

E Light Electric Services

Hot Work Safety Procedures

Purpose

Welding and Hot Work, such as brazing or grinding present a significant opportunity for fire and injury. All precautions of this program must be applied prior to commencing any welding or hot work by company employees or contractors. Reference: OSHA 29 CFR 1910.252

Responsibilities

Management

- Provide training for all employees whose task include 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

Supervisors

- Monitor all hot work operations
- Ensure all hot work equipment and PPE are in safe working order
- Allow only trained and authorized employees to conduct hot work
- 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
- Not use damaged hot work equipment

Definitions

Welding/Hot Works Procedures: any activity which results in sparks, fire, molten slag, or hot material which has the potential to cause fires or explosions.

Examples of Hot Works: Cutting, Brazing, Soldering, Thawing Pipes, Torch Applied Roofing, Grinding and Welding.

Special Hazard Occupancies: Any area containing Flammable Liquids, Dust Accumulation, Gases, Plastics, Rubber and Paper Products.

Hazards

- Fires & Explosions
- Skin burns
- Welding "blindness"
- Respiratory hazards from fumes & smoke

Training

Training shall include:

- Review of requirements listed in OSHA 1910.252
- Use of Hot Works Permit System
- Supervisor Responsibilities
- Fire Watch Responsibilities - specifically, the fire watch must know:
 1. That their ONLY duty is Fire Watch
 2. When they can terminate the watch
 3. How to use the provided fire extinguisher
 4. How to activate fire alarm if fire is beyond the incipient stage
- Operator Responsibilities
- Contractors Responsibilities
- Documentation requirements

- Respirator Usage requirements
- Fire Extinguisher training
- *Cadmium Awareness*
- *Hexavalent Awareness*
- *Zinc Oxide*

Hot Works Procedures

OSHA 29 CFR 1910.252 required fire prevention actions for welding/hot works.

A hot work permit shall be filled out by the person performing any hot work or by the supervisor of the person performing the hot work. The hot work permit shall be submitted to the person on site directly responsible of safety supervision for review and approval. A copy shall be kept by the safety supervisor and posted on the wall of the project office until such time as the permit is closed. Closed permits shall be filed with the job records.

A hard copy of the permit shall be posted in the area where the work is being performed and shall be clearly visible. The hard copy shall be returned to the safety supervisor when the hot work is completed.

The hot work permit shall include but not be limited to:

- Date of work performed
- Expected duration of work
- Area work is to be performed
- Hazards and Safety Precautions
- Type of Hot Work
- Fire Watch
- Name of persons performing work
- Approval and Close Out Acceptance Signatures

Where practicable all combustibles shall be relocated at least 35 feet from the work site. **Where relocation is impractical, combustibles shall be protected with flame proof covers, shielded with metal, guards, curtains, or wet down 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 a roof of combustible construction, fire-resistant shields or guards shall be provided to prevent ignition.

If welding is to be done on a metal wall, partition, ceiling, or roof, 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, ceiling or roof having a covering nor on walls having combustible sandwich panel construction.

Cutting or welding on pipes or other metal in contact with combustible walls, partitions, 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. a flammable
- 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 works will be conducted. *All dust accumulation should be cleaned up following the housekeeping program of the facility before welding/hot works are permitted.*

Suitable extinguishers shall be provided and maintained ready for instant use.

A fire watch person shall be provided during and for 2 hours past the completion of the welding project.

A cutting/welding permit will be issued on all welding or cutting outside of the designated welding area.

Welding & Hot Work fire prevention measures

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

- a. Floors swept and clean of combustibles within 35 ft. of work area.
- b. Flammable and combustible liquids and material will be kept 35 ft. from work area.
- c. Adequate ventilation providing 20 air changes per hour, such as a suction hood system should be provided to the work area.
- d. At least one 10 lb. dry chemical fire extinguisher should be within access of the 35 ft. of work area.
- e. Protective dividers such as welding curtains or non-combustible walls will be provided to contain sparks and slag to the combustible free area.

Requirements for welding conducted outside the designated welding area.

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

Welding Standard Operating Procedures

The following pages list the *Welding Standard Operating Procedures* (SOP) and are applicable for all electric and gas welding. These SOPs are to be posted at each Designated Welding & Hot Work Area for quick reference and review.

SOP - Electric Welding

Perform Safety Check on all equipment

Ensure fire extinguisher is charged and available

Ensure electrical cord, electrode holder and cables are free from defects (no cable splices are allowed within 10 feet of the electrode holder.

Ensure PPE (welding hood, gloves, rubber boots/soled shoes, aprons) are available and have no defects.

Ensure the welding unit is properly grounded.

All defective equipment must be repaired or replaced before use.

Remove flammables and combustibles

No welding is permitted on or near containers of flammable material, combustible material or unprotected flammable structures.

Place welding screen or suitable barricade around work area to provide a fire safety zone and prevent injuries to passersby (Do not block emergency exits or restrict ventilation)

Ensure Adequate Ventilation and Lighting

Execute Hot Work Permit procedures

Set Voltage Regulator

No higher than the following for:

Manual Alternating Current Welders - 80 volts

Automatic Alternating Current Welders - 100 volts

Manual or automatic Direct Current Welders -100 volts

Uncoil and spread-out welding cable

To avoid overheating, ensure proper contact of work leads and connections, remove any metal fragments from magnetic work clamps (to avoid electric shock do not wrap welding cables around a body part and avoid welding in wet conditions)

Fire watch for one hour after welding & until all welds have cooled

Perform final fire watch and terminate permit.

SOP: Gas Welding

Perform Safety Check on all equipment

Ensure tanks have gas and fittings are tight

Ensure fire extinguisher is charged and available

Ensure hoses have no defects

Ensure PPE (welding hood, gloves, rubber boots/soled shoes, aprons) are available and have no defects.

All defective equipment must be repaired or replace before uses.

Remove flammables and combustibles

No welding is permitted on or near containers of flammable material, combustible material or unprotected flammable structures.

Place welding screen or suitable barricade around work area to provide a fire safety zone and prevent injuries to passersby (Do not block emergency exits or restrict ventilation)

Ensure Adequate Ventilation and Lighting

Execute Hot Work Permit procedures

Open Valves on Oxygen and Gas tanks to desired flow

Shut Tank Valves & relieve hose pressure. Store hoses

Fire watch for one hour after welding & until all welds have cooled

Perform final fire watch and terminate permit.

Dangerous or Potentially Dangerous Gases Caused by Welding

Welding Specific Provisions

The process of welding, grinding and cutting of galvanized materials and certain other materials has been demonstrated to cause potential exposure to zinc oxide, hexavalent chromide and cadmium gases which can produce negative health effects. All welding, grinding and cutting of

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galvanized materials must be done with the use of a respirator and a respirator program must be established and maintained by the contractor responsible for the welding, grinding and cutting.

E Light Electric Service employees shall not perform welding in area where they could be exposed to cadmium gases.

NIOSH REPORT EXCERPT: Zinc Oxide

Overexposures to zinc oxide may produce metal fume fever, also known as brass chills, welders' ague, copper fever, zinc fever, and Monday morning fever. Metal fume fever is a syndrome that arises after respiratory exposure to the fume of any of several metals. Fume is generated when a metal is heated to above its melting point, typically in such settings as brass foundry work, welding, galvanized steel, and acetylene or plasma arc cutting. Exposure to fumes of zinc, copper, and magnesium are the most common causes. Symptoms, such as thirst, metallic taste, dry mouth, and headache, occur about four to eight hours after fume exposure. Cough, chills with irregular fever, dyspnea, muscle pain, and a sense of weakness and fatigue may develop over the subsequent few hours. The illness is self-limited and usually resolves within 24-48 hours. Illness can occur after an individual's first exposure to fume. Exposure to fume within a day or so of initial exposure tends to elicit less severe symptoms, but repeated exposure after having avoided metal fume for a longer period makes the individual susceptible again to the initial symptoms. The name "Monday morning fever" is used among workers with Monday through Friday fume exposure who become ill after a Monday exposure, feel well for the rest of the work week, and become ill again the next Monday.

Exception: Respirators shall not be required if (2) two persons are monitored with an approved air monitor for (2) two eight hour periods of welding, cutting or grinding and it is demonstrated that neither person was exposed to the levels exceeding the recommended NIOSH 5 mg/m^3 10-hour TWA limit with a 15-minute ceiling of 15 mg/m^3 .

NIOSH REPORT EXCERPT: Hexavalent Chromium

The NIOSH REL (10-hour TWA) is $0.001 \text{ mg Cr(VI)/m}^3$ for all hexavalent chromium [Cr(VI)] compounds. NIOSH considers all Cr(VI) compounds (including chromic acid, tert-butyl chromate, zinc chromate, and chromyl chloride) to be potential occupational carcinogens.

The NIOSH REL (8-hour TWA) is 0.5 mg Cr/m^3 for chromium metal and chromium(II) and chromium(III) compounds.

The OSHA PEL is $0.005 \text{ mg CrO}_3/\text{m}^3$ (8-hour TWA) for chromic acid and chromates (including tert-butyl chromate with a "skin" designation and zinc chromate); 0.5 mg Cr/m^3 (8-hour TWA) for chromium(II) and chromium(III) compounds; and 1 mg Cr/m^3 (8-hour TWA) for chromium metal and insoluble salts.

Overexposures to hexavalent chromium may produce negative health impacts. All employees that may potentially be exposed to hexavalent chromium shall complete Hexavalent chromium awareness training prior to performing welding operations in this environment. Testing shall be performed to determine hexavalent chromium levels and respirators shall be worn while performing welding in areas where exposure to hexavalent chromium is a potential.

Exception: *Respirators shall not be required if (2) two persons are monitored with an approved air monitor for (2) two eight hour periods of welding, cutting or grinding and it is demonstrated that neither person was exposed to the levels exceeding the recommended NIOSH .001 mg/m³ 10-hour TWA limit.*

All welders must demonstrate through the submittal of welding certifications their welding proficiency prior to welding on any E Light Electric project.