



Public Input No. 292-NFPA 99-2021 [New Section after 3.3]

3.3.14 Auxiliary Connection

A backup connection for a source medical gas system, in which to serve a facility during equipment replacement or in an emergency.

Statement of Problem and Substantiation for Public Input

This will go to support the definition for 5.1.4.10 Auxiliary Source Connections.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 261-NFPA 99-2021 [Section No. 5.1.4.10 [Excluding any Sub-Sections]]</u>	definition

Submitter Information Verification

Submitter Full Name: John Gregory
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Affiliation: P.I.P.E. Trust of Arizona Medical Gas Committee
Street Address:
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Submittal Date: Sun May 30 09:36:46 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1047-NFPA 99-2021

Statement: This revision supports the definition for 5.1.4.10 Auxiliary Source Connections.



Public Input No. 64-NFPA 99-2020 [Section No. 3.3.20]

3.3.20 – Category 3 Vacuum System.

A Category 3 vacuum distribution system that can be either a wet system designed to remove liquids, air–gas, or solids from the treated area; or a dry system designed to trap liquid and solids before the service inlet and to accommodate air–gas only through the service inlet. (PIP)

Statement of Problem and Substantiation for Public Input

This is old wordage from the 2015 edition.

These systems are no longer listed nor allowed in Chapter 5 Category 3, therefore this definition is no longer needed.

Submitter Information Verification

Submitter Full Name: Scott Winn

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Submittal Date: Mon Dec 21 12:47:12 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1015-NFPA 99-2021](#)

Statement: This is old language from the 2015 edition. These systems are no longer listed nor allowed in Chapter 5 Category 3, therefore this definition is no longer needed.



Public Input No. 288-NFPA 99-2021 [New Section after 3.3.37]

Dental Support Gas

Dental Support Gas - Dental air or instrument air used for driving dental tools or supplying air-driven equipment.

Statement of Problem and Substantiation for Public Input

The term Dental Support Gas is used in 15.3.3.1.1 as well as other locations in chapter 15 but is not defined in chpt 3 or 15. It appears to be primarily defined as the gas used to serve the function of driving dental tools or supplying air driven equipment (typically Dental Air although the function could potentially be served by Instrument Air). No other functions are mentioned in Chpt 15 as potentially being under the category of Dental Support Gas.

Submitter Information Verification

Submitter Full Name: David Braidich

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Submittal Date: Sat May 29 16:48:27 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: In lieu of adding a definition of 'dental support gas' as suggested in PI-288, terminology has been harmonized via FRs in Ch. 15. See FRs-1092 through -1101.



Public Input No. 65-NFPA 99-2020 [Section No. 3.3.67]

3.3.67 – Gas-Powered System.

A Level 3 gas distribution system comprised of component parts including but not limited to cylinders, manifolds, air compressor, motor, receivers, controls, filters, dryers, valves, and piping that delivers compressed air or nitrogen at pressures less than 1100 kPa (less than 160 psi) gauge to power devices (e.g., hand pieces, syringes, cleaning devices) as a power source. (PIP)

Statement of Problem and Substantiation for Public Input

This is old language from previous editions.

This system is no longer mentioned nor allowed in Chapter 5 Cat 3, therefore should be deleted.

Submitter Information Verification

Submitter Full Name: Scott Winn

Organization: Winns Career Education

Street Address:

City:

State:

Zip:

Submittal Date: Mon Dec 21 12:58:13 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1016-NFPA 99-2021](#)

Statement: This is old language from previous editions. This system is no longer mentioned nor allowed in Chapter 5 Cat 3, therefore should be deleted.



Public Input No. 228-NFPA 99-2021 [New Section after 3.3.104]

3.3.104.1 Pre-Manufactured rough-in assembly

An assembly containing both station outlet/inlet rough-in assemblies only (the station outlet/inlet primary valves are not included) and portions of the distribution piping system which is not constructed/assembled at the installation site.

Statement of Problem and Substantiation for Public Input

A trend exists within the healthcare construction industry to incorporate off-site manufacturing in multiple forms. The result is that portions of work are being completed off-site to be delivered and installed in various stages of completion. One common example is a frame that has station outlet/inlet rough-in assemblies as well as portions of the distribution piping assembly. These assemblies do not fit within the traditional definition of a manufactured assembly as they do not contain complete medical gas or vacuum outlets and therefore some tests required of manufactured assemblies in section 5.1.6.1 are not applicable. This addition seeks to clarify the differences in form and testing requirements.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 227-NFPA 99-2021 [Section No. 3.3.104]</u>	
<u>Public Input No. 232-NFPA 99-2021 [Section No. 5.1.12.2.2]</u>	
<u>Public Input No. 234-NFPA 99-2021 [New Section after 5.1.6.1]</u>	

Submitter Information Verification

Submitter Full Name: Travis Webb
Organization: Modular Services Company
Street Address:
City:
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Submittal Date: Wed May 26 14:58:51 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The proposed definition of 'pre-manufactured rough-in assembly' is somewhat confusing. Without specific language, this addition could result in confusion or imply that this testing would replace field testing requirements. Full field testing is always required for the final installation. Clarification is also needed for 5.1.6.1. The proposed revision would remove testing criteria from code requirements for manufactured assemblies that are meant to be a pre-test to validate the manufactured assembly will meet the performance requirements of 5.1.12. Testing required by 5.1.12 still needs to be performed.



Public Input No. 227-NFPA 99-2021 [Section No. 3.3.104]

3.3.104* Manufactured Assembly.

A factory-assembled product, that is delivered to the installation site fully assembled, designed for aesthetics or convenience that contains medical gas or vacuum outlets, piping, or other devices related to medical gases. (PIP)

Statement of Problem and Substantiation for Public Input

A trend exists within the healthcare construction industry to incorporate off-site manufacturing in multiple forms. The result is that portions of work are being completed off-site to be delivered and installed in various stages of completion. One common example is a frame that has station outlet/inlet rough-in assemblies as well as portions of the distribution piping assembly. These assemblies do not fit within the traditional definition of a manufactured assembly as they do not contain complete medical gas or vacuum outlets and therefore some tests required of manufactured assemblies in section 5.1.6.1 are not applicable. This addition seeks to clarify the differences in form and testing requirements.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 228-NFPA 99-2021 [New Section after 3.3.104]	
Public Input No. 234-NFPA 99-2021 [New Section after 5.1.6.1]	

Submitter Information Verification

Submitter Full Name: Travis Webb
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Street Address:
City:
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Submittal Date: Wed May 26 14:57:23 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision would create a hardship for manufacturers of factory-assembled products.



Public Input No. 2-NFPA 99-2020 [New Section after 3.3.170]

TITLE OF NEW CONTENT

Type your content here ...3.3.171 **Sleep Lab** - A sleep lab is a specialized center where sleep studies are administered to diagnose common sleep disorders. The sleep lab is usually located within a larger medical facility such as a hospital and equipped with a sleeping area, monitoring equipment, and a separate observation area for the medical professionals monitoring the patient during sleep.

Statement of Problem and Substantiation for Public Input

Currently there is no definition for the term Sleep Lab. As there are designated areas within medical facilities and medical gas pipeline equipment being used for sleep labs, it seems a definition is in order.

Submitter Information Verification

Submitter Full Name: James Lucas

Organization: Tri-tech Medical Inc.

Street Address:

City:

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Submittal Date: Tue Nov 17 15:44:07 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: FR-1019-NFPA 99-2021

Statement: Currently there is no definition for the term Sleep Lab. As there are designated areas within medical facilities and medical gas pipeline equipment being used for sleep labs, it seems a definition is in order. The term is used in 5.1.11.3.1.1 and a variation (sleep laboratories) is used in A.5.1.12.4.10.6.



Public Input No. 181-NFPA 99-2021 [Section No. 3.3.173]

3.3.173 – Station Inlet.

An inlet point in a piped medical/surgical vacuum distribution system at which the user makes connections and disconnections. (PIP)

Delete in favor of new usage of "terminal" and new definition thereof

Statement of Problem and Substantiation for Public Input

Refer to PI 178 and 180

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 178-NFPA 99-2021 [Section No. 5.1.5]</u>	Parent
<u>Public Input No. 180-NFPA 99-2021 [Section No. 3.3.178]</u>	Parent

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes

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Submittal Date: Tue May 18 12:17:52 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The parent public input PI-178 was resolved.



Public Input No. 182-NFPA 99-2021 [Section No. 3.3.174]

3.3.174 – Station-Outlet.

An outlet point in a piped medical gas distribution system at which the user makes connections and disconnections. (PIP)

Delete in favor of new usage of "terminal" and new definition thereof

Statement of Problem and Substantiation for Public Input

Refer to PI 178 and PI 180

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 178-NFPA 99-2021 [Section No. 5.1.5]</u>	Parent
<u>Public Input No. 180-NFPA 99-2021 [Section No. 3.3.178]</u>	Parent

Submitter Information Verification

Submitter Full Name: Mark Allen

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Submittal Date: Tue May 18 12:20:51 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The parent public input PI-178 was resolved.



Public Input No. 180-NFPA 99-2021 [Section No. 3.3.178]

3.3.178 Terminal.

The device at the user end of a flexible hose or tubing used in a manufactured assembly where the user is intended to make connection and disconnection the medical gas, support gas or vacuum pipeline where connections and disconnections are made . (PIP)

Statement of Problem and Substantiation for Public Input

See PI 178

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 178-NFPA 99-2021 [Section No. 5.1.5]	Parent
Public Input No. 181-NFPA 99-2021 [Section No. 3.3.173]	
Public Input No. 182-NFPA 99-2021 [Section No. 3.3.174]	

Submitter Information Verification

Submitter Full Name: Mark Allen

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Submittal Date: Tue May 18 12:16:10 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The parent public input PI-178 was resolved.



Public Input No. 344-NFPA 99-2021 [Section No. 5.1.1.5]

5.1.1.5

The following sections of this chapter shall apply to the operation, management, and maintenance of Category 1 medical gas and vacuum systems in both new and existing facilities:

- (1) 5.1.2
- (2) 5.1.3.1
- (3) 5.1.3.2
- (4) 5.1.3.3
- (5) 5.1.3.3.4
- (6) 5.1.3.6.2
- (7) 5.1.3.6.3.10(A)(2)
- (8) 5.1.3.7.6(A)(2)
- (9) 5.1.3.8.4.1(2)
- (10) 5.1.14

Statement of Problem and Substantiation for Public Input

These location requirements are meant to keep these systems and their location protected from the various hazards that could exist in the facility. These should be mandated even in existing facilities and not just new ones.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

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City:

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Submittal Date: Mon May 31 15:53:10 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1020-NFPA 99-2021

Statement: The location requirements of 5.1.3.3.1.5 are meant to keep these systems and their locations protected from fire and other various hazards that could exist in the facility. These should be mandated in existing facilities in addition to new ones.



Public Input No. 221-NFPA 99-2021 [Section No. 5.1.3.1.8 [Excluding any Sub-Sections]]

Source locations containing positive pressure gases other than oxygen and medical air shall have their ~~doors~~ entrance(s) labeled as follows:

Positive Pressure Gases

NO Smoking or Open Flame

Room May Have Insufficient Oxygen

Open Door and Allow Room to Ventilate Before Entering

Statement of Problem and Substantiation for Public Input

Per NFPA 80, 4.1.4, no more than 5% of a fire-door's surface may be covered by a sign. Per NFPA 99, 5.1.3.1.8, locations containing medical gas manifolds, shall have a label on the door. The label has lots of words and has to be readable from 5' away per 11.3.10.1 so it's likely that it obscures more than 5% of the door's surface. Changing the NFPA 99 code would avoid this conflict with the NFPA 80 code.

*There are other NFPA 99 codes (e.g. 5.1.3.1.9, chapter 15, etc.) that need the same word change from "door" to "entrance".

Submitter Information Verification

Submitter Full Name: MGPHO BOD
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Street Address:
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Submittal Date: Tue May 25 14:10:33 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: [FR-1021-NFPA 99-2021](#)

Statement: The revision clarifies that the required signage must be located outside the room but not necessarily on the door.



Public Input No. 143-NFPA 99-2021 [Section No. 5.1.3.1.8.1]

5.1.3.1.8.1

Existing signage that is not in strict compliance with the provisions of this code shall be permitted to be continued in use ~~as long as~~ unless the authority having jurisdiction has determined that such ~~use does not constitute~~ use constitutes a distinct hazard to life.

Statement of Problem and Substantiation for Public Input

Change to remain consistent with 5.1.1.4

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

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Submittal Date: Mon May 10 11:03:54 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1023-NFPA 99-2021

Statement: The revision is intended for consistency with 5.1.1.4.



Public Input No. 144-NFPA 99-2021 [Section No. 5.1.3.1.9.1]

5.1.3.1.9.1

Existing signage that is not in strict compliance with the provisions of this code shall be permitted to be continued in ~~use as long as the~~ use unless the authority having jurisdiction has determined that ~~such use does not constitute a~~ such use constitutes a distinct hazard to life.

Statement of Problem and Substantiation for Public Input

Change to remain consistent with 5.1.1.4

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

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Submittal Date: Mon May 10 11:05:59 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1024-NFPA 99-2021](#)

Statement: The revision is intended for consistency with 5.1.1.4.



Public Input No. 164-NFPA 99-2021 [New Section after 5.1.3.2.12]

5.1.3.2.13

Cylinders attached to central supply systems in an exterior location shall be protected from accumulations of ice or snow.

Statement of Problem and Substantiation for Public Input

This was removed from the Special Precautions for Storage of Cylinders and Containers in 11.6.5.4. The intent is to provide shade and provide protection from snow and ice for outdoor manifolds and header bars.

Submitter Information Verification

Submitter Full Name: Corky Bishop

Organization: Apex Medical Gas Systems

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City:

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Submittal Date: Fri May 14 17:58:30 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Snow and ice accumulation can prevent access to cylinders and is better handled through policy and procedures according to the facility location and climate conditions.



Public Input No. 345-NFPA 99-2021 [Section No. 5.1.3.3.2]

5.1.3.3.2* Design and Construction.

5.1.3.3.2.1

Locations for central supply systems, excluding cryogenic fluid central supply systems and motor-driven equipment, and for the storage of positive-pressure gases shall meet the following requirements:

- (1) They shall be constructed with access to move cylinders, equipment, and so forth in and out of the location on hand trucks complying with 11.4.3.1.1.
- (2) They shall be provided with lockable doors or gates or otherwise able to be secured.
- (3) If outdoors, they shall be well drained and provided with an enclosure (e.g., wall or fencing) constructed of noncombustible materials.
- (4) If outdoors, cylinders and containers shall be protected from prolonged contact with soil.
- (5) If indoors, they shall have interior finishes of noncombustible or limited-combustible materials.
- (6)* If indoors, rooms containing oxygen, nitrous oxide, or other oxidizers shall be separated from the rest of the building by walls and floors having a 1-hour fire resistance rating with doors and other opening protectives having a $\frac{3}{4}$ -hour fire protection rating.
- (7)* They shall comply with NFPA 70 for ordinary locations.
- (8)* Fuel-fired equipment shall not be located in the room.
- (9) If they require heat, the maximum allowable temperature of the in-room heating element shall be 130°C (266°F).
- (10) They shall be provided with racks, chains, or other fastenings to secure all cylinders from falling, whether connected, unconnected, full, or empty.
- (11)* They shall be supplied with electrical power compliant with the requirements for essential electrical systems as described in Chapter 6.
- (12) They shall have racks, shelves, and supports, where provided, constructed of noncombustible materials or limited-combustible materials.
- (13) They shall protect electrical devices from physical damage.
- (14)* They shall allow access by delivery vehicles and management of cylinders.
- (15) They shall be designed to meet the operational requirements of 5.1.3.2 with regard to room temperature.

5.1.3.3.2. 1

Locations for motor-driven equipment shall meet the following requirements:

- (1) They shall be constructed with access to move equipment and so forth in and out of the location as required.
- (2) They shall be provided with lockable doors or gates or otherwise able to be secured.
- (3) If indoors, they shall have interior finishes of noncombustible or limited-combustible materials.
- (4)* If indoors shall be separated from the rest of the building by walls and floors having a 1-hour fire resistance rating with doors and other opening protectives having a ~~3~~ /4 -hour fire protection rating.
- (5)* They shall comply with NFPA 70 for ordinary locations.
- (6) The maximum allowable temperature of the room shall be in accordance with the manufacturer's recommendations.
- (7)* They shall be supplied with electrical power compliant with the requirements for essential electrical systems as described in Chapter 6 .
- (8) They shall be constructed of noncombustible or limited-combustible materials.

5.1.3.3. 2.3

Design and construction of locations for cryogenic fluid central supply systems shall comply with 5.1.3.5.12.

Statement of Problem and Substantiation for Public Input

The location requirements between the various types of medical gas systems vary in design based on the location. Motor-driven equipment locations are different from cylinder manifold locations as they are from bulk cryogenic systems too. The requirements should better define these differences.

Submitter Information Verification

Submitter Full Name: Jonathan Willard
Organization: Acute Medical Gas Services
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Submission Date: Mon May 31 15:55:38 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1025-NFPA 99-2021

Statement: The location requirements between the various types of medical gas systems vary in design based on the location. Motor-driven equipment locations are different from cylinder manifold locations as they are from bulk cryogenic systems too. The requirements should better define these differences. The revision modifies that suggested by PI-345 by deleting the proposed items (3), (4), and (8) in the proposed 5.1.3.3.2.2, which are adequately addressed by other codes, such as NFPA 101 and/or

the applicable building code.

The revision also changes the reference to 5.1.3.5.12, which is deleted by FR-1043, to 5.1.3.10.



Public Input No. 350-NFPA 99-2021 [Section No. 5.1.3.3.2]

5.1.3.3.2* Design and Construction.

5.1.3.3.2.1

New medical gas and vacuum systems shall be designed by a party technically competent and experienced in the field of medical gas and vacuum system design and meeting the requirements of ASSE 6060, Professional Qualification Standard for Medical Gas System Design Engineers.

5.1.3.3.2.2

Locations for central supply systems, excluding cryogenic fluid central supply systems, and for the storage of positive-pressure gases shall meet the following requirements:

- (1) They shall be constructed with access to move cylinders, equipment, and so forth in and out of the location on hand trucks complying with 11.4.3.1.1.
- (2) They shall be provided with lockable doors or gates or otherwise able to be secured.
- (3) If outdoors, they shall be well drained and provided with an enclosure (e.g., wall or fencing) constructed of noncombustible materials.
- (4) If outdoors, cylinders and containers shall be protected from prolonged contact with soil.
- (5) If indoors, they shall have interior finishes of noncombustible or limited-combustible materials.
- (6)* If indoors, rooms containing oxygen, nitrous oxide, or other oxidizers shall be separated from the rest of the building by walls and floors having a 1-hour fire resistance rating with doors and other opening protectives having a ¾-hour fire protection rating.
- (7)* They shall comply with *NFPA 70* for ordinary locations.
- (8)* Fuel-fired equipment shall not be located in the room.
- (9) If they require heat, the maximum allowable temperature of the in-room heating element shall be 130°C (266°F).
- (10) They shall be provided with racks, chains, or other fastenings to secure all cylinders from falling, whether connected, unconnected, full, or empty.
- (11)* They shall be supplied with electrical power compliant with the requirements for essential electrical systems as described in Chapter 6.
- (12) They shall have racks, shelves, and supports, where provided, constructed of noncombustible materials or limited-combustible materials.
- (13) They shall protect electrical devices from physical damage.
- (14)* They shall allow access by delivery vehicles and management of cylinders.
- (15) They shall be designed to meet the operational requirements of 5.1.3.2 with regard to room temperature.

5.1.3.3.2.2

Design and construction of locations for cryogenic fluid central supply systems shall comply with 5.1.3.5.12.

Statement of Problem and Substantiation for Public Input

Adds the new ASSE 6000 professional qualification for design engineers.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

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Submittal Date: Mon May 31 16:23:41 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed standard is not yet available. Multiple paths to design competency should be identified.



Public Input No. 364-NFPA 99-2021 [New Section after 5.1.3.3.2.1]

5.1.3.3.2.1 Design and Construction

(16) Source locations containing positive pressure gases other than oxygen and medical air shall be equipped with oxygen depletion monitors with alarm indicators at the entrance(s) that will indicate ambient oxygen levels in the room below 19.5 percent.

Statement of Problem and Substantiation for Public Input

Source locations that contain positive pressure gases other than oxygen and medical air present a potentially dangerous environment to those entering the room if there is a leak on one of these systems or if the ventilation is not working properly. Several accidents have occurred in the past as a result of such hazards.

Submitter Information Verification

Submitter Full Name: Kyle Jussel

Organization: Medical Air Testing & Service, Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 23:31:58 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1039-NFPA 99-2021

Statement: Source locations that contain positive pressure gases, other than oxygen and medical air, present a potentially dangerous environment to those entering the room if there is a leak on one of these systems or if the ventilation is not working properly. Several accidents have occurred in the past as a result of such hazards.



Public Input No. 195-NFPA 99-2021 [New Section after 5.1.3.3.2.2]

Add new 5.1.3.3.2.3 and Tables 5.1.3.3.2.3 (a) and (b) to read:

Total quantities of gases in any location, including gas connected to Central Supply System(s) and in storage shall be limited as described in Tables 5.1.3.3.2.3 (a) and (b)

NOTE: This change will conflict with the current Chapter 11, Section 11.3 for 300-3000 scf and over 3000 scf. If accepted, Chapter 11 will need to harmonize or refer to this section. A 1st draft place holder will be needed for Chapter 11.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
Table_5.1.3.3.2.pdf	tables

Statement of Problem and Substantiation for Public Input

This submission is the result of questions from engineers due to the conflict between NFPA 99's traditional 20,000 ft³ limit on gas storage, and the more complex table in NFPA 55. The presentation here is intended to clear up any confusion and also to set the medical limits into 99 for ease of use.

The proposed tables are derived from NFPA 55, with modifications appropriate to medical systems. However, we did not alter the Table 5.1.3.3.2.2 (b), although we believe as written it will not reflect the practices in hospitals today, and in larger facilities will represent a hardship. We would recommend changing to an amended version (also in the submission) for fully sprinklered facilities like a hospital.

Submitter Information Verification

Submitter Full Name: Mark Allen
Organization: Beaconmedaes
Street Address:
City:
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Zip:
Submission Date: Tue May 18 15:01:20 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1040-NFPA 99-2021

Statement: This revision is the result of questions from engineers due to the conflict between NFPA 99's traditional 20,000 ft³ limit on gas storage and the more complex table in NFPA 55 and is intended to clear up any confusion and also to set the medical limits into NFPA 99 for ease of use.

The proposed tables are derived from NFPA 55, with modifications appropriate to medical systems. However, we did not alter the Table 5.1.3.3.1.6(b), although we believe as written it will not reflect the practices in hospitals today, and in larger facilities will represent a hardship. We would recommend changing to an amended version (also in

the submission) for fully sprinklered facilities like a hospital.

Proposal:

Add new 5.1.3.3.2.3 and Tables 5.1.3.3.2.3 (a) and (b) to read:

Total quantities of gases in any location, including gas connected to Central Supply System(s) and in storage shall be limited as described in Tables 5.1.3.3.2.3 (a) and (b)

Table 5.1.3.3.2.3 (a)
Storage Quantities for Medical Gas and Cryogenic Fluid Central Supply Systems for Medical Gases in each location ⁽¹⁾

Gas	Package Forms	Hazard Class and Description	Maximum Allowable Quantity, Connected and in Storage , Gas Equivalent at STP			
			Outdoors	Indoors		
			Outdoors Enclosure, Constructed and Ventilated per NFPA 99 and 55	Medical Gas Storage areas (see 5.1.3.3.2 and 11.3)	Gas Room Indoors Constructed per 5.1.3.3.2, Ventilated per 9.3.6	Gas Room Indoors, Constructed per 5.1.3.3.2, Ventilated per 9.3.6 and Sprinklered per NFPA 13
Sum of all gases ⁽²⁾			No Limit	84 m ³ (3,000 ft ³)	283 m ³ (10,000 ft ³)	566 m ³ (20,000 ft ³)
Carbon Dioxide	Liquified Compressed Gas in Cylinders	<i>n, i, a</i>	No Limit	84 m ³ (3,000 ft ³) (eg. 5 “H” cylinders)	283 m ³ (10,000 ft ³) (eg. 17 “H” cylinders)	566 m ³ (20,000 ft ³) (eg. 35 “H” cylinders) ⁽³⁾
	Refrigerated Liquid in Containers	<i>n, i, a, c</i>	No Limit	84 m ³ (3,000 ft ³)	283 m ³ (10,000 ft ³)	566 m ³ (20,000 ft ³)
Helium	Compressed Gas in Cylinders	<i>n, i, a</i>	No Limit	84 m ³ (3,000 ft ³) (eg. 14 “H” cylinders)	283 m ³ (10,000 ft ³) (eg. 47 “H” cylinders)	566 m ³ (20,000 ft ³) (eg. 94 “H” cylinders) ⁽³⁾
	Cryogenic Fluid in Containers	<i>n, i, a, c</i>	No Limit	84 m ³ (3,000 ft ³)	283 m ³ (10,000 ft ³)	566 m ³ (20,000 ft ³) ⁽³⁾
Oxygen	Compressed Gas in Cylinders	<i>n, x, a</i>	No Limit	84 m ³ (3,000 ft ³) (eg. 12 “H” cylinders)	283 m ³ (10,000 ft ³) (eg. 40 “H” cylinders)	566 m ³ (20,000 ft ³) (eg. 81 “H” cylinders) ⁽³⁾
	Cryogenic Fluid in Containers	<i>n, x, a, c</i>	No Limit	84 m ³ (3,000 ft ³)	283 m ³ (10,000 ft ³)	566 m ³ (20,000 ft ³) ⁽³⁾
Medical Air	Cylinder	<i>None</i>	No Limit	Not Limited in Quantity	Not Limited in Quantity	Not Limited in Quantity
Nitrogen	Compressed Gas in Cylinders	<i>n, i, a</i>	No Limit	Not Limited in Quantity	Not Limited in Quantity	Not Limited in Quantity
	Cryogenic Fluid in Containers	<i>n, i, a, c</i>				
Nitrous Oxide	Liquified Compressed Gas in Cylinders	<i>n, x, a</i>	No Limit	84 m ³ (3,000 ft ³) (eg. 5 “H” cylinders)	283 m ³ (10,000 ft ³) (eg. 17 “H” cylinders)	566 m ³ (20,000 ft ³) (eg. 35 “H” cylinders) ⁽³⁾
	Refrigerated Liquid in Containers	<i>n, x, a, c</i>		84 m ³ (3,000 ft ³)	283 m ³ (10,000 ft ³)	566 m ³ (20,000 ft ³) ⁽³⁾
Others	Cylinder	<i>Various</i>	See NFPA 55			

Hazard class coding: *n* ~ Non-Flammable, *i* ~ Inert, *a* ~ Asphyxiant, *c* ~ cryogen when liquid, *x* ~ oxidizer

⁽¹⁾ See Table 5.1.3.3.2.3 (b) for number of permitted locations and derating factors.

⁽²⁾ Maximum Allowable Quantity of medical gases within a single location is limited both by the total quantity of gas and type of gas. The allowable storage quantity is also limited by the gas type as listed and the Sum is the maximum aggregate quantity of gases of all species.

Example: In an indoor medical gas manifold room, provided with ventilation per 9.3.2 and sprinklers per NFPA 13, it would be permissible to store Eight (8) H size cylinders (4,464 SCF) of Nitrous Oxide, Two (2) 160 L Containers (9,722 SCF) and twenty-three (23) H size cylinders (5,727 SCF) of Oxygen for a total quantity of 19,913 ft³ gas equivalent. In this example indoor medical gas manifold room, cylinders or containers of the same capacity (Standard Cubic Feet of medical gas) (like for like) can be exchanged freely, but additional or cylinders or containers of a larger capacity would increase the room's total contents of medical gas above the allowed 20,000 ft³ of medical gas and could not be stored in this room.

⁽³⁾ These are the limits for indoor storage. Refer to NFPA 55 for outdoor storage limits.

Table 5.1.3.3.1.6 (b) (per NFPA 55)
Number and Derating Factors for Gas Storage Locations, per floor (NFPA 55 : 6.2.1)

	Floor	% of MAQ (see Table 5.1.3.3.2.3 (a))	# of locations permitted	Fire Rating (hrs)
Above grade >	>9	5%	1	2
	7-9	5%	2	2
	4-6	12.5%	2	2
	3	50%	2	1
	2	75%	3	1
	1 (on grade)	100%	4	1
< below grade	-1	75%	3	1
	≥ -2	50%	2	1
	<2	-	Not Permitted	Not applicable

Table 5.1.3.3.1.6 (b) (as proposed)
Number and Derating Factors for Gas Storage Locations, per floor (NFPA 55 : 6.2.1)

	Floor	% of MAQ (see Table 5.1.3.3.2.3 (a))	# of locations permitted	Fire Rating (hrs)
Above grade >	>9	5%	1	2
	7-9	15%	2	2
	4-6	25%	2	2
	3	50%	2	1
	2	75%	3	1
	1 (on grade)	100%	4	1
< below grade	-1	100%	3	1
	≥ -2	50%	2	1
	<2	-	Not Permitted	Not applicable



Public Input No. 129-NFPA 99-2021 [Section No. 5.1.3.3.2.2]

[Add new](#)

5.1.3.3.2.2

Design and construction of locations for cryogenic fluid central supply systems shall comply with 5.1.3. 5-12: 10

Statement of Problem and Substantiation for Public Input

This indirect reference is pointless. The reference can be direct.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 128-NFPA 99-2021 [Section No. 5.1.3.5.12]</u>	daughter

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Self

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City:

State:

Zip:

Submittal Date: Sun May 02 13:53:08 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1041-NFPA 99-2021

Statement: The revision changes the cross-reference from 5.1.3.5.12 to 5.1.3.10, which is more direct.



Public Input No. 219-NFPA 99-2021 [Section No. 5.1.3.3.4.1]

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 through 5.1.3.3.3 and shall be permitted to be in the same rooms or enclosures as their respective central supply systems. - ~~Approved existing installations shall be permitted to be continued in service.~~

Statement of Problem and Substantiation for Public Input

As written, any existing previously approved location can be used, regardless of potentially hazardous conditions within the location, or so the facility might argue. As it has been noted in a published document, this is unnecessary as 1.3.2.3 ("An existing system that is not in strict compliance...") already allows this to be continued in service.

5.1.3.3.4.1 differs from 1.3.2.3 though as it omits the stipulation "unless the authority having jurisdiction has determined..."

Submitter Information Verification

Submitter Full Name: MGPHO BOD
Organization: Medgas 1 - Robert Woisard
Affiliation: Medical Gas Professional Healthcare Organization (MGPHO)
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 25 14:02:14 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The provision serves as a reminder that existing conditions can remain if deemed safe.



Public Input No. 1-NFPA 99-2020 [Section No. 5.1.3.5.4]

5.1.3.5.4* Materials.

Materials used in central supply systems shall meet the following requirements:

- (1) In those portions of systems intended to handle oxygen at gauge pressures greater than 2413 kPa (350 psi), interconnecting hose shall contain no polymeric materials.
- (2) In those portions of systems intended to handle oxygen or nitrous oxide at gauge pressures of less than 2413 kPa (350 psig), material, construction shall be compatible with oxygen under the temperatures and pressures to which the components can be exposed in the containment and use of oxygen, nitrous oxide, mixtures of these gases, or mixtures containing more than 23.5 percent oxygen.
- (3) If potentially exposed to cryogenic temperatures, materials shall be designed for low temperature service.
- (4) If intended for outdoor installation, materials shall be installed per the manufacturer's requirements.

Statement of Problem and Substantiation for Public Input

The removal of the 300 psi statement in the 2012 and subsequent editions makes the requirement for N2O pigtails the same as the requirements for oxygen pigtails (no polymeric material permitted). I don't believe this was the intent of the committee. I believe the intent of the committee at that time was to simply change the pressure from 2070 kPa (300 psi) to 2413 kPa (350 psi) which would still allow polymeric pigtails to be used in high pressure N2O cylinder service. This proposal simply changes this paragraph back to it's 2005 text with the change of 350 psi instead of 300 psi.

FYI - the change from 300 to 350 psi was proposed by this author to align the pressure with the relief valve setting commonly used on portable liquid vessels so that this paragraph and 5.1.3.5.4 (1) were clearly defined with respect to high pressure N2O cylinder and liquid vessel N2O applications.

Submitter Information Verification

Submitter Full Name: James Lucas

Organization: Tri-tech Medical Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Thu Nov 12 08:06:33 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: FR-1042-NFPA 99-2021

Statement: In addition to the substantiation provided for PI-1, the revision changes the threshold pressure to 3000 kPa (435 psi) for consistency with CGA G-4.10, Use of Nonmetallic Materials in High Pressure Oxygen Breathing Gas Applications.



Public Input No. 372-NFPA 99-2021 [Section No. 5.1.3.5.4]

5.1.3.5.4* Materials.

Materials used in central supply systems shall meet the following requirements:

- (1) In those portions of systems intended to handle oxygen or nitrous oxide at gauge pressures greater than 2413 kPa (350 psi), interconnecting hose shall contain no polymeric materials materials shall be designed for this service at these pressures .
- (2) In those portions of systems intended to handle oxygen or nitrous oxide material, construction shall be compatible with oxygen under the temperatures and pressures to which the components can be exposed in the containment and use of oxygen, nitrous oxide, mixtures of these gases, or mixtures containing more than 23.5 percent oxygen.
- (3) If potentially exposed to cryogenic temperatures, materials shall be designed for low temperature service.
- (4) If intended for outdoor installation, materials shall be installed per the manufacturer's requirements.

Statement of Problem and Substantiation for Public Input

Clarifies that the materials used shall be designed for these service. Polymeric materials are not the only concern at these pressures. There are other materials that are not suitable as well. Add nitrous oxide to the list of gases that are of concern.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jun 01 09:03:04 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1042-NFPA 99-2021](#)

Statement: In addition to the substantiation provided for PI-1, the revision changes the threshold pressure to 3000 kPa (435 psi) for consistency with CGA G-4.10, Use of Nonmetallic Materials in High Pressure Oxygen Breathing Gas Applications.



Public Input No. 50-NFPA 99-2020 [Section No. 5.1.3.5.6.1]

5.1.3.5.6.1

All pressure relief valves shall meet the following requirements:

- (1) They shall be of brass, bronze, or stainless steel construction.
- (2) They shall be designed for the specific gas service.
- (3) They shall have a relief pressure setting not higher than the maximum allowable working pressure (MAWP) of the component with the lowest working pressure rating in the portion of the system being protected.
- (4) They shall be vented to the outside of the building, except that relief valves for compressed air systems having less than 84,950 L (3000 ft³) at STP shall be permitted to be diffused locally by means that will not restrict the flow.
- (5) They shall have a vent discharge line that is not smaller than the size of the relief valve outlet or 20 mm (³/₄NPS), whichever is larger.
- (6) Where two or more relief valves of the same gas discharge into a common vent line, the internal cross-sectional area of the common line shall be not less than the aggregate cross-sectional area of all relief valve vent discharge lines served.
- (7) They shall not discharge into locations creating potential hazards.
- (8) They shall have the discharge terminal turned down and screened to prevent the entry of rain, snow, or vermin.
- (9) They shall be designed in accordance with ASME B31.3, *Process Piping*.

Statement of Problem and Substantiation for Public Input

Since section 5.1.10.11.7 prohibits interconnection of two or more medical gas systems, this wordage should be added for clarification.

Submitter Information Verification

Submitter Full Name: Scott Winn

Organization: Winns Career Education

Street Address:

City:

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Submittal Date: Mon Dec 21 12:18:13 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: It is the intent of (6) to allow different gases to be vented together.

**Public Input No. 125-NFPA 99-2021 [Section No. 5.1.3.5.11]****5.1.3.5.11** Manifolds for Portable Cryogenic Liquid Containers.**5.1.3.5.11.1**

Manifolds for portable cryogenic liquid containers shall be located in accordance with 5.1.3.3.1 and shall meet the following:

- (1) If located outdoors, they shall be installed in an enclosure used only for the enclosure of such containers and sited to comply with minimum distance requirements in Table 5.1.3.5.11.1.
- (2) If located indoors, they shall be installed within a room used only for the enclosure of such containers.

Table 5.1.3.5.11.1 Minimum Separation Distance Between Portable Cryogenic Containers and Exposures

<u>Exposure</u>	<u>Minimum Distance</u>	
	<u>ft</u>	<u>m</u>
(1) Building exits	10	3.1
(2) Wall openings	1	0.3
(3) Air intakes	10	3.1
(4) Property lines	5	1.5
(5) Room or area exits	3	0.9
(6) Combustible materials, (e.g., paper, leaves, weeds, dry grass, debris)	15	4.5
(7) Incompatible ~~hazardous~~ <u>Hazardous</u> materials	20	6.1

[55:Table 8.7.3]

5.1.3.5.11.2

The manifolds in this category shall have their primary and secondary headers located in the same enclosure.

5.1.3.5.11.3

The reserve header shall be permitted to be located in the same enclosure as the primary and secondary headers or in another enclosure compliant with 5.1.3.5.11.1.

5.1.3.5.11.4

The manifolds in this category shall consist of the following:

- (1) Two equal headers in accordance with 5.1.3.5.9, each having sufficient internal or external vaporization capacity to meet the required peak flow rate and each having sufficient number of liquid container connections for one average day's supply, and with the headers connected to the final line pressure regulator assembly in such a manner that either header can supply the system
- (2) Reserve header in accordance with 5.1.3.5.9 having sufficient number of gas cylinder connections for one average day's supply, but not fewer than three connections, and connected downstream of the primary/secondary headers and upstream of the final line pressure regulators
- (3) Pressure relief installed downstream of the connection of the reserve header and upstream of the final line pressure regulating assembly and set at 50 percent above the nominal inlet pressure
- (4) If provided with one portable liquid container header (primary), one gas cylinder header (secondary), and a reserve gas cylinder header (a hybrid arrangement), a secondary gas cylinder supply having equal capacity to meet the required peak flow rate of the primary header, and a reserve gas cylinder header in accordance with 5.1.3.5.9 having sufficient number of gas cylinder connections for one average day's supply, but not fewer than three connections

5.1.3.5.11.5

The manifolds in this category shall include an automatic means of controlling the three headers to accomplish the following during normal operation:

- (1) If provided with two portable liquid container headers, one portable cryogenic liquid header shall be the primary and the other shall be the secondary, with either being capable of either role.
- (2) If provided with one portable liquid container header and one gas cylinder header (a hybrid arrangement), the liquid container header is the primary and the gas cylinder header is the secondary.
- (3) When the primary header is supplying the system, the secondary header is prevented from supplying the system.
- (4) When the primary header is depleted, the secondary header automatically begins to supply the system.

5.1.3.5.11.6

The manifolds in this category shall be equipped with a means to conserve the gas produced by evaporation of the cryogenic liquid in the secondary header (when so provided). This mechanism shall discharge the conserved gas into the system upstream of the final line regulator assembly.

5.1.3.5.11.7

The manifolds in this category shall include a manual or automatic means to place either header into the role of primary header and the other into the role of secondary header, except where a liquid/gas hybrid manifold is employed.

5.1.3.5.11.8

The manifolds in this category shall include a means to automatically activate the reserve header if for any reason the primary and secondary headers cannot supply the system.

5.1.3.5.11.9

The manifolds in this category shall have a local signal that visibly indicates the operating status of the equipment and activates an indicator at all master alarms under the following conditions:

- (1) When or at a predetermined set point before the secondary header begins to supply the system, indicating changeover
- (2) Where a hybrid arrangement is employed, when or at a predetermined set point before the secondary (cylinder) header contents fall to one average day's supply, indicating secondary low
- (3) When or at a predetermined set point before the reserve header begins to supply the system, indicating reserve is in use
- (4) When or at a predetermined set point before the reserve header contents fall to one average day's supply, indicating reserve low

Statement of Problem and Substantiation for Public Input

With the addition of the material in 5.1.3.10, there appear to be conflicts between these two sections. If this section is clearly understood to be for portable containers, those conflicts are resolved. Changes are also suggested for 5.1.3.10 in line with these.

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Self

Street Address:

City:

State:

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Submittal Date: Sun May 02 12:31:48 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Based on the action on PI-127, the term 'portable' would cause greater confusion.

**Public Input No. 126-NFPA 99-2021 [Section No. 5.1.3.5.11.1]****5.1.3.5.11.1**

Manifolds for cryogenic liquid containers shall be located in accordance with 5.1.3.3.1 and shall meet the following:

- (1) If located outdoors, they shall be installed in an enclosure used only for the enclosure of such containers and sited to comply with minimum distance requirements in Table 5.1.3.5.11.1.
- (2) If located indoors, they shall be installed within a room used only for the enclosure of such containers.

Table 5.1.3.5.11.1 Minimum Separation Distance Between Portable Cryogenic Containers and Exposures

<u>Exposure</u>	<u>Minimum Distance</u>	
	<u>ft</u>	<u>m</u>
(1) Building exits	10	3.1
(2) Wall openings	1	0.3
(3) Air intakes	10	3.1
(4) Property lines	5	1.5
(5) Room or area exits	3	0.9
(6) Combustible materials, (e.g., paper, leaves, weeds, dry grass, debris)	15	4.5
(7) ~~Incompatible hazardous materials~~ <u>Hazardous materials incompatible with the gases involved</u>	20	6.1

[55:Table 8.7.3]

Statement of Problem and Substantiation for Public Input

The wording "Incmpatible Haradous materials" is not clear as to what hazards to consider. The rewording attempts to make this specific

Submitter Information Verification

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City:

State:

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Submittal Date: Sun May 02 12:42:11 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Changes to extracted language are not permitted in accordance with the NFPA extract policy. Any proposed revisions must be submitted to NFPA 55.



Public Input No. 128-NFPA 99-2021 [Section No. 5.1.3.5.12]

5.1.3.5.12 – Cryogenic Fluid Central Supply Systems.

The storage, use, and handling of cryogenic fluid central supply systems that deliver compressed medical gases (CMGs) to health care facilities shall be in accordance with 5.1.3.10 .

Statement of Problem and Substantiation for Public Input

Delete the clause.

This clause is redundant. Any clause referring to it should properly refer to 5.1.3.10.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 129-NFPA 99-2021 [Section No. 5.1.3.3.2.2]	

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Self

Street Address:

City:

State:

Zip:

Submittal Date: Sun May 02 13:45:40 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1043-NFPA 99-2021](#)

Statement: The paragraph is redundant. Any paragraph referring to it should refer to 5.1.3.10.



Public Input No. 349-NFPA 99-2021 [Section No. 5.1.3.5.13]

5.1.3.5.13* ~~Emergency- Temporary~~ Oxygen Supply Connection (EOSC TOSC).

~~Emergency- Temporary~~ oxygen supply connections (EOSCs TOSCs) shall be installed to allow connection of a temporary auxiliary source of supply for ~~emergency- planned~~ or ~~maintenance unplanned~~ situations where either of the following conditions exist:

- (1) The bulk liquid system or cryogenic fluid central supply system is outside of and remote from the building that the oxygen supply serves, and there is no connected in-building oxygen reserve sufficient for one average day's supply. *(See 5.1.3.5.14 for requirements for such reserves.)*
- (2) Multiple freestanding buildings are served from a single oxygen source such that damage to the interconnecting oxygen line could result in one or more buildings losing oxygen supply, in which case each building is required to be provided with a separate emergency connection.

5.1.3.5.13.1

~~EOSCs~~ TOSCs shall be located as follows:

- (1) Located on the exterior of the building being served in a location accessible by emergency supply vehicles at all times in all weather conditions
- (2) Connected to the main supply line immediately downstream of the main shutoff valve

5.1.3.5.13.2

~~EOSCs~~ TOSCs shall consist of the following:

- (1) Physical protection to prevent unauthorized tampering
- (2) Female DN (NPS) inlet for connection of the emergency oxygen source that is sized for 100 percent of the system demand at the emergency source gas pressure
- (3) Manual shutoff valve in the TOSC box to isolate the TOSC when not in use
- (4) Manual shutoff valve inside the building to isolate the ~~EOSC~~ TOSC when not in use and prevent unauthorized use
- (5) Two check valves, one downstream of the ~~EOSC~~ TOSC and one downstream of the main line shutoff valve, with both upstream from the tee connection for the two pipelines
- (6) Relief valve sized to protect the downstream piping system and related equipment from exposure to pressures in excess of 50 percent higher than normal line pressure
- (7) Any valves necessary to allow connection of an emergency supply of oxygen and isolation of the piping to the normal source of supply
- (8) Minimum of 1 m (3 ft) of clearance around the ~~EOSC~~ TOSC for connection of temporary auxiliary source
- (9)* Four alarm connection points installed to both master alarm panels to allow the temporary supply to be monitored while in use

Statement of Problem and Substantiation for Public Input

Clarifies the expected use of the TOSC and also adds a "terrorist valve" inside the building in case unauthorized access to the box takes place.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 16:18:36 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision will not change how the connections are used. There is no issue with the existing terminology. The revision would require labeling to be changed in existing facilities. The auxiliary supply connection can be used in emergency situations. No data was provided to justify the change to item (4).



Public Input No. 184-NFPA 99-2021 [New Section after 5.1.3.6]

5.1.3.5.15 Auxiliary Connections. All medical gas and vacuum systems shall be provided with an auxiliary connection located patient side of the source valve for connection of a temporary or supplemental source of supply:

- (1) the auxiliary connection will be of the same size as the main line,
- (2) the auxiliary connection will consist of a tee, valve and removable plugged or capped connection point,
- (3) the location of the auxiliary connection will consider how it will be used in event of need,
- (4) the valve shall be secured (5.1.4.1.2).

A 5.1.3.5.15 These auxiliary connections (tee, valve and plug or cap) may also be useful in other locations the Responsible Facility Authority determines is appropriate for operating or supplementing their systems during maintenance, construction or emergencies. They are generally superior to "backfeeding" through outlets or gauge ports, which may be the only other option.

Statement of Problem and Substantiation for Public Input

One of the findings from COVID was that these connections are not commonly provided and that they proved invaluable (as the EOSC for oxygen) to many facilities. They are useful for emergency preparedness, for routine maintenance if the main central supply system is being replaced, and for supplementation (as was the case in COVID)

Submitter Information Verification

Submitter Full Name: Mark Allen
Organization: Beaconmedaes
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 18 12:32:51 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1044-NFPA 99-2021

Statement: One of the findings from COVID was that these connections are not commonly provided and that they proved invaluable (as the EOSC for oxygen) to many facilities. They are useful for emergency preparedness, for routine maintenance if the main central supply system is being replaced, and for supplementation (as was the case in COVID).



Public Input No. 40-NFPA 99-2020 [Section No. 5.1.3.6.2]

5.1.3.6.2* Uses of Medical Air.

Medical air sources shall be connected to the medical air distribution system only and shall be used only for air in the application of human respiration- ~~and~~ ,_ calibration of medical devices for respiratory application, and in simulation centers for the education, training, and assessment of health care professionals per section 5.1.3.5.2.

Statement of Problem and Substantiation for Public Input

This wordage should be added to align with section 5.1.3.5.2.

Submitter Information Verification

Submitter Full Name: Scott Winn

Organization: Winns Career Education

Street Address:

City:

State:

Zip:

Submittal Date: Mon Dec 21 12:08:34 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: FR-1028-NFPA 99-2021

Statement: This revision aligns with 5.1.3.5.2.



Public Input No. 357-NFPA 99-2021 [Section No. 5.1.3.6.3.7]

5.1.3.6.3.7 Medical Air Dryers.

Medical air dryers, where required, shall meet the following requirements:

- (1) Be designed to provide air at a maximum dew point that is below the frost point [0°C (32°F)] at 345 kPa to 380 kPa (50 psi to 55 psi) at any level of demand
- (2) Be sized for 100 percent of the system peak calculated demand at design conditions
- (3) Be constructed of materials deemed suitable by the manufacturer
- (4) Be provided with antivibration mountings installed as required by equipment dynamics or location and in accordance with the manufacturer's recommendations
- (5) *Be provided with test ports upstream and downstream of each dryer

A.5.1.3.6.3.7

This is to allow for the dryer to properly brought on line and allow for a purge to be conducted prior to swapping dryer. The test ports also allow for the dewpoint to be checked prior to placing the dryer online. This will help eliminate false alarms when changing from one dryer to other, which is usually monthly.

Statement of Problem and Substantiation for Public Input

This will allow for proper changeover of dryers during routine maintenance. It is difficult to purge dryers that are offline and test the dew point prior to putting the dryer online.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submission Date: Mon May 31 16:49:22 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1104-NFPA 99-2021

Statement: The revision will allow for proper changeover of dryers during routine maintenance. It is difficult to purge dryers that are offline and test the dew point prior to putting the dryer online.



Public Input No. 66-NFPA 99-2020 [Section No. 5.1.3.7.4]

5.1.3.7.4 Vacuum Filtration.

Central supply systems for vacuum other than liquid ring pumps shall be provided with inlet filtration with the following characteristics:

- (1) Filtration shall be at least duplex to allow one filter to be exchanged without impairing the vacuum system.
- (2) Filtration shall be located on the patient side of the vacuum producer.
- (3) Filters shall be efficient to 0.3 μ - μ M (micron) and 99.97 percent HEPA or better, per DOE-STD-3020, *Specification for HEPA Filters Used by DOE Contractors*.
- (4) Filtration shall be sized for 100 percent of the peak calculated demand while one filter or filter bundle is isolated.
- (5) It shall be permitted to group multiple filters into bundles to achieve the required capacities.
- (6) The system shall be provided with isolation valves on the source side of each filter or filter bundle and isolation valves on the patient side of each filter or filter bundle, permitting the filters to be isolated without shutting off flow to the central supply system.
- (7) A means shall be available to allow the user to observe any accumulations of liquids.
- (8) A vacuum relief petcock shall be provided to allow vacuum to be relieved in the filter canister during filter replacement.
- (9) Filter elements and canisters shall be permitted to be constructed of materials as deemed suitable by the manufacturer.
- (10) In normal operation, one filter or filter bundle shall be isolated from the system to be available for service should a blockage in the operating filter occur or rotation of the filters be desired after filter element exchange.

Statement of Problem and Substantiation for Public Input

Since 1960 the SI symbol for micron has been μ M, not μ .
 μ now simply means micro.

Additionally, the DOE-STD-3020 also calls for .3 micro meter (also know as micron), not .3 μ .
This correction will provide clarity.

Submitter Information Verification

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Submission Date: Mon Dec 21 13:14:08 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1045-NFPA 99-2021](#)

Statement: The revision is intended for consistency with DOE-STD-3020.



Public Input No. 358-NFPA 99-2021 [Section No. 5.1.3.8.1.2]

5.1.3.8.1.2

If WAGD is produced by the medical–surgical vacuum source, the following shall apply:

- (1) The medical–surgical vacuum source shall comply with 5.1.3.7.
- (2) The total concentration of oxygen shall be maintained below 23.6 percent , or either of the following shall be met
- (3) the vacuum pump shall comply with 5.1.3.8.2.1 .
- (4) the combined medical-surgical vacuum/WAGD system shall be monitored for oxygen and initiate an alarm at all master alarm panels if the oxygen concentration exceeds 23.6 percent.
- (5) The medical–surgical vacuum source shall be sized to accommodate the additional volume.

Statement of Problem and Substantiation for Public Input

Clarifies that monitoring of the system is an acceptable mitigation to the issue addressed in the code.

Submitter Information Verification

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Committee: HEA-PIP

Committee Statement

Resolution: FR-1029-NFPA 99-2021

Statement: The revision clarifies that monitoring of the system is an acceptable means to mitigate the issue addressed in the code.



Public Input No. 183-NFPA 99-2021 [Section No. 5.1.3.8.5]

5.1.3.8.5 WAGD Exhaust.

The WAGD pumps- producers shall exhaust in compliance with 5.1.3.7.7 - 7 with these exceptions :

(1) Producers under 1 Hp and venturi producers shall be permitted to exhaust individually in a manner which will allow for dispersion of the exhaust gases and not allow the exhaust gas to reenter the building (i.e. through openable windows or nearby intakes);

(2) anesthetic gas recovery (AGR) systems may be installed in the WAGD exhaust piping provided they allow for bypassing the AGR system if required.

Statement of Problem and Substantiation for Public Input

It may not be feasible to pipe In-terminal WAGD types to a central exhaust, and because of the small volumes they exhaust don't necessarily need to be centrally exhausted, as long as their exhausts are appropriately located and exhaust safely.

AGR systems are still relatively rare, but are poised to become more common over time, as they are already doing in Canada. It is sensible to make allowance for them.

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Committee: HEA-PIP

Committee Statement

Resolution: [FR-1046-NFPA 99-2021](#)

Statement: It may not be feasible to pipe In-terminal WAGD types to a central exhaust, and because of the small volumes they exhaust don't necessarily need to be centrally exhausted, as long as their exhausts are appropriately located and exhaust safely. AGR systems are still relatively rare, but are poised to become more common over time, as they are already doing in Canada. The revision makes an allowance for them.



Public Input No. 161-NFPA 99-2021 [Section No. 5.1.3.9.3]

5.1.3.9.3 Arrangement and Redundancies.

An oxygen central supply system using a concentrator(s) shall be permitted to consist of two or three supply sources, as follows:

- (1) If two supply sources are provided, one shall be an oxygen concentrator supply unit and the second shall be a cylinder header complying with 5.1.3.5.9 with sufficient cylinder connections for one average day's supply. Containers shall not be used as a supply source.
- (2) If three supply sources are provided, each shall be capable of independently supplying the full system demand in the event of the unavailability of one or both of the other sources. The three sources shall be permitted to be either of the following:
 - (a) An oxygen concentrator supply ~~system~~ unit complying with 5.1.3.9.1.
 - (b) A cylinder header complying with 5.1.3.5.9 with sufficient cylinder connections for one average day's supply. Containers shall not be used as a supply source.
- (3) Use of oxygen concentrator supply systems as all three sources shall only be permitted after a documented risk analysis by the governing authority of the health care facility indicating understanding of the inherent risks and defining how those risks shall be mitigated.
- (4) An isolation valve and automatic check valve shall be provided to isolate each of the three sources from the others and from the pipeline. The valves in 5.1.3.5.9(4), 5.1.3.5.9(6), 5.1.3.9.1.11, and 5.1.3.9.1.12 shall be permitted to be used for this purpose.
- (5) Each of the three supply sources shall be provided with a pressure relief valve complying with 5.1.3.5.6 on the source side of its respective isolating valve.
- (6) The three supply sources shall join to the pipeline systems through control arrangements with at least the following characteristics:
 - (a) Able to maintain stable pressures within the limits of Table 5.1.11
 - (b) Able to flow 100 percent of the peak calculated demand
 - (c) Redundant, such that each component of the control mechanism can be isolated for service or replacement while maintaining normal operation
 - (d) The cascade of sources described in 5.1.3.9.4
 - (e) Protected against overpressure (see 5.1.3.5.6)
- (7) A pressure relief valve shall be provided in the common line between the sources and the line pressure controls.
- (8) A source valve in accordance with 5.1.4.2 shall be provided on the patient side of the line pressure controls.
- (9) A gauge and switch or sensor shall be located between the three sources and the line pressure controls to monitor the pressure feeding the line pressure controls.
- (10) An oxygen concentration monitor, sampling the gas on the patient side of the line pressure controls and on the source side of the source valve, shall be provided with the following characteristics:
 - (a) The monitor shall be capable of monitoring 99 percent oxygen concentration with ± 1.0 percent accuracy.
 - (b) The monitor shall be attached to the pipeline through a demand check in accordance with 5.1.8.2.3.
 - (c) The monitor shall continuously display the oxygen concentration and shall activate local alarm and master alarms when an oxygen concentration lower than 91 percent is observed.
- (11) A DN8 (NPS $\frac{1}{4}$) valved sample port shall be provided on the patient side of the line pressure controls and source side of the source valve for sampling the oxygen.
- (12) An auxiliary source connection shall be provided complying with 5.1.4.10.

(13) Electrical installation and wiring shall conform to the requirements of *NFPA 70*.

(14) Emergency electrical service for all components of the oxygen supply system shall conform to the requirements of the essential electrical system as described in Chapter 6.

Statement of Problem and Substantiation for Public Input

The individual source is a unit, not a system.

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Submittal Date: Fri May 14 17:28:47 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1030-NFPA 99-2021](#)

Statement: The individual source is a unit, not a system.



Public Input No. 127-NFPA 99-2021 [Section No. 5.1.3.10]

5.1.3.10*— Stationary Cryogenic Fluid Central Supply Systems.

5.1.3.10.1 General.

5.1.3.10.1.1*

The ~~storage location~~ , use, and handling of stationary cryogenic fluid ~~supply sources and~~ central supply systems ~~that including them which are used to~~ deliver compressed medical gases (CMGs) to health care facilities shall be in accordance with the requirements of this section. [55:17.1.1]

5.1.3.10.1.2 Applicability.

(A)

The source valve (ref 5.1.4.2) shall be the line separating the applicability between NFPA 55 and this code. [55:17.1.2.1]

(B)

Stationary Cryogenic fluid central supply system installations up to, but not including, the source valve shall be covered by NFPA 55. [55:17.1.2.2]

(C)

The source valve and all downstream piping and components, including wiring to storage system alarms, shall be covered by this code. [55:17.1.2.3]

5.1.3.10.2— Stationary Cryogenic Fluid Central Supply Systems Installation.

5.1.3.10.2.1

Stationary Cryogenic fluid central supply systems shall be installed by personnel qualified in accordance with CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities*, or ASSE 6015, *Professional Qualifications Standard for Bulk Medical Gas Systems Installers*. [55:17.2.1]

5.1.3.10.2.2

Stationary Cryogenic fluid central supply systems shall be installed in compliance with the Food and Drug Administration (FDA) Current Good Manufacturing Practices per 21 CFR 210 and 21 CFR 211 where FDA has jurisdiction, and other appropriate local authority elsewhere . [55:17.2.2]

5.1.3.10.2.3

Stationary Cryogenic fluid central supply ~~systems~~ ~~sources and associated components~~ shall be anchored with foundations in accordance with CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities*. [55:17.2.3]

5.1.3.10.2.4

Stationary Cryogenic fluid central supply systems shall have a minimum work space clearance of 3 ft (1 m) around the storage container, vaporizer(s), and cabinet opening or front side of the pressure-regulating manifold for system maintenance and operation. [55:17.2.4]

5.1.3.10.2.5

~~Inert cryogenic~~ Stationary Cryogenic fluid central supply systems for inert gases shall be sited in accordance with Chapter 8 of NFPA 55 and CGA P-18, *Standard for Bulk Inert Gas Systems at Consumer Sites*. [55:17.2.5]

5.1.3.10.2.6

~~Oxygen-cryogenic~~ Stationary Cryogenic fluid central supply systems for Oxygen shall be sited in accordance with Chapters 8 and 9 of NFPA 55, as applicable, and CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities*. [55:17.2.6]

5.1.3.10.2.7

Carbon dioxide refrigerated liquid central supply systems shall be sited in accordance with Chapter 13 of NFPA 55 and CGA G-6.1, *Standard for Insulated Liquid Carbon Dioxide Systems at Consumer Sites*. [55:17.2.7]

5.1.3.10.2.8

Nitrous oxide refrigerated liquid central supply systems shall be sited in accordance with Chapter 16 of NFPA 55 and CGA G-8.1, *Standard for Nitrous Oxide Systems at Customer Sites*. [55:17.2.8]

5.1.3.10.3– Stationary Cryogenic Fluid Central Supply Systems Operation.**5.1.3.10.3.1**

The following components of the stationary cryogenic fluid central supply system containers shall be accessible and visible to delivery personnel during filling operations:

- (1) Fill connection
- (2) Top and bottom fill valves
- (3) Hose purge valve
- (4) Vent valve
- (5) Full trycock valve
- (6) Liquid level indicator
- (7) Tank pressure indicator

[55:17.3.1]

5.1.3.10.3.2

~~Cryogenic~~ Stationary cryogenic fluid central supply systems shall consist of the following:

- (1) One or more stationary main supply vessel, with capacity determined after consideration of the customer usage requirements, delivery schedules, proximity of the facility to alternative supplies, and the emergency plan
- (2) A contents gauge on every- ~~main-~~ stationary vessel
- (3) A reserve supply sized for greater than an average day's supply, with the size of vessel(s) or number of cylinders determined after consideration of delivery schedules, proximity of the facility to alternative supplies, and the emergency plan
- (4) At least two main vessel relief valves and rupture discs installed downstream of a three-way (i.e., three-port) valve
- (5) A check valve located in the primary supply piping upstream of the intersection with a secondary supply or reserve supply

[55:17.3.2]

5.1.3.10.3.3

Reserve CMG supply systems consisting of either a second cryogenic fluid source or a compressed gas source shall include the following:

- (1) Where the reserve source is a compressed gas source, the reserve shall be equipped with the following:
 - (a) A cylinder manifold having not less than three gas cylinder connections or as otherwise required for an average of one day's gas supply
 - (b) A pressure switch to monitor the pressure in the cylinder manifold
- (2) Where the reserve source is a second stationary cryogenic fluid vessel, the reserve tank shall be equipped with the following:
 - (a) An actuating switch or sensor to monitor the internal tank pressure
 - (b) A contents gauge to monitor the liquid level
- (3) Where the reserve source is either a portable cryogenic fluid container or compressed gas source, a check valve shall be provided to prevent backflow into the reserve system.

[55:17.3.3]

5.1.3.10.3.4

Bulk ~~Stationary~~ cryogenic liquid ~~sources~~ central supply systems shall include automatic means to provide the following functions:

- (1) When the main supply source is supplying the system, the secondary and reserve supply sources(s) shall be prevented from supplying the system until the main supply is reduced to a level at or below the reserve activation pressure.
- (2) When the main supply source cannot supply the system, the secondary or reserve supply source shall automatically begin to supply the system.
- (3) Where there is more than one main supply vessel, the system shall operate as follows for primary, secondary, and reserve operation:
 - (a) If provided with two portable liquid container headers, one ~~cryogenic liquid~~ portable liquid header shall be the primary and the other shall be the secondary, with either being capable of either role.
 - (b) If provided with one portable liquid container header and one gas cylinder header (i.e., a hybrid arrangement), the portable liquid container header shall be the primary and the gas cylinder header shall be the secondary.
 - (c) When the primary ~~header~~ supply source is supplying the system, the secondary ~~header~~ supply source shall be prevented from supplying the system.
 - (d) When the primary supply source header is depleted, the secondary ~~header~~ supply source shall automatically begin to supply the system.
- (4) Where there are two or more cryogenic vessels, they shall be permitted to alternate (e.g., on a timed basis) in the roles of primary, secondary, and reserve, provided that an operating cascade (i.e., primary–secondary–reserve) is maintained at all times.
- (5) Where a cryogenic vessel is used as the reserve, the reserve vessel shall include a means to conserve the gas produced by evaporation of the cryogenic liquid in the reserve vessel and to discharge the gas into the line upstream of the final line regulator assembly.

[55:17.3.4]

5.1.3.10.4 Main Supply System.

The main supply vessel for a cryogenic fluid central supply system shall be a stationary cryogenic storage tank. [55:17.4]

5.1.3.10.5 Reserve Supply System.

5.1.3.10.5.1

A CMG reserve supply ~~system~~ source shall consist of either of the following:

- (1) A ~~secondary~~ second stationary cryogenic vessel
- (2) A header for portable cryogenic containers (5.1.3.5.9)
- (3) A high-pressure compressed gas source

[55:17.5.1]

5.1.3.10.5.2

A ~~cryogenic source~~ reserve supply source using cryogenic vessels shall have a switch or sensor to monitor the tank pressure. [55:17.5.2]

5.1.3.10.5.3

A compressed gas reserve supply source shall meet the following requirements:

- (1) ~~It shall be manifolded with no~~ if employing cylinders, it shall be a header (5.1.3.9) with no fewer than three gas cylinders connections.
- (2) It shall have a pressure switch or sensor to monitor the ~~contents using~~ manifold pressure.
- (3) It shall have a check valve to prevent backflow into the system.
- (4) ~~It shall have a check valve at each connection on the cylinder header to minimize loss of gas from the reserve system.~~

[55:17.5.3]

5.1.3.10.6 Cryogenic Fill System - ~~for Stationary vessels~~

Stationary vessels in a Cryogenic fluid central supply systems shall include a fill mechanism consisting of the following components:

- (1) A nonremovable product-specific fill connection in compliance with CGA V-6, *Standard Bulk Refrigerated Liquid Transfer Connections*
- (2) A means to cap and secure the fill connection inlet
- (3) A check valve to prevent product backflow from the fill inlet
- (4) A fill hose purge valve
- (5) Supports that hold the fill piping off the ground
- (6) A secure connection between the bulk tank and the fill piping
- (7) Supports, as necessary, to hold the fill line in position during all operations associated with the filling procedure

[55:17.6]

5.1.3.10.7 Vaporizers.**5.1.3.10.7.1**

Vaporizers used to convert cryogenic CMG to a gaseous state shall meet the following requirements:

- (1) Vaporizers shall be permitted to operate by either ambient heat transfer or external thermal source (e.g., electric heater, hot water, steam) with the limitation given in 5.1.3.10.7.4.
- (2) Vaporizers using a heat source other than ambient air shall be protected in the event of a loss of the energy source.

[55:17.7.1]

5.1.3.10.7.2

Vaporizers shall be designed to provide capacity for the customer's use under the following conditions:

- (1) Customer's average and peak flows
- (2) Local conditions (e.g., structures that obstruct air circulation or sunlight)
- (3) Seasonal conditions (e.g., freeze periods)

[55:17.7.2]

5.1.3.10.7.3

A system design that uses switching vaporizers shall meet all of the following requirements:

- (1) Valves shall be permitted to be manual or automatic.
- (2) Valves and piping shall allow an operating vaporizer or an operating section of a vaporizer to be switched to a nonoperating condition for deicing.
- (3) The system design shall provide continuous flow of CMG to the health care facility during vaporizer switchover.
- (4) The system design shall provide continuous flow of CMG to the health care facility if vaporizer switchover fails.

[55:17.7.3]

5.1.3.10.7.4

Where a vaporizer uses an external thermal source, the flow of the CMG shall be unaffected by the loss of the external thermal source by one of the following methods:

- (1) Reserve ambient heat transfer vaporizers sized for at least one day's average supply and piped so that the flow of the CMG is unaffected by flow stoppage through the external thermal source vaporizer
- (2) A noncryogenic source capable of providing at least one day's average supply

[55:17.7.4]

5.1.3.10.7.5

Where vaporizers are used in the reserve system supply source, they shall be as follows:

- (1) Sized by the supplier to provide a source of vaporized CMG from the reserve bulk liquid storage vessel during times when the reserve system is operational
- (2) Able to provide a flow rate equal to at least that of the main system vaporizer(s); ~~however~~ however, the duration of flow might be different
- (3) Indirectly heated by ambient air

[55:17.7.5]

5.1.3.10.7.6

Low-temperature protection systems that interrupt or reduce flow shall not be used on the reserve system of cryogenic fluid central supply systems. [55:17.7.6]

5.1.3.10.8 High-Pressure Manifolds.**5.1.3.10.8.1 –**

~~Manifold assemblies shall be fit for service and shall have supports that are independent of the cylinders.~~ [55: 17.8.1]

5.1.3.10.8.2 –

~~Cylinders on the manifold shall be secured against falling.~~ [55: 17.8.2]

Where high pressure cylinder manifolds are used as secondary or reserve supplies within stationary Cryogenic central supply systems, they shall comply with 5.1.3.10.8.3 * –

~~Cylinders on the manifold shall have the same service pressure rating or the filled pressure of each cylinder shall not exceed the service pressure rating of the lowest rated cylinder on the manifold. [55: 17.8.3]~~

5.1.3.10.9– Pressure Control Devices.

~~The final pressure control device assembly or assemblies shall not be fabricated on-site. [55: 17.9]~~

5.1.3.10.10 Pressure Relief Devices.

Pressure relief devices (PRDs) used within stationary cryogenic supply systems shall meet the following requirements:

5.1.3.10.10.1

~~Pressure relief devices {~~

~~(1) PRDs~~

~~}~~

~~(1) shall~~

~~meet the following requirements:~~

- ~~(1) PRDs shall have a relief pressure setting not higher than the maximum allowable working pressure (MAWP) of the component with the lowest working pressure rating in the portion of the system being protected.~~
- ~~(2) PRDs shall be of brass or bronze construction.~~
- ~~(3) PRDs shall be designed for the specific gas service.~~
- ~~(4) PRDs shall have the discharge protected to prevent the entry of rain or snow.~~
- ~~(5) PRDs shall be designed in accordance with ASME B31.3, *Process Piping* .~~

[55:17.10.1]

5.1.3.10.10.2

PRDs shall have an identifier that contains the date of manufacture or test. **[55:17.10.2]**

5.1.3.10.10.3

The final line pressure relief valves shall be approved by a nationally recognized organization and shall have a relief capacity greater than or equal to the maximum throughput of the final line regulator. **[55:17.10.3]**

(A)

The pressure relief valve shall be set at 50 percent above the normal working pressure, but no higher than the MAWP, of the health care facility pipeline. **[55:17.10.3.1]**

(B)

The relief valve information shall be permanently identified either on the nameplate of the relief valve or on a permanently attached metal tag. **[55:17.10.3.2]**

5.1.3.10.11 Tubing and Valves.

5.1.3.10.11.1

~~New, hard-drawn Type K or L copper tube shall be used for all process piping. [55: 17.11.1]~~

~~**(A) –**~~

~~Tubing shall comply with ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems* . [55: 17.11.1.1]~~

(B) –

~~Tubing shall be capped and bear the marking OXY or MEDICAL or be otherwise packaged and labeled to indicate it is clean for oxygen service according to the supplier's policy.~~
[55:17.11.1.2]

Piping within the stationary cryogenic liquid central supply system shall comply with 5.1.10.2.1 (1)(c) and be installed in compliance with 5.1.10.4.1.

5.1.3.10.11.2

(A)

Instrumentation tubing shall be permitted to be constructed of annealed copper tubing or seamless stainless steel tubing. [55:17.11.2.1]

(B)

~~Copper~~ Annealed copper tubing used for instrumentation shall comply with ASTM B88, *Standard Specification for Seamless Copper Water Tube*. [55:17.11.2.2]

5.1.3.10.11.3

Valves of quick-open or quarter-turn designs, such as ball or plug valves, shall not be permitted in the portion of an oxygen piping system operating above 435 psi [3000 kPa]. [55:17.11.3]

5.1.3.10.11.4

(A)*

Alternate materials of construction for piping, tubing, valves, and instruments shall be permitted for installation ~~at with the request of approval of~~ the health care facility or the supplier, as under 1.4.1. [55:17.11.4.1]

(B)

Technical documentation of alternate materials shall be submitted to ~~the health care facility QA representative~~ the Responsible Facility Authority to demonstrate equivalency, and if ~~accepted retained in the facility's permanent records~~. [55:17.11.4.2]

5.1.3.10.12* Alarms.

The cryogenic fluid central supply system shall have a local signal that visibly indicates the operating status of the equipment and an indicator at all master alarms under the following conditions:

- (1) When, or at a predetermined set point before, the main supply ~~reaches~~ source reaches an average day's supply, indicating low contents
- (2) When, or at a predetermined set point before, the reserve supply source begins to supply the system, indicating reserve is in use
- (3) When, or at a predetermined set point before, the reserve supply source contents fall to one day's average supply, indicating low reserve
- (4) If the reserve ~~is~~ supply source is a cryogenic vessel, when, or at a predetermined set point before, the reserve vessel internal pressure falls too low for the reserve to operate properly, indicating reserve failure
- (5) Where there is more than one main supply vessel, when, or at a predetermined set point before, the secondary vessel begins to supply the system, indicating changeover

[55:17.12]

Statement of Problem and Substantiation for Public Input

5.1.3.10 was introduced in 2021 largely from the 55 and with the intent of aligning the 55 with the 99. In doing so, some conflicts were created (e.g. 5.1.10.3 and 5.1.3.5.12, 5.1.3.5.11 and 5.1.10.3.7, etc). This proposal attempts to smooth out many of those conflicts and to clarify that this section is for cryogenic central supply systems vs. portable cryogenic central supply systems. It is hoped that will

clarify the use of the two sections.

The terminology is cleaned up to be in line with usage with other systems: "supply sources" and "central supply systems" as appropriate.

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Submittal Date: Sun May 02 12:45:27 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Changes are not permitted to extracted language in accordance with the NFPA extract policy. Any proposed revisions must be submitted to NFPA 55.



Public Input No. 69-NFPA 99-2020 [Section No. 5.1.3.10]

5.1.3.10 * – Cryogenic Fluid Central Supply Systems.

5.1.3.10.1 – General.

5.1.3.10.1.1 * –

The storage, use, and handling of cryogenic fluid central supply systems that deliver compressed medical gases (CMGs) to health care facilities shall be in accordance with the requirements of this section. [**55:** 17.1.1]

5.1.3.10.1.2 – Applicability.

(A) –

The source valve shall be the line separating the applicability between NFPA 55 and this code. [**55:** 17.1.2.1]

(B) –

Cryogenic fluid central supply system installations up to, but not including, the source valve shall be covered by NFPA 55. [**55:** 17.1.2.2]

(C) –

The source valve and all downstream piping and components, including wiring to storage system alarms, shall be covered by this code. [**55:** 17.1.2.3]

5.1.3.10.2 – Cryogenic Fluid Central Supply Systems Installation.

5.1.3.10.2.1 –

Cryogenic fluid central supply systems shall be installed by personnel qualified in accordance with CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities*, or ASSE 6015, *Professional Qualifications Standard for Bulk Medical Gas Systems Installers*. [**55:** 17.2.1]

5.1.3.10.2.2 –

Cryogenic fluid central supply systems shall be installed in compliance with the Food and Drug Administration (FDA) Current Good Manufacturing Practices per 21 CFR 210 and 21 CFR 211. [**55:** 17.2.2]

5.1.3.10.2.3 –

Cryogenic fluid central supply systems shall be anchored with foundations in accordance with CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities*. [**55:** 17.2.3]

5.1.3.10.2.4 –

Cryogenic fluid central supply systems shall have a minimum work space clearance of 3 ft (1 m) around three sides of the storage container, three sides of the vaporizer(s), and the cabinet opening or front side of the pressure-regulating manifold for system maintenance and operation.

5.1.3.10.2.5 –

Inert cryogenic fluid central supply systems shall be sited in accordance with Chapter 8 of NFPA 55 and CGA P-18, *Standard for Bulk Inert Gas Systems at Consumer Sites*. [**55:** 17.2.5]

5.1.3.10.2.6 –

Oxygen-cryogenic fluid central supply systems shall be sited in accordance with Chapters 8 and 9 of NFPA 55, as applicable, and CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities*. [55: 17.2.6]

5.1.3.10.2.7 –

Carbon dioxide refrigerated liquid central supply systems shall be sited in accordance with Chapter 13 of NFPA 55 and CGA G-6.1, *Standard for Insulated Liquid Carbon Dioxide Systems at Consumer Sites*. [55: 17.2.7]

5.1.3.10.2.8 –

Nitrous oxide refrigerated liquid central supply systems shall be sited in accordance with Chapter 16 of NFPA 55 and CGA G-8.1, *Standard for Nitrous Oxide Systems at Customer Sites*. [55: 17.2.8]

5.1.3.10.3 – Cryogenic Fluid Central Supply Systems Operation.**5.1.3.10.3.1 –**

The following components of the cryogenic fluid central supply system shall be accessible and visible to delivery personnel during filling operations:

- (1) Fill connection
- (2) Top and bottom fill valves
- (3) Hose-purge valve
- (4) Vent valve
- (5) Full-trycock valve
- (6) Liquid level indicator
- (7) Tank pressure indicator

[55: 17.3.1]

5.1.3.10.3.2 –

Cryogenic fluid central supply systems shall consist of the following:

- (1) One or more main supply vessel, with capacity determined after consideration of the customer usage requirements, delivery schedules, proximity of the facility to alternative supplies, and the emergency plan
- (2) A contents gauge on every main vessel
- (3) A reserve supply sized for greater than an average day's supply, with the size of vessel or number of cylinders determined after consideration of delivery schedules, proximity of the facility to alternative supplies, and the emergency plan
- (4) At least two main vessel relief valves and rupture discs installed downstream of a three-way (i.e., three-port) valve
- (5) A check valve located in the primary supply piping upstream of the intersection with a secondary supply or reserve supply

[55: 17.3.2]

5.1.3.10.3.3 –

~~Reserve CMG supply systems consisting of either a second cryogenic fluid source or a compressed gas source shall include the following:~~

- ~~(1) Where the reserve source is a compressed gas source, the reserve shall be equipped with the following:~~
 - ~~(2) A cylinder manifold having not less than three gas cylinder connections or as otherwise required for an average of one day's gas supply~~
 - ~~(3) A pressure switch to monitor the pressure in the cylinder manifold~~
- ~~(4) Where the reserve source is a second cryogenic fluid vessel, the reserve tank shall be equipped with the following:~~
 - ~~(5) An actuating switch or sensor to monitor the internal tank pressure~~
 - ~~(6) A contents gauge to monitor the liquid level~~
- ~~(7) Where the reserve source is either a cryogenic fluid or compressed gas source, a check valve shall be provided to prevent backflow into the reserve system.~~

[55: 17.3.3]

5.1.3.10.3.4 –

~~Bulk cryogenic liquid sources shall include automatic means to provide the following functions:~~

- ~~(1) When the main supply is supplying the system, the reserve supply shall be prevented from supplying the system until the main supply is reduced to a level at or below the reserve activation pressure.~~
- ~~(2) When the main supply cannot supply the system, the reserve supply shall automatically begin to supply the system.~~
- ~~(3) Where there is more than one main supply vessel, the system shall operate as follows for primary, secondary, and reserve operation:~~
 - ~~(4) If provided with two liquid container headers, one cryogenic liquid header shall be the primary and the other shall be the secondary, with either being capable of either role.~~
 - ~~(5) If provided with one liquid container header and one gas cylinder header (i.e., a hybrid arrangement), the liquid container header shall be the primary and the gas cylinder header shall be the secondary.~~
 - ~~(6) When the primary header is supplying the system, the secondary header shall be prevented from supplying the system.~~
 - ~~(7) When the primary header is depleted, the secondary header shall automatically begin to supply the system.~~
- ~~(8) Where there are two or more cryogenic vessels, they shall be permitted to alternate (e.g., on a timed basis) in the roles of primary, secondary, and reserve, provided that an operating cascade (i.e., primary-secondary-reserve) is maintained at all times.~~
- ~~(9) Where a cryogenic vessel is used as the reserve, the reserve vessel shall include a means to conserve the gas produced by evaporation of the cryogenic liquid in the reserve vessel and to discharge the gas into the line upstream of the final line regulator assembly.~~

[55: 17.3.4]

5.1.3.10.4 – Main Supply System.

The main supply vessel for a cryogenic fluid central supply system shall be a cryogenic storage tank. [55: 17.4]

5.1.3.10.5 – Reserve Supply System.**5.1.3.10.5.1 –**

A CMG reserve supply system shall consist of either of the following:

- (1) A secondary cryogenic vessel
- (2) A high-pressure compressed gas source

[55: 17.5.1]

5.1.3.10.5.2 –

A cryogenic source reserve supply shall have a switch or sensor to monitor the tank pressure. [55: 17.5.2]

5.1.3.10.5.3 –

A compressed gas reserve supply shall meet the following requirements:

- (1) It shall be manifolded with no fewer than three gas cylinders.
- (2) It shall have a pressure switch or sensor to monitor the contents using manifold pressure.
- (3) It shall have a check valve to prevent backflow into the system.
- (4) It shall have a check valve at each connection on the cylinder header to minimize loss of gas from the reserve system.

[55: 17.5.3]

5.1.3.10.6 – Cryogenic Fill System.

Cryogenic fluid central supply systems shall include a fill mechanism consisting of the following components:

- (1) A nonremovable product specific fill connection in compliance with CGA V-6, *Standard Bulk Refrigerated Liquid Transfer Connections*
- (2) A means to cap and secure the fill connection inlet
- (3) A check valve to prevent product backflow from the fill inlet
- (4) A fill hose purge valve
- (5) Supports that hold the fill piping off the ground
- (6) A secure connection between the bulk tank and the fill piping
- (7) Supports, as necessary, to hold the fill line in position during all operations associated with the filling procedure

[55: 17.6]

5.1.3.10.7 – Vaporizers.

5.1.3.10.7.1 –

Vaporizers used to convert cryogenic CMG to a gaseous state shall meet the following requirements:

- (1) Vaporizers shall be permitted to operate by either ambient heat transfer or external thermal source (e.g., electric heater, hot water, steam).
- (2) Vaporizers using a heat source other than ambient air shall be protected in the event of a loss of the energy source.

[55: 17.7.1]

5.1.3.10.7.2 –

Vaporizers shall be designed to provide capacity for the customer's use under the following conditions:

- (1) Customer's average and peak flows
- (2) Local conditions (e.g., structures that obstruct air circulation or sunlight)
- (3) Seasonal conditions (e.g., freeze periods)

[55: 17.7.2]

5.1.3.10.7.3 –

A system design that uses switching vaporizers shall meet all of the following requirements:

- (1) Valves shall be permitted to be manual or automatic.
- (2) Valves and piping shall allow an operating vaporizer or an operating section of a vaporizer to be switched to a nonoperating condition for deicing.
- (3) The system design shall provide continuous flow of CMG to the health care facility during vaporizer switchover.
- (4) The system design shall provide continuous flow of CMG to the health care facility if vaporizer switchover fails.

[55: 17.7.3]

5.1.3.10.7.4 –

Where a vaporizer uses an external thermal source, the flow of the CMG shall be unaffected by the loss of the external thermal source by one of the following methods:

- (1) Reserve ambient heat transfer vaporizers sized for at least one day's average supply and piped so that the flow of the CMG is unaffected by flow stoppage through the external thermal source vaporizer
- (2) A noncryogenic source capable of providing at least one day's average supply

[55: 17.7.4]

5.1.3.10.7.5 –

Where vaporizers are used in the reserve system, they shall be as follows:

- (1) ~~Sized by the supplier to provide a source of vaporized CMG from the reserve bulk liquid storage vessel during times when the reserve system is operational~~
- (2) ~~Able to provide a flow rate equal to at least that of the main system vaporizer(s); however, the duration of flow might be different~~
- (3) ~~Indirectly heated by ambient air~~

[55: 17.7.5]

5.1.3.10.7.6 –

~~Low-temperature protection systems that interrupt or reduce flow shall not be used on the reserve system of cryogenic fluid central supply systems. [55: 17.7.6]~~

5.1.3.10.8 – High-Pressure Manifolds.**5.1.3.10.8.1 –**

~~Manifold assemblies shall be fit for service and shall have supports that are independent of the cylinders. [55: 17.8.1]~~

5.1.3.10.8.2 –

~~Cylinders on the manifold shall be secured against falling. [55: 17.8.2]~~

5.1.3.10.8.3 * –

~~Cylinders on the manifold shall have the same service pressure rating or the filled pressure of each cylinder shall not exceed the service pressure rating of the lowest rated cylinder on the manifold. [55: 17.8.3]~~

5.1.3.10.9 – Pressure Control Devices.

~~The final pressure control device assembly or assemblies shall not be fabricated on-site. [55: 17.9]~~

5.1.3.10.10 – Pressure Relief Devices.**5.1.3.10.10.1 –**

~~Pressure relief devices (PRDs) shall meet the following requirements:~~

- (1) ~~PRDs shall have a relief pressure setting not higher than the maximum allowable working pressure (MAWP) of the component with the lowest working pressure rating in the portion of the system being protected.~~
- (2) ~~PRDs shall be of brass or bronze construction.~~
- (3) ~~PRDs shall be designed for the specific gas service.~~
- (4) ~~PRDs shall have the discharge protected to prevent the entry of rain or snow.~~
- (5) ~~PRDs shall be designed in accordance with ASME B31.3, *Process Piping* .~~

[55: 17.10.1]

5.1.3.10.10.2 –

~~PRDs shall have an identifier that contains the date of manufacture or test. [55: 17.10.2]~~

5.1.3.10.10.3 –

~~The final line pressure relief valves shall be approved by a nationally recognized organization and shall have a relief capacity greater than or equal to the maximum throughput of the final line regulator. [55: 17.10.3]~~

(A) –

The pressure relief valve shall be set at 50 percent above the normal working pressure, but no higher than the MAWP, of the health care facility pipeline. [55: 17.10.3.1]

(B) –

The relief valve information shall be permanently identified either on the nameplate of the relief valve or on a permanently attached metal tag. [55: 17.10.3.2]

5.1.3.10.11 – Tubing and Valves.

5.1.3.10.11.1 –

New, hard-drawn Type K or L copper tube shall be used for all process piping. [55: 17.11.1]

(A) –

Tubing shall comply with ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*. [55: 17.11.1.1]

(B) –

Tubing shall be capped and bear the marking OXY or MEDICAL or be otherwise packaged and labeled to indicate it is clean for oxygen service according to the supplier's policy. [55: 17.11.1.2]

5.1.3.10.11.2 –

(A) –

Instrumentation tubing shall be constructed of annealed copper tubing or seamless stainless steel tubing. [55: 17.11.2.1]

(B) –

Copper tubing shall comply with ASTM B88, *Standard Specification for Seamless Copper Water Tube*. [55: 17.11.2.2]

5.1.3.10.11.3 –

Valves of quick-open or quarter-turn designs, such as ball or plug valves, shall not be permitted in the portion of an oxygen piping system operating above 435 psi [3000 kPa]. [55: 17.11.3]

5.1.3.10.11.4 –

(A) * –

Alternate materials of construction for piping, tubing, valves, and instruments shall be permitted for installation at the request of the health care facility or the supplier. [55: 17.11.4.1]

(B) –

Technical documentation of alternate materials shall be submitted to the health care facility QA representative to demonstrate equivalency. [55: 17.11.4.2]

5.1.3.10.12 * – Alarms:

The cryogenic fluid central supply system shall have a local signal that visibly indicates the operating status of the equipment and an indicator at all master alarms under the following conditions:

- (1) ~~When, or at a predetermined set point before, the main supply reaches an average day's supply, indicating low contents~~
- (2) ~~When, or at a predetermined set point before, the reserve supply begins to supply the system, indicating reserve is in use~~
- (3) ~~When, or at a predetermined set point before, the reserve supply contents fall to one day's average supply, indicating low reserve~~
- (4) ~~If the reserve is a cryogenic vessel, when, or at a predetermined set point before, the reserve internal pressure falls too low for the reserve to operate properly, indicating reserve failure~~
- (5) ~~Where there is more than one main supply vessel, when, or at a predetermined set point before, the secondary vessel begins to supply the system, indicating changeover~~

[55: 17.12]

Statement of Problem and Substantiation for Public Input

Delete this section in its entirety. While NFPA 55 is a good document with valuable information NFPA 99 is enforced on new and existing facilities. This section does not adequately address application in existing facilities when incorporated into NFPA 99 so it should be removed so that NFPA 55 can stand on its own.

Submitter Information Verification

Submitter Full Name: Chad Beebe

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Submittal Date: Mon Dec 21 15:41:43 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: The section is of value and issues of retroactivity can be resolved with individual AHJs. Modifications to the extracted language can be submitted to NFPA 55 as needed.

**Public Input No. 263-NFPA 99-2021 [Section No. 5.1.3.10.3.4]****5.1.3.10.3.4**

~~Bulk cryogenic liquid sources~~ Cryogenic fluid central supply system shall include automatic means to provide the following functions:

- (1) When the main supply is supplying the system, the reserve supply shall be prevented from supplying the system until the main supply is reduced to a level at or below the reserve activation pressure.
- (2) When the main supply cannot supply the system, the reserve supply shall automatically begin to supply the system.
- (3) Where there is more than one main supply vessel, the system shall operate as follows for primary, secondary, and reserve operation:
 - (a) If provided with two liquid container headers, one cryogenic liquid header shall be the primary and the other shall be the secondary, with either being capable of either role.
 - (b) If provided with one liquid container header and one gas cylinder header (i.e., a hybrid arrangement), the liquid container header shall be the primary and the gas cylinder header shall be the secondary.
 - (c) When the primary header is supplying the system, the secondary header shall be prevented from supplying the system.
 - (d) When the primary header is depleted, the secondary header shall automatically begin to supply the system.
- (4) Where there are two or more cryogenic vessels, they shall be permitted to alternate (e.g., on a timed basis) in the roles of primary, secondary, and reserve, provided that an operating cascade (i.e., primary–secondary–reserve) is maintained at all times.
- (5) Where a cryogenic vessel is used as the reserve, the reserve vessel shall include a means to conserve the gas produced by evaporation of the cryogenic liquid in the reserve vessel and to discharge the gas into the line upstream of the final line regulator assembly.

[55:17.3.4]

Statement of Problem and Substantiation for Public Input

standardize verbiage

Submitter Information Verification

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Submittal Date: Fri May 28 10:49:00 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Changes are not permitted to extracted language in accordance with the NFPA extract policy. Any proposed revisions must be submitted to NFPA 55.



Public Input No. 265-NFPA 99-2021 [Section No. 5.1.3.10.6]

5.1.3.10.6 Cryogenic Fill System.

Cryogenic fluid central supply systems shall include a fill mechanism consisting of the following components:

- (1) A nonremovable product-specific fill connection in compliance with CGA V-6, *Standard Bulk Refrigerated Liquid Transfer Connections*
- (2) A means to cap and secure the fill connection inlet
- (3) A check valve to prevent product backflow from the fill inlet
- (4) A minimum 100 mesh strainer of Monel or brass construction
- (5) A fill hose purge valve
- (6) Supports that hold the fill piping off the ground
- (7) A secure connection between the bulk tank and the fill piping
- (8) Supports, as necessary, to hold the fill line in position during all operations associated with the filling procedure

[55:17.6]

Statement of Problem and Substantiation for Public Input

the screen is a added level of protection to the bulk system. the screen will help with catching debris from the environment, tampering, and filling process.

Submitter Information Verification

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Submittal Date: Fri May 28 11:10:48 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Changes are not permitted to extracted language in accordance with the NFPA extract policy. Any proposed revisions must be submitted to NFPA 55.



Public Input No. 370-NFPA 99-2021 [Section No. 5.1.3.10.7.3]

5.1.3.10.7.3

A system ~~design that uses switching vaporizers~~ consisting of two equal vaporizers that allow switching shall meet all of the following requirements:

- (1) Valves shall be permitted to be manual or automatic.
- (2) Valves and piping shall allow an operating vaporizer or an operating section of a vaporizer to be switched to a nonoperating condition for deicing.
- (3) The system design shall provide continuous flow of CMG to the health care facility during vaporizer switchover.
- (4) The system design shall provide continuous flow of CMG to the health care facility if vaporizer switchover fails.

[55:17.7.3]

Statement of Problem and Substantiation for Public Input

with all the recent issues with lack of vaporization at hospitals, this would allow one vaporizer to thaw while the other is in use.

Submitter Information Verification

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Submittal Date: Tue Jun 01 08:52:59 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Changes are not permitted to extracted language in accordance with the NFPA extract policy. Any proposed revisions must be submitted to NFPA 55.



Public Input No. 38-NFPA 99-2020 [Section No. 5.1.4.1.1]

5.1.4.1.1 Gas and Vacuum Shutoff Valves.

Shutoff valves shall be provided to isolate sections or portions of the piped distribution system for maintenance, repair, emergencies, or planned future expansion need and to facilitate periodic testing.

Statement of Problem and Substantiation for Public Input

Since labeling of all valves must include caution to not close or open except in emergency (5.1.11.2.1(4)), that use should be listed here in 5.1.4.1.1 for clarity.

Submitter Information Verification

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Submittal Date: Mon Dec 21 11:50:04 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: FR-1031-NFPA 99-2021

Statement: Since labeling of all valves must include caution to not close or open except in emergency (5.1.11.2.1(4)), that use should be listed here in 5.1.4.1.1 for clarity.



Public Input No. 174-NFPA 99-2021 [Section No. 5.1.4.1.6]

5.1.4.1.6 Valve Types.

New or replacement valves shall be permitted to be of any type as long as they meet the following conditions:

- (1) They have a minimum Cv factor in accordance with either Table 5.1.4.1.6(a) or Table 5.1.4.1.6(b).
- (2) They use a quarter turn to off.
- (3) They are constructed of materials suitable for the service.
- (4) They are provided with copper tube extensions by the manufacturer for brazing or with corrugated medical tubing (CMT) fittings.
- (5) They indicate to the operator if the valve is open or closed.
- (6) They permit in-line serviceability.
- (7) They are cleaned for oxygen service by the manufacturer if used for any positive-pressure service.
- (8) They have threaded purge ports on the patient side and the source side.
- (9) They have a minimum working pressure equal to or greater than the relief valve protecting the piping system on which the valve is installed for any positive-pressure service.

Table 5.1.4.1.6(a) Positive Pressure Gases

<u>Valve Size</u>	<u>Minimum Cv</u>
<u>(in.)</u>	<u>(full open)</u>
½	17
¾	31
1	60
1¼	110
1½	169
2	357
2½	390
3	912
4	1837

Table 5.1.4.1.6(b) Vacuum and WAGD

<u>Valve Size</u>	<u>Minimum Cv</u>
<u>(in.)</u>	<u>(full open)</u>
½	17
¾	31
1	60
1¼	110
1½	169
2	357
2½	196
3	302
4	600
5	1022

<u>Valve Size</u>	<u>Minimum Cv</u>
<u>(in.)</u>	<u>(full open)</u>
6	1579
8	3136
<u>(10) Seals necessary to the operation of the valve and prevention of leaks shall comply with 5.1.3.5.4 and be replaceable.</u>	

Statement of Problem and Substantiation for Public Input

5.1.4.1.6 (10) is added to address a gap in the present description of these valves, all of which rely on some polymeric materials to make them gas tight in operation and leak free. The material used for these seals needs to be described.

As these materials are polymeric, some of which have a limited life, they may need replacement during the life of the valve.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 172-NFPA 99-2021 [Section No. 5.1.10.9.1]</u>	related
<u>Public Input No. 173-NFPA 99-2021 [Section No. 5.1.10.9.2]</u>	related

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Submittal Date: Tue May 18 11:03:49 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1032-NFPA 99-2021

Statement: 5.1.4.1.6 (10) is added to address a gap in the present description of these valves, all of which rely on some polymeric materials to make them gas tight in operation and leak free. The material used for these seals needs to be described.

As these materials are polymeric, some of which have a limited life, they may need replacement during the life of the valve.



Public Input No. 348-NFPA 99-2021 [Section No. 5.1.4.5]

5.1.4.5 ~~Service Valves~~ Branch Valves .

5.1.4.5.1

~~Service~~ Branch valves shall be installed to allow servicing or modification of lateral branch piping from a main or riser without shutting down the entire main, riser, or facility.

5.1.4.5.2

Only one ~~service~~ branch valve shall be required for each branch off of a riser, regardless of how many zone valve boxes are installed on that lateral.

5.1.4.5.3

~~Service~~ Branch valves shall be placed in the branch piping prior to any zone valve box assembly on that branch.

Statement of Problem and Substantiation for Public Input

Clarifies the terminology of the valve and its use.

Submitter Information Verification

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Submittal Date: Mon May 31 16:17:24 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: There is no technical reason for the proposed revision.



Public Input No. 379-NFPA 99-2021 [Section No. 5.1.4.6.2]

5.1.4.6.2

A zone valve in each medical gas or vacuum line shall be provided for each Category 1 space and ~~anesthetizing location for~~ where moderate sedation, deep sedation, or general anesthesia ~~specific for the occupancy occurs~~ , and shall be located as follows:

- (1) They are installed immediately outside the area controlled.
- (2) They are installed where they are visible and accessible at all times.

Statement of Problem and Substantiation for Public Input

The wording of the paragraph appears to allow for multiple interpretations. i.e. requiring a zone valve for all Category 1 spaces (regardless of sedation) OR for Anesthetizing locations (for these 3 levels of sedation) OR only where all 3 qualifiers occur simultaneously. The commentary provides an example where all 3 criteria occur simultaneously but does not preclude other interpretations. The proposed edits attempt to do 3 things. First, to generally align with the example in the commentary to require all qualifiers to be true. Second, remove the phrase “specific for the occupancy” as it doesn’t appear to add any technical value. Third, to remove the term “anesthetizing location” as a primary reason to have the ability to isolate a single space is to limit the number of patients’ incapable of self-preservation which may then require temporary portable medical gases in an emergency. It should not matter if the space has an official “anesthetizing location” designation but only that the level of sedation is occurring.

Note also that the Area Alarm requirements in 5.1.9.4 uses the same three parameters (Cat 1 space, anesthetizing location and 3 levels of sedation) but appears to consider the first parameter separate from the 2nd and 3rd essentially applying a different standard to Area Alarms than Zone Valves. Both requirements should arguably be predicated on the same triggers. Please coordinate the resolution of 5.1.4.6.2 with 5.1.9.4.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 279-NFPA 99-2021 [New Section after 3.3.7]	See also related public input 279 as the root cause for the ambiguity could be the lack of definition for “anesthetizing locations”.

Submitter Information Verification

Submitter Full Name: David Braidich
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City:
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Zip:
Submittal Date: Tue Jun 01 13:54:52 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1090-NFPA 99-2021

Statement: The wording of the paragraph appears to allow for multiple interpretations. i.e. requiring a zone valve for all Category 1 spaces (regardless of sedation) OR for Anesthetizing locations (for these 3 levels of sedation) OR only where all 3 qualifiers occur simultaneously. The commentary provides an example where all 3 criteria occur simultaneously but does not preclude other interpretations. The proposed edits attempt to do 3 things. First, to generally align with the example in the commentary to require all qualifiers to be true. Second, remove the phrase “specific for the occupancy” as it doesn’t appear to add any technical value. Third, to remove the term “anesthetizing location” as a primary reason to have the ability to isolate a single space is to limit the number of patients’ incapable of self-preservation which may then require temporary portable medical gases in an emergency. It should not matter if the space has an official “anesthetizing location” designation but only that the level of sedation is occurring.

Note also that the Area Alarm requirements in 5.1.9.4 uses the same three parameters (Cat 1 space, anesthetizing location and 3 levels of sedation) but appears to consider the first parameter separate from the 2nd and 3d essentially applying a different standard to Area Alarms than Zone Valves. Both requirements should arguably be predicated on the same triggers. Please coordinate the resolution of 5.1.4.6.2 with 5.1.9.4.

Item (1) = the word zone is added to match terminology used throughout the Valve section of the code (refer to 5.1.4.6.3 use of the word zone).

Item (3) = The submitter for PI 379 is correct in that an Operating Room, for example, is classified as a Category 1 space. To clarify this existing code section, a Category 1 space that administer general anesthesia, deep sedation or moderate sedation to patients should be listed as a subsection of the Category 1 space requirements for zone valves.

And it should be also made clear that zone valves are required for all station outlets/inlets as stated in 5.1.4.6.1.

For example:

- Station outlets/inlets that are located in a general patient ward, zone valves may be installed that control’s multiple rooms on the floor.
- Station outlets/inlets that are located in a Category 1 space will have zone valves that controls that specific Cat 1 zone (ex. ICU)
- Station outlets/inlets that are located in a Category 1 space that has N20 is piped into a room (ex. OR), will have zone valves outside each room.
- For a Category 1 space that administer general anesthesia, deep sedation or moderate sedation to patients cannot have zone valves that controls a “zone” or multiple rooms of station outlets/inlets, you need zone valves that are located outside of each room.

ANNEX = To better clarify and expand on want the requirements are zone valves for a Category 1 space.



Public Input No. 283-NFPA 99-2021 [New Section after 5.1.4.6.4]

Emergency Maintenance Connection

Provide an emergency maintenance inlet connection downstream of each zone valve for all systems serving Category 1 or 2 Spaces except vacuum systems. The emergency and maintenance inlet connection must be specific to the gas type. The dimensions of the inlet must take into account the flow required for emergency and maintenance activities. The emergency and maintenance entry point may be within the zone valve box.

Statement of Problem and Substantiation for Public Input

The suggested new emergency maintenance inlets are based on the European DIN EN ISO 7396-1 paragraph 8.3.8. Such features would be very useful for emergency maintenance activities and could have provided alternate means to augment systems in situations such as the high oxygen demands during the COVID crisis.

Submitter Information Verification

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Organization: US Army Corps of Engineers

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City:

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Submittal Date: Sat May 29 15:14:57 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The suggested revision does not comply with the Manual of Style (numbering, multiple requirements in one paragraph, nonmandatory language, etc.). In addition, the method of connection needs to be more specific.



Public Input No. 261-NFPA 99-2021 [Section No. 5.1.4.10 [Excluding any Sub-Sections]]

~~All cryogenic fluid central supply systems source equipment~~ shall be provided with an auxiliary source connection point of the same size as the main line, which shall be located immediately as follows.

- (1) Auxiliary connection size shall be no more than 2" pipe size.
- (2) Connected to the main line.
- (3) Shall be located on the patient side of the source valve.
- (4) Connection located in an area where a portable medical gas source can be located on a temporary basis.
- (5) Location of temporary source equipment shall meet the same distance requirements (intake and exhaust) as the source being served.
- (6) Connection end shall be gas specific.
- (7) Provide emergency power connection for temporary source equipment.
- (8) Provide same required signals back to the master alarm panel for monitoring during the duration portable unit is being used.

Statement of Problem and Substantiation for Public Input

When source equipment such as medical vacuum or medical air skids are to be replaced with new, there are no real safe options in place to serve a facility with a temporary portable source equipment. Replacement of source equipment requires other means to serve a facility during this down time. These should also be required in emergency preparedness processes for when a source equipment were ever to go down. This allows for a point of connection for a temporary source to be connected while primary source is replaced.

As part of this, chapter 12.5.3.3.6.5 talks about the Essential Utilities and Systems. Item (9) Medical Gas and Vacuum will be required to have a plan for continuity of operations during the loss or interruption of the medical gas systems during an emergency as applicable.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 292-NFPA 99-2021 [New Section after 3.3]	

Submitter Information Verification

Submitter Full Name: John Gregory
Organization: Henderson Engineers
Affiliation: P.I.P.E. Trust of Arizona Medical Gas Committee
Street Address:
City:
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Zip:
Submittal Date: Fri May 28 10:35:35 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: See the action on PI-184.



Public Input No. 354-NFPA 99-2021 [Section No. 5.1.4.10 [Excluding any Sub-Sections]]

All ~~cryogenic fluid~~ new central supply 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.

Statement of Problem and Substantiation for Public Input

This will assist with future back feed, repair, or replacement requirements for these systems. Having a full size auxiliary source connections will help with future work. This is only for "new" systems and should not apply to existing systems.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 16:36:05 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: A task group has been appointed to review PIs-354, -184, and -261 as a group for the second draft stage.



Public Input No. 178-NFPA 99-2021 [Section No. 5.1.5]

Proposal is for a global change though the entire standard:

Change all references to "Station inlet", "Station outlet", "station inlet/outlet", "Station outlet/inlet", "outlet" and "inlet" (when referencing the device, not when using the more general meaning of "inlet" or "outlet") to "Terminal"

Effect is illustrated here:

5.1.5* ~~Station Outlets/Inlets~~ Terminals .

5.1.5.1

Each ~~station outlet/inlet~~ Terminal for medical gases or vacuums shall be gas-specific, whether the ~~outlet/inlet~~ Terminal is threaded or is a noninterchangeable quick coupler.

5.1.5.2

Each ~~station outlet~~ pressure Terminal shall consist of a primary and a secondary valve (or assembly).

5.1.5.3

Each ~~station inlet~~ shall vacuum Terminal shall consist of a primary valve (or assembly) and shall be permitted to include a secondary valve (or assembly).

5.1.5.4

The secondary valve (or assembly) shall close automatically to stop the flow of gas (or vacuum, if provided) when the primary valve (or assembly) is removed.

5.1.5.5

Each ~~outlet/inlet~~ Terminal shall be legibly identified in accordance with 5.1.11.3.

5.1.5.6

Threaded ~~outlets/inlets~~ Terminals shall be noninterchangeable connections complying with the mandatory requirements of CGA V-5, *Diameter Index Safety System (Noninterchangeable Low Pressure Connections for Medical Gas Applications)*.

5.1.5.7

Each ~~station outlet/inlet~~ Terminal, including those mounted in columns, hose reels, ceiling tracks, or other special installations, shall be designed so that parts or components that are required to be gas-specific for compliance with 5.1.5.1 and 5.1.5.9 cannot be interchanged between the ~~station outlet/inlet~~ Terminals for different gases.

5.1.5.8

The use of common parts in outlets/inlets, such as springs, O-rings, fasteners, seals, and shutoff poppets, shall be permitted.

5.1.5.9

Components of a vacuum ~~station inlet~~ Terminal necessary for the maintenance of vacuum specificity shall be legibly marked to identify them as components or parts of a vacuum or suction system.

5.1.5.10

Components of ~~inlets~~ vacuum Terminals not specific to a vacuum shall not be required to be marked.

5.1.5.11

Factory-installed copper inlet tubes on ~~station outlets extending~~ pressure Terminal ~~extending~~ no further than 205 mm (8 in.) from the body of the terminal shall be not less than DN8 (NPS ¼) (¾ in. O.D.) size, with 8 mm (0.3 in.) minimum inside diameter.

5.1.5.12

Factory-installed copper outlet tubes on ~~station inlets~~ vacuum Terminals extending no further than 205 mm (8 in.) from the body of the terminal shall be not less than DN10 (NPS ¾) (½ in. O.D.) size, with 10 mm (0.4 in.) minimum inside diameter.

5.1.5.13

~~Station outlets/inlets~~ Terminals shall be permitted to be recessed or otherwise protected from damage.

5.1.5.14

When multiple wall ~~outlets/inlets~~ Terminals are installed, they shall be spaced to allow the simultaneous use of adjacent ~~outlets/inlets~~ Terminals with any of the various types of therapy equipment.

5.1.5.15

~~Station outlets~~ Terminals in systems having nonstandard operating pressures shall meet the following additional requirements:

- (1) They shall be gas-specific.
- (2) They shall be pressure-specific where a single gas is piped at more than one operating pressure [e.g., a ~~station outlet~~ Terminal for oxygen at 550 kPa (80 psi) shall not accept an adapter for oxygen at 345 kPa (50 psi)].
- (3) If operated at a pressure in excess of 550 kPa (80 psi), they shall be either D.I.S.S. connectors or comply with 5.1.5.15(4).
- (4) If operated at a gauge pressure between 1380 kPa and 2070 kPa (200 psi and 300 psi), the ~~station outlet~~ Terminal shall be designed so as to prevent the removal of the adapter until the pressure has been relieved to prevent the adapter injuring the user or others when removed from the ~~outlet~~ Terminal.

5.1.5.16

WAGD networks shall provide a WAGD ~~inlet~~ Terminals in all locations where nitrous oxide or halogenated anesthetic gas is intended to be administered.

5.1.5.16.1

~~Station inlets~~ Terminals for WAGD service shall have the following additional characteristics:

- (1) They shall not be interchangeable with any other systems, including medical-surgical vacuum.
- (2) Components necessary for the maintenance of WAGD specificity shall be legibly marked to identify them as components of a WAGD- ~~inlet~~ Terminal.
- (3) They shall be of a type appropriate for the flow and vacuum level required by the facility's gas anesthetic machines.
- (4) They shall be located to avoid physical damage to the inlet.

5.1.5.17

Where installed in a down-facing position, such as in a ceiling or ceiling column, ~~station outlets/inlets~~ Terminals shall be D.I.S.S. connectors.

Statement of Problem and Substantiation for Public Input

The terminology "station outlet" and "station inlet" is antiquated and it's use in the document adds

complication which actually reduces the clarity of the Code. (i.e. sometimes "Station outlet" and "Station Inlet", sometimes "Inlet" and "outlet", sometimes "Vacuum station inlet", sometimes station inlet for Vacuum", etc. In three cases, "terminal " is actually used although not in the actual way it is defined.)

Unifying the many different usages would improve the standard. As "Terminal" is the universal term used in all other standards, it makes sense to use this. It works very well and is much cleaner.

5.1.6.8 and 5.1.5.11 and 5.1.5.12 appear to be the only place that the current term "terminal" is used, so this has been rewritten to improve clarity but preserve the intent.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 180-NFPA 99-2021 [Section No. 3.3.178]	
Public Input No. 181-NFPA 99-2021 [Section No. 3.3.173]	
Public Input No. 182-NFPA 99-2021 [Section No. 3.3.174]	

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes

Street Address:

City:

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Zip:

Submittal Date: Tue May 18 11:22:37 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Inadequate technical substantiation has been provided for the proposed revisions. The impact on existing facilities to revise labels and inspection forms would be onerous.



Public Input No. 177-NFPA 99-2021 [Section No. 5.1.5.12]

5.1.5.12

~~Factory-installed copper outlet~~ installed outlet tubes on station inlets extending no further than 205 mm (8 in.) from the body of the terminal shall be not less than DN10 (NPS $\frac{3}{8}$) ($\frac{1}{2}$ in. O.D.) size, with 10 mm (0.4 in.) minimum inside diameter.

Statement of Problem and Substantiation for Public Input

The standard permits stainless on vacuum and other materials on WAGD. 5.1.5.12 needs to reflect that terminals may be made with other materials as well.

Submitter Information Verification

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Submittal Date: Tue May 18 11:20:42 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1048-NFPA 99-2021

Statement: The standard permits stainless on vacuum and other materials on WAGD. 5.1.5.12 needs to reflect that terminals may be made with other materials as well.



Public Input No. 21-NFPA 99-2020 [Section No. 5.1.5.16]

5.1.5.16

WAGD networks shall provide a WAGD inlet in all locations where nitrous oxide or halogenated anesthetic gas is intended to be administered.

5.1.5.16.1

Station inlets for WAGD service shall have the following additional characteristics:

- (1) They shall not be interchangeable with any other systems, including medical-surgical vacuum.
- (2) Components necessary for the maintenance of WAGD specificity shall be legibly marked to identify them as components of a WAGD inlet.
- (3) They shall be of a type appropriate for the flow and vacuum level required by the facility's gas anesthetic machines.
- (4) They shall be located to avoid physical damage to the inlet.

Statement of Problem and Substantiation for Public Input

Recommendation to edit the language throughout NFPA 99 with regard to WAGD and Nitrous Oxide (multiple code locations). WAGD inlets should only be required in areas performing Deep Sedation and General Anesthesia - not anywhere nitrous oxide is used. There are many areas of medical facilities that are using nitrous oxide and oxygen for minimal sedation and pain management. The failure of these "devices" (in these applications) from a WAGD / scavenging standpoint, would not cause any additional risk to the patient or healthcare professional. Whether they are connected to a WAGD inlet or a Vacuum inlet - makes no difference or safety improvement or risk. They would cease using the device - no harm to the patient or healthcare professional.

The areas of medical facilities that are using nitrous oxide and oxygen for minimal sedation and pain management do not have WAGD inlets as a "standard" option in the patient rooms. Requiring WAGD inlets will result in one of two things - high cost to the medical facility (which is wasteful) or the decision to cease using nitrous oxide and oxygen (and essentially restricting access to care). Many hospitals have either ceased using nitrous oxide and oxygen as well as decided against implementing due to this language. Hospitals are not going to spend tens of thousands of dollars to put in a dozen or so WAGD inlets - on top of disrupting the specific department patient rooms.

Hospitals are using nitrous oxide and oxygen for minimal sedation and pain management versus many other drugs / sedation agents (oral and IV - not gas) that produce deeper levels of sedation and have lingering after effects to the patients. These other drugs also stay in the patients system significantly longer (versus nitrous oxide) resulting in the healthcare facility needing to monitor the patient for prolonged periods of time (taking up staff time as well as bed space) - post procedure. There have been many studies and articles advocating for the use of nitrous oxide and oxygen in medical settings as a safer alternative to other options that are being used. NFPA 99 language is currently restricting this.

Hospitals have been using nitrous oxide and oxygen devices for minimal sedation and pain management for many years - and scavenging through Vacuum inlets safely and effectively. There have been no reported injuries as a result. If the committee disagrees with this statement - I request that they present data and information showing where scavenging through a WAGD inlet versus a Vacuum inlet has (or will) reduce(d) a risk, or injuries that have occurred when scavenging through a Vacuum inlet.

NFPA 99 states in Chapter 15 that scavenging through non-WAGD inlets (for minimal to moderate

sedation) is allowable. This should be no different in any medical facility - regardless if its a hospital or dental office. Language in Chapter 15 indicates WAGD inlets are required when performing Deep Sedation and General Anesthesia. NFPA 99 Chapter 5 should be consistent with Chapter 15 with this.

Thank you for your consideration with this - and I look forward to your response. I would be happy to discuss in more detail.

Submitter Information Verification

Submitter Full Name: Michael Civitello

Organization: Porter Instrument

Street Address:

City:

State:

Zip:

Submittal Date: Wed Dec 09 08:59:35 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: The PI includes no specific revisions. The submitter is encouraged to submit public comments with specific revisions for the second draft stage.



Public Input No. 234-NFPA 99-2021 [New Section after 5.1.6.1]

5.1.6.1.1

Pre-manufactured rough-in assemblies shall be pretested prior to arrival at the installation site in accordance with the following.

- (1) Initial blowdown test per 5.1.12.2.2
- (2) Initial pressure test per 5.1.12.2.3
- (3) Piping purge test per 5.1.12.2.5

Statement of Problem and Substantiation for Public Input

Since the pre-manufactured assemblies include only the station outlet/inlet rough-in assemblies, and do not include the primary valves (front bodies), then the standing pressure test per 5.1.12.2.6 and operational pressure test per 5.1.12.4.10 are unable to be completed before delivery.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 228-NFPA 99-2021 [New Section after 3.3.104]</u>	
<u>Public Input No. 227-NFPA 99-2021 [Section No. 3.3.104]</u>	

Submitter Information Verification

Submitter Full Name: Travis Webb
Organization: Modular Services Company
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 26 15:06:00 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The proposed definition of 'pre-manufactured assembly' is somewhat confusing. Without specific language, this addition could result in confusion or imply that this testing would replace field testing requirements. Full field testing is always required for the final installation. Clarification is also needed for 5.1.6.1. The submitter is removing testing criteria from code requirements for manufactured assemblies that is meant to be a pre-test to validate the manufactured assembly will meet the performance requirements of 5.1.12. Testing of 5.1.12 still needs to be performed.



Public Input No. 257-NFPA 99-2021 [Section No. 5.1.6.1]

5.1.6.1

Manufactured assemblies shall be pretested by the manufacturer prior to arrival at the installation site in accordance with the following:

- (1) Initial blowdown test per 5.1.12.2.2
- (2) Initial pressure test per 5.1.12.2.3
- (3) Piping purge test per 5.1.12.2.5
- (4) Standing pressure test per 5.1.12.2.6 or 5.1.12.2.7, except as permitted under 5.1.6.2
- (5) Operational pressure test per 5.1.12.4.10, except that the test gas is permitted to be in accordance with the manufacturer's process requirements
- (6) Manufacturer's process shall be corrected for the gas density and standardized conditions of temperature and pressure of system design

Statement of Problem and Substantiation for Public Input

Manufacturers testing with NF nitrogen in the factory and are not passing in the field under source gas. Factoring in the gas density at standard conditions will take care of the flow restrictions of the dancer gasses.

Submitter Information Verification

Submitter Full Name: edward albrycht
Organization: O E Meyer
Street Address:
City:
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Zip:
Submittal Date: Fri May 28 09:47:40 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is redundant and therefore not needed.



Public Input No. 179-NFPA 99-2021 [Section No. 5.1.6.8]

5.1.6.8

Manufactured assemblies employing hose or flexible connectors ~~, where the station outlet/inlet attached to the piping is not fully and immediately accessible- internal to the assembly (i.e. , cannot be manipulated without the removal of panels, doors, and so forth), shall have station outlets/inlets with the following additional characteristics:~~

- ~~They shall be gas-specific connections with positive locking mechanisms that ensure the connector is firmly seated and cannot detach without intentional actuation of the release (e.g., D.I.S.S. connectors).~~

~~In pressure gases, they shall be where access and inspection of the hose and connections requires opening or removing component(s) of the assembly) shall comply with the following:~~

~~(1) There shall be an intermediate Terminal at the end of the permanent pipeline to which the hose will connect,~~

~~(2) the intermediate Terminal will be gas specific, with positive locking mechanism(s) to ensure the connection is correctly seated and cannot unintentionally detach (e.g. DISS connectors),~~

~~(3) the intermediate Terminal is permitted to omit the secondary valve~~

~~(or
assembly~~

~~)~~

~~required in 5.1.5.2 if required to achieve flows as required in 5 .~~

- ~~In vacuum and WAGD, they shall be permitted to omit both primary and secondary valves (or assemblies) for minimum restriction to flow.~~

~~They shall be provided with a second terminal at which the user connects and disconnects that complies with~~

~~1.12.4.10,~~

~~(4) intermediate Terminals in vacuum or WAGD service are permitted to also omit the primary valve assembly required in 5.1.5.3 if required to achieve flows as required in 5.1.12.4.10,~~

~~(5) where Terminals omit the primary check (and therefore are open to unrestricted flow) the Terminal shall be labelled to caution anyone disconnecting the hoses.~~

~~(6) the Terminal to which the user will make connection on a manufactured assembly shall comply with 5.1.5 .~~

Statement of Problem and Substantiation for Public Input

The proposal clarifies the intent of the clause by making a clear distinction between the terminal where the user will connect and the internal connection to the pipeline. (see also PI 178) The omission of the checks permitted in (3) and (4) is limited. In the current wording the check can be omitted for any reason whatever, but the allowance was intended as a recognition of difficulties obtaining flow and was not meant to become a blanket exemption. The original intent is restored.

The allowance to omit this check does incur some additional risks because if the hose is disconnected (e.g. for servicing or replacing) there is nothing to stop the flow. The new (5) requires that there be some warning of this.

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes
Street Address:
City:
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Zip:
Submittal Date: Tue May 18 11:59:19 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is resolved based on the action on related PI-178.



Public Input No. 130-NFPA 99-2021 [Section No. 5.1.6.9]

5.1.6.9

Hose or flexible connectors employed in manufactured assemblies shall be labeled by stenciling or adhesive markers that identify the patient medical gas, the medical support gas, or the vacuum system and include the following:

- (1) Name of the gas or vacuum system or the chemical symbol per Table 5.1.11
- (2) Gas or vacuum system color code per Table 5.1.11
- (3) Where positive-pressure piping systems operate at pressures other than the standard gauge pressure in Table 5.1.11, the operating pressure in addition to the name of the gas
- (4) Date of installation replacement is recommended or required

Statement of Problem and Substantiation for Public Input

These hoses have a "shelf life", and they can sit for very long periods before actually being installed. Putting the installation date is ideal, but may in fact give a false impression of how much life is left in the hose. Therefore it makes more sense for the manufacturer to assess the total life and to mark that on the hose at time of manufacture.

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Self

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City:

State:

Zip:

Submittal Date: Sun May 02 13:57:04 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1033-NFPA 99-2021](#)

Statement: These hoses have a "shelf life", and they can sit for very long periods before actually being installed. Putting the installation date is ideal, but may in fact give a false impression of how much life is left in the hose. Therefore it makes more sense for the manufacturer to assess the total life and to mark that on the hose at time of manufacture.



Public Input No. 343-NFPA 99-2021 [New Section after 5.1.8.1.6]

5.1.8.1.6

Pressure and vacuum indicators used for testing shall be in accordance with 5.1.12.1.13.

Statement of Problem and Substantiation for Public Input

Clarifies where to look for gauges used for testing.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

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City:

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Zip:

Submittal Date: Mon May 31 15:48:44 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1034-NFPA 99-2021

Statement: Clarifies where to look for gauges used for testing.



Public Input No. 3-NFPA 99-2020 [Section No. 5.1.9]

[See attached "PC 18 99_A2020_HEA_PIP_PCResponses"]

5.1.9 Category 1 Warning Systems.

5.1.9.1 General.

All master, area, and local alarm systems used for medical gas and vacuum systems shall include the following:

- (1) Separate visual indicators for each condition monitored, except as permitted in 5.1.9.5.2 for local alarms that are displayed on master alarm panels
- (2) Visual indicators that remain in alarm until the situation that has caused the alarm is resolved
- (3) Cancelable audible indication of each alarm condition that produces a sound with a minimum level of 80 dBA at 0.92 m (3 ft)
- (4) Means to indicate a lamp or LED failure and audible failure
- (5) Visual and audible indication that the communication with an alarm-initiating device is disconnected
- (6) Labeling of each indicator, indicating the condition monitored
- (7) Labeling of each alarm panel for its area of surveillance
- (8) Reinitiating of the audible signal if another alarm condition occurs while the audible alarm is silenced
- (9) Power for master alarms, area alarms, sensors, and switches from the life safety branch of the essential electrical system as described in Chapter 6
- (10) Power for local alarms, dew point sensors, and carbon monoxide sensors permitted to be from the same essential electrical branch as is used to power the air compressor system
- (11) Where used for communications, wiring from switches or sensors that is supervised or protected as required by 517.30(C)(3) of *NFPA 70* for life safety and critical branches circuits in which protection is any of the following types:
 - (12) Conduit
 - (13) Free air
 - (14) Wire
 - (15) Cable tray
 - (16) Raceways
- (17) Communication devices that do not use electrical wiring for signal transmission and are supervised such that failure of communication initiates an alarm
- (18) Assurance by the responsible authority of the facility that the labeling of alarms, where room numbers or designations are used, is accurate and up-to-date
- (19) Provisions for automatic restart after a power loss of 10 seconds (e.g., during generator start-up) without giving false signals or requiring manual reset
- (20) Alarm switches/sensors installed so as to be removable and accessible for service and testing

5.1.9.2* Master Alarms.

A master alarm system shall be provided to monitor the operation and condition of the source of supply, the reserve source (if any), and the pressure in the main lines of each medical gas and vacuum piping system.

5.1.9.2.1

The master alarm system shall consist of two or more alarm panels located in at least two separate locations, as follows:

- (1) One master alarm panel shall be located in the office or work space of the on-site individual responsible for the maintenance of the medical gas and vacuum piping systems.
- (2) In order to ensure continuous surveillance of the medical gas and vacuum systems while the facility is in operation, the second master alarm panel shall be located in an area of continuous observation (e.g., the telephone switchboard, security office, or other continuously staffed location).

5.1.9.2.2

A centralized computer system shall be permitted to be substituted for one of the master alarms required in 5.1.9.2.1 if the computer system complies with 5.1.9.3.

5.1.9.2.3

The master alarm panels required in 5.1.9.2.1 shall communicate directly to the alarm-initiating devices that they monitor.

5.1.9.2.3.1

If communication is achieved by wires, the following shall apply:

(A)

Each of the two mandatory alarms shall be wired independently to the initiating device(s) for each signal.

(B)

The wiring between each mandatory alarm(s) and the initiating device(s) shall not utilize common conductors that, if interrupted, would disable more than one signal.

(C)

Each set of wires (in whatever number as required by the alarm) shall run to the initiating device(s) without interruption other than in-line splices necessary to complete the necessary length of wire.

(D)

Where initiating devices are remote from the building and the wiring is to run underground in compliance with *NFPA 70*, the following exceptions shall be permitted to be used:

- (1) Wiring from the initiating device and through the underground section shall be permitted to be run to a junction box located where the wiring first enters the building.
- (2) A single set of wires complying with 5.1.9.2.3.1(B) and 5.1.9.2.3.1(C) for each signal shall be permitted to connect the initiating device and the junction box.
- (3) Between the junction box and the two mandatory alarm panels, wiring shall comply with 5.1.9.2.3.1(A) through 5.1.9.2.3.1(C), 5.1.9.2.3.4, and 5.1.9.2.3.5 in all respects.

5.1.9.2.3.2

If communication is achieved by means other than wires, the following shall apply:

(A)

Each of the mandatory alarms shall communicate independently to the initiating device(s) for each signal.

(B)

The means of communication between each mandatory alarm(s) and the initiating device(s) shall not utilize a common communication device that, if interrupted, would disable the signal from another initiating device(s).

5.1.9.2.3.3

A single initiating device shall be permitted to actuate multiple master alarms.

5.1.9.2.3.4

The mandatory master alarm panels shall not be arranged such that failure of either panel would disable any signal on the other panel.

5.1.9.2.3.5

Where a relay is required to ensure correct operation of an initiating device, the control power for the relay shall not be such that disabling any master alarm panel would disable the relay.

5.1.9.2.3.6

Master alarm signals shall not be relayed from one master alarm panel to another.

5.1.9.2.3.7

Where multi-pole alarm relays are used to isolate the alarm-initiating signals to master alarm panels, the control power source for the relays shall be independent of any of the master alarm panels.

5.1.9.2.3.8

Multiple master alarms shall be permitted to monitor a single initiating device.

5.1.9.2.4

Master alarm panels for medical gas and vacuum systems shall each include the following signals:

- (1) Alarm indication when, or just before, changeover occurs in a medical gas system that is supplied by a manifold or other alternating-type bulk system that has as a part of its normal operation a changeover from one portion of the operating supply to another
- (2) Alarm indication for a cryogenic fluid central supply system when the main supply reaches one average day's supply, indicating low contents
- (3) Alarm indication when, or just before, the changeover to the reserve supply occurs in a medical gas system that consists of one or more units that continuously supply the piping system while another unit remains as the reserve supply and operates only in the case of an emergency
- (4) Alarm indication for cylinder reserve pressure low when the content of a cylinder reserve header is reduced below one average day's supply
- (5) For cryogenic fluid central supply systems, an alarm when or at a predetermined set point before the reserve supply contents fall to one average day's supply, indicating low reserve
- (6) Where a cryogenic liquid storage unit is used as a reserve for a cryogenic fluid central supply system, an alarm indication when the gas pressure available in the reserve unit is below that required for the medical gas system to function
- (7) Alarm indication when the pressure in the main line of each separate medical gas system increases 20 percent or decreases 20 percent from the normal operating pressure
- (8) Alarm indication when the medical-surgical vacuum pressure in the main line of each vacuum system drops to or below 300 mm (12 in.) gauge HgV
- (9) Alarm indication(s) from the local alarm panel(s) as described in 5.1.9.5.2 to indicate when one or more of the conditions being monitored at a site is in alarm
- (10) Medical air dew point high alarm from each compressor site to indicate when the line pressure dew point is greater than +2°C (+35°F)
- (11) WAGD low alarm when the WAGD vacuum level or flow is below effective operating limits
- (12) An instrument air dew point high alarm from each compressor site to indicate when the line pressure dew point is greater than -30°C (-22°F)
- (13) Alarm indication if the primary or reserve production stops on a proportioning system
- (14) When oxygen is supplied from an oxygen central supply system using concentrators (see 5.1.3.9), the following signals shall be provided:
 - (15) For each concentrator unit used in the oxygen central supply system, an alarm indication that oxygen concentration from that oxygen concentrator unit is below 91 percent
 - (16) For each oxygen concentrator unit used in the oxygen central supply system, an alarm indication that the isolating valve for that oxygen concentrator unit is closed and the unit is isolated
 - (17) For each cylinder header used as a source, an alarm indication that the header is in use
 - (18) For each cylinder header used as a source, an alarm indication that the cylinder contents are below one average day's supply
 - (19) If the source in use changes because of a failure to appropriately supply the system, an alarm indication that an unexpected oxygen supply change has occurred
 - (20) An alarm indication that the pressure in the common line on the source side of the line pressure controls is low
 - (21) An alarm indication that the oxygen concentration from the supply system is below 91 percent

5.1.9.2.5

The alarm indications required in 5.1.9.2.4(7) and 5.1.9.2.4(8) shall originate from sensors installed in the main lines immediately downstream (on the patient or use side) of the source valves. Where it is necessary to install a main line valve in addition to a source valve (see 5.1.4.3), the sensors shall be located downstream (on the patient or use side) of the main valve.

5.1.9.3 Master Alarms by Computer Systems.

Computer systems used as substitute master alarms as required by 5.1.9.2.1(2) shall have the mechanical and electrical characteristics described in 5.1.9.3.1 and the programming characteristics described in 5.1.9.3.2.

5.1.9.3.1

Computer systems used to substitute for alarms shall have the following mechanical and electrical characteristics:

- (1) The computer system shall be in continuous uninterrupted operation and provided with power supplies as needed to ensure such reliability.
- (2) The computer system shall be continuously attended by responsible individuals or shall provide remote signaling of responsible parties (e.g., through pagers, telephone autodialers, or other such means).
- (3) Where computer systems rely on signal interface devices (e.g., electronic interfaces, other alarm panels, 4 mA to 20 mA cards), such interfaces shall be supervised such that failure of the device(s) shall initiate an alarm(s).
- (4) If the computer system does not power the signaling switches/sensors from the same power supply required in 5.1.9.3.1(1), the power supply for the signaling switches/sensors shall be powered from the life safety branch of the essential electrical system as described in Chapter 6.
- (5) Computer systems shall be permitted to communicate directly to the sensors/switches in 5.1.9.2.3 in the same manner as an alarm panel if operation of another alarm panel(s) is not impaired.
- (6) Communication from the computer system to the signaling switches or sensors shall be supervised such that failure of communication shall initiate an alarm.
- (7) Computer systems shall be provided with an audio alert per 5.1.9.1(3), except the audio alert shall be permitted to be only as loud as needed to alert the system operator.
- (8) The facility shall ensure compliance with 5.1.9.1(13).

5.1.9.3.2

The operating program for computer systems used to substitute for alarms shall include the following:

- (1) The medical gas alarm shall be allocated the priority of a life safety signal.
- (2) A medical gas alarm signal shall interrupt any other activity of a lesser priority to run the alarm algorithm(s).
- (3) The alarm algorithm shall include activation of an audible alert, activation of any remote signaling protocol, and display of the specific condition in alarm.
- (4) The alarm algorithm shall provide for compliance with 5.1.9.1(1) through 5.1.9.1(5), and 5.1.9.1(8).

5.1.9.4* 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) * Category 1 space

5.1.9.4.1*

Area alarms shall be located at a nurse's station or other similar location that will provide for surveillance.

5.1.9.4.2

Area alarm panels for medical gas systems shall indicate if the pressure in the lines in the area being monitored increases or decreases by 20 percent from the normal line pressure.

5.1.9.4.3

Area alarm panels for medical–surgical vacuum systems shall indicate if the vacuum in the area drops to or below 300 mm (12 in.) gauge HgV.

5.1.9.4.4*

Alarm sensors for area alarms shall be located as follows:

- (1)* Category 1 spaces, other than anesthetizing locations addressed in 5.1.9.4.4(2), shall have the alarm sensors installed on the patient or use side of each of the individual zone valve box assemblies.
- (2)* Anesthetizing locations where moderate sedation, deep sedation, or general anesthesia is administered shall have the sensors installed either on the source side of each of the individual room zone valve box assemblies or on the patient or use side of each of the individual zone valve box assemblies.

5.1.9.4.5

One area alarm panel shall be acceptable to monitor multiple rooms located within an immediate vicinity meeting the requirements of 5.1.9.4.4(2).

5.1.9.4.6

Area alarm panels for medical gas systems shall provide visual and audible indication in the event a mismatch occurs between the transducer(s) and its associated circuit board(s).

5.1.9.5* Local Alarms.

Local alarms shall be installed to monitor the function of the air compressor system(s), medical–surgical vacuum pump system(s), WAGD systems, instrument air systems, and proportioning systems.

5.1.9.5.1

The signals referenced in 5.1.9.5.4 shall be permitted to be located as follows:

- (1) On or in the control panel(s) for the central supply system or supply source being monitored
- (2) Within a monitoring device (e.g., dew point monitor or carbon monoxide monitor)
- (3) On a separate alarm panel(s)

5.1.9.5.2

The master alarm shall include at least one signal from the source equipment to indicate a problem with the source equipment at this location. This master alarm signal shall activate when any of the required local alarm signals for this source equipment activates.

5.1.9.5.3

If there is more than one central supply system, for a specific gas or vacuum pipeline or more than one central supply system and pipeline for the same gas in the building, then it shall be necessary for each location to have separate local alarms per 5.1.9.5.4 and signals at the master panels per 5.1.9.2.4.

5.1.9.5.4

The following functions shall be monitored at each local alarm site:

- (1) Low medical air reserve capacity, to indicate when the medical air source is operating under a demand that could not be managed if one compressor ceased to operate
- (2) High carbon monoxide level, to indicate when the carbon monoxide level in the medical air system is 10 ppm or higher
- (3) Medical air dew point high, to indicate when the line pressure dew point is greater than +2°C (+35°F)
- (4) Low medical vacuum reserve capacity, to indicate when the medical vacuum source is operating under a demand that could not be managed if one pump ceased to operate
- (5) Low WAGD reserve capacity, to indicate when the WAGD source is operating under a demand that could not be managed if one producer ceased to operate
- (6) Instrument air dew point high, to indicate when the line pressure dew point is greater than -30°C (-22°F)
- (7) Low instrument air reserve capacity, if instrument air is provided by a source with more than one compressor, to indicate when the instrument air source is operating under a demand that could not be managed if one compressor ceased to operate
- (8) For compressor systems using liquid ring compressors or compressors with water-cooled components, high water in the receiver tank, to indicate when the water level in the receiver tank has reached a level determined to be detrimental to the operation of the system
- (9) For compressor systems using liquid ring compressors, high water in the separator
- (10) For compressor systems using other than liquid ring compressors, high discharge air temperature
- (11) Proportioning systems high/low indicator when the oxygen concentration is outside the 19.5 percent to 23.5 percent oxygen range
- (12) Proportion systems reserve system in operation
- (13) When oxygen is supplied from an oxygen central supply system using concentrators (see 5.1.3.9), the following signals shall be provided at the system's local alarm site(s):
 - (14) For each cylinder header used as a source, an alarm indication that the header is in use
 - (15) For each cylinder header used as a source, an alarm indication that the cylinder contents are below one average day's supply
 - (16) If the source in use changes because of a failure to appropriately supply the system, an alarm indication indicating an unexpected oxygen supply change has occurred
 - (17) An alarm indication that the pressure in the common line on the source side of the line pressure controls is low
 - (18) An alarm indication that the oxygen concentration from the supply system is below 91 percent

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
PC_18_99_A2020_HEA_PIP_PCResponses.pdf	PC 18 99_A2020_HEA_PIP_PCResponses	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 18 of the (A2020) Second Draft Report for NFPA 99 and per the Regs. at 4.4.8.3.1.

The original submission appears as an attempt to clarify some of the requirements that earlier work on this subject included in the standard. This is an advisable change, as users are struggling to understand the requirements in light of the available technologies. Part of that struggle is due to the earlier changes having been created in the context of what the code already included (i.e. wiring) rather than a more complete rewrite around the technologies actually available. It would appear that a more complete correction would be useful.

The three classes of known methods are grouped here (wire, communication using a physical medium and wireless formats) Each is separately described and specific requirements for each are clarified based on their unique risks.

Because it is understood that these are still emerging technologies without wide use or long histories of successful use, the proposal continues to consider wired alarms as the "gold standard". It is not practical to implement these technologies within the context of the rule that prohibited a single device that could take out more than one signal (see 99 18 5.1.9.2.3.2 (b)) Therefore, this requirement should be deleted.

However, a side effect of this change is that the "master-slave" alarm configuration which has been long prohibited must be permitted (see 99 18 5.1.9.2.3.6).

To deal with these two points, two new mandates are proposed:

1. one of the two master alarms must be wired. In this way at least one of the alarms will operate without fail.
2. the facility must have a plan to deal with loss of communication such that should communication be lost, they are ready to compensate.

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Submittal Date: Fri Nov 20 10:48:00 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: [CI-1071-NFPA 99-2021](#)

Statement: Further review of the alarm requirements of 5.1.9 is needed. This committee input is intended to solicit public comments and to permit revisions to be made at the second draft stage if warranted.



Public Input No. 120-NFPA 99-2021 [New Section after 5.1.9.2.4]

TITLE OF NEW CONTENT

Type your content here ...5.1.9.2.4 (15) An alarm indication when a reserve supply or a secondary supply is activated.

Statement of Problem and Substantiation for Public Input

Reserve Supply and Secondary Supply are both defined terms in chapter 3. This new paragraph provides additional objective requirements for the required master alarm signals and firmly establishes the requirement for a lag failure alarm.

Submitter Information Verification

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Submittal Date: Mon Apr 12 14:22:33 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is adequately addressed by items (1) and (3).



Public Input No. 119-NFPA 99-2021 [Section No. 5.1.9.2.4]

5.1.9.2.4

Master alarm panels for medical gas and vacuum systems shall each include the following signals:

- (1) Alarm indication when, or just before, changeover occurs in a medical gas system that is supplied by a manifold or other alternating-type bulk system that has as a part of its normal operation a changeover from one portion of the operating supply to another
- (2) Alarm indication for a cryogenic fluid central supply system when the main supply reaches one average day's supply, indicating low contents
- (3) Alarm indication when, or just before, the changeover to the reserve supply occurs in a medical gas system that consists of one or more units that continuously supply the piping system while another unit remains as the reserve supply and operates only in the case of an emergency
- (4) Alarm indication for cylinder reserve pressure low when the content of a cylinder reserve header is reduced below one average day's supply
- (5) For cryogenic fluid central supply systems, an alarm when or at a predetermined set point before the reserve supply contents fall to one average day's supply, indicating low reserve
- (6) Where a cryogenic liquid storage unit is used as a reserve for a cryogenic fluid central supply system, an alarm indication when the gas pressure available in the reserve unit is below that required for the medical gas system to function
- (7) Alarm indication when the pressure in the main line of each separate medical gas system increases 20 percent or decreases 20 percent from the normal operating pressure
- (8) Alarm indication when the medical-surgical vacuum pressure in the main line of each vacuum system drops to or below 300 mm (12 in.) gauge HgV
- (9) Alarm indication(s) from the local alarm panel(s) as described in 5.1. 3.6.3.12 and 5.1. 9.5. 2 to 4 to indicate when one or more of the conditions being monitored at a site is in alarm
- (10) Medical air dew point high alarm from each compressor site to indicate when the line pressure dew point is greater than +2°C (+35°F)
- (11) WAGD low alarm when the WAGD vacuum level or flow is below effective operating limits
- (12) An instrument air dew point high alarm from each compressor site to indicate when the line pressure dew point is greater than -30°C (-22°F)
- (13) Alarm indication if the primary or reserve production stops on a proportioning system
- (14) When oxygen is supplied from an oxygen central supply system using concentrators (see 5.1.3.9), the following signals shall be provided:
 - (15) For each concentrator unit used in the oxygen central supply system, an alarm indication that oxygen concentration from that oxygen concentrator unit is below 91 percent
 - (16) For each oxygen concentrator unit used in the oxygen central supply system, an alarm indication that the isolating valve for that oxygen concentrator unit is closed and the unit is isolated
 - (17) For each cylinder header used as a source, an alarm indication that the header is in use
 - (18) For each cylinder header used as a source, an alarm indication that the cylinder contents are below one average day's supply
 - (19) If the source in use changes because of a failure to appropriately supply the system, an alarm indication that an unexpected oxygen supply change has occurred
 - (20) An alarm indication that the pressure in the common line on the source side of the line pressure controls is low
 - (21) An alarm indication that the oxygen concentration from the supply system is below 91 percent

Statement of Problem and Substantiation for Public Input

Paragraphs 5.1.3.6.3.12 and 5.1.9.5.4 (which are lists of local alarm signals) provide a comprehensive objective list of the local signals. It's net result is really the same as the old paragraphs 5.1.9.2.4 (9) and 5.1.9.5.2 but the master alarm signal requirements are now all under 5.1 9.2.4 where they belong.

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Submittal Date: Mon Apr 12 14:00:21 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1035-NFPA 99-2021](#)

Statement: Paragraphs 5.1.3.6.3.12 and 5.1.9.5.4 (which are lists of local alarm signals) provide a comprehensive objective list of the local signals. It's net result is really the same as the old paragraphs 5.1.9.2.4 (9) and 5.1.9.5.2 but the master alarm signal requirements are now all under 5.1 9.2.4 where they belong.



Public Input No. 351-NFPA 99-2021 [Section No. 5.1.9.2.4]

5.1.9.2.4

Master alarm panels for medical gas and vacuum systems shall each include the following signals:

- (1) Alarm indication when, or just before, changeover occurs in a medical gas system that is supplied by a manifold or other alternating-type bulk system that has as a part of its normal operation a changeover from one portion of the operating supply to another
- (2) Alarm indication for a cryogenic fluid central supply system when the main supply reaches one average day's supply, indicating low contents
- (3) Alarm indication when, or just before, the changeover to the reserve supply occurs in a medical gas system that consists of one or more units that continuously supply the piping system while another unit remains as the reserve supply and operates only in the case of an emergency
- (4) Alarm indication for cylinder reserve pressure low when the content of a cylinder reserve header is reduced below one average day's supply
- (5) For cryogenic fluid central supply systems, an alarm when or at a predetermined set point before the reserve supply contents fall to one average day's supply, indicating low reserve
- (6) Where a cryogenic liquid storage unit is used as a reserve for a cryogenic fluid central supply system, an alarm indication when the gas pressure available in the reserve unit is below that required for the medical gas system to function
- (7) Alarm indication when the pressure in the main line of each separate medical gas system increases 20 percent ~~or from the normal operating pressure~~
- (8) Alarm indication when the pressure in the main line of each separate medical gas system decreases 20 percent from the normal operating pressure
- (9) Alarm indication when the medical-surgical vacuum pressure in the main line of each vacuum system drops to or below 300 mm (12 in.) gauge HgV
- (10) Alarm indication(s) from the local alarm panel(s) as described in 5.1.9.5.2 to indicate when one or more of the conditions being monitored at a site is in alarm
- (11) Medical air dew point high alarm from each compressor site to indicate when the line pressure dew point is greater than +2°C (+35°F)
- (12) WAGD low alarm when the WAGD vacuum level or flow is below effective operating limits
- (13) An instrument air dew point high alarm from each compressor site to indicate when the line pressure dew point is greater than -30°C (-22°F)
- (14) Alarm indication if the primary or reserve production stops on a proportioning system
- (15) When oxygen is supplied from an oxygen central supply system using concentrators (see 5.1.3.9), the following signals shall be provided:
 - (16) For each concentrator unit used in the oxygen central supply system, an alarm indication that oxygen concentration from that oxygen concentrator unit is below 91 percent
 - (17) For each oxygen concentrator unit used in the oxygen central supply system, an alarm indication that the isolating valve for that oxygen concentrator unit is closed and the unit is isolated
 - (18) For each cylinder header used as a source, an alarm indication that the header is in use
 - (19) For each cylinder header used as a source, an alarm indication that the cylinder contents are below one average day's supply
 - (20) If the source in use changes because of a failure to appropriately supply the system, an alarm indication that an unexpected oxygen supply change has occurred
 - (21) An alarm indication that the pressure in the common line on the source side of the line pressure controls is low
 - (22) An alarm indication that the oxygen concentration from the supply system is below

91 percent

Statement of Problem and Substantiation for Public Input

Clarifies these should be tow separate alarm points on the master alarm panels. We should not have oxygen pressure abnormal. The clinical response to high pressure alarm could be much different that that of a low pressure alarm. These should be clearly indicated on the alarms when either condition occurs.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

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Submittal Date: Mon May 31 16:29:00 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1049-NFPA 99-2021

Statement: The revision clarifies that these should be two separate alarm points on the master alarm panels. We should not have oxygen pressure abnormal. The clinical response to a high pressure alarm could be much different that that of a low pressure alarm. These should be clearly indicated on the alarms when either condition occurs.



Public Input No. 373-NFPA 99-2021 [Section No. 5.1.9.4.2]

5.1.9.4.2

Area alarm panels for medical gas systems shall indicate if the pressure in the lines in the area being monitored increases or decreases by 20 percent from the normal line- have separate indicators for an alarm condition when:

- (1) The pressure in the main line of each separate medical gas system increases 20 percent or from the normal operating pressure.
- (2) The pressure in the main line of each separate medical gas system decreases 20 percent from the normal operating pressure.

Statement of Problem and Substantiation for Public Input

Clarifies there should be separate indicators for both the high and low alarm conditions. Pressure abnormal grouping both alarms is not allowed. The emergency response to a high pressure alarm may be significantly different that a low pressure alarm. They should be easily discernible.

Submitter Information Verification

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Submittal Date: Tue Jun 01 09:10:03 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1037-NFPA 99-2021

Statement: Clarifies there should be separate indicators for both the high and low alarm conditions. Pressure abnormal grouping both alarms is not allowed. The emergency response to a high pressure alarm may be significantly different that a low pressure alarm. They should be easily discernible.



Public Input No. 141-NFPA 99-2021 [Section No. 5.1.9.4.4]

5.1.9.4.4*

Alarm sensors for area alarms shall be located as follows:

- (1)* Category 1 spaces, other than anesthetizing locations addressed in 5.1.9.4.4(2), shall have the alarm sensors installed on the patient or use side of each of the individual zone valve box assemblies.
- (2)* Anesthetizing locations where moderate sedation, deep sedation, or general anesthesia is administered shall have the sensors installed either on the source side of ~~each of the~~ any one individual room zone valve box ~~assemblies or assembly~~ on the same branch or on the patient or use side of each of the individual zone valve box assemblies.

Statement of Problem and Substantiation for Public Input

The current wording essentially requires sensors/area alarms panels for each Zone Valve Box. Added clarification language more specifically detailing the two different options.

Submitter Information Verification

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Submittal Date: Mon May 10 10:16:41 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1091-NFPA 99-2021

Statement: The substantiation for PI-141 is valid. The current wording in the 2021 edition requires a sensor on both sides of the zone valve in a Category 1 Space of an anesthetizing location where moderate sedation, deep sedation, or general anesthesia is administered. This was NOT the original intent when this section was modified for the 2021 edition.

The revision and listing the two choices allows the code user to better understand the intent of this requirement.



Public Input No. 142-NFPA 99-2021 [Section No. 5.1.9.4.5]

5.1.9.4.5

One area alarm panel shall be acceptable to monitor multiple ~~rooms~~ anesthetizing locations located within an immediate vicinity and being served by the same branch in the piping system, meeting the requirements of 5.1.9.4.4(2).

Statement of Problem and Substantiation for Public Input

Additional clarification regarding panel and sensor locations

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Submittal Date: Mon May 10 10:20:04 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision does not clarify the requirement.



Public Input No. 118-NFPA 99-2021 [Section No. 5.1.9.5.2]

5.1.9.5.2

~~The master alarm shall include at least one signal from the source equipment to indicate a problem with the source equipment at this location. This master alarm signal shall activate when any of the required local alarm signals for this source equipment activates.~~

Statement of Problem and Substantiation for Public Input

Proposing that we delete existing paragraph 5.1.9.5.2 as it is actually a duplicate of 5.1.9.2.4 (9).

I've also proposed changes (improvements) to 5.1.9.2.4 (9).

Submitter Information Verification

Submitter Full Name: James Lucas

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Submittal Date: Mon Apr 12 13:54:55 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1036-NFPA 99-2021](#)

Statement: 5.1.9.5.2 is a duplicate of 5.1.9.2.4(9).



Public Input No. 176-NFPA 99-2021 [Section No. 5.1.10.2.2]

5.1.10.2.2 Vacuum and WAGD Tube Marking Where Required.

5.1.10.2.2.1

If copper or CMT tubing for vacuum tubing or WAGD service is installed along with any medical gas tubing, the vacuum or WAGD tubing shall, prior to installation, be prominently labeled or otherwise identified to preclude using materials or installation procedures in the medical gas system that are not suitable for oxygen service.

5.1.10.2.2.2

If medical gas tube in accordance with ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, is used for vacuum or WAGD piping, such special marking shall not be required.

Statement of Problem and Substantiation for Public Input

5.1.10.2 is reorganized for clarity and to ensure WAGD is covered by 5.1.10.2.2,

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 175-NFPA 99-2021 [Section No. 5.1.10.2.3]	related

Submitter Information Verification

Submitter Full Name: Mark Allen
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Submittal Date: Tue May 18 11:17:14 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1038-NFPA 99-2021

Statement: 5.1.10.2 is reorganized for clarity and to ensure WAGD is covered by 5.1.10.2.2,



Public Input No. 169-NFPA 99-2021 [Section No. 5.1.10.2.2.1]

5.1.10.2.2.1

If copper or CMT vacuum tubing is installed along with any medical gas tubing, the vacuum tubing shall, prior to installation, be prominently labeled or otherwise identified to preclude using materials or installation procedures in the medical gas system that are not suitable for oxygen service.

Statement of Problem and Substantiation for Public Input

The UL 1365 listing for CMT requires that CMT be clean for Oxygen use and does not allow "Oxygen CMT" and "Vacuum CMT" as different products, so including CMT in the marking of Vacuum tubing is unnecessary and could lead to confusion.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

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City:

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Submittal Date: Sat May 15 10:29:34 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1050-NFPA 99-2021](#)

Statement: The UL 1365 listing for CMT requires that CMT be clean for Oxygen use and does not allow "Oxygen CMT" and "Vacuum CMT" as different products, so including CMT in the marking of Vacuum tubing is unnecessary and could lead to confusion.



Public Input No. 170-NFPA 99-2021 [Section No. 5.1.10.2.2.2]

5.1.10.2.2.2

If medical gas tube in accordance with ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems* OR CMT meeting the requirements of 5.1.10.1.4(2) and 5.1.10.1.5 -5.1.10.1.6 , is used for vacuum piping, such special marking shall not be required.

Statement of Problem and Substantiation for Public Input

Clarification language regarding marking of CMT if installed for Vacuum at the same time as other medical gasses

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

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City:

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Submittal Date: Sat May 15 10:34:27 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1051-NFPA 99-2021

Statement: Clarification language regarding marking of CMT if installed for Vacuum at the same time as other medical gasses



Public Input No. 175-NFPA 99-2021 [Section No. 5.1.10.2.3]

5.1.10.2.3 WAGD System Piping:

5.1.10.2.2 Piping Materials for Field installed WAGD

Piping for WAGD systems shall be

piped as follows: Using materials compliant

permitted to be constructed of any of the following:

(1) any materials complying with 5.1.10.2.1

or 5.1.10.2.2 In systems operated under 130 mm (5 in.) HgV maximum vacuum only, using any noncorroding tube or ductwork

5

(2) any noncorroding tube suitable to the vacuum level,

(3) for systems operated ≤ 130 mm (5 in) HgV, ductwork.

5.1.10.2.3.1

If joined to the vacuum piping, WAGD system piping shall be connected at a minimum distance of 1.5 m (5 ft) from any vacuum inlet.

5.1.10.2.3.2*

Systems meeting 5.1.10.2.3.1 shall be labeled as indicated in 5.1.11 for both WAGD and vacuum.

Move to 5.1.10.2.2

Statement of Problem and Substantiation for Public Input

5.1.10.2 is reorganized for clarity and to ensure that WAGD is covered by the provisions of current 5.1.10.2.2

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 176-NFPA 99-2021 [Section No. 5.1.10.2.2]	

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 11:13:13 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1105-NFPA 99-2021](#)

Statement: The revision responds to PI-175. See also FR-1106.



Public Input No. 135-NFPA 99-2021 [Section No. 5.1.10.7.1]

5.1.10.7.1

Axially swaged fittings providing metal-to-metal seals, ~~suitable for service at 2070 kPa (300 psig) and able to withstand~~ having a temperature of 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.

Statement of Problem and Substantiation for Public Input

The proposed wording is the similar wording used in prior editions regarding pressure ratings. Proposing change back to prior wording to maintain a consistent standard.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 08:31:53 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The current language is adequate. No technical justification was provided for the proposed revision.



Public Input No. 39-NFPA 99-2020 [Section No. 5.1.10.8]

5.1.10.8 Threaded Fittings.

Threaded fittings shall meet the following criteria:

- (1) They shall be limited to connections for pressure and vacuum indicators, alarm devices, and gas-specific demand check fittings, ~~and source equipment on the source side of the source valve .~~
- (2) They shall be tapered pipe threads complying with ASME B1.20.1, *Pipe Threads, General Purpose, Inch*.
- (3)* They shall be made up with polytetrafluoroethylene (PTFE) tape or other thread sealant recommended for oxygen service, with sealant applied to the male threads only and care taken to ensure sealant does not enter the pipe.

Statement of Problem and Substantiation for Public Input

Since section 5.1.10 is Distribution piping, there is no need to mention fittings used in source systems on the source side of the source valve here.

Submitter Information Verification

Submitter Full Name: Scott Winn

Organization: Winns Career Education

Street Address:

City:

State:

Zip:

Submittal Date: Mon Dec 21 12:01:46 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: It is the committee's intent that the provision applies to source equipment.



Public Input No. 172-NFPA 99-2021 [Section No. 5.1.10.9.1]

5.1.10.9.1

5.1.10.9.1 Listed or approved metallic gas tube fittings that

, when made up,

provide a permanent and nonseparable joint having the mechanical

thermal

and sealing integrity of a brazed joint shall be permitted to be used :

(1) if constructed of brass, copper or stainless steel,

(2) where no polymer components are needed for maintaining leak free seals .

Statement of Problem and Substantiation for Public Input

5.1.10.9.1 is rewritten to clarify the intent of the original requirement.

Added "nonseparable" to make it clear that deforming ferrule fittings (e.g. Swagelock, Trulock, Parker A-lok, Ham-let, etc.) which would qualify except that they can be disassembled are not permitted.

Added the provision that these fittings must not contain polymers, the a missing provision which has been used to imply fittings like Propress are acceptable.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 173-NFPA 99-2021 [Section No. 5.1.10.9.2]	
Public Input No. 174-NFPA 99-2021 [Section No. 5.1.4.1.6]	

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 10:52:46 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The substantiation does not justify why polymers should not be permitted.



Public Input No. 225-NFPA 99-2021 [New Section after 5.1.10.9.2]

5.1.10.9.3 Flange Fittings

Flange fittings that comply with the following shall be permitted only where required:

- (1) They shall be of brass or copper construction with an appropriate dielectric.
- (2) They shall not require extensions for brazing.
- (3) They shall be suitable for service at 2070 kPa (300 psig) or above and able to withstand temperatures of 538°C (1,000°F).
- (4) They shall have seals with a temperature rating not less than 538°C (1,000°F)
- (5) They shall be permitted for installation in vacuum and WAGD systems only.
- (6) They shall be limited to joining stainless tubing to copper tubing only.

Statement of Problem and Substantiation for Public Input

Stainless is allowed to be used for Vacuum & WAGD distribution piping. However, no joining method exists that is both permitted by code and also practical. Typically, the stainless pipe sizes involved would be too large to braze it to copper tubing. Flanges are bolted, and therefore not "permanent" as required. Welding stainless to copper tubing isn't possible because same size stainless and copper tubing aren't really the same size. Perhaps the code should permit flanges. This would also effect section 5.1.10.3.1. Paragraph 6 would need to be added and need to state the following as an acceptable joining method:

5.1.10.3.1 (6) Flange, as described in 5.1.10.9.3.

Submitter Information Verification

Submitter Full Name: MGPHO BOD
Organization: Evergreen Medical Services, Inc. - Steve Bradshaw
Affiliation: Medical Gas Professional Healthcare Organization (MGPHO)
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 25 15:02:25 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: Flange fittings are not currently accepted and there is no evidence to show that they would meet the requirements and expectations for medical gas. Technical justification for the transition from one metal to another should be provided.



Public Input No. 173-NFPA 99-2021 [Section No. 5.1.10.9.2]

- They shall be of brass or copper construction with an appropriate dielectric.
 - They shall be permitted to be a union.
- They shall be clean for oxygen where used for medical gases and medical support gases

5.1.10.9.2 —Dielectric Fittings

-

Dielectric fittings that comply with the following shall be permitted only where required by the manufacturer of special medical equipment to electrically isolate the equipment from the system distribution piping:

with Internal Seals. Fittings with internal seals (e.g. dielectric fittings, zero clearance fittings for facilitating the connection of source equipment, etc.) shall be permitted with the following limitations:

- (1) they shall be of brass, bronze or copper construction,
- (2) all materials used shall comply with 5.1.3.5.4,
- (3) internal seals, insulators and other polymeric materials shall be limited only to those parts essential for sealing or creating the dielectric break,
- (4) Internal seals, insulators and other elastomeric materials shall be replaceable,
- (5) when used for patient gases or medical support gases, they shall be cleaned for oxygen,
- (6) such fittings shall be installed only where visible and accessible, allowing for testing and servicing -

Statement of Problem and Substantiation for Public Input

5.1.10.9.2 is added to cover a class of fittings in very wide use primarily with manifold connections. These "zero clearance" fittings allow for the separation of two parts when neither end is easily moved (as is common with brazed piping).

The provision is also rewritten to update the dielectric exception which has long been in the standard. Some of these dielectrics are now in need of seal replacements.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 172-NFPA 99-2021 [Section No. 5.1.10.9.1]	
Public Input No. 174-NFPA 99-2021 [Section No. 5.1.4.1.6]	

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 11:00:08 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1052-NFPA 99-2021](#)

Statement: 5.1.10.9.2 is revised to cover a class of fittings in very wide use primarily with manifold connections.

These "zero clearance" fittings allow for the separation of two parts when neither end is easily moved (as is common with brazed piping).

The provision is also rewritten to update the dielectric exception which has long been in the standard. Some of these dielectrics are now in need of seal replacements.



Public Input No. 63-NFPA 99-2020 [Section No. 5.1.10.10]

5.1.10.10 Prohibited Joints.

The following joints shall be prohibited throughout medical gas and vacuum distribution pipeline systems:

- (1) Flared and compression-type connections, including connections to station outlets and inlets, alarm devices, and other components
- (2) Other straight-threaded connections, including unions
- (3) Pipe-crimping tools used to permanently stop the flow of medical gas and vacuum piping
- (4) Removable and nonremovable push-fit fittings that employ a quick assembly push fit connector
- (5) Press-fit fittings using an o-ring for it's seal.

Statement of Problem and Substantiation for Public Input

The question often arises as to whether these type fittings (with trade names such as ProPress) are allowed for medical gas.

Most plumbing codes refer to these as "press fit fittings".

Although they are not listed in section 5.1.10.3.1, listing them here as prohibited fittings could add clarity.

Submitter Information Verification

Submitter Full Name: Scott Winn

Organization: Winns Career Education

Street Address:

City:

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Zip:

Submittal Date: Mon Dec 21 12:38:41 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: No technical substantiation has been provided to substantiate the prohibition of press-connect fittings.



Public Input No. 188-NFPA 99-2021 [Section No. 5.1.10.11]

5.1.10.

~~11— Installation of Piping and Equipment.~~

~~5.1.10.11.1 — Pipe Sizing.~~

~~5.1.10.11.1.1 —~~

~~Piping systems shall be designed and sized to deliver the required flow rates at the utilization pressures.~~

~~5.1.10.11.1.2 —~~

~~Mains and branches in medical gas and WAGD piping systems shall be not less than DN15 (NPS $\frac{1}{2}$) ($\frac{5}{8}$ in. O.D.) size.~~

~~5.1.10.11.1.3 —~~

~~Mains and branches in medical surgical vacuum systems shall be not less than DN20 (NPS $\frac{3}{4}$) ($\frac{7}{8}$ in. O.D.) size.~~

~~5.1.10.11.1.4 —~~

~~Drops to individual station outlets and inlets shall be not less than DN15 (NPS $\frac{1}{2}$) ($\frac{5}{8}$ in. O.D.) size.~~

11 Pipe Sizing and System Design. Piping networks shall be designed, sized and installed to maintain system pressures under flows as set forth in 5.1.12.4.10 and in accordance with 5.1.10.11.1.

~~5—~~

~~Runouts to alarm panels and connecting tubing for gauges and alarm devices shall be permitted to be DN8 (NPS $\frac{1}{4}$) ($\frac{3}{8}$ in. O.D.) size.~~

{replace existing 5.1.10.11.

2— Protection of Piping.

Piping shall be protected against freezing, corrosion, and physical damage.

5.1.10.11.2.1 —

Piping exposed in corridors and other areas where subject to physical damage from the movement of carts, stretchers, portable equipment, or vehicles shall be protected.

1 with:}

5.1.10.11.

2.2-

Piping underground within buildings or embedded in concrete floors or walls shall be installed in a continuous conduit.

5.1.10.11.3 – Location of Piping.

1 Pipe Sizing

5.1.10.11.

3.

1

-

Piping risers shall be permitted to be installed in pipe shafts if protected from physical damage, effects of excessive heat, corrosion, or contact with oil.

5.1.10.11.3.2 –

Piping shall not be installed in kitchens, stairwells, elevator shafts, elevator machine rooms, areas with open flames, electrical service equipment over 600 volts, and areas prohibited under *NFPA 70* except for the following locations:

- (1) Room locations for medical air compressor supply systems and medical-surgical vacuum pump supply systems
- (2) Room locations for secondary distribution circuit panels and breakers having a maximum voltage rating of 600 volts

5.1.10.11.3.3 –

Medical gas piping shall be permitted to be installed in the same service trench or tunnel with fuel gas lines, fuel oil lines, electrical lines, steam lines, and similar utilities, provided that the space is ventilated (naturally or mechanically) and the ambient temperature around the medical gas piping is limited to 54°C (130°F) maximum.

5.1.10.11.3.4 –

Medical gas piping shall not be located where subject to contact with oil, including a possible flooding area in the case of a major oil leak

.1 The system designer shall size the piping such that calculated pressure or vacuum losses across the piping as designed do not exceed 10% of the intended operating pressure or vacuum at the source valve. The pressure drop calculations shall become part of the facility's permanent records .

5.1.10.11.

4- Pipe Support.

5.1.10.11.4.1 –

Piping shall be supported from the building structure.

5.1.10.11.4.2 –

Hangers and supports shall comply with and be installed in accordance with MSS SP-58, *Pipe Hangers and Supports — Materials, Design, Manufacture, Selection, Application, and Installation* .

5.1.10.11.4.3 –

Supports for copper tube shall be sized for copper tube.

5.1.10.11.4.4 * –

Supports for CMT shall be in accordance with the CMT manufacturer's installation instructions.

5.1.10.11.4.5 –

In potentially damp locations, copper tube hangers or supports that are in contact with the tube shall be plastic-coated or otherwise be electrically insulated from the tube by a material that will not absorb moisture.

5.1.10.11.4.6 –

Maximum support spacing shall be in accordance with Table 5.1.10.11.4.6.

Table 5.1.10.11.4.6 Maximum Pipe Support Spacing

- Hanger Spacing Pipe Size mm ft DN8 (NPS $\frac{1}{4}$) ($\frac{3}{8}$ in. O.D.) 1520 5 DN10 (NPS $\frac{3}{8}$) ($\frac{1}{2}$ in. O.D.) 1830 6 DN15 (NPS $\frac{1}{2}$) ($\frac{5}{8}$ in. O.D.) 1830 6 DN20 (NPS $\frac{3}{4}$) ($\frac{7}{8}$ in. O.D.) 2130 7 DN25 (NPS 1) (1 $\frac{1}{8}$ in. O.D.) 2440 8 DN32 (NPS 1 $\frac{1}{4}$) (1 $\frac{3}{8}$ in. O.D.) 2740 9 DN40 (NPS 1 $\frac{1}{2}$) (1 $\frac{5}{8}$ in. O.D.) and larger 3050 10 Vertical risers, all sizes, every floor, but not to exceed 4570 15

5.1.10.11.4.7 –

Where required, medical gas and vacuum piping shall be seismically restrained against earthquakes in accordance with the applicable building code.

5.1.10.11.5 – Underground Piping Outside of Buildings.**5.1.10.11.5.1 –**

Buried piping outside of buildings shall be installed below the local level of frost penetration.

5.1.10.11.5.2 –

The installation procedure for underground piping shall protect the piping from physical damage while being backfilled.

5.1.10.11.5.3 –

If underground piping is protected by a conduit, cover, or other enclosure, the following requirements shall be met:

- (1) Access shall be provided at the joints for visual inspection and leak testing.
- (2) The conduit, cover, or enclosure shall be self-draining and not retain groundwater in prolonged contact with the pipe.

5.1.10.11.5.4 –

Buried piping that will be subject to surface loads shall be buried at a depth that will protect the piping or its enclosure from excessive stresses.

5.1.10.11.5.5 –

The minimum backfilled cover above the top of the pipe or its enclosure for buried piping outside of buildings shall be 900 mm (36 in.), except that the minimum cover shall be permitted to be reduced to 450 mm (18 in.) where there is no potential for damage from surface loads or surface conditions.

5.1.10.11.5.6 –

Trenches shall be excavated so that the pipe or its enclosure has firm, substantially continuous bearing on the bottom of the trench.

5.1.10.11.5.7 –

Backfill shall be clean, free from material that can damage the pipe, and compacted.

5.1.10.11.5.8 –

A continuous tape or marker placed immediately above the pipe or its enclosure shall clearly identify the pipeline by specific name.

5.1.10.11.5.9 –

A continuous warning means shall also be provided above the pipeline at approximately one-half the depth of burial.

5.1.10.11.5.10 –

Where underground piping is installed through a wall sleeve, the outdoor end of the sleeve shall be sealed to prevent the entrance of groundwater into the building.

5.1.10.11.6 – Hose and Flexible Connectors.**5.1.10.11.6.1 –**

Hose and flexible connectors, both metallic and nonmetallic, shall be no longer than necessary and shall not penetrate or be concealed in walls, floors, ceilings, or partitions.

5.1.10.11.6.2 –

Flexible connectors, metallic or nonmetallic, shall have a minimum burst pressure, with a gauge pressure of 6895 kPa (1000 psi).

5.1.10.11.6.3 –

Metallic flexible joints shall be permitted in the pipeline where required for expansion joints, seismic protection, thermal expansion, or vibration control and shall be as follows:

- (1) For all wetted surfaces, made of bronze, copper, or stainless steel
- (2) Cleaned at the factory for oxygen service and received on the job site with certification of cleanliness
- (3) Suitable for service at 2070 kPa (300 psig) or above and able to withstand temperatures of 538°C (1000°F)
- (4) Provided with brazing extensions to allow brazing into the pipeline per 5.1.10.4
- (5) Supported with pipe hangers and supports as required for their additional weight

5.1.10.11.6.4 –

Metallic flexible joints in accordance with 5.1.10.11.6.3 shall be permitted to be concealed in walls, ceilings, or partitions.

5.1.10.11.7 – Prohibited System Interconnections.**5.1.10.11.7.1 –**

Two or more medical gas or vacuum piping systems shall not be interconnected for installation, testing, or any other reason, except as permitted by 5.1.10.11.7.2.

5.1.10.11.7.2 –

Medical gas and vacuum systems with the same contents shall be permitted to be interconnected with an in-line valve installed between the systems.

5.1.10.11.7.3 –

Leak testing shall be accomplished by separately charging and testing each individual piping system.

5.1.10.11.8 – Manufacturer's Instructions.**5.1.10.11.8.1 –**

The installation of individual components shall be made in accordance with the instructions of the manufacturer.

5.1.10.11.8.2 –

Manufacturer's instructions shall include directions and information deemed by the manufacturer to be adequate for attaining proper operation, testing, and maintenance of the medical gas and vacuum systems.

5.1.10.11.8.3 –

Copies of the manufacturer's instructions shall be left with the system owner.

5.1.10.11.9 – Changes in System Use.**5.1.10.11.9.1 –**

Where a positive pressure medical gas piping distribution system originally used or constructed for use at one pressure and for one gas is converted for operation at another pressure or for another gas, all provisions of 5.1.10 shall apply as if the system were new.

5.1.10.11.9.2 –

A vacuum system shall not be permitted to be converted for use as a gas system.

5.1.10.11.10 – Qualification of Installers.**5.1.10.11.10.1 –**

The installation of medical gas and vacuum systems shall be made by qualified, competent technicians who are experienced in performing such installations, including all personnel who actually install the piping system.

5.1.10.11.10.2 –

Installers of medical gas and vacuum piped distribution systems, all appurtenant piping supporting pump and compressor source systems, and appurtenant piping supporting source gas manifold systems not including permanently installed bulk source systems, shall be certified in accordance with ASSE 6010, *Professional Qualifications Standard for Medical Gas Systems Installers*.

5.1.10.11.10.3 –

CMT systems shall be installed by ASSE 6010-qualified installers using the CMT manufacturer's instructions.

5.1.10.11.10.4 –

Installers of medical gas and vacuum systems shall not use their certification to oversee installation by noncertified personnel.

5.1.10.11.10.5 –

Brazing shall be performed by individuals who are qualified in accordance with the provisions of 5.1.10.11.11.

5.1.10.11.10.6 –

Prior to any installation work, the installer of medical gas and vacuum piping shall provide and maintain documentation on the job site for the qualification of brazing procedures and individual brazers that is required under 5.1.10.11.11.

5.1.10.11.10.7 –

Health care organization personnel shall be permitted to install piping systems if all of the requirements of 5.1.10.11.10 are met during the installation.

5.1.10.11.11 – Qualification of Brazing Procedures and Brazing.**5.1.10.11.11.1 –**

Brazing procedures and brazer performance for the installation of medical gas and vacuum piping shall be qualified in accordance with either Section IX, "Welding and Brazing Qualifications," of the ASME *Boiler and Pressure Vessel Code*, or AWS B2.2/B2.2M, *Specification for Brazing Procedure and Performance Qualification*, both as modified by 5.1.10.11.11.2 through 5.1.10.11.11.5.

5.1.10.11.11.2 –

Brazers shall be qualified by visual examination of the test coupon followed by sectioning.

5.1.10.11.11.3 –

The brazing procedure specification shall address cleaning, joint clearance, overlap, internal purge gas, purge gas flow rate, and filler metal.

5.1.10.11.11.4 –

The brazing procedure qualification record and the record of brazer performance qualification shall document filler metal used, base metals, cleaning, joint clearance, overlap, internal purge gas and flow rate during brazing of coupon, and absence of internal oxidation in the completed coupon.

5.1.10.11.11.5 –

Brazing procedures qualified by a technically competent group or agency shall be permitted under the following conditions:

- (1) The brazing procedure specification and the procedure qualification records meet the requirements of this code.
- (2) The employer obtains a copy of both the brazing procedure specification and the supporting qualification records from the group or agency and signs and dates these records, thereby accepting responsibility for the qualifications that were performed by the group or agency.
- (3) The employer qualifies at least one brazer following each brazing procedure specification used.

5.1.10.11.11.6 –

An employer shall be permitted to accept brazer qualification records of a previous employer under the following conditions:

- (1) The brazer has been qualified following the same or an equivalent procedure that the new employer uses.
- (2) The new employer obtains a copy of the record of brazer performance qualification tests from the previous employer and signs and dates these records, thereby accepting responsibility for the qualifications performed by the previous employer.

5.1.10.11.11.7 –

Performance qualifications of brazers shall remain in effect indefinitely, unless the brazer does not braise with the qualified procedure for a period exceeding 6 months or there is a specific reason to question the ability of the brazer.

5.1.10.11.12 – Breaching or Penetrating Medical Gas Piping.**5.1.10.11.12.1 –**

Positive pressure patient medical gas piping and medical support gas piping shall not be breached or penetrated by any means or process that will result in residual copper particles or other debris remaining in the piping or affect the oxygen-clean interior of the piping.

5.1.10.11.12.2 –

The breaching or penetrating process shall ensure that any debris created by the process remains contained within the work area.

1.2 The design and installation shall also provide that:

(1) Mains and branches supplying medical gas to more than a single terminal shall be not smaller than DN15 (NPS 1/2) (5/8 in O.D.) size.

(2) Mains and branches supplying medical vacuum to more than a single terminal shall be not smaller than DN20 (NPS 3/4) (7/8 in O.D.) size.

(3) Mains and branches supplying WAGD or support gases to more than a single terminal shall be not smaller than DN15 (NPS 1/2) (5/8 in O.D.) size.

(4) Drops to individual terminals shall not be smaller than DN 15 (NPS 1/2) (5/8 in O.D.) size.

(5) Runouts to pressure sensing devices (e.g. lines not conveying flow) shall be permitted to be DN 8 (NPS 1/4) (3/8 in O.D.) size.

5.1.10.12 Installation of Piping and Equipment

renumber remainder

Statement of Problem and Substantiation for Public Input

One of the experiences of COVID has been that many facilities became concerned that their piping, especially inside individual zones, was not adequate to the demands being asked of it. Generally, experience was that systems designed compliant with 5.1.10.11.1 managed well, but some legacy installations with smaller piping came up short. The proposal therefore does not intend to change the current minima, but to clarify, reinforce and tie together the two relevant provisions in the standard (5.1.10.11 and 5.1.12.4.10)

A basic criteria for the sizing of the pipeline (10% pressure drop across the system at flow) is added as guidance for the designer.

Almost universally, facilities found they had no documentation of their systems or the original design calculations, and could not effectively assess where their limits were without actually physically tracing the piping and recalculating. The original calculations therefore should be added to the permanent documentation for the facility.

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 13:05:23 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1053-NFPA 99-2021

Statement: One of the experiences of COVID has been that many facilities became concerned that their piping, especially inside individual zones, was not adequate to the demands being asked of it. Generally, experience was that systems designed compliant with 5.1.10.11.1 managed well, but some legacy installations with smaller piping came up short. The proposal therefore does not intend to change the current minima, but to clarify, reinforce and tie together the two relevant provisions in the standard (5.1.10.11 and 5.1.12.4.10)

A basic criterion for the sizing of the pipeline (10% pressure drop across the system at flow) is added as guidance for the designer.

Almost universally, facilities found they had no documentation of their systems or the original design calculations, and could not effectively assess where their limits were without actually physically tracing the piping and recalculating. The original calculations therefore should be added to the permanent documentation for the facility.

**Public Input No. 171-NFPA 99-2021 [Sections****5.1.10.11.1.2, 5.1.10.11.1.3, 5.1.10.11.1.4]****Sections 5.1.10.11.1.2, 5.1.10.11.1.3, 5.1.10.11.1.4****5.1.10.11.1.2**

Mains and branches in medical gas and WAGD piping systems shall be not less than DN15 (NPS ½) (5⁄8 in. O.D.) size.

5.1.10.11.1.3

Mains and branches in medical–surgical vacuum systems shall be not less than DN20 (NPS ¾) (7⁄8 in. O.D.) size.

5.1.10.11.1.4

Drops to individual station outlets and inlets in medical gas and WAGD piping systems shall be not less than DN15 (NPS ½) (5⁄8 in. O.D.) size.

Drops to individual station inlets in medical–surgical vacuum systems shall be not less than DN20 (NPS ¾) (7⁄8 in. O.D.) size.

5.1.10.11.1.5

Existing piping that does not meet the minimum sizes in 5.1.10.11.1.2-5.1.10.11.1.4 may remain in-use as long as the outlet/inlets being served meet the minimum performance requirement for outlets/inlets in 5.1.12.4.10

Statement of Problem and Substantiation for Public Input

"Drop" is not defined in NFPA 99 as well as in most model plumbing codes. This would bring the standard in-line with industry best practices of all Vacuum piping being a minimum of 3/4" tube.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

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Zip:

Submittal Date: Sat May 15 10:40:34 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is not needed. The submitter's substantiation does not appear to correlate with the revision. Also see the action on PI-188 and related first revision.



Public Input No. 346-NFPA 99-2021 [Section No. 5.1.10.11.3.2]

5.1.10.11.3.2

Piping shall not be installed in kitchens, stairwells, elevator shafts, elevator machine rooms, areas with open flames, electrical service equipment over 600 volts, and areas prohibited under *NFPA 70* except for the following locations:

- (1) Room locations for medical air compressor supply systems and medical–surgical vacuum pump supply systems
- (2) Room locations for secondary distribution circuit panels and breakers having a maximum voltage rating of 600 volts

A.5.1.10.11.3.2

This requirement is meant to protect the piping from exposures that are of concern. These exposure hazards may be mitigated to protect the piping as intended in the code. An example is the allowance for protecting piping with a (2) hour fire wrap to allow piping to be located in an area with open flames if this is the only location available for the piping.

Statement of Problem and Substantiation for Public Input

There are times when it may be impossible to meet this requirement in an existing system. This annex helps to clarify that the hazard is the concern and as long as it can be mitigated, the installation should be allowed.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 16:06:42 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Equivalencies are permitted by the code. The proposal does not clarify the committee's intent. If an allowance for other methods of protection are intended to be permitted, they should be in the body of the code.



Public Input No. 215-NFPA 99-2021 [New Section after 5.1.10.11.4.7]

TITLE OF NEW CONTENT

Add new 5.1.10.11.5 Fire Stopping of Pipeline Penetrations

new 5.1.10.11.5.1 All pipeline floor, wall, ceiling penetrations shall be fire stopped according to code

Statement of Problem and Substantiation for Public Input

This has long been a requirement of all local jurisdictions, the Joint Commission, and the Centers for Medicare and Medicaid Services and is not yet addressed in Chapter 5.

Submitter Information Verification

Submitter Full Name: Edward Lyczko
Organization: The Cleveland Clinic
Affiliation: Current alternate member NFPA 99 HEA-PIP Working Group
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 24 10:44:50 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is adequately addressed by other codes, such as NFPA 101 and the applicable building code. Terminology would need to be aligned with other codes. Firestopping should not be the responsibility of the medical gas piping installer.



Public Input No. 163-NFPA 99-2021 [Section No. 5.1.10.11.5.3]

5.1.10.11.5.3

If underground piping is protected by a conduit, cover, or other enclosure, the following requirements shall be met:

- (1) Access shall be provided at the joints during construction for visual inspection and leak testing.
- (2) The conduit, cover, or enclosure shall be self-draining and not retain groundwater in prolonged contact with the pipe.

Statement of Problem and Substantiation for Public Input

This follows the wording from 15.4.5.8.2. Designers have required that manholes be installed to permanently provide visual inspection of underground joints. This is an expensive and unnecessary cost with little benefit after the Installers Tests have been performed.

Submitter Information Verification

Submitter Full Name: Corky Bishop

Organization: Apex Medical Gas Systems

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 14 17:41:57 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1072-NFPA 99-2021

Statement: Designers have required that manholes be installed to permanently provide visual inspection of underground joints. This is an expensive and unnecessary cost with little benefit after the Installers Tests have been performed.



Public Input No. 386-NFPA 99-2021 [New Section after 5.1.10.11.6.1]

TITLE OF NEW CONTENT

5.1.10.11.6.1.1 Connections that are part of a manufactured assembly shall be permitted to be concealed above a ceiling where access is provided to the ceiling space for inspection and maintenance.

Additional Proposed Changes

<u>File Name</u>	<u>Description Approved</u>
Connections_of_Flexible_Hoses.docx	

Statement of Problem and Substantiation for Public Input

The code is not clear regarding manufactured assemblies that come with connections located above a ceiling. An AHJ argued that these connections were not permitted based on this code section. See attachment

Submitter Information Verification

Submitter Full Name: James Peterkin
Organization: TLC Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 01 15:35:38 EDT 2021
Committee: HEA-PIP

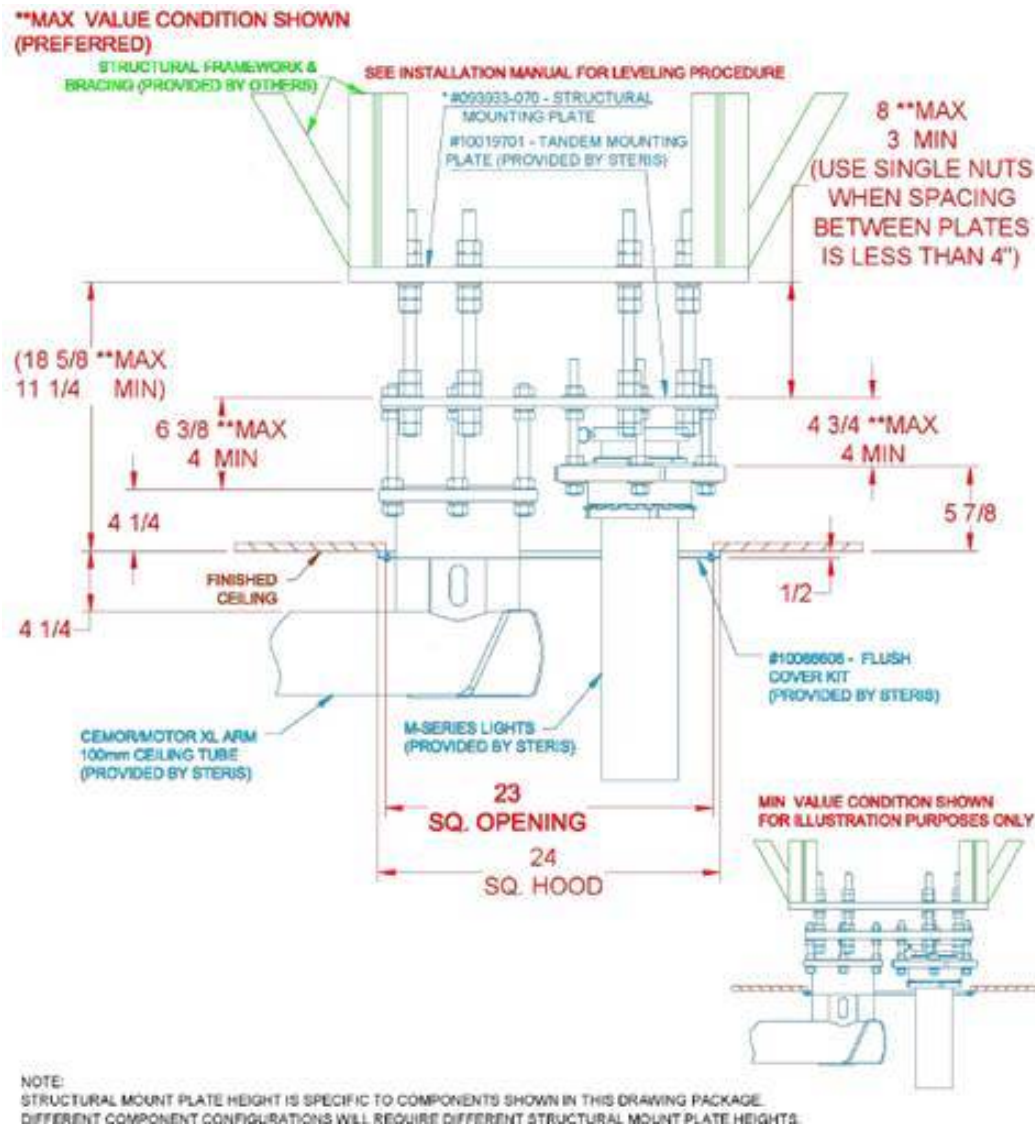
Committee Statement

Resolution: The proposed revision is already covered by the requirements for manufactured assemblies in 5.1.6.8.

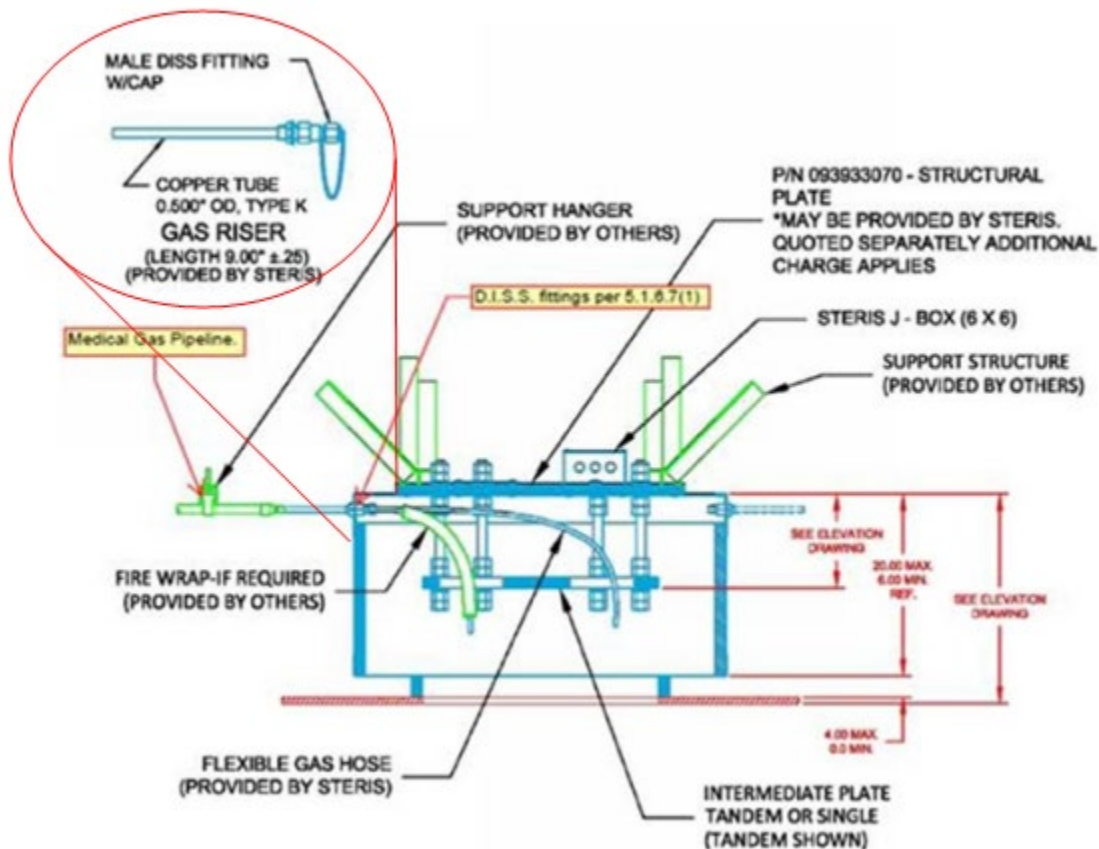
Manufactured assemblies are manufactured offsite and tested to meet a specific standard and the connected to the fixed piping on site. Many of these manufactured assemblies include flexible hoses and of these assemblies, some are fixed (do not move once installed) and others are articulating (surgical booms, ICU booms, etc.).

The screenshots below show how the boom mounts and how the medical gas hoses enter the boom.

Boom Mount to structure diagram:



Medical Gas Connections - flexible connections to hard piped connection. (Note the DISS fitting and copper pipe pigtail provided by the boom manufacturer):



Note : there is no access panel of the manufactured assembly. Once the ceiling access panel is opened, the fittings are accessible (without having to remove another access panel)

In accordance with NFPA 99, since the booms are a manufactured assembly, they comply with Section 5.1.6.7 (1) if they are connected to the manifold with D.I.S.S. connectors. Note from the sketches above, the DISS fittings are provided by the manufacturer as part of the assembly along with a copper pigtail that is to be connected/brazed by the installer.

5.1.6.7 Manufactured assemblies employing hose or flexible connectors, where the station outlet/inlet attached to the piping is not fully and immediately accessible (i.e., cannot be manipulated without the removal of panels, doors, and so forth), shall have station outlets/inlets with the following additional characteristics:

- (1) They shall be gas-specific connections with positive locking mechanisms that ensure the connector is firmly seated and cannot detach without intentional actuation of the release (e.g., D.I.S.S. connectors).
- (2) In pressure gases, they shall be permitted to omit the secondary valve (or assembly) required in 5.1.5.2.
- (3) In vacuum and WAGD, they shall be permitted to omit both primary and secondary valves (or assemblies) for minimum restriction to flow.
- (4) They shall be provided with a second terminal at which the user connects and disconnects that complies with 5.1.5.

The manifold and hose connection are part of the manufactured assembly, and 5.1.6.7 clearly anticipates hose or flexible connections to manufactured assemblies that are “not fully and immediately accessible”. These connections are accessible via access panels in the ceiling.

The Handbook commentary also acknowledges permanent hose connections to manufactured assemblies that are “more or less concealed”.

I have spoken to Medical Gas installers and this installation is typical. In fact, as noted in the sketch above, the manufacturer provides the copper “pigtailes” that are intended to be connected to the fixed piping at the location noted (above the ceiling). It is standard practice to provide access panels to provide access to both the medical gas connections and the electrical junction boxes. 99 -5.1.14.2.3.1.



Public Input No. 60-NFPA 99-2020 [Section No. 5.1.10.11.6.2]

5.1.10.11.6.2

Flexible connectors, metallic or nonmetallic, (such as those concealed in non-stationary manufactured assemblies) shall have a minimum burst pressure, with a gauge pressure of 6895 kPa (1000 psi).

Statement of Problem and Substantiation for Public Input

Confusion arises when comparing this section (requiring 1000 psig minimim) to section 5.1.10.11.6.3 (allowing 300 psig minimum).

If this assumption is correct, this added wording would help clarify the difference between the two sections.

Submitter Information Verification

Submitter Full Name: Scott Winn

Organization: Winns Career Education

Street Address:

City:

State:

Zip:

Submittal Date: Mon Dec 21 12:26:56 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: Manufactured assemblies are addressed in 5.1.6.8.



Public Input No. 356-NFPA 99-2021 [Section No. 5.1.11 [Excluding any Sub-Sections]]

Color and pressure requirements shall be in accordance with Table 5.1.11.

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

<u>Gas Service</u>	<u>Abbreviated Name</u>	<u>Colors (Background/Text)</u>	<u>Standard Gauge Pressure</u>	
			<u>kPa</u>	<u>psi</u>
Medical air	Med air	Yellow/black	345–380	50–55
Carbon dioxide	CO ₂	Gray/black or	345–380	50–55
		gray/white		
Helium	He	Brown/white	345–380	50–55
Nitrogen	N ₂	Black/white	345–127555–185	<u>Varies with system type</u>
Nitrous oxide	N ₂ O	Blue/white	345–380	50–55
Oxygen	O ₂	Green/white or	345–380	50–55
		white/green		
Oxygen/carbon dioxide mixtures	O ₂ /CO ₂ <i>n</i> % (<i>n</i> = % of CO ₂)	Green/white	345–380	50–55
Medical–surgical vacuum	Med vac	White/black	380 mm to 760 mm (15 in. to 30 in.) HgV	
Waste anesthetic gas disposal	WAGD	Violet/white	Varies with system type	
Medical–surgical vacuum/WAGD combination	Med–surg/WAGD	White/black and violet/white	380 mm to 760 mm (15 in. to 30 in.) HgV	
Other mixtures	Gas A%/Gas B%	Colors as above		None
		-	-	Major gas for background/minor gas for text
Nonmedical air	—	Yellow and white diagonal stripe/black		None
and dental air	—	White and black diagonal stripe/black		None
Nonmedical vacuum and dental vacuum	—	boxed		None
Laboratory air	—	Yellow and white checkerboard/black		None
Laboratory vacuum	—	White and black checkerboard/black boxed		None
Instrument air	—	Red/white	345–127550–185	<u>Varies with system type</u>

Statement of Problem and Substantiation for Public Input

Instrument air and Nitrogen are used for many purposes in the health care setting. We should allow the end user to decide the operating pressure the best suits them. There are some other standards that have to be met with systems based on their use. i.e. 30 psi for OSHA, instrument "grade" air for SPD, etc. The only major difference in the "standard operating pressure" requirements is in the labelling of components.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 16:41:26 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1055-NFPA 99-2021](#)

Statement: Instrument air and Nitrogen are used for many purposes in the health care setting. We should allow the end user to decide the operating pressure the best suits them. There are some other standards that have to be met with systems based on their use. i.e. 30 psi for OSHA, instrument "grade" air for SPD, etc. The only major difference in the "standard operating pressure" requirements is in the labelling of components.



Public Input No. 353-NFPA 99-2021 [Section No. 5.1.11.2.4]

5.1.11.2.4

Source valves shall be labeled in substance as follows:

- **SOURCE VALVE**

FOR THE (SOURCE- GAS/VACUUM NAME) _ SERVING (NAME OF THE AREA/BUILDING SERVED BY THE SOURCE VALVE) .

Statement of Problem and Substantiation for Public Input

Corrects the valve labelling requirement for source valves.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 16:32:47 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1056-NFPA 99-2021](#)

Statement: Corrects the valve labelling requirement for source valves.



Public Input No. 230-NFPA 99-2021 [Section No. 5.1.12.1.3]

5.1.12.1.3

All systems that are breached and components that are subject to additions, renovations, or replacement (e.g., new gas sources: bulk, manifolds, compressors, dryers, alarms, distribution piping) shall be inspected and tested.

Statement of Problem and Substantiation for Public Input

Modular Services has received requests to provide facelift products for small renovation projects which are to include new gas outlets. The new gas outlets would be connected to the existing gas outlets via hose assemblies. We are seeking clarification that this type of addition to the piping infrastructure is intended to be inspected and tested.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 231-NFPA 99-2021 [Section No. 5.1.12.1.4]</u>	

Submitter Information Verification

Submitter Full Name: Travis Webb
Organization: Modular Services Company
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 26 15:01:56 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1057-NFPA 99-2021

Statement: The revision clarifies the components for which inspection and testing are required and moves the examples to Annex A.



Public Input No. 231-NFPA 99-2021 [Section No. 5.1.12.1.4]

5.1.12.1.4

Systems shall be deemed breached at the point of pipeline intrusion by physical separation or by system component removal, replacement, or addition(e . g., connecting to existing station outlet/inlet via a hose assembly with the intent of adding a new station outlet/inlet to permanently relocate the user connection point). .

Statement of Problem and Substantiation for Public Input

Modular Services has received requests to provide facelift products for small renovation projects which are to include new gas outlets. The new gas outlets would be connected to the existing gas outlets via hose assemblies. We are seeking clarification that this type of addition to the piping infrastructure is intended to be inspected and tested.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 230-NFPA 99-2021 [Section No. 5.1.12.1.3]</u>	

Submitter Information Verification

Submitter Full Name: Travis Webb
Organization: Modular Services Company
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 26 15:02:53 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision does not add anything to the code and lacks technical merit. Explanatory information must be provided in Annex A.



Public Input No. 347-NFPA 99-2021 [Section No. 5.1.12.1.5]

5.1.12.1.5

Breached portions of the systems subject to inspection and testing shall be confined to only the specific altered zone and components in the immediate zone or area that is located upstream for vacuum systems and downstream for pressure gases at the point or area of intrusion the areas affected by the breach .

Statement of Problem and Substantiation for Public Input

This clarifies that all areas affected by a breach should be tested and inspected. Not just the areas downstream for positive pressure and upstream for vacuum. The breach could be located far away from the "isolation point", which may affect more areas that referenced with the current language.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 16:10:13 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1058-NFPA 99-2021](#)

Statement: The revision clarifies that all areas affected by a breach should be tested and inspected and not just the areas downstream for positive pressure and upstream for vacuum. The breach could be located far away from the "isolation point," which may affect more areas than referenced with the current language.



Public Input No. 342-NFPA 99-2021 [New Section after 5.1.12.1.11]

5.1.12.1.11

New medical gas and vacuum pipeline systems shall not be connected to existing systems for any reason until all the proper testing has been completed. The new piping systems shall be connected during the Final Tie-In Test as described in 5.1.12.4.9.

A5.1.12.1.11

Due to many of the testing requirements, it is unsafe to have a new piping system connected to an existing piping system with only a shutoff valve in between. The initial test pressure of 150 psig is much higher than many of the standard operating pressures of the positive pressure systems. The possibility of back feeding into the existing systems from the new system during testing due to the differential pressures has caused valves to leak by...

Statement of Problem and Substantiation for Public Input

It remains unclear in the code if installers should be connected to the existing systems as they conduct the installation of new piping systems. This is dangerous and the code seems to indicate that it is not allowed. This clarifies in the general requirements that we do not want the new piping connected to the existing until all most of the installer performed testing and system verification has been completed up until the Final Tie-in Test as described in the code.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 15:37:33 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1102-NFPA 99-2021

Statement: This revision, in addition to a CI on 5.1.12.2.3, responds to PI-342.



Public Input No. 232-NFPA 99-2021 [Section No. 5.1.12.2.2]

5.1.12.2.2 Initial Piping Blowdown.

Piping in medical gas and vacuum distribution systems shall be blown clear by means of oil-free, dry nitrogen NF after installation of the distribution piping but before installation of station outlet/inlet rough-in assemblies and other system components (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, pressure relief valves, manifolds, source equipment, manufactured assemblies, pre-manufactured rough-in assemblies).

Statement of Problem and Substantiation for Public Input

A conflict exists when manufactured assemblies or pre-manufactured rough-in assemblies are provided because they include both station outlets/inlets and portions of the distribution piping. As such, a reasonable argument can be made to support blowing down the piping either before or after the installation of the manufactured assembly or pre-manufactured rough-in assembly. This revision seeks to further clarify that the blowdown is to occur before installation of station outlets/inlets even when they are supplied as part of a manufactured assembly or pre-manufactured rough-in assembly as they are required to be blown down in accordance with 5.1.6.1 and 5.1.6.1.2.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 228-NFPA 99-2021 [New Section after 3.3.104]	

Submitter Information Verification

Submitter Full Name: Travis Webb
Organization: Modular Services Company
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 26 15:03:52 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1018-NFPA 99-2021

Statement: A conflict exists when manufactured assemblies are provided because they include both station outlets/inlets and portions of the distribution piping. As such, a reasonable argument can be made to support blowing down the piping either before or after the installation of the manufactured assembly . This revision seeks to further clarify that the blowdown is to occur before installation of station outlets/inlets even when they are supplied as part of a manufactured assembly as they are required to be blown down in accordance with 5.1.6.1 and 5.1.6.1.2. The proposed definition of 'pre-manufactured rough-in assembly' was not accepted. The revision moves the list of examples to a new Annex A note.



Public Input No. 233-NFPA 99-2021 [Section No. 5.1.12.2.3.2]

5.1.12.2.3.2

Initial pressure tests shall be conducted as follows:

- (1) After blowdown of the distribution piping
- (2) After installation of station outlet/inlet rough-in assemblies
- (3) Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, line pressure relief valves, station outlet/inlet primary valves or assemblies)

Statement of Problem and Substantiation for Public Input

Most gas outlet front bodies are rated for 100 PSI and should therefore be excluded from the system to conduct the initial pressure test according to this provision. However, in our experience, we commonly find that this has not been followed resulting in damaged seals within the front bodies. This revision seeks to further clarify the existing requirement.

Submitter Information Verification

Submitter Full Name: Travis Webb

Organization: Modular Services Company

Street Address:

City:

State:

Zip:

Submittal Date: Wed May 26 15:04:47 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1074-NFPA 99-2021

Statement: Most gas outlet front bodies are rated for 100 PSI and should therefore be excluded from the system to conduct the initial pressure test according to this provision. The revision relocates the example list to Annex A per the Manual of Style.



Public Input No. 336-NFPA 99-2021 [Section No. 5.1.12.2.3.3]

5.1.12.2.3.3

The source shutoff valve shall remain closed during the tests specified in 5.1.12.2.3.

A.5.1.12.2.3.3

This requirement is meant to apply to entirely new medical gas and vacuum systems. The intent is not to shut the source valve for anything other new installations or when systems are not being used for patient care.

Open to wording on this one.

Statement of Problem and Substantiation for Public Input

To clarify that the source valve shouldn't be closed when installing and connecting to existing systems. Should be obvious, but it comes up now and again.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 15:17:10 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The issue of isolating old work from new work during the initial pressure test is more complex than the revision would allow.



Public Input No. 338-NFPA 99-2021 [Section No. 5.1.12.2.3.5]

5.1.12.2.3.5*

The test pressure shall be maintained:

(1) until each joint has been examined for leakage by means of a leak detectant that is safe for use with oxygen and does not contain ammonia.

(2) for at least (2?) hours thereafter to prove no leaks exist in the piping

Statement of Problem and Substantiation for Public Input

This pressure test is to be witnessed under the "Inspection" section of the code. The test as is does not allow for an easy way for a third party to witness the test as written. This change allows for a more common pressure test to be witnessed and signed off by the "Inspector." I'm open the duration as this should be tied to some industry standard.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 15:20:30 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The submitter did not provide technical justification for the two hour criterion. Additionally the word thereafter implies in perpetuity.

**Public Input No. 268-NFPA 99-2021 [Section No. 5.1.12.2.6.5]****5.1.12.2.6.5***

The allowable leakage over the 24-hour test ~~shall not exceed 0.5 percent~~ shall not exceed a percent (to be determined) of the starting pressure [~~e.g., 2 kPa (0.3 psi) starting at 415 kPa (60 psig)~~], ~~except~~ with consideration of the volume being tested, except that attributed to specific changes in ambient temperature.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Copy_of_LEAK_RATE_CALC_20_FT_0.50_and_2.00_INCH_PIPE.xls	leak rate comparision	

Statement of Problem and Substantiation for Public Input

Same as described for vacume in section 5.1.12.2.7.5. That is negative pressure and this is positive pressure but both are dependent on volume that is calculated and shown in the uploaded file in the previous section.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 269-NFPA 99-2021 [Section No. 5.1.12.2.7.5]	

Submitter Information Verification

Submitter Full Name: Sunil Parikh
Organization: Tri-Tech Medical, Inc.
Affiliation: Mr. Jim Lucas
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 28 14:16:26 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The phrase "to be determined" is not permitted in the code. The submitter did not provide the percentage needed to make the requirement enforceable.

LEAK RATE CALCULATOR POSITIVE PRESSURE SYSTEMS

TEST PIECE

TEST DATE: CALCULATION ONLY

CALC DATE 5/28/2021

REF: DATA FOR TESTING 20 FT OF 2" NOMINAL TYPE K COPPER TUBE (1.959 ID)

START TEST	PSIG		PSI ABSOLUTE		ATMOSPHERES
		60		74.7	5.08163
END TEST	PSIG		PSI ABSOLUTE		ATMOSPHERES
		59.7 .5% DROP		74.40000	5.06122449
TEST PIECE	NOT PRESSURIZED		CC START TEST		CC END TEST
VOLUME CC		11863.25 CALC*		60284.68149	60042.57433
					TOTAL CC DELTA
					242.1071546
TEST DURATION			TEST DURATION MINUTES		TEST DURATION SECONDS
HOURS		24		1440	86400
LEAK RATE	CC/SEC		CC/MIN		
		0.00280217		0.16812997	
		2.80E-03		1.68E-01	

* NOTE- INTERNAL VOLUME INCLUDES THE FOLLOWING:

**Public Input No. 269-NFPA 99-2021 [Section No. 5.1.12.2.7.5]****5.1.12.2.7.5***

The allowable leakage over the 24-hour test shall not exceed ~~0.5 percent~~ a percent of the starting pressure [~~e.g., 0.3 mm (0.125 in.) HgV starting at 635 mm (25 in.) HgV~~] with consideration of the volume being tested, except that attributed to specific changes in ambient temperature.

Additional Proposed Changes

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Copy_of_LEAK_RATE_CALC_20_FT_0.50_and_2.00_INCH_PIPE.xls	Leak rate comparision 1/2" v/s. 2" dia pipe with volumes.	

Statement of Problem and Substantiation for Public Input

at present 0.5 percent of the pressure drop which relates to the leak rate or flow rate out in the atmosphere or decrease in volume in the closed piping system is dependent on volume of the trapped gas and any leaks will depend on the pipe size and when testing compound piping system that has multiple sizes of the pipes, bends, elbows, Y's, T's etc. with brazed joints and especially number of outlet terminals each with allowavel leaks of .006 cc/sec that is 518.4 cc in 24hrs. or a ballon or ball equivalent of 10 cm or 4" dia. The example calculation of leak rate of 1/2" pipe and 2" pipe is uploaded in excel file formate and that indicated 10 times difference of leak rate for small volume to large volume.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 268-NFPA 99-2021 [Section No. 5.1.12.2.6.5]	

Submitter Information Verification

Submitter Full Name: Sunil Parikh
Organization: Tri-Tech Medical, Inc.
Affiliation: Mr. Jim Lucas
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 28 14:44:31 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is unenforceable. No technical substantiation has been provided

as to why the proposed calculation method is preferred over the current requirement.

LEAK RATE CALCULATOR POSITIVE PRESSURE SYSTEMS

TEST PIECE

TEST DATE: CALCULATION ONLY

CALC DATE 5/28/2021

REF: DATA FOR TESTING 20 FT OF 2" NOMINAL TYPE K COPPER TUBE (1.959 ID)

START TEST	PSIG		PSI ABSOLUTE		ATMOSPHERES
		60		74.7	5.08163
END TEST	PSIG		PSI ABSOLUTE		ATMOSPHERES
		59.7 .5% DROP		74.40000	5.06122449
TEST PIECE	NOT PRESSURIZED		CC START TEST		CC END TEST
VOLUME CC		11863.25 CALC*		60284.68149	60042.57433
TEST DURATION			TEST DURATION MINUTES		TEST DURATION SECONDS
HOURS		24		1440	86400
LEAK RATE	CC/SEC		CC/MIN		
		0.00280217		0.16812997	
		2.80E-03		1.68E-01	

* NOTE- INTERNAL VOLUME INCLUDES THE FOLLOWING:



Public Input No. 340-NFPA 99-2021 [Section No. 5.1.12.3.2.1]

5.1.12.3.2.1

The initial pressure tests ~~performed~~ and cross connection tests performed by the installing contractor shall be witnessed by an ASSE 6020 inspector, an ASSE 6030 verifier, or 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 5.1.12.4.

Statement of Problem and Substantiation for Public Input

The cross connection test is THE most important test that is conducted on the medical gas and vacuum systems. It prevents the wrong gas being connected to the wrong outlet/inlet. This should be witnessed by the inspector with the initial pressure test. They can usually be conducted at the same time and allows for independent validation that the test was completed. This test is often omitted by installers if it is a project that requires a quick turnaround.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 15:25:28 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The code already has provisions in place for verification of these tests. The revision is repetitious and unnecessary. Additional verification of the test is not required.



Public Input No. 216-NFPA 99-2021 [New Section after 5.1.12.3.2.2]

TITLE OF NEW CONTENT

Add new 5.1.12.3.2.3 All pipeline floor, wall, ceiling pipeline penetrations shall be inspected for required fire stopping according to code.

Statement of Problem and Substantiation for Public Input

Correct inspection for the required fire stopping of floor, wall, ceiling pipeline penetrations can only be accomplished before the piping systems are concealed.

The best opportunity for this inspection is during the initial inspections of the ASSE 6020 Inspector.

Submitter Information Verification

Submitter Full Name: Edward Lyczko
Organization: The Cleveland Clinic
Affiliation: Current voting alternate member of NFPA 99 HEA-PIP working Group
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 24 11:07:46 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: Firestopping should be inspected by a qualified inspector. ASSE 6020 inspectors are not necessarily so qualified.



Public Input No. 258-NFPA 99-2021 [Section No. 5.1.12.4.7.5]

5.1.12.4.7.5

The test shall be performed with the use of oil-free, dry nitrogen NF.

Statement of Problem and Substantiation for Public Input

this should be eliminated, it is contradicting to 5.1.12.4.1.2 and 5.1.12.4.1.9

Submitter Information Verification

Submitter Full Name: edward albrycht

Organization: O E Meyer

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 28 10:06:12 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The submitter's intent is unclear. The submitter might consider revising the submittal to add source gas or system gas as permitted and not eliminate nitrogen NF. Additional technical substantiation would be helpful. The provision does not contradict the paragraphs cited.



Public Input No. 341-NFPA 99-2021 [Section No. 5.1.12.4.8 [Excluding any Sub-Sections]]

For each medical gas system, the purity of the piping system shall be verified in accordance with 5.1.12.4.8.

Form a task group to determine if these tests are still valid and if there should be other contaminant testing that should be added for the current chemicals being used to clean tubing for oxygen / medical gas service. I'm happy to volunteer for the task group.

Statement of Problem and Substantiation for Public Input

These tests have been in the code for a long time and I am unsure if they are still valid. My understanding is that piping used to be cleaned with refrigerants and those processes have changes significantly over the years. Since there have been runs of contaminated tubing directly from manufacturer's (I have been involved with a few and some within the last year), we should be testing the piping purity to detect the existence of these chemicals in the tubing. Maybe CGA could help since the CGA G-4.1 standard is referenced along with the ASTM B819 standard.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 15:31:25 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: No revision was provided in the public input.



Public Input No. 259-NFPA 99-2021 [Section No. 5.1.12.4.10.1]

5.1.12.4.10.1

Tests shall be performed with the gas of system designation or the operating vacuum._

(1) Test equipment shall be corrected for gas density with a means to test to standardized conditions of temperature and pressure.

(2) Pressure gauge(s) / transducer(s) shall have a accuracy and resolution of +- (7kPa (+-1.0 psig) or better fro positive pressure gasses

(3) Vacuum gauge(s) / transducer(s) shall have an accuracy and resolution of +- 25mm (1 inch) of mercury

Statement of Problem and Substantiation for Public Input

There is currently no standardization between verifiers. This will clarify the accuracy of the equipment for testing to the system design.

Submitter Information Verification

Submitter Full Name: edward albrycht

Organization: O E Meyer

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 28 10:07:56 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The level of precision being proposed is not warranted.



Public Input No. 366-NFPA 99-2021 [Section No. 5.1.12.4.10.5]

5.1.12.4.10.5

Oxygen and medical air outlets serving Category 1 space shall allow a transient flow rate of 170 SLPM (6 SCFM) for 3 seconds and a pressure drop of not more than 70 kPa (10 psi) gauge .

Statement of Problem and Substantiation for Public Input

I assume that this section of code was intended to accommodate the potential use of ventilators in Category 1 spaces. Most ventilators require a minimum pressure of roughly 30-40 psi (depending on the manufacturer) to operate. Why not set a minimum requirement for the operational pressure/flow test to insure proper ventilator operation in that zone by way of adequate pipe sizing.

Submitter Information Verification

Submitter Full Name: Kyle Jussel

Organization: Medical Air Testing & Service, Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 23:56:31 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1059-NFPA 99-2021

Statement: Most ventilators require a minimum pressure of roughly 30-40 psi (depending on the manufacturer) to operate. The revision sets a minimum requirement for the operational pressure/flow test to insure proper ventilator operation in that zone by way of adequate pipe sizing.



Public Input No. 187-NFPA 99-2021 [New Section after 5.1.12.4.14.6]

New 5.1.12.5 EOSC. The proper functioning of the Emergency Oxygen Supply Connection shall be tested.

Statement of Problem and Substantiation for Public Input

One of the experiences of COVID has been that many facilities had to rely on these EOSC connections. However, it was also discovered that many had never been used or even tested. It makes sense that the Verifier confirm that the connection is operational before a system is put into operation.

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 12:58:55 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is unenforceable and needs additional detail as to the type of testing required.



Public Input No. 355-NFPA 99-2021 [Section No. 5.1.13.3.7.4]

5.1.13.3.7.4

Instrument air sources shall be of either of the following formats: At least two compressors ~~One compressor and a standby header complying with 5.1.3.5.9~~

Statement of Problem and Substantiation for Public Input

We should eliminate the medical air reserve header option. It is not allowed by the FDA and is not a good option anymore since we changed the min. compressor pressure and standard operating pressure requirements.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 31 16:39:04 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Instrument air is not under the purview of the FDA. The committee would like to review the FDA criteria and believes the current provision is FDA compliant.



Public Input No. 270-NFPA 99-2021 [New Section after 5.1.14.2.2]

Add annex material for:

5.1.14.2.2

The Responsible Facility Authority's plan shall include processes to assure at least the following:

(2) Alternative supply or adjustments in patient care arrangements are in place prior to system interruption, including monitoring, as appropriate, of the work being performed and the alternate arrangements in use

A.5.1.14.2.2(2)

Recommendations for alternative medical gas & vacuum supply or adjustments in patient care arrangements of piped medical gas & vacuum systems during emergency operations, as defined in Chapter 12 Emergency Management 12.5.3.3.6.5* Essential Utilities and Systems, can be found in

A.5.1.14.2.2.(2)(a)

A.5.1.14.2.2.(2)(a)

General

During the Covid-19 Pandemic, there has been a significant increase in medical oxygen use for treating patients in healthcare facilities, with some hospitals seeing monthly oxygen usage increased well in excess of 200% (In some cases > 500%) of standard demand usage.

To assist healthcare facilities to plan for alternative medical gas or adjustments in patient care arrangements of piped medical gas systems during emergency operations, below are some system variables to include in the facility's MGVS risk assessment and checklists for an Medical Gas & Vacuum Systems.

Risk assessment

A risk assessment should be conducted by the health care facility's governing body to assist in the development of an MGVS to produce a safe and practical design and ensure that a safe supply of MG & Vacuum is available for patient use at all times. Limitations and vulnerability of the primary, sand reserve MGVS supplies will be critical factors in determining and planning both the type and the means of emergency supplies required and needed for the patient care.

A few Oxygen Supply Systems Variables that should be included in the MGVS risk assessment are:

- Patient Acuity
- Purity requirements,
- Design flow,
- Daily use patterns,
- Duration of demand (Low, Normal, Peak, 1 hr, 8 hrs, 24 hrs, > 24 hrs)
- Use pressure,
- Existing Distribution System Design, Performance Rating & Condition
- Existing Supply System Design, Performance Ratings & Condition
- Back up requirements,
- Oxygen Therapy Equipment requirements (flowmeters, nasal cannulas, masks, High Flow Nasal Cannula, HF Oscillating Ventilators, and CPAP Hoods, etc)
- Impact of Modifications to existing systems,

- Utilities available,
- Power costs,
- Customer locations,
- Site preparation,
- Planned utilization,
- Safety,
- Training and
- Monitoring

The primary concern is to ensure that an adequate supply of oxygen is available for patient use. The facility's risk management team should work closely with their medical gas suppliers to assess the effectiveness of the management of medical oxygen supplies, how adequate the supply of oxygen is at the facility, and ensure that no changes or other conditions impact the security of the oxygen supply system. Supplier management arrangements should be part of the risk assessment review and be validated to ensure that they can be met. These processes should be clearly documented within the facility's operational policy and procedures and enforced by the Responsible Facility Authority (RFA).

COVID-19 learnings: (Insert a Trouble Shooting Chart – "Problem – Cause – Solution" for the items below)

- Alarms Activation
 - Area Alarms
 - Low Line pressure
 - High Line Pressure
 - Master Alarms
 - Main Supply Low Contents (Liquid Level Low/Low Pressure)
 - Reserve In Use
 - Low Reserve (Reserve Liquid Low/Reserve Supply Low Contents)
 - Reserve Failure (Reserve Low Pressure)
- Distribution System line pressure/flow drop
 - Design, Ratings & Capacity
 - Gas Supply
- Primary Medical Gas Supply
 - Primary Tank Storage - Rating, Capacity, Design & Operation
 - Reserve Tank Storage - Rating, Capacity, Design & Operation

- Vaporizer(s) - Rating, Capacity, Design, Operation & Maintenance
- Control Cabinet (Regulator Station) - Rating, Capacity, Design, Operation & Maintenance
- Reorder Points
- Site Location
- Emergency Supply Connections
 - Tie in Locations
 - Design & Operation
- Temporary or Alternate Care Sites
 - Primary Supply – Design, Location, Installation
 - Primary Supply - Rating, Capacity & Operation
- Ancillary MGVS Equipment & Supplies
 - Oxygen carts,
 - Regulators,
 - MG Hoses,
 - Cylinder storage cabinets,
 - Monitor of gas supply

Checklist for planning/expanding/installing/upgrading - MGVS for Emergency Management Response:

- (1) Cryogenic Fluid Oxygen Supply System
- (2) Other Fluid MG Supply Systems
- (3) HP or LC Manifold Supply Systems
- (4) Medical Compressed Air Systems
- (5) Medical-Surgical Vacuum Systems
- (6) Waste Anesthetic Gas Disposal Systems

Check lists to include:

- MGVS Risk Assessment
- MGVS Emergency Management Policy
- Existing System design, ratings, capacity, and operations
- Base Line Testing
- Delivery frequency

- [Calculating consumption](#)
- [Age of current system](#)
- [Design and procurement of systems/equipment](#)
- [Siting of system and the site survey](#)
- [Cost Factors](#)
- [Temporary supply, system shutdown & provisions](#)
- [Project Management](#)
- [Documentation & Paperwork](#)
- [Health and safety](#)
- [Pre-Installation Preparation](#)
- [Installation](#)
- [Post – Installation Review](#)
- [Training](#)
- [Maintenance](#)
- [Follow-up](#)

(OPTIONAL ITEMS FOR DISCUSSION)

Medical Gas Pipeline Design (links or Guidelines)

MGVS Maintenance during Emergency Management Conditions (Links or Guidelines)

Statement of Problem and Substantiation for Public Input

During Covid-19, hospitals, engineers, contractors, and suppliers had a difficult time understanding the impact to the existing medical gas & vacuum systems limitations and solutions needed to support patient care, especially the oxygen system. The public input is an attempt to put in some language, recommendations and links to assist hospitals, their risk assessment and Emergency Management teams.

Submitter Information Verification

Submitter Full Name: Keith Ferrari

Organization: Praxair, Inc./Linde

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 28 14:57:48 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The PI does not include specific code language. A task group has been appointed to review lessons learned from the pandemic and provide recommendations as needed for

the next revision cycle.



Public Input No. 374-NFPA 99-2021 [Section No. 5.1.14.4.2.4]

5.1.14.4.2.4 Maintenance Schedules.

Scheduled maintenance for equipment and procedures shall be established through the risk assessment of the facility and developed with consideration of the original equipment manufacturer recommendations and other recommendations as required by the authority having jurisdiction.

5.1.14.4.2.5 Emergency Operations Plan.

An emergency operations plan for the unplanned loss of critical medical gas and vacuum systems shall be established through the risk assessment of the facility and developed with consideration of the original equipment manufacturer recommendations and other recommendations as required by the authority having jurisdiction.

Statement of Problem and Substantiation for Public Input

Adds the expectation that an EOP shall be developed for these critical utility systems as outlined in other codes, standards, and accreditation requirements.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jun 01 09:18:31 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Emergency operations plans are addressed by Ch. 12.



Public Input No. 186-NFPA 99-2021 [New Section after 5.2]

New

5.1.15 Emergency Planning. The facility shall develop and maintain emergency preparedness in respect of their medical gas systems in accordance with Chapter 12

Statement of Problem and Substantiation for Public Input

This reminds the facility of their obligations under Chapter 12, (notably 12.5.3.3.6.5 (9)) and connects the RFA's responsibilities described in 5.1.14.1.2 to Chapter 12.

Submitter Information Verification

Submitter Full Name: Mark Allen

Organization: Beaconmedaes

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 12:51:45 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: A pointer to Ch. 12 in Ch. 5 is not needed.



Public Input No. 375-NFPA 99-2021 [Section No. 5.2.1.2]

5.2.1.2

Category 2 piped gas or piped vacuum system requirements shall be permitted when all of the following criteria are met:

- (1) ~~Only moderate~~ Any level of sedation (as defined in 3.3.68.3), ~~minimal sedation (as defined in 3.3.68.4), or no sedation is performed. Deep sedation and general anesthesia shall not~~ shall be permitted.
- (2) The loss of the piped gas or piped vacuum systems is likely to cause minor injury to patients, staff, or visitors.
- (3) The facility piped gas or piped vacuum systems are intended for Category 2 patient care space per 3.3.140.2.

Statement of Problem and Substantiation for Public Input

This clarifies that deep sedation and general anesthesia is allowed in ambulatory health care facilities. Category 2 systems have employed in these setting for many years and these facilities are indeed performing procedures that required deep sedation and/or general anesthesia.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jun 01 09:22:07 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Category 2 piping systems are intended for procedures in which failure would cause minor injury to the patient. Ambulatory surgical centers, depending on the procedures, may or may not be Category 2 based on the required risk assessment.



Public Input No. 367-NFPA 99-2021 [New Section after 5.3.14]

5.4 Category 4 Piped Gas and Vacuum Systems.

5.4.1 Applicability

5.4.1.1 These requirements shall apply to health care facilities that require Category 4 systems as referenced in Chapter 4.

5.4.1.2 Category 4 piped gas and vacuum system requirements shall be applied where any of the following criteria is met:

- (1) The loss of the piped gas or piped vacuum system would have no impact on patient care.
- (2) These systems shall serve laboratories in health care facilities only and shall not serve patient care spaces.

A task group has been formed to review the requirements that would be appropriate for these systems.

Statement of Problem and Substantiation for Public Input

There have been requirements for piped gases and vacuum in a laboratory setting within the health care facility in the past. These systems are not currently required to meet any location or ventilation requirements. The minimum safeguards for these systems should be brought back into the code.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jun 01 08:14:27 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Categories are not occupancy specific.



Public Input No. 271-NFPA 99-2021 [Section No. 15.1 [Excluding any Sub-Sections]]

This chapter shall apply to dental health care facilities that qualify to install dental gas and vacuum piping systems.

Numbering:

Change the numbering so that the chapter 15 dental categories line up with the numbering.

i.e. Category 1 to be 15.1, category 2 to be 15.2, and category 3 to be 15.3

Statement of Problem and Substantiation for Public Input

In chapter 5, it was easy to determine the category we referenced because the categories lined up with the numbering. 5.1, 5.2, and 5.3

Please find a way to renumber the chapter to align the categories with the numbering.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 28 17:18:49 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is not editorial and will require review of the technical requirements.



Public Input No. 272-NFPA 99-2021 [New Section after 15.1.1]

TITLE OF NEW CONTENT:

Move all chapter 5 references to Chapter 15, and change any wording to reflect dental terminology.

Statement of Problem and Substantiation for Public Input

Since the establishment of chapter 15, there is a new focus from the dental industry to NFPA Code Compliance.

- 1) There is a better understanding of the code as the "medical confusion" has been reduced by no longer being interlaced and confused with the dental requirements.
- 2) The "typical" dental users of this code is less likely to "follow the bread crumbs" and flip from 15, to 5.2 and sometimes then again to 15.1. As a result, compliance with anything referenced in chapter 5 is less likely to be complied with.
- 3) This also applies to the 6010's and 6030's who are still a bit confused with Chapter 5 & 15 relationships.
(There have been numerous examples of this confusion that has brought about this suggestion.)
(Suggesting a task group be assigned to do this, or the correlating committee?)

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 28 17:21:48 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The public input is not editorial and will require review of the technical requirements.



Public Input No. 284-NFPA 99-2021 [Section No. 15.1.1]

15.1.1

Category 1 dental piped gas and piped vacuum system requirements shall be applied in facilities where general anesthesia and deep sedation is performed, as defined in 3.3.68.1 and 3.3.68.2 or where the loss of the piped gas or vacuum system is likely to cause major injury or death of patients, staff or visitors in accordance with the Risk Assessment required by Paragraph 4 . 2.1.1.

Statement of Problem and Substantiation for Public Input

15.1.1, 15.1.2 and 15.1.3 each identify the System Category based only on the type of sedation being performed with no consideration for a risk assessment. This contradicts the requirement in 4.2.1.1 for the governing body to conduct a risk assessment to determine the risk category. Chapter 5 addresses this for each Category by including risk language, e.g. 5.1.1.2 (2) identifies the risk consideration as well as the type of sedation which will require that Category 1 be applied. Recommend adding similar language to 15.1.1, 15.1.2 and 15.1.3 to ensure the full risk to patient, staff and visitors is considered in the selection of the system category. The NFPA 99 transition to a risk-based approach which began in 2012 should be consistently applied to all facility types whether medical or dental. In June 2019, the piping committee discussed this general issue and recommended adding the sentence "Facilities which meet the risk criteria of Category 1 in Chapter 4 shall meet Category 1 in chapter 5" to 15.1.1 however it was not incorporated as it was considered new business that could not be addressed until the 2021 version.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 285-NFPA 99-2021 [Section No. 15.1.2]	
Public Input No. 286-NFPA 99-2021 [Section No. 15.1.4]	
Public Input No. 290-NFPA 99-2021 [New Section after 15.3.3.5.1.2]	

Submitter Information Verification

Submitter Full Name: David Braidich
Organization: US Army Corps of Engineers
Street Address:
City:
State:
Zip:
Submittal Date: Sat May 29 15:39:32 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: [CI-1075-NFPA 99-2021](#)

Statement: The committee input is intended to clarify the structure and alignment of Ch. 15 and to solicit public comments from other interested parties. A task group has been appointed to further study this issue and provide recommendations for the second draft.



Public Input No. 285-NFPA 99-2021 [Section No. 15.1.2]

15.1.2

Category 2 dental piped gas and piped vacuum system requirements shall be applied in facilities where only moderate and minimal sedation is performed, as defined in 3.3.68.3 and 3.3.68.4 or where the loss of the piped gas or piped vacuum systems is likely to cause minor injury to patients, staff or visitors .

Statement of Problem and Substantiation for Public Input

15.1 .1, 15.1 .2 and 15.1 .3 each identify the System Category based only on the type of sedation being performed with no consideration for a risk assessment. This contradicts the requirement in 4.2.1.1 for the governing body to conduct a risk assessment to determine the risk category. Chapter 5 addresses this for each Category by including risk language, e.g. 5.1 .1.2 (2) identifies the risk consideration as well as the type of sedation which will require that Category 1 be applied. Recommend adding similar language to 15.1.1, 15.1.2 and 15.1.3 to ensure the full risk to patient, staff and visitors is considered in the selection of the system category. The NFPA 99 transition to a risk-based approach which began in 2012 should be consistently applied to all facility types whether medical or dental.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 284-NFPA 99-2021 [Section No. 15.1.1]</u>	related

Submitter Information Verification

Submitter Full Name: David Braidich
Organization: US Army Corps of Engineers
Street Address:
City:
State:
Zip:
Submittal Date: Sat May 29 15:48:54 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: CI-1075-NFPA 99-2021

Statement: The committee input is intended to clarify the structure and alignment of Ch. 15 and to solicit public comments from other interested parties. A task group has been appointed to further study this issue and provide recommendations for the second draft.



Public Input No. 286-NFPA 99-2021 [Section No. 15.1.4]

15.1.4 –

~~A single facility shall be permitted to include dental gas and vacuum systems for more than one category of dental piped gas and vacuum systems.~~

Statement of Problem and Substantiation for Public Input

15.1.4 indicates that a facility is permitted to include more than 1 category of dental piped gas and vacuum system but the system category is currently determined prescriptively for all systems in 15.1, 15.2, and 15.3. i.e. the level of sedation determines the system category for all systems. Therefore only 1 system category would be provided in a given facility. Recommended deleting 15.1.4 as it contradicts the structure of 15. This recommendation would be void if Public Inputs No. 284 and 285 are addressed to make the system categories risk based and not prescriptive, enabling each systems Category to be individually determined.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 284-NFPA 99-2021</u> <u>[Section No. 15.1.1]</u>	Incorporation of 284 and 285 would make 286 unnecessary.

Submitter Information Verification

Submitter Full Name: David Braidich
Organization: US Army Corps of Engineers
Street Address:
City:
State:
Zip:
Submittal Date: Sat May 29 15:57:27 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: CI-1075-NFPA 99-2021

Statement: The committee input is intended to clarify the structure and alignment of Ch. 15 and to solicit public comments from other interested parties. A task group has been appointed to further study this issue and provide recommendations for the second draft.



Public Input No. 145-NFPA 99-2021 [New Section after 15.3.2.1.2]

15.3.2.1.2.1 Alternate Power Required

Category 1 sources shall be provided with an alternate power source to maintain the source equipment operation in the event of a power loss. The alternate power source shall be capable of continued operation of the source equipment for sufficient time to complete any procedure in progress, or 90 minutes, whichever is longer.

Statement of Problem and Substantiation for Public Input

For small dental surgical centers it may not be feasible for a full Genset to be installed. New wording would allow for appropriately sized in-office battery back up to be installed.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 12:14:56 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is inherent in the definition of Category 1. Ch. 15 can designate where power is required. The proposed revision is too vague. Ch. 15 can specify where illumination or emergency power is required and how it's done is in accordance with Ch. 6.



Public Input No. 196-NFPA 99-2021 [New Section after 15.3.2.1.2]

15.3.2.1.2.1

Alternate Power Required

Category 1 sources shall be provided with an alternate power source to maintain the source equipment operation in the event of power loss. An alternate power source shall be capable of continued operation of the source equipment for sufficeient time to bring a patient around, and at least temporarily stabilize the patient, or even complete the proceedures in progress, or 90 minutes, whichever is longer.

Statement of Problem and Substantiation for Public Input

Two issues:

- 1) Most all of the chapter 15, category 1 installations are in facilities that do not allow or would be very challenging to install a generator with the fuel. This allows for a battery back up system and sets a minimum time of operation.
- 2) since the procedures are always on healthy patients coming in for elective procedures, the time I've surveyed is for 30-45 minutes to wrap up current procedures, (not starting new ones), and since the patients do not remain for extended care or overnight, 90 minutes of back-up power is more than enough. We also ALLOW for longer, we are establishing a minimum for the first time in the dental document.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 15:03:46 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The proposed revision is inherent in the definition of Category 1. Ch. 15 can designate where power is required. The proposed revision is too vague. Ch. 15 can specify where illumination or emergency power is required and how it's done is in accordance with Ch. 6.

**Public Input No. 280-NFPA 99-2021 [Section No. 15.3.2.1.5]****15.3.2.1.5 Medical Air Supply Systems.**

Category 1 systems shall comply with 5.1.3.6, ~~except as follows:~~

- ~~Medical air compressors, dryers, aftercoolers, filters, and regulators shall be permitted to be simplex.~~
- ~~The facility staff shall develop their emergency plan to deal with the loss of medical air.~~

Statement of Problem and Substantiation for Public Input

Recommend deleting subparagraphs (1) and (2) in 15.3.2.1.5, 15.3.2.1.7 and 15.3.2.1.8. The subparagraphs reduce the system redundancy standard for Medical Air, Medical Surgical Vacuum and WAGD in comparison with Chpt 5. These category 1 medical gas systems are predicated on the same level of sedation as would be assumed in Chpt 5. The inclusion of these exceptions lowers the system requirements simply based on the facility type (dental vs medical) and not based on a risk assessment. The same patient/staff/visitor risk should result in the same redundancies whether medical or dental. Notably the purpose of Medical Air is for human respiration and therefore the safety features should not be reduced for category 1 regardless of the building type. Also, the functionality (or failure of) a WAGD system is as much a risk to the staff as it is to the patient and therefore the redundancy feature for Cat 1 should be the same for Chpt 5 or Chpt 15.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 281-NFPA 99-2021 [Section No. 15.3.2.1.7]	
Public Input No. 282-NFPA 99-2021 [Section No. 15.3.2.1.8]	

Submitter Information Verification

Submitter Full Name: David Braidich
Organization: US Army Corps of Engineers
Street Address:
City:
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Submittal Date: Sat May 29 15:03:07 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: CI-1075-NFPA 99-2021

Statement: The committee input is intended to clarify the structure and alignment of Ch. 15 and to solicit public comments from other interested parties. A task group has been appointed to further study this issue and provide recommendations for the second draft.



Public Input No. 281-NFPA 99-2021 [Section No. 15.3.2.1.7]

15.3.2.1.7 Medical–Surgical Vacuum Systems.

Category 1 systems shall comply with 5.1.3.7, ~~except as follows:~~

- ~~Medical–surgical vacuum systems shall be permitted to be simplex.~~
- ~~The facility staff shall develop their emergency plan to deal with the loss of medical–surgical vacuum.~~

Statement of Problem and Substantiation for Public Input

Recommend deleting subparagraphs (1) and (2) in 15.3.2.1.5, 15.3.2.1.7 and 15.3.2.1.8. The subparagraphs reduce the system redundancy standard for Medical Air, Medical Surgical Vacuum and WAGD in comparison with Chpt 5. These category 1 medical gas systems are predicated on the same level of sedation as would be assumed in Chpt 5. The inclusion of these exceptions lowers the system requirements simply based on the facility type (dental vs medical) and not based on a risk assessment. The same patient/staff/visitor risk should result in the same redundancies whether medical or dental. Notably the purpose of Medical Air is for human respiration and therefore the safety features should not be reduced for category 1 regardless of the building type. Also, the functionality (or failure of) a WAGD system is as much a risk to the staff as it is to the patient and therefore the redundancy feature for Cat 1 should be the same for Chpt 5 or Chpt 15.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 280-NFPA 99-2021 [Section No. 15.3.2.1.5]	related

Submitter Information Verification

Submitter Full Name: David Braidich
Organization: US Army Corps of Engineers
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Submittal Date: Sat May 29 15:07:58 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: CI-1075-NFPA 99-2021

Statement: The committee input is intended to clarify the structure and alignment of Ch. 15 and to solicit public comments from other interested parties. A task group has been appointed to further study this issue and provide recommendations for the second draft.



Public Input No. 287-NFPA 99-2021 [Section No. 15.3.2.1.7]

15.3.2.1.7—Medical—Surgical— Dental —Surgical Vacuum Systems.

Category 1 systems shall comply with 5.1.3.7, except as follows:

- (1) ~~Medical—surgical—~~ Dental—surgical vacuum systems shall be permitted to be simplex.
- (2) The facility staff shall develop their emergency plan to deal with the loss of ~~medical—surgical—~~ dental—surgical vacuum.

Statement of Problem and Substantiation for Public Input

Recommending changing term “medical surgical vacuum” to Dental Surgical Vacuum. Chapter 15 mentions both Medical Surgical Vacuum and Dental Surgical Vacuum (reference 15.3.3.2.1, 15.3.3.2.3, 15.4.3.2.1, 15.4.3.2.3 etc.) but as the intent of Chpt 15 is only to address dental facilities then recommend only using the Dental Surgical Vacuum term. There is typically no technical difference between these two systems, however only Medical Surgical Vacuum is defined in Chapter 3. Need to also define the term Dental Surgical Vacuum in Chapter 3.

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Submittal Date: Sat May 29 16:06:36 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1077-NFPA 99-2021

Statement: The revision changes the term “medical surgical vacuum” to Dental Surgical Vacuum. Chapter 15 mentions both Medical Surgical Vacuum and Dental Surgical Vacuum (reference 15.3.3.2.1, 15.3.3.2.3, 15.4.3.2.1, 15.4.3.2.3 etc.) but as the intent of Chpt 15 is only to address dental facilities then only the Dental Surgical Vacuum term should be used. There is typically no technical difference between these two systems, however only Medical Surgical Vacuum is defined in Chapter 3. A companion revision adds the term 'Dental Surgical Vacuum' to Chapter 3.



Public Input No. 282-NFPA 99-2021 [Section No. 15.3.2.1.8]

15.3.2.1.8 WAGD Systems.

Category 1 systems shall comply with 5.1.3.8, ~~except as follows:~~

- ~~(1) Medical WAGD pumps shall be permitted to be simplex.~~
- ~~(2) The facility staff shall develop their emergency plan to deal with the loss of WAGD.~~

Statement of Problem and Substantiation for Public Input

Recommend deleting subparagraphs (1) and (2) in 15.3.2.1.5, 15.3.2.1.7 and 15.3.2.1.8. The subparagraphs reduce the system redundancy standard for Medical Air, Medical Surgical Vacuum and WAGD in comparison with Chpt 5. These category 1 medical gas systems are predicated on the same level of sedation as would be assumed in Chpt 5. The inclusion of these exceptions lowers the system requirements simply based on the facility type (dental vs medical) and not based on a risk assessment. The same patient/staff/visitor risk should result in the same redundancies whether medical or dental. Notably the purpose of Medical Air is for human respiration and therefore the safety features should not be reduced for category 1 regardless of the building type. Also, the functionality (or failure of) a WAGD system is as much a risk to the staff as it is to the patient and therefore the redundancy feature for Cat 1 should be the same for Chpt 5 or Chpt 15.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
<u>Public Input No. 280-NFPA 99-2021 [Section No. 15.3.2.1.5]</u>	related

Submitter Information Verification

Submitter Full Name: David Braidich
Organization: US Army Corps of Engineers
Street Address:
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Submittal Date: Sat May 29 15:11:01 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: CI-1075-NFPA 99-2021

Statement: The committee input is intended to clarify the structure and alignment of Ch. 15 and to solicit public comments from other interested parties. A task group has been appointed to further study this issue and provide recommendations for the second draft.



Public Input No. 146-NFPA 99-2021 [Section No. 15.3.2.7]

15.3.2.7 Warning Systems.

Warning systems associated with Category 1 systems shall provide the master, area, and local alarm functions of a Category 1 system as required in 5.1.9, except as follows:

- (1) Warning systems shall be permitted to be a single alarm panel.
- (2) The alarm panel shall be located in an area of continuous surveillance while the facility is in operation.
- (3) Pressure and vacuum switches/sensors shall be mounted at the source equipment with a pressure indicator at the master alarm panel.
- (4) Shall be provided with an alternate power source to maintain equipment operation in the event of a power loss. The alternate power source shall be capable of continued operation of the warning system for sufficient time to complete any procedure in progress, or 90 minutes, whichever is longer.

Statement of Problem and Substantiation for Public Input

Maintains alarm function with alternate power such as an in-office battery back up.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

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Submittal Date: Mon May 10 12:21:07 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Provision should focus on the desired performance and not on an alternate source.



Public Input No. 189-NFPA 99-2021 [Section No. 15.3.2.7]

15.3.2.7 Warning Systems.

Warning systems associated with Category 1 systems shall provide the master, area, and local alarm functions of a Category 1 system as required in 5.1.9, except as follows:

- (1) Warning systems shall be permitted to be a single alarm panel.
- (2) The alarm panel shall be located in an area of continuous surveillance while the facility is in operation.
- (3) Pressure and vacuum switches/sensors shall be mounted at the source equipment with a pressure indicator at the master alarm panel.
- (4) Shall be provided with an alternate power supply that maintains equipment operation in the event of interruption of power. The alternate power source whsall be capable of supplying power to complete proceedures in process, or 90 minutes or whichever is longer.

Statement of Problem and Substantiation for Public Input

The Chapter 15, category 1 procedures are always on healthy patients coming in for elective procedures. Therefore the time I've surveyed is for 30-45 minutes to wrap up current procedures, and not start new ones, and since the patients do not remain for extended care or overnight, 90 minutes of back-up power is more than enough. We also ALLOW for longer, we are establishing a minimum for the first time in the dental document.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

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City:

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Submittal Date: Tue May 18 13:15:20 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The provision should focus on performance and not on an alternate power source.



Public Input No. 289-NFPA 99-2021 [Section No. 15.3.3.4.1.2]

15.3.3.4.1.2

Dental air outlets shall not be interchangeable with any other gas outlets, ~~including oxygen, nitrous oxide, medical air, instrument air, and nitrogen .~~

Statement of Problem and Substantiation for Public Input

The list of systems deleted appears redundant and unnecessary. Simply stating that. "Dental air shall not be interchangeable with any other outlets." should be sufficient.

Submitter Information Verification

Submitter Full Name: David Braidich

Organization: US Army Corps of Engineers

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Submittal Date: Sat May 29 17:07:41 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1060-NFPA 99-2021](#)

Statement: The list of deleted systems is unnecessary. The revised language should be sufficient.



Public Input No. 150-NFPA 99-2021 [New Section after 15.3.3.4.2.2]

15.3.3.4.2.3 Sources of Compressor Intake Air

Air sources for a compressor(s) located inside the building shall meet the following requirements:

- (1) They shall be located within a space where no chemical based materials are stored or used.
- (2) They shall be located in a space that is not used for patient medical treatment.
- (3) They shall not be taken from a room or space in which there is an open or semi-open discharge from a Dental vacuum or scavenging system.

Statement of Problem and Substantiation for Public Input

Prevents the hazard of the dental air compressor intake potentially drawing in some infectious materials and then sending them into another patient care area.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 12:43:42 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1061-NFPA 99-2021

Statement: The revision reinstates language from previous code editions. This prevents Dental Air compressor air intake being drawn from spaces where infectious air, scavenged nitrous oxide, or other WAGD gasses may be present. This also re-establishes the "Remote Air Intake" requirement.



Public Input No. 197-NFPA 99-2021 [New Section after 15.3.3.4.2.2]

15.3.3.4.2.3

Sources of Dental Air Intake

Dental Air sources for a compressor(s) located inside the building shall meet the following requirements:

- (1) They shall be located within a space where no chemical based materials are stored or used.
- (2) They shall be located in a space that is not used for patient treatment or dental procedures.
- (3) They shall not be taken from a room or space in which there is an open or semi-open discharge from a Dental Vacuum or Dental Scavenging System.
- (4) When the compressor is located in a room with an open or semi-open discharge from a Dental Vacuum or Dental Scavenging System, the air shall be drawn from a remote location such as the building Return Air system.

Statement of Problem and Substantiation for Public Input

Similar words were in previous codes and we need to return them to the code.

This prevents Dental Air compressor air intake being drawn from spaces where infectious air, scavenged nitrous oxide, or other WAGD gasses may be present. This also re-establishes the "Remote Air Intake" clause once again to the code.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

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Street Address:

City:

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Submittal Date: Tue May 18 15:14:50 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1061-NFPA 99-2021

Statement: The revision reinstates language from previous code editions. This prevents Dental Air compressor air intake being drawn from spaces where infectious air, scavenged nitrous oxide, or other WAGD gasses may be present. This also re-establishes the "Remote Air Intake" requirement.



Public Input No. 290-NFPA 99-2021 [New Section after 15.3.3.5.1.2]

Dental vacuum shall comply with the equipment redundancy requirements of 5.1.3.7.

Statement of Problem and Substantiation for Public Input

There are currently no redundancy requirements for a Category 1 Dental Vacuum System (paragraph 15.3.3.5) which is potentially used for nitrous oxide scavenging (per 15.3.3.5.1.1). Since currently there is no required risk assessment for determining the System Categories in Chapter 15 (i.e. the impact of the loss of each system is not individually considered), it is unclear how one can arrive at the conclusion that a Category 1 Dental Vacuum System is never critical and can be lost without impact to the patient/staff/visitor. With chapter 15 currently structured as prescriptive....i.e. per 15.3.1 the System Category is determined only by the level of sedation, then a Category 1 dental vacuum system would need to have redundancies and features similar to Medical Surgical Vacuum in 5.1.3.7 to cover a range of risks.

Related Public Inputs for This Document

<u>Related Input</u>	<u>Relationship</u>
Public Input No. 284-NFPA 99-2021 [Section No. 15.1.1]	Incorporation of a risk based determination of system category could influence how this comment is addressed.

Submitter Information Verification

Submitter Full Name: David Braidich
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Street Address:
City:
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Submittal Date: Sat May 29 17:16:43 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: CI-1075-NFPA 99-2021

Statement: The committee input is intended to clarify the structure and alignment of Ch. 15 and to solicit public comments from other interested parties. A task group has been appointed to further study this issue and provide recommendations for the second draft.



Public Input No. 147-NFPA 99-2021 [New Section after 15.3.3.5.2.2]

15.3.3.5.2.3 Dental Vacuum Exhaust

Dental Vacuum Exhaust shall be one of the following:

___ (1) Exhausted to the outdoors in accordance with manufactures recommendations

___ (2) Filtered and diffused locally with a ULPA filter element capable of retaining 99.95% of particulates

___ (3) If used for Nitrous Oxide Scavenging, exhaust shall discharge outdoors

Statement of Problem and Substantiation for Public Input

Allows for new technology in dental vacuum exhaust piping

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 12:32:40 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1076-NFPA 99-2021

Statement: The revision allows for new technology in dental vacuum exhaust piping.



Public Input No. 165-NFPA 99-2021 [New Section after 15.3.3.5.2.2]

Special Requirements for Dental Vacuum Piping.

Horizontal piping in dental vacuum systems shall be sloped a minimum of 7 mm per 3.05 m (¼ in. per 10 ft) toward the vacuum source equipment.

Horizontal piping shall include no sags or low points that will permit fluids or debris to accumulate.

Accessible cleanouts that are limited to vertical downflow maybe provided where necessary to clear the piping of obstructions.

Dental vacuum inlets shall be capable of a 10 Scfm or greater capacity

Statement of Problem and Substantiation for Public Input

The piping requirements are critical for the long term performance of the dental vacuum system. The requirements were in place but removed in the last three editions.

The 10 Scfm capacity is vital as a 10 Scfm or greater suction has the ability to reduce airborne aerosols from leaving the patients mouth that could place staff at risk of infection.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

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City:

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Submittal Date: Sat May 15 09:38:32 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1062-NFPA 99-2021

Statement: The revision reinstates requirements from previous editions of the code:

1) Dental Vacuum needs a "slope" to the piping and it should never be "level" or less than 1/4" per 10' of pipe. Failure to provide the proper minimum slope, and or allowing dips or sags in the piping can cause failure of the systems.

2) Dental Vacuum cleanouts will clog up and cause vacuum loss if they are located on horizontal sections of the piping. Allowing, not requiring, these cleanouts on vertical risers can prevent this.

3) Three studies from 1971, 2004, and 2020 indicate that 10 cfm of vacuum flow in the oral cavity will remove ALL aerosols and prevent any of the viral and bacterial laden aerosols from escaping into the treatment room around the doctor and staff.



Public Input No. 198-NFPA 99-2021 [New Section after 15.3.3.5.2.2]

15.3.3.5.2.3 Dental Vacuum Exhaust

Dental Vacuum Exhaust shall be one of the following:

- (1) Exhausted to the outdoors in accordance with the manufacturers recommendations.
 - (2) Filtered and diffused locally with a ULPA filter element capable of retaining 99.95% of particulates.
 - (3) If used for Nitrous Oxide Scavenging or WAGD, exhaust shall discharge outdoors.
- _(1) Distance from openings? _____

Statement of Problem and Substantiation for Public Input

Dental Vacuum Exhaust was in previous editions of the code. We are re-establishing this to the code.

- 1) Nitrous Oxide scavenging and WAGD need to be exhausted to the outside of the building
- 2) This allows for new technology in dental vacuum exhaust, when scavenging and WAGD are not present.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

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Submittal Date: Tue May 18 15:24:54 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1076-NFPA 99-2021

Statement: The revision allows for new technology in dental vacuum exhaust piping.



Public Input No. 199-NFPA 99-2021 [New Section after 15.3.3.5.2.2]

15.3.3.5.2.3 Dental Vacuum System Piping, Special Requirements

Special Requirements for Dental Vacuum Piping:

1) Horizontal piping in dental vacuum system shall be sloped a minimum of 7 mm per 3.05 m (1/4" per 10ft) toward the vacuum source equipment.

2) Horizontal piping shall include no sags or low points that will permit fluids or debris to accumulate in the piping.

__ (a) VOIDS in the vacuum piping should be avoided to prevent build up and obstructions.

3) Accessible clean outs limited to vertical down flow may be provided where necessary to clear the piping of obstructions

__ (a) Dental Vacuum clean outs shall not to be installed on horizontal piping.

4) Dental Vacuum inlets shall be capable of 10 scfm or greater flow capacity.

Statement of Problem and Substantiation for Public Input

Most of this information was in previous versions of the code. We are placing them back into the code.

1) Dental Vacuum needs a "slope" to the piping and it should never be "level" or less than 1/4" per 10' of pipe. Failure to provide the proper minimum slope, and or allowing dips or sags in the piping can cause failure of the systems.

2) Dental Vacuum cleanouts will clog up and cause vacuum loss if they are located on horizontal sections of the piping. Allowing, not requiring, these cleanouts on vertical risers can prevent this.

3) three studies from 1971, 2004, and 2020 indicate that 10 cfm of vacuum flow in the oral cavity will remove ALL aerosols and prevent any of the viral and bacterially laden aerosols from escaping into the treatment room around the doctor and staff.

* Should we consider a minimum of 10 cfm for all dental high volume systems? IF so, this would drastically change dental vacuum. We are suggesting that we at least introduce this to start with "capable" instead of "shall be".

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

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Submittal Date: Tue May 18 15:30:57 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1062-NFPA 99-2021

Statement: The revision reinstates requirements from previous editions of the code:

1) Dental Vacuum needs a "slope" to the piping and it should never be "level" or less than 1/4" per 10' of pipe. Failure to provide the proper minimum slope, and or allowing dips or

sags in the piping can cause failure of the systems.

2) Dental Vacuum cleanouts will clog up and cause vacuum loss if they are located on horizontal sections of the piping. Allowing, not requiring, these cleanouts on vertical risers can prevent this.

3) Three studies from 1971, 2004, and 2020 indicate that 10 cfm of vacuum flow in the oral cavity will remove ALL aerosols and prevent any of the viral and bacterial laden aerosols from escaping into the treatment room around the doctor and staff.



Public Input No. 148-NFPA 99-2021 [Section No. 15.3.3.7.2.2]

15.3.3.7.2.2 Pipe.

Pipe under 15.3.3.7.2 shall comply with the following:

- (1) ASTM B88, *Standard Specification for Seamless Copper Water Tube*, Type L or K
- (2) ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, Type L or K
- (3) ASTM B280, *Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*, ACR tube (O.D. size)
- (4) Listed corrugated medical tubing (CMT) fabricated from copper alloy No. 51000 strip, meeting ASTM B103/B103M, Standard Specification for Phosphor Bronze Plate, Sheet, Strip, and Rolled Bar, with a design margin of 3.5, externally coated with a nonmetallic sheath marked with the manufacturer's marking. The listing shall include testing to demonstrate that CMT systems can be consistently gas-purged with results equivalent to comparable medical gas copper tubing.

Statement of Problem and Substantiation for Public Input

Provides for additional material options for dental air.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

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Submittal Date: Mon May 10 12:38:09 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1063-NFPA 99-2021](#)

Statement: The revision provides for additional material options for dental air piping systems.



Public Input No. 149-NFPA 99-2021 [Section No. 15.3.3.7.2.4]

15.3.3.7.2.4 Fittings.

Fittings for piping under 15.3.3.7.2 shall be permitted to be any of the following acceptable joining methods:

- (1) Brazed or soldered fittings conforming to ASME B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings*
- (2) Brazed fittings conforming to ANSI/ASME B16.50, *Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings*
- (3) Brazed fittings conforming to ASME B16.22 with socket depths equal to or greater than braze-joint pressure fittings in compliance with ANSI/ASME B16.50
- (4) Flared fittings conforming to ASME B16.26, *Cast Copper Alloy Fittings for Flared Copper Tubes*
- (5) Compression fittings ($\frac{3}{4}$ in. maximum size)
- (6) Axially swaged meeting the requirements of 5.1.10.7

Statement of Problem and Substantiation for Public Input

Adds additional fitting options.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

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Submittal Date: Mon May 10 12:40:07 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1064-NFPA 99-2021

Statement: The revision provides for additional fitting options.



Public Input No. 67-NFPA 99-2020 [New Section after 15.3.3.7.3.4]

15.3.3.8 Dental Air and Vacuum Systems Testing.

15.3.3.8.1 General.

15.3.3.8.1.1 Inspection and testing shall be performed on all new piped dental gas and vacuum systems, additions, renovations, temporary installations, or repaired systems to ensure, by a documented procedure, that the following have been completed:

(1) All applicable provisions of this code have been adhered to.

(2) System integrity has been achieved or maintained.

(3) Piping systems are ready for testing and verification.

(4) Piping systems are performing in accordance with their design requirements.

15.3.3.8.1.2 The inspection and testing reports shall be submitted directly to the party that contracted for the testing, who shall submit the reports through channels to the responsible authority and any others that are required.

15.3.3.8.1.1.3 Reports shall contain detailed listings of all findings and results.

15.3.3.8.1.1.4 The responsible facility authority shall review the inspection and testing records prior to the use of any systems to ensure that all findings and results of the inspection and testing have been successfully completed before use.

15.3.3.8.1.1.5 All documentation pertaining to inspections and testing shall be maintained on-site within the facility.

15.3.3.8.1.2 Category 2 Dental Air and Vacuum Systems.

N 15.4.8.1.2.1 All Category 2 dental gas and vacuum piping systems indicated in 15.4.3 shall be initially tested in accordance

with 15.4.8.1.

N 15.4.8.1.2.2 The support gas systems and vacuum systems (i.e., dental air, dental vacuum, and scavenging) shall be final tested in accordance with 15.4.8.1.7 and 15.4.8.1.8.

15.3.3.8.2 Initial Testing of Piping Systems.

15.3.3.8.2.1 General.

(A) Where plastic vacuum and plastic scavenging piping systems are installed, they shall be visually inspected for cross-connections to oxygen and nitrous oxide systems before applying positive test pressures to the copper piping systems.

(B) During the process of initial testing, the identification and labeling of the dental gas and vacuum piping shall be checked.

15.3.3.8.2.2 Initial Cross-Connection Test for Plastic Vacuum and Plastic Scavenging Piping Systems.

15.3.3.8.2.3 Plastic piping shall be tested before copper piping.

15.3.3.8.2.4 Tests shall be conducted to determine that no cross-connections exist between any plastic vacuum piping systems or plastic scavenging piping systems and any copper piping systems.

15.3.3.8.2.5 The vacuum or scavenging source shutoff valves for the vacuum or scavenging piping systems shall remain closed during the tests, unless they are being used for the cross connection test vacuum source.

15.3.3.8.2.6 The cross-connection test vacuum shall be a minimum of 300 mm (12 in.) HgV.

15.3.3.8.2.7 The source of test vacuum shall be connected only to the vacuum or scavenging piping system being tested.

15.3.3.8.2.8 All individual gas system outlets and vacuum or scavenging system inlets shall be checked to determine that the test vacuum is only present in the vacuum or scavenging piping system being tested.

15.3.3.8.2.9 The cross-connection tests shall be repeated for each installed vacuum and scavenging system with plastic piping.

15.3.3.8.2.10 Any cross-connections shall be removed and the associated piping repaired and leak tested.

15.3.3.8.2.11 The proper labeling and identification of system outlets/inlets shall be confirmed during the initial tests.

15.3.3.8.2.2 Initial Pressure Test.

15.3.3.8.2.2.1 Each section of the piping in dental air systems and copper vacuum systems shall be pressure tested. Plastic vacuum and plastic scavenging piping shall not be pressure tested.

15.3.3.8.2.2.2 Initial pressure tests shall be conducted as follows:

(1) After installation of station outlet/inlet rough-in assemblies

(2) Prior to the installation of components of the distribution piping system that would be damaged by the test pressure (e.g., pressure/vacuum alarm devices, pressure/vacuum indicators, and line pressure relief valves)

15.3.3.8.2.2.3 The source shutoff valve shall remain closed during the pressure tests.

15.3.3.8.2.2.4 The test pressure for dental air piping and copper vacuum piping shall be 1.5 times the system operating pressure but not less than a gauge pressure of 1035 kPa (150 psi).

15.3.3.8.2.2.5 The test pressure shall be maintained until each joint has been examined for leakage by means of a leak detectant that is safe for use with oxygen and does not contain ammonia.

15.3.3.8.2.2.6 Any leaks shall be located, repaired (if permitted), or replaced (if required) by the installer, and retested.

15.3.3.8.2.2.7 Initial Piping Purge Test.

15.3.3.8.2.2.8 The outlets in each dental air piping system shall be purged to remove any particulate matter from the distribution piping.

15.3.3.8.2.2.9 Using appropriate adapters, each outlet shall be purged with an intermittent high-volume flow of test gas until the purge produces no discoloration in a clean white cloth.

15.3.3.8.2.2.10 The purging shall be started at the closest outlet to the piping shutoff valve and continue to the furthest outlet from the shutoff valve.

15.3.3.8.2.3 Standing Pressure Test for Dental Air and Copper Vacuum Piping.

15.3.3.8.2.3.1 After successful completion of the initial pressure tests in 15.4.8.1, the dental air systems and copper vacuum systems shall be subject to a standing pressure test.

15.3.3.8.2.3.2 Tests shall be conducted after the final installation of station outlet valve bodies, faceplates, and other distribution system components (e.g., pressure alarm devices, pressure indicators, line pressure relief valves, manufactured assemblies, and hoses).

15.3.3.8.2.3.3 The source valve shall be closed during this test.

15.3.3.8.2.3.4 The piping systems shall be subjected to 24-hour standing pressure tests using oil-free, dry nitrogen NF.

15.3.3.8.2.3.5 Test pressures shall be 20 percent above the normal system operating line pressure.

15.3.3.8.2.3.6 At the conclusion of the tests, there shall be no change in the test pressure, except that attributed to specific changes in ambient temperature.

15.3.3.8.2.3.7 Any leaks shall be located, repaired (if permitted),

or replaced (if required) by the installer, and retested.

The piping shall be repurged if necessary.

15.3.3.8.2.4 Standing Vacuum Test for Plastic Vacuum Piping.

15.3.3.8.2.4.1 After successful completion of the initial pressure tests in 15.4.8.1, vacuum distribution piping, including scavenging, shall be subjected to a standing vacuum test.

15.3.3.8.2.4.2 Tests shall be conducted after installation and connection of all components of the vacuum system.

15.3.3.8.2.4.3 The piping systems shall be subjected to a 24-hour standing vacuum test.

15.3.3.8.2.4 Test pressure shall be between 300 mm (12 in.)

HgV and full vacuum.

15.3.3.8.2.5 During the test, the source of test vacuum shall be disconnected from the piping system.

15.3.3.8.2.6 At the conclusion of the test, there shall be no change in the vacuum pressure other than that attributed to changes of ambient temperature.

15.3.3.8.2.7 Any leaks shall be located, repaired (if permitted), or replaced (if required) by the installer, and retested.

15.3.3.8.3 Operation and Management.

15.3.3.8.3.1 System Shutdowns.

15.3.3.8.3.1.1 Gas and vacuum piping systems shall be shut down at the end of each workday.

15.3.3.8.3.1.2 Emergency shutoff valves or remote actuators shall not be used for daily shutdown of the systems. Cylinder gas valves shall be used for daily shutdowns.

15.3.3.8.3.2 Prohibited Interconnections. Two or more piping systems for different gases or different vacuums shall not be interconnected for testing or any other reason.

15.3.3.8.3.3 Manufacturer's Instructions.

15.3.3.8.3.1 Piping system components shall be installed, adjusted, operated, and maintained in accordance with the manufacturer's instructions.

15.3.3.8.3.2 Copies of the manufacturer's instructions shall be provided to the facility and maintained at the facility.

15.3.3.8.4 Maintenance.

15.3.3.8.4.1 Gas and vacuum system equipment shall be maintained by a qualified person.

15.3.3.8.4.2 Every facility shall establish a procedure for manually turning off the gas supply at the cylinder valves of Category 2 dental gas and vacuum systems at the end of each day.

15.3.3.8.5 Periodic Testing.

15.3.3.8.5.1 Station outlets for oxygen and nitrous oxide shall be tested for flow and pressure on an approved schedule.

Statement of Problem and Substantiation for Public Input

Performance Criteria and Testing of Dental Air and Dental Vacuum are not listed for Category 1 Dental, but they are in Category 2 and 3 Dental. They should be listed here for clarity.

Also- stating who is qualified to do Initial Testing of Dental Air and Dental Vacuum in all 3 Categories would be helpful.

In the 2015 edition they were one or more of the following:

- (1) Installer
- (2) Representative of the system supplier
- (3) Representative of the system manufacturer
- (4) ASSE 6030 Medical Gas Systems Verifier

Submitter Information Verification

Submitter Full Name: Scott Winn

Organization: Winns Career Education

Street Address:

City:

State:

Zip:

Submission Date: Mon Dec 21 13:54:00 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1107-NFPA 99-2021](#)

Statement: Performance Criteria and Testing of Dental Air and Dental Vacuum are not listed for Category 1 Dental, but they are in Category 2 and 3 Dental. The revision adds them here for clarity.



Public Input No. 68-NFPA 99-2020 [New Section after 15.3.3.7.3.4]

TITLE OF NEW CONTENT

15.3.3.7.3.5 Piping with floor slabs prohibited. Dental gas and vacuum piping shall not be installed within floor slabs.

Statement of Problem and Substantiation for Public Input

This piping in floor slabs is not prohibited in Category 1 Dental, but it is in Category 2 & 3 Dental. Was this intentional?

If not, it should either be added here or deleted from sections 15.4.5.9 and 15.5.6.7

Submitter Information Verification

Submitter Full Name: Scott Winn

Organization: Winns Career Education

Street Address:

City:

State:

Zip:

Submittal Date: Mon Dec 21 14:51:12 EST 2020

Committee: HEA-PIP

Committee Statement

Resolution: FR-1065-NFPA 99-2021

Statement: The revision is intended for consistency with 15.4.5.9 and 15.5.6.7.



Public Input No. 159-NFPA 99-2021 [Section No. 15.4.2.1.1]

15.4.2.1.1

Installers of medical gas systems shall be certified in accordance with ASSE 6010, *Professional Qualification Standard for Medical Gas Systems Installers*, regardless of the capacity of the source equipment.

why is the 6010 credential only written to apply to medical gases? So for the vacuum will you not need to be credentialed to the 6010 standard?

By not making it uniform with the rest of the book I've seen inspectors allow non credentialed people install these systems. I always believed if it was in the NFPA 99 it all had to be done the same way. Leaves lots of room for interpretation. I would like to see it say medical gas and vacuum systems.

Statement of Problem and Substantiation for Public Input

As an instructor I constantly get asked by contractor if they need to be certified. Too much room for interpretation. May not be the best code to change maybe just added in the vacuum section

Submitter Information Verification

Submitter Full Name: Douglas Miller

Organization: Local 190

Street Address:

City:

State:

Zip:

Submittal Date: Thu May 13 16:54:54 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: Dental vacuum and air system installers are not intended to be required to be certified in accordance with ASSE 6010 or ASSE 6030. No specific language has been proposed.



Public Input No. 218-NFPA 99-2021 [New Section after 15.4.2.4.2]

Dental Manifold Location Ventilation

Indoor locations for dental manifolds of any size shall be vented to the outdoors in compliance with 9.3.6.5.

Statement of Problem and Substantiation for Public Input

Currently there is no requirement for ventilation for systems with less than 3,000 cu ft of gas. The relief valves on a dental manifold are not made to allow piping the gas outdoors. They dump in the closet inside the dental office. Ventilation of the room is the only way to remove it. This is both a fire safety issue and provides for protection of personnel in the office space. If the goal of 15.4.2.4.1 was to avoid building the room with 1 hour fire walls and 3/4 hour door, then this proposal will still allow for that.

Submitter Information Verification

Submitter Full Name: MGPHO BOD
Organization: Apex Medical Gas Systems, Inc. - Corky Bishop
Affiliation: Medical Gas Professional Healthcare Organization (MGPHO)
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 25 13:54:56 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: FR-1066-NFPA 99-2021

Statement: The revision introduces minimum ventilation requirements for systems with less than 3000 cu-ft of gas.



Public Input No. 369-NFPA 99-2021 [New Section after 15.4.2.4.3]

15.4.2.4.3

Natural or mechanical ventilation for oxygen and nitrous oxide manifold locations shall be in accordance with Chapter 9.

Statement of Problem and Substantiation for Public Input

Ventilation for these locations should be brought back into the code. Currently, there are ventilation requirements for these locations when they have gases that are less than 3,000 cu. ft. There should be at least minimal protections for these locations.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jun 01 08:49:28 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1066-NFPA 99-2021

Statement: The revision introduces minimum ventilation requirements for systems with less than 3000 cu-ft of gas.



Public Input No. 160-NFPA 99-2021 [Sections 15.4.2.4.8, 15.4.2.4.9]

Sections 15.4.2.4.8, 15.4.2.4.9

15.4.2.4.8 –

~~Only gas cylinders, reusable shipping containers, and their accessories shall be permitted to be stored in rooms containing central supply systems or gas cylinders.~~

15.4.2.4.9 –

~~No flammable materials, cylinders containing flammable gases, or containers containing flammable liquids shall be stored in rooms with gas cylinders.~~

Statement of Problem and Substantiation for Public Input

These paragraphs are duplicated in 15.4.2.3.3 & 4. They belong in the Operations section, so are not needed in the Locations section too.

Submitter Information Verification

Submitter Full Name: Corky Bishop

Organization: Apex Medical Gas Systems

Street Address:

City:

State:

Zip:

Submittal Date: Fri May 14 17:14:54 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1068-NFPA 99-2021](#)

Statement: These paragraphs are duplicated in 15.4.2.3.3 and 15.4.2.3.4. They belong in the Operations section, so are not needed in the Locations section too.



Public Input No. 238-NFPA 99-2021 [Section No. 15.4.2.4.10]

15.4.2.4.10

Indoor enclosures shall not communicate directly with medical gas (oxygen and nitrous oxide) use points or storage locations ~~for~~ for oxidizers flammable materials or gasses .

Statement of Problem and Substantiation for Public Input

This appears to be a mistake in wording. Medical gas oxidizers shouldn't communicate directly with oxidizers? probably intended to say flammable materials or flammable gasses.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submittal Date: Thu May 27 00:37:02 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1069-NFPA 99-2021

Statement: The revision corrects an apparent error in the code language.



Public Input No. 151-NFPA 99-2021 [New Section after 15.4.2.4.13]

15.4.2.4.14

Locations containing positive pressure gasses or cylinders containing Oxygen and/or Nitrous Oxide shall be separated from the rest of the building by walls and floors having a 1-hour fire resistance rating with doors and other opening projective having a 3/4 hour fire protection rating.

15.4.2.4.15 Ventilation

Locations containing positive pressure gasses or cylinders containing positive pressure gasses shall be ventilated in accordance with 9.3.6

15.4.2.4.16 Fire Protection

Locations containing positive pressure gasses or cylinders containing positive pressure gasses shall be provided with an automatic fire sprinkler in accordance with the following:

(A) Where the automatic sprinkler is installed in a building with an automatic wet standpipe system, sprinklers shall be supplied by the standpipe system.

(B) Where the automatic sprinkler is installed in a building without an automatic wet standpipe system, water shall be permitted to be supplied by the plumbing system. The plumbing system must be capable of simultaneously supplying the domestic and sprinkler demands. The automatic sprinkler shall be a dedicated line branched from the main domestic water supply line, immediately after the main shutoff valve for the dental facility with appropriate backflow protection in accordance with local plumbing codes.

Statement of Problem and Substantiation for Public Input

Adds fire protection and ventilation requirements that were once removed as well as adding sprinkler requirements matching model building codes.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 13:05:56 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1067-NFPA 99-2021

Statement: The revision adds fire protection and ventilation requirements that were previously removed and adds sprinkler requirements matching model building codes.



Public Input No. 200-NFPA 99-2021 [New Section after 15.4.2.4.13]

15.4.2.4.14

Locations containing positive pressure gasses or cylinders containing Oxygen and/or Nitrous Oxide shall be separated from the rest of the facility by walls, floors, ceilings, doors, and door frames having a minimum 1-hour fire resistance protection.

15.4.2.4.15 Ventilation

Locations containing positive pressure gases or cylinders containing positive pressure gasses shall be ventilated in accordance with 9.3.6

15.4.2.4.16 Fire Protection

Locations containing positive pressure gasses or cylinders containing positive pressure gasses shall be provided with an automatic fire sprinkler in accordance with the following:

(a) Where the automatic sprinkler is installed in a building with an automatic wet standpipe system, sprinklers shall be supplied by the standpipe system.

(b) Where the automatic sprinkler is installed in a building without an automatic wet standpipe system, water shall be permitted to be supplied by the building cold water system. The plumbing system must be capable of simultaneously supplying the domestic and sprinkler demands. The cold water supply shall be a dedicated line, branched from the main domestic water supply line, immediately after the main shut-off valve for the dental facility with appropriate backflow protection in accordance with local plumbing codes.

Statement of Problem and Substantiation for Public Input

Ventilation: Previous versions of the code included this. When chapter 9 was established all reference was lost, and as a result, contractors and installers are ignoring ventilation. This will send them to the correct chapter and bring about compliance.

Fire Protection: We are following other codes with requirements for a sprinkler head in the medical gas storage room. We know of incidents where a sprinkler head would have prevented serious damage to the building and injuries to personnel (Spokane, WA cylinder room fire)

We wish to bring the NFPA up to date on this subject and preventing cities from referencing other codes.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submission Date: Tue May 18 15:57:40 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1067-NFPA 99-2021

Statement: The revision adds fire protection and ventilation requirements that were previously removed and adds sprinkler requirements matching model building codes.



Public Input No. 376-NFPA 99-2021 [Section No. 15.4.2.5.8]

15.4.2.5.8

Materials used in central supply systems shall meet the following requirements:

- (1) In those portions of systems intended to handle oxygen or nitrous oxide at gauge pressures equal to or greater than 2413 kPa (350 psi), ~~interconnecting hose shall contain no polymeric materials~~ materials shall be designed for this service at these pressures .
- (2) In those portions of systems intended to handle oxygen or nitrous oxide material, construction shall be compatible with oxygen under the temperatures and pressures to which the components can be exposed.
- (3) If potentially exposed to cryogenic temperatures, materials shall be designed for low temperature service.
- (4) If intended for outdoor installation, materials shall be installed per the manufacturer's requirements.

Statement of Problem and Substantiation for Public Input

Clarifies that the materials used shall be designed for these service. Polymeric materials are not the only concern at these pressures. There are other materials that are not suitable as well. Add nitrous oxide to the list of gases that are of concern.

Submitter Information Verification

Submitter Full Name: Jonathan Willard

Organization: Acute Medical Gas Services

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jun 01 09:49:28 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1070-NFPA 99-2021

Statement: The revision clarifies that the materials used must be designed for these service. Polymeric materials are not the only concern at these pressures. There are other materials that are not suitable as well.



Public Input No. 168-NFPA 99-2021 [Section No. 15.4.2.6]

15.4.2.6 Emergency Shutoff Valves (Oxygen and Nitrous Oxide).

15.4.2.6.1*

All Category 2 medical gas systems shall have an emergency shutoff valve accessible from all use-point locations in an emergency.

15.4.2.6.2

Where a central medical gas supply system supplies two treatment facilities, each facility shall be provided with an emergency shutoff valve located in that treatment facility so as to be accessible from all use-point locations in an emergency.

15.4.2.6.3

Emergency shutoff valves shall be labeled to indicate the gas controlled by the shutoff valve and shall shut off only the gas to the treatment facility that they serve.

15.4.2.6.4

A remotely activated shutoff valve at a gas supply manifold shall not be used for emergency shutoff.

15.4.2.6.4.1

For clinical purposes, such a remote valve actuator shall not fail-close in the event of loss of electric power.

15.4.2.6.4.2

Where remote actuators are the type that fail-open, it shall be mandatory that cylinder shutoff valves be closed whenever the system is not in use.

Emergency shutoff valves shall be located as follows:

- (1) It is readily operable from a standing position.
- (2) It is installed where it is visible and accessible at all times.
- (3) It is not installed where it can be hidden from plain view, such as behind normally open or normally closed doors.
- (4) It is installed near the exit of the treatment area that will be used in the event of an emergency.
- (5) It is not installed in rooms, areas, or closets that can be closed or locked.

-

Statement of Problem and Substantiation for Public Input

Provides additional direction of where the emergency valves should be located so that they are actually used in an emergency. Trends in dental construction have facilities wanting to locate emergency valves where they are "not seen" as they are not "aesthetically pleasing"

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac
Street Address:
City:
State:
Zip:
Submittal Date: Sat May 15 09:54:01 EDT 2021
Committee: HEA-PIP

Committee Statement

Resolution: [FR-1079-NFPA 99-2021](#)

Statement: The revision provides additional direction of where the emergency valves should be located so that they are actually used in an emergency. Trends in dental facility construction have facilities locating emergency valves where they are "not seen" as they are not "aesthetically pleasing."



Public Input No. 236-NFPA 99-2021 [Section No. 15.4.2.6.1]

15.4.2.6.1*

All Category 2 medical gas systems shall have an emergency shutoff valve accessible from all use point locations in an emergency.

All Category 2 dental gas systems shall have an emergency shutoff valve in each of the offices or zones on the system:

(a) shall be accessible for emergency access, near an emergency exit from the use point locations.

(b) shall have a downstream alarm (see alarms)

Statement of Problem and Substantiation for Public Input

We allow for up to two dental offices to share a manifold, but we don't indicate that each office or zone needs it's own emergency shut off valve and an alarm in that area.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submittal Date: Thu May 27 00:19:22 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1079-NFPA 99-2021

Statement: The revision provides additional direction of where the emergency valves should be located so that they are actually used in an emergency. Trends in dental facility construction have facilities locating emergency valves where they are "not seen" as they are not "aesthetically pleasing."



Public Input No. 201-NFPA 99-2021 [Section No. 15.4.2.6.4.2]

15.4.2.6.4.2

Where remote actuators are the type that fail-open, it shall be mandatory that cylinder shutoff valves be closed whenever the system is not in use.

Emergency Shutoff valves shall be located as follows:

(1) To be readily operable from a standing position.

(2) To be installed where it is visible and accessible at all times, in an egress corridor.

(a) It is not to be installed where it can be hidden from plain view, such as behind normally open or normally closed doors, inside alcoves, or behind pictures or decorations.

(3) To be installed near the exit of the treatment area or facility, for easy accessibility in the event of an emergency.

(4) It is not installed in rooms, areas, or closets that can be closed or locked.

Statement of Problem and Substantiation for Public Input

We are still seeing emergency shut-off valve boxes hidden from view. Sometimes intently and other times by mistake. We feel it is essential to give more direction to the nature and accessibility of emergency shut-off valve boxes.

Experience shows us that doctors don't want to see these and will direct the installers to hide them. By clarifying the intention of the committee, we will give the installers more detailed information to communicate to the contractors, designers, and owners of the dental offices.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 16:46:14 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1079-NFPA 99-2021](#)

Statement: The revision provides additional direction of where the emergency valves should be located so that they are actually used in an emergency. Trends in dental facility construction have facilities locating emergency valves where they are "not seen" as they are not "aesthetically pleasing."



Public Input No. 152-NFPA 99-2021 [New Section after 15.4.3.3.2.2(B)]

(C) Sources of Compressor Intake Air

Air sources for a compressor(s) located inside the building shall meet the following requirements:

(1) They shall be located within a space where no chemical based materials are stored or used.

(2) They shall be located in a space that is not used for patient medical treatment.

(3) They shall not be taken from a room or space in which there is an open or semi-open discharge from a Dental vacuum or scavenging system.

Statement of Problem and Substantiation for Public Input

Added for consistency in Dental Cat. 1-3

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 13:38:38 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1108-NFPA 99-2021

Statement: The revision responds to PI-152 and PI-202.



Public Input No. 202-NFPA 99-2021 [New Section after 15.4.3.3.2.2(B)]

15.4.3.3.2.2 (c) Sources of Compressor Intake Dental Air

Air sources for a dental compressor(s) located inside a building shall meet the following requirements:

- (1) They shall be located within a space where no chemical based materials are stored or used.
- (2) They shall be located in a space that is not used for patient care or dental procedures.
- (3) The intake shall not be taken from a room or space in which there is an open or semi-pen discharge from a dental vacuum, or nitrous oxide scavenging system.
- (a) The air intake shall be taken from a remote location, i.e. the building return air system, or outside air if quality inside air isn't available.

Statement of Problem and Substantiation for Public Input

Categories 1, 2, and 3 need to all be consistent, as all have the potential for Dental Air

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submittal Date: Tue May 18 16:57:22 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1108-NFPA 99-2021

Statement: The revision responds to PI-152 and PI-202.



Public Input No. 153-NFPA 99-2021 [New Section after 15.4.3.3.2(B)]

15.3.3.5.2.3 Dental Vacuum Exhaust

Dental Vacuum Exhaust shall be one of the following:

- ___(1)Exhausted to the outdoors in accordance with manufactures recommendations
- ___(2)Filtered and diffused locally with a ULPA filter element capable of retaining 99.95% of particulates
- ___(3) If used for Nitrous Oxide Scavenging, exhaust shall discharge outdoors

Statement of Problem and Substantiation for Public Input

Added for consistency in Dental Cat. 1-3

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 13:40:06 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1109-NFPA 99-2021

Statement: The revision responds to PI-153.



Public Input No. 166-NFPA 99-2021 [New Section after 15.4.3.3.2(B)]

Special Requirements for Dental Vacuum Piping.

Horizontal piping in dental vacuum systems shall be sloped a minimum of 7 mm per 3.05 m (¼ in. per 10 ft) toward the vacuum source equipment.

Horizontal piping shall include no sags or low points that will permit fluids or debris to accumulate.

Accessible cleanouts that are limited to vertical downflow may be provided where necessary to clear the piping of obstructions.

Dental vacuum inlets shall be capable of a 10 Scfm or greater capacity.

Statement of Problem and Substantiation for Public Input

Adding the piping requirements here to remain consistent in all three dental categories.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Sat May 15 09:46:22 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1110-NFPA 99-2021](#)

Statement: The revision responds to PI-166 and PI-204.



Public Input No. 204-NFPA 99-2021 [New Section after 15.4.3.3.2(B)]

15.4.3.3.2(B)

Special Requirements for Dental Vacuum Piping:

1) Horizontal piping in dental vacuum system shall be sloped a minimum of 7 mm per 3.05 m (1/4" per 10ft) toward the vacuum source equipment.

2) Horizontal piping shall include no sags or low points that will permit fluids or debris to accumulate in the piping.

 (a) Voids in the vacuum piping should be avoided to prevent build up and obstructions.

3) Accessible cleanouts limited to vertical downflow may be provided where necessary to clear the piping of obstructions

 (a) Dental Vacuum cleanouts are not to be installed on horizontal piping.

4) Dental Vacuum inlets shall be capable of 10 scfm or greater flow capacity.

Statement of Problem and Substantiation for Public Input

Most of this information was in previous versions of the code. We are placing them back into the code.

1) Dental Vacuum needs a "slope" to the piping and it should never be "level" or less than 1/4" per 10' of pipe. Failure to provide the proper minimum slope, and or allowing dips or sags in the piping can cause failure of the systems. 2) Dental Vacuum cleanouts will clog up and cause vacuum loss if they are located on horizontal sections of the piping. Allowing, not requiring, these cleanouts on vertical risers can prevent this. 3) three studies from 1971, 2004, and 2020 indicate that 10 cfm of vacuum flow in the oral cavity will remove ALL aerosols and prevent any of the viral and bacterially laden aerosols from escaping into the treatment room around the doctor and staff. * Should we consider a minimum or 10 cfm for all dental high volume systems? IF so, this would drastically change dental vacuum. We are suggesting that we at least introduce this to start with "capable" instead of "shall be".

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submission Date: Tue May 18 23:59:46 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1110-NFPA 99-2021

Statement: The revision responds to PI-166 and PI-204.



Public Input No. 291-NFPA 99-2021 [Section No. 15.4.3.3.4.1(A)]

(A)

The use of scavenging shall be limited to portions of dental facilities where moderate or minimal sedation is administered. ~~WAGD shall be provided where the dental treatment involves general anesthesia or deep sedation.~~

Statement of Problem and Substantiation for Public Input

This mention of WAGD is under section 15.4 for Category 2 Systems. Paragraph 15.4.1.2 indicates that the medical gases for Category 2 are limited to oxygen and nitrous oxide. WAGD is a medical gas system only allowed under Category 1. Also general anesthesia and deep sedation does not pertain to Cat 2 system per 15.4.1.1. This sentence is out of place and should be deleted.

Submitter Information Verification

Submitter Full Name: David Braidich

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Submittal Date: Sat May 29 17:28:39 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1078-NFPA 99-2021](#)

Statement: This mention of WAGD is under section 15.4 for Category 2 Systems. Paragraph 15.4.1.2 indicates that the medical gases for Category 2 are limited to oxygen and nitrous oxide. WAGD is a medical gas system only allowed under Category 1. Also general anesthesia and deep sedation does not pertain to Cat 2 system per 15.4.1.1. This sentence is out of place and should be deleted.



Public Input No. 137-NFPA 99-2021 [New Section after 15.4.4.2.1]

15.4.4.2.2 CMT shall have a flame spread index of 25 or less and a smoke developed index of

50 or less as determined by ASTM E84, Standard Test Method for Surface Burning

Characteristics of Building Materials.

15.4.4.2.3 CMT shall be identified by the manufacturer as suitable

for oxygen service at a minimum of every 0.92 m (3 ft).

Statement of Problem and Substantiation for Public Input

Additional Language regarding CMT to maintain consistent wording.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

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City:

State:

Zip:

Submission Date: Mon May 10 09:03:21 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1111-NFPA 99-2021

Statement: The revision responds to PI-136 and PI-137.



Public Input No. 136-NFPA 99-2021 [Section No. 15.4.4.2.2]

15.4.4.2.2 Pipe Piping Materials for Oxygen and Nitrous Oxide Systems .

1) Pipe shall be hard-drawn seamless copper tube conforming to ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, Type L or K.

2) Listed corrugated medical tubing (CMT) fabricated from copper alloy No. 51000 strip, meeting ASTM B103/B103M, *Standard Specification for Phosphor Bronze Plate*,

Sheet, Strip, and Rolled Bar, with a design margin of 3.5, externally coated with a nonmetallic sheath marked with the manufacturer's marking. The listing shall include testing

to demonstrate that CMT systems can be consistently gas-purged with results equivalent to comparable medical gas copper tubing.

Statement of Problem and Substantiation for Public Input

The use of CMT is already allowed for Medical Gasses in Dental Category 1. This revision allows for the Medical Gasses (Oxygen and Nitrous Oxide) to have consistent material usage in both Dental Category 1 and 2 medical gas systems.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

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Submittal Date: Mon May 10 08:57:10 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1111-NFPA 99-2021

Statement: The revision responds to PI-136 and PI-137.



Public Input No. 138-NFPA 99-2021 [Section No. 15.4.4.3.2 [Excluding any Sub-Sections]]

Pipe under 15.4.4.3 shall comply with the following:

- (1) ASTM B88, *Standard Specification for Seamless Copper Water Tube*, Type L or K
- (2) ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, Type L or K
- (3) ASTM B280, *Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*, ACR tube (O.D. size).
- (4) CMT meeting the requirements of 15.4.4.2.2

Statement of Problem and Substantiation for Public Input

Additional material options for dental air

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 09:08:49 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1112-NFPA 99-2021

Statement: The revision provides additional material options for dental air piping systems.



Public Input No. 139-NFPA 99-2021 [Section No. 15.4.4.3.3]

15.4.4.3.3 Fittings.

Fittings for piping under 15.4.4.3 shall be permitted to be any of the following acceptable joining methods:

- (1) Brazed or soldered fittings conforming to ASME B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings*
- (2) Brazed fittings conforming to ANSI/ASME B16.50, *Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings*
- (3) Brazed fittings conforming to ASME B16.22 with socket depths equal to or greater than braze-joint pressure fittings in compliance with ANSI/ASME B16.50
- (4) Flared fittings conforming to ASME B16.26, *Cast Copper Alloy Fittings for Flared Copper Tubes*
- (5) Compression fittings ($\frac{3}{4}$ in. maximum size)
- (6) Axially Swaged Fittings meeting the requirements of 15.4.4.2.3.5

Statement of Problem and Substantiation for Public Input

Additional fitting options for Dental Air.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 09:10:52 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1080-NFPA 99-2021

Statement: The revision provides additional fitting options for dental air piping systems.



Public Input No. 140-NFPA 99-2021 [Section No. 15.4.5.3]

15.4.5.3 Minimum Pipe Sizes.

The minimum size of the following piping shall be as follows:

- (1) Category 2 oxygen piping shall be not less than DN10 (NPS $\frac{3}{8}$ in.) ($\frac{1}{2}$ in. O.D.) size.
- (2) Category 2 nitrous oxide piping shall be not less than DN8 (NPS $\frac{1}{4}$ in.) ($\frac{3}{8}$ in. O.D.) size.
- (3) ~~Category 2 oxygen piping shall be at least 1 size larger than piping for nitrous oxide.~~
- (4)

Statement of Problem and Substantiation for Public Input

This requirement of having different pipe sizes for Nitrous and Oxygen is unnecessary when a system is properly installed, tested, inspected and verified, and could lead to additional cost of construction. While many small clinics are able to use the minimum required pipe sizes to meet flow requirements, which could allow for having different pipe sizes, this is not always the case. In the case of a larger system say requiring a 1/2" NPS Nitrous Oxide Line when properly sized the code would now require that the Oxygen be increased to 3/4" NPS even if a 1/2" NPS Oxygen line would meet the engineering and flow requirements.

Dental Category 2 medical Gas systems are still required to be installed and tested by an ASSE 6010 installer and verified by an ASSE 6030 Verifier to ensure proper installation and performance.

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 09:21:10 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The provision serves as a means to prevent cross connection between O2 and N2O systems.



Public Input No. 205-NFPA 99-2021 [Section No. 15.4.5.3]

15.4.5.3 Minimum Pipe Sizes.

The minimum size of the following piping shall be as follows:

- (1) Category 2 oxygen piping shall be not less than DN10 (NPS $\frac{3}{8}$ in.) ($\frac{1}{2}$ in. O.D.) size.
- (2) Category 2 nitrous oxide piping shall be not less than DN8 (NPS $\frac{1}{4}$ in.) ($\frac{3}{8}$ in. O.D.) size.
- (3) ~~Category 2 oxygen piping shall be at least 1 size larger than piping for nitrous oxide.~~

Statement of Problem and Substantiation for Public Input

- 1) The requirement for different pipe sizes for Nitrous Oxide and Oxygen is an unnecessary carryover from earlier code versions where we attempted to prevent crossing of lines by requiring different sizes. Since that time, the ASSE standards for installers, designers, and verifiers has been adopted.
- 2) Pipe sizing should be determined by engineering, according to the pressure and flow ... not by an arbitrary size requirement .

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

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City:

State:

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Submittal Date: Wed May 19 00:06:16 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: The provision serves as a means to prevent cross connection between O2 and N2O systems.



Public Input No. 154-NFPA 99-2021 [New Section after 15.5.4.2.2.2]

15.3.3.4.2.3 Sources of Compressor Intake Air

Air sources for a compressor(s) located inside the building shall meet the following requirements:

(1) They shall be located within a space where no chemical based materials are stored or used.

(2) They shall be located in a space that is not used for patient medical treatment.

(3) They shall not be taken from a room or space in which there is an open or semi-open discharge from a Dental vacuum or scavenging system.

Statement of Problem and Substantiation for Public Input

Added for consistency in Dental Cat. 1-3

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 13:47:10 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1113-NFPA 99-2021](#)

Statement: The revision responds to PI-154 and PI-208.



Public Input No. 208-NFPA 99-2021 [New Section after 15.5.4.2.2.2]

15.5.4.2.2.2

Sources of Dental Air Intake

Dental Air sources for a compressor(s) located inside the building shall meet the following requirements:

- (1) They shall be located within a space where no chemical based materials are stored or used.
- (2) They shall be located in a space that is not used for patient treatment or dental procedures.
- (3) They shall not be taken from a room or space in which there is an open or semi-open discharge from a Dental Vacuum or Dental Scavenging System.
- (4) When the compressor is located in a room with an open or semi-open discharge from a Dental Vacuum or Dental Scavenging System, the air shall be drawn from a remote location such as the building Return Air system.

Statement of Problem and Substantiation for Public Input

to retain consistency between the chapter 15 categories:

Similar words were in previous codes and we need to return them to the code. This prevents Dental Air compressor air intake being drawn from spaces where infectious air, scavenged nitrous oxide, or other WAGD gasses may be present. This also re-establishes the "Remote Air Intake" clause once again to the code.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

State:

Zip:

Submittal Date: Wed May 19 00:36:42 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1113-NFPA 99-2021

Statement: The revision responds to PI-154 and PI-208.



Public Input No. 155-NFPA 99-2021 [New Section after 15.5.4.3.2.2]

Dental Vacuum Exhaust

Dental Vacuum Exhaust shall be one of the following:

- (1) Exhausted to the outdoors in accordance with manufactures recommendations
- (2) Filtered and diffused locally with a ULPA filter element capable of retaining 99.95% of particulates
- (3) If used for Nitrous Oxide Scavenging, exhaust shall discharge outdoors

Statement of Problem and Substantiation for Public Input

Added for consistency in Dental Cat. 1-3

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 13:48:23 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1114-NFPA 99-2021

Statement: The revision responds to PI-155 and PI-209.



Public Input No. 167-NFPA 99-2021 [New Section after 15.5.4.3.2.2]

Special Requirements for Dental Vacuum Piping.

Horizontal piping in dental vacuum systems shall be sloped a minimum of 7 mm per 3.05 m (¼ in. per 10 ft) toward the vacuum source equipment.

Horizontal piping shall include no sags or low points that will permit fluids or debris to accumulate.

Accessible cleanouts that are limited to vertical downflow may be provided where necessary to clear the piping of obstructions.

Dental vacuum inlets shall be capable of a 10 Scfm or greater capacity.

Statement of Problem and Substantiation for Public Input

Adding section for same piping requirements in all three dental categories

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Sat May 15 09:48:12 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1115-NFPA 99-2021](#)

Statement: The revision responds to PI-167.



Public Input No. 209-NFPA 99-2021 [New Section after 15.5.4.3.2.2]

15.5.4.3.2.2 Dental Vacuum Exhaust

Dental Vacuum Exhaust shall be one of the following:

- (1) Exhausted to the outdoors in accordance with the manufacturers recommendations.
- (2) Filtered and diffused locally with a ULPA filter element capable of retaining 99.95% of particulates.
- (3) If used for Nitrous Oxide Scavenging or WAGD, exhaust shall discharge outdoors.

Statement of Problem and Substantiation for Public Input

Dental Vacuum Exhaust was in previous editions of the code. We are re-establishing this to the code.

1) Nitrous Oxide scavenging and WAGD need to be exhausted to the outside of the building 2) This allows for new technology in dental vacuum exhaust, when scavenging and WAGD are not present.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

Street Address:

City:

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Submittal Date: Wed May 19 00:40:01 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1114-NFPA 99-2021

Statement: The revision responds to PI-155 and PI-209.



Public Input No. 156-NFPA 99-2021 [Section No. 15.5.5.2.2 [Excluding any Sub-Sections]]

Pipe under 15.5.5 shall comply with the following:

- (1) ASTM B88, *Standard Specification for Seamless Copper Water Tube*, Type L or K
- (2) ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, Type L or K
- (3) ASTM B280, *Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service*, ACR tube (O.D. size)
- (4) Listed corrugated medical tubing (CMT) fabricated from copper alloy No. 51000 strip, meeting ASTM B103/B103M, Standard Specification for Phosphor Bronze Plate, Sheet, Strip, and Rolled Bar, with a design margin of 3.5, externally coated with a nonmetallic sheath marked with the manufacturer's marking. The listing shall include testing to demonstrate that CMT systems can be consistently gas-purged with results equivalent to comparable medical gas copper tubing.

Statement of Problem and Substantiation for Public Input

Adds additional materials for Dental Air

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

State:

Zip:

Submittal Date: Mon May 10 13:49:39 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1081-NFPA 99-2021

Statement: The revision provides for additional materials for dental air piping systems.



Public Input No. 157-NFPA 99-2021 [Section No. 15.5.5.2.3]

15.5.5.2.3 Fittings.

Fittings for piping under 15.5.5.2 shall be permitted to be any of the following acceptable joining methods:

- (1) Brazed or soldered fittings conforming to ASME B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings*
- (2) Brazed fittings conforming to ANSI/ASME B16.50, *Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings*
- (3) Brazed fittings conforming to ASME B16.22 with socket depths equal to or greater than braze-joint pressure fittings in compliance with ANSI/ASME B16.50
- (4) Flared fittings conforming to ASME B16.26, *Cast Copper Alloy Fittings for Flared Copper Tubes*
- (5) Compression fittings ($\frac{3}{4}$ in. maximum size)
- (6) Axially Swaged fittings meeting the requirements of 5.1.10.7

Statement of Problem and Substantiation for Public Input

Adds additional fitting type for Dental Air

Submitter Information Verification

Submitter Full Name: Mathis Carlson

Organization: Meditrac

Street Address:

City:

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Zip:

Submittal Date: Mon May 10 13:50:52 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1082-NFPA 99-2021

Statement: The revision provides for an additional fitting type for dental air piping systems.



Public Input No. 253-NFPA 99-2021 [Section No. 15.5.5.3.3]

15.5.5.3.3 PVC Plastic Piping.

PVC plastic piping under 15.5.5.3 shall be in accordance with the following:

- (1) PVC plastic pipe shall be Schedule 40 or Schedule 80, conforming to ASTM D1785, *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120*.
- (2) PVC plastic fittings shall be Schedule 40 or Schedule 80 to match the pipe, conforming to ASTM D2466, *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40*, or ASTM D2467, *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80*. **Or PVC DWV fittings shall conform to ASTM D2665, Standard Specifications for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.**
- (3) Joints in PVC plastic piping shall be solvent-cemented in accordance with ASTM D2672, *Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement*.

Statement of Problem and Substantiation for Public Input

DWV fittings allow for longer radius fittings and wider transitions to facilitate the movement of the solids and liquids. It is typical industry practice to install DWV fittings in the dental vacuum systems. Many jurisdictions recommend the use of the DWV fittings for this purpose (in conflict with the code) but I can find no evidence to suggest the use of DWV fittings is problematic as dental vacuum systems are low pressure systems.

Submitter Information Verification

Submitter Full Name: Wenhong Xue

Organization: US Army Corps of Engineer

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Submittal Date: Thu May 27 14:14:00 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1083-NFPA 99-2021

Statement: DWV fittings allow for longer radius fittings and wider transitions to facilitate the movement of the solids and liquids. It is typical industry practice to install DWV fittings in the dental vacuum systems. Many jurisdictions recommend the use of the DWV fittings for this purpose (in conflict with the code) but I can find no evidence to suggest the use of DWV fittings is problematic as dental vacuum systems are low pressure systems.



Public Input No. 162-NFPA 99-2021 [Section No. A.5.1.3.10]

A.5.1.3.10

For bulk oxygen systems, see NFPA 55. Two possible choices of reserves are illustrated in Figure A.5.1.3.10(a) and Figure A.5.1.3.10(b). Both are not required.

Figure A.5.1.3.10(a) Distance Between Bulk Oxygen Systems and Exposures.

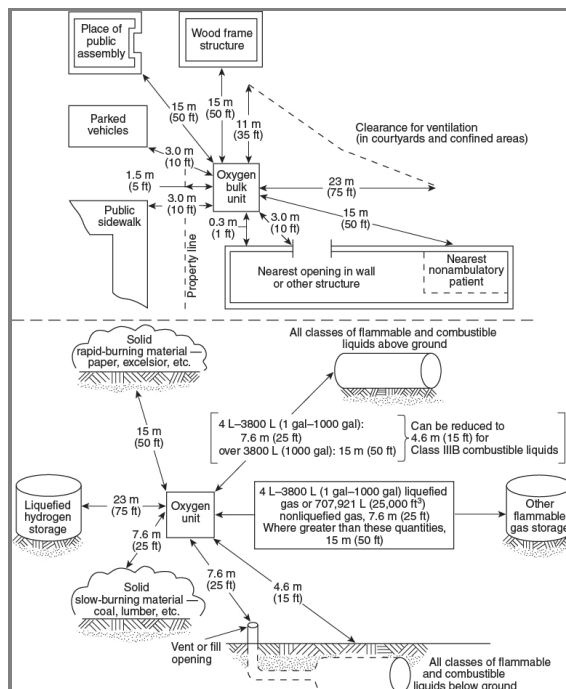
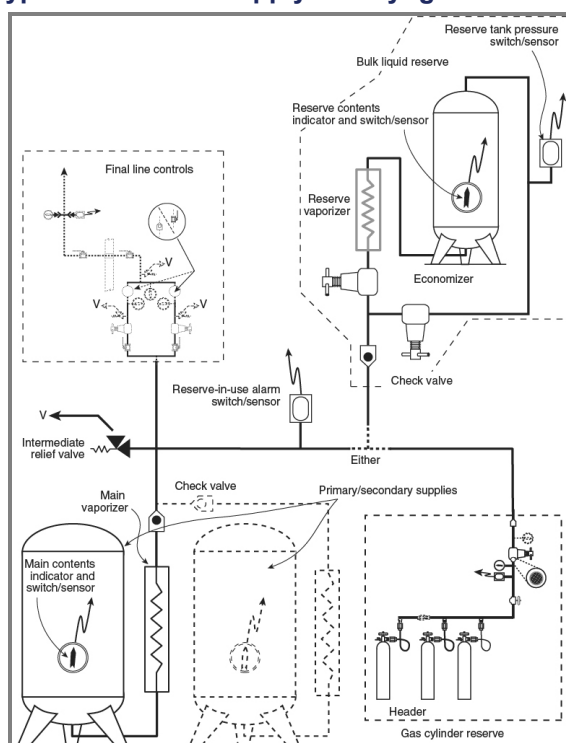


Figure A.5.1.3.10(b) Typical Source of Supply for Cryogenic Gas in Bulk.



Statement of Problem and Substantiation for Public Input

Figure (a) does not show reserve supplies. Figure (b) shows both the liquid option and the cylinder option.

Submitter Information Verification

Submitter Full Name: Corky Bishop

Organization: Apex Medical Gas Systems

Street Address:

City:

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Zip:

Submittal Date: Fri May 14 17:37:07 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: FR-1089-NFPA 99-2021

Statement: The current text incorrectly identifies Figure A.5.1.3.10(a) as bulk oxygen reserve option diagram; it is a diagram of the separation distances for bulk oxygen systems. This Annex comes from the section in NFPA 99 that is extracted from NFPA 55. To keep with the extracted information, the current NFPA 55 Figure is included.



Public Input No. 235-NFPA 99-2021 [Section No. A.15.3.3.5]

A.15.3.3.5— (note change all "vent to outside" to reflect new information with either vent to outside or in-room filter according to revised wording on dental vacuum exhaust)

-

A dental vacuum system is not intended for medical-surgical vacuum applications. A wet piping system is designed to accommodate liquid, air-gas, and solids through the service inlet. A dry piping system is designed to accommodate air-gas only through the service inlet, with liquids and solids being trapped before entering the system. [See Figure A.15.3.3.5(a) through Figure A.15.3.3.5(d).]

Figure A.15.3.3.5(a) Typical Wet or Dry Piping System with Single Vacuum Pump Source.

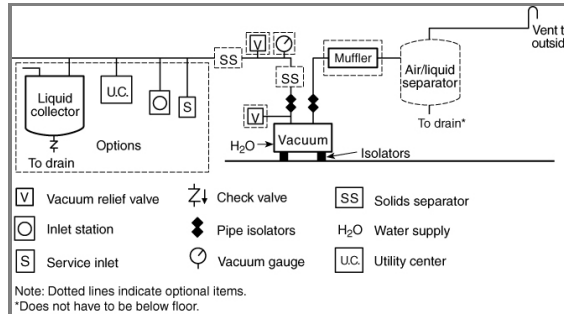


Figure A.15.3.3.5(b) Typical Wet or Dry Piping System with Duplex Vacuum Source with Air/Liquid Separator.

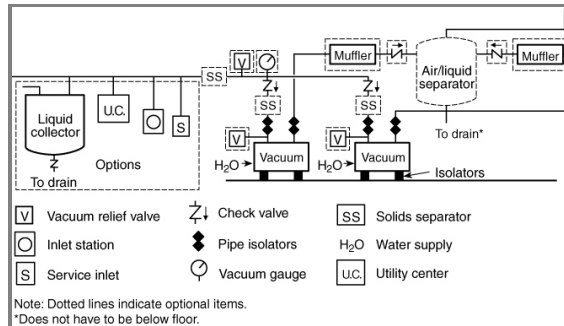


Figure A.15.3.3.5(c) Typical Wet or Dry Piping System with Single Vacuum Source.

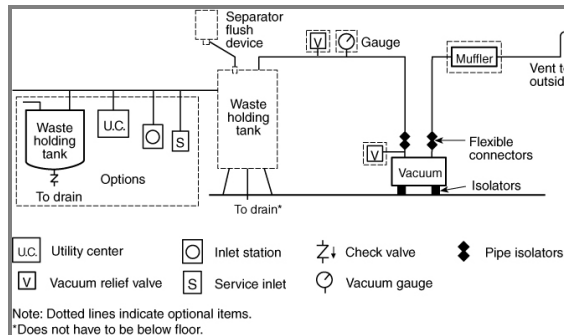
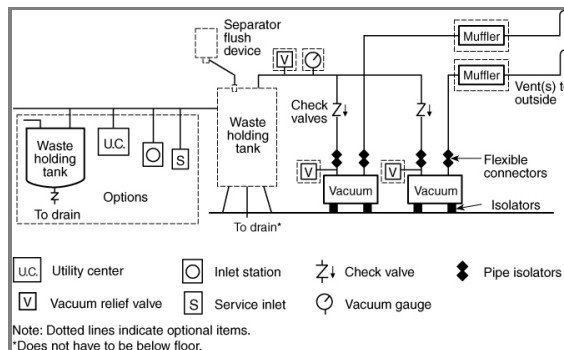


Figure A.15.3.3.5(d) Typical Wet or Dry Piping System with Duplex Vacuum Source with Waste Holding Tank.



Statement of Problem and Substantiation for Public Input

The dental vacuum exhaust proposal will allow new technology that needs to be reflected in the drawings.

Submitter Information Verification

Submitter Full Name: E. Daniel Shoemaker

Organization: Air Techniques

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City:

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Zip:

Submittal Date: Thu May 27 00:14:35 EDT 2021

Committee: HEA-PIP

Committee Statement

Resolution: [FR-1121-NFPA 99-2021](#)

Statement: The revision modifies Figures A.15.3.3.5(a) through (d) by including exhaust filters to more accurately represent typical dental vacuum arrangements.