

### **437-002-0280 Adoption by Reference**

*In addition to, and not in lieu of, any other safety and health codes contained in OAR Chapter 437, the Department adopts by reference the following federal regulations printed as part of the Code of Federal Regulations, 29 CFR 1910, in the Federal Register:*

(1) 29 CFR 1910.251 Definitions. Repealed. Oregon OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15. In Oregon, OAR [~~473~~437-002-~~2253~~] 0299 applies.

(2) 29 CFR 1910.252 General Requirements, published 3/26/12, FR vol. 77, no. 58, p. 17574. **Amended with Or-OSHA Admin. Order x-mxmx.**

(3) 29 CFR 1910.253 Oxygen-Fuel Gas Welding and Cutting. Repealed. Oregon OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15. In Oregon, OAR [~~473~~437-002-2253] applies.

(4) 29 CFR 1910.254 Arc Welding and Cutting, published 9/13/05, FR vol. 70, no. 176, p. 53925.

(5) 29 CFR 1910.255 Resistance Welding, published 4/11/90, Federal Register, vol. 55, no. 70, pp. 13710-13711.

*These standards are on file with the Oregon Occupational Safety and Health Division, Oregon Department of Consumer and Business Services, and the United States Government Printing Office.*

*Stat. Auth.: ORS 654.025(2) and ORS 656.726(4).*

*Stats. Implemented: ORS 654.001 through 654.295. Hist:*

*OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.*

*OR-OSHA Admin. Order 4-1997, f. 4/2/97, ef. 4/2/97.*

*OR-OSHA Admin. Order 3-1998, f. 7/7/98, ef. 7/7/98.*

*OR-OSHA Admin. Order 4-2005, f. 12/14/05, ef. 12/14/05.*

*OR-OSHA Admin. Order 7-2008, f. 5/30/08, ef. 5/30/08.*

*OR-OSHA Admin. Order 2-2010, f. 2/25/10, ef. 2/25/10.*

*OR-OSHA Admin. Order 1-2012, f. 4/10/12, ef. 4/10/12.*

*OR-OSHA Admin. Order 5-2012, f. 9/25/12, ef. 9/25/12.*

*OR-OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15.*

**OR-OSHA Admin. Order x-mxmx, f. x/m/mxmx ef.x/m/mxmx.**

### **437-002-0282 Job Planning and Layout**

**(1)** Before starting operations, securely block portable equipment to prevent accidental movement.

**(2)** Equip tanks, boilers, drums and similar containers with ladders for the use of welders and other workers when required for safe access and egress.

**(3)** Do not allow welding equipment on an elevated structure unless the structure is designed and built to support all loads imposed on the structure.

**(4)** Design, lay out and operate work areas in a manner that prevents welding hose and cable from creating a tripping hazard.

Stat. Auth.: ORS 654.025(2) and ORS 656.726(3).

Stats. implemented: ORS 654.001-654.295

Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.

OR-OSHA Admin. Order [x-mxmx](#), [f.x/mx/mx](#), [ef. mx/mx/mx](#)

### **1910.252 General Requirements**

(a) Fire prevention and protection.

(1) Basic precautions. For elaboration of these basic precautions and of the special precautions of paragraph (a)(2) of this section as well as a delineation of the fire protection and prevention responsibilities of welders and cutters, their supervisors (including outside contractors) and those in management on whose property cutting and welding is to be performed, see Standard for Fire Prevention in Use of Cutting and Welding Processes, NFPA Standard 51B, 1962, which is incorporated by reference as specified in 1910.6. The basic precautions for fire prevention in welding or cutting work are:

(i) Fire hazards. 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.

(ii) Guards. 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.

(iii) Restrictions. If the requirements stated in paragraphs (a)(1)(i) and (a)(1)(ii) of this section cannot be followed then welding and cutting shall not be performed.

(2) Special precautions. When the nature of the work to be performed falls within the scope of paragraph (a)(1)(ii) of this section certain additional precautions may be necessary:

(i) Combustible material. 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 which 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.

(ii) Fire extinguishers. Suitable fire extinguishing equipment shall be 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.

(iii) Fire watch.

(A) Fire watchers 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:

(1) Appreciable combustible material, in building construction or contents, closer than 35 feet (10.7 m) to the point of operation.

(2) Appreciable combustibles are more than 35 feet (10.7 m) away but are easily ignited by sparks.

(3) Wall or floor openings within a 35-foot (10.7 m) radius expose combustible material in adjacent areas including concealed spaces in walls or floors.

(4) 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.

(B) Fire watchers shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with facilities for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm. A fire watch shall be maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

(iv) Authorization. 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.

**437-002-0285 Additional Special Precautions**

*Before welding or cutting on walls, floors or ceilings, inspect the hidden side to ensure that no combustible material is present.*

Stat. Auth.: ORS 654.025(2) and ORS 656.726(3).

Stats. implemented: ORS 654.001-654.295

Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.

OR-OSHA Admin. Order [x-mxmx](#), [f.x/mx/mx](#), ef. [mx/mx/mx](#)

**[1910.252(a) ... (2) Special precautions, continued]**

(v) Floors. Where combustible materials such as paper clippings, wood shavings, or textile fibers are on the floor, the floor shall be swept clean for a radius of 35 feet (10.7 m). Combustible floors shall be kept wet, covered with damp sand, or protected by fire-resistant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock.

(vi) Prohibited areas. Cutting or welding shall not be permitted in the following situations:

(A) In areas not authorized by management.

(B) In sprinklered buildings while such protection is impaired.

(C) In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts.

(D) In areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton.

(vii) Relocation of combustibles. Where practicable, all combustibles shall be relocated at least 35 feet (10.7 m) from the work site. Where relocation is impracticable, combustibles shall be protected with flameproofed covers or otherwise shielded with metal or asbestos guards or curtains.

(viii) Ducts. Ducts and conveyor systems that might carry sparks to distant combustibles shall be suitably protected or shut down.

(ix) Combustible walls. Where cutting or welding is done near walls, partitions, ceiling or roof of combustible construction, fire-resistant shields or guards shall be provided to prevent ignition.

(x) Noncombustible walls. 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, preferably by relocating combustibles. Where combustibles are not relocated, a fire watch on the opposite side from the work shall be provided.

(xi) Combustible cover. Welding shall not be attempted on a metal partition, wall, ceiling or roof having a combustible covering nor on walls or partitions of combustible sandwich-type panel construction.

(xii) Pipes. 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 conduction.

(xiii) Management. Management shall recognize its responsibility for the safe usage of cutting and welding equipment on its property and:

- (A) Based on fire potentials of plant facilities, establish areas for cutting and welding, and establish procedures for cutting and welding, in other areas.
- (B) Designate an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes.
- (C) Insist that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and the safe use of the process.
- (D) Advise all contractors about flammable materials or hazardous conditions of which they may not be aware.

**437-002-0286 Flammable Preservative Coatings**

*(1) A competent person must test any preservative coating whose flammability is not known before welding, cutting or other hot work is started.*

*(2) Highly flammable coatings (those coatings whose surface scrapings ignite when heat is applied) must be stripped from the area to be heated to prevent ignition.*

Stat. Auth.: ORS 654.025(2) and ORS 656.726(3).

Stats. implemented: ORS 654.001-654.295

Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.

OR-OSHA Admin. Order ~~x-mxmx~~, ~~f.x/mx/mx~~, ~~ef. mx/mx/mx~~

**[1910.252(a) ... (2) Special precautions, continued]**

(xiv) Supervisor. The Supervisor:

- (A) Shall be responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process.
- (B) Shall determine the combustible materials and hazardous areas present or likely to be present in the work location.
- (C) Shall protect combustibles from ignition by the following:
  - (1) Have the work moved to a location free from dangerous combustibles.
  - (2) If the work cannot be moved, have the combustibles moved to a safe distance from the work or have the combustibles properly shielded against ignition.
  - (3) See that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding.

(D) Shall secure authorization for the cutting or welding operations from the designated management representative.

(E) Shall determine that the cutter or welder secures his approval that conditions are safe before going ahead.

(F) Shall determine that fire protection and extinguishing equipment are properly located at the site.

(G) Where fire watches are required, he shall see that they are available at the site.

(xv) Fire prevention precautions. Cutting or welding shall be permitted only in areas that are or have been made fire safe. When work cannot be moved practically, as in most construction work, the area shall be made safe by removing combustibles or protecting combustibles from ignition sources.

### (3) Welding or cutting containers

#### **437-002-0297 Oregon Requirements for Welding or Cutting Containers**

*(1) A competent person must ensure that the following actions are taken before any hot work (such as welding, or torch- or abrasive-cutting) is performed on drums, barrels, or tanks that contain substances that are flammable or that could produce toxic vapors when subjected to heat:*

*(a) Clean and ventilate the containers to eliminate these substances, including solvents, greases, tars, acids, and surface coatings that could be affected;*

*(b) Disconnect or blank any pipe lines or connections to the container unless it is necessary for the release of pressure during the application of heat;*

*(2) Use appropriate atmospheric testing equipment during the hot work operation to confirm that the air in the work area at the container remains within safe parameters.*

*(3) Document the actions taken to ensure safe conditions were maintained.*

*(4) Retain this documentation for at least one year following completion of the work.*

**NOTE:** 1910.252(a)(3)(i) was not adopted by the Department. In Oregon 437-002-0297 applies, instead.

Stat. Auth.: ORS 654.025(2) and ORS 656.726(3).

Stats. implemented: ORS 654.001-654.295

Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.

OR-OSHA Admin. Order ~~x-mxmx~~, ~~f.x/mx/mx~~, ef. ~~mx/mx/mx~~

#### **[1910.252 (a) ... (3) Welding or cutting containers, continued]**

(ii) Venting and purging. All hollow spaces, cavities or containers shall be vented to permit the escape of air or gases before preheating, cutting or welding. Purging with inert gas is recommended.

(4) Confined spaces.

(i) Accidental contact. 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 be disconnected from the power source.

(ii) Torch valve. In order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the gas 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.

(b) Protection of personnel.

(1) General.

(i) Railing. 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, life lines, or some other equally effective safeguards.

(ii) Welding cable. Welders shall place welding cable and other equipment so that it is clear of passageways, ladders, and stairways.

(2) Eye protection.

(i) Selection.

(A) Helmets or hand shields shall be used during all arc welding or arc cutting operations, excluding submerged arc welding. Helpers or attendants shall be provided with proper eye protection.

(B) Goggles or other suitable eye protection shall be used during all gas welding or oxygen cutting operations. Spectacles without side shields, with suitable filter lenses are permitted for use during gas welding operations on light work, for torch brazing or for inspection.

(C) All operators and attendants of resistance welding or resistance brazing equipment shall use transparent face shields or goggles, depending on the particular job, to protect their faces or eyes, as required.

(D) Eye protection in the form of suitable goggles shall be provided where needed for brazing operations not covered in paragraphs (b)(2)(i)(A) through (b)(2)(i)(C) of this section.

(ii) Specifications for protectors.

(A) Helmets and hand shields shall be made of a material which is an insulator for heat and electricity. Helmets, shields and goggles shall be not readily flammable and shall be capable of withstanding sterilization.

(B) Helmets and hand shields shall be arranged to protect the face, neck and ears from direct radiant energy from the arc.

(C) Helmets shall be provided with filter plates and cover plates designed for easy removal.

(D) All parts shall be constructed of a material which will not readily corrode or discolor the skin.

(E) Goggles shall be ventilated to prevent fogging of the lenses as much as practicable.

(F) All glass for lenses shall be tempered, substantially free from striae, air bubbles, waves and other flaws. Except when a lens is ground to provide proper optical correction for defective vision, the front and rear surfaces of lenses and windows shall be smooth and parallel.

(G) Lenses shall bear some permanent distinctive marking by which the source and shade may be readily identified.

(H) The following is a guide for the selection of the proper shade numbers. These recommendations may be varied to suit the individual's needs.

Welding operation	Shade No.
Shielded metal-arc welding – 1/16-, 3/32-, 1/8-, 5/32-inch electrodes	10
Gas-shielded arc welding (nonferrous) – 1/16-, 3/32-, 1/8-, 5/32-inch electrodes	11
Gas-shielded arc welding (ferrous) – 1/16-, 3/32-, 1/8-, 5/32-inch electrodes	12
Shielded metal-arc welding: 3/16-, 7/32-, 1/4-inch electrodes	12
Shielded metal-arc welding: 5/16-, 3/8-inch electrodes	14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to 1/8 inch	4 or 5
Gas welding (medium) 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy) 1/2 inch and over	6 or 8
<b>Note:</b> In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation.	

(l) Filter lenses must meet the test for transmission of radiant energy prescribed by any of the consensus standards listed in ~~[29 CFR 1910.133(b)(4)]~~ **ORAR 437-002-0134(8)**.

(iii) Protection from arc welding rays. Where the work permits, the welder should be enclosed in an individual booth painted with a finish of low reflectivity, such as zinc oxide (an important factor for absorbing ultraviolet radiations) and lamp black, or shall be enclosed with noncombustible screens similarly painted. 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.

**437-002-0284 Additional Specifications for Eye and Face Protection.**

**(1) Provide and require the use of appropriate eye and face protection during all welding, cutting, and grinding tasks, in accordance with the requirements of the personal protective equipment rules at OAR 437-002-134.**

**(2) Provide additional eye protection from the hazard of flying particles when a lift-front-type welder's helmet is used.**

Stat. Auth.: ORS 654.025(2) and ORS 656.726(3).  
 Stats. implemented: ORS 654.001-654.295  
 Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.  
 OR-OSHA Admin. Order ~~x-mxmx~~, ~~f.x/mx/mx~~, ~~ef. mx/mx/mx~~

**[1910.252 ... (b) Protection of personnel, continued]**

(3) Protective clothing – General requirements. Employees exposed to the hazards created by welding, cutting, or brazing operations shall be protected by personal protective equipment in accordance with the requirements of ~~[1910.132 of this part]~~  **OAR 437-002-0134**. Appropriate protective clothing required for any welding operation will vary with the size, nature and location of the work to be performed.

**437-002-0283 Additional Protective Clothing Requirements During Hot work Activities.**

**(1) Require employees to completely cover their skin with a double layer of clothing or equivalent to prevent burns or other damage by ultraviolet light.**

**(2) Do not allow employees to wear easily ignited, highly flammable clothing, such as is made from synthetic materials.**

Stat. Auth.: ORS 654.025(2) and ORS 656.726(3).

Stats. implemented: ORS 654.001-654.295

Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.

OR-OSHA Admin. Order ~~x-mxmx~~, ~~f.x/mx/mx~~, ef. ~~mx/mx/mx~~

**437-002-0279 Additional Oregon Confined Space Requirements.**

**(1) Prior to performing welding operations inside a confined space, evaluate the space in accordance with OAR 437-002-0146, Confined Spaces:**

**(a) When there are potential or actual hazards within the space that are not directly related to the welding process, follow the requirements of OAR 437-002-0146.**

**(b) When the only potential or actual hazards associated with the space are directly related to the welding process, follow the requirements of paragraphs (2) through (5), below.**

**(2) To ensure that the atmosphere remains safe for entry, continuously test the internal atmosphere of the confined space with a properly calibrated, direct-reading instrument.**

**(a) Provide all necessary equipment at no cost to employees.**

**(b) Ensure that all equipment is maintained and used in accordance with the instructions from the manufacturer.**

**(c) Train all employees who use the equipment in the proper use of that equipment.**

**(3) Document each entry.**

**(a) This documentation must include:**

**(A) The date of the entry.**

**(B) The duration of the entry.**

**(C) The location of the space.**

**(D) The hazards of the space determined to be related to the welding process.**

**(E) The measures taken to eliminate those hazards.**

- (F) The identity (such as make/ model) of the direct-reading instrument(s) used to test the atmosphere.*
- (G) When applicable, any conditions that required the evacuation of the space.*
- (H) The name, job title, contact information, and signature of the person responsible for ensuring the safe entry conditions.*

*(b) Maintain this documentation for at least one year from the date of entry.*

**(4) Ensure that all employees leave the space immediately if at any time during entry:**

*(a) Monitoring indicates that atmospheric conditions are outside of the ranges that are recognized as safe; or*

*(b) A hazardous condition is otherwise detected.*

**(5) Control respiratory hazards.**

**(a) Either:**

*(A) Provide forced air ventilation; or*

*(B) Provide and require the use of supplied air respiratory protection.*

**(b) When forced air ventilation is relied upon, it must:**

*(A) Be sufficient to protect employees entering the space from the respiratory hazards associated with the welding process; and,*

*(B) Be directed to ventilate the immediate area(s) where each employee is working within the space; and,*

*(C) Continue until all employees have left the space.*

**NOTE:** 29 CFR 1910.1020 Access to Employee Exposure and Medical Records requires that data -- from workplace monitoring showing employee exposure to a toxic substance or harmful physical agent -- be retained for at least thirty years as an employee exposure record.

Stat. Auth.: ORS 654.025(2) and ORS 656.726(3).

Stats. implemented: ORS 654.001-654.295

Hist: OR-OSHA Admin. Order [x-mxmx](#), [f.x/mx/mx](#), [ef. mx/mx/mx](#)

#### **[1910.252 ... (b) Protection of personnel, continued]**

**(4) Work in confined spaces.**

(i) General. As used herein confined space is intended to mean a relatively small or restricted space such as a tank, boiler, pressure vessel, or small compartment of a ship.

(ii) Ventilation. Ventilation is a prerequisite to work in confined spaces. For ventilation requirements see paragraph (c) of this section.

(iii) Securing cylinders and machinery. When welding or cutting is being performed in any confined spaces the gas cylinders and welding machines shall

be left on the outside. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement.

(iv) Lifelines. 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 belts 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 observe the welder at all times and be capable of putting rescue operations into effect.

(v) Electrode removal. 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.

(vi) Gas cylinder shutoff. 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.

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

**437-002-0288 Additional General Health Protection.**

*(1) When welding, cutting, or grinding operations are performed on or with the materials listed in Table OR Q-1, follow the protective measures indicated. These measures are not required if air monitoring samples confirm that the permissible exposure limits specified in Division 2/Z, OAR 437-002-0382, Oregon Rules for Air Contaminants are not exceeded.*

*(2) Use effective engineering controls, including local exhaust ventilation, as the primary control measure for indoor workplaces, when feasible.*

*(a) Use respiratory protection as a control measure when engineering controls are not feasible, or are not effective, or they are insufficient to protect employees to permissible exposure levels.*

*(b) Follow all applicable requirements when working with materials covered by substance-specific rules.*

*(3) Provide nearby workers with potential exposure to the air contaminants associated with the materials in Table OR Q-1 with equivalent, effective protection.*

<b>TABLE OR Q-1 General protective measures</b>		
<b>Material</b>	<b>Condition</b>	<b>In addition to the protective measures required in 1910.252 (c):</b>
Beryllium	Follow applicable requirements in <b>Subdivision 2/Z, Beryllium</b>	
Cadmium	Follow applicable requirements in <b>29 CFR 1910.1027 Cadmium</b>	
Chromium	Follow applicable requirements in <b>29 CFR 1910.1026 Chromium (VI)</b>	
Fluorine Compounds (Fluxes)	Indoors or Outdoors	Local Exhaust Ventilation or Appropriate Respirator
Lead	Follow applicable requirements in <b>29 CFR 1910.1025 Lead</b>	
Manganese	Local Exhaust Ventilation or Appropriate Respirator Also, see <b>OAR 437-002-0281</b>	
Mercury	Confined Space or Indoors	Local Exhaust Ventilation or Appropriate Respirator
Mercury	Outdoors	Appropriate Respirator
Zinc	Confined Space or Indoors	Local Exhaust Ventilation or Appropriate Respirator
Zinc	Outdoors	Appropriate Respirator

**NOTE:** The requirements of the Respiratory Protection Standard (1910.134) apply to all respirator use referenced in OAR 437-002-0288, and Table OR Q-1.

Stat. Auth.: ORS 654.025(2) and ORS 656.726(4).  
 Stats. Implemented: ORS 654.001-654.295  
 Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.  
 OR-OSHA Admin. Order 6-1994, f. 9/30/94, ef. 9/30/94.  
 OR-OSHA Admin. Order 5-2012, F. 9/25/12 ef. 9/25/12  
OR-OSHA Admin. Order X-XXXX, f. XX/XX/XX, ef. XX/XX/XX.

**[1910.252 General Requirements, continued]**

(c) Health protection and ventilation.

(1) General.

(i) Contamination. The requirements in this paragraph have been established on the basis of the following three factors in arc and gas welding which govern the amount of contamination to which welders may be exposed:

(A) Dimensions of space in which welding is to be done (with special regard to height of ceiling).

(B) Number of welders.

(C) Possible evolution of hazardous fumes, gases, or dust according to the metals involved.

(ii) Screens. When welding must be performed in a space entirely screened on all sides, the screens shall be so arranged that no serious restriction of ventilation exists. It is desirable to have the screens so mounted that they are about 2 feet (0.61 m) above the floor unless the work is performed at so low a level that the screen must be extended nearer to the floor to protect nearby workers from the glare of welding.

(iii) Maximum allowable concentration. Local exhaust or general ventilating systems shall be provided and arranged to keep the amount of toxic fumes, gases, or dusts below the maximum allowable concentration as specified in 1910.1000 of this part.

(iv) Hazard Communication. The employer shall include the potentially hazardous materials employed in fluxes, coatings, coverings, and filler metals, all of which are potentially used in welding and cutting, or are released to the atmosphere during welding and cutting, in the program established to comply with the Hazard Communication Standard (HCS) (1910.1200). The employer shall ensure that each employee has access to labels on containers of such materials and safety data sheets, and is trained in accordance with the provisions of 1910.1200. Potentially hazardous materials shall include but not be limited to the materials itemized in paragraphs (c)(5) through (c)(12) of this section.

#### **437-002-0287 Toxic Preservative Coatings**

**(1)** *In confined and other enclosed spaces, preservative coatings that are toxic but not highly flammable must be removed:*

- (a)** *A distance of at least 4 inches from the area of heat application; and*
- (b)** *A greater distance, if that is necessary to prevent the production of toxic fumes and gases.*

**(2)** *As an alternative to stripping the coating, the employer can choose to protect all affected employees by requiring the use of appropriate respiratory protection in accordance with the Respiratory Protection Standard, 1910.134.*

#### **NOTES:**

- *Artificial cooling of the metal surrounding the heated area may be used to limit the size of the area that must be stripped.*
- *“Coated steels” are excluded from these requirements unless the manufacturer’s safety data sheet classifies the product as a health hazard when heated.*

Stat. Auth.: ORS 654.025(2) and ORS 656.726(3).  
Stats. Implemented: ORS 654.001 - ORS 654.295.  
Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.  
**OR-OSHA Admin. Order X-XXXX, f. XX/XX/XX, ef. XX/XX/XX.**

#### **[1910.252 ...(c) Health protection and ventilation. (1) General, continued]**

(v) Additional Considerations for Hazard Communication in Welding, Cutting, and Brazing.

(A) The suppliers shall determine and shall label in accordance with 1910.1200 any hazards associated with the use of their materials in welding, cutting, and brazing.

(B) In addition to any requirements imposed by 1910.1200, all filler metals and fusible granular materials shall carry the following notice, as a minimum, on tags, boxes, or other containers:

**Do not use in areas without adequate ventilation. See ANSI Z49.1-1967 Safety in Welding, Cutting, and Allied Processes published by the American Welding Society.**

(C) Where brazing (welding) filler metals contain cadmium in significant amounts, the labels shall indicate the hazards associated with cadmium including cancer, lung and kidney effects, and acute toxicity effects.

(D) Where brazing and gas welding fluxes contain fluorine compounds, the labels shall indicate the hazards associated with fluorine compounds, the labels shall indicate the hazards associated with fluorine compounds including eye and respiratory tract effects.

(vi) Prior to June 1, 2015, employers may include the following information on labels in lieu of the labeling requirements in paragraph (c)(1)(v) of this section:

(A) 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.**

(B) 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 pain, cough, or fever develops after use call physician immediately.**

(C) Brazing and gas welding fluxes containing fluorine compounds shall have a cautionary 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.**

(2) Ventilation for general welding and cutting.

(i) General. Mechanical ventilation shall be provided when welding or cutting is done on metals not covered in paragraphs (c)(5) through (c)(12) of this section. (For specific materials, see the ventilation requirements of paragraphs (c)(5) through (c)(12) of this section.)

(A) In a space of less than 10,000 cubic feet (284 m<sup>3</sup>) per welder.

(B) In a room having a ceiling height of less than 16 feet (5 m).

(C) In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation.

(ii) Minimum rate. Such ventilation shall be at the minimum rate of 2,000 cubic feet (57 m<sup>3</sup>) per minute per welder, except where local exhaust hoods and booths as per paragraph (c)(3) of this section, or airline respirators approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health, pursuant to the provisions of 30 CFR part 11, are provided. Natural ventilation is considered sufficient for welding or cutting operations where the restrictions in paragraph (c)(2)(i) of this section are not present.

(3) Local exhaust hoods and booths. Mechanical local exhaust ventilation may be by means of either of the following:

(i) Hoods. Freely movable hoods intended to be placed by the welder as near as practicable to the work being welded and provided with a rate of air-flow sufficient to maintain a velocity in the direction of the hood of 100 linear feet (30 m) per minute in the zone of welding when the hood is at its most remote distance from the point of welding. The rates of ventilation required to accomplish this control velocity using a 3-inch (7.6 cm) wide flanged suction opening are shown in the following table:

Welding zone	Minimum air flow <sup>1</sup> cubic feet/minute	Duct diameter, inches <sup>2</sup>
4 to 6 inches from arc or torch	150	3
6 to 8 inches from arc or torch	275	3-1/2
8 to 10 inches from arc or torch	425	4-1/2
10 to 12 inches from arc or torch	600	5-1/2
<sup>1</sup> When brazing with cadmium bearing materials or when cutting on such materials increased rates of ventilation may be required.		
<sup>2</sup> Nearest half-inch duct diameter based on 4,000 feet per minute velocity in pipe.		

(ii) Fixed enclosure. A fixed enclosure with a top and not less than two sides which surround the welding or cutting operations and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet (30 m) per minute.

(4) Ventilation in confined spaces.

(i) Air replacement. 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 replacing that withdrawn shall be clean and respirable.

(ii) Airline respirators. 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) under 42 CFR part 84 must be used.

**437-002-0298 Supplied Air Respiratory Equipment.**

*Use self-contained breathing apparatus or other supplied air respiratory equipment in areas that are immediately dangerous to life and health (IDLH) due to known respiratory hazards; or when respiratory hazards are unknown. All respiratory equipment used must be approved by the National Institute for Occupational Safety and Health and used in accordance with the Respiratory Protection Standard, 1910.134.*

**NOTE:** 1910.252(c)(4)(iii) was not adopted by the Department. In Oregon OAR 437-002-0298 applies, instead.

Stat. Auth.: ORS 654.025(2) & ORS 656.726(3)  
 Stats. Implemented: ORS 654.001 - ORS 654.295  
 Hist.: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.  
[OR-OSHA Admin. Order X-XXXX, f. XX/XX/XX, ef. XX/XX/XX.](#)

**[1910.252 ... (c) ... (4) Ventilation in confined spaces, continued]**

(iv) Outside helper. 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 approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health, a worker shall be stationed on the outside of such confined spaces to insure the safety of those working within.

(v) Oxygen for ventilation. Oxygen shall never be used for ventilation.

(5) Fluorine compounds.

(i) General. In confined spaces welding or cutting involving fluxes, covering, or other materials which contain fluorine compounds shall be done in accordance with paragraph (c)(4) of this section. A fluorine compound is one that contains fluorine, as an element in chemical combination, not as a free gas.

(ii) Maximum allowable concentration. The need for local exhaust ventilation or airline respirators for welding or cutting in other than confined spaces will depend upon the individual circumstances. However, experience has shown such protection to be desirable for fixed-location production welding and for all production welding on stainless steels. Where air samples taken at the welding location indicate that the fluorides liberated are below the maximum allowable concentration, such protection is not necessary.

(6) Zinc.

(i) Confined spaces. In confined spaces welding or cutting involving zinc-bearing base or filler metals or metals coated with zinc-bearing materials shall be done in accordance with paragraph (c)(4) of this section.

(ii) Indoors. Indoors, welding or cutting involving zinc-bearing base or filler metals coated with zinc-bearing materials shall be done in accordance with paragraph (c)(3) of this section.

(7) Lead.

(i) Confined spaces. In confined spaces, welding involving lead-base metals (erroneously called lead-burning) shall be done in accordance with paragraph (c)(4) of this section.

(ii) Indoors. Indoors, welding involving lead-base metals shall be done in accordance with paragraph (c)(3) of this section.

(iii) Local ventilation. In confined spaces or indoors, welding or cutting operations involving metals containing lead, other than as an impurity, or metals coated with

lead-bearing materials, including paint, must be done using local exhaust ventilation or airline respirators. Such operations, when done outdoors, must be done using respirators approved for this purpose by NIOSH under 42 CFR part 84. In all cases, workers in the immediate vicinity of the cutting operation must be protected by local exhaust ventilation or airline respirators.

(8) Beryllium. Welding or cutting indoors, outdoors, or in confined spaces involving beryllium-containing base or filler metals shall be done using local exhaust ventilation and airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by 1910.1000 of this part. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators.

(9) Cadmium.

(i) General. In confined spaces or indoors, welding or cutting operations involving cadmium-bearing or cadmium-coated base metals must be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions show that employee exposure is within the acceptable concentrations specified by 29 CFR 1910.1000. Such operations, when done outdoors, must be done using respirators, such as fume respirators, approved for this purpose by NIOSH under 42 CFR part 84.

(ii) Confined space. Welding (brazing) involving cadmium-bearing filler metals shall be done using ventilation as prescribed in paragraph (c)(3) or (c)(4) of this section if the work is to be done in a confined space.

(10) Mercury. In confined spaces or indoors, welding or cutting operations involving metals coated with mercury-bearing materials, including paint, must be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions show that employee exposure is within the acceptable concentrations specified by 29 CFR 1910.1000. Such operations, when done outdoors, must be done using respirators approved for this purpose by NIOSH under 42 CFR part 84.

(11) Cleaning compounds.

(i) Manufacturer's instructions. In the use of cleaning materials, because of their possible toxicity or flammability, appropriate precautions such as manufacturers instructions shall be followed.

(ii) Degreasing. 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 perchlorethylene should be kept out of atmospheres penetrated by the ultraviolet radiation of gas-shielded welding operations.

(12) Cutting of stainless steels. Oxygen cutting, using either a chemical flux or iron powder or gas-shielded arc cutting of stainless steel, shall be done using mechanical ventilation adequate to remove the fumes generated.

(13) 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.

#### **437-002-0281 Manganese**

*Table OR Q-2 describes levels of respiratory protection that may be relied upon, within the duration of time indicated for the specific welding-related task, to prevent exposure to Manganese above the Permissible Exposure Limit (PEL) listed in Division 2/Z, OAR 437-002-0382, Oregon Rules for Air Contaminants.*

**(1)** *The guidelines in Table OR Q-2 may be used as an alternative to air monitoring for Manganese exposure under the following conditions:*

**(a)** *All respirator use must be in accordance with the Respiratory Protection Standard, 1910.134.*

**(b)** *The employer must provide the respiratory protection with the Assigned Protective Factor (APF) based on the type of welding-related task and the expected duration of that task. (See descriptions of tasks in 437-002-0299.)*

**(c)** *If the duration of the task reaches the upper time limit for the APF listed, then the employer must either:*

**(A)** *End the exposures for that employee for that shift, or*

**(B)** *Provide respiratory protection with the higher APF listed in the Table for any additional performance of the task during the employee's shift.*

**(2)** *If, during the course of a single work shift, an employee will perform more than one task listed in Table OR Q-2, the employer must add together the anticipated duration of all tasks and provide the respiratory protection with the most protective Assigned Protective Factor for the total duration of all tasks performed.*

#### **NOTES:**

**EXAMPLE #1:** *The employer anticipates 60 minutes of "Grinding tasks related to welding" and 90 minutes of FCAW during an employee's work shift. Although both of these tasks, performed individually for the specified time periods would fall within the APF=10 column for respiratory protection, adding 90 + 60 minutes together = 150 total minutes. For FCAW, exposures above 120 minutes fall in the APF=25 column.*

*Therefore, to meet the conditions for the exemption from air monitoring for Manganese, the employer would need to provide the APF=25 level of respiratory protection for the duration of both of the combined tasks.*

**EXAMPLE #2:** *The employer anticipates 10 minutes of "Grinding tasks related to welding" and 30 minutes of "Hand-held torch cutting" during a work shift. Although the grinding tasks, if done alone for the specified time would be below the threshold for the APF=10 column of respiratory protection, adding 10 + 30 minutes together = 40 total minutes. The combined duration of 40 minutes places both the hand-held torch work and the grinding tasks within the APF=10 column.*

Therefore, to meet the conditions for the exemption from air monitoring for Manganese, the employer would need to provide the APF=10 level of respiratory protection for the duration of both of the combined tasks.

<b>TABLE OR Q-2 for Manganese</b>		
<b>Welding, cutting or grinding tasks</b>	<b>Minimum Assigned Protective Factor (APF) for respiratory protection when performing the task listed during a single work shift within the ranges of times shown</b>	
	<b>APF = 10</b>	<b>APF = 25</b>
Carbon Arcing	5 minutes – 60 minutes (1 hr.)	> 60 minutes
Flux Core Arc Welding (FCAW) or MIG-flux core welding	15 minutes – 120 minutes (2 hrs.)	> 120 minutes
Gas Metal Arc Welding (GMAW) or MIG-solid wire welding	30 minutes – 270 minutes (4.5 hrs.)	>270 minutes
Gas Tungsten Arc Welding (GTAW) or TIG-welding	150 minutes (2.5 hrs.) or more	N/A
Grinding Tasks directly related to the Welding process	15 minutes – 180 minutes (3 hrs.)	> 180 minutes
Hand-Held Torch Cutting	15 minutes – 150 minutes (2.5 hrs.)	> 150 minutes
Hand-Held Plasma Cutting	30 minutes – 300 minutes (5 hrs.)	> 300 minutes
Shielded Metal Arc Welding (SMAW)	10 minutes – 90 minutes (1.5 hrs.)	> 90 minutes

**NOTES for Table OR Q-2:**

- The symbol “>” means “greater than” the number of minutes that follow it.
- See descriptions in OAR 437-002-0299 of the tasks included here.
- Assigned Protective Factor (APF) is defined in 1910.134 Respiratory Protection.
- Estimated exposures to Manganese within these guidelines are calculated using a more protective exposure target of 0.02 mg/m<sup>3</sup>.

Stat. Auth.: ORS 654.025(2) & ORS 656.726(3)  
 Stats. Implemented: ORS 654.001 - ORS 654.295  
 Hist.: OR-OSHA Admin. Order X-XXXX, f. XX/XX/XX, ef. XX/XX/XX.

## **[1910.252 General Requirements, continued]**

### (d) Industrial applications.

#### (1) Transmission pipeline.

(i) General. The requirements of paragraphs (b) and (c) of this section and 1910.254 of this part shall be observed.

(ii) Field shop operations. Where field shop operations are involved for fabrication of fittings, river crossings, road crossings, and pumping and compressor stations the requirements of paragraphs (a), (b), and (c) of this section and 1910.253 and 1910.254 of this part shall be observed.

(iii) Electric shock. When arc welding is performed in wet conditions, or under conditions of high humidity, special protection against electric shock shall be supplied.

(iv) Pressure testing. In pressure testing of pipelines, the workers and the public shall be protected against injury by the blowing out of closures or other pressure restraining devices. Also, protection shall be provided against expulsion of loose dirt that may have become trapped in the pipe.

(v) Construction standards. The welded construction of transmission pipelines shall be conducted in accordance with the Standard for Welding Pipe Lines and Related Facilities, API Std. 1104-1968, which is incorporated by reference as specified in 1910.6.

(vi) Flammable substance lines. The connection, by welding, of branches to pipelines carrying flammable substances shall be performed in accordance with Welding or Hot Tapping on Equipment Containing Flammables, API Std. PSD No. 2201-1963, which is incorporated by reference as specified in 1910.6.

(vii) X-ray inspection. The use of X-rays and radioactive isotopes for the inspection of welded pipeline joints shall be carried out in conformance with the American National Standard Safety Standard for Non-Medical X-ray and Sealed Gamma-Ray Sources, ANSI Z54.1-1963, which is incorporated by reference as specified in 1910.6.

#### (2) Mechanical piping systems.

(i) General. The requirements of paragraphs (a), (b), and (c) of this section and 1910.253 and 1910.254 of this part shall be observed.

(ii) X-ray inspection. The use of X-rays and radioactive isotopes for the inspection of welded piping joints shall be in conformance with the American National Standard Safety Standard for Non-Medical X-ray and Sealed Gamma-Ray Sources, ANSI Z54.1-1963.

[55 FR 13696, Apr. 11, 1990, as amended at 61 FR 9240, Mar. 7, 1996; 63 FR 1284, Jan. 8, 1998; 74 FR46357, Sept. 9, 2009; 77 FL 17777, Mar. 26, 2012.]

Stat. Auth.: ORS 654.025(2) and ORS 656.726(4).

Stats. Implemented: ORS 654.001 through 654.295.

Hist: OR-OSHA Admin. Order 23-1990, f. 9/28/90, ef. 12/1/90.

OR-OSHA Admin. Order 4-1997, f. 4/2/97, ef. 4/2/97.

OR-OSHA Admin. Order 3-1998, f. 7/7/98, ef. 7/7/98.

OR-OSHA Admin. Order 2-2010, f. 2/25/10, ef. 2/25/10.

OR-OSHA Admin. Order 5-2012, f. 9/25/12, ef. 9/25/12.

**OR-OSHA Admin. Order X-XXXX, f. XX/XX/XX, ef. XX/XX/XX.**

**[1910.253 Repealed]**

**437-002-0299**

**(1) Definitions of terms used in Division 2/Q**

**Approved:** *listed or approved by a nationally recognized testing laboratory (NRTL). (1910.7 has NRTL requirements.)*

**Coated steels:** *include metal coated to provide a protective covering such as to prevent rusting or to shield the metal from chemicals. Protective coatings can contain chromium, lead, tin, zinc or other potentially hazardous materials. During hot work, the coatings can give off fumes, smoke, or dust. Welders must know what a coating can give off when heated or burned. This information is available on the manufacturers' Safety Data Sheets. Permissible Exposure Limits for these materials must not be exceeded.*

**Competent person:** *a person capable of identifying existing and predictable hazards in the work environment which are unsanitary, hazardous, or dangerous to employees; and who has authorization to take prompt, corrective measures to eliminate these hazards.*

**Confined space:** *As defined in OAR 437-002-0146, a space that meets all of the following:*

- *Large enough and so configured that an employee can fully enter the space and perform work.*
- *Has limited or restricted means for entry or exit.*
- *Is not designed for continuous human occupancy.*

**Feasible:** *In this context, something that is possible or capable of being done and that effectively accomplishes the goal of protecting employees.*

**Hot work activities:** *include welding, torch-cutting, braising and any similar activity that produces heat or a source of ignition.*

**Toxic substance or harmful physical agent:** *As defined in 1910.1020, any chemical substance, biological agent (bacteria, virus, fungus, etc.), or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing and non-ionizing radiation, hypo- or hyperbaric pressure, etc.) which:*

- Is listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS); or
- Has yielded positive evidence of an acute or chronic health hazard in testing conducted by, or known to, the employer; or
- Is the subject of a safety data sheet kept by or known to the employer indicating that the material may pose a hazard to human health.

**(2) Welding, cutting or grinding tasks referenced in Table OR Q-2:**

**Carbon Arcing** – or carbon gouging -- is an arc cutting process in which metals to be cut are melted by the heat of the carbon arc and the molten metal is removed by a blast of air.

**Flux-Cored Arc Welding (FCAW)** -- or FCA or MIG flux core welding -- is an automatic or semi-automatic arc welding process requiring a continuously fed consumable tubular electrode containing a flux. (Shielding gas is often not needed; but a constant welding current or power supply is required.)

**Gas Metal Arc Welding (GMAW)** – or MIG Solid Wire uses a spooled, solid steel wire fed through a welding lead to the welding gun.

**Gas Tungsten Arc Welding (GTAW)** -- or Tungsten Inert Gas -- TIG Welding (also called “Heliarc” welding) uses a non-consumable tungsten electrode to produce the weld and an inert gas to shield the weld from the atmosphere.

**Grinding tasks directly related to the welding process** include the preparation of metal surfaces such as the removal of coatings, rust, or oxidation; and beveling or otherwise reducing the thickness at the edge of the metal to be joined by welding.

**Hand-held** means any welding or cutting process where the torch or electrode holder is manipulated by hand.

**Torch cutting** includes heating the metal with a torch flame until it is red, then using a blast trigger to deliver a higher concentration of oxygen that forces the molten metal away, creating a cut.

**Plasma Cutting** uses a high-intensity plasma arc to melt a very narrow area that pushes through the work piece and removes the molten metal.

**Shielded Metal Arc Welding (SMAW)** – also called “stick” welding -- uses a stick-type electrode core covered by chemical or metallic materials that provide shielding from surrounding air to complete an electrical circuit. Typically, a holder keeps the electrode at a chosen angle.

**(3) Notes about the recommended “Standard order for atmospheric testing” in a confined or other enclosed space:**

Before workers are allowed to enter confined and enclosed spaces, and at sufficient intervals to ensure safe conditions, a person competent in the use of atmospheric testing equipment may be required to test the atmosphere.

The following is considered the standard order of testing and provides guidelines for ranges of concentration that are recognized as safe:

1. **Oxygen.** To support life, Oxygen content levels must be maintained at or above 19.5% and below 22.0% by volume. (Above 22.0% by volume is an “oxygen-enriched atmosphere with additional safety hazards for fire and explosion.) If an oxygen-deficient or oxygen-enriched atmosphere is found, ventilation must be provided at volumes and flow rates sufficient to restore oxygen content to the safe range.

2. **Flammable gases/ vapors.** The concentration of flammable gasses or vapors must be maintained below 10% of the Lower Explosive Limit (LEL).

3. **Toxic vapors.** The types of toxic gases, vapors, or fumes present will depend on the types of materials being worked on and worked with. These air contaminants must be maintained below the OSHA permissible exposure limits (PELs). If there is no established OSHA PEL, the levels must be maintained below the NIOSH immediately dangerous to life and health (IDLH) level. Local exhaust ventilation can remove these contaminants at their source while general exhaust ventilation -- provided at sufficient volumes and flow rates -- can restore concentrations to safe levels.

Stat. Auth.: ORS 654.025(2) & ORS 656.726(3)

Stats. Implemented: ORS 654.001 - ORS 654.295

Hist.: [OR-OSHA Admin. Order X-XXXX, f. XX/XX/XX, ef. XX/XX/XX.](#)