



Topic 2.

Welding Process Training Series

Welding Safety

SAFETY



As in all occupations, safety is paramount. Because there are numerous safety codes and regulations in place, we recommend that you always read all labels and the Owner's Manual carefully before installing, operating, or servicing the unit. Read the safety information at the beginning of the manual and in each section. Also read and follow all applicable safety standards, especially ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes.

ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes is available as a free download from the American Welding Society at: <http://www.aws.org>

Here is a list of additional safety standards and where to get them.

Safe Practices for the Preparation of Containers and Piping for Welding and Cutting, American Welding Society Standard AWS F4.1, from Global Engineering Documents (Phone: 1-877-413-5184, website: www.global.ihs.com).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (Phone: 1-800-344-3555, website: www.nfpa.org and www.sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151 (Phone: 703-788-2700, website: www.cganet.com).

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Ontario, Canada L4W 5NS (Phone: 800-463-6727, website: www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (Phone: 212-642-4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, Quincy, MA 02269 (Phone: 1-800-344-3555, website: www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (Phone: 1-866-512-1800) (There are 10 OSHA Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

Booklet, *TLVs, Threshold Limit Values*, from American Conference of Governmental Industrial Hygienists (ACGIH), 1330 Kemper Meadow Drive, Cincinnati, OH 45240 (Phone: 513-742-3355, website: www.acgih.org).

Towing a Trailer – Being Equipped for Safety, Publication from U.S. Department of Transportation, National Highway Traffic Safety Administration, 400 Seventh Street, SW, Washington, D.C. 20590

U.S. Consumer Product Safety Commission (CPSC), 4330 East West Highway, Bethesda, MD 20814 (Phone: 301-504-7923, website: www.cpsc.gov).

Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30333 (Phone: 1-800-232-4636, website: www.cdc.gov/NIOSH).

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WARNING

This document contains general information about the topics discussed herein. This document is not an application manual and does not contain a complete statement of all factors pertaining to those topics.

The installation, operation, and maintenance of arc welding equipment and the employment of procedures described in this document should be conducted only by qualified persons in accordance with applicable codes, safe practices, and manufacturer's instructions.

Always be certain that work areas are clean and safe and that proper ventilation is used. Misuse of equipment and failure to observe applicable codes and safe practices can result in serious personal injury and property damage.

Welding Process and Filler Metals Training Series:

Welcome to the Welding Process and Filler Metals Training Series. This training series was developed for the purpose of providing a basic set of educational materials that can be used individually or in a classroom setting.

The topics covered in the series are:

Welding Processes

- **Topic 1. Introduction To Welding**
- **Topic 2. Welding Safety**
- **Topic 3. Basic Electricity For Welding**
- **Topic 4. Welding Power Source Design**
- **Topic 5. Engine Driven Power Sources**
- **Topic 6. Shielded Metal Arc Welding**
- **Topic 7. Gas Tungsten Arc Welding**
- **Topic 8. Gas Metal Arc Welding**
- **Topic 9. Flux Cored Arc Welding**
- **Topic 10. Metal Cutting**
- **Topic 11. Troubleshooting Welding Processes**
- **Topic 12. Submerged Arc Welding**

Filler Metals

- **Topic A. Introduction To Metals**
- **Topic B. Tubular Wires**
- **Topic C. Low Alloy Steel**
- **Topic D. Stainless Steel**
- **Topic E. Aluminum**
- **Topic F. Hard Surfacing**

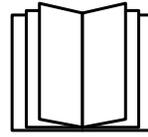
Please note, this series was not developed to teach the skill of welding or cutting, but rather to provide a foundation of general knowledge about the various processes and related topics.

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Always read and follow the Owner's Manual, the safety labels on the product, and all applicable safety standards, especially ANSI Z49.1, Safety in Welding, Cutting, and Allied Processes (we recommend you get a copy and keep it handy). A list of the safety standards and where to get them is located in Section 8 of this guide.



Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.

Wear a safety harness if working above floor level.

Keep children away from all equipment and processes.

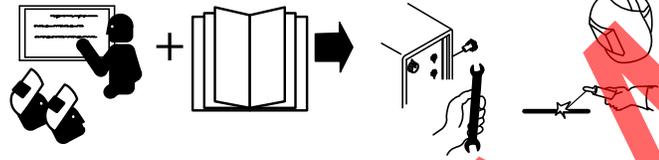
Do not install or place machine on or over combustible surfaces.

Use only genuine replacement parts from the manufacturer.

Use GFCI protection when operating auxiliary equipment in damp or wet locations.

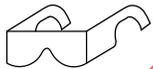
Perform maintenance and service according to the Owner's Manuals, industry standards, and national, state, and local codes.

1. General Safe Practices



Become trained and read the instructions before working on the machine or welding or cutting.

Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.



Wear approved safety glasses with side shields under your welding helmet or face shield and at all times in the work area.

2. Arc Welding Hazards



Electric shock from welding electrode or wiring can kill.

Wear dry, hole-free insulating gloves and body protection. Do not touch electrode with bare hand. Do not wear wet or damaged gloves.

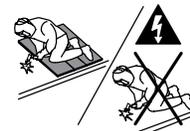
Do not touch live electrical parts.

Do not use AC weld output in damp, wet, or confined spaces, or if there is a danger of falling.

Use AC output ONLY if required for the welding process.

If AC output is required, use remote output control if present on unit.

Do not use worn, damaged, undersized, or repaired cables.



Protect yourself from electric shock by insulating yourself from work and ground.

Use non-flammable, dry insulating material if possible, or use dry rubber mats, dry wood or plywood, or other dry insulating material big enough to cover your full area of contact with the work or ground, and watch for fire.

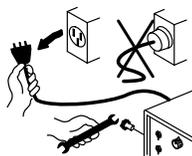
Welding Safety

Disconnect input plug or power before working on machine.

Do not make input connections if color blind.

Frequently inspect input power cord and ground conductor for damage or bare wiring — replace immediately if damaged - bare wiring can kill. Keep cords dry, free of oil and grease, and protected from hot metal and sparks. Be sure input ground wire is properly connected to a ground terminal in disconnect box or receptacle.

Properly install and ground all equipment according to its Owner's Manual and national, state, and local codes.



Breathing welding fumes can be hazardous to your health.

Keep your head out of the fumes. Do not breathe the fumes. Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from your breathing zone and the general area. The recommended way to determine adequate ventilation is to sample for the composition and quantity of fumes and gasses to which personnel are exposed.

Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.



Use enough forced ventilation or local exhaust (forced suction) at the arc to remove the fumes from your breathing area.



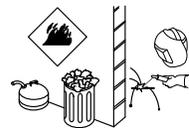
Use a ventilating fan to remove fumes from the breathing zone and welding area. If adequacy of ventilation or exhaust is uncertain, have your exposure measured and compared to the Threshold Limit Values (TLV) in the Safety Data Sheet (SDS).



Welding can cause fire or explosion.

Do not weld near flammable material or where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline). Move flammables at least 35 feet (11 meters) away or protect them with flame-proof covers (see NFPA 51B listed in Section 8).

Welding sparks can cause fires. Have a fire extinguisher nearby, and have a trained fire watcher ready to use it. After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.

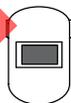


Do not weld on drums, tanks, or any closed containers unless a qualified person has tested it and declared it or prepared it to be safe (see AWS F4.1 listed in Section 8).



Arc rays can burn eyes and skin.

Use welding helmet with correct shade of filter (see Section 9 to choose the correct shade).



Wear welders cap and safety glasses with side shields. Use ear protection when welding out of position or in confined spaces. Button shirt collar.



Wear body protection made from durable, flame-resistant material (leather, heavy cotton, wool). Body protection includes oil-free protective clothing, such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.