

# Oregon OSHA – Adopted Changes Oxygen-Fuel (Oxy-fuel) Gas Standards in General Industry and Construction

Oregon OSHA Administrative Order 6-2014  
Filed October 28, 2014, effective May 1, 2015

Text removed is in [~~brackets with line through~~].

Text added is in **bold and underline**.

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## DIVISION 2 – GENERAL INDUSTRY

### Division 2/H, Hazardous Materials

437-002-0100

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 1910.101 Compressed gases (General requirements)[, published 3/7/96, FR vol. 61, no. 46, p. 9236]. **Repealed. Oregon OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15. In Oregon, OAR 437-002-2101 applies.**
- (2) 29 CFR 1910.102 Acetylene. Repealed. Oregon OSHA Admin. Order 1-2010, f. 2/19/10, ef. 2/19/10. In Oregon, OAR 437-002-2102 applies.
- (3) 29 CFR 1910.103 Hydrogen, published 12/14/07, FR vol. 72, no. 240, p. 71061.
- (4) 29 CFR 1910.104 Oxygen, published 3/7/96, FR vol. 61, no. 46, p. 9237.
- (5) 29 CFR 1910.105 Nitrous oxide, published 3/7/96, FR vol. 61, no. 46, p. 9237.
- (6) 29 CFR 1910.106 Flammable and combustible liquids, published 3/26/12, FR vol. 77, no. 58, p. 17574.
- (7) 29 CFR 1910.107 Spray finishing using flammable and combustible materials, amended with AO 3-2003, removed 1910.107, and Oregon note added, f. and ef. 4/21/03.
- (8) 29 CFR 1910.108 Reserved. Published 3/23/99, Federal Register, vol. 64, no. 55, p. 13909.
- (9) 29 CFR 1910.109 Explosives and blasting agents, published 6/18/98, FR vol. 63, no. 117, p. 33466.

- (10) 29 CFR 1910.110 Storage and handling of liquefied petroleum gases, published 12/14/07, FR vol. 72, no. 240, p. 71061.
  - (11) 29 CFR 1910.111 Storage and handling of anhydrous ammonia, published amended with AO 12-2001, Oregon note added, f. and ef. 10/26/01; 12/14/07, FR vol. 72, no. 240, p. 71061.
  - (12) Reserved for 29 CFR 1910.112 (Reserved)
  - (13) Reserved for 29 CFR 1910.113 (Reserved)
  - (14) 29 CFR 1910.114 Removed. Published 3/7/96, Federal Register, vol. 61, no. 46, p. 9238.
  - (15) 29 CFR 1910.115 Removed. Published 3/7/96, Federal Register, vol. 61, no. 46, p. 9238.
  - (16) 29 CFR 1910.116 Removed. Published 3/7/96, Federal Register, vol. 61, no. 46, p. 9238.
  - (17) 29 CFR 1910.119 Process safety management of highly hazardous chemicals, amended 2/8/13, FR vol. 78, no. 27, p. 9311.
  - (18) 29 CFR 1910.120 Hazardous waste operations and emergency response, amended 2/8/13, FR vol. 78, no. 27, p. 9311.
  - (19) 29 CFR 1910.121 Reserved. Published 3/23/99, Federal Register, vol. 64, no. 55, p. 13909.
  - (20) 29 CFR 1910.122 Table of contents. Repealed with OR-OSHA Admin. Order 9-2007, f. and ef. 12/3/07.
  - (21) 29 CFR 1910.123 Dipping and coating operations: Coverage and definitions. Repealed with OR-OSHA Admin. Order 9-2007, f. and ef. 12/3/07.
  - (22) 29 CFR 1910.124 General requirements for dipping and coating operations. Repealed with OR-OSHA Admin. Order 9-2007, f. and ef. 12/3/07.
  - (23) 29 CFR 1910.125 Additional requirements for dipping and coating operations that use flammable or combustible liquids. Repealed with OR-OSHA Admin. Order 9-2007, f. and ef. 12/3/07.
  - (24) 29 CFR 1910.126 Additional requirements for special dipping and coating applications. Repealed with OR-OSHA Admin. Order 9-2007, f. and ef. 12/3/07.
- 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: APD Admin. Order 19-1988, f. 11/17/88, ef. 11/17/88 (Hazardous Wastes – Interim).  
 APD Admin. Order 12-1989, f. 7/14/89, ef. 7/14/90 (Hazardous Wastes – Final).  
 OR-OSHA Admin. Order 22-1990, f. 9/28/90, ef. 10/1/90 (Hazwaste).  
 OR-OSHA Admin. Order 2-1992, f. 2/6/92, ef. 5/1/92 (all except Hazwaste).  
 OR-OSHA Admin. Order 3-1992, f. 2/6/92, ef. 2/6/92 (Hazwaste).  
 OR-OSHA Admin. Order 8-1992, f. 8/13/92, ef. 11/24/92 (PSM).  
 OR-OSHA Admin. Order 6-1994, f. 9/30/94, ef. 9/30/94 (PSM).  
 OR-OSHA Admin. Order 3-1995, f. 2/22/95, ef. 2/22/95 (Haz Wst/Emg Rsp).  
 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 4-1999, f. 4/30/99, ef. 4/30/99.  
 OR-OSHA Admin. Order 8-1999, f. 8/6/99, ef. 8/6/99.  
 OR-OSHA Admin. Order 12-2001, f. 10/26/01, ef. 10/26/01.  
 OR-OSHA Admin. Order 4-2002, f. 5/30/02, ef. 5/30/02.  
 OR-OSHA Admin. Order 3-2003, f. 4/21/03, ef. 4/21/03.  
 OR-OSHA Admin. Order 4-2004, f. 9/15/04, ef. 9/15/04.  
 OR-OSHA Admin. Order 4-2005, f. 12/14/05, ef. 12/14/05.  
 OR-OSHA Admin. Order 4-2006, f. 7/24/06, ef. 7/24/06.  
 OR-OSHA Admin. Order 9-2007, f. 12/3/07, ef. 12/3/07.

OR-OSHA Admin. Order 7-2008, f. 5/30/08, ef. 5/30/08.  
OR-OSHA Admin. Order 1-2010, f. 2/19/10, ef. 2/19/10.  
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 6-2012, f. 9/28/12, ef. 4/1/13.  
OR-OSHA Admin. Order 4-2013, f. 7/19/13, ef. 7/19/13.  
**OR-OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15.**

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~~§1910.101 Compressed Gases (General Requirements).~~

~~(a) Inspection of compressed gas cylinders. Each employer shall determine that compressed gas cylinders under his control are in a safe condition to the extent that this can be determined by visual inspection. Visual and other inspections shall be conducted as prescribed in the Hazardous Materials Regulations of the Department of Transportation (49 CFR Parts 171-179 and 14 CFR Part 103). Where those regulations are not applicable, visual and other inspections shall be conducted in accordance with Compressed Gas Association Pamphlets C-6-1968 and C-8-1962, which is incorporated by reference as specified in §1910.6.~~

~~(b) Compressed gases. The in-plant handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tankcars, or motor vehicle cargo tanks shall be in accordance with Compressed Gas Association Pamphlet P-1-1965, which is incorporated by reference as specified in §1910.6.~~

~~(c) Safety relief devices for compressed gas containers. Compressed gas cylinders, portable tanks, and cargo tanks shall have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda and S-1.2-1963, which is incorporated by reference as specified in §1910.6.~~

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

~~Stats. Implemented: ORS 654.001 to 654.295.~~

~~Hist: OR-OSHA Admin. Order 2-1992, f. 2/6/92, ef. 5/1/92.~~

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

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**437-002-2101 Compressed Gases (General Requirements).**

**(1) Inspection of compressed gas cylinders. Each employer must conduct a visual inspection of compressed gas cylinders under their control to determine they are in a safe condition. Visual and other inspections must be conducted as prescribed in the Hazardous Materials Regulations of the Department of Transportation (49 CFR Parts 171-179 and 14 CFR Part 103). Where those regulations are not applicable, visual and other inspections must be conducted in accordance with Compressed Gas Association (CGA) Pamphlet C-6 2013, 11<sup>th</sup> Edition, Standard for Visual Inspection of Steel Compressed Gas Cylinders and CGA Pamphlet C-8 2005, Reaffirmed 2010, 7<sup>th</sup> Edition, Standard for Requalification of DOT-3HT, CTC-3HT, and TC-3HTM Seamless Steel Cylinders.**

**(2) Compressed gases. The handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tankcars, or motor vehicle cargo tanks must be in accordance with Compressed Gas Association Pamphlet P-1 2008, 11<sup>th</sup> Edition, Safe Handling of Compressed Gases in Containers.**

**(3) Safety relief devices for compressed gas containers. Compressed gas cylinders, portable tanks, and cargo tanks must have pressure relief devices installed and maintained in accordance with Compressed Gas Association CGA S-1.1 2011 14<sup>th</sup> edition and, CGA S-1.2 2009 9<sup>th</sup> edition.**

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

**Stats. Implemented: ORS 654.001 to 654.295.**

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

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437-002-2102 Acetylene.

(1) Cylinders.

(a) Employers must ensure that the manufacturing, in-plant transfer, transportation, handling, storage, and use of acetylene in cylinders comply with this rule and the provisions of Compressed Gas Association (CGA) Pamphlet G-1-2009 ("Acetylene") (Compressed Gas Association, Inc., 12th ed., 2009).

(b) Definitions.

Confined space: **A space that meets all of the following:**

(i) Large enough and configured so that an employee can ~~[bodily enter to perform assigned work]~~ **fully enter the space and perform work.**

(ii) **Has I**~~[L]~~imited or restricted **means for** entry **and**/or exit~~[for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits].~~

(iii) **Is n**~~[N]~~ot designed for continuous **human**~~[employee]~~ occupancy.

Enclosed space – Spaces that are surrounded by something, and the only openings are access openings, for example, drawers, closets, unventilated cabinets, automobile trunks, unventilated **cylinder**~~[vehicle]~~ compartments, or toolboxes. Handling – Moving, connecting, or disconnecting a compressed gas container under normal conditions.

PSIG (Gauge Pressure) – Pressure above or below local atmospheric pressure displayed as pounds per square inch.

Secure – Arrange to prevent movement (including lashing and chaining), or a minimum of three points of contact with other cylinders or walls.

Use – Withdrawing and using the gas in a non-recoverable manner for applications other than manufacturing or repackaging of compressed gasses.

(c) Acetylene Cylinders General Requirements.

(A) You must:

(i) Store and use cylinders valve end up.

NOTE: Gas suppliers and distributors may store secured containers in a horizontal position.

(ii) Secure cylinder(s) to prevent falling or movement.

(iii) Use a cylinder cart or cylinder pallet to move acetylene cylinders.

NOTE: This rule does not apply to acetylene fill plants, handling, distribution, and maintenance processes where cylinders are tilted and rolled on their bottom edge only the minimal distance necessary to get them on and off carts or pallets.

(iv) Attach the cylinder to a pressure reducing regulator or blow back manifold before opening the cylinder valve.

(v) Remove pressure regulators before moving cylinders unless they are secured in an upright position on a cylinder cart.

(vi) Back out regulator adjusting screws before opening cylinder valves.

- (vii) Protect cylinders from contact with welding spatters and cutting or burning slag.
- (viii) Install reverse flow check valves and flashback arresters according to manufacturer recommendation.
- (B) You must not:
  - (i) Drop cylinders.
  - (ii) Drag cylinders.
  - (iii) Apply a torch to the side of a cylinder.
  - (iv) Hoist cylinders using lifting magnets, slings, ropes, chains, or any other device where the cylinders form a part of the carrier.
  - (v) Handle cylinders so that the bottom fusible metal pressure relief device can strike an object.
  - (vi) Expose any part of your body to the line of discharge of a fusible metal pressure relief device.
  - (vii) Use acetylene at a pressure exceeding 15 psig.
  - (viii) Exceed an acetylene withdrawal rate of one-seventh of the cylinder capacity per hour for welding, cutting, and allied processes.

(d) Transporting Acetylene Cylinders (additional requirements).

- (A) You must protect cylinders and attached regulators:
  - (i) From damage when being transported by any vehicle.
  - (ii) From abnormal mechanical shock that is likely to damage the cylinder, valve, or fusible metal pressure relief device.

(B) You must not transport cylinders in enclosed spaces~~[automobiles or unventilated, enclosed vehicle compartments]~~.

**(C) You must ensure that cylinders are leak checked prior to each placement into the vehicle. Cylinders left in vehicles overnight must be leak checked at the end of the day and again prior to transporting.**

(e) Acetylene Cylinder Storage.

- (A) You must store cylinders:
  - (i) In assigned locations.
  - (ii) In areas posted with signs prohibiting smoking and open flame.
  - (iii) In well-ventilated locations.
  - (iv) Away from heat sources.
  - (v) Where they are protected from corrosion.

**NOTE: Cylinders with or without regulators, kept in or on vehicles due to their frequency of use will not be considered as stored when a leak test is performed at the end of the day. When cylinders are used during multiple shifts, they must be leak tested at the end of each shift.**

(B) You must not store cylinders:

- (i) Where they contact electrical welding equipment or electrical circuits.

NOTE: All high and low pressure cylinders in contact with or secured to a conductive table or column without being isolated from electrical current can become part of an electrical circuit.

- (ii) Where they can be struck by heavy objects.
- (iii) In enclosed spaces.
- (iv) In confined spaces.
- (v) Within 20 feet of oxygen unless they are separated by a noncombustible partition. Partitions must:
  - (I) vertically extend at least 18 inches above the tallest container and not less than 5 feet.
  - (II) laterally extend at least 18 inches beyond the sides of the containers.
  - (III) have a fire resistance rating of at least one-half hour.

NOTE 1 (paragraph (1)(e)(B)(v)): Single cylinders of acetylene and oxygen can be stored secured on a cart or used adjacent to each other without a partition.

NOTE 2 (paragraph (1)(e)(B)(v)): Single cylinders of acetylene and oxygen secured at a work station without attached pressure reducing regulators are considered to be in use.

(vi) With full and empty cylinders grouped together.

NOTE (paragraph (1)(e)(B)(vi)): This does not apply to the cylinder distribution process.

(f) Connecting and Disconnecting Acetylene Cylinders for Use.

(A) You must:

(i) Return cylinders with contaminated valves (mud, oil, grease, and similar material) to the supplier.

(ii) Secure the cylinder(s) where it can not contact any electrical circuit or electrical welding equipment.

NOTE: All high and low pressure cylinders in contact with or secured to a conductive table column without being isolated from electrical current can become part of an electrical circuit.

(iii) Inspect hoses before each shift.

(iv) Remove damaged hoses from service.

(v) Check pressurized cylinder valves, fuse plugs and all connections for leaks prior to use.

(vi) Use industry approved leak detection solution or oil free soapy water.

(vii) Notify the gas supplier of any leaking cylinder and follow the supplier's instruction for returning the cylinder.

(viii) Back out the regulator adjusting screws before opening cylinder valves.

(ix) Close the system valves and release all gas from the regulators before removing the regulator from a cylinder.

(x) Keep the cylinder key used for opening the cylinder valve on the valve spindle when the cylinder is in use.

(B) You must not attempt to repair or alter cylinders or valves.

(2) Piped Systems.

(a) Employers must comply with Chapter 9 ("Acetylene Piping") of NFPA 51A-2006 ("Standard for Acetylene Charging Plants") (National Fire Protection Association, 2006 ed., 2006).

(b) When employers can demonstrate that the facilities, equipment, structures, or installations used to generate acetylene or to charge (fill) acetylene cylinders were installed prior to February 16, 2006, these employers may comply with the provisions of Chapter 7 ("Acetylene Piping") of NFPA 51A-2001 ("Standard for Acetylene Charging Plants") (National Fire Protection Association, 2001 ed., 2001).

(c) The provisions of 437-002-2102(2)(b) also apply when the facilities, equipment, structures, or installation used to generate acetylene or to charge (fill) acetylene cylinders were approved for construction or installation prior to February 16, 2006, but constructed and installed on or after that date.

(d) For additional information on acetylene piping systems, see CGA G-1.2-2006, Part 3 ("Acetylene piping") (Compressed Gas Association, Inc., 3rd ed., 2006).

(3) Generators and filling cylinders.

(a) Employer must ensure that facilities, equipment, structures, or installations used to generate acetylene or to charge (fill) acetylene cylinders comply with the provisions of NFPA 51A-2006 ("Standard for Acetylene Charging plants") (National Fire Protection Association, 2006 ed., 2006).

(b) When employers can demonstrate that the facilities, equipment, structures, or installations used to generate acetylene or to charge (fill) of acetylene cylinders were constructed or installed prior to February 16, 2006, these employers may comply with the provisions of NFPA 51A-2001 ("Standard for Acetylene Charging Plants") (National Fire Protection Association, 2001 ed., 2001).

(c) The provisions of 437-002-2102(3)(b) also apply when the facilities, equipment, structures, or installation were approved for construction or installation prior to February 16, 2006, but constructed and installed on or after that date.

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

Stats. Implemented: ORS 654.001 through 654.295.

Hist: OR-OSHA Admin. Order 1-2010, f. 2/19/10, ef. 2/19/10

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

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## Division 2/Q, Welding, Cutting and Brazing

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[~~published 12/14/07, FR vol. 72, no. 240, p. 71061~~].

**Repealed. Oregon OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15. In Oregon, OAR 473-002-2253 applies.**

(2) 29 CFR 1910.252 General Requirements, published 3/26/12, FR vol. 77, no. 58, p. 17574.

(3) 29 CFR 1910.253 Oxygen-Fuel Gas Welding and Cutting[~~published 12/14/07, FR vol. 72, no. 240, p. 71061~~]. **Repealed. Oregon OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15. In Oregon, OAR 473-002-2253 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 rules are on file with the Oregon Occupational Safety and Health Division, 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.

[437-002-0290

~~Blowpipes/Torches~~

~~(1) Approved backflow or flashback preventers shall be installed between the blowpipe or torch and the hoses.~~

~~(2) Torches shall be ignited using only friction lighters, stationary pilot flames or other recognized sources of ignition. The use of matches and other hand held open flames is prohibited.~~

~~(3) When welding or cutting is stopped for an extended period of time, for example, during the lunch break, overnight or longer:~~

~~(a) The oxygen and fuel-gas cylinder or manifold valves shall be closed;~~

~~(b) Torch valves shall be opened momentarily to release all gas pressure from the hoses and then closed;~~

~~(c) The regulator pressure adjusting screws shall be released; and~~

~~(d) When the welding or cutting has stopped for a few minutes, the closure of torch valves only is allowed.~~

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

~~Stats. Implemented: ORS 654.001 - ORS 654.295~~

~~Hist.: OSHA 232-1990, f. 9-28-90, cert. ef. 12-1-90]~~

[437-002-0291

~~Oxygen-Fuel Gas --- General~~

~~(1) Acetylene gas shall not be allowed to contact unalloyed copper except in a blowpipe or torch.~~

~~(2) Oxygen is prohibited for use in pneumatic tools, in oil preheating burners, to start internal-combustion engines, to blow out pipelines, to "dust" clothing or work, to create pressure, or for ventilation.~~

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

~~Stats. Implemented: ORS 654.001 - ORS 654.295~~

~~Hist.: OSHA 232-1990, f. 9-28-90, cert. ef. 12-1-90]~~

[437-002-0292

~~Oxygen-Fuel Gas --- Operating Procedures~~

~~(1) After connecting welding or cutting apparatus to oxygen and fuel-gas cylinders, or when starting to reuse the apparatus after an interval of a half hour or more, each gas shall be allowed to flow through its respective hose separately for a few seconds to purge the hose of any mixture of gases.~~

~~(2) Operators shall follow the procedure outlined by the manufacturer of the apparatus as they deal with the sequence of operations in lighting, adjusting, and extinguishing blowpipe flames and connecting the apparatus to the sources of gas supply.~~

~~(3) Operators shall never put down a torch unless the oxygen and fuel-gas have been completely shut off at the torch.~~

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

~~Stats. Implemented: ORS 654.001 - ORS 654.295~~

~~Hist.: OSHA 232-1990, f. 9-28-90, cert. ef. 12-1-90]~~



[437-002-0293

~~Cylinder Storage~~

- ~~(1) Unless connected to a manifold, oxygen from a cylinder shall not be used without first attaching an oxygen regulator to the cylinder valve.~~
- ~~(2) Before connecting the regulator to the cylinder valve, the valve shall be opened 1/4 of a turn and closed immediately.~~
- ~~(3) A suitable cylinder truck, chain or steadying device shall be used to keep cylinders from being knocked over while in use.~~
- ~~(4) Cylinders shall be securely lashed in place when necessary to prevent them from falling.~~
- ~~(5) Signs shall be conspicuously posted in such fuel-gas storage areas reading, "DANGER -- No Smoking, Matches or Open Lights," or equivalent wording.~~

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

~~Stats. Implemented: ORS 654.001 - ORS 654.295~~

~~Hist.: OSHA 232-1990, f. 9-28-90, cert. ef. 12-1-90]~~

[437-002-0294

~~Pressure-Reducing Regulators~~

- ~~(1) Pressure-adjusting screws on regulators shall always be fully released before the regulator is attached to a cylinder and the cylinder valve opened.~~
- ~~(2) Pressure-reducing regulators shall be kept in good repair. Cracked, broken or otherwise defective parts (including gauge glasses) shall be replaced.~~

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

~~Stats. Implemented: ORS 654.001 - ORS 654.295~~

~~Hist.: OSHA 232-1990, f. 9-28-90, cert. ef. 12-1-90]~~

[437-002-0295

~~Hoses~~

~~Hoses shall be protected from damage by physical hazards, hot objects or kinking. Damaged hoses shall not be repaired with tape.~~

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

~~Stats. Implemented: ORS 654.001 - ORS 654.295~~

~~Hist.: OSHA 232-1990, f. 9-28-90, cert. ef. 12-1-90]~~

[437-002-0296

~~Hose Connections~~

~~Connections for the oxygen hose shall be of sufficiently different dimension or pattern from that for fuel-gas to prevent intermixing in making connections, or hose connections shall be marked for identification to avoid interchange of fuel-gas and oxygen hoses.~~

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

~~Stats. Implemented: ORS 654.001 - ORS 654.295~~

~~Hist.: OSHA 232-1990, f. 9-28-90, cert. ef. 12-1-90]~~

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[§1910.251 Definitions:

As used in this subdivision:

(a) Welder and welding operator means any operator of electric or gas welding and cutting equipment.

(b) Approved means listed or approved by a nationally recognized testing laboratory. Refer to §1910.155(c)(3) for definitions of listed and approved, and §1910.7 for nationally recognized testing laboratory.

(c) Removed.

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 7-2008, f. 5/30/08, ef. 5/30/08.]

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~~§1910.253 Oxygen-Fuel Gas Welding and Cutting.~~

~~(a) General requirements.~~

~~(1) Flammable mixture. Mixtures of fuel gases and air or oxygen may be explosive and shall be guarded against. No device or attachment facilitating or permitting mixtures of air or oxygen with flammable gases prior to consumption, except at the burner or in a standard torch, shall be allowed unless approved for the purpose.~~

~~(2) Maximum pressure. Under no condition shall acetylene be generated, piped (except in approved cylinder manifolds) or utilized at a pressure in excess of 15 psig (103 kPa gauge pressure) or 30 psia (206 kPa absolute). (The 30 psia (206 kPa absolute) limit is intended to prevent unsafe use of acetylene in pressurized chambers such as caissons, underground excavations or tunnel construction.) This requirement is not intended to apply to storage of acetylene dissolved in a suitable solvent in cylinders manufactured and maintained according to U.S. Department of Transportation requirements, or to acetylene for chemical use. The use of liquid acetylene shall be prohibited.~~

~~(3) Apparatus. Only approved apparatus such as torches, regulators or pressure-reducing valves, acetylene generators, and manifolds shall be used.~~

~~(4) Personnel. Workers in charge of the oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems shall be instructed and judged competent by their employers for this important work before being left in charge. Rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment including generators, and oxygen or fuel-gas distribution piping systems shall be readily available.~~

~~(b) Cylinders and containers.~~

~~(1) Approval and marking.~~

~~(i) All portable cylinders used for the storage and shipment of compressed gases shall be constructed and maintained in accordance with the regulations of the U.S. Department of Transportation, 49 CFR parts 171-179.~~

~~(ii) Compressed gas cylinders shall be legibly marked, for the purpose of identifying the gas content, with either the chemical or the trade name of the gas. Such marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removable. Whenever practical, the marking shall be located on the shoulder of the cylinder.~~

~~(iii) Compressed gas cylinders shall be equipped with connections complying with the American National Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI B57.1-1965, which is incorporated by reference as specified in §1910.6.~~

~~(iv) All cylinders with a water weight capacity of over 30 pounds (13.6 kg) shall be equipped with means of connecting a valve protection cap or with a collar or recess to protect the valve.~~

~~(2) Storage of cylinders, General.~~

- ~~(i) Cylinders shall be kept away from radiators and other sources of heat.~~
- ~~(ii) Inside of buildings, cylinders shall be stored in a well-protected, well-ventilated, dry location, at least 20 feet (6.1 m) from highly combustible materials such as oil or excelsior. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage spaces shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards.~~
- ~~(iii) Empty cylinders shall have their valves closed.~~
- ~~(iv) Valve protection caps, where cylinder is designed to accept a cap, shall always be in place, hand-tight, except when cylinders are in use or connected for use.~~
- ~~(3) Fuel-gas cylinder storage. Inside a building, cylinders, except those in actual use or attached ready for use, shall be limited to a total gas capacity of 2,000 cubic feet (56 m<sup>3</sup>) or 300 pounds (135.9 kg) of liquefied petroleum gas.~~
- ~~(i) For storage in excess of 2,000 cubic feet (56 m<sup>3</sup>) total gas capacity of cylinders or 300 (135.9 kg) pounds of liquefied petroleum gas, a separate room or compartment conforming to the requirements specified in paragraphs (f)(6)(i)(H) and (f)(6)(i)(I) of this section shall be provided, or cylinders shall be kept outside or in a special building. Special buildings, rooms or compartments shall have no open flame for heating or lighting and shall be well-ventilated. They may also be used for storage of calcium carbide in quantities not to exceed 600 (271.8 kg) pounds when contained in metal containers complying with paragraphs (g)(1)(i) and (g)(1)(ii) of this section.~~
- ~~(ii) Acetylene cylinders shall be stored valve end up.~~
- ~~(4) Oxygen storage.~~
- ~~(i) Oxygen cylinders shall not be stored near highly combustible material, especially oil and grease; or near reserve stocks of carbide and acetylene or other fuel-gas cylinders, or near any other substance likely to cause or accelerate fire; or in an acetylene generator compartment.~~
- ~~(ii) Oxygen cylinders stored in outside generator houses shall be separated from the generator or carbide storage rooms by a noncombustible partition having a fire-resistance rating of at least 1 hour. This partition shall be without openings and shall be gastight.~~
- ~~(iii) Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet (6.1 m) or by a noncombustible barrier at least 5 feet (1.5 m) high having a fire-resistance rating of at least one-half hour.~~
- ~~(iv) Where a liquid oxygen system is to be used to supply gaseous oxygen for welding or cutting and the system has a storage capacity of more than 13,000 cubic feet (364 m<sup>3</sup>) of oxygen (measured at 14.7 psia (101 kPa) and 70° F (21.1° C)), connected in service or ready for service, or more than 25,000 cubic feet (700 m<sup>3</sup>) of oxygen measured at 14.7 psia (101 kPa) and 70° F (21.1° C)), including unconnected reserves on hand at the site, it shall comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566-1965, which is incorporated by reference as specified in §1910.6.~~
- ~~(5) Operating procedures.~~
- ~~(i) Cylinders, cylinder valves, couplings, regulators, hose, and apparatus shall be kept free from oily or greasy substances. Oxygen cylinders or apparatus shall not be handled with oily hands or gloves. A jet of oxygen must never be permitted to strike an oily surface, greasy clothes, or enter a fuel-oil or other storage tank.~~
- ~~(A) When transporting cylinders by a crane or derrick, a cradle, boat, or suitable platform shall be used. Slings or electric magnets shall not be used for this purpose. Valve protection caps, where cylinder is designed to accept a cap, shall always be in place.~~
- ~~(B) Cylinders shall not be dropped or struck or permitted to strike each other violently.~~
- ~~(C) Valve protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve protection caps to pry cylinders loose~~

when frozen to the ground or otherwise fixed; the use of warm (not boiling) water is recommended. Valve protection caps are designed to protect cylinder valves from damage.

~~(D) Unless cylinders are secured on a special truck, regulators shall be removed and valve protection caps, when provided for, shall be put in place before cylinders are moved.~~

~~(E) Cylinders not having fixed hand wheels shall have keys, handles or nonadjustable wrenches on valve stems while these cylinders are in service. In multiple cylinder installations only one key or handle is required for each manifold.~~

~~(F) Cylinder valves shall be closed before moving cylinders.~~

~~(G) Cylinder valves shall be closed when work is finished.~~

~~(H) Valves of empty cylinders shall be closed.~~

~~(I) Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them, or fire-resistant shields shall be provided.~~

~~(J) Cylinders shall not be placed where they might become part of an electric circuit. Contacts with third rails, trolley wires, etc., shall be avoided. Cylinders shall be kept away from radiators, piping systems, layout tables, etc., that may be used for grounding electric circuits such as for arc welding machines. Any practice such as the tapping of an electrode against a cylinder to strike an arc shall be prohibited.~~

~~(K) Cylinders shall never be used as rollers or supports, whether full or empty.~~

~~(L) The numbers and markings stamped into cylinders shall not be tampered with.~~

~~(M) No person, other than the gas supplier, shall attempt to mix gases in a cylinder. No one, except the owner of the cylinder or person authorized by him, shall refill a cylinder.~~

~~(N) No one shall tamper with safety devices in cylinders or valves.~~

~~(O) Cylinders shall not be dropped or otherwise roughly handled.~~

~~(P) Unless connected to a manifold, oxygen from a cylinder shall not be used without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator to the cylinder valve, the valve shall be opened slightly for an instant and then closed. Always stand to one side of the outlet when opening the cylinder valve.~~

~~(Q) A hammer or wrench shall not be used to open cylinder valves. If valves cannot be opened by hand, the supplier shall be notified.~~

~~(R)~~

~~(1) Cylinder valves shall not be tampered with nor should any attempt be made to repair them. If trouble is experienced, the supplier should be sent a report promptly indicating the character of the trouble and the cylinder's serial number. Supplier's instructions as to its disposition shall be followed.~~

~~(2) Complete removal of the stem from a diaphragm-type cylinder valve shall be avoided.~~

~~(ii)~~

~~(A) Fuel gas cylinders shall be placed with valve end up whenever they are in use. Liquefied gases shall be stored and shipped with the valve end up.~~

~~(B) Cylinders shall be handled carefully. Rough handling, knocks, or falls are liable to damage the cylinder, valve or safety devices and cause leakage.~~

~~(C) Before connecting a regulator to a cylinder valve, the valve shall be opened slightly and closed immediately. The valve shall be opened while standing to one side of the outlet; never in front of it. Never crack a fuel gas cylinder valve near other welding work or near sparks, flame, or other possible sources of ignition.~~

~~(D) Before a regulator is removed from a cylinder valve, the cylinder valve shall be closed and the gas released from the regulator.~~

~~(E) Nothing shall be placed on top of an acetylene cylinder when in use which may damage the safety device or interfere with the quick closing of the valve.~~

~~(F) If cylinders are found to have leaky valves or fittings which cannot be stopped by closing of the valve, the cylinders shall be taken outdoors away from sources of ignition and slowly emptied.~~

~~(G) A warning should be placed near cylinders having leaking fuse plugs or other leaking safety devices not to approach them with a lighted cigarette or other source of ignition. Such cylinders should be plainly tagged; the supplier should be promptly notified and his instructions followed as to their return.~~

~~(H) Safety devices shall not be tampered with.~~

~~(I) Fuel gas shall never be used from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.~~

~~(J) The cylinder valve shall always be opened slowly.~~

~~(K) An acetylene cylinder valve shall not be opened more than one and one-half turns of the spindle, and preferably no more than three-fourths of a turn.~~

~~(L) Where a special wrench is required it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be quickly turned off in case of emergency. In the case of manifolded or coupled cylinders at least one such wrench shall always be available for immediate use.~~

~~(c) Manifolding of cylinders:~~

~~(1) Fuel gas manifolds:~~

~~(i) Manifolds shall be approved either separately for each component part or as an assembled unit.~~

~~(ii) Except as provided in paragraph (c)(1)(iii) of this section fuel gas cylinders connected to one manifold inside a building shall be limited to a total capacity not exceeding 300 pounds (135.9 kg) of liquefied petroleum gas or 3,000 cubic feet (84 m<sup>3</sup>) of other fuel gas. More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet (15 m) apart or separated by a noncombustible barrier at least 5 feet (1.5 m) high having a fire-resistance rating of at least one-half hour.~~

~~(iii) Fuel gas cylinders connected to one manifold having an aggregate capacity exceeding 300 pounds (135.9 kg) of liquefied petroleum gas or 3,000 cubic feet (84 m<sup>3</sup>) of other fuel gas shall be located outdoors, or in a separate building or room constructed in accordance with paragraphs (f)(6)(i)(H) and (f)(6)(i)(I) of this section.~~

~~(iv) Separate manifold buildings or rooms may also be used for the storage of drums of calcium carbide and cylinders containing fuel gases as provided in paragraph (b)(3) of this section. Such buildings or rooms shall have no open flames for heating or lighting and shall be well-ventilated.~~

~~(v) High-pressure fuel gas manifolds shall be provided with approved pressure regulating devices.~~

~~(2) High-pressure oxygen manifolds (for use with cylinders having a Department of Transportation service pressure above 200 psig (1.36 MPa)).~~

~~(i) Manifolds shall be approved either separately for each component part or as an assembled unit.~~

~~(ii) Oxygen manifolds shall not be located in an acetylene generator room. Oxygen manifolds shall be separated from fuel gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet (6.1 m) or by a noncombustible barrier at least 5 feet (1.5 m) high having a fire-resistance rating of at least one-half hour.~~

~~(iii) Except as provided in paragraph (c)(2)(iv) of this section, oxygen cylinders connected to one manifold shall be limited to a total gas capacity of 6,000 cubic feet (168 m<sup>3</sup>). More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet (15 m) apart or separated by a noncombustible barrier at least 5 feet (1.5 m) high having a fire-resistance rating of at least one-half hour.~~

~~(iv) An oxygen manifold, to which cylinders having an aggregate capacity of more than 6,000 cubic feet (168 m<sup>3</sup>) of oxygen are connected, should be located outdoors or in a separate noncombustible building. Such a manifold, if located inside a building having other occupancy,~~

shall be located in a separate room of noncombustible construction having a fire-resistance rating of at least one-half hour or in an area with no combustible material within 20 feet (6.1 m) of the manifold.

~~(v) An oxygen manifold or oxygen bulk supply system which has storage capacity of more than 13,000 cubic feet (364 m<sup>3</sup>) of oxygen (measured at 14.7 psia (101 kPa) and 70° F (21.1° C)), connected in service or ready for service, or more than 25,000 cubic feet (700 m<sup>3</sup>) of oxygen (measured at 14.7 psia (101 kPa) and 70° F (21.1° C)), including unconnected reserves on hand at the site, shall comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566-1965.~~

~~(vi) High-pressure oxygen manifolds shall be provided with approved pressure-regulating devices.~~

~~(3) Low-pressure oxygen manifolds (for use with cylinders having a Department of Transportation service pressure not exceeding 200 psig (1.36 MPa)).~~

~~(i) Manifolds shall be of substantial construction suitable for use with oxygen at a pressure of 250 psig (1.7 MPa). They shall have a minimum bursting pressure of 1,000 psig (6.8 MPa) and shall be protected by a safety relief device which will relieve at a maximum pressure of 500 psig (3.4 MPa). DOT-4L200 cylinders have safety devices which relieve at a maximum pressure of 250 psig (1.7 MPa) (or 235 psig (1.6 MPa) if vacuum insulation is used).~~

~~(ii) Hose and hose connections subject to cylinder pressure shall bursting pressure of 1,000 psig (6.8 MPa).~~

~~(iii) The assembled manifold including leads shall be tested and proven gas-tight at a pressure of 300 psig (2.04 MPa). The fluid used for testing oxygen manifolds shall be oil-free and not combustible.~~

~~(iv) The location of manifolds shall comply with paragraphs (c)(2)(ii), (c)(2)(iii), (c)(2)(iv), and (c)(2)(v) of this section.~~

~~(v) The following sign shall be conspicuously posted at each manifold:~~

~~Low Pressure Manifold~~

~~Do Not Connect High Pressure Cylinders~~

~~Maximum Pressure—250 psig (1.7 MPa)~~

~~(4) Portable outlet headers.~~

~~(i) Portable outlet headers shall not be used indoors except for temporary service where the conditions preclude a direct supply from outlets located on the service piping system.~~

~~(ii) Each outlet on the service piping from which oxygen or fuel gas is withdrawn to supply a portable outlet header shall be equipped with a readily accessible shutoff valve.~~

~~(iii) Hose and hose connections used for connecting the portable outlet header to the service piping shall comply with paragraph (e)(5) of this section.~~

~~(iv) Master shutoff valves for both oxygen and fuel gas shall be provided at the entry end of the portable outlet header.~~

~~(v) Portable outlet headers for fuel gas service shall be provided with an approved hydraulic back-pressure valve installed at the inlet and preceding the service outlets, unless an approved pressure-reducing regulator, an approved back-flow check valve, or an approved hydraulic back-pressure valve is installed at each outlet. Outlets provided on headers for oxygen service may be fitted for use with pressure-reducing regulators or for direct hose connection.~~

~~(vi) Each service outlet on portable outlet headers shall be provided with a valve assembly that includes a detachable outlet seal cap, chained or otherwise attached to the body of the valve.~~

~~(vii) Materials and fabrication procedures for portable outlet headers shall comply with paragraphs (d)(1), (d)(2), and (d)(5) of this section.~~

~~(viii) Portable outlet headers shall be provided with frames which will support the equipment securely in the correct operating position and protect them from damage during handling and operation.~~

~~(5) Manifold operation procedures.~~

~~(i) Cylinder manifolds shall be installed under the supervision of someone familiar with the proper practices with reference to their construction and use.~~

~~(ii) All manifolds and parts used in methods of manifolding shall be used only for the gas or gases for which they are approved.~~

~~(iii) When acetylene cylinders are coupled, approved flash arresters shall be installed between each cylinder and the coupler block. For outdoor use only, and when the number of cylinders coupled does not exceed three, one flash arrester installed between the coupler block and regulator is acceptable.~~

~~(iv) The aggregate capacity of fuel gas cylinders connected to a portable manifold inside a building shall not exceed 3,000 cubic feet (84 m<sup>3</sup>) of gas.~~

~~(v) Acetylene and liquefied fuel gas cylinders shall be manifolded in a vertical position.~~

~~(vi) The pressure in the gas cylinders connected to and discharged simultaneously through a common manifold shall be approximately equal.~~

~~(d) Service piping systems.~~

~~(1) Materials and design.~~

~~(i)~~

~~(M) Piping and fittings shall comply with section 2, Industrial Gas and Air Piping Systems, of the American National Standard Code for Pressure Piping ANSI B31.1 1967, which is incorporated by reference as specified in §1910.6, insofar as it does not conflict with paragraphs~~

~~(d)(1)(i)(A)(1) and (d)(1)(i)(A)(2) of this section:~~

~~(1) Pipe shall be at least Schedule 40 and fittings shall be at least standard weight in sizes up to and including 6-inch nominal.~~

~~(2) Copper tubing shall be Types K or L in accordance with the Standard Specification for Seamless Copper Water Tube, ASTM B88-66a, which is incorporated by reference as specified in §1910.6.~~

~~(N) Piping shall be steel, wrought iron, brass or copper pipe, or seamless copper, brass or stainless steel tubing, except as provided in paragraphs (d)(1)(ii) and (d)(1)(iii) of this section.~~

~~(ii)~~

~~(A) Oxygen piping and fittings at pressures in excess of 700 psi (4.8 MPa), shall be stainless steel or copper alloys.~~

~~(B) Hose connections and hose complying with paragraph (e)(5) of this section may be used to connect the outlet of a manifold pressure regulator to piping providing the working pressure of the piping is 250 psi (1.7 MPa) or less and the length of the hose does not exceed 5 feet (1.5 m). Hose shall have a minimum bursting pressure of 1,000 psig (6.8 MPa).~~

~~(C) When oxygen is supplied to a service piping system from a low-pressure oxygen manifold without an intervening pressure regulating device, the piping system shall have a minimum design pressure of 250 psig (1.7 MPa). A pressure regulating device shall be used at each station outlet when the connected equipment is for use at pressures less than 250 psig (1.7 MPa).~~

~~(iii)~~

~~(A) Piping for acetylene or acetylene compounds shall be steel or wrought iron.~~

~~(B) Unalloyed copper shall not be used for acetylene or acetylenic compounds except in listed equipment.~~

~~(2) Piping joints.~~

~~(i) Joints in steel or wrought iron piping shall be welded, threaded or flanged. Fittings, such as ells, tees, couplings, and unions, may be rolled, forged or cast steel, malleable iron or nodular iron. Gray or white cast iron fittings are prohibited.~~

~~(ii) Joints in brass or copper pipe shall be welded, brazed, threaded, or flanged. If of the socket type, they shall be brazed with silver-brazing alloy or similar high melting point (not less than 800° F (427° C)) filler metal.~~

~~(iii) Joints in seamless copper, brass, or stainless steel tubing shall be approved gas tubing fittings or the joints shall be brazed. If of the socket type, they shall be brazed with silver-brazing alloy or similar high melting point (not less than 800° F (427° C)) filler metal.~~

~~(3) Installation.~~

~~(i) Distribution lines shall be installed and maintained in a safe operating condition.~~

~~(ii) All piping shall be run as directly as practicable, protected against physical damage, proper allowance being made for expansion and contraction, jarring and vibration. Pipe laid underground in earth shall be located below the frost line and protected against corrosion. After assembly, piping shall be thoroughly blown out with air, nitrogen, or carbon dioxide to remove foreign materials. For oxygen piping, only oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used.~~

~~(iii) Only piping which has been welded or brazed shall be installed in tunnels, trenches or ducts. Shutoff valves shall be located outside such conduits. Oxygen piping may be placed in the same tunnel, trench or duct with fuel-gas pipelines, provided there is good natural or forced ventilation.~~

~~(iv) Low points in piping carrying moist gas shall be drained into drip pots constructed so as to permit pumping or draining out the condensate at necessary intervals. Drain valves shall be installed for this purpose having outlets normally closed with screw caps or plugs. No open end valves or petcocks shall be used, except that in drips located out of doors, underground, and not readily accessible, valves may be used at such points if they are equipped with means to secure them in the closed position. Pipes leading to the surface of the ground shall be cased or jacketed where necessary to prevent loosening or breaking.~~

~~(v) Gas cocks or valves shall be provided for all buildings at points where they will be readily accessible for shutting off the gas supply to these buildings in any emergency. There shall also be provided a shutoff valve in the discharge line from the generator, gas holder, manifold or other source of supply.~~

~~(vi) Shutoff valves shall not be installed in safety relief lines in such a manner that the safety relief device can be rendered ineffective.~~

~~(vii) Fittings and lengths of pipe shall be examined internally before assembly and, if necessary freed from scale or dirt. Oxygen piping and fittings shall be washed out with a suitable solution which will effectively remove grease and dirt but will not react with oxygen. Hot water solutions of caustic soda or trisodium phosphate are effective cleaning agents for this purpose.~~

~~(viii) Piping shall be thoroughly blown out after assembly to remove foreign materials. For oxygen piping, oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used. For other piping, air or inert gas may be used.~~

~~(ix) When flammable gas lines or other parts of equipment are being purged of air or gas, open lights or other sources of ignition shall not be permitted near uncapped openings.~~

~~(x) No welding or cutting shall be performed on an acetylene or oxygen pipeline, including the attachment of hangers or supports, until the line has been purged. Only oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used to purge oxygen lines.~~

~~(4) Painting and signs.~~

~~(i) Underground pipe and tubing and outdoor ferrous pipe and tubing shall be covered or painted with a suitable material for protection against corrosion.~~

~~(ii) Aboveground piping systems shall be marked in accordance with the American National Standard Scheme for the Identification of Piping Systems, ANSI A13.1 1956, which is incorporated by reference as specified in §1910.6.~~

~~(iii) Station outlets shall be marked to indicate the name of the gas.~~

~~(5) Testing.~~



(i) Piping systems shall be tested and proved gas-tight at 1-1/2 times the maximum operating pressure, and shall be thoroughly purged of air before being placed in service. The material used for testing oxygen lines shall be oil free and noncombustible. Flames shall not be used to detect leaks.

(ii) When flammable gas lines or other parts of equipment are being purged of air or gas, sources of ignition shall not be permitted near uncapped openings.

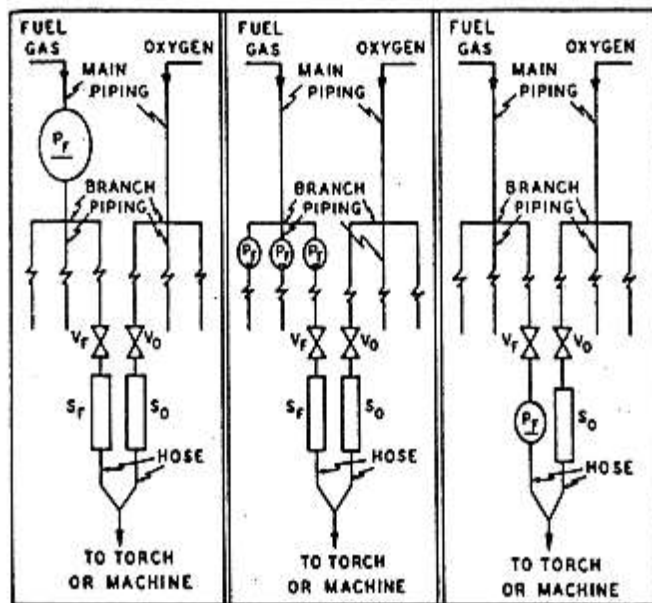
(e) Protective equipment, hose and regulators.

(1) General. Equipment shall be installed and used only in the service for which it is approved and as recommended by the manufacturer.

(2) Pressure relief devices. Service piping systems shall be protected by pressure relief devices set to function at not more than the design pressure of the systems and discharging upwards to a safe location.

(3) Piping protective equipment.

(i) The fuel-gas and oxygen piping systems, including portable outlet headers shall incorporate the protective equipment shown in Figures Q-1, Q-2, and Q-3. When only a portion of a fuel-gas system is to be used with oxygen, only that portion need comply with this paragraph



(e)(3)(i).

Fig. Q-1

Fig. Q-2

Fig. Q-3

#### LEGEND

- $P_F$  ————— Protective equipment in fuel gas piping
- $S_F$  ————— Backflow prevention device(s) at fuel gas station outlet
- $S_O$  ————— Backflow prevention device(s) at oxygen
- $V_F$  ————— Fuel gas station outlet valve
- $V_O$  ————— Oxygen station outlet valve station outlet

(ii) Approved protective equipment (designated  $P_F$  in Figures Q-1, Q-2, and Q-3) shall be installed in fuel-gas piping to prevent:

(C) Backflow of oxygen into the fuel-gas supply system;

- (D)** Passage of a flash back into the fuel-gas supply system; and
- (E)** Excessive back pressure of oxygen in the fuel-gas supply system. The three functions of the protective equipment may be combined in one device or maybe provided by separate devices.
- (1)** The protective equipment shall be located in the main supply line, as in Figure Q-1 or at the head of each branch line, as in Figure Q-2 or at each location where fuel-gas is withdrawn, as in Figure Q-3. Where branch lines are of 2-inch pipe size or larger or of substantial length, protective equipment (designated as P<sub>F</sub>) shall be located as shown in either Q-2 and Q-3.
- (2)** Backflow protection shall be provided by an approved device that will prevent oxygen from flowing into the fuel-gas system or fuel from flowing into the oxygen system (see S<sub>F</sub>, Figures Q-1 and Q-2).
- (3)** Flash-back protection shall be provided by an approved device that will prevent flame from passing into the fuel-gas system.
- (4)** Back-pressure protection shall be provided by an approved pressure-relief device set at a pressure not greater than the pressure rating of the backflow or the flashback protection device, whichever is lower. The pressure-relief device shall be located on the downstream side of the backflow and flashback protection devices. The vent from the pressure-relief device shall be at least as large as the relief device inlet and shall be installed without low points that may collect moisture. If low points are unavoidable, drip pots with drains closed with screw-plugs or caps shall be installed at the low points. The vent terminus shall not endanger personnel or property through gas discharge; shall be located away from ignition sources; and shall terminate in a hood or bend.
- (iii)** If pipeline protective equipment incorporates a liquid, the liquid level shall be maintained, and a suitable antifreeze may be used to prevent freezing.
- (iv)** Fuel-gas for use with equipment not requiring oxygen shall be withdrawn upstream of the piping protective devices.
- (4)** Station outlet protective equipment.
- (i)** A check valve, pressure regulator, hydraulic seal, or combination of these devices shall be provided at each station outlet, including those on portable headers, to prevent backflow, as shown in Figures Q-1, Q-2, and Q-3 and designated as S<sub>F</sub> and S<sub>O</sub>.
- (ii)** When approved pipeline protective equipment (designated P<sub>F</sub>) is located at the station outlet as in Figure Q-3, no additional check valve, pressure regulator, or hydraulic seal is required.
- (iii)** A shutoff valve (designated V<sub>F</sub> and V<sub>O</sub>) shall be installed at each station outlet and shall be located on the upstream side of other station outlet equipment.
- (iv)** If the station outlet is equipped with a detachable regulator, the outlet shall terminate in a union connection that complies with the Regulator Connection Standards, 1958, Compressed Gas Association, which is incorporated by reference as specified in §1910.6.
- (v)** If the station outlet is connected directly to a hose, the outlet shall terminate in a union connection complying with the Standard Hose Connection Specifications, 1957, Compressed Gas Association, which is incorporated by reference as specified in §1910.6.
- (vi)** Station outlets may terminate in pipe threads to which permanent connections are to be made, such as to a machine.
- (vii)** Station outlets shall be equipped with a detachable outlet seal cap secured in place. This cap shall be used to seal the outlet except when a hose, a regulator, or piping is attached.
- (viii)** Where station outlets are equipped with approved backflow and flash-back protective devices, as many as four torches may be supplied from one station outlet through rigid piping, provided each outlet from such piping is equipped with a shutoff valve and provided the fuel-gas capacity of any one torch does not exceed 15 cubic feet (0.42 m<sup>3</sup>) per hour. This paragraph (e)(4)(viii) does not apply to machines.
- (5)** Hose and hose connections.

- ~~(i) Hose for oxy-fuel gas service shall comply with the Specification for Rubber Welding Hose, 1958, Compressed Gas Association and Rubber Manufacturers Association, which is incorporated by reference as specified in §1910.6.~~
- ~~(ii) When parallel lengths of oxygen and acetylene hose are taped together for convenience and to prevent tangling, not more than 4 inches (10.2 cm) out of 12 inches (30.5 cm) shall be covered by tape.~~
- ~~(iii) Hose connections shall comply with the Standard Hose Connection Specifications, 1957, Compressed Gas Association.~~
- ~~(iv) Hose connections shall be clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than a pressure of 300 psi (2.04 MPa). Oil-free air or an oil-free inert gas shall be used for the test.~~
- ~~(v) Hose showing leaks, burns, worn places, or other defects rendering it unfit for service shall be repaired or replaced.~~
- ~~(6) Pressure-reducing regulators.~~
- ~~(i) Pressure-reducing regulators shall be used only for the gas and pressures for which they are intended. The regulator inlet connections shall comply with Regulator Connection Standards, 1958, Compressed Gas Association.~~
- ~~(ii) When regulators or parts of regulators, including gauges, need repair, the work shall be performed by skilled mechanics who have been properly instructed.~~
- ~~(iii) Gauges on oxygen regulators shall be marked "USE NO OIL."~~
- ~~(iv) Union nuts and connections on regulators shall be inspected before use to detect faulty seats which may cause leakage of gas when the regulators are attached to the cylinder valves.~~
- ~~(f) Acetylene generators.~~
- ~~(1) Approval and marking.~~
- ~~(i) Generators shall be of approved construction and shall be plainly marked with the maximum weight and size of carbide necessary for a single charge; the manufacturer's name and address; and the name or number of the type of generator.~~
- ~~(ii) Carbide shall be of the size marked on the generator nameplate.~~
- ~~(2) Rating and pressure limitations.~~
- ~~(i) The total hourly output of a generator shall not exceed the rate for which it is approved and marked. Unless specifically approved for higher ratings, carbide-feed generators shall be rated at 1 cubic foot (0.028 m<sup>3</sup>) per hour per pound of carbide required for a single complete charge.~~
- ~~(ii) Relief valves shall be regularly operated to insure proper functioning. Relief valves for generating chambers shall be set to open at a pressure not in excess of 15 psig (103 kPa gauge pressure). Relief valves for hydraulic back pressure valves shall be set to open at a pressure not in excess of 20 psig (137 kPa gauge pressure).~~
- ~~(iii) Nonautomatic generators shall not be used for generating acetylene at pressures exceeding 1 psig (7 kPa gauge pressure), and all water overflows shall be visible.~~
- ~~(3) Location. The space around the generator shall be ample for free, unobstructed operation and maintenance and shall permit ready adjustment and charging.~~
- ~~(4) Stationary acetylene generators (automatic and nonautomatic).~~
- ~~(i)~~
- ~~(A) The foundation shall be so arranged that the generator will be level and so that no excessive strain will be placed on the generator or its connections. Acetylene generators shall be grounded.~~
- ~~(B) Generators shall be placed where water will not freeze. The use of common salt (sodium chloride) or other corrosive chemicals for protection against freezing is not permitted. (For heating systems see paragraph (f)(6)(iii) of this section.)~~
- ~~(C) Except when generators are prepared in accordance with paragraph (f)(7)(v) of this section, sources of ignition shall be prohibited in outside generator houses or inside generator rooms.~~

**(D)** Water shall not be supplied through a continuous connection to the generator except when the generator is provided with an adequate open overflow or automatic water shutoff which will effectively prevent overflowing of the generator. Where a noncontinuous connection is used, the supply line shall terminate at a point not less than 2 inches (5 cm) above the regularly provided opening for filling so that the water can be observed as it enters the generator.

**(E)** Unless otherwise specifically approved, generators shall not be fitted with continuous drain connections leading to sewers, but shall discharge through an open connection into a suitably vented outdoor receptacle or residue pit which may have such connections. An open connection for the sludge drawoff is desirable to enable the generator operator to observe leakage of generating water from the drain valve or sludge cock.

**(ii)**

**(A)** Each generator shall be provided with a vent pipe.

**(B)** The escape or relief pipe shall be rigidly installed without traps and so that any condensation will drain back to the generator.

**(C)** The escape or relief pipe shall be carried full size to a suitable point outside the building. It shall terminate in a hood or bend located at least 12 feet (3.7 m) above the ground, preferably above the roof, and as far away as practicable from windows or other openings into buildings and as far away as practicable from sources of ignition such as flues or chimneys and tracks used by locomotives. Generating chamber relief pipes shall not be interconnected but shall be separately led to the outside unobstructed by rain, snow, ice, insects, or birds. The outlet shall be at least 3 feet (0.9 m) from combustible construction.

**(iii)**

**(A)** Gas holders shall be constructed on the gasometer principle, the bell being suitably guided. The gas bell shall move freely without tendency to bind and shall have a clearance of at least 2 inches (5 cm) from the shell.

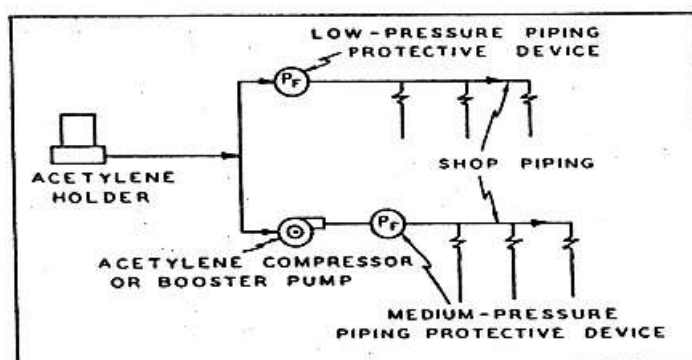
**(B)** The gas holder may be located in the generator room, in a separate room or out of doors. In order to prevent collapse of the gas bell or infiltration of air due to a vacuum caused by the compressor or booster pump or cooling of the gas, a compressor or booster cutoff shall be provided at a point 12 inches (0.3 m) or more above the landing point of the bell. When the gas holder is located indoors, the room shall be ventilated in accordance with paragraph (f)(6)(ii) of this section and heated and lighted in accordance with paragraphs (f)(6)(iii) and (f)(6)(iv) of this section.

**(C)** When the gas holder is not located within a heated building, gas holder seals shall be protected against freezing.

**(D)** Means shall be provided to stop the generator-feeding mechanism before the gas holder reaches the upper limit of its travel.

**(E)** When the gas holder is connected to only one generator, the gas capacity of the holder shall be not less than one-third of the hourly rating of the generator.

**(F)** If acetylene is used from the gas holder without increase in pressure at some points but with increase in pressure by a compressor or booster pump at other points, approved piping protective devices shall be installed in each supply line. The low-pressure protective device shall be located between the gas holder and the shop piping, and the medium-pressure protective device shall be located between the compressor or booster pump and the shop piping (see Figure Q-4). Approved protective equipment (designated  $P_F$ ) is used to prevent: Backflow



of oxygen into the fuel-gas supply system; passage of a flashback into the fuel-gas supply system; and excessive back pressure of oxygen in the fuel-gas supply system. The three functions of the protective equipment may be combined in one device or may be provided by separate devices.

Figure Q-4

- ~~(A) The compressor or booster system shall be of an approved type.~~
- ~~(B) Wiring and electrical equipment in compressor or booster pump rooms or enclosures shall conform to the provisions of Subdivision S, Electrical, of this division for Class I, Division 2 locations.~~
- ~~(C) Compressors and booster pump equipment shall be located in well-ventilated areas away from open flames, electrical or mechanical sparks, or other ignition sources.~~
- ~~(D) Compressor or booster pumps shall be provided with pressure relief valves which will relieve pressure exceeding, 15 psig (103 kPa gauge pressure) to a safe outdoor location as provided in paragraph (f)(4)(ii) of this section, or by returning the gas to the inlet side or to the gas supply source.~~
- ~~(E) Compressor or booster pump discharge outlets shall be provided with approved protective equipment. (See paragraph (e) of this section.)~~
- ~~(5) Portable acetylene generators.~~
  - ~~(i)~~
  - ~~(F) All portable generators shall be of a type approved for portable use.~~
  - ~~(G) Portable generators shall not be used within 10 feet (3 m) of combustible material other than the floor.~~
  - ~~(H) Portable generators shall not be used in rooms of total volume less than 100 cubic feet per generator in the room. Generators shall not be used in rooms having a ceiling height of less than 10 feet (3 m). (To obtain the gas-generating capacity in cubic feet per charge, multiply the pounds of carbide per charge by 4.5.)~~
  - ~~(I) Portable generators shall be protected against freezing. The use of salt or other corrosive chemical to prevent freezing is prohibited.~~
    - ~~(ii)~~
    - ~~(A) Portable generators shall be cleaned and recharged and the air mixture blown off outside buildings.~~
    - ~~(B) When charged with carbide, portable generators shall not be moved by crane or derrick.~~
    - ~~(C) When not in use, portable generators shall not be stored in rooms in which open flames are used unless the generators contain no carbide and have been thoroughly purged of acetylene. Storage rooms shall be well ventilated.~~
    - ~~(D) When portable acetylene generators are to be transported and operated on vehicles, they shall be securely anchored to the vehicles. If transported by truck, the motor shall be turned off during charging, cleaning, and generating periods.~~
    - ~~(E) Portable generators shall be located at a safe distance from the welding position so that they will not be exposed to sparks, slag, or misdirection of the torch flame or overheating from hot materials or processes.~~
- ~~(6) Outside generator houses and inside generator rooms for stationary acetylene generators.~~
  - ~~(i)~~
  - ~~(A) No opening in any outside generator house shall be located within 5 feet (1.5 m) of any opening in another building.~~
  - ~~(B) Walls, floors, and roofs of outside generator houses shall be of noncombustible construction.~~
  - ~~(C) When a part of the generator house is to be used for the storage or manifolding of oxygen cylinders, the space to be so occupied shall be separated from the generator or carbide storage section by partition walls continuous from floor to roof or ceiling, of the type of construction stated in paragraph (f)(6)(i)(H) of this section. Such separation walls shall be without openings~~

and shall be joined to the floor, other walls and ceiling or roof in a manner to effect a permanent gas-tight joint.

~~(D) Exit doors shall be located so as to be readily accessible in case of emergency.~~

~~(E) Explosion venting for outside generator houses and inside generator rooms shall be provided in exterior walls or roofs. The venting areas shall be equal to not less than 1 square foot (0.09 m<sup>2</sup>) per 50 cubic feet (1.4 m<sup>3</sup>) of room volume and may consist of anyone or any combination of the following: Walls of light, noncombustible material preferably single-thickness, single-strength glass; lightly fastened hatch covers; lightly fastened swinging doors in exterior walls opening outward; lightly fastened walls or roof designed to relieve at a maximum pressure of 25 pounds per square foot (0.001 MPa).~~

~~(F) The installation of acetylene generators within buildings shall be restricted to buildings not exceeding one story in height; provided, however, that this will not be construed as prohibiting such installations on the roof or top floor of a building exceeding such height.~~

~~(G) Generators installed inside buildings shall be enclosed in a separate room.~~

~~(H) The walls, partitions, floors, and ceilings of inside generator rooms shall be of noncombustible construction having a fire-resistance floor to ceiling and shall be securely anchored. At least one wall of the room shall be an exterior wall.~~

~~(I) Openings from an inside generator room to other parts of the building shall be protected by a swinging type, self-closing fire door for a Class B opening and having a rating of at least 1 hour. Windows in partitions shall be wired glass and approved metal frames with fixed sash. Installation shall be in accordance with the Standard for the Installation of Fire Doors and Windows, NFPA 80-1970, which is incorporated by reference as specified in §1910.6.~~

~~(ii) Inside generator rooms or outside generator houses shall be well ventilated with vents located at floor and ceiling levels.~~

~~(iii) Heating shall be by steam, hot water, enclosed electrically heated elements or other indirect means. Heating by flames or fires shall be prohibited in outside generator houses or inside generator rooms, or in any enclosure communicating with them.~~

~~(iv)~~

~~(A) Generator houses or rooms shall have natural light during daylight hours. Where artificial lighting is necessary it shall be restricted to electric lamps installed in a fixed position. Unless specifically approved for use in atmospheres containing acetylene, such lamps shall be provided with enclosures of glass or other noncombustible material so designed and constructed as to prevent gas vapors from reaching the lamp or socket and to resist breakage. Rigid conduit with threaded connections shall be used.~~

~~(B) Lamps installed outside of wired-glass panels set in gas-tight frames in the exterior walls or roof of the generator house or room are acceptable.~~

~~(v) Electric switches, telephones, and all other electrical apparatus which may cause a spark, unless specifically approved for use inside acetylene generator rooms, shall be located outside the generator house or in a room or space separated from the generator room by a gas-tight partition, except that where the generator system is designed so that no carbide fill opening or other part of the generator is open to the generator house or room during the operation of the generator, and so that residue is carried in closed piping from the residue discharge valve to a point outside the generator house or room, electrical equipment in the generator house or room shall conform to the provisions of Subpart S of this part for Class I, Division 2 locations.~~

~~(7) Maintenance and operation.~~

~~(i) Unauthorized persons shall not be permitted in outside generator houses or inside generator rooms.~~

~~(C) Operating instructions shall be posted in a conspicuous place near the generator or kept in a suitable place available for ready reference.~~

~~(D) When recharging generators the order of operations specified in the instructions supplied by the manufacturer shall be followed.~~

~~(E) In the case of batch-type generators, when the charge of carbide is exhausted and before additional carbide is added, the generating chamber shall always be flushed out with water, renewing the water supply in accordance with the instruction card furnished by the manufacturer.~~

~~(F) The water-carbide residue mixture drained from the generator shall not be discharged into sewer pipes or stored in areas near open flames. Clear water from residue settling pits may be discharged into sewer pipes.~~

~~(ii) The carbide added each time the generator is recharged shall be sufficient to refill the space provided for carbide without ramming the charge. Steel or other ferrous tools shall not be used in distributing the charge.~~

~~(iii) Generator water chambers shall be kept filled to proper level at all times except while draining during the recharging operation.~~

~~(iv) Whenever repairs are to be made or the generator is to be charged or carbide is to be removed, the water chamber shall be filled to the proper level.~~

~~(v) Previous to making repairs involving welding, soldering, or other hot work or other operations which produce a source of ignition, the carbide charge and feed mechanism shall be completely removed. All acetylene shall be expelled by completely flooding the generator shell with water and the generator shall be disconnected from the piping system. The generator shall be kept filled with water, if possible, or positioned to hold as much water as possible.~~

~~(vi) Hot repairs shall not be made in a room where there are other generators unless all the generators and piping have been purged of acetylene.~~

~~(g) Calcium carbide storage.~~

~~(1) Packaging.~~

~~(i) Calcium carbide shall be contained in metal packages of sufficient strength to prevent rupture. The packages shall be provided with a screw top or equivalent. These packages shall be constructed water- and air-tight. Solder shall not be used in such a manner that the package would fail if exposed to fire.~~

~~(ii) Packages containing calcium carbide shall be conspicuously marked "Calcium Carbide—Dangerous If Not Kept Dry" or with equivalent warning.~~

~~(iii) Caution: Metal tools, even the so-called spark-resistant type may cause ignition of an acetylene and air mixture when opening carbide containers.~~

~~(iv) Sprinkler systems shall not be installed in carbide storage rooms.~~

~~(2) Storage indoors.~~

~~(i) Calcium carbide in quantities not to exceed 600 pounds (272.2 kg) may be stored indoors in dry, waterproof, and well-ventilated locations.~~

~~(G) Calcium carbide not exceeding 600 pounds (272.2 kg) may be stored indoors in the same room with fuel-gas cylinders.~~

~~(H) Packages of calcium carbide, except for one of each size shall be kept sealed. The seals shall not be broken when there is carbide in excess of 1 pound (0.5 kg) in any other unsealed package of the same size of carbide in the room.~~

~~(ii) Calcium carbide exceeding 600 pounds (272.2 kg) but not exceeding 5,000 pounds (2,268 kg) shall be stored:~~

~~(A) In accordance with paragraph (g)(2)(iii) of this section;~~

~~(B) In an inside generator room or outside generator house; or~~

~~(C) In a separate room in a one-story building which may contain other occupancies, but without cellar or basement beneath the carbide storage section. Such rooms shall be constructed in accordance with paragraphs (f)(6)(i)(H) and (f)(6)(i)(I) of this section and ventilated in accordance with paragraph (f)(6)(ii) of this section. These rooms shall be used for no other purpose.~~

~~(iii) Calcium carbide in excess of 5,000 pounds (2,268 kg) shall be stored in one-story buildings without cellar or basement and used for no other purpose or in outside generator houses. If~~

~~the storage building is of noncombustible construction, it may adjoin other one-story buildings if separated therefrom by unpierced firewalls; if it is detached less than 10 feet (3 m) from such building or buildings, there shall be no opening in any of the mutually exposing sides of such buildings within 10 feet (3 m). If the storage building is of combustible construction, it shall be at least 30 feet (9.1 m) from any other building exceeding two stories.~~

~~(3) Storage outdoors:~~

~~(i) Calcium carbide in unopened metal containers may be stored outdoors.~~

~~(ii) Carbide containers to be stored outdoors shall be examined to make sure that they are in good condition. Periodic reexaminations shall be made for rusting or other damage to a container that might affect its water or air tightness.~~

~~(iii) The bottom tier of each row shall be placed on wooden planking or equivalent, so that the containers will not come in contact with the ground or ground water.~~

~~(iv) Containers of carbide which have been in storage the longest shall be used first.~~

~~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 7-2008, f. 5/30/08, ef. 5/30/08.]~~

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## 437-002-2253 Oxygen-fuel gas welding and cutting

### (1) Scope and Application

These rules apply to safe practices for users of oxy-fuel gas for welding, cutting, soldering, brazing, flame coating (thermal spraying), related materials and equipment, in general industry and construction. This rule does not apply to agriculture, forest activities, or maritime industries.

### (2) Definitions

Apparatus – Includes regulators, hoses, connections (fittings), torches, manifolds and safety devices.

Approved – Means listed or approved by a nationally recognized testing laboratory. Refer to 1910.7 for definitions and requirements for a nationally recognized testing laboratory.

Attended – When a trained employee or qualified person is within sight of and can maintain control of the torch.

Brazing – Is a metal joining process where filler metal is heated to join two or more close-fitting metal parts. It is similar to soldering but the temperatures used to melt the filler metal at or above 800°F.

Burners – A type of torch system usually designed for stationary use at the bench or lathe. The material being worked, such as glass, is moved into and around the flame. Flame size is determined by valves that adjust the flow and mix of fuel gas and oxygen.

Check valve (reverse flow check valve) – A device designed to prevent the unintentional backflow of gases.

NOTE: Reverse flow check valves alone will not stop a flashback in the system.

Compartment (inside) – Is within an enclosed vehicle and opens to the inside.

Compartment (outside) – Is recessed or built into an enclosed vehicle but opens to the outside of the enclosed vehicle. This compartment seals the compressed gases from entering the vehicle compartment and is vented to the outside of the vehicle.

Competent person – one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Confined space: 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.

**Containers (compressed, liquefied and dissolved gas) – Cylinders, portable tanks, non-refillable cylinders, or stationary tanks, consisting of various shapes and sizes that are designed and constructed to meet ASME, TC or DOT specification.**

**Crack (Cracking) – Opening a cylinder valve slightly and immediately closing it prior to attaching a pressure reducing regulator. This is an approved process that applies only to oxygen cylinders.**

**Cutting (oxy-fuel cutting) – A process where a cutting torch is used to heat metal to kindling temperature. A stream of oxygen is then trained on the metal, and metal burns in that oxygen and then flows out of the cut.**

**Cylinder(s) – An approved DOT portable container used for transportation and storage of compressed gas. Generally a cylinder is a compressed gas container having a maximum water capacity of 454 kg (1000 lbs).**

**Drop Test – A method using compressed gas cylinder (container) pressure to test connected regulators, hoses, torch and connections for leaks.**

**Enclosed space – Spaces that are surrounded by something and the only openings are access openings, for example, drawers, closets, unventilated cabinets, automobile trunks, unventilated cylinder compartments or toolboxes.**

**Enclosed vehicle – Includes but is not limited to the interior of automobiles, automobile trunks, vans, or in any enclosed truck or trailer.**

**Flame coating (thermal spraying) – The use of oxygen and fuel gases to apply fine metallic or nonmetallic materials in a molten or semi-molten condition to form a coating. The coating material may be in the form of powder, ceramic-rod, wire, or molten materials.**

**Flashback (flame) arrestor – A device that prevents the propagation of a flame upstream.**

**Fuel Gas – A flammable product or mixture of products used in welding, cutting and heating processes. Commonly used fuel gases are available in compressed gases, liquefied and liquefied mixtures, acetylene dissolved, and gasoline.**

**Handling – Moving, connecting, or disconnecting oxygen and fuel gas containers under normal conditions.**

**Leak test – The application of a liquid solution, or the use of other methods, to verify that oxygen and fuel gas cylinders and apparatus do not leak. Solutions must be compatible with the gas being used.**

**Manifold – An apparatus designed to connect two or more cylinders for use. In construction this may mean that two cylinders or more are connected by pigtailed to form a manifold.**

**Moving cylinders – The movement of a cylinder(s) from one location to another at the worksite or place of business.**

Periodic Inspection – An inspection that is made at least once per quarter.

Portable Cylinder banks – Multiple cylinders manifolded together on a portable frame.

PSIG (Gauge Pressure) – Pressure above or below local atmospheric pressure displayed as pounds per square inch.

Secure – Arrange to prevent movement (including lashing and chaining), or a minimum of three points of contact with other cylinders or walls.

Special truck – A vehicle or cart that is designed for the specific purpose of moving compressed, dissolved and liquefied gas cylinders in a stable manner.

Stored – Cylinders without attached regulators, cylinders not secured to a workstation, or cylinders that have not been used for 24 hours or more will be considered stored. This does not include cylinders secured on a cart.

Note: No more than one additional set of cylinders may be secured to a workstation.

Cylinders, with or without regulators, kept in or on vehicles due to their frequency of use will not be considered as stored when a leak test is performed at the end of the day. When cylinders are used during multiple shifts, they must be leak tested at the end of each shift.

Soldering – Is a metal joining process where filler metal is heated to join two or more close-fitting metal parts. It is similar to brazing but the temperatures used to melt the filler metal are below 800°F.

Supervisory personnel (supervisor) – An agent of the employer such as a manager, superintendent, foreperson, or person in charge of all or part of the place of employment who directs the work activities of one or more employees.

#### Torches

(Pre-mix) – Oxygen and fuel gases are mixed in a chamber within the torch body.

(Surface-mix) – Oxygen and fuel gases are mixed at the torch tip.

Transporting cylinders – Any cylinder movement by a vehicle to a worksite or place of business.

NOTE 1: A cylinder(s) loaded into a vehicle for movement to a worksite or place of business is not in storage.

NOTE 2: Requirements for the separation of oxidizers and fuel gases do not apply when cylinders are being transported to a work site or place of business.

Use – Withdrawing and using the gas in a non-recoverable manner for applications other than manufacturing or repackaging of compressed gasses.

Valve end up – The tops of all acetylene cylinders are elevated so that the cylinders are inclined at an angle of not less than 30 degrees from horizontal (to protect against loss of acetone).

**Welder and welding operator – One who operates electric or gas welding and cutting equipment.**

**Welding (oxy-fuel welding) – A process using fuel gases and oxygen to weld metals. Welded metal occurs when two pieces are heated to a temperature that produces a shared pool of molten metal. The molten pool is generally supplied with additional metal called filler. Filler material depends upon the metals to be welded.**

### **(3) Training and Evaluation**

**(a) You must provide training by a competent person that covers:**

**(A) Procedures, practices and requirements for representative tasks employees are expected to perform.**

**(B) Instructions for safe use, operation and maintenance of tools, equipment and machinery.**

**(C) Manufacturer's operating and maintenance instructions, warnings and precautions.**

**(D) Work performance expectations in a language or manner that employees are able to understand.**

**(E) Hazards associated with expected tasks.**

**(F) Ways to prevent or control identified hazards.**

**NOTE: A new employee does not need to be retrained in all of (3)(a)(A)-(F) if you are able to determine through discussion and observations that they received adequate training prior to employment with you. Retraining is required if the employee fails to demonstrate the knowledge and experience to safely perform the expected tasks.**

**(b) You must evaluate employee's ability to adequately perform the expected tasks prior to allowing them to work independently.**

### **(4) General Requirements**

**(a) You must:**

**(A) Guard against mixtures of fuel gases and air or oxygen that may be explosive.**

**(i) Use approved apparatus such as torches, regulators, or pressure reducing valves, hoses and connections, protective equipment, acetylene generators, and manifolds.**

**(ii) Install and use reverse flow check valves and flashback arrestors according to torch manufacturers' recommendations unless they are not required by the manufacturer.**

**(B) Use cylinders that meet the Department of Transportation requirements published in 49 CFR Part 178.**

**(C) Use portable cylinders for the storage and shipment of compressed gases that are constructed and maintained in accordance with the U.S. Department of Transportation regulations, 49 CFR Parts 171-179.**

**(D) Use compressed gas cylinders equipped with connections complying with Compressed Gas Association (CGA) Pamphlet V-1 1994, 7<sup>th</sup> Edition, Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections.**

**(E) Use compressed gas cylinders whose contents are legibly marked with:**

**(i) The chemical or trade name of the gas in conformance with Compressed Gas Association (CGA) Pamphlet C-7 2011, 9<sup>th</sup> Edition, Guide to Preparation of Precautionary Labeling and Marking of Compressed Gas Containers, and**

**(ii) Stenciling, stamping, or labeling that is not readily removable.**

**(F) Protect against oil and grease hazards.**

**(i) Keep cylinders, cylinder valves, couplings, regulators, hose, and apparatus free from oily or greasy substances.**

**(ii) Keep oxygen cylinders away from contacting oil and grease.**

**(G) Follow the requirements of OAR 437-002-2253(13) Service Piping, OAR 437-002-2253 (14) Acetylene Generators, OAR 437-002-2253 (15) Calcium Carbide Storage when generating acetylene for immediate use at the work location.**

**(H) Make readily available the rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment including generators, and oxygen or fuel-gas distribution piping systems.**

**(b) You must not:**

**(A) Remove any product or shipping hazard labels.**

**(B) Deface any product or shipping hazard labels.**

**(C) Use liquid acetylene.**

**(D) Generate acetylene at a pressure in excess of 15 psig (30 psia).**

**(E) Pipe or use acetylene at a pressure in excess of 15 psig unless it is in an approved manifold.**

**NOTE 1: This requirement does not apply to storage of acetylene dissolved in a suitable solvent in cylinders manufactured and maintained according to U.S. Department of Transportation requirements, or to acetylene for chemical use.**

**NOTE 2: Due to the instability of acetylene, the 15 psig (30 psia) limit is intended to prevent unsafe use of acetylene in pressurized chambers such as caissons, underground excavations, or tunnel construction.**

**(F) Use any device or attachment facilitating or permitting mixtures of air or oxygen with flammable gases prior to consumption, except at the burner or in a standard torch, unless approved for the purpose.**

**(G) Attempt to mix gases in a cylinder unless you are a gas supplier.**

**(H) Refill a cylinder unless you are:**

**(i) The owner of the cylinder, or**

**(ii) Authorized by the owner of the cylinder.**

**(I) Use a cylinder's contents for purposes other than those intended by the supplier.**

**(J) Use a damaged cylinder.**

**(K) Repair or alter cylinders or valves.**

**(L) Tamper with the numbers and markings stamped into cylinders.**

**(M) Handle oxygen cylinders, cylinder caps and valves, couplings, regulators, hoses, and apparatus with oily hands or gloves.**

**(N) Permit a jet of oxygen to:**

**(i) Strike an oily surface.**

**(ii) Strike greasy clothes.**

**(iii) Enter a fuel oil or other storage tank.**

**(O) Blow off clothing with oxygen.**

**(P) Use oxygen in pneumatic tools, in oil preheating burners, to start internal-combustion engines, to blow out pipelines, to create pressure, or for ventilation.**

## **(5) Transportation of Compressed, Liquefied and Dissolved Gas Cylinders**

**(a) When transporting cylinders in vehicles you must:**

**(A) Secure cylinders from moving.**

**(B) Keep valve protection caps in place on cylinders when regulators are not attached.**

**NOTE: This applies to cylinders designed to accept valve caps.**

(C) Protect cylinder valves and regulators when regulators are attached.

(D) Keep acetylene gas cylinders with valve(s) end up.

(E) Keep liquid cylinder valve(s) vertical.

(F) Keep oil residue from contacting oxygen cylinders.

(b) When transporting cylinders in enclosed vehicle(s) you must:

NOTE: This rule does not apply to cylinders transported in an unoccupied enclosed truck or trailer compartment with a shippers' certificate meeting the code for Hazardous Materials Regulations CFR 49 part 172.204.

(A) Ensure that cylinders are leak checked prior to each placement into the vehicle. Cylinders left in vehicles overnight must be leak checked at the end of the day and again prior to transporting.

(B) Cap cylinders.

(C) Secure cylinders from movement.

(D) Isolate fuel gas cylinders from sources of ignition.

(E) Maintain vehicle temperatures below 125 degrees.

Note: Temperatures in vehicles can exceed 125 F during sunny or warm weather. This may affect your decision to leave cylinders in vehicles for periods of time when temperatures may climb.

(F) Remove cylinders from the "inside vehicle compartment" to the outside of the vehicle prior to use.

(G) Open "outside vehicle compartment" doors when withdrawing product from cylinders.

(H) Ensure that all outside cylinder compartment(s) are sealed to prevent leakage to the inside of the vehicle. Outside compartment doors must open to the outside of the vehicle.

(I) Ensure the interior of any cylinder compartment containing oxidizers does not contain petroleum products or materials that have contacted petroleum products.

(c) When transporting cylinders in vehicles you must not put them in the trunks of passenger vehicles.

(6) Storage of Oxygen and Fuel Gas Cylinders

(a) You must store oxygen and fuel gas cylinders in locations:

(A) Specifically assigned.

(B) Well ventilated.

(C) That avoids prolonged exposure to damp environments.

(D) Away from heat sources.

(E) Posted with signs prohibiting smoking and open flame within 20 feet.

(F) Where the temperature does not exceed 125°F (52°C).

(G) Where sparks, hot slag, or flame will not reach them.

(H) Where they will not contact electrical welding equipment or electrical circuits.

NOTE: All high and low pressure cylinders in contact with or secured to a conductive table or column without being isolated from electrical current can become part of an electrical circuit.

(I) Where they are protected from corrosion.

(J) Where they cannot be knocked over.

(K) Where they cannot be damaged by passing or falling objects.

(L) Where they will not be tampered with by unauthorized persons.

(M) Where they will not be struck by heavy objects.

(N) Away from inside or outside exit routes or other areas normally used or intended for safe travel of personnel.

(O) Where they will not be subject to unventilated enclosed spaces.

(P) That are not identified as confined spaces.

(Q) With prominent signs posted identifying the names of the gasses stored.

(b) You must store cylinders in the following manner:

(A) With valve caps in place.

NOTE: This applies to cylinders designed to accept valve caps.

(B) Valve end up and secured from movement.

(C) Liquefied gas cylinders and acetylene cylinders with valve end up.

NOTE: Liquefied petroleum gas cylinders used on forklifts may be stored either horizontally or vertically.



**(D) Refrigerated liquid cylinders in a vertical position.**

**(E) With all individual oxygen and flammable gas cylinder valves on portable cylinder banks closed.**

**(c) You must separate oxygen cylinders from fuel-gas cylinders or combustible materials (especially oil or grease) and any other substance likely to cause or accelerate fire by:**

**(A) A minimum distance of 20 feet, or**

**(B) A noncombustible barrier that:**

**(i) Vertically extends 18 inches above the tallest cylinder(s) and is at least 5 feet high.**

**(ii) Laterally extends 18 inches beyond the sides of the cylinders.**

**(iii) Has a fire-resistance rating of at least one-half hour.**

**(d) You must separate oxygen and fuel gas cylinders secured on a cart from assigned cylinder storage areas by a minimum of 20 feet or a non combustible barrier.**

**NOTE 1: Single cylinders of oxygen and fuel gas can be secured on a cart or used adjacent to each other without being separated by a partition.**

**NOTE 2: An additional set of cylinders secured at a workstation without attached pressure reducing regulators will be considered in use and not in storage.**

**(e) You must limit cylinders, except those in actual use or attached ready for use, stored inside buildings to a total gas capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.**

**(f) Store cylinders of fuel gases in excess of 2,000 cubic feet total gas capacity or 300 pounds of liquefied petroleum gas (LPG), or any LPG mixture where LPG is the primary gas, (this does not apply to cylinders in actual use or attached ready for use) in the following manner:**

**(A) Outside, or**

**(B) In a separate room, compartment or special building with interior walls, partitions, floors, and ceilings that:**

**(i) Are constructed with noncombustible material having a fire-resistance floor to ceiling**

**(ii) Are securely anchored**

**(iii) Have at least one wall of the room that is an exterior wall**

**(C) The room must have a swinging type, self-closing fire door for a Class B opening and have a rating of at least 1 hour if there are openings to other parts of the building.**

**(D) The room must have wired glass windows mounted with approved metal frames and fixed sashes where windows are used. They must be installed in accordance with the Standard for the Installation of Fire Doors and Windows, NFPA 80-1970.**

**(g) You must comply with the provisions of the Compressed Gases and Cryogenic Fluid Code, NFPA No. 55-2010 when a liquid oxygen system is to be used to supply gaseous oxygen that has a storage capacity of more than 20,000 cubic feet of oxygen (measured at 14.7 psia (101 kPa) and 70° F (21.1° C)), connected in service or ready for service, or unconnected reserves on site.**

**(h) The handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tank cars, or motor vehicle cargo tanks must be in accordance with Compressed Gas Association (CGA) Pamphlet P-1 2008, 11<sup>th</sup> Edition, Safe Handling of Compressed Gases in Containers.**

#### **(7) Handling of Oxygen and Fuel Gas Cylinders**

**(a) When handling or moving cylinders you must:**

**(A) Provide adequate access for cylinder handling.**

**(B) Remove regulators and ensure any required valve protection is in place before moving unsecured cylinders.**

**(C) Move cylinders using a special truck, a cylinder hand truck, a cart or cylinder pallet.**

**NOTE: This rule does not apply to acetylene manufacturers, cylinder fill plants and distributors of compressed gases and acetylene. (7)(a)(C) does not apply to the movement of individual fuel gas cylinders of 40 cubic feet (b-tank) or less.**

**(D) Leave the valve protection cap and valve seal outlet in place until the cylinder has been secured in place and is ready to be connected to a regulator or manifold.**

**NOTE: This does not apply to manufacturers and distributors of compressed gases and acetylene plants where cylinders are connected and disconnected to cylinder manifolds.**

**(E) Use warm, not boiling, water to thaw frozen cylinders loose from the ground or if otherwise fixed.**

**(b) When moving cylinders by a crane or derrick you must:**

**(A) Use a cradle, boat, or suitable platform that secures cylinders.**

**(B) Install valve-protection caps on cylinders, including those cylinders with a water weight capacity of over 30 lbs., designed to accept a cap.**

**(C) Not use slings or electric magnets for this purpose.**

**(c) Before moving a portable bank or cylinder cradles you must:**

**(A) Close all individual oxygen and flammable gas cylinder valves on portable cylinder banks when in storage.**

**(B) Restrict manual movement of portable cylinder banks to clean, smooth, level stationary surfaces.**

**(C) Stay out of the portable-bank's travel path when moving manually.**

**(d) When moving a portable bank or cylinder cradles with a forklift you must secure them to the forklift.**

**(e) When moving a portable bank or cylinder cradles with a crane you must use the lifting hook attached to the cradles or other appropriate moving equipment.**

**(f) When lifting liquid cylinders you must:**

**(A) Lift by using the cylinder lift eyes.**

**(B) Use a lifting device designed for the lift and rated for the weight.**

**(g) Before moving cylinders to storage you must:**

**(A) Close the cylinder valve.**

**(B) Replace and secure any valve outlet seals.**

**(C) Properly install the cylinder cap.**

**(h) When handling or moving cylinders you must not:**

**(A) Repair or alter cylinders or valves.**

**(B) Place bars under valves or valve protection caps to pry cylinders loose when frozen to the ground or otherwise fixed.**

**(C) Use valve protection caps for lifting or lowering cylinders manually or with a crane from one position or location to another.**

**(D) Drag or slide cylinders.**

**(E) Lift liquid cylinders by the cylinder grab ring.**

**(F) Drop cylinders or permit them to strike each other violently.**

**(G) Subject any cylinder to mechanical shocks that may damage the valve.**

**(H) Use cylinders as rollers for moving material or other equipment.**

**(I) Permit oil, grease or other combustible substances to contact cylinders, valves, or other apparatus.**

**(J) Attempt to catch a falling cylinder.**

**(K) Place cylinders where they can become part of an electrical circuit.**

**NOTE: All pressurized cylinders in contact with or secured to a conductive table or column without being isolated from electrical current can become part of an electrical circuit.**

**(i) When connecting cylinders for use you must:**

**(A) Use a pressure-reducing regulator or separate control valve to discharge gas from a cylinder.**

**(B) Use regulators approved for the specific gas.**

**(C) Loosen the valve outlet seal slowly when preparing to connect a cylinder.**

**(D) Back out the regulator adjusting screws before opening cylinder valves.**

**(E) Open oxygen cylinder valves slowly and slightly (called cracking) for an instant and then close before attaching a regulator. Stand with the cylinder valve between you and the valve outlet connection so the outlet connection is facing away from your body when cracking an oxygen cylinder.**

**NOTE: Cracking is an approved process that applies only to oxygen cylinders.**

**(F) Open acetylene cylinder valves no more than one and one half turns.**

**NOTE: It is preferable to open the acetylene valve no more than three-fourths of a turn.**

**(G) Return cylinders with contaminated valves (mud, oil, grease, and similar material) to the supplier.**

**(H) Use acetylene tank keys or wrenches designed to open acetylene stem type valves.**

**(I) Notify the supplier if cylinder valves cannot be opened by hand.**

**(J) Stand with the cylinder valve between you and the regulator so your body, the cylinder valve, and regulator form a straight line when opening the cylinder valve.**

**(K) Open cylinder valves slowly and carefully after the cylinder has been connected to the process.**

**(L) Ensure that cylinder valves, pressure-reducing regulators, hoses, torches and all connections do not leak.**

**(i) Perform a drop test**

- **Ensure that both the oxygen and fuel control valves on the torch handle are closed.**
- **With the oxygen cylinder valve open, adjust the oxygen regulator to deliver a minimum of 20 PSIG (10kPa).**
- **With the fuel cylinder valve open, adjust the fuel regulator to deliver a minimum of 10 PSIG (70kPa).**
- **Close both the oxygen and fuel cylinder valves.**
- **Turn the adjusting screws counterclockwise to relieve regulator pressure.**
- **Observe the gauges on both regulators for a minimum of five minutes. If the gauge readings do not change, then the system is leak tight. If there is a leak, use an approved leak detection method to locate it.**

**(ii) If the pressure drops during the drop test, perform a leak test to identify all leaks.**

**(iii) Use industry approved oil free leak detection solution.**

**(iv) Perform a leak test on cylinder pressure relief and safety devices, valves and regulator connections after the cylinder valve is open and connected to the pressure reducing regulator.**

**(v) Remove from service any cylinder that leaks at the valve, safety device or fittings that cannot be stopped by closing the valve. Isolate the cylinder away from ignition sources.**

**NOTE: Remove leaking cylinders to a safe outside location whenever possible. A warning should be placed near cylinders with leaking fuse plugs or other leaking safety devices not to approach them with a lighted cigarette or other source of ignition.**

**(vi) Promptly notify the supplier of any leaking cylinder or trouble with any cylinder valve and follow their instructions.**

**(vii) Tag cylinders having leaking fuse plugs or other leaking safety devices.**

**(M) Keep the cylinder key used for opening stem type cylinder valves on the valve spindle.**

**(N) Allow each gas to flow through its respective hose for a few seconds to purge the hose of any mixture of gases:**

**(i) After connecting welding, cutting or heating apparatus to oxygen and fuel-gas cylinders.**

**(ii) When starting to reuse the apparatus after an interval of a half hour or more.**

**(j) When connecting cylinders you must not:**

**(A) Open cylinder valves (other than cracking oxygen) until a regulator has been attached.**

**(B) Stand or have any body part in front or behind the pressure reducing regulator when opening cylinder valves.**

**(C) Use a hammer or wrench to open hand wheel cylinder valves.**

**(k) When removing regulators from cylinders you must:**

**(A) Ensure that oxygen and fuel gas cylinder valves are closed.**

**(B) Visually check the low pressure delivery gauges and high pressure supply gauge to ensure there is no pressure remaining in the system.**

**(C) Use the appropriate wrench to disconnect the regulator.**

**(D) Place disconnected regulators, hoses, and torches where they will not come into contact with dust and oily or greasy substances.**

**(8) Use of Oxygen and Fuel Gas Cylinders**

**(a) When using cylinders you must:**

**(A) Secure from movement with valve end up.**

**(B) Perform a drop test as defined in (7)(i)(L)(i) at the beginning of each shift to verify no leaks exist.**

**(C) Close cylinder or manifold valves:**

**(i) Before moving cylinders.**

**(ii) At the end of the shift or when work is finished.**

**(iii) When cylinders are empty.**

**(D) Place cylinders far enough away from the actual welding or cutting operation to:**

**(i) Ensure sparks, hot slag, or flame will not reach them, or**

**(ii) Protect them with fire resistant shields.**

**(E) Keep cylinders away from radiators, piping systems, layout tables, etc., that may be used for grounding electric circuits such as for arc welding machines.**

**(F) Keep keys, handles or nonadjustable wrenches on valve stems of cylinders not having fixed hand wheel while these cylinders are in service.**

**(G) Keep one key or handle on valve stems for each in service manifold in multiple cylinder installations.**

**(H) Allow each gas to flow through its respective hose for a few seconds to purge the hose of any mixture of gases before using a torch assembly that has been shutdown for an interval of one half hour or more.**

**(I) Follow the apparatus manufacturer's operating sequence when lighting, adjusting, and extinguishing torch flames.**

**(J) Close the torch handle valves on oxygen and/or fuel gas when the welding and cutting equipment is unattended for only a few minutes.**

**Note: This does not apply to jeweler's torches or other torches similar in size when placed in proper holders.**

**(K) Completely shut down a torch system (refer to (8)(a)(C)) in the following order:**

**(i) Close and drain the oxygen system before the closing and draining of the fuel gas system.**

**(ii) Open the torch valves momentarily after closing the cylinder valves to release all gas pressure from the hoses and regulators; then close the torch valves.**

**(iii) Turn the regulator pressure adjusting screws counter clockwise to release all spring pressure.**

**(iv) Visually check the low pressure delivery gauge and high pressure supply gauge to ensure there is no pressure remaining in the system.**

**(b) When using cylinders you must not:**

**(A) Place a cylinder where it might become part of an electric circuit.**

**(B) Tap an electrode against a cylinder to strike an arc.**

**(C) Use a cylinder as a roller or support.**

**(D) Attempt to mix gases in a cylinder unless you are the gas supplier.**

**(E) Refill a cylinder unless you are the owner of the cylinder or a person authorized by the owner.**

**(F) Use a cylinder's contents for purposes other than those intended by the supplier.**

**(G) Tamper with safety devices on cylinders or valves.**

**(H) Drop or handle cylinders roughly.**

**(I) Put down a lighted torch unless the torch or torch assembly is placed in a holder and secured from unintended movement.**

**(J) Use the regulator adjusting screw as a shut-off mechanism.**

**(K) Place anything on top of any cylinder when in use which may damage the safety device or interfere with the quick closing of the valve.**

**(L) Take cylinders containing oxygen or acetylene or other fuel gas into confined spaces.**

**(9) Pressure Reducing Regulators**

**(a) When using pressure reducing regulators you must:**

**(A) Use them with cylinder and piping outlets to ensure suitable working pressure for fuel gas and oxygen-fuel gas applications.**

**(B) Use them for the gas and pressures for which they are intended.**

**(C) Ensure that regulator inlet connections are marked with an identifying Compressed Gas Association (CGA) number.**

**NOTE: The CGA numbers identify the cylinder valve and gas service for which an inlet connection is designed.**

**(D) Ensure that inlet connections of regulators intended for attachment to gas storage cylinders comply with the requirements of Compressed Gas Association (CGA) Pamphlet V-1 1994, 7<sup>th</sup> Edition, Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections and Compressed Gas Association (CGA) Pamphlet V-7 2009, 5<sup>th</sup> Edition, Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures.**

**(E) Ensure that regulators or parts of regulators, including gauges, are repaired only by skilled mechanics who have been properly instructed.**

**(F) Use oxygen regulators that are marked with "USE NO OIL."**

**(G) Use acetylene regulator with a delivery pressure gauge that graphically indicates the maximum 15 psig working pressure.**

**(H) Inspect regulator union nuts and connections to detect faulty seats before the regulators are attached to the cylinder valves.**

**(I) Fully turn the regulator pressure-adjusting screw counter clockwise before slowly opening the cylinder valve.**

**(J) Keep pressure-reducing regulators in good repair.**

**(K) Replace cracked, broken or otherwise defective parts (including gauge glasses).**

**(b) When using pressure reducing regulators you must not:**

**(A) Use the regulator adjusting screw as a "shut-off" mechanism.**



**(B) Use oxygen and/or fuel gases from cylinders, piping, or manifolds through torches or other devices equipped with shutoff valves without using a pressure reducing regulator.**

**(10) Hose and Hose Connections**

**(a) When using fuel gas and oxygen hoses you must:**

**(A) Use hoses that comply with the Compressed Gas Association (CGA) Pamphlet E-1 2009, 6<sup>th</sup> Edition, Standard for Rubber Welding Hose and Hose Connections for Gas Welding, Cutting, and Allied Processes and Association for Rubber Products Manufacturers (ARPM) Publication IP-7 2011, 10<sup>th</sup> Edition.**

**NOTE: This standard does not apply to liquefied petroleum gas hose covered under NFPA 58, Liquefied Petroleum Gas Code applicable to the propane industry.**

**(B) Use fuel gas and oxygen hoses that are easily distinguishable from each other.**

**NOTE: The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Use red for fuel gases, green for oxygen, and black for inert gas.**

**(C) Use “Grade T” hose for most fuel gases to include acetylene.**

**Note: Grade R or RM hose may only be used with acetylene. Do not use with any other fuel gas.**

**(D) Use oil free air or an oil free inert gas to test hoses.**

**(E) Keep hoses and couplings (connectors) free from oily or greasy substances.**

**(F) Visually inspect each hose for leaks, burns, worn places, bulges, cracks, crimps, multiple splices, cuts, oil and grease, damaged or worn fittings, and other defects rendering it unfit for service:**

**(i) At the beginning of each task, the portion of hose intended for use, or**

**(ii) At the end of each working shift, the portion of hose used before storing it on a cart or hose reel.**

**(G) Perform inspections on hoses and hose connections following any failed drop test to determine the cause of the failure.**

**(H) Test hose to twice the normal pressure it will be subjected to but in no case less than 300 psi. when it:**

**(i) Has been subject to flashback, or**

**(ii) Shows evidence of severe wear or damage.**

**(I) Repair or replace hoses that have defects rendering them unfit for service.**

**(J) Protect hoses from damage by physical hazards, hot objects, or kinking.**

**(K) Keep hoses, cables, and other equipment clear of passageways, ladders and stairs.**

**(L) Use manifold hose connections, including both ends of the supply hose that lead to the manifold, with hose that cannot be interchanged between fuel gas and oxygen manifolds and supply header connections. You must not use adapters to permit the interchange of hose.**

**(M) Cap manifold and header hose connections when not in use.**

**(N) Store gas hoses in ventilated boxes.**

**(b) When using fuel gas and oxygen hoses you must not:**

**(A) Route in such a manner that severely bends the hose at the hose coupling (connector).**

**(B) Pull or drag welding equipment with the hose assembly.**

**(C) Drag or rest hoses on materials that are not fully cooled.**

**(D) Drag hoses across potential puncture or abrading points.**

**(E) Handle oxygen hoses with oily hands or oily gloves.**

**(F) Tape together more than 4 inches out of 12 inches of parallel sections of oxygen and fuel gas hose.**

**(G) Use a single hose having more than one gas passage.**

**(H) Repair damaged hoses with tape.**

**(I) Use a defective hose.**

**(c) Hose connections must:**

**(A) Comply with Compressed Gas Association (CGA) Pamphlet E-1 2009, 6<sup>th</sup> Edition, Standard for Rubber Welding Hose and Hose Connections for Gas Welding, Cutting, and Allied Processes, (3) Connections.**

**(B) Clamp or securely fasten in a manner that will withstand twice the pressure to which they are normally subjected, and in no case less than a pressure of 300 psi, for one (1) minute, without leakage.**

**(C) Use oxygen and fuel gas connection fittings that are different in size and prevent the intermixing of connections, or**

**(D) Be marked in a manner to identify the oxygen and fuel gas hose.**

**(E) Use hose couplings that cannot be unlocked or disconnected by means of a straight pull without rotary motion.**

**(d) When using hose connections you must not use adaptors that permit the interchange of manifold hose connections.**

**(11) Torches used with Oxygen and Fuel Gas**

**(a) When using oxygen and fuel gas torches you must:**

**(A) Follow the manufacturer's recommendation for the use of torch handles with internal check valves and flashback arrestors.**

**(B) Keep torches free from oily or greasy substances.**

**(C) Clean clogged torch tip openings with suitable:**

**(i) Cleaning wires.**

**(ii) Drills.**

**(iii) Devices designed for such purposes.**

**(D) Inspect torches following any failed drop test to determine the cause of the failure prior to using. Check:**

**(i) Shut-off valves.**

**(ii) Hose couplings.**

**(iii) Tip connections.**

**(E) Only light torches with friction lighters, stationary pilot flames or other approved devices.**

**(b) You must not:**

**(A) Use defective torches.**

**(B) Light a torch:**

**(i) With matches.**

**(ii) From hot work.**

**(iii) With other hand held open flame.**

**(12) Manifolds with Oxygen and Fuel Gas**

**(a) When working with oxygen and fuel gas manifolds you must:**

**(A) Label each manifold with the name of the product they contain in letters at least 1-inch high:**

**(i) Use permanent signage, or**

**(ii) Use painted letters.**

**(B) Place oxygen and fuel gas manifolds in safe, well ventilated and accessible locations.**

**(C) Use manifolds that are either approved separately for each component part or as an approved assembled unit.**

**(D) Limit the total capacity of fuel-gas cylinders connected to one manifold inside a building. The total capacity must not exceed 300 pounds (135.9 kg) of liquefied petroleum gas or 3,000 cubic feet (m<sup>3</sup>) of other fuel-gas, except as provided for in paragraph (a)(F).**

**(E) Separate more than one manifold connected to cylinders located in the same room by:**

**(i) At least 50 feet, or**

**(ii) A noncombustible partition that:**

**(I) Extends at least 18 inches above the tallest container and is not less than 5 feet high.**

**(II) Extends laterally at least 18 inches beyond the sides of the containers.**

**(III) Has a fire-resistance rating of at least one-half hour.**

**(F) Locate fuel-gas cylinders connected to one manifold having an aggregate capacity exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel-gas:**

**(i) Outdoors, or**

**(ii) In a separate building or room constructed in accordance with the rules on acetylene generators (14)(d)(H)(i), (d)(H)(ii), and (d)(H)(iii) and (14)(d)(I)(i), (d)(I)(ii), and (d)(I)(iii).**

**(G) Ensure that separate manifold buildings or rooms used for storage of calcium carbide and cylinders containing fuel gases:**

**(i) Are well-ventilated.**

**(ii) Do not have open flames for heat or lighting.**

**(iii) Are in compliance with Storage (6)(f)(B) when cylinders exceed 2000 cubic feet or 300 pounds of liquefied petroleum gas.**

**(H) Use approved pressure regulating devices on high-pressure fuel-gas manifolds.**

**(I) Use manifold hose connections that are not interchangeable on all ends of the supply hose that leads to the manifold.**

**(J) Keep hose connections free of grease and oil.**

**(K) Cap manifold and header hose connections when not in use.**

**(b) When working with oxygen and fuel gas manifolds you must not:**

**(A) Locate oxygen and fuel gas manifolds in enclosed or confined spaces.**

**(B) Use adaptors that permit the interchange of manifold hose connections.**

**(C) Place anything on top of a manifold when in use which will:**

**(i) Damage the manifold**

**(ii) Interfere with the quick closing of the manifold valve(s).**

**(c) When using high-pressure oxygen manifolds (for use with cylinders having a Department of Transportation service pressure above 200 psig (1.36 MPa)) you must:**

**(A) Use manifolds that are either approved separately for each component part or approved as an assembled unit.**

**(B) Separate oxygen manifolds from fuel-gas cylinders or combustible materials (especially oil or grease) by a:**

**(i) Minimum distance of 20 feet, or**

**(ii) Noncombustible partition that complies with Compressed Gas Association (CGA) Pamphlet P-1 2008, 11<sup>th</sup> Edition, Safe Handling of Compressed Gases in Containers:**

**(I) Extends at least 18 inches above the tallest container and is not less than 5 feet high.**

**(II) Extends laterally at least 18 inches beyond the sides of the containers.**

**(III) Has a fire-resistance rating of at least one-half hour.**

**(C) Limit oxygen cylinders connected to one manifold to a total gas capacity of 6,000 cubic feet except as provided in paragraph (c)(E).**

**(D) Separate manifolds by:**

**(i) At least 50 feet, or**

**(ii) A noncombustible partition that complies with Compressed Gas Association (CGA) Pamphlet P-1 2008, 11<sup>th</sup> Edition, Safe Handling of Compressed Gases in Containers:**

**(I) Extends at least 18 inches above the tallest container and not less than 5 feet high.**

**(II) Extends laterally at least 18 inches beyond the sides of the containers.**

**(III) Has a fire-resistance rating of at least one-half hour.**

**(E) Locate an oxygen manifold inside a building having other occupancy, with an aggregate cylinder capacity of more than 6,000 cubic feet of oxygen, in a separate room that is:**

**(i) Of noncombustible construction having a fire-resistance rating of at least one-half hour, or**

**(ii) A noncombustible partition that complies with Compressed Gas Association (CGA) Pamphlet P-1 2008, 11<sup>th</sup> Edition, Safe Handling of Compressed Gases in Containers:**

**(I) Extends at least 18 inches above the tallest container and is not less than 5 feet high.**

**(II) Extends laterally at least 18 inches beyond the sides of the containers.**

**(III) Has a fire-resistance rating of at least one-half hour.**

**(F) Comply with NFPA 55, 2010 Edition, Compressed Gases and Cryogenic Fluid Code, when an oxygen manifold or oxygen bulk supply system has more than 20,000 cubic feet of oxygen (measured at 14.7 psia (101 kPa) and 70<sup>0</sup> F (21.1°C)), connected in service, ready for service, or unconnected reserves on hand at the site.**

**(G) Use approved pressure regulating devices on high-pressure oxygen manifolds.**

**(d) When using high pressure oxygen manifolds you must not locate them in an acetylene generator room.**

**(e) When using low-pressure oxygen manifolds with cylinders having a Department of Transportation service pressure not exceeding 200 psig (1.36 Mpa) you must:**

**(A) Use manifolds that:**

**(i) Are constructed for use with oxygen at a pressure of 250 psig.**

**(ii) Have a minimum bursting pressure of 1,000 psig.**

**(iii) Are protected by a safety relief device that will relieve at a maximum pressure of 500 psig.**

**NOTE: DOT-4L200 cylinders safety device relieve at a maximum pressure of 250 psig, or 235 psig if vacuum insulation is used.**

**(B) Use hose and hose connections subject to cylinder pressure that have a bursting pressure of 1,000 psig.**

**(C) Test and prove manifolds are gas-tight at a pressure of 300 psig.**

**(D) Use oil-free non-combustible fluid for testing oxygen manifolds.**

**(E) Locate manifolds to comply with paragraphs (c)(B), (C), (D), (E), and (F) and all their parts.**

**(F) Post the following sign at each manifold:**

**Low-Pressure Manifold**  
**Do Not Connect High-Pressure Cylinders**  
**Maximum Pressure – 250 psig**

**(f) When using portable outlet headers you must:**

**(A) Equip each outlet on the service piping from which oxygen or fuel-gas is withdrawn, to supply a portable outlet header, with a readily accessible shutoff valve.**

**(B) Use hose and hose connections that comply with paragraph (a)(l) of this section when connecting the portable outlet header to the service piping.**

**(C) Provide master shutoff valves for both oxygen and fuel-gas at the entry end of the portable outlet header.**

**(D) Provide a hydraulic back-pressure valve, installed at the inlet and preceding the service outlets, on portable fuel-gas service outlet headers unless one of the following is installed at each outlet and approved for use:**

**(i) Pressure-reducing regulator.**

**(ii) Back-flow check valve, or**

**(iii) Hydraulic back-pressure valve.**

**(E) Provide oxygen service header outlets with pressure reducing regulators or direct hose connections.**

**(F) Provide each valve assembly with a detachable outlet seal cap, chained or otherwise attached to the body of the valve on the portable header service outlet.**

**(G) Use materials and fabrication procedures for portable outlet headers that comply with the rule on Service Piping Systems paragraphs (13)(a)(A-L), (13)(b)(A-E), and (13)(f)(A-C).**

**(H) Provide frames for portable outlet headers that will:**

**(i) Secure the equipment in the correct operating position.**

**(ii) Protect them from damage during handling and operation.**

**(g) When using portable outlet headers you must not use them indoors except for temporary service when a direct supply outlet located on the service piping system cannot be accessed.**

**(h) To comply with manifold operation procedures you must:**

**(A) Ensure that cylinder manifolds are installed under the supervision of someone familiar with the proper practices with reference to their construction and use.**

**(B) Ensure all manifolds and parts used in methods of manifolding are used only for the gas or gases for which they are approved.**

**(C) Install approved flash arresters between each acetylene cylinder and the coupler block.**

**NOTE: For outdoor use only, and when the number of cylinders coupled does not exceed three, one flash arrester installed between the coupler block and regulator is acceptable.**

**(D) Install manifold acetylene and liquefied fuel-gas cylinders in a vertical position.**

**(E) Maintain approximately equal pressure in the gas cylinders connected to and discharged simultaneously through a common manifold.**

**(i) To comply with manifold operation procedures you must not connect more than 3,000 cubic feet of aggregate capacity of fuel-gas cylinders to a portable manifold inside a building.**

**(13) Service piping systems materials and designs**

**(a) Service piping systems must use:**

**(A) Piping and fittings that comply with section 2, Industrial Gas and Air Piping Systems, of the American National Standard Code for Power Piping ASME B31.1 2010.**

**(B) At least Schedule 40 pipe and use fittings that are at least standard weight in sizes up to and including 6-inch nominal.**

**(C) Copper tubing that is Type K or L and complies with the Standard Specification for Seamless Copper Water Tube, ASTM B88-66a.**

**(D) Steel, wrought iron, brass or copper pipe, or seamless copper, brass or stainless steel tubing, except when stated otherwise.**



**(E) Stainless steel or copper alloys for oxygen piping and fittings when pressures exceed 700 psi.**

**(F) Hose connections and hose to connect the outlet of a manifold pressure regulator to piping, provided that the working pressure of the piping is 250 psi or less and they comply with the rules for hose and hose connections found in paragraphs (10) (a)(A), (10) (a)(K), (10) (b)(G), (10)(c)(A), and (10)(c)(B).**

**(G) Hose(s) that do not exceed 5 feet in length to connect manifold pressure regulators to piping.**

**(H) Hose that has a minimum bursting pressure of 1,000 psig (6.8 MPa).**

**(I) A piping system with a minimum design pressure of 250 psig when oxygen is supplied from a low-pressure oxygen manifold without an intervening pressure regulating device.**

**(J) Pressure regulating devices at each station outlet when the connected equipment is for use at pressures less than 250 psig (1.7 MPa).**

**(K) Steel or wrought iron piping for acetylene or acetylenic compounds.**

**(L) Unalloyed copper for acetylene or acetylenic compounds only with equipment listed as appropriate for its use.**

**(b) Piping joints must be treated as follows. You must:**

**(A) Weld, thread or flange joints in steel or wrought iron piping.**

**NOTE: Fittings, such as ells, tees, couplings, and unions, may be rolled, forged or cast steel, malleable iron or nodular iron.**

**(B) Weld, braze, thread, or flange brass or copper pipe joints.**

**(C) Braze socket type joints with silver-brazing alloy or similar high melting point (not less than 800° F (427° C)) filler metal.**

**(D) Braze joints or use approved gas tubing fittings in seamless copper, brass, or stainless steel tubing.**

**(E) Prohibit the use of gray or white cast iron fittings on piping joints.**

**(c) When installing piping systems you must:**

**(A) Internally examine and remove scale and dirt from fittings and lengths of pipe before assembly.**

**(B) Wash out oxygen pipe and fittings with a suitable solution which will effectively remove grease and dirt but will not react with oxygen.**

**NOTE: Hot water solutions of caustic soda or trisodium phosphate are effective cleaning agents for this purpose. Rinse and dry piping thoroughly after cleaning.**

**(C) Install and maintain distribution lines in a safe operating condition.**

**(D) Run all piping as directly as practicable.**

**(E) Protect piping against physical damage.**

**(F) Make allowances for piping expansion, contraction, jarring and vibration.**

**(G) Locate pipe laid underground below the frost line.**

**(H) Protect against corrosion.**

**(I) Weld or braze piping that is installed in tunnels, trenches or ducts.**

**(J) Install shutoff valves outside of tunnels, trenches or ducts.**

**(K) Provide good natural or forced ventilation when oxygen piping is installed in the same tunnel, trench or duct with fuel-gas pipelines.**

**(L) Drain low points in piping that carries moist gas into drip pots, constructed to permit pumping or draining out the condensate, at necessary intervals.**

**(M) Install drain valves having outlets normally closed with screw caps or plugs for draining low points in piping systems.**

**(N) Case or jacket pipes leading to the surface of the ground where necessary to prevent loosening or breaking.**

**(O) Install gas cocks or valves for all buildings at points where they will be readily accessible for shutting off the gas supply to these buildings in an emergency.**

**(P) Install a shutoff valve in the discharge line from the generator, gas holder, manifold or other source of supply.**

**(Q) Thoroughly blow out assembled piping with air, nitrogen or carbon dioxide to remove foreign materials.**

**(R) Blowout oxygen piping using oil-free air, oil-free nitrogen, or oil-free carbon dioxide:**

**NOTE: Air or inert gas may be used with other piping.**

**(S) Purge oxygen lines, using oil-free air, oil-free nitrogen, or oil-free carbon dioxide.**

**(T) Use pressure relief devices set to function at not more than the design pressure of the systems and that discharge upwards to a safe location.**

**(d) When installing piping systems you must not:**

**(A) Install shutoff valves in safety relief lines in such a manner that the safety relief device can be rendered ineffective.**

**(B) Have uncapped openings of flammable gas lines or other parts of equipment being purged of air or gas near open lights or other sources of ignition.**

**(C) Use open end valves or petcocks except when drips are located outdoors, underground, and not readily accessible.**

**(D) Use valves outdoors, underground or in areas not readily accessible unless they are equipped with a means to secure them in the closed position.**

**(E) Weld or cut an acetylene or oxygen pipeline, including the attachment of hangers or supports, until the line has been purged.**

**(e) When painting and marking piping systems you must ensure that:**

**(A) Underground pipe and tubing and outdoor ferrous pipe and tubing is covered or painted with a suitable material for protection against corrosion.**

**(B) Aboveground piping systems are marked in accordance with the American National Standard Scheme for the Identification of Piping Systems, ASME A13.1 2007.**

**(C) Station outlets are marked with the name of the gas.**

**(f) When testing piping systems you must:**

**(A) Test and prove they are gas-tight at 1-1/2 times their maximum operating pressure.**

**(B) Thoroughly purge them of air before placing them in service.**

**(C) Use oil free and noncombustible material to test oxygen lines.**

**(g) When testing piping systems you must not:**

**(A) Use flames to detect leaks.**

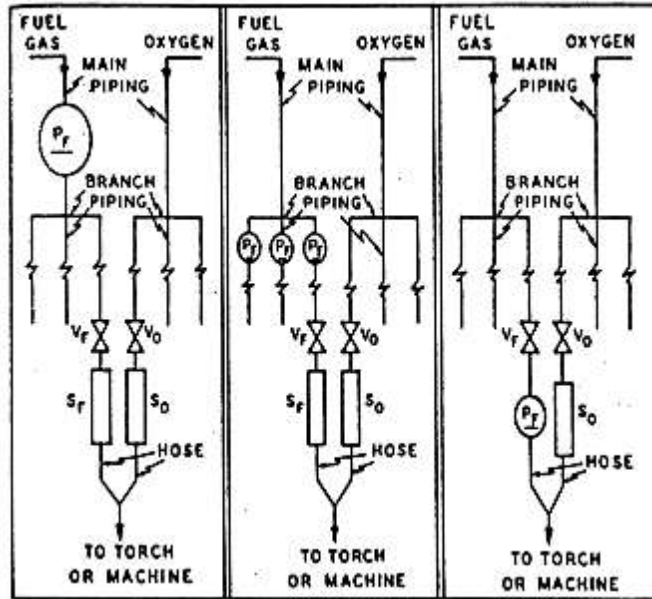
**(B) Purge flammable gas lines or other parts of equipment of air or gas when uncapped openings are near sources of ignition.**

**(h) When installing protective equipment, hose and regulators in service piping systems you must:**

**(A) Install and use equipment in the service for which it was approved and as recommended by the manufacturer.**

**(B) Install the protective equipment shown in Figures Q-1, Q-2, and Q-3 in portable outlet headers and fuel-gas and oxygen piping systems to prevent:**

**NOTE: When only a portion of a fuel-gas system is to be used with oxygen, only that portion need comply with paragraph (h)(A).**



**Fig. Q-1**

**Fig. Q-2**

**Fig. Q-3**

**LEGEND**

**PF — Protective equipment in fuel gas piping**

**SF — Backflow prevention device(s) at fuel gas station outlet**

**SO — Backflow prevention device(s) at oxygen**

**VF — Fuel gas station outlet valve**

**VO — Oxygen station outlet valve station outlet**

- (i) **Backflow of oxygen into the fuel-gas supply system.**
- (ii) **Passage of a flash back into the fuel-gas supply system.**
- (iii) **Excessive back pressure of oxygen in the fuel-gas supply system.**

**NOTE: The three functions of the protective equipment may be combined in one device or may be provided by separate devices.**

**(C) Locate protective equipment:**

- (i) **As in Figure Q-1 In the main supply line, Figure Q-1, or**
- (ii) **As in Figure Q-2 at the head of each branch line, or**
- (iii) **As in Figure Q-3 at each location where fuel-gas is withdrawn.**
- (iv) **As in Figure Q-2 or Figure Q-3 where branch lines are of 2 inch pipe size or larger or of substantial length.**

- (D) Install flash-back protection that will prevent flame from passing into the fuel-gas system.
- (E) Provide an approved back-pressure relief device set at a pressure not greater than the pressure rating of the backflow or the flashback protection device, whichever is lower.
- (F) Locate pressure-relief devices on the downstream side of backflow and flashback protection devices.
- (G) Install pressure-relief device vents that are at least as large as the relief device inlet.
- (H) Install pressure-relief vents without low points that may collect moisture.
- (I) Install drip pots with drains closed with screw plugs or caps at the low points if low points are unavoidable.
- (J) Install the vent end so it:
  - (i) Does not endanger personnel or property through gas discharge.
  - (ii) Is located away from ignition sources.
  - (iii) Terminates in a hood or bend.
- (K) Maintain liquid levels when using a liquid in the pipeline protective equipment.

NOTE: Suitable antifreeze may be used to prevent freezing.

- (L) Withdraw fuel-gas for use with equipment not requiring oxygen upstream of the piping protective devices.

(i) Station outlet protective equipment must:

- (A) Have a check valve, pressure regulator, hydraulic seal, or combination of these devices at each station outlet, including those on portable headers.
- (B) Have these devices as shown in Figures Q-1, Q-2, and Q-3 and designated as SF and SO.
- (C) Use approved pipeline protective equipment (designated PF) located at the station outlet as in Figure Q-3, or an additional check valve, pressure regulator, or hydraulic seal is required.
- (D) Have a shutoff valve (designated VF and VO) installed at each station outlet.
- (E) Have a shutoff valve located on the upstream side of other station outlet equipment.

- (F) Terminate the station outlet in a union connection that complies with the Compressed Gas Association (CGA) Pamphlet E-1 2009, 6<sup>th</sup> Edition, Standard for Rubber Welding Hose and Hose Connections for Gas Welding, Cutting, and Allied Processes and Compressed Gas Association (CGA) Pamphlet E-4 2010, 6<sup>th</sup> Edition, Standard for Gas Pressure Regulators if the outlet is equipped with a detachable regulator.
- (G) Terminate in a union connection complying with the Compressed Gas Association (CGA) Pamphlet E-1 2009, 6<sup>th</sup> Edition, Standard for Rubber Welding Hose and Hose Connections for Gas Welding, Cutting, and Allied Processes if it is connected directly to a hose.
- (H) Terminate in pipe threads to which permanent connections are to be made, such as to a machine.
- (I) Have station outlets equipped with a detachable outlet seal cap secured in place.
- (J) Use this cap to seal the outlet except when a hose, a regulator, or piping is attached.
- (K) Be equipped with station outlets with approved backflow and flash-back protective devices when four or less torches are supplied from one station outlet through rigid piping provided:
  - (i) Each outlet from this piping is equipped with a shutoff valve, and
  - (ii) The fuel-gas capacity of any one torch does not exceed 15 cubic feet (0.42m<sup>3</sup>) per hour.

**(14) Acetylene generators**

**(a) When using acetylene generators you must:**

**(A) Use those that are of approved construction.**

**(B) Ensure they are plainly marked with:**

**(i) Maximum weight and size of carbide necessary for a single charge.**

**(ii) Manufacturer's name and address.**

**(iii) Name or number of the type of generator.**

**(iv) Size of the carbide to be used on the generator nameplate.**

**(v) Rating and pressure limitations.**

**(C) Limit the total hourly output rate for which it is approved and marked. Unless specifically approved for higher ratings, carbide-feed generators must be rated at 1 cubic foot (0.028 m<sup>3</sup>) per hour per pound of carbide required for a single complete charge.**

**(D) Require regular operating of relief valves.**

**(E) Set relief valves to open at a pressure not in excess of 15 psig.**

**(F) Set hydraulic back pressure valves to open at a pressure not in excess of 20 psig.**

**(G) Locate the generator where the operator can maintain ample free, unobstructed operation and maintenance space around the generator to permit ready adjustment and charging.**

**(H) Ensure that all non-automatic generator water overflows are visible.**

**(I) Ensure that non-automatic generators are not used to generate acetylene at pressures exceeding 1 psig.**

**(b) When using stationary acetylene generators (automatic and non-automatic) you must:**

**(A) Place on a foundation where:**

**(i) The generator(s) is level.**

**(ii) No excessive strain will be placed on the generator or its connections.**

**(B) Ensure the generator(s) is grounded.**

**(C) Place generators where water will not freeze.**

**(D) Ensure there are no prohibited sources of ignition in outside generator houses or inside generator rooms unless the generators are prepared in accordance with paragraph (h)(H)(i) through (iv) of this section:**

**(E) Ensure that when a non-continuous connection to the water supply is used the supply line must terminate at a point not less than 2 inches above the regularly provided opening for filling so that the water can be observed as it enters the generator.**

**(F) Discharge generators through an open connection into a suitably vented outdoor receptacle or residue pit.**

**NOTE: An open connection for the sludge draw off is desirable to enable the generator operator to observe leakage of generator water from the drain valve or sludge cock.**

**(G) Provide a vent pipe for each generator.**

**(H) Rigidly install the escape or relief pipe:**

**(i) Without traps.**

**(ii) So condensation will drain back to the generator.**

**(I) Carry the full size escape or relief pipe to a suitable point outside the building.**

**(J) Terminate the escape or relief pipe in a hood or bend located at least 12 feet (3.7m) above the ground.**

**NOTE: It is preferable to terminate the escape or relief pipe above the roof, and as far away as practicable from windows or other openings into buildings and as far away as practicable from sources of ignition such as flues or chimneys and tracks used by locomotives.**

**(K) Route the generating chamber relief pipes separately to the outside so they are unobstructed by rain, snow, ice, insects, or birds.**

**(L) Locate the end of the relief pipes at least 3 feet (0.9 m) from combustible construction.**

**(M) Use gas holders constructed on the gasometer principle that has the bell suitably guided.**

**(N) Ensure the gas bell moves freely without tendency to bind and it has at least 2 inches (5 cm) clearance from the shell.**

**(O) Provide a compressor or booster cutoff at a point 12 inches (0.3 m) or more above the landing point of the bell.**

**(P) Ventilate the room in accordance with paragraph (d)(J) of this section when the gas holder is located indoors.**

**(Q) Heat and light the room in accordance with paragraphs (d)(K) and (d)(L), (M), (N), (O), and (P) of this section when the gas holder is located indoors.**

**(R) Protect gas holder seals against freezing when the gas holder is not located within a heated building.**

**(S) Provide means to stop the generator-feeding mechanism before the gas holder reaches the upper limit of its travel.**

**(T) Ensure that the gas capacity of the gas holder is not less than one-third of the hourly rating of the generator when the holder is connected to only one generator.**

**(U) Ensure if acetylene is used from the gas holder without increase in pressure at some points, but with increase in pressure by a compressor or booster pump at other points, then you must:**

**(i) Install approved piping protective devices in each supply line.**

**(ii) Locate a low-pressure protective device between the gas holder and the shop piping.**



(iii) Locate the medium-pressure protective device between the compressor or booster pump and the shop piping (see Figure 1).

NOTE 1: Approved protective equipment (designated P<sub>F</sub>) is used to prevent backflow of oxygen into the fuel-gas supply system, passage of a flashback into the fuel-gas supply system; and excessive back pressure of oxygen in the fuel-gas supply system.

NOTE 2: The three functions of the protective equipment may be combined in one device or may be provided by separate devices.

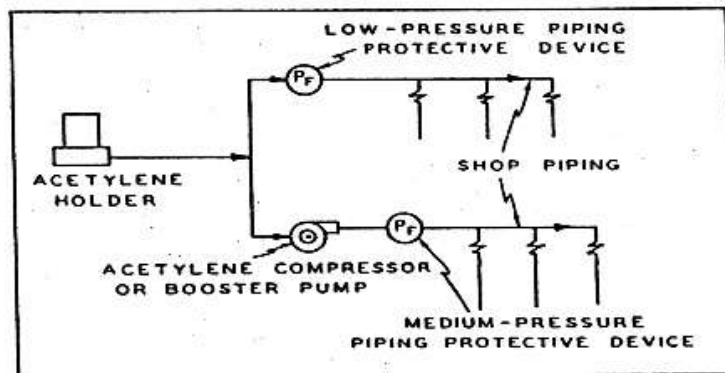
Figure 1

(V) Use approved compressor or booster systems only.

(W) Ensure that wiring and electrical equipment in compressor or booster pump rooms or enclosures conform to the provisions of Subdivision S, Electrical, Class I, Division 2.

(X) Locate compressors and booster pump equipment:

(i) In well-ventilated areas and



(ii) Away from ignition sources including, but not limited to, open flames, electrical or mechanical sparks.

(Y) Provide compressor or booster pumps with pressure relief valves which will relieve pressure exceeding 15 psig:

(i) To a safe outdoor location as provided in paragraph (b)(G), (H), (I), (J), (K), and (L) of this section, or

(ii) By returning the gas to the inlet side or to the gas supply source.

(Z) Provide compressor or booster pump discharge outlets with approved protective equipment. (See Service Piping Systems (h) and (i)).

**(c) When using stationary acetylene generators (automatic and non-automatic) you must not:**

**(A) Use common salt (sodium chloride) or other corrosive chemicals for protection against freezing.**

**(B) Supply water through a continuous connection to the generator unless the generator is provided with an:**

**(i) Adequate open overflow, or**

**(ii) Automatic water shutoff which will effectively prevent overfilling the generator.**

**(C) Fit generators with continuous drain connections leading to sewers unless otherwise specifically approved.**

**(D) Interconnect generating chamber relief pipes.**

**(d) When outside generator houses and inside generator rooms for stationary acetylene generators are used, you must.**

**(A) Ensure that the walls, floors, and roofs of outside generator houses are of noncombustible construction.**

**(B) Separate the storage or manifolding of oxygen cylinders from the generator or carbide storage section by partition walls continuous from floor to roof or ceiling, of the type of construction stated in paragraph (d)(H)(i) thru (iii) of this section.**

**(C) Ensure that separation walls are:**

**(i) Without openings.**

**(ii) Joined to the floor, other walls and ceiling or roof in a manner to create a permanent gastight joint.**

**(D) Locate exit doors so they are readily accessible in case of emergency.**

**(E) Provide explosion venting:**

**(i) For outside generator houses and inside generator rooms in exterior walls or roofs.**

**(ii) In areas equal to not less than 1 square foot (0.09 m<sup>2</sup>) per 50 cubic feet (1.4 m<sup>3</sup>) of room volume.**

**(iii) That consists of one or any combination of the following:**

**(I) Walls of light, noncombustible material preferably single-thickness,**

**(II) Single-strength glass;**

**(III) Lightly fastened hatch covers;**

**(IV) Lightly fastened swinging doors in exterior walls opening outward;**

**(V) Lightly fastened walls or roof designed to relieve at a maximum pressure of 25 pounds per square foot (0.001 MPa).**

**(F) Restrict the installation of acetylene generators inside buildings to buildings not exceeding one story in height.**

**NOTE: This does not prohibit such installation on the roof or top floor of a building exceeding such height.**

**(G) Enclose generators installed inside a building in a separate room.**

**(H) Ensure that the walls, partitions, floors, and ceilings of inside generator rooms:**

**(i) Are constructed from noncombustible materials having a fire-resistance rating of at least 1 hour floor to ceiling.**

**(ii) Are securely anchored.**

**(iii) Have at least one wall of the room be an exterior wall.**

**(I) Protect openings from an inside generator room to other parts of the building:**

**(i) By a swinging type, self-closing fire door for a Class B opening and having a rating of at least 1 hour.**

**(ii) With wired glass windows in partitions that are in approved metal frames with fixed sash.**

**(iii) By completing Installation in accordance with the Standard for the Installation of Fire Doors and Windows, NFPA 80-1970.**

**NOTE: Inside generator rooms built after July 1, 2014 must comply with NFPA 80-2013.**

**(J) Ventilate inside generator rooms or outside generator houses with vents located at floor and ceiling levels.**

**(K) Heat by steam, hot water, enclosed electrically heated elements or other indirect means.**

**(L) Ensure that generator houses or rooms have natural light during daylight hours.**

**(M) Restrict installation of electric lamps to fixed position where artificial lighting is necessary.**

**(N) Provide lamps with enclosures of glass or other noncombustible material so designed and constructed to prevent gas vapors from reaching the lamp or socket and to resist breakage.**

**(O) Use rigid conduit with threaded connections.**

**(P) Install lamps outside of wired-glass panels in gas-tight frames in the exterior walls or roof of the generator house or room.**

**(Q) Locate electric switches, telephones, and all other electrical apparatus which may cause a spark, outside the generator house or in a room or space separated from the generator room by a gas-tight partition, except:**

**(i) If they are specifically approved for use inside acetylene generator room.**

**(ii) Where the generator system is designed so that no carbide fill opening or other part of the generator is open to the generator house or room during the operation of the generator, and**

**(iii) When residue is carried in closed piping from the residue discharge valve to a point outside the generator house or room, and**

**(iv) Where electrical equipment in the generator house or room must conform to the provisions of Subpart S for Class I, Division 2 locations.**

**(R) Ensure that unauthorized persons do not enter outside generator houses or inside generator rooms.**

**(e) When outside generator houses and inside generator rooms for stationary acetylene generators are used, you must not:**

**(A) Locate openings in any outside generator house within 5 feet (1.5m) of any opening in another building.**

**(B) Use flames or fire to heat outside generator houses or inside generator rooms, or in any enclosure communicating with them.**

**(f) When using portable acetylene generators you must:**

**(A) Use those that are approved for portable use.**

**(B) Use them further than 10 feet (3m) from combustible materials other than the floor.**

**(C) Protect them against freezing.**

**(D) Clean and recharge them and blow off the air mixture outside of buildings.**

**(E) Anchor them to the vehicles they are to be transported and used on.**

**(F) Turn off the vehicle motor during charging, cleaning, and generating processes.**

**(G) Locate portable generators at a safe distance from the welding position so they will not be exposed to sparks, slag, and misdirection of the torch flame or over heating from hot materials or processes.**

**(g) When using portable acetylene generators you must not:**

**(A) Use them in rooms with:**

**(i) A total volume less than the total gas-generating capacity per charge of all generators in the room (to obtain the gas-generating capacity in cubic feet per charge, multiply the pounds of carbide per charge by 4.5).**

**(ii) A ceiling height less than 10 feet (3 m).**

**(B) Use salt or other corrosive chemical to prevent freezing.**

**(C) Move those charged with carbide by crane or derrick.**

**(D) Store those not in use in rooms where open flames are used unless the:**

**(i) Generator contains no carbide.**

**(ii) Generator has been thoroughly purged of acetylene.**

**(iii) Rooms are well ventilated.**

**(h) When providing maintenance and operating acetylene generators you must:**

**(A) Post operating instructions in a conspicuous place near the generator or keep those in a suitable place available for ready reference.**

**(B) Follow the order of operations specified in the manufacturer instructions when recharging generators.**

**(C) Flush out batch-type generators with water:**

**(i) When the charge of carbide is exhausted.**

**(ii) Before additional carbide is added to the generating chamber, and**

**(D) Renew the water supply according to instruction card furnished by the manufacturer.**

**(E) Add enough carbide each time the generator is recharged to refill the space provided for carbide without ramming the charge.**

**(F) Keep the generator water chambers filled to the proper level at all times except while draining during the recharging operation.**

**(G) Fill the water chamber to the proper level whenever:**

(i) Repairs are to be made.

(ii) The generator is to be charged.

(iii) Carbide is to be removed.

(H) Do the following before making repairs involving welding, soldering, or other hot work or other operations which produce a source of ignition:

(i) Completely remove the carbide charge and feed mechanism.

(ii) Expel all acetylene by completely flooding the generator shell with water.

(iii) Disconnect the generator from the piping system.

(iv) Keep the generator filled with water, if possible, or positioned to hold as much water as possible.

(i) When maintaining or operating acetylene generators you must not:

(A) Discharge water-carbide residue from the generator:

(i) Into sewer pipes, or

(ii) Store in areas near open flames.

NOTE: Clear water from residue settling pits may be discharged into sewer pipes.

(B) Use steel or ferrous tools while distributing the charge.

(C) Make hot repairs in a room where there are other generators unless all the generators and piping have been purged of acetylene.

(15) Storing of calcium carbide

(a) Packaging of calcium carbide must:

(A) Be in containers that are:

(i) Constructed from metal having sufficient strength to prevent rupture.

(ii) Equipped with a screw top or equivalent.

(iii) Constructed to be water-and-air-tight.

(iv) Soldered in a manner that the package will not fail if exposed to fire.

(B) Ensure that the packages are conspicuously marked "Calcium Carbide – Dangerous If Not Kept Dry" or with equivalent warning.

**(C) Make known this caution: “Metal tools, even the so-called spark resistant type may cause ignition of an acetylene and air mixture when opening carbide containers”.**

**(b) When storing calcium carbide indoors you must:**

**(A) Store in dry, waterproof, well-ventilated locations when quantities of 600 pounds or less are being stored.**

**(B) Keep packages of calcium carbide sealed, except one of each size may be open.**

**(C) Store calcium carbide exceeding 600 pounds (272.2 kg) but not exceeding 5,000 pounds (2,268 kg):**

**(i) In accordance with paragraph (b)(D)(i), (ii), (I) through (III) of this section;**

**(ii) In an inside generator room or outside generator house; or**

**(iii) In a separate room in a one-story building which may contain other occupancies, but without cellar or basement beneath the carbide storage section. Such rooms must be constructed in accordance with paragraphs (d)(H)(i) through (iii) and (d)(I)(i) and (ii) of this section and ventilated in accordance with paragraph (d)(J) of this section. These rooms must be used for no other purpose.**

**(D) Store calcium carbide in excess of 5,000 pounds (2,268 kg) in:**

**(i) An outside generator houses, or**

**(ii) A one story building without cellar or basement and used for no other purpose:**

**(I) If the storage building is of noncombustible construction, it may adjoin other one-story buildings if they are separated by unpierced firewalls.**

**(II) If the storage building is detached and less than 10 feet (3 m) from a building or buildings, there must not be an opening in any of the mutually exposing sides of such buildings within 10 feet (3 m).**

**(III) If the storage building is of combustible construction, it must be at least 30 feet (9.1 m) from any other building exceeding two stories.**

**(c) When storing calcium carbide indoors you must not:**

**(A) Store more than 600 pounds of calcium carbide in the same room with fuel-gas cylinders.**

**(B) Break the seals when there is carbide in excess of 1 pound (0.5 kg) in any other unsealed package of the same size of carbide in the room.**

**(C) Store in rooms with sprinkler systems.**

**(d) When storing calcium carbide outdoors you must:**

**(A) Examine carbide containers to make sure they are in good condition.**

**(B) Place the bottom tier of each row on wooden planking or equivalent so containers will not contact the ground or ground water.**

**(C) Periodically re-examine carbide containers for rusting or other damage that might affect its water or air tightness.**

**(D) Ensure the carbide containers that are stored the longest are used first.**

**(E) Only store in unopened air and water tight metal containers.**

**(F) Store only those containers that are unopened.**

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

**Stats. Implemented: ORS 654.001 to 654.295.**

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

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## DIVISION 3, CONSTRUCTION

437-003-0001

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, in the Federal Register:

(1) Subdivision A – GENERAL

(a) 29 CFR 1926.1 Purpose and Scope, published 4/6/79, FR vol. 44, p. 20940.

(b) 29 CFR 1926.2 Variances from safety and health standards, published 4/6/79, FR vol. 44, p. 20940.

(c) 29 CFR 1926.3 Inspections – right of entry, published 4/6/79, FR vol. 44, p. 20940.

(d) 29 CFR 1926.4 Rules of practice for administrative adjudications for enforcement of safety and health standards, published 4/6/79, FR vol. 44, p. 20940.

(e) 29 CFR 1926.6 Incorporation by reference, published 6/13/13, FR vol. 78, no. 114, p. 35559; 11/6/13, FR vol. 78, no. 215, p. 66641.

(2) Subdivision B – GENERAL INTERPRETATIONS

(a) 29 CFR 1926.10 Scope of subpart, published 4/6/79, FR vol. 44, p. 20940.

(b) 29 CFR 1926.11 Coverage under section 103 of the act distinguished, published 4/6/79, FR vol. 44, p. 20940.

(c) 29 CFR 1926.12 Reorganization plan No. 14 of 1950, published 4/6/79, FR vol. 44, p. 20940.

(d) 29 CFR 1926.13 Interpretation of statutory terms, published 4/6/79, FR vol. 44, p. 20940.

(e) 29 CFR 1926.14 Federal contracts for 'mixed' types of performance, published 4/6/79, FR vol. 44, p. 20940.

(f) 29 CFR 1926.15 Relationship to the service contract act; Walsh-Healey Public Contracts Act, published 4/6/79, FR vol. 44, p. 20940.

(g) 29 CFR 1926.16 Rules of construction, published 4/6/79, FR vol. 44, p. 20940.

(3) Subdivision C – GENERAL SAFETY AND HEALTH PROVISIONS

(a) 29 CFR 1926.20 General safety and health provisions, published 12/12/08, FR vol. 73, no. 240, pp. 75568-75589.

(b) 29 CFR 1926.21 Safety training and education, published 4/6/79, FR vol. 44, p. 20940; amended with Oregon OSHA AO 6-2012, repealed (b)(6), f. 9/28/12, ef. 4/1/13.

(c) 29 CFR 1926.22 Recording and reporting of injuries (Reserved)

(d) 29 CFR 1926.23 First aid and medical attention, published 4/6/79, FR vol. 44, p. 20940.

(e) 29 CFR 1926.24 Fire protection and prevention, published 4/6/79, FR vol. 44, p. 20940.

(f) 29 CFR 1926.25 Housekeeping, published 4/6/79, FR vol. 44, p. 20940.

(g) 29 CFR 1926.26 Illumination, published 4/6/79, FR vol. 44, p. 20940.

(h) 29 CFR 1926.27 Sanitation, published 4/6/79, FR vol. 44, p. 20940.

(i) 29 CFR 1926.28 Personal protective equipment. REPEALED with Oregon OSHA Admin. Order 2-2013, filed 2/15/13, effective 4/1/13. In Oregon, OAR 437-003-0134 applies.

(j) 29 CFR 1926.29 Acceptable certifications, published 4/6/79, FR vol. 44, p. 20940.

(k) 29 CFR 1926.30 Shipbuilding and ship repairing, published 3/7/96, FR vol. 61, no. 46, p. 9249.

(l) 29 CFR 1926.31 (Reserved).

(m) 29 CFR 1926.32 Definitions, published 6/30/93, FR vol. 58, no. 124, p. 35078.

(n) 29 CFR 1926.33 Access to employee exposure and medical records, published 6/20/96, FR vol. 61, no. 46, p. 31427.

(o) 29 CFR 1926.34 Means of egress, published 6/30/93, Federal Register, vol. 58, no. 124, p. 35083.

(4) Subdivision D – OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROLS

- (a) 29 CFR 1926.50 Medical services and first aid, published 6/18/98, FR vol. 63, no. 117, p. 33469.
- (b) 29 CFR 1926.51 Sanitation, published 6/30/93, FR vol. 58, no. 124, p. 35084.
- (c) 29 CFR 1926.52 Occupational noise exposure, published 4/6/79, FR vol. 44, p. 20940.
- (d) 29 CFR 1926.53 Ionizing radiation, published 4/6/79, FR vol. 44, p. 20940.
- (e) 29 CFR 1926.54 Nonionizing radiation, published 4/6/79, FR vol. 44, p. 20940.
- (f) 29 CFR 1926.55 Gases, vapors, fumes, dusts, and mists, published 1/10/97, FR vol. 62, no. 7, p. 1619.
- (g) 29 CFR 1926.56 Illumination, published 4/6/79, FR vol. 44, p. 20940.
- (h) 29 CFR 1926.57 Ventilation, published 1/8/98, FR vol. 63, no. 5, p. 1295.
- (i) 29 CFR 1926.58 Reserved, §1926.58, Asbestos, tremolite, anthophyllite and actinolite is redesignated as §1926.1101, Asbestos, and §1926.58 is reserved (8/10/94, FR vol. 59, no. 153, pp. 41131-62).
- (j) 29 CFR 1926.59 Hazard Communication, published 6/20/96, FR vol. 61, p. 31427.
- (k) 29 CFR 1926.60 Methylenedianiline (MDA), published 12/12/08, FR vol. 73, no. 240, pp. 75568-75589.
- (l) 29 CFR 1926.61 Retention of DOT markings, placards and labels, published 6/20/96, FR vol. 61, p. 31427.
- (m) 29 CFR 1926.62 Lead, published 12/12/08, FR vol. 73, no. 240, pp. 75568-75589.  
NOTE: Cadmium has been redesignated as §1926.1127.
- (n) 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response  
NOTE: Division 2/H, 1910.120, Hazardous Waste Operations and Emergency Response, applies to Construction.

(5) Subdivision E – PERSONAL PROTECTIVE AND LIFE SAVING EQUIPMENT

- (a) 29 CFR 1926.95 Criteria for personal protective equipment. REPEALED with Oregon OSHA Admin. Order 2-2013, filed 2/15/13, effective 4/1/13. In Oregon, OAR 437-003-0134 applies.
- (b) 29 CFR 1926.100 Head protection. REPEALED with Oregon OSHA Admin. Order 2-2013, filed 2/15/13, effective 4/1/13. In Oregon, OAR 437-003-0134 applies.
- (c) 29 CFR 1926.101 Hearing protection. REPEALED with Oregon OSHA Admin. Order 2-2013, filed 2/15/13, effective 4/1/13. In Oregon, OAR 437-003-0134 applies.
- (d) 29 CFR 1926.102 Eye and face protection. REPEALED with Oregon OSHA Admin. Order 2-2013, filed 2/15/13, effective 4/1/13. In Oregon, OAR 437-003-0134 applies.
- (e) 29 CFR 1926.103 Respiratory protection, published 1/8/98, FR vol. 63, no. 5, p. 1297.  
NOTE: 29 CFR 1926.104 Removed, 8/9/94, FR vol. 59, no. 152, p. 40729.
- (f) 29 CFR 1926.105 Reserved, 8/9/94, FR vol. 59, no. 152, p. 40729.
- (g) 29 CFR 1926.106 Working over or near water, published 4/6/79, FR vol. 44, p. 20940.
- (h) 29 CFR 1926.107 Definitions applicable to this subpart, published 8/9/94, FR vol. 59, no. 152, p. 40729.

(6) Subdivision F – FIRE PROTECTION AND PREVENTION

- (a) 29 CFR 1926.150 Fire protection, published 4/6/79, FR vol. 44, p. 20940.
- (b) 29 CFR 1926.151 Fire prevention, published 7/11/86, FR vol. 51, p. 25318.
- (c) 29 CFR 1926.152 Flammable and combustible liquids, published 6/30/93, FR vol. 58, no. 124, p. 35162.
- (d) 29 CFR 1926.153 Liquefied petroleum gas (LP-Gas), published 6/30/93, FR vol. 58, no. 124, p. 35170.
- (e) 29 CFR 1926.154 Temporary heating devices, published 4/6/79, FR vol. 44, p. 20940.
- (f) 29 CFR 1926.155 Definitions applicable to this subpart, published 4/6/79, FR vol. 44, p. 20940.

(7) Subdivision G – SIGNS, SIGNALS, AND BARRICADES

- (a) 29 CFR 1926.200 Accident prevention signs and tags, published 6/13/13, FR vol. 78, no. 114, p. 35559; 11/6/13, FR vol. 78, no. 215, p. 66641.
- (b) 29 CFR 1926.201 Signaling, REPEALED with OR-OSHA Admin. Order 2-2003, f. 1/30/03, ef. 1/30/03.
- (c) 29 CFR 1926.202 Barricades, REPEALED with OR-OSHA Admin. Order 2-2003, f. 1/30/03, ef. 1/30/03.
- (d) 29 CFR 1926.203 Definitions applicable to this subpart, published 4/6/79, FR vol. 44, p. 20940; amended with OR-OSHA Admin. Order 2-2003, f. 1/30/03, ef. 1/30/03.
- (8) Subdivision H – MATERIALS HANDLING, STORAGE, USE AND DISPOSAL
  - (a) 29 CFR 1926.250 General requirements for storage, published 6/30/93, FR vol. 58, no. 124, p. 35173.
  - (b) 29 CFR 1926.251 Rigging equipment for material handling, published 6/30/93, FR vol. 58, no. 124, p. 35173.
  - (c) 29 CFR 1926.252 Disposal of waste materials, published 4/6/79, FR vol. 44, p. 20940.
- (9) Subdivision I – TOOLS – HAND AND POWER
  - (a) 29 CFR 1926.300 General requirements, published 3/7/96, FR vol. 61, no. 46, p. 9250.
  - (b) 29 CFR 1926.301 Hand tools, published 4/6/79, FR vol. 44, p. 20940.
  - (c) 29 CFR 1926.302 Power operated hand tools, published 6/30/93, FR vol. 58, no. 124, p. 35175.
  - (d) 29 CFR 1926.303 Abrasive wheels and tools, published 6/30/93, FR vol. 58, no. 124, p. 35175.
  - (e) 29 CFR 1926.304 Woodworking tools, published 3/7/96, FR vol. 61, no. 46, p. 9251.
  - (f) 29 CFR 1926.305 Jacks - lever and ratchet, screw, and hydraulic, published Federal Register vol. 58, no. 124, p. 35176.
- (10) Subdivision J – WELDING AND CUTTING
  - (a) 29 CFR 1926.350 Gas welding and cutting, ~~published 6/30/93, FR vol. 58, no. 124, p. 35179~~. **Repealed. Oregon OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15. In Oregon, OAR 437-002-2253 applies.**
  - (b) 29 CFR 1926.351 Arc welding and cutting, published 7/11/86, FR vol. 51, p. 25318.
  - (c) 29 CFR 1926.352 Fire prevention, published 4/6/79, FR vol. 44, p. 20940.
  - (d) 29 CFR 1926.353 Ventilation and protection in welding, cutting, and heating, published 6/30/93, FR vol. 58, no. 124, p. 35179.
  - (e) 29 CFR 1926.354 Welding, cutting, and heating in way of preservative coatings, published 4/6/79, FR vol. 44, p. 20940.
- (11) Subdivision K – ELECTRICAL
  - (a) 29 CFR 1926.400 Introduction, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
  - (b) 29 CFR 1926.401 (Reserved)
  - (c) 29 CFR 1926.402 Applicability, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
  - (d) 29 CFR 1926.403 General requirements, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
  - (e) 29 CFR 1926.404 Wiring design and protection, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335; amended with AO 5-2002, repeal (b)(1), f. 6/28/02, ef. 10/1/03.
  - (f) 29 CFR 1926.405 Wiring methods, components, and equipment for general use, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
  - (g) 29 CFR 1926.406 Specific purpose equipment and installations, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
  - (h) 29 CFR 1926.407 Hazardous (classified) locations, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
  - (i) 29 CFR 1926.408 Special systems, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
  - (j) 29 CFR 1926.409 (Reserved)
  - (k) 29 CFR 1926.415 (Reserved)

- (l) 29 CFR 1926.416 General requirements, published 8/12/96, FR vol. 61, no. 156, p. 41738.
- (m) 29 CFR 1926.417 Lockout and tagging of circuits, published 8/12/96, FR vol. 61, no. 156, p. 41739.
- (n) 29 CFR 1926.418 (Reserved)
- (o) 29 CFR 1926.430 (Reserved)
- (p) 29 CFR 1926.431 Maintenance of equipment, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
- (q) 29 CFR 1926.432 Environmental deterioration of equipment, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
- (r) 29 CFR 1926.433 - 29 CFR 1926.440 (Reserved)
- (s) 29 CFR 1926.441 Battery locations and battery charging, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
- (t) 29 CFR 1926.442 - 29 CFR 1926.448 (Reserved)
- (u) 29 CFR 1926.449 Definitions applicable to this subpart, published 7/11/86, FR vol. 51, no. 133, pp. 25294-25335.
- (12) Subdivision L – SCAFFOLDING
  - (a) 29 CFR 1926.450 Scope, application and definitions applicable to this subpart, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
  - (b) 29 CFR 1926.451 General requirements, published 11/25/96, FR vol. 61, no. 228, p. 59831.
  - (c) 29 CFR 1926.452 Additional requirements applicable to specific types of scaffolds, published 8/30/96, FR vol. 61, no. 170, p. 46113.
  - (d) 29 CFR 1926.453 Aerial lifts, published 11/25/96, FR vol. 61, no. 228, p. 59832.
  - (e) 29 CFR 1926.454 Training, published 8/30/96, FR vol. 61, no. 170, p. 46117.
  - (f) Appendix A to Subpart L Scaffold Specifications, published 8/30/96, FR vol. 61, no. 170, p. 46117.
  - (g) Appendix B to Subpart L Criteria for determining the feasibility of providing safe access and fall protection for scaffold erectors and dismantlers (Reserved), published 8/30/96, FR vol. 61, no. 170, p. 46122.
  - (h) Appendix C to Subpart L List of National Consensus Standards, published 8/30/96, FR vol. 61, no. 170, p. 46122.
  - (i) Appendix D to Subpart L List of training topics for scaffold erectors and dismantlers, published 8/30/96, FR vol. 61, no. 170, p. 46122.
  - (j) Appendix E to Subpart L Drawing and illustrations, published 11/25/96, FR vol. 61, no. 228, p. 59832.
- (13) Subdivision M – FALL PROTECTION
  - (a) 29 CFR 1926.500 Scope, application, and definitions applicable to this subpart, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
  - (b) 29 CFR 1926.501 Duty to have fall protection, published 8/9/94, FR vol. 59, no. 152, p. 40732-40733; amended with AO 6-2002, f. and ef. 7/19/02.
  - (c) 29 CFR 1926.502 Fall protection systems criteria and practices, published 8/9/94, FR vol. 59, no. 152, p. 40733-40738; amended with AO 6-2002, f. and ef. 7/19/02.
  - (d) 29 CFR 1926.503 Training requirements. REPEALED with AO 6-2002, f. and ef. 7/19/02, replaced with OI.
  - (e) Appendix A to Subpart M Determining Roof Widths, published 8/9/94, FR vol. 59, no. 152, p. 40738-40742.
  - (f) Appendix B to Subpart M Guardrail Systems, published 8/9/94, FR vol. 59, no. 152, p. 40743.
  - (g) Appendix C to Subpart M Personal Fall Arrest Systems, published 8/9/94, FR vol. 59, no. 152, p. 40743-40746.
  - (h) Appendix D to Subpart M Positioning Device Systems, published 8/9/94, FR vol. 59, no. 152, p. 40746.
- (14) Subdivision N – HELICOPTERS, HOISTS, ELEVATORS, AND CONVEYORS

- (a) 29 CFR 1926.550 (Reserved).
- (b) 29 CFR 1926.551 Helicopters, published 4/6/79, FR vol. 44, p. 20940.
- (c) 29 CFR 1926.552 Material hoists, personnel hoists, and elevators, published 4/6/79, FR vol. 44, p. 20940.
- (d) 29 CFR 1926.553 Base-mounted drum hoist, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (e) 29 CFR 1926.554 Overhead hoists, published 4/6/79, FR vol. 44, p. 20940.
- (f) 29 CFR 1926.555 Conveyors, published 4/6/79, FR vol. 44, p. 20940.
- (15) Subdivision O – MOTOR VEHICLES, MECHANIZED EQUIPMENT, AND MARINE OPERATIONS
  - (a) 29 CFR 1926.600 Equipment, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
  - (b) 29 CFR 1926.601 Motor vehicles, REPEALED by OR-OSHA Admin. Order 6-2007, f. 9/26/07, ef. 9/26/07.
  - (c) 29 CFR 1926.602 Material handling equipment, published 12/1/98, FR vol. 63, no. 230, p. 66274; amended by AO 7-2003, f. 12/5/03, ef. 12/5/03.
  - (d) 29 CFR 1926.603 Pile driving equipment, published 4/6/79, FR vol. 44, p. 20940.
  - (e) 29 CFR 1926.604 Site clearing, published 7/22/77, FR vol. 42, p. 37674.
  - (f) 29 CFR 1926.605 Marine operations and equipment, published 4/6/79, FR vol. 44, p. 20940.
  - (g) 29 CFR 1926.606 Definitions applicable to this subpart, published 4/6/79, FR vol. 44, p. 20940.
- (16) Subdivision P – EXCAVATIONS
  - (a) 29 CFR 1926.650 Scope, application, and definitions applicable to this subdivision, published 10/31/89, FR vol. 54, no. 209, pp. 45959-45961.
  - (b) 29 CFR 1926.651 General requirements, published 8/9/94, FR vol. 59, no. 152, p. 40730.
  - (c) 29 CFR 1926.652 Requirements for protective systems, published 10/31/89, FR vol. 54, no. 209, pp. 45961-45962.
  - (d) Appendices A-F to Subdivision P, Excavations, published 10/31/89, FR vol. 54, no. 209, pp. 45962-45991.
- (17) Subdivision Q – CONCRETE AND MASONRY CONSTRUCTION
  - (a) 29 CFR 1926.700 Scope, application and definitions applicable to this subpart, published 10/18/90, FR vol. 55, no. 202, p. 42326.
  - (b) 29 CFR 1926.701 General requirements, published 8/9/94, FR vol. 59, no. 152, p. 40730.
  - (c) 29 CFR 1926.702 Requirements for equipment and tools, published 6/16/88, FR vol. 53, p. 22612.
  - (d) 29 CFR 1926.703 Requirements for cast-in-place concrete, published 6/16/88, FR vol. 53, p. 22612.
  - (e) 29 CFR 1926.704 Requirements for precast concrete, published 10/5/89, FR vol. 54, no. 192, p. 41088.
  - (f) 29 CFR 1926.705 Requirements for lift-slab construction operations, published 10/18/90, FR vol. 55, no. 202, p. 42326.
  - (g) Appendix A to 1926.705 Lift-slab operations, published 10/18/90, FR vol. 55, no. 202, p. 42326.
  - (h) 29 CFR 1926.706 Requirements for masonry construction, published 6/16/88, FR vol. 53, p. 22612; amended with OR-OSHA Admin. Order 1-2003, f. 1/30/03, ef. 4/30/03.
- (18) Subdivision R – STEEL ERECTION
  - (a) 29 CFR 1926.750 Scope, published 7/17/01, FR vol. 66, no. 137, p. 37137.
  - (b) 29 CFR 1926.751 Definitions, published 7/17/01, FR vol. 66, no. 137, p. 37137; amended with AO 6-2002, f. and ef. 7/19/02; amended with AO 8-2003, f. 12/30/03, ef. 1/1/04.
  - (c) 29 CFR 1926.752 Site layout, site-specific erection plan and construction sequence, published 7/17/01, FR vol. 66, no. 137, p. 37137.

- (d) 29 CFR 1926.753 Hoisting and rigging, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (e) 29 CFR 1926.754 Structural steel assembly, published 4/3/06, FR vol. 71, no. 63, p. 16669.
- (f) 29 CFR 1926.755 Column anchorage, published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (g) 29 CFR 1926.756 Beams and columns, published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (h) 29 CFR 1926.757 Open web steel joists, published 7/17/01, FR vol. 66, no. 137, p. 37137; amended with AO 8-2003, f. 12/30/03, ef. 1/1/04.
- (i) 29 CFR 1926.758 Systems-engineered metal buildings, published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (j) 29 CFR 1926.759 Falling object protection, published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (k) 29 CFR 1926.760 Fall protection, published 7/17/01, FR vol. 66, no. 137, p. 37137; amended with AO 8-2003, f. 12/30/03, ef. 1/1/04.
- (l) 29 CFR 1926.761 Training, published 12/12/08, FR vol. 73, no. 240, pp. 75568-75589.
- (m) Appendix A to Subpart R Guidelines for establishing the components of a site-specific erection plan: Nonmandatory Guidelines for Complying with §1926.752(e), published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (n) Appendix B to Subpart R Reserved.
- (o) Appendix C to Subpart R Illustrations of bridging terminus points: Nonmandatory Guidelines for Complying with §1926.757(a)(10) and §1926.757(c)(5), published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (p) Appendix D to Subpart R Illustration of the use of control lines to demarcate controlled decking zones (CDZs): Nonmandatory Guidelines for Complying with §1926.760(c)(3), REPEALED with AO 6-2002, f. and ef. 7/19/02; amended with AO 8-2003, f. 12/30/03, ef. 1/1/04.
- (q) Appendix E to Subpart R Training: Nonmandatory Guidelines for Complying with §1926.761, published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (r) Appendix F to Subpart R Perimeter columns: Nonmandatory Guidelines for Complying with §1926.756(e) to Protect the Unprotected Side or Edge of a Walking/Working Surface, published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (s) Appendix G to Subpart R Fall protection systems criteria and practices from §1926.502: Nonmandatory Guidelines for Complying with §1926.760(d), REPEALED with AO 6-2002, f. and ef. 7/19/02; amended with AO 8-2003, f. 12/30/03, ef. 1/1/04.
- (t) Appendix H to Subpart R Double connections: Illustration of a clipped end connection and a staggered connection: Non-Mandatory Guidelines for Complying with §1926.756(c)(1), published 7/17/01, FR vol. 66, no. 137, p. 37137.
- (19) Subdivision S – UNDERGROUND CONSTRUCTION, CAISSONS, COFFERDAMS, AND COMPRESSED AIR
  - (a) 29 CFR 1926.800 Underground construction, published 4/23/13, FR vol. 78, no. 78, p. 23837.
  - (b) 29 CFR 1926.801 Caissons, published 4/6/79, FR vol. 44, p. 20940.
  - (c) 29 CFR 1926.802 Cofferdams, published 4/6/79, FR vol. 44, p. 20940.
  - (d) 29 CFR 1926.803 Compressed air, published 7/11/86, FR vol. 51, p. 25318.
  - (e) 29 CFR 1926.804 Definitions applicable to this subpart, published 4/6/79, FR vol. 44, p. 20940.
  - (f) Appendix A to Subpart S Decompression Tables, published 4/6/79, FR vol. 44, p. 20940.
- (20) Subdivision T – DEMOLITION
  - (a) 29 CFR 1926.850 Preparatory operations, published 4/6/79, FR vol. 44, p. 20940.
  - (b) 29 CFR 1926.851 Stairs, passageways, and ladders, published 4/6/79, FR vol. 44, p. 20940.
  - (c) 29 CFR 1926.852 Chutes, published 4/6/79, FR vol. 44, p. 20940.
  - (d) 29 CFR 1926.853 Removal of materials through floor openings, published 4/6/79, FR vol. 44, p. 20940.

- (e) 29 CFR 1926.854 Removal of walls, masonry sections, and chimneys, published 4/6/79, FR vol. 44, p. 20940.
- (f) 29 CFR 1926.855 Manual removal of floors, published 4/6/79, FR vol. 44, p. 20940.
- (g) 29 CFR 1926.856 Removal of walls, floors, and materials with equipment, published 4/23/13, FR vol. 78, no. 78, p. 23837.
- (h) 29 CFR 1926.857 Storage, published 4/6/79, FR vol. 44, p. 20940.
- (i) 29 CFR 1926.858 Removal of steel construction, published 4/23/13, FR vol. 78, no. 78, p. 23837.
- (j) 29 CFR 1926.859 Mechanical demolition, published 4/6/79, FR vol. 44, p. 20940.
- (k) 29 CFR 1926.860 Selective demolition by explosives, published 4/6/79, FR vol. 44, p. 20940.
- (21) Subdivision U – BLASTING AND USE OF EXPLOSIVES
  - (a) 29 CFR 1926.900 General provisions, published 4/6/79, FR vol. 44, p. 20940.
  - (b) 29 CFR 1926.901 Blaster qualifications, published 4/6/79, FR vol. 44, p. 20940.
  - (c) 29 CFR 1926.902 Surface transportation of explosives, published 6/30/93, FR vol. 58, no. 124, p. 35311.
  - (d) 29 CFR 1926.903 Underground transportation of explosives, published 4/6/79, FR vol. 44, p. 20940.
  - (e) 29 CFR 1926.904 Storage of explosives and blasting agents, published 6/30/93, FR vol. 58, no. 124, p. 35311.
  - (f) 29 CFR 1926.905 Loading of explosives or blasting agents, published 6/30/93, FR vol. 58, no. 124, p. 35184.
  - (g) 29 CFR 1926.906 Initiation of explosive charges – electric blasting, published 6/18/98, FR vol. 63, no. 117, p. 33469.
  - (h) 29 CFR 1926.907 Use of safety fuse, published 4/6/79, FR vol. 44, p. 20940.
  - (i) 29 CFR 1926.908 Use of detonating cord, published 4/6/79, FR vol. 44, p. 20940.
  - (j) 29 CFR 1926.909 Firing the blast, published 4/6/79, FR vol. 44, p. 20940.
  - (k) 29 CFR 1926.910 Inspection after blasting, published 4/6/79, FR vol. 44, p. 20940.
  - (l) 29 CFR 1926.911 Misfires, published 4/6/79, FR vol. 44, p. 20940.
  - (m) 29 CFR 1926.912 Underwater blasting, published 4/6/79, FR vol. 44, p. 20940.
  - (n) 29 CFR 1926.913 Blasting in excavation work under compressed air, published 4/6/79, FR vol. 44, p. 20940.
  - (o) 29 CFR 1926.914 Definitions applicable to this subpart, published 6/30/93, FR vol. 58, no. 124, p. 35184, 35311.
- (22) Subdivision V – POWER TRANSMISSION AND DISTRIBUTION
  - (a) 29 CFR 1926.950 General requirements, published 4/6/79, FR vol. 44, p. 20940.
  - (b) 29 CFR 1926.951 Tools and protective equipment, published 8/9/94, FR vol. 59, no. 152, p. 40730.
  - (c) 29 CFR 1926.952 Mechanical equipment, published 5/29/13, FR vol. 78, no. 103, p. 32110.
  - (d) 29 CFR 1926.953 Material handling, published 4/6/79, FR vol. 44, p. 20940.
  - (e) 29 CFR 1926.954 Grounding for protection of employees, published 4/6/79, FR vol. 44, p. 20940.
  - (f) 29 CFR 1926.955 Overhead lines, published 4/6/79, FR vol. 44, p. 20940.
  - (g) 29 CFR 1926.956 Underground lines, published 4/6/79, FR vol. 44, p. 20940.
  - (h) 29 CFR 1926.957 Construction in energized substations, published 4/6/79, FR vol. 44, p. 20940.
  - (i) 29 CFR 1926.958 External load helicopters, published 4/6/79, FR vol. 44, p. 20940.
  - (j) 29 CFR 1926.959 Lineman’s body belts, safety straps, and lanyards, published 4/6/79, FR vol. 44, p. 20940.
  - (k) 29 CFR 1926.960 Definitions applicable to this subpart, published 4/6/79, FR vol. 44, p. 20940.
- (23) Subdivision W – ROLLOVER PROTECTIVE STRUCTURES: OVERHEAD PROTECTION

- (a) 29 CFR 1926.1000 Rollover protective structures (ROPS) for material handling equipment, published 4/6/79, FR vol. 44, p. 20940.
- (b) 29 CFR 1926.1001 Minimum performance criteria for rollover protective structure for designated scrapers, loaders, dozers, graders, and crawler tractors, published 4/6/79, FR vol. 44, p. 20940.
- (c) 29 CFR 1926.1002 Protective frame (ROPS) test procedures and performance requirements for wheel-type agricultural and industrial tractors used in construction, published 7/20/06, FR vol. 71, no. 139, p. 41127..
- (d) 29 CFR 1926.1003 Overhead protection for operators of agricultural and industrial tractors, published 2/28/06, FR vol. 71, no. 39, p. 9909.
- (24) Subdivision X – STAIRWAYS AND LADDERS
- (a) 29 CFR 1926.1050 Scope, application and definitions applicable to this Subdivision, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (b) 29 CFR 1926.1051 General requirements, published 11/14/90, FR vol. 55, no. 220, p. 47688.
- (c) 29 CFR 1926.1052 Stairways, published 8/23/91, FR vol. 56, no. 164, pp. 41793-41794.
- (d) 29 CFR 1926.1053 Ladders, published 8/23/91, FR vol. 56, no. 164, pp. 41793-41794.
- (e) 29 CFR 1926.1054 (Reserved)
- (f) 29 CFR 1926.1055 (Reserved)
- (g) 29 CFR 1926.1056 (Reserved)
- (h) 29 CFR 1926.1057 (Reserved)
- (i) 29 CFR 1926.1058 (Reserved)
- (j) 29 CFR 1926.1059 (Reserved)
- (k) 29 CFR 1926.1060 Training requirements, published 11/14/90, FR vol. 55, no. 220, p. 47691.
- (25) Subdivision Z – TOXIC AND HAZARDOUS SUBSTANCES
- (a) 29 CFR 1926.1101 Asbestos, published 2/8/13, FR vol. 78, no. 27, p. 9311.
- (b) 29 CFR 1926.1126 Chromium (VI), published; 3/17/10, FR vol. 75, no. 51, pp. 12681-12686.
- (c) 29 CFR 1926.1127 Cadmium, published 12/12/08, FR vol. 73, no. 240, pp. 75568-75589.
- (d) 29 CFR 1926.1152 Methylene Chloride, published 12/18/97, FR vol. 62, no. 243, p. 66275.
- (26) Subdivision AA – (Reserved)
- (27) Subdivision BB – (Reserved)
- (28) Subdivision CC – Cranes and Derricks in Construction
- (a) 29 CFR 1926.1400 Scope, published 5/29/13, FR vol. 78, no. 103, p. 32110.
- (b) 29 CFR 1926.1401 Definitions, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (c) 29 CFR 1926.1402 Ground conditions, published 8/9/10, FR vol. 75, no. 152. Pp. 47906-48177.
- (d) 29 CFR 1926.1403 Assembly/Disassembly – selection of manufacturer or employer procedures, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (e) 29 CFR 1926.1404 Assembly/Disassembly – general requirements (applies to all assembly and disassembly operations), published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (f) 29 CFR 1926.1405 Disassembly – additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures), published 8/9/10, FR vol. 75, no. 152. Pp. 47906-48177.
- (g) 29 CFR 1926.1406 Assembly/Disassembly – employer procedures – general requirements, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (h) 29 CFR 1926.1407 Power line safety (up to 350 kV) – assembly and disassembly, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (i) 29 CFR 1926.1408 Power line safety (up to 350 kV) – equipment operations, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.



- (j) 29 CFR 1926.1409 Power line safety (over 35 kV), published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (k) 29 CFR 1926.1410 Power line safety (all voltages) – equipment operations closer than the Table A zone, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (l) 29 CFR 1926.1411 Power line safety – while traveling, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (m) 29 CFR 1926.1412 Inspections, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (n) 29 CFR 1926.1413 Wire rope – inspection, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (o) 29 CFR 1926.1414 Wire rope – selection and installation criteria, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (p) 29 CFR 1926.1415 Safety devices, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (q) 29 CFR 1926.1416 Operational aids, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (r) 29 CFR 1926.1417 Operation, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (s) 29 CFR 1926.1418 Authority to stop operation, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (t) 29 CFR 1926.1419 Signals – general requirements, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (u) 29 CFR 1926.1420 Signals – radio, telephone or other electronic transmission of signals, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (v) 29 CFR 1926.1421 Signals – voice signals – additional requirements, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (w) 29 CFR 1926.1422 Signals – hand signal chart, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (x) 29 CFR 1926.1423 Fall protection, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (y) 29 CFR 1926.1424 Work area control, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (z) 29 CFR 1926.1425 Keeping clear of the load, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (aa) 29 CFR 1926.1426 Free fall and controlled load lowering, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (bb) 29 CFR 1926.1427 Operator qualification and certification, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (cc) 29 CFR 1926.1428 Signal person qualifications, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (dd) 29 CFR 1926.1429 Qualifications of maintenance & repair employees, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (ee) 29 CFR 1926.1430 Training, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (ff) 29 CFR 1926.1431 Hoisting personnel, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (gg) 29 CFR 1926.1432 Multiple-crane/derrick lifts – supplemental requirements, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (hh) 29 CFR 1926.1433 Design, construction and testing, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (ii) 29 CFR 1926.1434 Equipment modifications, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (jj) 29 CFR 1926.1435 Tower cranes, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (kk) 29 CFR 1926.1436 Derricks, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.
- (ll) 29 CFR 1926.1437 Floating cranes/derricks and land cranes/derricks on barges, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.

(mm) 29 CFR 1926.1438 Overhead & gantry cranes, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.  
(nn) 29 CFR 1926.1439 Dedicated pile drivers, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.  
(oo) 29 CFR 1926.1440 Sideboom cranes, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.  
(pp) 29 CFR 1926.1441 Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.  
(qq) 29 CFR 1926.1442 Severability, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.  
(rr) Appendix A to Subdivision CC of 1926 – Standard Hand Signals, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.  
(ss) Appendix B to Subdivision CC of 1926 – Assembly/Disassembly – Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.  
(tt) Appendix C to Subdivision CC of 1926 – Operator Certification – Written Examination – Technical Knowledge Criteria, published 8/9/10, FR vol. 75, no. 152, pp. 47906-48177.  
These standards are available at 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 656.726(4).

Stats. Implemented: ORS 654.001 through 654.295.

Hist: APD Admin. Order 5-1989, f. 3/31/89, ef. 5/1/89 (temp).

APD Admin. Order 8-1989, f. 7/7/89, ef. 7/7/89 (perm).

APD Admin. Order 14-1989, f. 7/20/89, ef. 8/1/89 (temp).

APD Admin. Order 15-1989, f. 9/13/89, ef. 9/13/89 (perm).

APD Admin. Order 16-1989 (temp), f. 9/13/89, ef. 9/13/89.

OR-OSHA Admin. Order 2-1989, f. 10/17/89, ef. 10/17/89.

OR-OSHA Admin. Order 3-1990, f. 1/19/90, ef. 1/19/90 (temp).

OR-OSHA Admin. Order 7-1990, f. 3/2/90, ef. 3/2/90 (perm).

OR-OSHA Admin. Order 8-1990, f. 3/30/90, ef. 3/30/90.

OR-OSHA Admin. Order 13-1990, f. 6/28/90, ef. 8/1/90 (temp).

OR-OSHA Admin. Order 19-1990, f. 8/31/90, ef. 8/31/90 (perm).

OR-OSHA Admin. Order 27-1990, f. 12/12/90, ef. 2/1/91.

OR-OSHA Admin. Order 6-1991, f. 3/18/91, ef. 4/15/91.

OR-OSHA Admin. Order 7-1991, f. 4/25/91, ef. 4/25/91.

OR-OSHA Admin. Order 15-1991, f. 12/13/91, ef. 12/13/91.

OR-OSHA Admin. Order 16-1991, f. 12/16/91, ef. 1/1/92.

OR-OSHA Admin. Order 6-1992, f. 5/18/92, ef. 5/18/92.

OR-OSHA Admin. Order 11-1992, f. 10/9/92, ef. 10/9/92.

OR-OSHA Admin. Order 1-1993, f. 1/22/93, ef. 1/22/93.

OR-OSHA Admin. Order 16-1993, f. 11/1/93, ef. 11/1/93 (Lead).

OR-OSHA Admin. Order 1-1994, f. 4/27/94, ef. 4/27/94.

OR-OSHA Admin. Order 4-1994, f. 8/4/94, ef. 8/4/94 (HazCom).

OR-OSHA Admin. Order 6-1994, f. 9/30/94, ef. 9/30/94.

OR-OSHA Admin. Order 1-1995, f. 1/19/95, ef. 1/19/95 (DOT markings, placards & labels).

OR-OSHA Admin. Order 3-1995, f. 2/22/95, ef. 2/22/95 (Haz Waste).

OR-OSHA Admin. Order 4-1995, f. 3/29/95, ef. 3/29/95 (Asbestos).

OR-OSHA Admin. Order 5-1995, f. 4/6/95, ef. 4/6/95 (HazCom).

OR-OSHA Admin. Order 6-1995, f. 4/18/95, ef. 6/1/95 (Fall Protection).

OR-OSHA Admin. Order 8-1995, f. 8/25/95, ef. 8/25/95 (Asbestos).

OR-OSHA Admin. Order 5-1996, f. 11/29/96, ef. 11/29/96.  
OR-OSHA Admin. Order 6-1996, f. 11/29/96, ef. 11/29/96.  
OR-OSHA Admin. Order 2-1997, f. 3/12/97, ef. 3/12/97.  
OR-OSHA Admin. Order 4-1997, f. 4/2/97, ef. 4/2/97.  
OR-OSHA Admin. Order 6-1997, f. 5/2/97, ef. 5/2/97.  
OR-OSHA Admin. Order 7-1997, f. 9/15/97, ef. 9/15/97 (Fall Protection).  
OR-OSHA Admin. Order 8-1997, f. 11/14/97, e. 11/14/97 (Methylene Chloride).  
OR-OSHA Admin. Order 1-1998, f. 2/13/98, e. 2/13/98 (Methylene Chloride).  
OR-OSHA Admin. Order 3-1998, f. 7/7/98, ef. 7/7/98 (Respiratory Protection).  
OR-OSHA Admin. Order 6-1998, f. 10/15/98, ef. 10/15/98 (Slings 3/H).  
OR-OSHA Admin. Order 7-1998, f. 12/28/98, ef. 12/28/98 (Asbestos).  
OR-OSHA Admin. Order 1-1999, f. 3/22/99, e. 3/22/99 (Methylene Chloride).  
OR-OSHA Admin. Order 4-1999, f. 4/30/99, ef. 4/30/99.  
OR-OSHA Admin. Order 6-1999, f. 5/26/99, ef. 5/26/99.  
OR-OSHA Admin. Order 3-2000, f. 2/8/00, ef. 2/8/00.  
OR-OSHA Admin. Order 3-2001, f. 2/5/01, ef. 2/5/01 (Fall Protection/Oregon Exceptions).  
OR-OSHA Admin. Order 3-2002, f. 4/15/02, ef. 4/18/02 (Steel Erection).  
OR-OSHA Admin. Order 5-2002, f. 6/28/02, ef. 10/1/03 (GFCI 3/K).  
OR-OSHA Admin. Order 6-2002, f. 7/19/02, ef. 7/19/02 (Fall Protection/Steel Erection).  
OR-OSHA Admin. Order 1-2003, f. 1/30/03, ef. 4/30/03 (3/Q Masonry Wall Bracing).  
OR-OSHA Admin. Order 2-2003, f. 1/30/03, ef. 1/30/03 (3/G).  
OR-OSHA Admin. Order 7-2003, f. 12/5/03, ef. 12/5/03 (3/O).  
OR-OSHA Admin. Order 8-2003, f. 12/30/03, ef. 1/1/04 (3/R).  
OR-OSHA Admin. Order 1-2005, f. 4/12/05, ef. 4/12/05 (3/D and 3/Z).  
OR-OSHA Admin. Order 2-2006, f. 4/28/06, ef. 4/28/06 (3/R).  
OR-OSHA Admin. Order 4-2006, f. 7/24/06, ef. 7/24/06.  
OR-OSHA Admin. Order 5-2006, f. 8/7/06, ef. 1/1/07.  
OR-OSHA Admin. Order 6-2006, f. 8/30/06, ef. 8/30/06.  
OR-OSHA Admin. Order 10-2006, f. 11/30/06, ef. 11/30/06.  
OR-OSHA Admin. Order 6-2007, f. 9/26/07, ef. 9/26/07 (3/O).  
OR-OSHA Admin. Order 5-2008, f. 5/1/08, ef. 5/15/08 (PPE).  
OR-OSHA Admin. Order 5-2009, f. 5/29/09, ef. 5/29/09.  
OR-OSHA Admin. Order 3-2010, f. 6/10/10, ef. 6/15/10.  
OR-OSHA Admin. Order 1-2011, f. 2/9/11, ef. 2/9/11.  
OR-OSHA Admin. Order 4-2011, f. 12/8/11, ef. 12/8/11.  
OR-OSHA Admin. Order 5-2011, f. 12/8/11, ef. 7/1/12.  
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 1-2013, f. 2/14/13, ef. 2/14/13.  
OR-OSHA Admin. Order 2-2013, f. 2/15/13, ef. 4/1/13.  
OR-OSHA Admin. Order 4-2013, f. 7/19/13, ef. 7/19/13.  
OR-OSHA Admin. Order 5-2013, f. 9/13/13, ef. 9/13/13.  
OR-OSHA Admin. Order 6-2013, f. 10/9/13, ef. 10/9/13.  
OR-OSHA Admin. Order 7-2013, f. 12/12/13, ef. 12/12/13.  
**OR-OSHA Admin. Order 6-2014, f. 10/28/14, ef. 5/1/15.**

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## Division 3/J, Welding and Cutting

### ~~§1926.350 Gas Welding and Cutting.~~

#### ~~(a) Transporting, moving, and storing compressed gas cylinders.~~

- ~~(1) Valve protection caps shall be in place and secured.~~
- ~~(2) When cylinders are hoisted, they shall be secured on a cradle, slingboard, or pallet. They shall not be hoisted or transported by means of magnets or choker slings.~~
- ~~(3) Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dropped, struck, or permitted to strike each other violently.~~
- ~~(4) When cylinders are transported by powered vehicles, they shall be secured in a vertical position.~~
- ~~(5) Valve protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve protection caps to pry cylinders loose when frozen. Warm, not boiling, water shall be used to thaw cylinders loose.~~
- ~~(6) Unless cylinders are firmly secured on a special carrier intended for this purpose, regulators shall be removed and valve protection caps put in place before cylinders are moved.~~
- ~~(7) A suitable cylinder truck, chain, or other steadying device shall be used to keep cylinders from being knocked over while in use.~~
- ~~(8) When work is finished, when cylinders are empty, or when cylinders are moved at any time, the cylinder valve shall be closed.~~
- ~~(9) Compressed gas cylinders shall be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried.~~
- ~~(10) Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet (6.1 m) or by a noncombustible barrier at least 5 feet (1.5 m) high having a fire-resistance rating of at least one-half hour.~~
- ~~(11) Inside of buildings, cylinders shall be stored in a well-protected, well-ventilated, dry location, at least 20 feet (6.1 m) from highly combustible materials such as oil or excelsior. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage places shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards.~~
- ~~(12) The in-plant handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tankcars, or motor vehicle cargo tanks shall be in accordance with Compressed Gas Association Pamphlet P-1-1965.~~

#### ~~(b) Placing cylinders.~~

- ~~(1) Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them. When this is impractical, fire resistant shields shall be provided.~~
- ~~(2) Cylinders shall be placed where they cannot become part of an electrical circuit. Electrodes shall not be struck against a cylinder to strike an arc.~~
- ~~(3) Fuel gas cylinders shall be placed with valve end up whenever they are in use. They shall not be placed in a location where they would be subject to open flame, hot metal, or other sources of artificial heat.~~
- ~~(4) Cylinders containing oxygen or acetylene or other fuel gas shall not be taken into confined spaces.~~

#### ~~(c) Treatment of cylinders.~~

- ~~(1) Cylinders, whether full or empty, shall not be used as rollers or supports.~~
- ~~(2) No person other than the gas supplier shall attempt to mix gases in a cylinder. No one except the owner of the cylinder or person authorized by him, shall refill a cylinder. No one shall~~

use a cylinder's contents for purposes other than those intended by the supplier. All cylinders used shall meet the Department of Transportation requirements published in 49 CFR Part 178, Subpart C, Specification for Cylinders.

(3) No damaged or defective cylinder shall be used.

**(d) Use of fuel gas.** The employer shall thoroughly instruct employees in the safe use of fuel gas, as follows:

(1) Before a regulator to a cylinder valve is connected, the valve shall be opened slightly and closed immediately. (This action is generally termed "**cracking**" and is intended to clear the valve of dust or dirt that might otherwise enter the regulator.) The person cracking the valve shall stand to one side of the outlet, not in front of it. The valve of a fuel gas cylinder shall not be cracked where the gas would reach welding work, sparks, flame, or other possible sources of ignition.

(2) The cylinder valve shall always be opened slowly to prevent damage to the regulator. For quick closing, valves on fuel gas cylinders shall not be opened more than 1-1/2 turns. When a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be shut off quickly in case of an emergency. In the case of manifolded or coupled cylinders, at least one such wrench shall always be available for immediate use. Nothing shall be placed on top of a fuel gas cylinder, when in use, which may damage the safety device or interfere with the quick closing of the valve.

(3) Fuel gas shall not be used from cylinders through torches or other devices which are equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.

(4) Before a regulator is removed from a cylinder valve, the cylinder valve shall always be closed and the gas released from the regulator.

(5) If, when the valve on a fuel gas cylinder is opened, there is found to be a leak around the valve stem, the valve shall be closed and the gland nut tightened. If this action does not stop the leak, the use of the cylinder shall be discontinued, and it shall be properly tagged and removed from the work area. In the event that fuel gas should leak from the cylinder valve, rather than from the valve stem, and the gas cannot be shut off, the cylinder shall be properly tagged and removed from the work area. If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder need not be removed from the work area.

(6) If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.

**(e) Fuel gas and oxygen manifolds.**

(1) Fuel gas and oxygen manifolds shall bear the name of the substance they contain in letters at least 1-inch high which shall be either painted on the manifold or on a sign permanently attached to it.

(2) Fuel gas and oxygen manifolds shall be placed in safe, well ventilated, and accessible locations. They shall not be located within enclosed spaces.

(3) Manifold hose connections, including both ends of the supply hose that lead to the manifold, shall be such that the hose cannot be interchanged between fuel gas and oxygen manifolds and supply header connections. Adapters shall not be used to permit the interchange of hose. Hose connections shall be kept free of grease and oil.

(4) When not in use, manifold and header hose connections shall be capped.

(5) Nothing shall be placed on top of a manifold, when in use, which will damage the manifold or interfere with the quick closing of the valves.

**(f) Hose.**

(1) Fuel gas hose and oxygen hose shall be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily

distinguishable by the sense of touch. Oxygen and fuel gas hoses shall not be interchangeable. A single hose having more than one gas passage shall not be used.

(2) When parallel sections of oxygen and fuel gas hose are taped together, not more than 4 inches out of 12 inches shall be covered by tape.

(3) All hose in use, carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance which may ignite or enter into combustion, or be in any way harmful to employees, shall be inspected at the beginning of each working shift. Defective hose shall be removed from service.

(4) Hose which has been subject to flashback, or which shows evidence of severe wear or damage, shall be tested to twice the normal pressure to which it is subject, but in no case less than 300 p.s.i. Defective hose, or hose in doubtful condition, shall not be used.

(5) Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion.

(6) Boxes used for the storage of gas hose shall be ventilated.

(7) Hoses, cables, and other equipment shall be kept clear of passageways, ladders and stairs.

**(g) Torches.**

(1) Clogged torch tip openings shall be cleaned with suitable cleaning wires, drills, or other devices designed for such purpose.

(2) Torches in use shall be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings, and tip connections. Defective torches shall not be used.

(3) Torches shall be lighted by friction lighters or other approved devices, and not by matches or from hot work.

**(h) Regulators and gauges.** Oxygen and fuel gas pressure regulators, including their related gauges, shall be in proper working order while in use.

**(i) Oil and grease hazards.** Oxygen cylinders and fittings shall be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or gloves. Oxygen shall not be directed at oily surfaces, greasy clothes, or within a fuel oil or other storage tank or vessel.

**(j) Additional rules.** For additional details not covered in this subpart, applicable technical portions of American National Standards Institute, Z49.1-1967, Safety in Welding and Cutting, shall apply.

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

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

**Hist:** APD Admin. Order 8-1989, f. 7/7/89, ef. 7/7/89.

OR-OSHA Admin. Order 3-2000, f. 2/8/00, ef. 2/8/00.]

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**NOTE: In Oregon, OAR 437-002-2253 Oxygen-fuel gas welding and cutting, applies to general industry and construction. For convenience, 437-002-2253 Oxygen-fuel gas welding and cutting, is reprinted here from Division 2/Q.**