



UC Davis Health Fire Marshal's Office Fire Prevention

4800 2nd Avenue, Suite 3010 · Sacramento, CA 95817 · (916) 734-1223 · hs-fireprevention@ucdavis.edu

Fire & Life Safety Standard

Title: Storage of Medical Gases in Group I-2 Hospitals, Version 1.0

Note: This standard is a summary of the applicable codes for the storage of medical gases within hospitals accredited by the Joint Commission. Information contained herein applies to typical circumstances and may not address all situations.

1. Purpose

This standard was developed with safety as the principal objective, pursuant to the California Fire Code (CFC) the fire code official is authorized to render interpretations of the CFC, and to adopt policies, procedures, rules and regulations in order to clarify the application of its provisions. Such interpretations, policies, procedures, rules and regulations shall be in compliance with the intent and purpose of the CFC and shall not have the effect of waiving requirements specifically provided for in the CFC.

2. Scope

The CFC defines specific upper limits or maximum allowable quantities (MAQs) for hazardous materials based on several determining factors. Some of these factors are based on the properties of the hazardous material (e.g., the hazard class and physical state), while others are based on building attributes such as construction type, occupancy type, and the presence of fire sprinklers.

The regulations for the storage of medical gases at health care facilities can be complex. This standard has been developed as a resource outlining the applicable regulations to assist health care professionals with compliance. This standard covers medical gas cylinders that are commonly used within hospitals for direct patient care. This standard does not cover bulk oxygen systems or rated supply locations.

3. Medical Gases

Medical gases as defined by the National Fire Protection Association (NFPA) are gases such as oxygen, nitrous oxide, helium, carbon dioxide, and medical air that are used in the application of human respiration and the calibration of medical devices used for human respiration (Section 3.3.142, NFPA 99 2012 edition). This standard is primarily focused on the storage of oxygen within Institutional Group I-2 occupancies.

4. Institutional Group I-2 Occupancy

An Institutional Group I-2 occupancy is the use of a building or structure, or a portion thereof, for medical care on a 24-hour basis for more than five persons who are not capable of self-preservation or classified as non-ambulatory or bedridden. Institutional Group I-2 occupancies include hospitals, nursing homes, psychiatric hospitals and detoxification facilities. (CFC Section 202) This standard is primarily focused on the storage of oxygen within hospitals.

5. Applicable Regulations

The regulations associated with the storage of medical gases in hospitals can be divided into two groups. The first is the California Building Standards Code (California Code of Regulations (CCR), Title 24). The second includes regulations adopted by the Centers for Medicare and Medicaid Services (CMS). CMS is the federal agency that oversees quality standards for health care facilities and designates national accreditation organizations such as the Joint Commission (TJC).



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6. California Building Standards Code, CCR Title 24

2022 California Building Code, CCR Title 24, Part 2

The California Building Code (CBC) contains general building design and construction requirements relating to fire and life safety, structural safety, and access compliance. CBC provisions provide minimum standards to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures and certain equipment.

2022 California Fire Code, CCR Title 24, Part 9

The California Fire Code (CFC) contains regulations consistent with nationally recognized and accepted practices for safeguarding life and property from fire, explosions, and dangerous conditions arising from the storage, handling, and use of hazardous materials and devices.

7. NFPA Standards for CMS and TJC Accreditation

NFPA 99, Health Care Facilities Code, 2012 edition

NFPA 99 establishes risk-based criteria to help ensure health care facility compliance and protect patients, staff, and property from fire, explosion, and electrical hazards.

NFPA 101, Life Safety Code, 2012 edition

NFPA 101 addresses construction, protection, and occupancy features necessary to minimize danger to life from the effects of fire, including smoke, heat, and toxic gases created during a fire.

8. California Building Standards Code Verses NFPA Standards Adopted by CMS for TJC Accreditation

The regulations for the storage and use of medical gases contained within the California Building Standards Code and those contained within NFPA standards adopted by CMS for TJC accreditation provide consistent requirements for the storage of medical gases within hospitals. When the provisions of these two codes differ the more restrictive shall apply.

9. Determining the Amount of Oxygen Permitted within a Hospital

There are several code provisions used to determine the amount of oxygen permitted within a hospital. They include, but are not limited to, quantity, location, and if cylinders are being utilized for immediate patient care. This standard will outline each code provision from both the California Building Standards Code and NFPA standards adopted by CMS for accreditation.

10. Fire Resistance Rating Requirements

The CBC in Table 414.2.2, requires that walls separating control areas have a fire-resistance rating of either one or two hours, this wall assembly is called a fire barrier. A fire barrier is defined as a fire resistance rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained. When determining control areas within a hospital, the location, construction and continuity of fire barriers should be verified.

Additionally, CBC section 414.2.4 requires that the floor assembly of the control area and the construction supporting the floor assembly to have a fire-resistance rating of not less than two hours. The two hour rating applies to all hospitals greater than 5,200 square feet per CBC 407.1.1. When determining control areas within a hospital, the construction and continuity of the floor assembly should be verified.



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11. Smoke Compartments

The CBC defines a smoke compartment as a space within a building separated from other interior areas of the building by smoke barriers, including interior walls and horizontal assemblies. Within a hospital, a smoke compartment has a maximum size of 22,500 square feet as specified in CBC section 407.5.1. This definition is important when incorporating the CMS requirements for TJC accreditation. The 2012 edition of NFPA 99 specifies in section 11.3.3.1 that individual cylinder storage areas not exceeding 22,500 square feet of floor area, shall not be required to be stored in enclosures.

12. Common Medical Gas Cylinders Utilized within Hospitals

The chart below includes the most common oxygen cylinders used within hospitals. Cylinder size and volume can be identified either by a single letter designation or by the letter M with a corresponding number approximating the cylinder's volume in SCF. An example based on the chart below is that an "E" cylinder is equivalent to an "M-24" which contains approximately twenty-four SCF of oxygen.

Cylinder Size		Cylinder Volume (SCF)
A	M-4	4
B	M-6	6
D	M-15	15
E	M-24	24
H	M-250	244

13. Cylinders In Storage

The 2012 edition of NFPA 99 specifies that cylinders in storage are those cylinders that are **not** available for immediate use in patient care areas and are not attached to medical equipment. The amount of storage shall be 300 SCF or less within interior spaces with doors that can be secured against unauthorized entry.

14. Full, Partial or Empty Cylinder

The 2012 edition of NFPA 99 specifies in section 11.6.5.2.1, that when a facility employs cylinders with an internal pressure gauge, it shall establish the threshold pressure at which a cylinder is considered empty. UCDH Policy 1685, Handling and Storage of Compressed Medical Gas, outlines the following thresholds:

- **FULL:** Unused cylinder with a pressure of 1800 PSI or greater.
- **PARTIAL:** A partially consumed cylinder with a remaining pressure less than 1800 PSI but greater than 500 PSI.
- **Empty:** A fully consumed cylinder with a pressure of 500 PSI or lower.

Full and partial cylinders may be stored in the same room but cannot be comingled and need to be segregated in separate storage racks. Full and partial cylinders cannot be stored in a dirty utility room.

Empty cylinders shall not be stored in the same room used to store full and partial cylinders and should be marked to avoid confusion and delay if a full cylinder is needed in a rapid manner. All cylinders stored within an approved rack shall have a sign placed above indicating full, partial or empty cylinders.



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15. Cylinders In-Use Versus Storage

The 2012 edition of NFPA 99 specifies in section 11.3.3.3 that when small-size (A, B, D, or E) cylinders are in use, they shall be attached to a cylinder stand or to medical equipment designed to receive and hold compressed gas cylinders. Section 11.3.3.4 further states that individual small-size (A, B, D, or E) cylinders available for immediate use in patient care areas shall not be considered to be in storage.

The CFC became consistent with NFPA 99 with the July 2024 Supplement by including the following exception in section 5003.1.1 as follows: Exception: Medical gases utilized for patient care within patient areas of a Group I-2 occupancy when the applicable requirements of NFPA 99 chapter 5 and Chapter 11 have been met. Medical gases meeting this exception are not included when determining maximum allowable quantities in storage.

16. Frequently Asked Questions

Can oxygen cylinders be stored in elevator lobbies or corridors for later distribution?

- Oxygen cylinders can only be stored within interior spaces equipped with doors that can be secured against unauthorized entry. Storage in elevator lobbies or corridors is not permitted. **Section 13**

When is oxygen considered to be in storage?

- Oxygen cylinders in storage are those cylinders that are **not** available for immediate use in patient care areas and are not attached to medical equipment. **Section 13**

If an oxygen cylinder is attached to a patient bed or medical equipment is it considered in storage?

- Individual small-size (A, B, D, or E) cylinders available for immediate use in patient care areas shall not be considered to be in storage. **Section 15**

How many cubic feet of oxygen in individual cylinder storage are permitted within a smoke compartment?

- Individual cylinder storage within a smoke compartment shall not exceed 300 SCF. **Sections 11 and 13.**

How many size "E" cylinders of oxygen equals 300 SCF?

- Twelve "E" sized oxygen cylinders contain approximately 300 SCF of oxygen. **Section 12.**

How do you determine if a cylinder is full or empty?

- Individual cylinder pressure determines cylinder status. **Section 14.**