stainless steel, or when working with someone else who is, be sure to protect yourself from overexposure to hexavalent chromium.

Operation:

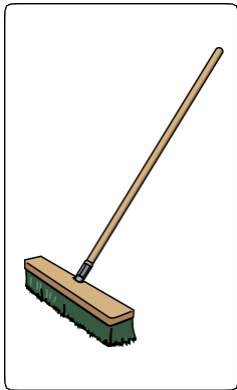
- Make sure the work area in the shop is well ventilated.
- Use a point-of-operation ventilation system, such as a welding fume extractor whenever it is available.
- Always position your welding helmet so that the fumes cannot rise underneath it.
- If your company's hexavalent chromium exposure assessment shows that you could be overexposed without respiratory protection, be sure to wear an appropriate respirator.
- Before starting to work while wearing a respirator, you will need to pass a medical evaluation, receive proper respiratory protection training, and be fit tested to ensure that the respirator you will be using is sufficiently effective.

Housekeeping

Housekeeping is the process of keeping the work area properly organized and clean.

General:

- Keep materials in the work area properly organized.
- Regularly dispose of scrap materials and trash as the work progresses each day.
- Focus on keeping slip and trip hazards away from walking/working surfaces.
- Do not leave tools lying around. When not using them, put them in your toolbox or other designated safe location.
- Whenever possible, keep hoses, power cords, welding leads and other trip hazards from lying across heavily traveled work areas or walkways.
- Regularly dispose of greasy or oily rags and other combustible materials in approved containers with self-closing lids.



Ladders

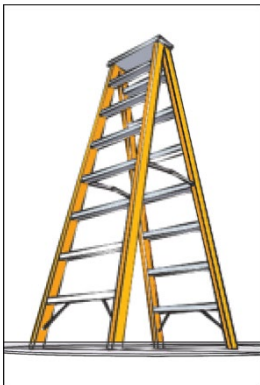
Ladders are specially designed equipment used by workers to safely reach objects overhead.

General:

- Get ladder safety training before using any ladder.
- Carefully inspect each ladder before use.
- If you discover any defects, do not use it. Immediately follow your company's procedure for taking defective equipment out of service.
- Never exceed the ladder's maximum load capacity.
- Always face the ladder when climbing up or down and maintain a constant three-point contact (e.g., two hands and one foot or two feet and one hand on the ladder always).
- Never carry tools, materials or equipment in your hands when climbing up or down a ladder.
- Never reach out too far from a ladder. Get down and move it so you will not have to reach too far.
- Make sure that all ladders are used only for their intended purpose.
- Use ladders with non-conductive side rails, especially when working near sources of electricity.
- Do not let ladders contact overhead power lines.
- Do not use painted ladders—paint can hide ladder defects.
- Protect ladders in doorways and passageways so they will not get bumped or knocked over.

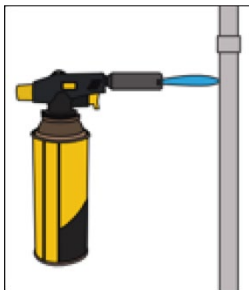
Portable Stepladders:

- Open stepladders fully and lock them in the open position before using them.
- Never use a stepladder as a straight ladder.
- Do not climb higher than the second rung from the top of a stepladder.



Lead

Lead is a heavy metal that can cause serious health problems if inhaled in significant concentrations. It is a cumulative poison that can stay in the human body for decades. Lead can cause chronic health problems such as birth defects, reproductive system damage, seizures, coma and death. Lead exposure in fabrication shops is most likely to come from soldering operations.



General:

- When performing hot work with lead, or when working near someone else who is, be sure to protect yourself from overexposure to lead.

Operation:

- Make sure the affected work area in the shop is well ventilated.
- Use a point-of-operation ventilation system, such as a metals fume extractor, whenever available.
- If your company's lead exposure assessment shows that you could be overexposed without respiratory protection, be sure to wear an appropriate respirator.
- Before starting to work while wearing a respirator, you will need to pass a medical evaluation, receive proper respiratory protection training, and be fit tested to ensure that the respirator you will be using is sufficiently effective.

Liquefied Petroleum (LP) Gas

LP gas is a mixture of gases that change into liquid under moderate pressure. In the mechanical construction industry, it is used to fuel temporary heaters and other equipment.

General:

- Check containers, valves, connectors, manifold valve assemblies and regulators to ensure they are the proper system components.

- Make sure that each container and vaporizer has approved safety relief valves.


- Verify that LP gas cylinders have an excess flow valve to minimize the flow of gas if the fuel line becomes ruptured.

- Never store LP gas inside buildings.

- Make sure there is a Class ABC fire extinguisher wherever LP gas is stored.

LIQUEFIED PETROLEUM GAS

DANGER



HAZARD STATEMENT

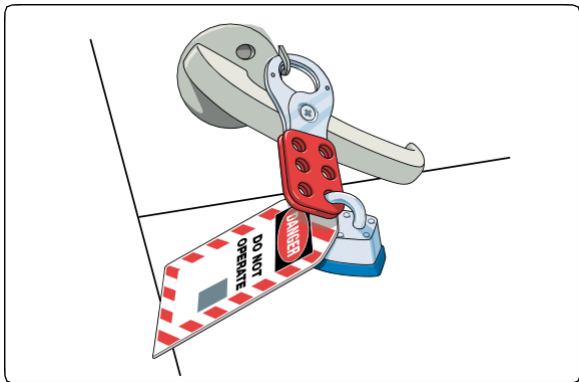
- Extremely flammable gas
- Gases under pressure – liquefied gas
- Gas may reduce oxygen in confined spaces

PRECAUTIONARY STATEMENT

- Keep away from heat/sparks/open flames/hot surfaces – no smoking
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
- Eliminate all ignition sources if safe to do so.
- Protect from sunlight. Store in well-ventilated place.

SEE THE SDS FOR MORE INFORMATION.

Lockout/Tagout



Lockout/tagout is a method of controlling hazardous energy during the servicing or maintenance of machines, power tools and equipment. The types of energy that generate hazards in the mechanical construction industry are electrical, mechanical, thermal, pneumatic and chemical.

General:

- Make sure that you have the proper training on lockout/tagout before you use the method, and before you work where others could be using it.
- Lockout sources of uncontrolled energy so they cannot be unexpectedly released when servicing or performing repairs or maintenance work on machines, power tools or equipment.
- On the rare occasion where it is not possible to use a lockout device, use an appropriate warning tag in place of the lock.

Machine Guarding

Machine guarding is a term describing devices designed to protect machine operators' hands and fingers from the machinery's point of operation. The devices can be barriers, two-hand tripping devices, electronic safety devices and other similar devices.

General:

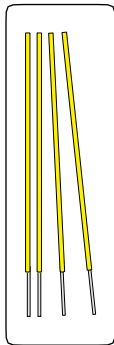
- Before using any fabrication shop machine for the first time read the operator's manual to become familiar with the machine's guarding system(s).

Operation:

- Before starting to prepare a machine for the work, make sure that it is secured in place so that it will not walk or move once work begins.
- Each time before using the machine, make sure the machine's moving parts, such as revolving wheels, pulleys, drums, gears, sprockets, chains, etc., are properly enclosed according to the manufacturer's instructions.
- Also, each time before using a machine, ensure that there is a suitable guard(s) established at the machine's point of operation.
- Make sure the guard(s) is in good condition.
- Check the guard(s) to ensure that it is properly attached and secured in place.
- When necessary for protection, and always when recommended by the machine's manufacturer, use special hand tools to place and remove material from the machine.

Manganese

Manganese is a metal used in many welding rods. There are higher concentrations of manganese in carbon steel rods than in stainless steel rods, but both types can contain small amounts of the metal. Manganese becomes airborne as a part of the welding fumes where it can be inhaled. Overexposure usually takes place in poorly ventilated areas and can lead to problems in the human nervous system, such as tremors, loss of balance, poor memory, slurred speech and sleep disorders.



General:

- Before beginning a welding operation, always determine whether the welding rods you will be using contain manganese by checking the appropriate Safety Data Sheet (SDS) and looking at the ingredients in Section #3.

Operation:

- Make sure the affected work area is well ventilated.
- If necessary, use portable blowers or fans to improve ventilation in the affected area.
- If you cannot get the area properly ventilated, you may need to wear a respirator. Before starting the work, check with your supervisor to determine whether respiratory protection is needed.
- Before starting to work while wearing a respirator, you will need to pass a medical evaluation, receive proper respiratory protection training, and be fit tested to ensure that the respirator you will be using is sufficiently effective.

Noise

Noise is constant in fabrication and it can be harmful if exposure is excessive for a long enough period. Hearing damage is permanent.

General:

- When the noise level exceeds the point that you cannot understand a normal, conversational speaking voice within 3 feet of where you are working, the noise level may be excessive and potentially harmful.



Operation:

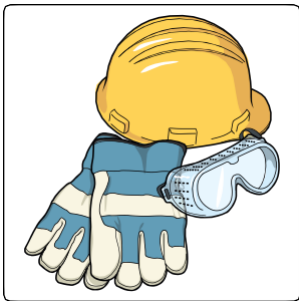
- When working with power tools or machinery that could generate excessive noise, be sure to use hearing protection, such as earplugs or earmuffs.
- If you are working near any shop operation generating noise levels that could be harmful, be sure to use hearing protection.
- Choose hearing protection that is comfortable to use.
- When using earplugs, make sure they are clean.
- Be sure to replace disposable earplugs immediately after use and replace them with new ones the next time you need them.
- Select hearing protection with a suitable noise reduction rating (NRR), but which does not prohibit you from hearing a warning alarm or another person's warning shout.

- When choosing hearing protection devices, check the packaging to determine the NRR.
- Use a noise level meter or noise dosimeter to determine the noise level.
- If measuring instruments are not available, gauge the noise level based on the noise levels of tools, machinery, or equipment that you are familiar with, such as:
 - Air Compressors—around 90 decibels.
 - Circular Saws—around 100 decibels.
 - Gas Powered Lawnmowers—around 100 decibels.
 - Gas Powered Chain Saws—around 100 decibels.
- Make sure that what you choose will reduce the noise level to an acceptable range based on the length of time you anticipate being exposed to it.
- Never exceed noise levels based on the following exposure duration information.

Duration Per Day/Hours	Sound Level in Decibels
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or Less	115

Personal Protective Equipment

Personal protective equipment is designed to protect workers from workplace hazards in situations where engineering controls and other established methods are not feasible or effective.



Body Protection:

- Wear flame-resistant, long-sleeved shirts and pants.
- Wear an approved coverall or apron when welding or flame torch cutting.

Eye and Face Protection:

- Wear approved safety glasses or goggles always while in the shop.
- Wear a face shield to protect your face from flying particles, grinding sparks, chemical splashes, and other potential hazards.
- Always wear safety glasses under your face shield or welding helmet.
- Make sure that you have the properly shaded lens or lenses when exposed to radiant energy (light), such as when welding, torch cutting, soldering, or brazing.

Foot Protection:

- Wear work shoes or boots with built-in toe protection.

Hand Protection:

- Wear the proper gloves when moving materials or working with sharp objects or material such as sheet metal.
- Wear the proper type of impermeable gloves for work around chemicals.

Head Protection:

- Wear a hardhat anytime there is an overhead struck by hazard, such as pipe suspended from an overhead crane.

Hearing Protection:

- Wear approved earplugs or earmuffs whenever you are exposed to loud noise. The noise level next to an operating air compressor or circular saw is too loud to safely endure over extended time without hearing protection. If you cannot hear someone speaking in a normal tone 3 feet or less away from you, use hearing protection.
- If you are unsure about the noise level in your work area, wear the approved hearing protection.

Respiratory Protection:

- Ensure you have the proper respiratory protection training before using any respirator.
- Request a copy of your company's respiratory protection program and follow it closely.
- Participate in the respirator selection process to ensure you are using the proper type and class of

respirator.

- Only use respirators approved by the National Institute for Occupational Safety and Health (NIOSH). Look for “NIOSH” on the respirators.
- Go through a formal respirator fit testing process to select a properly fitting respirator.
- Where applicable, conduct a negative and positive pressure check each time you put on a respirator, and before you enter the contaminated area. If either test fails, do not use the respirator. Report to your supervisor immediately for another formal fit test.

Pneumatic Tools

Pneumatic tools are tools powered by compressed air.

General:

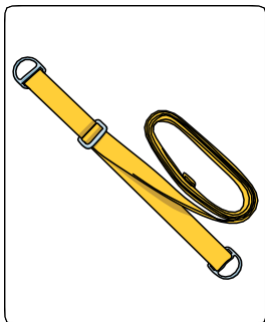
- Check the manufacturer's safe operating pressure for each tool or fitting before using it.
- Never exceed the established safe operating pressure for the tool or fitting.
- Properly secure the hose to the compressor before attaching the tool or fitting.
- Properly secure tools to their hoses before using them.
- Use safety clips or retainers on pneumatic impact tools to keep the attachments from being expelled.
- Ensure that the system is equipped with a pressure reduction device at the source of supply or branch line when hoses exceed ½ inch in diameter.

Rigging & Materials Handling

Rigging and materials handling and storage is the process of lifting, moving, carrying, placing and storing construction materials and equipment.

General:

- Check the load capacities, operating speeds, and other instructions before using hoists or rigging equipment.
- Rig the load so that it will be lifted straight up.
- Place the hook directly over the load.
- Keep your hands away from pinch points when the lift starts.
- Stay out from under the load always.
- Use tag lines to control the load.
- Watch the placement of your feet when receiving a load.
- Stop immediately if anything appears unsafe.



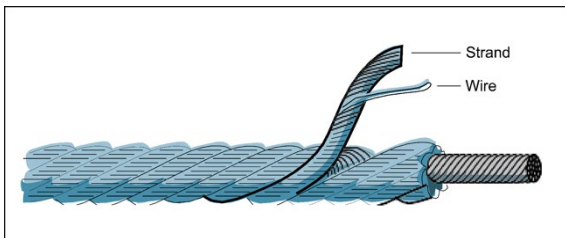
Alloy Steel Chain Slings:

- Carefully inspect each sling before use.
- If you see stretching, excessive wear, nicks and/or gouges, immediately follow your company's procedure for taking defective equipment out of service.

Look for a permanently attached identification tag on each sling stating the size, grade, rated capacity and

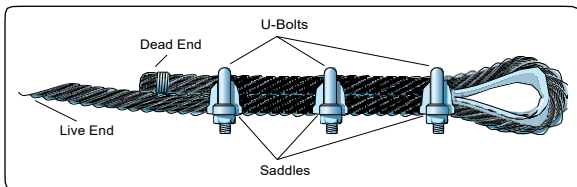
the name of the sling manufacturer. If the identification is not attached, immediately follow your company's procedure for taking defective equipment out of service.

Wire Rope Slings:



- Carefully inspect each sling before use.
- If you see signs of wear such as crushed sections, corrosion, kinking and/or an excessive number of broken wires, immediately follow your company's procedure for taking defective equipment out of service.
- A rope is defective if:
 - There are 5 or more broken wires in 1 rope lay.
 - There are 3 or more broken wires in 1 strand of 1 rope lay.
- Check the manufacturer's stated load capacities before using any sling.
- Never exceed the sling's load capacity.
- Install wire rope clips properly. Use the correct size and number of clips.

- Never install U-bolts on the live end of the wire rope. The live end is where the saddle goes, so remember, “Never Saddle a Dead Horse.”



Number and Spacing of U-Bolt Wire Rope Clips

Improved plow steel rope diameter (inches)	Number of clips		Minimum Spacing (inches)
	Drop forged	Other material	
½ (1.27 cm)	3	4	3 (7.62 cm)
⅝ (.625 cm)	3	4	¾ (8.37 cm)
¾ (.75 cm)	4	5	4½ (11.43 cm)
⅞ (.875 cm)	4	5	5¼ (12.95 cm)
1 (2.54 cm)	5	6	6 (15.24 cm)
1⅛ (2.665 cm)	6	6	6¾ (15.99 cm)
1¼ (2.79 cm)	6	7	7½ (19.05 cm)
1⅝ (2.915 cm)	7	7	8¼ (20.57 cm)

Natural Rope and Synthetic Fiber Slings:

- Carefully inspect each sling before use.
- If you see abnormal wear, powdered fibers between strands, broken fibers, variations in the size of the strands, variations in the roundness of strands, discoloration or rotting, and/or distortion of hardware in the sling, immediately follow your company’s procedure for taking defective equipment out of service.

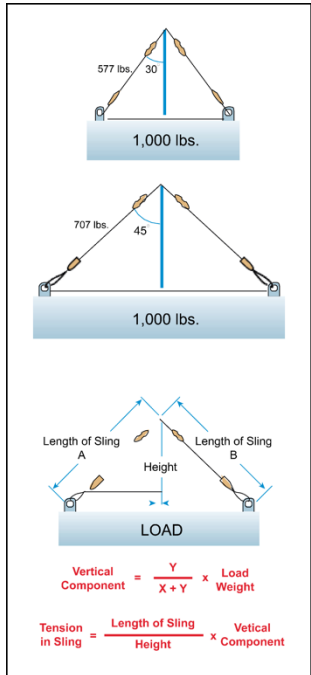
- Check the manufacturer's stated load capacities before using the slings. Never exceed the sling's load capacity.
- Ensure that any splices made to rope slings are in complete accordance with the manufacturer's recommendations.

Synthetic Webbing:

- Carefully inspect each sling before use.
- If you see acid or caustic burns, melting or charring of any part, snags, punctures, tears, or cuts, broken, or worn stitches, and/or distortion of fittings, immediately follow your company's procedure for taking defective equipment out of service.
- Check for marks or codes on each sling that state the name of the manufacturer, its trademark, the rated capacity for the type of hitch, and the type of material. If this information is not shown, immediately follow your company's procedure for taking defective equipment out of service.

Sling Angles:

- Verify that each sling can support the load based on the projected horizontal angle of the sling during the lift.
- Calculate the sling tension before the lift to ensure that it can support the load.



Material Storage:

- Make sure that all materials stored in tiers are secured to prevent sliding, falling or collapse.
- Never store materials in passageways or aisles, or where they could obstruct exits.
- Do not stack materials so high that they could fall.
- Ensure that pipe that is not on a rack is stacked and blocked so it will not spread.
- Never place materials within 6 feet of any hoist areas or floor opening, or within 10 feet of an unfinished exterior wall inside unfinished buildings.
- Store materials safely based on their flammability and/or combustibility characteristics.

Manual Material Handling:

- Have materials delivered as close to your work area as possible.
- Have the materials staged at waist level to reduce bending.
- Use material moving equipment whenever possible.
- Use proper lifting techniques when you must lift something.

Manual Lifting Techniques:

- Start by getting your body as close to the object as possible.
- Position your feet and get a good grip on the object.
- Keep your butt down and your head up to retain the natural curves of your back.
- Lift straight up with a slow, steady movement, letting your legs do the work.
- Never twist or turn your torso with your feet planted.
- When you turn, move your feet and body without twisting.
- When placing an object, reverse the order, remembering to keep your butt down and your head up.



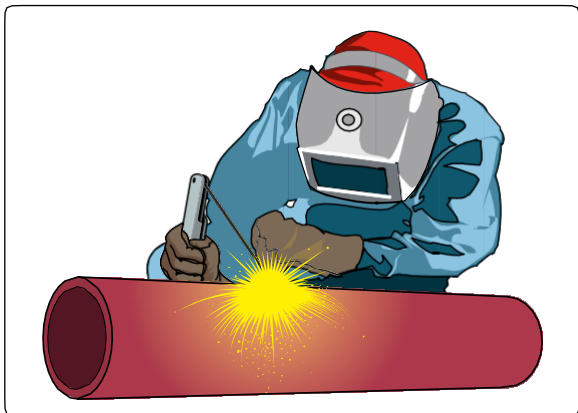
Rollover Protective Structures

Rollover protective structures (ROPS) are structures on construction equipment that help protect workers from injury in the event of equipment rollover.

General:

- Make sure that the rubber-tired, self-propelled scrapers; rubber-tired front-end loaders; rubber-tired dozers; wheel type agricultural and industrial tractors; crawler tractors; crawler-type loaders; and motor graders you use are equipped with the proper rollover protective structures.
- If an appropriate rollover protective structure is not provided when needed, do not use the equipment. Report the situation to your supervisor.
- Always wear your seat belt when using the equipment.

Welding, Cutting & Heating



Welding, cutting and heating are methods of melting, cutting or heating metal with electrical current or compressed gases. The biggest concerns with welding, cutting and heating in the mechanical fabrication shops are electrical shock from electric arc welding, eye hazards, fire hazards and respiratory hazards.

General:

- Protect yourself from welding, cutting and brazing hazards by getting familiar with the associated hazards and learning the safe work practices established for worker protection.
- Always wear the appropriate eye protection with the proper shade of lens or lenses.
- Always have an appropriately sized Class ABC fire extinguisher readily available when welding.

- Be sure not to strike an arc or ignite a torch where flammable/combustible materials or chemicals are present.

Electric Arc Welding and Cutting:

- Select cables that are capable of safely handling the maximum current requirements of the work.
- Use only manual electrode holders that are specifically designed for arc welding and cutting.
- Carefully inspect the welding cables, electrode holders and any other current-carrying parts to ensure that they are properly insulated and in good condition. If any parts are damaged, immediately follow your company's procedure for taking defective equipment out of service.
- Do not use damaged cables until they have been spliced or repaired by a properly qualified person.
- If a cable has been spliced or repaired, never use it within 10 feet of the electrode holder, unless the material used for the repair has the same or better insulating characteristics than the original insulation.
- Ensure that the ground return cable can safely carry the specified maximum amount of current generated by the arc welding unit.
- Before starting to weld each day, check all ground connections to ensure they are properly connected and have suitable capacity for the specified maximum current.
- Never place an electrode against a cylinder to strike an arc.

- Verify that the frames of the electric arc welding units are grounded with a third wire in the cable containing the circuit conductor, or through a separate wire that is grounded at the source of the current.
- Always attach the work cable directly to the work or work table and as close to the weld as practical.

Gas Welding and Cutting:

- Carefully inspect cylinder valves, regulators, hoses, and torches before making any connections. If you see any damage, immediately follow your company's procedure for taking defective equipment out of service.
- Inspect hoses and torches at the start of each work shift.
- Before connecting the regulators, stand to the side of the fuel gas cylinder valve, open it, and close it quickly (cracking). Repeat the process with the oxygen cylinder.
- When cracking a fuel gas cylinder or an oxygen cylinder, make sure the escaping gases will not be affected by sparks, flames, or other ignition sources.
- Make sure that you can easily tell the difference between fuel gas hoses and oxygen hoses.
- Ensure that it is physically impossible to connect hoses, regulators, and torches to the incorrect equipment by using incompatible fittings.
- Inspect the regulators, hoses, torches and all their connections again after they are connected, and the gas has been turned on. Check carefully for leaks and never use leaking equipment.
- Use only friction lighters to light torches.

Ventilation:

- Always ensure that the ventilation is adequate before you start welding or cutting operations.
- Use adequate local ventilation and an airline respirator when performing hot work on zinc, lead, chromium, cadmium, mercury, beryllium bearing based or coated materials, or stainless steel (hexavalent chromium), unless air monitoring by a properly qualified person shows no risk of overexposure.

Inert Gases:

- Always ensure that the oxygen content in the work areas in and around tanks, vessels, large bore piping systems, exchangers, etc. is sufficient when purging the systems with inert gases, such as argon and nitrogen.
- Inert gases displace oxygen and can result in asphyxiation, including suffocation.

Zinc

Zinc is a heavy metal found in galvanized metals. When galvanized metals are heated during hot work operations, fumes containing zinc oxide are generated, become airborne and can be inhaled by anyone in the work area. When zinc oxide is inhaled in large enough concentrations over a long enough period, the illness zinc fume fever (also referred to as metal fume fever) can occur. The symptoms include fever, chills, nausea, dryness in the throat, cough, fatigue, headache and body ache.

General:

- When performing hot work on galvanized metals, be sure to protect yourself from overexposure to zinc oxide.

Operation:

- Make sure the work area is well ventilated.
- Use a point-of-operation ventilation system, such as a welding fume extractor, whenever it is available.
- Always position your welding helmet so that the fumes cannot rise underneath it.
- If your company's zinc oxide exposure assessment shows that you could be overexposed without respiratory protection, be sure to wear an appropriate respirator.
- Before starting to work while wearing a respirator, you will need to pass a medical evaluation, receive proper respiratory protection training, and be fit tested to ensure that the respirator you will be using is sufficiently effective.

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