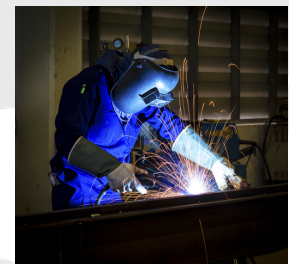


# WELDING, CUTTING & BRAZING

Welding is the most common method of joining metals. Welding, cutting, and brazing are hazardous activities that present a combination of safety and health risks. Operations conducting welding, cutting and brazing shall comply with applicable health, safety and fire regulations as stated by the Occupational Health and Safety Act (OSHA) and national fire codes published by National Fire Protection Association (NFPA).

## Fire Prevention and Protection:

- If the object to be welded or cut cannot readily be moved, all movable fire hazards in the vicinity shall be taken to a safe place.
- If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, then appropriate controls shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.
- Suitable fire extinguishing equipment shall be maintained in a state of readiness for immediate use.
- Do not weld, cut or braze in building atmospheres where gases, vapors, liquids, dust, or large quantities of exposed ignitable materials are present.
- Fire Watchers are required whenever welding and cutting is performed in locations where the possibility of a fire may occur or any of the following conditions exist:
  - Appreciable combustible materials in building construction or contents should not be closer than 35 feet to the point of operation.
  - Check for appreciable combustible materials more than 35 feet away but that are easily ignited by sparks.
  - A fire watch shall be maintained for at least one half hour after the completion of welding or cutting operations.



## Personal Protective Equipment:

- A welder or helper working on platforms, scaffolds, or runways shall be protected against falling. This may be accomplished by the use of railings, safety belts, lifelines, or other effective safeguards.
- Welders shall place welding cable and other equipment so that it is clear of passageways, ladders, and stairways.
- Helmets or hand shields shall be used during all arc welding or arc cutting operations, excluding submerged arc welding. Helpers or attendants shall be provided with proper eye protection.

- Goggles or other suitable eye protection shall be used during all gas welding or oxygen cutting operations. Spectacles without side shields, with suitable filter lenses are permitted for use during gas welding operations on light work, for torch brazing or for inspection.
- Helmets and hand shields shall be made of a material, which is an insulator for heat and electricity. Helmets, shields and goggles shall not be readily flammable and shall be capable of withstanding sterilization.
- Helmets and hand shields shall be arranged to protect the face, neck and ears from direct radiant energy from the arc. Helmets shall be provided with filter plates and cover plates designed for easy removal.
- Consult OSHA 1910.252 General Requirements reference chart for appropriate shade selection.

## Handling and Storage of Welding Equipment:

- Compressed gas cylinders shall be legibly marked, for identifying the gas content.
- Inside of buildings, oxygen cylinders shall be stored in a well-protected, well-ventilated, dry location, at least 20 (6.1 m) feet from highly combustible materials or by a noncombustible barrier at least 5 feet (1.5 m) high having a fire-resistance rating of at least one-half hour.
- Assigned storage spaces shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons.
- Empty cylinders shall have their valves closed.
- Valve protection caps, where cylinder is designed to accept a cap, shall always be in place, hand-tight, except when cylinders are in use or connected for use.
- Cylinders shall be moved by tilting and rolling them on their bottom edges.
- When powered vehicles transport cylinders, they shall be secured in an upright position.
- A suitable cylinder truck, chain, or other steadying device shall be used to keep cylinders from being knocked over while in use.



## Ventilation:

- Mechanical ventilation shall be provided when welding or cutting is performed on metals not listed below. These metals have their own specific allowable concentration/ventilation requirements.
  - Fluorine compounds, Zinc, Lead, Beryllium, Cadmium, Mercury, Cleaning Compounds, Stainless Steels
- MECHANICAL VENTILATION is needed when:
  1. Space is less than 10,000 cubic feet per welder
  2. Ceiling height in room is less than sixteen feet
  3. In confined spaces, or where welding space contains partitions or mechanical ventilation at a minimum rate of 2,000 cubic feet per minute per welder, except where local exhaust hoods, booths, or airline respirators are provided. Natural ventilation is considered sufficient for welding or cutting where restrictions 1-3 are not present.

## Hoses and Regulators:

- Equipment shall be installed and used only in the service for which it is approved and as recommended by the manufacturer.
- Hose connections shall comply with the Standard Hose Connection Specifications, 1957, Compressed Gas Association.
- Hose connections shall be clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service.
- Hose showing leaks, burns, worn places, or other defects rendering it unfit for service shall be repaired or replaced.
- Pressure-reducing regulators shall be used only for the gas and pressures for which they are intended.
- When regulators or parts of regulators, including gages, need repair, the work shall be performed by skilled mechanics that have been properly trained.
- Gages on oxygen regulators shall be marked "USE NO OIL."
- Union nuts and connections on regulators shall be inspected before use to detect faulty seats, which may cause leakage of gas when the regulators are attached to the cylinder valves.



## Welding Flashbacks:

- **Burn back:** If the oxygen cylinder is low or empty, reverse flow of gas may occur. The fuel gas, being at a higher pressure, can travel up the oxygen line and mix with gas in the hose, regulator and cylinder. If the torch is lit without purging the lines, a burn back may occur with explosions in the hose, regulator, or cylinder.
- **Backfire:** Backfire is generally caused by holding the cutting torch too close to your work. This causes gas starvation of the cutting flame and results in the flame being sucked into the torch head. Usually this will result in a popping sound that turns to a whistle.
- **Flashback:** When a backfire takes place in a mixing chamber, unless the oxygen valve is shut off, the flame burning in the torch head may ignite gases in the hoses resulting in a flashback. A flashback is an explosion that progresses through the torch, hoses, regulators, and into the cylinders. Consequence can range from a burst hose to a violent explosion of the regulator and cylinders.
- Methods for preventing flashbacks:
  - If using acetylene, keep the pressure below 15 pounds.
  - Purge your hoses before lighting the torch.
  - Never light your torch with a mixture of fuel and oxygen. After purging the lines, light the torch with only the fuel gas valve open.
  - Check valves should be installed on both torch inlets and operating properly.
  - Check valves can stop the reverse flow of gases, but will not prevent flashbacks.
- To prevent flashbacks, flashback arrestors must be installed on the outlets of both regulators, and/or torch inlets.