



Sabine Environmental Services, LLC

ES & H Procedures

Title: **Welding, Cutting & Hot Work**
Revision: 1
Effective Date: 6/23/2010

Welding & Cutting Procedure

American Welding Society (AWS) Publications

ANSI Z49.2005 – Safety in Welding, Cutting & Allied Processes

AWS Safety & Health Fact Sheet 1 – Fumes and Gases

AWS Safety & Health Fact Sheet 2 – Radiation

AWS Safety & Health Fact Sheet 7 – Burn Protection

AWS Safety & Health Fact Sheet 24 – Fluxed for Arc Welding and Brazing: Safe Handling & Use

AWS Safety & Health Fact Sheet 26 – Arc Viewing Distance

AWS Safety & Health Fact Sheet 28 – Oxyfuel Safety: Check Valves and Flashback Arrestors

AWS Safety & Health Fact Sheet 29 – Grounding of Portable / Vehicle Mounted Welding Generators

AWS Safety & Health Fact Sheet 30 – Cylinders: Safe Storage, Handling, and Use

AWS Safety & Health Fact Sheet 31 – Eye and Face Protection for Welding & Cutting

AWS Safety & Health Fact Sheet 33 – PPE for Welding & Cutting

AWS Safety & Health Fact Sheet 37 – Selecting Gloves for Welding & Cutting



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1.0 Purpose

The purpose of this procedure is to identify and help implement practices for safe welding, cutting and hot work. This plan is intended to comply with the requirements of OSHA's 29 CFR Subpart Q.

2.0 References & Attachments

OSHA Subpart Q	Welding, Cutting & Brazing
OSHA 1910.252	General Requirements
OSHA 1910.253	Oxygen-fuel gas welding and cutting
OSHA 1910.254	Arc welding and cutting
OSHA 1910.133	Eye and Face Protection

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AWS Safety & Health Fact Sheet 29 – Grounding of Portable / Vehicle Mounted Welding Generators

AWS Safety & Health Fact Sheet 30 – Cylinders: Safe Storage, Handling, and Use

AWS Safety & Health Fact Sheet 31 – Eye and Face Protection for Welding & Cutting

AWS Safety & Health Fact Sheet 33 – PPE for Welding & Cutting

AWS Safety & Health Fact Sheet 37 – Selecting Gloves for Welding & Cutting

3.0 General Requirements

Equipment defects and or safety hazards shall be reported and use discontinued until safety has been assured and repairs performed by qualified personnel;

3.1 Fire prevention and protection

Separating or guarding combustible materials

- a) When fire hazards exist in the area in which welding will be performed, either the object to be welded or the fire hazard shall be moved to a safe place;
- b) If the hazard and the object cannot be separated, guards shall be used to confine the heat, sparks and slag;
- c) If the welding cannot be separated from a hazard and guards are not available, welding shall not be performed;
- d) When welding is performed over flooring with openings that cannot be covered, combustible materials on the floor below must be protected from sparks either by separation or by guards, as above;

Fire extinguishing abilities

- e) Suitable fire extinguishing material must be readily available and can include portable fire extinguishers and/or pails of water or sand;

Fire Watch

- f) A fire watch is required if:
 - a. Locations where other than a minor fire might develop;
 - b. Combustible material is present within 35';
 - c. Combustible materials or are greater than 35' but are easily ignited;
 - d. Combustible materials are accessible by sparks via floor or wall openings within 35'
 - e. Combustible materials are adjacent to partitions, walls, ceilings or roofs and are likely to be ignited;
 - f. Welding, cutting, brazing and/or soldering are performed near combustible materials and/or in locations where fire may develop.
- g) Fire Watch requirements include:
 - a. Extinguishing equipment shall be readily available
 - b. The fire watch shall be familiar with sounding alarms
 - c. Continuously watching for fires and trying to extinguish them only when within the capacity of the equipment available
 - d. The fire watch shall be maintained for at least ½ hour after completion of welding or cutting operations;
- h) Personnel serving as Fire Watch shall be trained in fire extinguisher use and familiarized with facility alarms.

Area preparation, inspection & authorization

- i) The proposed welding area shall be inspected prior to operations and precautions established. The welder is responsible for safe operations, including inspection and authorization;
- j) A written permit shall be utilized that specifies required precautions;
- k) The floor shall be cleaned for a radius of 35' and/or kept wet, covered with damp sand or protected by fire resistant shields;
- l) If the floor is wet, the welder shall be protected from electric shock;
- m) Welding and cutting cannot be performed in the following areas: In the presence of explosive atmospheres or where large quantities of exposed ignitable material is stored;
- n) Precautions shall be taken when any other combustible material may be exposed (walls, coverings) or where ignition sources may travel (pipe, ducts, metal walls);
- o) Ensure the area is safe for welding or cutting prior to operations, including protection of non-welding personnel.

Welding or cutting containers

- p) Welding, cutting or hot work shall not be performed on used drums, barrels, tanks or other containers until cleaned of potentially flammable material

Confined Space hot work

- q) Welding, cutting or hot work will NOT be performed in confined spaces;

3.2 Protection of personnel

- r) Welding cables and other equipment shall be placed clear of passageways, ladders and stairways;
- s) First aid equipment will be available at all times

Head and Eye Protection

- t) Helmets or hand shields shall be used, including by helpers, during arc welding;
- u) Goggles or the equivalent shall be used during gas welding or oxygen cutting;
- v) Helmets and hand shields shall be made of material that is insulating for heat and electricity;
- w) Helmets and hand shields shall protect the face, neck and ears from the arc's radiant energy;
- x) Helmets shall include filter and cover plates that can be easily removed;
- y) Goggles shall be ventilated to prevent fogging to the greatest extent possible;

- z) Glass lenses shall be constructed of tempered material and free of air bubbles, waves and flaws;
- aa) Lenses shall be marked with their source and shade. Shading shall meet the minimum requirements of 1910.133, Eye and Face Protection;
- bb) See AWS Safety & Health Fact Sheet 31 – Eye and Face Protection for Welding & Cutting;

Protective Clothing

- cc) Select boots that meet the requirements of ASTM F2412 and ASTM F2413 (or the older ANSI Z41 which has been withdrawn). Look for a compliance mark inside your boot;
- dd) Wear leather, steel-toed, high-topped boots in good condition. They will help protect your feet and ankles from injury;
- ee) In heavy spark or slag areas, use fire resistant boot protectors or leather spats strapped around your pant legs and boot tops to prevent injury and burns;
- ff) Do not wear pants with cuffs. Wear the bottoms of your pants over the tops of your boots to keep out sparks and flying metal. Do not tuck pant legs into your boots;
- gg) Always wear dry, hole-free, insulated welding gloves in good condition. They will help protect your hands from burns, sparks, heat, cuts, scratches, and electric shock;
- hh) ANSI Z49.1 requires all welders to wear protective flame-resistant gloves, such as leather welder's gloves. They should provide the heat resistance and general hand protection needed for welding;
- ii) Wear oil-free protective clothing made of wool or heavy cotton. Heavier materials work best. They are harder to ignite and resist wear and damage;
- jj) Choose clothing that allows freedom of movement and covers all areas of exposed skin. Wear long sleeved shirts (no t-shirts), and button the cuffs, pockets, and collar. They will protect your arms and neck from radiation exposure and skin burns (caused by ultraviolet radiation from the arc);
- kk) Wear heavy, durable, long pants (no shorts) without cuffs that overlap the tops of your boots;
- ll) Keep clothing dry. Change it when needed (this reduces the possibility of electric shock);
- mm) Be aware that any cuffs or open pockets can catch flying sparks and start on fire easily. Unroll cuffs and button pockets to prevent spark entry;
- nn) Keep clothing clean (free of oil, grease, or solvents which may catch fire and burn easily). Keep it in good repair (no holes, tears, or frayed edges). Always follow the manufacturer's directions for their use, care, and maintenance.
- oo) Remove all flammables and matches and cigarette lighters from your pockets.
- pp) Do not wear synthetic (man-made) fabrics because they may burn easily, melt, stick to your skin, and cause serious burns.
- qq) Wear leather aprons, leggings, capes and sleeves as needed for the application. Leather protects better than most materials.
- rr) See AWS Safety & Health Fact Sheet 33 – PPE for Welding & Cutting and AWS Safety & Health Fact Sheet 37 – Selecting Gloves for Welding & Cutting

3.3 Health protection and ventilation

- a) Local exhaust or ventilation shall be provided to ensure that maximum allowable concentrations of toxic fumes, gases or dusts are below the limits specified in 1910.1000
- b) Precautions shall be taken with fluxes, coatings, coverings and filler metals as prescribed by the respective manufacturer;
- c) Mechanical ventilation shall be used when welding is performed in (i) a room with a ceiling height < 16', (ii) a confined space, (iii) a space that significantly obstructs cross ventilation, or (iv) a space < 10,000 cubic feet per welder.
- d) Mechanical ventilation shall be at least 2,000 cfm;
- e) Additional ventilation or respiratory protection may be appropriate when welding on materials with more than trace amounts of antimony, arsenic, barium, cadmium, lead, manganese, mercury, nickel, ozone, selenium, silver or vanadium;
- f) When using thoriated tungsten electrodes, use local exhaust to prevent dust inhalation;
- g) Locate welding operations, or distance personnel, so that workers are not exposed to either direct or reflected radiation;
- h) Do not consume food or beverages in areas where flux dust, fumes or dusts have been present;

4.0 Oxygen-fuel gas welding and cutting

4.1 General requirements

- a) Review and comply with section 3.0, General Requirements, of this procedure;
- b) Because mixtures of fuel gas (acetylene, propane, natural gas, etc.) and air or oxygen may be explosive, fuel gases and air/oxygen may ONLY be mixed at the burner or in a standard torch;
- c) Acetylene shall NOT be used, generated or piped at pressures > 15 psig gage pressure or 30 psia absolute pressure. This limit does not include storage;
- d) Only approved apparatus such as torches, regulators or pressure reducing valves may be used;
- e) Workmen using oxygen or fuel-gas equipment shall be provided proper instruction on its use;
- f) Operating procedures from the manufacturer should be utilized, if available;

4.2 Cylinders and containers

Markings and Storage

- g) Compressed gas cylinders shall be legibly marked using stencils, stamps or labels;
- h) If cylinders with a water weight > 30 lbs shall be equipped with a valve protection cap or collar;
- i) Cylinders shall be kept away from sources of heat;
- j) Empty cylinders shall have their valves closed;
- k) Oxygen cylinders shall not be stored near combustible materials, reserve stocks of acetylene or other fuel gas, or near other material likely to cause or generate fire;
- l) Oxygen cylinders shall be separated from fuel gas cylinders or combustible materials by at least 20' or by a non-combustible fire barrier at least 5' high;
- m) See AWS Safety and Health Fact Sheet 30 – Cylinders: Safe Storage, Handling, and Use;

Operating

- n) Before opening a fuel gas cylinders, inspect the area for ignition sources;
- o) Cylinders and their parts shall be kept clean and free of oil and grease;
- p) Handling oxygen cylinders with oily hands is prohibited;
- q) Cylinders shall not be dropped, struck or permitted to strike each other;
- r) Valve protection caps shall not be used for lifting;
- s) When being transported on other than specially equipped trucks, the regulator shall be removed and the valve cap installed;
- t) Cylinders not having fixed wheels shall have non-adjustable wrenches, keys or handles on the valve stems;
- u) Cylinders shall be closed when work is finished, when empty and before moving;
- v) Cylinders shall be separated from fire and ignition sources, either by distance or guards;
- w) Cylinders shall not be located so that they become part of an electrical circuit;
- x) Cylinders shall not be handled roughly;
- y) Cylinders shall not be used as rollers or supports;
- z) Safety devices shall not be tampered with;
- aa) Hammers or wrenches may not be used to open cylinders;
- bb) Before connecting a regulator to a valve, the valve shall be opened slightly and closed immediately;
- cc) Before removing a regulator, shut the valve and release the gas from the cylinder;
- dd) If the cylinder is found to leak, take the cylinder outside and slowly empty it;
- ee) An acetylene cylinder valve shall never be opened more than 1 ½ turns and preferably no more than ¾ turns;
- ff) If special wrenches are required for valve operation, it should be affixed safely to the valve step;
- gg) Hose colors should be as follows: red for acetylene, green for oxygen and black for inert or air gas;

5.0 Arc welding and cutting

5.1 General

- a) Review and comply with section 3.0, General Requirements, of this procedure;
- b) Workmen shall be properly instructed and qualified prior to use;
- c) Arc welding equipment shall be chosen appropriately for its use;
- d) Operate in a well-ventilated area;
- e) Never fuel the engine while running or in the presence of an open flame;
- f) Wipe p spilled fuel immediately and wait for fumes to disperse to start the engine;
- g) Keep all guards and shields in place;
- h) Keep hands, hair and clothing away from moving parts;
- i) Maintain a well-stocked first aid kit readily available;

5.2 Application of arc welding equipment

- j) Operating voltages should be as low as possible, however, the following voltage limits shall not be exceeded
 - a. AC Manual arc welding/cutting – 80 volts
 - b. AC Automatic arc welding/cutting – 80 volts
 - c. DC arc welding/cutting – 100 volts

5.3 Installation

- k) The frame or case of the welding machine shall be grounded (See AWS Safety and Health Fact Sheet 29 – Grounding of Portable and Vehicle Mounted Welding Generators);
- l) A safety type disconnecting switch or controller shall be located near the machine;
- m) The welder shall be protected by a properly sized fuse or circuit breaker on an independent circuit;

5.4 Operation and Maintenance

- n) Equipment defects and or safety hazards shall be reported and use discontinued until safety has been assured and repairs performed by qualified personnel;
- o) Operating procedures from the manufacturer should be utilized, if available;
- p) Prior to startup check all connections to ensure they are secure;
 - a. Work lead shall be firmly attached;
 - b. Magnetic work clamps shall be freed from metal particles of spatter on contact surfaces;
 - c. Coiled welding cable shall be spread out before use to avoid serious overheating and damage to insulation.
- q) The welding machine frame shall be grounded;

- r) No leaks of engine fuel, cooling water or shielding gas should be evident;
- s) Manufacturer instructions shall be followed;
- t) Wet welding machines shall be dried and tested prior to use;
- u) Special care shall be taken to prevent shock during operation. Non conductive ppe may be appropriate;
- v) Control arc line of sight distances so that UVR exposure is minimized;
- w) Electrode holders not in use shall be placed so that they cannot make contact with persons, conducting objects, fuel or compressed gas tanks. Preferably, when not in use, electrodes should be removed from their holders;
- x) Cables with splices within 10' of the holder shall not be used;
- y) Welding cable shall not be coiled or looped around body parts;
- z) Equipment defects or safety hazards shall be reported and corrected;
- aa) Cables with damaged insulation or exposed bare conductors shall be replaced;
- bb) Shut off electric power to the welder when no one is in attendance;

6.0 Training

- Cutters, welders and supervisors shall be training in safe equipment operations and practices.
- Prior to authorizing a welder or worker to be in charge of any hot work activity, including arc welding, that individual shall be instructed on safe precautions and practices and evaluated/judged competent for such work.
- Prior to authorizing a worker to perform any hot work, that worker shall be instructed on and verified familiar with OSHA regulations 1910.254 and/or 1910.252 (a), (b), and (c)