

# Welding, Cutting, and Other Hot Work

Each year numerous deaths from explosions, electrocutions, asphyxiation, falls, and crushing injuries are associated with hot work activities. These deaths from hot work often occur in confined or restricted spaces. In addition, numerous health hazards including heavy metal poisoning, lung cancer, metal fume fever, flash burns, and welders flash (burn to the eyes) are associated with exposure to fumes, gases, and ionizing and non-ionizing radiation formed or released during welding, cutting, brazing, and other hot work.

A. Before workers begin a hot work, the following controls must be established:

1. No welding is permitted in an explosive environment. 4848
2. A written “hot work” permit is recommended whenever a combustible environment may exist. 4848
3. All combustible materials in the work area must be removed or shielded. 4848
4. Suitable fire extinguishers that meet NFPA and ANSI Standards must be provided in the work area. 4848
5. Welding blankets, curtains, and pads shall be approved for their intended use in accordance with Section 3206 of these Orders. 4848(b)
6. Employers must instruct employees on hot work safety. 4848(a)
7. Welders must be required to wear:
  - a. Non-flammable gloves with gauntlets. 3384
  - b. Appropriate foot protection. 3385
  - c. Aprons (leather) and shirts that have sleeves and collars. 1522(a)
  - d. Helmets, hoods, and face shields suitable for head protection. 3381(a), 3382(a)
  - e. Suitable eye protection. 3382
  - f. Respiratory protection (as required). 5144

g. Screens must be provided to protect the eyes of nonwelders from flash burns and ultraviolet light rays. 3382(b)

B. Gas welding is regulated as follows:

1. Fuel gas and oxygen hoses must be distinguished from each other. 1742(a)
2. Couplings must not disconnect by means of a straightpull motion. 1742(g)
3. Oil or grease must never come into contact with oxygen equipment. 1743(c)
4. Oxygen from a system without a pressure regulation device must never be used. 1743(e)
5. Gas cylinders must be stored and used as follows:
  - a. Cylinders must be protected from all heat sources. 1740(a)
  - b. Cylinders containing oxygen, acetylene, or fuel-gases shall not be taken into confined spaces. 1740(b)
  - c. Acetylene and Fuel gas cylinders, including but not limited to welding and cutting fuel gas cylinders, shall be stored and used with the valve end up. 1740(b) Exception: Fuel gas cylinders containing fuel gas used to power industrial trucks regulated by Article 25 of the GISO.
  - d. All gas cylinders in service shall be securely held in substantial fixed or portable racks, or placed so they will not fall or be knocked over. 1740(c)
  - e. Cylinders must be handled in suitable cradles with their valve caps installed; they must never be lifted by magnet, rope, or chain. 1740(c),(d)
  - f. Cylinders must not be placed where they might form a part of any electric circuit. 1740(e)
  - g. Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 ft. or by a noncombustible barrier at least 5 ft. high having a fireresistance rating of at least one-half hour. 1740(g)
  - h. Valve stem wrenches must be left in place while cylinders are in use. 1743(g)
  - i. A fire extinguisher rated at least 10 B:C must be kept near the operation. 1743(j)

j. Backflow protection is required. 4845(b)

C. Arc welding is regulated as follows:

1. Cables in poor condition must not be used; no cable may be spliced within 10 ft. of the electrode holder. 4851(e)(2)
2. The frames of arc welding and cutting machines must be grounded. 4851(f)(5)
3. Electrodes and holders that are not in use shall be protected so they cannot make electrical contact with employees or conducting objects. 4851(g)
4. Defective equipment must not be used. 4851(j)

D. Ventilation regulations for welding, cutting, and brazing operations require that worker's exposure(s) to hazardous fumes, gases, and vapors be reduced below PELs. 1536, 1537, 5155

### **1. Outdoor operations**

Respirators are required for any operation involving beryllium, cadmium, lead, or mercury. For other operations and materials, respirators are not required when natural or mechanical ventilation is sufficient to prevent exposure to airborne contaminants in excess of the PELs noted in 5155. 1536(c).

### **2. Indoor operations**

Respirators shall be used when local exhaust or mechanical ventilation is not feasible or able to prevent exposures that exceed limits specified in 5155.

E. In enclosed spaces supplied-air respirators shall be used when local exhaust ventilation is not an effective means for preventing potentially hazardous exposures. 1536(b), 5152

F. Employer needs to include all potentially hazardous materials involved in welding and cutting such as fluxes, coatings, coverings, and filler metals in the HAZCOM program. Also must provide employee access to labels and safety data sheets, and train as per 5194, 5150.

