How NFPA 99 2012 Will Affect Your Medical Gas Systems

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March 9, 2017
Webinar

PURELY MED GAS

Our Presenter

- Owner & founder of Purely Med Gas, Inc.
- Actively involved in the Medical Gas and Vacuum field for 35 yrs
- Instructor NFPA 99 & ASSE 6000 credentialing courses since 1994
- Credentialed ASSE 6010 Installer, ASSE 6020 Inspector, ASSE 6030 Verifier, ASSE 6040 Service Tech, ASSE 6050 Instructor
- Licensed Master Plumber
- Member of WHEA Code Committee
- Member of ASSE 6000 & CGA M-1 Technical Committees
- Member of ASHE, NFPA, ASSE, ASPE, WHEA, UA and MGPHO
- Consultant to facilities, engineers, architectural firms, regulatory agencies and contractors

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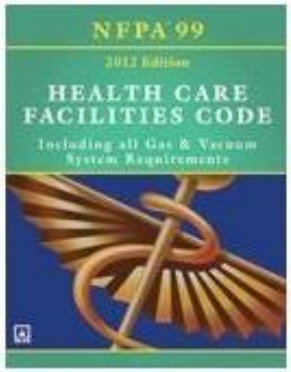
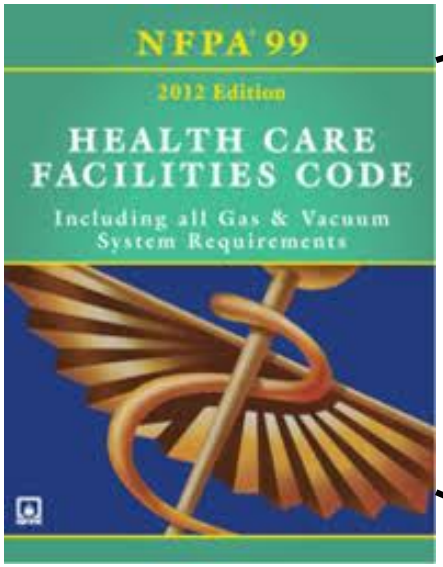
NFPA 99 Health Care Facilities Code

- National Fire Protection Association
- Periodically Revised (1999, 2002, 2005, **2012**, 2015)
- Handbook, *No more NFPA 99C*



NFPA 55 & NFPA 45

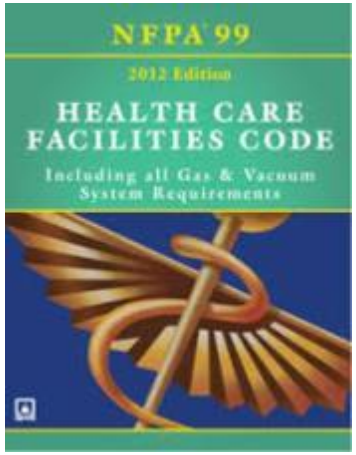


NFPA 55
Compressed Gases and Cryogenic Fluids Code

NFPA 45
Standard on Fire Protections for Laboratories Using Chemicals

Key Difference

- 1999: Standard
- **2012: CODE**



Key Difference

- 1999: Occupancy Based
- **2012: Risk Based**

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Contents

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4.1 Building System Categories

- **4.1.1 Category 1** - Facility systems in which failure of such equipment or system is likely to cause ***major injury or death*** to patients or caregivers…
- **4.1.2 Category 2** - Facility systems in which failure of such equipment is likely to cause ***minor injury*** to patients or caregivers…
- **4.1.3 Category 3** - Facility systems in which failure of such equipment is ***not likely to cause injury*** to patients or caregivers, but can cause patient discomfort…
- **4.1.4 Category 4** - Facility systems in which failure of such equipment would have ***no impact*** on patient care…

Key Difference

direction of licensed medical professionals

5.1.3.5.2 Permitted Locations for Medical Gases

1) Direct respiration by **patients**
2) Clinical application of the gas to a **patient**, such as the use of an insufflator…
3) Medical device applications directly related to **respiration**
4) Power for medical devices used directly on **patients**
5) Calibration of medical devices intended for (1) through (4) **patients**

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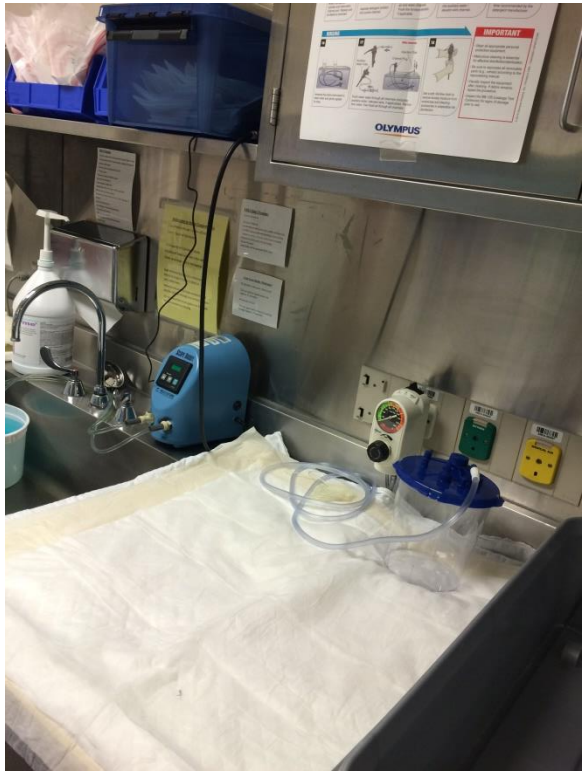
Key Difference

Medical Vacuum System Use:



- 5.1.14.1.14 The medical-surgical vacuum and WAGD systems shall not be used for nonmedical applications
- A.5.1.14.1.4 Other examples of prohibited use of medical-surgical vacuum would be scope cleaning, decontamination, and laser plume

Key Difference

- 5.1.3.75.1 (3) Analysis, research or teaching lab can be piped directly to the receiver tank via a fluid trap

Key Differences

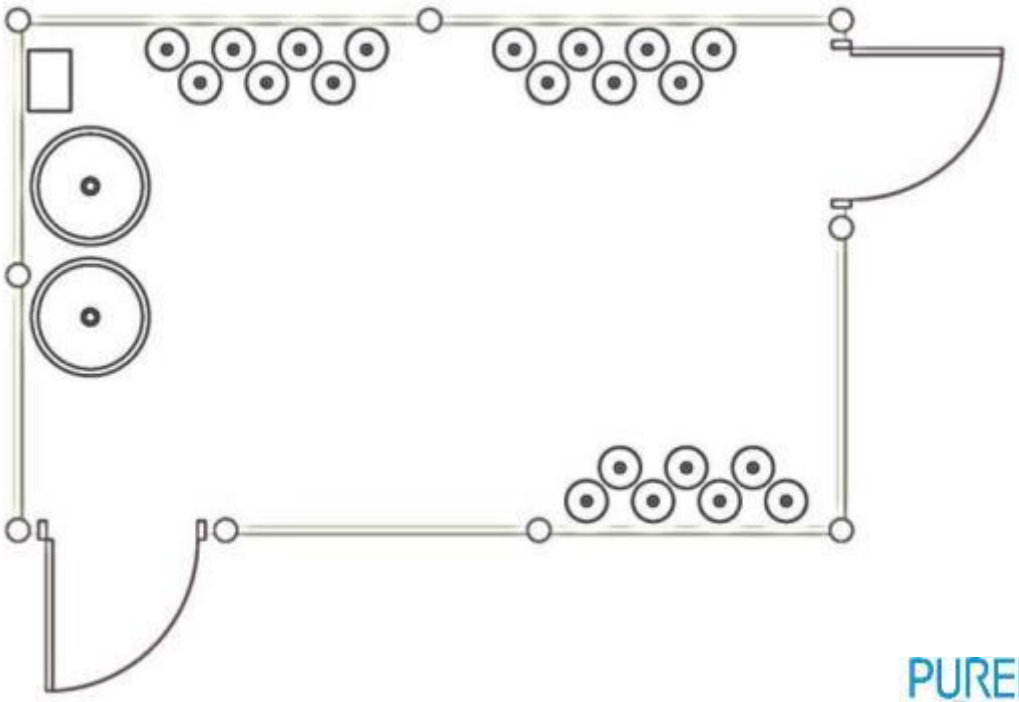
- **Gas Purity & Particulate Requirements**

	1999	2012
Medical Air Dew Point High Alarm	39°F	35°F
Allowable Particulate Matter	0.1 mg	1 mg
Allowable Halogenated Hydrocarbons	1 ppm	5 ppm

Key Difference

Outdoor Central Supply Systems or Storage

- 1999: One exit
- **2012: Two exits**



Key Differences

- 3’-0” Clearance around all Bulk Cryogenic Liquid systems and in front of EOSC
- 10’-0” Parking from Bulk

Key Differences

- NO Combustibles in Manifold / Cylinder Storage Rooms (includes wooden racks, etc.)

Key Difference

Cylinder Supports:

- 1999: *"Cylinders in service and in storage shall be individually secured and located to prevent falling or being knocked over."*

- **2012: *"They shall be provided with racks, chains, or other fastenings to secure all cylinders from falling, whether connected, unconnected, full, or empty."***

Key Difference

"WAGD" - "Evacuation" - "Scavenger"

WAGD Inlet required where Nitrous Oxide or Halogenated Anesthetic Gas is administered

Dedicated WAGD producer:

- Oil-less or Inert Oil

Combined WAGD/Vacuum producer:

- Oxidizers below 23.6%
- Or Oil-less or Inert Oil
- 5 ft of Vacuum pipe before WAGD connection

Key Difference

- 5.1.4.8.7 Individual Zone Valves are not required for each minimal sedation location

Key Difference

- 5.1.9.3 (1) An Area Alarm is not required for minimal sedation areas

Key Difference

Non-Stationary Booms Flexible Connectors:

- 5.1.14.2.3.2 Nonstationary booms and articulating assemblies, *other than head walls* utilizing flexible connectors, shall be tested for leaks, per manufacturer's recommendations, every 18 mos or at a duration determined by a Risk Assessment

Computer as Master Alarm

- Continuous uninterrupted power
- Attended or remote signaling
- Supervised signal interface devices
- Signaling devices Life safety branch *
- Wiring supervised or protected
- Audio alert required
- Med gas signal interrupts lesser priority signal
- Wireless

- TERMINOLOGY

Pipe Labeling

- Every 20 feet
- Once in each room minimum
- Each side of every wall penetration
- Each floor level

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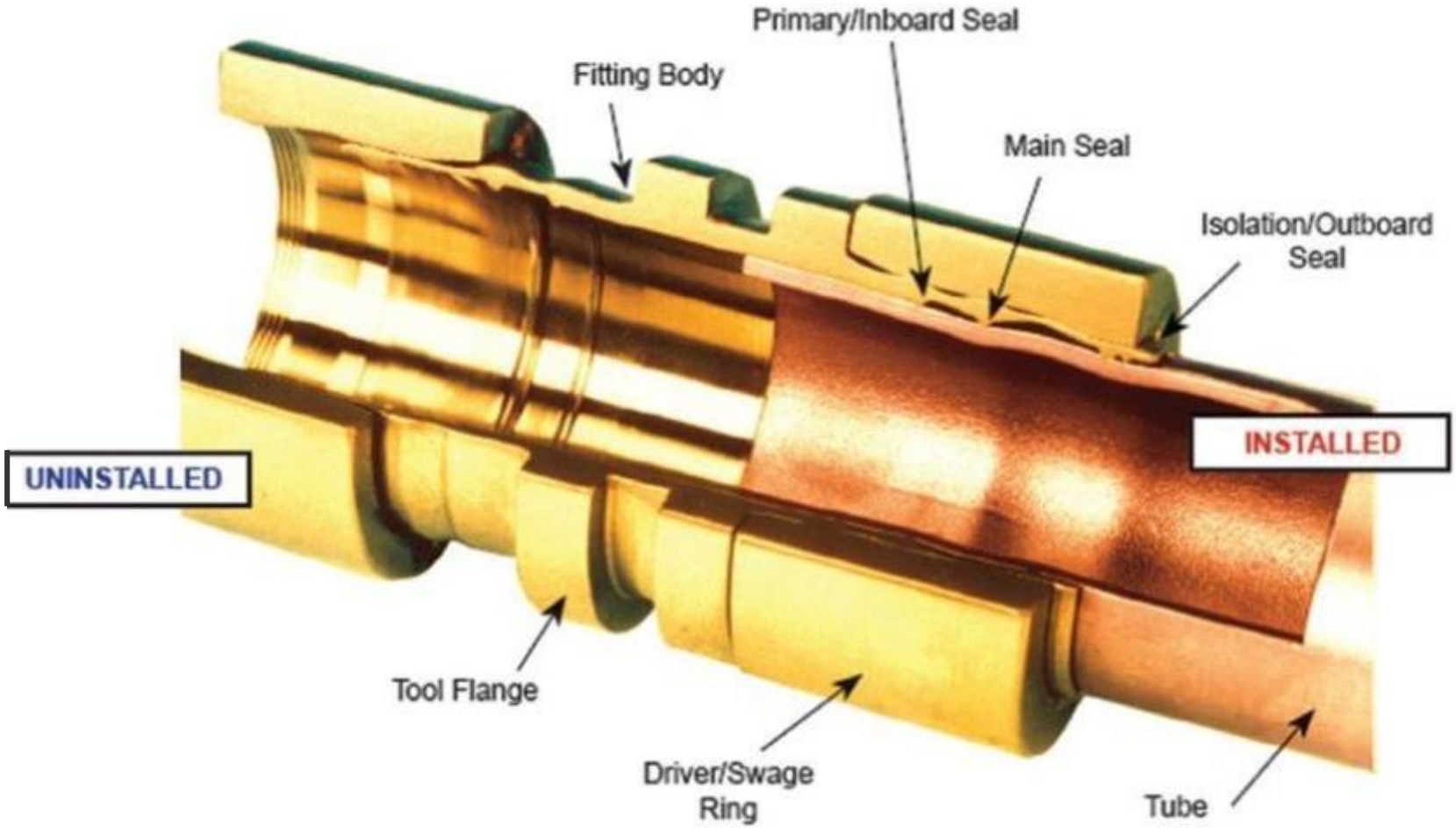
Valve Identification

- Name of Gas or Vacuum system
- Room or Areas served
- A caution to not close or open the valve except in an emergency.
- Ensure these are kept current / accurate following modifications

Alternative Pipe Joints

- **Welded Joints (5.1.10.5)**
- Memory metal fittings (5.1.10.6)
- Dielectric fittings (5.1.10.9.2)
- **Axially swaged elastic strain preload fittings (5.1.10.7)**

“Flameless” Axially Swaged Fitting



“Flameless” Axially Swaged Fitting

Valve Assembly

Area Alarm Transducers

Key Differences

Piping Distribution

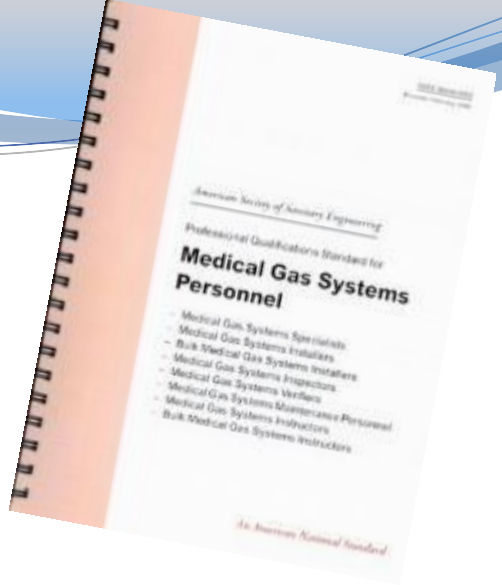
- 3-piece check valves with copper extensions, **no threads**
- Dielectric unions acceptable
- **No Soldered Joints for Vacuum Systems**
- Deburring & Dimpling
- Not Allowed: Galvanized Steel Piping for Vacuum
- Allowed: Stainless Steel piping for Vacuum

Key Differences

Piping Distribution

- **5.1.12.2.6.7** The 24-hour standing pressure test of the positive pressure system shall be witnessed by the authority having jurisdiction or its designee. A form indicating that this test has been performed and witnessed shall be provided to the verifier at the start of the tests required in 5.1.12.3.
- **5.1.12.2.7.6** ***same as above for Vacuum***

Key Difference



- **Medical Gas Personnel Credentials**

	1999	2002	2012	2015
ASSE 6010 Installer	-	X*	X	X
ASSE 6030 Verifier	-	X*	X	X
ASSE 6040 Maintenance Tech	-	-	X*	X

Regulatory Preparedness

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Federal Policy

Timeline Review: of 2012 LSC

	2012 LSC
Proposed	**April 2014**
Final Rule	**May 2016**
Effective	**July 2016**
Enforcement	**Nov 2016**

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Updated Standards

NFPA 13	Sprinkler Systems	2010
NFPA 45	Laboratories	2011
NFPA 55	Compressed Gases & Cryo	2010
NFPA 70	Electrical	2011
NFPA 72	Fire Alarm	2010
NFPA 80	Fire Doors	2010
NFPA 90A	Ventilation	2012
NFPA 96	Cooking	2011
NFPA 99	Healthcare	2012
NFPA 110	Emergency Power	2010

K Tags

K323 Anesthetizing Locations

K900 Healthcare Facilities Code

K901 Fundamentals - Building System Categorization

K902 Gas and Vacuum Piped Systems - Other

K903 Gas and Piped System (G&PS) Categories

K904 G&VS Warning Systems

K905 G&VS Identification & Labeling

K906 G&VS Central Supply System Operation

K907 G&VS Maintenance Program

K908 G&VS Inspection & Testing

K909 G&VS Info & Warning Signs

K910 G&VS Modifications

K Tags

K922 Gas Equipment (GE) - Other

K923 GE Cylinder & Container Storage

K924 GE Testing & Maintenance

K925 GE Respiratory Therapy Source of Ignition

K926 GE Qualification & Training of Personnel

K927 GE Transfilling Cylinders

K928 GE Labeling Equipment & Cylinders

K929 GE Handling Oxygen Cylinders & Manifolds

K930 GE Liquid Oxygen Equipment

K931 Hyperbaric Facilities

K901

Fundamentals – Building System Categories
Building systems are designed to meet Category 1 through 4 requirements as detailed in NFPA 99. Categories are determined by a formal and documented risk assessment procedure performed by qualified personnel. Chapter 4 (NFPA 99)

K902

Gas and Vacuum Piped Systems – Other

List in the REMARKS section any NFPA 99 Chapter 5 Gas and Vacuum Systems requirements that are not addressed by the provided K-Tags, but are deficient. This information, along with the applicable Life Safety Code or NFPA standard citation, should be included on Form CMS-2567. Chapter 5 (NFPA 99)

K905

Gas and Vacuum Piped Systems – Central Supply System Identification and Labeling

Containers, cylinders and tanks are designed, fabricated, tested, and marked in accordance with 5.1.3.1.1 through 5.1.3.1.7. Locations containing only oxygen or medical air have doors labeled with "Medical Gases, NO Smoking or Open Flame". Locations containing other gases have doors labeled "Positive Pressure Gases, NO Smoking or Open Flame, Room May Have Insufficient Oxygen, Open Door and Allow Room to Ventilate Before Opening." 5.1.3.1, 5.2.3.1, 5.3.10 (NFPA 99)

K907

Gas and Vacuum Piped Systems – Maintenance Program Medical gas, vacuum, WAGD, or support gas systems have documented maintenance programs. The program includes an inventory of all source systems, control valves, alarms, manufactured assemblies, and outlets. Inspection and maintenance schedules are established through risk assessment considering manufacturer recommendations. Inspection procedures and testing methods are established through risk assessment. Persons maintaining systems are qualified as demonstrated by training and certification or credentialing to the requirements of AASE 6030 or 6040. 5.1.14.2.1, 5.1.14.2.2, 5.1.15, 5.2.14, 5.3.13.4.2 (NFPA 99)

K908

Gas and Vacuum Piped Systems – Inspection and Testing Operations
The gas and vacuum systems are inspected and tested as part of a maintenance program and include the required elements. Records of the inspections and testing are maintained as required. 5.1.14.2.3, B.5.2, 5.2.13, 5.3.13, 5.3.13.4 (NFPA 99)

K909

Gas and Vacuum Piped Systems – Information and Warning Signs
Piping is labeled by stencil or adhesive markers identifying the gas or vacuum system, including the name of system or chemical symbol, color code (Table 5.1.11), and operating pressure if other than standard. Labels are at intervals not more than 20 feet, are in every room, at both sides of wall penetrations, and on every story traversed by riser. Piping is not painted. Shutoff valves are identified with the name or chemical symbol of the gas or vacuum system, room or area served, and caution to not use the valve except in emergency. 5.1.14.3, 5.1.11.1, 5.1.11.2, 5.2.11, 5.3.13.3, 5.3.11 (NFPA 99)

K910

Gas and Vacuum Piped Systems – Modifications

Whenever modifications are made that breach the pipeline, any necessary installer and verification test specified in 5.1.2 is conducted on the downstream portion of the medical gas piping system. Permanent records of all tests required by system verification tests are maintained. 5.1.14.4.1, 5.1.14.4.6, 5.2.13, 5.3.13.4.3 (NFPA 99)

K923

Gas Equipment – Cylinder and Container Storage ≥ 3,000 cubic feet

Storage locations are designed, constructed, and ventilated in accordance with 5.1.3.3.2 and 5.1.3.3.3. > 300 but <3,000 cubic feet Storage locations are outdoors in an enclosure or within an enclosed interior space of non- or limited- combustible construction, with door (or gates outdoors) that can be secured. Oxidizing gases are not stored with flammables, and are separated from combustibles by 20 feet (5 feet if sprinklered) or enclosed in a cabinet of noncombustible construction having a minimum 1/2 hr. fire protection rating

K923

≤ 300 cubic feet In a single smoke compartment, individual cylinders available for immediate use in patient care areas with an aggregate volume of ≤ 300 cubic feet are not required to be stored in an enclosure. Cylinders must be handled with precautions as specified in 11.6.2. A precautionary sign readable from 5 feet is on each door or gate of a cylinder storage room, where the sign includes the wording as a minimum "CAUTION: OXIDIZING GAS(ES) STORED WITHIN NO SMOKING". Storage is planned so cylinders are used in order of which they are received from the supplier. Empty cylinders are segregated from full cylinders. When facility employs cylinders with integral pressure gauge, a threshold pressure considered empty is established. Empty cylinders are marked to avoid confusion. Cylinders stored in the open are protected from weather. 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.6.5 (NFPA 99)

K926

Gas Equipment – Qualifications and Training of Personnel
Personnel concerned with the application, maintenance and handling of medical gases and cylinders are trained on the risk. Facilities provide continuing education, including safety guidelines and usage requirements. Equipment is serviced only by personnel trained in the maintenance and operation of equipment. 11.5.2.1 (NFPA 99)

K927

Gas Equipment – Transfilling Cylinders

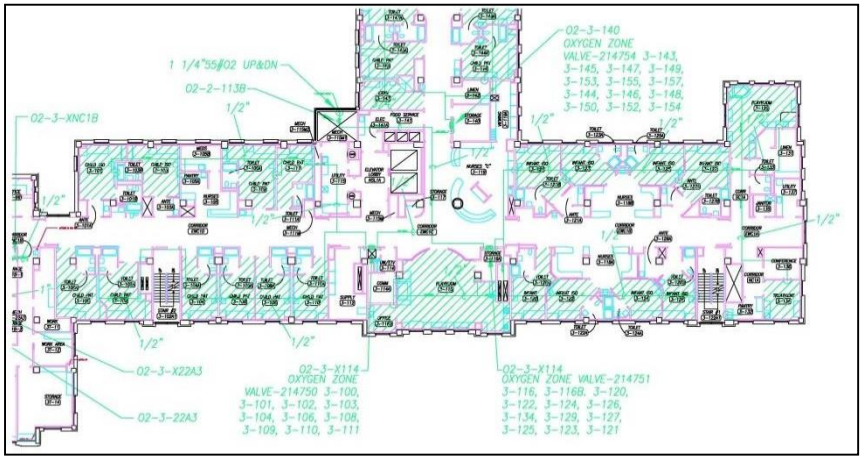
Transfilling of oxygen from one cylinder to another is in accordance with CGA P-2.5, Transfilling of High Pressure Gaseous Oxygen Used for Respiration. Transfilling of any gas from one cylinder to another is prohibited in patient care rooms. Transfilling to liquid oxygen containers or to portable containers over 50 psi comply with conditions under 11.5.2.3.1 (NFPA 99). Transfilling to liquid oxygen containers or to portable containers under 50 psi comply with conditions under 11.5.2.3.2 (NFPA 99). 11.5.2.2 (NFPA 99)

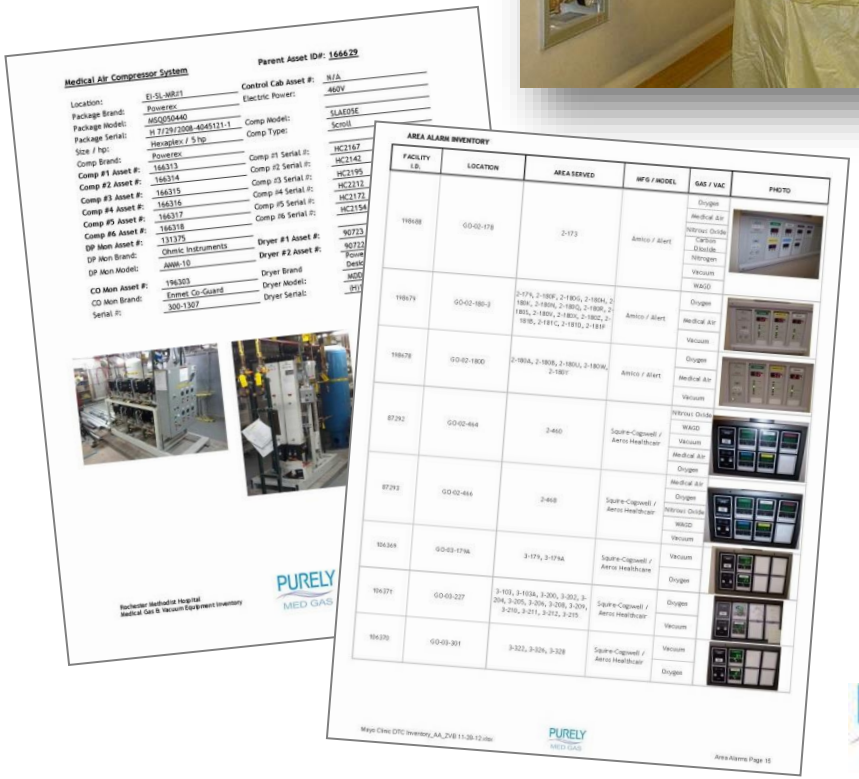
K928

Gas Equipment – Labeling Equipment and Cylinders
Equipment listed for use in oxygen-enriched atmospheres are so labeled. Oxygen metering equipment and pressure reducing regulators are labeled "OXYGEN-USE NO OIL". Flowmeters, pressure reducing regulators, and oxygen-dispensing apparatus are clearly and permanently labeled designating the gases for which they are intended. Oxygen-metering equipment, pressure reducing regulators, humidifiers, and nebulizers are labeled with name of manufacturer or supplier. Cylinders and containers are labeled in accordance with CGA C-7. Color coding is not utilized as the primary method of determining cylinder or container contents. All labeling is durable and withstands cleaning or disinfecting. 11.5.3.1 (NFPA 99)

Regulatory Preparedness

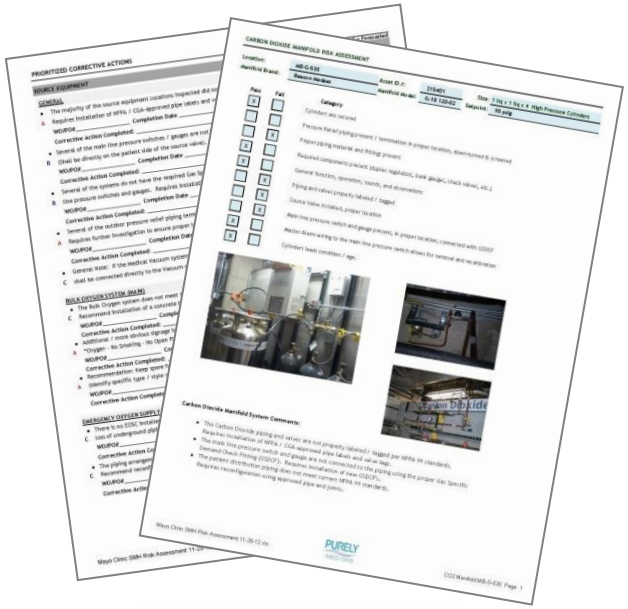
- Risk Assessment
- Current Inventory
- Equipment Location Drawings





Regulatory Preparedness

- Testing/Verification Records
- Inspection Records
- Planned Maintenance Records
  - *ALL Categories*



AREA ALARM SYSTEM

SMH: (90) Facility-Wide

DTC: (57) Facility-Wide

RMH: (70) Facility-Wide

AREA ALARM SYSTEM Category: Medical Gas, Sub-Category: Area Alarm Panel				DRIVEN BY	LABOR/ TASK (hrs)	EQUIP QUANTITY			TOTAL ANNUAL LABOR HRS		
WHO	TASK	FREQUENCY				SMH	DTC	RMH	SMH	DTC	RMH
	Visually check overall condition; ensure labels are present, and record all information	Quarterly	4	C	0.15	90	57	70	54.00	34.20	42.00
	Perform push-button audible / visual testing	Quarterly	4	C	0.05	90	57	70	18.00	11.40	14.00
	Verify accuracy of pressure indicator (within 5% accuracy)	Quarterly	4	C	0.05	90	57	70	18.00	11.40	14.00
	Activate and test all signal activation devices; recalibrate as necessary	Annually	1	C	0.50	90	57	70	45.00	28.50	35.00
								Total Annual Labor Hrs (By Facility):	135.00	85.50	105.00
								Total Annual Labor Hrs (RO Campus):	325.50		
								QUARTERLY Labor Hrs (By Facility):	22.50	14.25	17.50
								ANNUAL Labor Hrs (By Facility):	45.00	28.50	35.00

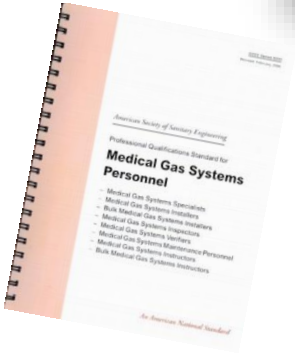
SMH

DTC

RMH

Regulatory Preparedness

- Qualifications
- Cylinder Handling Training
- Emergency Preparedness



Facilities Operations and Equipment Service
DTC Facilities Operations

Med Gas Failure (Nitrous Oxide)

Effective Date: 11/4/08

Reviewed/Revised: 11/4/08, 7/6/10 LJH

Responsibility All Facilities Operations/Maintenance Personnel

Purpose To outline the steps to be taken in the event of a failure of all or part of Med Gas – Nitrous Oxide

Policy It is the policy of Mayo Foundation –to take all the necessary steps to ensure the health, safety, and welfare of all patients, visitors, and employees involved in a disruption and/or repair of the Med Gas – Nitrous Oxide.

Information

Possible reasons for Nitrous Oxide System failure
1. Equipment malfunction
2. Depletion of gas
3. Rupture of gas lines
4. Shut-off of a zone valve

Warning signs or indications of failure
1. Audible alarm
2. Drop in pressure
3. Call from affected areas

Back-up mechanisms and/or reserves
1. Reserve bank of gas cylinders
2. Reserve gas tanks on carts available on anesthesia carts

Areas that may be affected
1. Operating rooms

Thank You!

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