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NEW CODES AND STANDARDS

AHCA VIRTUAL DESIGN & CONSTRUCTION SEMINAR
NOVEMBER 16 -18, 2020

NFPA 99 Health Care Facilities Code: Updates to the 2018 Edition

Course Number: **AHCA2020_16**

Credit Designation: 1 LU| HSW

AIA CES Provider Number: E240

November 18, 2020

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AIA Learning Objectives

1 OBJECTIVE

Learn how the new revisions to NFPA 99 *Health Care Facilities Code* will affect the design of rooms and spaces inside of a health care facility.

2 OBJECTIVE

Understand how the requirements found in NFPA 99 *Health Care Facilities Code* are directly related to the health and safety of patients being treated, housed, and examined inside of health care facilities.

3 OBJECTIVE

Be able to describe the new revisions in NFPA 99 that directly affect patient health and safety.

4 OBJECTIVE

Identify the specific areas in NFPA 99 *Health Care Facilities Code* that affect architectural design requirements, such as fire safety requirements for medical gas storage, requirements for the location and design of the emergency generator and switch gear, design of IT rooms and spaces, and etc.

Medical Gas Utilities Management: NFPA 2015/2018 Changes

Presented By

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Your Presenter…

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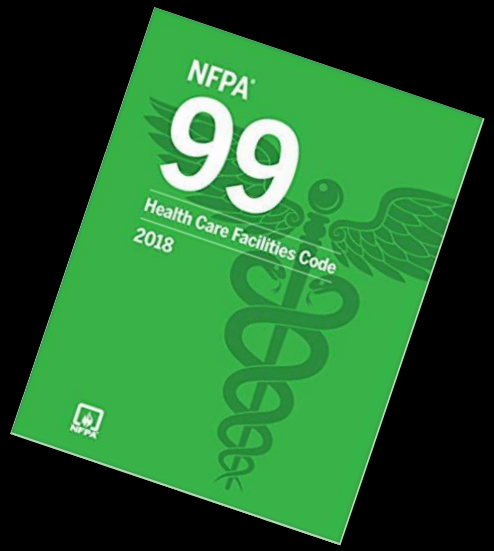
Paul Rumbos

Major Medical Hospital Services

- *Medical Gas Credentials: NITC/MGTI/MGPHO*
  - *ASSE 6050 Certified Medical Gas Instructor*
  - *ASSE 6030 Certified Medical Gas Verifier*
  - *ASSE 6020 Certified Medical Gas Inspector*
  - *ASSE 6010 Medical Gas System Installer*
  - *MGPHO Credentialed Medical Gas Verifier*
  - *NFPA 99 Committee Member (Alternate)*
  - *ASSE 6000 Committee Member*
  - *Affiliations in ASHE, ASSE and member in good standing with Hospital Engineers' Societies*



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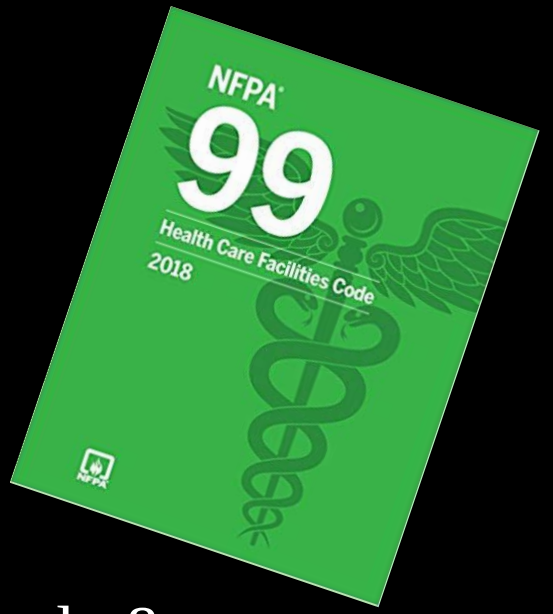
Presentation Outline



- Introduction & Overview
- Defining our Terms
- NFPA 2018 Summary of Changes
- Revised Emergency Management Code & Emergency Preparedness as it Related to Pandemic Response
- Conclusions & Discussion

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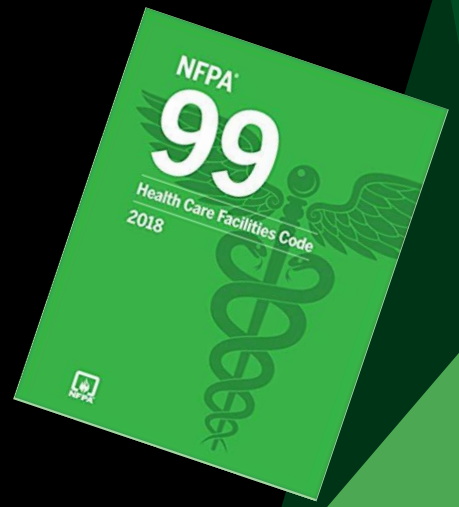


Regulatory Codes & Standards

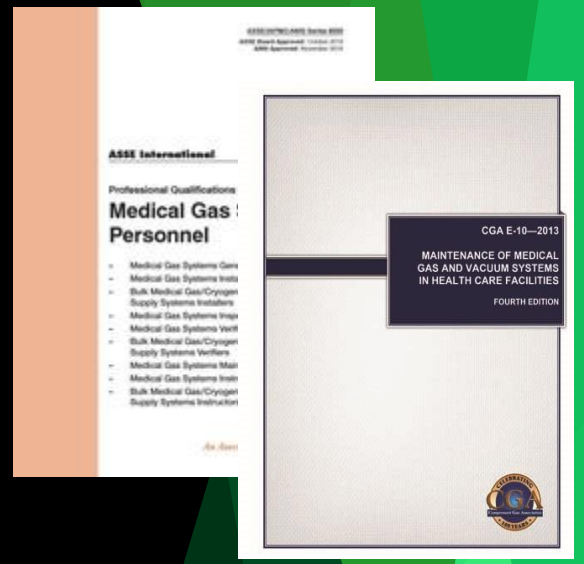
NFPA 99: *Health Care Facilities Code*, 2015/2018 Edition

The scope of the NFPA 99: *Health Care Facilities Code* is to establish criteria to minimize the hazards of fire, explosion, and electricity in health care facilities providing services to human beings.

Chapter 5, Gas and Vacuum Systems, covers the performance, maintenance, installation, and testing of nonflammable medical gas systems with operating pressures below a gauge pressure of 300 psi, vacuum systems used within health care facilities, waste anesthetic gas disposal (WAGD) systems, also referred to as scavenging systems, and manufactured assemblies that are intended for connection to the medical gas, vacuum, or WAGD systems.

Other Reference Guides

CGA E-10: Maintenance of Medical Gas and Vacuum Systems at Health Care Facilities



- ✓ A guide to the preparation of a maintenance program regarding piped medical gas/vacuum systems in health care facilities.
- ✓ National codes require health care facilities with these systems to have an effective, documented maintenance program.
- ✓ Covers inspection and testing of Gas/Vacuum Outlets, Gas/Vacuum Alarm Systems, Compressed Gas Manifolds, Vacuum Pumps, Medical Air Compressors, Suggested Frequency of Inspection, Test Methods, & Documentation.
- ✓ Also *CGA M-1*, P-1&2 Safe Handling, P-2.7 Guide for safe storage, Handling, and use of small portable liquid 02 systems, P-2.6 Trans- filling Liquid 02 use for Resp., P-30 Cryogenics, P-39 02 Rich Atm. & G-4 Oxygen

CGA
Compressed Gas Association
The Standard For Safety Since 1913

Code Administration

- The purpose of NFPA 99 is to provide *minimum requirements* for the installation, inspection, testing, maintenance, performance, and safe practices for facilities, material, equipment, and appliances, including other hazards associated with the primary hazards.

History of NFPA 99 Code

1986

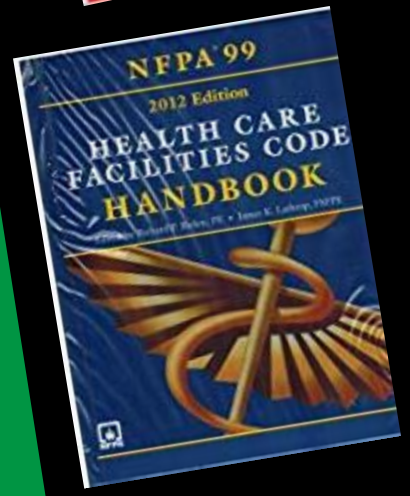
- **Medical Gas Board is established for the purpose of ensuring patient safety through standardization of practice.**

1999

- **NFPA updates code relevant to new industry standards.**

2002/2005

- **Minor edits completed for the purpose of staying current with evolving industry practices.**



2012

- **Major changes and reorganization of chapters.**

2015

- **NFPA 99 gets promoted from a "Standard" to a Code."**

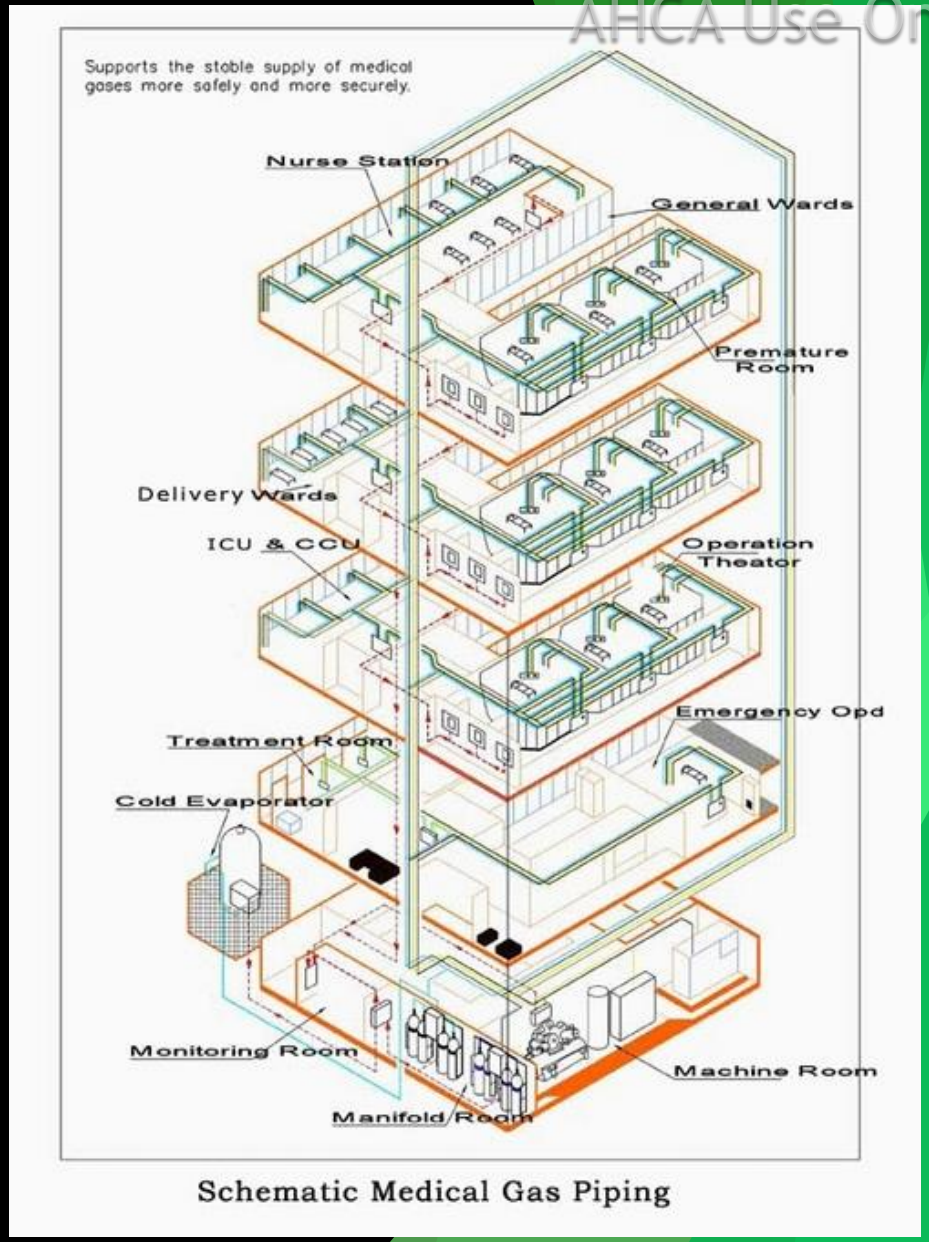
2018

- **Category 3 Systems get assigned to Dental Chapter #15.**

2021

- **Published. Available in 12/2020.**

Typical Category 1 Medical Gas Systems



Schematic Medical Gas Piping

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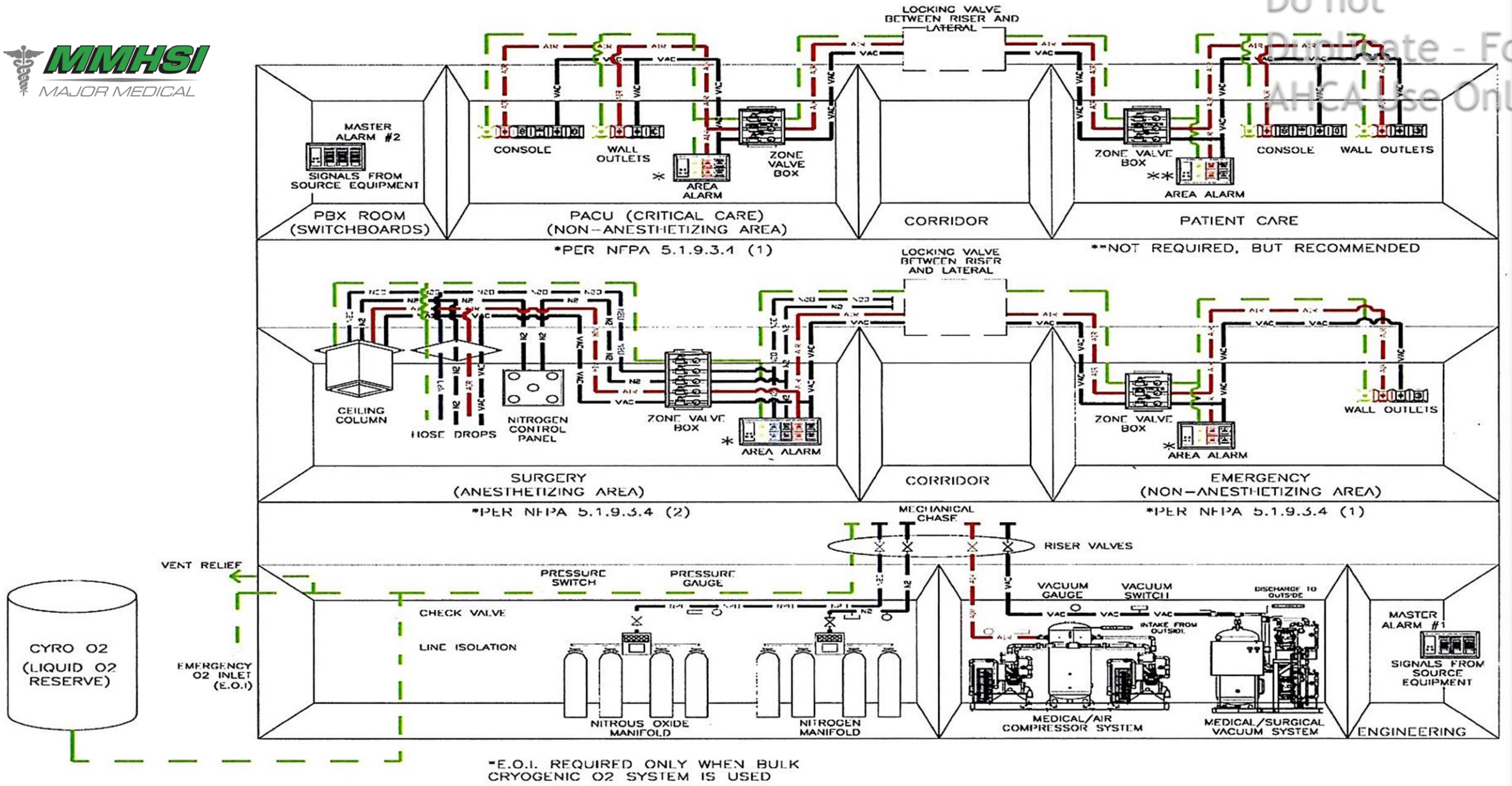


Components of Hospital Medical Gas Systems

SOURCE EQUIPMENT

- Bulk Tank
- Manifolds
- Med Air Compressors
- Med Surgical Vacuum
- Instrument Air
- New Technologies

ALARMS

- Local
- Master
- Area

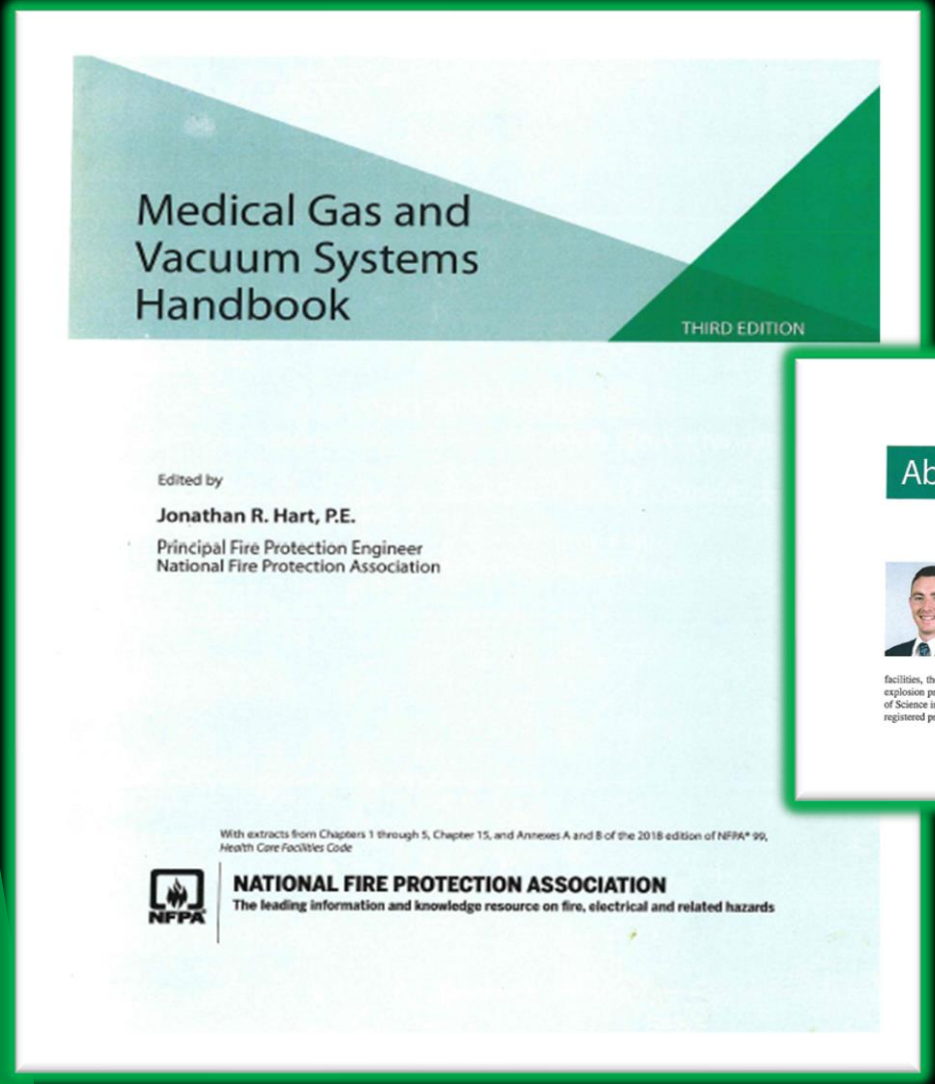
VALVES

- Master
- Service
- Zone Valve Box

OUTLETS

- Boom Arms
- Hoses
- Columns

Summary of Technical Changes 2015 -2018



Medical Gas and Vacuum Systems Handbook

THIRD EDITION

Edited by

Jonathan R. Hart, P.E.

Principal Fire Protection Engineer
National Fire Protection Association

With extracts from Chapters 1 through 5, Chapter 15, and Annexes A and B of the 2018 edition of NFPA® 99, *Health Care Facilities Code*

NATIONAL FIRE PROTECTION ASSOCIATION
The leading information and knowledge resource on fire, electrical and related hazards

About the Editor

Jonathan R. Hart, PE
Jon Hart is a Principal Fire Protection Engineer for NFPA. In this role he serves as staff liaison to NFPA 99, *Health Care Facilities Code*, working with the technical committees and the correlating committee responsible for the development of the document. He is a developer and instructor of the two-day NFPA 99 Seminar and is the technical editor of the *Health Care Facilities Code Handbook*. Jon has also worked with codes and standards involving the fire protection of IT equipment, the fire protection of telecommunications facilities, the ventilation control and fire protection of commercial cooking operations, and explosion protection. He has a Bachelor of Science in Mechanical Engineering and a Master of Science in Fire Protection Engineering, both from Worcester Polytechnic Institute. Jon is a registered professional engineer in the discipline of fire protection.

About the Contributors

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Mark Allen is Director of Marketing for BeaconMedaes and has been involved in the writing of the medical gas standards in NFPA 99 since the 1983 edition. He is also involved with the Canadian Standards and ISO medical gas and vacuum standards. He has also contributed to the writing of several other industry guidelines, design guides, and technical articles involving medical gas and vacuum piping systems.

Neil Gagne (Chapter 15)
Neil Gagne is one of the principle owners of William G Frank Medical Gas Testing & Consulting LLC. He is a voting member of the NFPA 99 Technical Committee and specializes in the design and testing of medical gas systems. Currently he holds the credentials of ASSE 6010, 6020, 6030, 6035, 6040, 6050 and MGPHO CMGV (Credentialed Medical Gas Verifier).

Jonathan Willard, CPD, PMP, CHC, CMGV (Test Procedures, Chapter 5)
Jonathan Willard is the President of Acute Medical Gas Services, Inc., a comprehensive turnkey provider of medical and specialty gas services and equipment. He has worked in effectively all aspects of the medical gas industry, including regulatory compliance, consulting, design, construction, testing, training, and emergency preparedness, for over 20 years. His involvement in health care projects have taken him all over the world, including Afghanistan, Korea, Cuba, Haiti, and St. Lucia. In addition to being one of a handful of individuals holding all of the ASSE 6000 medical gas certifications, Jonathan is a principal voting member of the NFPA 99 Technical Committee on Medical Gas and Vacuum Piping Systems and the NFPA 55 Technical Committee on Industrial and Medical Gases. He holds a Credentialed Medical Gas Verifier (CMGV©) certification and currently serves on the Medical Gas Professional Healthcare Organization (MGPHO) Board of Directors. He is also Certified in Plumbing Design (CPD©), a LEED AP© (Accredited Professional), a certified Project Management Professional (PMP©), and an ASHE Certified Healthcare Constructor (CHC) with an M.S. degree in business education (MBE) and an M.S. degree in community economic development.

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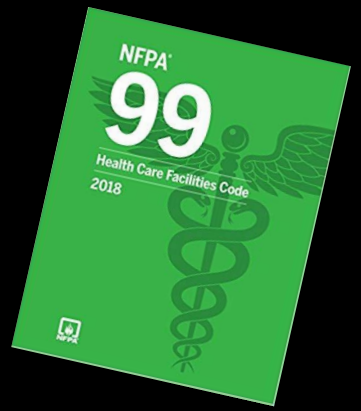
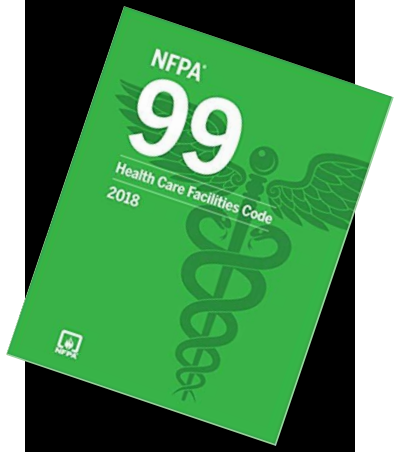
Summary of Technical Changes 2015 -2018



Section Number	Comments	FR/FCR/ SR/SCR Reference
Chapter 1		
1.1.12	Revised to specify that the hyperbaric facilities chapter is used for facility design, chamber design, and facility operation.	FR 103
1.1.13	Added to include a scope statement for the new chapter on dental gas and vacuum systems.	SR 109
1.3.4 1.3.4.1 1.3.4.2 1.3.4.3	The defined term *governing body* has been changed to *health care facility's governing body* for consistency throughout the document.	FR 113, FCR 2
Chapter 3		
3.3.22 A.3.3.22	Definition of *central supply system* was added in combination with ensuring consistency to terminology throughout Chapter 5. This allows for better differentiation between the complete source of supply and references to just the supply source.	FR 601
3.3.37 3.3.38 3.3.39	Definitions of *dental air, dental office, and dental vacuum/scavenging were* added to define terms widely used in new Chapter 15 on dental gas and vacuum systems.	SR 642, SR 643
3.3.72 A.3.3.72	Definition of health care facility's governing body was added as the term is now used in multiple chapters in NFPA 99.	FR 112
3.3.127	Definition of *oxygen concentrator unit* was added because these units are now permitted by Chapter 5 as central supply sources.	FR 106, SR 602
3.3.131	Definition of *oxygen 93 USP* was added to delineate between oxygen USP and oxygen 93 USP, two different and distinct medical gases.	SR 604
3.3.138 A.3.3.138	Definition of *producer* was added because it is used for WAGD and for plume.	FR 603
3.3.171	The definition of *supply source* and the subdefinitions that fall under 3.3.171 have been revised to clarify that supply source is only one component of the central supply system.	FR 601

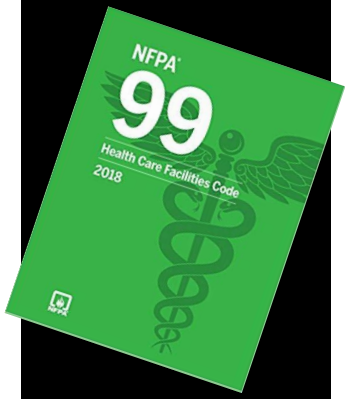
Section Number	Comments	FR/FCR/ SR/SCR Reference
Chapter 4		
4.2.1 4.2.1.1	Revised to clearly identify that the health care facility's governing body is the party responsible for determining risk categories.	FR 108, SR 105
4.2.2 A.4.2.2 4.2.2.1	Revised to clarify that the facility always has the responsibility for determining the risk categories and the AHJ always has the oversight to require that risk assessments be submitted for review.	SR 106
4.2.3	Revised to clarify that risk assessments are not needed if the user selects to meet Category 1 requirements.	FR 108
4.3	Revised to reflect the applicability of risk categories to Chapter 14 and the new Chapter 15.	SR 110
Chapter 5		
5.1.3.3.1.6 5.1.3.3.1.7 5.1.3.3.1.8 5.1.3.3.1.9 5.1.3.3.1.10	Terminology has been revised to correlate with the definition changes made in Chapter 3.	FR 903
5.1.3.3.2	Item (3) was modified and item (4) was added to specify that outdoor central supply locations only need to be provided a minimum of two entry/exits where the location is greater than 200 ft². Item (9) was modified and item (10) was added to clarify the requirement for heating these locations. The previous language referencing heating by indirect means was not clear. Now, fuel fired equipment is clearly prohibited, which was the original intent.	FR 610, SR 607
5.1.3.3.3.1	Added language requiring central supply locations to reference ventilation requirements.	FR 611
5.1.3.3.4.1	Revised to correlate with changes made to Chapter 11. The language added matches the application statement in Chapter 1 by not requiring construction requirements to be applied retroactively to previously approved installations.	SCR 6
5.1.3.5.2(6)	Added item (6) to allow the use of medical gases in the training and assessment of health care professionals in simulation centers.	FR 613
5.1.3.5.5 5.1.3.5.5.1 A.5.1.3.5.5.1	Revised to allow all effective methods to be used for controlling line pressure.	FR 614
5.1.3.5.7	Revised to require auxiliary connections only for liquid cryogenic sources.	SR 641
5.1.3.5.11	Added to define the requirements for oxygen concentrator supplies.	FR 609, SCR 16
5.1.3.5.12.3	Revised to improve safety by prohibiting an installation where the cylinder headers are not in the same room as the manifold control cabinet.	FR 616
Table 5.1.3.5.13.1	Extracts the table for Minimum Separation Distance Between Portable Cryogenic Containers and Exposures in NFPA 55.	FR 617
5.1.3.5.13.4	Revised to add requirement for flow capacity to also be addressed in the design and construction of the system.	FR 618



Section Number	Comments	FR/FCR/ SR/SCR Reference
5.1.3.5.14	Deleted section on microbulk. The requirements for stationary microbulk and bulk are identical and there is no need for two separate sections. This will provide guidance for the AHJ. Also see the revised definitions in Chapter 3.	FR 627
5.1.3.5.14	This section has been renamed Cryogenic Fluid Supply Systems, in order to apply to what were previously separated bulk and micro-bulk systems. Throughout the section, "bulk cryogenic" was replaced with "cryogenic fluid supply." Items (2), (3), and (4) were deleted from 5.1.3.5.14.2 because they are included in 5.1.3.3, Central Supply Systems	FR 626
5.1.3.6.3.10	Revised to account for new developments in control methods for compressors and pumps, while preserving the performance characteristics inherent in the original text. Previously the language of Item (C) potentially allowed the installation of equipment that did not comply with NFPA 70E. The language of (C) has been revised to prevent this.	FR 620
5.1.3.6.3.12(F)	Revised to account for new developments in control methods for compressors and pumps, while preserving the performance characteristics inherent in the original text.	FR 621
5.1.3.7.1.2(7)	New item (7) requires vacuum filtration as now specified in 5.1.3.7.4	FR 652
5.1.3.7.4	Added requirement for inlet filtration of vacuums to align with normal international practice.	FR 651
5.1.3.7.6	Revised to account for new developments in control methods for compressors and pumps, while preserving the performance characteristics inherent in the original text.	FR 622
5.1.3.7.8	Revised to account for new developments in control methods for pumps, while preserving the performance characteristics inherent in the original text.	FR 623
5.1.3.8.3.2	Revised to account for new developments in control methods for compressors and pumps, while preserving the performance characteristics inherent in the original text.	FR 624
5.1.3.8.4	Revised to account for new developments in control methods for compressors and pumps, while preserving the performance characteristics inherent in the original text.	FR 625
5.1.3.9	Added to provide details for a central supply system that uses an oxygen concentrator as one of the supply sources.	FR 640, SCR 5
5.1.4.1.6 Table 5.1.4.1.6(a) Table 5.1.4.1.6(b)	Added new Tables 5.1.4.1.6(a) and 5.1.4.1.6(b) to prevent the possibility of ball valves using smaller internal components inside larger valve bodies.	FR 650
5.1.4.6	Revised for clarity and to delete redundant clauses and remove an unnecessary requirement.	SR 633
A.5.1.4.6.1(2)	Added to better define standing position and that it is not meant to be standing on a ladder or anything other than the floor.	FR 649
A.5.1.5	Added to include reference to the FGI guidelines for the minimum number of outlets/ inlets required	FR 628
5.1.5.17	Added to prevent instances of hose assemblies occasionally disconnecting from quick connect outlets. DISS outlets provide a much safer / secure connection.	FR 628
5.1.6.1(5)	Added to require that the operational pressure test be done by the assembly manufacturer prior to installation.	FR 647, SR 634
5.1.6.2	Revised to update leakage requirements.	FR 642

Summary of Technical Changes 2015 -2018

Section Number	Comments	FR/FCR/ SR/SCR Reference
5.1.6.5	Revised to require the manufacturer of the assembly to provide verification documentation certifying that the assembly meets the requirement.	FR 644
5.1.6.6	Requirement has been changed to require that components meet this criterion rather than the manufactured assembly itself. ANSI/UL 723 has been added as an alternate test method to ASTM E84.	FR 676
5.1.6.9	Added labeling requirement to help those providing care and maintenance better identify what gas they are dealing with on a given hose.	FR 645, SR 635
5.1.9.2.4(14)	Added requirements for alarms needed to support the concentrator supply system.	FR 641, SR 616
5.1.9.4.5	Added to clarify 5.1.9.4.4(2) to show that the use of one area alarm panel for an operating room suite is permissible.	FR 629
5.1.9.5.4	Added new alarm requirements to support the new oxygen concentrator supplies	FR 630, SCR 20
5.1.10.1.4	Added to allow for the use of corrugated medical tubing for positive-pressure medical gas systems.	SR 620
5.1.10.1.5	Added to provide a minimum flame spread index and smoke developed index for the plastic jacket of medical tubing using ASTM E84, which is widely used for these measurements.	SR 624
5.1.10.1.6	Added to provide the requirement for marking CMT, similar to the other types of tubing currently allowed in the Code. Distance between marking has been included to make sure that the marking is not spread out over too great of a distance.	SR 625
5.1.10.2.1	New allowance for the use of corrugated medical tubing for vacuum systems.	SR 621
5.1.10.3.2	Added to recognize that CMT is an inherently flexible tube product that can be safely bent up to the minimum bend radius with no reduction in cross sectional area or damage to the tubing. The minimum bend radius is verified for each tube size as part of the listing process.	SR 627
5.1.10.3.4	Added to prohibit mechanically formed, drilled, and extruded tee-branch connections as they are not appropriate for corrugated metal tubing.	SR 628
5.1.10.4.3.4	Revised to require stainless steel or brass brush, which should help prevent the potential for degreasing a steel wire brush, which could cause it to rust.	FR 633
5.1.10.11.3.2	Revised to clearly prohibit locating unprotected medical gas piping in stairwells.	FR 634
5.1.10.11.4.4	Added requirements for the support of CMT.	SR 630
5.1.10.11.6.4	Clarified that it is not the intent that the prohibition of concealing hose and flexible connectors be applied to the joints detailed in 5.1.10.11.6.3.	FR 902
5.1.10.11.10.3	Added installer qualifications for systems using CMT.	SR 622
5.1.10.11.11.4	Added base metal as an item to be documented because it is an essential variable and is critical to the brazing procedure.	FR 635
5.1.11.2.7	Revised to require more specific labeling for zone valve box assemblies.	FR 677
5.1.11.5	Added to require source equipment to be labeled with minimum information to allow those responding to an issue to be able to understand the potential impact on patient care as quickly as possible.	FR 636
5.1.12.1.1	Revised to clarify application is to both gas and vacuum and that both the process as well as the procedure need to be documented.	FR 679



Section Number	Comments	FR/FCR/ SR/SCR Reference
5.1.12.1.11	Revised to clarify that only the verifier final report is sufficient to meet this requirement.	FR 680
5.1.12.2.6.5	Revised to update leakage requirements.	FR 643
5.1.12.2.6.7	Added requirement for ASSE 6020 Inspector certification for the standing pressure test of the positive pressure system.	FR 637
5.1.12.3	Added to require that the concealed piping distribution system and associated components be inspected prior to being concealed.	FR 631
5.1.12.4.1.4	Added to require qualifications to new standard ASSE 6035, *Professional Qualifications Standard for Bulk Medical Gas Systems Verifiers.*	FR 638
5.1.12.4.8.2	Added to clarify that halogenated hydrocarbons is a comparative test.	FR 653
5.1.12.4.10	Revised title to more accurately reflect what the test is evaluating.	FR 659
5.1.12.4.14.3(H)	Revised to match item (E), which states the compressor system shall operate for at least 12 hours prior to testing.	FR 663
5.1.12.4.14.4	Tests have been added to support the addition of concentrator sources and to verify that they are operating properly prior to use.	FR 661, SCR 21
5.1.13.3.4.3	Revised item (1) to no longer specify a gauge pressure of 1380 kPa (200 psi) at the compressor but now to require pressure adequate for the intended line pressure.	FR 665
5.1.13.3.4.5	Revised to no longer specify a compressor capable of gauge pressure of 1380 kPa (200 psi) but now to require they are a capable of providing pressure adequate for the intended line pressure.	FR 668
5.1.13.3.4.12	Revised to account for new developments in control methods for compressors and pumps, while preserving the performance characteristics inherent in the original text.	FR 683
5.1.13.8	Revised to no longer specify a compressor capable of gauge pressure of 1380 kPa (200 psi) but now to require they are a capable of providing pressure adequate for the intended line pressure.	FR 670
5.1.14.4	Added a reference to the new requirement for labeling in 5.1.11.5.	FR 678
5.1.14.5.7(5) and (6)	Added new (5) and (6) to support the use of oxygen concentrators by including maintenance requirements to ensure their continued safe use once in service.	FR 671
5.1.14.5.10	Revised to support concentrators when cylinders are used as reserves by adding important maintenance requirements.	FR 672, SR 619
5.2.3.6	Added to allow oxygen concentrator supply systems in a Category 2 system.	FR 673
5.3	Deleted majority of Category 3 requirements. Requirements for dental gas and vacuum systems are now located in Chapter 15.	SR 632
Chapter 15	Added new chapter specific to dental gas and vacuum systems to properly address their unique needs.	

Summary of Technical Changes 2015 -2018

NFPA 99 2018: Summary of Changes

Chapter 3 - Definitions
- ❑ Defining & Clarifying Terms

Chapter 4 - Fundamentals
- ❑ Fundamentals of Risk Assessment

Chapter 5 – Gas & Vacuum Systems
- ❑ Outdoor/indoor locations for central supply
- ❑ Storage of Medical Gas Cylinders
- ❑ Controls for Line Pressure
- ❑ Auxiliary Source Connection
- ❑ Oxygen Concentrator Supply Units
- ❑ Cryogenic Fluid Central Supply Systems
- ❑ Operating, Area and Local Alarms and Signals
- ❑ Vacuum Filtration
- ❑ Manufactured Assemblies/ Corrugated Medical Tubing
- ❑ System Inspection
- ❑ Source Equipment Labelling
- ❑ Bulk System Verification

Chapter 11 – Gas Equipment
- ❑ Performance and maintenance of gas equipment in ***new and existing*** healthcare facilities
- ❑ Cylinder Storage and Protection

Chapter 12 – Emergency Management
- ❑ Pandemic/ COVID Response

Chapter 15 - Dental Gas and Vacuum Systems
- ❑ Removed from chapter 5 and moved to its own chapter

Chapter 3: Defining and Clarifying Terms

- Central Supply Systems & Supply Sources
- Operating Supply, Primary Supply, Reserve Supply & Secondary Supply
- Defining Dental Terms
- Oxygen Concentrator Unit & O2 93 USP
- Plume as it relates to capture and exhaust system
  - 9.3.8 Plumes... shall be captured by one of the following methods:
    - (1) Dedicated exhaust system that discharges in accordance with…
    - (2) Connection and return or exhaust duct after air cleaning through...
    - (3) Point of use smoke evacuator for air cleaning and return...
  - "Inlets can be of any design suitable for the plume capture device in use, provided the design does NOT permit interconnection to any medical vacuum, WAGD, or housekeeping vacuum systems."

WAGD is not to be used for plume exhaust

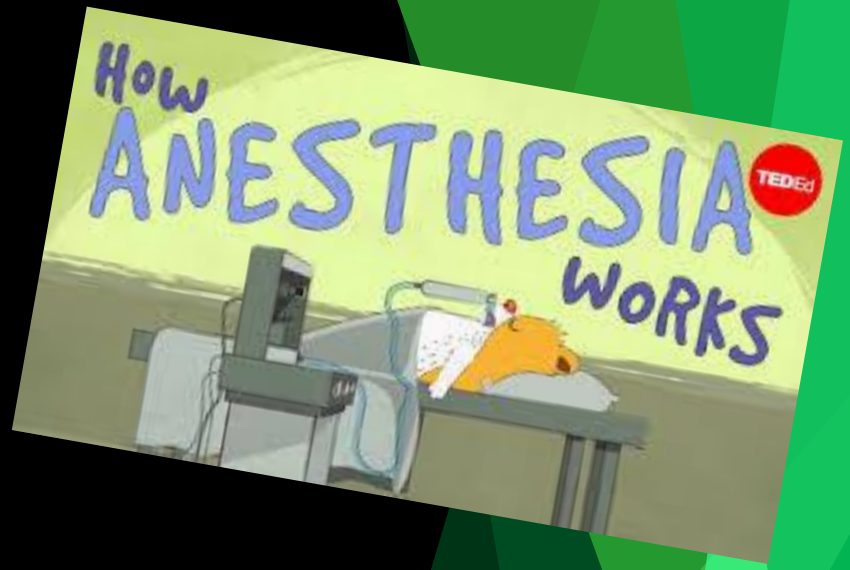
Chapter 4: Fundamentals

Designed to meet one of four "Categories" (exclusive from levels as it was in 2005)

Category 1: Likely to cause

Major injury or death of patient or caregiver

A risk assessment is not needed if determined a category 1*



Category 2: Likely to cause

Minor injury to patient or caregiver

Category 3: Likely to cause

Not likely to cause injury, but may cause patient discomfort

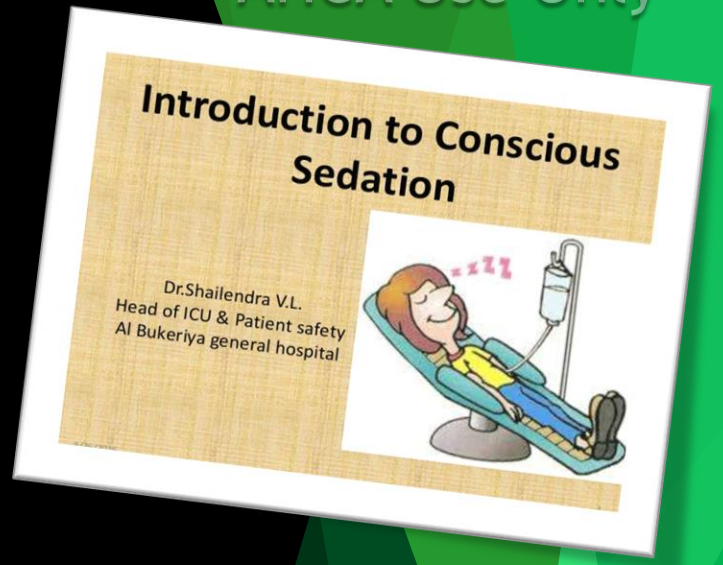
Category 4: Likely to cause

No impact on patient care

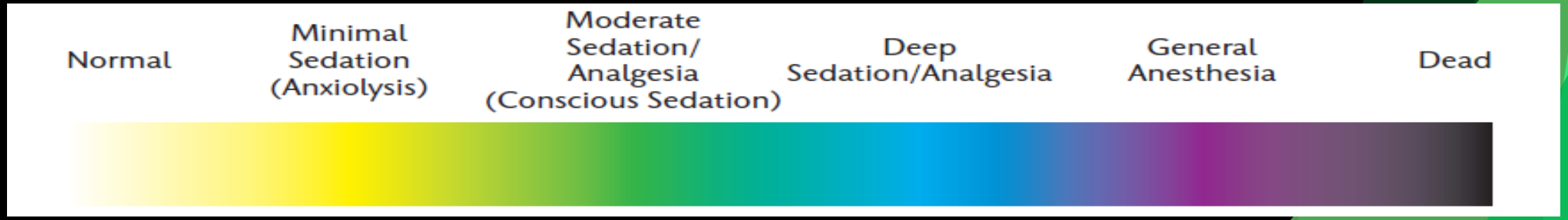
Language added to clarify risk assessments. Who is responsible and how categories are determined?

Categories are determined by the facility through a "*Documented Risk Assessment*"

Chapter 4: Risk Assessment - Levels of Sedation



- The scope of necessary safety precautions will be determined by a risk assessment of levels of anesthesia (Ex: use of ZVB & Area Alarms).
- It is the responsibility of the facility's "governing body" to determine through a *documented* process the maximum level of sedation to be used in a given location.
  - ❖ Results of this assessment determine use of
  - ❖ Zone Valves & Area Alarms.



Chapter 4: Risk Assessment

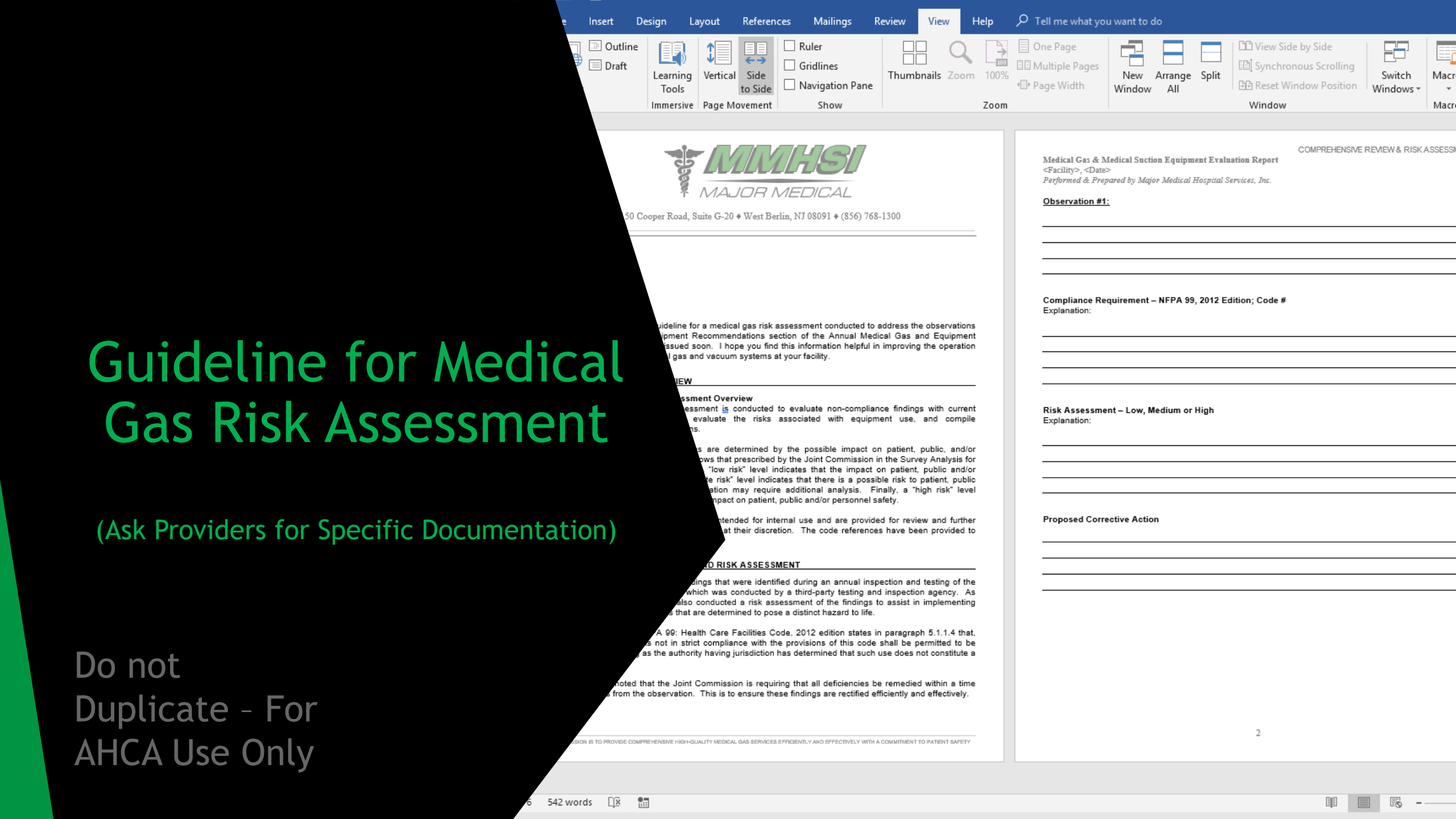
NFPA 2015/ 2018- Defining Occupancy

- “Rooms” have been redefined as “Spaces,” thereby removing implications that doors, walls, windows, etc. must be present to have this distinction.
- Room types are no longer specifically defined.
- Category Designations: Space vs Locations

Guideline for Medical Gas Risk Assessment

(Ask Providers for Specific Documentation)

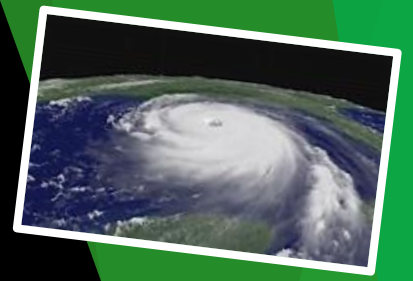
Do not Duplicate – For AHCA Use Only

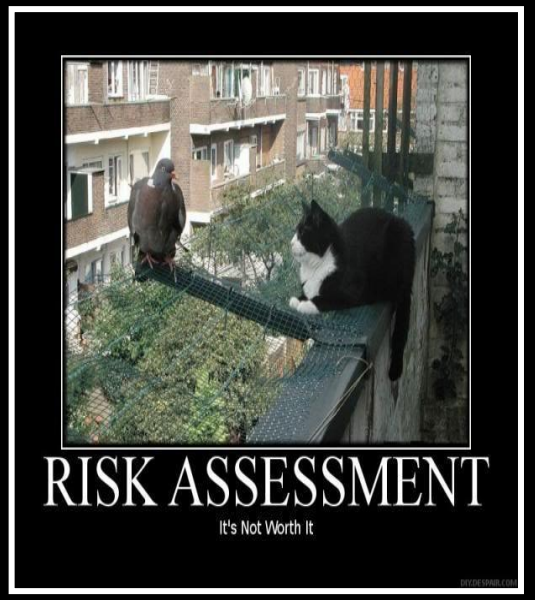


RISK ASSESSMENT

What are the worst-case scenarios?

Look for them…



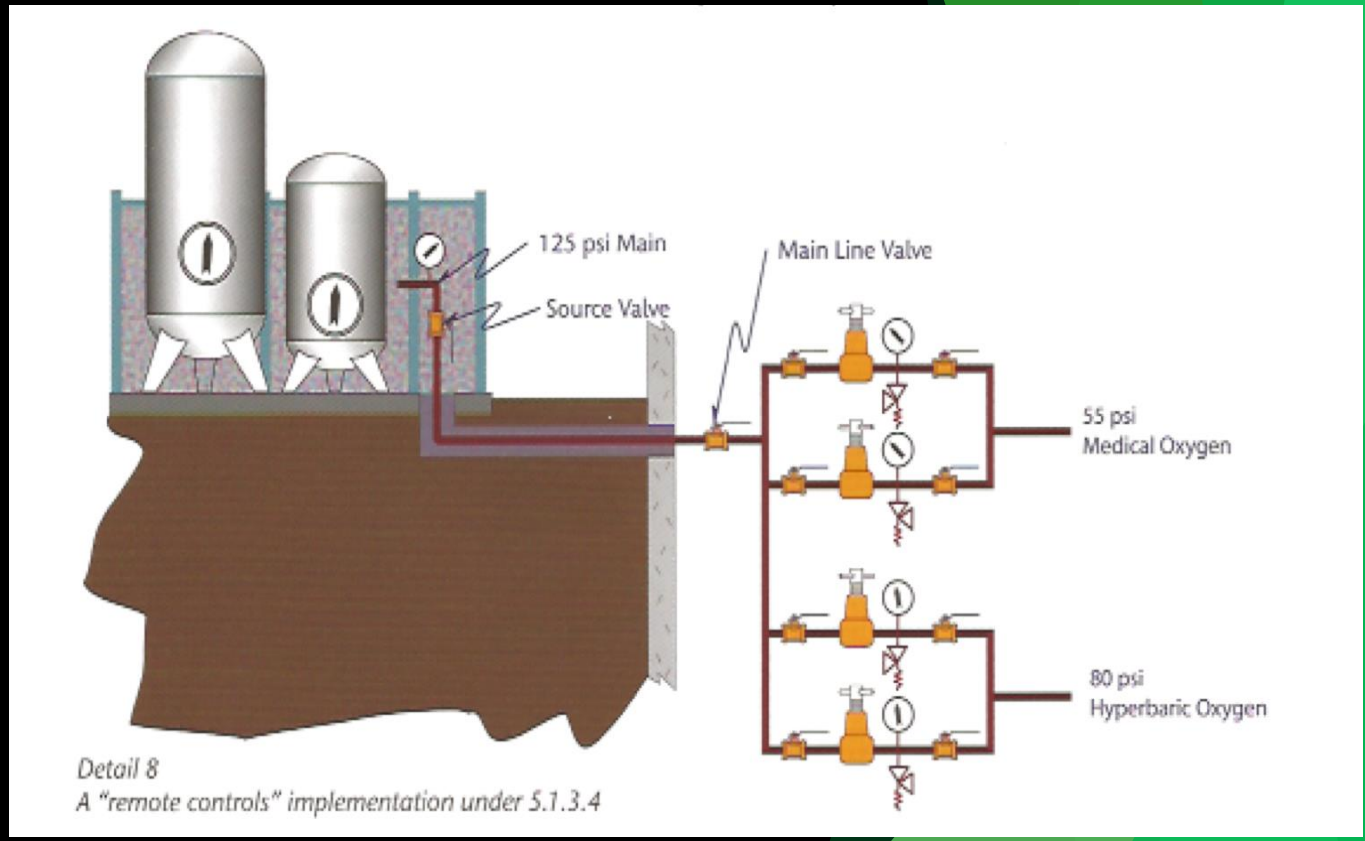


MMHSI
MAJOR MEDICAL

Chapter 5: Central Supply System Location

"Remote" Control Equipment (i.e. Regulators, valves, and gauges) for Central Supply Systems

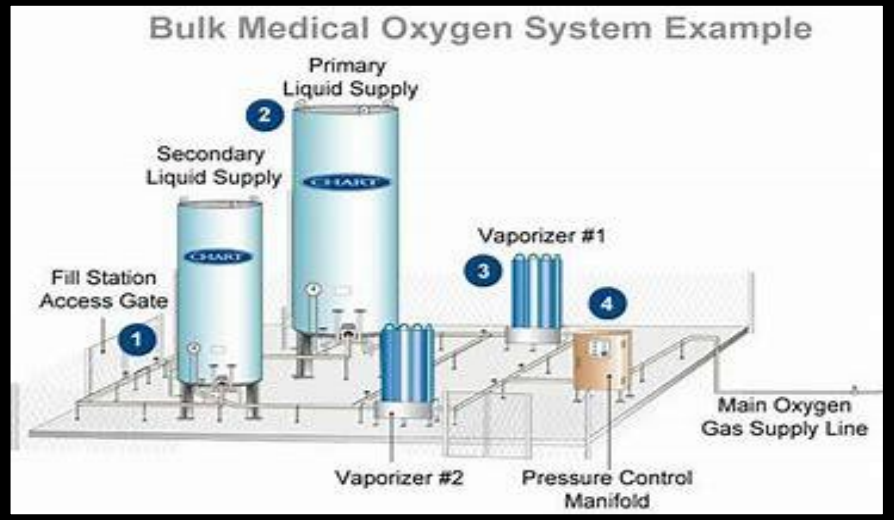
Control Equipment is allowed to be remote from the source equipment with this new provision (5.1.3.4).

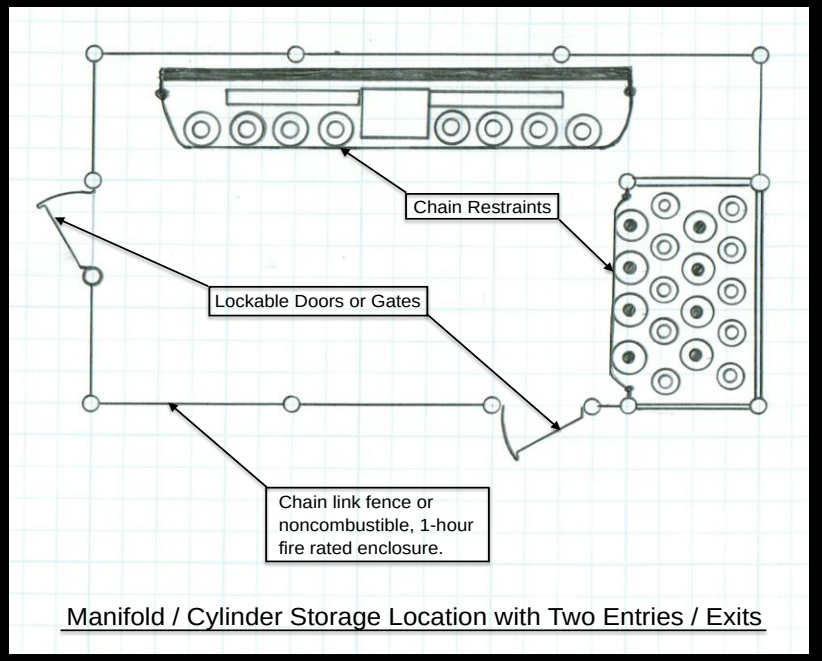


Detail 8
A "remote controls" implementation under 5.1.3.4

Chapter 5: Design and Construction

All outdoor locations require 2 forms of egress 5.1.3.3.2 (3)





Manifold / Cylinder Storage Location with Two Entries / Exits

2018 Change: 5.1.3.3.2 (4) If greater than 200 ft², you must provide a minimum of two entry/exit.

Chapter 5: Design and Construction

Indoor locations for central supply systems and gas storage 5.1.3.3.2(9)

Prohibits fuel-fired equipment in the room

Heating by any other means is allowed, if the element does not get hotter than 266°F

- Ex. - Electric heater with open coils, kerosene – not allowed
- Examples in *NFPA 99* – steam, hot water, and electric heat – were moved to the Annex (A)

Chapter 5: Storage of Medical Gas Cylinder

- 5.1.3.3.4.1 Full or empty medical gas cylinders, when not connected, shall be stored in locations complying with 5.1.3.3.2-5.1.3.3.3 permitted in the same room or enclosures as respective central supply systems.
  - Refer to 5.1.3.3 Central Supply System Locations
  - Refer to 5.1.3.3.3 Ventilation

New for 2018- “Approved existing installations shall be permitted to be continued in service.”

Chapter 5: Controls for Line Pressure 5.1.3.5.5

All positive-pressure supply systems shall be provided with means to control the final line pressure at the source with all the following characteristics:

(1) Able to maintain stable pressures within the limits of Table 5.1.11

(2) Each control mechanism able to flow 100 percent of the peak calculated demand.

(3) Redundant, such that each component of the control mechanism can be isolated for service or replacement while maintaining normal operation.

(4) Be constructed of materials deemed suitable by the manufacturer.

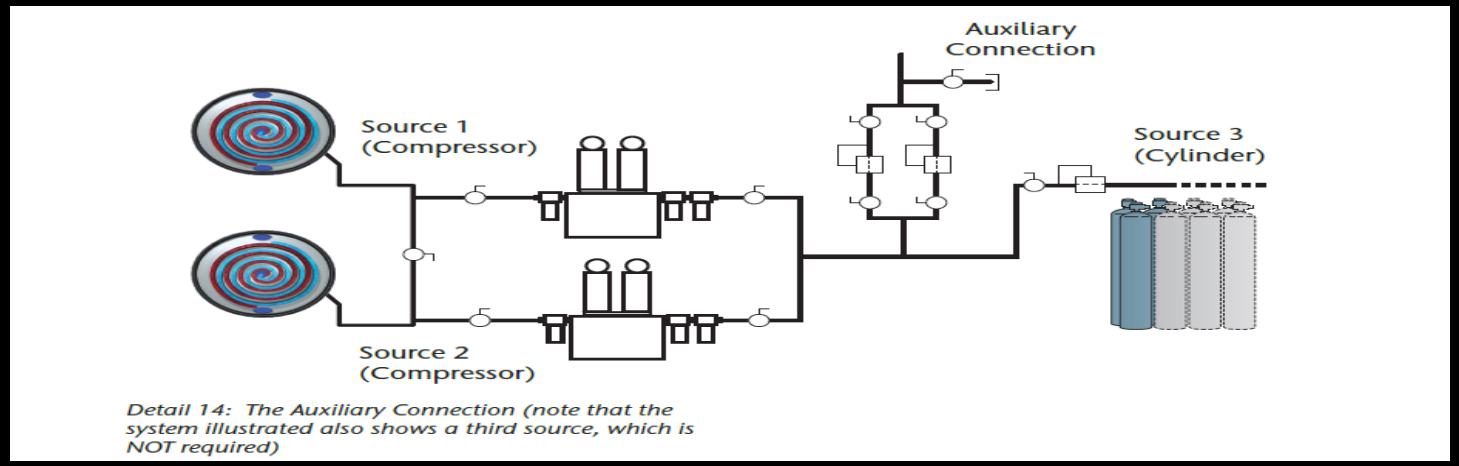
(5) Protected against overpressure.

Chapter 5: Auxiliary Line Connections

2015 - 5.1.3.5.7 Auxiliary Source Connection. All source systems shall be provided with an auxiliary source connection point of the same size as the main line, which shall be located immediately on the patient side of the source valve.

2018 - 5.1.3.5.7 Auxiliary Source Connection. Only for Cryogenic fluid central supply systems *(Personal Opinion – all source equipment should have an auxiliary connection)*

- **5.1.3.5.7.1** The connection shall consist of a tee, a valve, and a removable plug or cap.
- **5.1.3.5.7.2** The auxiliary source connection valve shall be normally closed and secured.



Detail 14: The Auxiliary Connection (note that the system illustrated also shows a third source, which is NOT required)

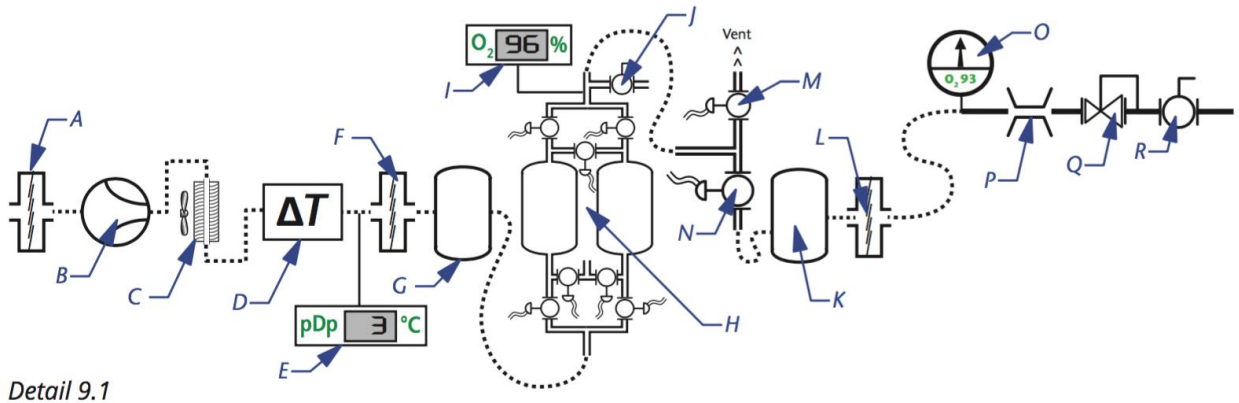
Chapter 5: Oxygen Concentrator Supply Units (5.1.3.5.11)

Normal air is about 21% oxygen and 79% nitrogen

- Molecular sieve removes the nitrogen
- A vent, blower, or pump is used to remove the nitrogen and recycle the sieve.
- Sieve bed also removes particulates/contaminants
  - Filter required downstream, to remove stray particulate
  - Intake air requirements not as stringent as medical air

Chapter 5: Oxygen Concentrator Supply Units (5.1.3.5.11)

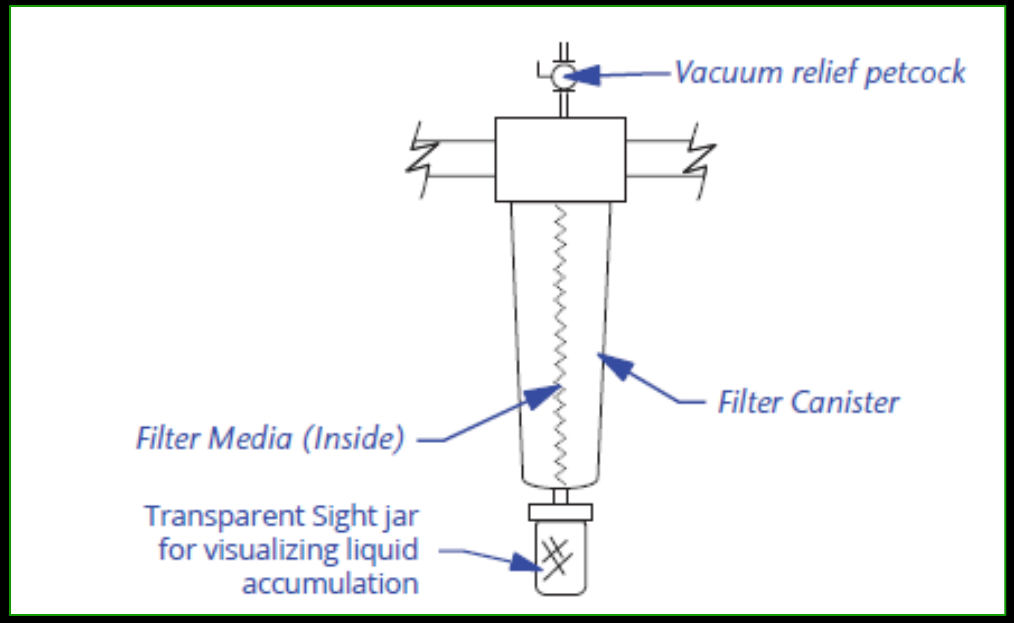
- Valved sample port and vent (to outside) are required
- "Outlet" valve to isolate all components from the pipeline required to be both manual and automatic
  - Manual to isolate source if needed for maintenance
  - Automatic if oxygen concentration drops too low (contaminated sieve bed)



Detail 9.1
Elements of a Typical Pressure Swing Absorber supply source
(Note: only elements with citations are required by NFPA 99. Other arrangements are possible)
(A) Concentrator Inlet filter 5.1.3.5.11.6; (B) Air Compressor; (C) Compressor aftercooler; (D) Dryer; (E) Dew point monitor; (F) Filter; (G) Receiver; (H) Concentrator; (I) Oxygen concentration monitor 5.1.3.5.11.13; (J) Sampling port 5.1.3.5.11.9; (K) Oxygen vessel; (L) Final filter 5.1.3.5.11.10; (M) Purge valve 5.1.3.5.11.8; (N) Automatic valve 5.1.3.5.11.12 and 5.1.3.9.2 (4); (O) Pressure Gauge; (P) Control orifice; (Q) Pressure regulator or check valve 5.1.3.5.11.11 and 5.1.3.9.2 (4); (R) Supply source isolation valve 5.1.3.5.11.12.

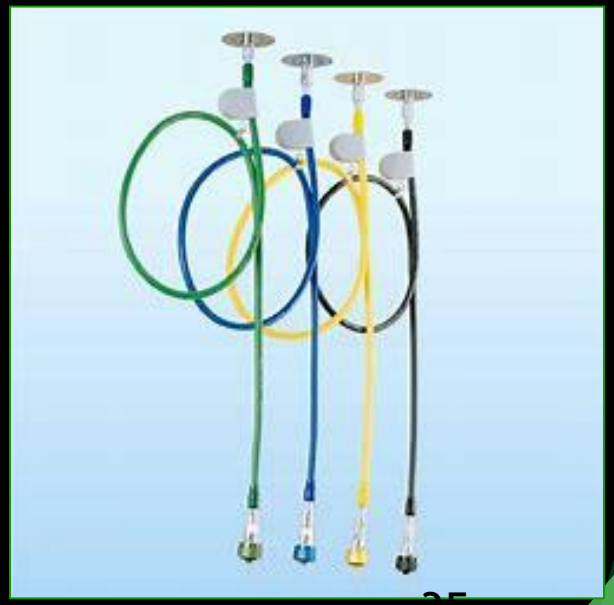
Chapter 5: Vacuum Filtration 5.1.3.7.4 (1-10)

- Vacuum filtration is required at system source
- Filters efficient to HEPA
- Sight Glass adequate to see any contaminants



Chapter 5: Downward Facing Outlets/Inlet 5.1.5.17

To avoid inadvertent disconnect of downward facing hoses or other high stress applications (i.e. ceiling outlet), DISS outlets will now be required.



Chapter 5: Bulk System Verification (5.1.12.4.1.4)

- Reminder: All "bulk systems" are now called "cryogenic fluid central supply systems"

- Testing / verification of these systems requires an *ASSE 6035 Bulk Medical Gas Systems Verifier* certification, in accordance with CGA M-1 requirements.

- Does this include "micro-bulk"?

Chapter 5: Cryogenic Fluid Central Supply System

2018 Term change: from "*Microbulk or Small Bulk Cryogenic Liquid Systems*" to "***Cryogenic Fluid Central Supply Systems***"

- ❑Reflects the usage of *NFPA 55*
- ❑Allows the merger of 'micro' and bulk liquid systems
- ❑'Performance' requirements are largely the same for both

Figure 4. Chart has turnkey solutions for medical microbulk applications.

Chapter 5: Alarm Warning Systems

2015 Reminder

Wiring for sensors, switches, and transducers:

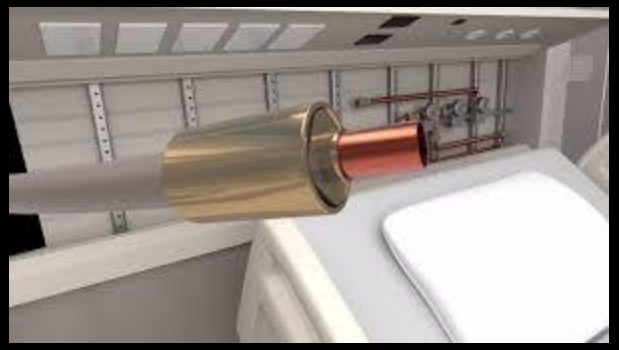
Protection of wiring has been clearly defined 5.1.9.1 (11). Wiring may be protected by any of the following:

1. Conduit
2. Free Air
3. Wire
4. Cable Tray
5. Raceways

Chapter 5: Manufactured Assemblies/ Corrugated Medical Tubing

New 5.1.10.1.4 (2) **Corrugated Medical Tubing (CMT)**

- Flexible
- Much easier & not utilizing brazing
- Lokring-type connection
- Good for Temporary Ancilary Service Locations for Medical Gas



Chapter 5: Manufactured Assemblies/ Corrugated Medical Tubing

September 2020

The *Categorical Waiver Process* allows providers and/or suppliers to request special permission to violate specific code based on the "unreasonable hardship" it may cause.

- Health and Safety of patients is priority
- Decision must be formally elected, documented and communicated to survey team
- Surveyor will describe under Tag K000 and form CMS-2786 will indicate waiver.

DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Medicare & Medicaid Services
7500 Security Boulevard, Mail Stop C2-21-16
Baltimore, Maryland 21244-1850

CMS
CENTERS FOR MEDICARE & MEDICAID SERVICES

Center for Clinical Standards and Quality/Quality, Safety & Oversight Group

Ref: QSO-20-40-LSC

DATE: September 25, 2020

TO: State Survey Agency Directors

FROM: Director
Quality, Safety & Oversight Group

SUBJECT: Categorical Waiver – Corrugated Medical Tubing

Memorandum Summary

- CMS regulation requires compliance with the 2012 edition of the NFPA Health Care Facilities Code (NFPA 99) for Ambulatory Surgical Centers, Critical Access Hospitals, End-Stage Renal Disease, Hospitals, Inpatient Hospice, Intermediate Care Facilities for Intellectuals with Disabilities, Long-term Care, Programs for All-Inclusive Care of the Elderly, and Religious Nonmedical Health Care Institutions facilities.
- The 2012 NFPA 99 requires medical gas and vacuum system tubing to be rigid copper tubing and does not allow for the use of corrugated medical tubing (CMT).
- In certain applications, the inability to use CMT may be considered an unreasonable hardship as the installation of CMT may be more efficient and economical.
- CMS is issuing a categorical waiver to allow the use of CMT in new and existing health care facilities based on provisions provided in the 2018 NFPA 99.

Background

CMS regulations governing Ambulatory Surgical Centers, Critical Access Hospitals, End-Stage Renal Disease, Hospitals, Inpatient Hospice, Intermediate Care Facilities for Intellectuals with Disabilities, Long-term Care, Programs for All-Inclusive Care of the Elderly, and Religious Nonmedical Health Care Institutions require compliance with the 2012 edition of the National Fire Protection Association (NFPA) Health Care Facilities Code (NFPA 99).

The 2012 NFPA 99 requires medical gas and vacuum system distribution piping to be rigid copper tubing and does not include provisions for corrugated medical tubing (CMT). CMT is flexible copper tubing that is externally coated with non-metallic fire-retardant sheath and is typically provided in lengths longer than rigid tubing, which may make it more efficient and economical to install. The 2018 NFPA 99 added new provisions that allow for the use of CMT.

Discussion

CMS regulation allows for the waiver of specific provisions of the 2012 NFPA 99 where the application would result in unreasonable hardship upon a provider or supplier, but only if the waiver does not adversely affect the health and safety of patients or residents.

The 2012 NFPA 99 does not include provisions for the use of CMT, which may be more efficient and economical to install. This may result in unreasonable hardship upon providers and suppliers. The 2018 NFPA 99 established requirements for the installation, inspection, testing, maintenance, performance, and safe practices for CMT that provide protection from related hazards.

The inability to install CMT may cause unreasonable hardship and a minimum level of protection is achieved based on compliance with provisions in the 2018 NFPA 99, CMS is providing a categorical waiver to allow for the use of CMT in new and existing facilities in accordance with the 2018 NFPA 99, sections 5.1.10, 5.2.10, and 5.3.10.

The NFPA 99 requires the installation of CMT to be made by American Society of Safety Engineers (ASSE) 6010, *Professional Qualifications Standard for Medical Gas Systems Installers*, qualified installers who are experienced in performing such installations. In addition, inspection and testing must be performed on all new piped medical gas and vacuum systems, additions, renovations, temporary installations, or repaired systems to ensure, by a documented process and procedure, that all applicable provisions of the NFPA 99 have been adhered to and system integrity has been achieved or maintained.

Categorical Waiver Process

Providers and suppliers that want to utilize a categorical waiver must formally elect and document their decision. At the survey entrance conference, a provider/supplier that has elected to use a categorical waiver must provide the survey team with their documented decision and verification of compliance with all applicable provisions. It is not acceptable for a facility to notify surveyors of the election to use a categorical waiver after the survey team has issued a citation. The survey team will review the documentation decision to use the categorical waiver and confirm the facility is compliant with all applicable provisions. This will confirm a minimum level of protection is afforded to protect the health and safety of patients and residents, as required by regulation.

If a provider/supplier conforms to the requirements identified for the categorical waiver, it will not be required to request waiver approval from a CMS Location nor will it need to be cited for an associated deficiency in order to implement this categorical waiver.

The elected categorical waiver must be described by the surveyor under Tag K000, and the Form CMS-2786 should be marked as "Facility Meets, Based Upon, 3. Waivers". If the survey team determines that the provisions required for the categorical waiver are not being met, a deficiency must be cited under the applicable NFPA 99 waiver regulatory standard:

Chapter 5: Alarm Warning Systems

2015 Reminder

ALARM WARNING SYSTEMS

Alarm sensors, switches, and transducers

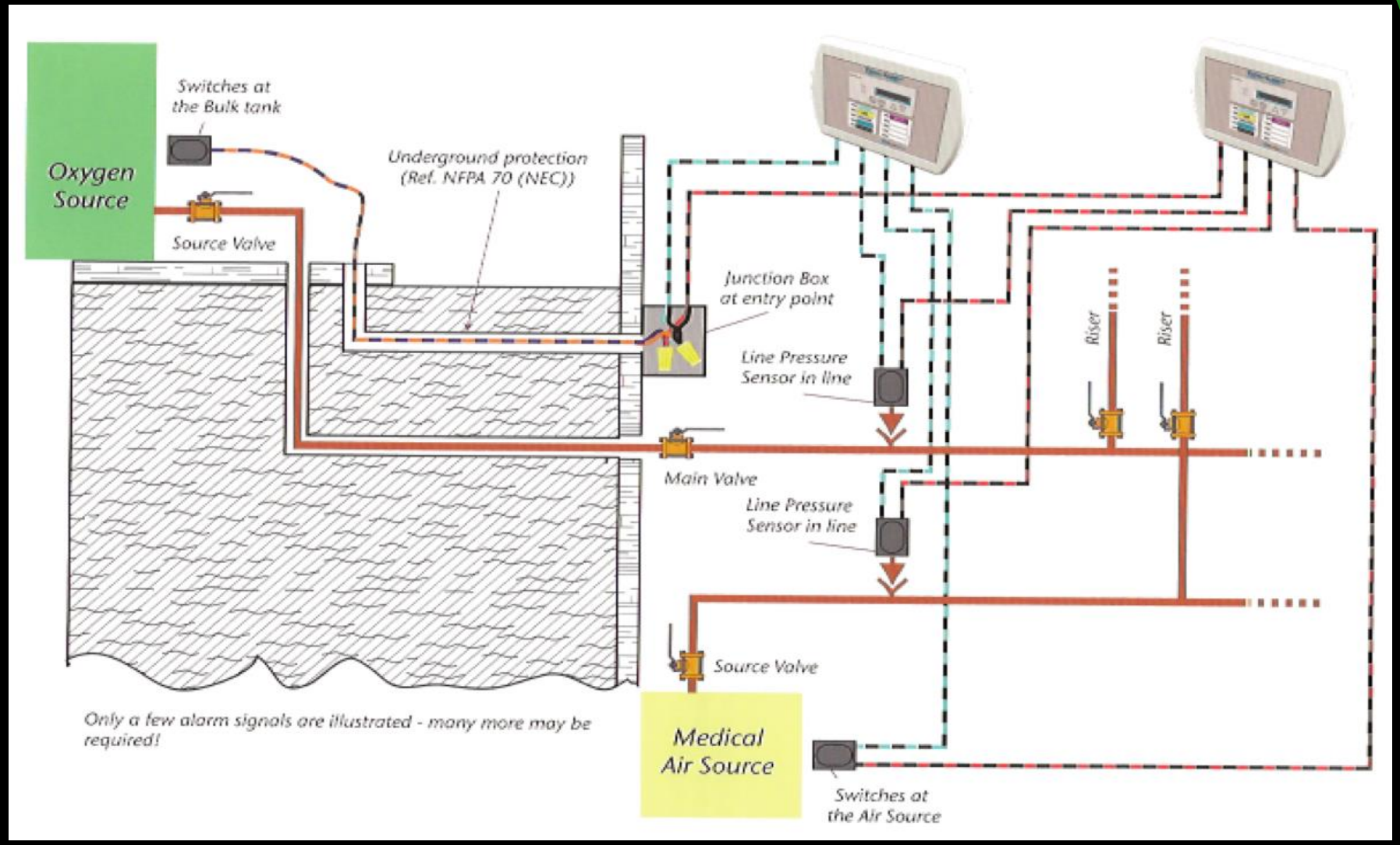
- Must be removable 5.1.9.1 (15). To eliminate any confusion (if there was any).

Master alarm wiring is clarified

- Splicing is permitted and clearly defined (5.1.9.2.3.3).
- Underground master alarm wiring single set of wires is permitted, in regard to emerging technologies and otherwise (5.1.9.2.3.6).

Reinforcement

- Alarm labelling must be current and updated regularly.



5.1.9.2.3.6
Underground master alarm wiring single set of wires is permitted, in regard to emerging technologies and otherwise.

ZVB Locations

It is now ***clearly*** defined that a zone valve shall NOT be located in the same room with station outlets and inlets that it controls 5.1.4.6 (1)

A wall must intervene between the ZVB and the outlets and inlets that it serves.
This is to allow someone to shut off flow of gas to a fire without being directly exposed to the fire.

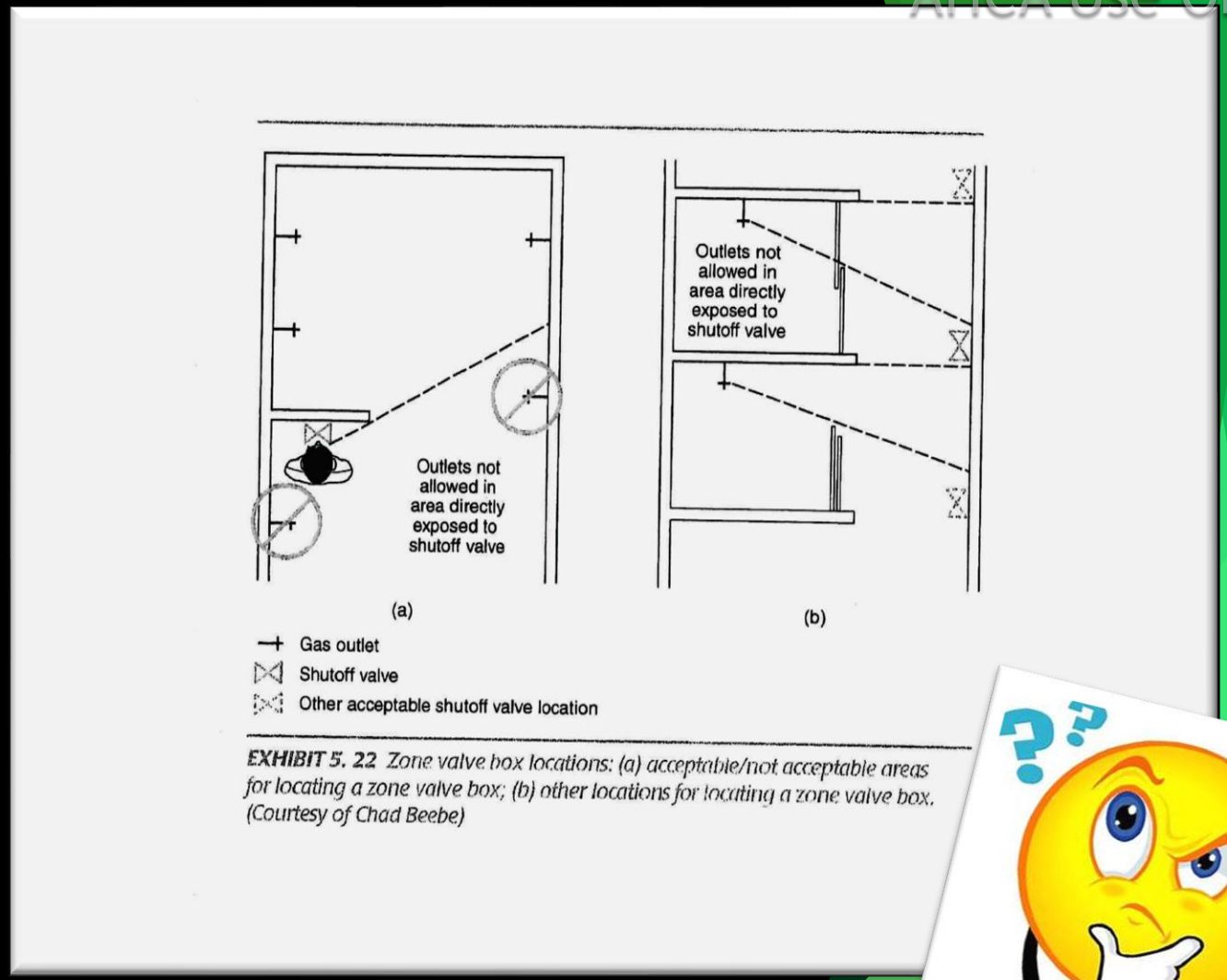


EXHIBIT 5. 22 *Zone valve box locations: (a) acceptable/not acceptable areas for locating a zone valve box; (b) other locations for locating a zone valve box. (Courtesy of Chad Beebe)*

Important Changes: NFPA 2015/2018 Building System Categories

“EZ Find” Technology

- New technology allows for combo unit and access to sensors.
- Also includes “EZ Back Feed”
- 5 Year Warranty on Pipeline Product

Zone Valves Area Alarm Combo

Emergency Management

MMHSI MAJOR MEDICAL

New Technologies

E Z Find®

Is this where you want to look for transducers?

Wouldn't it make more sense to install them in the zone valve box?

Chapter 5: System Inspection

5.1.14.2.3.1 Inspection & Testing Operations

NEW Changes for 2018

- 5.1.6.1 (5) Flow test is required (by manufacturer)
- 5.1.6.2 Changes provide clarity on the specific testing requirements of pressure loss
- 5.1.6.5 Manufacturer must certify hose burst pressure
- 5.1.6.9 Hoses must be thouroughly labeled & dated
  - Helps maintenance people know when maintenance or replacement is needed
- Installer/Manufacturer should provide this documentation for verifier

Chapter 5: System Inspection

5.1.14.2.3.1 Inspection & Testing Operations

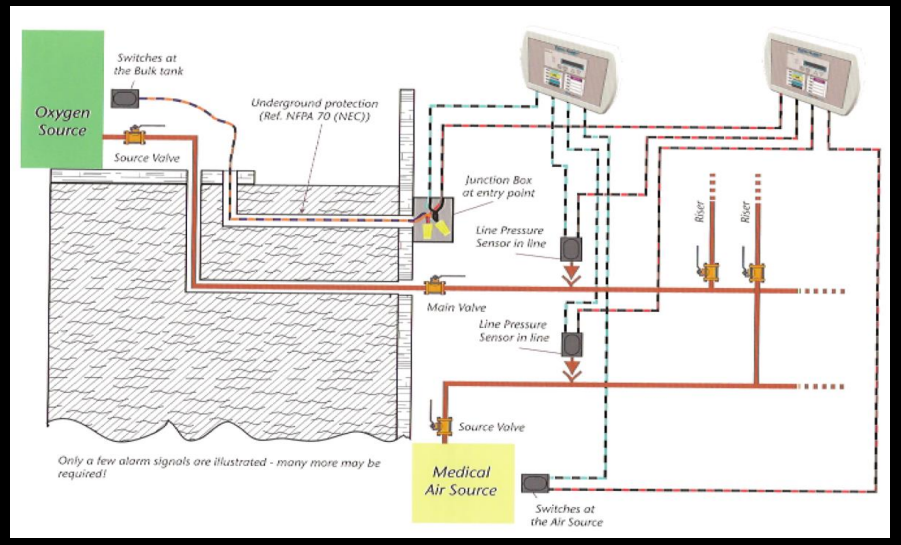
REMINDER 5.1.14.2.3.1 Manufactured Assemblies Employing Flexible Connections

(A) Non-stationary booms and articulating assemblies, other than headwalls utilizing flexible connectors, shall be tested for leaks, per the manufacturers recommendations
Every 18 months or at a duration as determined by a risk assessment
(B) The system pressure to non-stationary booms and articulating arms shall be maintained at operating pressure until each joint has been examined for leakage by effective means of leak detection safe for use with oxygen

"Flexible" has been removed from definition to allow for certain "manufactured assemblies."

Chapter 5: General 5.12.3

- 5.1.12.3.1 Inspection of systems should be performed prior to the concealing of piping
- 5.1.12.3.1.3 Inspections should be performed by technically competent technicians certified as ASSE 6020, 6030
- 5.1.12.3.1.4 Inspections should be performed by party other than installing contractor
- 5.1.12.3.2.2 Presence and accuracy of labelling and valve tagging by this code shall be inspected



Category 1 Operation and Management

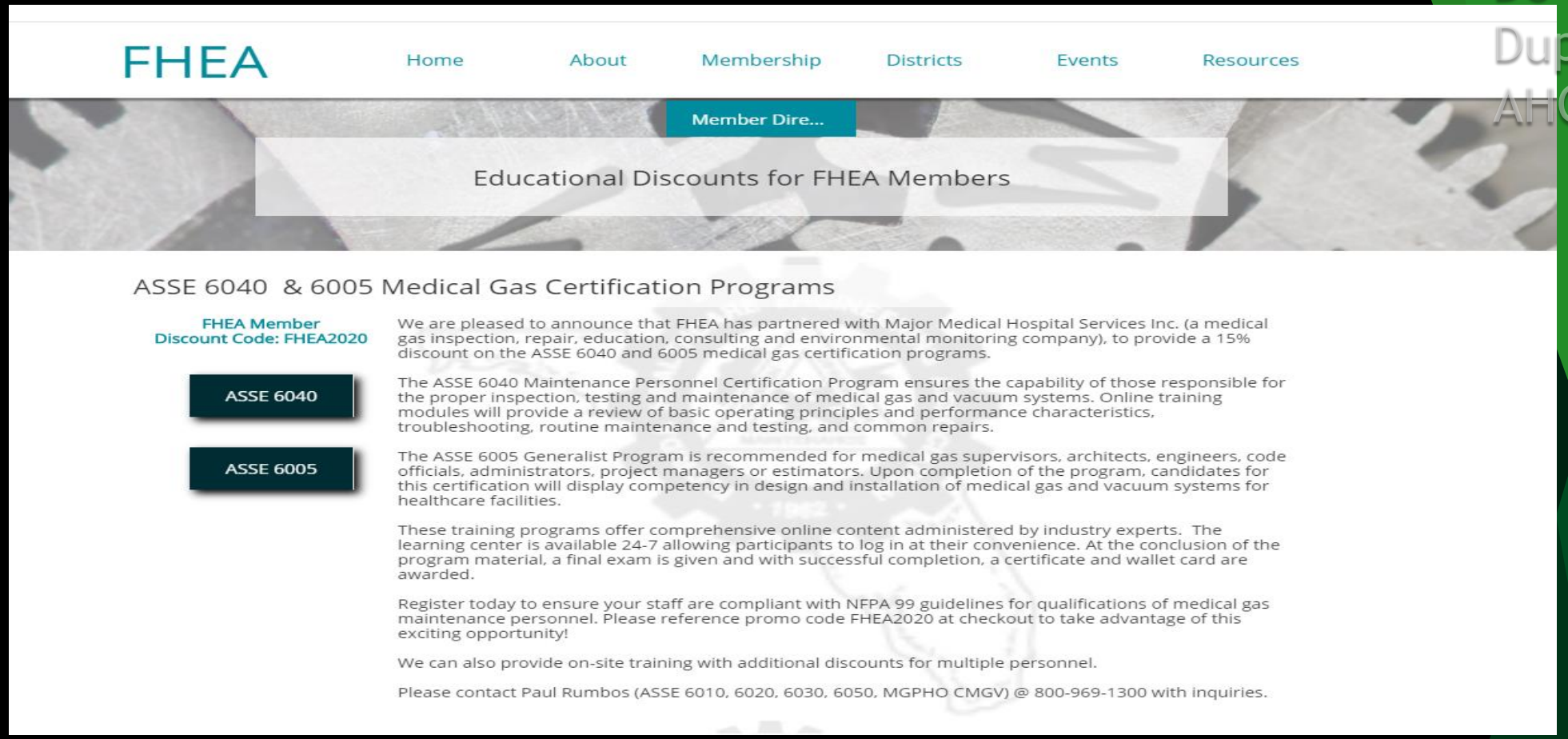
- 5.1.14.1 Special Precautions
  - Piping systems should NOT be distributing flammable anesthetic gas or used as a grounding electrode.
  - Liquid or debris should NOT be introduced into the systems for disposal

- 5.1.14.2 Maintenance of Medical Support Gas Systems
  - Develop and document periodic maintenance to systems appropriate for equipment:
    - Inventory
    - Inspection Schedule & Inspection Procedure
    - Maintenance Schedule
    - Qualification of Maintenance Staff- Credentialing to the 6030 and/or 6040 requirements

Certification Requirements

(5.1.14.2.2.5) Qualifications 2018

- A technician's training must be "documented" but the requirement to be "certified" has been removed.
- Competence on ALL facility equipment is required to obtain certification.



For online training go to:

https://www.fhea.org/educational-discounts

Category 1 Operation and Management

5.1.14.4 *New* Source Equipment labelling shall be in accordance with 5.1.11.5

Name of Gas or Vacuum System, Color Code, Rooms areas or buildings served, Emergency contact information of the department or individual responsible for maintaining

5.1.14.5 Medical Gas and Vacuum System Maintenance and Record Keeping

Category 1 Operation and Management

OPERATIONS AND MANAGEMENT

Maintenance Programs with:

- 5.1.14.2.2.1 Inventories
- 5.1.14.2.2.2 Inspection Schedules (PM's)
- 5.1.14.2.2.3 Inspection Procedures (Risk Assessment)
- 5.1.14.2.2.2 Maintenance Schedules

All have paper trails

Plan for life cycle replacements and unexpected failures.

Chapter 15: Dental Gas and Vacuum Systems

Dental Assigned to New Chapter

- Formerly Category 3, has its own categories 1, 2 & 3
- Dental offices are doing more sedations with procedures
- Former Category 3 still exists and applies to low-risk facilities
  - Moderate/Minimal or no sedation , not likely to cause injury if loss to system

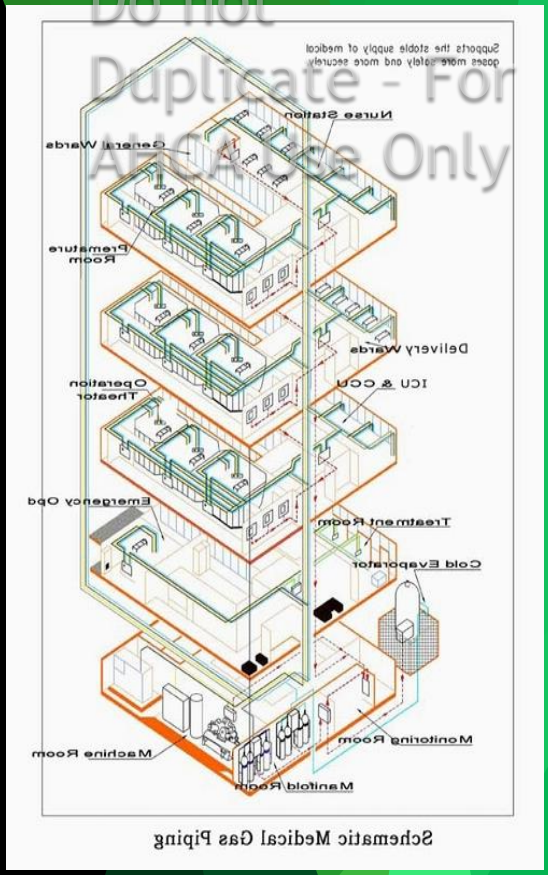
Category 3:

Not likely to cause injury, but may cause patient discomfort

KNOWING YOUR FACILITY

Pandemic Response:
What We Learned from Medical Gas Overuse

- **Medical Gas System Capabilities**
- **Ventilator Usage**
- **Infrastructure (Can it Handle It)**
- **How your bulk supply handles the usage**
- **Obsolescence of Systems**
- **New Facility Design**
- **Identifying Future Needs**
- **Utilize your Industry Experts**
- **Consider current or future codes for design of new systems**



Schematic Medical Gas Piping

Example: If You Have a 500 Bed Facility,
Can you Use 500 Vents or More?

Utilities Management

KNOWING YOUR FACILITY

- **Educating your staff – (ASSE 6040) through vendors or in-house**
- **Having in-line Drawings (up to date)**
- **Utilizing a Software medical gas management program**
- **Managing your medical gas inventory**
  - **Helps with *Planning & Consulting***
  - **Helps with *Design***
- **Knowing Flow Parameters**
- **Having an *Emergency Plan in case of failure***
- **Providing a *Risk Assessment for spaces***

FACILITY MEMORY

The expertise held by a select few key staff who have gained their facility-specific knowledge through experience within that organization

- Avoid the pitfall of relying on staff knowledge and experience in responding and recovering from an emergency.
- Without proper documentation, lay offs, retirement or natural attrition can cause enormous gaps in transfer of knowledge.
- Train and learn from your Subject Matter Experts. Document while the info is accessible!

Chapter 12: Revised Emergency Management

CMS Emergency Preparedness Rule

CMS.gov
Centers for Medicare & Medicaid Services

- To increases patient safety during emergencies.
- To establishes consistent emergency preparedness requirements across provider and supplier types.
- Establishes a more coordinated response to natural and man-made disasters.
- Applies to 17 Medicare and Medicaid providers and suppliers.
- Final rule published in the Federal Register on September 16, 2016.
- Rule is effective as of November 15, 2016.
- Rule must be implemented November 15, 2017.
- There have been some updates since then.

KNOWING YOUR FACILITY

CMS.gov
Centers for Medicare & Medicaid Services

Goals for the Rule

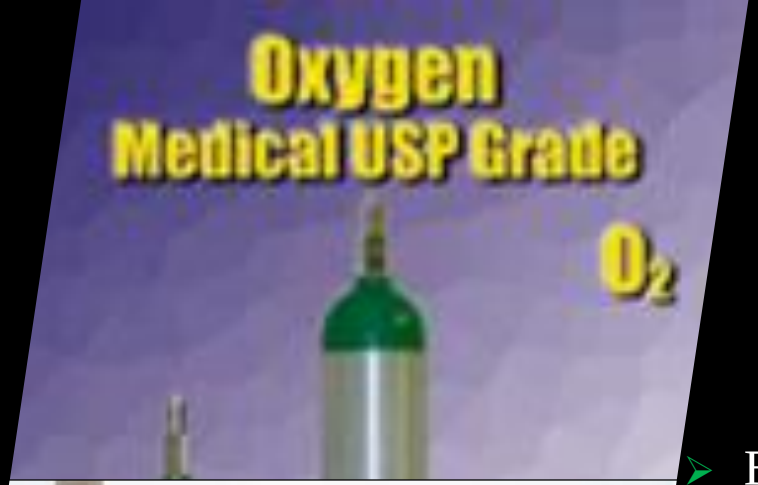
- Address systemic gaps
- Establish consistency
- Encourage coordination
- Establish conditions of participation within organization or network
- Collaborate with external resources

The rule serves to protect all individuals receiving care from those organizations.

The Joint Commission

Elements of Performance for Emergency Management

- Standard EM.02.02.09 EP 07
  - For organizations that plan to offer services during an emergency: The Emergency Management Plan describes how the organization will deliver alternative means of meeting essential building utility needs and provide *continuous* services during an emergency.
  - Examples of potential utility problems might include disruption to piped medical gas systems, failure of backup generators and/or water pipe rupture.



What are Typical Solutions?

- Bring cylinders to patients or transport multiple tanks with headers/regulators/carts for back feeding.

  (Always keeping safety in mind when transporting)

- Call the Bulk Supplier to bring an Oxygen Trailer/Truck with Vaporizers to site. Make sure area is cleared for truck (How long will that take and other contingencies?).

- Communicate with your Medical Gas Company & Suppliers to acquire enough rental supplies, cylinders/headers regulator/hoses, on hand for catastrophes.
- Or just a thought, utilizing resources within network and other local facilities.

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Alternative Oxygen Supply

Emergency Oxygen Supply Manifolds

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Emergency Oxygen Manifold in Use

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The Joint Commission

Elements of Performance for Emergency Management

- Standard EM 03.01.03 EP 11
  - Monitor the management of staff roles and responsibilities during emergency response exercises.
- Standard EC 04.01.01 EP 11
  - Investigate and report utility failures with a focus on team-based communications.

Provisions of the Emergency Preparedness Program (EPP)

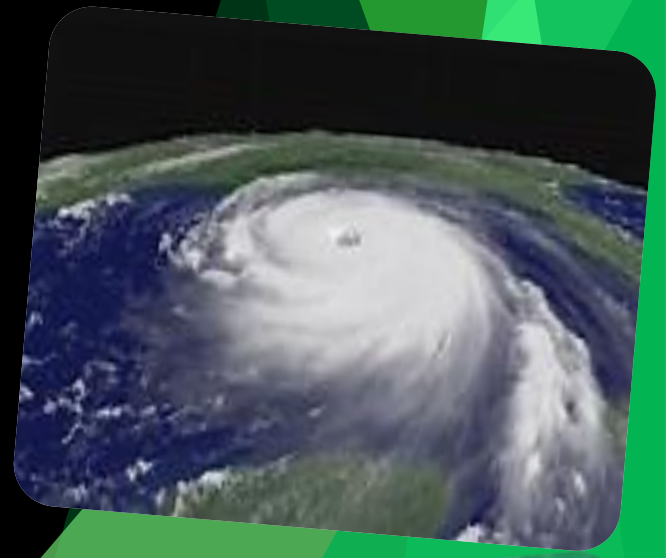
Risk Assessment and Planning

Policies and Procedures

Emergency Preparedness Program

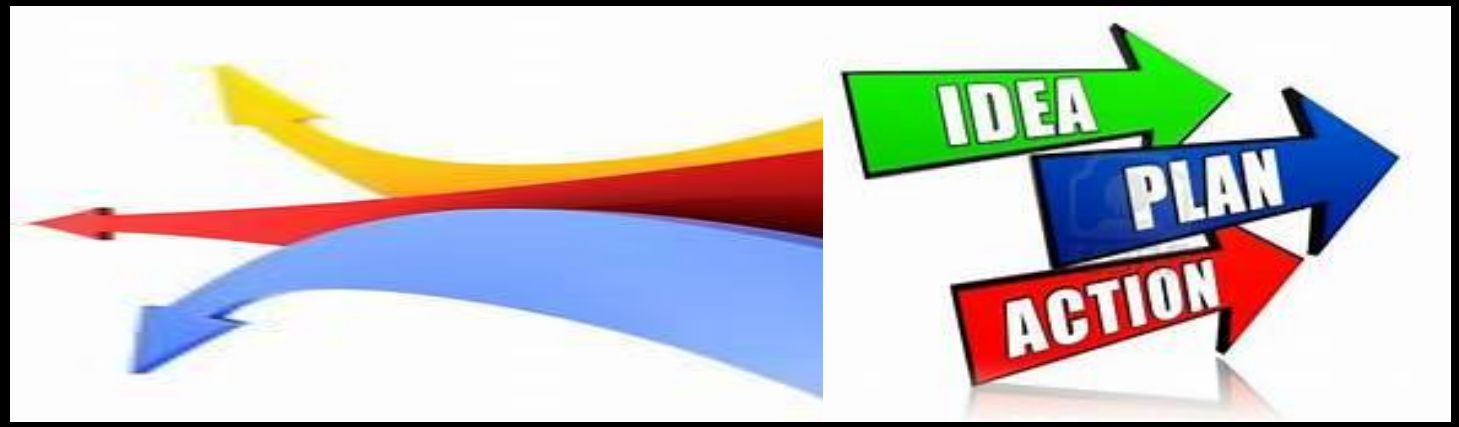
Communication Plan

Training and Testing



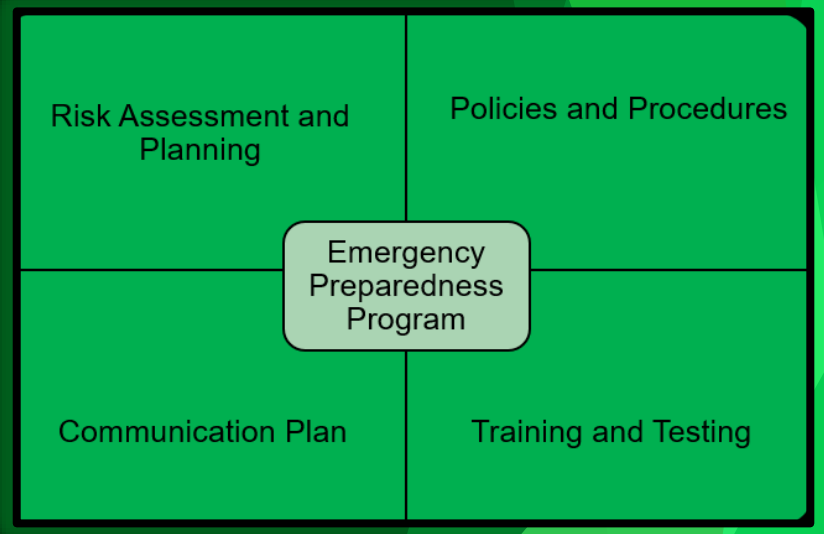
Emergency Preparedness:

Addressing the 4 Phases of an Emergency Situation



Plan ➡ Execute ➡ Document ➡ Evaluate

Provisions of the
Emergency Preparedness Program (EPP)

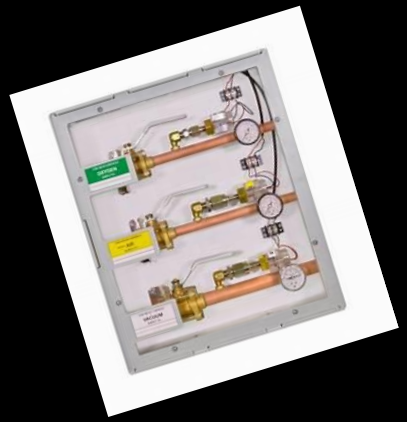


Knowing and Utilizing Inventories & PM's Will help with your Risk Assessment and Emergency Preparedness Program.

Maintenance Programs

- 5.1.14.2.2.1 **Inventories**
- 5.1.14.2.2.2 **Inspection Schedules (PM's)**
- 5.1.14.2.2.3 **Inspection Procedures (Risk Assessment)**
- 5.1.14.2.2.2 **Maintenance Schedules**

Organizational Facility Memory Documented



Summary of 2021 Changes

- 5.1.3.10 Cryogenic Fluid Central Supply Systems
  - ➢ Multiple Changes
- 5.1.10.2.3.2 Labelling for both Vacuum and WAGD
- 5.1.11 Labelling, Identification and Operating Pressure
  - ➢ Multiple Changes
- 5.1.13 Category 1 Medical Support Gas
  - ➢ Multiple Changes
- 5.1.14 Category 1 Operations and Management
  - ➢ Very Important - Multiple Changes

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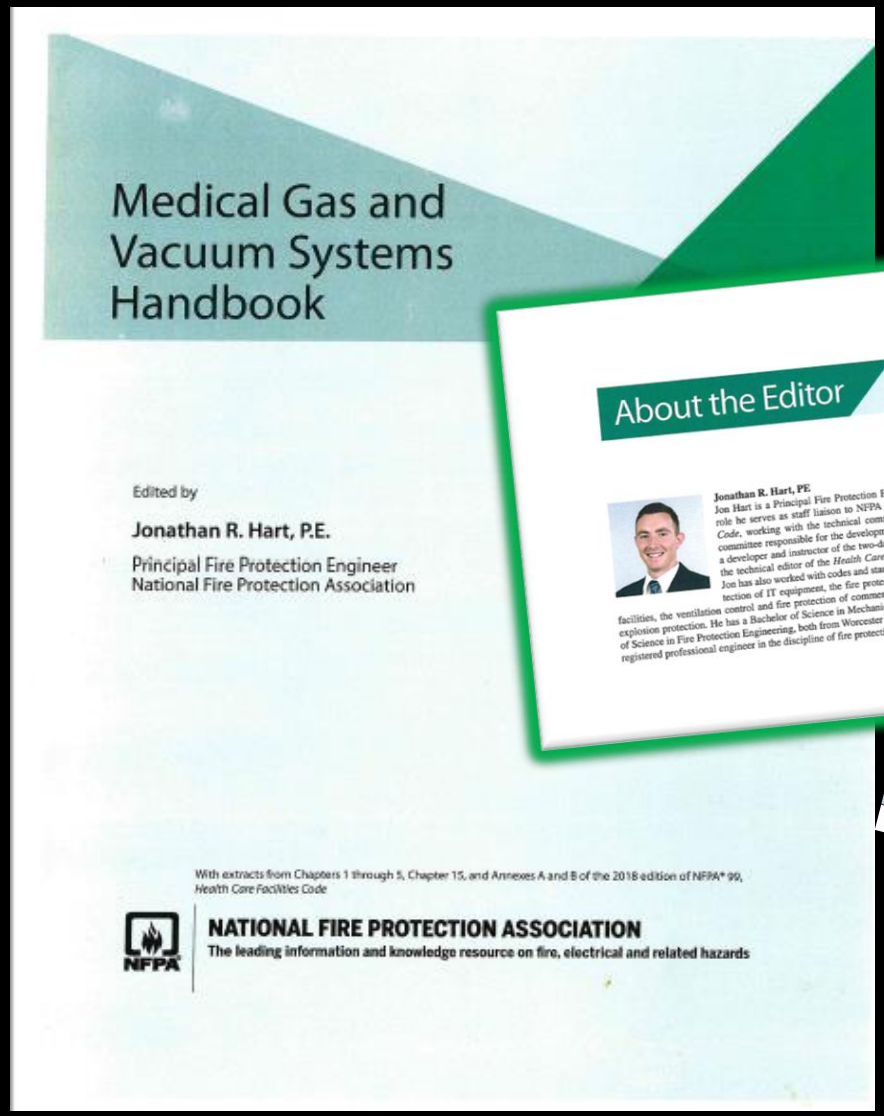
Summary

Summary of Technical Changes 2015 -2018



Section Number	Comments	FR/FCR/ SR/SCR Reference
Chapter 1		
1.1.12	Revised to specify that the hyperbaric facilities chapter is used for facility design, chamber design, and facility operation.	FR 103
1.1.13	Added to include a scope statement for the new chapter on dental gas and vacuum systems.	SR 109
1.3.4 1.3.4.1 1.3.4.2 1.3.4.3	The defined term *governing body* has been changed to *health care facility's governing body* for consistency throughout the document.	FR 113, FCR 2
Chapter 3		
3.3.22 A.3.3.22	Definition of *central supply system* was added in combination with ensuring consistency to terminology throughout Chapter 5. This allows for better differentiation between the complete source of supply and references to just the supply source.	FR 601
3.3.37 3.3.38 3.3.39	Definitions of *dental air, dental office, and dental vacuum/scavenging* were added to define terms widely used in new Chapter 15 on dental gas and vacuum systems.	SR 642, SR 643
3.3.72 A.3.3.72	Definition of health care facility's governing body was added as the term is now used in multiple chapters in NFPA 99.	FR 112
3.3.127	Definition of *oxygen concentrator unit* was added because these units are now permitted by Chapter 5 as central supply sources.	FR 106, SR 602
3.3.131	Definition of *oxygen 93 USP* was added to delineate between oxygen USP and oxygen 93 USP, two different and distinct medical gases.	SR 604
3.3.138 A.3.3.138	Definition of *producer* was added because it is used for WAGD and for plume.	FR 603
3.3.171	The definition of *supply source* and the subdefinitions that fall under 3.3.171 have been revised to clarify that supply source is only one component of the central supply system.	FR 601

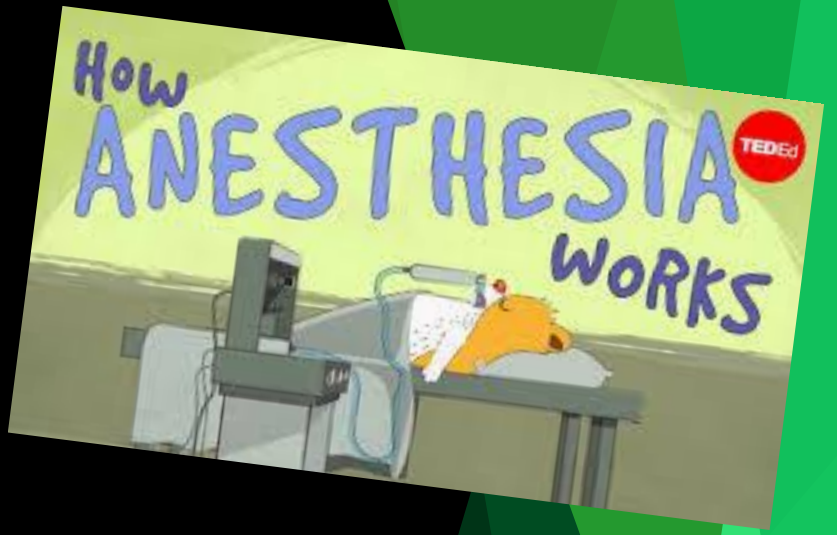
Chapter 4: Fundamentals

Designed to meet one of four "Categories" (exclusive from levels as it was in 2005)

Category 1: Likely to cause

Major injury or death of patient or caregiver

A risk assessment is not needed if determined a category 1*



Category 2: Likely to cause

Minor injury to patient or caregiver

Category 3: Likely to cause

Not likely to cause injury, but may cause patient discomfort

Category 4: Likely to cause

No impact on patient care

Language added to clarify risk assessments. Who is responsible and how categories are determined?

Categories are determined by the facility through a "*Documented Risk Assessment*"

NFPA 99 2018: Summary of Changes

Chapter 3 - Definitions
- ❑ Defining & Clarifying Terms

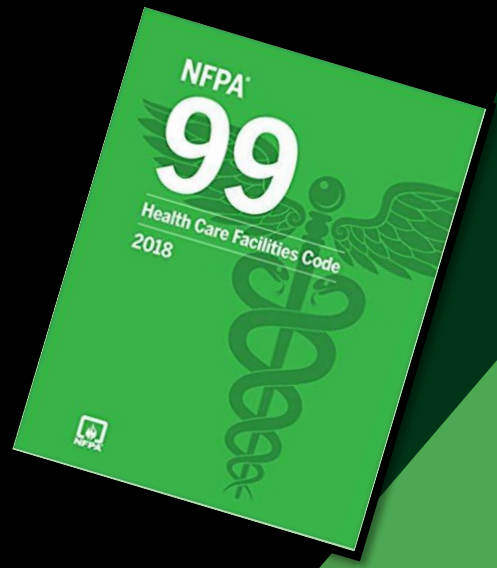
Chapter 4 - Fundamentals
- ❑ Fundamentals of Risk Assessment

Chapter 5 – Gas & Vacuum Systems
- ❑ Outdoor/indoor locations for central supply
- ❑ Storage of Medical Gas Cylinders
- ❑ Controls for Line Pressure
- ❑ Auxiliary Source Connection
- ❑ Oxygen Concentrator Supply Units
- ❑ Cryogenic Fluid Central Supply Systems
- ❑ Operating, Area and Local Alarms and Signals
- ❑ Vacuum Filtration
- ❑ Manufactured Assemblies/ Corrugated Medical Tubing
- ❑ System Inspection
- ❑ Source Equipment Labelling
- ❑ Bulk System Verification

Chapter 11 – Gas Equipment
- ❑ Performance and maintenance of gas equipment in ***new and existing*** healthcare facilities
- ❑ Cylinder Storage and Protection

Chapter 12 – Emergency Management
- ❑ Pandemic/ COVID Response

Chapter 15 - Dental Gas and Vacuum Systems
- ❑ Removed from chapter 5 and moved to its own chapter



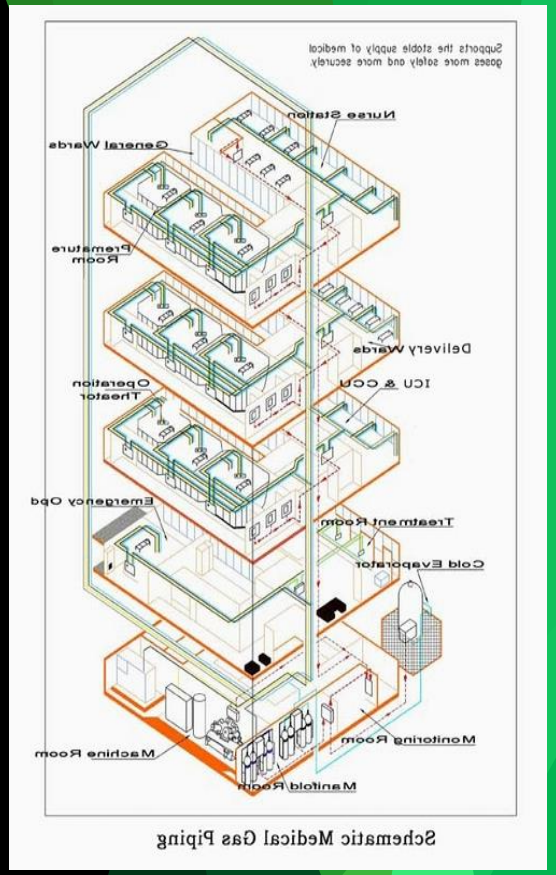
FACILITY MEMORY

The expertise held by a select few key staff who have gained their facility-specific knowledge through experience within that organization

- Avoid the pitfall of relying on staff knowledge and experience in responding and recovering from an emergency.
- Without proper documentation, lay offs, retirement or natural attrition can cause enormous gaps in transfer of knowledge.
- Train and learn from your Subject Matter Experts. Document while the info is accessible!

KNOWING YOUR FACILITY

Pandemic Response
What We Learned from Medical Gas Overuse



Schematic Medical Gas Piping

- **Medical Gas System Capabilities**
- **Ventilator Usage**
- **Infrastructure (Can it Handle It)**
- **How your bulk supply handles the usage**
- **Obsolescence of Systems**
- **New Facility Design**
- **Identifying Future Needs**
- **Utilize your Industry Experts**
- **Consider current or future codes for design of new systems**

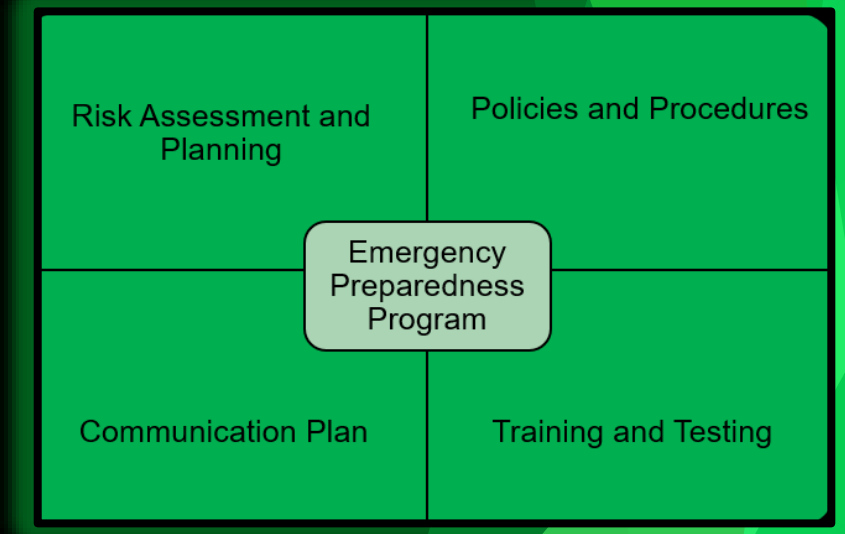
Example: If You Have a 500 Bed Facility,
Can you Use 500 Vents or More?

Emergency Preparedness:

Addressing the 4 Phases of an Emergency Situation

Plan ➡ Execute ➡ Document ➡ Evaluate

Provisions of the
Emergency Preparedness Program (EPP)



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THANK YOU SO MUCH FOR YOUR TIME!!!

Please contact our office for additional information

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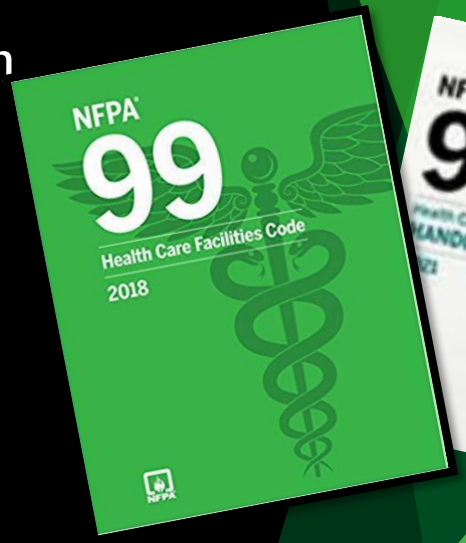

Thank you for your attention!