# NFPA 50

# Standard for Bulk Oxygen Systems at Consumer Sites

# 2001 Edition

NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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## Licensing Policy

**NFPA 50**

**Standard for**

# Bulk Oxygen Systems at Consumer Sites

**2001 Edition**

This edition of NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*, was prepared by the Technical Committee on Industrial and Medical Gases and acted on by the National Fire Protection Association, Inc., at its November Meeting held November 12–15, 2000, in Orlando, FL. It was issued by the Standards Council on January 13, 2001, with an effective date of February 9, 2001, and supersedes all previous editions.

This edition of NFPA 50 was approved as an American National Standard on February 9, 2001.

## Origin and Development of NFPA 50

Development of NFPA 50 was initiated by the Compressed Gas Association, Inc., which submitted a complete text to the NFPA Committee on Gases in 1955. Working responsibility for the project was assigned to the Sectional Committee on Industrial Gases, and the standard was tentatively adopted in 1956. A revised edition was officially adopted in 1957, and subsequent revised editions were adopted in 1962 and 1965 as NFPA 566.

In June 1966 responsibility for NFPA 566 was reassigned to the Committee on Industrial and Medical Gases. With the 1971 edition, the standard was redesignated as NFPA 50.

Since the 1971 edition, revised editions were adopted in 1973, 1974, 1979, 1985, 1990, and 1996.

The 2001 edition contains relatively minor changes. Several definitions were clarified and the exposure separation requirements in Chapter 2 were restructured for ease of use.

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*This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.*

NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

**Committee Scope:** This Committee shall have primary responsibility for documents on the storage, transfer, and use of industrial gases. Included are the storage and handling of such gases in their gaseous or liquid phases; the installation of associated storage, piping, and distribution equipment; and operating practices. The Committee also has a technical responsibility for contributions in the same areas for medical gases and clean rooms.

## Contents

**NFPA 50**

**Standard for**

# Bulk Oxygen Systems at Consumer Sites

**2001 Edition**

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Appendix A.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

A reference in parentheses ( ) following a section or paragraph indicates material that has been extracted from another NFPA document. The complete title and edition of the document the material is extracted from is found in Chapter 5. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the appropriate technical committee.

Information on referenced publications can be found in Chapter 5 and Appendix B.

## Chapter 1 General

### 1.1 Scope.

**1.1.1*** This standard shall cover the general principles recommended for the installation of bulk oxygen systems on consumer premises where the supply to the consumer premises originates outside the consumer premises and is delivered by mobile equipment.

**1.1.2** The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where it is clearly evident that a reasonable degree of safety is provided.

**1.1.3** This standard shall not apply to oxygen manufacturing plants or other establishments operated by the oxygen supplier or his or her agent for the purpose of storing oxygen and refilling portable containers, trailers, mobile supply trucks, or tank cars.

**1.1.4*** This standard shall not apply to oxygen storage systems having capacities less than those stated in 1.3.3, Bulk Oxygen System.

**1.1.5** Where a bulk oxygen system is intended for medical gas applications, additional provisions are included in NFPA 99, *Standard for Health Care Facilities.*

**1.2* Materials.** Oxygen system components, including, but not limited to, containers, valves, valve seats, lubricants, fittings, gaskets, and interconnecting equipment including hoses, shall be compatible with oxygen under the conditions of temperature and pressure to which the components can be exposed in the containment and use of oxygen. Easily ignitable materials shall be avoided unless they are parts of equipment or systems that are approved, listed, or proved suitable by tests or by past experience.

**1.3 Definitions.** For the purpose of the standard, the following terms are defined as follows.

**1.3.1* Approved.** Acceptable to the authority having jurisdiction.

**1.3.2* Authority Having Jurisdiction.** The organization, office, or individual responsible for approving equipment, materials, an installation, or a procedure.

**1.3.3 Bulk Oxygen System.** An assembly of equipment, such as oxygen storage containers, pressure regulators, safety devices, vaporizers, manifolds, and interconnecting piping, that has a storage capacity of more than 20,000 $ft^3$ (566 $m^3$) of oxygen (SCF) 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 can be stationary or movable, and the oxygen can be stored as gas or liquid.

**1.3.4 Combustible Liquid.** A liquid having a closed-cup flash point at or above 100°F (37.8°C) and subdivided as follows: Class II liquids include those having a flash point at or above 100°F (37.8°C) and below 140°F (60°C). Class IIIA liquids include those having a flash point at or above 140°F (60°C) and below 200°F (93.4°C). Class IIIB liquids include those having flash points at or above 200°F (93.4°C).

**1.3.5 Cubic Foot.** Cubic foot of gas at 14.7 psia (101 kPa) and 70°F (21°C).

**1.3.6 Flammable Gas.** A gas that is flammable at atmospheric temperature and pressure in a mixture of 13 percent or less (by volume) with air, or that has a flammable range with air wider than 12 percent, regardless of the lower limit.

**1.3.7 Flammable Liquid.** Any liquid having a closed-cup flash point below 100°F (37.8°C) and having a vapor pressure not exceeding 40 psia (276 kPa) at 100°F (37.8°C).

**1.3.8 Gallon.** A standard U.S. gallon.

**1.3.9* Listed.** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

**1.3.10 Noncombustible Material.** A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat. Materials that are reported as passing ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, shall be considered noncombustible materials. (**220:**2)

**1.3.11 Noncombustible/Limited-Combustible Construction.** A building constructed of noncombustible material.

**1.3.12 Shall.** Indicates a mandatory requirement.

**1.3.13 Should.** Indicates a recommendation or that which is advised but not required.

**1.3.14 Wood Frame Construction.** A type of building construction, Type V (000), as defined in NFPA 220, *Standard on Types of Building Construction.*

## Chapter 2 Siting

### 2.1 Location of Bulk Oxygen Systems.

**2.1.1** Bulk oxygen storage systems shall be located aboveground out of doors or shall be installed in a building of fire-resistive or noncombustible/limited-combustible construction, adequately vented, and used for that purpose exclusively. The location selected shall be such that containers and associated equipment shall not be beneath or exposed by the failure of electric power lines, piping containing all classes of flammable or combustible liquids (*see 1.3.4 and 1.3.7*), or piping containing flammable gases.

**2.1.2** The system shall be located so that it is readily accessible to mobile supply equipment at ground level and to authorized personnel. Bulk oxygen systems shall not be located on rooftops of buildings or other structures.

**2.1.3** On bulk liquid oxygen storage systems, the tank's liquid delivery connections, pressure relief device outlets, and the mobile supply equipment withdrawal connection shall be at least 8 ft (2.5 m) from the inlet of underground sewer systems.

**2.1.4** Where oxygen is stored as a liquid, surfacing of noncombustible material shall be provided at ground level under liquid delivery connections for the storage container and mobile supply equipment. This area of noncombustible surfacing shall be at least 3 ft (1 m) in diameter from points at ground level where leakage of liquid oxygen might fall during unloading and normal operation of the system. The area under the mobile supply equipment shall be at least the full width of the vehicle and at least 8 ft (2.5 m) in the direction of the vehicle axis. For purposes of this standard, asphaltic or bitumastic paving is considered to be combustible. The slope, if any, of such areas shall take into consideration the possible flow of spilled liquid oxygen to adjacent combustible material. If expansion joints are used, fillers shall also be of noncombustible materials.

**2.1.5*** Where it is necessary to locate a bulk oxygen system on ground lower than all classes of adjacent flammable or combustible liquid storage, means shall be taken (such as by diking, diversion curbs, or grading) with respect to the adjacent flammable or combustible liquid storage to prevent accumulation of liquids under the bulk oxygen system.

**2.2* Distance between Bulk Oxygen Systems and Exposures.** Except as provided in 2.2.14, the minimum distance from any bulk oxygen storage container to exposures, measured in the most direct line (except as indicated in 2.2.5 and 2.2.11), shall be as indicated in 2.2.1 to 2.2.14, inclusive.

**2.2.1** The minimum distance from any bulk oxygen system to buildings of wood frame construction shall be 50 ft (15 m).

**2.2.2** The minimum distance from any bulk oxygen system to buildings of other than wood frame construction shall be 1 ft (0.3 m) (or other distance to permit system maintenance).

**2.2.3** The minimum distance from any bulk oxygen system to any opening in walls of adjacent structures shall be 10 ft (3 m). This provision shall apply to all elements of a bulk oxygen system where the oxygen storage is high-pressure gas. Where the storage is a liquid, this provision shall apply only to pressure regulators, safety devices, vaporizers, manifolds, and interconnecting piping.

**2.2.4** The minimum distance from any bulk oxygen system to all classes of flammable and combustible liquid storage aboveground shall be as shown in Table 2.2.4. Distances shown in Table 2.2.4 shall be permitted to be reduced to 15 ft (4.6 m) for Class IIIB combustible liquids.

**Table 2.2.4 All Classes of Flammable and Combustible Liquid Storage Aboveground**

| Distance | | Capacity | |
|---|---|---|---|
| ft | m | gal | L |
| 25 | 7.5 | 1000 or less | 3785 |
| 50 | 15 | 1001 or more | 3789 |

**2.2.5** The minimum distance from any bulk oxygen system to all classes of flammable and combustible storage belowground shall be as shown in Table 2.2.5.

**Table 2.2.5 All Classes of Flammable and Combustible Liquid Storage Belowground**

| Distance Measured Horizontally from Oxygen Storage Container to Tank | | Distance from Oxygen Storage Container to Filling and Vent Connections or Openings to Tank | |
|---|---|---|---|
| ft | m | ft | m |
| 15 | 4.6 | 25 | 7.5 |

**2.2.6*** The minimum distance from any bulk oxygen system to flammable gases aboveground shall be as shown in Table 2.2.6.

**2.2.7** The minimum distance from any bulk oxygen system to solid materials that burn rapidly, such as excelsior or paper, shall be 50 ft (15 m).

**2.2.8** The minimum distance from any bulk oxygen system to solid materials that burn slowly, such as coal and heavy timber, shall be 25 ft (7.5 m).

**Table 2.2.6 Flammable Gases Aboveground**

| Flammable Gas | Quantity | Distance | |
|---|---|---|---|
| | | ft | m |
| Liquefied hydrogen | Any | 75 | 22.5 |
| Other liquefied gases | 1000 gal (3785 L) or less | 25 | 7.5 |
| | Over 1000 gal (3785 L) | 50 | 15 |
| Nonliquefied or dissolved gases | 25,000 $ft^3$ (708 $m^3$) (SCF) or less | 25 | 7.5 |
| | Over 25,000 $ft^3$ (708 $m^3$) (SCF) | 50 | 15 |

**2.2.9** The minimum distance from any bulk oxygen system to confining walls [not including protective structures having a minimum fire resistance rating of 2 hours less than 12 ft (3.7 m) high] shall be 75 ft (22.5 m) in one direction and 35 ft (11 m) in approximately 90 degrees direction where the container is enclosed on three sides or fewer to provide adequate ventilation in courtyards and similar confining areas.

**2.2.10** The minimum distance from any bulk oxygen system to places of public assembly shall be 50 ft (15 m).

**2.2.11** The minimum distance from any bulk oxygen system to areas occupied by nonambulatory patients shall be 50 ft (15 m) in a direct line from the inner container pressure-relief device discharging piping outlets, and from filling and vent connections.

**2.2.12** The minimum distance from any bulk oxygen system to any public sidewalk or parked vehicle shall be 10 ft (3 m).

**2.2.13** The minimum distance from any bulk oxygen system to any line of adjoining property that can be built upon shall be 5 ft (1.5 m).

**2.2.14** The distances in 2.2.1, 2.2.4 to 2.2.8, inclusive, 2.2.12, and 2.2.13 shall not apply where protective structures having a minimum fire resistance of 2 hours interrupt the line of sight between uninsulated portions of the bulk oxygen storage installation and the exposure. In such cases, the bulk oxygen installation shall be a minimum distance of 1 ft (0.3 m) (or greater distance if required for system maintenance) from the protective structure.

## Chapter 3 System Fabrication

### 3.1 Bulk Oxygen Storage Containers.

**3.1.1** Permanently installed containers shall be provided with substantial supports of noncombustible material on firm foundations of noncombustible material.

**3.1.2** Liquid oxygen containers shall comply with one of the following:

(1) Be fabricated from materials meeting the impact test requirements of Paragraph UG-84 of the ASME *Boiler and Pressure Vessel Code*, Section VIII — Unfired Pressure Vessels; containers operating at gage pressures above 15 psi (103 kPa) designed, constructed, and tested in accordance with appropriate requirements of the ASME *Boiler and Pressure Vessel Code*, Section VIII — Unfired Pressure Vessels; insulation surrounding the liquid oxygen container of noncombustible material

(2) Be designed, constructed, tested, and maintained in accordance with U.S. Department of Transportation (DOT) Specifications and Regulations for 4L containers

**3.1.3** High-pressure gaseous oxygen containers shall comply with one of the following:

(1) Be designed, constructed, and tested in accordance with appropriate requirements of the ASME *Boiler and Pressure Vessel Code*, Section VIII — Unfired Pressure Vessels

(2) Be designed, constructed, tested, and maintained in accordance with U.S. Department of Transportation (DOT) Specifications and Regulations

### 3.2 Piping, Tubing, and Fittings.

**3.2.1** Piping, tubing, and fittings shall be designed for the pressures and temperatures required for oxygen service.

**3.2.2** Material specifications and thickness requirements for piping and tubing shall conform to ANSI/ASME B31.3, *Code for Chemical Plant and Petroleum Refinery Piping*.

**3.2.3*** Piping or tubing for operating temperatures below −20°F (−28.9°C) shall be fabricated from materials meeting the impact test requirements of Chapter III of ANSI/ASME B31.3, *Code for Chemical Plant and Petroleum Refinery Piping*, when tested at the minimum operating temperature to which the piping can be subjected in service.

### 3.3 Safety Relief Devices.

**3.3.1** Bulk oxygen storage containers, regardless of design pressure, shall be equipped with safety relief devices as required by the ASME Code or the DOT Specifications and Regulations *(see Section 3.1)*.

**3.3.2** Bulk oxygen storage containers designed and constructed in accordance with DOT Specifications *[see 3.1.3(2)]* shall be equipped with safety relief devices as required by the DOT.

**3.3.3** Bulk oxygen storage containers designed and constructed in accordance with the ASME *Boiler and Pressure Vessel Code*, Section VIII — Unfired Pressure Vessels, shall be equipped with safety relief devices meeting the provisions of CGA Publication S-1.3, *Safety Relief Device Standards for Compressed Gas Storage Containers*.

**3.3.4** Insulation casing on liquid oxygen containers shall be equipped with safety relief devices.

**3.3.5** All safety relief devices shall be designed or located so that moisture cannot collect and freeze in a manner that would interfere with proper operation of the device.

### 3.4 Liquid Oxygen Vaporizers.

**3.4.1** The vaporizer shall be anchored and its connecting piping shall provide for the effects of expansion and contraction due to temperature changes.

**3.4.2** The vaporizer and its piping shall be protected on the oxygen and heating medium sections with safety relief devices.

**3.4.3** Heat used in an oxygen vaporizer shall be supplied indirectly only through mediums such as steam, air, water, or water solutions that do not react with oxygen.

**3.4.4** If electric heaters are used to provide the primary source of heat, the vaporizing system shall be electrically grounded.

**3.5 Equipment Assembly and Installation.**

**3.5.1** Equipment making up a bulk oxygen system shall be cleaned before placing the system in service in order to remove oil, grease, solvents, particulates, or other readily oxidizable materials.

**3.5.2** Joints in piping and tubing shall be permitted to be made by welding or brazing, or by use of flanged, threaded, socket, slip, or compression fittings. Gaskets or thread sealants shall be designed for oxygen service. Brazing materials shall have a melting point above 1000°F (538°C).

**3.5.3** Valves, gauges, regulators, and other accessories shall be designed for oxygen service.

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

**3.5.5** After installation, all field-erected piping shall be tested and proved gastight at maximum operating pressure. Any medium used for testing shall be oil-free and nonflammable.

**3.5.6** Storage containers, piping, valves, regulating equipment, and other accessories shall be protected against physical damage and against tampering by the general public. A shutoff valve shall be located in liquid product withdrawal lines as close to the container as practical.

**3.5.7** Any enclosure containing oxygen control or operating equipment shall be vented.

**3.5.8** The bulk oxygen storage location shall be permanently placarded to indicate "OXYGEN — NO SMOKING — NO OPEN FLAMES."

**3.5.9*** Electrical wiring and equipment shall be installed in accordance with the applicable provisions of NFPA 70, *National Electrical Code®*.

## Chapter 4 Operation and Maintenance

**4.1 Operating Instructions.** For installations that require any operation of equipment by the user, legible instructions shall be maintained at operating locations.

**4.2 Maintenance.**

**4.2.1** Each bulk oxygen system installed on consumer premises shall be inspected annually and maintained by a qualified representative of the equipment owner.

**4.2.2** Weeds and long dry grass shall not be within 15 ft (4.6 m) of any bulk oxygen storage container.

## Chapter 5 Referenced Publications

**5.1** The following documents or portions thereof are referenced within this standard as mandatory requirements and shall be considered part of the requirements of this standard. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this standard. Some of these mandatory documents might also be referenced in this standard for specific informational purposes and, therefore, are also listed in Appendix B.

**5.1.1 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 70, *National Electrical Code®*, 1999 edition.

NFPA 99, *Standard for Health Care Facilities,* 1999 edition.

NFPA 220, *Standard on Types of Building Construction*, 1999 edition.

**5.1.2 ASME Publications.** American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990.

ANSI/ASME B31.3, *Code for Chemical Plant and Petroleum Refinery Piping*, 1993.

ASME *Boiler and Pressure Vessel Code,* 1995.

**5.1.3 CGA Publication.** Compressed Gas Association, Inc., 1725 Jefferson Davis Highway, Arlington, VA 22202-4100.

S-1.3, *Safety Relief Device Standards for Compressed Gas Storage Containers*, 1980.

**5.1.4 ASTM Publication.** American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 1994.

**5.1.5 U.S. Government Publication.** U.S. Government Printing Office, Washington, DC 20402.

DOT Specifications and Regulations. Title 49, *Code of Federal Regulations*, Parts 171–190, "Transportation." (Also available from the Association of American Railroads, 50F Street NW, Washington, DC 20001 and American Trucking Assn., Inc., 2200 Mill Road, Alexandria, VA 22314.)

## Appendix A Explanatory Material

*Appendix A is not a part of the requirements of this NFPA document but is included for informational purposes only. This appendix contains explanatory material, numbered to correspond with the applicable text paragraphs.*

**A.1.1.1** Oxygen gas is colorless, odorless, tasteless, and nontoxic. It comprises about 21 percent of normal air and is about 10 percent heavier than air. At atmospheric pressure and temperatures below –297°F (–182.5°C) oxygen is a liquid. Oxygen is stable in both gas and liquid phases. In the absence of moisture, oxygen in the gaseous or liquid form is noncorrosive.

Oxygen is nonflammable. Ignition of combustible materials can occur more readily in an oxygen-rich atmosphere than in air, and combustion proceeds at a faster rate, although no more total heat is released. This standard, therefore, provides primarily for protection of the bulk oxygen system from involvement by fire from sources apart from the system itself. It is important to locate bulk oxygen systems in well-ventilated locations, since oxygen-rich atmospheres can collect temporarily in confined areas in the event of functioning of a safety relief device or leakage from the system.

**A.1.1.4** For information on oxygen systems having capacities less than those stated in definition 1.3.3, Bulk Oxygen System, see NFPA 51, *Standard for the Design and Installation of Oxygen–Fuel Gas Systems for Welding, Cutting, and Allied Processes*, NFPA 55, *Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders*, and NFPA 99, *Standard for Health Care Facilities (Chapters 4 and 8).*

**A.1.2** Compatibility involves both combustibility and ease of ignition. Materials that burn in air will burn violently in pure oxygen at normal pressure and explosively in pressurized oxygen. Also, many materials that do not burn in air will do so in pure oxygen, particularly under pressure. Metals for containers and piping must be selected carefully, depending on service conditions. The various steels are acceptable for many applications, but some service conditions can call for other materials (usually copper or its alloys) because of their greater resistance to ignition and lower rate of combustion. Data regarding the combustibility and ease of ignition of materials is available in NFPA 53, *Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres*.

Similarly, materials that can be ignited in air have lower ignition energies in oxygen. Many such materials can be ignited by friction at a valve seat or stem packing or by adiabatic compression produced when oxygen at high pressure is rapidly introduced into a system initially at low pressure. Other recognized ignition mechanisms include particle impact, mass impact, static electric discharge, electrical arc, fresh metal exposure, resonance, and promoted ignition.

**A.1.3.1 Approved.** NFPA does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

**A.1.3.2 Authority Having Jurisdiction.** The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

**A.1.3.9 Listed.** The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

**A.2.1.5** When locating bulk oxygen systems near all classes of aboveground flammable or combustible liquid storage that may be either indoors or outdoors, it is advisable to locate the system on ground higher than the flammable or combustible liquid storage.

**A.2.2** Figure A.2.2 serves to illustrate the separation distances between bulk oxygen systems and exposures.

These distances do not apply where protective structures having a minimum fire resistance rating of 2 hours interrupt the line of sight between uninsulated portions of the bulk oxygen storage installation and the exposure. The protective structures protect uninsulated oxygen storage containers or supports, control equipment, and system piping (or parts thereof) from external fire exposure. Liquid oxygen storage containers are insulated. Such containers can provide line-of-sight protection for uninsulated system components. Interruption of the line of sight means that an "eye" on any part of the uninsulated portion of the bulk oxygen storage installation cannot "see" any part of the exposure.

**A.2.2.6** See NFPA 50B, *Standard for Liquefied Hydrogen Systems at Consumer Sites*.

**A.3.2.3** Some materials suitable for low-temperature piping are austenitic chromium–nickel alloy steels, copper, copper–silicon alloys, aluminum, and some brasses and bronzes.

**A.3.5.9** Bulk oxygen installations are not hazardous (classified) locations as defined and covered in NFPA 70, *National Electrical Code®* general-purpose types of electrical wiring and equipment are acceptable.

## Appendix B Referenced Publications

**B.1** The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not considered part of the requirements of this standard unless also listed in Chapter 5. The edition indicated here for each reference is the current edition as of the date of the NFPA issuance of this standard.

**B.1.1 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 50B, *Standard for Liquefied Hydrogen Systems at Consumer Sites*, 1999 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen–Fuel Gas Systems for Welding, Cutting, and Allied Processes*, 1997 edition.

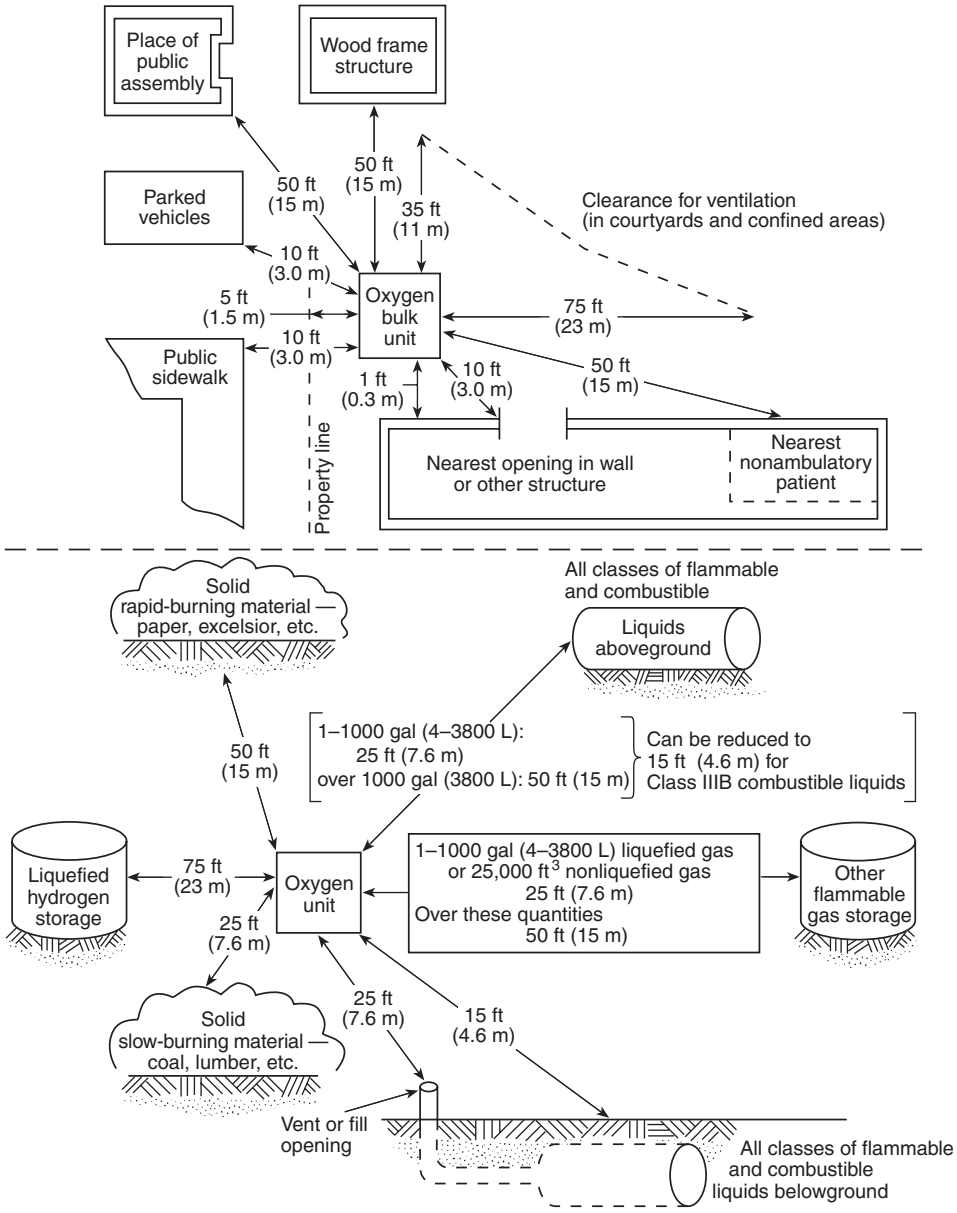
NFPA 53, *Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres*, 1999 edition.

NFPA 55, *Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders*, 1998 edition.

NFPA 70, *National Electrical Code®*, 1999 edition.

NFPA 99, *Standard for Health Care Facilities*, 1999 edition.

**FIGURE A.2.2 Distance between bulk oxygen systems and exposures.**



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