



## **ELECTRIC WELDING**

Meets California OSHA Requirements  
Integrated Water Services, Inc.  
(the Company)



## **Purpose**

---

The purpose of this program is to assure a safe work environment during electric welding, cutting and hot work operations in California. Electric welding, cutting and heating shall be conducted in accordance with Cal/OSHA California Code of Regulations, Title 8, Section 4851.

## **Scope**

---

This program is applicable to all employees directly involved or assisting in the welding, cutting and hot work operations in California. When work is performed on a no owned or operated site, the operator's program shall take precedence, however, this document covers Company employees and contractors and shall be used on owned premises, or when an operator's program doesn't exist or is less stringent.

## **Responsibilities**

---

### **Managers and Supervisors**

- Determine if its property is safe for welding and cutting operations. Establish safe areas for welding and cutting operations.
- Provide training for all employees whose task includes heat, spark or flame producing operations such as welding, brazing, or grinding.
- Develop and monitor effective hot work procedures. Provide safe equipment for hot work.
- Provide proper and effective PPE for all hot work. Monitor all hot work operations.
- Defective arc welding or cutting equipment must not be used. Arc welding or cutting equipment having a functional defect shall not be used. Only cable free from repair or splice for 10 feet (3 m) from the electrode holder shall be used unless insulated connectors or splices with insulating quality equal to that of the cable are provided. When a cable other than the lead wears and exposes bare conductors, the portion exposed shall not be used until it is protected by insulation equivalent in performance capacity to the original.
- Allow only trained and authorized employees to conduct hot work and conduct inspections of the hot work area before operations begin. Ensure permits are used for all hot work outside authorized areas.

### **Employees**

- Follow all hot work procedures.
- Properly use appropriate hot work PPE.
- Inspect all hot work equipment before use.
- Report any equipment problems or unsafe conditions.

## **Procedure**

---

### **General**

A hot work permit must be completed before performing hot work. Precautions that are to be taken shall be in the form of a written permit. Before cutting or welding is permitted the area shall be inspected and a written permit shall be used to authorize welding and cutting operations.



Where practicable all combustibles shall be relocated at least 35 feet from the work site. Where relocation is impractical, combustibles shall be protected with flameproof covers, shielded with metal, guards, curtains, or wet down the material to help prevent ignition of material.

Ducts, conveyor systems, and augers that might carry sparks to distant combustibles shall be protected or shut down.

Where cutting or welding is done near walls, partitions, ceilings, or openings in the floor (grating, manholes, etc.), fire-resistant shields or guards shall be provided to prevent ignition.

If welding is to be done on a metal wall, partition, ceiling, or solid decking/flooring, precautions shall be taken to prevent ignition of combustibles on the other side, due to conduction or radiation of heat. Where combustibles cannot be relocated on the opposite side of the work, a fire watch person shall be provided on the opposite side of the work.

Welding shall not be attempted on a metal partition, wall, and ceiling or decking/flooring constructed of combustible sandwich panels.

Cutting or welding on pipes or other metal in contact with combustible walls, partitions, floors, ceilings, or roofs shall not be undertaken if the work is close enough to cause ignition by combustion.

Cutting or welding shall not be permitted in the following situations:

- In areas not authorized by management.
- In sprinkled buildings while such protection is impaired.
- In the presence of potentially explosive atmospheres, e.g. flammables.
- In areas near the storage of large quantities of exposed, readily ignitable materials.
- In areas where there is dust accumulation of greater than 1/16 inch within 35 feet of the area where welding/hot work will be conducted.
- All dust accumulation shall be cleaned up before welding or hot work is permitted.

Whenever welding or cutting is performed in locations where other than a minor fire might develop or any of the conditions mentioned above cannot be met, a fire watch shall be provided.

- The fire watch shall be provided during and for a minimum of 1/2 hour past the completion of the welding project.
- The fire watch shall be trained in the use of fire extinguishers and the facility's alarm system.
- During this time the fire watch will have appropriate fire extinguishers readily available.
- Suitable extinguishers shall be provided and maintained ready for instant use.
- A hot-work permit will be issued on all welding or cutting outside of the designated welding area.

### **Fire Prevention Measures**

A designated welding area shall be established to meet the following requirements:

- Floors swept and cleaned of combustibles within 35 feet of work area.
- Flammable and combustible liquids and material will be kept 35 feet from work area.
- Adequate ventilation providing 20 air changes per hour.



- At least one 10 pound dry chemical fire extinguisher shall be within access of 35 feet of the work area.
- Protective dividers such as welding curtains or noncombustible walls will be provided to contain sparks and slag to the combustible free area.

Requirements for welding conducted outside the designated welding area:

- Portable welding curtains or shields must be used to protect other workers in the welding area.
- A hot-work permit must be completed and complied with prior to initiating welding operations.
- Respiratory protection is mandatory unless an adequate monitored airflow away from the welder and others present can be established and maintained.
- Plastic materials must be covered with welding tarps during welding procedures.
- Fire Watch must be provided for all hot-work operations.

After welding operations are completed, the welder shall mark the hot metal or provide some other means of warning other workers.

### **Confined Space**

- Definition - A space that is large enough and so configured that an employee can bodily enter and perform assigned work; Has limited or restricted means for entry or exit (for example, tanks, vessels, coolers, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and is not designed for continuous occupancy.

Refer to the Confined Space Program for the Company before commencing any welding, cutting, and/or brazing operations in an area meeting the requirements of a confined space.

Ventilation is a prerequisite to work in confined spaces.

Welding machines are positioned outside of a confined space. Welding machines shall be left on the outside of a confined space and heavy portable equipment shall be blocked to prevent accidental movement. When operations are suspended for any substantial period of time, such as during lunch or overnight, welding machines shall be shut off at some point outside the confined space. Where practicable, the electrodes and electrode holders shall be removed from the confined space. All electrodes shall be removed from the holders and the holders carefully located to prevent accidental contact.

When 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 an emergency.

- When safety belts and lifelines are used for this purpose, they shall be so attached to the welder's body that it cannot be jammed in a small exit opening.
- An attendant with a preplanned rescue procedure shall be stationed outside to observe 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 shall be disconnected from the power source.



All welding and cutting operations carried on in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. This applies not only to the welder, but also to helpers and other personnel in the immediate vicinity. All air withdrawn will be replaced with air that is clean.

In circumstances for which it is impossible to provide such ventilation, airline respirators or hose masks approved for this purpose by the National Institute for Occupational Safety and Health (NIOSH) will be provided. In areas immediately hazardous to life, a full-face piece, positive pressure, self-contained breathing apparatus or a combination full-face piece, positive pressure supplied-air respirator with an auxiliary, self-contained air supply approved by NIOSH must be used.

Where welding operations are carried on in confined spaces and where welders and helpers are provided with hose masks, hose masks with blowers or self-contained breathing equipment, a worker shall be stationed on the outside of such confined spaces to ensure the safety of those working within.

#### **Protective Screens/Guards Are Used During Welding**

Where the work permits, the welder shall be enclosed in an individual booth painted with a finish of low reflectivity, such as zinc oxide and lamp black or shall be enclosed with noncombustible screens having a similar low reflectivity finish. Booths and screens shall permit circulation of air at floor level. Workers or other persons adjacent to the welding areas shall be protected from the rays by noncombustible or flameproof screens or shields or shall be required to wear appropriate goggles.

#### **Fumes, Gases and Dust**

Fumes produced by some welding processes can be toxic and may require source extraction. An assessment of the work to be performed must be completed before each job is undertaken. Fumes generally contain particles from the material being welded. Welding fumes can have an acute effect on the respiratory system.

Any welding, cutting or burning of lead base metals, zinc, cadmium, mercury, fluorides, beryllium or exotic metals or paints not listed here that could produce dangerous fumes shall have proper ventilation or respiratory protection. This includes inert-gas metal-arc welding or oxygen cutting of stainless steel.

Welders and helpers will refer to the Respiratory Protection Program for the Company to determine the appropriate respiratory protection to be used during welding operations. All welding and cutting operations shall be adequately ventilated to prevent the accumulation of toxic materials. This applies not only to the welder, but also to helpers and other personnel in the immediate vicinity.

#### **Personal Protection**

- Helmets and hand shields shall be made of a material, which is an insulator for heat and electricity. Helmets, shields, and goggles shall not be readily flammable and shall be capable of withstanding sterilization.
- Helmets and hand shields shall be arranged to protect the face, neck and ears from direct radiant energy from the arc.
- Helmets shall be provided with filter plates and cover plates designed for easy removal.
- All parts shall be constructed of a material, which will not readily corrode or discolor the skin.
- Goggles shall be ventilated to prevent fogging of the lenses as much as practicable.



- All glass for lenses shall be tempered, substantially free from scratches, air bubbles, waves and other flaws. Except when a lens is ground to provide proper optical vision correction, the front and rear surfaces of lenses and windows shall be smooth and parallel.
- Lenses shall bear some permanent distinctive marking which may readily identify the source and shade.
- Adequate hand protection and clothing must be used to protect the body from welding hazards.

#### **Cleaning Compounds**

In the use of cleaning materials, because of their possible toxicity or flammability, appropriate precautions such as manufacturer instructions shall be followed.

- Degreasing and other cleaning operations involving chlorinated hydrocarbons shall be so located that no vapors from these operations will reach or be drawn into the atmosphere surrounding any welding operation.
- In addition, trichloroethylene and perchloroethylene shall be kept out of atmospheres penetrated by the ultraviolet radiation of gas-shielded welding operations.

#### **Arc Welding and Cutting**

- All personnel operating, installing, and maintaining welding equipment shall be qualified or trained to operate and maintain such equipment.
- Arc welding equipment must be designed to meet conditions such as exposure to corrosive fumes, excessive humidity, excessive oil vapor, flammable gasses, abnormal vibration or shock, excessive dust and seacoast or shipboard conditions. It shall be operated at recommended voltage in accordance to the manufacturer recommendations.
- Leads shall not be repaired with electrical tape.
- Damaged cables are not to be used or repaired/protected except by insulation equivalent in performance to the original capacity. When a cable other than the lead wears and exposes bare conductors, the portion exposed shall not be used until it is protected by insulation equivalent in performance capacity to the original.
- Ground connections are adequate to carry the current. Ground connections shall be mechanically and electrically adequate to carry the current. Arc welding and cutting machine frames shall be grounded, either through a third wire in the cable containing the circuit conductor or through a separate wire at the source of the current. Grounding circuits shall have resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.
- A disconnecting switch or controller shall be provided at or near each welding machine along with over current protection.
- The power supply switch must be in the off position when welders or cutters stop work. The Company will ensure that when arc welders or cutters leave or stop work or when machines are moved, the power supply switch shall be kept in the off position. Upon completion or discontinuance of welding operations, the welder shall provide some means of warning other workers of the location of hot metal.
- All direct current machines shall be connected with the same polarity and all alternating current machines connected to the same phase of the supply circuit and with the same polarity.
- To prevent electrical contact with personnel, all electrode holders shall be placed where they do not make contact with persons, conducting objects or the fuel of compressed gas tanks.
- Only cables free from repair or splice for 10 feet from the electrode holder are used. Only cable free from repair or splice for 10 feet (3 m) from the electrode holder shall be used unless insulated connectors or splices with insulating quality equal to that of the cable are provided.



- If the object to be welded or cut cannot readily be moved, all moveable fire hazards should be removed.
- If an 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.
- Protection for employees while working in damp or humid conditions - When arc welding is performed in wet or high humidity conditions, employees shall use additional protection, such as rubber pads or boots, against electric shock. If a receptacle(s) is installed or exists as part of the permanent wiring of the building or structure and is used for temporary electric power, ground-fault circuit-interrupter protection for personnel shall be provided.

### **Fire Watch Requirements**

A fire watch shall be under these conditions as a minimum and when welding, cutting, brazing and/or soldering is performed near combustible materials and/or locations where fire may develop:

- Locations where other than a minor fire might develop.
- Combustible materials are closer than 35 feet to the point of operation.
- Combustibles that are 35 feet or more away but are easily ignited.
- Wall or floor openings within a 35 feet radius of exposed combustible materials.
- Combustible materials are adjacent to the opposite side of metal partitions, ceilings or roofs.

Fire watch personnel shall be maintained at least a half an hour after welding or cutting operations have been completed and fire watchers shall have fire extinguishers readily available.

### **First Aid Equipment**

First aid equipment shall be available at all times. All injuries shall be reported as soon as possible for medical attention. First aid shall be rendered until medical attention can be provided.

### **Training**

---

Training shall include:

- Position Responsibilities
- Cutters, welders and their supervisors must be suitably trained in the safe operations of their equipment and the safe use of the process.
- Fire Watch Responsibilities - specifically, the fire watch must know:
  - That their ONLY duty is Fire Watch.
  - When they can terminate the watch.
  - How to use the provided fire extinguisher(s).
  - Be familiar with facilities and how to activate fire alarm, if fire is beyond the incipient stage.
  - Operator Responsibilities
  - Contractor Responsibilities
  - Documentation requirements
  - Respirator Usage requirements
  - Fire Extinguisher training.