

# CHAPTER 40

## OXIDIZERS

### SECTION 4001 GENERAL

**4001.1 Scope.** The storage and use of oxidizers shall be in accordance with this chapter and Chapter 27. Compressed gases shall also comply with Chapter 30.

**Exceptions:**

1. Display and storage in Group M and storage in Group S occupancies complying with Section 2703.11.
2. Bulk oxygen systems at industrial and institutional consumer sites shall be in accordance with NFPA 55.

**4001.2 Permits.** Permits shall be required as set forth in Section 105.6.

### SECTION 4002 DEFINITIONS

**4002.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**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 cubic feet (566 m<sup>3</sup>) of oxygen at normal temperature and pressure (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 can be stationary or movable, and the oxygen can be stored as a gas or liquid.

**OXIDIZER.** A material that readily yields oxygen or other oxidizing gas, or that readily reacts to promote or initiate combustion of combustible materials. Examples of other oxidizing gases include bromine, chlorine and fluorine.

**Class 4.** An oxidizer that can undergo an explosive reaction due to contamination or exposure to thermal or physical shock. In addition, the oxidizer will enhance the burning rate and can cause spontaneous ignition of combustibles.

**Class 3.** An oxidizer that will cause a severe increase in the burning rate of combustible materials with which it comes in contact or that will undergo vigorous self-sustained decomposition caused by contamination or exposure to heat.

**Class 2.** An oxidizer that will cause a moderate increase in the burning rate or that causes spontaneous ignition of combustible materials with which it comes in contact.

**Class 1.** An oxidizer whose primary hazard is that it slightly increases the burning rate but which does not cause sponta-

neous ignition when it comes in contact with combustible materials.

**OXIDIZING GAS.** A gas that can support and accelerate combustion of other materials.

### SECTION 4003 GENERAL REQUIREMENTS

**4003.1 Quantities not exceeding the maximum allowable quantity per control area.** The storage and use of oxidizers in amounts not exceeding the maximum allowable quantity per control area indicated in Section 2703.1 shall be in accordance with Sections 2701, 2703, 4001 and 4003. Oxidizing gases shall also comply with Chapter 30.

**4003.1.1 Special limitations for indoor storage and use by occupancy.** The indoor storage and use of oxidizers shall be in accordance with Sections 4003.1.1.1 through 4003.1.1.3.

**4003.1.1.1 Class 4 liquid and solid oxidizers.** The storage and use of Class 4 liquid and solid oxidizers shall comply with Sections 4003.1.1.1.1 through 4003.1.1.1.4.

**4003.1.1.1.1 Group A, E, I or U occupancies.** In Group A, E, I or U occupancies, any amount of Class 4 liquid and solid oxidizers shall be stored in accordance with the following:

1. Class 4 liquid and solid oxidizers shall be stored in hazardous materials storage cabinets complying with Section 2703.8.7.
2. The hazardous materials storage cabinets shall not contain other storage.

**4003.1.1.1.2 Group R occupancies.** Class 4 liquid and solid oxidizers shall not be stored or used within Group R occupancies.

**4003.1.1.1.3 Offices, and retail sales areas.** Class 4 liquid and solid oxidizers shall not be stored or used in offices, or retail sales areas of Group B, F, M or S occupancies.

**4003.1.1.1.4 Classrooms.** In classrooms of Group B, F or M occupancies, any amount of Class 4 liquid and solid oxidizers shall be stored in accordance with the following:

1. Class 4 liquid and solid oxidizers shall be stored in hazardous materials storage cabinets complying with Section 2703.8.7.
2. Hazardous materials storage cabinets shall not contain other storage.

**4003.1.1.2 Class 3 liquid and solid oxidizers.** A maximum of 200 pounds (91 kg) of solid or 20 gallons (76 L) of liquid Class 3 oxidizer is allowed in Group I occupancies when such materials are necessary for maintenance purposes or operation of equipment. The oxidizers shall be stored in approved containers and in an approved manner.

**4003.1.1.3 Oxidizing gases.** Except for cylinders not exceeding a capacity of 250 cubic feet (7 m<sup>3</sup>) each used for maintenance purposes, patient care or operation of equipment, oxidizing gases shall not be stored or used in Group A, B, E, I or R occupancies.

The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the maximum allowable quantity per control area listed in Table 2703.1.1(1).

Medical gas systems and medical gas supply cylinders shall also be in accordance with Section 3006.

**4003.1.2 Emergency shutoff.** Compressed gas systems conveying oxidizing gases shall be provided with approved manual or automatic emergency shutoff valves that can be activated at each point of use and at each source.

**4003.1.2.1 Shutoff at source.** A manual or automatic fail-safe emergency shutoff valve shall be installed on supply piping at the cylinder or bulk source. Manual or automatic cylinder valves are allowed to be used as the required emergency shutoff valve when the source of supply is limited to unmanifolded cylinder sources.

**4003.1.2.2 Shutoff at point of use.** A manual or automatic emergency shutoff valve shall be installed on the supply piping at the point of use or at a point where the equipment using the gas is connected to the supply system.

**4003.1.3 Ignition source control.** Ignition sources in areas containing oxidizing gases shall be controlled in accordance with Section 2703.7.

**4003.2 Quantities exceeding the maximum allowable quantity per control area.** The storage and use of oxidizers in amounts exceeding the maximum allowable quantity per control area indicated in Section 2703.1 shall be in accordance with Chapter 27 and this chapter.

**SECTION 4004  
STORAGE**

**4004.1 Indoor storage.** Indoor storage of oxidizers in amounts exceeding the maximum allowable quantity per control area indicated in Table 2703.1.1(1) shall be in accordance with Sections 2701, 2703, 2704 and this chapter.

**4004.1.1 Detached storage.** Storage of liquid and solid oxidizers shall be in detached buildings when required by Section 2703.8.2.

**4004.1.2 Distance from detached storage buildings to exposures.** In addition to the requirements of the *International Building Code*, detached storage buildings shall be located in accordance with Table 4004.1.2.

**TABLE 4004.1.2  
OXIDIZER LIQUIDS AND SOLIDS—DISTANCE FROM DETACHED BUILDINGS AND OUTDOOR STORAGE AREAS TO EXPOSURES**

OXIDIZER CLASS	WEIGHT (pounds)	MINIMUM DISTANCE TO BUILDINGS, LOT LINES, PUBLIC STREETS, PUBLIC ALLEYS, PUBLIC WAYS OR MEANS OF EGRESS (feet)
1	Note a	Not Required
2	Note a	35
3	Note a	50
4	Over 10 to 100	75
	101 to 500	100
	501 to 1,000	125
	1,001 to 3,000	200
	3,001 to 5,000	300
	5,001 to 10,000	400
	Over 10,000	As required by the fire code official

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg.

a. Any quantity over the amount required for detached storage in accordance with Section 2703.8.2, or over the outdoor maximum allowable quantity for outdoor control areas.

**4004.1.3 Explosion control.** Indoor storage rooms, areas and buildings containing Class 4 liquid or solid oxidizers shall be provided with explosion control in accordance with Section 911.

**4004.1.4 Automatic sprinkler system.** The automatic sprinkler system shall be designed in accordance with NFPA 430.

**4004.1.5 Liquid-tight floor.** In addition to Section 2704.12, floors of storage areas for liquid and solid oxidizers shall be of liquid-tight construction.

**4004.1.6 Smoke detection.** An approved supervised smoke detection system in accordance with Section 907 shall be installed in liquid and solid oxidizer storage areas. Activation of the smoke detection system shall sound a local alarm.

**Exception:** Detached storage buildings protected by an approved automatic fire-extinguishing system.

**4004.1.7 Storage conditions.** The maximum quantity of oxidizers per building in detached storage buildings shall not exceed those quantities set forth in Tables 4004.1.7(1) through 4004.1.7(4).

The storage configuration for liquid and solid oxidizers shall be as set forth in Tables 4004.1.7(1) through 4004.1.7(4).

Class 2 oxidizers shall not be stored in basements except when such storage is in stationary tanks.

Class 3 and 4 oxidizers in amounts exceeding the maximum allowable quantity per control area set forth in Section 2703.1 shall be stored on the ground floor only.

**TABLE 4004.1.7(1)  
STORAGE OF CLASS 1 OXIDIZER LIQUIDS AND SOLIDS IN COMBUSTIBLE CONTAINERS<sup>a</sup>**

STORAGE CONFIGURATION	LIMITS (feet)
Piles	
Maximum length	No Limit
Maximum width	50
Maximum height	20
Minimum distance to next pile	3
Minimum distance to walls	2
Maximum quantity per pile	No Limit
Maximum quantity per building	No Limit

For SI: 1 foot = 304.8 mm.

- a. Storage in noncombustible containers or in bulk in detached storage buildings is not limited as to quantity or arrangement.

**TABLE 4004.1.7(2)  
STORAGE OF CLASS 2 OXIDIZER LIQUIDS AND SOLIDS<sup>a,b</sup>**

STORAGE CONFIGURATION	LIMITS		
	Segregated storage	Cutoff storage rooms <sup>c</sup>	Detached building
Piles			
Maximum width	16 feet	25 feet	25 feet
Maximum height	10 feet	12 feet	12 feet
Minimum distance to next pile	Note d	Note d	Note d
Minimum distance to walls	2 feet	2 feet	2 feet
Maximum quantity per pile	20 tons	50 tons	200 tons
Maximum quantity per building	200 tons	500 tons	No Limit

For SI: 1 foot = 304.8 mm, 1 ton = 0.907185 metric ton.

- a. Storage in noncombustible containers is not limited as to quantity or arrangement, except that piles shall be at least 2 feet from walls in sprinklered buildings and 4 feet from walls in nonsprinklered buildings; the distance between piles shall not be less than the pile height.
- b. Quantity limits shall be reduced by 50 percent in buildings or portions of buildings used for retail sales.
- c. Cutoff storage rooms shall be separated from the remainder of the building by 2-hour fire barriers.
- d. Aisle width shall not be less than the pile height.

**TABLE 4004.1.7(3)  
STORAGE OF CLASS 3 OXIDIZER LIQUIDS AND SOLIDS<sup>a,b</sup>**

STORAGE CONFIGURATION	LIMITS		
	Segregated storage	Cutoff storage rooms <sup>c</sup>	Detached building
Piles			
Maximum width	12 feet	16 feet	20 feet
Maximum height	8 feet	10 feet	10 feet
Minimum distance to next pile	Note d	Note d	Note d
Minimum distance to walls	4 feet	4 feet	4 feet
Maximum quantity per pile	20 tons	30 tons	150 tons
Maximum quantity per building	100 tons	500 tons	No Limit

For SI: 1 foot = 304.8 mm, 1 ton = 0.907185 metric ton.

- a. Storage in noncombustible containers is not limited as to quantity or arrangement, except that piles shall be at least 2 feet from walls in sprinklered buildings and 4 feet from walls in nonsprinklered buildings; the distance between piles shall not be less than the pile height.
- b. Quantity limits shall be reduced by 50 percent in buildings or portions of buildings used for retail sales.
- c. Cutoff storage rooms shall be separated from the remainder of the building by 2-hour fire barriers.
- d. Aisle width shall not be less than the pile height.

**TABLE 4004.1.7(4)  
STORAGE OF CLASS 4 OXIDIZER LIQUIDS AND SOLIDS**

STORAGE CONFIGURATION	LIMITS (feet)
Piles	
Maximum length	10
Maximum width	4
Maximum height	8
Minimum distance to next pile	8
Maximum quantity per building	No Limit

For SI: 1 foot = 304.8 mm.

**4004.1.8 Separation of Class 4 oxidizers from other materials.** In addition to the requirements in Section 2703.9.8, Class 4 oxidizer liquids and solids shall be separated from other hazardous materials by not less than a 1-hour fire barrier or stored in hazardous materials storage cabinets.

Detached storage buildings for Class 4 oxidizer liquids and solids shall be located a minimum of 50 feet (15 240 mm) from other hazardous materials storage.

**4004.1.9 Contamination.** Liquid and solid oxidizers shall not be stored on or against combustible surfaces. Liquid and solid oxidizers shall be stored in a manner to prevent contamination.

**4004.2 Outdoor storage.** Outdoor storage of oxidizers in amounts exceeding the maximum allowable quantities per control area set forth in Table 2703.1.1(3) shall be in accordance with Sections 2701, 2703, 2704 and this chapter. Oxidizing gases shall also comply with Chapter 30.

**4004.2.1 Distance from storage to exposures for liquid and solid oxidizers.** Outdoor storage areas for liquid and solid oxidizers shall be located in accordance with Table 4004.1.2.

**4004.2.2 Distance from storage to exposures for oxidizer gases.** Outdoor storage areas for oxidizer gases shall be located in accordance with Table 4004.2.2.

**4004.2.3 Storage configuration for liquid and solid oxidizers.** Storage configuration for liquid and solid oxidizers shall be in accordance with Tables 4004.1.7(1) through 4004.1.7(4).

**4004.2.4 Storage configuration for oxidizer gases.** Storage configuration for oxidizer gases shall be in accordance with Table 4004.2.2.

**SECTION 4005  
USE**

**4005.1 Scope.** The use of oxidizers in amounts exceeding the maximum allowable quantity per control area indicated in Table 2703.1.1(1) or 2703.1.1(3) shall be in accordance with Sections 2701, 2703, 2705 and this chapter. Oxidizing gases shall also comply with Chapter 30.

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**TABLE 4004.2.2  
OXIDIZER GASES—DISTANCES FROM STORAGE TO EXPOSURES<sup>a</sup>**

<b>QUANTITY OF GAS STORED (cubic feet at NTP)</b>	<b>DISTANCE TO A BUILDING NOT ASSOCIATED WITH THE MANUFACTURE OR DISTRIBUTION OF OXIDIZER GASES OR PUBLIC WAY OR LOT LINE THAT CAN BE BUILT UPON (feet)</b>	<b>DISTANCE BETWEEN STORAGE AREAS (feet)</b>
0 - 50,000	5	5
50,001 - 100,000	10	10
100,001	15	10

For SI: 1 foot = 304.8 mm, 1 cubic foot = 0.02832 m<sup>3</sup>.

- a. The minimum required distances shall not apply when fire barriers without openings or penetrations having a minimum fire-resistance rating of 2 hours interrupt the line of sight between the storage and the exposure. The configuration of the fire barrier shall be designed to allow natural ventilation to prevent the accumulation of hazardous gas concentrations.