Policy: Installation, Testing, and Maintenance of Medical Gas Outlets/Piping

APPLICATION

NYU Langone Medical Center (NYULMC)

PURPOSE

To provide guidelines for safe and proper installation, testing and maintenance of medical gas outlets and piping.

POLICY AND GENERAL INFORMATION

1.0 Prior to any installation, testing, maintenance of, or work on medical gas outlets or piping:

- Authorization shall be obtained from Facilities Operations, HJD Facilities Engineering or Real Estate, as applicable.
- Facilities Operations, HJD Facilities Engineering or Real Estate, as applicable, shall locate the nearest isolation valve and determine shutdown requirements.

2.0 Medical air, nitrous oxide, and oxygen piping shall:

- Comply with the standards outlined in the most current version of National Fire Protection Association (NFPA) 99 (see excerpt in Appendix A).
- Be installed only by qualified personnel meeting American Society of Sanitary Engineering (ASSE) 6010 requirements.
- Have brazed fittings and be installed in accordance with NFPA 99 procedures.
  - During brazing, joints shall be continuously purged with oil-free, dry nitrogen to prevent the formation of copper oxide on the inside surfaces of the joint.

3.0 Medical gas outlets shall be manufactured by BeaconMedaes through Hill Rom using the Diameter-Index Safety System (DISS).

4.0 Testing shall be conducted by an approved contractor. It shall be witnessed at start and finish by the Project Manager and/or a representative of Facilities Operations (e.g., Plumbing Foreman), HJD Facilities Engineering or Real Estate, as applicable. Documentation of findings shall be kept in the project folder. The tests are to be performed in accordance with ASSE 6010 requirements.

- An Initial Pressure Test shall be conducted when all rough assemblies are completed. It shall be conducted at 1.5 times the working pressure but not less than 150 pounds per square inch (psi). It shall include a check for leaks and retest. For vacuum systems, it shall be conducted at 60 psi with soapy water or equivalent.

- A Standing Pressure Test shall be conducted for 24 hours at 20% above normal working pressure. It shall include a check for leaks and retest. For vacuum systems, it shall be conducted at no less than 12 inches of mercury (Hg).

- Following pressure testing, the contractor shall perform a Piping Purge Test by purging lines with oil-free, dry nitrogen in accordance with NFPA 99 to ensure that no debris remains in the piping.

- Purity testing (of all lines affected) shall be conducted with oil-free, nitrogen gas. Results shall be reviewed by Facilities Operations, HJD Facilities Engineering or Real Estate, as applicable.

- A Final Tie-In Test shall be conducted at normal system pressure.

5.0 All piping shall be labeled in accordance with NFPA 99 (see Appendices A and B).

6.0 Facilities Operations, HJD Facilities Engineering or Real Estate, as applicable, shall coordinate preventive maintenance of medical gas systems.

- Maintenance shall include periodic inspection and testing of the entire medical gas distribution systems on a frequency of not less than one year (annual).

- The testing shall be completed by qualified personnel meeting the requirements of ASSE 6030.

- Maintenance and repairs shall be conducted by qualified personnel meeting the requirements of ASSE 6030 and/or 6040.

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Selected Standards from NFPA 99 (2005 ed.), Chapter 5: Gas and Vacuum Systems

5.1.3.6.7	**Medical-Surgical Vacuum Source Exhaust**
5.1.3.6.7.4	The exhaust shall be piped of materials approved for medical-surgical vacuum piping under 5.1.10.2
5.1.10.1	**Piping Materials for Field-Installed Positive Pressure Medical Gas Systems.**
5.1.10.1.1	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 in accordance with CGA G-4.1, *Cleaning Equipment for Oxygen Service*, except that fittings shall be permitted to be cleaned by a supplier or agency other than the manufacturer.
5.1.10.1.2	Each length of tube shall be delivered plugged or capped by the manufacturer and kept sealed until prepared for installation.
5.1.10.1.3	Fittings, valves, and other components shall be delivered sealed, labeled, and kept sealed until prepared for installation.
5.1.10.1.4	Tubes shall be hard-drawn seamless copper ASTM B 819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, medical gas tube, Type L, except that where operating pressures are above a gauge pressure of 1275 kPa (185 psi) Type K shall be used for sizes larger than DN80 (NPS 3) (3⅛ in. O.D.).
5.1.10.1.5	ASTM B 819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, medical gas tube shall be identified by the manufacturer's markings "OXY," "MED," "OXY/MED," "OXY/ACR," or "ACR/MED" in blue (Type L) or green (Type K).
5.1.10.1.6	The installer shall furnish documentation certifying that all installed piping materials comply with the requirements of 5.1.10.1.1.
5.1.10.2	**Piping Materials for Field-Installed Medical-Surgical Vacuum and WAGD Systems**
5.1.10.2.1	Piping for vacuum systems shall be constructed of any of the following: (1) Hard-drawn seamless copper tube: a) ASTM B 88, *Standard Specification for Seamless Copper Water Tube*, copper tube (Types K, L, or M) b) ASTM B 280, *Standard Specification for Seamless Copper Tubing for Air Conditioning and Refrigeration Field Service*, copper ACR tube c) ASTM B 819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, copper medical gas tubing (Type K or Type L) (2) Stainless steel tube
5.1.11.1	**Pipe Labeling**
5.1.11.1.1	Piping shall be labeled by stenciling or adhesive markers that identify the patient medical gas, the support gas, or vacuum system, and include: (1) The name of the gas/vacuum system or the chemical symbol per Table 5.1.11 (2) The gas or vacuum system color code per Table 5.1.11 (3) Where positive pressure gas piping systems operate at pressures other than the standard gauge pressure in Table 5.1.11, the pipe labeling shall include the operating pressure in addition to the name of the gas.
5.1.11.1.2	Pipe labels shall be located as follows: (1) At intervals of not more than 6.1 m (20 ft) (2) At least once in or above every room (3) On both sides of walls or partitions penetrated by the piping (4) At least once in every story height traversed by risers

Table 5.1.11 Standard Designation Colors and Operating Pressures for Gas and Vacuum Systems

Gas Service	Abbreviated Name	Colors (Background/Text)	Standard Gauge Pressure
Medical air	Med Air	Yellow/black	345-380 kPa (50-55 psi)
Carbon dioxide	CO_2	Gray/black or gray/white	345-380 kPa (50-55 psi)
Helium	He	Brown/white	345-380 kPa (50-55 psi)
Nitrogen	N_2	Black/white	1,100-1,275 kPa (160-185 psi)
Nitrous oxide	N_2O	Blue/white	345-380 kPa (50-55 psi)
Oxygen	O_2	Green/white or white/green	345-380 kPa (50-55 psi)
Oxygen/carbon dioxide mixture	O_2/CO_2 *n*% (*n* is % of CO_2)	Green/white	345-380 kPa (50-55 psi)
Medical-surgical vacuum	Med Vac	White/black	380mm to 760 mm (15in. to 30 in. HgV)
Waste anesthetic gas disposal	WAGD	Violet/white	Varies with system type
Other mixtures	Gas A%/ Gas B%	Colors as above Major gas for background/ minor gas for text	None
Nonmedical air (level 3 gas-powered device)		Yellow-and-white diagonal stripe/black	None
Nonmedical and Level 3 vacuum		White-and-black diagonal stripe/black boxed	None
Laboratory air		Yellow-and-white checkerboard/black	None
Laboratory vacuum		White-and-black checkerboard/black boxed	None
Instrument air		Red/white	1,100-1,275 kPa (160-185 psi)

Source: NFPA 99, 2005 Ed. National Fire Protection Association.