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Revise/Reorganize Chapter 6 as shown in the word doc.

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Committee Statement

Committee Statement: As requested by the Correlating Committee, a Task Group of the Technical Committee on Electrical Systems was formed to review the overall organization of Chapter 6. The numbering system of the current document has become cumbersome and does not follow NFPA style guidelines for 99. Additionally, the CC recommended that the Chapter follow more of a Risk-Based flow similar to that of Chapter 5. Additional goals of the proposed reorganization are to reduce the number of subheadings and duplications, while consolidating related requirements to make the Chapter more logical to users. Effort was made to ensure no requirement content was changed as part of the reorganization. The reorganization is intended to be purely editorial and not change any of the performance requirements of the chapter.

Response Message:

Public Input No. 412-NFPA 99-2015 [Global Input]

Public Input No. 507-NFPA 99-2015 [Section No. 6.3.2.2]

Note: This is provided as a basic outline for the reorganization of the Chapter only. For final editorial changes and revisions see the First Draft.

6.1 [6.1] Applicability

6.1.1 [6.3.2.1] Electrical Installation. Installation shall be in accordance with NFPA 70, National Electrical Code.

6.1.2 [6.1.1] This chapter shall apply to new health care facilities as specified in Section 1.3.

6.1.3 [6.1.2] The following paragraphs of this chapter shall apply to new and existing health care facilities:

(1) 6.3.2.2.4.2

(2) 6.3.2.2.6.1

(3) 6.3.2.2.6.2(F)

(4) 6.3.2.2.8.5(B)(2)and (3)

(5) 6.3.2.2.8.7

(6) 6.3.2.2.11.5

(6) 6.3.4

(7) 6.4.1.1.18.7

(8) 6.4.2.2.6.2(C)

(9) 6.4.2.2.6.3

(10) 6.4.4

(11) 6.5.4

6.1.4 [6.1.3] Paragraph 6.3.2.2.2.3 shall apply only to existing facilities.

6.2 [6.2] Nature of Hazards

6.2.1* [6.2.1] Fire and Explosions.

6.2.2 [6.2.2] Shock. (RESERVED)

6.2.3 [6.2.3] Thermal. (RESERVED)

6.2.4* Location of Essential Electrical System Components.

6.2.4.1 Essential electrical system components shall be located to minimize interruptions caused by natural forces common to the area (e.g., storms, floods, earthquakes, or hazards created by adjoining structures or activities).

6.2.4.2 Installations of electrical services shall be located to reduce possible interruption of normal electrical services resulting from similar causes as well as possible disruption of normal electrical service due to internal wiring and equipment failures.

6.2.4.3 Feeders shall be located to provide physical separation of the feeders of the alternate source and from the feeders of the normal electrical source to prevent possible simultaneous interruption

6.3 General

6.3.1 [6.3.1] Sources.

Each health care appliance requiring electrical line power for operation shall be supported by power sources that provide power adequate for each service.

6.3.1.1 [6.3.1.1] Power/Utility Company. (Reserved)

6.3.1.2 [6.3.2.1.2] On-Site Generator Set. (Reserved)

6.3.2 [6.3.2] Distribution

6.3.2.1* [6.3.2.1.1] Distribution system arrangements shall be designed to minimize interruptions to the electrical systems due to internal failures by the use of adequately rated equipment.

6.3.2.2 [6.3.2.2.6] Receptacles.

6.3.2.2.1* [6.3.2.2.6.1] Types of Receptacles.

(A) Each ~~power~~ receptacle shall provide at least one separate, ~~highly dependable~~ grounding ~~pole~~ terminal capable of maintaining low-contact resistance with its mating plug, despite severe electrical and mechanical ~~abuse~~ use of the receptacle. The grounding terminal of each receptacle shall be connected to the reference grounding point by means of an insulated copper equipment grounding conductor.

(B) Special receptacles, such as the following, shall be permitted:

(1) Four-pole units providing an extra pole for redundant grounding or ground continuity monitoring

(2) Locking-type receptacles

~~(3) Where required for reduction of electrical noise on the grounding circuit, receptacles in which the grounding terminals are purposely insulated from the receptacle yoke~~

(C) All nonlocking-type, 125-volt, 15- or 20-ampere single, duplex, or quadruplex type receptacles, or any combination thereof, located in operating rooms and at patient bed locations in Category 1 spaces shall be listed and identified as hospital grade.

(D) Designated Pediatric Locations. Receptacles that are located within the patient rooms, bathrooms, playrooms, and activity rooms of pediatric units or spaces with similar risk as determined by the governing body by conducting a risk assessment, other than infant nurseries, shall be listed and identified as "tamper-resistant" or shall employ a listed tamper-resistant cover.

6.3.2.2.2 [6.3.2.2.6.2] Minimum Number of Receptacles. The number of receptacles shall be determined by the intended use of the spaces in accordance with 6.3.2.2.6.2(A) through 6.3.2.2.6.2(~~F~~E).

(A) Receptacles ~~for~~ Serving Patient Bed Locations in Category 2 Spaces. Each patient bed location shall be provided with a minimum of eight nonlocking-type, 125-volt, 15- or 20-ampere receptacles. They shall be permitted to be of the ~~locking or nonlocking type,~~ single, duplex, or quadruplex type, or any combination of the three. ~~All receptacles shall be listed hospital grade.~~ Other receptacles (e.g., portable X-ray receptacles) serving special-purpose, cord-and-plug-connected equipment shall be permitted to be of the locking or nonlocking type.

(B) Receptacles ~~for~~ Serving Patient Bed Locations in Category 1 Spaces Other than Operating Rooms. Each patient bed location shall be provided with a minimum of 14 nonlocking-type, 125-volt, 15- or 20-ampere receptacles. They shall be permitted to be of the ~~locking or nonlocking type,~~ single, duplex, or quadruplex type, or any combination of the three. ~~All receptacles shall be listed hospital grade.~~ Other receptacles (e.g., portable X-ray receptacles) serving special-purpose, cord-and-plug-connected equipment shall be permitted to be of the locking or nonlocking type.

(C) Receptacles ~~for~~ in Operating Rooms. Each ~~O~~ operating room~~s~~ shall be provided with a minimum of 36 125-volt, 15- or 20-ampere receptacles, at least 12 of which shall be connected to either of the following:

(1) The normal system branch circuit

(2) A critical branch circuit supplied by a different transfer switch other than the receptacles at the same location

They shall be permitted to be of the ~~locking or nonlocking type,~~ single, duplex, or quadruplex type, or any combination of the three. ~~All receptacles shall be listed hospital grade.~~ Other receptacles (e.g., portable X-ray receptacles) serving special-purpose, cord-and-plug-connected equipment shall be permitted to be of the locking or nonlocking type.

(D) Receptacles ~~for~~ in Bathrooms or Toilet~~s~~ Rooms. Receptacles shall not be required in bathrooms or toilet rooms.

(E) Receptacles for Special Rooms. Receptacles shall not be required in rooms where medical requirements mandate otherwise (e.g., certain psychiatric, pediatric, or hydrotherapy rooms).

~~(F) Designated Pediatric Locations. Receptacles that are located within the patient rooms, bathrooms, playrooms, and activity rooms of pediatric units or spaces with similar risk as determined by the governing body, other than nurseries, shall be listed tamper-resistant or shall employ a listed tamper-resistant cover.~~

6.3.2.2.3 Polarity of Receptacles. Each receptacle shall be wired in accordance with NFPA 70, National Electrical Code, to ensure correct polarity.

6.3.2.2.4 Other Services Receptacles. Receptacles provided for other services having different voltages, frequencies, or types on the same premises shall be of such design that attachment plugs and caps used in such receptacles cannot be connected to circuits of a different voltage, frequency, or type, but shall be interchangeable within each classification and rating required for two-wire, 125-V, single-phase ac service.

6.3.2.2.5* [6.3.2.2.7.1] Use of Isolated Ground Receptacles.

(A) An isolated ground receptacle, if used, shall not defeat the purposes of the safety features of the grounding systems detailed ~~herein~~ in 6.3.2.2.4.

(B) An isolated ground receptacle shall not be installed within a patient care vicinity.

(C) Isolated grounding receptacles installed in branch circuits for patient care spaces shall be connected to an insulated equipment grounding conductor in accordance with NFPA 70, National Electrical Code, 250.146(D) in addition to the two equipment grounding conductor paths required in 6.3.2.2.2.4 .

(D) The equipment grounding conductor installed for isolated grounding receptacles in patient care areas shall be clearly identified using green insulation with one or more yellow stripes along its entire length.

6.3.2.2.6 [6.3.2.2.1.4] Special-Purpose Outlets. Branch circuits serving only special-purpose outlets or receptacles (e.g., portable X-ray receptacles) shall not be required to conform to the requirements of 6.3.2.2.1.2.

6.3.2.2.7 [6.3.2.3] Clinical Laboratories. Outlets with two to four receptacles, or an equivalent ~~power strip~~ multioutlet assembly, shall be installed every 0.5 m to 1.0 m (1.6 ft to 3.3 ft) in instrument usage areas, and either installation shall be at least 80 mm (3.15 in.) above the countertop.

6.3.2.3 [6.3.2.2.8] Wet Procedure Locations.

6.3.2.3.1 [6.3.2.2.8.1] Wet procedure locations shall be provided with special protection against electric shock.

6.3.2.3.2 [6.3.2.2.8.2] This special protection shall be provided as follows:

(1) Power distribution system that inherently limits the possible ground-fault current due to a first fault to a low value, without interrupting the power supply

(2) Power distribution system in which the power supply is interrupted if the ground-fault current does, in fact, exceed the trip value of a Class A GFCI

6.3.2.3.3 [6.3.2.2.8.3] Patient beds, toilets, bidets, and wash basins shall not be required to be considered wet procedure locations.

6.3.2.3.4* [6.3.2.2.8.4] Operating rooms shall be considered to be a wet procedure location, unless a risk assessment conducted by the health care governing body determines otherwise.

6.3.2.3.5 If the risk assessment conducted by the governing body, as defined in Chapter 3, determines that the operating room is not a wet procedure location, then the special protection of 6.3.2.2.8 shall not be required.

6.3.2.3.5 [6.3.2.2.8.5] In existing construction, the requirements of 6.3.2.2.8.1 shall not be required when a written inspection procedure, acceptable to the authority having jurisdiction, is performed by a designated individual at the hospital to indicate that equipment grounding conductors for 120-V, single-phase, 15-A and 20-A receptacles; equipment connected by cord and plug; and fixed electrical equipment are installed and maintained in accordance with NFPA 70, National Electrical Code, and the applicable performance requirements of this chapter.

(A) The procedure shall include electrical continuity tests of all required equipment, grounding conductors, and their connections.

(B) Fixed receptacles, equipment connected by cord and plug, and fixed electrical equipment shall be tested as follows:

(1) When first installed

(2) Where there is evidence of damage

(3) After any repairs

6.3.2.3.6 [6.3.2.2.8.6] The use of an isolated power system (IPS) shall be permitted as a protective means capable of limiting ground-fault current without power interruption. When installed, such a power system shall conform to the requirements of 6.3.2.6.

6.3.2.3.7* [6.3.2.2.8.7] Operating rooms defined as wet procedure locations shall be protected by either isolated power or ground-fault circuit interrupters.

6.3.2.3.8 [6.3.2.2.8.8] Where GFCI protection is used in an operating room, one of the following shall apply:

(1) Each receptacle shall be an individual GFCI device.

(2) Each receptacle shall be individually protected by a single GFCI device.

6.3.2.4 [6.3.2.2.9] Isolated Power.

6.3.2.4.1 [6.3.2.2.9.1] An isolated power system shall not be required to be installed in any patient care space, except as specified in 6.3.2.2.8.

6.3.2.4.2 [6.3.2.2.9.2] The system shall be permitted to be installed where it conforms to the performance requirements specified in 6.3.2.6.

6.3.2.5 [6.3.2.2.1] Circuits. ~~Branch circuit wiring 600 V or less shall comply with the requirements in 6.3.2.2.1.1 through 6.3.2.2.1.4.~~

6.2.3.5.1 [6.3.2.2.1.1(A)] Normal branch-~~Branch~~ circuits serving a ~~given~~ patient bed location shall be fed from not more than one normal branch-circuit distribution panel.

6.2.3.5.2 [6.3.2.2.1.1(B)] ~~When required, branch~~ Branch circuits serving a ~~given~~ patient bed location shall be permitted to be fed from more than one critical branch-circuit distribution panel.

6.3.2.3.5.3 [6.3.2.2.1.3]

(A) Only authorized personnel shall have access to overcurrent protective devices serving Category 1 and Category 2 spaces.

(B) Overcurrent protective devices serving Category 1 and Category 2 spaces shall not be permitted to be located in public access spaces.

(C) Where used in locations such as in Category 1 spaces, isolated power panels shall be permitted in those locations.

6.3.2.5.4 [6.3.2.2.5] Low-voltage wiring shall comply with either of the following:

(1) Fixed systems of 30 V (dc or ac rms) or less shall be permitted to be ungrounded, provided that the insulation between each ungrounded conductor and the primary circuit, which is supplied from a conventionally grounded distribution system, is the same protection as required for the primary voltage.

(2) A grounded low-voltage system shall be permitted, provided that load currents are not carried in the grounding conductors.

6.3.2.6 Grounding

6.3.2.6.1 [6.3.2.2.2] Grounding requirements shall comply with the requirements in 6.3.2.2.2.1 through 6.3.2.2.2.4.

6.3.2.6.1.1 [6.3.2.2.2.1] Grounding Circuitry Integrity. Grounding circuits and conductors in patient care spaces shall be installed in such a way that the continuity of other parts of those circuits cannot be interrupted nor the resistance raised above an acceptable level by the installation, removal, and replacement of any installed equipment, including power receptacles.

6.3.2.6.1.2 [6.3.2.2.2.2] Reliability of Grounding. The equipment grounding conductors shall conform to NFPA 70, National Electrical Code. Branch circuits serving electrical equipment within the patient care vicinity shall be provided with effective ground-fault current paths dual-fed by a wiring method that qualifies as an equipment grounding conductor and by an insulated copper equipment grounding conductor.

6.3.2.6.1.3 [6.3.2.2.2.3] Separate Grounding Conductor. When existing construction does not have a separate grounding conductor, the continued use of the system shall be permitted, provided that it meets the performance requirements in 6.3.3.1.

6.3.2.6.1.4 [6.3.2.2.2.4] ~~Metal Receptacle Boxes~~ Grounding of Receptacles and Fixed Electrical Equipment in Patient Care Spaces. ~~Where metal receptacle boxes are used, the performance of the connection between the receptacle grounding terminal and the metal box shall be equivalent to the performance provided by copper wire no smaller than 12 AWG.~~

(A) All branch circuits serving patient care spaces shall be provided with an effective ground-fault current path by installation in a metal raceway system, or a cable having a metallic armor or sheath assembly. The metal raceway system, or metallic cable armor, or sheath assembly shall itself qualify as an equipment grounding conductor.

(B) Insulated Equipment Grounding Conductors and Insulated Equipment Bonding Jumpers.

The following shall be directly connected to an insulated copper equipment grounding conductor that is clearly identified along its entire length by green insulation, with no yellow stripes, and installed with the branch circuit conductors in the wiring methods as provided in 6.3.2.2.2.4(A):

1. The grounding terminals of all receptacles other than isolated ground receptacles.

2. Where receptacles are mounted in metal receptacle outlet boxes are used, metal device boxes, or metal enclosures, the performance of the connection between the receptacle grounding terminal and the metal box or enclosure shall be equivalent to the performance provided by copper wire sized in accordance with 250.146 and Table 250.122 of NFPA 70, National Electrical Code®, but no smaller than 12 AWG.

3. All non–current-carrying conductive surfaces of fixed electrical equipment likely to become energized that are subject to personal contact, operating at over 100 volts.

4. Metal faceplates shall be connected to the equipment grounding conductor by means of a metal mounting screw(s) securing the faceplate to a grounded outlet box or grounded wiring device.

5. Luminaires more than 2.3 m (7½ ft) above the floor and switches located outside of the patient care vicinity shall be permitted to be connected to an equipment grounding return path complying with 6.3.2.2.2.4(A) and (B).

6.3.2.6.1.5 [6.3.2.2.3] Grounding Interconnects. In patient care spaces supplied by the normal distribution system and any branch of the essential electrical system, the grounding system of the normal distribution system and that of the essential electrical system shall be interconnected.

6.3.2.6.2 [6.3.2.2.7.2] Patient Equipment Grounding Point. A patient equipment grounding point comprising one or more grounding terminals or jacks shall be permitted in an accessible location in the patient care vicinity.

6.3.2.6.3* [6.3.2.2.7.3] Special Grounding in Patient Care Rooms. In addition to the grounding required to meet the performance requirements of 6.3.3.1, additional grounding shall be permitted where special circumstances so dictate.

6.3.2.7 [6.6.2.2.11] Battery-Powered Lighting Units.

6.3.2.7.1 [6.3.2.2.11.1] One or more battery-powered lighting units shall be provided within locations where deep sedation and general anesthesia is administered.

6.3.2.7.2 [6.3.2.2.11.2] The lighting level of each unit shall be sufficient to terminate procedures intended to be performed within the operating room.

6.3.2.7.3 [6.3.2.2.11.3] The sensor for units shall be wired to the unswitched portion of branch circuit(s) serving general lighting within the room.

6.3.2.7.4 [6.3.2.2.11.4] Units shall be capable of providing lighting for 1½ hours.

6.3.2.7.5 [6.3.2.2.11.5] Units shall be tested monthly for 30 seconds, and annually for 30 minutes.

6.3.2.8 [6.3.2.4] Other Non-Patient Care Areas (RESERVED)

6.3.2.9 [6.3.2.5] Ground Fault Protection

6.3.2.9.1 [6.3.2.5.1] Applicability. The requirements of 6.3.2.5.2 shall apply to ~~hospitals and other buildings~~ health care facilities housing Category 1 spaces or utilizing life-support equipment and

buildings that provide essential utilities or services for the operation of Category 1 spaces or electrical life-support equipment.

6.3.2.9.2 [6.3.2.5.2] When ground-fault protection is provided for operation of the service or feeder disconnecting means, an additional step of ground-fault protection shall be provided in the next level of feeder downstream toward the load.

6.3.2.9.3 [6.3.2.5.3] Ground-fault protection for operation of the service and feeder disconnecting means shall be fully selective such that the downstream device and not the upstream device shall open for downstream ground faults.

6.3.2.9.4 [6.3.2.2.4] Protection against Ground Faults.

6.3.2.9.4.1 [6.3.2.2.4.1] Equipment Protection. The main and downstream ground-fault protective devices (where required) shall be coordinated as required in 6.3.2.5.

6.3.2.9.4.2 [6.3.2.2.4.2] Personnel Protection. If used, ground-fault circuit interrupters (GFCIs) shall be listed.

6.3.2.10 [6.3.2.6] Isolated Power Systems

6.3.2.10.1 [6.3.2.6.1] Isolation Transformer.

6.3.2.10.1.1 [6.3.2.6.1.1] The isolation transformer shall be listed and approved for the purpose.

6.3.2.10.1.2 [6.3.2.6.1.2] The primary winding shall be connected to a power source so that it is not energized with more than 600 V (nominal).

(A) If present, the neutral of the primary winding shall be grounded in an approved manner.

(B) If an electrostatic shield is present, it shall be connected to the reference grounding point.

6.3.2.10.1.3 [6.3.2.6.1.3] Wiring of isolated power systems shall be in accordance with 517.160 of NFPA 70, National Electrical Code.

6.3.2.10.2 [6.3.2.6.2] Impedance of Isolated Wiring.

6.3.2.10.2.1* [6.3.2.6.2.1] The impedance (capacitive and resistive) to ground of either conductor of an isolated system shall exceed 200,000 ohms when installed. The installation at this point shall include receptacles but is not required to include lighting fixtures or components of fixtures. This value shall be determined by energizing the system and connecting a low-impedance ac milliammeter (0 to 1 mA

scale) between the reference grounding point and either conductor in sequence. This test shall be permitted to be performed with the line isolation monitor (see 6.3.2.6.3) connected, provided that the connection between the line isolation monitor and the reference grounding point is open at the time of the test. After the test is made, the milliammeter shall be removed and the grounding connection of the line isolation monitor shall be restored. When the installation is completed, including permanently connected fixtures, the reading of the meter on the line isolation monitor, which corresponds to the unloaded line condition, shall be made. This meter reading shall be recorded as a reference for subsequent line impedance evaluation. This test shall be conducted with no phase conductors grounded.

6.3.2.10.2.2 [6.3.2.6.2.2] An approved capacitance suppressor shall be permitted to be used to improve the impedance of the permanently installed isolated system; however, the resistive impedance to ground of each isolated conductor of the system shall be at least 1 megohm prior to the connection of the suppression equipment. Capacitance suppressors shall be installed so as to prevent inadvertent disconnection during normal use.

6.3.2.10.3 [6.3.2.6.3] Line Isolation Monitor.

6.3.2.10.3.1* [6.3.2.6.3.1] In addition to the usual control and protective devices, each isolated power system shall be provided with an approved, continually operating line isolation monitor that indicates possible leakage or fault currents from either isolated conductor to ground.

6.3.2.10.3.2 [6.3.2.6.3.2] The monitor shall be designed such that a green signal lamp, conspicuously visible in the area where the line isolation monitor is utilized, remains lighted when the system is adequately isolated from ground; and an adjacent red signal lamp and an audible warning signal (remote if desired) shall be energized when the total hazard current (consisting of possible resistive and capacitive leakage currents) from either isolated conductor to ground reaches a threshold value of 5.0 mA under normal line voltage conditions. The line isolation monitor shall not alarm for a fault hazard current of less than 3.7 mA.

6.3.2.10.3.3* [6.3.2.6.3.3] The line isolation monitor shall comply with either of the following:

(1) It shall have sufficient internal impedance such that, when properly connected to the isolated system, the maximum internal current that will flow through the line isolation monitor, when any point of the isolated system is grounded, shall be 1 mA.

(2) It shall be permitted to be of the low-impedance type such that the current through the line isolation monitor, when any point of the isolated system is grounded, will not exceed twice the alarm threshold value for a period not exceeding 5 milliseconds.

6.3.2.10.3.4* [6.3.2.6.3.4] An ammeter connected to indicate the total hazard current of the system (contribution of the fault hazard current plus monitor hazard current) shall be mounted in a plainly visible place on the line isolation monitor with the “alarm on” zone (total hazard current = 5.0 mA) at approximately the center of the scale. A line isolation monitor shall be located in the operating room.

6.3.2.10.3.5 [6.3.2.6.3.5] Means shall be provided for shutting off the audible alarm while leaving the red warning lamp activated. When the fault is corrected and the green signal lamp is reactivated, the audible alarm-silencing circuit shall reset automatically, or an audible or distinctive visual signal shall indicate that the audible alarm is silenced.

6.3.2.10.3.6 [6.3.2.6.3.6] A reliable test switch shall be mounted on the line isolation monitor to test its capability to operate (i.e., cause the alarms to operate and the meter to indicate in the “alarm on” zone). This switch shall transfer the grounding connection of the line isolation monitor from the reference grounding point to a test impedance arrangement connected across the isolated line; the test impedance(s) shall be of the appropriate magnitude to produce a meter reading corresponding to the rated total hazard current at the nominal line voltage, or to a lesser alarm hazard current if the line isolation monitor is so rated. The operation of this switch shall break the grounding connection of the line isolation monitor to the reference grounding point before transferring this grounding connector to the test impedance(s), so that making this test will not add to the hazard of a system in actual use; nor will the test include the effect of the line-to-ground stray impedance of the system. The test switch shall be of a self-restoring type.

6.3.2.10.3.7 [6.3.2.6.3.7] The line isolation monitor shall not generate energy of sufficient amplitude or frequency, as measured by a physiological monitor with a gain of at least 104 with a source impedance of 1000 ohms connected to the balanced differential input of the monitor, to create interference or artifact on human physiological signals. The output voltage from the amplifier shall not exceed 30 mV when the gain is 104. The impedance of 1000 ohms shall be connected to the ends of typical unshielded electrode leads that are a normal part of the cable assembly furnished with physiological monitors. A 60 Hz notch filter shall be used to reduce ambient interference, as is typical in physiological monitor design.

6.3.2.10.4 [6.3.2.6.4] Identification of Conductors for Isolated (Ungrounded) Systems. The isolated conductors shall be identified in accordance with 517.160(A)(5) of NFPA 70, National Electrical Code.

6.3.3 [6.3.3] Performance Criteria and Testing

6.3.3.1 [6.3.3.1] Grounding System in Patient Care Spaces.

6.3.3.1.1* [6.3.3.1.1] Grounding System Testing. The effectiveness of the grounding system shall be determined by voltage measurements and impedance measurements.

6.3.3.1.1.1 [6.3.3.1.1.1] For new construction, the effectiveness of the grounding system shall be evaluated before acceptance.

6.3.3.1.1.2 [6.3.3.1.1.2] Small wall-mounted conductive surfaces not likely to become energized, such as surface-mounted towel and soap dispensers, mirrors, and so forth, shall not be required to be intentionally grounded or tested.

6.3.3.1.1.3 [6.3.3.1.1.3] Large metal conductive surfaces not likely to become energized, such as windows, door frames, and drains, shall not be required to be intentionally grounded or periodically tested.

6.3.3.1.1.4* [6.3.3.1.1.4] Whenever the electrical system has been altered or replaced, that portion of the system shall be tested.

6.3.3.1.2 [6.3.3.1.2] Reference Point. The voltage and impedance measurements shall be taken with respect to a reference point, which shall be one of the following:

(1) Reference grounding point (see Chapter 3)

(2) Grounding point, in or near the room under test, that is electrically remote from receptacles (e.g., an all-metal cold-water pipe)

(3) Grounding contact of a receptacle that is powered from a different branch circuit from the receptacle under test

6.3.3.1.3* [6.3.3.1.3] Voltage Measurements.

6.3.3.1.3.1 [6.3.3.1.3.1] The voltage measurements shall be made under no-fault conditions between a reference point and exposed fixed electrical equipment with conductive surfaces in a patient care vicinity.

6.3.3.1.3.2 [6.3.3.1.3.2] The voltage measurements shall be made with an accuracy of ~~±20~~ ±5 percent.

6.3.3.1.3.3 [6.3.3.1.3.3] Voltage measurements for faceplates of wiring devices shall not be required.

6.3.3.1.4* [6.3.3.1.4] Impedance Measurements. The impedance measurement shall be made with an accuracy of ~~±20~~ ±5 percent.

6.3.3.1.4.1 [6.3.3.1.4.1] For new construction, the impedance measurement shall be made between the reference point and the grounding contact of 10 percent of all receptacles within the patient care vicinity.

6.3.3.1.4.2 [6.3.3.1.4.2] The impedance measurement shall be the ratio of voltage developed (either 60 Hz or dc) between the point under test and the reference point to the current applied between these two points.

6.3.3.1.5 [6.3.3.1.5] Test Equipment. Electrical safety test instruments shall be tested periodically, but not less than annually, for acceptable performance.

6.3.3.1.5.1 [6.3.3.1.5.1] Voltage measurements specified in 6.3.3.1.3 shall be made with an instrument having an input resistance of 1000 ohms ±10 percent at frequencies of 1000 Hz or less.

6.3.3.1.5.2 [6.3.3.1.5.2] The voltage across the terminals (or between any terminal and ground) of resistance-measuring instruments used in occupied patient care rooms shall not exceed 500 mV rms or 1.4 dc or peak to peak.

6.3.3.1.6 [6.3.3.1.6] Criteria for Acceptability for New Construction.

6.3.3.1.6.1 [6.3.3.1.6.1] The voltage limit shall be 20 mV.

6.3.3.1.6.2 [6.3.3.1.6.2] The impedance limit shall be 0.2 ohm for systems containing isolated ground receptacles and 0.1 ohm for all others.

6.3.3.2 [6.3.3.2] Receptacle Testing in Patient Care Spaces.

6.3.3.2.1 [6.3.3.2.1] The physical integrity of each receptacle shall be confirmed by visual inspection.

6.3.3.2.2 [6.3.3.2.2] The continuity of the grounding circuit in each electrical receptacle shall be verified.

6.3.3.2.3 [6.3.3.2.3] Correct polarity of the hot and neutral connections in each electrical receptacle shall be confirmed.

6.3.3.2.4 [6.3.3.2.4] The retention force of the grounding blade of each electrical receptacle (except locking-type receptacles) shall be not less than 115 g (4 oz).

6.3.3.2.5 [6.3.4.1.1] Where hospital-grade receptacles are required at patient bed locations and in locations where deep sedation or general anesthesia is administered, testing shall be performed after initial installation, replacement, or servicing of the device.

6.3.3.2.6 [6.3.4.1.2] Additional testing of receptacles in patient care spaces shall be performed at intervals defined by documented performance data.

6.3.3.2.7 [6.3.4.1.3] Receptacles not listed as hospital-grade, at patient bed locations and in locations where deep sedation or general anesthesia is administered, shall be tested at intervals not exceeding 12 months.

6.3.3.3 [6.3.3.3] Isolated Power Systems.

6.3.3.3.1 [6.3.3.3.1] Patient Care Spaces. If installed, the isolated power system shall be tested in accordance with 6.3.3.3.2.

6.3.3.3.2 [6.3.3.3.2] Line Isolation Monitor Tests. The line isolation monitor (LIM) circuit shall be tested after installation, and prior to being placed in service, by successively grounding each line of the energized distribution system through a resistor whose value is 200 × V (ohms), where V equals measured line voltage. The visual and audible alarms (see 6.3.2.6.3.2) shall be activated.

6.3.3.3.3 [6.3.4.1.4] The LIM circuit shall be tested at intervals of not more than 1 month by actuating the LIM test switch (see 6.3.2.6.3.6). For a LIM circuit with automated self-test and self-calibration capabilities, this test shall be performed at intervals of not more than 12 months. Actuation of the test switch shall activate both visual and audible alarm indicators.

6.3.3.3.4 [6.3.4.1.5] After any repair or renovation to an electrical distribution system, the LIM circuit shall be tested in accordance with 6.3.3.3.2.

6.3.3.4 [6.3.3.4] Ground-Fault Protection Testing. When equipment ground-fault protection is first installed, each level shall be performance-tested to ensure compliance with 6.3.2.5.

6.3.4 [6.3.4] Administration of Electrical System

6.3.4.1 [6.3.4.2] Record Keeping

6.3.4.1.1 [6.3.4.2.1.1] A record shall be maintained of the tests required by this chapter and associated repairs or modification.

6.3.4.1.2 [6.3.4.2.1.2] At a minimum, the record shall contain the date, the rooms or areas tested, and an indication of which items have met, or have failed to meet, the performance requirements of this chapter.

6.3.4.1.3 [6.3.4.2.2] Isolated Power System (Where Installed). A permanent record shall be kept of the results of each of the tests.

<u>6.4 Category 1 Spaces</u>

6.4.1 [6.3.2.2.10.1] Category 1 spaces shall be served ~~only~~ by a Type 1 EES.

<u>6.4.2 Category 1 spaces shall not be served by a Type 2 EES.</u>

6.4.3 [6.3.2.2.1.2] Category 1 spaces shall be served by circuits from a critical branch panel(s) served from a single automatic transfer switch and a minimum of one circuit served by the normal power distribution system or by a system originating from a second critical branch automatic transfer switch.

6.4.4 [6.3.2.2.10.3] A Type I EES serving a Category 1 space shall be permitted to serve Category 2 spaces in the same facility.

6.5 Category 2 Spaces

6.5.1 [6.3.2.2.10.2] Category 2 spaces shall be served by a Type 1 or Type 2 EES.

6.5.2 Category 2 spaces served by a Type 2 EES shall be served by circuits from an equipment branch panel(s) served from a single automatic transfer switch and a minimum of one circuit served by the normal power distribution system or by a system originating from a second equipment branch automatic transfer switch.

6.6 Category 3 and 4 Spaces

6.6.1 [6.3.2.2.10.4] Category 3 or Category 4 spaces shall not be required to be served by an EES.

6.7 [6.4] Essential Electrical Systems

6.7.1 [6.4.1] Sources (Type 1 EES).

6.7.1.1* [6.4.1.1.1] Design Considerations. Dual sources of normal power shall not constitute an alternate source of power as described in this chapter.

6.7.1.2 [6.4.1.1] On-Site Generator Set.

6.7.1.2.1 [6.4.1.1.2] Current-sensing devices, phase and ground, shall be selected to minimize the extent of interruption to the electrical system due to abnormal current caused by overload or short circuits, or both.

6.7.1.2.2 [6.4.1.1.4] Essential electrical systems shall have a minimum of the following two independent sources of power: a normal source generally supplying the entire electrical system and one or more alternate sources for use when the normal source is interrupted.

6.7.1.2.3 [6.4.1.1.5] Where the normal source consists of generating units on the premises, the alternate source shall be either another generating set or an external utility service.

6.7.1.2.4 [6.4.1.1.6] General. Generator sets installed as an alternate source of power for essential electrical systems shall be designed to meet the requirements of such service.

6.7.1.2.4.1 [6.4.1.1.6.1] Type 1 and Type 2 essential electrical system power sources shall be classified as Type 10, Class X, Level 1 generator sets per NFPA 110, Standard for Emergency and Standby Power Systems.

~~6.7.1.2.4.2 [6.4.1.1.6.2] Type 3 essential electrical system power sources shall be classified as Type 10, Class X, Level 2 generator sets per NFPA 110, Standard for Emergency and Standby Power Systems.~~

6.7.1.2.5 [6.4.1.1.8] Use for Essential Electrical System.

6.7.1.2.5.1 [6.4.1.1.8.1] The generating equipment used shall be either reserved exclusively for such service or normally used for other purposes of peak demand control, internal voltage control, load relief for the external utility, or cogeneration. If normally used for such other purposes, two or more sets shall be installed, such that the maximum actual demand likely to be produced by the connected load of the life safety and critical branches, as well as medical air compressors, medical–surgical vacuum pumps, electrically operated fire pumps, jockey pumps, fuel pumps, and generator accessories, shall be met by a multiple generator system, with the largest generator set out of service (not available). The alternate source of emergency power for illumination and identification of means of egress shall be the essential electrical system. The alternate power source for fire protection signaling systems shall be the essential electrical system.

6.7.1.2.5.2 [6.4.1.1.8.2] A single generator set that operates the essential electrical system shall be permitted to be part of the system supplying the other purposes as specified in 6.4.1.1.8.1, provided that any such use will not decrease the mean period between service overhauls to less than 3 years.

6.7.1.2.5.3* [6.4.1.1.8.3] Optional loads shall be permitted to be served by the essential electrical system generating equipment. Optional loads shall be served by their own transfer means, such that these loads shall not be transferred onto the generating equipment if the transfer will overload the generating equipment and shall be shed upon a generating equipment overload. Use of the generating equipment to serve optional loads shall not constitute “other purposes” as described in 6.4.1.1.8.1 and, therefore, shall not require multiple generator sets.

6.7.1.2.5.4 [6.4.1.1.8.4] Where optional loads include contiguous or same-site facilities not covered in this code, provisions shall be made to meet the requirements of NFPA 101, Life Safety Code; Article 700 of NFPA 70, National Electrical Code; and other applicable NFPA requirements for emergency egress under load-shed conditions.

6.7.1.2.6 [6.4.1.1.9] Work Space or Room.

6.7.1.2.6.1 [6.4.1.1.9.1] The EPS shall be installed in a separate room for Level 1 installations. EPSS equipment shall be permitted to be installed in this room. [110:7.2.1]

(A) The room shall have a minimum 2-hour fire rating or be located in an adequate enclosure located outside the building capable of resisting the entrance of snow or rain at a maximum wind velocity required by local building codes. [110:7.2.1.1]

(B) The rooms, enclosures, or separate buildings housing Level 1 or Level 2 EPSS equipment shall be designed and located to minimize damage from flooding, including that caused by the following:

(1) Flooding resulting from fire fighting

(2) Sewer water backup

(3) Other disasters or occurrences [110:7.2.3]

6.7.1.2.6.2 [6.4.1.1.9.2] The EPS equipment shall be installed in a location that permits ready accessibility and a minimum of 0.9 m (36 in.) from the skid rails' outermost point in the direction of access for inspection, repair, maintenance, cleaning, or replacement. This requirement shall not apply to units in outdoor housings. [110:7.2.6]

6.7.1.2.7* [6.4.1.1.10] Capacity and Rating. The generator set(s) shall have the capacity and rating to meet the maximum actual demand likely to be produced by the connected load of the essential electrical system(s).

6.7.1.2.8 [6.4.1.1.11] Load Pickup. The energy converters shall have the required capacity and response to pick up and carry the load within the time specified in Table 4.1(b) of NFPA 110, Standard for Emergency and Standby Power Systems, after loss of primary power.

6.7.1.2.9 [6.4.1.1.12] Maintenance of Temperature. The EPS shall be heated as necessary to maintain the water jacket and battery temperature determined by the EPS manufacturer for cold start and load acceptance for the type of EPSS. [110:5.3.1]

6.7.1.2.10* [6.4.1.1.13] Heating, Cooling, and Ventilating. With the EPS running at rated load, ventilation airflow shall be provided to limit the maximum air temperature in the EPS room or the enclosure housing the unit to the maximum ambient air temperature required by the EPS manufacturer. [110:7.7.1]

6.7.1.2.10.1 [6.4.1.1.13.1] Consideration shall be given to all the heat emitted to the EPS equipment room by the energy converter, uninsulated or insulated exhaust pipes, and other heat-producing equipment. [110:7.7.1.1]

6.7.1.2.10.2 [6.4.1.1.13.2] Air shall be supplied to the EPS equipment for combustion. [110:7.7.2]

(A) For EPS supplying Level 1 EPSS, ventilation air shall be supplied directly from a source outside the building by an exterior wall opening or from a source outside the building by a 2-hour fire-rated air transfer system. [110:7.7.2.1]

(B) For EPS supplying Level 1 EPSS, discharge air shall be directed outside the building by an exterior wall opening or to an exterior opening by a 2-hour fire-rated air transfer system. [110:7.7.2.2]

(C) Fire dampers, shutters, or other self-closing devices shall not be permitted in ventilation openings or ductwork for supply or return/discharge air to EPS equipment for Level 1 EPSS. [110:7.7.2.3]

6.7.1.2.10.3 [6.4.1.1.13.3] Ventilation air supply shall be from outdoors or from a source outside of the building by an exterior wall opening or from a source outside the building by a 2-hour fire-rated air transfer system. [110:7.7.3]

6.7.1.2.10.4 [6.4.1.1.13.4] Ventilation air shall be provided to supply and discharge cooling air for radiator cooling of the EPS when running at rated load. [110:7.7.4]

(A) Ventilation air supply and discharge for radiator-cooled EPS shall have a maximum static restriction of 125 Pa (0.5 in. of water column) in the discharge duct at the radiator outlet. [110:7.7.4.1]

(B) Radiator air discharge shall be ducted outdoors or to an exterior opening by a 2-hour rated air transfer system. [110:7.7.4.2]

6.7.1.2.10.5 [6.4.1.1.13.5] Motor-operated dampers, when used, shall be spring operated to open and motor closed. Fire dampers, shutters, or other self-closing devices shall not be permitted in ventilation openings or ductwork for supply or return/discharge air to EPS equipment for Level 1 EPSS. [110:7.7.5]

6.7.1.2.10.6 [6.4.1.1.13.6] The ambient air temperature in the EPS equipment room or outdoor housing containing Level 1 rotating equipment shall be not less than 4.5°C (40°F). [110:5.3.5]

6.7.1.2.10.7 [6.4.1.1.13.7] Units housed outdoors shall be heated as specified in 5.3.1 [of NFPA 110, Standard for Emergency and Standby Power Systems]. [110:7.7.7]

6.7.1.2.10.8 [6.4.1.1.13.8] Design of the heating, cooling, and ventilation system for the EPS equipment room shall include provision for factors including, but not limited to, the following:

(1) Heat

(2) Cold

(3) Dust

(4) Humidity

(5) Snow and ice accumulations around housings

(6) Louvers

(7) Remote radiator fans

(8) Prevailing winds blowing against radiator fan discharge air [110:7.7.7]

6.7.1.2.11 [6.4.1.1.14] Cranking Batteries. Internal combustion engine cranking batteries shall be in accordance with the battery requirements of NFPA 110, Standard for Emergency and Standby Power Systems.

6.7.1.2.12 [6.4.1.1.15] Compressed Air Starting Devices. Other types of stored energy starting systems (except pyrotechnic) shall be permitted to be used where recommended by the manufacturer of the prime mover and subject to approval of the authority having jurisdiction, under the following conditions:

(1) Where two complete periods of cranking cycles are completed without replacement of the stored energy

(2) Where a means for automatic restoration from the emergency source of the stored energy I s provided

(3) Where the stored energy system has the cranking capacity specified in 5.6.4.2.1 of NFPA 110, Standard for Emergency and Standby Power Systems

(4) Where the stored energy system has a “black start” capability in addition to normal discharge capability [110:5.6.4.1.2]

6.7.1.2.13 [6.4.1.1.16] Fuel Supply. The fuel supply for the generator set shall comply with Sections 5.5 and 7.9 of NFPA 110, Standard for Emergency and Standby Power Systems.

6.7.1.2.14 [6.4.1.1.17] Requirements for Safety Devices.

6.7.1.2.14.1 [6.4.1.1.17.1] Internal Combustion Engines. Internal combustion engines serving generator sets shall be equipped with the following:

(1) Sensor device plus visual warning device to indicate a water-jacket temperature below that required in 6.4.1.1.12

(2) Sensor devices plus visual pre-alarm warning device to indicate the following:

(a) High engine temperature (above manufacturer's recommended safe operating temperature range)

(b) Low lubricating oil pressure (below manufacturer's recommended safe operating range)

(c) Low water coolant level

(3) Automatic engine shutdown device plus visual device to indicate that a shutdown took place due to the following:

(a) Overcrank (failed to start)

(b) Overspeed

(c) Low lubricating oil pressure

(d) Excessive engine temperature

(4) Common audible alarm device to warn that one or more of the pre-alarm or alarm conditions exist

6.7.1.2.14.2 [6.4.1.1.17.2] Safety indications and shutdowns shall be in accordance with Table 6.4.1.1.17.2.

6.7.1.2.15 [6.4.1.1.18] Alarm Annunciator. A remote annunciator that is storage battery powered shall be provided to operate outside of the generating room in a location readily observed by operating personnel at a regular work station (see 700.12 of NFPA 70, National Electrical Code). The annunciator shall be hard-wired to indicate alarm conditions of the emergency or auxiliary power source as follows:

6.7.1.2.15.1 [6.4.1.1.18(1)] Individual visual signals shall indicate the following:

(a) When the emergency or auxiliary power source is operating to supply power to load

(b) When the battery charger is malfunctioning

6.7.1.2.15.2 [6.4.1.1.18(2)] Individual visual signals plus a common audible signal to warn of an engine-generator alarm condition shall indicate the following:

(a) Low lubricating oil pressure

(b) Low water temperature (below that required in 6.4.1.1.12)

(c) Excessive water temperature

(d) Low fuel when the main fuel storage tank contains less than a 4-hour operating supply

(e) Overcrank (failed to start)

(f) Overspeed

6.7.1.2.15.3* [6.4.1.1.18.1] A remote, common audible alarm shall be provided as specified in 6.4.1.1.18.6. [110:5.6.6]

6.7.1.2.15.4 [6.4.1.1.18.2] The following annunciation shall be provided at a minimum:

(1) For Level 1 EPS, local annunciation and facility remote annunciation, or local annunciation and network remote annunciation

~~(2) For Level 2 EPS, local annunciation~~ [110:5.6.6.2]

6.7.1.2.15.5 [6.4.1.1.18.4] For the purposes of defining the types of annunciation in 6.4.1.1.17.2, the following shall apply:

(1) Local annunciation is located on the equipment itself or within the same equipment room.

(2) Facility remote annunciation is located on site but not within the room where the equipment is located.

(3) Network remote annunciation is located off site. [110:5.6.6.3]

6.7.1.2.15.6 [6.4.1.1.18.4] An alarm-silencing means shall be provided, and the panel shall include repetitive alarm circuitry so that, after the audible alarm has been silenced, it reactivates after the fault condition has been cleared and has to be restored to its normal position to be silenced again. [110:5.6.6.4]

6.7.1.2.15.7 [6.4.1.1.18.5] In lieu of the requirement of 5.6.6.4 of NFPA 110, a manual alarm-silencing means shall be permitted that silences the audible alarm after the occurrence of the alarm condition, provided such means do not inhibit any subsequent alarms from sounding the audible alarm again

without further manual action. [110:5.6.6.5]

6.7.1.2.15.8 [6.4.1.1.18.6] Individual alarm indication to annunciate any of the conditions listed in Table 6.4.1.1.17.2 shall have the following characteristics:

(1) It shall be battery powered.

(2) It shall be visually indicated.

(3) It shall have additional contacts or circuits for a common audible alarm that signals locally and remotely when any of the itemized conditions occurs.

(4) It shall have a lamp test switch(es) to test the operation of all alarm lamps.

6.7.1.2.15.9 [6.4.1.1.18.7] A centralized computer system (e.g., building automation system) shall not be permitted to be substituted for the alarm annunciator in 6.4.1.1.18 but shall be permitted to be used to supplement the alarm annunciator.

6.7.1.3 [6.4.1.2] Battery. Battery systems shall meet all requirements of ~~Article 700 of NFPA 70, National Electrical Code~~ NFPA 111, Standard on Stored Electrical Energy and Standby Power Systems.

6.7.1.4 [6.4.1.1.7] Fuel Cell Systems. Fuel cell systems shall be permitted to serve as the alternate source for all or part of an essential electrical system, provided the following conditions apply:

6.7.1.4.1 [6.4.1.1.7.1] Installation shall comply with NFPA 853, Standard for Installation of Stationary Fuel Cell Power Systems.

6.7.1.4.2 [6.4.1.1.7.2] N+1 units shall be provided where N units have sufficient capacity to supply the demand load of the portion of the system served.

6.7.1.4.3 [6.4.1.1.7.3] System shall be able to assume loads within 10 seconds of loss of normal power source.

6.7.1.4.4 [6.4.1.1.7.4] System shall have a continuing source of fuel supply, together with sufficient on-site fuel storage for the essential system type.

6.7.1.4.5 [6.4.1.1.7.5] A connection shall be provided for a portable diesel generator to supply life safety and critical portions of the distribution system (if present).

6.7.1.4.6 Systems shall be listed for emergency use.

6.7.2* [6.4.2] Distribution (Type 1 EES).

6.7.2.1 [6.4.1.1.1] Design Considerations

6.7.2.1.1 [6.4.1.1.1.1] Distribution system arrangements shall be designed to minimize interruptions to the electrical systems due to internal failures by the use of adequately rated equipment.

6.7.2.1.2 [6.4.1.1.1.2] The following factors shall be considered in the design of the distribution system:

(1) Abnormal voltages, such as single phasing of three-phase utilization equipment; switching or lightning surges, or both; voltage reductions; and so forth

(2) Capability of achieving the fastest possible restoration of any given circuit(s) after clearing a fault

(3) Effects of future changes, such as increased loading or supply capacity, or both

(4) Stability and power capability of the prime mover during and after abnormal conditions

(5) *Sequence reconnection of loads to avoid large current inrushes that trip overcurrent devices or overload the generator(s)

(6) Bypass arrangements to allow testing and maintenance of system components that could not otherwise be maintained without disruption of important hospital functions

7) Effects of any harmonic currents on neutral conductors and equipment

6.7.2.2 [6.4.2.1] General Requirements.

6.7.2.2.1 [6.4.2.1.1] Electrical characteristics of the transfer switches shall be suitable for the operation of all functions and equipment they are intended to supply.

6.7.2.2.2* [6.4.2.1.2] Coordination.

6.7.2.2.2.1 [6.4.2.1.2.1] Overcurrent protective devices serving the essential electrical system shall be coordinated for the period of time that a fault's duration extends beyond 0.1 second.

6.7.2.2.2.2 [6.4.2.1.2.2] Coordination shall not be required as follows:

(1) Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the

transformer secondary

(2) Between overcurrent protective devices of the same size (ampere rating) in series

6.7.2.2.3 [6.4.2.1.3] Switch Rating. The rating of the transfer switches shall be adequate for switching all classes of loads to be served and for withstanding the effects of available fault currents without contact welding.

6.7.2.2.4 [6.4.2.1.4] Automatic Transfer Switch. Transfer of all loads shall be accomplished using an automatic transfer switch(es). Each automatic transfer switch of 600 V or less shall be listed for the purpose and approved for emergency electrical service (seeNFPA 70, National Electrical Code, Article 700.3) as a complete assembly.

6.7.2.2.5 [6.4.2.1.5] Automatic Transfer Switch Features.

6.7.2.2.5.1 [6.4.2.1.5.1] Source Monitoring.

(A)* [6.4.2.1.5.1(A)] Undervoltage-sensing devices shall be provided to monitor all ungrounded lines of the primary source of power as follows:

(1) When the voltage on any phase falls below the minimum operating voltage of any load to be served, the transfer switch shall automatically initiate engine start and the process of transfer to the emergency power supply (EPS).

(2) *When the voltage on all phases of the primary source returns to within specified limits for a designated period of time, the process of transfer back to primary power shall be initiated. [110:6.2.2.1]

(B) [6.4.3.1.5.1(B)] Both voltage-sensing and frequency-sensing equipment shall be provided to monitor one ungrounded line of the EPS. [110:6.2.2.2]

(C) [6.4.3.1.5.1(C)] Transfer to the EPS shall be inhibited until the voltage and frequency are within a specified range to handle loads to be served. [110:6.2.2.3]

(D) [6.4.3.1.5.1(D)] Sensing equipment shall not be required in the transfer switch, provided it is included with the engine control panel. [110:6.2.2.3.1]

(E) [6.4.3.1.5.1(E)] Frequency-sensing equipment shall not be required for monitoring the public utility source where used as an EPS, as permitted by 5.1.3 of NFPA 110. [110:6.2.2.3.2]

6.7.2.2.5.2 [6.4.2.1.5.2] Interlocking. Mechanical interlocking or an approved alternate method shall prevent the inadvertent interconnection of the primary power supply and the EPS, or any two separate sources of power. [110:6.2.3]

6.7.2.2.5.3* [6.4.2.1.5.3] Manual Operation. Instruction and equipment shall be provided for safe manual nonelectric transfer in the event the transfer switch malfunctions. [110:6.2.4]

6.7.2.2.5.4* [6.4.2.1.5.4] Time Delay on Starting of EPS. A time-delay device shall be provided to delay starting of the EPS. The timer shall prevent nuisance starting of the EPS and possible subsequent load transfer in the event of harmless momentary power dips and interruptions of the primary source. [110:6.2.5]

6.7.2.2.5.5 [6.4.2.1.5.5] Time Delay at Engine Control Panel. Time delays shall be permitted to be located at the engine control panel in lieu of in the transfer switches. [110:6.2.6]

6.7.2.2.5.6 [6.4.2.1.5.6] Time Delay on Transfer to EPS. An adjustable time-delay device shall be provided to delay transfer and sequence load transfer to the EPS to avoid excessive voltage drop when the transfer switch is installed for Level 1 use. [110:6.2.7]

(A) [6.4.2.1.5.6(A)] Time Delay Commencement. The time delay shall commence when proper EPS voltage and frequency are achieved. [110:6.2.7.1]

(B) [6.4.2.1.5.6(B)] Time Delay at Engine Control Panel. Time delays shall be permitted to be located at the engine control panel in lieu of in the transfer switches. [110:6.2.7.2]

6.7.2.2.5.7* [6.4.2.1.5.7] Time Delay on Retransfer to Primary Source. An adjustable time-delay device with automatic bypass shall be provided to delay retransfer from the EPS to the primary source of power, and allow the primary source to stabilize before retransfer of the load. [110:6.2.8]

6.7.2.2.5.8 [6.4.2.1.5.8] Time Delay Bypass If EPS Fails. The time delay shall be automatically bypassed if the EPS fails. [110:6.2.9]

(A) [6.4.2.1.5.8(A)] The transfer switch shall be permitted to be programmed for a manually initiated retransfer to the primary source to provide for a planned momentary interruption of the load. [110:6.2.9.1]

(B) [6.4.2.1.5.8(B)] If used, the arrangement in 6.2.9.1 of NFPA 110 shall be provided with a bypass feature to allow automatic retransfer in the event that the EPS fails and the primary source is available.

6.7.2.2.5.9 [6.4.2.1.5.9] Time Delay on Engine Shutdown. A minimum time delay of 5 minutes shall be provided for unloaded running of the EPS prior to shutdown to allow for engine cooldown. [110:6.2.10]

(A) [6.4.2.1.5.9(A)] The minimum 5-minute delay shall not be required on small (15 kW or less) air-cooled prime movers. [110:6.2.10.1]

(B) [6.4.2.1.5.9(B)] A time-delay device shall not be required, provided it is included with the engine control panel, or if a utility feeder is used as an EPS. [110:6.2.10.2]

~~6.7.2.2.5.10 [6.4.2.1.5.10] Engine Generator Exercising Timer. A program timing device shall be provided to exercise the EPS as described in Chapter 8 of NFPA 110. [110:6.2.11]~~

~~6.7.2.2.5.10.1 [6.4.2.1.5.10(A)] Transfer switches shall transfer the connected load to the EPS and immediately return to primary power automatically in case of the EPS failure. [110:6.2.11.1]~~

~~6.7.2.2.5.10.2 [6.4.2.1.5.10(B)] Exercising timers shall be permitted to be located at the engine control panel in lieu of in the transfer switches. [110:6.2.11.2]~~

~~6.7.2.2.5.10.3 [6.4.2.1.5.10(C)] A program timing device shall not be required in health care facilities that provide scheduled testing in accordance with NFPA 99, Health Care Facilities Code. [110:6.2.11.3]~~

6.7.2.2.5.11 [6.4.2.1.5.11] Test Switch. A test means shall be provided on each automatic transfer switch (ATS) that simulates failure of the primary power source and then transfers the load to the EPS. [110:6.2.12]

6.7.2.2.5.12* [6.4.2.1.5.12] Indication of Transfer Switch Position. Two pilot lights with identification nameplates or other approved position indicators shall be provided to indicate the transfer switch position. [110:6.2.13]

6.7.2.2.5.13 [6.4.2.1.5.13] Motor Load Transfer. Provisions shall be included to reduce currents resulting from motor load transfer if such currents could damage EPSS equipment or cause nuisance tripping of EPSS overcurrent protective devices. [110:6.2.14]

6.7.2.2.5.14* [6.4.2.1.5.14] Isolation of Neutral Conductors. Provisions shall be included for ensuring continuity, transfer, and isolation of the primary and the EPS neutral conductors wherever they are separately grounded to achieve ground-fault sensing. [110:6.2.15]

6.7.2.2.5.15 [6.4.3.2.7] Retransfer. If the emergency power source fails during a test, provisions shall be made to immediately retransfer to the normal source.

6.7.2.2.5.16* [6.4.2.1.5.15] Nonautomatic Transfer Switch Features. Switching devices shall be mechanically held and shall be operated by direct manual or electrical remote manual control. [110:6.2.16]

(A) Interlocking. Reliable mechanical interlocking, or an approved alternate method, shall prevent the inadvertent interconnection of the primary power source and the EPS. [110:6.2.16.1]

(B) Indication of Switch Position. Two pilot lights with identification nameplates, or other approved position indicators, shall be provided to indicate the switch position. [110:6.2.16.2]

6.7.2.2.6 [6.4.2.1.6] Nonautomatic Transfer Device Classification. Nonautomatic transfer devices of 600 V or less shall be listed for the purpose and approved.

6.7.2.2.7 [6.4.2.1.7] Nonautomatic Transfer Device Features.

6.7.2.2.7.1 [6.4.2.1.7.1] General. Switching devices shall be mechanically held and shall be operated by direct manual or electrical remote manual control. [110:6.2.16]
6.7.2.2.7.2 [6.4.2.1.7.2] Interlocking. Reliable mechanical interlocking, or an approved alternate method, shall prevent the inadvertent interconnection of the primary power source and the EPS. [110:6.2.16.1]

6.7.2.2.7.3 [6.4.2.1.7.3] Indication of Switch Position. Two pilot lights with identification nameplates, or other approved position indicators, shall be provided to indicate the switch position. [110:6.2.16.2]

6.7.2.2.8 [6.4.2.1.8] Bypass and Isolating Transfer Switches. Bypass-isolation switches shall be permitted for bypassing and isolating the transfer switch and installed in accordance with 6.4.2,6.4.3, and 6.4.4 of NFPA 110. [110:6.4.1]

6.7.2.2.8.1 [6.4.2.1.8.1] Bypass-Isolation Switch Rating. The bypass-isolation switch shall have a continuous current rating and a current rating compatible with that of the associated transfer switch. [110:6.4.2]

6.7.2.2.8.2 [6.4.2.1.8.2] Bypass-Isolation Switch Classification. Each bypass-isolation switch shall be listed for emergency electrical service as a completely factory-assembled and factory-tested apparatus. [110:6.4.3]

6.7.2.2.8.3* [6.4.2.1.8.3] Operation. With the transfer switch isolated or disconnected, the bypass-isolation switch shall be designed so it can function as an independent nonautomatic transfer switch and allow the load to be connected to either power source. [110:6.4.4]

6.7.2.2.8.4 [6.4.2.1.8.4] Reconnection of Transfer Switch. Reconnection of the transfer switch shall be possible without a load interruption greater than the maximum time, in seconds, specified by the type of system. [110:6.4.5]

6.7.2.3 [6.4.2.2] Branches.

6.7.2.3.1 [6.4.2.2.1.2] The division between the branches shall occur at transfer switches where more than one transfer switch is required.

6.7.2.3.2 [6.4.2.2.1.3] Each branch shall be arranged for connection, within time limits specified in this chapter, to an alternate source of power following a loss of the normal source.

6.7.2.3.3 [6.4.2.2.1.4] The number of transfer switches to be used shall be based upon reliability, design, and load considerations.

6.7.2.3.3.1 [6.4.2.2.1.4(A)] Each branch of the essential electrical system shall have one or more transfer switches.

6.7.2.3.3.2 [6.4.2.2.1.4(B)] One transfer switch shall be permitted to serve one or more branches in a facility with a continuous load on the switch of 150 kVA (120 kW) or less.

6.7.2.3.4 [6.4.2.2.2] Feeders from Alternate Source.

6.7.2.3.4.1 [6.4.2.2.2.1] A single feeder supplied by a local or remote alternate source shall be permitted to supply the essential electrical system to the point at which the life safety, critical, and equipment branches are separated.

6.7.2.3.4.2 [6.4.2.2.2.2] Installation of the transfer equipment shall be permitted at other than the location of the alternate source.

6.7.2.3.5 [6.4.2.2.6.2] Receptacles. The requirements for receptacles shall comply with 6.7.1.2.3.5(A), 6.7.1.2.3.5(B), and 6.7.1.2.3.5(C).

~~(A) [6.4.2.2.6.2(A)] The number of receptacles on a single branch circuit for areas described in 6.4.2.2.4.2(8) shall be minimized to limit the effects of a branch-circuit outage.~~

(B) [6.4.2.2.6.2(B)] Branch-circuit overcurrent devices shall be readily accessible to authorized personnel.

(C)* [6.4.2.2.6.2(C)] The electrical receptacles or the cover plates for the electrical receptacles supplied from the life safety and critical branches shall have a distinctive color or marking so as to be readily identifiable.

6.7.2.3.6 [6.4.2.2.6.2] Switches. Switches of all types shall be permitted in the lighting circuits connected to the essential electrical system that do not serve as the illumination of egress as required by NFPA 101, Life Safety Code.

6.7.2.3.7 [6.4.2.2.6.6] Secondary circuits of transformer-powered communication or signaling systems shall not be required to be enclosed in raceways unless otherwise specified by Chapters 7 or 8 of NFPA 70, National Electrical Code.

6.7.3 [6.4.3] Performance Criteria and Testing

6.7.3.1 [6.4.3.2] Transfer Switches.

6.7.3.1 [6.4.3.2.1] All ac-powered support and accessory equipment necessary to the operation of the EPS shall be supplied from the load side of the automatic transfer switch(es), or the output terminals of the EPS, ahead of the main EPS overcurrent protection, as necessary, to ensure continuity of the EPSS operation and performance. [110:7.12.5]

6.7.3.2 [6.4.3.2.2] The essential electrical system shall be served by the normal power source, except when the normal power source is interrupted or drops below a predetermined voltage level. Settings of the sensors shall be determined by careful study of the voltage requirements of the load.

6.7.3.3 [6.4.3.2.3] Failure of the normal source shall automatically start the alternate source generator after a short delay, as described in 6.4.2.1.5.4. When the alternate power source has attained a voltage and frequency that satisfies minimum operating requirements of the essential electrical system, the load shall be connected automatically to the alternate power source.

6.7.3.4 [6.4.3.2.4] Upon connection of the alternate power source, the loads comprising the life safety and critical branches shall be automatically re-energized. The load comprising the equipment system shall be connected either automatically after a time delay, as described in 6.4.2.1.5.6, or nonautomatically and in such a sequential manner as not to overload the generator.

6.7.3.5 [6.4.3.2.5] When the normal power source is restored, and after a time delay, as described in 6.4.2.1.5.7, the automatic transfer switches shall disconnect the alternate source of power and connect the loads to the normal power source. The alternate power source generator set shall continue to run unloaded for a preset time delay, as described in 6.4.2.1.5.9.

6.7.3.6 [6.4.3.2.6] If the emergency power source fails and the normal power source has been restored, retransfer to the normal source of power shall be immediate, bypassing the retransfer delay timer.

6.7.3.7 [6.4.3.2.8] Nonautomatic transfer switching devices shall be restored to the normal power source as soon as possible after the return of the normal source or at the discretion of the operator.

6.7.4 [6.4.4] Administration (Type 1 EES).

6.7.4.1 [6.4.4.1] Maintenance and Testing of Essential Electrical System.

6.7.4.1.1 [6.4.4.1.1] Maintenance and Testing of Alternate Power Source, ~~and~~ Transfer Switches, and Associated Equipment.

6.7.4.1.1.1 [6.4.4.1.1.1] Maintenance of Alternate Power Source. The generator set or other alternate power source and associated equipment, including all appurtenance parts, shall be so maintained as to be capable of supplying service within the shortest time practicable and within the 10-second interval specified in 6.4.1.1.11 and 6.4.3.1.

6.7.4.1.1.2 [6.4.4.1.1.2] The 10-second criterion shall not apply during the monthly testing of an essential electrical system. If the 10-second criterion is not met during the monthly test, a process shall be provided to annually confirm the capability of the life safety and critical branches to comply with 6.4.3.1.

6.7.4.1.1.3 [6.4.4.1.1.3] Maintenance shall be performed in accordance with NFPA 110, Standard for Emergency and Standby Power Systems, Chapter 8.

6.7.4.1.1.4 Maintenance of the electrical equipment for the life safety branch, critical branch, and equipment branch shall be maintained in accordance with the manufacturer's instructions and preventative maintenance programs.

6.7.4.1.1.4 [6.4.4.1.1.4] Inspection and Testing. Criteria, conditions, and personnel requirements shall be in accordance with 6.7.1.4.1.1.4(A) through 6.7.1.4.1.1.4(C).

(A)* Test Criteria. Generator sets shall be tested 12 times a year, with testing intervals of not less than 20 days nor more than 40 days. Generator sets serving essential electrical systems shall be tested in accordance with NFPA 110, Standard for Emergency and Standby Power Systems, Chapter 8.

(B) Test Conditions. The scheduled test under load conditions shall include a complete simulated cold start and appropriate automatic and manual transfer of all essential electrical system loads.

(C) Test Personnel. The scheduled tests shall be conducted by ~~competent~~ qualified personnel to keep the machines ready to function and, in addition, serve to detect causes of malfunction and to train personnel in operating procedures.

6.7.4.1.2 [6.4.4.1.2] Maintenance and Testing of Circuitry.

6.7.4.1.2.1* [6.4.4.1.2.1] Circuit Breakers. Main and feeder circuit breakers shall be inspected annually, and maintained in accordance with the manufacturer's instructions and industry standards. A program for periodically exercising the components shall be established according to manufacturer's ~~recommendations~~ instructions.

6.7.4.1.2.2 [6.4.4.1.2.2] Insulation Resistance. The resistance readings of main feeder insulation shall be taken prior to acceptance and whenever damage is suspected.

6.7.4.1.2.3 [6.4.4.1.3] Maintenance of Batteries. Batteries for on-site generators shall be maintained in accordance with NFPA 110, Standard for Emergency and Standby Power Systems.

6.7.4.2 [6.4.4.2] Record Keeping. A written record of inspection, performance, exercising period, and repairs shall be regularly maintained and available for inspection by the authority having jurisdiction.

6.7.5 Type 1 Essential Electrical System Requirements

6.7.5.1 [6.4.2.2] Branches

6.7.5.1.1 [6.4.2.2.1.1] The essential electrical system shall be divided into the following three branches:

(1) Life safety

(2) Critical

(3) Equipment

6.7.5.1.2 [6.4.2.2.3] Life Safety Branch.

6.7.5.1.2.1 [6.4.2.2.1.5] For the purposes of this code, the provisions for emergency systems in Article 700 of NFPA 70, National Electrical Code, shall be applied only to the life safety branch.

6.7.5.1.2.2 [6.4.2.2.1.6] The following portions of Article 700 of NFPA 70 shall be amended as follows:

(A) 700.4 shall not apply.

(B) 700.10 (D) (1) through (3) shall not apply.

(C) 700.17 Branch Circuits for Emergency Lighting. Branch circuits that supply emergency lighting shall be installed to provide service from a source complying with 700.12 when the normal supply for lighting is interrupted or where single circuits supply luminaires containing secondary batteries.

(D) 700.28 shall not apply.

6.7.5.1.2.3 [6.4.2.2.3.1] The life safety branch shall be limited to circuits essential to life safety.

6.7.5.1.2.4 [6.4.2.2.3.2] The life safety branch shall supply power as follows:

(1) Illumination of means of egress in accordance with NFPA 101, Life Safety Code

(2) Exit signs and exit directional signs in accordance with NFPA 101, Life Safety Code

(3) *~~Hospital c~~Communications systems, where used for issuing instruction during emergency conditions

(4) Generator set location as follows:

(a) Task illumination

(b) Battery charger for emergency battery-powered lighting unit(s)

(c) Select receptacles at the generator set location and essential electrical system transfer switch locations

(5) Elevator cab lighting, control, communications, and signal systems

(6) Electrically powered doors used for building egress

(7) Fire alarms and auxiliary functions of fire alarm combination systems complying with NFPA 72, National Fire Alarm and Signaling Code

6.7.5.1.2.5 [6.4.2.2.3.3] Alarm and alerting systems (other than fire alarm systems) shall be connected to the life safety branch or critical branch.

6.7.5.1.2.6 [6.4.2.2.3.4] Loads dedicated to a specific generator, including the fuel transfer pump(s), ventilation fans, electrically operated louvers, controls, cooling system, and other generator accessories essential for generator operation, shall be connected to the life safety branch or the output terminals of the generator with overcurrent protective devices.

6.7.5.1.2.7 [6.4.2.2.3.5] No functions other than those in 6.4.2.2.3.2, 6.4.2.2.3.3, and 6.4.2.2.3.4 shall be connected to the life safety branch, except as specifically permitted in 6.4.2.2.3.

6.7.5.1.3* [6.4.2.2.4] Critical Branch.

6.7.5.1.3.1 [6.4.2.2.4.1] The critical branch shall be permitted to be subdivided into two or more branches.

6.7.5.1.3.2 [6.4.2.2.4.2] The critical branch, or a dual fed scheme including the critical branch shall supply power for task illumination, fixed equipment, select receptacles, and select power circuits serving the following spaces and functions related to patient care:

(1) ~~Critical care~~ Category 1 spaces ~~that utilize anesthetizing gases~~ where deep sedation or general anesthesia is administered, task illumination, select receptacles, and fixed equipment

~~(2) Isolated power systems in special environments~~

(3) Task illumination and select receptacles in the following:

(a) Patient care spaces, including infant nurseries, selected acute nursing areas, psychiatric bed areas (omit receptacles), and ward treatment rooms

(b) Medication preparation spaces

(c) Pharmacy dispensing spaces

(d) Nurses' stations (unless adequately lighted by corridor luminaires)

(4) Additional specialized patient care task illumination and receptacles, where needed

(5) Nurse call systems

(6) Blood, bone, and tissue banks

(7) *~~Telephone equipment rooms and closets~~ Telecommunications entrance facility, telecommunications equipment rooms, and telecommunication rooms and equipment in these rooms.

(8) Task illumination, select receptacles, and select power circuits for the following areas:

(a) ~~General care beds~~ Category 1 or 2 spaces with at least one duplex receptacle per patient ~~bedroom~~ bed location, and task illumination as required by the governing body of the health care facility

(b) Angiographic labs

(c) Cardiac catheterization labs

(d) Coronary care units

(e) Hemodialysis rooms or areas

(f) Emergency room treatment areas (select)

(g) Human physiology labs

(h) Intensive care units

(i) Postoperative recovery rooms (select)

(9) Clinical IT-Network equipment

(10) Wireless phone and paging equipment for clinical staff communications

(~~9~~11) Additional task illumination, receptacles, and select power circuits needed for effective facility operation, including single-phase fractional horsepower motors, which are permitted to be connected to the critical branch

6.7.5.1.4 [6.4.2.2.5] Equipment Branch.

6.7.5.1.4.1 [6.4.2.2.5.1] General. The equipment branch shall be connected to equipment described in 6.4.2.2.5.3 through 6.4.2.2.5.4.

6.7.5.1.4.2 [6.4.2.2.5.2] Connection to Alternate Power Source.

(A) The equipment branch shall be installed and connected to the alternate power source, such that equipment described in 6.4.2.2.5.3 is automatically restored to operation at appropriate time-lag intervals following the energizing of the life safety and critical branches.

(B) The arrangement of the connection to the alternate power source shall also provide for the subsequent connection of equipment described in 6.4.2.2.5.4.

6.7.5.1.4.3* [6.4.2.2.5.3] Equipment for Delayed-Automatic Connection.

(A) The following equipment shall be permitted to be arranged for delayed-automatic connection to the alternate power source:

(1) Central suction systems serving medical and surgical functions, including controls, with such suction systems permitted to be placed on the critical branch

(2) Sump pumps and other equipment required to operate for the safety of major apparatus, including associated control systems and alarms

(3) Compressed air systems serving medical and surgical functions, including controls, with such air systems permitted to be placed on the critical branch

(4) Smoke control and stair pressurization systems

(5) Kitchen hood supply or exhaust systems, or both, if required to operate during a fire in or under the hood

(6) Supply, return, and exhaust ventilating systems for the following:

(a) Airborne infectious/isolation rooms

b) Protective environment rooms

(c) Exhaust fans for laboratory fume hoods

(d) Nuclear medicine areas where radioactive material is used

(e) Ethylene oxide evacuation

(f) Anesthetic evacuation

(B) Where delayed-automatic connection is not appropriate, the ventilation systems specified in 6.4.2.2.5.3(A)(6) shall be permitted to be placed on the critical branch.

6.7.5.1.4.4* [6.4.2.2.5.4] Equipment for Delayed-Automatic or Manual Connection. The following equipment shall be permitted to be arranged for either delayed-automatic or manual connection to the alternate power source (also see A.6.4.2.2.5.3):

(1) Heating equipment used to provide heating for operating, delivery, labor, recovery, intensive care, coronary care, nurseries, infection/isolation rooms, emergency treatment spaces, and general patient rooms; and pressure maintenance (jockey or make-up) pump(s) for water-based fire protection systems

(2) *Heating of general patient rooms during disruption of the normal source shall not be required under any of the following conditions:

(a) Outside design temperature is higher than -6.7°C (+20°F)

(b) Outside design temperature is lower than -6.7°C (+20°F), where a selected room(s) is provided for the needs of all confined patients [then only such room(s) need be heated].

(3) Elevator(s) selected to provide service to patient, surgical, obstetrical, and ground floors during

(4) Supply, return, and exhaust ventilating systems for surgical and obstetrical delivery suites, intensive care, coronary care, nurseries, and emergency treatment spaces

(5) Hyperbaric facilities

(6) Hypobaric facilities

(7) Autoclaving equipment, which is permitted to be arranged for either automatic or manual connection to the alternate source

(8) Controls for equipment listed in 6.4.2.2.4

(9) *Other selected equipment

6.7.5.1.5 [6.4.1.1.3] Generator load-shed circuits designed for the purpose of load reduction or for load priority systems shall not shed life safety branch loads, critical branch loads serving ~~critical care areas~~ Category 1 spaces, medical air compressors, medical–surgical vacuum pumps, fire pumps, the pressure maintenance (jockey) pump(s) for water-based fire protection systems, generator fuel pumps, or other generator accessories.

6.7.5.2 [6.4.2.2.6] Wiring Requirements.

6.7.5.2.1* [6.4.2.2.6.1] Separation from Other Circuits. The life safety branch and critical branch shall be kept independent of all other wiring and equipment.

6.7.5.2.2 [6.4.2.2.6.4] Mechanical Protection of the Life Safety and Critical Branches. The wiring of the life safety and critical branches shall be mechanically protected by raceways, as defined in NFPA 70, National Electrical Code.

6.7.5.2.3 [6.4.2.2.6.5] Flexible power cords of appliances or other utilization equipment connected to the life safety and critical branches shall not be required to be enclosed in raceways.

6.7.5.3 [6.4.3] Performance Criteria and Testing (Type 1 EES)

6.7.5.3.1 [6.4.3.1] Source. The life safety and critical branches shall be installed and connected to the alternate power source specified in 6.4.1.1.4 and 6.4.1.1.5 so that all functions specified herein for the life safety and critical branches are automatically restored to operation within 10 seconds after interruption of the normal source.

6.7.6 Type 2 Essential Electrical System Requirements

6.7.6.1 Sources (Type 2 EES). The requirements for sources for Type 2 essential electrical systems shall conform to those listed in 6.4.1.

6.7.6.2 Distribution (Type 2 EES).

6.7.6.2.1 General. The distribution requirements for Type 2 essential electrical systems shall conform to those listed in 6.4.2.1.

6.7.6.2.1.1* Coordination.

(A) Overcurrent protective devices serving the essential electrical system shall be coordinated for the period of time that a fault's duration extends beyond 0.1 second.

(B) Coordination shall not be required as follows:

(1) Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the transformer secondary

(2) Between overcurrent protective devices of the same size (ampere rating) in series

6.7.6.2.2 Branches

6.7.6.2.2.1 The number of transfer switches to be used shall be based upon reliability, design, and load considerations.

6.7.6.2.2.2 The essential electrical system shall be divided into the following two branches:

(1) Life safety branch

(2) Equipment branch

6.7.6.2.2.3 Each branch of the essential electrical system shall have one or more transfer switches.

6.7.6.2.2.4 One transfer switch shall be permitted to serve one or more branches in a facility with a continuous load on the switch of 150 kVA (120 kW) or less.

6.7.6.2.2.5 Life Safety Branch.

(A) For the purposes of this code, Article 700 shall only be applied to the life safety branch.

(B) The following portions of Article 700 of NFPA 70 shall be amended as follows:

(1) 700.4 shall not apply.

(2) 700.10 (D) (1) through (3) shall not apply.

(3) 700.17 Branch Circuits for Emergency Lighting. Branch circuits that supply emergency lighting shall be installed to provide service from a source complying with 700.12 when the normal supply for lighting is interrupted or where single circuits supply luminaires containing secondary batteries.

(4) 700.28 shall not apply.

(C) The life safety branch shall supply power as follows:

(1) Illumination of means of egress in accordance with NFPA 101, Life Safety Code

(2) Exit signs and exit directional signs in accordance with NFPA 101, Life Safety Code

(3) Alarm and alerting systems, including the following:

(a) Fire alarms

(b) Alarms required for systems used for the piping of nonflammable medical gases as specified in Chapter 5

(4) *Communications systems, where used for issuing instructions during emergency conditions

~~(5) Sufficient lighting in dining and recreation areas to provide illumination to exit ways at a minimum of 5 ft-candles~~

(6) Task illumination and select receptacles at the generator set location

(7) Elevator cab lighting, control, communications, and signal systems

(D) No functions, other than those listed in 6.5.2.2.2.1(1) through 6.5.2.2.2.1(7), shall be connected to the life safety.

6.7.6.2.2.6 Equipment Branch.

(A) The equipment branch shall be installed and connected to the alternate power source such that equipment listed in 6.5.2.2.3.2 is automatically restored to operation at appropriate time-lag intervals following the restoration of the life safety branch to operation.

(B) The equipment branch arrangement shall also provide for the additional connection of equipment listed in 6.5.2.2.3.3.

(C) AC Equipment for Nondelayed-Automatic Connection. Generator accessories including, but not limited to, the transfer fuel pump, electrically operated louvers, and other generator accessories essential for generator operation shall be arranged for automatic connection to the alternate power source.

(D) Delayed-Automatic Connections to Equipment Branch. The following equipment shall be permitted to be connected to the equipment branch and shall be arranged for delayed-automatic connection to the alternate power source:

(1) Task illumination and select receptacles in the following:

(a) Patient care spaces

(b) Medication preparation spaces

(c) Pharmacy dispensing spaces

(d) Nurses' stations (unless adequately lighted by corridor luminaires)

(2) Supply, return, and exhaust ventilating systems for airborne infectious isolation rooms

(3) Sump pumps and other equipment required to operate for the safety of major apparatus and associated control systems and alarms

(4) Smoke control and stair pressurization systems

(5) Kitchen hood supply or exhaust systems, or both, if required to operate during a fire in or under the hood

(6) Nurse call systems

(7) HVAC systems serving the EF, TER, and TR

(E)* Delayed-Automatic or Manual Connections to Equipment Branch. The equipment in 6.7.6.1.6.4(A) and 6.7.3.1.6.4(B) shall be permitted to be connected to the equipment branch and shall be arranged for either delayed-automatic or manual connection to the alternate power source.

(1) Heating Equipment to Provide Heating for General Patient Rooms. Heating of general patient rooms during disruption of the normal source shall not be required under any of the following conditions:

(a) *The outside design temperature is higher than −6.7°C (+20°F).

(b) The outside design temperature is lower than −6.7°C (+20°F) and, where a selected room(s) is provided for the needs of all confined patients, then only such room(s) need be heated.

(c) The facility is served by a dual source of normal power. See A.6.4.1.1.1 for more information.

(2)* Elevator Service. In instances where interruptions of power would result in elevators stopping between floors, throw-over facilities shall be provided to allow the temporary operation of any elevator for the release of passengers.

(3) Optional Connections to the Equipment Branch. Additional illumination, receptacles, and equipment shall be permitted to be connected only to the equipment branch.

(4) Multiple Systems. Where one switch serves multiple systems as permitted in 6.5.2.2, transfer for all loads shall be nondelayed automatic.

6.7.6.3 Wiring Requirements.

6.7.6.3.1* Separation from Other Circuits. The life safety and equipment branches shall be kept entirely independent of all other wiring and equipment.

6.7.6.3.2* Receptacles. The electrical receptacles or the cover plates for the electrical receptacles supplied from the life safety and equipment branches shall have a distinctive color or marking so as to be readily identifiable.

6.7.6.4 Performance Criteria and Testing (Type 2 EES).

6.7.6.4.1 Source. The life safety and equipment branches shall be installed and connected to the alternate source of power specified in 6.4.1.1.4 and 6.4.1.1.5 so that all functions specified herein for the life safety and equipment branches are automatically restored to operation within 10 seconds after interruption of the normal source.

6.7.6.5 Other

6.7.6.5.1 Transfer Switches. The essential electrical system shall be served by the normal power source until the normal power source is interrupted or drops below a predetermined voltage level. Settings of the sensors shall be determined by careful study of the voltage requirements of the load.

6.7.6.5.1.1 Failure of the normal source shall automatically start the alternate source generator after a short delay, as described in 6.4.2.1.5.4. When the alternate power source has attained a voltage and frequency that satisfies minimum operating requirements of the essential electrical system, the load shall be connected automatically to the alternate power source.

6.7.6.5.2 All ac-powered support and accessory equipment necessary to the operation of the EPS shall be supplied from the load side of the automatic transfer switch(es), or the output terminals of the EPS, ahead of the main EPS overcurrent protection to ensure continuity of the EPSS operation and performance. [110:7.12.5]

6.7.6.5.3 Upon connection of the alternate power source, the loads comprising the life safety and equipment branches shall be automatically re-energized. The loads comprising the equipment branch shall be connected either automatically after a time delay, as described in 6.4.2.1.5.6, or nonautomatically and in such a sequential manner as not to overload the generator.

6.7.6.5.4 When the normal power source is restored, and after a time delay as described in 6.4.2.1.5.7, the automatic transfer switches shall disconnect the alternate source of power and connect the loads to the normal power source. The alternate power source generator set shall continue to run unloaded for a preset time delay as described in 6.4.2.1.5.9.

6.7.6.5.5 If the emergency power source fails and the normal power source has been restored, retransfer to the normal source of power shall be immediate, bypassing the retransfer delay timer.

6.7.6.5.6 If the emergency power source fails during a test, provisions shall be made to immediately retransfer to the normal source.

6.7.6.5.7 Nonautomatic transfer switching devices shall be restored to the normal power source as soon as possible after the return of the normal source or at the discretion of the operator.

6.7.6.6 Administration (Type 2 EES).

6.7.6.6.1 Maintenance and Testing of Essential Electrical System.

6.7.6.6.1.1 Maintenance and Testing of Alternate Power Source and Transfer Switches.

(A) Maintenance of Alternate Power Source. The generator set or other alternate power source and associated equipment, including all appurtenance parts, shall be so maintained as to be capable of supplying service within the shortest time practicable and within the 10-second interval specified in 6.4.1.1.8 and 6.4.3.1.

(B) Inspection and Testing. Generator sets shall be inspected and tested in accordance with 6.4.4.1.1.4.

6.7.6.6.1.2 Maintenance and Testing of Circuitry. Circuitry shall be maintained and tested in accordance with 6.4.4.1.2.

6.7.6.6.1.3 Maintenance of Batteries. Batteries shall be maintained in accordance with 6.4.4.1.3.

6.7.6.6.2 Record Keeping. A written record of inspection, performance, exercising period, and repairs shall be regularly maintained and available for inspection by the authority having jurisdiction.

First Revision No. 111-NFPA 99-2015 [Global Input]

Replace all instances of “critical care area” with “Category 1 Space”

Submitter Information Verification

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Organization: [Not Specified]
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City:
State:
Zip:
Submittal Date: Tue Aug 18 09:56:00 EDT 2015

Committee Statement

Committee Statement: The definition of critical care area has now been removed from NFPA 99 through action on FR 104. The correct term is now Category 1 Space.
Response Message:

First Revision No. 113-NFPA 99-2015 [Global Input]

Change the various references from “governing body” to “health care facility’s governing body”

1.3.4.1

1.3.4.2

1.3.4.3

3.3.148

3.3.155

6.3.2.2.6.2(F)

6.3.2.2.8.4

6.4.2.2.4(8)(A)

8.2 (correct)

9.2 (correct)

10.5.1

14.3.1.3.3 (different?) FLAG FOR CC

A.6.3.2.2.8.4

A.6.3.2.2.8.7

A.14.3.1.3.3

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Committee Statement

Committee Statement: The defined term of “governing body” has been changed to “health care facility’s governing body.” Revising the use globally will result in consistency throughout the document.
Response Message:

First Revision No. 308-NFPA 99-2015 [Global Input]

In all instances in Chapter 14 where "Category of Care" is used, change to "Category of hyperbaric care"

Similarly, change "Category 1 care" to "Category 1 hyperbaric care" (same with Category 2 and 3)

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Committee Statement

Committee Statement: This change is meant to make language consitstent.
Response Message:

First Revision No. 34-NFPA 99-2015 [Global Input]

Revise all instances of "Health Care Governing Body" as well as "Governing Body" to "Health Care Facility's Governing Body"

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Organization: [Not Specified]
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Zip:
Submittal Date: Tue Aug 04 08:26:56 EDT 2015

Committee Statement

Committee Statement: To avoid confusion and misinterpretation, this change is being made in several instances within Chapter 6 to clarify that it is intended that where the term "governing body" has been used, it is meant to apply to the governing body of the health care facility itself and not the authority having jurisdiction.

The HEA-ELS TC requests that the HEA-FUN TC modify the definition of "governing body" to match this terminology. The HEA-ELS TC further requests that the Correlating Committee ensures that this terminology is used consistently throughout the code. This term "health care facility's governing body" is already used in Chapters 8 and 9.

Response Message:

First Revision No. 601-NFPA 99-2015 [Global Input]

See attached file for changes to Chapters 3 and 5 regarding central supply systems and supply sources.

Supplemental Information

File Name	Description
99_HEA-PIP_Global_FR-601.docx	

Submitter Information Verification

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Committee Statement

Committee Statement: terminology
Response Message:

Public Input No. 120-NFPA 99-2015 [Section No. 5.1.3.5.13]
Public Input No. 113-NFPA 99-2015 [Section No. 3.3.159]
Public Input No. 112-NFPA 99-2015 [New Section after 3.3.22]
Public Input No. 114-NFPA 99-2015 [Section No. 5.1.3.3.1.1]
Public Input No. 127-NFPA 99-2015 [Section No. 5.1.4.2]
Public Input No. 115-NFPA 99-2015 [Section No. 5.1.3.3.1.3]
Public Input No. 124-NFPA 99-2015 [Section No. 5.1.3.6.3.14]
Public Input No. 116-NFPA 99-2015 [Section No. 5.1.3.3.1.4]
Public Input No. 126-NFPA 99-2015 [Section No. 5.1.3.8]
Public Input No. 129-NFPA 99-2015 [Section No. 5.1.9.5.3]
Public Input No. 118-NFPA 99-2015 [Section No. 5.1.3.5.7 [Excluding any Sub-Sections]]
Public Input No. 128-NFPA 99-2015 [Section No. 5.1.9.5.1]
Public Input No. 122-NFPA 99-2015 [Section No. 5.1.3.6]
Public Input No. 123-NFPA 99-2015 [Section No. 5.1.3.6.3]
Public Input No. 117-NFPA 99-2015 [Section No. 5.1.3.3.3.3]
Public Input No. 119-NFPA 99-2015 [Section No. 5.1.3.5.9.1]
Public Input No. 125-NFPA 99-2015 [Section No. 5.1.3.7]
Public Input No. 121-NFPA 99-2015 [Section No. 5.1.3.5.14]

Make the following changes:

Add new definition:

3.3.22 Central Supply System.

The source of supply for a medical gas or vacuum system or a medical support gas system. Central supply systems comprise the equipment necessary to produce, condition, control and monitor the gases or vacuum. They include all equipment from the atmospheric intake on air compressors, exhaust on vacuum pumps, and cylinders or containers for pressurized gases through to the Source Valve (see 5.1.4.2). Examples of central supply systems include air compressor sources, vacuum pump sources, cylinder and container headers and manifolds, liquid bulk gas systems, proportioning systems and combinations of these.

3.3.159 Supply Source.

Those portions of the central supply system which act as a self contained supply acting in one of the roles described below:

3.3.159.1 Operating Supply.

The portion of the central supply system that is supplying the piping system at the time of observation~~normally supplies the piping systems. The operating supply consists of a primary supply or a primary and secondary supply~~. (PIP)

3.3.159.2 Primary Supply.

That portion of the central supply system that is the default supply for the piping system~~source equipment that actually supplies the system~~. (PIP)

3.3.159.3 Reserve Supply.

Where provided, that portion of the central supply system that will supply the piping system when the primary and secondary supplies are exhausted or are not operative~~source equipment that automatically supplies the system in the event of failure of the primary and secondary operating supply~~. (PIP)

3.3.159.4 Secondary Supply.

Where provided, that portion of the central supply system that will supply the piping system when the primary supply is exhausted or is not operative~~source equipment that automatically supplies the system when the primary supply becomes exhausted~~. (PIP)

5.1.3.3.1.1

Any of the following central supply systems shall be permitted to be located together in the same outdoor enclosure:
(1) Manifolds for gas cylinders (see 5.1.3.5.11)
(2) Manifolds for cryogenic liquid containers (see 5.1.3.5.12)
(3) Bulk cryogenic liquid central supply systems (see 5.1.3.5.14)

5.1.3.3.1.3

Any of the following central supply systems shall be permitted to be located together in the same room:
(1) Medical air compressor central supply systems supply sources (see 5.1.3.6.3)
(2) Medical–surgical vacuum central supply systems sources (see 5.1.3.7)
(3) Waste anesthetic gas disposal (WAGD) central supply systems sources (see 5.1.3.8)
(4) Instrument air compressor central supply systems sources (see 5.1.13.3.5)
(5) Any other compressor, vacuum pump, or electrically powered machinery

5.1.3.3.1.4

Any central supply system listed under 5.1.3.3.1.3 shall not be located in the same room with any central supply system listed under 5.1.3.3.1.1 or 5.1.3.3.1.2, except instrument air reserve headers complying with 5.1.3.2.12 and 5.1.13.3.5.7 shall be permitted to be in the same room as an instrument air compressor.

5.1.3.3.3.3 Ventilation for Motor-Driven Equipment.

The following source locations shall be adequately ventilated to prevent accumulation of heat:

(1) Medical air central supply systems sources *(see 5.1.3.6)*

(2) Medical–surgical vacuum central supply systems sources *(see 5.1.3.7)*

(3) Waste anesthetic gas disposal (WAGD) central supply systems sources *(see 5.1.3.8.1)*

(4) Instrument air central supply systems sources *(see 5.1.13.3.5)*

5.1.3.5.7 Auxiliary Source Connection.

All ~~source~~ central supply systems sources 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.

5.1.3.5.9.1

5.1.3.5.9.1

The following central supply systems shall have local signals located at the source equipment:

(1) Manifolds for gas cylinders without reserve supply *(see 5.1.3.5.11)*

(2) Manifolds for gas cylinders with reserve supply

(3) Manifolds for cryogenic liquid containers *(see 5.1.3.5.12)*

(4) Bulk cryogenic liquid systems *(see 5.1.3.5.14)*

(5) In-building emergency reserves *(see 5.1.3.5.16)*

(6) Instrument air headers *(see 5.1.3.5.10)*

5.1.3.6* Category 1 Medical Air Central Supply Systems.

5.1.3.6.1* Quality of Medical Air.
Medical air shall be required to have the following characteristics:

(1) It shall be supplied from cylinders, bulk containers, or medical air compressor sources, or it shall be reconstituted from oxygen USP and oil-free, dry nitrogen NF.

(2) It shall meet the requirements of medical air USP.

(3) It shall have no detectable liquid hydrocarbons.

(4) It shall have less than 25 ppm gaseous hydrocarbons.

(5) It shall have equal to or less than 1 mg/m^3 (6.85 × 10^{-7} lb/yd^3) of permanent particulates sized 1 micron or larger in the air at normal atmospheric pressure.

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.

5.1.3.6.3* Medical Air Compressor Supply Sources.

5.1.3.6.3.1 Location.

Medical air compressor systems shall be located per 5.1.3.3 as follows:

1. Indoors in a dedicated mechanical equipment area, adequately ventilated and with any required utilities (e.g., electricity, drains, lighting)
2. In a room ventilated per 5.1.3.3.3.3
3. For air-cooled equipment, in a room designed to maintain the ambient temperature range as recommended by the manufacturer

5.1.3.6.3.14 Category 1 Medical Air Proportioning ~~System~~Supply Sources.

(A) General.

1. Medical air reconstituted from oxygen USP and nitrogen NF, produced using proportioning system(s), shall be required to meet the following:
    1. The quality of medical air shall be in accordance with 5.1.3.6.1.
    2. The system shall be capable of supplying this quality of medical air, per 5.1.3.6.1, over the entire range of flow.
    3. The system shall produce medical air with an oxygen content of 19.5 percent to 23.5 percent.
    4. The medical air shall be cleared for marketing by the FDA or approved by the FDA.
2. The medical air proportioning system shall operate automatically.
3. The mixture shall be analyzed continuously, and a recording capability shall be provided (e.g., via data port).
4. The analyzing system specified in 5.1.3.6.3.14(A) (3) shall be a dedicated and an independent analyzer used to control the medical air proportioning system.
5. If the mixture goes out of specification, an alarm shall be activated automatically, the primary medical air proportioning system shall be disconnected, and the reserve supply shall be activated.
6. The system shall be arranged such that manual intervention is necessary to correct the composition of the mixture before reconnecting the medical air proportioning system to the health care facility pipeline system.
7. If dedicated sources of oxygen USP and nitrogen NF supply the medical air proportioning system, reserve sources for the oxygen and nitrogen shall not be required.
8. If dedicated sources of oxygen USP and nitrogen NF supply the medical air proportioning system, they shall not be used as the reserves for oxygen and nitrogen systems supplying the pipelines of the health care facility.
9. * If the sources of oxygen USP and nitrogen NF that supply the medical air proportioning system are the same sources that supply the health care facility, engineering controls shall be provided to prevent cross contamination of oxygen and nitrogen supply lines, as provided in 5.1.3.5.8.
10. A risk analysis and approval from the authority having jurisdiction shall be required.

5.1.3.7* Medical–Surgical Vacuum Central Supply Systems.

5.1.3.7.1 ~~5.1.3.7.1.1~~

Medical–surgical vacuum central supply systems~~sources~~ shall be located per 5.1.3.3 as follows:

1. Indoors in a dedicated mechanical equipment area, adequately ventilated and with any required utilities
2. In a room ventilated per 5.1.3.3.3.3
3. For air-cooled equipment, in a room designed to maintain the ambient temperature range as recommended by the equipment manufacturer

5.1.3.7.2
Medical–surgical vacuum central supply systems~~sources~~ shall consist of the following:

1. Two or more vacuum pumps sufficient to serve the peak calculated demand with the largest single vacuum pump out of service
2. Automatic means to prevent backflow from any on-cycle vacuum pumps through any off-cycle vacuum pumps
3. Shutoff valve or other isolation means to isolate each vacuum pump from the centrally piped system and other vacuum pumps for maintenance or repair without loss of vacuum in the system
4. Vacuum receiver
5. Piping between the vacuum pump(s), discharge(s), receiver(s), and vacuum source shutoff valve in accordance with 5.1.10.2, except brass, galvanized, or black steel pipe, which is permitted to be used as recommended by the manufacturer
6. Except as defined in 5.1.3.7.1.2 (1) through (5), materials and devices used between the medical vacuum exhaust and the medical vacuum source that are permitted to be of any design or construction appropriate for the service as determined by the manufacturer

5.1.3.7.3 Vacuum Pumps.
5.1.3.7.3.1
Vacuum pumps shall be constructed of materials deemed suitable by the manufacturer.
5.1.3.7.3.2
Antivibration mountings shall be installed for vacuum pumps as required by equipment dynamics or location and in accordance with the manufacturer's recommendations.
5.1.3.7.3.3
Flexible connectors shall connect the vacuum pumps with their intake and outlet piping.
5.1.3.7.3.4
For liquid ring vacuum pumps, seal water shall be of a quality recommended by the vacuum pump manufacturer.

5.1.3.7.4 Vacuum Receivers.
Receivers for vacuum shall meet the following requirements:

1. They shall be made of materials deemed suitable by the manufacturer.
2. They shall comply with Section VIII, “Unfired Pressure Vessels,” of the ASME *Boiler and Pressure Vessel Code.*

3. They shall be capable of withstanding a gauge pressure of 415 kPa (60 psi) and 760 mm (30 in.) gauge HgV.
4. They shall be equipped with a manual drain.
5. They shall be of a capacity based on the technology of the pumps.

5.1.3.7.5 Piping Arrangement and Redundancies.

5.1.3.7.5.1

Piping arrangement shall be as follows:

1. Piping shall be arranged to allow service and a continuous supply of medical–surgical vacuum in the event of a single fault failure.
2. Piping arrangement shall be permitted to vary based on the technology(ies) employed, provided that an equal level of operating redundancy is maintained.
3. Where only one set of vacuum pumps is available for a combined medical–surgical vacuum system and an analysis, a research, or a teaching laboratory vacuum system, such laboratories shall be connected separately from the medical–surgical system directly to the receiver tank through its own isolation valve and fluid trap located at the receiver, and between the isolation valve and fluid trap, a scrubber shall be permitted to be installed.

5.1.3.7.5.2

The medical–surgical vacuum receiver(s) shall be serviceable without shutting down the medical–surgical vacuum system by any method to ensure continuation of service to the facility's medical–surgical pipeline distribution system.

5.1.3.7.5.3

Medical–surgical vacuum central supply systems~~source~~ shall be provided with a source shutoff valve per 5.1.4.2.

5.1.3.7.6 Electrical Power and Control.

5.1.3.7.6.1

Additional pumps shall automatically activate when the pump(s) in operation is incapable of adequately maintaining the required vacuum.

5.1.3.7.6.2

Automatic or manual alternation of pumps shall allow division of operating time. If automatic alternation of pumps is not provided, the facility staff shall arrange a schedule for manual alternation.

5.1.3.7.6.3

Each pump motor shall be provided with electrical components including, but not limited to, the following:

1. Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter
2. Motor starting device
3. Overload protection
4. Where pump systems having two or more pumps employ a control transformer or other voltage control power device, at least two such devices
5. Control circuits arranged in such a manner that the shutdown of one pump does not interrupt the operation of another pump

6. Automatic restart function such that the pump(s) will restart after power interruption without manual intervention

5.1.3.7.6.4
Electrical installation and wiring shall conform to the requirements of *NFPA 70, National Electrical Code*.
5.1.3.7.6.5
Emergency electrical service for the pumps shall conform to the requirements of the essential electrical system as described in Chapter 6.

5.1.3.7.7 Medical–Surgical Vacuum Exhaust~~Source~~.

5.1.3.7.7.1
The medical–surgical vacuum pumps shall exhaust in a manner and location that minimizes the hazards of noise and contamination to the facility and its environment.
5.1.3.7.7.2
The exhaust shall be located as follows:

1. Outdoors
2. At least 7.5 m (25 ft) from any door, window, air intake, or other openings in buildings or places of public assembly
3. At a level different from air intakes
4. Where prevailing winds, adjacent buildings, topography, or other influences will not divert the exhaust into occupied areas or prevent dispersion of the exhaust

5.1.3.7.7.3
The end of the exhaust shall be turned down and screened or otherwise be protected against the entry of vermin, debris, or precipitation by screening fabricated or composed of a noncorroding material.
5.1.3.7.7.4
The exhaust shall be free of dips and loops that might trap condensate or oil or provided with a drip leg and valved drain at the bottom of the low point.
5.1.3.7.7.5
Vacuum exhausts from multiple pumps shall be permitted to be joined together to one common exhaust where the following conditions are met:

1. The common exhaust is sized to minimize back pressure in accordance with the pump manufacturer's recommendations.
2. Each pump can be isolated by manual or check valve, blind flange, or tube cap to prevent open exhaust piping when the pump(s) is removed for service from consequent flow of exhaust air into the room.

5.1.3.7.7.6
Vacuum exhaust piping shall be permitted to be made of materials and use a joining technique as permitted under 5.1.10.2 and 5.1.10.3.

5.1.3.7.8 Operating Alarms.

Medical–surgical vacuum supply systems shall activate a local alarm when the backup or lag pump is running per 5.1.9.5. This signal shall be manually reset.

5.1.3.8* Waste Anesthetic Gas Disposal (WAGD) Central Supply Systems.

5.1.3.8.1* Supply Sources.
WAGD supply sources shall be chosen in consultation with the medical staff having knowledge of the requirements to determine the type of system, number and placement of terminals, and other required safety and operating devices.

5.1.4.2 Source Valve.

5.1.4.2.1
A shutoff valve shall be placed at the immediate connection of each ~~source~~ central supply system to the piped distribution system to allow the entire ~~source~~central supply system, including all accessory devices (e.g., air dryers, final line regulators), to be isolated from the facility.

5.1.4.2.2

The source valve shall be located in the immediate vicinity of the ~~source equipment~~central supply system.

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~~machinery~~ being monitored
2. Within a monitoring device (e.g., dew point monitor or carbon monoxide monitor)
3. On a separate alarm panel(s)

5.1.9.5.3

If there is more than one central supply~~medical air compressor~~ 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~~, instrument air compressor system, WAGD system, medical–surgical vacuum pump system, or proportioning system at different locations in the facility, or if the compressors and vacuum~~

~~sources are in different locations in the facility, then it shall be necessary for each location to have separate alarms at the master panels.~~

First Revision No. 604-NFPA 99-2015 [Global Input]

Change the term 'critical care area' or 'critical care areas' to 'Category 1 space' in the following sections:

3.3.160

5.1.4.6.8

5.1.9.4

5.1.9.4.4

5.1.12.3.10.5

A.3.3.160

A.5.1.3.5.15

A.5.1.7 (also change 'critical care unit' to 'Category 1 space care unit')

A.5.1.9.4(2)

A.5.1.9.4.4(1)

Critical care terminology all Beckstrand

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Committee Statement

Committee Statement: temrinology
Response Message:

Public Input No. 369-NFPA 99-2015 [Section No. 5.1.9.4 [Excluding any Sub-Sections]]

Public Input No. 367-NFPA 99-2015 [Section No. 5.1.4.6.8]

Public Input No. 370-NFPA 99-2015 [Section No. 5.1.9.4.4]

Public Input No. 373-NFPA 99-2015 [Section No. 5.1.12.3.10.5]

Public Input No. 385-NFPA 99-2015 [Section No. A.5.1.3.5.15]

Public Input No. 388-NFPA 99-2015 [Section No. A.5.1.9.4.4(1)]

Public Input No. 364-NFPA 99-2015 [Section No. 3.3.160]

Public Input No. 383-NFPA 99-2015 [Section No. A.3.3.160]

Public Input No. 386-NFPA 99-2015 [Section No. A.5.1.7]

Public Input No. 387-NFPA 99-2015 [Section No. A.5.1.9.4(2)]

First Revision No. 505-NFPA 99-2015 [Detail]

Change the title of 10.3.

10.3 Testing Requirements — ~~Fixed and Portable~~ Patient Care- Related Electrical Appliances and Equipment .

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Submittal Date: Tue Aug 11 10:55:21 EDT 2015

Committee Statement

Committee Statement: The title of 10.3 has been revised to follow the pattern set by the title of 10.2 to better identify which equipment is referenced.

Response Message:

Public Input No. 328-NFPA 99-2015 [Section No. 10.3]

First Revision No. 509-NFPA 99-2015 [Detail]

Replace references to IEC 60601-1 with ANSI/AAMI ES60601-1 throughout the document.

Submitter Information Verification

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Zip:
Submittal Date: Tue Aug 11 11:53:41 EDT 2015

Committee Statement

Committee Statement: The Medical Equipment committee has used the ANSI/AAMI version in a recent revision. The reference should be consistent throughout the document.
Response Message:

First Revision No. 512-NFPA 99-2015 [Detail]

For each reference to CGA documents in Chapter 11, add the words "the mandatory requirements of" prior to the document citation.

Submitter Information Verification

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Zip:
Submittal Date: Tue Aug 11 15:43:54 EDT 2015

Committee Statement

Committee Statement: This addition of these words will resolve conflicts associated with referencing non-mandatory text in a code.
Response Message:

Public Input No. 329-NFPA 99-2015 [Chapter 11]

First Revision No. 103-NFPA 99-2015 [Section No. 1.1.12]

1.1.12* Hyperbaric Facilities.

Chapter 14 ~~covers the recognition of, and protection against, hazards of an electrical, explosive, or implosive nature, as well as fire~~ establishes criteria for design and operation of hyperbaric chambers and facilities. Chapter 14 covers electrical, fire, pressure, and gas hazards associated with hyperbaric ~~chambers and associated~~ facilities that are used, or intended to be used, for medical ~~applications~~ and experimental procedures at gauge pressures from 0 kPa to 690 kPa (0 psi to 100 psi).

Supplemental Information

File Name	Description
FR_103_Annex_Material.docx	Revised annex material

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Submittal Date: Tue Aug 18 09:28:50 EDT 2015

Committee Statement

Committee Statement: This revision specifies that the hyperbaric facilities chapter is used for facility design, chamber design, and facility operation. The section has been further revised to make the existing paragraph more concise.

The annex material is out of date and required revision. When last edited, this material was located in the hyperbaric facilities chapter and served as a preamble to the chapter's requirements. The material is out of context now that it is located in Chapter 1.

Response Message:

Public Input No. 237-NFPA 99-2015 [Section No. 1.1.12]

Public Input No. 238-NFPA 99-2015 [Section No. A.1.1.12]

FR 103 – Annex Material

A.1.1.12

~~During the past 20 years, there has been a widespread interest in the use of oxygen at elevated environmental pressure to increase the partial pressure of oxygen in a patient's tissues in order to treat certain medical conditions or to prepare a patient for surgery. These techniques are also employed widely for the treatment of decompression sickness (e.g., bends, caisson worker's disease) and carbon monoxide poisoning.~~

~~Recently, however, the level of knowledge and expertise has increased so dramatically that the codes are in need of updating. By the end of 1988, there were 218 hyperbaric facilities in operation in the United States and Canada. These facilities supported hyperbaric medical treatments for 62,548 patients between 1971 and 1987. As these facilities provide therapy for disorders indicated for treatment, these numbers will continue to increase. As the number of facilities increases, the number of patients treated will also increase.~~

~~Such treatment involves placement of the patient, with or without attendants, in a hyperbaric chamber or pressure vessel, the pressure of which is raised above ambient pressure. In the course of the treatment, the patient breathes up to 100 percent oxygen.~~

~~In addition to being used for patient care, these chambers also are being employed for research purposes using experimental animals and, in some instances, humans.~~

~~The partial pressure of oxygen present in a gaseous mixture is the determinate factor in the amount of available oxygen. This pressure will rise if the volume percentage of oxygen present increases, if the total pressure of a given gas mixture containing oxygen increases, or if both these factors increase. Because the sole purpose of the hyperbaric technique of treatment is to raise the total pressure within the treatment chamber, an increased partial pressure of oxygen always is available during treatment, unless positive means are taken to limit the oxygen content. In addition, the patient is often given an oxygen-enriched atmosphere to breathe.~~

~~The need for human diligence in the establishment, operation, and maintenance of hyperbaric facilities is continual. The chief administrator of the facility possessing the hyperbaric chamber is responsible to adopt and enforce appropriate regulations for hyperbaric facilities. In formulating and administering the program, full use should be made of technical personnel highly qualified in hyperbaric chamber operations and safety.~~

~~It is essential that personnel having responsibility for the hyperbaric facility establish and enforce appropriate programs to fulfill the provisions of Chapter 14.~~

~~Potential hazards can be controlled only when continually recognized and understood by all pertinent personnel.~~

~~The purpose of Chapter 14 is to set forth minimum safeguards for the protection of patients or others subject to, and personnel who administer, hyperbaric therapy and experimental procedures. Its purpose is also to offer some guidance for rescue personnel who are not ordinarily involved in hyperbaric chamber operation, but who could become so involved in an emergency.~~

~~Requirements cited in 1.1.12 are minimum requirements. Discretion on the part of chamber operators and others might dictate the establishment of more stringent regulations~~

Hyperbaric chambers are found in a variety of settings, including hospitals, doctor's offices, private clinics, and business occupancies. Not all hyperbaric facilities are designed or equipped the same. Hyperbaric

treatment is used for a variety of emergent and non-emergent conditions; and the possible acuity of patients ranges from critically ill to stable outpatients. Hyperbaric facilities vary in the types of conditions treated and the acuity of patients accepted. These variations lead to differences in hyperbaric equipment, ancillary support equipment, and facility location. This chapter is intended to provide minimum safeguards for hyperbaric patients and personnel regardless of the location of the facility.

First Revision No. 101-NFPA 99-2015 [Chapter 2]

Chapter 2 Referenced Publications

2.1* General.

The documents referenced in this chapter, or portions of such documents, are referenced within this code and shall be considered part of the requirements of this code, and the following shall also apply:

(1) Documents referenced in this chapter, or portion of such documents, shall only be applicable to the extent called for within other chapters of this code.

(2) Where the requirements of a referenced code or standard differ from the requirements of this code, the requirements of this code shall govern.

(3) Existing buildings or installations that do not comply with the provisions of the codes or standards referenced in this chapter shall be permitted to be continued in service, provided that the lack of conformity with these documents does not present a serious hazard to the occupants as determined by the authority having jurisdiction. [***101*:** 2.1]

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers,* ~~2013~~ 2017 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* ~~2013~~ 2016 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* ~~2013~~ 2016 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* ~~2013~~ 2016 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* ~~2014~~ 2017 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* ~~2015~~ 2018 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment,* ~~2011~~ 2016 edition.

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines,* ~~2015~~ 2018 edition.

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals,* ~~2011~~ 2015 edition.

NFPA 54, *National Fuel Gas Code,* ~~2015~~ 2018 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code,* ~~2013~~ 2016 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* ~~2014~~ 2017 edition.

NFPA 70®, National Electrical Code®, ~~2014~~ 2017 edition.

NFPA 72®, National Fire Alarm and Signaling Code, ~~2013~~ 2016 edition.

NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment,* 2014 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* ~~2015~~ 2018 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids,* ~~2010~~ 2015 edition.

NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations,* ~~2014~~ 2017 edition.

NFPA *101®, Life Safety Code®,* ~~2015~~ 2018 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* ~~2013~~ 2016 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems,* ~~2013~~ 2016 edition.

NFPA 170 *tandard for Fire Safety and Emergency Symbols, 2015 edition.* 2015 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances,* ~~2013~~ 2016 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* 2013 edition.

NFPA 260, *Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture,* 2013 edition.

NFPA 261, *Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes,* 2013 edition.

NFPA 286, *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth,* ~~2011~~ 2015 edition.

NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films,* ~~2010~~ 2015 edition.

NFPA 750, *Standard on Water Mist Fire Protection Systems,* 2015 edition.

NFPA 853, *Standard for the Installation of Stationary Fuel Cell Power Systems,* ~~2010~~ 2015 edition.

NFPA 1600®, Standard on Disaster/Emergency Management and Business Continuity Programs, ~~2013~~ 2016 edition.

NFPA 2001, *Standard for Fire Safety and Emergency Symbols,.* 2015 edition.

NFPA 5000®, Building Construction and Safety Code®, ~~2015~~ 2018 edition.

2.3 Other Publications.

2.3.1 ANSI Publications.

American National Standards Institute, Inc., 22 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI B57.1, *Compressed Gas Cylinder Valve Outlet and Inlet Connections*

ANSI Z136.3, *Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources*, 2011.

~~ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials* , 2010.~~

ANSI/AAMI ES 60601–1, *Medical Electrical Equipment*, 2012.

~~ANSI/UL 1069, *Safety Standard for Hospital Signaling and Nurse Call Equipment* , 2012.~~

2.3.2 ASHRAE Publications.

ASHRAE, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.

ASHRAE 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, 2010.

ASHRAE 170, *Ventilation of Health Care Facilities*, 2013.

2.3.3 ASME Publications.

American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME A.17.1, *Safety Code for Elevators and Escalators*, ~~2010~~ 2013 .

ASME A.17.3, *Safety Code for Existing Elevators and Escalators*, 2011.

ASME B1.20.1, *Pipe Threads, General Purpose, Inch*, 2013 ~~2006~~ .

ASME B16.22, *Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings*, ~~2010~~ 2013 .

ASME B16.26, *Cast Copper Alloy Fittings for Flared Copper Tubes*, ~~2011~~ 2013 .

ANSI/ASME B16.50, *Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings*, ~~2008~~ 2013 .

ASME B31.3, *Pressure Process Piping*, ~~2010~~ 2014 .

ASME B40.100, *Pressure Gauges and Gauge Attachments*, ~~2011~~ 2013 .

ASME *Boiler and Pressure Vessel Code*, Sections VIII and IX, ~~2010~~ 2014 .

ANSI/ASME PVHO-1, *Safety Standard for Pressure Vessels for Human Occupancy*, 2012.

2.3.4 ASSE Publications.

~~American Society of Sanitary Engineering, 901 Canterbury Road, Suite A, Westlake, OH 44145-1480~~ ASSE International, 18927 Hickory Creek Drive, Suite 220, Mokena, IL 60448 .

ASSE 6010, *Professional Qualification Standard for Medical Gas Systems Installers*, ~~2012~~ 2015 .

~~ASSE 6015, *Professional Qualification Standard for Bulk Medical Gas Systems Installer* , 2012 .~~

ASSE 6020, *Professional Qualification Standard for Medical Gas Systems Inspectors* , 2015

ASSE 6030, *Professional Qualification Standard for Medical Gas Systems Verifiers*, ~~2012~~ 2015 .

ASSE 6035, *Professional Qualification Standard for Bulk Medical Gas Systems Verifiers* , 2015

ASSE 6040, *Professional Qualification Standard for Medical Gas Maintenance Personnel*, ~~2012~~ 2015 .

2.3.5 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM A240/A240M, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications* , 2015.

ASTM A269/A269M , *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*, ~~2010~~ 2014 e1 .

ASTM A312/A312M , *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*, ~~2013a~~ 2015 .

ASTM B32, *Standard Specification for Solder Metal*, 2008, reapproved 2014 .

ASTM B88, *Standard Specification for Seamless Copper Water Tube*, ~~2009~~ 2014 .

ASTM B280, *Standard Specification for Seamless Copper Tubing for Air Conditioning and Refrigeration Field Service*, ~~2008~~ 2013 .

ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, 2000, ~~(2011)~~ reapproved 2011 .

ASTM B828, *Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings*, 2002, ~~(2010)~~ reapproved 2010 .

ASTM D5/D5M, ~~D5~~ , *Standard Test Method for Penetration of Bituminous Materials*, ~~2006 e1~~ 2013 .

ASTM ~~D 1785~~ D1785, , *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120*, 2012.

ASTM D2466, *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40*, ~~2006~~ 2013 .

ASTM D2467, *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80*, ~~2006~~ 2015 .

ASTM D2672, *Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement*, ~~1996a (2009)~~ 2014 .

ASTM D2846/D2846M , *Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems,*~~2009b e1~~ 2014 .

~~ASTM D2863, *Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)* , 2012.~~

ASTM D4359, *Standard Test Method for Determining Whether a Material Is a Liquid or a Solid*, 2012.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2012c~~ 2015a .

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2012.

ASTM E1352, *Standard Test Method for Cigarette Ignition Resistance of Mock-Up Upholstered Furniture Assemblies*, ~~2008~~ 2008a .

ASTM E1353, *Standard Test Methods for Cigarette Ignition Resistance of Components of Upholstered Furniture*, 2008a e1 .

ASTM E1537, *Standard Test Method for Fire Testing of Upholstered Furniture*, 2013.

ASTM E1590, *Standard Test Method for the Fire Testing of Mattresses*, ~~2012~~ 2013 .

ASTM ~~2652~~ E2652 , *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, 2012.

ASTM F438, *Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chlorinated) (CPVC) Plastic Pipe Fittings, Schedule 40*, ~~2009~~ 2015 .

ASTM F439, *Standard Specification for Chlorinated Poly (Vinyl Chlorinated) (CPVC) Plastic Pipe Fittings, Schedule 80,*~~2011~~ 2013 .

ASTM F441/F441M , *Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80,*~~2009~~ 2013 e1 .

ASTM ~~493~~ F493 , *Solvent Cements for CPVC Pipe and Fittings,*~~2010~~ 2014 .

2.3.6 AWS Publications.

American Welding Society, ~~550 NW LeJeune Road, Miami, FL 33126~~ 8669 NW 36 Street, #130, Miami, FL 33166-6672 .

ANSI/AWS ~~A5.8~~ A5.8M/A5.8, , *Specification for Filler Metals for Brazing and Braze Welding*, 2011, Addendum 1, 2014 .

AWS B2.2/B2.2M , *Standard for Brazing Procedure and Performance Qualification*, 2010.

2.3.7 BICSI Publications.

BICSI, 8610 Hidden River Parkway, Tampa, FL 33637-1000.

The BICSI Information Transport Systems (ITS) Dictionary, 3rd edition.

2.3.8 CDA Publications.

Copper Development Association Inc., 260 Madison Avenue, New York, NY 10016.

Copper Tube Handbook, 2010.

2.3.9 CGA Publications.

Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151-2923.

CGA C-4 , *Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained*, 1954.

CGA C-7, *Guide to ~~the Preparation of Precautionary Labeling and Marking of Compressed Gas Containers~~ Classification and Labeling of Compressed Gases* , ~~2011~~ 2014 .

CGA G-4, *Oxygen*, ~~2008~~ 2015 .

CGA G-4.1, *Cleaning Equipment for Oxygen Service*, ~~2009~~ 2009 .

CGA G-6.1, *Standard for Insulated Carbon Dioxide Systems at Consumer Sites*, ~~2005~~ 2013 .

CGA G-6.5, *Standard for Small, Stationary, Insulated Carbon Dioxide Supply Systems*, ~~2007~~ 2013 .

CGA G-8.1, *Standard for Systems at Consumer Sites*, ~~2007~~ 2013 .

CGA M-1, ~~*Guide for Medical Gas Installations at Consumer Sites*~~ *Standard for Medical Gas Installations at Health Care Facilities* , ~~2007.~~ 2013.

CGA O2-DIR, *Directory of Cleaning Agents for Oxygen Service*, ~~Edition~~ edition 4.

CGA P-2.5, *Transfilling of High Pressure Gaseous Oxygen to Be Used for Respiration*, 2011.

CGA P-2.6, *Transfilling of Liquid Oxygen to Be Used for Respiration*, 2011.

CGA P-18, *Standard for Bulk Inert Gas Systems at Consumer Sites*, ~~2006~~ 2013 .

CGA V-1, ~~*Compressed Gas Association*~~ *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections* (ANSI B57.1), ~~2005~~ 2013 .

CGA V-5, *Diameter-Index Safety System (Noninterchangeable Low Pressure Connections for Medical Gas Applications)*, 2008, reaffirmed 2013 .

2.3.10 CSA Publications.

Canadian Standards Association, ~~5060 Spectrum Way,~~ 178 Rexdale Blvd., ~~Mississauga~~ Toronto , ~~ON, L4W 5N6~~ M9W 1R3 , Canada.

CSA C22.2 No. 0.3, *Test Methods for Electrical Wires and Cables*, 2009, reaffirmed 2014 .

2.3.11 FGI Publications.

Facility Guidelines Institute, 1919 McKinney Avenue, Dallas, TX 75201.

Guidelines for Design and Construction of Hospitals and Outpatient Facilities, 2014.

~~**2.3.12** IEC Publications.~~

~~International Electrotechnical Commission, 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland.~~

~~IEC 60601-1, *Medical Electrical Equipment—Part 1: General Requirements for Basic Safety and Essential Performance* , 2007.~~

2.3.12 ISA Publications.

~~Instrumentation, Systems, and Automation Society (ISA),~~ International Society of Automation, 67 T.W. Alexander Drive, PO Box 12277, Research Triangle Park, NC 27709.

ANSI/ISA S-7.0.01, *Quality Standard for Instrument Air*, 1996.

2.3.13 MSS Publications.

Manufacturer's Standardization Society of the Valve and Fittings Industry, Inc., 127 Park Street NE, Vienna, VA ~~22180~~ 22180-4602. .

SP-58, *Pipe Hangers and Supports — Materials, Design, Manufacture, Selection, Application and Installation*, 2009.

2.3.14 State of California Publications.

State of California, Department of Consumer Affairs, 3485 Orange Grove Avenue, North Highlands, CA 95660-5595.

California Technical Bulletin 117, *Requirements, Test Procedure and Apparatus for Testing the Flame Retardance of Resilient Filling Materials Used in Upholstered Furniture,* 2000.

California Technical Bulletin 129, *Flammability Test Procedure for Mattresses for Use in Public Buildings,* 1992.

California Technical Bulletin 133, *Flammability Test Procedure for Seating Furniture for Use in Public Occupancies* , 1991.

2.3.15 TC Publications.

Transport Canada, 330 Sparks Street, Ottawa, ON, ~~K1A/ON5~~ K1A ON5 , Canada.

Transportation of Dangerous Goods Regulations.

2.3.16 TIA Publications.

Telecommunications Industry Association, ~~2500 Wilson Boulevard, Suite 300,~~ 1320 North Courthouse Road, Suite 200, Arlington, VA 22201.

TIA/EIA 568-~~B~~ C.1 , *Commercial Building Telecommunications Cabling Standard*, 2012.

TIA/EIA 606-A, *Administration Standard for Commercial Telecommunications Infrastructure*, 2009.

2.3.17 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/ UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2008, ~~Revised 2010~~ 2013 .

ANSI/UL 1069, *Safety Standard for Hospital Signaling and Nurse Call Equipment* , 2007, revised 2015.

UL 1685, *Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables*, ~~2007, Revised 2010~~ 2015 .

2.3.18 U.S. Government Publications.

Document Automation and Production Service (DAPS), Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094~~, www.dodssp.daps.mil~~ .

21 USC 9, ~~United States Food, Drug, and Cosmetic Act - .~~ United States Food, Drug, and Cosmetic Act.

~~U.S. Government Commercial Standard 223-59, *Casters, Wheels, and Glides for Hospital Equipment* .~~

16 CFR 1632, *Standard for the Flammability of Mattresses and Mattress Pads (FF 4-72)*, 2000.

16 CFR ~~Part~~ 1633, *Standard for the Flammability (Open Flame) of Mattress Sets*, 2000.

2.3.19 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

~~California Technical Bulletin 117, *Requirements, Test Procedure and Apparatus for Testing the Flame Retardance of Resilient Filling Materials Used in Upholstered Furniture,* 2000.~~

~~California Technical Bulletin 129, *Flammability Test Procedure for Mattresses for Use in Public Buildings,* 1992.~~

~~California Technical Bulletin 133, *Flammability Test Procedure for Seating Furniture for Use in Public Occupancies* , State of California, Department of Consumer Affairs, 3485 Orange Grove Avenue, North Highlands, CA 95660-5595.~~

2.4 References for Extracts in Mandatory Sections.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* ~~2013~~ 2016 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* ~~2015~~ 2018 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code,* ~~2013~~ 2016 edition.

NFPA 70®, National Electrical Code®, ~~2014~~ 2017 edition.

NFPA 99B, *Standard for Hypobaric Facilities,* ~~2015~~ 2018 edition.

NFPA *101®, Life Safety Code®,* ~~2015~~ 2018 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* ~~2013~~ 2016 edition.

NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents,* ~~2014~~ 2017 edition.

NFPA 5000®, Building Construction and Safety Code®, ~~2015~~ 2018 edition.

Supplemental Information

File Name	Description
FR_101.docx	Revisions shown here

Submitter Information Verification

Submitter Full Name: HEA-FUN
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 17 14:57:39 EDT 2015

Committee Statement

Committee Statement: Referenced standards updates.
Response Message:

Public Input No. 283-NFPA 99-2015 [Section No. 2.3.5]

Public Input No. 6-NFPA 99-2015 [Section No. 2.3]

Public Input No. 41-NFPA 99-2015 [Section No. 2.3.4]

Public Input No. 5-NFPA 99-2015 [Global Input]

Public Input No. 297-NFPA 99-2015 [Section No. 2.3.1]

Public Input No. 298-NFPA 99-2015 [Section No. 2.3.17]

Public Input No. 276-NFPA 99-2015 [Section No. 2.3.5]

First Revision No. 39-NFPA 99-2015 [New Section after 3.3.22]

3.3.23* Clinical IT Network.

An information technology video, voice, and data communication network that is dedicated for shared use by medical devices, nurse call, clinical information systems, patient-critical applications, and clinical wireless communication equipment. (ELS).

Supplemental Information

File Name	Description
A.3.3.22_FR-39.docx	

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 04 11:01:53 EDT 2015

Committee Statement

Committee Statement: As the clinical environment becomes more and more automated, integrated and evolved, there is a need for the NFPA 99 code to establish a framework of requirements for a shared interoperable clinical IT-network. Doing so will institute the necessary electrical safety and risk management provisions that can have direct benefit on patient and clinician safety. There is a need for the NFPA 99 code to establish and define the infrastructure requirements for a clinical IT-network, which is dedicated for use by clinicians and patients. Such a network comprises the servers, switches, routers (etc.) and voice and data communications equipment which are used to transport clinical data and information over a shared IT network infrastructure. Defining the requirements for a Clinical IT network in the NFPA 99 Code will ensure patient and staff safety, safe system operation, overall system effectiveness, and data and system security of personal information and clinical use data which can be transported on the clinical IT network.

Response Message:

Public Input No. 284-NFPA 99-2015 [New Section after 3.3.22]

FR-39, New Annex material

A.3.3.22 Clinical IT-Network.

A clinical IT-network comprises the servers, switches, routers and voice and data communications equipment which are employed to transport patient critical clinical data, information and staff communications over a shared interoperable IT network infrastructure.

First Revision No. 104-NFPA 99-2015 [Section No. 3.3.28]

~~**3.3.30** Critical Care Area.~~

~~A room or space in which failure of equipment or a system is likely to cause major injury or death to patients or caregivers (Category 1). *(See 3.3.127 .)*~~

Submitter Information Verification

Submitter Full Name: HEA-FUN
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 18 09:31:16 EDT 2015

Committee Statement

Committee Statement: Definition for Critical Care Area or Space is no longer necessary and should be eliminated to avoid confusion of technical terms used in NFPA 99. The term has changed to reflect Category language. This term is now designated as shown in NFPA 99: 3.3.137 Patient Care Space designated as Category 1 Space. This definition and any references to the term "Critical Care Area" or "Critical Care Space" used through out NFPA 99 should be removed and/or changed to “Category 1 Space”.

Response Message:

Public Input No. 357-NFPA 99-2015 [Section No. 3.3.28]

First Revision No. 602-NFPA 99-2015 [New Section after 3.3.29]

3.3.30 Cryogenic Fluid Central Supply System.

An assembly of equipment for supplying compressed gas, including, but not limited to, a stationary tank(s) that is permanently installed through anchoring to a foundation, pressure regulators, pressure relief devices, vaporizers, manifolds, and interconnecting piping that is designed to be filled at the health care facility with a cryogenic fluid and that terminates at the source valve.

3.3.30.1 Bulk Cryogenic Fluid Central Supply System.

A cryogenic fluid central supply system with a storage capacity of more than 566 m^3 [20,000 ft^3 (scf)].

3.3.30.2 Bulk Nitrous Oxide Central Supply System.

A central supply system with a storage capacity of more than 1452 kg (3200 lb) [i.e., approximately 793 m^3 (28,000 ft^3) at normal temperature and pressure] of nitrous oxide (PIP).

3.3.30.3 Micro-Bulk Cryogenic Fluid Central Supply System.

A cryogenic fluid central supply system with a storage capacity of less than or equal to 566 m^3 [20,000 ft^3 (scf)].

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 09:02:52 EDT 2015

Committee Statement

Committee Statement: To harmonize with terminology used in NFPA 55. The word stationary was added to clarify the requirements between stationary and portable systems. This enables us to eliminate duplicate requirements in 5.1.3.5.13 that applied to stationary microbulk systems.

Response Message:

Public Input No. 196-NFPA 99-2015 [Section No. 3.3.19 [Excluding any Sub-Sections]]

Public Input No. 198-NFPA 99-2015 [New Section after 3.3.29]

Public Input No. 199-NFPA 99-2015 [New Section after 3.3.29]

Public Input No. 200-NFPA 99-2015 [New Section after 3.3.29]

Public Input No. 197-NFPA 99-2015 [Global Input]

First Revision No. 905-NFPA 99-2015 [New Section after 3.3.33]

3.3.31 Dental Office.

A building or part thereof in which the following occur: (1) examinations and minor treatments/procedures performed under the continuous supervision of a dental professional; (2) use of limited to minimal sedation and treatment or procedures that do not render the patient incapable of self-preservation under emergency conditions; and (3) no overnight stays for patients or 24-hour operations.

Submitter Information Verification

Submitter Full Name: HEA-FUN
Organization: NATIONAL FIRE PROTECTION ASSOC
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 25 10:03:26 EDT 2015

Committee Statement

Committee Statement: The definitions for medical office and dental office have been broken out and separated. The definition for dental office has been separated out from that for medical office. It is more logical for a code user to look for the definition of dental office on its own rather than look for it under medical office. See FR 105.

Response Message:

First Revision No. 114-NFPA 99-2015 [Section No. 3.3.49]

~~**3.3.55***~~ ~~Failure.~~

~~An incident that increases the hazard to personnel or patients or that affects the safe functioning of electric appliances or devices. (MED)~~

Submitter Information Verification

Submitter Full Name: HEA-FUN
Organization: [Not Specified]
Street Address:
City:
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Zip:
Submittal Date: Tue Aug 18 10:04:04 EDT 2015

Committee Statement

Committee Statement: Failure is a term that is used widely throughout the document. It should not be defined to fit the use of only one technical committee. The commonly accepted definition of Failure should be sufficient for all the uses throughout the document.

Response Message:

First Revision No. 112-NFPA 99-2015 [Section No. 3.3.62]

Global FR-34

3.3.64* Health Care Facility's Governing Body.

The person or persons who have the overall legal responsibility for the operation of a health care facility. (FUN)

Supplemental Information

File Name	Description
FR_112_Annex_Material.docx	New annex material

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Submitter Full Name: HEA-FUN
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 18 09:58:19 EDT 2015

Committee Statement

Committee Statement: The phrase “Health Care Facility’s Governing Body” is now used in multiple chapters in NFPA 99 and should be properly defined in Chapter Three. It appears that several committees are forming a consensus that this term will be the most appropriate.

Response Message:

FR 112 Annex Material

A.3.3.62 Health Care Facility's Governing Body

This definition excludes political governmental agencies, such as authorities having jurisdiction, who exercise local, regional, or national legal jurisdiction over the design, construction, inspection and operation of a particular health care facility.

First Revision No. 301-NFPA 99-2015 [New Section after 3.3.73]

3.3.74* Hyperbaric Operations.

Procedures conducted on the patient receiving hyperbaric treatment.

Supplemental Information

File Name	Description
A.3.3.72_FR-301.docx	

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 08:24:47 EDT 2015

Committee Statement

Committee Statement: NOTE: The following Public Input appeared as “Reject but Hold” in Public Comment No. 38 of the (A2014) Second Draft Report for NFPA 99 and per the Regs. At 4.4.8.3.1.

Defining Hyperbaric Procedures affords the AHJs and end users an understanding of the activities allowed in the hyperbaric room.

Response Message:

Public Input No. 48-NFPA 99-2015 [New Section after 3.3.73]

FR-301, New annex material

A.3.3.72 Hyperbaric Operations.

Such procedures include but are not limited to; (a) therapy inside a hyperbaric chamber, (b) changing clothes, (c) vital signs, (d) non-invasive transcutaneous oxygen monitoring, (e) clinical and medical assessments, and (f) minor dressing changes. Debridement or other surgical procedures, application of casting material, application of skin substitutes, and application of bio-engineered grafts are not recommended in the chamber room. (HYP)

First Revision No. 105-NFPA 99-2015 [Section No. 3.3.98]

3.3.101* Medical/~~Dental~~ Office.

A building or part thereof in which the following occur: (1) examinations and minor treatments/procedures ~~are~~ performed under the continuous supervision of a medical/dental professional; (2) ~~only sedation or local anesthesia is involved~~ the use of limited to minimal sedation and treatment or procedures that do not render the patient incapable of self-preservation under emergency conditions; and (3) no overnight stays for patients or 24-hour ~~operation~~ operations ~~are not provided~~ . (FUN)

Submitter Information Verification

Submitter Full Name: HEA-FUN
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 18 09:32:49 EDT 2015

Committee Statement

Committee Statement: To improve readability of the Code, and for compatibility with the Style Manuals of other NFPA Codes that extract content from NFPA 99.

The existing language was ambiguous as to whether BOTH medical AND dental (treatments, professionals) or medical OR dental.

Item (2) could have been interpreted to REQUIRE that sedation or local anesthesia MUST be performed at a MINIMUM (rather than OPTIONALLY at a MAXIMUM)..

The definition for dental office has been separated out from that for medical office. It is more logical for a code user to look for the definition of dental office on its own rather than look for it under medical office. See FR 905.

Also (3) to correctly match the pluralization of nouns and verbs grammatically.

Response Message:

Public Input No. 18-NFPA 99-2015 [Section No. 3.3.98]

First Revision No. 658-NFPA 99-2015 [New Section after 3.3.116]

3.3.120 Nonseparable Connection.

A type of connection incorporating mechanical seal features that, once connected, has the durability, strength, thermal, and sealing capability of the pipe or tubing to which it is applied and cannot be disconnected without destroying the integrity of connection.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:19:55 EDT 2015

Committee Statement

Committee Statement: A new definition of nonseparable connection is proposed to define the term that is currently used in the code, and is proposed to be added in several locations in this proposal. It is noted that the term “semipermanent connection” is defined in 3.3.164, and the new definition therefore appropriate.

Response Message:

Public Input No. 249-NFPA 99-2015 [New Section after 3.3.116]

First Revision No. 214-NFPA 99-2015 [New Section after 3.3.117]

3.3.122 Opportunity for Improvement.

An identified gap or shortfall with the potential to raise something to a more desirable or outstanding quality or condition. (HES)

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 15:48:22 EDT 2015

Committee Statement

Committee Statement: The definition was provided for clarity
Response Message:

First Revision No. 106-NFPA 99-2015 [New Section after 3.3.119]

3.3.125 Oxygen Concentrator Unit.

An engineered assembly of components that operate to separate air into constituent gases, typically providing oxygen 93 USP as a product.

Submitter Information Verification

Submitter Full Name: HEA-FUN
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 18 09:38:00 EDT 2015

Committee Statement

Committee Statement: This new definition has been added to support the extensive new material on oxygen concentrators that has been added into Chapter 5.
Response Message:

Public Input No. 147-NFPA 99-2015 [New Section after 3.3.119]

First Revision No. 107-NFPA 99-2015 [Section No. 3.3.124]

3.3.130 Oxygen USP.

Oxygen complying with oxygen USP or oxygen 93 USP.

Submitter Information Verification

Submitter Full Name: HEA-FUN
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 18 09:40:57 EDT 2015

Committee Statement

Committee Statement: This new definition recognizes that two medical oxygen monographs exist, are in clinical use and should be recognized in NFPA 99.

Response Message:

Public Input No. 130-NFPA 99-2015 [Section No. 3.3.124]

First Revision No. 2-NFPA 99-2015 [Section No. 3.3.125]

Global FR-604

3.3.131 Patient Bed Location.

The location of a patient sleeping bed, or the bed or procedure table of a ~~critical care~~ Category 1 space. (ELS)

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 09:20:48 EDT 2015

Committee Statement

Committee Statement: The definition for Critical Care Area is covered in NFPA 99: 3.3.137 Patient Care Space and is designated as Category 1 Space. Any references in NFPA 99 to “Critical Care Area” should be changed to “Category 1 Space”.

Response Message:

Public Input No. 359-NFPA 99-2015 [Section No. 3.3.125]

First Revision No. 403-NFPA 99-2015 [New Section after 3.3.135]

3.3.134 Plume (Medical).

The smoke by-product consisting of vapors, smoke, and particulate debris produced during the thermal destruction of tissue by energy-based devices such as lasers, electrosurgical generators, and broadband light sources. (MEC)

Submitter Information Verification

Submitter Full Name: HEA-MEC
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 04 15:35:12 EDT 2015

Committee Statement

Committee Statement: Provided a definition of plume as used in the code.
Response Message:

Public Input No. 301-NFPA 99-2015 [New Section after 3.3.135]

First Revision No. 603-NFPA 99-2015 [New Section after 3.3.135]

3.3.135* Producer.

The machine(s) or device(s) that generate the flow and suction required for vacuum, WAGD, and plume evacuation systems to operate.

Supplemental Information

File Name	Description
A.3.3.135_FR-603.docx	

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 09:07:57 EDT 2015

Committee Statement

Committee Statement: This term is used for WAGD and for Plume, but not defined.
Response Message:

Public Input No. 302-NFPA 99-2015 [New Section after 3.3.135]

A.3.3.135 Producer (vacuum, WAGD or plume evacuation).

Examples of these producers include vacuum pumps, fans, blowers, and venturis.

First Revision No. 517-NFPA 99-2015 [New Section after 3.3.143]

3.3.142 Relocatable Power Tap (RPT).

Multiple-outlet power cord that can be used to channel electricity from a single outlet. (MED)

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 16:49:31 EDT 2015

Committee Statement

Committee Statement: The definition is provided for clarity in the requirements of Chapter 10.
Response Message:

First Revision No. 108-NFPA 99-2015 [Section No. 4.2]

4.2* Risk Assessment.

4.2.1

The health care facility's governing body is responsible for conducting risk assessments and shall have the authority to determine risk.

4.2.2

Categories shall be determined by the health care facility's governing body by following and documenting a defined risk assessment procedure.

4.2.3

A documented risk assessment shall not be required ~~for Category 1~~ where Category 1 is selected .

Submitter Information Verification

Submitter Full Name: HEA-FUN
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 18 09:45:06 EDT 2015

Committee Statement

Committee Statement: This revision is intended help to clearly identify that the health care facility's governing body is the responsible party to determine risk. Section 4.2.3 has been revised to clarify that risk assessments are not needed if the user selects to meet Category 1 requirements.

Response Message:

Public Input No. 457-NFPA 99-2015 [Section No. 4.2.1]

Public Input No. 482-NFPA 99-2015 [New Section after 4.2.1]

First Revision No. 904-NFPA 99-2015 [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) 5.1.3.3.4

(5) 5.1.3.6.2

(6) 5.1.3.6.3.10(A)(2) ~~5.1.3.6.3.10(A)(2)5.1.3.6.3.10(A)(2)5.1.3.6.3.10(A)(2)5.1.3.8.4.2~~

(7) 5.1.3.7.6(A)(2) ~~5.1.3.7.5~~

(8) 5.1.3.8.4.3(A)(2)

(9) 5.1.14

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: NATIONAL FIRE PROTECTION ASSOC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 24 14:12:48 EDT 2015

Committee Statement

Committee Statement: This adds the requirements to provide manual alternation of medical air and vacuum sources where it is not automatically achieved to apply to existing facilities.
Response Message:

First Revision No. 606-NFPA 99-2015 [Section No. 5.1.3.3.1.1]

Global FR-601

5.1.3.3.1.1

Any of the following central supply systems shall be permitted to be located together in the same outdoor enclosure:

(1) Manifolds for gas cylinders *(see 5.1.3.5.12 ~~5.1.3.5.125.1.3.5.125.1.3.5.125.1.3.5.125.1.3.5.12 5.1.3.5.125.1.3.5.125.1.3.5.11~~)*

(2) Manifolds for cryogenic liquid containers *(see 5.1.3.5.13 ~~5.1.3.5.135.1.3.5.135.1.3.5.135.1.3.5.135.1.3.5.13 5.1.3.5.135.1.3.5.135.1.3.5.12~~)*

(3) Bulk cryogenic liquid systems *(see 5.1.3.5.14 ~~5.1.3.5.145.1.3.5.145.1.3.5.145.1.3.5.145.1.3.5.14 5.1.3.5.145.1.3.5.145.1.3.5.14~~)*

(4)* *Individual components on the oxygen side of concentrator sources (see 5.1.3.9)*

Supplemental Information

File Name	Description
FR_606.docx	Annex material

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 09:33:14 EDT 2015

Committee Statement

Committee Statement: A concentrator has parts which will handle air and parts which handle oxygen enriched air at various percentages. The equipment on the oxygen (output) side should be treated the same as any other oxygen containing source.

Response Message:

Public Input No. 136-NFPA 99-2015 [Section No. 5.1.3.3.1.1]

A.5.1.3.3.1.1(4)

Examples include concentrator unit, oxygen reservoir, and regulating devices.

First Revision No. 607-NFPA 99-2015 [Section No. 5.1.3.3.1.2]

5.1.3.3.1.2

Any of the following systems shall be permitted to be located together in the same indoor enclosure:

(1) Manifolds for gas cylinders *(see* 5.1.3.5.12 ~~5.1.3.5.125.1.3.5.125.1.3.5.125.1.3.5.125.1.3.5.12~~ ~~5.1.3.5.125.1.3.5.125.1.3.5.11~~ *)*

(2) Manifolds for cryogenic liquid containers *(see* 5.1.3.5.13 ~~5.1.3.5.135.1.3.5.135.1.3.5.135.1.3.5.135.1.3.5.13~~ ~~5.1.3.5.135.1.3.5.135.1.3.5.12~~ *)*

(3) In-building emergency reserves *(see* 5.1.3.5.16 ~~5.1.3.5.165.1.3.5.165.1.3.5.165.1.3.5.165.1.3.5.16~~ ~~5.1.3.5.165.1.3.5.165.1.3.5.16~~ *)*

(4) Instrument air standby headers *(see* 5.1.13.3.5.6 ~~5.1.13.3.5.65.1.13.3.5.65.1.13.3.5.65.1.13.3.5.65.1.13.3.5.6~~ ~~5.1.13.3.5.65.1.13.3.5.65.1.13.3.5.7~~ *)*

(5)* Individual components on the oxygen side of concentrator sources *(see* 5.1.3.9 *)*

Supplemental Information

File Name	Description
FR_607.docx	Annex material

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 09:34:41 EDT 2015

Committee Statement

Committee Statement: The equipment on the oxygen side of a concentrator should be treated the same as any other oxygen containing source.

Response Message:

Public Input No. 137-NFPA 99-2015 [Section No. 5.1.3.3.1.2]

A.5.1.3.3.1.1(4)

Examples include concentrator unit, oxygen reservoir, and regulating devices.

First Revision No. 608-NFPA 99-2015 [Section No. 5.1.3.3.1.3]

Global FR-601

5.1.3.3.1.3

Any of the following central supply systems shall be permitted to be located together in the same room:

(1) Medical air central supply compressor supply sources *(see 5.1.3.6.3)*

(2) Medical–surgical vacuum central supply sources *(see 5.1.3.7)*

(3) Waste anesthetic gas disposal (WAGD) central supply sources *(see 5.1.3.8)*

(4) Instrument air compressor central supply sources *(see 5.1.13.3.5)*

(5) Any other compressor, vacuum pump, or electrically powered machinery

(6)* Compressors, dryers, and air receivers used to supply oxygen concentrators (*see* 5.1.3.9)

(7) Concentrator units with air and oxygen sides in an integral unit (*see* 5.1.3.9)

Supplemental Information

File Name	Description
FR_608.docx	Annex material

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 09:37:02 EDT 2015

Committee Statement

Committee Statement: The equipment on the air side of a concentrator should be treated the same as any other air containing source. This makes sense when the concentrator is in a "train" with air compressor, dryer, receiver, and concentrator. The exception that must be made is for integral concentrator units which contain the air and oxygen elements in a single "package". In those designs, since the larger risk with respect to their location comes on the air side, they are placed here.

Response Message:

Public Input No. 138-NFPA 99-2015 [Section No. 5.1.3.3.1.3]

FR 608 – Annex Material

A.5.1.3.3.1.3 (6)

This includes individual components on the air side of concentrators.

First Revision No. 903-NFPA 99-2015 [Sections 5.1.3.3.1.6, 5.1.3.3.1.7, 5.1.3.3.1.8, 5.1.3.3.1.9...]

5.1.3.3.1.6

~~Central~~ Cryogenic fluid central supply systems for oxygen ~~with a total capacity connected and in storage of 566,335 L (20,000 ft 3) or more outside of the facility at standard temperature and pressure (STP)~~ shall comply with NFPA 55~~, *Compressed Gases and Cryogenic Fluids Code*~~ .

5.1.3.3.1.7

~~Central supply systems for nitrous oxide with a total capacity connected and in storage of 1451 kg (3200 lb) or more~~ Bulk nitrous oxide central supply systems shall comply with the mandatory requirements of CGA G-8.1, *Standard for Nitrous Oxide Systems at Consumer Sites*.

5.1.3.3.1.8

Central supply systems for carbon dioxide using permanently installed containers with product capacities greater than 454 kg (1000 lb) shall comply with the mandatory requirements of CGA G-6.1, *Standard for Insulated Carbon Dioxide Systems at Consumer Sites*.

5.1.3.3.1.9

Central supply systems for carbon dioxide using permanently installed containers with product capacities of 454 kg (1000 lb) or less shall comply with the mandatory requirements of CGA G-6.5, *Standard for Small, Stationary, Insulated Carbon Dioxide Supply Systems*.

5.1.3.3.1.10*

~~Central~~ Cryogenic fluid central supply systems for ~~bulk~~ inert gases ~~systems with a total capacity connected and in storage of 20,000 ft 3 or more of compressed gas or cryogenic fluid at standard temperature and pressure,~~ shall comply with the mandatory requirements of CGA P-18, *Standard for Bulk Inert Gas Systems at Consumer Sites*.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: NATIONAL FIRE PROTECTION ASSOC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 24 14:08:28 EDT 2015

Committee Statement

Committee Statement: Terminology has been revised to correlate with the definition changes made in Chapter 3.
Response Message:

First Revision No. 901-NFPA 99-2015 [New Section after 5.1.3.3.1.10]

5.1.3.3.1.11

If indoors, and containing gases other than medical air or oxygen, the central supply location shall be equipped with an oxygen monitor that shall indicate when the oxygen level in the room is below 19.5 percent. The monitor shall have the following:

(1) The oxygen sensor mounted on or near the central supply system

(2) A visual and audible annunciator outside the main entrance to the room

5.1.3.3.1.12

If indoors, and containing oxygen, the central supply location shall be equipped with an oxygen monitor that indicates when the oxygen level in the room is above 23.5 percent. The oxygen monitor shall have the following:

(1) The oxygen sensor mounted on or near the central supply system,

(2) A visual and audible annunciator outside the main entrance to the room.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: NATIONAL FIRE PROTECTION ASSOC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 24 13:56:34 EDT 2015

Committee Statement

Committee Statement: Manifold rooms present a recognized hazard to the worker who enters the room unaware of the possible lack of oxygen. Oxygen depletion monitors are now being applied to ameliorate this hazard in many similar situations in labs and industrial settings.

Oxygen monitors are also now required for oxygen storage locations. This will increase the safety for those entering these locations. There is an OSHA requirement that potentially hazardous locations are monitored to ensure personnel safety is protected and these locations remain safe for staff.

Response Message:

Public Input No. 59-NFPA 99-2015 [Section No. 5.1.3.1.8]

Public Input No. 393-NFPA 99-2015 [Section No. 5.1.3.3.2]

First Revision No. 610-NFPA 99-2015 [Section No. 5.1.3.3.2]

5.1.3.3.2* Design and Construction.

Locations for central supply systems and 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 provided with an enclosure (e.g., wall or fencing) constructed of noncombustible materials ~~with a minimum of two entry/exits~~ .

(4) If outdoors and greater than 200 ft^2 , they shall be provided with a minimum of two entry/exits.

(5) If outdoors, bulk cryogenic liquid systems shall be provided with a minimum of two entry/exits.

(6) If indoors, they shall have interior finishes of noncombustible or limited-combustible materials.

(7)* If indoors, the room shall be separated from the rest of the building by walls and floors having a one-hour fire resistance rating with doors and other opening protectives having a ¾-hour fire protection rating.

(8)* They shall comply with *NFPA 70*, ~~*National Electrical Code*~~ , for ordinary locations.

(9)* They shall be heated by indirect means ~~(e.g., steam, hot water)~~ if heat is required.

(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. ~~(e.g., proximity to loading docks, access to elevators, and passage of cylinders through public areas).~~

(15) They shall be designed to meet the operational requirements of 5.1.3.2 with regard to room temperature.

Supplemental Information

File Name	Description
FR_610.docx	Annex material and legislative text

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 11:05:44 EDT 2015

Committee Statement

Committee Statement: Item number 8 (now 9) on this list was revised along with its annex material to identify that certain types of electric heat can be considered "indirect means" as allowed to heat the room. Annex material mirroring NFPA 101 on the maximum temperature a heating element should reach was also included.

Item number 3 (now 4) was revised to specify a minimum square footage where two entry/exits are required. In some small, outdoor central supply areas, it is not practical or necessary to provide a second exit from the room.

Response Message:

Public Input No. 322-NFPA 99-2015 [Section No. 5.1.3.3.2]

Public Input No. 520-NFPA 99-2015 [Section No. 5.1.3.3.2]

FR 610

5.1.3.3.2* Design and Construction.
Locations for central supply systems and 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 provided with an enclosure (wall or fencing) constructed of noncombustible materials.
4. If outdoors and greater than 200 ft^2 they shall be provided with a minimum of two entry/exits [new item 4]
5. If outdoors, bulk cryogenic liquid systems shall be provided with a minimum of two entry/exits.
6. If indoors, they shall have interior finishes of noncombustible or limited-combustible materials.
7. * If indoors, the room shall be separated from the rest of the building by walls and floors having a one-hour fire resistance rating with doors and other opening protectives having a ¾ -hour fire protection rating.
8. * They shall comply with *NFPA 70, National Electrical Code,* for ordinary locations.
9. They shall be heated by indirect means ~~(e.g., steam, hot water, electric)~~ if heat is required.
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 ~~(e.g., proximity to loading docks, access to elevators, and passage of cylinders through public areas).~~
15. They shall be designed to meet the operational requirements of 5.1.3.2 with regard to room temperature.

A.5.1.3.3.2(8)

Examples of indirect heating include steam, hot water, and electric heating. The heating element of such devices should not exceed 212 F (100 C).

A.5.1.3.3.2(14)

Considerations for this access include proximity to loading docks, access to elevators, and passage of cylinders through public areas.

First Revision No. 611-NFPA 99-2015 [Section No. 5.1.3.3.3.1]

5.1.3.3.3.1 Ventilation for Indoor Locations.

~~Medical gas storage and~~ Central supply system locations, medical gas storage rooms, and transfilling room ventilation shall comply with 9.3.6.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 11:22:51 EDT 2015

Committee Statement

Committee Statement: Language requiring central supply locations to reference ventilation requirements has been added. Prior to this change it could be argued that manifold rooms and other central supply locations did not directly require ventilation in chapter 5.

Response Message:

Public Input No. 333-NFPA 99-2015 [Section No. 5.1.3.3.3.1]

First Revision No. 612-NFPA 99-2015 [Section No. 5.1.3.5 [Excluding any Sub-Sections]]

Central supply systems shall be permitted to consist of the following:

(1) Cylinder manifolds for gas cylinders per 5.1.3.5.12 ~~5.1.3.5.125.1.3.5.125.1.3.5.125.1.3.5.125.1.3.5.12~~ ~~5.1.3.5.125.1.3.5.125.1.3.5.11~~

(2) Manifolds for cryogenic liquid containers per 5.1.3.5.13 ~~5.1.3.5.135.1.3.5.135.1.3.5.135.1.3.5.135.1.3.5.13~~ ~~5.1.3.5.135.1.3.5.135.1.3.5.12~~

(3) ~~Bulk cryogenic liquid~~ Cryogenic fluid central supply systems per 5.1.3.5.14 ~~5.1.3.5.145.1.3.5.145.1.3.5.145.1.3.5.145.1.3.5.14~~ ~~5.1.3.5.145.1.3.5.145.1.3.5.14~~

(4) Medical air compressor systems per 5.1.3.6

(5) Medical–surgical vacuum producers per 5.1.3.7

(6) WAGD producers per 5.1.3.8

(7) Instrument air compressor systems per 5.1.13.3.5

(8) Proportioning systems for medical air USP per 5.1.3.6.3.14

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 11:27:44 EDT 2015

Committee Statement

Committee Statement: Update to terminology based on the new cryogenic fluid supply definitions.
Response Message:

Public Input No. 176-NFPA 99-2015 [Section No. 5.1.3.5 [Excluding any Sub-Sections]]

First Revision No. 613-NFPA 99-2015 [Section No. 5.1.3.5.2]

5.1.3.5.2 Permitted Locations for Medical Gases.

Central supply systems ~~and medical gas outlets~~ for oxygen, medical air, nitrous oxide, carbon dioxide, and all other patient medical gases shall be piped only to medical gas outlets complying with 5.1.5 , into areas where the gases will be used under the direction of licensed medical professionals for purposes congruent with the following:

(1) Direct respiration by patients

(2) Clinical application of the gas to a patient, such as the use of an insufflator to inject carbon dioxide into patient body cavities during laparoscopic surgery and carbon dioxide used to purge heart-lung machine blood flow ways

(3) Medical device applications directly related to respiration

(4) Power for medical devices used directly on patients

(5) Calibration of medical devices intended for (1) through (4)

(6) Simulation centers for the education, training, and assessment of health care professionals

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Committee Statement

Committee Statement: The charging language of this section was revised for clarity.

Many hospitals and health care facilities have added simulation centers in parts of their facilities. It is necessary to use medical gases in the training and assessment of health care professionals in these simulation centers. There is no danger to patients, staff or the public in using theses piped medical gases in the simulation centers. Item number 6 was added to allow this use.

Response Message:

Public Input No. 23-NFPA 99-2015 [Section No. 5.1.3.5.2]

Public Input No. 22-NFPA 99-2015 [Section No. 5.1.3.5.2]

Public Input No. 50-NFPA 99-2015 [Section No. 5.1.3.5.2]

Public Input No. 24-NFPA 99-2015 [Section No. 5.1.3.5.2]

First Revision No. 614-NFPA 99-2015 [Section No. 5.1.3.5.5]

5.1.3.5.5 ~~Final Line Pressure Regulators~~ Controls for Line Pressure. .

5.1.3.5.5.1*

~~All positive pressure supply systems shall be provided with duplex line pressure regulators piped in parallel with the following characteristics:~~ All positive-pressure supply systems shall be provided with means to control the final line pressure at the source with all the following characteristics:

(1) ~~They shall be provided with isolation valves on the source side of each regulator.~~ Able to maintain stable pressures within the limits of Table 5.1.11

(2) ~~They shall be provided with isolation or check valves on the patient side of each regulator~~ Each control mechanism able to flow 100 percent of the peak calculated demand .

(3) ~~A pressure indicator(s) shall be located downstream (patient or use side) of each regulator or immediately downstream of the isolating valves for the regulators~~ Redundant, such that each component of the control mechanism can be isolated for service or replacement while maintaining normal operation .

(4) ~~They shall be piped to allow either regulator to be serviced without interrupting supply~~ Protected against overpressure *(see 5.1.3.5.6)* .

(5) ~~Each regulator shall be sized for 100 percent of the peak calculated demand~~ Be constructed of materials deemed suitable by the manufacturer .

~~They shall be constructed of materials deemed suitable by the manufacturer.~~

5.1.3.5.5.2

The line pressure regulators required under 5.1.3.5.5.1 , ~~when~~ where used for bulk cryogenic liquid systems, shall be of a balanced design.

Supplemental Information

File Name	Description
FR_614.docx	Annex material

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Committee Statement

Committee Statement: Line pressure regulators are one of several ways that line pressure can be controlled, particularly for compressor based air sources and vacuum systems. The revised language allows for all effective methods to be used.

Response Message:

Public Input No. 53-NFPA 99-2015 [Section No. 5.1.3.5.5]

Public Input No. 52-NFPA 99-2015 [Section No. 5.1.3.5.5.1]

PI 614 – Annex Material

A.5.1.3.5.5.1

The intent of this clause is to ensure that the pressure at the station outlet is steady and maintained safely within the limits of Table 5.1.11. Traditionally line pressure regulators were required here as the only allowed control-of-pressure devices. Other methods of control are becoming possible (e.g. variable speed controlled on pressure). The present wording is intended to achieve the performance requirement (Table 5.1.11) and to allow not only traditional pressure regulators but other control methods as well.

First Revision No. 609-NFPA 99-2015 [New Section after 5.1.3.5.10]

5.1.3.5.11* Oxygen Concentrator Supply Units.

5.1.3.5.11.1

Oxygen concentrator supply units for use with medical gas pipelines shall produce oxygen meeting the requirements of Oxygen 93 USP or Oxygen USP.

5.1.3.5.11.2

Output shall have less than or equal to 1 mg/m^3 (6.85×10^{-7} lb/yd^3) of permanent particulates sized 1 micron or larger at normal atmospheric pressure.

5.1.3.5.11.3

Materials of construction on the air side of the oxygen concentrator unit shall be suitable for the service as determined by the manufacturer.

5.1.3.5.11.4

Materials of construction on the oxygen side of the oxygen concentrator unit shall comply with 5.1.3.5.4

5.1.3.5.11.5

The components that make up the oxygen concentrator unit shall be as follows:

(1) The manufacturer of the concentrator unit shall be permitted to use such components and arrangement of such components as needed to produce oxygen complying with 5.1.3.5.11.1 in the quantity as required by the facility, except where otherwise specifically defined in this Code.

(2) Air receivers and oxygen accumulators, where used, shall comply with Section VIII, "Unfired Pressure Vessels," of the ASME *Boiler and Pressure Vessels Code* and be provided with overpressure relief valves.

5.1.3.5.11.6

The supply air to the concentrators shall be of a quality to ensure the oxygen concentrator unit can produce oxygen complying with 5.1.3.5.11.1 and shall not be subject to normally anticipated contamination (e.g., vehicle or other exhausts, gas leakage, discharge from vents, flooding, and so forth).

5.1.3.5.11.7

The oxygen concentrator supply unit and any associated electrical equipment shall be provided, a minimum, with the following electrical components:

(1) Either a disconnect switch for each major electrical component or a single disconnect that deactivates all electrical components in the concentrator unit.

(2) Motor starting devices with overload protection for any component with an electrical motor over 2 hp.

5.1.3.5.11.8

A vent valve shall be provided as follows:

(1) Located on the source side of the concentrator outlet isolation valve to permit the operation of the oxygen concentrator unit for validation, calibration, and testing while the unit is isolated from the pipeline system

(2) Sized to allow for at least 25 percent of the oxygen concentrator unit flow

(3) Vented to a location compliant with 5.1.3.3.3.2

5.1.3.5.11.9

A DN8 (NPS 1/4) valved sample port shall be provided near the oxygen concentration monitor sensor connection for sampling of the gas from the oxygen concentrator unit.

5.1.3.5.11.10

At least one 0.1 micron filter suitable for oxygen service shall be provided at the outlet of the oxygen concentrator supply unit.

5.1.3.5.11.11

A check valve shall be provided at the outlet of the oxygen concentrator supply unit to prevent backflow into the oxygen concentrator supply unit and to allow service to the unit.

5.1.3.5.11.12

An outlet valve shall be provided to isolate all components of the oxygen concentrator from the pipeline with the following characteristics:

(1) The valve shall have both manual and automatic actuation with visual indication of open or closed,

(2) The valve shall close automatically whenever the oxygen concentrator unit is not producing oxygen of a concentration equal to that in 5.1.3.5.11.1 ,

(3) Continuing operation of the oxygen concentrator supply unit through the vent mode shall be permitted with the isolating valve closed.

(4) The isolating valve, when automatically closed due to low concentration, shall require manual reset to ensure the oxygen concentrator supply unit is examined prior to return to service,

(5) Closing the isolating valve, whether automatically or manually, shall activate an alarm signal at the master alarms *(see 5.1.9.2)* indicating that the oxygen concentrator supply unit is disconnected.

5.1.3.5.11.13

The oxygen concentrator supply unit shall be provided with an oxygen concentration monitor with the following characteristics:

(1) The monitor shall be capable of monitoring 99 percent oxygen concentration with ±0.5 percent accuracy,

(2) The monitor shall continuously display the oxygen concentration and shall activate local alarm and master alarms per 5.1.3.9.4 when a concentration lower than 91 percent is observed.

(3) It shall be permitted to insert the monitor into the pipeline without a demand check.

Supplemental Information

File Name	Description
PI_150_FR.pdf	Figure modified from the original submittal
FR_609_Annex_Material.docx	Annex material. See PDF for the figure

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Committee Statement

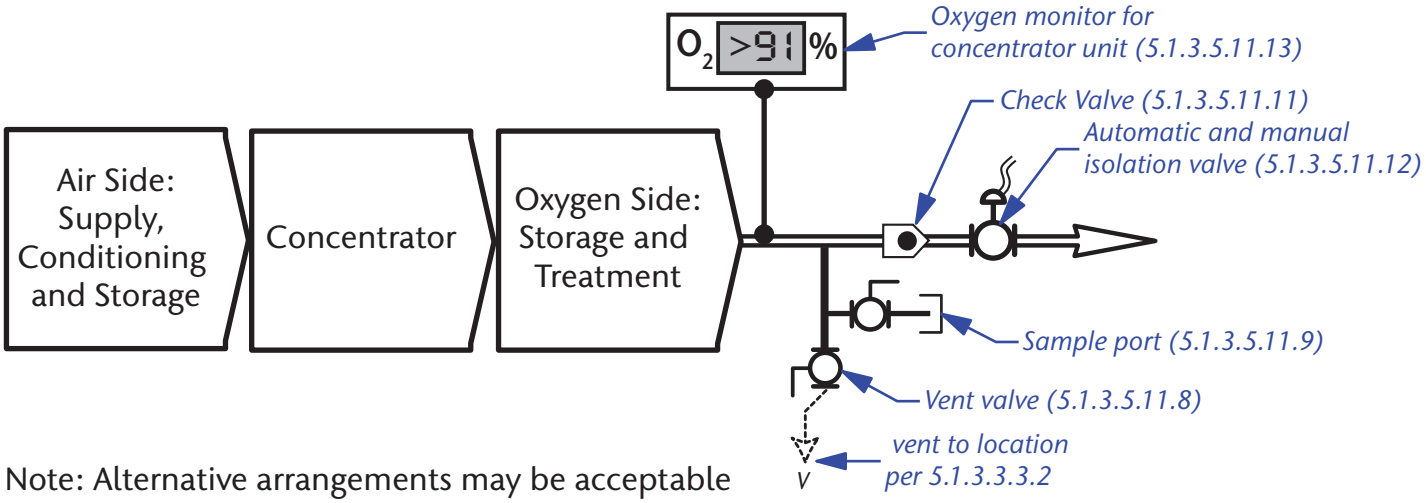
Committee Statement: This new section 5.1.3.9 defines the requirements for oxygen concentrator supplies. A typical supply for oxygen from concentrators is composed of three sub-sources, one or two of which are concentrators. This section defines that sub-source.

Response Message:

Public Input No. 150-NFPA 99-2015 [New Section after A.5.1.3.5.11]

Public Input No. 139-NFPA 99-2015 [New Section after 5.1.3.5.10]

Figure A.5.1.3.5.11 Elements of an Oxygen Concentrator Supply Source



Note: Alternative arrangements may be acceptable

FR 609 Annex Material

A.5.1.3.5.11

See Figure A.5.1.3.5.11

First Revision No. 615-NFPA 99-2015 [Section No. 5.1.3.5.11.1]

5.1.3.5.12.1

The manifolds in this category 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 this purpose and sited to comply with minimum distance requirements in ~~NFPA 55~~ Table 5.1.3.5.13.1 .

(2) If located indoors, they shall be installed within a room used only for enclosure of such manifolds.

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Committee Statement

Committee Statement: This revision leads the reader to the table for Minimum Separation Distance Between Portable Cryogenic Containers and Exposures in NFPA 55, which will now be extracted into NFPA 99.

Response Message:

Public Input No. 184-NFPA 99-2015 [Section No. 5.1.3.5.11.1]

First Revision No. 616-NFPA 99-2015 [New Section after 5.1.3.5.11.2]

5.1.3.5.12.3

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

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Committee Statement

Committee Statement: This was not stated as a requirement in the current code for cylinder manifolds. It is stated in the current code for cryogenic manifolds. This improves safety by prohibiting an installation where the cylinder headers are not in the same room as the manifold control cabinet.

Response Message:

Public Input No. 178-NFPA 99-2015 [New Section after 5.1.3.5.11.2]

First Revision No. 617-NFPA 99-2015 [Section No. 5.1.3.5.12.1]

5.1.3.5.13.1

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 5.1.3.5.13.1 . *[See ~~Figure A.5.1.3.5.14(a)~~ ~~for minimum siting distance requirements.~~]*

(2) If located indoors, they shall be installed within a room used only for the enclosure of such containers.

Table 5.1.3.5.13.1 Minimum Separation Distance Between Portable Cryogenic Containers and Exposures

	Minimum Distance	
Exposure	**ft**	**m**
(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	20	6.1

[**55:** Table 8.7.3]

Supplemental Information

File Name	Description
FR_617_New_Table.docx	

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Committee Statement

Committee Statement: Extracts the table for Minimum Separation Distance Between Portable Cryogenic Containers and Exposures in NFPA 55. This is the appropriate than the diagram that describes minimum separation distances between permanently installed bulk liquid oxygen systems and exposure hazards and it will be beneficial to have it contained in NFPA 99.

Response Message:

Public Input No. 185-NFPA 99-2015 [Section No. 5.1.3.5.12.1]

First Revision No. 618-NFPA 99-2015 [Section No. 5.1.3.5.12.4]

5.1.3.5.13.4

The manifolds in this category shall consist of the following:

(1) Two equal headers per 5.1.3.5.10, 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 an 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 per 5.1.3.5.10 having sufficient number of gas cylinder connections for an 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

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Committee Statement

Committee Statement: The current code addresses volume but ignores flow capacity. This change adds the needed requirement for flow capacity to also be addressed in the design and construction of the system.
Response Message:

Public Input No. 180-NFPA 99-2015 [Section No. 5.1.3.5.12.4]

First Revision No. 627-NFPA 99-2015 [Section No. 5.1.3.5.13]

5.1.3.5.14 Micro-Bulk or Small Bulk Cryogenic Liquid Systems.

5.1.3.5.14.1

Micro-bulk cryogenic liquid systems shall comply with the following requirements:

If located indoors, be installed within a room used only for this purpose.

If located outdoors, oxygen systems be sited to comply with the minimum distance requirements in NFPA 55 .

If located outdoors, nitrogen systems be sited to comply with the mandatory minimum distance requirements in CGA P-18, *Standard for Bulk Inert Gas Systems at Consumer Sites* .

Be compliant with the mandatory requirements of CGA M-1, *Guide for Medical Gas Installations at Consumer Sites* .

Be located in an enclosure constructed in accordance with 5.1.3.3.2(1) through 5.1.3.3.2(3) and 5.1.3.3.2(5) , 5.1.3.3.2(8) , and 5.1.3.3.2(9) .

Be located in an enclosure ventilated in accordance with 5.1.3.3.3 .

Be designed such that the items noted in 5.1.3.5.13.2 and items located in the trailer unloading area are readily visible to delivery personnel during filling operations.

Be protected against overpressurization of the pressure vessel during filling operations.

Not have a bottom fill valve.

Be installed in accordance with 5.1.10.1 through 5.1.10.5.1.7 .

Be installed by personnel qualified to meet the mandatory requirements of CGA M-1, *Guide for Medical Gas Installations at Consumer Sites* , or ASSE 6015 *Professional Qualifications Standards for Bulk Medical Gas Systems Installers* .

Be installed in compliance with Food and Drug Administration (FDA) Current Good Manufacturing Practices as found in 21 CFR 210 and 21 CFR 211 .

5.1.3.5.14.2

A micro-bulk cryogenic liquid system with a primary and secondary supply shall have headers located in the same enclosure.

5.1.3.5.14.3*

A micro-bulk cryogenic liquid system with a reserve header shall be permitted to be located in the same enclosure as the primary and secondary headers or in another enclosure compliant with 5.1.3.5.13.1 .

5.1.3.5.14.4

A micro-bulk cryogenic liquid system shall consist of the following:

Two equal headers each having sufficient capacity for an average day's supply, with either being capable of either role, consisting of one primary supply and one secondary supply, and with the headers connected to the final line pressure regulator assembly in such a manner that either header can supply the system and a reserve header, in accordance with 5.1.3.5.10 , having sufficient number of gas cylinder connections for an average day's supply but not fewer than three, and connected downstream of the primary/secondary headers and upstream of the final line pressure regulators.

One micro-bulk cryogenic liquid main header, having sufficient capacity for an average day's supply, one secondary supply consisting of a micro-bulk cryogenic liquid, liquid containers, or high-pressure cylinders and having sufficient capacity for an average day's supply, and a reserve header, in accordance with 5.1.3.5.10 , having sufficient number of gas cylinder connections for an average day's supply but not fewer than three, and connected downstream of the primary/secondary headers and upstream of the final line pressure regulators.

One micro-bulk cryogenic liquid main header, having sufficient capacity for an average day's supply, one reserve header consisting of either a micro-bulk cryogenic liquid supply or high-pressure cylinders in accordance with 5.1.3.5.10 connections for an average day's supply and connected downstream of the primary/secondary headers and upstream of the final line pressure regulators.

5.1.3.5.14.5

Conditions for the micro-bulk cryogenic system shall include the following:

When the primary or main header is supplying the system, the secondary and reserve headers is prevented from supplying the system.

When the primary or main header is depleted, the roles of primary or main, the secondary (when installed), and the reserve headers alternate and will provide an operating cascade (primary-secondary-reserve) that automatically begins to supply the system.

Capacity be determined after consideration of the customer usage requirements, delivery schedules, proximity of the facility to alternative supplies, and the emergency plan.

Where there are two or more micro-bulk cryogenic liquid vessels of equal capacity, they are permitted to alternate in the roles of primary and secondary.

A reserve supply sized for a greater than an average day's supply and the appropriate size of vessel or number of cylinders shall be determined after consideration of delivery schedules, proximity of the facility to alternative supplies, and the facility's emergency plan.

At least two main vessel relief valves and rupture discs shall be installed downstream of a three-way (three-port) valve.

A check valve shall be located in the primary supply piping upstream of the intersection with a secondary supply or reserve supply.

A contents gauge shall be on each main vessel.

A pressure relief shall be 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.

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 (where so provided). This mechanism shall discharge the conserved gas into the system upstream of the final line regulator assembly.

The manifolds for two equal headers shall include a manual or automatic means to place either header into the role as primary header and the other in the role of secondary header (where so provided).

The manifolds for main supply with a secondary supply (where so provided) headers shall include a manual or automatic means to place the secondary header into the role as primary header during the filling of the main supply.

The manifolds shall include a means to automatically actuate the reserve header if for any reason the primary and secondary (where so provided) headers cannot supply the system.

Permanent anchors shall hold the components to the pad or flooring in accordance with the design requirements.

~~5.1.3.5.14.6~~

~~The micro-bulk cryogenic system in this category shall actuate a local signal and shall activate an indicator at all master alarms under the following conditions:~~

~~When or at a predetermined set point before the main or primary supply reaches an average day's supply, indicating low contents~~

~~If the secondary supply is a cryogenic vessel, when or at a predetermined set point before the secondary supply reaches an average day's supply, indicating low contents~~

~~If the reserve supply is a cryogenic vessel, when or at a predetermined set point before the reserve supply reaches an average day's supply, indicating low contents~~

~~Where there is more than one main supply vessel, when or at a predetermined set point before the secondary supply begins to supply the system, indicating changeover~~

~~When or at a predetermined set point before the reserve supply begins to supply the system, indicating reserve is in use~~

~~When or at a predetermined set point before the reserve supply contents fall to one day's average supply, indicating reserve low~~

~~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~~

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Committee Statement

Committee Statement: Section 5.1.3.5.13 has been deleted in its entirety and Section 5.1.3.5.14 was renamed to Cryogenic Fluid Supply Systems. The requirements for stationary microbulk and bulk are identical and there is no need for two separate sections. This will provide guidance for the AHJ. Also see the revised definitions in Chapter 3.

Response Message:

Public Input No. 207-NFPA 99-2015 [Section No. 5.1.3.5.13]

First Revision No. 626-NFPA 99-2015 [Section No. 5.1.3.5.14]

5.1.3.5.14* ~~Bulk Cryogenic Liquid Systems.~~ Cryogenic Fluid Central Supply Systems.

5.1.3.5.14.1

~~Bulk cryogenic liquid storage~~ Cryogenic fluid central supply systems shall be in accordance with NFPA 55. ~~, *Compressed Gases and Cryogenic Fluids Code*~~ .

5.1.3.5.14.2

Bulk cryogenic liquid systems shall have the following protections:

(1) Be installed in accordance with NFPA 55~~, *Compressed Gases and Cryogenic Fluids Code*~~

(2) ~~Meet the requirements of 5.1.3.3.2 (1)~~ Be installed in accordance with the mandatory requirements in CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities*

(3) ~~Meet the requirements of 5.1.3.3.2 (10)~~ Have a minimum work space clearance of 3 ft (1 m) around the storage container, vaporizer(s), and the cabinet opening or front side of the pressure regulating manifold for system maintenance and operation.

~~Meet the requirements of 5.1.3.3.2 (12)~~

~~Be installed meeting the requirements in 5.1.10.1 through 5.1.10.4.7~~

~~Have a minimum work space clearance of 3 ft (1 m) around the storage container, vaporizer(s), and the cabinet opening or front side of the pressure regulating manifold for system maintenance and operation~~

5.1.3.5.14.3

~~Bulk cryogenic liquid~~ Cryogenic fluid central supply 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 described in 5.1.3.5.13 ~~5.1.3.5.135.1.3.5.135.1.3.5.135.1.3.5.135.1.3.5.13~~ ~~5.1.3.5.135.1.3.5.135.1.3.5.12~~ for primary, secondary, and reserve operation.

(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 (primary–secondary–reserve) as required in 5.1.3.5.13.5 ~~5.1.3.5.13.55.1.3.5.13.55.1.3.5.13.55.1.3.5.13.55.1.3.5.13.5~~ ~~5.1.3.5.13.55.1.3.5.13.55.1.3.5.12.5~~ 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 as required by 5.1.3.5.13.6 ~~5.1.3.5.13.65.1.3.5.13.65.1.3.5.13.65.1.3.5.13.65.1.3.5.13.6~~ ~~5.1.3.5.13.65.1.3.5.13.65.1.3.5.12.6~~ .

5.1.3.5.14.4*

~~The bulk systems~~ The cryogenic fluid central supply 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 reserve low

(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

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Committee Statement

Committee Statement: Section 5.1.3.5.13 was completely deleted and Section 5.1.3.5.14 has been revised to Cryogenic Fluid Supply Systems, and throughout Section 5.1.3.5.14 “bulk cryogenic” was replaced with “cryogenic fluid supply”. The requirements for stationary micro bulk and bulk are identical and there is no need for two separate sections. This will provide guidance for the AHJ. See also, the revised definitions in Chapter 3.

Items (2), (3), and (4) were deleted because they are included in section 5.1.3.3, central supply systems, all of whose requirements are used for supply systems when appropriate. A reference to CGA M-1 for piping requirements has been added to be consistent with NFPA 55.

Response Message:

Public Input No. 203-NFPA 99-2015 [Section No. 5.1.3.5.14]

Public Input No. 201-NFPA 99-2015 [Section No. 5.1.3.5.14.2]

First Revision No. 620-NFPA 99-2015 [Section No. 5.1.3.6.3.10]

5.1.3.6.3.10* Electrical Power and Control.

(A)

~~An additional compressor(s) shall automatically activate when the compressor(s) in operation is incapable of maintaining the required pressure.~~ Medical air source systems shall be controlled to ensure continuous supply of medical air at pressures consistent with Table 5.1.11 under all conditions of system use as follows:

(1) Automatic activation of compressor(s) as necessary to supply the demand.

(2) Managing the operation to equalize wear on all compressors. Where this equalization is achieved manually, the facility staff shall arrange a schedule for manual alternation.

(B)

~~Automatic or manual alternation of compressors shall allow division of operating time. If automatic alternation of compressors is not provided, the facility staff shall arrange a schedule for manual alternation.~~ Controls shall provide the following functions:

(1) Where medical air source systems having two or more compressors employ any electrical circuit device that upon failure could prevent supply of medical air, the controls shall be provided with an automatically activated alternative method for ensuring supply (e.g., redundant component(s), an alternate electrical supply path, or other equivalent method).

(2) Control circuits shall be arranged in such a manner that isolation of one compressor or component from the system (e.g., for maintenance or repair) does not interrupt the operation of other compressor(s) or component(s).

(3) Automatic restart function shall be included, such that the supply of medical air will resume normally after power interruption without manual intervention.

(C)

~~Each compressor motor shall be provided with electrical components including, but not limited to, the following:~~ Each compressor motor shall be provided with electrical components including, but not limited to, the following:

(1) ~~Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter~~ Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter

(2) ~~Motor starting device~~ Motor starting device

(3) ~~Overload protection~~ Overload protection

~~Where compressor systems having two or more compressors employ a control transformer or other voltage control power device, installation of at least two such devices~~

~~Control circuits arranged in such a manner that the shutdown of one compressor does not interrupt the operation of another compressor~~

~~Automatic restart function, such that the compressor(s) will restart after power interruption without manual intervention~~

(D)

~~Electrical installation and wiring shall conform to the requirements of *NFPA 70* , *National Electrical Code*~~ Medical air compressor system controls shall be provided with electrical systems including, at a minimum: .

(1) Built-in disconnect means shall be included to allow appropriate operation of multiple compressor systems and protect service personnel from exposure to live voltages.

(2) Control circuits shall be arranged so that failure of any component of the control circuit, or shutdown of one compressor (e.g., for service), does not interrupt automatic operation of the standby compressor.

(3) An automatic restart function shall be included, such that the compressor(s) will restart after power interruption without manual intervention.

(4) Where components are common to more than one control circuit (e.g., autodrains) the common device shall be provided with electrical protection to prevent loss of the control circuits(s) in the event of short circuit in the device.

(E)

~~Emergency electrical service for the compressors shall conform to the requirements of the essential electrical system as described in Chapter 6 .~~ Electrical installation and wiring shall conform to the requirements of *NFPA 70* .

(F)

Emergency electrical service for the compressors shall conform to the requirements of the essential electrical system as described in Chapter 6 .

Supplemental Information

File Name	Description
FR_620.docx	Annex material to go along with revision

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Committee Statement

Committee Statement: The standard was written around one type of control (on/off operation defined by pressure). Control methods for compressors and pumps are becoming more sophisticated and now can control on other conditions (e.g. flow) and in a variety of modes (e.g. continuous run with VSD). The proposed text attempts to account for these developments while preserving the performance characteristics inherent in the original text.

Previously the language of Item (C) potentially allowed the installation of equipment that did not comply with NFPA70E. The language of (C) has been revised to prevent this.

Response Message:

Public Input No. 39-NFPA 99-2015 [Section No. 5.1.3.6.3.10(C)]

Public Input No. 151-NFPA 99-2015 [Section No. 5.1.3.6.3.10]

Public Input No. 336-NFPA 99-2015 [Section No. 5.1.3.6.3.10(C)]

Annex A 5.1.3.6.3.10

The intent of this clause is to ensure that the pressure at the station outlet is steady and maintained safely within the limits of Table 5.1.11. Traditionally line pressure regulators were required here as the only allowed control-of-pressure devices. Other methods of control are becoming possible (e.g. variable speed controlled on pressure). The present wording is intended to achieve the performance requirement (Table 5.1.11) and to allow not only traditional pressure regulators but other control methods as well.

First Revision No. 621-NFPA 99-2015 [Section No. 5.1.3.6.3.12(F)]

(F)

When ~~the backup or lag compressor is running~~ the capacity of the medical air system not in use is less than the equivalent capacity of one compressor , a local alarm shall activate *[see 5.1.9.5.4(1)]*. This signal shall ~~be manually reset~~ require manual reset .

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Response Message:

Public Input No. 152-NFPA 99-2015 [Section No. 5.1.3.6.3.12(F)]

First Revision No. 652-NFPA 99-2015 [Section No. 5.1.3.7.1.2]

5.1.3.7.1.2

Medical–surgical vacuum ~~sources~~ central supply systems shall consist of the following:

(1) Two or more vacuum pumps sufficient to serve the peak calculated demand with the largest single vacuum pump out of service

(2) Automatic means to prevent backflow from any on-cycle vacuum pumps through any off-cycle vacuum pumps

(3) Shutoff valve or other isolation means to isolate each vacuum pump from the centrally piped system and other vacuum pumps for maintenance or repair without loss of vacuum in the system

(4) Vacuum receiver

(5) Piping between the vacuum pump(s), discharge(s), receiver(s), and vacuum source shutoff valve in accordance with 5.1.10.2, except brass, galvanized, or black steel pipe, which is permitted to be used as recommended by the manufacturer

(6) Except as defined in 5.1.3.7.1.2(1) through 5.1.3.7.1.2(5), materials and devices used between the medical vacuum exhaust and the medical vacuum source that are permitted to be of any design or construction appropriate for the service as determined by the manufacturer

(7) Vacuum filtration per 5.1.3.7.4

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Committee Statement

Committee Statement: See filtration proposal
Response Message:

Public Input No. 162-NFPA 99-2015 [Section No. 5.1.3.7.1.2]

First Revision No. 651-NFPA 99-2015 [New Section after 5.1.3.7.3]

5.1.3.7.4 Vacuum Filtration.

Central supply systems for vacuum 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 vacuum system

(2) Filtration shall be located on the patient side of the vacuum producer.

(3) Filters shall be efficient to 0.03µ and 99.97 percent HEPA or better, per DOE-STD- 3020-2005.

(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.

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Committee Statement

Committee Statement: Recent events have increased occupational health and safety and public health concerns over the biohazard emissions possible from a medical facility. One of these is the medical vacuum central supply system, which under NFPA discharges to atmosphere with no mandatory filtration. Such filters as are provided are coarse filters intended to protect the pumps, not the public or the worker.

NFPA is the only world standard which does not mandate inlet filtration on vacuum. Adding this requirement will bring NFPA into alignment with normal practice internationally, and afford a degree of assurance to the maintenance staff in medical facilities that the pumps are not contaminated.

Response Message:

Public Input No. 161-NFPA 99-2015 [New Section after 5.1.3.7.3]

First Revision No. 622-NFPA 99-2015 [Section No. 5.1.3.7.5]

5.1.3.7.6 Electrical Power and Control.

(A)

Medical vacuum source systems shall be controlled to ensure continuous supply of suction at pressures consistent with Table 5.1.11 under all conditions of system use as follows:

(1) Automatic activation of pump(s) as necessary to supply the demand.

(2) Managing the operation to equalize wear on all pumps. Where this equalization is achieved manually, the facility staff shall arrange a schedule for manual alternation.

(B)

Controls shall provide the following functions:

(1) Where medical vacuum source systems having two or more pumps employ any electrical circuit device that upon failure could prevent supply of medical vacuum, the controls shall be provided with an automatically activated alternative method for ensuring supply (e.g., redundant component(s), an alternate electrical supply path, or other equivalent method).

(2) Control circuits shall be arranged in such a manner that isolation of one pump or component from the system (e.g. for maintenance or repair) does not interrupt the operation of other pump(s) or component(s).

(3) An automatic restart function shall be included, such that the supply of medical vacuum will resume normally after power interruption without manual intervention.

(C)

Each pump motor shall be provided with electrical components including, but not limited to:

(1) Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter

(2) Motor starting device

(3) Overload protection

(D)

Vacuum source system controls shall be provided with electrical systems including, at a minimum:

(1) Control circuits shall be arranged so that failure of any component of the control circuit, or shutdown of one pump (e.g., for service), does not interrupt automatic operation of the standby pump.

(2) Controls shall be provided with built-in disconnect means to allow appropriate operation of multiple pump systems and protect service personnel from exposure to live voltages.

(3) Where components are common to more than one control circuit, the common device shall be provided with electrical protection to prevent loss of the control circuits(s) in the event of short circuit in the device.

(4) An automatic restart function shall be included, such that the pump(s) will restart after power interruption without manual intervention.

(E)

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

(F)

Emergency electrical service for the pumps shall conform to the requirements of the essential electrical system as described in Chapter 6 .

~~**5.1.3.7.5.1**~~

~~Additional pumps shall automatically activate when the pump(s) in operation is incapable of adequately maintaining the required vacuum.~~

~~**5.1.3.7.5.2**~~

~~Automatic or manual alternation of pumps shall allow division of operating time. If automatic alternation of pumps is not provided, the facility staff shall arrange a schedule for manual alternation.~~

~~**5.1.3.7.5.3**~~

~~Each pump motor shall be provided with electrical components including, but not limited to, the following:~~

~~Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter~~

~~Motor starting device~~

~~Overload protection~~

~~Where pump systems having two or more pumps employ a control transformer or other voltage control power device, at least two such devices~~

~~Control circuits arranged in such a manner that the shutdown of one pump does not interrupt the operation of another pump~~

~~Automatic restart function such that the pump(s) will restart after power interruption without manual intervention~~

~~**5.1.3.7.5.4**~~

~~Electrical installation and wiring shall conform to the requirements of *NFPA 70* , *National Electrical Code* .~~

~~**5.1.3.7.5.5**~~

~~Emergency electrical service for the pumps shall conform to the requirements of the essential electrical system as described in Chapter 6 .~~

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Committee Statement

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Previously the language of Item (C) potentially allowed the installation of equipment that did not comply with NFPA70E. The language of (C) and the new (D) has been revised to prevent this.

Response Message:

Public Input No. 153-NFPA 99-2015 [Section No. 5.1.3.7.5]

Public Input No. 337-NFPA 99-2015 [Section No. 5.1.3.7.5.3]

First Revision No. 623-NFPA 99-2015 [Section No. 5.1.3.7.7]

Global FR-601

5.1.3.7.8 Operating Alarms.

~~Medical–surgical vacuum systems shall activate a local alarm when the backup or lag pump is running per 5.1.9.5 . This signal shall be manually reset.~~ When the capacity of the medical vacuum supply system not in use is less than the equivalent capacity of one pump, a local alarm shall activate *(see 5.1.9.5.4(4))* . This signal shall require manual reset.

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Committee Statement

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Response Message:

Public Input No. 154-NFPA 99-2015 [Section No. 5.1.3.7.7]

First Revision No. 624-NFPA 99-2015 [Section No. 5.1.3.8.3.2]

5.1.3.8.3.2

~~A WAGD source system shall activate a local alarm when the backup or lag producer is running.~~ Where WAGD source systems have two or more producers, and the capacity of the WAGD system not in use is less than the equivalent capacity of one producer, a local alarm shall activate *(see 5.1.9.5.4(5))* . This signal shall require manual reset.

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Committee Statement

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Response Message:

Public Input No. 156-NFPA 99-2015 [Section No. 5.1.3.8.3.2]

First Revision No. 625-NFPA 99-2015 [Section No. 5.1.3.8.4.3]

5.1.3.8.4.3

~~Each producer motor shall be provided with electrical components including, but not limited to, the following:~~

- ~~Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter~~
- ~~Motor starting device~~
- ~~Overload protection~~
- ~~Where WAGD systems having two or more producers employ a control transformer or other voltage control power device, at least two such devices~~
- ~~Control circuits arranged in such a manner that the shutdown of one producer does not interrupt the operation of another producer~~
- ~~Automatic restart function such that the pump(s) will restart after power interruption without manual intervention~~

(A)

WAGD source systems shall be controlled to ensure continuous flow under all conditions of system use as follows:

(1) Automatic activation of producer(s) as necessary to supply the demand.

(2) Managing the operation to equalize wear on all producers. Where this equalization is achieved manually, the facility staff shall arrange a schedule for manual alternation.

(B)

Controls shall provide the following functions:

(1) Where WAGD source systems having two or more producers employ any electrical circuit device which upon failure could stop the WAGD, the controls shall be provided with a automatically activated alternative method for ensuring supply (i.e., redundant component(s), an alternate electrical supply path or other equivalent method).

(2) Control circuits shall be arranged in such a manner that isolation of one producer or component from the system (e.g., for maintenance or repair) does not interrupt the operation of other pump(s) or component(s).

(3) An automatic restart function shall be included, such that the supply of WAGD will resume normally after power interruption without manual intervention.

(C)

Each producer motor shall be provided with electrical components including, but not limited to, the following:

(1) Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter

(2) Motor starting device

(3) Overload protection

(D)

WAGD source system controls shall be provided with electrical systems including at least:

(1) Control circuits shall be arranged so that failure of any component of the control circuit, or shutdown of one producer (e.g. for service) does not interrupt automatic operation of the standby producer.

(2) Controls shall be provided with built in disconnect means to allow appropriate operation of multiple producer systems and protect service personnel from exposure to live voltages.

(3) Where components are common to more than one control circuit, the common device shall be provided with electrical protection to prevent loss of the control circuits(s) in the event of short circuit in the device.

(4) An automatic restart function shall be included, such that the pump(s) will restart after power interruption without manual intervention.

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Committee Statement

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Previously the language of Item (C) potentially allowed the installation of equipment that did not comply with NFPA70E. The language of (C) and the new (D) has been revised to prevent this.

Response Message:

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Public Input No. 338-NFPA 99-2015 [Section No. 5.1.3.8.4.3]

First Revision No. 640-NFPA 99-2015 [New Section after 5.1.3.8.5]

5.1.3.9* Oxygen Central Supply Systems Using Concentrator(s).

Any oxygen central supply system that includes one or more oxygen concentrator supply system(s) shall comply with 5.1.3.9.1 through 5.1.3.9.4 .

5.1.3.9.1 Location.

Oxygen central supply systems using concentrator(s) shall be located per 5.1.3.3 and as follows:

(1) Indoors in a dedicated mechanical equipment area, ventilated, and with any required utilities (e.g., electricity, drains, lighting).

(2)* In a room ventilated per 5.1.3.3.3.3 .

(3) For air cooled equipment, in a room designed to maintain the ambient temperature range as recommended by the manufacturer.

(4) Rooms containing oxygen central supply systems using concentrators(s) that do not have the concentrator purge gas vented to the outside 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.

(5)* Individual elements of the orxygen central supply system using concentrator(s) shall be permitted to be located in separate rooms or enclosures as necessary to meet 5.1.3.9.1(1) through 5.1.3.9.1(4) .

5.1.3.9.2 Arrangement and Redundancies.

. Oxygen central supply systems using 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 5.1.3.5.10 with sufficient cylinder connections for an average day's supply. Container manifolds as per 5.1.3.5.13 shall not be used.

(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 any of the following:

(a) An oxygen concentrator supply system complying with 5.1.3.5.11 .

(b) A cylinder header complying with 5.1.3.5.10 with sufficient cylinder connections for an average day's supply. Container manifolds as per 5.1.3.5.10(9) shall not be used.

(c) A cryogenic liquid supply system complying with 5.1.3.5.13 or 5.1.3.5.14 , where the concentrator unit shall only operate as a secondary or reserve and never as the primary supply.

(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 healthcare 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 5.1.3.5.10(4) , 5.1.3.5.10(6) , 5.1.3.5.11.11 , and 5.1.3.5.11.12 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 5.1.3.9.3

(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 as required in 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 ±0.5 percent accuracy,

(b) The monitor shall be attached to the pipeline through a demand check complying with 5.1.8.2.3 ,

(c) The monitor shall continuously display the oxygen concentration and shall activate local alarm and master alarms indicating low oxygen concentration.

(11) A DN8 (NPS 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 5.1.3.5.7

(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 .

5.1.3.9.3 Operating Controls.

Oxygen central supply systems using concentrator(s) shall include means to provide the following functions:

(1) Selection of an appropriate primary supply source. When the primary supply source is in operation and oxygen quality is suitable, the secondary and reserve supply sources shall be prevented from supplying the system.

(2) Automatic activation of the secondary supply source shall be available if the primary supply source is not able to maintain pressure or concentration of oxygen.

(3) Automatic activation of the reserve supply source shall be available if the primary and secondary supply source are not able to maintain supply pressure or concentration of oxygen.

(4) Where two or more concentrator supply sources are included in the system, the oxygen concentrator supply sources shall be permitted to rotate as the primary supply source.

(5) Automatic operation such that the supply of gas will continue through interruption of the main electrical source.

(6) Oxygen concentrator supply source(s) in the system shall be capable of automatically returning to normal operation following a power interruption. If required by the technology, it shall be permitted to isolate the concentrator supply source(s) using the automatic valve(s) to restore normal oxygen concentration prior to reconnecting the oxygen concentrator supply source to the system by opening the automatic valve. The valve can be actuated automatically for this purpose as an exception to 5.1.3.5.11.9(3).

5.1.3.9.4 Operating Alarms and Local Signals.

5.1.3.9.4.1

For each oxygen concentrator supply source in the system, the supply source's concentration monitor (*see* *5.1.3.5.11.10*) shall be able to perform the following:

(1) Indicate low oxygen concentration when a concentration lower than 91 percent is observed

(2) Activate a local alarm (*see* *5.1.9.5*)

(3) Activate an alarm signal at the master alarm (*see* *5.1.9.2*) indicating that the oxygen concentration from that supply source is low

(4) Activate the automatic isolating valve for that oxygen concentrator supply source (*see* *5.1.3.5.11.12*) to prevent supply from that oxygen concentrator supply source.

(5) Close the automatic isolating valve for that oxygen concentrator supply source (*see* *5.1.3.5.11.12*), which shall activate an alarm signal at the master alarm (*see* *5.1.9.2*) indicating that the oxygen concentrator supply source is disconnected.

5.1.3.9.4.2

For the entire oxygen central supply system, the system concentration monitor [*see* *5.1.3.9.2(10)*] shall be able to perform the following:

(1) Indicate low oxygen concentration when a concentration lower than 90 percent is observed

(2) Activate a local alarm (*see* *5.1.9.5*)

(3) Activate an alarm signal at the master alarm (*see* *5.1.9.2*) indicating the oxygen concentration is low

5.1.3.9.4.3

For each header source (*see* *5.1.3.5.10*) in the supply system, local signals and alarms shall be provided as follows:

(1) A pressure gauge for delivery pressure,

(2) A means to activate an alarm signal at the master alarm (*see* *5.1.9.2*) indicating the oxygen cylinders are in use

(3) A means to activate an alarm signal at the master alarm (*see* *5.1.9.2*) indicating the oxygen cylinder contents are low when the contents are at or below 12 hours average supply

5.1.3.9.4.4

The oxygen central supply systems using concentrator(s) shall be provided with operating alarms as follows:

(1) *Change of Source* . An operating alarm shall be provided as follows:

(a) If the supply source in use fails to supply the system and is changed in accordance with 5.1.3.9.3(2) or 5.1.3.9.3(3) , a local alarm and a signal at the master alarm shall be activated, indicating an oxygen supply change has occurred,

(b) The signal in 5.1.3.9.4.4(1) (a) shall not be activated if the system has rotated sources in accordance with 5.1.3.9.3(6) ,

(2) *Internal Pressure Low* , A local alarm and a signal at the master alarm shall be activated when or just before the pressure falls below the pressure required to drive the calculated required flow rate through the line pressure controls indicating the oxygen supply internal pressure is low [*see* *5.1.3.9.2(9)* *for sensor location*].

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Committee Statement

Committee Statement: Oxygen concentrators are a technology which has reached the level of reliability, economics and clinical acceptance that facilities are beginning to install and operate them, particularly in many situations outside of the U.S. where traditional supplies are expensive, unreliable or simply unobtainable.

A series of revisions attempt to address this, drawing on the other international standards already in use as well as current practice with these supply sources, with adaptations appropriate to the conventions used in NFPA.

Also considered in the wording is an effort to assure that the common technologies now available (PSA and VSA) are both encompassed.

This section defines the common components required for the supply. The requirements draw primarily on the design of sources used elsewhere in the document and provide requirements for designs with duplex or triplex arrangemnet with appropriate alarms for each stage of the cascade.

Other proposals deal with the various elements under this consolidated central supply source.

The one unusual characteristic of this proposal is provision of an automatic valve. This valve is necessary because one mode of failure for concentrators is to produce progressively lower concentration at the same pressure, which would contaminate the gas going to the pipeline, so it is necessary to immediately isolate the system in the event of low concentration.

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Public Input No. 134-NFPA 99-2015 [New Section after A.5.1.3.8.1]

Public Input No. 133-NFPA 99-2015 [New Section after A.5.1.3.8.1]

Public Input No. 132-NFPA 99-2015 [New Section after A.5.1.3.8.1]

First Revision No. 650-NFPA 99-2015 [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 ~~maximum pressure drop at intended maximum flow of 1.4 kPa (0.2 psig) in pressure service and 3.8 mm Hg (0.15 Hg) in vacuum service.~~ minimum Cv factor in accordance with either Table 5.1.4.1.6(a) or Table 5.1.4.1.6(b) .

Table 5.1.4.1.6(a) Positive Pressure Gases.

Valve Size (in.)	Minimum Cv (full open)
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) Table 5.1.4.1.6(b) Vacuum and WAGD.

Valve Size (in.)	Minimum Cv (full open)
¾	31
1	60
1¼	110
1½	169
2	357
2½	196
3	302
4	600
5	1022
6	1579
8	3136

(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.

(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.

Supplemental Information

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Committee Statement

Committee Statement: The 2012 NFPA 99 Chapt 5 codes and prior all included the requirement that valves be "full ported" and that they be ball valves. However, the 2012 also allowed butterfly valves for vacuum and WAGD services which was a contradiction. The requirement that valves be ball valves restricted technology. The current 2015 edition was an attempt to allow for new technology valves and to allow for both ball and butterfly valves. The problem is, the maximum pressure drop factors adopted in the 2015 code allow ball valve manufacturers to utilize internal components of smaller size(s) inside of larger size valve bodies. For example - a 2" ball assembly could be used inside a 2 1/2" ball valve. This was not the intent of the committee and this revision looks to make sure that this does not happen.

Response Message:

Public Input No. 496-NFPA 99-2015 [Section No. 5.1.4.1.6]

First Revision No. 649-NFPA 99-2015 [Section No. 5.1.4.6.2]

5.1.4.6.2*

Zone valves shall be readily operable from a standing position ~~in the corridor on the same floor they serve~~ .

Supplemental Information

File Name	Description
FR_649.docx	includes annex material

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 17:37:36 EDT 2015

Committee Statement

Committee Statement: This requirement previously included 3 separate ideas. Locating the valve on a wall that intervenes between the valve and the outlet/inlet is addressed in 5.1.4.6.1(1). Locating the valve on the same story as the outlets/inlets that it serves is addressed in 5.1.4.6.1(2).

Annex material was added to better define what is meant by standing position and that it is not meant to be standing on a ladder or anything other than the floor.

Response Message:

FR 649

5.1.4.6.2
Zone valves shall be readily operable from a standing position ~~in the corridor on the same floor they serve~~.

A.5.1.4.6.2
Standing position is meant to refer to an average height individual standing with their feet on the floor in front of the zone valve.

Substantiation:
This requirement previously included 3 separate ideas. Locating the valve on a wall that intervenes between the valve and the outlet/inlet is addressed in 5.1.4.6.1(1). Locating the valve on the same story as the outlets/inlets that it serves is addressed in 5.1.4.6.1(2).

Annex material was added to better define what is meant by standing position and that it is not meant to be standing on a ladder or anything other than the floor.

First Revision No. 628-NFPA 99-2015 [Section No. 5.1.5]

5.1.5* Station Outlets/Inlets.

5.1.5.1

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

5.1.5.2

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

5.1.5.3

Each station inlet 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 shall be legibly identified in accordance with 5.1.11.3.

5.1.5.6

Threaded outlets/inlets shall be non- interchangeable 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, 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 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 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 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 no further than 205 mm (8 in.) from the body of the terminal shall be not less than DN8 (NPS ¼) (⅜ 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 extending no further than 205 mm (8 in.) from the body of the terminal shall be not less than DN10 (NPS ⅜) (½ in. O.D.) size, with 10 mm (0.4 in.) minimum inside diameter.

5.1.5.13

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

5.1.5.14

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

5.1.5.15

Station outlets 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 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 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.

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.

5.1.5.17

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

Supplemental Information

File Name	Description
FR_628.docx	Annex material

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 16:56:08 EDT 2015

Committee Statement

Committee Statement: Annex note has been added to include reference ot the FGI guidelines for the minimum number of outlets/inlets required.

New 5.1.5.17 was added to prevent instances of hose assemblies occasionally disconnecting from quick connect outlets. DISS outlets provide a much safer / secure connection.

Response Message:

Public Input No. 456-NFPA 99-2015 [Section No. 5.1.5]

Public Input No. 181-NFPA 99-2015 [New Section after 5.1.6.1]

FR 628 – Annex material

A.5.1.5

Station outlets/inlets should be located at an appropriate height above the floor to prevent physical damage to equipment attached to the outlet. The minimum number of station outlets/inlets for each system that is installed should be provided per the FGI Guidelines for Design and Construction of Hospitals and Outpatient Facilities or other federal, state or local codes.

First Revision No. 647-NFPA 99-2015 [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 recommendations

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 16:14:21 EDT 2015

Committee Statement

Committee Statement: The committee has been advised that manufactured assemblies can often fail the operational pressure test once installed. Requiring that this test be done by the manufacturer prior to installation will help alleviate this problem. An allowance has been added to let the manufacturer use a test gas other than the system gas as is required in the referenced test.

Response Message:

First Revision No. 642-NFPA 99-2015 [Section No. 5.1.6.2]

5.1.6.2

~~The standing pressure test under 5.1.6.1 (4) shall be permitted to be performed by any testing method that will ensure a pressure decay of less than 1 percent in 24 hours.~~ The leakage from a completed manufactured assembly shall not exceed 0.5 percent of the starting pressure when tested at 20 percent above operating pressure for pressure pipelines and 635 mm (25 in.) HgV for vacuum and WAGD systems [e.g., 2 kPa (0.3 psi) starting at 415 kPa (60 psig), 0.3 mm (0.125 in.) inHg HgV starting at 635 mm (25 in.) HgV].

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 15:33:14 EDT 2015

Committee Statement

Committee Statement: The leakage requirements as currently stated are essentially impossible to meet. All systems leak to some extent, and the only reason one can pass the current requirement at all is through the use of gauges which naturally have a limit on their readability and resolution. Therefore a user can "fudge" the "no change in the test pressure" required by the standard.

As gauges are improving, becoming more precise and digital, it is increasingly difficult to rely on this anachronism to pass the test. As a result, failures are being reported on processes which formerly passed. It is clear technology has grown out of this requirement and need something more realistic and fitting the real conditions.

Worse, there are two mutually contradictory tests given. 5.1.6.2 permits a loss from a manufactured assembly of of 1% of the starting pressure in 24 hours. 5.1.12.2.6.5 and permits no loss from the piping system in 24 hours. This revision along with others are meant to fix these issues.

Response Message:

Public Input No. 307-NFPA 99-2015 [Section No. 5.1.6.2]

First Revision No. 644-NFPA 99-2015 [New Section after 5.1.6.4]

5.1.6.5

The manufacturer of the assembly shall provide documentation certifying that the flexible hose assembly has a minimum burst gauge pressure of 6895 kPa (1000 psi).

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 15:52:26 EDT 2015

Committee Statement

Committee Statement: The committee has been advised that some manufacturers of these assemblies are not using high pressure hose or flex connectors and that often times there are no markings on the hoses to allow for verification that the assemblies meet this requirement. This revision will give the verification documentation certifying that the assembly meets the requirement.

Response Message:

Public Input No. 425-NFPA 99-2015 [New Section after 5.1.6.4]

First Revision No. 676-NFPA 99-2015 [Section No. 5.1.6.5]

5.1.6.6

~~Manufactured assemblies shall have a flame spread index of not greater than 200 when tested in accordance with ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or shall comply with the requirements for heat release in accordance with NFPA 286 , *Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth* , as described in Section 10.2 of NFPA *101* , *Life Safety Code* .~~ Components of manufactured assemblies shall have a flame spread index of not greater than 200 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials* , or ANSI/UL 723, Standard for Test for Surface Burning Characteristics of Building Materials, or shall comply with the requirements for heat release in accordance with NFPA 286 as described in Section 10.2 of NFPA *101* .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 13:41:38 EDT 2015

Committee Statement

Committee Statement: ANSI/UL 723 is an equivalent standard to ASTM E 84 for testing surface burning characteristics of building materials. In all other sections in NFPA 99 where ASTM E 84 is required, ANSI/UL 723 is identified as an alternate test method (Sections 4.4.2.3, 4.4.2.4, and 14.2.2.5.1).

Response Message:

Public Input No. 299-NFPA 99-2015 [Section No. 5.1.6.5]

First Revision No. 645-NFPA 99-2015 [New Section after 5.1.6.7]

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 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.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 15:58:39 EDT 2015

Committee Statement

Committee Statement: The committee has been advised that manufactured assemblies are often deficient in their identification and labeling of their flexible hose or connectors. This requirement will help those providing care and maintenance better identify what gas they are dealing with on a given hose.

Response Message:

First Revision No. 641-NFPA 99-2015 [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 bulk cryogenic liquid system when the main supply reaches an 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 bulk cryogenic liquid systems, an alarm when or at a predetermined set point before the reserve supply contents fall to one day’s average supply, indicating reserve low

(6) Where a cryogenic liquid storage unit is used as a reserve for a bulk 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:

(a) 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

(b) 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

(c) For each cylinder header used as a source, an alarm indication that the header is in use

(d) For each cylinder header used as a source, an alarm indication that the cylinder contents are below an average day's supply

(e) 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

(f) An alarm indication that the pressure in the common line on the source side of the line pressure controls is low

(g) An alarm indication that the that oxygen concentration from the supply system is below 90 percent

Submitter Information Verification

Submitter Full Name: HEA-PIP

Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 15:14:32 EDT 2015

Committee Statement

Committee Statement: This revision adds requirements for alarms are needed to support the Concentrator supply system
Response Message:

Public Input No. 140-NFPA 99-2015 [Section No. 5.1.9.2.4]

First Revision No. 629-NFPA 99-2015 [New Section after 5.1.9.4.4]

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) .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 08:05:33 EDT 2015

Committee Statement

Committee Statement: This revision is an attempted clarification of 5.1.9.4.4(2) to show that the use of one area alarm panel for an operating room suite is permissible.
Response Message:

Public Input No. 331-NFPA 99-2015 [New Section after 5.1.9.4.4]

First Revision No. 630-NFPA 99-2015 [Section No. 5.1.9.5.4]

5.1.9.5.4

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

~~Backup or lag compressor in operation, to indicate when the primary or lead air compressor is incapable of satisfying the demand of the requirements of the system, except when the medical air system consists of three or more compressors, in which case the backup or lag signal is permitted to energize when the last compressor has been signaled to start~~

~~High carbon monoxide level, to indicate when the carbon monoxide level in the medical air system is 10 ppm or higher~~

~~Medical air dew point high, to indicate when the line pressure dew point is greater than +2°C (+35°F)~~

~~Backup or lag vacuum pump in operation, to indicate when the primary or lead vacuum pump is incapable of satisfying the demand of the requirements of the system, except when the vacuum pump system consists of three or more pumps, in which case the backup or lag signal is permitted to energize when the last pump has been signaled to start~~

~~When a central dedicated WAGD producer is provided per 5.1.3.8.1.3 , WAGD lag in use with the signal to be manually reset~~

~~Instrument air dew point high, to indicate when the line pressure dew point is greater than -30°C (-22°F)~~

~~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~~

~~For compressor systems using liquid ring compressors, high water in the separators~~

~~For compressor systems using other than liquid ring compressors, high discharge air temperature~~

~~Proportioning systems high/low indicator when the oxygen concentration is outside 19.5 percent to 23.5 percent oxygen~~

~~Proportion systems reserve system in operation~~

(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):

(a) For each cylinder header used as a source, an alarm indication that the header is in use

(b) For each cylinder header used as a source, an alarm indication that the cylinder contents are below an average day's supply

(c) 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

(d) An alarm indication that the pressure in the common line on the source side of the line pressure controls is low

(e) An alarm indication that the that oxygen concentration from the supply system is below 90 percent

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 08:19:20 EDT 2015

Committee Statement

Committee Statement: The standard was written around one type of control (on/off operation defined by pressure). Control methods for compressors and pumps are becoming more sophisticated and now can control on other conditions (e.g. flow) and in a variety of modes (e.g. continuous run with VSD). The revised text attempts to account for these developments while preserving the performance characteristics inherent in the original text.

Instrument air has been added to this list - it appears to have been an omission.

New alarm requirements have been added to support the new oxygen concentrator supplies.

Response Message:

Public Input No. 141-NFPA 99-2015 [Section No. 5.1.9.5.4]

Public Input No. 157-NFPA 99-2015 [Section No. 5.1.9.5.4]

First Revision No. 654-NFPA 99-2015 [Section No. 5.1.10.1.4]

5.1.10.1.4*

~~Tubes shall be hard-drawn seamless copper in accordance with ASTM B 819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*, medical gas tube, Type L, except Type K shall be used where operating pressures are above a gauge pressure of 1275 kPa (185 psi) and the pipe sizes are larger than DN80 [NPS 3 (3 1/8 in. O.D.)].~~ Tubes shall be one of the following:

(1) Hard-drawn seamless copper in accordance with ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems*; medical gas tube, Type L, except Type K shall be used where operating pressures are above a gauge pressure of 1275 kPa (185 psi) and the pipe sizes are larger than DN80 [NPS 3 (3 1/8 .in. O.D.)].

(2) Listed corrugated stainless medical tubing (CSMT) manufactured from ASTM A240, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications*, stainless steel with a maximum allowable working pressure at least 300 psi (2068 kPa) with a pressure safety factor of 3.5 for all medical gases except medical air compressed onsite.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 08:05:56 EDT 2015

Committee Statement

Committee Statement: This revision permits an additional material for medical gas tubing. This will need a listing to be used as written. There are several other revisions related to the use of this new material. It is understood that a listing for this purpose will include Leakage Test, Hydrostatic Strength, Impact, Axial Tension, Torsion, Elevated Temperature, Flame, Compression, Bending, Effectiveness of Striker Plates, Electrical Resistance, Resistance to Installation Damage, Jacket Burning Characteristics, Mechanical Fitting Performance, Mechanical Fittings Resistance to Removal or Re-Assembly.

This tubing is being limited to use in systems other than medical air systems which produce the air on site. There are concerns with how water accumulation will be affected by corrugations in the piping and also with how the stainless steel will react where subject to water accumulation in the tubing.

Response Message:

Public Input No. 269-NFPA 99-2015 [Section No. 5.1.10.1.4]

Public Input No. 268-NFPA 99-2015 [Section No. 5.1.10.1.4]

First Revision No. 655-NFPA 99-2015 [New Section after 5.1.10.1.5]

5.1.10.1.6

Corrugated stainless steel medical tubing jacket shall have a flame spread index of 25 or less, and smoke density index of 50 or less as determined by ASTM E84 , *Standard Test Method for Surface Burning Characteristics of Building Materials* .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 08:24:00 EDT 2015

Committee Statement

Committee Statement: This new section is added to provide a minimum flame spread index and smoke developed index for the plastic jacket of the CSMT using ASTM E84, which is widely used for these measurements. The values are identical to those used for Corrugated Stainless Steel Tubing used for fuel gas service. These values are compliant with the flame and smoke indices for Class A interior finishes in NFPA 101, Life Safety Code®. Class A is the most stringent class of interior finish materials in the Life Safety Code®

Response Message:

Public Input No. 270-NFPA 99-2015 [New Section after 5.1.10.1.5]

First Revision No. 632-NFPA 99-2015 [Section No. 5.1.10.2.2.2]

5.1.10.2.2.2

If medical gas tube in accordance with ASTM ~~B 819~~ B819 , *Standard Specification for Seamless Copper Tube for Medical Gas Systems,* is used for vacuum piping, such special marking shall not be required~~, provided that the vacuum piping installation meets all other requirements for medical gas piping, including the prohibition of flux on copper-to-copper joints and the use of a nitrogen purge while brazing~~ .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 09:30:59 EDT 2015

Committee Statement

Committee Statement: This revision is a simplification of the code text. All brazed joints require nitrogen purge per 5.1.10.4.1.10 regardless tube type. The information deleted was unnecessary.
Response Message:

Public Input No. 332-NFPA 99-2015 [Section No. 5.1.10.2.2.2]

First Revision No. 657-NFPA 99-2015 [New Section after 5.1.10.3.1]

5.1.10.3.2

Positive-pressure patient gas systems and medical support gas systems fabricated from listed corrugated stainless steel medical tubing shall have all turns, offsets, and other changes in direction made by bending the tubing up to its minimum bend radius or with listed corrugated stainless steel medical tubing fittings in accordance with 5.1.10.9 .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 08:47:26 EDT 2015

Committee Statement

Committee Statement: A new paragraph 5.1.10.3.2 is proposed to recognize CSMT fitting and to reference their installation requirements.
Response Message:

Public Input No. 272-NFPA 99-2015 [New Section after 5.1.10.3.1]

First Revision No. 656-NFPA 99-2015 [Section No. 5.1.10.3.1]

5.1.10.3.1*

Positive- pressure patient gas systems, medical support gas systems, vacuum systems, and WAGD systems fabricated from other than corrugated stainless steel medical tubing shall have all turns, offsets, and other changes in direction made using fittings or techniques appropriate to any of the following acceptable joining methods:

(1) Brazing, as described in 5.1.10.4

(2) Welding, as described in 5.1.10.5

(3) Memory metal fittings, as described in 5.1.10.6

(4) Axially swaged, elastic preload fittings, as described in 5.1.10.7

(5) Threaded, as described in ~~under~~ 5.1.10.8

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 08:29:48 EDT 2015

Committee Statement

Committee Statement: This section has been revised to limit the current joining methods to piping materials other than CSMT, as the joining methods are not appropriate for CSMT.

Public Input No. 271-NFPA 99-2015 [Section No. 5.1.10.3.1]

First Revision No. 633-NFPA 99-2015 [Section No. 5.1.10.4.3.4]

5.1.10.4.3.4

If the interior surfaces of fitting sockets become contaminated prior to brazing, they shall be recleaned for oxygen in accordance with 5.1.10.4.3.10 and be cleaned for brazing with a clean, oil-free, stainless steel or brass wire brush.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 09:52:10 EDT 2015

Committee Statement

Committee Statement: Degreasing a steel wire brush may cause it to rust. The pecification of stainless steel or brass should help prevent this issue.
Response Message:

Public Input No. 168-NFPA 99-2015 [Section No. 5.1.10.4.3.4]

First Revision No. 634-NFPA 99-2015 [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*, *National Electrical Code*, 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

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 10:33:15 EDT 2015

Committee Statement

Committee Statement: Unprotected medical gas piping should not be located in stairwells. See NFPA 101, 2015; 7.1.3.2.1(10). The committee has been advised of examples where been done in the past with all the gases serving the surgery suites. This revision should clearly prohibit this.

Response Message:

Public Input No. 25-NFPA 99-2015 [Section No. 5.1.10.11.3.2]

First Revision No. 902-NFPA 99-2015 [New Section after 5.1.10.11.6.3]

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.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: NATIONAL FIRE PROTECTION ASSOC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 24 14:05:23 EDT 2015

Committee Statement

Committee Statement: It is not the intent that the prohibition of concealing hose and flexible connectors be applied to the joints detailed in 5.1.10.11.6.3.
Response Message:

First Revision No. 635-NFPA 99-2015 [Section No. 5.1.10.11.11.4]

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.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 10:53:25 EDT 2015

Committee Statement

Committee Statement: The base metal is an essential variable and is critical to the brazing procedure.
Response Message:

Public Input No. 282-NFPA 99-2015 [Section No. 5.1.10.11.11.4]

First Revision No. 677-NFPA 99-2015 [Section No. 5.1.11.2.7]

5.1.11.2.7*

Zone valve box assemblies shall be labeled ~~outside of the valve box as to the areas~~ with the rooms, areas, or spaces that they control as follows:

ZONE VALVES FOR THE (GAS/VACUUM NAME) SERVING (NAME ~~OF AREA~~ OF ROOMS OR SPACES SERVED BY THE PARTICULAR VALVE)

Labeling shall either be visible from outside the zone valve box assembly through the cover or be replicated on the outside, but not affixed to the removable cover.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 13:43:35 EDT 2015

Committee Statement

Committee Statement: Zone valves labeled "Emergency Department" are not specific enough when they actually control a dozen rooms in the department. A good example would be "Patient Rooms 201 thru 212 and 214 thru 220."

Labeling can be made visible from inside or outside the box when the cover has a clear area to view the labels. Labels should not be applied to the cover, as it can be lost or switched with another box.

Response Message:

Public Input No. 234-NFPA 99-2015 [Section No. 5.1.11.2.7]

First Revision No. 636-NFPA 99-2015 [New Section after 5.1.11.4]

5.1.11.5 Source Equipment.

Source equipment shall be labeled or tagged to identify the patient medical gas, the support gas, or the vacuum system and include the following information:

(1) Name of the gas or vacuum system

(2) Gas or vacuum system color code

(3) Rooms, areas, or buildings served

(4) Emergency contact information for the department or individual responsible for maintaining the equipment

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 11:11:13 EDT 2015

Committee Statement

Committee Statement: Many other components are required to be labeled with critical information. The source equipment should also be labeled with minimum information to allow for those responding to an issue to be able to under stand the potential impact on patient care as quickly as possible.

Response Message:

Public Input No. 426-NFPA 99-2015 [New Section after 5.1.11.4]

First Revision No. 679-NFPA 99-2015 [Section No. 5.1.12.1.1]

5.1.12.1.1

Inspection and testing shall be performed on all new piped medical gas and vacuum systems, additions, renovations, temporary installations, or repaired systems to ensure, by a documented process and procedure, that all applicable provisions of this document have been adhered to and system integrity has been achieved or maintained.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 17:07:39 EDT 2015

Committee Statement

Committee Statement: Revised to clarify application is to both gas and vacuum and that both the process as well as the procedure need to be documented.
Response Message:

Public Input No. 32-NFPA 99-2015 [Section No. 5.1.12.1]

First Revision No. 680-NFPA 99-2015 [Section No. 5.1.12.1.11]

5.1.12.1.11

Acceptance of the verifier's final report shall be permitted to satisfy the requirements in 5.1.12.1.10.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 17:09:38 EDT 2015

Committee Statement

Committee Statement: This has been revised to clarify that only the verifier final report is sufficient to meet this requirement.
Response Message:

First Revision No. 631-NFPA 99-2015 [New Section after 5.1.12.2]

5.1.12.3 System Inspection.

5.1.12.3.1 General.

5.1.12.3.1.1

System inspections shall be performed prior to concealing piping distribution systems in walls, ceilings, chases, trenches, underground, or otherwise hidden from view.

5.1.12.3.1.2

The test gas shall be nitrogen NF.

5.1.12.3.1.3

Inspections shall be conducted by a party technically competent and experienced in the field of medical gas and vacuum pipeline inspections and testing and meeting the requirements of ASSE 6020, *Professional Qualifications Standard for Medical Gas Systems Inspectors* , or ASSE 6030, *Professional Qualifications — Standard for Medical Gas Systems Verifiers* .

5.1.12.3.1.4

Inspections shall be performed by a party other than the installing contractor.

5.1.12.3.1.5

Where systems have not been installed by in-house personnel, inspections shall be permitted by personnel of the organization who meet the requirements of 5.1.12.3.1.3

5.1.12.3.2 Inspections

5.1.12.3.2.1

The initial pressure tests perfomed by the installing contractor shall be witnessed by an ASSE 6020 inspector, an ASSE 6030 verifier, or the authority having jurisdiction or it's 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 .

5.1.12.3.2.2

The presence and correctness of labeling and valve tagging required by this code for all concealed components and piping distribution systems shall be inspected.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 09:20:28 EDT 2015

Committee Statement

Committee Statement: This revision will require that the concealed piping distribution system and associated components are inspected prior to being concealed. This will eliminate systems being installed that are not properly labeled or pressure tested. And eliminate system failures during the verification phase. This is being required by some states already and precedence has been established for this requirement.

Response Message:

Public Input No. 34-NFPA 99-2015 [New Section after 5.1.10.1.6]

Public Input No. 350-NFPA 99-2015 [New Section after 5.1.12.3]

First Revision No. 643-NFPA 99-2015 [Section No. 5.1.12.2.6.5]

5.1.12.2.6.5*

~~At the conclusion of the tests, there shall be no change in the test pressure except that attributed to specific changes in ambient temperature.~~ The leakage over the 24-hour test shall not exceed 0.5 percent of the starting pressure [e.g., 2 kPa (0.3 psi) starting at 415 kPa (60 psig), 0.3 mm (0.125 in.) HgV starting at 635 mm (25 in.) HgV] except that attributed to specific changes in ambient temperature.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 15:34:28 EDT 2015

Committee Statement

Committee Statement: Copy from related revision.
Response Message:

Public Input No. 308-NFPA 99-2015 [Section No. 5.1.12.2.6.5]

First Revision No. 637-NFPA 99-2015 [Section No. 5.1.12.2.6.7]

5.1.12.2.6.7

The 24-hour standing pressure test of the positive pressure system 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 ~~5.1.12.45.1.12.45.1.12.45.1.12.45.1.12.4~~ ~~5.1.12.45.1.12.45.1.12.45.1.12.3~~ .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 11:18:37 EDT 2015

Committee Statement

Committee Statement: Often times there is not an AHJ available to witness this test, and more times than not, this test is not witnesses. If we allow for an ASSE 6020 Inspector to witness the test, it will be more likely for this test to be witnessed and more importantly documented. There is precedent for this as it is already being done in some states as required by those individual states.

Response Message:

Public Input No. 349-NFPA 99-2015 [Section No. 5.1.12.2.6.7]

First Revision No. 638-NFPA 99-2015 [New Section after 5.1.12.3.1.3]

5.1.12.4.1.4

Testing of the cryogenic fluid central supply system shall be conducted by a party technically competent and experienced in the field of cryogenic fluid systems and meeting the requirements of ASSE 6035, *Professional Qualifications Standard for Bulk Medical Gas Systems Verifiers* , in accordance with the mandatory requirements in CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities* .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 11:23:29 EDT 2015

Committee Statement

Committee Statement: PI 205
Response Message:

Public Input No. 205-NFPA 99-2015 [New Section after 5.1.12.3.1.4]

First Revision No. 639-NFPA 99-2015 [Section No. 5.1.12.3.1.3]

5.1.12.4.1.3

Testing shall be conducted by a party technically competent and experienced in the field of medical gas and vacuum pipeline testing and meeting the requirements of ASSE 6030, *Professional Qualifications Standard for Medical Gas Systems Verifiers*~~.~~ , except as required by 5.1.12.4.1.4 .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 11:27:18 EDT 2015

Committee Statement

Committee Statement: The ASSE has a new standard ASSE 6035, Professional Qualifications Standard for Bulk Medical Gas Systems Verifiers. The proposed change calls out an exception for testing that specifically deals with the cryogenic fluid supply system.

Response Message:

Public Input No. 204-NFPA 99-2015 [Section No. 5.1.12.3.1.3]

First Revision No. 653-NFPA 99-2015 [Section No. 5.1.12.3.8.2]

5.1.12.4.8.2

The outlet most remote from the source shall be tested for total ~~non-methane~~ nonmethane hydrocarbons and halogenated hydrocarbons and compared to the source gas.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 18:17:42 EDT 2015

Committee Statement

Committee Statement: Halogenated hydrocarbons is a comparative test. This has been added to this subsection to clarify.

Response Message:

Public Input No. 368-NFPA 99-2015 [Section No. 5.1.12.3.8.2]

First Revision No. 659-NFPA 99-2015 [Section No. 5.1.12.3.10]

5.1.12.4.10 ~~Operational Pressure Test~~ Operational Flow Pressure Drop Test .

Operational flow pressure drop tests shall be performed at each station outlet/inlet or terminal where the user makes connections and disconnections.

5.1.12.4.10.1

Tests shall be performed with the gas of system designation or the operating vacuum.

5.1.12.4.10.2

All gas outlets with a gauge pressure of 345 kPa (50 psi), including, but not limited to, oxygen, nitrous oxide, medical air, and carbon dioxide, shall deliver 100 SLPM (3.5 SCFM) with a pressure drop of not more than 35 kPa (5 psi) and static pressure of 345 kPa to 380 kPa (50 psi to 55 psi).

5.1.12.4.10.3

Support gas outlets shall deliver 140 SLPM (5.0 SCFM) with a pressure drop of not more than 35 kPa (5 psi) gauge and static pressure of 1100 kPa to 1275 kPa (160 psi to 185 psi) gauge.

5.1.12.4.10.4

Medical–surgical vacuum inlets shall draw 85 Nl/min (3 SCFM) without reducing the vacuum pressure below 300 mm (12 in.) gauge HgV at any adjacent station inlet.

Global FR-111

5.1.12.4.10.5

Oxygen and medical air outlets serving ~~critical care areas~~ Category 1 Space shall allow a transient flow rate of 170 SLPM (6 SCFM) for 3 seconds.

5.1.12.4.10.6*

Where outlets are being fed with non-standard line pressure, volume, or gas content, for clinical reasons, they shall be labeled in accordance with 5.1.11 .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:22:57 EDT 2015

Committee Statement

Committee Statement: We are actually ensuring required flow rates with maximum pressure drops in this section. The current section title Operational Pressure Test is not accurate.

Response Message:

Public Input No. 274-NFPA 99-2015 [Section No. 5.1.12.3.10]

First Revision No. 660-NFPA 99-2015 [Section No. 5.1.12.3.11]

5.1.12.4.11 Medical Gas Concentration Test.

After purging each system with the gas of system designation, the following shall be performed:

(1) Each pressure gas source and outlet shall be analyzed for concentration of gas, by volume.

(2) Analysis shall be conducted with instruments designed to measure the specific gas dispensed.

(3)* Allowable concentrations shall be as indicated in Table 5.1.12.4.11 ~~Table 5.1.12.4.11Table 5.1.12.4.11Table 5.1.12.4.11Table 5.1.12.4.11Table 5.1.12.4.11 Table 5.1.12.4.11Table 5.1.12.4.11Table 5.1.12.4.11Table 5.1.12.3.11~~ .

Table 5.1.12.4.11 Gas Concentrations

Medical Gas	Concentration
Oxygen USP	≥ 99% oxygen
Oxygen 93 USP	≥ 90% oxygen ≤ 96%
Nitrous oxide USP	≥ 99% nitrous oxide
Nitrogen NF	≤ 1% oxygen or ≥ 99% nitrogen
Medical air USP	19.5%–23.5% oxygen
Other gases	~~As specified~~ Named gases by ±1%, ~~unless otherwise specified~~ or per specification

Supplemental Information

File Name	Description
FR_660.docx	

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:26:20 EDT 2015

Committee Statement

Committee Statement: These changes are necessary to support the oxygen concentrator source

Other gases has been reworded only for clarity.

Response Message:

Public Input No. 142-NFPA 99-2015 [Section No. 5.1.12.3.11]

First Revision No. 661-NFPA 99-2015 [New Section after 5.1.12.3.14.3]

5.1.12.4.14.4 Oxygen Central Supply System Using Concentrators.

The oxygen central supply system using concentrators shall be tested according to the following:

(1) The oxygen central supply system shall be tested for purity of the oxygen.

(2) Tests of the alarms after calibration and setup per the manufacturer's instructions shall be conducted as well as tests of the operational controls.

(3) Each concentrator supply system shall be operated with the supply system's isolating valve closed and the unit venting at a flow of 25 percent or more of nameplate capacity for an elapsed time of at least 12 hours prior to the tests in 5.1.12.4.14.4(4) .

(4) The oxygen quality from each concentrator supply system shall be validated as follows:

(a) The operation of all control sensors/switches and the oxygen monitor shall be checked for proper operation and function.

(b) The quality of the oxygen shall be confirmed to meet the USP monograph appropriate for the technology in use.

(c) The accuracy of the oxygen monitor shall be validated against oxygen of known concentration, and the monitor calibrated.

(5) The central supply system shall be tested for correct operation of the cascade (i.e., primary — secondary — reserve). It shall be permitted to test source rotation for systems so constructed.

(6) The operation of all alarms (*see* *5.1.9.2.4(12)* *and* *5.1.9.2.4(14)*) shall be tested,

(7) The accuracy of the central system oxygen monitor shall be validated against oxygen of known concentration, and the monitor calibrated.

(8) Tests in 5.1.12.4.14.4(3) to 5.1.12.4.14.4(5) shall be performed when any concentrator supply system has been opened to atmosphere (e.g., during service or replacement).

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:33:12 EDT 2015

Committee Statement

Committee Statement: These tests have been added to support the addition of concentrator sources and to verify that they are operating properly prior to use.
Response Message:

Public Input No. 143-NFPA 99-2015 [New Section after 5.1.12.3.14.3]

First Revision No. 662-NFPA 99-2015 [Section No. 5.1.12.3.14.3(A)]

(A)

Tests of the medical air compressor system shall include the purity test for air quality, and the test of the alarm sensors after calibration and setup per the ~~manufacturer's~~ manufacturer's instructions, as well as ~~lead-lag~~ reserve capacity controls.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:35:12 EDT 2015

Committee Statement

Committee Statement: The standard was written around one type of control (on/off operation defined by pressure). Control methods for compressors and pumps are becoming more sophisticated and now can control on other conditions (e.g. flow) and in a variety of modes (e.g. continuous run with VSD). The proposed text attempts to account for these developments while preserving the performance characteristics inherent in the original text.

Response Message:

Public Input No. 158-NFPA 99-2015 [Section No. 5.1.12.3.14.3(A)]

First Revision No. 663-NFPA 99-2015 [Section No. 5.1.12.3.14.3(H)]

(H)

A demand of approximately 25 percent of the rated compressor capacity shall be created to cause the compressors to cycle on and off continuously and the dryers to operate for the ~~24~~ 12 -hour period.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:36:53 EDT 2015

Committee Statement

Committee Statement: This has been revised to match item (E), which states the compressor system shall operate for at least 12 hours prior to testing. This should have been corrected in the current edition.

Response Message:

Public Input No. 422-NFPA 99-2015 [Section No. 5.1.12.3.14.3(H)]

Public Input No. 532-NFPA 99-2015 [Section No. 5.1.12.3.14.3(H)]

First Revision No. 664-NFPA 99-2015 [Section No. 5.1.13.1.2]

5.1.13.1.2

Support gas sources shall be permitted to be used for many general utility uses (e.g., to remove excess moisture from instruments before further processing, or to operate gas-driven booms, boom brakes, pendants, or similar applications). ~~Requirements for general utility systems will be found in Chapter~~ *(See Chapter 8 ~~88888 889~~ for general utility systems requirements.)* .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:39:23 EDT 2015

Committee Statement

Committee Statement: Nonmedical Compressed Air is addressed in chapter 8. Chapter 9 is HVAC systems.
Response Message:

Public Input No. 290-NFPA 99-2015 [Section No. 5.1.13.1.2]

First Revision No. 665-NFPA 99-2015 [Section No. 5.1.13.3.5.3]

5.1.13.3.5.3

Instrument air sources shall provide air with the following characteristics:

(1) A gauge pressure ~~not less than 1380 kPa (200 psi) at the compressor~~ adequate for the intended line pressure and pressure controls *(see Table 5.1.11)*

(2) The quality of instrument air, as described in 5.1.13.3.5.1

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:40:12 EDT 2015

Committee Statement

Committee Statement: The original justification for the 200 psi compressor was based on using classic pressure regulators to ensure a 185 psi line pressure. As regulators inevitably have some pressure drop, the pressure needed to drive the regulators had to be higher. This reasoning no longer pertains, as technologies now exist which can control the pressure by means other than pressure regulation, and not all facilities wish to operate their instrument air at 185 psi.

Response Message:

Public Input No. 54-NFPA 99-2015 [Section No. 5.1.13.3.5.3]

First Revision No. 666-NFPA 99-2015 [Section No. 5.1.13.3.5.5]

~~5.1.13.3.5.5~~

~~Instrument air sources shall include the components specified in~~ ~~5.1.3.6.3.2~~ ~~,~~ ~~5.1.3.6.3.5~~ ~~,~~ ~~5.1.3.6.3.6~~ ~~, and~~ ~~5.1.3.6.3.7~~ ~~[except~~ ~~5.1.3.6.3.7(1)~~ ~~].~~

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:44:03 EDT 2015

Committee Statement

Committee Statement: This revision eliminates duplicated requirements. Certain provisions have been added to 5.1.13.3.5.10.
Response Message:

Public Input No. 289-NFPA 99-2015 [Section No. 5.1.13.3.5.5]

First Revision No. 668-NFPA 99-2015 [Section No. 5.1.13.3.5.6]

5.1.13.3.5.5

Instrument air compressors shall be permitted to be of any type capable of ~~not less than a gauge pressure of 1380 kPa (200 psi) output pressure~~ the output pressure nedeed for the intended line pressure *see Table 5.1.11* . and of providing air meeting the definition of instrument air in 5.1.13.3.5.1 .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:50:23 EDT 2015

Committee Statement

Committee Statement: The original justification for the 200 psi compressor was based on using classic pressure regulators to ensure a 185 psi line pressure. As regulators inevitably have some pressure drop, the pressure needed to drive the regulators had to be higher. This reasoning no longer pertains, as technologies now exist which can control the pressure by means other than pressure regulation, and not all facilities wish to operate their instrument air at 185 psi.

Response Message:

Public Input No. 57-NFPA 99-2015 [Section No. 5.1.13.3.5.6]

First Revision No. 667-NFPA 99-2015 [Section No. 5.1.13.3.5.10]

5.1.13.3.5.9 Instrument Air Accessories.

~~Accessories used for instrument air sources shall comply with the following subparagraphs:~~ Accessories used for instrument air sources shall comply with the following subparagraphs:

(1) For aftercoolers, 5.1.3.6.3.5 ~~for aftercoolers~~

(2) For air receivers, 5.1.3.6.3.6 ~~for air receivers~~

(3) For air dryers, 5.1.3.6.3.7 ~~for air dryers~~ [except 5.1.3.6.3.7(1)]

(4) For required components, 5.1.3.6.3.2 ~~5.1.3.6.3.25.1.3.6.3.25.1.3.6.3.25.1.3.5.5~~ ~~for air regulators~~

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 09:47:31 EDT 2015

Committee Statement

Committee Statement: The original justification for the 200 psi compressor was based on using classic pressure regulators to ensure a 185 psi line pressure. As regulators inevitably have some pressure drop, the pressure needed to drive the regulators had to be higher. This reasoning no longer pertains, as technologies now exist which can control the pressure by means other than pressure regulation, and not all facilities wish to operate their instrument air at 185 psi.

Response Message:

Public Input No. 55-NFPA 99-2015 [Section No. 5.1.13.3.5.10]

First Revision No. 683-NFPA 99-2015 [Section No. 5.1.13.3.5.13]

5.1.13.3.5.12 Electrical Power and Control.

~~When multiple compressors are used, an additional compressor(s) shall automatically activate when the compressor(s) in operation is incapable of maintaining the required pressure.~~

~~When multiple compressors are used, automatic or manual alternation of compressors shall allow division of operating time. If automatic alternation of compressors is not provided, the facility staff shall arrange a schedule for manual alternation.~~

~~Each compressor motor shall be provided with electrical components including, but not limited to, the following:~~

~~Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter~~

~~Motor starting device~~

~~Overload protection~~

~~Where compressor systems having two or more compressors employ a control transformer or other voltage control power device, installation of at least two such devices~~

~~Control circuits arranged in such a manner that the shutdown of one compressor does not interrupt the operation of another compressor~~

~~Automatic restart function such that the compressor(s) will restart after power interruption without manual intervention~~

~~Electrical installation and wiring shall conform to the requirements of *NFPA 70* , *National Electrical Code* .~~

~~Emergency electrical service for the compressors shall conform to the requirements of the essential electrical system, as described in Chapter 6 .~~

(A)

Instrument air source systems with compressors shall be controlled to ensure continuous supply of air at pressures consistent with Table 5.1.11 under all conditions of system use as follows:

(1) Automatic activation of compressor(s) as necessary to supply the demand.

(2) If provided with more than one compressor, managing the operation to equalize wear on all compressors. Where this equalization is achieved manually, the facility staff shall arrange a schedule for manual alternation.

(B)

Controls shall provide the following functions:

(1) Where instrument air source systems having two or more compressors employ any electrical circuit device that upon failure could prevent supply of air, the controls shall be provided with an automatically activated alternative method for ensuring supply (e.g., redundant component(s), an alternate electrical supply path, or other equivalent method).

(2) Control circuits shall be arranged in such a manner that isolation of one compressor or component from the system (e.g. for maintenance or repair) does not interrupt the operation of other compressor(s) or component(s).

(3) An automatic restart function shall be included, such that the supply of air will resume normally after power interruption without manual intervention

(C)

Each compressor motor shall be provided with electrical components including, but not limited to, the following:

(1) Dedicated disconnect switch installed in the electrical circuit ahead of each motor starter

(2) Motor starting device

(3) Overload protection

(D)

Instrument air compressor system controls shall be provided with electrical systems including at a minimum:

(1) Built-in disconnect means to allow appropriate operation of multiple compressor systems and protect service personnel from exposure to live voltages

(2) Control circuits shall be arranged so that failure of any component of the control circuit, or shutdown of one compressor (e.g., for service), does not interrupt automatic operation of the standby compressor

(3) An automatic restart function such that the compressor(s) will restart after power interruption without manual intervention

(4) Where components are common to more than one control circuit (e.g., autodrains), the common device shall be provided with electrical protection to prevent loss of the control circuits(s) in the event of short circuit in the device

(E)

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

(F)

Emergency electrical service for the compressors shall conform to the requirements of the essential electrical system, as described in Chapter 6 .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 18 11:50:18 EDT 2015

Committee Statement

Committee Statement: The standard was written around one type of control (on/off operation defined by pressure). Control methods for compressors and pumps are becoming more sophisticated and now can control on other conditions (e.g. flow) and in a variety of modes (e.g. continuous run with VSD). The proposed text attempts to account for these developments while preserving the performance characteristics inherent in the original text.

Previously the language of Item (C) potentially allowed the installation of equipment that did not comply with NFPA70E. The language of (C) and new item (D) has been revised to prevent this.

Response Message:

Public Input No. 159-NFPA 99-2015 [Section No. 5.1.13.3.5.13]

Public Input No. 339-NFPA 99-2015 [Section No. 5.1.13.3.5.13]

First Revision No. 670-NFPA 99-2015 [New Section after 5.1.13.7]

5.1.13.8 Line Pressure Control.

Instrument air systems shall be provided with means to control line pressure at the source with at least the following characteristics:

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

(2) Able to flow 100 percent of the peak calculated demand

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

(4) Protected against overpressure (*see* *5.1.3.5.6*)

(5) Be constructed of materials deemed suitable for the service by the manufacturer

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 10:30:01 EDT 2015

Committee Statement

Committee Statement: The original justification for the 200 psi compressor was based on using classic pressure regulators to ensure a 185 psi line pressure. As regulators inevitably have some pressure drop, the pressure needed to drive the regulators had to be higher. This reasoning no longer pertains, as technologies now exist which can control the pressure by means other than pressure regulation, and not all facilities wish to operate their instrument air at 185 psi.

Response Message:

Public Input No. 56-NFPA 99-2015 [New Section after 5.1.13.7]

First Revision No. 678-NFPA 99-2015 [New Section after 5.1.14.3.4]

5.1.14.4

Source equipment labeling shall be in accordance with 5.1.11.5 .

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 14:08:03 EDT 2015

Committee Statement

Committee Statement: Verification of the new requirement for labeling in 5.1.11.5 should a part of the operation and management for medical gas systems.
Response Message:

First Revision No. 671-NFPA 99-2015 [Section No. 5.1.14.4.7]

5.1.14.5.7

Procedures, as specified, shall be established for the following:

(1) Maintenance program for the medical air compressor supply system in accordance with the manufacturer's recommendations

(2) Facility testing and calibration procedure that ensures carbon monoxide monitors are calibrated at least annually or more often if recommended by the manufacturer

(3) Maintenance program for both the medical–surgical vacuum piping system and the secondary equipment attached to medical–surgical vacuum station inlets to ensure the continued good performance of the entire medical–surgical vacuum system

(4) Maintenance program for the WAGD system to ensure performance

(5) Facility testing and calibration procedure that ensures that oxygen concentration monitors are calibrated at least every three months, or more often if recommended by the manufacturer

(6) Where oxygen sources include concentrator units, maintenance programs for the oxygen concentrator units and all essential subcomponents

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 10:31:26 EDT 2015

Committee Statement

Committee Statement: These changes are needed to support the concentrators by adding maintenance requirements to ensure their continued safe use once in service.

Response Message:

Public Input No. 144-NFPA 99-2015 [Section No. 5.1.14.4.7]

First Revision No. 672-NFPA 99-2015 [New Section after 5.1.14.4.9]

5.1.14.5.10

Where oxygen central supply system using concentrators are used, and one or more of the three sources is a cylinder header the facility shall establish procedures to ensure the facility is always provided with an average day's supply of oxygen in reserve, as follows:

(1) The facility shall establish a minimum cylinder pressure that will permit an average day's supply. That value will be included as part of the standard operating procedure for the oxygen supply system,

(2) The cylinders shall be inspected daily and any loss of pressure noted.

(3) When the cylinders are found to have lost pressure, due to use or leakage and thus are below the pre-established pressure, the cylinders shall be exchanged.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 10:32:01 EDT 2015

Committee Statement

Committee Statement: These changes are needed to support concentrators when cylinders are used as reserves by adding important maintenance requirements.
Response Message:

Public Input No. 145-NFPA 99-2015 [New Section after 5.1.14.4.9]

First Revision No. 673-NFPA 99-2015 [New Section after 5.2.3.5]

5.2.3.6

Oxygen supply system using concentrators shall be permitted to consist of two sources, one of which shall be a cylinder header with sufficient cylinder connections for an average day's supply.

Submitter Information Verification

Submitter Full Name: HEA-PIP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 12 10:34:17 EDT 2015

Committee Statement

Committee Statement: These changes are needed to support the concentrators if used in Category 2 facilities, and follows the precedent of a less redundant system.
Response Message:

Public Input No. 146-NFPA 99-2015 [New Section after 5.2.3.5]

First Revision No. 3-NFPA 99-2015 [Section No. 6.1.2]

6.1.3

The following paragraphs shall apply to new and existing health care facilities:

(1) 6.3.2.9.4.2

(2) 6.3.2.2.1

(3) 6.3.2.2.1(D)

(4) 6.3.2.3.6(B)(b) and 6.3.2.3.6(B)(c)

(5) 6.3.2.3.8

(6) 6.3.2.7.5

(7) 6.3.3.4

(8) 6.7.1.2.15.9

(9) 6.7.2.3.5(B)

(10) 6.7.2.3.6

(11) 6.7.4

(12) 6.7.6.6

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 10:44:18 EDT 2015

Committee Statement

Committee Statement: Battery-powered lighting unit testing should be a retroactive requirement for existing facilities. The requirement in 6.3.2.2.11.5 is for monthly testing for 30 seconds and annual testing for 30 minutes. This is definitely a requirement that should apply to both new and existing facilities. Adding this requirement 6.1.2 makes it clear that this testing is required on existing facilities which is in line with testing requirements for other similar battery lighting systems as outlined in NFPA 70.

Response Message:

Public Input No. 416-NFPA 99-2015 [Section No. 6.1.2]

First Revision No. 4-NFPA 99-2015 [New Section after 6.2.3]

6.2.4* Location of Essential Electrical System Components.

6.2.4.1

Essential electrical system components shall be located to minimize interruptions caused by natural forces common to the area (e.g., storms, floods, earthquakes, or hazards created by adjoining structures or activities).

6.2.4.2

Installations of electrical services shall be located to reduce possible interruption of normal electrical services resulting from similar causes as well as possible disruption of normal electrical service due to internal wiring and equipment failures.

6.2.4.3

Feeders shall be located to provide physical separation of the feeders of the alternate source and from the feeders of the normal electrical source to prevent possible simultaneous interruption.

Supplemental Information

File Name	Description
FR_4_Annex_Material.docx	

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 10:53:05 EDT 2015

Committee Statement

Committee Statement: Various recent Standards Council decisions have clearly established that NFPA 99, Health Care Facilities Code, is a performance code. These same Standards Council decisions have clearly established NFPA 70, National Electrical Code, as an installation code. This is consistent with each document's published scope. With this clear delineation established, NFPA 99, a performance code, cannot modify NFPA 70, an installation code. This modification cannot occur because NFPA 99, as a performance code, does not have jurisdiction over installation elements found in NFPA 70, or any other NFPA installation code. For this re=ason, certain elements of NFPA 70 must be written in NFPA 99.

NFPA 70: National Electrical Code 2014 517.35 (C) contains language similar to what is show above. This language should be contained in NFPA 99 as direction for location of essential electrical system components. This particular reference provides for design considerations protecting the essential electrical system that are critical for operation from both manmade and natural catastrophe.

Recent natural weather events in the United States have exposed a design weakness in some facilities where redundant power was affected by flooding or other disasters effects. This provision will provide a reminder to all that location of power systems and fuel sources must not be affected by these events.

Response Message:

Public Input No. 389-NFPA 99-2015 [New Section after 6.2.3]

Public Input No. 390-NFPA 99-2015 [New Section after A.6.1]

FR 4 Annex Material

A.6.2.4 Facilities in which the normal source of power is supplied by two or more separate central station-fed services experience greater than normal electrical service reliability than those with only a single feed. Such a dual source of normal power consists of two or more electrical services fed from separate generator sets or a utility distribution network that has multiple power input sources and is arranged to provide mechanical and electrical separation so that a fault between the facility and the generating sources is not likely to cause an interruption of more than one of the facility service feeders.

First Revision No. 6-NFPA 99-2015 [Section No. 6.3.2.2.1 [Excluding any Sub-Sections]]

~~Branch circuit wiring 600 V or less shall comply with the requirements in~~ ~~6.3.2.2.1.1~~ ~~through~~ ~~6.3.2.2.1.4~~ ~~.~~

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 11:09:56 EDT 2015

Committee Statement

Committee Statement: This section requires that branch circuit wiring in patient care rooms which is 600V or less must comply with the requirements of 6.3.2.2.1.1 to 6.3.2.2.1.4. Sections 6.3.2.2.1.2 (Category 1 Spaces), 6.3.2.2.1.3 (access to over current devices) and 6.3.2.2.1.4 (special purpose outlets) do not necessarily only apply to branch circuits in patient care rooms.

Response Message:

Public Input No. 480-NFPA 99-2015 [Section No. 6.3.2.2.1 [Excluding any Sub-Sections]]

First Revision No. 7-NFPA 99-2015 [Section No. 6.3.2.2.1.1]

6.3.2.5* Circuits.

6.3.2.5.1

Normal branch circuits serving a patient bed location shall be fed from not more than one normal branch-circuit distribution panel.

6.3.2.5.2

Branch circuits serving a patient bed location shall be permitted to be fed from more than one critical branch-circuit distribution panel.

6.3.2.5.3

(A)

Only authorized personnel shall have access to overcurrent protective devices serving Category 1 and Category 2 spaces.

(B)

Overcurrent protective devices serving Category 1 and Category 2 spaces shall not be permitted to be located in public access spaces.

(C)

Where used in locations such as in Category 1 spaces, isolated power panels shall be permitted in those locations.

6.3.2.5.4

Low-voltage wiring shall comply with either of the following:

(1) Fixed systems of 30 V (dc or ac rms) or less shall be permitted to be ungrounded, provided that the insulation between each ungrounded conductor and the primary circuit, which is supplied from a conventionally grounded distribution system, is the same protection as required for the primary voltage.

(2) A grounded low-voltage system shall be permitted, provided that load currents are not carried in the grounding conductors.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 11:26:39 EDT 2015

Committee Statement

Committee Statement: The "when required" language does not seem to correspond to the "it shall be permitted" language. This is an attempt to clarify.

The separation of normal and EES circuits from each other, as required by NFPA 70 Article 700 and by NFPA 99, are clarified by these revisions to improve readability of the Code.

Response Message:

Public Input No. 441-NFPA 99-2015 [Section No. 6.3.2.2.1.1]

First Revision No. 8-NFPA 99-2015 [New Section after 6.3.2.2.1.2]

6.5.2

Category 2 spaces served by a Type 2 EES shall be served by circuits from an equipment branch panel(s) served from a single automatic transfer switch and a minimum of one circuit served by the normal power distribution system or by a system originating from a second equipment branch automatic transfer switch.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 11:33:13 EDT 2015

Committee Statement

Committee Statement: This requirement is necessary to adequately define the circuit arrangement in a Category 2 Space served by a Type 2 EES. This requirement is identical to the requirements of 6.3.2.2.1.2 except for replacing ‘critical’ with ‘equipment’ in accordance with the requirements of 6.5.2.2.3.4(C). If a Category 2 Space is served by a Type 1 EES, it is still intended that these circuits be connected to the critical branch.

Response Message:

Public Input No. 523-NFPA 99-2015 [New Section after 6.3.2.2.1.3]

First Revision No. 31-NFPA 99-2015 [Section No. 6.3.2.2.2.2]

6.3.2.6.1.2 Reliability of Grounding.

The equipment grounding conductors shall conform to *NFPA 70.* Branch circuits serving electrical equipment within the patient care vicinity shall be provided with effective ground-fault current paths dual-fed by a wiring method that qualifies as an equipment grounding conductor and by an insulated copper equipment grounding conductor.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:42:29 EDT 2015

Committee Statement

Committee Statement: The inclusion of this performance requirement is intended to provide clarification as to the objective of 6.3.2.2.7.1.
Response Message:

Public Input No. 315-NFPA 99-2015 [Section No. 6.3.2.2.2.2]

First Revision No. 30-NFPA 99-2015 [Section No. 6.3.2.2.2.4]

6.3.2.6.1.4 Grounding of Receptacles and Fixed Electrical Equipment in Patient Care Spaces.

(A) Wiring Methods.

All branch circuits serving patient care spaces shall be provided with an effective ground-fault current path by installation in a metal raceway system, or a cable having a metallic armor or sheath assembly. The metal raceway system, or metallic cable armor, or sheath assembly shall itself qualify as an equipment grounding conductor.

(B) Insulated Equipment Grounding Conductors and Insulated Equipment Bonding Jumpers.

The following shall be directly connected to an insulated copper equipment grounding conductor that is clearly identified along its entire length by green insulation, with no yellow stripes, and installed with the branch circuit conductors in the wiring methods as provided in 6.3.2.6.1.4(A):

(1) The grounding terminals of all receptacles other than isolated ground receptacles.

(2) Where receptacles are mounted in metal receptacle outlet boxes, metal device boxes, or metal enclosures, the performance of the connection between the receptacle grounding terminal and the metal box or enclosure shall be equivalent to the performance provided by copper wire sized in accordance with 250.146 and Table 250.122 of *NFPA 70*, but no smaller than 12 AWG.

(3) All non-current-carrying conductive surfaces of fixed electrical equipment likely to become energized and subject to personal contact, operating at over 100 volts.

(4) Metal faceplates, which shall be connected to the equipment grounding conductor by means of a metal mounting screw(s) securing the faceplate to a grounded outlet box or grounded wiring device.

(5) Luminaires more than 2.3 m (7½ ft) above the floor and switches located outside of the patient care vicinity, which shall be permitted to be connected to an equipment grounding return path complying with 6.3.2.6.1.4(A) and 6.3.2.6.1.4(B).

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:39:17 EDT 2015

Committee Statement

Committee Statement: This revision correlates NFPA 99 with Section 517.13 of NFPA 70, National Electrical Code®. Clarification will assist and provide direction for design, installation, inspection, and maintenance requirements for receptacle grounding in patent care spaces.

Conductor color requirements for the Equipment Grounding Conductor using and insulated conductor of green is added to provide clear and distinct installation requirements for the Isolated Equipment Grounding Conductor associated with the revised PI in 6.3.2.2.7.1.

Metal faceplates are required by Section 406.6(B) of NFPA 70, National Electrical Code® to be grounded. This is not permissively optional.

An equipment bonding jumper (or its equivalent, a listed self-grounding contact device or direct

metal-to-metal contact with insulating screw-retention washers removed) is required by Section 250.146 of NFPA 70, National Electrical Code®. This is not permissively optional.

The revision to exclude isolated ground receptacles is essential to correlate with 6.3.2.2.7.1 as modified and to avoid defeating the isolated grounding of an IG receptacle by miswiring.

The term "metal receptacle boxes" is inconsistent with the term "metal outlet boxes" or "metal device boxes" used in the National Electrical Code® NFPA 70 (e.g., "Article 314 Outlet, Device, Pull, and Junction Boxes ...") and the Safety Standard UL 514A under which such metal outlet boxes (for receptacles) are evaluated.

Although 6.3.2.2.2.2 makes it clear that the equipment grounding conductor shall be sized in accordance with NEC® 250.122 and Table 250.122, as 6.3.2.2.2.4 is presently stated, however, it is ambiguous whether 6.3.2.2.2.4 permits equipment bonding jumpers to be sized as copper 12 AWG for 60A, 100A, and 200A receptacles rather than to be unequivocally equivalent to copper 10 AWG, 8 AWG, or 6 AWG, respectively, in accordance with the minimum sizes of NEC® 250.146 and Table 250.122.

Response Message:

Public Input No. 394-NFPA 99-2015 [Section No. 6.3.2.2.2.4]

Public Input No. 110-NFPA 99-2015 [Section No. 6.3.2.2.2.4]

First Revision No. 9-NFPA 99-2015 [Section No. 6.3.2.2.6]

6.3.2.2 Receptacles.

6.3.2.2.1* Types of Receptacles.

(A)

Each receptacle shall provide at least one separate, grounding terminal capable of maintaining low-contact resistance with its mating plug, despite severe electrical and mechanical use of the receptacle. The grounding terminal of each receptacle shall be connected to the reference grounding point by means of an insulated copper equipment grounding conductor.

(B)

Special receptacles, such as the following, shall be permitted:

(1) Four-pole units providing an extra pole for redundant grounding or ground continuity monitoring

(2) Locking-type receptacles

(C)

All non-locking-type, 125-volt, 15- or 20-ampere single, duplex, or quadruplex type receptacles, or any combination thereof, located in operating rooms and at patient bed locations in Category 1 spaces shall be listed and identified as hospital grade.

Global FR-113

(D)

Receptacles that are located within patient rooms, bathrooms, playrooms, and activity rooms of pediatric units or spaces with similar risk as determined by the health care facility's governing body by conducting a risk assessment, other than infant nurseries, shall be listed and identified as "tamper resistant" or shall employ a listed tamper-resistant cover.

6.3.2.2.2 Minimum Number of Receptacles.

The number of receptacles shall be determined by the intended use of the spaces in accordance with 6.3.2.2.2(A) through 6.3.2.2.2(E).

(A) Receptacles Serving Patient Bed Locations in Category 2 Spaces.

Each patient bed location shall be provided with a minimum of eight non-locking-type, 125-volt, 15- or 20-ampere receptacles. They shall be permitted to be of the single, duplex, or quadruplex type, or any combination of the three. Other receptacles (e.g., portable X-ray receptacles) serving special-purpose, cord-and-plug-connected equipment shall be permitted to be of the locking or non-locking- type.

(B) Receptacles Serving Patient Bed Locations in Category 1 Spaces Other than Operating Rooms.

Each patient bed location shall be provided with a minimum of 14 non-locking-type, 125-volt, 15- or 20-ampere receptacles. They shall be permitted to be of the single, duplex, or quadruplex type, or any combination of the three. Other receptacles (e.g., portable X-ray receptacles) serving special-purpose, cord-and-plug-connected equipment shall be permitted to be of the locking or non-locking-type

(C) Receptacles in Operating Rooms.

Each operating rooms shall be provided with a minimum of 36 125-volt, 15- or 20-ampere receptacles, at least 12 of which shall be connected to either the normal branch circuit or a critical branch circuit supplied by a different transfer switch other than the receptacles at the same location. They shall be permitted to be of the single, duplex, or quadruplex type, or any combination of the three. Other receptacles (e.g., portable X-ray receptacles) serving special-purpose, cord-and-plug-connected equipment shall be permitted to be of the locking or non-locking-type.

(D) Receptacles in Bathrooms or Toilet Rooms.

Receptacles shall not be required in bathrooms or toilet rooms.

(E) Receptacles for Special Rooms.

Receptacles shall not be required in rooms where medical requirements mandate otherwise (e.g., certain psychiatric, pediatric, or hydrotherapy rooms).

6.3.2.2.3 Polarity of Receptacles.

Each receptacle shall be wired in accordance with *NFPA 70* to ensure correct polarity.

6.3.2.2.4 Other Services Receptacles.

Receptacles provided for other services having different voltages, frequencies, or types on the same premises shall be of such design that attachment plugs and caps used in such receptacles cannot be connected to circuits of a different voltage, frequency, or type, but shall be interchangeable within each classification and rating required for two-wire, 125-V, single-phase ac service.

6.3.2.2.5* Use of Isolated Ground Receptacles.

(A)

An isolated ground receptacle, if used, shall not defeat the purposes of the safety features of the grounding systems detailed in 6.3.2.9.4.

(B)

An isolated ground receptacle shall not be installed within a patient care vicinity.

(C)

Isolated grounding receptacles installed in branch circuits for patient care spaces shall be connected to an insulated equipment grounding conductor in accordance with , 250.146(D) of *NFPA 70* in addition to the two equipment grounding conductor paths required in 6.3.2.6.1.4.

(D)

The equipment grounding conductor installed for isolated grounding receptacles in patient care areas shall be clearly identified using green insulation with one or more yellow stripes along its entire length.

6.3.2.2.6 Special-Purpose Outlets.

Branch circuits serving only special-purpose outlets or receptacles (e.g., portable X-ray receptacles) shall not be required to conform to the requirements of 6.4.3.

6.3.2.2.7 Clinical Laboratories.

Outlets with two to four receptacles, or an equivalent multioutlet assembly, shall be installed every 0.5 m to 1.0 m (1.6 ft to 3.3 ft) in instrument usage areas, and either installation shall be at least 80 mm (3.15 in.) above the countertop.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 14:15:49 EDT 2015

Committee Statement

Committee Statement: Many of the requirements of 6.3.2.2.6.2 relate to TYPES of receptacles rather than MINIMUM NUMBERS. This revision also removes redundant language from the final sentence of 6.3.2.2.6.2(A) for Category 1 spaces and relocates the similar requirement from Category 2 spaces and operating rooms in the final sentences of 6.3.2.2.6.2(B) and (C). References to receptacles being listed as “hospital grade” in those sections have been relocated for clarity to the code users. Similarly, 6.3.2.2.6.2(F) for tamper-resistant receptacles has been relocated to 6.3.2.2.6.1.

The requirements for Hospital Grade receptacles in UL Standard UL 498, Attachment Plugs and Receptacles, Supplement SD are inherently limited by their nature to 125- and 250-volt, 15- and 20-ampere, NONLOCKING-type receptacles and CANNOT be applied to receptacles of the locking type. The Scope of UL 498, Attachment Plugs and Receptacles, Supplement SD, reads:

“SD1.1 The requirements of this supplement cover Hospital Grade attachment plugs, cord connectors, and receptacles, intended for hospital use in other than hazardous locations in accordance with Article 517 of the National Electrical Code, ANSI/NFPA 70. THEY ARE APPLICABLE ONLY TO NONLOCKING-TYPE DEVICES OF THE 5-15, 6-15, 5-20, AND 6-20 CONFIGURATIONS. Receptacles shall be intended only for flush installation, and plugs and connectors shall be either of the straight type (flexible cord exits at the rear of the device) or angled type (cord exits at an angle to the major plug axis) intended for field assembly on flexible cord.” [Emphasis added. NEMA Standard WD6 receptacle configuration designations "5-15, 6-15, 5-20, and 6-20" refer to the dimensional configurations for grounding-type, single-phase (i.e., 2-pole, 3-wire), 15- and 20-ampere, 125- and 250-volt, NONLOCKING-type receptacles.]

Consequently, the requirements must state that the REQUIRED receptacles are limited to 125-volt, 15- or 20-ampere, NONLOCKING-type receptacles that are listed Hospital Grade. The intent was to set requirements for the REQUIRED quantity of hospital grade receptacles and to permit separately that any other receptacles beyond those minimum numbers to be either of the nonlocking or locking type for design flexibility for specialized cord-and-plug-connected equipment.

Furthermore, inclusion of locking-type receptacles in 6.3.2.2.6.2(B) that inherently cannot be listed Hospital Grade represents a correlation conflict with the requirements of 6.3.2.2.6.1(C) that limit receptacles at patient bed locations in Category 1 to listed hospital grade.

Response Message:

Public Input No. 484-NFPA 99-2015 [Section No. 6.3.2.2.6.3]

Public Input No. 163-NFPA 99-2015 [Section No. 6.3.2.2.6.2(F)]

Public Input No. 481-NFPA 99-2015 [Section No. 6.3.2.2.6.2]

Public Input No. 511-NFPA 99-2015 [Section No. 6.3.2.2.6]

Public Input No. 499-NFPA 99-2015 [Section No. 6.3.2.2.6.1(B)]

Public Input No. 16-NFPA 99-2015 [Section No. 6.3.2.2.6.2]

Public Input No. 17-NFPA 99-2015 [Section No. 6.3.2.2.6.2(F)]

Public Input No. 460-NFPA 99-2015 [Section No. 6.3.2.2.6.2(B)]

Public Input No. 463-NFPA 99-2015 [Section No. 6.3.2.2.6.2(F)]

Public Input No. 392-NFPA 99-2015 [Section No. 6.3.2.2.7.1]

First Revision No. 10-NFPA 99-2015 [New Section after 6.3.2.2.8.4]

6.3.2.3.5

If the risk assessment conducted by the governing body, as defined in Chapter 3 , determines that the operating room is not a wet procedure location, then the special protection of 6.3.2.3 shall not be required.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 15:31:54 EDT 2015

Committee Statement

Committee Statement: This revision is intended to clarify that if the risk assessment conducted by the governing body should be the final determination as to the applicability of wet procedure locations in ORs.
Response Message:

First Revision No. 11-NFPA 99-2015 [Section No. 6.3.2.2.10.1]

6.4.1

Category 1 spaces shall be served by a Type 1 EES.

6.4.2

Category 1 spaces shall not be served by a Type 2 EES.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 15:53:47 EDT 2015

Committee Statement

Committee Statement: The revision of this requirements clarifies the allowance of normal circuits to serve Category I spaces as described in 6.3.2.2.1.2. The word “only” in 6.3.2.2.10.1 could be misinterpreted to conflict with 6.3.2.2.1.2.

A new 6.3.2.2.10.2 was added to make it clear that a Category 1 space cannot be served by a Type 2 EES.

Response Message:

Public Input No. 476-NFPA 99-2015 [Section No. 6.3.2.2.10.1]

First Revision No. 12-NFPA 99-2015 [Section No. 6.3.2.2.11.3]

6.3.2.7.3

The sensor for units shall be wired to the unswitched portion of branch circuit(s) serving general lighting within the room.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 15:56:11 EDT 2015

Committee Statement

Committee Statement: The addition of the term “unswitched” removes any confusion a code user may have concerning the applicability of this provision.
Response Message:

Public Input No. 375-NFPA 99-2015 [Section No. 6.3.2.2.11.3]

First Revision No. 13-NFPA 99-2015 [Section No. 6.3.2.3]

6.3.2.2.7 Clinical Laboratories.

Outlets with two to four receptacles, or an equivalent multioutlet assembly, shall be installed every 0.5 m to 1.0 m (1.6 ft to 3.3 ft) in instrument usage areas, and either installation shall be at least 80 mm (3.15 in.) above the countertop.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:02:31 EDT 2015

Committee Statement

Committee Statement: The term “power strip” may be mistaken for a temporary, off the shelf, male cord cap multiple outlet assemblies. The term “multioutlet assembly” is more accurate, and defined in Article 100, and detailed in Article 380 of NFPA 70 National Electrical Code.

This revision of the title for this section introduces a delineation between standard laboratories and clinical laboratories. The latter is an important function of a health care facility and as such the performance of the electrical systems should be included in this chapter.

Response Message:

Public Input No. 477-NFPA 99-2015 [Section No. 6.3.2.3]

Public Input No. 371-NFPA 99-2015 [Section No. 6.3.2.3]

First Revision No. 14-NFPA 99-2015 [Section No. 6.3.2.5.1]

6.3.2.9.1 Applicability.

The requirements of 6.3.2.9.2 shall apply to health care facilities housing Category 1 spaces or utilizing life-support equipment and buildings that provide essential utilities or services for the operation of Category 1 spaces or electrical life-support equipment.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:04:07 EDT 2015

Committee Statement

Committee Statement: Revised wording correlates with terminology used throughout the chapter.
Response Message:

Public Input No. 522-NFPA 99-2015 [Section No. 6.3.2.5.1]

First Revision No. 15-NFPA 99-2015 [Section No. 6.3.3.1.3.2]

6.3.3.1.3.2

The voltage measurements shall be made with an accuracy of ± 5 percent.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:09:28 EDT 2015

Committee Statement

Committee Statement: Modern measuring instruments are much more accurate than those in the past, this change acknowledges technological progress.
Response Message:

Public Input No. 365-NFPA 99-2015 [Section No. 6.3.3.1.3.2]

First Revision No. 16-NFPA 99-2015 [Section No. 6.3.3.1.4 [Excluding any Sub-Sections]]

The impedance measurement shall be made with an accuracy of ± 5 percent.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:10:26 EDT 2015

Committee Statement

Committee Statement: Modern measuring instruments are much more accurate than those in the past, this change acknowledges technological progress.
Response Message:

Public Input No. 361-NFPA 99-2015 [Section No. 6.3.3.1.4 [Excluding any Sub-Sections]]

First Revision No. 17-NFPA 99-2015 [Section No. 6.4.1.1.3]

6.7.5.1.5

Generator load-shed circuits designed for the purpose of load reduction or for load priority systems shall not shed life safety branch loads, critical branch loads serving Category 1 spaces, medical air compressors, medical–surgical vacuum pumps, fire pumps, the pressure maintenance (i.e., jockey) pump(s) for water-based fire protection systems, generator fuel pumps, or other generator accessories.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:19:07 EDT 2015

Committee Statement

Committee Statement: Definition for Critical Care Area is covered in NFPA 99: 3.3.137 Patient Care Space and is designated as Category 1 Space. Any references in NFPA 99 to “Critical Care Area” should be changed to “Category 1 Space”.

Response Message:

Public Input No. 374-NFPA 99-2015 [Section No. 6.4.1.1.3]

First Revision No. 18-NFPA 99-2015 [Section No. 6.4.1.1.6.2]

~~6.4.1.1.6.2~~

~~Type 3 essential electrical system power sources shall be classified as Type 10, Class X, Level 2 generator sets per~~ NFPA 110 ~~,~~ ~~*Standard for Emergency and Standby Power Systems*~~ ~~.~~

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:26:20 EDT 2015

Committee Statement

Committee Statement: This section includes requirements for type 3 EES Generator sets. Since type 3 has been deleted this is no longer needed.
Response Message:

Public Input No. 503-NFPA 99-2015 [Section No. 6.4.1.1.6.2]

First Revision No. 19-NFPA 99-2015 [Section No. 6.4.1.1.7]

6.7.1.4 Fuel Cell Systems.

Fuel cell systems shall be permitted to serve as the alternate source for all or part of an essential electrical system, provided the conditions in 6.7.1.4.1 through 6.7.1.4.6 apply.

6.7.1.4.1

Installation shall comply with NFPA 853.

6.7.1.4.2

N+1 units shall be provided where N units have sufficient capacity to supply the demand load of the portion of the system served.

6.7.1.4.3*

Systems shall be able to assume loads within 10 seconds of loss of normal power source.

6.7.1.4.4

Systems shall have a continuing source of fuel supply, together with sufficient on-site fuel storage for the essential system type.

6.7.1.4.5

Where life safety and critical portions of the distribution system are present, a connection shall be provided for a portable diesel generator.

6.7.1.4.6

Systems shall be listed for emergency use.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:28:46 EDT 2015

Committee Statement

Committee Statement: This revision moves the requirements outlined in this section to fall under “Sources”. The requirements for fuel cells belong under the sources section not under “on-site generator”.

The final provision has been added because when fuel cell systems are used as an alternate source for an essential electrical systems, they should be held to the same listing standards as other approved equipment and systems.

Response Message:

Public Input No. 360-NFPA 99-2015 [New Section after 6.4.1.1.7.5]

Public Input No. 513-NFPA 99-2015 [Section No. 6.4.1.1.7]

First Revision No. 20-NFPA 99-2015 [Section No. 6.4.1.1.18.2]

6.7.1.2.15.4

For Level 1 EPS, at a minimum, local annunciation and facility remote annunciation, or local annunciation and network remote annunciation shall be provided.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:33:20 EDT 2015

Committee Statement

Committee Statement: This section still references level 2 EPS which is no longer valid given the deletion of the type 3 EES requirements.
Response Message:

Public Input No. 505-NFPA 99-2015 [Section No. 6.4.1.1.18.2]

First Revision No. 21-NFPA 99-2015 [Section No. 6.4.1.2]

6.7.1.3 Battery.

Battery systems shall meet all requirements of NFPA 111.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:33:43 EDT 2015

Committee Statement

Committee Statement: This section conflicted with the requirements of section 6.4.2.2.1.5 which states;

"For the purposes of this code, the provisions for emergency systems in Article 700 of NFPA 70, National Electrical Code, shall be applied only to the life safety branch."

The appropriate reference standard is NFPA 111, which has been added to this section.

Response Message:

Public Input No. 415-NFPA 99-2015 [Section No. 6.4.1.2]

First Revision No. 22-NFPA 99-2015 [Section No. 6.4.2.1.5.10]

~~**6.4.2.1.5.10** Engine Generator Exercising Timer.~~

~~A program timing device shall be provided to exercise the EPS as described in Chapter 8 of NFPA 110 . [**110:** 6.2.11]~~

~~**(A)**~~

~~Transfer switches shall transfer the connected load to the EPS and immediately return to primary power automatically in case of the EPS failure. [**110:** 6.2.11.1]~~

~~**(B)**~~

~~Exercising timers shall be permitted to be located at the engine control panel in lieu of in the transfer switches. [**110:** 6.2.11.2]~~

~~**(C)**~~

~~A program timing device shall not be required in health care facilities that provide scheduled testing in accordance with NFPA 99 , *Health Care Facilities Code* . [**110:** 6.2.11.3]~~

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 16:47:58 EDT 2015

Committee Statement

Committee Statement: This section is not required for the following reasons:

1. The requirements outlined in 6.4.2.1.5.10 is in conflict with subparagraph (C).

2. The requirements outlined in item (A) are addressed in 6.4.3.2.7.

3. Deleting this section will still allow health care facilities to omit engine exercising timers on automatic transfer switches

Response Message:

Public Input No. 509-NFPA 99-2015 [Section No. 6.4.2.1.5.10]

First Revision No. 23-NFPA 99-2015 [Section No. 6.4.2.2.3.2]

6.7.5.1.2.4

The life safety branch shall supply power as follows:

(1) Illumination of means of egress in accordance with NFPA *101*

(2) Exit signs and exit directional signs in accordance with NFPA *101*

(3)* Communications systems, where used for issuing instruction during emergency conditions

(4) Generator set location as follows:

(a) Task illumination

(b) Battery charger for emergency battery-powered lighting unit(s)

(c) Select receptacles at the generator set location and essential electrical system transfer switch locations

(5) Elevator cab lighting, control, communications, and signal systems

(6) Electrically powered doors used for building egress

(7) Fire alarms and auxiliary functions of fire alarm combination systems complying with *NFPA 72*

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:05:37 EDT 2015

Committee Statement

Committee Statement: Deleting the word hospital makes the wording consistent with type 2 EES 6.5.2.2.2.1 (4).
Response Message:

Public Input No. 502-NFPA 99-2015 [Section No. 6.4.2.2.3.2]

First Revision No. 33-NFPA 99-2015 [Section No. 6.4.2.2.4.2]

6.7.5.1.3.2

The critical branch, or a dual-fed scheme including the critical branch shall supply power for task illumination, fixed equipment, select receptacles, and select power circuits serving the following spaces and functions related to patient care:

(1) Category 1 spaces where deep sedation or general anesthesia is administered, task illumination, select receptacles, and fixed equipment

(2) Task illumination and select receptacles in the following:

- (a) Patient care spaces, including infant nurseries, selected acute nursing areas, psychiatric bed areas (omit receptacles), and ward treatment rooms
- (b) Medication preparation spaces
- (c) Pharmacy dispensing spaces
- (d) Nurses' stations —unless adequately lighted by corridor luminaires

(3) Additional specialized patient care task illumination and receptacles, where needed

(4) Nurse call systems

(5) Blood, bone, and tissue banks

(6)* Telecommunications entrance facility, telecommunications equipment rooms, and telecommunication rooms and equipment in these rooms.

(7) Task illumination, select receptacles, and select power circuits for the following areas:

- (a) Category 1 or 2 spaces with at least one duplex receptacle per patient bed location, and task illumination as required by the governing body of the health care facility
- (b) Angiographic labs
- (c) Cardiac catheterization labs
- (d) Coronary care units
- (e) Hemodialysis rooms or areas
- (f) Emergency room treatment areas (select)
- (g) Human physiology labs
- (h) Intensive care units
- (i) Postoperative recovery rooms (select)

(8) Clinical IT-network equipment

(9) Wireless phone and paging equipment for clinical staff communications

(10) Additional task illumination, receptacles, and select power circuits needed for effective facility operation, including single-phase fractional horsepower motors, which are permitted to be connected to the critical branch

Supplemental Information

File Name	Description
FR_33_Critical_Branch_Revisions.docx	

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 04 08:22:37 EDT 2015

Committee Statement

Committee Statement: Item (1) was revised to used consistent terminology, acknowleding that the term "critical care areas" has been replaced with "Category 1 spaces." Specific levels of sedation have also been added to this item to be consistent with the use in the rest of the code.

Item (2) was deleted because it is not necessary to place all isolated power systems on the critical care branch in all instances. Other sections may require some of the components served by an IPS to be on the critical branch which will then drive the inclusion of it.

Item (7) was revised to match the terminology in Chapter 7 and therefore include much more than what it was limited to in just referring to telephone equipment rooms and closets.

Item (8)(a) was revised to use consistent terminology with the rest of the chapter/code.

Items (9) and (10) were added based on the additions of these important IT and Communication equipment to Chapter 7.

Response Message:

Public Input No. 285-NFPA 99-2015 [Section No. 6.4.2.2.4.2]

Public Input No. 485-NFPA 99-2015 [Section No. 6.4.2.2.4.2]

Public Input No. 363-NFPA 99-2015 [Section No. 6.4.2.2.4.2]

Public Input No. 483-NFPA 99-2015 [Section No. 6.4.2.2.4.2]

Public Input No. 495-NFPA 99-2015 [Section No. 6.4.2.2.4.2]

First Revision No. 24-NFPA 99-2015 [Section No. 6.4.2.2.6.2(A)]

~~(A)~~

~~The number of receptacles on a single branch circuit for areas described in 6.4.2.2.4.2(8) shall be minimized to limit the effects of a branch-circuit outage.~~

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:13:51 EDT 2015

Committee Statement

Committee Statement: The requirement to “minimize” the number of receptacles is not quantified and therefore is unenforceable language.
Response Message:

Public Input No. 492-NFPA 99-2015 [Section No. 6.4.2.2.6.2(A)]

First Revision No. 25-NFPA 99-2015 [Section No. 6.4.3.2.7]

6.7.2.2.5.14 Retransfer.

If the emergency power source fails during a test, provisions shall be made to immediately retransfer to the normal source.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:21:01 EDT 2015

Committee Statement

Committee Statement: This requirement describes a performance feature required for automatic transfer switches and as such is more appropriate to be included under 6.4.2.1.5 “Automatic Transfer Switch Features” rather than under

Response Message:

Public Input No. 489-NFPA 99-2015 [Section No. 6.4.3.2.7]

First Revision No. 26-NFPA 99-2015 [Section No. 6.4.4.1.1]

6.7.4.1.1 Maintenance and Testing of Alternate Power Source, Transfer Switches, and Associated Equipment.

6.7.4.1.1.1 Maintenance of Alternate Power Source.

The generator set or other alternate power source and associated equipment, including all appurtenance parts, shall be so maintained as to be capable of supplying service within the shortest time practicable and within the 10-second interval specified in 6.7.1.2.8 and 6.7.5.3.1.

6.7.4.1.1.2

The 10-second criterion shall not apply during the monthly testing of an essential electrical system. If the 10-second criterion is not met during the monthly test, a process shall be provided to annually confirm the capability of the life safety and critical branches to comply with 6.7.5.3.1.

6.7.4.1.1.3

Maintenance shall be performed in accordance with Chapter 8 of NFPA 110.

6.7.4.1.1.4

Maintenance of the electrical equipment for the life safety branch, critical branch, and equipment branch shall be maintained in accordance with the manufacturer's instructions and preventative maintenance programs.

6.7.4.1.1.5 Inspection and Testing.

Criteria, conditions, and personnel requirements shall be in accordance with 6.7.4.1.1.5(A) through 6.7.4.1.1.5(C).

(A)* Test Criteria.

Generator sets shall be tested 12 times a year, with testing intervals of not less than 20 days nor more than 40 days. Generator sets serving essential electrical systems shall be tested in accordance with Chapter 8 of NFPA 110.

(B) Test Conditions.

The scheduled test under load conditions shall include a complete simulated cold start and appropriate automatic and manual transfer of all essential electrical system loads.

(C) Test Personnel.

The scheduled tests shall be conducted by qualified personnel to keep the machines ready to function and, in addition, serve to detect causes of malfunction and to train personnel in operating procedures.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:22:29 EDT 2015

Committee Statement

Committee Statement: NFPA 110 Scope 1.1.1 only covers from the Level 1 and Level 2 power sources to the loadside terminals of the transfer equipment. Proper maintenance of the electrical equipment on the

loadside of the transfer equipment is equally important.

Response Message:

Public Input No. 461-NFPA 99-2015 [Section No. 6.4.4.1.1]

First Revision No. 27-NFPA 99-2015 [Section No. 6.4.4.1.2.1]

6.7.4.1.2.1* Circuit Breakers.

Main and feeder circuit breakers shall be inspected annually and maintained in accordance with the manufacturer's instructions and industry standards. A program for periodically exercising the components shall be established according to the manufacturer's instructions.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:31:10 EDT 2015

Committee Statement

Committee Statement: Maintenance should be required according to the manufacturer's instructions or industry standards.
Response Message:

Public Input No. 466-NFPA 99-2015 [Section No. 6.4.4.1.2.1]

First Revision No. 28-NFPA 99-2015 [Section No. 6.5.2.2.1.3]

6.7.6.2.2.3

Each branch of the essential electrical system shall have one or more transfer switches.

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:32:28 EDT 2015

Committee Statement

Committee Statement: This revision places this requirement before 6.5.2.2.1.6. These two sections need to be consecutive as the contain requirements relating to the number and topology of automatic transfer switches.

Response Message:

Public Input No. 524-NFPA 99-2015 [Section No. 6.5.2.2.1.3]

First Revision No. 29-NFPA 99-2015 [Section No. 6.5.2.2.2.1]

(C)

The life safety branch shall supply power as follows:

(1) Illumination of means of egress in accordance with NFPA *101*

(2) Exit signs and exit directional signs in accordance with NFPA *101*

(3) Alarm and alerting systems, including the following:

(a) Fire alarms

(b) Alarms required for systems used for the piping of nonflammable medical gases as specified in Chapter 5

(4)* Communications systems, where used for issuing instructions during emergency conditions

(5) Task illumination and select receptacles at the generator set location

(6) Elevator cab lighting, control, communications, and signal systems

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 03 18:34:47 EDT 2015

Committee Statement

Committee Statement: This section contains performance requirements which are in conflict of the requirements of NFPA 101.
Response Message:

Public Input No. 504-NFPA 99-2015 [Section No. 6.5.2.2.2.1]

First Revision No. 41-NFPA 99-2015 [Section No. 6.5.2.2.3.3]

(D) Delayed-Automatic Connections to Equipment Branch.

The following equipment shall be permitted to be connected to the equipment branch and shall be arranged for delayed-automatic connection to the alternate power source:

(1) Task illumination and select receptacles in the following:

(a) Patient care spaces

(b) Medication preparation spaces

(c) Pharmacy dispensing spaces

(d) Nurses' stations — unless adequately lighted by corridor luminaires

(2) Supply, return, and exhaust ventilating systems for airborne infectious isolation rooms

(3) Sump pumps and other equipment required to operate for the safety of major apparatus and associated control systems and alarms

(4) Smoke control and stair pressurization systems

(5) Kitchen hood supply or exhaust systems, or both, if required to operate during a fire in or under the hood

(6) Nurse call systems

(7) HVAC systems serving the EF, TER, and TR

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 04 11:46:09 EDT 2015

Committee Statement

Committee Statement: This adds the correct location of these on EES.
Response Message:

First Revision No. 36-NFPA 99-2015 [Section No. 7.1]

7.1* Applicability.

This chapter shall apply to ~~information technology and communications systems in all~~ new health care facilities ~~that provide services to human beings.~~ as specified in Section 1.3 .

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 04 09:34:46 EDT 2015

Committee Statement

Committee Statement: This revision clarifies the application of Chapter 7 is meant to apply to new health care facilities. This language correlates with the related section in Chapter 6.
Response Message:

First Revision No. 35-NFPA 99-2015 [Section No. 7.3.1]

7.3.1 Information Technology and Communications Systems Infrastructure.

7.3.1.1 Premises Distribution System (Fiber and Copper).

7.3.1.1.1

Cables and installation shall be in compliance with *NFPA 70*~~, *National Electrical Code* ,~~ and TIA/EIA 568-B.

7.3.1.1.2

Distribution system cable labeling, record keeping, and alphanumeric schemes shall be in accordance with TIA/EIA 606-A B .

7.3.1.2* Telecommunications Systems' Spaces and Pathways.

7.3.1.2.1 Entrance Facility (EF).

7.3.1.2.1.1 General.

The ~~entrance facility (~~ EF~~)~~ location shall be permitted to be combined with the telecommunications equipment room (TER).

7.3.1.2.1.2

Not less than two physically separated service entrance pathways into this location shall be required.

7.3.1.2.1.3 Remote Primary Data Center.

In a facility where the primary data center is located remotely, two EFs and redundant telecommunications service entrances shall be provided.

~~(A)~~

~~In a facility where the primary data center is located remotely, two EFs and redundant telecommunications service entrances shall be provided.~~

~~(B)~~* ~~*~~

~~Electronic storage with a minimum capacity to store all inpatient records shall be provided at the building.~~

7.3.1.2.1.4 Location Requirements and Restrictions.

(A)

The EF shall be permitted to be located with the ~~telecommunications equipment room (TER)~~ TER .

(B)

Where the EF is combined with the TER, the space and electrical power and cabling shall be added to the TER to accommodate the telecommunications service provider's space and access requirements.

(C)*

The EF shall be dedicated to low-voltage communication systems.

(D)

Electrical equipment or fixtures (e.g., transformers, panelboards, conduit, wiring) that are not directly related to the support of the EF shall not be installed in or pass through the EF.

(E)

Mechanical equipment and fixtures (e.g., water or drainage piping of any kind, ductwork, pneumatic tubing) that are not directly related to the support of the EF shall not be installed in, pass through, or enter the EF.

~~(F)*~~

~~The EF shall be located not less than 3.66 m (12 ft) from any permanent source of electromagnetic interference.~~

(F)

The EF shall be located in an area not subject to flooding.

(G)

The EF shall be as close as practicable to the building communications service entrance point.

7.3.1.2.1.5 Working Space. (Reserved).

7.3.1.2.1.6 Security.

~~Access~~ Only authorized personnel shall have access to EFs ~~shall be restricted and controlled~~ .

7.3.1.2.1.7 Power Requirements.

(A)

Circuits serving the EF shall be dedicated to serving the EF.

(B)

Circuits serving equipment in the EF shall be connected to the critical branch of the essential electrical system.

(C)

A minimum of one duplex receptacle served from normal power shall be provided on one wall of the EF for service and maintenance.

7.3.1.2.1.8 Environmental Requirements.

(A)

Temperature and humidity in the EF shall be controlled in accordance with the manufacturer's equipment requirements.

(B)*

HVAC systems serving the EF shall be connected to the equipment branch of the essential electrical system.

(C)*

A positive- pressure differential with respect to surrounding areas shall be provided.

(D)

Sprinklers shall be provided with wire cages or shall be recessed to prevent accidental operation.

7.3.1.2.1.9 Other Requirements. (Reserved).

7.3.1.2.2 Telecommunications Equipment Room (TER).

Each facility shall have at least one TER space that meets the minimum requirements of this chapter.

7.3.1.2.2.1 General.

(A)

~~The telecommunications equipment room (TER)~~ The TER houses the main networking equipment and shall be permitted to also house application servers and data storage devices that serve the health care facility.

(B)

Central equipment for other communications systems shall be permitted to be housed in the TER.

7.3.1.2.2.2*

The ~~entrance facility (EF)~~ EF shall be permitted to be combined with the TER space.

7.3.1.2.2.3 Reserved.

7.3.1.2.2.4 Location Requirements and Restrictions.

(A)

Electrical equipment or fixtures (e.g., transformers, panelboards, conduit, wiring) that are not directly related to the support of the TER shall not be installed in, pass through, or enter the TER.

(B)

Any mechanical equipment or fixtures (e.g., water or drainage piping of any kind, ductwork, pneumatic tubing) not directly related to the support of the TER shall not be installed in, pass through, or enter the TER.

(C)

The TER shall be located in a nonsterile area of the facility.

(D)

In geographic areas prone to hurricanes or ~~tornados~~ tornadoes , the TER shall be located away from exterior curtain walls to prevent wind and water damage.

(E)*

The TER shall be located not less than 3.66 m (12 ft) from any permanent source of electromagnetic interference.

(F)

The TER shall be located or designed to avoid vibration from mechanical equipment or other sources.

7.3.1.2.2.5 Working Space.

Working space about communications cabinets, racks, or other equipment shall be in accordance with 110.26(A) of *NFPA 70*, ~~*National Electrical Code*~~ .

7.3.1.2.2.6 Security.

Access to the TER shall be restricted and controlled.

7.3.1.2.2.7 Power Requirements.

(A)

Circuits serving the TER and the equipment within the TER shall be dedicated to serving the TER.

~~**(B)**~~

~~Circuits serving fire alarms, medical gas alarms, elevator communications, and communications systems used for issuing instructions during emergency conditions (e.g., fire fighter's phone system) shall be connected to the life safety branch of the essential electrical system.~~

(B)

Circuits serving other communications equipment in the TER shall be connected to the essential electrical system.

(C)

A minimum of one duplex outlet shall be provided on each wall and shall be connected to normal power for service and maintenance.

~~**(E)**~~

~~Consideration shall be given to the reliability of power supply to the HVAC equipment because of its important function within the TER.~~

7.3.1.2.2.8 Environmental Requirements.

(A)

Temperature and humidity in the TER shall be controlled in accordance with the manufacturer's equipment requirements.

(B)

HVAC systems serving the TER shall be connected to the equipment branch of the essential electrical system.

(C)

A positive pressure differential with respect to surrounding areas shall be provided.

7.3.1.2.2.9 Other Requirements (Reserved).

7.3.1.2.3 Telecommunications Room (TR).

7.3.1.2.3.1 General.

A ~~telecommunications room (TR)~~ TR houses telecommunications equipment, cable terminations, and cross-connect cabling.

7.3.1.2.3.2

Sufficient TRs shall be provided so that any data or communications outlet in the building can be reached without exceeding 90 m (~~292~~ 295 ft) maximum pathway distance from the termination point in the TR to the outlet.

7.3.1.2.3.3 Reserved.

7.3.1.2.3.4 Location Requirements and Restrictions.

(A)

Switchboards, panelboards, transformers, and similar electrical equipment that are not directly related to the support of the TR shall not be installed in the TR.

(B)

Any mechanical equipment or fixtures (e.g., water or drainage piping of any kind, ductwork, pneumatic tubing) not directly related to the support of the TR shall not be installed in, pass through, or enter the TR.

(C)

In geographic areas prone to hurricanes or ~~tornados~~ tornadoes , TRs shall be located away from exterior curtain walls to prevent wind and water damage.

(D)*

The TR shall be located a minimum of 3.66 m (12 ft) from any permanent source of electromagnetic interference.

(E)

A minimum of one TR shall be on each floor of the facility.

(F)

A TR shall serve a maximum of 1858 m^2 (20,000 ft^2) of usable space on a single floor.

7.3.1.2.3.5 Working Space.

Working space about communications cabinets, racks, or other equipment shall be in accordance with 110.26(A) of *NFPA 70*, ~~*National Electrical Code*~~ .

7.3.1.2.3.6 Security.

Access to TRs shall be restricted and controlled.

7.3.1.2.3.7 Power Requirements.

(A)

Circuits serving the TR and the equipment within the TR shall be dedicated to serving the TR.

(B)

Circuits serving the TR shall be connected to the critical branch of the essential electrical system.

(C)

A minimum of one duplex receptacle shall be provided in each TR and shall be connected to normal power for service and maintenance.

7.3.1.2.3.8 Environmental Requirements.

(A)

Temperature and humidity in the TR shall be controlled in accordance with the manufacturer's equipment requirements.

(B)

Sprinklers shall be provided with wire cages or shall be recessed to prevent accidental discharge.

7.3.1.2.3.9 Other Requirements.

~~Dropped~~ Suspended ceilings shall not be ~~installed~~ required in the EF, TER, and TR.

7.3.1.2.4 Cabling Pathways and Raceway Requirements.

7.3.1.2.4.1 Backbone Distribution.

Redundant pathways shall be provided between the EF and TER.

7.3.1.2.4.2

Conduits shall be provided for cabling in inaccessible ceiling spaces.

7.3.1.2.5 Outside Plant (OSP) Infrastructure.

7.3.1.2.5.1 General.

~~Outside plant (OSP)~~ OSP infrastructure shall consist of the conduits, vaults, and other pathways and cabling used to connect buildings on a campus and to provide services from off-campus service providers.

7.3.1.2.5.2 Pathways.

(A)

Dual telecommunications service entrance pathways shall be provided to the ~~TEF~~ EF.

(B)

Service entrance pathways shall be a minimum of 6.1 m (20 ft) apart.

(C)

Underground conduits for technology systems shall be a minimum of 0.61 m (2 ft) from underground steam and water piping if crossing perpendicularly, and a minimum of 1.83 m (6 ft) if parallel.

(D)

Underground conduits for technology systems shall be a minimum of 0.61 m (2 ft) below grade.

7.3.1.3 Antennas. (Reserved)

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
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Submittal Date: Tue Aug 04 09:33:45 EDT 2015

Committee Statement

Committee Statement: The reference in 7.3.1.1.2 was updated to the most current.

Section 7.3.1.2.1.3(B) was deleted because requirements for medical record storage are not within the purview of this document.

Section 7.3.1.2.1.4(F) was deleted because the requirement was not enforceable because it failed to quantify the field strength level of electromagnetic interference.

Section 7.3.1.2.1.6 was revised to be less subjective and to better indicate what the committee was looking for to restrict access.

Section 7.3.1.2.2.7(B) was deleted because the requirements are sufficiently addressed within Chapter 6 are not within the scope of this chapter.

Section 7.3.1.2.2.7(E) was deleted because the requirement to give “consideration to the reliability of power” is not quantifiable and therefore is unenforceable language.

The conversion into ft was corrected in Section 7.3.1.2.3.2.

Section 7.3.1.2.3.9 was revised to include both the EF and TER in addition to the TR and to make the installation of drop ceilings a design option rather than outright prohibiting them.

Reference was made to the correct term in Section 7.3.1.2.5.2(A).

Response Message:

Public Input No. 437-NFPA 99-2015 [Section No. 7.3.1.2.1.6]

Public Input No. 516-NFPA 99-2015 [Section No. 7.3.1.2.2.7(E)]

Public Input No. 351-NFPA 99-2015 [Section No. 7.3.1.1.2]

Public Input No. 517-NFPA 99-2015 [Section No. 7.3.1.2.1.3(B)]

Public Input No. 515-NFPA 99-2015 [Section No. 7.3.1.2.3.9]

Public Input No. 519-NFPA 99-2015 [Section No. 7.3.1.2.2.7(B)]

Public Input No. 439-NFPA 99-2015 [Section No. 7.3.1.2.5.2(A)]

Public Input No. 352-NFPA 99-2015 [Section No. 7.3.1.2.3.2]

Public Input No. 518-NFPA 99-2015 [Section No. 7.3.1.2.1.4(F)]

First Revision No. 37-NFPA 99-2015 [Section No. 7.3.3.5]

7.3.3.5 Wireless Phone and Paging Integration. ~~(Reserved)~~

7.3.3.5.1

Wireless phone and paging systems that are used for enhanced clinical staff communications and that can be integrated with the nurse call system or with a shared interoperable clinical IT network shall provide listed electrical safety and FCC certifications that are appropriate for the intended use.

7.3.3.5.2*

Wireless phone and paging systems that are used for enhanced clinical staff communications and notification of nurse call events or interoperable clinical alarm events shall be managed and controlled as described in 7.3.3.7.1 .

Supplemental Information

File Name	Description
FR_37_Annex_Material.docx	

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
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State:
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Submittal Date: Tue Aug 04 10:20:59 EDT 2015

Committee Statement

Committee Statement: There is a need for the NFPA 99 code to establish and define the infrastructure requirements for a clinical IT-network, which is dedicated for use by clinicians and patients. Such a network comprises the servers, switches, routers (etc.) and voice and data communications equipment which are used to transport clinical data and information over a shared IT network infrastructure. Defining the requirements for a Clinical IT network in the NFPA 99 Code will ensure patient and staff safety, safe system operation, overall system effectiveness, and data and system security of personal information and clinical use data which can be transported on the clinical IT network.

Response Message:

Public Input No. 288-NFPA 99-2015 [Section No. 7.3.3.5]

FR 37 Annex Material

A.7.3.3.5.2 Currently, no standard exist for the certification of a wireless communication system having the specific intended use as a clinical alarm communication and notification system. While desirable for enhancing clinical communications and optimizing clinical workflow, these types of communication systems have inherent reliability limitations. For example, there is no notification at a wireless pager when it is out of range for receiving messages and there is no alert at the central station that the communication device is unreachable or return confirmation that a message has been delivered or received.

A document with information on how to manage and control is ANSI-AAMI-IEC 80001-1 *Application of risk management for IT-networks incorporating medical devices -- Part 1: Roles, responsibilities and activities*.

There may be manufacturers of FDA cleared medical equipment which can have wireless communication capabilities and which might be FDA cleared for a specific intended use. Such medical equipment would typically be certified to one or more ANSI-AAMI-IEC 60601 standards (e.g., 60601-1-1 *General requirements for safety*; 60601-1-2 *Collateral standard for electromagnetic disturbances*; 60601-1-8 *Collateral standard for alarm systems*; etc.)

The responsible organization may also contract with a provider of communication equipment to integrate a wireless communication system with nurse call system or with the clinical IT-network for the purposes of enhanced clinical staff communications. However, such an integration would not be listed to any governing standard.

Therefore, when a wireless communication system is integrated with the clinical IT-network and used as a clinical alarm notification or enhanced communication system, it is necessary for the responsible organization to follow and enact the risk management requirements established in ANSI-AAMI-IEC TIR 80001-1 *Application of risk management for IT-networks incorporating medical devices -- Part 1: Roles, responsibilities and activities*.

Further in this context, the end-to-end system integration and its management need to also conform to the guidelines established in ANSI-AAMI-IEC TIR 80001-2-5 *Application of risk management for IT-networks incorporating medical devices -- Part 2-5: Guidance on distributed alarm systems.*

First Revision No. 38-NFPA 99-2015 [Section No. 7.3.3.7]

7.3.3.7 Clinical Information Systems. ~~(Reserved)~~

7.3.3.7.1*

The clinical IT network shall be managed and controlled in accordance with the following:

(1) The overall responsibility for risk management of the clinical IT network shall be that of the responsible organization.

(2) The responsible organization shall establish, maintain, and be accountable for the clinical IT network risk management file.

(3) The health care facility's health care facility's governing body shall be accountable for all policies, resources, and risk management processes.

(4) The health care facility's health care facility's governing body shall appoint a clinical IT network risk manager.

(5) The clinical IT network risk manager shall be responsible for all duties.

(6) Manufacturers for each device placed on the clinical IT network shall provide all required documentation.

(7) The health care facility's governing body shall be accountable for document control and procedures.

7.3.3.7.2*

It shall be permitted for the nurse call system to utilize the interoperable clinical IT network provided that the nurse call system is listed to ANSI/UL 1069, *Hospital Signaling and Nurse Call Equipment* , and identified for use in a shared network environment.

7.3.3.7.3*

The clinical IT network shall provide at least two independent pathways where the operational capability of each pathway to each device shall be verified through end-to-end communication.

7.3.3.7.3.1

Where one single addressable device is served (e.g., an end-point terminal device with a single connection to the clinical IT network, which is not part of the network infrastructure transporting clinical information between end points), only one pathway shall be required.

7.3.3.7.4*

The normal and redundant clinical IT network pathways shall not be permitted to share traffic over the same physical segment.

7.3.3.7.5

Conditions that affect the operation of the normal and redundant clinical IT network pathways shall be annunciated as a trouble signal when minimal operational requirements cannot be met.

7.3.3.7.6*

Requirements for utilizing the independent redundant network paths and monitoring the operational integrity of the clinical IT network shall be established in the clinical IT network risk management plan maintained by the health care facility's governing body.

7.3.3.7.7

An event management process for the clinical IT network shall be documented by the health care facility's governing body and include at least the following:

(1) Switchover from one pathway to the other when deemed necessary

(2) Record all negative events and remediation actions

(3) Report of events, actions, and findings by the clinical IT network risk manager

(4) Evaluate events, reassess risks, and propose appropriate changes through change-release management processes and, track all corrective and preventive actions

Supplemental Information

File Name	Description
FR_38_Annex_Material.docx	

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
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Submittal Date: Tue Aug 04 10:29:07 EDT 2015

Committee Statement

Committee Statement: There is a need for the NFPA 99 code to establish and define the infrastructure requirements for a clinical IT-network, which is dedicated for use by clinicians and patients. Such a network comprises the servers, switches, routers (etc.) and voice and data communications equipment which are used to transport clinical data and information over a shared IT network infrastructure. Defining the requirements for a Clinical IT network in the NFPA 99 Code will ensure patient and staff safety, safe system operation, overall system effectiveness, and data and system security of personal information and clinical use data which can be transported on the clinical IT network.

Response Message:

Public Input No. 291-NFPA 99-2015 [Section No. 7.3.3.7]

FR 38 Annex Material

A.7.3.3.7.1 As the clinical environment becomes more and more automated, integrated and evolved there is a need to ensure that the servers and networking equipment which transport interoperable clinical data and communications over a clinical IT-network are properly instituted and sufficiently managed. The ANSI-AAMI-IEC 80001-1 standard for risk management of IT-networks that incorporate medical devices is the governing standard by which the clinical IT-network needs to be managed.

A.7.3.3.7.2 While all nurse call systems need to be listed to ANSI/UL 1069, not all nurse call systems may be identified for use on a shared clinical IT-network. Only those nurse call systems which are listed for use on a "Shared Network" are permitted to use the clinical IT-network as the means for nurse call system IT-network infrastructure.

A.7.3.3.7.3 To ensure an effective, reliable and resilient clinical IT-network, two independent physical pathways providing network communications need to be provided. Both paths need to be at operational readiness at all times. Operational readiness can be ensured by continuous self-monitoring of each path. All equipment items comprising each clinical IT-network path need to be verified for availability by means of communicaiton. End-point terminal equipment items (e.g., computers, monitors, discrete medical devices, discrete devices comprising the nurse call system, etc.), which are connected to but are not part of the clinical IT-network, only require one physical connection to the clinical IT-network.

A.7.3.3.7.4 While each physical path of the clinical IT-network can comprise both hardwired and wireless IT-networking equipment, each path must maintain independent autonomous operational integrity. Network traffic on one path cannot be allowed to cross-over and utilize the same channel of the other path at any time.

A.7.3.3.7.6 Examples for operational monitoring of the clinical IT-network includes but is not limited to the following:

1. Environmental changes including risks associated with data and system security vulnerabilities;
2. Operational/performance feedback from both automated measurement and user feedback (e.g., speed problems, high error rates, equipment failure, malicious software attacks, etc.).

First Revision No. 40-NFPA 99-2015 [Section No. 7.4.1.1.1]

~~7.4.1.1.1~~

~~HVAC systems serving the TEF, the TER, and TRs shall be connected to the essential electrical system.~~

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
Street Address:
City:
State:
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Submittal Date: Tue Aug 04 11:37:06 EDT 2015

Committee Statement

Committee Statement: This section has been deleted since the connection to the EES is under the jurisdiction of Chapter 6 and is addressed there.
Response Message:

Public Input No. 450-NFPA 99-2015 [Section No. 7.4.1.1.1]

First Revision No. 42-NFPA 99-2015 [Section No. 7.4.3.5]

7.4.3.5 Wireless Phone and Paging Integration. ~~(Reserved)~~

Wireless phone and paging integration systems shall be in accordance with 7.3.3.5 .

Submitter Information Verification

Submitter Full Name: HEA-ELS
Organization: [Not Specified]
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Committee Statement

Committee Statement: There is a need for the NFPA 99 code to establish and define the infrastructure requirements for a clinical IT-network, which is dedicated for use by clinicians and patients. Such a network comprises the servers, switches, routers (etc.) and voice and data communications equipment which are used to transport clinical data and information over a shared IT network infrastructure. Defining the requirements for a Clinical IT network in the NFPA 99 Code will ensure patient and staff safety, safe system operation, overall system effectiveness, and data and system security of personal information and clinical use data which can be transported on the clinical IT network.

Response Message:

Public Input No. 292-NFPA 99-2015 [Section No. 7.4.3.5]

First Revision No. 43-NFPA 99-2015 [Section No. 7.4.3.7]

7.4.3.7 ~~Material Management Information Systems~~ Clinical Information Systems . ~~(Reserved)~~

Clinical information systems shall be in accordance with 7.3.3.7 .

Submitter Information Verification

Submitter Full Name: HEA-ELS
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Committee Statement

Committee Statement: There is a need for the NFPA 99 code to establish and define the infrastructure requirements for a clinical IT-network, which is dedicated for use by clinicians and patients. Such a network comprises the servers, switches, routers (etc.) and voice and data communications equipment which are used to transport clinical data and information over a shared IT network infrastructure. Defining the requirements for a Clinical IT network in the NFPA 99 Code will ensure patient and staff safety, safe system operation, overall system effectiveness, and data and system security of personal information and clinical use data which can be transported on the clinical IT network.

Response Message:

Public Input No. 293-NFPA 99-2015 [Section No. 7.4.3.7]

First Revision No. 404-NFPA 99-2015 [Section No. 8.3.6]

8.3.6 Special Use Water Systems.

When special use water systems are required, application of FGI Guidelines or ~~other appropriate publicly reviewed nationally published standards~~ the applicable ANSI-reviewed standard shall be followed.

Submitter Information Verification

Submitter Full Name: HEA-MEC
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 04 15:38:08 EDT 2015

Committee Statement

Committee Statement: This revision looks to simplify the language related to acceptable reference standards.
Response Message:

First Revision No. 402-NFPA 99-2015 [Section No. 9.3.6.5.3]

9.3.6.5.3 Mechanical Ventilation.

9.3.6.5.3.1

Mechanical exhaust to maintain a negative pressure in the space shall be provided continuously, unless an alternative design is approved by the authority having jurisdiction.

9.3.6.5.3.2

Mechanical exhaust shall be at a rate of 1 L/sec of airflow for each 300 L (1 cfm per 5 ft^3 of fluid) designed to be stored in the space and not less than 24 L/sec (50 cfm) nor more than 235 L/sec (500 cfm).

9.3.6.5.3.3

Mechanical exhaust inlets shall be unobstructed and shall draw air from within 300 mm (1 ft) of the floor and adjacent to the cylinder or containers.

9.3.6.5.3.4

Mechanical exhaust air fans shall be supplied with electrical power from the essential electrical system. Where an essential electrical system is not provided, a risk assessment shall be conducted to determine if continuous ventilation shall be provided by alternate means.

9.3.6.5.3.5

Dedicated exhaust systems shall not be required, provided that the system does not connect to spaces that contain combustible or flammable materials.

9.3.6.5.3.6

The exhaust duct material shall be noncombustible.

9.3.6.5.3.7

A means of make-up air shall be provided according to one of the following:

(1) Air shall be permitted via noncombustible ductwork to be transferred from adjacent spaces, from outside the building, or from spaces that do not contain combustible or flammable materials.

(2) Air shall be permitted to be transferred from a corridor under the door up to the greater of 24 L/sec (50 cfm) or 15 percent of the room exhaust in accordance with NFPA 90A, ~~*Standard for the Installation of Air-Conditioning and Ventilating Systems*~~ .

(3) Supply air shall be permitted to be provided from any building ventilation system that does not contain flammable or combustible vapors.

Submitter Information Verification

Submitter Full Name: HEA-MEC
Organization: [Not Specified]
Street Address:
City:
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Submittal Date: Tue Aug 04 15:27:58 EDT 2015

Committee Statement

Committee Statement: This revision is meant to recognize that some facilities do not have essential electrical systems. The added language provides a strategy to address the ventilation of that space.

Response Message:

First Revision No. 401-NFPA 99-2015 [Section No. 9.3.8]

9.3.8 Medical Plume Evacuation.

~~Plumes from medical procedures, including the use of lasers, shall be captured by one of the following methods:~~

~~Direct connection to an unfiltered dedicated exhaust system that discharges outside the building~~

~~HEPA filtering and direct connection to a return or exhaust duct~~

~~Chemical and thermal sterilization and return to the space~~

9.3.8.1*

Plumes from medical procedures, including the use of lasers, shall be captured by one of the following methods:

(1)* Dedicated exhaust system that discharges in accordance with 9.3.8.2.

(2) Connection and return or exhaust duct after air cleaning through HEPA and gas phase filtration.

(3) Point of use smoke evacuator for air cleaning and return to the space

9.3.8.2

The exhaust shall be located as follows:

(1) Outdoors

(2) At least 7.5 m (25 ft) from any door, window, air intake, or other openings in buildings or places of public assembly

(3) At an elevation different from air intakes

(4) Where prevailing winds, adjacent buildings, topography, or other influences will not divert the exhaust into occupied areas or prevent dispersion of the exhaust

Supplemental Information

File Name	Description
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Submitter Information Verification

Submitter Full Name: HEA-MEC
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Street Address:
City:
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Submittal Date: Tue Aug 04 15:09:29 EDT 2015

Committee Statement

Committee Statement: The revised language is meant to provide greater clarity to the types of systems used.

Removed “unfiltered” to allow use of filtered or unfiltered dedicated systems. Defined where the exhaust should discharge for safety reasons.

Specified where the connection point is, and included gas phase filtering to recognize an industry standard practice.

Clarified the section addresses standalone systems.

Response Message:

Public Input No. 303-NFPA 99-2015 [Section No. 9.3.8]

FR 401 Annex Material

A.9.3.8.1

Inlets can be of any design suitable for the plume capture device in use, provided the design does not permit interconnection to any medical vacuum, WAGD, or housekeeping vacuum systems.

Flow control for the inlets should be as appropriate for the plume capture device in use.

A warning system, such as utilizing building automation system, that monitors the operation of the source equipment should be provided.

A.9.3.8.1(1)

A dedicated medical plume evacuation system can serve multiple locations. The discharge of a dedicated system can be filtered or unfiltered.

First Revision No. 501-NFPA 99-2015 [Section No. 10.2.3.6]

10.2.3.6 ~~Multiple Outlet Connection.~~ Relocatable Power Taps.

Two or more power receptacles supplied by a flexible cord shall be permitted to be used to supply power to plug-connected components of a movable equipment assembly that is pole-, rack-, table-, pedestal-, or cart-mounted, provided that all of the following conditions are met:

(1)* The receptacles are ~~permanently~~ securely attached to the equipment assembly.

(2)* The sum of the ampacity of all appliances connected to the outlets does not exceed 75 percent of the ampacity of the flexible cord supplying the outlets.

(3) The ampacity of the flexible cord is in accordance with *NFPA 70*, ~~*National Electrical Code*~~ .

(4) The electrical and mechanical integrity of the assembly ~~is~~ and its securement method are regularly verified and documented.

Supplemental Information

File Name	Description
TIA_99-15-1.pdf	
FR501_A.10.2.3.6_1_.docx	New annex material.
FR_501_Annex_Material.docx	This includes the new annex material as well as the modified existing annex material.

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
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Submittal Date: Tue Aug 11 09:02:24 EDT 2015

Committee Statement

Committee Statement: This revision reaffirms the revisions adopted under TIA 15-1 (attached for convenience).

Change "Multiple Outlet Connections" to "Relocatable Power Taps" for consistency with other ANSI documents.

The word "pole-" has been added because the most common relocatable power tap configuration is securely attached to an IV pole that in turn supplies power to several devices in proximity to the IV pole. This combination is frequently used in Operating Rooms and Catheterization Labs where wall mounted power outlets are mounted far away from the patient. Utilization of these pole-mounted Relocatable Power Taps avoids multiple long power cords from snaking across the floor to the wall periphery outlets, thereby minimizing trip hazards.

Item (1) was revised and annex material added to clarify permissible attachment methods.

Item (4) was modified to ensure that the attachment method remains secure.

A.10.2.3.6(2): The existing annex material was deleted. Since it is not known in advance where whole-body hyperthermia/hypothermia units will be used, this issue has no bearing on meeting the 75% ampacity requirement. The 75% ampacity requirement has generated lots of confusion in the field as to how to comply. Suggested revised text may alleviate some of that confusion.

A.10.2.3.6(4) The existing annex material is irrelevant to the section to which it is attached and has therefore been deleted.

Response Message:

Public Input No. 305-NFPA 99-2015 [Section No. 10.2.3.6]

Public Input No. 60-NFPA 99-2015 [Global Input]

Public Input No. 103-NFPA 99-2015 [Section No. 10.2.3.6]

Public Input No. 104-NFPA 99-2015 [Section No. A.10.2.3.6(4)]

Public Input No. 101-NFPA 99-2015 [Section No. A.10.2.3.6(2)]

Tentative Interim Amendment

NFPA® 99

Health Care Facilities Code

2015 Edition

Reference: 10.2.3.6(5)
TIA 15-1
(SC 14-8-22 / TIA Log #1104)

Note: Text of the TIA issued and incorporated into the text of the document, therefore no separate publication is necessary.

1. Delete entire subsection 10.2.3.6(5) as follows:

~~(5) *Means are employed to ensure that additional devices or nonmedical equipment cannot be connected to the multiple outlet extension cord after leakage currents have been verified as safe.~~

2. Delete corresponding Annex A material A.10.2.3.6(5) as follows:

~~**A.10.2.3.6**(5) Power taps used in conjunction with an isolated power system are not subject to this requirement.~~

Issue Date: August 14, 2014
Effective Date: September 3, 2014

A.10.2.3.6(1)

Tape, adhesive, and hook-and-loop fasteners are not considered to be secure means of attachment.

FR 501 – Annex Material

A.10.2.3.6(1)

Tape, adhesive, and hook-and-loop fasteners are not considered to be secure means of attachment.

A.10.2.3.6(2)

~~Whole-body hyperthermia/hypothermia units should be powered from a separate branch circuit.~~

A means of meeting the requirement is through summation of nameplate ampacity of connected equipment and proactive administrative actions (e.g. education, signs). A circuit protective device (e.g., circuit breaker, surge protector, supplementary protector), alone, is not considered sufficient.

~~A.10.2.3.6(4)~~
~~See Chapter 6 for criteria of receptacles.~~

First Revision No. 504-NFPA 99-2015 [Section No. 10.2.5]

10.2.5 Leakage Current — Fixed Equipment.

The leakage current flowing through the ground conductor of the power supply connection to ground of permanently wired appliances installed in ~~general or critical care areas~~ Category 1 or Category 2 spaces shall not exceed 10.0 mA (ac or dc) with all grounds lifted.

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 10:46:47 EDT 2015

Committee Statement

Committee Statement: The section was revised to correlate with the use of risk categories throughout the document.
Response Message:

Public Input No. 381-NFPA 99-2015 [Section No. 10.2.5]

First Revision No. 506-NFPA 99-2015 [Section No. 10.3.2.2]

10.3.2.2

The requirement of 10.3.2.1 shall not apply to accessible metal parts that achieve separation from main parts by ~~double~~ insulation or metallic screening or that are unlikely to become energized (e.g., escutcheons or nameplates, small screws).

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 10:58:54 EDT 2015

Committee Statement

Committee Statement: The word "double" was deleted to remove confusion. The use of the term "double insulated" has no bearing on this testing requirement.
Response Message:

Public Input No. 405-NFPA 99-2015 [Section No. 10.3.2.2]

First Revision No. 507-NFPA 99-2015 [Section No. 10.3.6]

10.3.6* Lead Leakage Current Tests and Limits — Portable Equipment.

10.3.6.1

The leakage current between all patient leads connected together and ground shall be ~~measured~~ tested with the power plug connected normally and the device powered on.

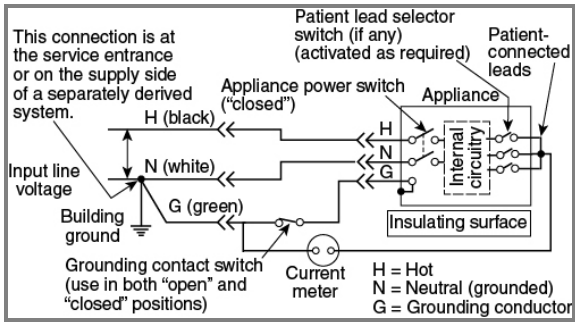
10.3.6.2

The leakage current between all patient leads connected together and ground shall be measured with the ground switch open and with the ground switch closed.

10.3.6.3

An acceptable test configuration shall be as illustrated in ~~Figure 10.3.6.2~~ Figure 10.3.6.3 .

Figure 10.3.6.3 Test Circuit for Measuring Leakage Current Between Patient Leads and Ground — Nonisolated.



10.3.6.4

The leakage current shall not exceed 100 µA for ground wire closed and 500 µA ac for ground wire open.

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 11:27:48 EDT 2015

Committee Statement

Committee Statement: The requirement to test the device with the ground switch in both states was provided only in the figure. It has been incorporated into the main body for consistency.
Response Message:

Public Input No. 406-NFPA 99-2015 [Section No. 10.3.6.2]

First Revision No. 508-NFPA 99-2015 [Section No. 10.5.2.4]

10.5.2.4 Devices Likely to Be Used During Defibrillation.

Devices that are critical to patient safety and that are likely to be attached to the patient when a defibrillator is used (such as ECG monitors) shall be ~~rated~~ marked as ~~"defibrillator proof"~~ "defibrillation proof," as defined in ANSI/AAMI ES60601-1, *Medical Electrical Equipment* ~~.~~ ."

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 11:36:28 EDT 2015

Committee Statement

Committee Statement: The requirement was revised to more accurately depict the means of confirming that the device is rated as "defibrillation proof."
Response Message:

Public Input No. 407-NFPA 99-2015 [Section No. 10.5.2.4]

First Revision No. 510-NFPA 99-2015 [Section No. 10.5.2.6]

~~**10.5.2.6** Electrical Equipment Systems.~~

~~Purchase contracts for electrical equipment systems, such as nurse call and signaling that consist of interconnected elements, shall require all of the following:~~

~~The elements are intended to function together.~~

~~The manufacturers provide documentation for such interconnection.~~

~~The systems are installed by personnel qualified to do such installations.~~

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 12:00:24 EDT 2015

Committee Statement

Committee Statement: Delete 10.5.2.6 and all subsections. This requirement is redundant to Chapter 7.
Response Message:

Public Input No. 45-NFPA 99-2015 [Section No. 10.5.2.6]

First Revision No. 511-NFPA 99-2015 [Section No. 11.3]

11.3 Cylinder and Container Storage Requirements.

11.3.1

For the purpose of this section, the health care facility's governing body shall define criteria for determining full cylinders and containers.

11.3.2

Full cylinders and containers shall be stored in accordance with this section.

11.3.3

Full cylinders and containers shall be segregated from all others.

11.3.4*

Storage for nonflammable gases equal to or greater than 85 m^3 (3000 ft^3) at STP shall comply with 5.1.3.3.2 and 5.1.3.3.3.

11.3.5*

Storage for nonflammable gases greater than 8.5 m^3 (300 ft^3), but less than 85 m^3 (3000 ft^3), at STP shall comply with the requirements in 11.3.5.1 ~~11.3.2.1~~ through 11.3.5.8 ~~11.3.2.8~~ .

11.3.5.1

Storage locations shall be outdoors in an enclosure or within an enclosed interior space of noncombustible or limited-combustible construction, with doors (or gates outdoors) that can be secured against unauthorized entry.

11.3.5.2

Oxidizing gases~~,~~ such as oxygen and nitrous oxide~~,~~ shall not be stored with any flammable gas, liquid, or vapor.

11.3.5.3

Oxidizing gases such as oxygen and nitrous oxide shall be separated from combustibles or flammable materials by one of the following:

(1) Minimum distance of 6.1 m (20 ft)

(2) Minimum distance of 1.5 m (5 ft) if the entire storage location is protected by an automatic sprinkler system designed in accordance with NFPA 13~~, *Standard for the Installation of Sprinkler Systems*~~

(3) A gas cabinet constructed per NFPA 30~~, *Flammable and Combustible Liquids Code* ,~~ or NFPA 55, ~~*Compressed Gases and Cryogenics Fluids Code* ,~~ if the entire storage location is protected by an automatic sprinkler system designed in accordance with NFPA 13

11.3.5.4

Gas cylinder and cryogenic liquid container storage shall comply with 5.1.3.3.3 ~~5.1.3.3.2~~ and 5.1.3.3.4 ~~5.1.3.3.3~~ .

11.3.5.5

Cylinder and container storage locations shall comply with 5.1.3.2.12 with respect to temperature limitations.

11.3.5.6

Cylinder or container restraints shall comply with 11.6.2.3.

11.3.5.7

Smoking, open flames, electric heating elements, and other sources of ignition shall be prohibited within storage locations and within 6.1 m (20 ft) of outside storage locations.

11.3.5.8

Cylinder valve protection caps shall comply with 11.6.2.2(4) ~~11.6.2.3~~ .

11.3.6

Storage for nonflammable gases with a total volume equal to or less than 8.5 m^3 (300 ft^3) shall comply with the requirements in 11.3.6.1 ~~11.3.3.1~~ and 11.3.6.2 ~~11.3.3.2~~ .

11.3.6.1

Individual cylinder storage associated with patient care ~~areas~~ spaces , not to exceed 2100 m^2 (22,500 ft^2) of floor area, shall not be required to be stored in enclosures.

11.3.6.2

Precautions in handling cylinders specified in 11.3.6.1 ~~11.3.3.1~~ shall be in accordance with 11.6.2.

11.3.7

When small-size (A, B, D, or E) cylinders are in use, they shall be attached to a cylinder stand or to medical equipment designed to receive and hold compressed gas cylinders.

11.3.8

Individual small-size (A, B, D, or E) cylinders available for immediate use in patient care ~~areas~~ spaces shall not be considered to be in storage.

11.3.9

Cylinders shall not be chained to portable or movable apparatus such as beds and oxygen tents.

11.3.10 Signs.

11.3.10.1

A Storage locations meeting the requirements of 11.3.4 or 11.3.5 shall have precautionary sign, readable from a distance of 1.5 m (5 ft), shall be displayed on each door or gate of the storage room or enclosure.

11.3.10.2

The sign shall include the following wording as a minimum:

CAUTION

OXIDIZING GAS(ES) STORED WITHIN

NO SMOKING

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 13:57:45 EDT 2015

Committee Statement

Committee Statement: The section was revised to focus on full cylinders, as opposed to all cylinders, which aligns with the current industry practice.

Response Message:

Public Input No. 397-NFPA 99-2015 [Section No. 11.3.3.1]

Public Input No. 398-NFPA 99-2015 [Section No. 11.3.3.1]

Public Input No. 404-NFPA 99-2015 [New Section after 11.3]

Public Input No. 399-NFPA 99-2015 [Section No. 11.3.3.4]

Public Input No. 326-NFPA 99-2015 [Section No. 11.3]

Public Input No. 21-NFPA 99-2015 [Section No. 11.3.4.1]

First Revision No. 513-NFPA 99-2015 [Section No. 11.4.2.1]

11.4.2.1

Oxygen-delivery equipment intended to rest on the floor shall be equipped with a base designed to render the entire assembly stable during storage, transport, and use. ~~If casters are used, they shall conform to Class C of U.S. Government Commercial Standard 223-59, *Casters, Wheels, and Glides for Hospital Equipment.*~~

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 15:51:45 EDT 2015

Committee Statement

Committee Statement: U.S. Commercial Standard 223-59, “Casters, Wheels, and Glides for Hospital Equipment" was withdrawn in October, 1973.
Response Message:

Public Input No. 325-NFPA 99-2015 [Section No. 11.4.2.1]

First Revision No. 516-NFPA 99-2015 [Section No. 11.5.1.1]

11.5.1.1 Elimination of Sources of Ignition.

11.5.1.1.1

Smoking materials (e.g., matches, cigarettes, lighters, lighter fluid, tobacco in any form) shall be removed from patients receiving respiratory therapy.

11.5.1.1.2*

When a nasal cannula and its associated supply tubing are delivering oxygen outside of a patient care space ~~room~~ , no sources of open flame shall be permitted in the site of intentional expulsion.

11.5.1.1.3*

When any other oxygen delivery equipment not specified in 11.5.1.1.2 is in use, no sources of open flame shall be permitted in the area of administration.

11.5.1.1.4*

Solid fuel-burning appliances shall not be permitted in the area of administration.

11.5.1.1.5*

Sparking toys shall not be permitted in any patient care ~~vicinity~~ space .

11.5.1.1.6

Nonmedical appliances that have hot surfaces or sparking mechanisms shall not be permitted within oxygen-delivery equipment or within the site of intentional expulsion.

Supplemental Information

File Name	Description
FR516_A.11.5.1.1.2.docx	Annex material.
TIA_99-15-2.pdf	

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 16:37:22 EDT 2015

Committee Statement

Committee Statement: This revision reaffirms the revisions incorporated under TIA 15-2 (attached for convenience).

The use of the term "patient care space" was used for consistency.

Response Message:

Public Input No. 401-NFPA 99-2015 [Section No. A.11.5.1.1.2]

Public Input No. 61-NFPA 99-2015 [Global Input]

A.11.5.1.1.2

Outside of a patient care space ~~room~~, 11.5.1.1.2 prohibits sources of open flames within the site of intentional expulsion [1 ft (0.3 m)] of a nasal cannula. No sources of open flame are permitted within the area of administration [15 ft (4.3 m)] for other types of oxygen delivery equipment or in patient care spaces ~~rooms~~ *(see 11.5.1.1.3)*.

The amount of oxygen delivered by a nasal cannula is limited. One foot (0.3 m) is sufficient separation from an oxygen-enriched atmosphere produced by a nasal cannula, which is oxygen delivery equipment used outside of patient care spaces ~~areas~~. In the open air, dilution goes to ambient levels (not oxygen-enriched atmosphere) within a few inches of the cannula openings, but 12 in. (300 mm) provides an adequate safety factor. Other oxygen delivery equipment, such as masks, are not included since masks would not typically be associated with mobile patients in health care facilities and can deliver greater quantities of oxygen than nasal cannula.

The household-style nursing homes that include kitchens intended for residents' use and enclosed gas fireplaces present a source of flame ignition to which residents will be exposed. Residents utilizing a nasal cannula would potentially not be allowed to participate in the cooking because it would place the cooking flame within the site of intentional expulsion. However, they would be allowed in the kitchen area to assist in preparing the food and to

socialize with other residents and staff in the kitchen similar to what happens in the kitchens of residential environments. The primary concern is that flame-producing equipment exists in many places in a nursing home and that it would be impractical to maintain a resident with a nasal cannula a minimum of 15 ft (4.3 m) (Area of Administration) away from the flame-producing equipment. Typical flame-producing equipment found in a nursing home includes the following:

1. Candles in chapels
2. Open kitchens using gas cooking equipment
3. Fireplaces
4. Fuel-fired heating equipment
5. Private family dining rooms using fuel-fired equipment
6. Canned cooking fuel (e.g., used under chafing dishes)

A.11.5.1.1.3

Patients and hospital personnel in the area of administration should be advised of respiratory therapy hazards and regulations.

Visitors should be cautioned of these hazards through the prominent posting of signs. *(See 11.3.4.)*

A.11.5.1.1.4

Solid fuel-burning appliances include wood-burning fireplaces, wood stoves, and similar appliances. These pose a

greater risk in locations where oxygen is being provided than gas-fueled appliances, in part due to their ability to emit embers into the environment.

A.11.5.1.1.5

Such toys have been associated with fire incidents in health care facilities.

A suggested text for precautionary signs for oxygen tent canopies and oxygen hoods used in pediatric nursing units is the following:

CAUTION: OXYGEN IN USE
ONLY TOYS APPROVED BY
NURSES MAY BE GIVEN TO CHILD

Tentative Interim Amendment

NFPA® 99

Health Care Facilities Code

2015 Edition

Reference: 11.5.1.1.2 through 11.5.1.1.4 and A.11.5.1.1.2 through A.11.5.1.1.3
TIA 15-2
(SC 14-8-23 / TIA Log #1125)

Note: Text of the TIA issued and incorporated into the text of the document, therefore no separate publication is necessary.

1. Revise text to read as follows:

11.5.1.1 Elimination of Sources of Ignition.

11.5.1.1.1 Smoking materials (e.g., matches, cigarettes, lighters, lighter fluid, tobacco in any form) shall be removed from patients receiving respiratory therapy.

11.5.1.1.2* When a nasal cannula and its associated supply tubing are delivering oxygen outside of a patient care room, no sources of open flame shall be permitted in the site of intentional expulsion.

11.5.1.1.3~~2~~* When any other oxygen delivery equipment not specified in 11.5.1.1.2 is in use, ~~N~~no sources of open flame~~, including candles,~~ shall be permitted in the area of administration.

11.5.1.1.4* Solid fuel-burning appliances shall not be permitted in the area of administration.

11.5.1.1.~~3~~5* Sparking toys shall not be permitted in any patient care room.

11.5.1.1.~~4~~6 Nonmedical appliances that have hot surfaces or sparking mechanisms shall not be permitted within oxygen-delivery equipment or within the site of intentional expulsion.

A.11.5.1.1.2 Outside of a patient care room, 11.5.1.1.2 prohibits sources of open flames within the site of intentional expulsion [1 ft (0.3 m)] of a nasal cannula. No sources of open flame are permitted within the area of administration [15 ft (4.3 m)] for other types of oxygen delivery equipment or in patient care rooms (see 11.5.1.1.3).

The amount of oxygen delivered by a nasal cannula is limited. One (1) ft (0.3 m) is sufficient separation from an oxygen-enriched atmosphere produced by a nasal cannula which is an oxygen delivery equipment used outside of patient care areas. In the open air, dilution goes to ambient levels (not oxygen-enriched atmosphere) within a few inches of the cannula openings, but 12 in. (300 mm) provides an adequate safety factor. Other oxygen delivery equipment such as masks, are not included since masks would not typically be associated with mobile patients in health care facilities and may deliver greater quantities of oxygen than nasal cannula.

The household-style nursing homes that include kitchens intended for residents' use and enclosed gas fireplaces present a source of flame ignition to which residents will be exposed. Residents utilizing a nasal cannula would potentially not be allowed to participate in the cooking because it would place the cooking flame within the site of intentional expulsion. However, they would be allowed in the kitchen area to assist in preparing the food and to socialize with other residents and staff in the kitchen similar to what happens in the kitchens of residential environments.

The primary concern is that flame-producing equipment exists in many places in a nursing home and that it would be impractical to maintain a resident with a nasal cannula a minimum of 15 ft (4.3 m) (Area of Administration) away from the flame-producing equipment. Typical flame-producing equipment found in a nursing home includes the following:

1. Candles in chapels
2. Open kitchens using gas cooking equipment
3. Fireplaces
4. Fuel-fired heating equipment
5. Private family dining rooms using fuel-fired equipment
6. Canned cooking fuel (e.g., used under chafing dishes)

A.11.5.1.1.2~~3~~3 Patients and hospital personnel in the area of administration should be advised of respiratory therapy hazards and regulations.

Visitors should be cautioned of these hazards through the prominent posting of signs. *(See 11.3.4.)*

A.11.5.1.1.4 Solid fuel–burning appliances include wood-burning fireplaces, wood stoves, and similar appliances. These pose a greater risk in locations where oxygen is being provided than gas-fueled appliances, in part due to their ability to emit embers into the environment.

A.11.5.1.1.3~~5~~5 Such toys have been associated with fire incidents in health care facilities.
A suggested text for precautionary signs for oxygen tent canopies and oxygen hoods used in pediatric nursing units is the following:

CAUTION: OXYGEN IN USE
ONLY TOYS APPROVED BY
NURSES MAY BE GIVEN TO CHILD

Issue Date: August 14, 2014
Effective Date: September 3, 2014

First Revision No. 514-NFPA 99-2015 [Section No. 11.5.2.5]

11.5.2.5 Ambulatory Patients.

~~Ambulatory~~ Areas where ambulatory patients on oxygen therapy are permitted access shall be ~~permitted access to all~~ flame- and smoke-free areas ~~within the health care facility~~.

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 16:02:36 EDT 2015

Committee Statement

Committee Statement: The requirement was revised to indicate the attributes of the space, rather than the patient access.
Response Message:

Public Input No. 402-NFPA 99-2015 [Section No. 11.5.2.5]

First Revision No. 515-NFPA 99-2015 [New Section after 11.6.5.4]

11.6.5.5*

Storage of nitrous oxide cylinders shall be secured against unauthorized access.

Supplemental Information

File Name	Description
FR515_A.11.6.5.5.docx	New annex material.

Submitter Information Verification

Submitter Full Name: HEA-MED
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Tue Aug 11 16:07:46 EDT 2015

Committee Statement

Committee Statement: Any quantity of nitrous oxide is a chemical of concern (COC)/chemical of interest (COI) Tier 4. CGA P-50 section 7.8 provides requirements for COC/COI storage.
Response Message:

Public Input No. 206-NFPA 99-2015 [New Section after 11.6.5]

A.11.6.5.5

For further guidance, refer to CGA P-50 *Site Security Standard*.

First Revision No. 201-NFPA 99-2015 [New Section after 12.2.2.2]

12.2.2.3

At least one representative of senior management shall provide a documented review of after-action reports and the annual evaluation of the emergency operations plan (EOP).

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 08:52:18 EDT 2015

Committee Statement

Committee Statement: Adding senior management review supports Joint Commission requirements introduced in 2014. Documentation provides a permanent record of the review and follow-on decisions.
Response Message:

Public Input No. 194-NFPA 99-2015 [New Section after 12.2.2.2]

First Revision No. 202-NFPA 99-2015 [New Section after 12.2.2.2]

12.2.2.4

Senior management shall direct the prioritization of opportunities for improvement identified during exercises and actual events.

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 08:59:03 EDT 2015

Committee Statement

Committee Statement: Adding senior management to direct prioritization of opportunities for improvement is a necessary feature.
Response Message:

Public Input No. 211-NFPA 99-2015 [New Section after 12.2.2.2]

First Revision No. 203-NFPA 99-2015 [Section No. 12.2.3.1]

12.2.3.1*

The membership of the emergency management committee shall include a chairperson, the emergency program coordinator, ~~a member of senior management, nursing, and representatives from key areas within the organization, such as physicians, infection control, facilities engineering,~~ and leadership representatives of the following key areas: ~~safety/industrial hygiene, security, and other key individuals.~~

(1) Senior management
(2) Medical staff
(3) Nursing
(4) Infection prevention
(5) Facilities engineering
(6) Safety/industrial hygiene
(7) Security
(8) Information technology
(9) Materials management
(10) Other key areas within the organization

Supplemental Information

File Name	Description
FR203_A.12.2.3.1.docx	New annex material

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 09:17:15 EDT 2015

Committee Statement

Committee Statement: The requirement has been re-written to clarify key functional areas that must be represented on the committee. Previous language suggested that some key functional areas were optional.

Response Message:

Public Input No. 212-NFPA 99-2015 [Section No. 12.2.3.1]

A.12.2.3.1

An individual member may represent multiple disciplines, as appropriate to the facility.

First Revision No. 204-NFPA 99-2015 [Section No. 12.5.3.3.6.5]

12.5.3.3.6.5* Essential Utilities~~.~~ and Systems.

The facility shall plan for the following utilities and systems during an emergency, as applicable :

(1) Electricity
(2) Potable water
(3) Nonpotable water
(4) Wastewater
(5) HVAC
(6) Fire protection ~~systems~~
(7) Fuel ~~required~~ for building operations
(8) Fuel for essential transportation
(9) Medical gas and vacuum ~~systems (if applicable)~~
(10) Information technology

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 10:51:28 EDT 2015

Committee Statement

Committee Statement: The changes recognize that some of the utilities may or may not be present in every facility. Additional utilities thought to be essential have been incorporated.
Response Message:

Public Input No. 448-NFPA 99-2015 [Section No. 12.5.3.3.6.5]

First Revision No. 205-NFPA 99-2015 [New Section after 12.5.3.4.5.3]

12.5.3.4.5.4

Identification issued to volunteers shall distinguish volunteers from staff members.

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 12:57:05 EDT 2015

Committee Statement

Committee Statement: Volunteers must be distinguished from staff to assure patient safety and appropriate supervision.
Response Message:

Public Input No. 193-NFPA 99-2015 [New Section after 12.5.3.4.5.3]

First Revision No. 206-NFPA 99-2015 [Sections 12.5.3.4.9, 12.5.3.4.10, 12.5.3.4.11]

12.5.3.4.9* Crisis Standards of Care.

Crisis standards of care shall be developed through a community- wide approach, as approved by the authority having jurisdiction.

12.5.3.4.9.1

The decision to implement crisis standards of care shall be coordinated with the community leadership.

12.5.3.4.9.2

Upon implementation of crisis standards of care in a community, the following shall be considered:

(1) The triage process

(2) The allocation of medical services across the population

12.5.3.4.9.3

Standards of care shall be returned to normal at the earliest feasible time.

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 13:14:48 EDT 2015

Committee Statement

Committee Statement: Section was renumbered for clarity.

The AHJ establishes acceptable standards of care and must approve alternatives to these standards.

12.5.3.4.9.3 was moved from 12.5.3.4.13 and revised to use consistent terminology.

Response Message:

Public Input No. 506-NFPA 99-2015 [Section No. 12.5.3.4.13]

First Revision No. 207-NFPA 99-2015 [Section No. 12.5.3.4.13]

~~12.5.3.4.11~~

~~Recovery from controlled reduction in care standards shall be reversed at the earliest feasible time.~~

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 13:52:00 EDT 2015

Committee Statement

Committee Statement: See 12.5.3.4.9 [FR 206].
Response Message:

First Revision No. 208-NFPA 99-2015 [Section No. 12.5.3.6.1]

12.5.3.6.1

The facility shall modify, as necessary, its HVA, EOP, supply chain (including the current emergency supplies inventory), and other components of the emergency management program, as a result of exercises, ~~real event~~ actual events , and annual review.

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 14:02:17 EDT 2015

Committee Statement

Committee Statement: The revised text recognizes that modifications are not always needed.
Response Message:

Public Input No. 191-NFPA 99-2015 [Section No. 12.5.3.6.1]

First Revision No. 210-NFPA 99-2015 [New Section after 13.3.1]

13.3.2

The facility shall modify, as necessary, its SVA as a result of exercises, national or local events, and annual review.

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 14:25:49 EDT 2015

Committee Statement

Committee Statement: Many hospitals utilize the same threat list for the SVA each year, without considering additional potential events to be ranked.
Response Message:

Public Input No. 213-NFPA 99-2015 [New Section after 13.3.1]

First Revision No. 211-NFPA 99-2015 [Section No. 13.5.3]

13.5.3

Pediatric and infant care areas shall have a security plan for the prevention of, and response to, pediatric and infant abduction that shall include appropriate protections, such as the following:

(1) Control and limitation of access by the general public

(2) Screening by nursing prior to allowing persons access to infant care areas

(3) Matching protocol with staff clearance to pair infants with parents

(4) System to monitor and track the location of pediatric and infant patients

(5)* Facility alert system~~, lockdown, and staff inspection of all packages leaving the premises~~ and lockdown procedures

(6) Use of electronic monitoring, tracking, and access control equipment

(7) Use of an automated and standardized facility-wide alerting system to announce pediatric or infant abduction

(8) Remote exit locking or alarming

(9) ~~Facility lockdown procedures and staff~~ Staff observation of all persons and inspection of all ~~persons and~~ packages leaving the premises

(10) Prohibition on birth announcements by staff

(11) Detection of the presence of nonidentified individual constitutes security breach

(12) Movement of infants restricted to basinets only — no hand carries

(13) Health care staff wear unique identification or uniforms

(14) Secure storage of scrubs and uniforms, both clean and dirty

(15) Education in pediatric and infant abduction as follows:

(a) Health care staff are familiar with infant abduction scenarios~~.~~

(b) Parents know not to leave a child or an infant unattended or in the care of an unidentified person~~.~~

(c) Parents know that they have the right to refuse to release their child to any individual without validation of official hospital identification

(16) Visiting family and friends not permitted to enter any nursery area with an infant or a newborn from the outside

(17) Infant abduction drills conducted periodically to test effectiveness of chosen measures

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 14:37:57 EDT 2015

Committee Statement

Committee Statement: The redundant material in items 5 and 9 was removed and clarified.

The concept of parental education was expanded to include parents rights to challenge individuals.

Response Message:

Public Input No. 214-NFPA 99-2015 [Section No. 13.5.3]

Public Input No. 69-NFPA 99-2015 [Section No. 13.5.3]

First Revision No. 217-NFPA 99-2015 [Section No. 13.9]

13.9 ~~Security~~ Access Control Equipment.

13.9.1

Exterior entrances shall be provided with locking devices.

13.9.2

Locking devices shall comply with applicable federal, state, and local requirements.

13.9.3

Locking devices shall be properly installed and be in good working order.

Moved by FR-217

~~**13.9.2**~~

~~The security management plan shall include processes and procedures for controlling access to the health care facility.~~

13.9.4*

The facility shall operate a key control program.

Submitter Information Verification

Submitter Full Name: HEA-HES
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 10 16:25:35 EDT 2015

Committee Statement

Committee Statement: The title was revised to more accurately reflect the content of the section.

Section 13.9.1 was deleted because it was redundant to Section 13.8.1.

Section 13.9.2 was moved to a more appropriate location, since it deals with policies and procedures and not equipment.

Sections 13.9.2.1 through 13.9.3 were renumbered.

Response Message:

Public Input No. 215-NFPA 99-2015 [Section No. 13.9.1]

First Revision No. 302-NFPA 99-2015 [New Section after 14.1]

14.1.4 Applicable Code.

Hyperbaric facilities that are conducting any form of treatment and are not located in a designated health care facility, including residential occupancies, shall comply with the requirements of the applicable code.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 08:41:29 EDT 2015

Committee Statement

Committee Statement: Beginning with the 2000 edition of NFPA 101, Life Safety Code, compliance to the hyperbaric facility chapter of NFPA 99, Health Care Facilities, has been mandated by reference. This action was taken as a result of a number of hyperbaric treatment centers that were opening across the country in business occupancies such as strip shopping malls, etc. In some instances, the owners of these businesses were able to successfully argue that since they were not housed in a health care occupancy, they did not need to comply with the hyperbaric requirements of NFPA 99 even though they were conducting patient treatments. In doing so, they were very specific in stating that compliance was expected in all occupancy classifications. The primary purpose of this revision is to highlight the NFPA 101 or other applicable codes requirement so that it is more widely known among the AHJ community.

Response Message:

Public Input No. 342-NFPA 99-2015 [New Section after 14.1]

First Revision No. 303-NFPA 99-2015 [Section No. 14.1.3]

14.1.3 Category ~~of Care~~ .

Global FR-308

14.1.3.1 Category 1 Hyperbaric Care.

~~Where interruption or failure of medical gas supply is likely to cause major injury or death of patients, staff, or visitors, the level of care shall be considered Category 1 in the requirements for medical gas systems in hyperbaric facilities.~~

14.1.3.1.1

Where interruption or failure of medical gas supply is likely to cause major injury or death of patients, staff, or visitors, the ~~level of care~~ medical gas system shall be ~~considered~~ Category 1 for use ~~in the requirements for medical gas systems in hyperbaric facilities.~~ in this chapter.

14.1.3.1.2

Where interruption or failure of electrical service is likely to cause major injury or death of patients, staff, or visitors, the electrical service shall be Category 1 for use in this chapter.

14.1.3.2 ~~Category 2 Care~~ Category 2 Hyperbaric Care .

~~Where interruption or failure of medical gas supply is likely to cause minor injury of patients, staff, or visitors, the level of care shall be considered Category 2 in the requirements for medical gas systems in hyperbaric facilities.~~

14.1.3.2.1

Where interruption or failure of medical gas supply is likely to cause minor injury of patients, staff, or visitors, ~~the level of care~~ the medical gas system shall be considered Category 2 for use in this chapter. ~~in the requirements for medical gas systems in hyperbaric facilities.~~

14.1.3.2.2

Where interruption or failure of electrical service is likely to cause minor injury of patients, staff, or visitors, the electrical service shall be Category 2 for use in this chapter.

14.1.3.3 ~~Category 3 Care~~ Category 3 Hyperbaric Care .

~~Where interruption or failure of medical gas supply is not likely to cause injury to patients, staff, or visitors, the level of care shall be considered Category 3 in the requirements for medical gas systems in hyperbaric facilities.~~

14.1.3.3.1

Where interruption or failure of medical gas supply is not likely to cause injury to patients, staff, or visitors, ~~the level of care~~ the medical gas system shall be considered Category 3 for use in ~~the requirements for medical gas systems in hyperbaric facilities~~ this chapter .

14.1.3.3.2

Where interruption or failure of electrical service is not likely to cause injury to patients, staff, or visitors, the electrical service shall be Category 3 for use in this chapter.

14.1.3.4 Category 4 Care. (Reserved)

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:

State:

Zip:

Submittal Date: Wed Aug 05 09:10:21 EDT 2015

Committee Statement

Committee Statement: The electrical service requirements of hyperbaric facilities have been revised to be based on the relative risk of losing electrical power. This risk varies with the types of chamber equipment and acuity of patients treated. The terminology has been modified to closer align with the rest of the document.

Response Message:

Public Input No. 323-NFPA 99-2015 [Section No. 14.1.3]

First Revision No. 305-NFPA 99-2015 [Section No. 14.2.1.2 [Excluding any Sub-Sections]]

~~A hydraulically calculated automatic wet pipe sprinkler system meeting the requirements of NFPA 13 , *Standard for the Installation of Sprinkler Systems* , or an automatic water mist fire protection system installed in accordance with NFPA 750 , *Standard on Water Mist Fire Protection Systems* , shall be installed in the room housing a Class A, Class B, or Class C chamber and in any ancillary equipment rooms.~~ The room housing a Class A, Class B, or Class C chamber and any ancillary equipment rooms shall be provided protection by one of the following systems:

(1)* A hydraulically calculated automatic wet pipe sprinkler system meeting the requirements of NFPA 13

(2) An automatic water mist fire protection system installed in accordance with NFPA 750

(3)* A clean agent fire protection system in accordance with NFPA 2001

Supplemental Information

File Name	Description
FR_305.docx	Associated annex material

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 10:13:57 EDT 2015

Committee Statement

Committee Statement: There are other fire suppression systems that can provide appropriate protection for these rooms other than just wet sprinkler systems. This revision allows the use of clean agent systems designed in accordance with NFPA 2001 to be utilized as a design option.

Response Message:

Public Input No. 531-NFPA 99-2015 [Section No. 14.2.1.2 [Excluding any Sub-Sections]]

FR- 305

A.14.2.1.2

In addition to the functions of building protection, the chamber room sprinkler system should be designed to ensure a degree of protection to chamber operators who likely will not be able to immediately evacuate the premises in the event of a fire.

A.14.2.1.2(1)

When the area to be covered is small (six sprinklers or less), 9.7.1.2 of NFPA 101, Life Safety Code, permits fire sprinkler systems required to be installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, to be supplied from the local domestic water system, provided that the local domestic water system has sufficient pressure and flow capacity.

A.14.2.1.2(3)

When selecting a clean agent fire protection system, careful consideration should be given to the selection of agent based on permissible exposure levels.

First Revision No. 306-NFPA 99-2015 [New Section after 14.2.1.2.1]

14.2.1.2.2

The room housing a Class A, Class B, or Class C chamber shall contain a minimum of one 2-A:10B:C portable fire extinguisher.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 10:21:01 EDT 2015

Committee Statement

Committee Statement: Currently there is no requirement for a portable fire extinguisher to be located in the room housing hyperbaric chambers Class A, Class B, or Class C. This revision requires that one be available and that it be appropriate for a range of potential types of fires that can be encountered in these rooms.

Response Message:

Public Input No. 410-NFPA 99-2015 [New Section after 14.2.1.2.1]

First Revision No. 307-NFPA 99-2015 [Section No. 14.2.1.4.4]

14.2.1.4.4 ~~General~~ .

~~Where an oxygen system is installed for hyperbaric treatments, it shall comply with the requirements for the appropriate level as determined in 14.2.1.4.4.2 through 14.2.1.4.4.7~~ Hyperbaric oxygen systems for Category 1, Category 2, and Category 3 hyperbaric care connected directly to a hospital's oxygen system shall comply with Section 5.1, as applicable, except as noted in 14.2.1.4.4.1 ~~14.2.1.4.4.1~~ ~~14.2.1.4.4.2~~ .

~~**14.2.1.4.4.1**~~

~~Hyperbaric oxygen systems for Category 1, Category 2, and Category 3 care connected directly to a hospital's oxygen system shall comply with Section 5.1 , as applicable, except as noted in 14.2.1.4.4.2 .~~

14.2.1.4.4.1 Central Supply Systems.

Oxygen systems shall comply with 5.1.3.5, as applicable, except as follows:

(1) An emergency oxygen supply connection (EOSC) ~~is~~ shall not be required for the hyperbaric oxygen system.

(2) An in-building emergency reserve (IBER) ~~is~~ shall not be required for the hyperbaric oxygen system.

14.2.1.4.5

Hyperbaric stand-alone oxygen systems for Category 1 and Category 2 hyperbaric care shall comply with Section 5.1, as applicable, except as noted in 14.2.1.4.5.1 ~~14.2.1.4.5.1~~ ~~14.2.1.4.4.4~~ .

14.2.1.4.5.1 Central Supply Systems.

Oxygen systems shall comply with 5.1.3.5, as applicable, except as follows:

(1) An EOSC ~~is~~ shall not be required for the hyperbaric oxygen system.

(2) An IBER ~~is~~ shall not be required for the hyperbaric oxygen system.

14.2.1.4.6 Warning Systems.

14.2.1.4.6.1

Oxygen systems shall comply with 5.1.9 ~~5.1.10~~ , as applicable, except that warning systems shall be permitted to be a single master/area alarm panel.

14.2.1.4.6.2

The alarm panel shall be located in the room housing the chamber(s) to allow for easy audio and visual monitoring by the chamber operator.

14.2.1.4.7

Hyperbaric stand-alone oxygen systems for ~~Category 3 care~~ Category 3 hyperbaric care shall comply with Section 5.2, as applicable, except as noted in 14.2.1.4.7.1 ~~14.2.1.4.7.1~~ ~~14.2.1.4.4.7~~ .

14.2.1.4.7.1 Central Supply Systems.

Oxygen systems shall comply with 5.1.3.5, as applicable, except as follows:

(1) If the operating oxygen supply consists of high pressure cylinders designed with a primary and secondary source, no reserve supply ~~is~~ shall be required.

(2) If the operating oxygen supply consists of liquid containers designed with a primary and secondary source, a reserve with a minimum supply of 15 minutes ~~is~~ shall be required.

(3) If the operating oxygen supply consists of a bulk primary, a reserve with a minimum supply of 15 minutes ~~is~~ shall be required.

(4) An EOSC ~~is~~ shall not be required for the hyperbaric oxygen system.

(5) An IBER ~~is~~ shall not be required for the hyperbaric oxygen system.

Submitter Information Verification

Submitter Full Name: HEA-HYP

Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 10:39:21 EDT 2015

Committee Statement

Committee Statement: The manual of style allows for a maximum of 6 levels of paragraph numbering. Section 14.2.1.4.4 contains 5 paragraphs that are meant to be subordinate to their preceding paragraph but were not numbered as such because it would require a 7th level of numbering. The requirement in 14.2.1.4.4 is unnecessary and could be removed, allowing for renumbering of subsequent paragraphs. In the new numbering scheme, paragraphs 14.2.1.4.4.2, 14.2.1.4.4.4, 14.2.1.4.4.5(A), 14.2.1.4.4.5(B), and 14.2.1.4.4.7 are obviously subordinate to their preceding paragraphs.

Response Message:

Public Input No. 235-NFPA 99-2015 [Section No. 14.2.1.4.4]

First Revision No. 309-NFPA 99-2015 [Section No. 14.2.1.5]

14.2.1.6 Storage and Handling of Medical Gases.

Storage and handling of medical gases shall meet the applicable requirements of Chapter 5 and Chapter 11 .

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 10:45:49 EDT 2015

Committee Statement

Committee Statement: The existing placement of this paragraph could be interpreted to apply only to oxygen systems. Moving it to the end of the section makes it more obvious that it applies to all medical gases. Adding reference to chapter 11 also add another reference to storage.

Response Message:

Public Input No. 233-NFPA 99-2015 [Section No. 14.2.1.5]

First Revision No. 344-NFPA 99-2015 [Section No. 14.2.1.6.4.7]

14.2.1.5.4.7

Medical air systems shall comply with Section 5.2 as applicable, except as follows:

(1) Area and master alarms ~~are~~ shall not be required for ~~Category 3 care~~ Category 3 hyperbaric care .

(2) A gas cylinder header per Section 5.2 with sufficient cylinder connections to provide for at least an average day's supply with the appropriate number of connections being determined after consideration of delivery schedule, proximity of the facility to alternate supplies, and the facility's emergency plan ~~is~~ shall be permitted.

(3) A medical air cylinder directly connected to a Class B or Class C chamber and used to provide air to that chamber shall be permitted to be in the same room as the chamber.

(4) Where a cylinder is used as described in 14.2.1.5.4.7(3) , the cylinder shall be considered to be "in use" and shall not be counted when determining the total volume of medical gas outside a storage area in Section 11.3 .

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 07 11:39:16 EDT 2015

Committee Statement

Committee Statement: It is typical for a chamber in a facility to have a large H-size cylinder of medical air next to, and directly connected to, the chamber to provide "air breaks" during administration of oxygen therapy. A facility with more than one chamber together in a treatment room then has more than 300 CF of gas in the room, since one H-size cylinder contains 242 CF of gas. This requires the cylinders to be stored in a separate room and piped to each chamber, adding an unnecessary level of complexity and cost to the chamber operation.

Response Message:

Public Input No. 446-NFPA 99-2015 [New Section after 14.2.1.6.4.7]

First Revision No. 341-NFPA 99-2015 [Section No. 14.2.2.5.2]

14.2.2.5.2*

One additional application of paint shall be permitted, provided total paint thickness does not exceed 1⁄28 in. (0.9 mm).

Supplemental Information

File Name	Description
FR_341.docx	Staff use only- Associated annex material which has been relocated to match with this section

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Fri Aug 07 10:07:14 EDT 2015

Committee Statement

Committee Statement: The existing annex material is relevant to paragraph 14.2.2.5.2. This was not relocated properly when 14.2.2.5 was last changed.
Response Message:

Public Input No. 231-NFPA 99-2015 [Section No. A.14.2.2.5]

First Revision No. 311-NFPA 99-2015 [Section No. 14.2.2.5.3]

14.2.2.5.3

If the interior of a Class A chamber is treated (painted) ~~with a finish described in~~ ~~14.2.2.5~~ , the cure procedure and minimum duration for each layer of paint/coating to off-gas shall be in accordance with the manufacturer's application instructions.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 10:53:00 EDT 2015

Committee Statement

Committee Statement: The existing reference to 14.2.2.5 is inaccurate. The better reference would be to 14.2.2.5.1. However, based on the flow of the requirements in section 14.2.2.5, specific reference back to the performance criteria of the paint/coating is unnecessary.

Response Message:

Public Input No. 232-NFPA 99-2015 [Section No. 14.2.2.5.3]

First Revision No. 312-NFPA 99-2015 [Section No. 14.2.4.2.4.1]

~~14.2.4.2.4.1~~

~~The air treatment packages shall include automatic safeguards.~~

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 10:54:42 EDT 2015

Committee Statement

Committee Statement: Section 14.2.4.2.4.1 is unnecessary and can add confusion. The prior requirement (14.2.4.2.4) affords adequate protection to ensure that quality air is provided from compressors. Other requirements for maintaining air quality are also in place elsewhere in the Chapter.

Response Message:

Public Input No. 493-NFPA 99-2015 [Section No. 14.2.4.2.4.1]

First Revision No. 314-NFPA 99-2015 [Section No. 14.2.4.5]

14.2.5 Emergency Depressurization ~~and Facility Evacuation Capability~~.

14.2.5.1

Class A chambers shall be capable of depressurizing from 3 ATA (304.0 kPa) to ambient pressure in not more than 6 minutes.

14.2.5.2

Class B chambers shall be capable of depressurizing from 3 ATA (304.0 kPa) to ambient pressure in not more than 2 minutes.

14.2.5.3*

A means for respiratory and eye protection from combustion products allowing unrestricted mobility shall be available outside a Class A or Class B chamber for use by personnel in the event the air in the vicinity of the chamber is fouled by smoke or other combustion products.

~~**14.2.4.5.4**~~

~~The time required to evacuate all persons from a hyperbaric area with a full complement of chamber occupants all at treatment pressure shall be measured annually during the fire training drill required by 14.3.1.4.5 .~~

~~**14.2.4.5.4.1**~~

~~The occupants for this training drill shall be permitted to be simulated.~~

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 11:16:30 EDT 2015

Committee Statement

Committee Statement: The ability to evacuate the hyperbaric facility does not belong in the section on chamber ventilation. It should be promoted to its own section.

The requirements for the timed evacuation drill belong under 14.3.1.4.5, which is the requirement to perform emergency procedures at least annually. See FR 313.

Response Message:

Public Input No. 318-NFPA 99-2015 [Section No. 14.2.4.5]

Public Input No. 317-NFPA 99-2015 [Section No. 14.2.4.5.3]

Public Input No. 239-NFPA 99-2015 [Section No. 14.2.4.5]

First Revision No. 317-NFPA 99-2015 [Section No. 14.2.5.1.4]

14.2.6.1.4

A ~~fire alarm signaling device~~ means of communication shall be provided at the chamber operator's control console for ~~signaling~~ notifying the ~~emergency fire/rescue network of the institution containing the hyperbaric facility~~ fire department .

14.2.6.1.4.1

If the building housing the hyperbaric facility has a central fire alarm system, the communication shall be a pull-station connected to the system.

14.2.6.1.4.2

Trailer or vehicle-mounted facilities not contiguous to a health care facility shall conform to one of the following:

(1) They shall comply with 14.2.6.1.4 ~~14.2.6.1.4~~ ~~14.2.5.1.4~~ .

(2) They shall have a means for immediately contacting the local fire department.

Supplemental Information

File Name	Description
FR_317_Annex_Material.docx	Revised (deleted) annex material

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 12:16:02 EDT 2015

Committee Statement

Committee Statement: This revision intends to clarify that it is not the intent that the presence of the hyperbaric chamber(s) to require the installation of a fire alarm system. A telephone to notify the fire department can be sufficient. If a fire alarm is available, there must be a direct connection by means of a pull station as a signalling device. The revision to the code section makes the associated annex note irrelevant and it has been deleted.

Response Message:

FR 317 – Annex Material

~~A.14.2.5.1.4~~

~~This requirement does not preclude the use of an alarm system affording direct fire department contact.~~

First Revision No. 315-NFPA 99-2015 [New Section after 14.2.5.3]

14.2.6.2.9

All dedicated storage vessels used to provide the deluge system with water shall be fitted with a suitable water level indicator, with the level displayed at the chamber console.

14.2.6.2.10

Deluge systems using pressurized water vessels shall be designed to prevent the driving gas supply from pressurizing the hyperbaric chamber if all the water is driven out of the water vessel.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 11:42:39 EDT 2015

Committee Statement

Committee Statement: Section 14.2.5.2.9 has been added to ensure that the chamber operator has assurance that the deluge vessels are indeed filled with water prior to treatments commencing. This does not do away with the requirements for daily visual checks nor semi-annual testing.

Section 14.2.5.2.10 has been added to prevent excessive driving gas from adding pressure to the chamber. One solution might be a residual pressure device on the driving gas cylinder (shuts off when pressure reaches a certain minimum level, but then this would make cylinder change-out potentially restricted. Refilling is always difficult with a residual pressure device.

Response Message:

Public Input No. 223-NFPA 99-2015 [New Section after 14.2.5.3]

First Revision No. 316-NFPA 99-2015 [Section No. 14.2.7.2]

14.2.8.2

A ~~fire alarm signaling device~~ means for communication shall be provided within the room housing the chamber(s) for ~~signaling~~ notifying the ~~emergency fire/rescue network of the institution containing the hyperbaric facility~~ fire department.

14.2.8.2.1

If the building housing the hyperbaric facility has a central fire alarm system, the communication shall be a pull-station connected to the system.

14.2.8.2.2

Trailer or vehicle-mounted facilities not contiguous to a health care facility shall conform to one of the following:

(1) They shall comply with 14.2.8.2 ~~14.2.8.2~~ ~~14.2.7.2~~ .

(2) They shall have a means for immediately contacting the local fire department.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 12:02:53 EDT 2015

Committee Statement

Committee Statement: This revision intends to clarify that it is not the intent that the presence of the hyperbaric chamber(s) to require the installation of a fire alarm system. A telephone to notify the fire department can be sufficient. If a fire alarm is available, there must be a direct connection by means of a pull station as a signalling device.

Response Message:

Public Input No. 494-NFPA 99-2015 [New Section after 14.2.7.2]

First Revision No. 320-NFPA 99-2015 [Section No. 14.2.8.1.4.1]

~~14.2.8.1.4.1*~~

~~If motors are to be located in the chamber, they shall meet the requirements of 14.2.8.3.14 .~~

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 14:03:41 EDT 2015

Committee Statement

Committee Statement: This section is redundant with 14.2.8.3.14 for class A chambers. Motors should not be permitted within Class B chambers.
Response Message:

Public Input No. 257-NFPA 99-2015 [Section No. 14.2.8.1.4.1]

First Revision No. 304-NFPA 99-2015 [Section No. 14.2.8.2]

14.2.9.2 Electrical Service.

~~**14.2.8.2.1**~~

~~All hyperbaric facilities shall contain an electrical service that is supplied from two independent sources of electric power.~~

14.2.9.2.1*

All hyperbaric facilities equipped with any of the following electrically driven feature shall be provided with some means of backup electric power:

(1)* Chamber room emergency lighting, installed per NFPA *101* Section 7.9.

(2)* Chamber emergency lighting, whether internally or externally mounted

(3)* Chamber intercommunications

(4)* Alarm systems, including flame detectors

(5)* Chamber fire suppression system equipment and controls

(6)* Electrical controls used for chamber pressurization and ventilation control

14.2.9.2.1.1

Electrical control and alarm system design shall be such that hazardous conditions (e.g., loss of chamber pressure control, deluge activation, spurious alarms) do not occur during power interruption or during power restoration. ~~All hyperbaric facilities for human occupancies shall contain an electrical service that is supplied from two independent sources of electric power~~ .

14.2.9.2.1.2

Booster pumps in the chamber fire suppression system shall be on separate branch circuits serving no other loads.

~~**14.2.8.2.1.3**~~

~~Article 700 of *NFPA 70* , National Electrical Code , shall apply to hyperbaric systems located in facilities other than health care facilities.~~

14.2.9.2.2

Article 700 of *NFPA 70*, ~~National Electrical Code~~ , shall apply to hyperbaric systems located in facilities other than health care facilities.

14.2.9.2.3

~~All hyperbaric facilities~~ Hyperbaric electrical service for Category 1 or 2 hyperbaric care shall ~~contain an electrical service that is~~ be supplied from two independent sources of electric power.

14.2.9.2.3.1

For hyperbaric facilities using a prime-mover–driven generator set, they shall be designated as the life safety and critical branches and shall meet the requirements of Chapter 6 for hyperbaric systems based in health care facilities.

14.2.9.2.3.2

Electrical equipment associated with life-support functions of hyperbaric facilities shall be connected to the critical branch of the ~~life safety and critical branches~~ essential electrical system, , which requires that such equipment shall have electrical power restored within 10 seconds of interruption of normal power.

~~**14.2.8.2.1.2**~~

~~For hyperbaric facilities using a prime-mover–driven generator set, they shall be designated as the life safety and critical branches and shall meet the requirements of Chapter 6 for hyperbaric systems based in health care facilities.~~

~~14.2.8.2.2~~

~~Electrical equipment associated with life-support functions of hyperbaric facilities shall be connected to the critical branch of the life safety and critical branches essential electrical system,, which requires that such equipment shall have electrical power restored within 10 seconds of interruption of normal power.~~

~~14.2.9.2.4.1~~

~~The equipment specified in shall include, but is not limited to, the following:~~

~~Electrical power outlets located within the chamber~~

~~Chamber emergency lighting, whether internally or externally mounted~~

~~Chamber intercommunications~~

~~Alarm systems, including fire detectors~~

~~Chamber fire suppression system equipment and controls~~

~~Other electrical controls used for chamber pressurization and ventilation control~~

~~A sufficient number of chamber room lights (either overhead or local) to ensure continued safe operation of the facility during a normal power outage~~

~~14.2.9.2.4.2~~

~~Booster pumps in the chamber fire suppression system shall be on separate branch circuits serving no other loads.~~

14.2.9.2.4

Electric motor–driven compressors and auxiliary electrical equipment normally located outside the chamber and used for chamber atmospheric control shall be connected to the equipment system *(see Chapter 6)* or the life safety and critical branches *(see NFPA 70*, ~~*National Electrical Code* , *Article 700)*~~, as applicable.

14.2.9.2.5

Electric motor–driven compressors and auxiliary electrical equipment shall be arranged for delayed-automatic or manual connection to the alternate power source so as to prevent excessive current draw on the system during restarting.

14.2.9.2.6

~~When~~ Where reserve air tanks or a nonelectric compressor(s) is provided to maintain ventilation airflow within the chamber and supply air for chamber pressurization, the compressor(s) and auxiliary equipment shall not be required to have an alternate source of power.

~~14.2.9.2.7~~

~~Electrical control and alarm system design shall be such that hazardous conditions (e.g., loss of chamber pressure control, deluge activation, spurious alarms) do not occur during power interruption or during power restoration.~~

Supplemental Information

File Name	Description
FR_304_Annex.docx	Associated annex notes

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:

Zip:

Submittal Date: Wed Aug 05 09:33:09 EDT 2015

Committee Statement

Committee Statement: The requirements of this section are modified to identify specific features of all hyperbaric facilities that should have back up electric power, and to allow for hyperbaric facilities with less elaborate backup power needs. Some hyperbaric facilities do not need two independent sources of electrical power. Example: a pneumatically driven monoplace chamber where ancillary critical care equipment is never used.

Response Message:

Public Input No. 248-NFPA 99-2015 [Section No. 14.2.8.2.1.1]

Public Input No. 408-NFPA 99-2015 [Section No. 14.2.8.2.1 [Excluding any Sub-Sections]]

Public Input No. 324-NFPA 99-2015 [Section No. 14.2.8.2]

FR 304 – Annex Material

A.14.2.8.2.1
A backup generator or backup power system for the hyperbaric facility may not be necessary, but certain electrically driven features of hyperbaric facilities should have some type of backup. This may be addressed as a single backup power system or as multiple, smaller power sources. The source for such backup power and emergency lighting can be battery supplied.

A.14.2.8.2.1(1) Chamber room emergency lighting should be provided and does not require a unique type of emergency lighting because it is a hyperbaric facility.

A.14.2.8.2.1(2) Chamber emergency lighting requirements vary. For chambers with a large acrylic window, found in most Class B chambers, the room emergency lighting is sufficient to meet this requirement. For chamber made primarily of steel, with a small window(s), lighting dedicated to the chamber interior may be necessary. In this case, at least one light should be provided with backup power.

A.14.2.8.2.1(3)Chamber intercommunication power requirements vary. The duration of backup power for communications depends on the type of hyperbaric treatments performed, but should not need to exceed the duration of a hyperbaric treatment conducted in the facility.

A.14.2.8.2.1(4) Class A chambers may employ flame detectors. If employed, these detectors should have backup power. Flame detectors are typically not employed in Class B chambers.

A.14.2.8.2.1(5) Class A chambers are required to have a fire suppression system. All electrical controls related to activation and performance of the fire suppression system should have backup power. Fire suppression systems are not typically employed in Class B chambers.

A.14.2.8.2.1(6) Some Class A and Class B chambers employ electrical controls as part of the pressurization and ventilation system of the chamber. These controls should have backup power.

First Revision No. 327-NFPA 99-2015 [Section No. 14.2.8.3.9 [Excluding any Sub-Sections]]

Flexible cords used to connect portable utilization equipment to the fixed electrical supply circuit shall meet all ~~of~~ the following requirements:

(1) They shall be of a type approved for extra-hard ~~utilization~~ use in accordance with Table 400.4 of *NFPA 70*, ~~*National Electrical Code*~~ .

(2) T~~hey shall include a ground conductor.~~ Electrically conductive casings of all portable equipment for use inside the chamber shall be grounded.

(3) They shall meet the requirements of 501.140 of *NFPA 70*, ~~*National Electrical Code*~~ .

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 18:18:58 EDT 2015

Committee Statement

Committee Statement: AC devices (110 VAC) are generally supplied with a ground conductor within the flexible electrical cord. VDC devices are generally supplied from ungrounded power supplies. Section 14.2.8.3.7.2 requires that "a continuous ground shall be maintained between all conductive surfaces enclosing electrical circuits and the chamber hull using approved grounding means." A VDC powered device generally does not possess any grounding facilities.

Response Message:

Public Input No. 225-NFPA 99-2015 [Section No. 14.2.8.3.9 [Excluding any Sub-Sections]]

First Revision No. 321-NFPA 99-2015 [Section No. 14.2.8.3.14]

14.2.9.3.14* Motors.

Motors located in the chamber and that are not a component of medical equipment shall meet one of the following requirements:

(1) They shall comply with 501.125(A)(1) of *NFPA 70*, ~~*National Electrical Code* , for the chamber pressure and oxygen concentration~~ .

(2) They shall be ~~of the~~ totally enclosed ~~types meeting~~ in accordance with 501.125(A)(2) or 501.125(A)(3) of *NFPA 70*, ~~*National Electrical Code*~~ .

Supplemental Information

File Name	Description
FR_321.docx	New Annex section.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 14:23:08 EDT 2015

Committee Statement

Committee Statement: There has been confusion regarding how to apply the code for motors for chamber operation and patient care equipment
Response Message:

Public Input No. 258-NFPA 99-2015 [Section No. 14.2.8.3.14]

FR 321 – Annex Material

A.14.2.8.3.14

It is recommended that system design be such that electric motors not be located inside the chamber. This requirement is not intended to apply to a motor that is within a piece of portable medical equipment.

First Revision No. 322-NFPA 99-2015 [Section No. 14.2.8.3.15.1]

14.2.9.3.15.1

Lighting installed or used inside the chamber shall be ~~rated for a pressure of~~ of a type that is not damaged by exposure to 1½ times the ~~chamber operating pressure~~ maximum allowable working pressure (MAWP) .

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 14:56:41 EDT 2015

Committee Statement

Committee Statement: Using the word rated is problematic as there are not any lighting fixtures rated for our application
Response Message:

Public Input No. 259-NFPA 99-2015 [Section No. 14.2.8.3.15.1]

First Revision No. 323-NFPA 99-2015 [Section No. 14.2.8.3.17.1]

14.2.9.3.17.1

The appliance shall be designed, constructed, inspected, and ~~constructed~~ maintained in accordance with Chapter 10.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 15:14:10 EDT 2015

Committee Statement

Committee Statement: This helps clarify the intent of this section regarding patient care manufacture, ITM of patient care equipment.
Response Message:

Public Input No. 260-NFPA 99-2015 [Section No. 14.2.8.3.17.1]

First Revision No. 324-NFPA 99-2015 [Section No. 14.2.8.3.17.5]

14.2.9.3.17.5 Battery-Operated Devices.

Battery-operated devices shall meet the following requirements:

(1) Batteries shall be fully enclosed and secured within the equipment enclosure.

(2) Batteries shall not be damaged by the maximum chamber pressure to which they are exposed.

(3) Batteries shall be of a sealed type that does not off-gas during normal use.

(4) Batteries or battery-operated equipment shall not undergo charging while located in the chamber.

(5) Batteries shall not be changed on in-chamber equipment while the chamber is in use.

(6) The equipment electrical rating shall not exceed 12 V and 48 W.

~~Lithium and lithium ion batteries shall be prohibited in the chamber during chamber operations, unless the product has been accepted or listed for use in hyperbaric conditions by the manufacturer or a nationally recognized testing agency.~~

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 15:16:44 EDT 2015

Committee Statement

Committee Statement: The existing provision for manufactures to approve or third party testing is not functional and does not work. While this revision deletes the prohibition of lithium and lithium ion batteries, other protection are in place. See sections 14.2.8.3.1, 14.8.3.2, 14.2.8.3.3, 14.2.8.3.4, 14.2.8.3.12 and 14.2.8.3.17 for example.

Section 14.3.1.5.1.2 Would still be in effect prohibiting cell phones and personal electronic devices.

Section 14.2.8.1.5 requires us to use chapter 10 for patient care equipment so these devices are part of a PM program.

The existing protections in chapter 14 exceed the FAA guidelines for carry-on baggage.

The FAA and NASA have the most experience with issues related to pressure changes with these types of batteries and the FAA has developed rules for carry-on baggage and cargo. This revision will allow a limited quantity of lithium and lithium ion batteries for essential equipment. Cells phone, and personal electronic devices would still be prohibited, temperature limits, only required equipment for chamber operation or patient care and a preventive maintenance program are all in place for the class A chamber. Chapter 14 requirements would still be more conservative than the FAA regulations for carry on baggage.

UL abuse standard exposes the batteries to a pressure test of 2000 pounds. Clinical pressures are

less than 10% of this test.

Secondary batteries (rechargeable) should be allowed using the existing requirements. There are devices with rechargeable lithium batteries that have been approved for hyperbaric chambers. Literature search indicates that LVAD batteries have been taken into the chamber safely.

The reported incidents that have occurred have been related to battery charging, large volume shipments, loose batteries shorting out, overheating caused by mixed batteries, exposure to high temperature, etc. There have been no documented cases of fires that the committee is aware of from primary or secondary lithium or lithium ion batteries that are not charging, contained within the device as designed, part of a required preventive maintenance program and not exposed to heat.

Response Message:

Public Input No. 49-NFPA 99-2015 [Section No. 14.2.8.3.17.5]

Public Input No. 263-NFPA 99-2015 [Section No. 14.2.8.3.17.5]

First Revision No. 325-NFPA 99-2015 [New Section after 14.2.8.3.17.6]

14.2.9.3.18* Gas Purging.

Gas purging of AC and DC equipment used inside the chamber shall be permitted using inert gas or air.

Supplemental Information

File Name	Description
FR_325.docx	FR and associated annex material.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 16:14:51 EDT 2015

Committee Statement

Committee Statement: Currently chapter 14 has only one mention of inert gas purging with no minimal requirements or guidelines listed in chapter 14 or the Annexes. This additional section is an attempt to introduce some minimal requirements and further safe practice guidelines in Annex B. The standard for allowable oxygen percentage in a purged device is stated in the notes of Annex B Table B.14.4 "Pressure Table" stating that "However, 6 percent oxygen in nitrogen will not support combustion, regardless of oxygen partial pressure".

Introducing an electrical device inside a chamber increases the risk of fire as stated in 14.2.8.3*. This is true even if the device is less than 120 VAC and under 2 amps. I would petition that this risk also applies to DC devices as well as all corded and cordless devices except as mentioned in 14.2.8.3.18.1.

Response Message:

Public Input No. 346-NFPA 99-2015 [New Section after 14.2.8.3.17.6]

Public Input No. 347-NFPA 99-2015 [New Section after A.14.2.8.3.17]

Public Input No. 411-NFPA 99-2015 [New Section after B.14.2.2]

Inert Gas Purging of Electrical Devices

14.2.8.3.18 Gas Purging

14.2.8.3.18.1*

Gas purging of AC and DC equipment used inside the chamber shall be permitted using inert gas or air.

A.14.2.8.3.18.1

The intent of this section is to mitigate the risks of fire when an electrical device is placed inside the chamber and put under pressure.

The requirements of this section are not intended for things such as approved wrist watches and similar approved small battery powered devices. See Annex B.14.5 for additional information on inert gas or air purging.

B.14.5 Gas Purging

Inert gas or air purging is a means to mitigate the risk of fire initiating from an electrical device brought into the chamber. The three main objectives to inert gas or air purging are to lower the oxygen level, purge increased heat from the device and to help prevent dust accumulation inside the device.

Fire research has demonstrated that under normal conditions combustion will not take place when the oxygen level is at 6% or less. This is regardless of the treatment pressure and is more related to the ratio of oxygen to the inert gas. With an oxygen level of 6% and the balancing inert gas level at 94%, the high percentage of inert gas will prevent combustion.

A clear policy and procedure should be written for an inert gas purging systems and include the inert gas parameters for each device and the proper set up of the system.

All testing to determine the proper inert gas or air flow should be well documented.

Approval signatures need to be obtained from the medical director and the safety director at minimum. Other signatures should include the department manager and biomed representatives.

Start-up and shut-down checklist should include purge gas parameters with visual checks and verifications of inside devices, purge gas equipment and alarms.

Where gas purging is used, the following considerations should be made:

(1) Each electrical device should comply with section 14.2.8.3.19. Gas purging is only one element of the essential risk assessment and management that is critical to safely managing any electrical device that is introduced into the chamber. A comprehensive risk assessment with approved safety procedures and mitigation orders needs to be documented and signed by the medical director, safety director and all who are directly involved, prior to the device being used in the chamber. Available guides for risk assessment of electrical devices are listed in Annex B.14.2.8.3.19.1

(2) Each gas purge device should have its own dedicated purging line and flowmeter with each flowmeter clearly labeled identifying the gas used. Splitting a purge line to supply two or more devices can create a disparity of flow between the multiple gas lines depending on the length and resistance of each line. One device may be well protected with high flow and the other device under protected with very little flow. A single line with a single flowmeter will prevent this and give a measurable way to verify the correct flow to the device. A gas flowmeter can be mistaken for an oxygen flowmeter.

(3) When using an inert gas, oxygen percent should be maintained at less than or equal to 6 percent within the electrical compartment(s) of the device at all treatment levels. For initial testing, in order to establish the proper inert gas flow,

oxygen levels in the electrical compartments of the device must be tested at all treatment pressures.

(4) The manufacturer's safe operating temperature range should be maintained at all treatment levels. Gas purging is useful for purging increased heat from the device. For initial testing, in order to establish the proper inert gas flow, temperature levels in the electrical compartments of the device must be tested at all treatment pressures.

(5) Supply pressure for gas purging should be supplied from a regulator system that will maintain the surface pressure over the chamber's treatment pressure, or over-bottom pressure. Maintaining purge gas pressure at all treatment levels can be accomplished by means of a tracking type regulator outside of the chamber or by placing the regulator inside the chamber with an adequate supply pressure for all treatment pressures.

(6) An audio and visual alarm system should activate at the operator's console if there is a loss of sufficient pressure to maintain set flowrates to the gas purging system during any pressurization of the chamber. The chamber operator needs to be alerted to a loss of purge gas flow.

(7) Chamber operations should be aborted if there is a loss of sufficient pressure to the gas purging system as noted in (6). Loss of purge gas creates a risks to patients and staff.

(8) When utilizing inert gas, oxygen monitoring of the chamber's atmosphere should have a low level alarm limit set at no lower than 19.5 percent. Normal gas purging is unlikely to lower the oxygen level of the chamber atmosphere during hyperbaric oxygen treatments. However, because inert gas is being introduced into the chamber, an oxygen low alarm limit of 19.5 percent should be set.

(9) Electrical devices that are enclosed, such as TV monitors placed in acrylic boxes, should have some means of extinguishing the device with water from the deluge system or the hand held hose. Acrylic boxes / enclosures are sometimes

used to make gas purging easier. In the event of a fire or smoke inside this box there should be some means of drenching the inside device with water.

(10) Chambers with gas purging systems utilizing inert gas should keep the chamber doors open during non-operational hours. Chambers are made to be air tight. If the chamber doors are closed, for example over night, and the inert gas is inadvertently left on, there is a potential for the inert gas to accumulate inside the chamber to a dangerous level. This will deplete the oxygen level and becomes a hazard for anyone entering the chamber.

First Revision No. 326-NFPA 99-2015 [Section No. 14.2.8.4.2 [Excluding any Sub-Sections]]

~~In health care facilities,~~ All ac electrical power circuits located within the chamber shall be supplied from an ungrounded electrical system equipped with a line isolation monitor with signal lamps and audible alarms.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 17:17:07 EDT 2015

Committee Statement

Committee Statement: A line isolation monitor does not generally monitor any actual current flow, but rather it predicts what could flow should there be a low-impedance connection from either L1 or L2 to ground. These monitors are used with VAC powered systems and generally not VDC powered systems. This is confusing and reads as if ALL electrical power circuits located in the chamber shall utilise a line isolation monitor. The inserted term VAC could help clarify this.

The term health care facility has been removed because this should be applied regardless of the building occupancy housing the chamber.

Response Message:

Public Input No. 486-NFPA 99-2015 [Section No. 14.2.8.4.2 [Excluding any Sub-Sections]]

Public Input No. 226-NFPA 99-2015 [Section No. 14.2.8.4.2 [Excluding any Sub-Sections]]

First Revision No. 328-NFPA 99-2015 [Section No. 14.2.9.4]

14.2.10.4 Oxygen Monitoring.

14.2.10.4.1

Oxygen levels shall be continuously monitored in any chamber in which nitrogen ~~or other diluent gas~~ is added to the chamber or to reduce the volumetric concentration of oxygen in the atmosphere.

14.2.10.4.1.1

Oxygen monitors shall be equipped with audible and visual alarms.

14.2.10.4.1.2

Sample response time, at all treatment levels, shall be no more than 30 seconds.

14.2.10.4.2*

Oxygen levels shall be continuously monitored in Class A chambers when breathing mixtures containing in excess of 21 percent oxygen by volume are being breathed by patients or attendants, ~~or~~ when any flammable agents are present in the chamber, or when ~~either of these~~ both conditions exist~~s~~ .

14.2.10.4.2.1

Audible and visual alarms shall indicate volumetric oxygen concentrations in excess of 23.5 percent range for Class A chambers .

14.2.10.4.2.2*

At least one sample port shall be equipped with a removable extension to allow for spot-checking of any location within the chamber.

Supplemental Information

File Name	Description
FR_328.docx	Associate New annex material.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 18:21:01 EDT 2015

Committee Statement

Committee Statement: Language has been specified to make it clear that the reasoning for this requirement is specific for nitrogen and is not meant to be applied where air is used.

A minimum response time has been added because long sample lines, with low flows, such as 0.5 LPM, will take a long time to reach the sensor head.

Oxygen pooling is a serious concern that seems to be often overlooked. The requirement for a removable extension should help increase the awareness of oxygen pooling and give the proper tool to troubleshoot and resolve areas of pooling. The Annex A asterisk will increase understanding

and awareness.

Response Message:

Public Input No. 266-NFPA 99-2015 [Section No. 14.2.9.4.1 [Excluding any Sub-Sections]]

Public Input No. 344-NFPA 99-2015 [New Section after A.14.2.9.2.1]

Public Input No. 340-NFPA 99-2015 [Section No. 14.2.9.4]

A.14.2.9.4.2

Oxygen levels in Class A chambers should be sampled from at least two sample ports at disparate locations of the chamber and shall have a separate oxygen monitor for each sample port.

Chamber atmospheres are typically not homogenous. Oxygen can accumulate in pools or pockets around patients with levels that are dangerously high. A single oxygen sample port inside the chamber might not be sufficient to detect increased oxygen levels in another area of the chamber. In this case, a serious increase of oxygen, well above the allowed level of 23.5 percent, can go undetected. Providing at least two sample ports provides an increased standard for better assessment the oxygen levels inside the chamber. The size of the vessel should be factored into determining how many ports are necessary. A dedicated oxygen analyzer on each line is to prevent false and unsafe readings from two or more sample lines feeding into one oxygen sensor.

For example: one sample line may come from an area of 21 percent and the other line come from an area of 50 percent or more. Both lines coming together will mix and give a false low oxygen reading. Having a dedicated oxygen monitor for each sample line will avoid this unsafe situation.

A.14.2.9.4.2.2

The ability to spot check for oxygen leaks and or oxygen pooling is essential for the safe management of oxygen levels. If the minimum 30 second response time is not compromised, the extension or "snooping wand" can be left (in place) connected for easy use.

First Revision No. 334-NFPA 99-2015 [Section No. 14.2.9.7]

14.2.10.1.1

Electrical monitoring equipment used inside the chamber shall comply with the applicable requirements of 14.2.9 ~~14.2.9~~ ~~14.2.8~~ .

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 06 10:04:24 EDT 2015

Committee Statement

Committee Statement: This section belongs as the first requirement under 14.2.9.1 "General".
Response Message:

Public Input No. 498-NFPA 99-2015 [Section No. 14.2.9.7]

First Revision No. 335-NFPA 99-2015 [Section No. 14.2.9.8]

14.2.10.2.2*

Closed-circuit television monitoring of the chamber interior shall be employed for chamber operators who do not have direct visual contact with the chamber interior from their normal operating location.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 06 10:09:28 EDT 2015

Committee Statement

Committee Statement: The requirement for closed circuit television belongs with Intercommunications.
Response Message:

Public Input No. 500-NFPA 99-2015 [Section No. 14.2.9.8]

First Revision No. 336-NFPA 99-2015 [Section No. 14.2.10.2.5]

14.2.11.2.5*

The point of exhaust shall be identified as an oxygen exhaust by a sign prohibiting smoking or open flame and the sign shall include a pictograph indicating "no smoking" and "no open flame — flame" in accordance with NFPA 170 .

Supplemental Information

File Name	Description
FR_336.docx	Associated annex with figures from NFPA 170

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 06 10:12:12 EDT 2015

Committee Statement

Committee Statement: Maintenance work being done in hospitals is often done by outside contractors that are left on their own with little or no guidance and assistance from facility management. Work being done on a hospitals roof by a contractor that does not speak/understand English is a potential disaster waiting to happen. Old Roofs leak, and need to be repaired. One of these methods requires Hot Tar in which a propane torch is needed to heat the tar and lay the roofing material out.

Response Message:

Public Input No. 182-NFPA 99-2015 [Section No. 14.2.10.2.5]

A.14.2.10.2.5
The facility should consider bilingual signage that is appropriate to the location. The hyperbaric safety director should be aware of any work performed on the roof near exhaust vent.

A.14.2.10.2.5.1
See Figure A.14.2.10.2.5.1 for examples of the pictographs required by NFPA 170.

No Open Flame — Flame 	Circular field Red circle and slash Black image White background	The identification of areas in which open flame is prohibited	The identification of areas, such as combustible storage areas, gas stations, and hazardous areas

No Smoking 	Circular field Red circle and slash Black image White background	The identification of areas in which smoking is prohibited	The identification of areas, such as those for flammable liquid storage, where smoking could lead to fire or explosion

First Revision No. 337-NFPA 99-2015 [Section No. 14.2.10.3]

14.2.1.3.3

The supply piping for all air, oxygen, or other breathing mixtures from certified commercially supplied cylinders and portable containers shall be provided with a particulate filter of 66 microns or finer.

14.2.1.3.3.1

The particulate filter shall meet the construction requirements of ANSI/ASME PVHO-1, *Safety Standard for Pressure Vessels for Human Occupancy*~~, and be located as close as practical to the source.~~

14.2.1.3.3.2

The particulate filter shall be located as close as practical to the source

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 06 10:29:55 EDT 2015

Committee Statement

Committee Statement: This requirement is clearly a piping issue and should be located in section 14.2.1.3 "Hyperbaric Piping Requirements", not in 14.2.10 "other Equipment and Fixtures".

Response Message:

Public Input No. 512-NFPA 99-2015 [Section No. 14.2.10.3]

First Revision No. 313-NFPA 99-2015 [Sections 14.3.1.4.4, 14.3.1.4.5]

14.3.1.5.1

Emergency procedures specific to the hyperbaric facility shall be established.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 11:13:22 EDT 2015

Committee Statement

Committee Statement: Requirements related to emergency procedures have been relocated to a new section titled "Emergency Procedures". Surveys have shown that compliance with conducting emergency drills is poor. Creating the new section adds emphasis to these requirements.

Two requirements on emergency drills previously located in 14.2.4 (chamber ventilation) have been moved to this new section.

Response Message:

Public Input No. 250-NFPA 99-2015 [Section No. 14.2.4.5.4]

Public Input No. 240-NFPA 99-2015 [Sections 14.3.1.4.4, 14.3.1.4.5]

First Revision No. 319-NFPA 99-2015 [Section No. 14.3.1.5.1]

14.3.1.6.1.3*

Prior to each hyperbaric treatment a pretreatment, safety check to identify and remove prohibited items shall be performed and documented by a qualified person.

Supplemental Information

File Name	Description
FR_319.docx	New annex material

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Wed Aug 05 13:22:31 EDT 2015

Committee Statement

Committee Statement: It has been shown by Sheffield et all, that some 80% of mishaps have occurred in chambers because of some prohibited item allowed to come into the chamber during operation. The UHMS has adopted a position statement regarding a safety time out modeled after surgery prior to chamber operations. Requiring a per-treatment safety check will help keep hazards out of the chamber. Additional annex material has been added to guide the user on what this check might include.

Response Message:

Public Input No. 47-NFPA 99-2015 [Section No. 14.2.1.1.7]

Public Input No. 267-NFPA 99-2015 [Section No. 14.3.1.5.1]

First Revision No. 329-NFPA 99-2015 [Section No. 14.3.1.5.4.5(A)]

(A)

Upholstered furniture (fixed or portable), shall be resistant to ~~a cigarette~~ ignition ~~(i.e., smoldering)~~ in accordance with one of the following:

(1) The components of the upholstered furniture shall meet the requirements for Class 1 when tested in accordance with NFPA 260, ~~*Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture*~~ ~~,~~ ASTM ~~E 1353~~ E1353 , *Standard Test Methods for Cigarette Ignition Resistance of Components of Upholstered Furniture*; or California Technical Bulletin 133, *Flammability Test Procedure for Seating Furniture for Use in Public Occupancies*.

(2) Mocked-up composites of the upholstered furniture shall have a char length not exceeding 1½ in. (38 mm) when tested in accordance with NFPA 261~~,~~ ~~*Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes*~~ , or ~~ASTM E 1352~~ ASTM E1352 , *Standard Test Method for Cigarette Ignition Resistance of Mock-Up Upholstered Furniture Assemblies*.

Submitter Information Verification

Submitter Full Name: HEA-HYP
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Submittal Date: Thu Aug 06 09:15:22 EDT 2015

Committee Statement

Committee Statement: The wording has been revised to encompass tests that don't necessarily require cigarette ignition or smoldering. This permits alternative tests to be used rather than limiting it to just one. The intention is that the upholstered furniture be resistant to ignition.

Response Message:

Public Input No. 278-NFPA 99-2015 [Section No. 14.3.1.5.4.5(A)]

First Revision No. 330-NFPA 99-2015 [Section No. 14.3.1.5.4.6]

14.3.1.6.4.6 Mattresses.

(A)

Mattresses and mattress components shall have a char length not exceeding 2 in. (51 mm) when tested in accordance with 16 CFR 1632, *Standard for the Flammability of Mattresses and Mattress Pads* (FF 4-72); 16 CFR Part 1633, *" Standard for the Flammability (Open Flame) of Mattress Sets"* ; ~~or~~ California Technical Bulletin 129, *Flammability Test Procedure for Mattresses for Use in Public Buildings*; .or NFPA 260 .

(B)

Mattresses shall have limited rates of heat release when tested in accordance with ASTM ~~E 1590~~ E1590 , *Standard Test Method for Fire Testing of Mattresses*, as follows:

(1) The peak rate of heat release for the mattress shall not exceed 100 kW. ~~The peak rate of heat release for the mattress shall not exceed 100 kW~~ .

(2) The total heat released by the mattress during the first 10 minutes of the test shall not exceed 25 MJ.

Submitter Information Verification

Submitter Full Name: HEA-HYP
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Committee Statement

Committee Statement: The wording was revised in an attempt to continue to allow a variety of tests to meet the requirements which can be applied to both mattresses and mattress components..

Response Message:

Public Input No. 279-NFPA 99-2015 [Section No. 14.3.1.5.4.6]

First Revision No. 331-NFPA 99-2015 [Section No. 14.3.1.5.4.7]

14.3.1.6.4.7

Fill materials contained within upholstered furniture and mattresses shall comply with the open flame test in Section A-1 of the 2000 edition of California Technical Bulletin 117, *Requirements, Test Procedure and Apparatus for Testing the Flame Retardance of Resilient Filling Materials Used in Upholstered Furniture*.

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
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Submittal Date: Thu Aug 06 09:32:00 EDT 2015

Committee Statement

Committee Statement: This revision clarifies the current requirement. The latest edition of the standard no longer has an open flame test, which was what the requirements were previously.
Response Message:

Public Input No. 280-NFPA 99-2015 [Section No. 14.3.1.5.4.7]

First Revision No. 333-NFPA 99-2015 [Section No. 14.3.1.5.5 [Excluding any Sub-Sections]]

The use of flammable hair sprays, hair oils, and skin oils shall be ~~forbidden~~ prohibited for all chamber occupants/patients as well as personnel.

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Submitter Full Name: HEA-HYP
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City:
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Zip:
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Committee Statement

Committee Statement: Editorial revision.
Response Message:

Public Input No. 253-NFPA 99-2015 [Section No. 14.3.1.5.5 [Excluding any Sub-Sections]]

First Revision No. 332-NFPA 99-2015 [Section No. 14.3.1.5.7]

14.3.1.6.7

Drapes used within the chamber shall meet the flame propagation performance criteria contained in Test 1 or Test 2, as appropriate, of NFPA 701, ~~*Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*~~ .

Submitter Information Verification

Submitter Full Name: HEA-HYP
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Thu Aug 06 09:33:48 EDT 2015

Committee Statement

Committee Statement: NFPA 101 and NFPA 5000 (and other documents) have been revised as shown because the reference to just NFPA 701 has led to "cheating" by using a "small-scale test" that has been eliminated from NFPA 701 in the 1980s because it was an invalid test that did not represent improved fire performance.

Response Message:

Public Input No. 281-NFPA 99-2015 [Section No. 14.3.1.5.7]

First Revision No. 338-NFPA 99-2015 [Sections 14.3.2.1.6, 14.3.2.1.7]

14.3.1.6.9*

Paper brought into the chamber shall be stored in a closed metal container.

14.3.1.6.10

Containers used for paper storage shall be emptied after each chamber operation.

Submitter Information Verification

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City:
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Committee Statement

Committee Statement: This requirement is out of place currently and is better located in the general materials section.

Response Message:

Public Input No. 527-NFPA 99-2015 [Section No. A.14.3.2.1.6]

Public Input No. 525-NFPA 99-2015 [Section No. 14.3.2.1.6]

Public Input No. 526-NFPA 99-2015 [Section No. 14.3.2.1.7]

First Revision No. 340-NFPA 99-2015 [Sections 14.3.4, 14.3.5, 14.3.6]

14.3.4 Inspection, Testing and Maintenance.

14.3.4.1 General.

14.3.4.1.1

The hyperbaric safety director shall ensure that all valves, regulators, meters, and similar equipment used in the hyperbaric chamber are compensated for use under hyperbaric conditions and tested as part of the routine maintenance program of the facility.

14.3.4.1.1.1

Pressure relief valves shall be tested and calibrated as part of the routine maintenance program of the facility.

14.3.4.1.2

The hyperbaric safety director shall ensure that all gas outlets in the chambers are labeled or stenciled in accordance with CGA C-4, *Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained*.

14.3.4.1.3

The requirements set forth in Section 5.1 and NFPA 55, ~~*Compressed Gases and Cryogenic Fluids Code*~~ , concerning the storage, location, and special precautions required for medical gases shall be followed.

14.3.4.1.4

Storage areas for hazardous materials shall not be located in the room housing the hyperbaric chamber. *(See 14.2.1.)*

14.3.4.1.4.1

Flammable gases, except as provided in 14.3.1.6.2.2 ~~14.3.1.6.2.2~~ ~~14.3.1.5.2.2~~ (1), shall not be used or stored in the hyperbaric room.

14.3.4.1.5

All replacement parts and components shall conform to original design specification.

14.3.4.1.6*

Air from compressors shall be sampled at least every 6 months and after major repair or modification of the compressor(s).

14.3.4.2 Maintenance Logs.

14.3.4.2.1

Installation, repairs, and modifications of equipment related to a chamber shall be evaluated by engineering personnel, tested under pressure, and approved by the safety director.

14.3.4.2.1.1

Logs of all tests shall be maintained.

14.3.4.2.2

Operating equipment logs shall be maintained by engineering personnel.

14.3.4.2.2.1

Operating equipment logs shall be signed before chamber operation by the person in charge. *(See A.14.3.1.3.2.)*

14.3.4.2.3

Operating equipment logs shall not be taken inside the chamber.

14.3.4.3 Fire Protection Equipment Inside for Class A Hyperbaric Chambers.

14.3.4.3.1

Electrical switches, valves, and electrical monitoring equipment associated with fire detection and extinguishment shall be visually inspected before each chamber pressurization.

14.3.4.3.1.1

Where provided, water level indicators shall be visually inspected before each chamber pressurization.

14.3.4.3.1.2

Where provided, air pressure gauges shall be visually inspected before each chamber pressurization.

14.3.4.3.2

Fire detection equipment shall be tested each week~~, and full testing, including discharge of extinguishing media, shall be conducted annually~~ .

14.3.4.3.2.1

Testing shall include activation of trouble circuits and signals.

14.3.4.3.3

Full testing, including discharge of extinguishing media, shall be conducted annually.

14.3.4.3.4

Inspection, testing, and maintenance of the water storage tanks for Class A chambers shall be in accordance with applicable sections of Chapter 9 of NFPA 25 .

Moved by FR-340

14.3.4.3.5* ~~Testing.~~

The deluge and handline systems shall be functionally tested at least semiannually per 14.2.6.2.7 ~~14.2.6.2.7~~ ~~14.2.5.2.7~~ for deluge systems and 14.2.6.3.7 ~~14.2.6.3.7~~ ~~14.2.5.3.7~~ for handline systems.

14.3.4.3.5.1

Following the test, all valves shall be placed in their baseline position.

14.3.4.3.5.2

If a bypass system is used, it shall not remain in the test mode after completion of the test.

14.3.4.3.5.3

During initial construction, or whenever changes are made to the installed deluge system that will affect the spray pattern, testing of spray coverage to demonstrate conformance to the requirements of 14.2.6.2.6 shall be performed at surface pressure and at maximum operating pressure.

(A)

The requirements of 14.2.6.2.6 shall be satisfied under both surface pressure and maximum operating pressure.

14.3.4.3.5.4

A detailed record of the test results shall be maintained and a copy sent to the hyperbaric facility safety director.

14.3.4.3.5.5

Inspection, testing, and maintenance of hyperbaric fire suppression systems shall be performed by a qualified person.

14.3.4.4 Electrical Safeguards.

~~**14.3.4.4.1**~~

~~Electrical equipment shall be installed and operated in accordance with~~ ~~14.2.8~~ ~~.~~

14.3.4.4.1

All electrical circuits shall be tested in accordance with the routine maintenance program of the facility.

14.3.4.4.1.1

Electrical circuit tests shall include the following:

(1) Ground-fault check to verify that no conductors are grounded to the chamber

(2) Test of normal functioning *(see 14.2.9.2.3.2 ~~14.2.9.2.3.2~~ ~~14.2.8.2.2~~)*

14.3.4.4.1.2

In the event of fire, all nonessential electrical equipment within the chamber shall be de-energized before extinguishing the fire.

(A)

Smoldering, burning electrical equipment shall be de-energized before extinguishing a localized fire involving only the equipment. *(See 14.2.6.)*

~~**14.3.4.4.2** Furniture Used in the Chamber .~~

~~**14.3.4.4.2.1**~~

~~Conductive devices on furniture and equipment shall be inspected to ensure that they are free of wax, lint, or other extraneous material that could insulate them and defeat the conductive properties.~~

~~**14.3.4.4.2.2***~~

~~Casters or furniture leg tips shall not be capable of impact sparking.~~

~~**14.3.4.4.2.3**~~

~~Casters shall not be lubricated with oils or other flammable materials.~~

~~**14.3.4.4.2.4**~~

~~Lubricants shall be oxygen compatible.~~

~~**14.3.4.4.2.5**~~

~~Wheelchairs and gurneys with bearings lubricated and sealed by the manufacturer shall be permitted in Class A chambers where conditions prescribed in 14.2.9.4 are met.~~

14.3.4.5 Furniture and Grounding.

14.3.4.5.1

Conductive devices on furniture and equipment shall be inspected to ensure that they are free of wax, lint, or other extraneous material that could insulate them and defeat the conductive properties.

14.3.4.5.2*

Casters or furniture leg tips shall not be capable of impact sparking.

14.3.4.5.3

Casters shall not be lubricated with oils or other flammable materials.

14.3.4.5.4

Lubricants shall be oxygen compatible.

14.3.4.5.5

Wheelchairs and gurneys with bearings lubricated and sealed by the manufacturer shall be permitted in Class A chambers where conditions prescribed in 14.2.10.4 are met.

14.3.4.6* ~~Conductive Accessories.~~ Electrostatic Safeguards.

14.3.4.6.1

Conductive accessories shall meet conductivity and antistatic requirements.

14.3.4.6.2*

Patient ground shall be verified in Class B chambers prior to each chamber operation.

14.3.4.6.3*

Patient ground shall be verified in Class A chambers prior to chamber operation whenever atmospheres containing more than 23.5 percent oxygen by volume are used.

14.3.4.6.4

Chamber ground shall be verified to be in accordance with 14.2.9.4.1.3 for Class A and Class B chambers as part of the preventive maintenance program of the facility.

14.3.4.6.5*

Materials containing rubber shall be inspected as part of the routine maintenance program of the facility, especially at points of kinking.

14.3.4.7* Housekeeping.

A housekeeping program shall be implemented, whether or not the facility is in regular use.

14.3.4.7.1

The persons assigned to the task of housekeeping shall be trained in the following:

(1) Potential damage to the equipment from cleaning procedures

(2) Potential personal injury

(3) Specific cleaning procedures

(4) Equipment not to be cleaned

~~**14.3.5** Electrostatic Safeguards.~~

~~**14.3.5.1** Administration. (Reserved)~~

~~**14.3.5.2** Maintenance.~~

~~**14.3.10.2.1** Furniture Used in the Chamber .~~

~~**14.3.10.2.1.1**~~

~~Conductive devices on furniture and equipment shall be inspected to ensure that they are free of wax, lint, or other extraneous material that could insulate them and defeat the conductive properties.~~

~~**14.3.10.2.1.2***~~

~~Casters or furniture leg tips shall not be capable of impact sparking.~~

~~**14.3.10.2.1.3**~~

~~Casters shall not be lubricated with oils or other flammable materials.~~

~~**14.3.10.2.1.4**~~

~~Lubricants shall be oxygen compatible.~~

~~**14.3.10.2.1.5**~~

~~Wheelchairs and gurneys with bearings lubricated and sealed by the manufacturer shall be permitted in Class A chambers where conditions prescribed in 14.2.9.4 are met.~~

~~**14.3.10.2.1** Conductive Accessories. Electrostatic Safeguards.~~

~~Conductive accessories shall meet conductivity and antistatic requirements.~~

~~**14.3.10.2.1***~~

~~Materials containing rubber shall be inspected as part of the routine maintenance program of the facility, especially at points of kinking.~~

~~**14.3.6.3** Fire Protection Equipment InsideHyperbaric Chambers.~~

~~**14.3.6.3.1**~~

~~Electrical switches, valves, and electrical monitoring equipment associated with fire detection and extinguishment shall be visually inspected before each chamber pressurization.~~

~~**14.3.6.3.2**~~

~~Fire detection equipment shall be tested each week, and full testing, including discharge of extinguishing media, shall be conducted annually.~~

~~**14.3.6.3.3**~~

~~Testing shall include activation of trouble circuits and signals.~~

~~**14.3.10.3***~~ ~~Housekeeping.~~

~~A housekeeping program shall be implemented, whether or not the facility is in regular use.~~

~~**14.3.10.3.1**~~

~~The persons assigned to the task of housekeeping shall be trained in the following:~~

- ~~Potential damage to the equipment from cleaning procedures~~
- ~~Potential personal injury~~
- ~~Specific cleaning procedures~~
- ~~Equipment not to be cleaned~~

Supplemental Information

File Name	Description
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Submitter Information Verification

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Organization: [Not Specified]
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City:
State:
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Committee Statement

Committee Statement: This revision is intended to compile all ITM requirements in one location. This includes relocating the provisions previously located in 14.2.5.5 and 14.2.9.6.1.

Response Message:

Public Input No. 530-NFPA 99-2015 [Section No. A.14.3.6.4]

Public Input No. 251-NFPA 99-2015 [Section No. 14.3.6.4]

Public Input No. 252-NFPA 99-2015 [Section No. 14.3.6.3]

Public Input No. 254-NFPA 99-2015 [Section No. 14.3.6]

Public Input No. 255-NFPA 99-2015 [Section No. 14.3.4]

Public Input No. 256-NFPA 99-2015 [Section No. 14.2.5.5]

Public Input No. 265-NFPA 99-2015 [Section No. 14.2.9.6.1]

Public Input No. 529-NFPA 99-2015 [Section No. 14.3.6.4]

Public Input No. 528-NFPA 99-2015 [Section No. 14.3.6.3]

FR- 340

ITM Collection

PI 255, PI 252, PI 528, PI 251, PI 529, PI 254, PI 265, PI 256

14.3.4 Inspection, Testing and Maintenance.

14.3.4.1 General.

14.3.4.1.1
The hyperbaric safety director shall ensure that all valves, regulators, meters, and similar equipment used in the hyperbaric chamber are compensated for use under hyperbaric conditions and tested as part of the routine maintenance program of the facility.

14.3.4.1.1.1
Pressure relief valves shall be tested and calibrated as part of the routine maintenance program of the facility.

14.3.4.1.2
The hyperbaric safety director shall ensure that all gas outlets in the chambers are labeled or stenciled in accordance with CGA C-4, *Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained*.

14.3.4.1.3
The requirements set forth in Section 5.1 and NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, concerning the storage, location, and special precautions required for medical gases shall be followed.

14.3.4.1.4

Storage areas for hazardous materials shall not be located in the room housing the hyperbaric chamber. *(See 14.2.1.)*

14.3.4.1.4.1
Flammable gases, except as provided in 14.3.1.5.2.2 (1), shall not be used or stored in the hyperbaric room.

14.3.4.1.5
All replacement parts and components shall conform to original design specification.

14.3.4.1.6*
Air from compressors shall be sampled at least every 6 months and after major repair or modification of the compressor(s).

14.3.4.2 Maintenance Logs.

14.3.4.2.1
Installation, repairs, and modifications of equipment related to a chamber shall be evaluated by engineering personnel, tested under pressure, and approved by the safety director.

14.3.4.2.1.1
Logs of all tests shall be maintained.

14.3.4.2.2
Operating equipment logs shall be maintained by engineering personnel.

14.3.4.2.2.1
Operating equipment logs shall be signed before chamber operation by the person in charge. *(See A.14.3.1.3.2.)*

14.3.4.2.3
Operating equipment logs shall not be taken inside the chamber.

14.3.4.3 Fire Protection Equipment ~~Inside~~ for class A Hyperbaric Chambers.
14.3.4.3.1
Electrical switches, valves, and electrical monitoring equipment associated with fire detection and extinguishment shall be visually inspected before each chamber pressurization.
14.3.4.3.1.1
Where provided, water level indicators shall be visually inspected before each chamber pressurization.

14.3.4.3.1.2
Where provided, air pressure gauges shall be visually inspected before each chamber pressurization.

14.3.4.3.2
Fire detection equipment shall be tested each week.

14.3.4.3.2.1
Testing shall include activation of trouble circuits and signals.

14.3.4.3.3
Full testing, including discharge of extinguishing media, shall be conducted annually.

14.3.4.3.4
Applicable sections of Chapter 9 of NFPA 25, shall be used as a guide for the inspection, testing and maintenance of the water storage tanks for Class A chambers.

14.3.4.3.5* ~~14.2.5.5~~

The deluge and handline systems shall be functionally tested at least semiannually per 14.2.5.2.7 for deluge systems and 14.2.5.3.7 for handline systems.

14.3.4.3.5.1

Following the test, all valves shall be placed in their baseline position.

14.3.4.3.5.2

If a bypass system is used, it shall not remain in the test mode after completion of the test.

14.3.4.3.5.3

During initial construction, or whenever changes are made to the installed deluge system that will affect the spray pattern, testing of spray coverage to demonstrate conformance to the requirements of 14.2.5.2.6 shall be performed at surface pressure and at maximum operating pressure.

(A)

The requirements of 14.2.5.2.6 shall be satisfied under both surface pressure and maximum operating pressure.

14.3.4.3.5.4

A detailed record of the test results shall be maintained and a copy sent to the hyperbaric facility safety director.

14.3.4.3.5.5

Inspection, testing, and maintenance of hyperbaric fire suppression systems shall be performed by a qualified person.

14.3.5~~5~~4.4 Electrical Safeguards.

~~**14.3.5.1**~~

~~Electrical equipment shall be installed and operated in accordance with 14.2.8.~~

14.3.4.4.1

All electrical circuits shall be tested in accordance with the routine maintenance program of the facility.

14.3.4.4.1.1

Electrical circuit tests shall include the following:

(1) Ground-fault check to verify that no conductors are grounded to the chamber

(2) Test of normal functioning *(see 14.2.8.2.2)*

14.3.4.4.1.2
In the event of fire, all nonessential electrical equipment within the chamber shall be de-energized before extinguishing the fire.
(A)
Smoldering, burning electrical equipment shall be de-energized before extinguishing a localized fire involving only the equipment. *(See 14.2.5.)*

14.3.4.5 Furniture ~~Used in the Chamber~~ and grounding.
14.3.4.5.1
Conductive devices on furniture and equipment shall be inspected to ensure that they are free of wax, lint, or other extraneous material that could insulate them and defeat the conductive properties.
14.3.4.5.2*
Casters or furniture leg tips shall not be capable of impact sparking.
14.3.4.5.3
Casters shall not be lubricated with oils or other flammable materials.
14.3.4.5.4
Lubricants shall be oxygen compatible.
14.3.4.5.5
Wheelchairs and gurneys with bearings lubricated and sealed by the manufacturer shall be permitted in Class A chambers where conditions prescribed in 14.2.9.4 are met.

14.3.4.6* Electrostatic Safeguards.
14.3.4.6.1

Conductive accessories shall meet conductivity and antistatic requirements.

14.3.4.6.2*

Patient ground shall be verified in class B chambers prior to each chamber operation.

14.3.4.6.3

Patient ground shall be verified in Class A chambers prior to chamber operation when whenever atmospheres containing more than 23.5 percent oxygen by volume are used.

14.3.4.6.4

Chamber ground shall be verified to be in accordance with 14.2.8.4.1.3 for class A and class B chambers as part of the preventative maintenance program of the facility

14.3.4.6.5*

Materials containing rubber shall be inspected as part of the routine maintenance program of the facility, especially at points of kinking.

14.3.4.7* Housekeeping.

A housekeeping program shall be implemented, whether or not the facility is in regular use.

14.3.4.7.1

The persons assigned to the task of housekeeping shall be trained in the following:

(1) Potential damage to the equipment from cleaning procedures

(2) Potential personal injury

(3) Specific cleaning procedures

(4) Equipment not to be cleaned

Associated Annex

A.14.3.4.1.6* [was A.14.2.9.6.1]

The frequency of such monitoring should depend on the location of the air intake relative to potential sources of contamination.

A.14.3.4.3.5 [was A.14.2.5.5]

The primary focus for the semiannual test of a water-based extinguishing system is to ensure water flow through the system (i.e., inspector's test). Other vitally important benefits are the activation of water flow devices, alarm appliances, and notification and annunciator systems.

A.14.3.4.5.2 [was A.14.3.6.2.1.2]

Ferrous metals can cause such sparking, as can magnesium or magnesium alloys, if contact is made with rusted steel.

A.14.3.4.6 [was A.14.3.6]

The elimination of static charges is dependent on the vigilance of administrative supervision of materials purchased, maintenance, and periodic inspection and testing.

A.14.3.4.6.2 [new]

Verification of patient grounding should include actual testing of ground, not just a visual verification. Ideally, the verification will include connecting the patient to the ground pathway and measuring no more than 100,000,000 ohms with a meter. This value comes from NFPA 77, Recommended Practice on Static Electricity.

A.14.3.4.6.3 [new]

See A.14.3.4.6.2.

A.14.3.4.6.5 [was A.14.3.6.2.3]

Materials containing rubber deteriorate rapidly in oxygen-enriched atmospheres.

14.3.4.7 [was A.14.3.6.4]

It is absolutely essential that all areas of, and components associated with, the hyperbaric chamber be kept meticulously free of grease, lint, dirt, and dust.

First Revision No. 109-NFPA 99-2015 [Section No. 15.7.4.3.5]

15.7.4.3.5*

In ~~critical care areas, visible~~ patient care spaces where alarm notification adversely affects patient care, as determined by a risk assessment, visual or audible alarm notification appliances shall ~~be permitted to be used in lieu of audible alarm signals~~ not be required as long as an alternative means of alarm notification is provided .

Supplemental Information

File Name	Description
FR_109_Annex_Material.docx	New annex material

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Submittal Date: Tue Aug 18 09:49:50 EDT 2015

Committee Statement

Committee Statement: This section has been revised to allow the omission of either or both audible and visual alarms in any patient care space regardless of the risk category, where a risk assessment determines the alarm notification can adversely affect patient care. The previous language only permitted this for critical care areas, which could limit the allowance from being applied to spaces where this can be beneficial.

Response Message:

Public Input No. 382-NFPA 99-2015 [Section No. 15.7.4.3.5]

Public Input No. 384-NFPA 99-2015 [Section No. 15.7.4.3.5]

FR 109 Annex Material

A.15.7.4.3.5

This section allows the omission of either or both audible and visual alarms in any patient care space regardless of the risk category, where a risk assessment determines the alarm notification can adversely affect patient care. Examples of such areas can include but are not limited to intensive care units, coronary care units, angiography laboratories, cardiac catheterization laboratories, nurseries, delivery rooms, operating rooms, post-anesthesia recovery rooms, emergency departments, and similar areas.

First Revision No. 681-NFPA 99-2015 [Section No. A.5.1.3.3]

A.5.1.3.3

The bulk supply system should be installed on a site that has been prepared to meet the requirements of NFPA 55~~, *Compressed Gases and Cryogenic Fluids Code* ,~~ or CGA G-8.1, *Standard for Nitrous Oxide Systems at Consumer Sites*. A storage unit(s), reserve, pressure regulation, and a signal actuating switch(es) are components of the supply system. Shutoff valves, piping from the site, and electric wiring from a signal switch(es) to the master signal panels are components of the piping system.

The bulk supply system is normally installed on the site by the owner of this equipment. The owner or the organization responsible for the operation and maintenance of the bulk supply system is responsible for ensuring that all components of the supply system — main supply, reserve supply, supply system signal-actuating switch(es), and delivery pressure regulation equipment — function properly before the system is put in service.

In the locating of central supply systems, consideration should be given to ensuring the resilience of the facility under reasonably anticipated adverse conditions. Examples have included the following:

(1) Flooding of systems located in basements from extraordinary weather, water main breaks, and sprinkler head failures

(2) Seismic events that rendered the supply system inoperative

(3) Degradation of the quality of air at the intake due to a nearby fire and chemical release

(4) Electrical problems, including failure of motor control centers and failure of switchgear to properly connect

Many of these risks can be ameliorated by care when siting the central supply systems and their utility connections.

Submitter Information Verification

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Committee Statement

Committee Statement: There is a great deal of concern being expressed over ensuring the resilience of medical facilities and a great deal of press on the problems that have resulted from failure of medical facilities to fulfill their mission when some problem occurred which in retrospect could reasonably been anticipated. This addition to this annex note simply attempts to call attention to the desirability of thinking about this in the design process.

Response Message:

Public Input No. 51-NFPA 99-2015 [Section No. A.5.1.3.3]

First Revision No. 682-NFPA 99-2015 [Section No. A.5.1.9.5]

A.5.1.9.5

Activation of any of the warning signals should immediately be reported to the department of the facility responsible for the medical gas piping system involved. If the medical gas is supplied from a bulk supply system, the owner or the organization responsible for the operation and maintenance of that system, usually the supplier, should also be notified. As much detail as possible should be provided. See Table A.5.1.9.5.

Table A.5.1.9.5 Requirements for Category 1 Local Alarms

	Medical Air Compressors					
Alarm Condition	**Oil-less (Sealed Bearing) 5.1.3.6.3.4(A)(1)**	**Oil-Free (Separated) 5.1.3.6.3.4(A)(2)**	**Liquid Ring (Water-Sealed) 5.1.3.6.3.4(A)1**	**Instrument Air Compressors**	**Medical–Surgical Vacuum Pumps**	**WAGD Producers**
~~Backup (lag) compressor in operation~~ Low Medical Air Reserve Capacity	5.1.3.6.3.12(F) 5.1.9.5.4(1)	5.1.3.6.3.12(F) 5.1.9.5.4(1)	5.1.3.6.3.12(F) 5.1.9.5.4(1)			
~~Backup (lag) medical–surgical vacuum pump in operation~~ Low Medical Vacuum Reserve Capacity					5.1.3.7.7 5.1.9.5.4(4)	
~~Backup (lag) WAGD producer in operation~~ Low WAGD Reserve Capacity						5.1.3.8.3.2 5.1.9.5.4(5)
~~Backup (lag) instrument air compressor in operation~~ Low Instrument Air Reserve Capacity				5.1.13.3.5.12(1) 5.1.9.5.4(1)		
Carbon monoxide high	5.1.3.6.3.13(2) 5.1.9.5.1(2)	5.1.3.6.3.13(2) 5.1.9.5.1(2)	5.1.3.6.3.13(2) 5.1.9.5.1(2)			
High discharge air temperature	5.1.3.6.3.12(D) 5.1.9.5.4(9)	5.1.3.6.3.12(E)(1) 5.1.9.5.4(9)				
High water in receiver	5.1.3.6.3.12(B) 5.1.9.5.4(7)	5.1.3.6.3.12(B) 5.1.9.5.4(7)	5.1.3.6.3.12(B) 5.1.9.5.4(7)			
High water in separator			5.1.3.6.3.12(C)			

Alarm Condition	Medical Air Compressors					
	Oil-less (Sealed Bearing) 5.1.3.6.3.4(A)(1)	Oil-Free (Separated) 5.1.3.6.3.4(A)(2)	Liquid Ring (Water-Sealed) 5.1.3.6.3.4(A)1	Instrument Air Compressors	Medical–Surgical Vacuum Pumps	WAGD Producers
			5.1.9.5.4(8)			
Medical air dew point high	5.1.3.6.3.13(1) 5.1.9.5.4(3)	5.1.3.6.3.13(1) 5.1.9.5.4(3)	5.1.3.6.3.13(1) 5.1.9.5.4(3)			
Instrument air dew point high				5.1.3.6.3.13(1) 5.1.9.5.4(6)		

Supplemental Information

File Name	Description
FR_682_Table_Revisions.docx	

Submitter Information Verification

Submitter Full Name: HEA-PIP
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Submittal Date: Tue Aug 18 11:01:17 EDT 2015

Committee Statement

Committee Statement: The standard was written around one type of control (on/off operation defined by pressure). Control methods for compressors and pumps are becoming more sophisticated and now can control on other conditions (e.g. flow) and in a variety of modes (e.g. continuous run with VSD). The proposed text attempts to account for these developments while preserving the performance characteristics inherent in the original text.

Public Input No. 160-NFPA 99-2015 [Section No. A.5.1.9.5]

First Revision No. 44-NFPA 99-2015 [Section No. A.7.3.3.1.2.1]

A.7.3.3.1.2.1

Patient care ~~areas~~ spaces and nursing unit support areas ~~may~~ can contain many types of call stations with varying combinations of call initiation functions (e.g., code call, staff emergency, medical device alarm, help, assistance). A single call station can be equipped and configured to activate a single call type or a number of different call types, and can ~~may~~ have bidirectional voice communication capability.

Submitter Information Verification

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Committee Statement

Committee Statement: The term "patent care area" is no longer used in NFPA 99. The term is replaced by "patent care space", see 3.3.127.
Response Message:

Public Input No. 400-NFPA 99-2015 [Section No. A.7.3.3.1.2.1]

First Revision No. 339-NFPA 99-2015 [Section No. B.14.3]

B.14.3 Suggested Fire Procedures for ~~Hyperbaric Chamber Operator to Follow in Event of Fire in~~ Facilities with Class B Chambers.

B.14.3.1

For fires within the facility not involving the chamber, the following procedure should be performed:

(1) If there is smoke in the area, don the operator's ~~source of breathable gas~~ means for respiratory and eye protection per 14.2.4.5.3 .

(2) Decompress the chamber. The urgency of decompression should be determined by the location of the fire.

(3) Remove the patient and evacuate to safe area.

(4) Turn off the oxygen zone valve to the chamber room and close any smoke/fire barrier doors. These steps are consistent with the Rescue and Confine elements of the Rescue, Alarm, Confine, Extinguish (R.A.C.E.) procedure. It is assumed that other personnel will evacuate other patients and visitors from the area and activate a fire alarm signaling device (if not already activated).

These steps are consistent with the rescue and confine elements of the rescue, alarm, confine, extinguish (R.A.C.E.) procedure. It is assumed that other personnel will evacuate other patients and visitors from the area and activate a fire alarm signaling device (if not already activated).

B.14.3.2

For fire within the chamber, the following procedure should be performed:

(1) Stop oxygen from flowing into the chamber by switching off the chamber (if the chamber is compressed with oxygen) or switching the supply gas of a breathing device from oxygen to air (if the chamber is compressed with air).

(2) Decompress the chamber as rapidly as possible in accordance with the emergency decompression procedures .

(3) Stand by with a ~~hand-held~~ handheld fire extinguisher and spray into the chamber (if necessary) when the chamber door is opened.

(4) Remove the patient and evacuate to a safe area.

(5) Turn off the oxygen zone valve to the chamber room and close any smoke/fire barrier doors.

These steps are consistent with the ~~Rescue~~ rescue and confine ~~Confine~~ elements of the ~~Rescue~~ rescue , ~~Alarm~~ alarm , ~~Confine~~ confine , ~~Extinguish~~ extinguish (R.A.C.E.) procedure. It is assumed that other personnel will evacuate other patients and visitors from the area and activate a fire alarm signaling device (if not already activated). The injured patient should have appropriate medical attention immediately after evacuation to a safe area. Many Class B chambers require oxygen supply pressure to operate a rapid decompression feature. If this is the case, do not turn off the oxygen zone valve or any inline oxygen supply shutoff valve until all patients have been removed from the chamber(s).

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Committee Statement

Committee Statement: The title of B.14.3 was revised to clarify that this guidance is for fires in facilities with Class B chambers, and nor fires in Class B chambers themselves.

The wording of this annex section has been revised to better correlate with the language now used in Chapter 14.

Response Message:

Public Input No. 341-NFPA 99-2015 [Section No. B.14.3]

First Revision No. 345-NFPA 99-2015 [New Section after B.14.4]

B.14.5 Gas Purging.

Inert gas or air purging is a means to mitigate the risk of fire from an electrical device brought into the chamber. The three main objectives to inert gas or air purging are to lower the oxygen level, to purge increased heat from the device and to help prevent dust accumulation inside the device.

Fire research has demonstrated that under normal conditions combustion will not take place when the oxygen level is at 6 percent or less. This is regardless of the treatment pressure and is related to the ratio of oxygen to the inert gas. With an oxygen level of 6 precent and the balancing inert gas level of 94 percent, the high percentage of inert gas will prevent combustion.

A clear policy and procedure should be written for an inert gas purging system. It should include the inert gas parameters for each device and instructions for the proper setup of the system.

All testing to determine the proper inert gas or air flow should be well documented. At a minimum, approval signatures have to be obtained from the medical director and the safety director. Other signatures should include the department manager and biomedical representatives.

Startup and shutdown checklists should include purge gas parameters with visual checks and verifications of inside devices, purge gas equipment, and alarms.

Where gas purging is used, the following should be considered:

(1) Each electrical device should comply with 14.2.8.3.18 Gas purging is only one element of the essential risk assessment and management that is critical to safely managing any electrical device that is introduced into the chamber. A comprehensive risk assessment with approved safety procedures and mitigation orders needs to be documented and signed by the medical director, safety director and all who are directly involved, prior to the device being used in the chamber.

(2) Each gas purge device should have its own dedicated purging line and flowmeter with each flowmeter clearly labeled identifying the gas used. Splitting a purge line to supply two or more devices can create a disparity of flow between the multiple gas lines depending on the length and resistance of each line. One device might be well protected with high flow and the other device inadequately protected with very little flow. A single line with a single flowmeter will prevent this and will provide a measurable way to verify the correct flow to the device. A gas flowmeter can be mistaken for an oxygen flowmeter.

(3) When using an inert gas, oxygen should be maintained at less than or equal to 6 percent within the electrical compartment(s) of the device at all treatment levels. For initial testing and, to establish the proper inert gas flow, oxygen levels in the electrical compartments of the device should be tested at all treatment pressures.

(4) The manufacturer's safe operating temperature range should be maintained at all treatment levels. Gas purging is useful for purging increased heat from the device. For initial testing and, to establish the proper inert gas flow, temperature levels in the electrical compartments of the device should be tested at all treatment pressures.

(5) Supply pressure for gas purging should be supplied from a regulator system that will maintain the surface pressure over the chamber's treatment pressure, or over-bottom pressure. Maintaining purge gas pressure at all treatment levels can be accomplished by means of a tracking type regulator outside the chamber or by placing the regulator inside the chamber with an adequate supply pressure for all treatment pressures.

(6) An audio and visual alarm system should activate at the operator's console if there is a loss of sufficient pressure to maintain set flowrates to the gas purging system during any pressurization of the chamber. The chamber operator needs to be alerted to a loss of purge gas flow.

(7) Chamber operations should be aborted if there is a loss of sufficient pressure to the gas purging system as noted in (6). Loss of purge gas pressure creates risks to patients and staff.

(8) When using inert gas, oxygen monitoring of the chamber's atmosphere should have a low-level alarm limit set at no lower than 19.5 percent. Normal gas purging is unlikely to lower the oxygen level of the chamber atmosphere during hyperbaric oxygen treatments. However, because inert gas is being introduced into the chamber, an oxygen low-level alarm limit of 19.5 percent should be set.

(9) Electrical devices that are enclosed, such as TV monitors placed in acrylic boxes, should have some means of extinguishing the device with water from the deluge system or the handheld hose. Acrylic boxes/enclosures are sometimes used to make gas purging easier. In the event of a fire or smoke inside this box there should be some means of drenching the device inside with water.

(10) The doors to chambers with gas purging systems using inert gas should be kept open during nonoperational hours. Chambers are made to be airtight. If the chamber doors are closed, (e.g., overnight), and the inert gas is inadvertently left on, the inert gas could potentially accumulate inside the chamber to a dangerous level. This would deplete the oxygen level and create a hazard for anyone entering the chamber.

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Committee Statement

Committee Statement: This new annex B material adds a large amount of guidance for inert gas purging using inert gas or air.
Response Message:

First Revision No. 102-NFPA 99-2015 [Chapter D]

Annex D Informational References

D.1 Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this code and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

D.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, ~~2013~~ 2017 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, ~~2013~~ 2016 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, ~~2015~~ 2018 edition.

~~NFPA 49 , *Hazardous Chemicals Data* , 1994 edition. (No longer in print; appears in NFPA *Fire Protection Guide to Hazardous Materials,* 13th edition, 2002.)~~

NFPA 53, *Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres*, ~~2011~~ 2016 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, ~~2013~~ 2016 edition.

NFPA 56D, *Standard for Hyperbaric Facilities* ,1982 (withdrawn).

NFPA 58, *Liquefied Petroleum Gas Code*, ~~2014~~ 2017 edition.

NFPA 70®, *National Electrical Code®*, ~~2014~~ 2017 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*, ~~2013~~ 2016 edition.

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, ~~2015~~ 2018 edition.

NFPA 99B, *Standard for Hypobaric Facilities*, 2015 edition.

NFPA *101®*, *Life Safety Code®*, ~~2015~~ 2018 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 2013 edition.

NFPA 220, *Standard on Types of Building Construction*, ~~2015~~ 2016 edition.

NFPA 252, *Standard Methods of Fire Tests of Door Assemblies*, ~~2012~~ 2017 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 2013 edition.

NFPA 325, *Guide to Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids*, 1994 edition. (No longer in print; appears in NFPA *Fire Protection Guide to Hazardous Materials,* 13th edition, 2002.)

NFPA 491, *Guide to Hazardous Chemical Reactions*, 1997 edition.

NFPA 551, *Guide for the Evaluation of Fire Risk Assessments*, ~~2013~~ 2016 edition.

NFPA 730, *Guide for Premises Security*, ~~2014~~ 2017 edition.

NFPA 1600®, *Standard on Disaster/Emergency Management and Business Continuity Programs*, 2013 edition.

NFPA *Fire Protection Guide to Hazardous Materials*, ~~2008~~ 2016 edition.

D.1.2 AAMI Publications.

Association for the Advancement of Medical Instrumentation, 4301 N. Fairfax Drive, Suite 301, Arlington, VA 22203-1633.

ANSI/AAMI ES60601-1:2005, *Medical electrical equipment—Part 1: General requirements for basic safety and essential performance* , 2006, reaffirmed 2012.

D.1.3 Other Publications.

D.1.3.1 ACS Publications.

American College of Surgeons, 633 N. Saint Clair Street, Chicago, IL 60611-3211.

04–GR-0001, *Guidelines for Optional Ambulatory Surgical Care and Office-Based Surgery*, 2000.

D.1.3.2 ASHRAE Publications.

ASHRAE, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.

ASHRAE Handbook of Fundamentals, ~~2001~~ 2013 .

ASHRAE Guideline 0, *The Commissioning Process*, ~~2005~~ 2013 .

ASHRAE Guideline 1.1, *HVAC&R Technical Requirements for the Commissioning Process*, 2007.

D.1.3.3 ASME Publications.

American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME B16.22, *Wrought Copper and Copper Alloy Solder Joint Pressure Fitting*, ~~2001~~ 2013 .

ANSI/ASME B16.50, *Wrought Copper and Copper Alloy Braze Joint Pressure Fitting*, ~~2001~~ 2015 .

ASME Boiler and Pressure Vessel Code, 2001.

D.1.3.4 ASSE Publications.

~~American Society of Sanitary Engineering~~ ASSE International ~~, 901 Canterbury Road, Suite A~~ 18927 Hickory Creek Drive, Suite 220 , ~~Westlake, OH 44145-1480~~ Mokena, IL 60448 .

ASSE 6040, *Professional Qualification Standard for Medical Gas Maintenance Personnel*, ~~2001~~ 2015 .

D.1.3.5 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E119, *Standard Test Method for Fire Tests of Building Construction and Materials,*~~2012~~ 2014 .

ASTM G63, *Standard Guide for Evaluating Nonmetallic Materials for Oxygen Service*,1999, reaffirmed 2007.

ASTM G88, *Standard Guide for Designing Systems for Oxygen Service*, ~~2005.~~ 2013.

ASTM G93, *Standard Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments*, ~~1999 (2007)~~ 2003, reaffirmed 2011 .

ASTM G94, *Standard Guide for Evaluating Metals for Oxygen Service*, 2005, reaffirmed 2014. ~~.~~

D.1.3.6 CGA Publications.

Compressed Gas Association, ~~4221 Walney Road, 5th Floor~~ 14501 George Carter Way, Suite 103 , Chantilly, VA 20151-2923.

CGA P-2.6, *Transfilling of Liquid Oxygen to Be Used for Respiration* , 2011.

CGA G-8.1, *Standard for Nitrous Oxide Systems at ~~Consumer~~ Customer Sites*, ~~1990~~ 2013 .

CGA P-2.7, *Guide for the Safe Storage, Handling, and Use of Small Portable Liquid Oxygen Systems in Health Care Facilities*, 2011.

CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections* (ANSI B57.1), ~~1994~~ 2013 .

D.1.3.7 FGI Publications.

Facility Guidelines Institute, 1919 McKinney Avenue, Dallas, TX 75201.

Guidelines for Design and Construction of Hospitals and Outpatient Facilities, 2014.

D.1.3.8 IEC Publications.

International Electrotechnical Commission, 3, rue de Varembé, P.O. Box 131, CH-1211 Geneva 20, Switzerland.

ANSI/IEC/ISO 80001-1-1, *Risk Management of Medical IT-Networks*, 2010.

ANSI/IEC/ISO 80001-2-5, *Guidance for Application of Risk Management for ~~of Distributed Alarm Systems Utilizing Medical IT-Networks~~ , IT-Networks Incorporating Medical Devices – Part 2-5: Application guidance – Guidance for Distributed Alarm Systems* , ~~2010~~ 2014 .

IEC, 60601-1-1, *Medical Electrical Equipment — Part 1: General Requirements for Basic Safety and Essential Performance*, ~~2007~~ 2014 .

IEC 60601-1-2 , *Medical Electrical Equipment – — Part 1-2: General Requirements for Safety 2 – : Collateral Standard: Electromagnetic Compatibility – Requirements and Tests*, ~~2007~~ 2014 .

D.1.3.9 IEEE Publications.

IEEE, Three Park Avenue, 17th Floor, New York, NY 10016-5997.

ANSI/IEEE 493-~~2007~~ , *Recommended Practice for the Design of Reliable Industrial and Commercial Power System*, 2007.

IEEE 602, *Recommended Practice for Electric Systems in Health Care Facilities,* 2007.

D.1.3.10 Ocean Systems, Inc., Publications.

Ocean Systems, Inc., Research and Development Laboratory, Tarrytown, NY 10591. Work carried out under U.S. Office of Contract No. N00014-67-A-0214-0013.

Ocean Systems, Inc., "Technical Memorandum UCRI-721, Chamber Fire Safety." (Figure A.3.3.11.2 is adapted from Figure 4, "Technical Memorandum UCRI-721, Chamber Fire Safety," T. C. Schmidt, V. A. Dorr, and R. W. Hamilton, Jr., Ocean Systems, Inc., Research and Development Laboratory, Tarrytown, NY 10591. Work carried out under ~~US~~ U.S. Office of Naval Research, Washington~~,~~ DC, Contract No. N00014-67-A-0214-0013.) (G. A. Cook, R. E. Meierer, and B. M. Shields, "Screening of Flame-Resistant Materials and Comparison of Helium with Nitrogen for Use in Dividing Atmospheres." First summary report under ONR Contract No. 0014-66-C-0149. Tonawanda, NY: Union Carbide, 31 March 1967. DDC No. Ad-651583.)

D.1.3.11 SAE Publications.

Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

AMS QQ-N290, *Nickel Plating (Electrodeposited)*, reinstated 2009.

D.1.3.12 TIA Publications.

Telecommunications Industry Association, ~~2500 Wilson Boulevard, Suite 300,~~ 1320 North Courthouse Road, Suite 200, Arlington, VA 22201.

TIA/EIA 569-B, *Commercial Building Standard for Telecommunications Pathways and Spaces,* 2004.

D.1.3.13 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 263, *Fire Resistance Ratings*, 2011.

ANSI/UL 1069, *Safety Standard for Hospital Signaling and Nurse Call Equipment*, 2012.

D.1.3.14 U.S. Government Publications.

U.S. Government ~~Printing~~ Publishing Office, Washington, DC 20402.

"Crisis Standards of Care: A Systems Framework for Catastrophic Disaster Response," Institute of Medicine (IOM) Report, 2012.

Medical Surge Capacity and Capability Handbook, Department of Health and Human Services, 2007.

D.1.3.15 Other Publications.

D.2 Informational References.

The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

D.2.1 Published Articles on Fire Involving Respiratory Therapy Equipment and Related Incidents.

Benson, D. M., and Wecht, C. H. Conflagration in an ambulance oxygen system. *Journal of Trauma*, vol. 15, no. 6:536-649, 1975.

Dillon, J. J. Cry fire! *Respiratory Care*, vol. 21, no. 11:1139-1140, 1976.

Gjerde, G. E., and Kraemer, R. An oxygen therapy fire. *Respiratory Care*, vol. 25, no. 3 3:362-363, 1980.

Walter, C. W. Fire in an oxygen-powered respirator. *JAMA* 197:44-46, 1960.

Webre, D. E., Leon, R., and Larson, N.W. Case History; Fire in a nebulizer. *Anesthesia and Analgesia* 52:843-848, 1973.

D.2.2 References for A.10.2.13.4.3.

Dalziel, C. F., and Lee, W. R., ~~Reevaluation of lethal, electric currents effects of electricity on man.~~ *Transactions on Industry and General Applications*, vol. IGA-4, no. 5, September/October 1968.

Roy, O. A., Park, G. R., and Scott, J. R., Intracardiac catheter fibrillation thresholds as a function of duration of 60 Hz current and electrode area. *IEEE Trans. Biomed. Eng.* BME 24:430-435, 1977.

Roy, O. A., and Scott, J. R., 60 Hz ventricular fibrillation and pump failure thresholds versus electrode area. *IEEE Trans. Biomed. Eng.* BME 23:45-48, 1976.

Watson, A. B., Wright, J. S., and Loughman, J., Electrical thresholds for ventricular fibrillation in man. *Med. J. Australia* 1:1179-1181, 1973.

Weinberg, D. I., et al., Electric shock hazards in cardiac catheterization. *Elec. Eng.* 82:30-35, 1963.

D.2.3 References for A.14.3.1.5.4.3.

NASA BMS Document GRC-M8300.001. 2005. Chapter ~~.~~ 5, ~~Para~~ Paragraph . 5.6.3.

Raleigh, G., et al. 2005. *Air-Activated Chemical Warming Devices: Effects of Oxygen and Pressure*. Undersea Hyper Med, 32 (6).

Workman, W.T. 1999. *Hyperbaric Facility Safety: A Practical Guide* p. 531 Flagstaff AZ: Best Publishing.

Kindwall, E.P., & Whelan, H.T. 2004. *Hyperbaric Medicine Practice* p. 86. Flagstaff AZ: Best Publishing.

Burman, F. ~~2006~~ 2015 . *Risk Assessment Guide for the Installation and Operation of Clinical Hyperbaric Facilities*; ~~4th~~ 5 th edition~~.~~ revised 2015. San Antonio, TX: International ATMO.

D.2.4 Addresses of Other Organizations that Publish Standards or Guidelines.

American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Cincinnati, OH 45240-1634.

American Industrial Hygiene ~~Assoc.~~ Association , ~~475 Wolf Ledges Parkway, Akron, OH 44311~~ 3141 Fairview Park Dr., Suite 777, Falls Church, VA 22042 .

U.S. Department of Health and Human Services,Office of the Assistant for Preparedness and Response ~~ASPR~~ (ASPR) , National Disaster Medical System (NDMS), ~~http://~~ www.phe.gov/preparedness/responders /ndms/pages/default.aspx.

George Washington University, School of Engineering and Applied Sciences, Institute for Crisis, Disaster and Risk Management. *Medical and Health Incident Management (maHim) System: A Comprehensive Functional System Description for Mass Casualty Medical and Health Incident Management*, December.2002. http://www.seas.gwu.edu/~icdm/MaHIM%20V2%20final%20report%20sec%202.pdf.

National Emergency Management Association, Council of State Governments, Lexington, KY, Emergency Management Assistance Compact, ~~http://www.emacweb.org/emac/index.cfm?CFID=5327& CFTOKEN=28115803.~~

~~Scientific Apparatus Makers Assoc., 1101 16th Street, NW, Washington, DC 20036~~ Laboratory Products Association, PO Box 428, Fairfax, VA 22038 .

University of Colorado, Natural Hazards and Information Applications Center, Disaster Research Clearinghouse, www.colorado.edu/hazards.

University of Delaware, Disaster Research Center, ~~http://www.udel.edu/DRC/~~ http://dcr.udel.edu .

American Society for Healthcare Engineering ~~(www.ashe.org)~~ , 155 North Wacker Drive, Chicago, IL 60606, www.ashe.org.

D.2.5 Addresses of Organizations and Agencies That Provide Health Care Emergency Preparedness Educational Materials.

D.2.5.1 Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

American Health Care Association, 1201 L Street NW , Washington, DC 20005.

American Hospital Association, 155 N. Wacker Drive, Suite 400, Chicago, IL 60606.

American Medical Association, ~~515 N. State Street~~ AMA Plaza, 330 North Wabash Ave, Suite 39300 , Chicago, IL ~~60610~~ 60611-5885 .

American Nurses' Association, 8515 Georgia Avenue, Suite 400, Silver Spring, MD 20910.

American Red Cross, National Headquarters, 2025 E Street, NW, Washington, DC 20006.

(1) Family Disaster Planning , www.redcross.org/prepare/disaster. ~~http://www.redcross.org/services/disaster/beprepared/familyplan.html~~

(2) Disaster Preparedness for People with Disabilities, www.redcross.org/prepare/location/home-family/disabilities ~~http://www.redcross.org/services/disaster/beprepared/disability.html~~

Association of American Railroads, 50 F Street, Washington, DC 20001-1564.

Charles C. Thomas Publisher, 2600 South First Street, Springfield, IL 62704.

Dun-Donnelley Publishing Corp., 666 Fifth Avenue, New York, NY 10019.

Federal Emergency Management Agency, 500 C Street, SW, Washington, DC 20472.

Florida Health Care Association, 307 W. Park Avenue, P.O. Box 1459, Tallahassee, FL 32301.

Helicopter Association International, 1~~635 Prince Street~~ 1920 Ballenger Avenue , Alexandria, VA 22314-~~2818~~ 2898 .

Hospital Emergency Incident Command System, State of California Emergency Medical Services Authority, 1930 9th Street, Sacramento, CA 95814. http://www.emsa.ca.gov/dms2/heics3.htm

www.emsa.ca.gov/disaster_medical_services_division_hospital_incident_commandsysstem_resources

International Association of Fire Chiefs, 4025 Fair Ridge Drive, Suite 300, Fairfax, VA 22033-2868.

Joint Commission on Accreditation of Healthcare Organizations (JCAHO), One Renaissance Blvd., Oakbrook Terrace, IL 60181.

National Interagency ~~Incident Management System, Incident Command System, National Interagency Fire Coordination Center~~ Fire , Boise, ID, - www.nifc.gov ~~http://www.nwcg.gov/pms/forms/ics_cours/ics_courses.htm~~

Pan American Health Organization, 525 23rd Street, NW, Washington, DC 20037 (Attn.: Editor, Disaster Preparedness in the Americas).

Standardized Emergency Management System, State of California Governor's Office of Emergency Services, 3650 Schreiber Avenue, Mather, CA 95655, - www.caloes.ca.gov/cal-oes-divisions/planning-preparedness/standardized-emergency-management-system ~~http://www.oes.ca.gov/Operational/OESHome.nsf/Content/B4943535210895448825 6C2A0071E038?OpenDocument~~

University of Delaware, Disaster Research Center (Publications), Newark, DE 19716.

U.S. Department of Transportation (available from U.S. Government ~~Printing~~ Publishing Office, Washington, DC 20402).

D.2.5.2 Audiovisual Materials.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

Abbott Laboratories, Audiovisual Services, 565 Fifth Avenue, New York, NY 10017.

Brose Productions, Inc., 10850 Riverside Drive, N. Hollywood, CA 91602.

Federal Emergency Management Agency, Office of Public Affairs, Washington, DC 20472.

Fire Prevention Through Films, Inc., P.O. Box 11, Newton Highlands, MA 02161.

General Services Administration, National Audiovisual Center, Reference Section, Washington, DC 20409.

Helicopter Association International, ~~1635 Prince Street~~ 1920 Ballenger Avenue , Alexandria, VA 22314-2898 ~~2818~~ .

Pyramid Media , P.O. Box 1048, Santa Monica, CA 90406.

University of Illinois Medical Center, Circle Campus, Chicago, IL 60612.

D.2.6 Additional U.S. Government Informational Sources.

~~Kidney Community Emergency Response Coalition, www.kcercoalition.com~~

Health Professional Predisaster Identification (ESAR-VHP), www.phe.gov/esarvhp

~~Hospital Available Beds for Emergencies and Disasters HAvBED, havbedhhs.gov~~

Kidney Community Emergency Response Coalition, www.kcercoalition.com

National Response Framework, www.fema.gov/national-response-framework

National Disaster Recovery Framework, www.fema.gov/national-disaster-recovery-framework ~~www.fema.gov/recovery-framework~~

Department of Health and Human Services, ASPR National Health Security Strategy, http://www.phe.gov /Preparedness/planning/authority/nhss/Pages/default.aspx

Department of Health and Human Services, ASPR Hospital Preparedness Program, ~~http://~~ www.phe.gov /preparedness/planning/hpp/pages/default.aspx

U.S. Government ~~Printing~~ Publishing Office, Washington, DC 20402.

Biological Threat Interrogatories, http://www.va.gov/emshg/page.cfm?ID=BioThreatInterr.

Title 29, Code of Federal Regulations, Part 1910, Subpart 1030, " Bloodborne Pathogens."

Title 29, Code of Federal Regulations, Part 910, Subpart 1910, " Occupational Exposures to Chemical Laboratories."

Title 49, Code of Federal Regulations, Parts 171 through 190 (U.S. Dept. of Transportation, Specifications for Transportation of Explosives and Dangerous Articles). (In Canada, the regulations of the Board of Transport Commissioners, Union Station, Ottawa, Canada, apply.)

Title 49, Code of Federal Regulations, Part 173, " Shippers — General Requirements for Shipments and Packagings."

Commercial Standard 223-59, *Casters, Wheels, and Glides for Hospital Equipment*.

Environmental Protection Agency, Chemical Emergency Preparedness and Prevention, ~~http://yosemite.epa.gov/oswer/ceppoweb.nsf/content/homelandSecurity.htm?OpenDocument.~~ http: //www.epa.gov/R5Super/cepps/index.html

National Research Council Publication 1132, *Diesel Engines for Use with Generators to Supply Emergency and Short Term Electric Power*. (Also available as Order No. O.P.52870 from University Microfilms, P.O. Box 1366, Ann Arbor, MI 48106.)

U.S. Department of Defense:

U.S. Army Medical Research Institute of Chemical Defense (USAMRICD), ~~http://chemdef.apgea.army.mil /.~~ www.usamriid.army.mil

U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), http://www.usamriid.army.mil /general/index.html.

U.S. Army Soldier and Biological Chemical Command ~~(SBCCOM)~~ , http://hld.sbccom.army.mil /ip/detectors.

U.S. Department of Health and Human Services:

Centers for Disease Control and Prevention: HHS Publication No. 93–8395, *Biosafety in Microbiological and Biomedical Laboratories*.

Centers for Disease Control and Prevention, Public Health Preparedness and Response for Bioterrorism Program, ~~http://www.bt.cdc.gov/planning/continuationguidance/index.asp~~ http://emergency.cdc.gov /bioterrorism .

National Institute for Occupational Health and Safety, Personal Protection Equipment, ~~http://~~ www.cdc.gov /niosh/topics/emres/ppe.html.

Protecting Building Environments from Airborne Chemical, Biologic and Radiologic Agents (page 9). ~~http://~~ www.cdc.gov/mmwr/PDF/wk/mm5135.pdf.

U.S. Department of Homeland Security:

Capability Assessment for Readiness, ~~http://www.fema.gov/pdf/rrr/car.pdf~~ .

Exercise Design Course, ~~http://training.fema.gov/emiweb/IS/is120.asp.~~ https://training.fema.gov

/is/courseoverview.aspx?code=is-120.a

Guide for All-Hazard Emergency Operations Planning, http://www.fema.gov/pdf/rrr/slg101.pdf.

Metropolitan Medical Response System, Resources, http://mmrs.hhs.gov/main/Resources.aspx.

National Disaster Medical System, Conference Library, ~~http://ndms.dhhs.gov/NDMS%20Conference/conf2k3/previous_confe_03/previous_confe_03.html.~~ http://www.phe.gov/Preparedness/responders/ndms/Pages/default.aspx

Strategic National Stockpile, ~~http://www.bt.cdc.gov/stockpile/index.asp~~ www.cdc.gov/phpr/stockpile/stockpile.htm .

U.S. Department of Justice, Office of Domestic Preparedness, Publications Library, http://www.ojp.usdoj.gov/odp/library/bulletins.htm.

U.S. Department of Labor, Occupational Health and Safety Administration, Washington, DC:

Title 29, Code of Federal Regulations, Part 1910; ~~:~~ *Employee Protection Plans*, 1910.38; Subpart H, *Hazardous Materials* (1910.101-126), specifically 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER) and Appendices A-E; Subpart I. ~~,~~ *Personal Protective Equipment* (1910.132-139 and Appendix B), specifically: 1910.132, *General Provisions*. ~~;~~ 1910.133, *Eye and Face Protection*. ~~;~~ 1910.134, *Respiratory Protection* (and Appendices A- — D); 1910.136, *Occupational Foot Protection*. ~~;~~ 1910.138, *Hand Protection*; Subpart Z - — *Toxic and Hazardous Substances* (1910.1000- – 1450 and Appendix B), specifically 1910.1200– – *Hazard Communication* (and Appendices A- — E).

Publication 3114, *Hazardous Waste Operations and Emergency Response*, ~~http://~~ www.osha.gov/Publications/OSHA3114/osha3114.html.

Publication 3152, *Hospitals and Community Emergency Response – What You Need to Know*, ~~http:/~~ /www.osha.gov/Publications/OSHA3152/osha3152.html.

D.2.7 Additional Resources for Emergency Management.

Emergency Management Principles and Practices for Health c ~~C~~ are Systems, Institute of Crisis, Disaster and Risk Management, The George Washington University, Washington, DC, 2010, for the Veterans Health Administration, Principal Investigator Joseph Barbera, MD; ~~http:/~~ /www.gwu.edu/~icdrm/publications/index.html#books.

D.2.8 Other Publications.

DuPont Safety News, June 14, 1965.

~~Dasler and Bauer, Ind. Eng. Chem. Ana~~ l l., Ed. 18, 52 (1964).

Hoeltge, G. A., Miller, A., Klein, B. R., Hamlin, W. B., *Accidental fires in clinical laboratories*.

ISO/IEC 31010, *Risk Management — Risk Assessment Techniques*, 2009.

SEMI S10-0307E, *Safety Guideline for Risk Assessment and Risk Evaluation Process*.

D.3 References for Extracts in Informational Sections.

NFPA 70®, *National Electrical Code*®, 2014 edition.

NFPA *101*®, *Life Safety Code*®, 2015 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 2013 edition.

Supplemental Information

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