WELDING – FIRE & EXPOSURE CONTROL

OCCUPATIONAL SAFETY AND HEALTH MANUAL

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Associated Form:	Hot Work Permit Procedures and Instructions	**Training Frequency:**	Prior to use

WELDING: FIRE AND EXPOSURE CONTROL

OAR 437, Division 2, Subdivision Q (Welding, Cutting, and Brazing)

OAR 437, Division 2, Subdivision H (Hazardous Materials)

OAR 437, Division 2, Subdivision Z (Chromium)

This welding safety policy is designed to ensure that employees are aware of the hazards associated with welding and to ensure proper fire protection. Welding is a hazardous operation, which must be performed in accordance with safety standards and by qualified trained employees. This chapter is to ensure work place safety and compliance with Oregon OSHA standards.

Note: For employers that weld, cut, and grind on Stainless Steel structures for fabrication and/or repair a hexavalent chromium exposure plan may be needed. Initial employee exposure monitoring must be done and if levels exceed the Oregon OSHA standard, a written plan is required. See below for a hexavalent chromium plan.

This chapter reviews welding safety procedures. Specific information on the welding hazards is also found in the Hazard Communication Program section.

DEFINITIONS

Approved: Either listed or approved by a nationally recognized testing laboratory.

Welding and welding operator: Any operator of electric or gas welding and cutting equipment.

All other welding terms used in the Oregon OSHA standard are in accordance with American Welding Society: Terms & Definitions A3-0.969.

RESPONSIBILITIES

Department Director and supervisors: Must see that only trained employees are authorized to weld. Fire watch personnel will be trained in their duties by the Maintenance Supervisors. Management is required to see that adequate maintenance services are provided and used to ensure safe operating conditions and that all Energy Control Procedures (see Lockout/Tagout Safety) are followed as they relate to maintenance welding on equipment.

Authorized Operators: Employees who are authorized to perform welding must follow all safety procedures as outlined in this chapter, by Oregon OSHA rules and manufacturer's recommendations. Employees are required to inspect their equipment daily prior to operation to ensure that all safeguards are on the equipment. Any problems are to be reported immediately to the employee's supervisor.

All accidents will be reported immediately to the supervisor.

Personnel Director: Assist in providing employee training and auditing facilities for compliance with this chapter and Oregon OSHA regulations.

Safety Committee: The Safety Committee will include review of welding safety in their quarterly inspection activities.

Basic Hazard Awareness: Safety in the many processes of welding and cutting requires certain precautions and standardized operating procedures. Welding is associated with five principal hazards. It is the responsibility of the employee supervisor and/or Safety Coordinator to ensure that all welders and fire watch personnel understand these hazards.

1. Electric shock and burns must be guarded against when using welding equipment. The degree of risk depends on the type of welding process. Welders are to be trained in Electrical Safety.
2. Fire Hazards:
    a. Flying sparks are the source of many industrial fires.
    b. In areas where flammable gases, vapors, and dusts are present, only a tiny spark is needed to set off a fire or explosion. Flying pieces of molten metal can fall through cracks and openings as small as nail holes and ignite combustibles that are beyond the welder's visual range.
    c. Hot metal that is being welded or cut can cause fires if allowed to contact flammable or combustible material such as drip pans, oily rags or combustible materials.
    d. The torch flame used by the welder is another source of ignition and must be handled carefully. Compressed oxygen gas used in welding is a fire hazard because it supports and intensifies the rate of combustion of other materials.
3. Radiant energy hazards in welding include: ultraviolet light, infrared light and visible light.
    a. Exposure to the welding arc (ultraviolet rays) may result in very painful irritation of the eyes and skin.
    b. Infrared rays act upon the eyes simply as heat and can cause a burn or irritation of the tissue affected.
    c. The glare of excessive visible radiation can cause head-aches, eye fatigue and loss of visual efficiency.
    d. Protective eye wear must be worn during welding to prevent harm to the eyes from light energy
    e. Welding barriers will be used to protect employees working in the same area as welding operations.
4. Inhalation of Welding Fumes: Welding produces airborne exposures to a variety of potentially harmful gases and fumes. Fumes are generated from both the base metal and the wire or rod used in the process. The hazard level from metal fumes depends on the type of metal. In steel welding exposures include iron oxides, chromium, manganese, and nickel. The gases also vary with the type of shield gases used in arc welding, type of rods and fluxes used. Welding must be performed in a well-ventilated area, either by working outside the building, near an open doorway or in a location with a fan ventilation system.

Authorized Employees: Welding will be performed by qualified welders only. Welding operations need to be performed away from flammable materials.

1. If the object to be welded cannot be moved to a safe location, all movable hazardous materials should be moved to a safe location.
2. If this cannot be done, a Hot Work Permit will need to be issued by the Supervisor. The permit will describe the welding zone controls such as enclosing in fireproof blankets or other protective shields when materials in nearby areas can be affected by welding arcs, flames, sparks, spatter, slag or heat. (See below).
3. Fire protection equipment should be kept immediately at hand and ready for use. In critical areas, the fire protection equipment should be staffed while welding operations are being conducted.
4. Care must be taken against allowing mixtures of fuel gas and air to accumulate.
5. Flammable and other potentially hazardous materials should be cleaned from surfaces before welding is started. (Note: The very high temperature of the welding air or flame can cause ignition of materials such as grease, oil or surface coating. These materials will also break down under heat to hazardous gases or fumes).
    a. No welding, cutting or similar work should be under-taken on tanks, barrels, drums or other containers which have been contaminated with flammables unless the contamination is first removed so that there is no possibility of fire, explosion, or emission of toxic vapors. (See Hot Work Permit).
    b. Adequate ventilation should be provided as protection against accumulations of toxic fumes and gases. If such precautions cannot be taken, the welder should wear appropriate respiratory protection (See Personal Protective Equipment and Respiratory Protection).
    c. If welding is to be done in enclosed or confined spaces, a specific “confined space” work permit will be required to be obtained from the management staff. The permit will detail the specific precautions that are required to perform welding in confined areas (See Confined Space Procedures).
6. Precautions need to be taken to avoid shock from electric welding operations.
    a. The welder should not stand in water while doing electric welding.
    b. Hot electrode holders should not be dipped in water.
    c. Cables with damaged insulation or exposed conductors must not be used, and should be replaced before any such work is attempted. If necessary to join lengths of cable, it must be done using only connectors designed specifically for the purpose.

PERSONAL PROTECTIVE EQUIPMENT

The face, body and hands should be covered to prevent burns from splatter, slag, sparks, or hot metal. Flame proof; heat-insulating gloves should be worn during welding operations. Wet or excessively worn gloves should not be used.

1. The eyes and skin should be protected against the glare and radiation from a welding arc or flame.
2. Helpers and attendants should also be provided with eye protection.
3. Other personnel in the vicinity of welding operations should be protected from reflections by suitable shields and barriers.
4. Respiratory equipment may be necessary if ventilation is not sufficient. Specific operation requirements should be made by your supervisor.

GAS CYLINDERS

Gas cylinders must be handled carefully (breaking the neck from a full cylinder can turn the bottle into a missile).

1. Cylinders must be secured to keep them from falling.
2. Acetylene cylinders must always be maintained in an upright position.
3. Oxygen cylinders should be separated from fuel-gas cylinders or other combustible materials by at least 20 feet or by a fire-resistant barrier at least 5 feet high.

4. Oxygen from supply cylinders should be checked to make certain they are not leaking, especially in enclosed spaces, where it can cause ignition of materials that are not normally highly flammable.
5. Grease and oil should be kept away from and never used to lubricate oxygen cylinder valves or regulators.
6. Do not handle oxygen cylinders with oily hands or gloves.
7. Before connecting an oxygen bottle, first open the valve slightly for an instant, then close and attach an oxygen regulator to the valve. Always stand to one side when opening the valve.
8. Empty gas cylinders should be marked and have their valves closed tightly. Valve protection caps should always be in place on those cylinders designed for caps, except when the cylinder is in use or being connected/disconnected.
9. Gas cylinders should be stored out of the direct rays of the sun and away from other sources of heat. Never strike an arc against a gas cylinder.
10. Do not use a hammer or wrench to open cylinder valves. If valves will not open by hand, notify the supplier. Always open the cylinder valve slowly.
11. Do not tamper with cylinder valves or try to repair them. Send the supplier a prompt report of the trouble, including the cylinder serial number, and follow the supplier's instructions.
12. Backflow or flashback preventers will be installed on all oxygen/flammable gas welding and cutting units between the torch or blowpipe and the hoses.
13. Gauges will be maintained in good condition. Cracked or missing glass will be replaced prior to use.

HEXAVALENT CHROMIUM EXPOSURE PLAN

This plan provides the required Oregon OSHA Exposure Assessment Plan OAR 437, Division 2, Subdivision Z Chromium (VI). http://osha.oregon.gov/OSHARules/div2/div2Z-1026-chromiumVI.pdf

The exposure assessment process is designed to comply with the "performance-oriented option" which permits current sampling data, historical data, and objective data to determine the TWA 8-Hour exposure for plant operations.

This plan is also the compliance plan for protection of employees' whose exposures exceed the action limit and the permissible exposure limit.

KEY DEFINITIONS

Action level means a concentration of airborne chromium (VI) of 2.5 micrograms per cubic meter of air (2.5 µg/m3) calculated as an 8-hour time-weighted average (TWA).

Employee exposure means the exposure to airborne chromium (VI) that would occur if the employee were not using a respirator.

Permissible exposure limit (PEL). The employer will ensure that no employee is exposed to an airborne concentration of chromium (VI) in excess of 5 micrograms per cubic meter of air (5 µg/m3), calculated as an 8-hour time-weighted average (TWA).

Regulated area means an area, demarcated by the employer, where an employee's exposure to airborne concentrations of chromium (VI) exceeds, or can reasonably be expected to exceed, the PEL.

RESPONSIBILITIES

Department Management must ensure compliance with this program and supervisors are responsible to implement the program with their employees.

Safety Manager is responsible to ensure that adequate expo-sure monitoring is conducted, written program for chromium(VI) protection are developed and implemented by the affected departments and various records are appropriately maintained.

The following processes result in exposure to Cr(VI) during welding and grinding operations. Note: Each employer must arrange for baseline and periodic sampling of employees' exposures during welding, cutting, grinding on stainless steel. The results of monitoring should be included in this plan.

1. **Employee Job Classes with Cr(VI) Exposures**: Fabrication Welders/Grinders. These employees weld tanks and parts together and make structures for the tanks. The processes involve: gas metal shielded wire arc welding; plasma arc cutting, carbon scarfing, electrode arc welding, and grinding down welds.
2. **Compliance Issues**
    a. Exposure Determination and On-going Monitoring:
        i. Sampling will be based on quarterly to semi-annual monitoring based on Oregon OSHA requirements if the action limit or permissible expo-sure limit is exceeded.
3. **Regulated Area**: If overexposures occur to employees during welding and grinding operations, then the work area becomes a regulated area. Employees working in these areas will be trained and required to wear respiratory equipment when working with stainless steel. Warning signs are posted at the east personnel door entrance and other appropriate areas.
4. **Methods of Compliance:** Respiratory protection of either N100 or P100 filters are required for exposed personnel in the regulated area. Mechanical ventilation improvements are currently under engineering study. Long-term goal is to reduce exposure by engineering methods to less than the action limit.
5. **Respiratory Protection**: For complete respirator pro-gram see Chapter 14. Respiratory Protection Plan.
6. **Emergencies:** No emergency release of Cr (VI) is possible based on the exposure processes.
7. **Protective work clothing and equipment:**
    a. Welders and grinders are provided coveralls that are part of special laundering process.
    b. Coveralls used in the regulated area are laundered by an outside company that has been informed of the potential Cr(VI) contamination.
    c. No employee will remove contaminated protective clothing or equipment from the workplace except those who launder, repair, clean or replace these items.
    d. Removal of chromium from protective clothing or equipment by blowing or shaking into the air or onto an employee's body is prohibited.
    e. Employees have assigned change room lockers for storing clean street clothing and these facilities pre-vent cross-contamination from protective clothing and equipment
    f. Welding leather coats and other styles of non-flammable clothing are stored in the regulated area welding supply lockers.
    g. Leather gloves will also be stored with welding supplies and leather clothing in regulated area lockers.
8. **Hygiene areas and practices**:
    a. The welders and grinders have wash facilities available at
    b. Laundry bins are located in the change room at
    c. Prior to eating, the employees will change out of the work coveralls at either the entrance to regulated area or on dirty side of the locker room.
    d. Employees will wash their face and hands prior to entering lunchroom.
9. **Eating and Drinking Areas**:
    a. Employees are not permitted to eat or drink in the regulated area.
    b. Welders and grinders will doff protective outer clothing prior to eating and wash face and hands.
10. **Housekeeping**:
    a. All surfaces are maintained as free as practicable of accumulations of Cr(VI).

b. All spills and releases of Cr(VI) containing material are cleaned up promptly.
c. Cleaning methods including use of compressed air and dry sweeping of Cr(VI) contaminated dust to remove Cr(VI) from any surface is prohibited.
d. Cleaning equipment is handled in a manner that minimizes the reentry of Cr(VI) into the workplace.
e. Disposal of waste, scrap, debris, and any other materials contaminated with Cr(VI) are collected and dis-posed of in sealed, impermeable bags or other closed, impermeable containers and these containers are clearly labeled.

11. **Medical Surveillance**: The welders and grinders are part of Cr(VI) medical surveillance program managed by The employees are part of the respiratory protection clearance program.
12. **Training**: All welders, grinders and supervisors are part of the Cr(VI) training and information program. The employees will be informed of the quarterly exposure monitoring results and any changes in compliance plan.
13. **Recordkeeping**: All exposure records, exposure assessment and related documents are maintained for a mini-mum of 30 years by the main office administration.

Hot Work Permit Procedures And Instructions

Instructions:

1. This cutting and welding permit may be issued only by a ***supervisor*** and must be used for all cutting and welding done outside of an approved shop.
2. Complete the checklist below before issuing the permit.
3. Display the permit in a highly visible location at the job site.
4. The permit is to be picked up by the supervisor who issued the permit 2 to 4 hours after the work is completed. In the event of a change of shifts, it is the responsibility of the supervisor who issued the permit to notify the supervisor ***on the next shift*** that a permit was issued and will need to be picked up.
5. If you issue a permit late in the work shift and the worksite is down the following shift, notify the next shift supervisor to pick up the permit.
6. If a permit is issued for an unstaffed area of the worksite, notify the next shift supervisor so that they can check there more often.
7. All permits are to be turned into the Safety Office after the final checkup has been completed.

P	Checklist of required precautions:
	Floor swept clean of combustibles.
	Floor wet down (protections from possible shock are put into place if operating arc welding or cutting equipment).
	Flammable liquids removed; other combustible, if not removed, wet down or protected with fire-resistant tarpaulins or metal shields.
	Explosive atmospheres in area are eliminated.
	All wall and floor openings covered or provide an additional fire watch at the lower level.
	Fire watch will be provided during and for ***at least*** 30 minutes after completion of welding or cutting operations to detect and extinguish possible smoldering fires and during any coffee or lunch breaks.
	Fire watch is supplied with a charged fire hose.
	Fire watch is trained in the use of this equipment.

Job date:	Location:
Nature of job:	
Welder's name:	
Time started:	Time finished:
Fire watch name:	

Hot Work Permit Procedures And Instructions, *page 2*

Final checkup by maintenance: work area and all adjacent areas to which sparks and heat might have spread (i.E. Floors above, below and opposite side of walls) were inspected after the work was completed and found to be fire safe.
Maintenance Person Signature:
Final checkup by supervisor: 2 to 4 hours after work completed
Date & time:
Signature of person responsible:

Cutting: Welding Hot Work Permit

Date:	Location:
Work To Be Done:	
Maintenance:	
Instructions To Fire Watch:	
Fire Watch Names:	