

Guide to the Safe Use of COMPRESSED GAS CYLINDERS

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combustible materials), which are located at one-third and two-thirds the height of the cylinder.

Santa Clara County Central Fire Protection District, Standard Details & Specification #SI-3
CCR, Title 8, Section 4650 (e)
CCR, Title 19, Section 3.18
CCR, Title 24, Part 9, Section 7401.6.4
NFPA 45, 8-1.5
NFPA 99, 4-3.1.1.2.3
CCR, Title 19, Section 3.18(a)

A restraint system of chains, metal straps, or storage racks provides a reliable method of securing gas cylinders. Chains or metal straps at the bottom and top one third of each cylinder provides protection against tipping and falling. [Work Practice Note: When compressed gas cylinders in service, they shall be adequately secured by chains, metal straps, or other approved materials, to prevent cylinders from falling or being knocked over.]

- 3. The purchase and installation of compressed gas cylinder securing systems must be subject to review and approval of EH&S.**

Good Practice per Stanford EH&S

EH&S can assist in identifying good quality securing systems.

- 4. Gas cylinder securing systems should be anchored to a permanent building member or fixture.**

Good practice

Connection to a permanent building member or fixture is needed to prevent movement during a seismic event.

D. Storage of Compressed Gas Cylinders - Toxic and Highly Toxic Gases

Note: The following requirements apply to H-7 occupancies only.

- 1. Laboratory design shall incorporate storage capabilities of compressed gas cylinders of toxic and highly toxic gases per the following table. The number of lecture bottle cylinders [approximately 5 cm x 33 cm (2 in. x 13 in.)] shall be limited to 25.**

Table 6-1

	Flammable Gases	or	Oxidizing	Liquefied Flammable Gases		Gases with Health Hazard Rating of 3 or 4
	Sprinklered Space		Nonsprinklered Space	Sprinklered Space	Nonsprinklered Space	Nonsprinklered or Sprinklered Space
Max. no. of cylinders per 46.5m ² (500 ft ²) or less	6		3	3	2	3

NFPA 45, Table 8-1

➤ **Storage Systems**

2. **Laboratory design shall include one of the following storage systems for toxic and highly toxic compressed gas cylinders:**

- **ventilated gas cabinets/exhausted enclosures/ laboratory fume hoods; or**
- **separate ventilated gas storage rooms without other occupancy or use, which have explosion control.**

CCR, Title 24, Part 9, Section 8003.3

CCR, Title 24, Part 9, Section 8003.1.12

3. **When gas cabinets or exhausted enclosures are provided they shall:**

- a. **be located in a room or area which has independent exhaust ventilation;**
- b. **operate at negative pressure in relation to the surrounding area;**
- c. **have self-closing limited access parts or noncombustible windows to provide access to equipment controls, with an average face velocity of at least 200 fpm and with a minimum of 150 fpm at any part of the access port or window;**
- d. **be connected to an exhaust system;**
- e. **have self-closing doors and be constructed of at least 0.097 inch (12 gauge) steel;**
- f. **be internally sprinklered;**
- g. **be seismically anchored;**

➤ **Security**

- 10. Storage areas shall be secured against unauthorized entry.**

CCR, Title 24, Part 9, Section 7401.6.1

E. Storage of Compressed Gas Cylinders - Medical Gases

- 1. Enclosures such as 1-hour interior and exterior rooms (detailed below) must be provided for supply systems cylinder storage or manifold locations for oxidizing agents such as oxygen and nitrous oxide. Such enclosures must be constructed of an assembly of building materials with a fire-resistive rating of at least 1 hour and must not communicate directly with anesthetizing locations.**

CCR, Title, 8, Section 4650(d)
NFPA 99, Sections 4-3.1.1.2(a).2

Other nonflammable (inert) medical gases may be stored in the enclosure. Flammable gases shall not be stored with oxidizing agents. Storage of full or empty cylinders is permitted. Such enclosures shall serve no other purpose.

- 2. A 1-hour exterior room shall be a room or enclosure separated from the rest of the building by not less than 1-hour-rated fire-resistive construction. Openings between the room or enclosure and interior spaces shall be smoke-and draft-control assemblies having no less than a 1-hour fire-protection rating. Rooms shall have at least one exterior wall provided with at least two vents. Each vent shall not be less than 36 square inches in area. One vent shall be within 6 inches of the floor and one shall be within 6 inches of the ceiling. Containers of medical gases shall be provided with at least one fire sprinkler to provide container cooling in case of fire.**

CCR, Title 24, Part 9, Section 7404.2.1.2

- 3. When an exterior wall cannot be provided for the room, automatic sprinklers shall be installed within the room. The room shall be exhausted through a duct to the exterior. Makeup air to the room shall be taken from the exterior. Both separate air streams shall be enclosed in a 1-hour-rated shaft enclosure from the room to the exterior. Approved mechanical ventilation shall be in accordance with the California Mechanical Code and provided at a minimum rate of 1 cubic foot per minute per square foot of the room area.**

CCR, Title 24, Part 9, Section 7404.2.1.3 CCR, Title 24, Part 9, Section 7404.2.1.3

- 4. Medical gas system cabinets shall be in accordance with the following:**
- a. Operated at a negative pressure in relation to surrounding area,**

- b. Provided with self-closing, limited-access ports or noncombustible windows to give access to equipment controls. The average velocity of ventilation at the face of access ports or windows shall not be less than 200 feet per minute, with a minimum of 150 feet per minute at any point of the access port or window,**
- c. Connected to an exhaust system,**
- d. Provided with a self-closing door,**
- e. Constructed of not less than 0.097-inch (12 gage) steel, and**
- f. Internally sprinklered.**

CCR, Title 24, Part 9, Section 7404.2.1.4