



Welding & Cutting Procedures

These written Welding & Cutting Procedures establish guidelines to be followed whenever any of our employees work with welding and cutting equipment at this company. The procedures here establish uniform requirements designed to ensure that welding and cutting safety training, operation, and maintenance practices are communicated to and understood by the affected employees. These requirements also are designed to ensure that procedures are in place to safeguard the health and safety of all employees.

It is our intent to comply with the requirements of 29 CFR 1926.350 through .354. These regulations have requirements for welding and cutting operations. We also comply with applicable requirements of:

Standard or Regulation:	Name:
ANSI Z49.1-1967	<i>Safety in Welding and Cutting</i>
CGA Pamphlet P-1-1965	<i>Safe Handling of Compressed Gases</i>
29 CFR 1926, Subpart D	<i>Occupational Health and Environmental Controls</i>
29 CFR 1926, Subpart E	<i>Personal Protective And Life Saving Equipment</i>
29 CFR 1926.406(c)	<i>Electrical—Specific Purpose Equipment and Installations</i>
49 CFR 192	<i>Minimum Federal Safety Standards for Gas Pipelines</i>
49 CFR 178, Subpart C	<i>Specifications for Cylinders</i>

Administrative Duties

The Project Manager is responsible for implementing and maintaining the written Welding & Cutting Procedures. These procedures are kept EMA written Safety and Health manual and our corporate offices. Copies can be obtained from the Project Manager.

Prior to any welding or cutting is to be performed, the Project Manager shall ensure that the area has been inspected and that the requirements of this program have been met. If acceptable conditions are found, the Project Manager may then authorize the welding and/or cutting operation through the use of a written permit.

Welding and Cutting Equipment

Our company uses various welding and cutting equipment in its construction operations.

Training

It is the policy of EMA to permit only trained and authorized personnel to operate welding and cutting equipment. The Project Manager will identify all new employees in the employee orientation program and make arrangements with department management to schedule training.

The Project Manager or designee will conduct initial training and evaluation: This instructor(s) must

have the necessary knowledge, training, and experience to train new welding and cutting equipment operators.

Initial Training

Our instruction includes both classroom instruction and practical training.

During training, EMA covers the operational hazards of our welding and cutting operations, including:

- Hazards associated with the particular make and model of the welding and cutting equipment;
- Hazards of the workplace/duties of the fire watch; and
- General hazards that apply to the operation of all or most welding and cutting equipment.

Each potential welder or cutter who has received training in any of the elements of our training program for the types of equipment which that employee will be authorized to operate and for the type of workplace in which the welding and cutting equipment will be operated need not be retrained in those elements before initial assignment in our workplace if EMA has written documentation of the training and if the employee is evaluated to be competent.

Training Certification

After an employee has completed the training program, the instructor will determine whether the potential welder or cutter can safely perform the job. At this point, the trainee will take a performance test or practical exercise through which the instructor(s) will decide if the training has been adequate. All welding and cutting trainees are tested on the equipment they will be operating.

The Project Manager is responsible for keeping records certifying that each employee who has successfully completed training and testing. Each certificate includes the name of the employee, the date(s) of the training, and the signature of the person who did the training and evaluation.

Performance Evaluation

Each certified welder or cutter is evaluated to verify that the welder or cutter has retained and uses the knowledge and skills needed to operate safely. This evaluation is done by the Project Manager. If the evaluation shows that the welder or cutter is lacking the appropriate skills and knowledge, the welder or cutter is retrained. When a welder or cutter has an accident or near miss or some unsafe operating procedure is identified, we also do retraining.

Current Welders and Cutters

Under no circumstances may an employee operate welding or cutting equipment until he/she has successfully completed this company's welding and cutting training program. This includes all new welders and cutters regardless of claimed previous experience.

All employees have a general obligation to work safely with and around welding and cutting operations.

Operating Procedures

Welding and cutting can create certain hazards that only safe work practices can prevent. That's why we have created a set of operating procedures. Our operating procedures follow:

Compressed Gas Cylinders

- A. Handling, storage, and use of compressed gases around the job site represents a number of hazards. Questions should be resolved through supervisors or use of the Compressed Gas Association Pamphlet P-1-1965.
- B. Approved practices that EMA employees must follow include:
 - 1. Keep valve protection cap in place at all times when a cylinder is not in use.
 - 2. When cylinders are hoisted, secure them on a cradle, sling board, or pallet.
 - 3. Move cylinders by tilting and rolling on their bottom edges. Care in handling is required.
 - 4. Secure cylinders in an upright position at all times, especially when moving them by machine.
 - 5. Use carriers or carts provided for the purpose when cylinders are in use.
 - 6. When in use, isolate cylinders from welding or cutting operations, or suitably shield. Care will be taken to prevent them from becoming part of an electrical circuit.
 - 7. Maintain a distance of at least 20 feet or provide a non-combustible barrier at least five feet high in separating fuel gas cylinders from oxygen cylinders. This applies to indoor and outdoor storage.
 - 8. The Project Manager will designate: * Well-ventilated storage areas for cylinders inside buildings. Care will be taken to keep storage areas out of traffic areas or other situations where they could be knocked over, damaged or be tampered with. * Locations for fuel gas and oxygen manifolds in well-ventilated areas.
- C. Prohibited practices that EMA employees must comply with include:
 - 1. Use of valve protection caps for lifting cylinders.
 - 2. Use of damaged or defective cylinders. The Project Manager will provide appropriate tags and designate an appropriate storage area for these cylinders.
 - 3. Mixing of gases.
 - 4. Use of a magnet or choker sling when hoisting cylinders.
 - 5. Use of a bar to pry cylinders from frozen ground. Warm, not boiling, water is used to thaw cylinders.
 - 6. Taking oxygen, acetylene, or other fuel gas or manifolds with these gases into confined spaces.

Gas Welding and Cutting

- A. Safe practices in using compressed gases and torches include:
1. Cracking cylinders and attaching regulators according to industry practice.
 2. Putting caps on header hose connections and manifolds when not in use.
 3. Keeping all hoses, regulators, cylinders, valve protection caps, couplings, apparatus, and torch connections free of grease and oil, especially those involving oxygen.
 4. Using fuel gas hose and oxygen hose of different colors.
 5. Inspections: * All hoses before every shift; * All torches. Only devices designed for the purpose will be used to clean torch tips.
 6. Use only friction lighters to ignite torches.
 7. Removal of torches and hoses and positive shut-off of gas sources from confined spaces when leaving a confined space project for any substantial period of time.
- B. Prohibited practices include:
1. Interchange of hoses, including use of adapters, between fuel gas and oxygen sources.
 2. Placement of anything on or near a manifold or cylinder top that may interfere with the prompt shut-off in case of an emergency.
 3. Taping more than four inches out of every 12 inches in joining fuel gas and oxygen hoses.
 4. Using defective hose or torches.
 5. Use of oxygen for personal cooling, cleaning off of surfaces, ventilation or blowing dust from clothing.

Arc Welding and Cutting

- A. Safe practices in using arc welders include:
1. Use of holders, cable, and other apparatus specifically designed for the purpose, matched to the job and other components and in good repair.
 2. Following Department Of Transportation standards for welding on natural gas pipelines.
 3. When leaving electrode holders unattended, electrodes are removed and holders placed so that accidental electrical contact is not made.
 4. Turning off the arc welding or cutting machine when it is to be left unattended for a substantial period of time or when it is being moved.

5. Immediate reporting of any defective equipment to the Project Manager.
6. Use of non-combustible or flame-proof screens to protect employees and passersby from arc rays wherever practicable.
7. Keeping chlorinated solvents at least 200 feet from an inert-gas metal-arc welder or providing adequate shielding. Surfaces prepared with chlorinated solvents will be thoroughly dry before welding.

B. Prohibited practices include:

1. Using cables with repairs or splices within 10 feet of the holder that are not equivalent in insulating value to the original cable.
2. Use of pipelines with flammable gases or liquids or conduits with electrical circuits as ground return.
3. Dipping hot electrode holders into water.

Fire Prevention

A. The Project Manager will use this guide to assess fire hazards at a job site:

1. When the object to be welded, cut or heated can be moved, and a fire-resistant, safe workspace is available, then the welding, cutting, brazing, or heating must be done in that space.
2. When the object to be welded, cut, or heated can be moved, and all fire hazards can be moved to a safe distance, then the welding, cutting, brazing or heating can be done.
3. When the object to be welded, cut, or heated cannot be moved, and all the fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.
4. When there is a welding, cutting, or heating task, and concentrations of flammable paints, dusts, or other flammable compounds are present, then welding, cutting, brazing or heating is not allowed.

B. All employees will be required to:

1. Wear flame-resistant clothing.
2. Have a fire watch in attendance when they are welding.
3. Remove all combustible material at least 35 feet from the work area and to move away from combustible materials or cover combustibles with fire resistant material.
4. Not weld in atmospheres containing dangerously reactive or flammable gases, vapors, liquid, or dust.
5. Clean and purge containers which may have held combustible material before applying heat.

6. Get a hot work permit and follow its safety precautions.
- C. The company will provide suitable fire extinguishing equipment based on the Project Manager's assessment of hazards. The Project Manager will ensure the equipment is maintained for immediate use.

Fire Watches

- A. When normal fire prevention measures are not sufficient, the company, based on the Project Manager's assessment, assigns fire watch(s).
- B. Fire watch(s) will provide additional safeguards against fire during and after operations.
- C. The company will provide training for fire watches on the specific fire hazards and equipment available.

Ventilation

- A. The Project Manager will determine the number, location, and capacity of ventilation devices.
- B. Where ventilation is not sufficient to provide clean, respirable air, respirators will be specified according to the provisions in the Personal Protective Equipment section.
- C. Ventilation will be sufficient to protect passersby as well as the welder.
- D. Employees will be required to:
 1. Know the symptoms of fumes and gases and get out of the area if they should develop.
 2. Perform atmospheric tests.
 3. Keep a safe distance from the fume or gas plume.

Personal Protective Equipment

- A. Air line respirators will be provided for confined space jobs when sufficient ventilation cannot be provided without blocking the exit. Employees will be trained on the proper use of their respirators.
- B. When known or unknown toxic materials are present in a job, respirators will be provided that match the hazard for all employees. The hazards include zinc or zinc-bearing base or filler metals, lead base metals, cadmium-bearing filler metals, chromium-bearing or chromium-coated metals, mercury, nitrogen dioxide, and beryllium. Due to beryllium's extreme danger, both ventilation and air line respirators will be used.
- C. Where screens are not sufficient to protect welders and passersby from arc radiation, the company will provide eye protection with appropriate helmets, ANSI approved filter lens goggles, or hand shields. The helmets and shields will be maintained in good repair.
- D. When a toxic preservative is detected on a surface in a confined space, air line respirators will be provided (or the toxic coating will be stripped from at least four inches around the

heated area).

E. Other PPE used may include

1. Flame resistant aprons to protect against heat and sparks.
2. Leggings and high boots for heavy work.
3. Ankle-length safety shoes worn under pant legs to keep from catching slag.
4. Shoulder cape and skull cap to protect against overhead welding.
5. Ear plugs or ear muffs on very noisy jobs like high velocity plasma torches.
6. Insulated gloves to protect against contact with hot items and radiation exposure.
7. Safety helmets to protect against sharp or falling objects.

F. Employees are asked to wear wool, leather, or cotton treated clothing to reduce flammability for gas shielding arc welding. Long sleeves and pants without cuffs/front pockets are recommended to avoid catching sparks.

Confined Spaces

- A. Confined spaces, such as manholes, tunnels, trenches and vaults, are particularly hazardous working areas made more dangerous by welding. These spaces shall be identified by signage and all employees will be made aware of them. Ventilation is a primary consideration and will be required by the Project Manager or other competent employee designated by the company in accordance with EMA Confined Space Program.
- B. When welding or cutting is suspended for any substantial period of time, such as lunch or over night, torches and hoses and/or electrodes and leads shall be removed from the confined space. Additionally, valves will be shut and welders shall be disconnected from their power sources.
- C. An employee will be stationed outside the confined space to maintain communication with those entering and ready to render emergency assistance when respirators are used.
- D. When confined spaces are entered through a manhole or similar small opening, the company will provide a means of quickly removing a worker. An attendant with a rescue procedure will observe the worker at all times and be able to put the rescue plan into effect.
- E. Limited work spaces, hazardous atmospheres, slippery floor surfaces and interior surfaces of the space will be evaluated for flammability.

Flammable, Toxic, or Hazardous Materials

- A. The company will designate a competent person to test the flammability and/or composition of unknown coatings.

- B. When a coating is found to be highly flammable or contain potentially toxic materials, such as lead-painted surfaces, it will be stripped from the area to prevent fire or unnecessary exposure to the welder/cutter.

Electrical Equipment

- A. Approved safe practices include:
 - 1. Arc welding will not be done while standing on damp surfaces or in damp clothing.
 - 2. Equipment will be properly grounded, installed, and operated.
 - 3. Defective equipment will not be used.
 - 4. Well-insulated electrode holders and cables will be used.
 - 5. Employees should insulate themselves from both the work and the metal electrode and holder.
 - 6. Welding cables must not be wrapped around the welder's body.
 - 7. Employees should wear dry gloves and rubber-soled shoes.
 - 8. No damaged or bare cables and connectors will be used.
 - 9. In case of electric shock, a victim should not be touched. Current should be turned off at the control box and then help called for. After the power is off, cardio-pulmonary resuscitation (CPR) may be performed if necessary.

Fall Protection

- A. A platform with railings, or safety harness and lifeline will be used when welding or cutting above ground or floor levels and there are falling hazards.
- B. A clear welding or cutting area will be maintained to prevent slips, trips, and falls.

First Aid/Medical Services

- A. First Aid equipment/Medical Services shall be available at all times in accordance with our First Aid/Medical Services written program.

Inspections

A number of inspections are required under the welding and cutting regulations. To make inspections efficient, EMA has compiled a list of inspection items to be checked before welding or cutting. The Project Manager or designated representative shall make inspections at the beginning of each shift utilizing the Inspection Checklist. Should any deficiencies or safety hazards be identified during the inspections shall immediately take the equipment out of service and notify the Project Manager. The Project Manager shall not allow the equipment to be returned to service until

it has been repaired by qualified personnel and its safety has been assured.

Maintenance

Any deficiencies found in our welding and cutting equipment are repaired, or defective parts replaced, before continued use. However, no modifications or additions that affect the capacity or safe operation of the equipment may be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals, must be changed accordingly. In no case may the original safety factor of the equipment be reduced.

While defective parts may be found, we prefer to invest time and effort into the proper upkeep of our equipment, which results in day-to-day reliability. Keeping up with the manufacturer's recommended maintenance schedules, and completing the proper records, will also increase our welding and cutting equipment's longevity.

Recordkeeping

The Project Manager is responsible for maintaining inspection records for each project. Upon completion of the project, records shall be forwarded to the corporate office for review.

EMA WELDING & CUTTING INSPECTION CHECKLIST

WELDING

- _____ Are only authorized and trained personnel permitted to use welding, cutting or brazing equipment? 29 CFR 1910.252(a)(2)(xiii)(C)
- _____ Does each operator have a copy of the appropriate operating instructions and are they directed to follow them? 29 CFR 1910.253(a)(4), (d)(6), (f)(7)(A)
- _____ Are pressure-reducing regulators used only for the gas and pressures for which they are intended? 29 CFR 1910.253(e)(6)(i)
- _____ Is grounding of the machine frame and safety ground connections of portable machines checked periodically? 29 CFR 1910.254(d)(3); 255(b)(9), (c)(6)
- _____ Are only approved apparatus (torches, regulators, pressure-reducing valves, acetylene generators, manifolds) used? 29 CFR 1910.253(a)(3)
- _____ Is a check made for adequate ventilation in and where welding or cutting is performed? 29 CFR 1910.252(c)(1)(iii), (2)(i)
- _____ When working in confined places, are environmental monitoring tests taken and means provided for quick removal of welders in case of an emergency? 29 CFR 1910.252(c)(4)

WELDING EQUIPMENT

- _____ Is necessary personal protective equipment available? 29 CFR 1910.252(b)(2)
- _____ Are only approved apparatus (torches, regulators, pressure-reducing valves, acetylene

generators, manifolds) used? 29 CFR 1910.253(a)(3)

_____ Is open circuit (No Load) voltage of arc welding and cutting machines as low as possible and not in excess of the recommended limits? 29 CFR 1910.254(b)(3)(i)-(iv)

_____ Is grounding of the welding machine frame and safety ground connections of portable machines checked periodically? 29 CFR 1910.254(d)(3); .255(b)(9), (c)(6)

EQUIPMENT MARKINGS

_____ Is red used to identify acetylene (and other fuel-gas) hose, green for oxygen hose, and black for inert gas and air hose? 29 CFR 1910.253(e)(5)(i)

_____ Are empty compressed gas cylinders appropriately marked and their valves closed? 29 CFR 1910.101(b); .253(b)(1)(ii), (2)(iii), (5)(ii)(H)

COMPRESSED GAS CYLINDER MANAGEMENT

_____ Are compressed gas cylinders regularly examined for obvious signs of defects, deep rusting, or leakage? 29 CFR 1910.254(d)(4); 255(e)

_____ Is care used in handling and storage of cylinders, safety valves, relief valves, etc., to prevent damage? 29 CFR 1910.253 (b)(2)(ii), (5)(iii)(B)

_____ Are liquefied gases stored and shipped valve-end up with valve covers in place? 29 CFR 1910.253(b)(5)(iii)(A)

_____ Before a regulator is removed, is the valve closed and gas released from the regulator? 29 CFR 1910.253(b)(5)(iii)(D)

_____ Are cylinders, cylinder valves, couplings, regulators, hoses, and apparatus kept free of oily or greasy substances? 29 CFR 1910.253(b)(5)(i)

_____ Are the cylinders kept away from elevators, stairs, or gangways? 29 CFR 1910.253(b)(2)(ii)

_____ Is it prohibited to use cylinders as rollers or supports? 29 CFR 1910.253(b)(5)(ii)(K)

_____ Is care taken not to drop or strike cylinders? 29 CFR 1910.253(b)(5)(ii)(B)

_____ Unless secured on special trucks, are regulators removed and valve-protection caps put in place before moving cylinders? 29 CFR 1910.253(b)(5)(ii)(D)

_____ Do cylinders without fixed hand wheels have keys, handles, or non-adjustable wrenches on stem valves when in service? 29 CFR 1910.253(b)(5)(ii)(E)

_____ Are empty compressed gas cylinders appropriately marked and their valves closed? 29 CFR 1910.253(b)(1)(ii), (2)(iii), (5)(ii)(H)

_____ Are fuel gas cylinders and oxygen cylinders separated by distance, fire resistant barriers,

etc., while in storage? 29 CFR 1910.253(b)(4)(iii)

PERSONAL PROTECTIVE EQUIPMENT

- _____ Are all employees required to use personal protective equipment (PPE) as needed? 29 CFR 1910.132(a)
- _____ Is PPE functional and in good repair? Does it have ANSI or ASTM specifications marked on it? 29 CFR 1910.132(e)
- _____ Are employees exposed to the hazards created by welding, cutting, or brazing operations protected with personal protective equipment and clothing? 29 CFR 1910.252(b)(3)
- _____ Is personal protective equipment provided and are all employees required to use PPE as needed to protect against eye and face injury? 29 CFR 1910.132(a); .133(a)(1)
- _____ Are protective goggles or face shields provided and worn where there is any danger of flying particles or corrosive materials? 29 CFR 1910.133(a)(1)
- _____ Are approved safety glasses required to be worn at all times in areas where there is a risk of eye injuries such as punctures, abrasions, contusions, or burns? 29 CFR 1910.133(a)(2)
- _____ Are appropriate safety glasses, face shields, etc., used while using hand tools or equipment which might produce flying materials or be subject to breakage? 29 CFR 1910.133(a)(1)
- _____ Are employees who need corrective lenses (glasses or contacts) in working environments having harmful exposures required to wear only approved safety glasses, protective goggles, or use other medically approved precautionary procedures? 29 CFR 1910.133(a)(3)
- _____ Is appropriate foot protection required where there is the risk of foot injury? 29 CFR 1910.132(a); .136(a)
- _____ Is appropriate hand protection required where there is the risk of hand injury? 29 CFR 1910.132(a); .138(a)
- _____ Are hard hats provided and worn where danger of falling objects exists? 29 CFR 1910.135(a)(1)
- _____ Are hard hats inspected periodically for damage to the shell and suspension system? 29 CFR 1910.135(b)

AIR EMISSIONS

- _____ If welding creates hazardous air emissions, is the welding area appropriately marked to indicate this? 29 CFR 1910.252(c)(iv)(A)-(C)
- _____ If welding creates hazardous air emissions, have ventilation or local exhaust systems been provided to keep fumes below the maximum allowable concentrations? 29 CFR 1910.252(c)(iii)

FIRE PREVENTION

- _____ Are precautions taken to prevent the mixture of air or oxygen with flammable gases, except at a burner or in a standard torch? 29 CFR 1910.253(a)(1)
- _____ Are signs reading DANGER NO SMOKING, MATCHES, OR OPEN LIGHTS or the equivalent, posted in welding areas?
- _____ Are provisions made to never crack a fuel-gas cylinder valve near sources of ignition? 29 CFR 1910.253(b)(5)(iii)(C)
- _____ When welding is done on metal walls, are precautions taken to protect combustibles on the other side? 29 CFR 1910.252(a)(2)(x)
- _____ Before hot work is begun, are used drums, barrels, tanks, and other containers so thoroughly cleaned that no substances remain that could explode, ignite, or produce toxic vapors? 29 CFR 1910.252(a)(3)(i)
- _____ If welding gases are stored, are oxygen and acetylene separated by a 5-foot noncombustible barrier? 29 CFR 1910.253(b)(4)(i)-(iii)
- _____ Are compressed gas cylinders kept away from sources of heat? 29 CFR 1910.253(b)(2)(i)
- _____ Is combustible scrap, debris, and waste stored safely and removed from the work site promptly? 29 CFR 1910.252 (a)(2)(i), (vii), (xiv)(C)(2)
- _____ Are fire watchers assigned when welding or cutting is performed in locations where a serious fire might develop? 29 CFR 1910.252(a)(2)(iii)(A)
- _____ Are provisions made for personnel to perform fire watch duties under appropriate circumstances? 29 CFR 1910.252(d)(4)(iv)

FIRE ALARM SYSTEMS

- _____ If you have a non-supervised fire alarm system, is it tested bimonthly? 29 CFR 1910.165(d)(2)
- _____ If you have a supervised employee alarm system (that is, does the alarm have a device that indicates system malfunction), is it tested yearly? 29 CFR 1910.165(d)(4)

PORTABLE FIRE EXTINGUISHERS

- _____ Are appropriate fire extinguishers mounted, located, and identified so that they are readily accessible to employees? 29 CFR 1910.157(c)(1)
- _____ Are all fire extinguishers inspected and recharged regularly, and noted on the inspection tag? 29 CFR 1910.157(e)

_____ Are portable fire extinguishers provided in adequate number and type? 29 CFR 1910.157(d)

AISLES

_____ Are aisles marked? 29 CFR 1910.22(b)(2)

_____ Are aisle widths maintained? 29 CFR 1910.22(b)(1)

_____ Are aisles in good condition? 29 CFR 1910.22(b)(1)

_____ Are aisles and passageways properly illuminated? 29 CFR 1910.22

_____ Are aisles kept clean and free of obstructions? 29 CFR 1910.22(b)(1)