

Welding and cutting operations expose workers to many potential hazards, such as sparks, spatter, intense light, radiation, electrical current, heat and fumes. To prevent injury, welders must wear appropriate clothing and protective equipment when performing welding or cutting tasks.

Clothing

Any cotton clothing worn by welders should be heavyweight and chemically treated to reduce its combustibility. Woolen clothing does not ignite easily, so it is preferred. Here are some other clothing recommendations:

- Avoid clothing or shoes made of synthetic or plastic materials, which can burn, melt and stick to skin, causing severe burns
- Keep outer clothing reasonably free of oil and grease
- Replace clothing with holes, tears and frayed edges
- Wear long, cuff-less pants with covered pockets to avoid burns and spark entrapment
- Pants should extend past the top of shoes or boots and should not be tucked into footwear
- Wear long-sleeve shirts to protect against burns and radiation exposure to bare skin
- Keep cuffs, collars and pockets buttoned
- Wear aprons, leggings, leather sleeves/shoulder capes and caps when circumstances warrant additional protection

Hand and Foot Protection

- Wear high-topped, steel-toed leather boots with rubber soles conforming to ASTM F2413-05 Standard Specification for Performance Requirements for Foot Protection
- Wear fire-resistant boot protectors or leather spats for heavy spark operation
- Wear durable leather welding gloves to protect the hands from burns, abrasion or electric shock that are dry and in good condition

Eye and Ear Protection

- Wear helmets or hand-held face shields to protect the eyes from radiation exposure, match the lens filter shade level to the specific welding process, and refer to the lens shade selector chart in ANSI Z49.1-2012 Safety in Welding and Cutting
- Never use a helmet or shield with a cracked or broken lens
- Wear safety glasses with side shields or goggles in addition to a helmet or shield that offer form-fitting eye coverage and soft foam eye guards to keep out dust and perspiration, and they should conform to ANSI Z87.1 (1989, 2003 or 2010 version) Standard for Occupational and Educational Eye and Face Protection
- Wear properly fitted, flame-resistant earplugs or muffs to prevent hot spatter from entering the ears and to prevent hearing loss when working in noisy areas



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Fumes and Gases

Welding processes produce visible smoke that contains harmful metal fume and gas by-products. Acute exposure to welding fumes and gases can result in eye, nose and throat irritation, dizziness and nausea. Prolonged exposure may cause lung damage and various types of cancer. Welders as well as other persons in the immediate area must be protected from overexposure to welding fumes and gases. Avoid exposure that exceeds the permissible limits specified by the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Regulations 29 CFR 1910.1000, or by other recognized authority, such as the American Conference of Governmental Industrial Hygienists. Persons with special health problems may have increased sensitivity that requires more stringent protection.

Fumes and gases are usually a greater concern in arc welding than in oxy-fuel gas welding, brazing and cutting. Arc welding involves higher temperatures, a greater variety of materials and many process variables. The composition and quantity of the fumes or gases depend upon the following:

- Base metal composition
- Process and consumables used
- Coatings on the work (such as paint, galvanizing or plating)
- Contaminants in the atmosphere (such as vapors from cleaning and degreasing activities)

Gases are produced during the welding process or may be produced by the effects of process radiation on the surrounding environment.

Reasonably expected gaseous products include:

- Carbon monoxide
- Carbon dioxide
- Fluorides
- Nitrogen dioxide
- Ozone

Always consult the material safety data sheets for all materials used, including electrodes, base metals and coatings. These will specify the hazards involved and the protective measures that must be taken. For help, contact a recognized specialist in industrial hygiene or environmental services.

To avoid overexposure, local and/or general ventilation may be necessary, even if welding outdoors. Here are some tips:

- Instruct welders to position themselves to avoid breathing the plume
- Position a portable or flexible exhaust system so that fumes and gases are drawn away from the welder's breathing zone
- Always use ventilation when welding in confined spaces
- Wear appropriate respiratory protection whenever the exposure exceeds permissible limits, even with available ventilation

For Additional Information

Occupational Safety & Health Administration:
www.osha.gov

- Eye and Face Protection eTool
- OSHA FactSheet: Controlling Hazardous Fume and Gases during Welding

American Welding Society: www.aws.org

EMC Insurance Companies: www.emcins.com

> Loss Control > Tech Sheets

- Tech Sheets – Hot Work Permits, Protecting Against Cutting and Welding Fires, General Welding Safety Guidelines