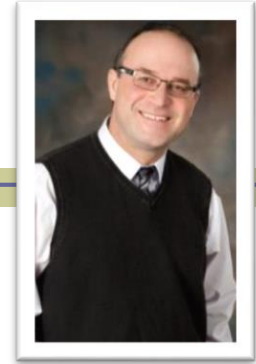


Medical Gas and Vacuum Systems of Today



Tom Spremo
President / Founder
Purely Med Gas, Inc.
www.purelymedgas.com

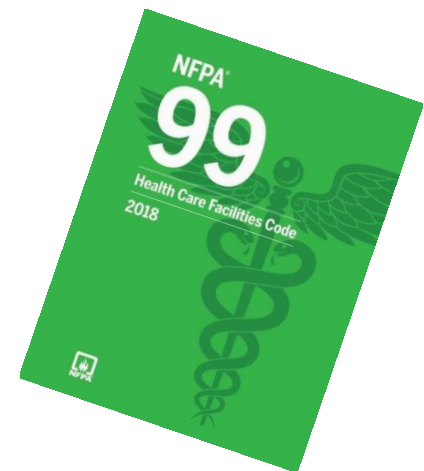
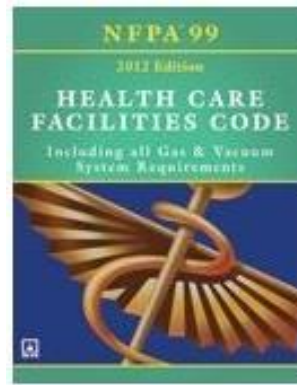
Our Presenter



- Owner & founder of Purely Med Gas, Inc.
- Actively involved in the Medical Gas and Vacuum field for 40 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 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

NFPA 99 Health Care Facilities

- National Fire Protection Association
- Revised every three years
- NFPA 99, NFPA 99C, Handbook



Medical Gas Systems

Oxygen	50-55 psi	Respiratory
Medical Air	50-55 psi	Respiratory
Nitrous Oxide	50-55 psi	Anesthesia
Carbon Dioxide	50-55 psi	Surgical
Helium	50-55 psi	Respiratory
Vacuum	15-30" Hg	Suction
WAGD	As required	Waste Anesthetic Gas Disposal

- *Medical Gas: Used in the application of human respiration and the calibration of medical devices used for human respiration.*

Support Gas Systems

Nitrogen	160-185 psi	Support / Tools
Instrument Air	160-185 psi	Support

- *Support Gas: Nitrogen or Instrument Air used to support medical procedures by operating medical-surgical (tools, booms, devices, etc.) and not respired as part of any treatment.*

Risk Categories

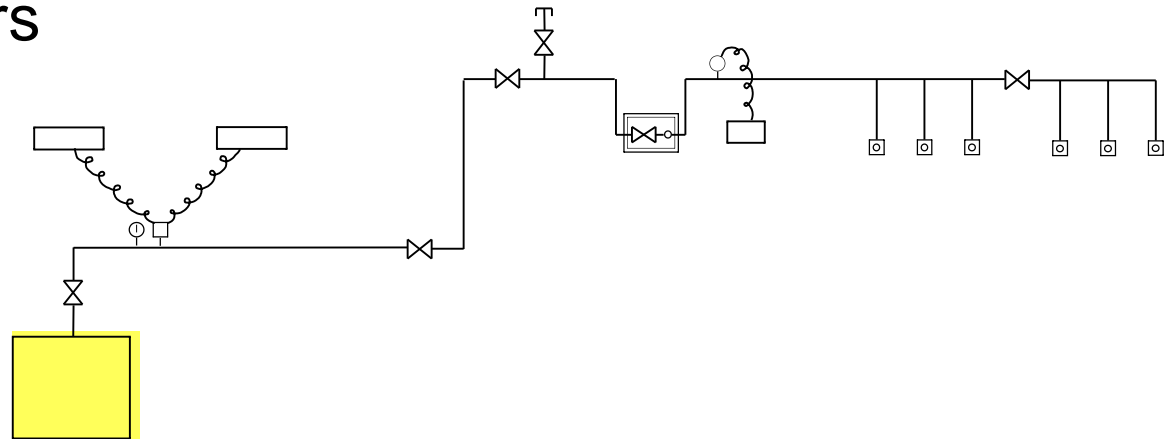
The Sudden Failure of Equipment or System is Likely to Cause:

- 1: Major injury or death of patients or caregivers
- 2: Minor injury to patients or caregivers
- 3: Not likely to cause injury to patients or caregivers
- 4: No impact on patient care

*Categories Determined by Risk Assessment

Central Supply Systems/Source Equipment

- Bulk Cryogenic Liquid Systems
- Manifolds for Cylinder systems
- Manifolds for Cryogenic liquid containers
- Medical Air Compressor systems
- Medical Air Proportioning Systems (NEW)
- Instrument Air Systems
- Vacuum Producers
- WAGD Producers



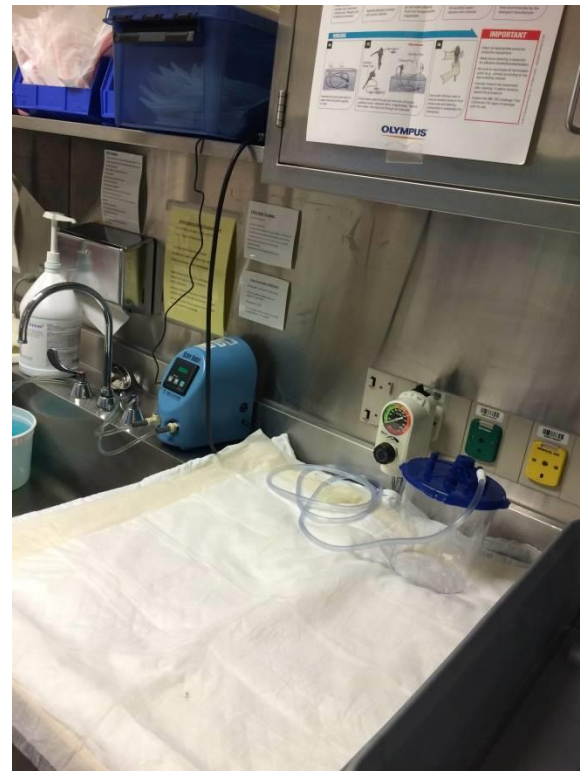
Permitted Locations for Medical Gases

- Medical Gases shall be piped only into areas where the gases will be used under the direction of licensed medical professionals
- Patient use
- Operation and calibration of patient medical devices

NFPA 99 2012 Update

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.



Electrical Power

- Electrical power for all medical gas source equipment and alarms shall be from the Emergency electrical service
- **Alarms** - Life Safety Branch
- **Source Equipment** - Essential Equipment Branch
- NFPA 99 2005 Chapter 4
- NFPA 70 (National Electric Code)

Cylinder Room Door Signage

Positive Pressure Gases

No Smoking or Open Flame

Room May Have Insufficient Oxygen

Open Door and Allow Room to Ventilate Before Entering

NFPA 99 2012 Update

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.”



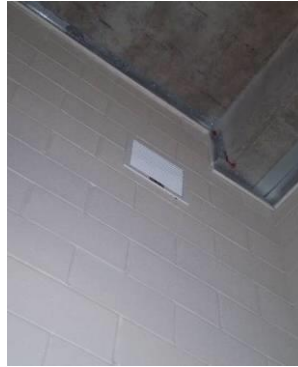
Cylinder Handling Qualification

- Personnel who handle Medical Gas cylinders shall be trained on the risks associated with their handling and use

Cylinder Storage / Manifold Rooms



~ Room Identification



~ Ventilation



~ Relief to Outdoors



~ Electrical Protected



~ No Flammables or Combustibles

- ~ Secured Entry
- ~ 1 hour fire rating
- ~ Exposure to hot/cold
- ~ Pipe and Valve I.D.

Warning Systems

Warning Systems

5.1.9

- Master Alarms 5.1.9.2
- Area Alarms 5.1.9.3
- Local Alarms 5.1.9.5

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

3.3.63 General Anesthesia and Levels of Sedation / Analgesia

- Minimal Sedation
- Moderate Sedation / Analgesia (Conscious Sedation)
- Deep Sedation / Analgesia
- General Anesthesia



Minimal Sedation Exceptions

- **5.1.4.8.7 Zone Valves.** A zone valve shall be located immediately outside each vital life-support area, critical care area, and anesthetizing location of *moderate sedation*, *deep sedation*, or *general anesthesia*, in each medical gas or vacuum line, or both, and located so as to be readily accessible in an emergency.

- **5.1.9.3* Area Alarms.** Area alarm panels shall be provided to monitor all medical gas, medical–surgical vacuum, and piped WAGD systems supplying the following:
 - (1) Anesthetizing locations where *moderate sedation*, *deep sedation*, or *general anesthesia* is administered.
 - (2) *Critical care areas

WAGD Inlets

- 5.1.5.16: Required where Nitrous Oxide or Anesthetic Gas is intended to be administered
- Not interchangeable with Vacuum
- Flow as required by anesthetic gas machines

Pipe Labeling

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



Valve Identification

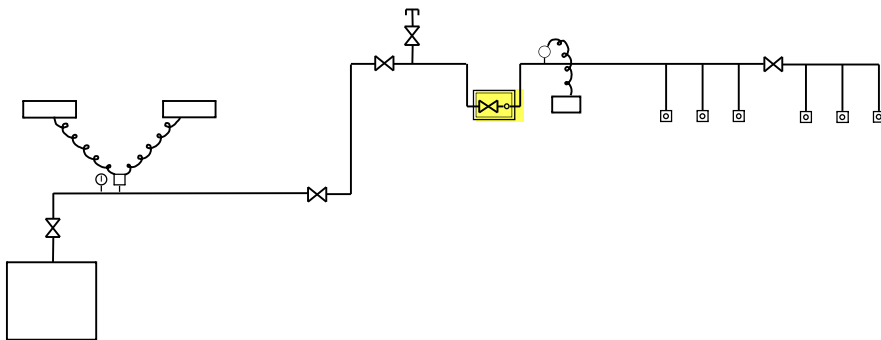
- Name of Gas or Vacuum system
- Room or Areas served
- A caution to not close or open the valve except in an emergency

Ensure these are kept current / accurate following all modifications...



Zone Valves

- Located within Corridor
- Always visible / readily accessible
- Labeled to identify Area served



Zone Valve Locations



NFPA 99 2012 Update

Piping Distribution (testing)

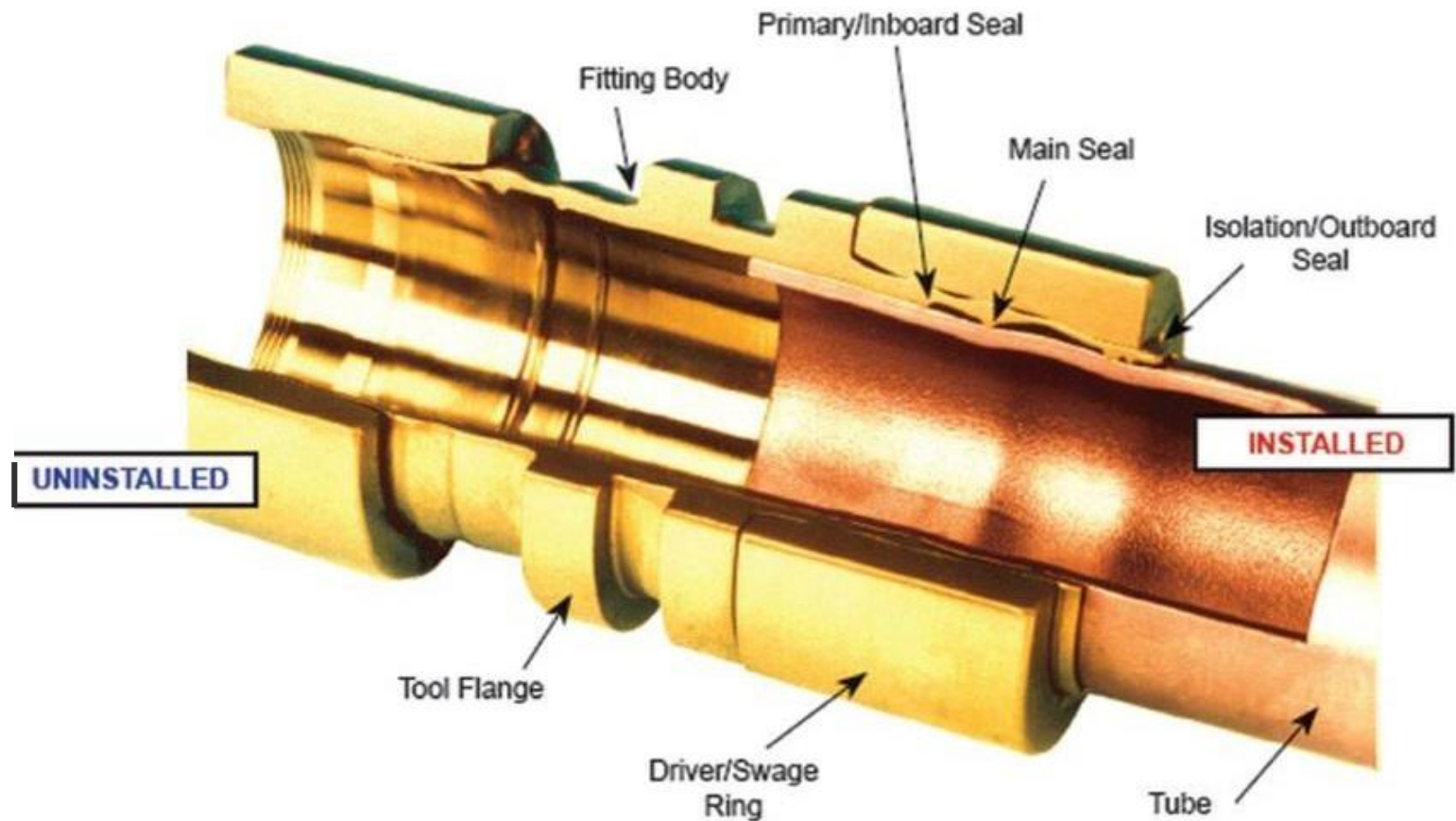
- **5.1.12.2.6.7** The 24-hour standing pressure test of the positive pressure system shall be witnessed by the authority having jurisdiction or its designee. A form indicating that this test has been performed and witnessed shall be provided to the verifier at the start of the tests required in 5.1.12.3.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

System Verification

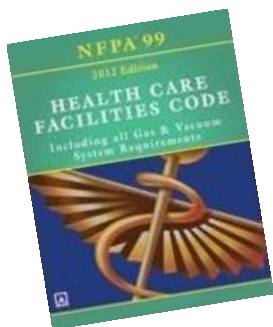
- Required when a system is breached: pipeline intrusion or component replacement
- System meets NFPA 99 Standards
- Proper equipment and materials were used
- Work was performed & pretested by credentialed installers
- Systems are functioning properly
- Gas purity/particulates are safe for patient use
- Documentation for facility record



“Flameless” Axially Swaged Fitting

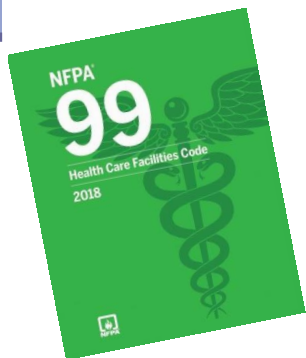


Code Approved



NFPA 99 2012 EDITION: 5.1.10.7.1

Axially swaged, elastic strain preload fittings providing metal-to-metal seals, having a temperature rating not less than 538°C (1000°F) and a pressure rating not less than 2070 kPa (300 psi), and that, when complete, are permanent and nonseparable shall be permitted to be used to join copper or stainless steel tube.

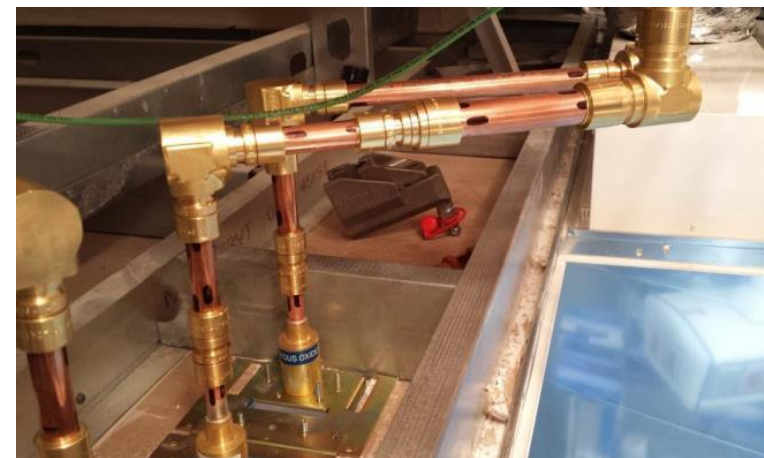


NFPA 99 2018 EDITION: 5.1.10.7.1

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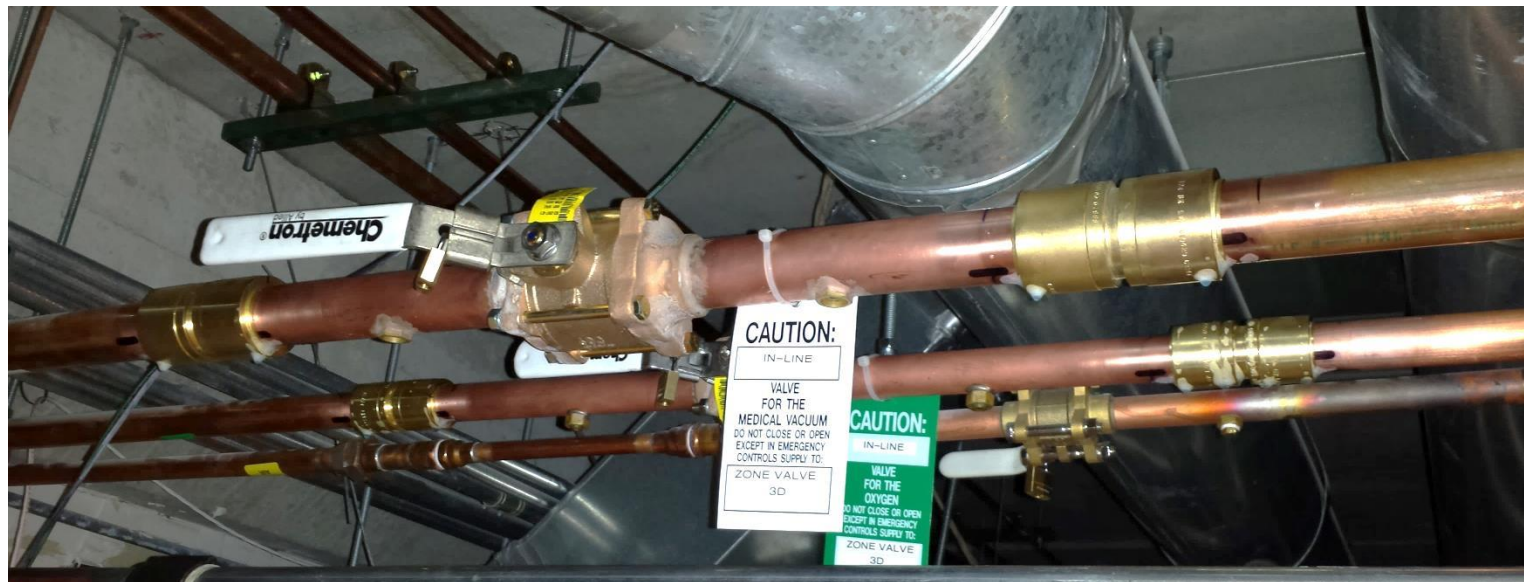
Benefits

- No Brazing - No Open Flame
- No Flammable Gas in Patient Area
- No Burn Permits / Fire Watch
- Smoke & Fire Alarms Remain On
- Reduce Damage to Surroundings
- No Cool Down
- No Nitrogen Purge
- No Particulate
- Reduce Verification Time
- Return to System Use Sooner
- Cost Savings



Valve Assemblies

- Ball Valve with copper extensions & 2 Lokring couplings



Area Alarm Transducers

- Gauge Port Couplings



Inventories

A current list which includes:

- Source Equipment
- Valves
- Alarms
- Manufactured Assemblies
- Outlets/Inlets

Inspection

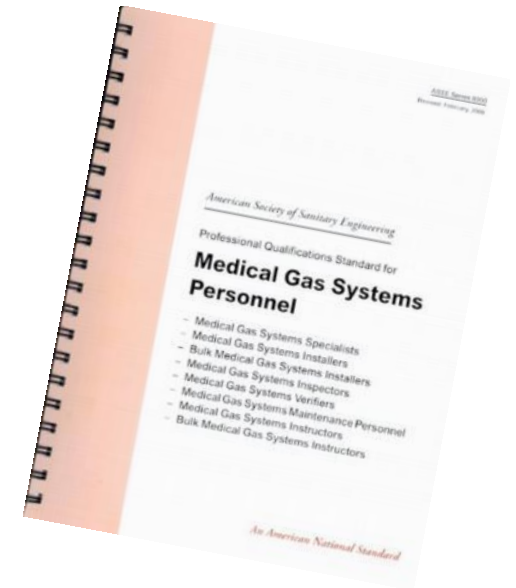
- Scheduled inspections for equipment and procedures per manufacturer and authority having jurisdiction requirements.

Maintenance

- Scheduled maintenance for equipment and procedures established through risk assessment, equipment manufacturer and authority having jurisdiction requirements.

ASSE 6000

■ Medical Gas Personnel Credentials



	1999	2002	2012	2018
ASSE 6010 Installer	-	X*	X	X
ASSE 6030 Verifier	-	X*	X	X
ASSE 6040 Maintenance Tech	-	-	X*	X



Thank You!



For Additional Training/More Information:

Tom Spremo

tom@purelymedgas.com

414-699-4757

