

WAC 296-24-32003 Bulk oxygen systems. (1) **Definitions.** As used in this section: A bulk oxygen system is an assembly of equipment, such as oxygen storage containers, pressure regulators, safety devices, vaporizers, manifolds, and interconnecting piping, which has storage capacity of more than 13,000 cubic feet of oxygen, normal temperature and pressure (NTP), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (NTP) including unconnected reserves on hand at the site. The bulk oxygen system terminates at the point where oxygen at service pressure first enters the supply line. The oxygen containers may be stationary or movable, and the oxygen may be stored as gas or liquid.

(2) **Location.**

(a) **General.** You must locate bulk oxygen storage systems shall be located above ground out of doors, or in a building of noncombustible construction, adequately vented, and used for that purpose exclusively. The location selected must be such that containers and associated equipment must not be exposed by electric power lines, flammable liquid or gas lines.

(b) **Accessibility.** The system must be located so that it is readily accessible to mobile supply equipment at ground level and to authorized personnel.

(c) **Leakage.** Where oxygen is stored as a liquid, you must provide noncombustible surfacing in an area in which any leakage of liquid oxygen might fall during operation of the system and filling of a storage container. For purposes of these standards, asphaltic or bituminous paving is considered to be combustible.

(d) **Elevation.** When locating bulk oxygen systems near above ground flammable liquid storage which may be either indoors or outdoors, it is advisable to locate the system on ground higher than the flammable liquid storage.

(e) **Dikes.** Where it is necessary to locate a bulk oxygen system on ground lower than adjacent flammable liquid storage you must take suitable means (such as by diking, diversion curbs, or grading) with respect to the adjacent flammable liquid storage to prevent accumulation of liquids under the bulk oxygen system.

(3) **Distance between systems and exposures.**

(a) **General.** You must ensure that the minimum distance from any bulk oxygen storage container to exposures, measured in the most direct line except as indicated in (f) and (g) of this subsection are as indicated in (b) through (r) of this subsection inclusive.

(b) **Combustible structures.** 50 feet from any combustible structures.

(c) **Fire resistive structures.** 25 feet from any structures with fire-resistive exterior walls or sprinklered buildings or other construction, but not less than one-half the height of adjacent side wall of the structure.

(d) **Openings.** At least 10 feet from any opening in adjacent walls of fire resistive structures. You must ensure that spacing from such structures is adequate to permit maintenance, but not less than one foot.

(e) **Flammable liquid storage above ground.**

Distance (feet)	Capacity (gallons)
50 _____	0-1000
90 _____	1001 or more

(f) **Flammable liquid storage below ground.**

Distance measured horizontally from oxygen storage container to flammable liquid tank (feet)	Distance from oxygen storage container to filling and vent connections or openings to flammable liquid tank (feet)	Capacity gallons
15 _____	50 _____	0-1000
30 _____	50 _____	1001 or more

(g) **Flammable liquid storage above ground.**

Distance (feet)	Capacity (gallons)
25 _____	0-1000
50 _____	1001 or more

(h) **Flammable liquid storage below ground.**

Distance measured horizontally from oxygen storage container to flammable liquid tank (feet)	Distance from oxygen storage container to filling and vent connections or openings to flammable liquid tank (feet)
15 _____	40 _____

(i) **Flammable gas storage.** (Such as compressed flammable gases, liquefied flammable gases and flammable gases in low pressure gas holders):

Distance (feet)	Capacity (cu. ft. NTP)
50 _____	Less than 5000
90 _____	5000 or more

(j) **Highly combustible materials.** 50 feet from solid materials which burn rapidly, such as excelsior or paper.

(k) **Slow-burning materials.** 25 feet from solid materials which burn slowly, such as coal and heavy timber.

(l) **Ventilation.** 75 feet in one direction and 35 feet in approximately 90° direction from confining walls (not including firewalls less than twenty feet high) to provide adequate ventilation in courtyards and similar confining areas.

(m) **Congested areas.** 25 feet from congested areas such as offices, lunchrooms, locker rooms, time clock areas, and similar locations where people may congregate.

(n) **Public areas.** 50 feet from places of public assembly.

(o) **Patients.** 50 feet from areas occupied by nonambulatory patients.

(p) **Sidewalks.** 10 feet from any public sidewalk.

(q) **Adjacent property.** 5 feet from any line of adjoining property.

(r) **Exceptions.** The distances in (b), (c), (e) through (k) inclusive, and (p) and (q) of this subsection do not apply where protective structures such as firewalls of adequate height to safeguard the oxygen storage systems are located between the bulk oxygen storage installation and the exposure. In such cases, the bulk oxygen storage installation may be a minimum distance of one foot from the firewall.

(4) **Storage containers.**

(a) **Foundations and supports.** You must provide permanently installed containers with substantial noncombustible supports on firm noncombustible foundations.

(b) **Construction—Liquid.** Liquid oxygen storage containers must be fabricated from materials meeting the impact test requirements of paragraph UG-84 of ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessels—1968. Containers operating at pressures above fifteen pounds per square inch gage (p.s.i.g.) must be designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VII—Unfired Pressure Vessels—1968. Insulation surrounding the liquid oxygen container must be noncombustible.

(c) **Construction—Gaseous.** High-pressure gaseous oxygen containers must comply with one of the following:

(i) Designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessels—1968.

(ii) Designed, constructed, tested, and maintained in accordance with DOT specifications and regulations.

(5) **Piping, tubing, and fittings.**

(a) **Selection.** You must ensure that piping, tubing, and fittings are suitable for oxygen service and for the pressures and temperatures involved.

(b) **Specification.** Piping and tubing must conform to Section 2—Gas and Air Piping Systems of Code for Pressure Piping, ANSI, B31.1-1967 with addenda B31.10a-1969.

(c) **Fabrication.** Piping or tubing for operating temperatures below -20°F must be fabricated from materials meeting the impact test requirements of paragraph UG-84 of ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessels—1968, when tested at the minimum operating temperature to which the piping may be subjected in service.

(6) **Safety relief devices.**

(a) **General.** Bulk oxygen storage containers, regardless of design pressure must be equipped with safety relief devices as required by the ASME code or the DOT specifications and regulations.

(b) **DOT containers.** Bulk oxygen storage containers designed and constructed in accordance with DOT specification must be equipped with safety relief devices as required thereby.

(c) **ASME containers.** Bulk oxygen storage containers designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessel—1968 must be equipped with safety relief devices meeting the provisions of the Compressed Gas Association Pamphlet "Safety Relief Device Standards for Compressed Gas Storage Containers," S-1, Part 3.

(d) **Insulation.** Insulation casings on liquid oxygen containers must be equipped with suitable safety relief devices.

(e) **Reliability.** You must ensure that all safety relief devices are designed or located so that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device.

(7) **Liquid oxygen vaporizers.**

(a) **Mounts and couplings.** You must anchor the vaporizer and its connecting piping is sufficiently flexible to provide for the effect of expansion and contraction due to temperature changes.

(b) **Relief devices.** You must adequately protect the vaporizer and its piping on the oxygen and heating medium sections with safety relief devices.

(c) **Heating.** You must indirectly supply heat used in an oxygen vaporizer only through media such as steam, air, water, or water solutions which do not react with oxygen.

(d) **Grounding.** If electric heaters are used to provide the primary source of heat, you must electrically ground the vaporizing system.

(8) **Equipment assembly and installation.**

(a) **Cleaning.** You must clean equipment making up a bulk oxygen system in order to remove oil, grease or other readily oxidizable materials before placing the system in service.

(b) **Joints.** Joints in piping and tubing may be made by welding or by use of flanged, threaded, slip, or compression fittings. Gaskets or thread sealants must be suitable for oxygen service.

(c) **Accessories.** Valves, gages, regulators, and other accessories must be suitable for oxygen service.

(d) **Installation.** Installation of bulk oxygen systems shall be supervised by personnel familiar with proper practices with reference to their construction and use.

(e) **Testing.** After installation all field erected piping must be tested and proved gas tight at maximum operating pressure. Any medium used for testing shall be oil free and nonflammable.

(f) **Security.** You must protect storage containers, piping, valves, regulating equipment, and other accessories against physical damage and against tampering.

(g) **Venting.** Any enclosure containing oxygen control or operating equipment must be adequately vented.

(h) **Placarding.** You must permanently placard the bulk oxygen storage location to indicate: "OXYGEN—NO SMOKING—NO OPEN FLAMES," or an equivalent warning.

(i) **Electrical wiring.** Bulk oxygen installations are not hazardous locations as defined and covered by chapter 296-24 WAC Part L. Therefore, general purpose or weatherproof types of electrical wiring and equipment are acceptable depending upon whether the installation is indoors or outdoors. You must install such equipment according to chapter 296-24 WAC Part L.

(9) **Operating instructions.** For installations which require any operation of equipment by the user, you must maintain legible instructions at operating locations.

(10) **Maintenance.** You must maintain the equipment and functioning of each charged bulk oxygen system in a safe operating condition in accordance with the requirements of this section. You must cut back wood and long dry grass within fifteen feet of any bulk oxygen storage container.

[Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, and 49.17.060. WSR 15-24-100, § 296-24-32003, filed 12/1/15, effective 1/5/16. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060 and 29 C.F.R. 1910 Subpart Z. WSR 14-07-086, § 296-24-32003, filed 3/18/14, effective 5/1/14. Statutory Authority: Chapter 49.17 RCW. WSR 91-24-017 (Order 91-07), § 296-24-32003, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. WSR 85-10-004 (Order 85-09), § 296-24-32003, filed 4/19/85; Order 76-6, § 296-24-32003, filed 3/1/76; Order 73-5, § 296-24-32003, filed 5/9/73 and Order 73-4, § 296-24-32003, filed 5/7/73.]