

<p>July 1, 2010</p>	<p><b>SANTA ROSA FIRE DEPARTMENT</b>  <b>FIRE PREVENTION BUREAU STANDARD</b></p>
	<p><b>MEDICAL GAS SYSTEMS</b></p>

**SCOPE:**

This standard provides requirements for Medical Gas Systems. This Standard is not all-inclusive of all Code requirements, but is intended as a guide to the State Laws and Codes and local requirements. These requirements are based upon codes in effect as of the date of this standard.

**CODE REFERENCES:**

- 2007 CFC Chapter 30 Compressed Gases Section 3006
- 2007 CFC Chapter 27 Sections 2703.2.2.1, 2703.8.6.3 and 4004.2.1
- 2005 NFPA 99

**PERMIT REQUIRED:**

Medical and Other Compressed Gas System Installation Permit is required to install a Medical Gas System. Permit includes cryogenic systems, excludes compressed air systems.

**GENERAL REQUIREMENTS**

**CFC 2703.2.2.1 Design and construction.**

Piping, tubing, valves, fittings and related components used for hazardous materials shall be in accordance with the following:

1. Piping, tubing, valves, fittings and related components shall be designed and fabricated from materials that are compatible with the material to be contained and shall be of adequate strength and durability to withstand the pressure, structural and seismic stress and exposure to which they are subject.
2. Piping and tubing shall be identified in accordance with ASME A13.1 to indicate the material conveyed.
3. Readily accessible manual valves or automatic remotely activated fail-safe emergency shutoff valves shall be installed on supply piping and tubing at the following locations:
  - 3.1. The point of use.
  - 3.2. The tank, cylinder or bulk source.
4. Manual emergency shutoff valves and controls for remotely activated emergency shutoff valves shall be identified and the location shall be clearly visible, accessible and indicated by means of a sign.
5. Backflow prevention or check valves shall be provided when the backflow of hazardous materials could create a hazardous condition or cause the unauthorized discharge of hazardous materials.
6. Where gases or liquids having a hazard ranking of:

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Health hazard Class 3 or 4

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Flammability Class 4

Reactivity Class 3 or 4

in accordance with NFPA 704 are carried in pressurized piping above 15 pounds per square inch gauge (psig) (103 kPa), an approved means of leak detection and emergency shutoff or excess flow control shall be provided. Where the piping originates from within a hazardous material storage room or area, the excess flow control shall be located within the storage room or area. Where the piping originates from a bulk source, the excess flow control shall be located as close to the bulk source as practical.

**Exceptions:**

1. Piping for inlet connections designed to prevent backflow.
2. Piping for pressure relief devices.

**CFC 2703.8.6.3 Maximum number of cylinders per gas cabinet.**

The number of cylinders contained in a single gas cabinet shall not exceed three.

**CFC SECTION 3006 MEDICAL GAS SYSTEMS**

**CFC 3006.1 General.**

Compressed gases at hospitals and similar facilities intended for inhalation or sedation including, but not limited to, analgesia systems for dentistry, podiatry, veterinary and similar uses shall comply with this section in addition to other requirements of this chapter.

**CFC 3006.2 Interior supply location.**

Medical gases shall be stored in areas dedicated to the storage of such gases without other storage or uses. Where containers of medical gases in quantities greater than the permit amount are located inside buildings, they shall be in a 1-hour exterior room, a 1-hour interior room or a gas cabinet in accordance with **CFC Section 3006.2.1, 3006.2.2 or 3006.2.3.**

**CFC 3006.2.1 One-hour exterior rooms.**

A 1-hour exterior room shall be a room or enclosure separated from the remainder of the building by fire barriers with a fire-resistance rating of not less than 1 hour. Openings between the room or enclosure and interior spaces shall be self-closing smoke- and draft control assemblies having a fire protection rating of not less than 1 hour. Rooms shall have at least one exterior wall that is provided with at least two vents. Each vent shall not be less than 36 square inches (0.023 m<sup>2</sup>) in area. One vent shall be within

6 inches (152 mm) of the floor and one shall be within 6 inches (152 mm) of the ceiling. Rooms shall be provided with at least one automatic sprinkler to provide container cooling in case of fire.

**CFC 3006.2.2 One-hour interior room.**

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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. Supply and exhaust ducts shall be enclosed in a 1-hour-rated shaft enclosure from the room to the exterior. Approved mechanical ventilation shall comply with the *California Mechanical Code* and be provided at a minimum rate of 1 cubic foot per minute per square foot [0.00508 m<sup>3</sup>/(s · m<sup>2</sup>)] of the area of the room.

### **CFC 3006.2.3 Gas cabinets.**

Gas cabinets shall be constructed in accordance with **CFC Section 2703.8.6** and the following:

1. The average velocity of ventilation at the face of access ports or windows shall not be less than 200 feet per minute (61 m/s) with a minimum of 150 feet per minute (46 m/s) at any point of the access port or window.
2. Connected to an exhaust system.
3. Internally sprinklered.

### **CFC 3006.3 Exterior supply locations.**

Oxidizer medical gas systems located on the exterior of a building with quantities greater than the permit amount shall be located in accordance with **CFC Section 4004.2.1**.

#### **CFC 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.

### **CFC 3006.4 Medical gas systems.**

Medical gas systems including, but not limited to, distribution piping, supply manifolds, connections, pressure regulators and relief devices and valves, shall comply with 2005 NFPA 99 and the general provisions of this chapter.

## **2005 NFPA CHAPTER 5 GENERAL REQUIREMENTS**

**NFPA 99: 5.1.3.3.2(2)** Rooms or enclosures shall have lockable doors.

**NFPA 99: 5.1.3.3.2(7)** Provisions are made to securely fasten or rack gas cylinders.

**NFPA 99: 5.1.11.1** All gas piping shall be labeled at the source, the outlet, and not more than every 20 ft., and at least once in or above every room, and both sides of wall penetrations.

**NFPA 99: 5.1.11.2** Shut-off valve(s) are identified with name of gas or specific vacuum system, the room or areas served, and a warning not to close or open valves except in an emergency.

**NFPA 99: 5.1.12.2** The following tests to be performed, documented, and certified by the installer:

1. Blow down test: Intermittent flow of oil-free, dry nitrogen (NF) through piping.
2. Initial pressure test for pressure gases, 1.5 times the working pressure, minimum 150 PSIG.

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3. Pipe purge test
4. Cross-connection test, no cross connection exists between systems.
5. Standing pressure test, 24 hrs at 20 percent above normal operating line pressure.

**NFPA 99: 5.1.12.3** The following system verification tests are to be performed, documented, and certified by a qualified third party:

1. Cross-connection test
2. Valve test
3. Outlet flow test
4. Alarm testing
5. Standing pressure
6. Piping particulate test
7. Pipe purge test
8. Piping purity test
9. Operational pressure test, pressure differential
10. Medical gases concentration test
11. Medical air purity test, compressor system
12. Final tie-in and labeling

**NFPA 99: 5.1.12.3.14** Source equipment verification shall be performed, documented, and certified by a qualified party:

1. Gas supply sources
2. Medical air compressor