

2019 Medical Gas Cylinder Storage, Piping & Alarms System Reminder List

Applicable Codes and Standards

CBC 2019, CEC 2019, CFC 2019
NFPA 55 2016, NFPA 99 2018

I. APPLICABILITY

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| | <p>1. The design, installation and testing of medical gas and vacuum systems shall conform to Table 1224.4.6.1 and NFPA 99-2018, <i>Standard for Health Care Facilities</i>.</p> | <p>CBC, Sec.
1224.4.6.2</p> |
| | <p>2. The performance, installation and testing of Category 1 piped medical gas and vacuum systems shall be in accordance with Section 5.1 of NFPA 99, 2018 edition. Wherever the terms medical gas or vacuum occur, the provisions of Section 5.1 apply to all piped systems for oxygen, nitrous oxide, medical air, carbon dioxide, helium, medical-surgical vacuum, waste anesthetic gas disposal, and mixtures thereof. Wherever the name of a specific gas or vacuum occurs, the provision applies only to that gas.</p> | <p>NFPA 99,
Sec. 5.1.1, Sec.
5.1.1.2 & Sec.
5.1.1.3</p> |
| | <p>3. The installation of bulk oxygen systems in excess of 20,000 cu. ft. shall be in accordance with NFPA 55, 2016 edition.</p> | <p>CFC, Sec.
5501.1 & Sec.
6301.1</p> |
| | <p>4. Storage of compressed medical gas cylinders shall be in accordance with Chapters 50 and 53 of the California Fire Code when such storage exceeds 504 cu. ft. and NFPA 99, Sec. 11.3.5 when such storage quantity is 300 cu. ft. or greater but less than 3,000 cu. ft.</p> | <p>CFC, Sec.
5306.2 & Sec.
5306.5</p> |
| | <p>5. Rooms or areas where medical gases are stored or used in quantities exceeding the maximum allowable quantity per control area as set forth in Section 5003.1 shall be in accordance with the California Building Code for high-hazard Group H occupancies.</p> | <p>CFC, Sec.
5306.2</p> |

CHK

NA

II. MEDICAL GAS STORAGE & SYSTEM SOURCE LOCATIONS

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|--------------------------|--------------------------|--|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <p>1. Medical gases shall be stored in areas dedicated to the storage of such gases without other storage or uses.</p> | <p>CFC, Sec.
5306.2</p> |
| <input type="checkbox"/> | <input type="checkbox"/> | <p>2. Medical gases in quantities greater 300 cu, ft. located inside buildings shall be in a one- hour exterior room, a one-hour interior room or a gas cabinet.</p> | <p>CFC, Sec.
5306.5 & NFPA
99, Sec. 11.3.5</p> |

CHK

NA

II. MEDICAL GAS STORAGE & SYSTEM SOURCE LOCATIONS (CONTINUED)

**CFC, Sec.
5306.2.1**

3. A one-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 one hour. Rooms shall have at least one exterior wall that is provided with not less than two have a minumum free opening area of 36 square inches each 1,000 cubic feet at normal temperature and pressure of gas stored in the room and shall be not less than 72 square inches in aggregate free opening area; one vent shall be within 6 inches of the floor and one shall be within 6 inches of the ceiling. Rooms shall be provided with at least one fire sprinkler to provide container cooling in case of fire.

**CFC, Sec.
5306.2.2**

4. When an exterior wall cannot be provided for the room, a 1-hour interior room shall be a room or enclosure separated from the remainder of the building by fire barriers or horizontal assemblies, or both, 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 assemblieshaving a fire protection rating of not less than 1 hour. 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 cfm per sq. ft. of the area of the room.

**CFC, Sec.
5306.2.3**

5. Gas cabinets shall be constructed in accordance with CFC, Section 5003.8.6 and shall have an average velocity of ventilation at access ports or windows of at least 200 fpm with a minimum of 150 fpm at any point of the access port or window, exhausted to the exterior through dedicated exhaust duct system installed in accordance with Chapter 5 of the California Mechanical Code, be connected to an exhaust system and shall be internally sprinklered, and be provided with an automatic sprinkler system internal to the cabinet.

**CFC, Sec.
5306.3**

6. Medical gas cylinders containing more than the permit amount of 504 cu. ft. of oxidizers located on the exterior of a building shall be in accordance with CFC, Section 6304.2.1.

**NFPA 99, Sec.
5.1.3.3.2(6) &
(7)**

7. When located indoors, locations for central supply systems and the storage of positive pressure (compressed) gases shall be noncombustible or limited combustible materials of not less than 1-hour fire-resistance rating with protected openings.

**NFPA 99, Sec.
5.1.3.3.2(3) &
(4)**

8. When located outdoors, locations for central supply systems and the storage of positive pressure (compressed) gases shall be located in an enclosure (wall or fencing) constructed of noncombustible materials. Outdoor locations >200 sq. ft. shall have a minimum of two entry/exits.

<u>CHK</u>	<u>NA</u>	II. MEDICAL GAS STORAGE & SYSTEM SOURCE LOCATIONS (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	9. Locations for central supply systems and the storage of positive pressure (compressed) gases shall be secured with lockable doors or gates or otherwise secured.	NFPA 99, Sec. 5.1.3.3.2(2)
<input type="checkbox"/>	<input type="checkbox"/>	10. No cylinders containing flammable gasses, or containers containing flammable liquids shall be stored in rooms containing medical gas cylinders.	NFPA 99, Sec. 5.1.3.2.4
<input type="checkbox"/>	<input type="checkbox"/>	11. Provisions shall be made for racks, chains or other fasteners to protect cylinders from falling.	NFPA 99, Sec. 5.1.3.3.2(11)
<input type="checkbox"/>	<input type="checkbox"/>	12. Electric wall fixtures, switches, receptacles, etc. shall be protected, located to avoid damage from cylinders or located at least 5 ft. above the floor.	NFPA 99, Sec. 5.1.3.3.2(8)
<input type="checkbox"/>	<input type="checkbox"/>	13. Fuel-fired equipment shall not be located in the room. If heat is required the maximum allowable temperature of the in-room heating element shall be 130°C (266°F).	NFPA 99, Sec. 5.1.3.3.2(9) & (10)
<input type="checkbox"/>	<input type="checkbox"/>	14. Medical air compressors and vacuum pumps shall be located separately from cylinder storage locations.	NFPA 99, Sec. 5.1.3.3.1.4
<input type="checkbox"/>	<input type="checkbox"/>	15. Full or empty medical gas cylinders, when not connected, shall be stored in locations complying with the requirements for a central supply location and shall be permitted to be in the same rooms or enclosures as their respective central supply systems.	NFPA 99, Sec. 5.1.3.3.4.1
<input type="checkbox"/>	<input type="checkbox"/>	16. Source locations containing compressors shall be ventilated to prevent the accumulation of heat. (medical air, medical-surgical vacuum, waste anesthetic gas disposal and instrument air sources).	NFPA 99, Sec. 5.1.3.3.3.3
<input type="checkbox"/>	<input type="checkbox"/>	17. Relief valves shall be vented to the exterior. Compressed air excepted.	NFPA 99, Sec. 5.1.3.3.3.2
<input type="checkbox"/>	<input type="checkbox"/>	18. Where natural ventilation cannot be provided, mechanical ventilation shall be provided. Mechanical exhaust to maintain a negative pressure in the space shall be provided continuously.	CFC, Sec. 5306.2.2 & NFPA 99, Sec. 9.3.6.5.3.1 & 9.3.6.5.2.5
<u>CHK</u>	<u>NA</u>	III. PIPED MEDICAL GAS SYSTEMS - SUPPLY	
<input type="checkbox"/>	<input type="checkbox"/>	1. Patient medical gas systems shall conform to the requirements for Risk Category 1 gas systems.	NFPA 99, Sec. 4.1.1
<input type="checkbox"/>	<input type="checkbox"/>	2. Task illumination and receptacles provided at the medical gas supply location which are needed for effective hospital operation shall be connected to the critical branch of the essential electrical system.	NFPA 99, Sec. 5.1.3.3.2(12) & CEC, Sec. 517-34(A)(9)
<input type="checkbox"/>	<input type="checkbox"/>	3. Indoor central supply locations for oxygen, nitrous oxide and mixtures of these gases shall not communicate with critical patient care areas, anesthetizing locations, locations storing flammables, rooms containing open electrical contacts or transformers, storage tanks for flammable or combustible liquids, engines, kitchens or areas with open flames.	NFPA 99, Sec. 5.1.3.3.1.5

<u>CHK</u>	<u>NA</u>	III. PIPED MEDICAL GAS SYSTEMS - SUPPLY (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	4. Medical gas central supply systems shall be piped only into areas where gases will be used under the direction of licensed medical professionals including: direct respiration of patients, clinical application, medical device applications directly related to respiration, power for medical devices used directly on patients, calibration of medical devices intended for such uses, and simulation centers.	NFPA 99, Sec. 5.1.3.5.2
<input type="checkbox"/>	<input type="checkbox"/>	5. Central supply systems for support gases (nitrogen and instrument air) shall not be piped to or used for any purpose except medical support application.	NFPA 99, Sec. 5.1.3.5.3
		6. Central supply systems shall have means to control the final line pressure at the source with all the following characteristics:	NFPA 99, Sec. 5.1.3.5.5.1
<input type="checkbox"/>	<input type="checkbox"/>	(1) Able to maintain stable pressures within the limits of Table 5.1.11	
<input type="checkbox"/>	<input type="checkbox"/>	(2) Each control mechanism able to flow 100 percent of the peak calculated demand.	
<input type="checkbox"/>	<input type="checkbox"/>	(3) Redundant, such that each component of the control mechanism can be isolated for service or replacement while maintaining normal operation.	
<input type="checkbox"/>	<input type="checkbox"/>	(4) Protected against overpressure (see NFPA 99, Sec. 5.1.3.5.6).	
<input type="checkbox"/>	<input type="checkbox"/>	(5) Be constructed of materials deemed suitable by the manufacturer.	
<input type="checkbox"/>	<input type="checkbox"/>	7. A pressure relief valve shall be installed between each final pressure regulator and before the source valve.	NFPA 99, Sec. 5.1.3.5.6.3(1)
<input type="checkbox"/>	<input type="checkbox"/>	8. A pressure relief valve shall be installed in the main line set a 50% above normal line pressure.	NFPA 99, Sec. 5.1.3.5.6.3(2)
<input type="checkbox"/>	<input type="checkbox"/>	9. Pressure relief valves shall vent to the exterior except that relief valves for compressed air systems having a capacity of less than 3,000 cu. ft. are permitted to be diffused locally by a means that will not restrict flow.	NFPA 99, Sec. 5.1.3.5.6.1(4)
<input type="checkbox"/>	<input type="checkbox"/>	10. When vented to the exterior, relief valve discharge lines shall be of the same materials and construction as distribution lines.	NFPA 99, Sec. 5.1.3.5.6.2
<input type="checkbox"/>	<input type="checkbox"/>	11. When vented to the exterior, relief valve discharge lines shall be labeled in accordance with Section 5.1.11.1.	NFPA 99, Sec. 5.1.3.5.6.4
<input type="checkbox"/>	<input type="checkbox"/>	12. Vent discharge terminal shall be turned down and screened to prevent the entry of rain, snow or vermin.	NFPA 99, Sec. 5.1.3.5.6.1(8)
<input type="checkbox"/>	<input type="checkbox"/>	13. The relief valve vent discharge shall not be smaller than the size of the relief valve outlet.	NFPA 99, Sec. 5.1.3.5.6.1(5)
<input type="checkbox"/>	<input type="checkbox"/>	14. Where two or more relief valves discharge into a common vent line, the internal cross-sectional area shall be not less than the aggregate cross-sectional area of all vent discharge lines served.	NFPA 99, Sec. 5.1.3.5.6.1(6)
<input type="checkbox"/>	<input type="checkbox"/>	15. An inlet for connecting a temporary emergency supply shall be incorporated into the medical gas system where the bulk oxygen central supply system is outside and remote from the building served or there is no reserve supply sufficient for an average day's supply located in the building or there are multiple freestanding buildings served from a single oxygen source. Where multiple buildings are served, each building shall have a separate emergency connection.	NFPA 99, Sec. 5.1.3.5.15

<u>CHK</u>	<u>NA</u>	III. PIPED MEDICAL GAS SYSTEMS - SUPPLY (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	16. The emergency oxygen supply connection (EOSC) shall be located on the exterior of the building served at a location accessible by emergency supply vehicles at all times in all weather conditions.	NFPA 99, Sec. 5.1.3.5.15.1(1)
<input type="checkbox"/>	<input type="checkbox"/>	17. Noncombustible surfacing is required under mobile supply equipment at least 12' wide and 12' in length in the direction of the vehicle axis.	NFPA 55, Sec. 9.3.2.3
<input type="checkbox"/>	<input type="checkbox"/>	18. Delivery connections, pressure-relief device outlets, mobile supply equipment, and liquid withdrawal connections shall be at least 8 ft. from inlets to underground sewer or drainage systems.	NFPA 55, Table 9.3.2, Item (15)
<input type="checkbox"/>	<input type="checkbox"/>	19. The Emergency Oxygen Supply Connection (EOSC) shall be physically protected from tampering and unauthorized access.	NFPA 99, Sec. 5.1.3.5.15.2(1)
<input type="checkbox"/>	<input type="checkbox"/>	20. The EOSC shall be installed immediately downstream of the main supply shut-off valve and provided with any valves necessary to allow emergency supply of oxygen and to isolate the piping to the normal source of supply.	NFPA 99, Sec. 5.1.3.5.15.1(2) & 5.1.3.5.15.2(6)
<input type="checkbox"/>	<input type="checkbox"/>	21. The EOSC shall have two check valves, one downstream of the EOSC and one downstream of the main line shutoff valve, with both upstream from the tee connection for the two pipelines.	NFPA 99, Sec. 5.1.3.5.15.2(4)
<input type="checkbox"/>	<input type="checkbox"/>	22. The EOSC shall be provided with a pressure relief valve set at 50% above normal line pressure.	NFPA 99, Sec. 5.1.3.5.15.2(5)
<input type="checkbox"/>	<input type="checkbox"/>	23. The EOSC shall be female DN (NPS) sized to accommodate 100% of the system demand.	NFPA 99, Sec. 5.1.3.5.15.2(2)
<u>CHK</u>	<u>NA</u>	IV. SUPPLY MANIFOLD SYSTEMS	
<input type="checkbox"/>	<input type="checkbox"/>	1. Each header shall be provided with a shutoff valve downstream from the nearest cylinder connection but upstream of the point where the header connects to the central supply system.	NFPA 99, Sec. 5.1.3.5.10(4)
<input type="checkbox"/>	<input type="checkbox"/>	2. Each header shall be provided with a filter to prevent the intrusion of debris into the manifold controls.	NFPA 99, Sec. 5.1.3.5.10(3)
<input type="checkbox"/>	<input type="checkbox"/>	3. Each header shall be provided with a pressure gauge.	NFPA 99, Sec. 5.1.3.5.10(5)
<input type="checkbox"/>	<input type="checkbox"/>	4. Each header shall be provided with a check valve to prevent backflow into the header and to permit service to the header.	NFPA 99, Sec. 5.1.3.5.10(6)
<input type="checkbox"/>	<input type="checkbox"/>	5. Each gas cylinder header shall be provided with a check valve at each gas cylinder connection.	NFPA 99, Sec. 5.1.3.5.10(7)
<input type="checkbox"/>	<input type="checkbox"/>	6. Each gas cylinder header shall be provided with a pressure regulator to reduce the cylinder pressure for proper operation of the system.	NFPA 99, Sec. 5.1.3.5.10(8)
<input type="checkbox"/>	<input type="checkbox"/>	7. Each cryogenic liquid container header shall be provided with a pressure relief valve.	NFPA 99, Sec. 5.1.3.5.10(9)
<input type="checkbox"/>	<input type="checkbox"/>	8. Vent valves if provided, shall vent to the exterior.	NFPA 99, Sec. 5.1.3.5.10(10)
<input type="checkbox"/>	<input type="checkbox"/>	9. Each manifold system using gas cylinders shall include two equal headers, each with a sufficient number of cylinder connections for an average day's supply.	NFPA 99, Sec. 5.1.3.5.12.4(1)
<input type="checkbox"/>	<input type="checkbox"/>	10. Each manifold system using gas cylinders shall include an intermediate relief valve piped to the exterior located between the header pressure regulator and the line pressure regulator assembly to protect the line pressure regulators in the event of a header regulator failure.	NFPA 99, Sec. 5.1.3.5.12.4(3)

CHK	NA	IV. SUPPLY MANIFOLD SYSTEMS (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	11. Vent valves if provided, shall vent to the exterior.	NFPA 99, Sec. 5.1.3.5.12.4(2)
<input type="checkbox"/>	<input type="checkbox"/>	12. Manifolds with two headers shall actuate a local signal and an indicator at all master alarm panels when changeover has occurred or is about to occur.	NFPA 99, Sec. 5.1.3.5.12.6
<input type="checkbox"/>	<input type="checkbox"/>	13. Manifolds with a reserve supply are required for gas cylinder systems when an emergency oxygen supply connection is not provided and for all cryogenic liquid container manifold systems.	NFPA 99, Sec. 5.1.3.5.16.2 & Sec. 5.1.3.5.13.4(2)
<input type="checkbox"/>	<input type="checkbox"/>	14. The reserve header is permitted to be located in the same enclosure with the primary and secondary headers or in another enclosure.	NFPA 99, Sec. 5.1.3.5.13.3
<input type="checkbox"/>	<input type="checkbox"/>	15. The In-Building Emergency Reserve (IBER) shall have sufficient number of cylinders for an average day's supply.	NFPA 99, Sec. 5.1.3.5.16.3(1)
<input type="checkbox"/>	<input type="checkbox"/>	16. The IBER shall include a check valve in the main line placed on the distribution system side of the ordinary source's main line valve to prevent flow from the reserve to the ordinary source.	NFPA 99, Sec. 5.1.3.5.16.4
<input type="checkbox"/>	<input type="checkbox"/>	17. The system shall automatically activate the reserve header if the primary and the secondary headers cannot supply the system.	NFPA 99, Sec. 5.1.3.5.13.8 & 5.1.3.5.16.3(2)
<input type="checkbox"/>	<input type="checkbox"/>	18. Manifolds with a reserve header shall actuate a local signal and an indicator at all master alarm panels before changeover to the secondary header occurs, before the reserve header begins to supply the system and when the reserve supply falls to one day's supply.	NFPA 99, Sec. 5.1.3.5.16.5
CHK	NA	V. CRYOGENIC MANIFOLD SYSTEMS	
<input type="checkbox"/>	<input type="checkbox"/>	1. Cryogenic manifolds shall include two equal headers, each having sufficient number of liquid containers for an average day's supply and a reserve header having sufficient number of gas cylinders for an average day's supply.	NFPA 99, Sec. 5.1.3.5.13.4(1) & (2)
<input type="checkbox"/>	<input type="checkbox"/>	2. Cryogenic manifolds shall have a pressure relief valve installed downstream of the reserve header and upstream of the final line pressure regulating assembly and set at 50% above the nominal inlet pressure.	NFPA 99, Sec. 5.1.3.5.13.4(3)
<input type="checkbox"/>	<input type="checkbox"/>	3. Cryogenic manifolds shall be provided with two liquid container headers, either capable of functioning as the primary or secondary header or one primary liquid container header and one secondary gas cylinder header.	NFPA 99, Sec. 5.1.3.5.13.5(1) & (2)
<input type="checkbox"/>	<input type="checkbox"/>	4. Cryogenic manifolds shall be provided with an economizer that shall discharge conserved gas upstream of the final line regulator assembly.	NFPA 99, Sec. 5.1.3.5.13.6
<input type="checkbox"/>	<input type="checkbox"/>	5. Cryogenic manifolds shall include a manual or automatic means to place either header into the role of primary header and the other in the role of the secondary header, except where a liquid/gas hybrid manifold is used.	NFPA 99, Sec. 5.1.3.5.13.7
<input type="checkbox"/>	<input type="checkbox"/>	6. The system shall automatically activate the reserve header if the primary and the secondary headers cannot supply the system.	NFPA 99, Sec. 5.1.3.5.13.8

CHK	NA	V. CRYOGENIC MANIFOLD SYSTEMS (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	7. Manifolds with a reserve header shall actuate a local signal and an indicator at all master alarm panels before changeover to the secondary header occurs, before the reserve header begins to supply the system and when the reserve supply falls to one day's supply.	NFPA 99, Sec. 5.1.3.5.13.9(1) (3) & (4)
<input type="checkbox"/>	<input type="checkbox"/>	8. Hybrid liquid/gas manifolds shall actuate a local signal and an indicator at all master alarm panels before the secondary (gas) header supply falls to one day's supply.	NFPA 99, Sec. 5.1.3.5.13.9 (2)
CHK	NA	VI. PIPED MEDICAL GAS SYSTEMS – ALARMS	
<input type="checkbox"/>	<input type="checkbox"/>	1. All local, master, and area medical gas alarm panels shall provide: (1) separate visual indication for each condition monitored, (2) visual indicators that remain in alarm until the situation is resolved, (3) cancelable audible indication of alarm condition, and (4) a visual means to check or indicate LED or lamp failure and audible failure.	NFPA 99, Sec. 5.1.9.1 (1), (2), (3) & (4)
<input type="checkbox"/>	<input type="checkbox"/>	2. Local, master and area medical gas alarms shall indicate a visual and audible signal if the monitored condition occurs or the if wiring to the sensor switch is disconnected.	NFPA 99, Sec. 5.1.9.1(5)
<input type="checkbox"/>	<input type="checkbox"/>	3. The audible indication of medical gas alarm panels shall produce a minimum of 80dBA measured at 3 ft. from the alarm.	NFPA 99, Sec. 5.1.9.1(3)
<input type="checkbox"/>	<input type="checkbox"/>	4. A second indicated condition occurring while a medical gas alarm panel is silenced shall cause the audible signal to reinitiate.	NFPA 99, Sec. 5.1.9.1(8)
<input type="checkbox"/>	<input type="checkbox"/>	5. Medical gas alarms shall be labeled to indicate the type of gas they serve and the room(s) or area(s) they serve.	NFPA 99, Sec. 5.1.9.1(6) & (7)
<input type="checkbox"/>	<input type="checkbox"/>	6. Master alarms shall be connected by dedicated wiring directly to the sensors or switches.	NFPA 99, Sec. 5.1.9.2.3
<input type="checkbox"/>	<input type="checkbox"/>	7. A master medical gas alarm panel shall be provided to monitor the operation and condition of the source of supply and the reserve, and the pressure of the medical gas piping system.	NFPA 99, Sec. 5.1.9.2
<input type="checkbox"/>	<input type="checkbox"/>	8. One of the two required master medical gas alarm panels shall be located in the principal working area of the individual responsible for maintenance of the medical gas system.	NFPA 99, Sec. 5.1.9.2.1(1)
<input type="checkbox"/>	<input type="checkbox"/>	9. One of the two required master medical gas alarm panels shall be located to assure continuous surveillance during the operating hours of the facility (e.g. telephone switchboard, security office, nurse station, or other continuously staffed location).	NFPA 99, Sec. 5.1.9.2.1(2)
<input type="checkbox"/>	<input type="checkbox"/>	10. A centralized computer system shall be permitted to be substituted for one of the required master alarms.	NFPA 99, Sec. 5.1.9.2.2
<input type="checkbox"/>	<input type="checkbox"/>	11. Local, master and area medical gas alarms shall be powered by the Life Safety Branch or the Critical Branch of the Essential Electrical System.	NFPA 99, Sec. 6.7.5.1.2.5 & CEC, Sec. 517-33(C)(2)
<input type="checkbox"/>	<input type="checkbox"/>	12. All wiring to pressure switches and sensors shall be supervised or in conduit, free air, wire, cable tray or raceways.	NFPA 99, Sec. 5.1.9.1(11) & CEC, Sec. 517.31(C)(3)

<u>CHK</u>	<u>NA</u>	VI. PIPED MEDICAL GAS SYSTEMS – ALARMS (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	13. Communication that does not use electrical wiring for signal transmission shall be supervised such that failure shall initiate an alarm.	NFPA 99, Sec. 5.1.9.1(12)
<input type="checkbox"/>	<input type="checkbox"/>	14. Provisions for automatic restart after power loss of 10 seconds without false signals or requiring manual restart.	NFPA 99, Sec. 5.1.9.1(14)
<input type="checkbox"/>	<input type="checkbox"/>	15. All pressure switches and sensors shall be provided with a gas specific demand check fitting to facilitate service, testing and replacement except zone valve gauges.	NFPA 99, Sec. 5.1.8.2.3 & Sec. 5.1.8.2.3.1
<input type="checkbox"/>	<input type="checkbox"/>	16. Demand check valves shall be provided for all monitors.	NFPA 99, Sec. 5.1.8.2.4
<input type="checkbox"/>	<input type="checkbox"/>	17. A master medical gas alarm panel shall provide a visual and audible indication for each of the following conditions: (1) bulk system changeover (manifold or alternating-type), (2) bulk cryogenic liquid system reaches an average day's supply, (3) reserve in use, (4) cylinder reserve quantity low, (5) cryogenic liquid system reserve is low, (6) cryogenic liquid storage unit used as reserve for bulk system is low, (7) low or high line pressure (20% above or below normal operating pressure), (8) vacuum pressure in main vacuum line drops to or below 12 in., (9) alarm indications from source equipment local alarm panels, (10) medical air dew point high alarm, (11) WAGD low alarm, (12) instrument air dew point high alarm and (13) when the primary or reserve production stops on a proportioning system.	NFPA 99, Sec. 5.1.9.2.4
<input type="checkbox"/>	<input type="checkbox"/>	18. A medical gas area alarm shall be provided for each piping system supplying anesthetizing locations where moderate sedation, deep sedation, or general anesthesia is administered and critical care areas, such as postanesthesia recovery, intensive care units, coronary care units, emergency departments, etc.	NFPA 99, Sec. 5.1.9.4
<input type="checkbox"/>	<input type="checkbox"/>	19. Area alarm panels shall be located at a nurse's station or other location that will provide for responsible surveillance.	NFPA 99, Sec. 5.1.9.4.1
<input type="checkbox"/>	<input type="checkbox"/>	20. Area alarms shall indicate if the pressure in the local line increases or decreases 20% from normal pressure.	NFPA 99, Sec. 5.1.9.4.2
<input type="checkbox"/>	<input type="checkbox"/>	21. Area alarms for medical-surgical vacuum shall indicate a drop in vacuum pressure to or below 12 in.	NFPA 99, Sec. 5.1.9.4.3
<input type="checkbox"/>	<input type="checkbox"/>	22. Sensors for Category 1 spaces shall be located on the patient or use side of any individual zone box assemblies.	NFPA 99, Sec. 5.1.9.4.4(1)
<input type="checkbox"/>	<input type="checkbox"/>	23. Sensors for area alarms for anesthetizing locations where moderate sedation, deep sedation or general anesthesia is administered shall be located either on the source side of individual room zone box assemblies or on the patient use side of individual zone valve assemblies.	NFPA 99, Sec. 5.1.9.4.4(2)
<input type="checkbox"/>	<input type="checkbox"/>	24. Computer systems used to substitute for alarms shall be in continuous uninterrupted operation with power supplies as needed to ensure such reliability.	NFPA 99, Sec. 5.1.9.3.1(1)
<input type="checkbox"/>	<input type="checkbox"/>	25. Computer systems used to substitute for alarms shall be continuously attended by responsible individuals or provide remote signaling of responsible parties (e.g., pagers, auto dialers, or other such means).	NFPA 99, Sec. 5.1.9.3.1(2)

<u>CHK</u>	<u>NA</u>	VI. PIPED MEDICAL GAS SYSTEMS – ALARMS (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	26. Where computer systems used to substitute for alarms rely on signal interface devices (e.g., electronic interfaces, other alarm panels, 4-20 mA cards, etc.), such interfaces shall be supervised such that failure shall initiate an alarm.	NFPA 99, Sec. 5.1.9.3.1(3)
<input type="checkbox"/>	<input type="checkbox"/>	27. If the computer does not power the signaling switches/sensors, the power supply for the switches/sensors shall be from the life safety branch of the emergency electrical system.	NFPA 99, Sec. 5.1.9.3.1(4)
<input type="checkbox"/>	<input type="checkbox"/>	28. Computer systems shall be permitted to connect directly to the sensors/switches in the same manner as an alarm panel if operation of other alarm panels is not impaired.	NFPA 99, Sec. 5.1.9.3.1(5)
<input type="checkbox"/>	<input type="checkbox"/>	29. Wiring from computer systems to signaling switches/sensors shall be supervised.	NFPA 99, Sec. 5.1.9.3.1(6)
<input type="checkbox"/>	<input type="checkbox"/>	30. Computer systems shall be provided with an audio alert.	NFPA 99, Sec. 5.1.9.3.1(7)
<input type="checkbox"/>	<input type="checkbox"/>	31. Operating systems for computer systems used as a substitute for master alarms shall allocate medical gas alarms the priority of a life safety signal.	NFPA 99, Sec. 5.1.9.3.2(1)
<input type="checkbox"/>	<input type="checkbox"/>	32. A medical gas alarm signal shall interrupt any other activity of lesser priority to run the alarm algorithm(s).	NFPA 99, Sec. 5.1.9.3.2(2)
<input type="checkbox"/>	<input type="checkbox"/>	33. The alarm algorithm shall activate an audible alert, any remote signaling protocol and display the specific alarm condition.	NFPA 99, Sec. 5.1.9.3.2(3)
<input type="checkbox"/>	<input type="checkbox"/>	34. The alarm algorithm shall provide (1) separate visual indication for each condition monitored, (2) visual indicators that remain in alarm until the situation is resolved, (3) cancelable audible indication of alarm condition, (4) indicate a visual and audible signal if the monitored condition occurs or the if wiring to the sensor switch is disconnected, (5) visual and audible indication that the communication with an alarm-initiating device is disconnected and and (6) reinitiation of the audible signal if a second indicated condition occurs while a medical gas alarm panel is silenced.	NFPA 99, Sec. 5.1.9.3.2(4)
<input type="checkbox"/>	<input type="checkbox"/>	35. Local alarms shall be installed to monitor functions of air compressor system(s), medical-surgical vacuum pump system(s), WAGD system(s) instrument air system(s) and proportioning systems.	NFPA 99, Sec. 5.1.9.5
<input type="checkbox"/>	<input type="checkbox"/>	36. Local alarm signals are permitted to be located on or in the machinery control panel, within a monitoring device or on a separate alarm panel.	NFPA 99, Sec. 5.1.9.5.1 (1), (2) & (3)
<input type="checkbox"/>	<input type="checkbox"/>	37. The master alarm panel shall include at least one signal from source equipment to indicate a problem with the source equipment. The master alarm signal shall activate when any local alarm signal activates.	NFPA 99, Sec. 5.1.9.5.2
<input type="checkbox"/>	<input type="checkbox"/>	38. Where there is more than one central supply system, for a specific gas or vacuum pipeline or more than one central supply system and pipeline for the same gas in the building, then it shall be necessary for each location to have separate local alarms per 5.1.9.5.4 and signals at the master panels per 5.1.9.2.4.	NFPA 99, Sec. 5.1.9.5.3

<u>CHK</u>	<u>NA</u>	VI. PIPED MEDICAL GAS SYSTEMS – ALARMS (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	39. A local alarm shall monitor low medical air reserve capacity, to indicate when the medical air source is operating under a demand that could not be managed if one compressor ceased to operate.	NFPA 99, Sec. 5.1.9.5.4(1)
<input type="checkbox"/>	<input type="checkbox"/>	40. A local alarm shall monitor high carbon monoxide level in the medical air system is 10 ppm or higher.	NFPA 99, Sec. 5.1.9.5.4(2)
<input type="checkbox"/>	<input type="checkbox"/>	41. A local alarm shall monitor high medical air dew point greater than +2°C (+35°F).	NFPA 99, Sec. 5.1.9.5.4(3)
<input type="checkbox"/>	<input type="checkbox"/>	42. A local alarm shall monitor low medical vacuum reserve capacity, to indicate when the medical vacuum source is operating under a demand that could not be managed if one pump ceased to operate.	NFPA 99, Sec. 5.1.9.5.4(4)
<input type="checkbox"/>	<input type="checkbox"/>	43. A local alarm shall monitor low WAGD reserve capacity, to indicate when the WAGD source is operating under a demand that could not be managed if one producer ceased to operate.	NFPA 99, Sec. 5.1.9.5.4(5)
<input type="checkbox"/>	<input type="checkbox"/>	44. A local alarm shall monitor high instrument air dew point greater than greater than -30°C (-22°F).	NFPA 99, Sec. 5.1.9.5.4(6)
<input type="checkbox"/>	<input type="checkbox"/>	45. A local alarm shall monitor low instrument air reserve capacity, if instrument air is provided by a source with more than one compressor, to indicate when the instrument air source is operating under a demand that could not be managed if one compressor ceased to operate.	NFPA 99, Sec. 5.1.9.5.4(7)
<input type="checkbox"/>	<input type="checkbox"/>	46. A local alarm shall monitor water level in the receiver tank of compressor systems using liquid ring or water cooled compressors.	NFPA 99, Sec. 5.1.9.5.4(8)
<input type="checkbox"/>	<input type="checkbox"/>	47. A local alarm shall monitor water level in separators of compressor systems using liquid ring compressors.	NFPA 99, Sec. 5.1.9.5.4(9)
<input type="checkbox"/>	<input type="checkbox"/>	48. A local alarm shall monitor discharge air temperature for compressor systems using other than liquid ring compressors.	NFPA 99, Sec. 5.1.9.5.4(10)
<input type="checkbox"/>	<input type="checkbox"/>	49. Proportioning systems high/low indicator when the oxygen concentration is outside 19.5 % to 23.5% oxygen.	NFPA 99, Sec. 5.1.9.5.4(11)
<input type="checkbox"/>	<input type="checkbox"/>	50. Proportioning system reserve in operation.	NFPA 99, Sec. 5.1.9.5.4(12)
<input type="checkbox"/>	<input type="checkbox"/>	51. When oxygen is supplied from a system using concentrators, a local alarm shall monitor when each cylinder header is in use and when each cylinder header is below a days supply.	NFPA 99, Sec. 5.1.9.5.4(13) (a) & (b)
<u>CHK</u>	<u>NA</u>	VII. PIPED MEDICAL GAS SYSTEMS – SHUTOFF VALVES	
<input type="checkbox"/>	<input type="checkbox"/>	1. Zone valves shall be installed in valve boxes with removable covers large enough to allow manual operation and shall be permitted to be secured to prevent inappropriate access.	NFPA 99, Sec. 5.1.4.1.4(A) & (B)
<input type="checkbox"/>	<input type="checkbox"/>	2. A shutoff valve shall be placed at the immediate connection of each source system to the piped distribution system to permit the entire source of supply, including all accessory devices, to be isolated from the facility. The source valve shall be located in the immediate vicinity of the central supply system.	NFPA 99, Sec. 5.1.4.2.1 & Sec. 5.1.4.2.2
<input type="checkbox"/>	<input type="checkbox"/>	3. A source valve shall be labeled “ SOURCE VALVE FOR THE (SOURCE NAME). ”	NFPA 99, Sec. 5.1.11.2.3

<u>CHK</u>	<u>NA</u>	VII. PIPED MEDICAL GAS SYSTEMS – SHUTOFF VALVES (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	4. The main supply line shall be provided with a shutoff valve inside of the building except where the source and source valve are located in the building served or the source system is physically mounted to the wall of the building in the immediate vicinity of the source valve.	NFPA 99, Sec. 5.1.4.3.1
<input type="checkbox"/>	<input type="checkbox"/>	5. The main supply line shutoff valve shall be located to permit access by authorized personnel only (i.e., above a ceiling, a secured area, locked or latched in their operating position).	NFPA 99, Sec. 5.1.4.1.2
<input type="checkbox"/>	<input type="checkbox"/>	6. The main supply line shutoff valve shall be located on the facility side of the source valve and outside of the source room, enclosure, or where the main line first enters the building.	NFPA 99, Sec. 5.1.4.3.2
<input type="checkbox"/>	<input type="checkbox"/>	7. The main valve shall be identified " MAIN LINE VALVE FOR THE (GAS/VACUUM NAME) SERVING THE (NAME OF THE BUILDING) "	NFPA 99, Sec. 5.1.11.2.4
<input type="checkbox"/>	<input type="checkbox"/>	8. Each riser supplied from the main line shall be provided with a shutoff valve adjacent to the main line.	NFPA 99, Sec. 5.1.4.4
<input type="checkbox"/>	<input type="checkbox"/>	9. Riser valves shall be permitted to be located above ceilings but shall remain accessible (to authorized personnel) and shall not be obstructed.	NFPA 99, Sec. 5.1.4.1.2(3)
<input type="checkbox"/>	<input type="checkbox"/>	10. A riser valve shall be labeled " RISER FOR THE (GAS/VACUUM NAME) SERVING (NAME OF AREA/BUILDING SERVED BY THE PARTICULAR RISER) "	NFPA 99, Sec. 5.1.11.2.5
<input type="checkbox"/>	<input type="checkbox"/>	11. Service valves shall be installed to allow servicing or modification of lateral branch piping from a main line or a riser without shutting down the entire main, riser or facility.	NFPA 99, Sec. 5.1.4.5.1
<input type="checkbox"/>	<input type="checkbox"/>	12. Only one service valve shall be required for each branch off a riser regardless of the number of zone valves installed on the lateral.	NFPA 99, Sec. 5.1.4.5.2
<input type="checkbox"/>	<input type="checkbox"/>	13. Service valves shall be placed in branch piping prior to any zone valve box on the branch line.	NFPA 99, Sec. 5.1.4.5.3
<input type="checkbox"/>	<input type="checkbox"/>	14. Service valves shall be located behind a locked access door, locked open above a ceiling or locked open in a secured area.	NFPA 99, Sec. 5.1.4.1.2
<input type="checkbox"/>	<input type="checkbox"/>	15. Service valves shall be labeled " SERVICE VALVE FOR (GAS/VACUUM NAME) SERVING (NAME OF THE AREA/BUILDING SERVED BY THE PARTICULAR VALVE) "	NFPA 99, Sec. 5.1.11.2.6
<input type="checkbox"/>	<input type="checkbox"/>	16. Station outlets/inlets shall not be supplied directly from a riser unless a manual shutoff valve (zone valve) is installed between the riser and the outlets/inlets with a wall intervening between the valve and the outlets/inlets.	NFPA 99, Sec. 5.1.4.6.1(1)
<input type="checkbox"/>	<input type="checkbox"/>	17. A zone valve shall be readily operable from a standing position.	NFPA 99, Sec. 5.1.4.6.1(2)
<input type="checkbox"/>	<input type="checkbox"/>	18. A zone valve shall not be located in a room with station outlets/inlets that it controls.	NFPA 99, Sec. 5.1.4.6.1(5)
<input type="checkbox"/>	<input type="checkbox"/>	19. A zone valve is permitted to be located at a nurse station within a suite when the suite is subdivided by walls.	NFPA 99, Sec. 5.1.4.6.1(1)
<input type="checkbox"/>	<input type="checkbox"/>	20. A pressure/vacuum gauge shall be provided on the station outlet/inlet side of each zone valve.	NFPA 99, Sec. 5.1.4.6.4

<u>CHK</u>	<u>NA</u>	VII. PIPED MEDICAL GAS SYSTEMS – SHUTOFF VALVES (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	21. A zone valve shall be located immediately outside each Category 1 space and anesthetizing location of moderate sedation, deep sedation or general anesthesia in each medical gas and/or vacuum line, and located so as to be readily accessible in an emergency.	NFPA 99, Sec. 5.1.4.6.2
<input type="checkbox"/>	<input type="checkbox"/>	22. Zone valves shall not be located in closed or locked rooms, areas or closets.	NFPA 99, Sec. 5.1.4.6.1 (6)
<input type="checkbox"/>	<input type="checkbox"/>	23. Zone valves shall be so arranged that service will only be to outlets/inlets located on the same story.	NFPA 99, Sec. 5.1.4.6.3 (2)
<input type="checkbox"/>	<input type="checkbox"/>	24. All gas-delivery columns, hose reels, ceiling tracks, control panels, pendants, booms, or other special installations shall be located on the patient side of the zone valve.	NFPA 99, Sec. 5.1.4.6.3 (3)
<input type="checkbox"/>	<input type="checkbox"/>	25. Zone valves shall be so arranged that shutting off the supply of medical gas or vacuum to one zone will not affect the supply of medical gas or vacuum to another zone or the rest of the system.	NFPA 99, Sec. 5.1.4.6.3 (1)
<input type="checkbox"/>	<input type="checkbox"/>	26. Zone valves shall be installed where they are visible and accessible at all times. Zone valves and shutoff valves (manual) shall not be installed behind normally open or normally closed doors, or otherwise hidden from plain view.	NFPA 99, Sec. 5.1.4.6.1 (3) & (4)
<input type="checkbox"/>	<input type="checkbox"/>	27. Optional in-line valves shall be permitted to be installed to isolate or shut off piping for servicing of individual rooms or areas.	NFPA 99, Sec. 5.1.4.7
<input type="checkbox"/>	<input type="checkbox"/>	28. In-line valves shall be located in a restricted area and shall be locked or latched open.	NFPA 99, Sec. 5.1.4.1.2 (2) & (3)
<input type="checkbox"/>	<input type="checkbox"/>	29. In-line valves shall be identified " SERVICE VALVE FOR (GAS/VACUUM NAME) SERVING (NAME OF THE AREA/BUILDING SERVED BY THE PARTICULAR VALVE) "	NFPA 99, Sec. 5.1.11.2.6
<input type="checkbox"/>	<input type="checkbox"/>	30. All shutoff valves shall be identified with the name or chemical symbol for the specific system, the room or area served and a caution to not close or open valve except in an emergency.	NFPA 99, Sec. 5.1.11.2.1
<input type="checkbox"/>	<input type="checkbox"/>	31. When positive pressure gas systems operate at a pressure other than 50 psi to 55 psi or a pressure of 160 psi to 185 psi for nitrogen or instrument air, the valve identification shall also include the nonstandard operating pressure.	NFPA 99, Sec. 5.1.11.2.2
<u>CHK</u>	<u>NA</u>	VIII. PIPED MEDICAL GAS SYSTEMS – DISTRIBUTION	
<input type="checkbox"/>	<input type="checkbox"/>	1. Tubes, valves, fittings, station outlets and other piping components in medical gas systems shall have been cleaned for oxygen service by the manufacturer prior to installation, except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.	NFPA 99, Sec. 5.1.10.1.1
<input type="checkbox"/>	<input type="checkbox"/>	2. Each length of tube shall be delivered plugged or capped by the manufacturer and kept sealed until prepared for installation.	NFPA 99, Sec. 5.1.10.1.2
<input type="checkbox"/>	<input type="checkbox"/>	3. Fittings, valves and other components shall be delivered sealed, labeled and kept sealed until prepared for installation.	NFPA 99, Sec. 5.1.10.1.3

<u>CHK</u>	<u>NA</u>	VIII. PIPED MEDICAL GAS SYSTEMS – DISTRIBUTION (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	4. Tubes shall be hard-drawn seamless copper or listed corrugated medical tubing (CMT).	NFPA 99, Sec. 5.1.10.1.4
<input type="checkbox"/>	<input type="checkbox"/>	5. Hard-drawn seamless copper ASTM B 819 for medical gas service and each length of tubing shall be permanently labeled Type K or L and bear one of the following markings: OXY, MED, OXY/MED, ACR/OXY, or ACR/MED , in blue for Type L and green for Type K. For systems operated above 185 psi, Type K copper shall be used for sizes larger than DN80 (NPS 3) (3-1/8 in. O.D.).	NFPA 99, Sec. 5.1.10.1.4 (1) & 5.1.10.1.7
<input type="checkbox"/>	<input type="checkbox"/>	6. CMT shall be copper alloy No. 51000 strip, meeting ASTM B103/B103M externally coated with a nonmetallic sheath marked with manufacturer's marking. Listing shall include testing confirming CMT can be gas-purged with results equivalent to gas copper tubing. CMT shall have a flame spread index of 25 or less and a smoke developed index of 50 or less. CMT shall be identified for oxygen service at a minimum of every 0.92 m (3 ft.).	NFPA 99, Sec. 5.1.10.1.4 (2), 5.1.10.1.5 & 5.1.10.1.6
<input type="checkbox"/>	<input type="checkbox"/>	7. Piping for vacuum systems shall be hard-drawn seamless copper tube ASTM B 88, (Types K, L, M) or ASTM B 280 copper ACR tube or ASTM B 819, copper medical gas tubing (Type K or L) or stainless steel tube or CMT meeting the requirements of 5.1.10.1.4(2).	NFPA 99, Sec. 5.1.10.2.1
<input type="checkbox"/>	<input type="checkbox"/>	8. Where copper or CMT vacuum tubing is installed along with any medical gas tubing, the vacuum tubing shall be prominently labeled prior to installation.	NFPA 99, Sec. 5.1.10.2.2.1
<input type="checkbox"/>	<input type="checkbox"/>	9. Where medical gas tubing (ASTM B 819) is used for vacuum piping, special marking prior to installation is not required.	NFPA 99, Sec. 5.1.10.2.2.2
<input type="checkbox"/>	<input type="checkbox"/>	10. WAGD systems shall be piped using materials permitted for vacuum systems or when operated under 5 in., any noncorroding tube or ductwork.	NFPA 99, Sec. 5.1.10.2.3
<input type="checkbox"/>	<input type="checkbox"/>	11. Piping systems shall be designed and sized to deliver the required flow rates for the utilization pressures.	NFPA 99, Sec. 5.1.10.11.1.1
<input type="checkbox"/>	<input type="checkbox"/>	12. Mains and branches in medical gas piping systems shall be not less than DN15 (NPS 1/2) (5/8 in. O.D.) size.	NFPA 99, Sec. 5.1.10.11.1.2
<input type="checkbox"/>	<input type="checkbox"/>	13. Mains and branches in medical-surgical vacuum systems shall be not less than DN20 (NPS 3/4) (7/8 in. O.D.) size.	NFPA 99, Sec. 5.1.10.11.1.3
<input type="checkbox"/>	<input type="checkbox"/>	14. Drops to individual station outlets and inlets shall be not less than DN15 (NPS 1/2) (5/8 in. O.D.) size.	NFPA 99, Sec. 5.1.10.11.1.4
<input type="checkbox"/>	<input type="checkbox"/>	15. Runouts to alarm panels and connecting tubing for gauges and alarm devices shall be permitted to be DN8 (NPS 1/4) (3/8 in. O.D.) size.	NFPA 99, Sec. 5.1.10.11.1.5
<input type="checkbox"/>	<input type="checkbox"/>	16. Piping shall be supported from the building structure.	NFPA 99, Sec. 5.1.10.11.4.1
<input type="checkbox"/>	<input type="checkbox"/>	17. Hangers and supports shall comply with MSS SP-58.	NFPA 99, Sec. 5.1.10.11.4.2

<u>CHK</u>	<u>NA</u>	VIII. PIPED MEDICAL GAS SYSTEMS – DISTRIBUTION (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	18. Supports for copper tube shall be sized for copper tube.	NFPA 99, Sec. 5.1.10.11.4.3
<input type="checkbox"/>	<input type="checkbox"/>	19. Supports for corugated medical tubing (CMT) shall be in accordance with the CMT manufacturer’s installation instructions.	NFPA 99, Sec. 5.1.10.11.4.4
<input type="checkbox"/>	<input type="checkbox"/>	20. In potentially damp locations, hangers or supports that are in contact with the tube shall be plastic-coated or otherwise electrically insulated from the tube by a material that will not absorb moisture.	NFPA 99, Sec. 5.1.10.11.4.5
<input type="checkbox"/>	<input type="checkbox"/>	21. Maximum support spacing shall be 5 ft. for ¼ in. tubing; 6 ft. for 3/8 and ½ in. tubing; 7 ft. for ¾ in. tubing; 8 ft. for 1 in. tubing; 9 ft. for 1 ¼ in. tubing; and 10 ft. for 1 ½ in. tubing.	NFPA 99, Sec. 5.1.10.11.4.6 & Table 5.1.10.11.4.6
<input type="checkbox"/>	<input type="checkbox"/>	22. Vertical risers of all sizes shall be supported at every floor but not to exceed 15 ft.	NFPA 99, Sec. 5.1.10.11.4.6
<input type="checkbox"/>	<input type="checkbox"/>	23. Where required, medical gas and vacuum piping shall be seismically restrained against earthquakes in accordance with the applicable building code.	NFPA 99, Sec. 5.1.10.11.4.7
<input type="checkbox"/>	<input type="checkbox"/>	24. Flared and compression-type connections and unions in medical gas systems are prohibited. This includes connections to station outlets, alarm devices, etc.	NFPA 99, Sec. 5.1.10.10
<input type="checkbox"/>	<input type="checkbox"/>	25. Threaded connections shall be limited to devices such as pressure/vacuum gauges, alarm devices, check valves and source equipment. Threaded joints shall be tapered threads complying with ASME B1.20.1.	NFPA 99, Sec. 5.1.10.8
<input type="checkbox"/>	<input type="checkbox"/>	26. Turns, off-sets and changes in directions in hard-drawn seamless copper and stainless steel tubing shall be made with fittings; bending of tubing is prohibited.	NFPA 99, Sec. 5.1.10.3.1
<input type="checkbox"/>	<input type="checkbox"/>	27. Medical gas piping shall be protected from freezing, corrosion, and physical damage.	NFPA 99, Sec. 5.1.10.11.2
<input type="checkbox"/>	<input type="checkbox"/>	28. Piping exposed in corridors and other areas subject to physical damage from carts, stretchers, portable equipment, or vehicles shall be protected.	NFPA 99, Sec. 5.1.10.11.2.1
<input type="checkbox"/>	<input type="checkbox"/>	29. Piping underground within buildings or embedded in concrete floors or concrete walls shall be in a continuous conduit.	NFPA 99, Sec. 5.1.10.11.2.2
<input type="checkbox"/>	<input type="checkbox"/>	30. Pipe risers shall be permitted to be installed in pipe shafts if protected from physical damage, excessive heat, corrosion, or contact with oil.	NFPA 99, Sec. 5.1.10.11.3.1
<input type="checkbox"/>	<input type="checkbox"/>	31. Piping shall not be installed in kitchens, stairwells, elevator shafts, elevator machine rooms, areas with open flames and electrical service equipment over 600 volts except room locations for medical air compressor supply systems and medical-surgical vacuum pump supply systems and room locations containing secondary electrical distribution circuit panels and breakers having a maximum voltage of 600 volts.	NFPA 99, Sec. 5.1.10.11.3.2

CHK	NA	VIII. PIPED MEDICAL GAS SYSTEMS – DISTRIBUTION (CONTINUED)	
<input type="checkbox"/>	<input type="checkbox"/>	32. Where medical gas piping is installed in the same trench or tunnel as fuel gas lines, fuel oil lines, electric lines, steam lines and similar utilities, the space shall be naturally or mechanically ventilated to limit temperatures in the space to 130° F.	NFPA 99, Sec. 5.1.10.11.3.3
<input type="checkbox"/>	<input type="checkbox"/>	33. Medical gas piping shall not be located where subject to contact with oil, including flooding caused by major oil leaks.	NFPA 99, Sec. 5.1.10.11.3.4
<input type="checkbox"/>	<input type="checkbox"/>	34. Hoses and flexible connectors shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions.	NFPA 99, Sec. 5.1.10.11.6.1
<input type="checkbox"/>	<input type="checkbox"/>	35. Hoses and flexible connectors shall have a minimum burst pressure of 1000 psig.	NFPA 99, Sec. 5.1.10.11.6.2
<input type="checkbox"/>	<input type="checkbox"/>	36. Where an existing system is being converted for operation at another pressure or for another gas, the existing system shall comply with the provisions of a new system.	NFPA 99, Sec. 5.1.10.11.9.1
<input type="checkbox"/>	<input type="checkbox"/>	37. Vacuum systems shall never be converted for use as a medical gas system.	NFPA 99, Sec. 5.1.10.11.9.2
<input type="checkbox"/>	<input type="checkbox"/>	38. Piping shall be labeled by stenciling or adhesive markers that identify patient medical gas, support gas, or vacuum system including the name of the gas/vacuum system or chemical symbol, the color code and where positive pressure systems operate at pressures other than standard gauge pressure, the label shall include the operating pressure.	NFPA 99, Sec. 5.1.11.1.1
<input type="checkbox"/>	<input type="checkbox"/>	39. Pipe labels shall be located at intervals of not more than 20 ft., at least once in or above every room, on both sides of walls or partitions penetrated by piping and at least once in every story height of riser piping.	NFPA 99, Sec. 5.1.11.1.2
CHK	NA	IX. UNDERGROUND PIPING OUTSIDE OF BUILDINGS	
<input type="checkbox"/>	<input type="checkbox"/>	1. Medical gas piping shall be buried below the local level of frost penetration.	NFPA 99, Sec. 5.1.10.11.5.1
<input type="checkbox"/>	<input type="checkbox"/>	2. Underground installations shall be protected from damage during backfilling using conduit, cover or other enclosure.	NFPA 99, Sec. 5.1.10.11.5.2
<input type="checkbox"/>	<input type="checkbox"/>	3. When protected by conduit, cover or other enclosure, access to joints shall be provided and the conduit, cover or enclosure shall be self draining and not retain groundwater in prolonged contact with the pipe.	NFPA 99, Sec. 5.1.10.11.5.3
<input type="checkbox"/>	<input type="checkbox"/>	4. Buried piping that will be subject to surface loads shall be buried at a depth that will protect the piping or its enclosure from excessive stresses.	NFPA 99, Sec. 5.1.10.11.5.4
<input type="checkbox"/>	<input type="checkbox"/>	5. The minimum cover for buried pipe outside of buildings shall be 36 inches; where physical damage is not likely to occur, minimum bury depth may be reduced to 18 inches.	NFPA 99, Sec. 5.1.10.11.5.5
<input type="checkbox"/>	<input type="checkbox"/>	6. Trenches shall be excavated so that the pipe or its enclosure has firm, substantial continuous bearing on the trench bottom.	NFPA 99, Sec. 5.1.10.11.5.6
<input type="checkbox"/>	<input type="checkbox"/>	7. Backfill shall be clean and compacted so as to protect and uniformly support the pipe or its enclosure.	NFPA 99, Sec. 5.1.10.11.5.7
<input type="checkbox"/>	<input type="checkbox"/>	8. A continuous tape or marker shall be placed directly above buried pipe identifying the pipeline by specific name.	NFPA 99, Sec. 5.1.10.11.5.8
<input type="checkbox"/>	<input type="checkbox"/>	9. Continuous warning means shall be provided above buried piping approximately ½ of the depth of bury.	NFPA 99, Sec. 5.1.10.11.5.9

CHK

NA

IX. UNDERGROUND PIPING OUTSIDE OF BUILDINGS (CONTINUED)

- 10.** Where underground piping is installed through a wall sleeve, the ends of the sleeve shall be sealed to prevent the entrance of ground water into the building.

**NFPA 99, Sec.
5.1.10.11.5.10**

2019 Medical Gas Cylinder Storage, Piping & Alarms System Reminder List

APPLICABLE CODES AND STANDARDS

**2019 California Building Code – Part 2, Title 24, CCR
(2018 International Building Code and 2019 California Amendments)**

**2019 California Electrical Code – Part 3, Title 24, CCR
(2017 National Electrical Code and 2019 California Amendments)**

**2019 California Fire Code – Part 9, Title 24, CCR
(2018 International Fire Code and 2019 California Amendments)**

National Fire Protection Association (NFPA)

NFPA 55 Storage Use and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders and Tanks, 2016 Edition

NFPA 99 Health Care Facilities, 2018 Edition

NOTE:

Compliance with all items on this list does not necessarily assure compliance with all provisions of the applicable codes and standards. This reminder list should be used only by persons with a comprehensive knowledge of the applicable codes and standards.

OSHPD Policy Intent Notices and Code Application Notices.

<https://oshpd.ca.gov/construction-finance/codes-and-regulations/#cans-pins-fags>

OSHPD Project Review Status

<https://esp.oshpd.ca.gov/CitizenAccess/>

OSHPD Public Use Forms

<https://oshpd.ca.gov/construction-finance/resources/forms-applications-reminder-lists/#ProjectForms>