
	WELDING, CUTTING & HOTWORK PROGRAM	Document No.:	HSE-OP-017
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Purpose

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 the intent of Trinity Medical Management ("Trinity") to comply with the requirements of all applicable OSHA regulations. These regulations have requirements for welding and cutting operations. We also comply with applicable requirements of:

Standard or Regulation	Name
ANSI A13.1-1956	<i>American National Standard Scheme for the Identification of Piping Systems</i>
ANSI B31.3-1967	<i>American National Standard Code for Pressure Piping</i>
ANSI C33.2-1956	<i>Safety Standard for Transformer-Type Arc-Welding Machines</i>
ANSI Z48.1-1954	<i>American National Standard Method for Marking Portable Compressed Gas Containers to Identify the Material Contained</i>
ANSI Z49.1-1967	<i>Safety in Welding and Cutting</i>
ANSI Z54.1-1963	<i>American National Standard Safety Standard for Non-Medical X-ray and Sealed Gamma-Ray Sources</i>
ANSI B57.1-1965	<i>American National Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections</i>
ANSI Z87.1-1968	<i>American National Standard Practice for Occupational and Educational Eye and Face Protection</i>
API Std. 1104-1968	<i>Standard for Welding Pipe Lines and Related Facilities</i>

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API Std. PSD No. 2201-1963	<i>Welding or Hot Tapping on Equipment Containing Flammables</i>
ASTM B88-66a	<i>Standard Specification for Seamless Copper Water Tube</i>
AWS A6.1-1966	<i>Recommended Safe Practices for Gas-Shielded Arc Welding</i>
CGA--Regulator Connection Standards-1958	----
CGA & RMA--Specification for Rubber Welding Hose-1958	----
CGA--Standard Hose Connection Specifications-1957	----
NEMA EW-1-1962	<i>Requirements for Electric Arc-Welding Apparatus</i>
NFPA Standard 51B-1962	<i>Standard for Fire Prevention in Use of Cutting and Welding Processes</i>
NFPA 80-1970	<i>Standard for the Installation of Fire Doors and Windows</i>
29 CFR 1910.132	<i>Personal Protective Equipment—General Requirements</i>
29 CFR 1910.217	Mechanical Power Presses
29 CFR 1910.219	Mechanical Power-Transmission Apparatus
29 CFR 1910, Subpart S	Electrical
29 CFR 1910.1000	Air Contaminants
42 CFR 84	<i>Approval of Respiratory Protective Devices</i>
49 CFR 171-179	<i>Hazardous Materials Regulations</i>

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Administrative Duties

The Operations Manager is responsible for developing and maintaining the written Welding & Cutting Procedures. These procedures are kept in the Operations office.

Training

It is the policy of Trinity to permit only trained and authorized personnel to operate welding and cutting equipment. The Training and Compliance Manager (TCM) will identify all new employees in the employee orientation program and make arrangements with department management to schedule training. The TCM will ensure that all instructor(s) have the necessary knowledge, training, and experience to train new welding and cutting equipment operators.

Cutters, welders and their supervisors must be suitably trained in the safe operations of their equipment and the safe use of the processes.

Training consists of on-the-job operational training. All welders and cutters are trained and tested on the equipment they will be operating before they begin their job. Trinity 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; 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 Trinity has written documentation of the training and if the employee is evaluated to be competent.

Assigned fire watchers must be trained in the use of fire extinguishing equipment and familiar with the facilities for sounding an alarm in the event of a fire.

Workers in charge of oxygen or fuel-gas supply equipment (including distribution piping systems and generators) must be instructed and judged competent for such work.

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.

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The TCM 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 annually 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 Supervisor/Instructor. If the evaluation shows that the welder or cutter is lacking the appropriate skills and knowledge, the welder or cutter is retrained by our instructor(s). When a welder or cutter has an accident or near miss or some unsafe operating procedure is identified, we 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.

Hot-Work Permit


Prior to any cutting, welding or brazing activities a hot work permit must be completed. Before cutting or welding is permitted the area will be inspected by either the HSE Technician or Supervisor for inspection and granting authorized welding and cutting operations. Precautions that are to be taken shall be in the form of a written permit.

Operating Procedures

If the object to be welded or cut cannot readily be moved, all moveable fire hazards should be removed. If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, then guards should be used to confine the heat sparks and slag and to protect the immovable fire hazards. If these conditions cannot be met then welding and cutting is prohibited.


Employees assigned to operate arc welding equipment must be properly instructed and qualified to operate such equipment. Employees assigned must be familiar with this the applicable regulations. If gas shielded arc welding is done they must be familiar with the American Welding Society Standard A6-1-1966.

Operators of equipment should report any equipment defect or safety hazards and discontinue use of equipment until its safety has been assured. Repairs will be made only by qualified personnel.


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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
 - Handling, storage, and use of compressed gases around the workplace represent a number of hazards. Questions are resolved through supervisors or use of the Compressed Gas Association Pamphlet P-1-1965.
 - Approved practices include:
 - Keep valve protection cap in place at all times when a cylinder is not in use.
 - Use care in handling and storage of cylinders, safety valves, relief valves, etc., to prevent damage.
 - When cylinders are hoisted, secure them on a cradle, slingboard, or pallet.
 - Move cylinders by tilting and rolling them on their bottom edges. Care in handling is required.
 - Secure cylinders in an upright position at all times, especially when moving them by machine.
 - Oxygen cylinders must be stored in an upright, secured position 20 feet from any flammable gases or petroleum products.
 - Use carriers or carts provided for the purpose when cylinders are in use.
 - When in use, isolate cylinders from welding or cutting or suitably shield them. Care will be taken to prevent them from becoming part of an electrical circuit.
 - 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.
 - The supervisor 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 tampered with.
 - Locations for fuel gas and oxygen manifolds in well-ventilated areas.
 - Before a regulator is removed, check that the valve is closed and the gas released from the regulator.
 - Keep cylinders, cylinder valves, couplings, regulators, hoses, and apparatus free of oily or greasy substances.
 - Keep empty compressed gas cylinders appropriately marked and their valves closed.
 - Store full and empty cylinders apart.
 - Group cylinders by types of gas.
 - Use old stock before newer stock.
 - Prohibited practices include:
 - Use of valve protection caps for lifting cylinders.
 - Use of damaged or defective cylinders. The plant manager will provide appropriate tags and designate an appropriate storage area for these cylinders.

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- Use of a wrench or hammer to open cylinder valves. Attempting to repair a cylinder valve. The supplier should be contacted.
 - Mixing of gases.
 - Use of a magnet or choker sling when hoisting cylinders. Use of a bar to pry cylinders from frozen ground. Warm, not boiling, water is used to thaw cylinders.
 - Taking oxygen, acetylene, or other fuel gas or manifolds with these gases into confined spaces.
 - Storing cylinders near elevators, stairs, or gangways. Using cylinders as rollers or supports.
- Gas Welding and Cutting
 - Safe practices in using fuel gas include:
 - Before a regulator to a cylinder valve is connected, "crack" the valve to clear it of dust or dirt. Stand to one side of the outlet, not in front of it. Do not do this where the gas would reach welding work, sparks, flame, or other possible sources of ignition.
 - Open cylinder valves slowly to prevent damage to the regulator. For quick closing, do not open valves on fuel gas cylinders more than 1 1/2 turns. When a special wrench is required, leave it in position on the valve stem while the cylinder is in use. In the case of manifold or coupled cylinders, make sure at least one such wrench is always available for immediate use.
 - Do not place anything on top of a fuel gas cylinder, when in use, which may damage the safety device or interfere with quick closing.
 - Do not use fuel gas directly from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator.
 - Before a regulator is removed from a cylinder valve, always close the cylinder valve and release the gas from the regulator.
 - If gas leaks around the valve stem, close the valve and tighten the gland nut. If this doesn't work, do not use the cylinder. Properly tag it and remove it from the work area.
 - If fuel gas leaks from the cylinder valve and the gas cannot be shut off, properly tag and remove the cylinder from the work area. If a regulator will effectively stop a leak through the valve seat, the cylinder can be used.
 - Do not use oxygen for personal cooling, cleaning off of surfaces, ventilation, or blowing dust from clothing.
 - Do not weld or cut an acetylene or oxygen pipeline, including the attachment of hangers or supports, until the line has been purged.
 - Only use pressure-reducing regulators for gas and pressures for which they are intended.
 - Do not attempt to repair a regulator or parts of a regulator. Have a skilled mechanic do so.
 - Safe practices in using manifolds include:
 - Do not place fuel gas and oxygen manifolds in enclosed spaces.

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- Do not place oxygen manifolds in an acetylene generator room.
- Use manifolds and their parts only for the gas(es) for which they are approved.
- Do not alter or substitute manifold hose connections to allow interchange between fuel gas and oxygen manifolds and supply header connections. Keep hose connections free of grease and oil.
- Cap manifold and header hose connections when not in use.
- Do not place anything on top of a manifold, when in use, which will damage the manifold and interfere with quick closing of valves.
- Install approved flash arresters between each cylinder and the coupler block when acetylene cylinders are coupled.
- Manifold acetylene and liquefied fuel-gas cylinders only in a vertical position.
- Safe practices in using hoses include:
 - Make sure fuel gas hose and oxygen hose are easily distinguishable from each other, by different colors or by surface characteristics readily distinguishable by the sense of touch. Do not allow use of a single hose with more than one gas passage.
 - Do not interchange hoses, including use of adapters, between fuel gas and oxygen sources.
 - When parallel sections of oxygen and fuel gas hose are taped together, do not cover more than four inches out of 12 inches with tape.
 - Inspect all hose at the beginning of each working shift. Do not use defective hose.
 - Hose subjected to flashback, or with evidence of severe wear or damage, must be tested to twice the normal pressure to which it is subject, but in no case less than 300 p.s.i. Do not use defective hose, or hose in doubtful condition.
 - Use only hose couplings that cannot be unlocked or disconnected by means of a straight pull without rotary motion.
 - Do not store gas hose in unventilated boxes.
 - Keep hoses, cables, and other equipment clear of passageways, ladders, and stairs.
 - Clamp or securely fasten hose connections in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than a pressure of 300 p.s.i. Oil-free air or an oil-free inert gas shall be used for the test.
- Safe practices in using torches include:
 - Clean clogged tip openings only with suitable cleaning wires, drills, or other devices designed for such purposes.
 - Inspect at the beginning and end of each shift for leaking shutoff valves, hose couplings, and tip connections. Do not use defective torches.
 - Light only with friction lighters or other approved devices. Do not use matches or hot work.
- Safe practices in using regulators and gauges include:

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- Make sure oxygen and fuel gas pressure regulators, including their related gauges are in proper working order.
 - Keep oxygen cylinders and fittings away from oil or grease. Oxygen shall not be directed at oily surfaces, greasy clothes, or within a fuel oil or other storage tank or vessel.
- Arc Welding and Cutting
 - When arc welding is performed in wet conditions, or under conditions of high humidity, special protection against electric shock shall be supplied.
 - Do not dip a hot electrode into water.
 - Use holders, cable, and other apparatus specifically designed for the purpose, matched to the job and other components and in good repair.
 - When leaving electrode holders unattended, electrodes must be removed and holders placed so that accidental electrical contact is not made.
 - Use non-combustible or flame-proof screens to protect employees and passersby from arc rays wherever practicable.
 - Keep chlorinated solvents at least 200 feet from an inert-gas metal-arc welder or provide adequate shielding. Surfaces prepared with chlorinated solvents will be thoroughly dry before welding.
 - Workman assigned must be familiar with this section (1910.254) and with 1910.252(a)(b) & (c). If gas shielded arc welding is done they must be familiar with the American Welding Society Standard A6-1-1966.
 - Before starting operations all connections to the machine shall be checked to make certain they are properly made. The work lead shall be firmly attached to the work; magnetic work clamps shall be freed from adherent metal particles of spatter on contact surfaces. Coiled welding cable shall be spread out before use to avoid serious overheating and damage to insulation.
 - Grounding of the welding machine frame shall be checked. Special attention shall be given to safety ground connections of portable machines.
 - There shall be no leaks of cooling water, shielding gas, or engine fuel.
 - It shall be determined that proper switching equipment for shutting down the machine is provided.
 - Printed rules and instructions covering operation of equipment supplied by the manufacturers shall be strictly followed.
 - Electrode holders when not in use shall be so placed that they cannot make electrical contact with persons, conducting objects, fuel, or compressed gas tanks.
 - Cables with splices within 10 feet (3 m) of the holder shall not be used. The welder should not coil or loop welding electrode cable around parts of his body.
 - The operator should report any equipment defect or safety hazard to his supervisor and the use of the equipment shall be discontinued until its safety has been assured. Only qualified personnel shall make repairs.
 - Machines that have become wet shall be thoroughly dried and tested before being used.
 - Cables with damaged insulation or exposed bare conductors shall be replaced. Joining lengths of work and electrode cables shall be done by the use of

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connecting means specifically intended for the purpose. The connecting means shall be insulation adequate for the service conditions.

- Fire Prevention
 - The supervisor will use this guide to assess fire hazards at the workplace:
 - 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 guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.
 - If the requirements stated in the two boxes above cannot be followed then welding and cutting shall not be performed.
 - Wherever there are floor openings or cracks in the flooring that cannot be closed, precautions shall be taken so that no readily combustible materials on the floor below will be exposed to sparks that might drop through the floor. The same precautions shall be observed with regard to cracks or holes in walls, open doorways, and open or broken windows.
 - Suitable fire extinguishing equipment shall be provided and maintained in a state of readiness for instant use. Such equipment may consist of pails of water, buckets of sand, hose or portable extinguishers depending upon the nature and quantity of the combustible material exposed. A Fire Watch must be maintained at least ½ hour after the welding and cutting operation has been completed.
 - Before cutting or welding is permitted, the area shall be inspected by the individual responsible for authorizing cutting and welding operations. He shall designate precautions to be followed in granting authorization to proceed preferably in the form of a written permit.
 - Special precautions shall be taken for floors covered with combustible materials; combustibles within 35 feet of the work area; ducts that might carry sparks; combustible walls; combustibles on the other side of a noncombustible wall; combustible coverings; pipes in contact with combustible walls; storage of readily ignitable materials; drums, barrels, tanks, other containers that may contain flammable materials; pipes leading to a drum or vessel; and all hollow spaces, cavities or containers.
 - The company will establish procedures for cutting and welding and designate an individual responsible for authorizing welding operations in areas not designed for such processes.
 - The company will advise all contractors about flammable materials or hazardous conditions.
 - Cutting or welding shall not be permitted in the following situations:
 - In areas not authorized by management.
 - In sprinklered buildings while such protection is impaired.
 - In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside unclean or improperly prepared tanks or

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equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts.

- Fire Watchers


- Firewatchers shall be required whenever welding or cutting is performed in locations where other than a minor fire might develop, or any of the following conditions exist:
 - Appreciable combustible material, in building construction or contents, closer than 35 feet (10.7m) to the point of operation.
 - Appreciable combustibles are more than 35 feet (10.7m) away but are easily ignited by sparks.
 - Wall or floor openings within a 35-foot (10.7m) radius expose combustible material in adjacent areas including concealed spaces in walls or floors.
 - Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.
 - Fire watchers shall have fire-extinguishing equipment readily available and be trained in its use.
 - Fire watchers will be trained on the specific fire hazards.
 - Assigned fire watchers must be trained in the use of fire extinguishing equipment and familiar with the facilities for sounding an alarm in the event of a fire.
 - Fire watchers must be maintained at least a half-hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

- Ventilation

- The supervisor will determine the number, location, and capacity of ventilation devices.
- Ventilation will be sufficient to protect passersby as well as the welder.
- Oxygen shall never be used for ventilation.
- Don't rely on general ventilation as the only means of protection when air contaminants are toxic.
- Where ventilation is not sufficient to provide clean, respirable air, respirators will be specified according to specifications applicable to your facility and policies.


- Personal Protective Equipment

- Proper eye protection i.e., helmets, hand shields, goggles, and spectacles, must be provided.
- Proper protective clothing must be provided.
- First-aid equipment shall be available at all times.
- Air line respirators will be provided for confined space jobs when sufficient ventilation cannot be provided without blocking the exit.
- 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,

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and beryllium. Due to beryllium's extreme danger, both ventilation and air line respirators will be used.

- Where screens are not sufficient to protect welders and passersby from arc radiation, the company will provide eye protection with appropriate helmets, filter lens goggles, or hand shields. The helmets and shields will be maintained in good repair.
- 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).
- Confined Spaces
 - Evaluate the space, the hazardous atmosphere, the floor surface, and the interior surface for flammability, combustibility, or toxic fumes that could result from the welding process.
 - Perform atmospheric testing for oxygen deficiency and for toxic and flammable or combustible gases before and during entry. If the tests show that flammable or combustible gases are present, the space must be ventilated until safe to enter. If the atmosphere is toxic and cannot be cleared through ventilation, appropriate respiratory equipment must be used. All energy sources that could cause employee injury must be disconnected and locked in the "off" position before entry.
 - Ventilation must be provided. Confined spaces such as manholes, tunnels, trenches, and vaults, are particularly hazardous working areas made more dangerous by welding.
 - Gas cylinders and welding machines shall be left on the outside of the confined space. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement.
 - Where a welder must enter a confined space through a manhole or other small opening, means shall be provided for quickly removing him in case of emergency. When safety harnesses and lifelines are used for this purpose they shall be so attached to the welder's body that his body cannot be jammed in a small exit opening. An attendant with a preplanned rescue procedure shall be stationed outside to maintain communication with the welder at all times and be capable of putting rescue operations into effect.
 - When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine disconnected from the power source.
 - In order to eliminate the possibility of gas escaping through leaks of improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the fuel-gas and oxygen supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable the torch and hose shall also be removed from the confined space after welding operations are completed the welder.
 - Applicable warning signs will be posted as necessary.

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- Flammable, Toxic, or Hazardous Materials
 - The company will designate a competent person to test the flammability of unknown coatings.
 - When a coating is found to be highly flammable, it will be stripped from the area to prevent fire.
 - Any welding, cutting or burning of lead base metals, zinc, cadmium, mercury, beryllium or exotic metals or paints not listed here shall have proper ventilation or respiratory protection.
- Electrical Equipment
 - Do not arc weld while standing on damp surfaces or in damp clothing.
 - Properly ground, install, and operate equipment.
 - Do not use defective equipment.
 - Use well-insulated electrode holders and cables.
 - Insulate yourself from both the work and the metal electrode and holder.
 - Don't wrap a welding cable around your body.
 - Wear dry gloves and rubber-soled shoes.
 - Do not use damaged or bare cables and connectors.
 - In case of electric shock, don't touch a victim. Turn off the current at the control box and then call for help. After the power is off, you may perform cardiopulmonary resuscitation (CPR) if necessary.
- Fall Protection
 - 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 some other equally effective safeguards.
 - Welders shall place welding cable and other equipment so that it is clear of passageways, ladders, and stairways.
 - Maintain a clear welding or cutting area to prevent slips, trips, and falls.

First Aid Equipment

First aid equipment is available at all times.

Inspections

A number of inspections are required under the welding and cutting regulations. To make inspections efficient, we have compiled a list of inspection items to be checked before welding or cutting (see the attached inspection checklist).

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

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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.

The Maintenance Department follow(s) the manufacturer's operator instruction manual for daily or weekly maintenance.

Periodic maintenance (those completed monthly or less frequently) is done by a factory-trained-expert, or a dealer.

Signs and Labels

Our company posts signs as follows:

- Warning Sign: After welding operations are completed, the welder shall mark the hot metal or provide some other means of warning other workers.
- Precautionary Labels: A number of potentially hazardous materials are employed in fluxes, coatings, coverings, and filler metals used in welding and cutting or are released to the atmosphere during welding and cutting. These include but are not limited to the materials itemized in OSHA regulations. The suppliers of welding materials shall determine the hazard, if any, associated with the use of their materials in welding, cutting, etc.
- All filler metals and fusible granular materials shall carry the following notice, as a minimum, on tags, boxes, or other containers:

CAUTION

Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. Use adequate ventilation. See ANSI Z49.1-1967 Safety in Welding and Cutting published by the American Welding Society.

Brazing (welding) filler metals containing cadmium in significant amounts shall carry the following notice on tags, boxes, or other containers:

WARNING

CONTAINS CADMIUM--POISONOUS FUMES MAY BE FORMED ON HEATING Do not breathe fumes. Use only with adequate ventilation such as fume collectors, exhaust ventilators, or air-supplied respirators. See ANSI Z49.1-1967. If chest pains, cough, or fever develops after use call physician immediately.

Brazing and gas welding fluxes containing fluorine compounds shall have a cautionary

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wording to indicate that they contain fluorine compounds. One such cautionary wording recommended by the American Welding Society for brazing and gas welding fluxes reads as follows:

CAUTION

CONTAINS FLUORIDES

This flux when heated gives off fumes that may irritate eyes, nose and throat.

1. Avoid fumes--use only in well-ventilated spaces.
2. Avoid contact of flux with eyes or skin.
3. Do not take internally.

Compressed gas cylinders shall be legibly marked, for the purpose of identifying the gas content, with either the chemical or the trade name of the gas. Such marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removable. Whenever practical, the marking shall be located on the shoulder of the cylinder. This method conforms to the American National Standard Method for Marking Portable Compressed Gas Containers to Identify the Material Contained, ANSI Z48.1-1954, which is incorporated by reference as specified in 29 CFR 1910.6.

A warning should be placed near cylinders having leaking fuse plugs or other leaking safety devices not to approach them with a lighted cigarette or other source of ignition. Such cylinders should be plainly tagged; the supplier should be promptly notified and his instructions followed as to their return.


The following sign shall be conspicuously posted at each manifold:

Low-Pressure Manifold

Do Not Connect High-pressure Cylinder

Maximum Pressure--250 psig (1.7 MPa)

- Aboveground piping systems shall be marked in accordance with the American National Standard Scheme for the Identification of Piping systems, ANSI A13.1-1956, which is incorporated by reference as specified in 29 CFR 1910.6. 06-01-96
- Station outlets shall be marked to indicate the name of the gas.
- Gages on oxygen regulators shall be marked USE NO OIL.
- Acetylene generators.

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- Generators shall be of approved construction and shall be plainly marked with the maximum rate of acetylene in cubic feet per hour for which they are designed;
- the weight and size of carbide necessary for a single charge;
- the manufacturers name and address; and the name of number of the type of generator.
- Carbide shall be of the size marked on the generator nameplate.
- Rating and pressure limitations. The total hourly output of a generator shall not exceed the rate for which it is approved and marked. Unless specifically approved for higher ratings, carbide-feed generators shall be rated at 1 cubic foot (0.028 m³) per hour per pound of carbide required for a single complete charge.
- Operating instructions shall be posted in a conspicuous place near the generator or kept in a suitable place available for ready reference.
- Packages containing calcium carbide shall be conspicuously marked CALCIUM CARBIDE--DANGEROUS IF NOT KEPT DRY or with equivalent warning.

Welder Maintenance & Inspection

Manufacturer's recommendations for maintenance of welding units are as follows:

Annual

- Clean all internal components & wiring.

Quarterly

- Inspect power cord.
- Inspect leads.
- Insure external labeling for legibility.

Maintenance will be conducted by qualified maintenance personnel with written reports completed and filed in the Training and Compliance office.


Recordkeeping

The TCM is responsible for keeping records certifying that each employee who has successfully completed training and testing.

The Maintenance Department keeps inspection records for welding and cutting equipment.

Additional State Requirements

Some state requirements regarding welding, cutting, and brazing include a substantial amount of regulatory information beyond the federal requirements. A summary of the additional requirements includes the following:

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- For acetylene generators located inside, a portion of the exterior walls or roof equal to at least 10% of the combined areas of the enclosing walls and roof must be of light, noncombustible material, preferably single-strength glass.
- In every acetylene generator house, room, or compartment over 100 sq. ft. in floor area, there must be 2 readily accessible exits remotely located from each other. At least one exit door must give direct access to the outside.
- At least one fire extinguisher of at least 10B:C rating must be kept available for service and in good working order near each acetylene generator house or room.
- Whenever a person is inside an acetylene generator, another person must be stationed outside the generator to assist in case of emergency. The person in the generator must be provided with, and must wear an approved life line and belt. In addition, a ladder must give access to the interior of the generator.
- Flashlights used in the generator room or storage building must be Bureau of Mines permissible type or equivalent.
- Before portable acetylene generators are recharged, partially or completely, they must be thoroughly cleaned of all sludge and refilled with clean water.
- The seal on calcium carbide storage containers stored indoors must not be broken so long as there is carbide in excess of one pound in any other unsealed package of that size of carbide *in the building*. The contents of damaged containers must be promptly used or transferred to another container.
- Sealed metal containers of calcium carbide stored out-of-doors must be stored in rows with ample space for easy inspection and under tarpaulins.
- Carbide storage rooms must not be used for the storage of any other material except fuel gas cylinders, singly or manifolded.
- Trucks or wheelbarrows used inside carbide storage rooms must be equipped with rubber or other nonsparking tires.
- There must be no opening from a carbide storage room into any other room or building, except that if there be a partition between the carbide room and a generator room, a doorway will be permitted if all electrical equipment in the carbide room is installed in accordance with Electrical Safety Orders for hazardous locations.
- Nonferrous tools except copper or copper base alloy tools must be provided and used for opening carbide containers.
- Service piping and fittings must comply with Section 2, Industrial Gas and Air Piping Systems of the American National Standard Code for Pressure Piping ANSI B31.1.1983.
- All drip pots must be readily accessible.
- Oxygen piping must never be placed in a tunnel, trench, manhole, or duct where it may be exposed to contact with oil.
- In low-pressure (less than 1 psi) gas piping systems, a hydraulic back-pressure valve must be employed at every point where fuel gas and oxygen are withdrawn from the system.
- If the station outlet is equipped with a detachable regulator or connected directly to a hose, the outlet must terminate in a union connection that complies with the Standard

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Connections for Regulator Outlets, Torches and Fitted Hose for Welding and Cutting Equipment, Compressed Gas Association, Pamphlet E-1-1980.

- Each fuel-gas and oxygen cylinder lead must be provided with a backflow check valve.
- Manifolds must be located and guarded to protect them against damage from trucks and from any material being moved in the vicinity.
- Fuel gas and oxygen manifolds must bear the name of the substance they contain in letters at least 1-inch high, either painted on the manifold or on a sign permanently attached to it.
- Nothing may be placed on top of a manifold, when in use, which will damage the manifold or interfere with the quick closing of the valves.
- Special manifold buildings or rooms also used for the storage of cylinders containing fuel gas and of drums of carbide must have signs conspicuously posted, reading, "Danger No Smoking, Matches or Open Lights," or other equivalent wording.
- Where liquid oxygen in a quantity exceeding 100 gallons is to be used for welding and cutting, the containers must be located outside or in a special building having no other occupancy except that related to the handling and gasification of the oxygen, and must comply with the provisions of Article 139, Oxygen.
- Hose for oxy-fuel gas service must comply with the Specification for Rubber Welding Hose, 1979, Rubber Manufacturers Association.
- Hose connections must comply with the Standard Connections for Regulator Outlets, Torches and Fitted Hose for Welding and Cutting Equipment, Compressed Gas Association, Pamphlet E-1-1980.
- All hose in use carrying any gas or substance which may ignite or enter into combustion, or which is in any way harmful to employees, must be inspected at the beginning of each working shift.
- All oxygen pipe lines must be painted one color (preferably green) and all fuel gas pipes a different color. If more than one fuel gas is employed, the pipe lines supplying the different gases must be painted distinctive colors. A color chart indicating the colors employed for this purpose must be prominently displayed. Signs clearly establishing the location and identity of section shut-off valves must be provided.
- Torches in use must be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings, and tip connections. Defective torches must not be used. Clogged torch tip openings must be cleaned with suitable cleaning wires, drills, or other devices designed for that purpose.
- Torches must be lighted by friction lighters or other approved devices, and not by matches or from hot work.
- Management must:
 - establish a fire prevention and suppression procedure relative to use of cutting and welding equipment on its property and issue instructions based upon the applicable parts of ANSI Z49.1-1973, Safety in Welding and Cutting;
 - insist that only approved apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used; and

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- select contractors to perform hot work involving cutting or welding who have suitably trained personnel and who have an awareness of the magnitude of the risks involved.
- All electric welding equipment must be installed and maintained in accordance with the OSHA regulations and applicable technical portions of ANSI Z49.1-1973.
- Arc welding cables with splices or repairs within 10 feet of the holder may be used if insulated connectors or splices have insulating quality equal to that of the cable are used.
- Arc welding and cutting cables must be insulated, flexible, and capable of handling the maximum current required by the operations, taking into account the duty cycles.
- The employer must ensure that only manual electrode holders intended for arc welding and cutting, and capable of handling the maximum current required for such welding or cutting, may be used.
- Hot electrode holders must not be dipped in water.
- Employers must ensure that when arc welders or cutters leave or stop work or when machines are moved, the power supply switch must be kept in the off position.
- When arc welding is performed in wet or high humidity conditions, employees must use additional protection, such as rubber pads or boots, against electric shock.
- One or more safety emergency stop buttons must be provided on all multi-spot welding machines, with a minimum of one stop button at each operator's position.

Attachments

HSE-BF-022 WELDING & CUTTING SAFETY INSPECTION CHECKLIST
HSE-BF-023 HOT WORK PERMIT
HSE-BF-024 WELDER MAINTENANCE & INSPECTION REPORT