

# 2010 Medical Gas System Cylinder Storage, Piping & Alarms Reminder List

**Applicable Codes and Standards**

CBC 2010, CEC 2010, CFC 2010

NFPA 55 2005, NFPA 99 2005

**I. APPLICABILITY**

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| <p>1. The design, installation and testing of medical gas and vacuum systems shall be in accordance with NFPA 99-2005, <i>Standard for Health Care Facilities</i>.</p>   | <p><b>CBC, Sec.<br/>1224.4.6.2</b></p>  |
| <p>2. The performance, installation and testing of Level 1 piped medical gas and vacuum systems shall be in accordance with Section 5.1 of NFPA 99, 2005 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><b>NFPA 99,<br/>Sec. 5.1.1</b></p>   |
| <p>3. The installation of bulk oxygen systems in excess of 20,000 cu. ft. shall be in accordance with NFPA 55, 2010 edition.</p>   | <p><b>CCR, Title 19,<br/>Div. 1, Sec.<br/>318(a)<br/>CFC, Sec.<br/>3006.2 &amp; Sec.<br/>3006.4</b></p> |
| <p>4. Storage of compressed medical gas cylinders shall be in accordance with Chapter 30 of the California Fire Code and NFPA 99, Sec. 9.4 when such storage quantity is 504 cu. ft. or greater and less than 3,000 cu. ft.</p>  | <p><b>CFC, Sec.<br/>3006.2</b></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 2703.1 shall be in accordance with the California Building Code for high-hazard Group H occupancies.</p>   | <p><b>CFC, Sec.<br/>3006.2</b></p>  |

**CHK**

**NA**

**II. MEDICAL GASES CYLINDER STORAGE**

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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><b>CFC, Sec.<br/>3006.2</b></p>   |
| <input type="checkbox"/> | <input type="checkbox"/> | <p>2. Medical gases in quantities greater 504 cu. ft. located inside buildings shall be in a one- hour exterior room, a one-hour interior room or a gas cabinet.</p>  | <p><b>CFC, Sec.<br/>3006.2</b></p>   |
| <input type="checkbox"/> | <input type="checkbox"/> | <p>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 which is 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. Rooms shall be provided with at least one fire sprinkler to provide container cooling in case of fire.</p> | <p><b>CFC, Sec.<br/>3006.2.1</b></p> |

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| <input type="checkbox"/> | <input type="checkbox"/> | 4. 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 cfm per sq. ft. of the area of the room. | <b>CFC, Sec.<br/>3006.2.2</b>           |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Gas cabinets shall be constructed in accordance with CFC, Section 2703.8.6 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, be connected to an exhaust system and shall be internally sprinklered.  | <b>CFC, Sec.<br/>3006.2.3</b>           |
| <input type="checkbox"/> | <input type="checkbox"/> | 6. Medical gas cylinders containing more than 504 cu. ft. of oxidizers located on the exterior of a building shall be in accordance with CFC, Section 4004.2.1.   | <b>CFC, Sec.<br/>3006.3</b>             |
| <input type="checkbox"/> | <input type="checkbox"/> | 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.  | <b>NFPA 99, Sec.<br/>5.1.3.3.2(4)</b>   |
| <input type="checkbox"/> | <input type="checkbox"/> | 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.  | <b>NFPA 99, Sec.<br/>5.1.3.3.2(3)</b>   |
| <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.   | <b>NFPA 99, Sec.<br/>5.1.3.3.2(2)</b>   |
| <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.   | <b>NFPA 99, Sec.<br/>5.1.3.2.4</b>      |
| <input type="checkbox"/> | <input type="checkbox"/> | 11. Provisions shall be made for racks, chains or other fasteners to protect cylinders from falling.  | <b>NFPA 99, Sec.<br/>5.1.3.3.2(7)</b>   |
| <input type="checkbox"/> | <input type="checkbox"/> | 12. Electric wall fixtures, switches, receptacles, etc. shall be located at least 5 ft. above the floor.  | <b>NFPA 99, Sec.<br/>5.1.3.3.2(5)</b>   |
| <input type="checkbox"/> | <input type="checkbox"/> | 13. Medical air compressors and vacuum pumps shall be located separately from cylinder storage locations.   | <b>NFPA 99, Sec.<br/>5.1.3.3.1.4</b>    |
| <input type="checkbox"/> | <input type="checkbox"/> | 14. 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.  | <b>NFPA 99, Sec.<br/>5.1.3.3.4.1</b>    |
| <input type="checkbox"/> | <input type="checkbox"/> | 15. Locations containing central supply systems or used for storing medical gas cylinders shall be ventilated.  | <b>NFPA 99, Sec.<br/>5.1.3.3.3.1</b>    |
| <input type="checkbox"/> | <input type="checkbox"/> | 16. Relief valves shall be vented to the exterior. Compressed air excepted.   | <b>NFPA 99, Sec.<br/>5.1.3.3.3.1(A)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | 17. Where the total volume of medical gases connected and in storage is greater than 3,000 cu. ft., a dedicated mechanical ventilation system is required. Such system shall operate continuously, draw air from within 1 ft. of the floor and be provided with a means of makeup air.  | <b>NFPA 99, Sec.<br/>5.1.3.3.3.1(B)</b> |

- 18. Power supply for mechanical ventilation shall conform to the requirements of the essential electrical system. **NFPA 99, Sec. 5.1.3.3.3.1(C)**
- 19. Where the total volume of medical gases connected and in storage is less than 3,000 cu. ft. or the only compressed gas in the room is medical air, natural ventilation is permitted. **NFPA 99, Sec. 5.1.3.3.3.1(D)**
- 20. Where natural ventilation is permitted, it shall consist of two louvered openings, each having a minimum free area of 72 sq. in., with one located within 1 ft. of the floor and one located within 1 ft. of the ceiling. **NFPA 99, Sec. 5.1.3.3.3.1(E)**
- 21. Where natural ventilation cannot be provided, mechanical ventilation shall be provided. **NFPA 99, Sec. 5.1.3.3.3.1(G)**
- 22. Ventilation to prevent the accumulation of heat shall be provided at medical air, medical-surgical vacuum, waste anesthetic gas disposal and instrument air sources. **NFPA 99, Sec. 5.1.3.3.3.2**

**CHK    NA    III. PIPED MEDICAL GAS SYSTEMS - SUPPLY**

- 1. Patient medical gas systems shall conform to the requirements for Level 1 gas systems. **NFPA 99, Sec. 13-3.5.1**
- 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(8) & CEC, Sec. 517-33(A)(9)**
- 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. 5.1.3.3.1.6**
- 4. Medical gas central supply systems shall not be piped to, or used for, any purpose except patient care. Medical air shall be used only in the application of human respiration and calibration of medical devices for respiratory application. **NFPA 99, Sec. 5.1.3.4.2**
- 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. 5.1.3.4.3**
- 6. Central supply systems shall have duplex final pressure regulators installed in parallel. with isolation valves before each regulator and an isolation/check valve after each regulator. **NFPA 99, Sec. 5.1.3.4.5.1**
- 7. A manual shut-off valve shall be installed before each central supply system final pressure regulator. **NFPA 99, Sec. 5.1.3.4.5.1**
- 8. A manual shut-off valve or check valve shall be installed after each central supply system final pressure regulator. **NFPA 99, Sec. 5.1.3.4.5.1**
- 9. A pressure relief valve shall be installed between each final pressure regulator and before the source valve. **NFPA 99, Sec. 5.1.3.4.6.3(1)**
- 10. A pressure relief valve shall be installed in the main line set a 50% above normal line pressure. **NFPA 99, Sec. 5.1.3.4.6.3(2)**
- 11. 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. 5.1.3.4.6.1(4)**

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| <input type="checkbox"/> | <input type="checkbox"/> | <b>12.</b> When vented to the exterior, relief valve discharge lines shall be of the same materials and construction as distribution lines.   | <b>NFPA 99, Sec. 5.1.3.4.6.2</b>                           |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>13.</b> When vented to the exterior, relief valve discharge lines shall be labeled.  | <b>NFPA 99, Sec. 5.1.3.4.6.4</b>                           |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>14.</b> Vent discharge terminal shall be turned down and screened to prevent the entry of rain, snow or vermin.  | <b>NFPA 99, Sec. 5.1.3.4.6.1(8)</b>                        |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>15.</b> The relief valve vent discharge shall not be smaller than the size of the relief valve outlet.   | <b>NFPA 99, Sec. 5.1.3.4.6.1(5)</b>                        |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>16.</b> 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.   | <b>NFPA 99, Sec. 5.1.3.4.6.1(6)</b>                        |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>17.</b> 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. | <b>NFPA 99, Sec. 5.1.3.4.14</b>                            |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>18.</b> The emergency supply inlet 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.   | <b>NFPA 99, Sec. 5.1.3.4.14.1</b>                          |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>19.</b> Noncombustible surfacing is required under mobile supply equipment at least the full width of the delivery vehicle and at least 8 ft. in the direction of the vehicle axis.  | <b>NFPA 55, Sec. 9.3.2.3</b>                               |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>20.</b> 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.   | <b>NFPA 55, Sec. 9.3.2.3</b>                               |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>21.</b> The emergency supply inlet shall be physically protected from tampering and unauthorized access.   | <b>NFPA 99, Sec. 5.1.3.4.14.2(1)</b>                       |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>22.</b> The emergency supply inlet 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.  | <b>NFPA 99, Sec. 5.1.3.4.14.1(2) &amp; 5.1.3.4.14.2(6)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>23.</b> The emergency supply inlet shall have one check valve between the normal supply shut-off and the emergency inlet and one check valve between the main line and the emergency inlet shut-off valve.   | <b>NFPA 99, Sec. 5.1.3.4.14.2(4)</b>                       |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>24.</b> The emergency supply inlet shall be provided with a pressure relief valve set at 50% above normal line pressure.   | <b>NFPA 99, Sec. 5.1.3.4.14.2(5)</b>                       |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>25.</b> The emergency supply inlet shall be National Pipe Thread sized to accommodate 100% of the system demand.   | <b>NFPA 99, Sec. 5.1.3.4.14.2(2)</b>                       |

**CHK NA IV. SUPPLY MANIFOLD SYSTEMS**

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| <input type="checkbox"/> | <input type="checkbox"/> | <b>1.</b> 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. | <b>NFPA 99, Sec. 5.1.3.4.9(4)</b> |
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| <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.  | <b>NFPA 99, Sec. 5.1.3.4.9(3)</b>                            |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Each header shall be provided with a pressure gauge.  | <b>NFPA 99, Sec. 5.1.3.4.9(5)</b>                            |
| <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.   | <b>NFPA 99, Sec. 5.1.3.4.9(6)</b>                            |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Each gas cylinder header shall be provided with a check valve at each gas cylinder connection.  | <b>NFPA 99, Sec. 5.1.3.4.9(7)</b>                            |
| <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.  | <b>NFPA 99, Sec. 5.1.3.4.9(8)</b>                            |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. Each cryogenic liquid container header shall be provided with a pressure relief valve.  | <b>NFPA 99, Sec. 5.1.3.4.9(9)</b>                            |
| <input type="checkbox"/> | <input type="checkbox"/> | 8. Vent valves if provided, shall vent to the exterior.  | <b>NFPA 99, Sec. 5.1.3.4.9(10)</b>                           |
| <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.  | <b>NFPA 99, Sec. 5.1.3.4.10.4(1)</b>                         |
| <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. | <b>NFPA 99, Sec. 5.1.3.4.10.4(3)</b>                         |
| <input type="checkbox"/> | <input type="checkbox"/> | 11. Vent valves if provided, shall vent to the exterior.   | <b>NFPA 99, Sec. 5.1.3.4.10.4(2)</b>                         |
| <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.   | <b>NFPA 99, Sec. 5.1.3.4.10.6</b>                            |
| <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.  | <b>NFPA 99, Sec. 5.1.3.4.15.2 &amp; Sec. 5.1.3.4.12.4(2)</b> |
| <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.  | <b>NFPA 99, Sec. 5.1.3.4.11.3 &amp; 5.1.3.4.12.3</b>         |
| <input type="checkbox"/> | <input type="checkbox"/> | 15. The reserve header shall have sufficient number of cylinders for an average day's supply but not less than 3.  | <b>NFPA 99, Sec. 5.1.3.4.11.6(2)</b>                         |
| <input type="checkbox"/> | <input type="checkbox"/> | 16. The reserve header shall be connected downstream of the primary/secondary headers and upstream of the final line pressure regulators.  | <b>NFPA 99, Sec. 5.1.3.4.11.6(2)</b>                         |
| <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.  | <b>NFPA 99, Sec. 5.1.3.4.11.9 &amp; 5.1.3.4.12.8</b>         |
| <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.              | <b>NFPA 99, Sec. 5.1.3.4.11.10</b>                           |

**CHK      NA      V. CRYOGENIC MANIFOLD SYSTEMS**

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| <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. | <b>NFPA 99, Sec. 5.1.3.4.12.4(1) &amp; (2)</b> |
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- 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. 5.1.3.4.12.4(3)**
- 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. 5.1.3.4.12.5(1)**
- 4. Cryogenic manifolds shall be provided with an economizer that shall discharge conserved gas upstream of the final line regulator assembly. **NFPA 99, Sec. 5.1.3.4.12.6**
- 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. 5.1.3.4.12.7**
- 6. The system shall automatically activate the reserve header if the primary and the secondary headers cannot supply the system. **NFPA 99, Sec. 5.1.3.4.12.8**
- 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. 5.1.3.4.12.9**
- 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. 5.1.3.4.12.9**
- 9. A cryogenic liquid manifold is permitted to have three headers. When so arranged, the minimum number of containers on each header is two. When three headers are used, an economizer is not required. **NFPA 99, Sec. 5.1.3.4.12.10**

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**NA**

**VI. PIPED MEDICAL GAS SYSTEMS – ALARMS**

- 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. **NFPA 99, Sec. 5.1.9.1 (1), (2), (3) & (4)**
- 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)**
- 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)**
- 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)**
- 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)**
- 6. Master alarms shall be connected by dedicated wiring directly to the sensors or switches. **NFPA 99, Sec. 5.1.9.2.3**

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| <input type="checkbox"/> | <input type="checkbox"/> | <b>7.</b> 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.  | <b>NFPA 99, Sec. 5.1.9.2</b>                                  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>8.</b> 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.  | <b>NFPA 99, Sec. 5.1.9.2.1(1)</b>                             |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>9.</b> 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).  | <b>NFPA 99, Sec. 5.1.9.2.1(2)</b>                             |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>10.</b> A centralized computer system shall be permitted to be substituted for one of the required master alarms.   | <b>NFPA 99, Sec. 5.1.9.2.2</b>                                |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>11.</b> Local, master and area medical gas alarms shall be powered by the Life Safety Branch of the Emergency Power System.   | <b>NFPA 99, Sec. 5.1.9.1 (9) &amp; CEC, Sec. 517-32(C)(2)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>12.</b> All wiring to pressure switches and sensors shall be supervised or in conduit or raceways.  | <b>NFPA 99, Sec. 5.1.9.1(11) &amp; CEC, Sec. 517.30(C)3</b>   |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>13.</b> 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.   | <b>NFPA 99, Sec. 5.1.8.2.3 &amp; Sec. 5.8.2.3.1</b>           |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>14.</b> Demand check valves shall be provided for all monitors.   | <b>NFPA 99, Sec. 5.1.8.2.4</b>                                |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>15.</b> 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 and (12) instrument air dew point high alarm. | <b>NFPA 99, Sec. 5.1.9.2.4</b>                                |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>16.</b> A medical gas area alarm shall be provided for each piping system supplying anesthetizing locations and other vital life support and critical care areas, such as post anesthesia recovery, intensive care units, coronary care units, emergency departments, etc.  | <b>NFPA 99, Sec.5.1.9.3</b>                                   |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>17.</b> Area alarm panels shall be located at a nurse's station or other location that will provide for responsible surveillance.   | <b>NFPA 99, Sec. 5.1.9.3.1</b>                                |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>18.</b> Area alarms shall indicate if the pressure in the local line increases or decreases 20% from normal pressure.   | <b>NFPA 99, Sec. 5.1.9.3.2</b>                                |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>19.</b> Area alarms for medical-surgical vacuum shall indicate a drop in vacuum pressure to or below 12 in.   | <b>NFPA 99, Sec. 5.1.9.3.3</b>                                |

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| <input type="checkbox"/> | <input type="checkbox"/> | <b>20.</b> Sensors for area alarms for vital life support and critical care areas shall be located on the patient or use side of any individual zone box assemblies.   | <b>NFPA 99, Sec. 5.1.9.3.4(1)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>21.</b> Sensors for area alarms for anesthetizing gas delivery areas 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.  | <b>NFPA 99, Sec. 5.1.9.3.4(2)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>22.</b> Computer systems used to substitute for alarms shall be in continuous uninterrupted operation with power supplies as needed to ensure such reliability.   | <b>NFPA 99, Sec. 5.1.9.4.1(1)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>23.</b> 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).  | <b>NFPA 99, Sec. 5.1.9.4.1(2)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>24.</b> 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.  | <b>NFPA 99, Sec. 5.1.9.4.1(3)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>25.</b> 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.   | <b>NFPA 99, Sec. 5.1.9.4.1(4)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>26.</b> 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.  | <b>NFPA 99, Sec. 5.1.9.4.1(5)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>27.</b> Wiring from computer systems to signaling switches/sensors shall be supervised or in conduit or raceways.   | <b>NFPA 99, Sec. 5.1.9.4.1(6)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>28.</b> Computer systems shall be provided with an audio alert.   | <b>NFPA 99, Sec. 5.1.9.4.1(7)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>29.</b> Operating systems for computer systems used as a substitute for master alarms shall allocate medical gas alarms the priority of a life safety signal.   | <b>NFPA 99, Sec. 5.1.9.4.2(1)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>30.</b> A medical gas alarm signal shall interrupt any other activity of lesser priority to run the alarm algorithm(s).   | <b>NFPA 99, Sec. 5.1.9.4.2(2)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>31.</b> The alarm algorithm shall activate an audible alert, any remote signaling protocol and display the specific alarm condition.  | <b>NFPA 99, Sec. 5.1.9.4.2(3)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>32.</b> 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) labels to indicate the type of gas they serve and the room(s) or area(s) they serve and (6) reinitiation of the audible signal if a second indicated condition occurs while a medical gas alarm panel is silenced. | <b>NFPA 99, Sec. 5.1.9.4.2(4)</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>33.</b> Local alarms shall be installed to monitor functions of air compressor system(s), medical-surgical vacuum pump system(s), WAGD system(s) and instrument air system(s).  | <b>NFPA 99, Sec. 5.1.9.5</b>      |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>34.</b> 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.  | <b>NFPA 99, Sec. 5.1.9.5.1</b>    |

- 35.** 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**
- 36.** Where there is more than one medical air compressor system, instrument air compressor system, WAGD system, or more than one medical-surgical vacuum pump system at different locations in the facility, or if the compressors or vacuum pumps are at different locations in the facility, it shall be necessary for each location to have separate alarms at master panels.

**NFPA 99, Sec.  
5.1.9.5.3**
- 37.** A local alarm shall monitor when a backup or lag compressor is in operation except when a medical air system consists of three or more compressors in which case the alarm shall activate when the last compressor is signaled to start.

**NFPA 99, Sec.  
5.1.9.5.4(1)**
- 38.** 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)**
- 39.** A local alarm shall monitor high medical air dew point greater than +4°C (+39°F)

**NFPA 99, Sec.  
5.1.9.5.4(3)**
- 40.** A local alarm shall monitor when a backup or lag vacuum pump is in operation except when a vacuum pump system consists of three or more pumps in which case the alarm shall activate when the last pump is signaled to start.

**NFPA 99, Sec.  
5.1.9.5.4(4)**
- 41.** A local alarm shall monitor when a WAGD lag is in use. The signal shall be manually reset.

**NFPA 99, Sec.  
5.1.9.5.4(5)**
- 42.** 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)**
- 43.** 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(7)**
- 44.** A local alarm shall monitor water level in separators of compressor systems using liquid ring compressors.

**NFPA 99, Sec.  
5.1.9.5.4(8)**
- 45.** 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(9)**

**CHK**

**NA**

**VII. PIPED MEDICAL GAS SYSTEMS – SHUTOFF VALVES**

- 1.** Shutoff valves accessible to other than authorized personnel shall be installed in valve boxes with frangible or removable windows large enough to permit manual operation.

**NFPA 99, Sec.  
5.1.4.2.1**
- 2.** A source 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 source equipment.

**NFPA 99, Sec.  
5.1.4.4 & Sec.  
5.1.4.4.1**
- 3.** A source valve shall be labeled “**SOURCE VALVE FOR THE (SOURCE NAME).**”

**NFPA 99, Sec.  
5.1.11.2.3**
- 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.  
5.1.4.5**

- |                          |                          |   |                             |
|--------------------------|--------------------------|---|-----------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | 5. The main supply line shutoff valve shall be located to permit access by authorized personnel only (e.g., in a ceiling or a locked room).   | NFPA 99, Sec.<br>5.1.4.5.1  |
| <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.<br>5.1.4.5.2  |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. The main valve shall be identified " <b>MAIN LINE VALVE FOR THE (GAS/VACUUM NAME) SERVING THE (NAME OF THE BUILDING)</b> "   | NFPA 99, Sec.<br>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.<br>5.1.4.6    |
| <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.<br>5.1.4.6.1  |
| <input type="checkbox"/> | <input type="checkbox"/> | 10. A riser valve shall be labeled " <b>RISER FOR THE (GAS/VACUUM NAME) SERVING (NAME OF AREA/BUILDING SERVED BY THE PARTICULAR RISER)</b> "  | NFPA 99, Sec.<br>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.<br>5.1.4.7    |
| <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.<br>5.1.4.7.1  |
| <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.<br>5.1.4.7.2  |
| <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.<br>5.1.4.7.3  |
| <input type="checkbox"/> | <input type="checkbox"/> | 15. Service valves shall be labeled " <b>SERVICE VALVE FOR (GAS/VACUUM NAME) SERVING (NAME OF THE AREA/BUILDING SERVED BY THE PARTICULAR VALVE)</b> "   | NFPA 99, Sec.<br>5.1.11.2.6 |
| <input type="checkbox"/> | <input type="checkbox"/> | 16. Sensors for area alarms panels shall be permitted to be placed in any relationship to service valves.   | NFPA 99, Sec.<br>5.1.4.7.5  |
| <input type="checkbox"/> | <input type="checkbox"/> | 17. 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.<br>5.1.4.8(1) |
| <input type="checkbox"/> | <input type="checkbox"/> | 18. A zone valve shall serve only outlets/inlets located on the same story.   | NFPA 99, Sec.<br>5.1.4.8(2) |
| <input type="checkbox"/> | <input type="checkbox"/> | 19. A zone valves shall be readily operable from a standing position in the corridor on the same floor they serve.  | NFPA 99, Sec.<br>5.1.4.8.1  |
| <input type="checkbox"/> | <input type="checkbox"/> | 20. 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.<br>5.1.4.8(1) |
| <input type="checkbox"/> | <input type="checkbox"/> | 21. A pressure/vacuum gauge shall be provided on the station outlet/inlet side of each zone valve.  | NFPA 99, Sec.<br>5.1.4.8.3  |
| <input type="checkbox"/> | <input type="checkbox"/> | 22. A zone valve shall be so arranged that shutting off the supply of medical gas to one zone will not affect the supply of medical gas to another zone or the rest of the system.  | NFPA 99, Sec.<br>5.1.4.8.2  |

- 23.** A zone valve shall be located immediately outside each vital life-support, critical care and anesthetizing location in each medical gas and/or vacuum line, and located so as to be readily accessible in an emergency.

**NFPA 99, Sec. 5.1.4.8.7**
- 24.** Zone valves shall not be located in closed or locked rooms, areas or closets.

**NFPA 99, Sec. 5.1.4.8.6**
- 25.** All gas-delivery columns, hose reels, ceiling tracks, control panels, pendants, booms, or other special installations shall be located downstream of the zone valve.

**NFPA 99, Sec. 5.1.4.8.7.1**
- 26.** Zone valves shall be so arranged that shutting off the supply of gas to any one operating room or anesthetizing location will not affect others.

**NFPA 99, Sec. 5.1.4.8.7.2**
- 27.** 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. 5.1.4.8.5**
- 28.** 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. 5.1.4.9**
- 29.** In-line valves shall be located in a restricted area and shall be locked or latched open.

**NFPA 99, Sec. 5.1.4.9.1**
- 30.** 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**
- 31.** 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**
- 32.** 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**

**CHK      NA      VIII. PIPED MEDICAL GAS SYSTEMS – DISTRIBUTION**

- 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**
- 2.** Each length of tube shall be delivered plugged or capped by the manufacturer and kept sealed until prepared for installation.

Fittings, valves and other components shall be delivered sealed, labeled and kept sealed until prepared for installation.

**NFPA 99, Sec. 5.1.10.1.2**
- 3.** Piping shall be 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.

**NFPA 99, Sec. 5.1.10.1.4 & 5.1.10.1.5**
- 4.** For piping 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**

- |                          |                          |  |  |
|--------------------------|--------------------------|--|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <b>5.</b> 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.  | <b>NFPA 99, Sec.<br/>5.1.10.2.1</b>    |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>6.</b> Where copper vacuum tubing is installed along with any medical gas tubing, the vacuum tubing shall be prominently labeled prior to installation.   | <b>NFPA 99, Sec.<br/>5.1.10.2.2.1</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>7.</b> Where medical gas tubing (ASTM B 819) is used for vacuum piping, special marking prior to installation is not required, provided that the vacuum piping installation meets all the requirements for medical gas piping including prohibition of flux on copper-to-copper joints and provide for the use of a nitrogen purge while brazing. | <b>NFPA 99, Sec.<br/>5.1.10.2.2.2</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>8.</b> WAGD systems shall be piped using materials permitted for vacuum systems or when operated under 5 in., any noncorroding tube or ductwork.  | <b>NFPA 99, Sec.<br/>5.1.10.2.3</b>    |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>9.</b> Piping systems shall be designed and sized to deliver the required flow rates for the utilization pressures.   | <b>NFPA 99, Sec.<br/>5.1.10.10.1.1</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>10.</b> Mains and branches in medical gas piping systems shall be not less than DN15 (NPS 1/2) (5/8 in. O.D.) size.   | <b>NFPA 99, Sec.<br/>5.1.10.10.1.2</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>11.</b> Mains and branches in medical-surgical vacuum systems shall be not less than DN20 (NPS 3/4) (7/8 in. O.D.) size.  | <b>NFPA 99, Sec.<br/>5.1.10.10.1.3</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>12.</b> Drops to individual station outlets and inlets shall be not less than DN15 (NPS 1/2) (5/8 in. O.D.) size.   | <b>NFPA 99, Sec.<br/>5.1.10.10.1.4</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>13.</b> 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.  | <b>NFPA 99, Sec.<br/>5.1.10.10.1.5</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>14.</b> Piping shall be supported from the structure in accordance with MSS SP-69.  | <b>NFPA 99, Sec.<br/>5.1.10.10.4.1</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>15.</b> Hangers for copper tube shall comply with MSS SP-58.  | <b>NFPA 99, Sec.<br/>5.1.10.10.4.2</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>16.</b> Hangers for medical gas piping shall have a copper finish and be sized for copper tube.   | <b>NFPA 99, Sec.<br/>5.1.10.10.4.3</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>17.</b> In potentially damp locations, hangers or supports that are in contact with the tube shall be plastic-coated or otherwise insulated from the tube.  | <b>NFPA 99, Sec.<br/>5.1.10.10.4.4</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>18.</b> Maximum hanger spacing shall be 5 ft. for ¼ in. tubing; 6ft. 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.   | <b>NFPA 99, Sec.<br/>5.1.10.10.4.5</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>19.</b> Vertical risers of all sizes shall be supported at every floor but not to exceed 15 ft.   | <b>NFPA 99, Sec.<br/>5.1.10.10.4.5</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>20.</b> Where required, medical gas and vacuum piping shall be seismically restrained against earthquakes in accordance with the applicable building code.  | <b>NFPA 99, Sec.<br/>5.1.10.10.4.6</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>21.</b> Flared and compression-type connections and unions in medical gas systems are prohibited. This includes connections to station outlets, alarm devices, etc.   | <b>NFPA 99, Sec.<br/>5.1.10.8</b>      |

- |                          |                          |   |   |
|--------------------------|--------------------------|---|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <b>22.</b> 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.   | <b>NFPA 99, Sec.<br/>5.1.10.4</b>       |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>23.</b> Turns, off-sets and changes in directions shall be made with fittings; bending of tubing is prohibited.  | <b>NFPA 99, Sec.<br/>5.1.10.3.1</b>     |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>24.</b> Runouts from horizontal piping shall be taken off above the centerline of the main or branch pipe and rise vertically or at an angle of not more than 45 degrees from vertical.  | <b>NFPA 99, Sec.<br/>5.1.10.10.6</b>    |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>25.</b> Medical gas piping shall be protected from freezing, corrosion, and physical damage.   | <b>NFPA 99, Sec.<br/>5.1.10.10.2</b>    |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>26.</b> Piping exposed in corridors and other areas subject to physical damage from carts, stretchers, portable equipment, or vehicles shall be suitably protected.  | <b>NFPA 99, Sec.<br/>5.1.10.10.2.1</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>27.</b> Piping underground within buildings or embedded in concrete floors or concrete walls shall be in a continuous conduit.   | <b>NFPA 99, Sec.<br/>5.1.10.10.2.2</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>28.</b> Pipe risers shall be permitted to be installed in pipe shafts if protected from physical damage, excessive heat, corrosion, or contact with oil.   | <b>NFPA 99, Sec.<br/>5.1.10.10.3.1</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>29.</b> Piping shall not be installed in kitchens, 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 | <b>NFPA 99, Sec.<br/>5.1.10.10.3.2</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>30.</b> 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 degrees.  | <b>NFPA 99, Sec.<br/>5.1.10.10.3.3</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>31.</b> Medical gas piping shall not be located where subject to contact with oil, including flooding caused by major oil leaks.   | <b>NFPA 99, Sec.<br/>5.1.10.10.3.4</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>32.</b> Hoses and flexible connectors shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions.   | <b>NFPA 99, Sec.<br/>5.1.10.10.7.1</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>33.</b> Hoses and flexible connectors shall have a minimum burst pressure of 1000 psig.  | <b>NFPA 99, Sec.<br/>5.1.10.10.7.2</b>  |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>34.</b> 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.  | <b>NFPA 99, Sec.<br/>5.1.10.10.10.1</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>35.</b> Vacuum systems shall never be converted for use as a medical gas system.   | <b>NFPA 99, Sec.<br/>5.1.10.10.10.2</b> |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>36.</b> 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.   | <b>NFPA 99, Sec.<br/>5.1.11.1.1</b>     |
| <input type="checkbox"/> | <input type="checkbox"/> | <b>37.</b> 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 east once in every story height of riser piping.   | <b>NFPA 99, Sec.<br/>5.1.11.1.2</b>     |

<b>CHK</b>	<b>NA</b>	<b>IX. UNDERGROUND PIPING OUTSIDE OF BUILDINGS</b>	
<input type="checkbox"/>	<input type="checkbox"/>	1. Medical gas piping shall be buried below the local level of frost penetration.	<b>NFPA 99, Sec. 5.1.10.10.5.1</b>
<input type="checkbox"/>	<input type="checkbox"/>	2. Underground installations shall be protected from damage during backfilling using conduit, cover or other enclosure.	<b>NFPA 99, Sec. 5.1.10.10.5.2</b>
<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.	<b>NFPA 99, Sec. 5.1.10.10.5.3</b>
<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.	<b>NFPA 99, Sec. 5.1.10.10.5.4</b>
<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.	<b>NFPA 99, Sec. 5.1.10.10.5.5</b>
<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.	<b>NFPA 99, Sec. 5.1.10.10.5.6</b>
<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.	<b>NFPA 99, Sec. 5.1.10.10.5.7</b>
<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.	<b>NFPA 99, Sec. 5.1.10.10.5.8</b>
<input type="checkbox"/>	<input type="checkbox"/>	9. Continuous warning means shall be provided above buried piping approximately ½ of the depth of bury.	<b>NFPA 99, Sec. 5.1.10.10.5.9</b>
<input type="checkbox"/>	<input type="checkbox"/>	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.	<b>NFPA 99, Sec. 5.1.10.10.5.10</b>

**APPLICABLE CODES AND STANDARDS**

**2010 California Building Code – Part 2, Title 24, CCR  
(2009 International Building Code and 2010 California Amendments)**

**2010 California Electrical Code – Part 3, Title 24, CCR  
(2008 National Electrical Code and 2010 California Amendments)**

**2010 California Fire Code – Part 9, Title 24, CCR  
(2009 International Fire Code and 2010 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*, 2005 Edition**

**NFPA 99 *Health Care Facilities*, 2005 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.

<http://www.oshpd.ca.gov/FDD/Regulations/CANs/index.html>

OSHPD Project Review Status

[http://www.oshpd.ca.gov/FDD/project\\_status/index.asp](http://www.oshpd.ca.gov/FDD/project_status/index.asp)

OSHPD Public Use Forms

<http://www.oshpd.ca.gov/FDD/Forms/index.html>