AGENDA

NFPA Health Care Facilities Technical Committee on Hyperbaric and Hypobaric Facilities (HEA-HYP)
NFPA 99 & NFPA 99B First Draft Meeting (A2023)

July 19-21, 2021
11:00 a.m. – 5:00 p.m. (ET)

Microsoft Teams Web Conference
To join the meeting, please contact ecarroll@nfpa.org

1. **Call to order -** Chair Richard Barry
2. **Introductions, pg. 2**
3. **Chair report –** R. Barry
4. **Staff liaison report –** J. Sargent, acting SL
   a. Presentation on first draft meeting process, **pg. 4**
   b. Reference publication update process
5. **Previous meeting minutes, pg. 22**
6. **Task group reports**
7. **Public Input (PI) review**
   a. NFPA 99 PIs, **pg. 26**
   b. NFPA 99B PIs, **pg. 119**
8. **Oxygen concentrators at high elevations (11/7/19 correlating committee minutes, Item 5, pg. 25)**
9. **Other business**
10. **Future meetings**
11. **Adjournment**

Address List No Phone

06/11/2021
Gregory E. Harrington
HEA-HYP

Hyperbaric and Hypobaric Facilities

Health Care Facilities

Richard C. Barry **SE** 4/15/2004
Chair **HEA-HYP**
Healogics
5220 Belfort Road, Suite 130
Jacksonville, FL 32256

Chad E. Beebe **U** 03/05/2012
Principal **HEA-HYP**
ASHE - AHA
PO Box 5756
Lacey, WA 98509-5756
American Society for Healthcare Engineering

James Edwin Bell **M** 01/10/2008
Principal **HEA-HYP**
Fink Engineering
4605 South 600 East
Murray, UT 84107

Chae Bliss **U** 12/06/2019
Principal **HEA-HYP**
Aviv Clinic
Safety Director
2955 Brownwood Boulevard
Suite 100
The Villages, FL 32163

W. Robert Bryant **M** 8/2/2010
Principal **HEA-HYP**
Perry Baromedical Corporation
11610 Aspenway Drive
Houston, TX 77070

Francois Burman **SE** 11/30/2016
Principal **HEA-HYP**
Divers Alert Network
6 West Colony Place
Durham, NC 27705

Mario Caruso **SE** 7/26/2007
Principal **HEA-HYP**
Hyperbaric Consulting LLC
3231 Glenwood Circle
Holiday, FL 34691-2545
Alternate: Paul Mario Caruso

Mark Chipps **U** 10/29/2012
Principal **HEA-HYP**
Life Support Technologies Group Inc.
314 West 2nd Street
West Islip, NY 11795

Jay Duchnick **SE** 12/06/2019
Principal **HEA-HYP**
University of California San Diego (UCSD)
200 W. Arbor Drive
San Diego, CA 92103-8688

Keith Ferrari **M** 1/25/2007
Principal **HEA-HYP**
Praxair, Inc.
2807 Gresham Lake Road
Raleigh, NC 27615

Adrian Garay **M** 04/11/2018
Principal **HEA-HYP**
HYPERBARIC MODULAR SYSTEMS, Inc.
3224 Hoover Avenue
National City, CA 91950

Derall Garrett **U** 08/17/2018
Principal **HEA-HYP**
Undersea Hyperbaric Medical Society (UHMS)
1503 Oak Street
Melbourne Beach, FL 32951

Barry E. Newton **SE** 7/24/1997
Principal **HEA-HYP**
WHA International, Inc.
5605 Dona Ana Road
Las Cruces, NM 88007-5953
Alternate: Gwenael Chiffoleau

Dennis Noskin **SE** 08/08/2019
Principal **HEA-HYP**
Dennis Noskin Architects
100 White Plains Road
Tarrytown, NY 10591

Address List No Phone

06/11/2021
Gregory E. Harrington
HEA-HYP

Hyperbaric and Hypobaric Facilities

Health Care Facilities

Robert B. Sheffield **U** 1/17/1997
Principal **HEA-HYP**
International ATMO, Inc.
405 North Saint Mary's St
Suite 720
San Antonio, TX 78205
Alternate: Kevin I. Posey

John M. Skinner **IM** 3/15/2007
Principal **HEA-HYP**
Medical Equipment Technology, Inc.
2723 Brickton North Drive
Buford, GA 30518

Deepak Talati **M** 10/27/2009
Principal **HEA-HYP**
Sechrist Industries, Inc.
4225 East LaPalma Avenue
Anaheim, CA 92807

Shaun Wallace **U** 12/06/2019
Principal **HEA-HYP**
Altitude Control Technologies
568 Melba Road
Encinitas, CA 92024

John L. Williams **E** 08/08/2019
Principal **HEA-HYP**
Washington State Department of Health
Construction Review Services
310 Israel Road, SE
PO Box 47852
Olympia, WA 98504
NFPA Health Care Section
Alternate: Kevin A. Scarlett

Justin Callard **C** 03/07/2013
Voting Alternate **HEA-HYP**
Hyperbaric Technicians & Nurses Association Inc.
Prince of Wales Hospital, Randwick
15 Stirgess Avenue
Curl Curl, NSW 2096 Australia

Paul Mario Caruso **SE** 04/05/2016
Alternate **HEA-HYP**
Hyperbaric Consulting LLC
4422 Foxboro Drrive
New Port Richey, FL 34653
Principal: Mario Caruso

Gwenael Chiffoleau **SE** 11/30/2016
Alternate **HEA-HYP**
WHA International
5605 Dona Ana Road
Las Cruces, NM 88007
Principal: Barry E. Newton

Kevin I. Posey **U** 10/27/2009
Alternate **HEA-HYP**
International ATMO, Inc.
405 North Saint Mary's Street
Suite 720
San Antonio, TX 78205
Principal: Robert B. Sheffield

Kevin A. Scarlett **E** 10/23/2013
Alternate **HEA-HYP**
Washington State Department of Health
5801 60th Street West
University Place, WA 98467-2831
NFPA Health Care Section
Principal: John L. Williams

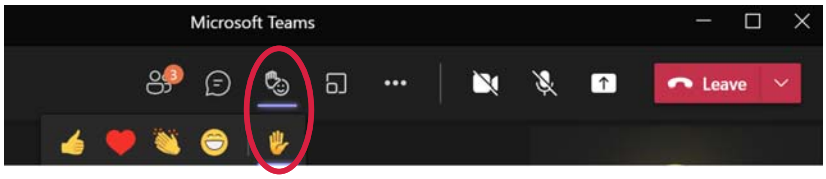
Wilbur T. Workman **O** 1/1/1984
Member Emeritus **HEA-HYP**
Undersea & Hyperbaric Medical Society
14607 San Pedro Avenue
Suite 270
San Antonio, TX 78232
Undersea & Hyperbaric Medical Society

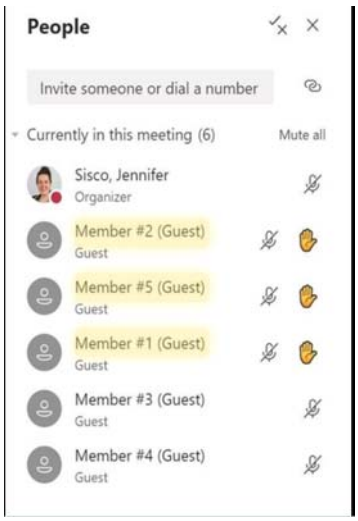
Gregory E. Harrington 5/19/2020
Staff Liaison **HEA-HYP**
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169-7471

1

NFPA Virtual Meeting

- Please use the "hand raise" function to speak





NFPA.ORG | © National Fire Protection Association. All rights reserved. 2

2

NFPA First Draft Meeting

Web Conference Tips

- Use “raise hand” function to be recognized
- State name before speaking
- Mute your microphone/phone when not speaking (*6 on phone) – staff can mute you but CAN’T unmute you
- Shut off video if you have a slow connection

3

NFPA First Draft Meeting

Members

- Please verify your contact information on roster at www.nfpa.org/99tc or www.nfpa.org/99Btc and email any changes to ecarroll@nfpa.org
- Use of audio recorders or other means capable of reproducing verbatim transcriptions of this or any NFPA meeting is not permitted

4

NFPA First Draft Meeting

Guests

- Sign in and identify affiliations
- Participation
  - Requested 7 days prior to the meeting or;
  - At the discretion of the Chair
- Equal opportunity granted to opposing views

5

NFPA First Draft Meeting

Members categorized in ANY interest category who have been retained to represent the interests of ANOTHER interest category (with respect to a specific issue or issues that are to be addressed by a TC/CC) shall declare those interests to the committee and refrain from voting on any Public Input, Comment, or other matter relating to those issues throughout the process.

6

Annual 2023 Revision Cycle – Key Dates

- Public Input Stage (First Draft):
  - First Draft Meeting**: July 8 – August 6, 2021**
  - Posting of First Draft for Balloting Date: **November 2, 2021**
  - Posting of First Draft for Public Comment: **March 22, 2022**
- Comment Stage (Second Draft):
  - Public Comment Closing Date: **May 31, 2022**
  - Second Draft Meeting Period: **NLT August 23, 2022**
  - Posting of Second Draft for Balloting Date: **October 4, 2022**
  - Posting of Second Draft for NITMAM: **February 28, 2023**
- Tech Session Preparation:
  - NITMAM Closing Date: **March 28, 2023**
  - NFPA Technical Meeting: **June 2023**
- Standards Council Issuance:
  - Documents with CAMs: **August 2023**

7

NFPA First Draft Meeting

Voting During the First Draft Meeting:

- Either Principal or Alternate can vote, not both.
- All Principals are encouraged to have an Alternate.
- Voting (simple majority) during meeting is used to create proposed First Revisions.
- Voting (simple majority) during meeting is also used to establish Public Input resolution responses and to create Committee Inputs.

8

NFPA First Draft Meeting

General Procedures:

- Follow Robert's Rules of Order
- Discussion requires a motion

9

NFPA First Draft Meeting

Committee Member Actions:

- Member addresses the chair
- Receives recognition from the chair
- Member introduces the motion
- Another member seconds the motion

10

NFPA First Draft Meeting

Committee Chair Actions:

- Restates the motion
- Calls for discussion
- Ensures all issues have been heard
- Calls for a vote
- Announces the vote result

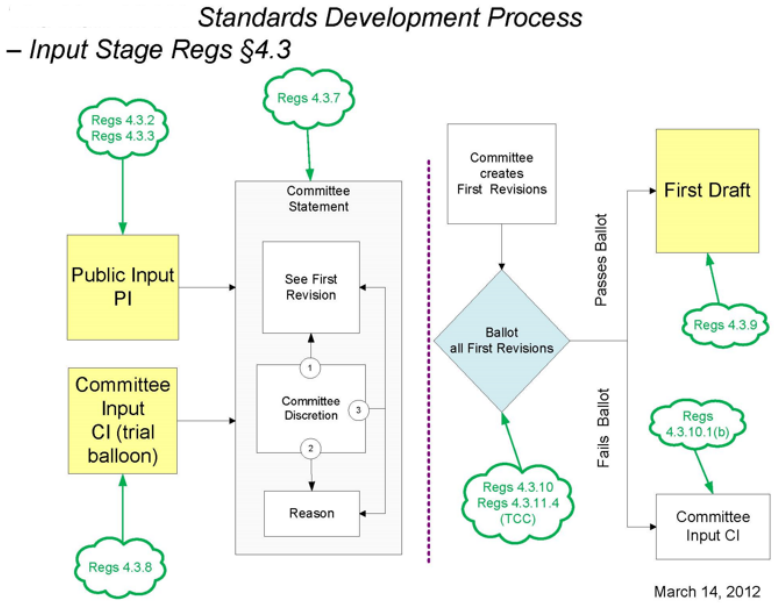
11

NFPA First Draft Meeting

Motion to End Debate, Previous Question, or to "Call the Question"

- Not in order when another member has the floor
- Requires a second
- Not debatable and DOES NOT automatically stop debate
- 2/3 affirmative vote immediately closes debate, returns to the original motion
- Less than 2/3 allows debate to continue

12



13

NFPA First Draft Meeting

Committee Actions and Motions:

- Resolve Public Input (PI)
- Create a First Revision (FR)
- Create a Committee Input (CI) – a placeholder used to solicit Public Comments and permit further work at Second Draft stage

14

14

NFPA First Draft Meeting

Resolve a Public Input (PI):

- Committee develops a committee statement to respond to (i.e., resolve) a Public Input.
- Committee indicates in statement its reasons for not accepting the recommendation and/or points to a relevant First Revision.
- PI response does not get balloted.

15

NFPA First Draft Meeting

Create a First Revision (FR):

- FR is created to change current text or add new text.
- Committee statement is developed to substantiate the change.
- Associated PIs get a committee response, often simply referring to the relevant FR.
- Each FR gets balloted.

16

NFPA First Draft Meeting

Create a Committee Input (CI):

- Committee is not ready to incorporate a change into the First Draft but wants to receive Public Comment on a topic that can be revisited at Second Draft stage.
- Committee statement is developed to explain committee's intent.
- CI is not balloted.

17

NFPA First Draft Meeting

Committee Statements:

- All Public Input must receive a Committee Statement.
- A valid technical reason must be provided.
- Vague references to "intent" should not be used.
- Reasons for why the submitter's substantiation is inadequate should be provided.
- A First Revision should be referenced if it addresses the intent of the submitter's Public Input.

18

NFPA First Draft Meeting

Formal Voting on First Revisions

- In-meeting votes establish a base committee position on the development of First Revisions (FRs).
- FRs are secured by electronic balloting (≥2/3 of completed ballots affirmative, and affirmative by ≥1/2 voting members).
- Only the results of the electronic ballot determine the official position of the committee on the First Draft.

19

NFPA First Draft Meeting

Ballots:

- Only First Revisions (FR) are balloted.
  - Public Inputs and Committee Statements are not balloted.
  - Reference materials are available.
    - First Draft, PI, CI, and CS
- Voting options:
  - Affirmative on all FRs
  - Affirmative on all FRs with exceptions specifically noted
- Ballot provides option to vote affirmative with comment.
- Vote to reject or abstain requires a reason.

20

NFPA First Draft Meeting

Electronic Balloting:

- Ballot system is web-based.
- Alternates are encouraged to complete ballots.
- Ballot session will time out after 90 minutes.
- Use “submit” to save your work – ballots can be revised until the balloting period is closed.

21

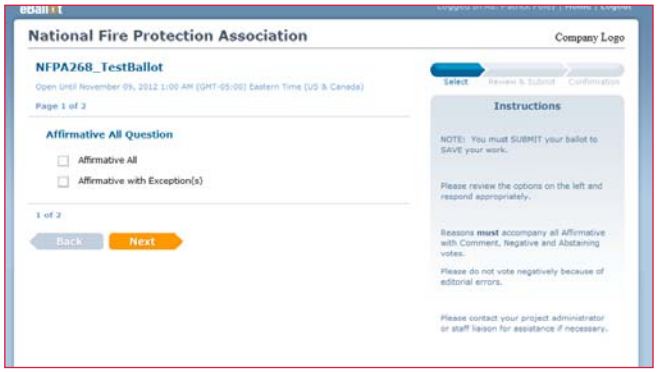
NFPA First Draft Meeting

- Click link provided in ballot email.
- Sign in with NFPA.org username and password.

22

NFPA First Draft Meeting

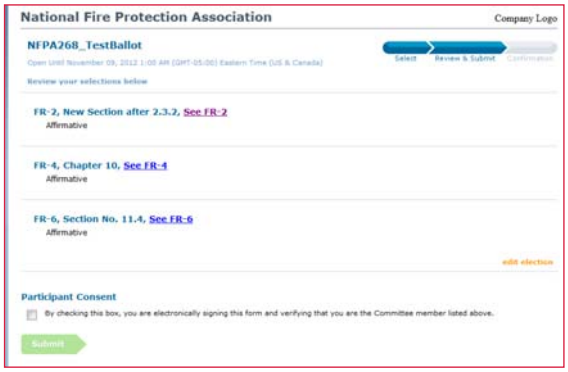
- Select either ‘Affirmative All’ or ‘Affirmative with Exception(s)’.



23

NFPA First Draft Meeting

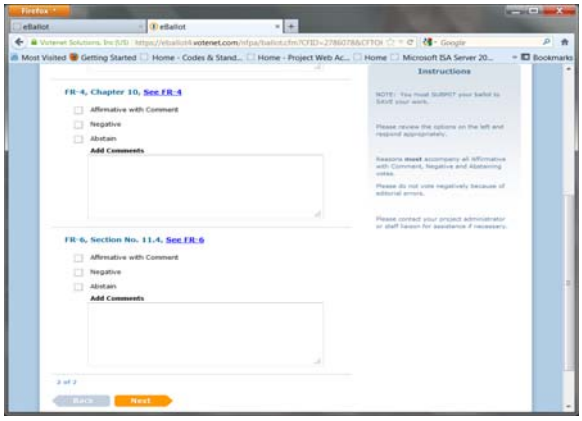
- Use “See FR- #” link to review all First Revisions.
- Use “edit election” to change individual votes or to modify vote after submitting ballot.



24

NFPA First Draft Meeting

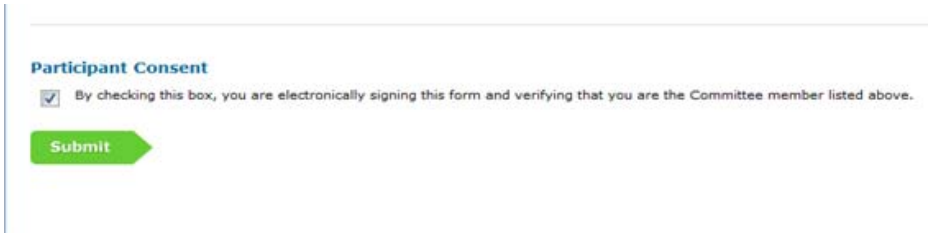
- Make selection: Affirmative with Comment, Negative, or Abstain
- No selection defaults to affirmative
- Must include comment (reason) on each vote other than Affirmative



25

NFPA First Draft Meeting

- To complete ballot, click ‘Participant Consent and Submit’.
- Return to edit any votes by ballot due date.



26

NFPA First Draft Meeting

Balloting:

- Initial ballot
- Circulation of negatives and comments – electronic balloting re-opened to permit members to change votes
- Any First Revision that fails ballot becomes a Committee Input (CI)

27

Legal

Antitrust Matters:

- Must comply with state and federal antitrust laws
- Participants are to conduct themselves in strict accordance with these laws
- Read and understand NFPA's Antitrust Policy which can be accessed at nfpa.org/regs

28

Legal

Antitrust Matters (cont'd):

- Participants must avoid any conduct, conversation or agreement that would constitute an unreasonable restraint of trade
- Conversation topics that are off limits include:
  - Profit, margin, or cost data
  - Prices, rates, or fees
  - Selection, division or allocation of sales territories, markets or customers
  - Refusal to deal with a specific business entity

29

Legal

Antitrust Matters (cont'd):

- NFPA's standards development activities are based on openness, honesty, fairness and balance
- Participants must adhere to the *Regulations Governing the Development of NFPA Standards* and the *Guide for the Conduct of Participants in the NFPA Standards Development Process* which can accessed at nfpa.org/regs
- Follow guidance and direction from your employer or other organization you may represent

30

Legal

Antitrust Matters (cont'd):

- Manner is which standards development activity is conducted can be important
- The *Guide of Conduct* requires standards development activity to be conducted with openness, honesty and in good faith
- Participants are not entitled to speak on behalf of NFPA
- Participants must take appropriate steps to ensure their statements whether written or oral and regardless of the setting, are portrayed as personal opinions, not the position of NFPA
- Be sure to ask questions if you have them

31

Legal

Patents:

- Disclosures of essential patent claims should be made by the patent holder
- Patent disclosures should be made early in the process
- Others may also notify NFPA if they believe that a proposed or existing NFPA standard includes an essential patent claim
- NFPA has adopted and follows ANSI's Patent Policy
- It is the obligation of each participant to read and understand NFPA's Patent Policy which can be accessed at nfpa.org/regs

32

NFPA 99 Reference Publication Updates

First Draft

- FUN to create CIs to update all reference publication editions at SD
- Each TC to notify FUN if they have a technical reason for not updating reference publication within their scope.
  - Public comment
  - Note to CC via meeting minutes

Second Draft

- Staff to draft SRs with all reference publication updates (Ch. 2 & annexes)
- FUN to act on draft SRs
- TCs provided with draft SRs for information
- Title changes to be updated editorially in code body by staff

NOTES:

- FUN will not update documents that are withdrawn, merged, or otherwise unclear. Responsible TC to provide new reference document via SR.
- Newly referenced documents in code body will be added editorially to Ch. 2.
- TC responsible for providing all information required by Chapter 2 for newly referenced publications.
- Correlating Committee to resolve any conflicts or correlation issues between committees.

33

THE FIRE PROTECTION RESEARCH FOUNDATION

TC Struggles with an Issue
- TC needs data on a new technology or emerging issue
- Two opposing views on an issue with no real data
- Data presented is not trusted by committee

Code Fund Lends a Hand
- TC rep and/or staff liaison submits a Code Fund Request
- Requests are reviewed by a Panel and chosen based on need / feasibility

Research Project Carried Out
- Funding for project is provided by the Code Fund and/or industry sponsors
- Project is completed and data is available to TC

www.nfpa.org/research

34

Document Information Pages

About	Current and Previous Editions	Next Edition	Technical Committee
• Document scope • Table of contents • Articles • Research and statistical reports • Latest codes and standards news on NFPA Today blog feed • Free access	• Issued TIAs, FIs, Errata • Archived revision information such as meeting and ballot information, First Draft Reports (previously ROPs), Second Draft Reports (previously ROCs), and Standards Council and NITMAM information	• Revision cycle schedule • Posting & closing dates • Submit public input/comments via electronic submission system. • Meeting and ballot information • First Draft Report and Second Draft Report • NITMAM information • Standard Council Decisions • Private TC info (*red asterisk) • Ballot circulations, informational ballots and other committee info	• Committee name and staff liaison • Committee scope and responsibility • Committee list with private information • Committee documents (codes & standards) in PDF format • Committees seeking members • Online committee membership application

35

Questions?

NFPA 99 & NFPA 99B Document Information Pages:

- www.nfpa.org/99
- www.nfpa.org/99B

36

36

Technical Committee on Hyperbaric and Hypobaric Health Care Facilities (HEA-HYP)

NFPA 99/99B Second Draft Meeting (Annual 2020)
Monday, June 24, 2019
Indianapolis Marriott Downtown
350 West Maryland Street Indianapolis, IN 46225

Minutes

Monday, June 24, 2019

1. **Call to Order.** The meeting was called to order at 8:00 am ET on Monday, June 24, 2019 by Chair, Richard Barry.

2. **Chairman Comments.** Richard Barry spoke to the agenda of the meeting and stated that the purpose of the meeting is to address public comments and create a Second Draft of the next edition.

3. **Introductions and Attendance.** Those members who were in attendance are listed below.

Name	Organization
Richard Barry	Healogics
Mario Caruso, Principal	Hyperbaric Consulting LLC
Jolene Cormier, Principal	Baylor Medical Center
Adrian Garay, Principal	Hyperbaric Modular Systems, Inc.
Robert Sheffield, Principal	International ATMO, Inc.
Jim Bell, Guest	Fink Engineering
Richard Bielen (Staff Liaison)	National Fire Protection Association

4. **Approval of Previous Meeting Minutes.** The minutes of the committee's August, 2018 First Draft committee meeting were approved as distributed in the agenda package.

5. **Staff Liaison Presentation.** Rich Bielen reviewed the meeting procedures and available actions for the committee during the meeting.

6. **Task Group Reports.** Adrian Garay of Hyperbaric Modular Systems, Inc gave an update on electrical requirements in hypobaric chambers. There was also discussion about eliminating Class E chambers, but the committee decided to keep the requirements.

7. **Preparation of the First Draft.** The Committee reviewed all of the Public Comments that were submitted and created Second Revisions as necessary.

8. **New Business.** There was an update on the PVHO and the possibility of removing the reference to NFPA 99. In addition there was a discussion about the use of lasers in a hyperbaric chamber and possible hazards. More research is needed however, funding is an issue.

9. **Next Meeting.** The next meeting of the committee will be after the next Public Input period. The meeting location will be determined at a later date.

10. **Adjournment** – The Meeting was adjourned on June 24 around 4:20 pm ET.

Public Input No. 22-NFPA 99-2020 [New Section after 14.2.1.3.1]

Pressure relief devices

Potential suitable wording could be inserted in section 14.2.1.3 Hyperbaric Piping Requirements or 14.2.2 Fabrication of Hyperbaric Chamber and such as:

(1) Where a hyperbaric chamber is designed, constructed and certified to a working pressure in excess of the maximum safe partial pressure of oxygen (3.0 ATA), measures shall be put in place to prevent such a situation resulting from system failure or human negligence. Where the chamber is required to allow for greater pressures, such measures should be able to be adjusted accordingly. At no time may a condition exist where the partial pressure of oxygen exceeds 3.0 ATA without some form of pressure relief device or pressure restricting device from being activated automatically.

(2) Pressure relief devices shall be capable of preventing any increase in chamber pressure where the device is fully open. This must be considered where changes in the pressurization gas supply system are made.

(3) The design of the chamber shall consider the fire case, either inside or outside the chamber. Where a situation could arise such that the chamber could rupture due to an uncontrollable, rapid increase in pressure, an additional rapid-acting device shall be installed to prevent a catastrophic rupture. Such a device shall have sufficiently high integrity to prevent the likelihood of failure during normal operation. A burst disc or similar device would be a suitable solution.

Additional Proposed Changes

File Name	Description	Approved
Public_input_safety_relief_devices.docx	Motivation/explanation of proposed changes regarding pressure relief valves	

Statement of Problem and Substantiation for Public Input

Compromised safety of chamber occupants due to excessive pressure exposure.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 17 11:42:15 EST 2020
Committee: HEA-HYP

Pressure relief:

While perhaps solely the purview of the PVHO-1 standard, I would like to raise the following considerations here. Chapter 14, specifically 14.3.4.1.1.1, refers to the testing and calibration of pressure relief valves, but there is no further mention of these safety-critical devices in chapter 14.

(1) Pressure relief valves are generally set to prevent a vessel from exceeding design pressure. These need to be fully open at design pressure, or no more than 10% above maximum operating pressure, which-ever is the lower.

While some chambers are limited in design pressure to accommodate treatments not exceeding 3 ATA (29 psig or 60 fsw), multiplace chambers especially are often designed for future, potentially deeper excursions. Examples would be a chamber capable of the USN treatment table 6A, requiring a treatment pressure of 6 ATA (73 psi or 165 fsw), or a chambers with the capability of a ± 4 ATA (43.5 psi or 98 fsw) mixed gas treatment (such as for a 50:50 heliox or nitrox treatment table). There are chambers designed for even higher pressures, such as those used for research applications or previously for deep diving applications. In terms of a hyperbaric medical application, where treatment on oxygen may not exceed 3 ATA, these pressure relief valves would not protect an occupant on oxygen in the event of loss of increasing pressure control (be this through a system failure or negligence).

Consideration should be given to more than one pressure relieve valve, or a warning device and associated control system, to prevent any excursion deeper than 3 ATA unless specifically planned for and the control system set to manage this. Multiple, mechanical safety relief devices may need manual isolation, shut-off valves to facilitate deeper excursions.

This should be discussed with the PVHO committee if the preference is to have the ASME include this in that standard.

(2) While a pressure relief device is intended to prevent over-pressurization, the relevant capacity of this valve needs to take into account the volumetric and flow characteristics of the gas supply system. This should be tested and validated at least prior to installation. Great care needs to be taken when the gas supply system is first selected or changed at a later date.

(3) It has been shown that the increase in pressure in a monoplace chamber of limited volume (such as a 25” diameter, 100% oxygen chamber) during a fire was sufficient to exceed the capacity of the pressure relief valve(s) and hence allow pressure to continue to rise, and then exceed the maximum potential strength of the chamber construction.

While there are arguments that fitting a bursting disc might result in a liability suit in the event of premature failure, this is not a sound argument in this case. Modern burst discs have very small tolerances on set pressure; the design pressure could be significantly higher than the maximum intended operating pressure (say 50% or more); and rapid depressurization versus potentially much higher pressures followed by the subsequent depressurization should the chamber fail catastrophically would increase survivability of the patient(s) and protect any bystanders.

Consideration should be given to such a safety device for chambers where a fire on the inside, or on the outside, could see internal pressure rise to beyond the potential explosion condition of the vessel. Devices with the capacity for near instantaneous opening could include reverse-acting bursting discs or buckling pin relief valves.

Potential suitable wording could be inserted in section 14.2.1.3 Hyperbaric Piping Requirements or 14.2.2 Fabrication of Hyperbaric Chamber and such as:

(1) Where a hyperbaric chamber is designed, constructed and certified to a working pressure in excess of the maximum safe partial pressure of oxygen (3.0 ATA), measures shall be put in place to prevent such a situation resulting from system failure or human negligence. Where the chamber is required to allow for greater pressures, such measures should be able to be adjusted accordingly. At no time may a condition exist where the partial pressure of oxygen exceeds 3.0 ATA without some form of pressure relief device or pressure restricting device from being activated automatically.

(2) Pressure relief devices shall be capable of preventing any increase in chamber pressure where the device is fully open. This must be considered where changes in the pressurization gas supply system are made.

(3) The design of the chamber shall consider the fire case, either inside or outside the chamber. Where a situation could arise such that the chamber could rupture due to an uncontrollable, rapid increase in pressure, an additional rapid-acting device shall be installed to prevent a catastrophic rupture. Such a device shall have sufficiently high integrity to prevent the likelihood of failure during normal operation. A burst disc or similar device would be a suitable solution.

Electrical systems:

Public Input No. 106-NFPA 99-2021 [Section No. 14.2.1.3.3]

~~**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* .~~

~~**14.2.1.3.3.2** –~~

~~The particulate filter shall be located as close as practical to the source.~~

Statement of Problem and Substantiation for Public Input

Removing the requirement for a particulate filter will bring chapter 14 in line with NFPA 99 chapter 5. In my opinion, there is no need for an additional filter. The manufactures of the medical gas regulators and installation of medical gas components to meet chapter 5 do not add addition filters unless specifically asked to do so. We have had this in the code for several cycles and it adds to the cost and complexity of the system.
Consider removing the requirement and referencing chapter 5.
Alternatively, use risk based language, eg...allow the facility to add the filters if the medical gas is suspect...rural areas or non hospital based assemblies.

Submitter Information Verification

Submitter Full Name: James Bell
Organization: Fink Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 05 14:47:16 EST 2021
Committee: HEA-HYP

Public Input No. 371-NFPA 99-2021 [Section No. 14.2.1.4.6.1]

14.2.1.4.6.1

Oxygen systems shall comply with 5.1.9, as applicable, except ~~that warning systems shall~~ as follows:

(1) The warning system shall be permitted to be a single combination master/area alarm panel.

(2) The alarm panel shall be located in an area of continuous surveillance while the facility is in operation.

(2) Pressure and vacuum sensors/switches shall be mounted at the source equipment with a pressure indicator at the master alarm panel.

Statement of Problem and Substantiation for Public Input

Clarifies that the single combination master/area alarm panel is intended to be the same as required for Category 2 medical gas systems in Chapter 5.

Submitter Information Verification

Submitter Full Name: Jonathan Willard
Organization: Acute Medical Gas Services
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 01 08:53:20 EDT 2021
Committee: HEA-HYP

Public Input No. 203-NFPA 99-2021 [Section No. 14.2.4.1.3 [Excluding any Sub-Sections]]

Individual breathing apparatus shall be available inside a Class A chamber for each occupant for use in the event that the chamber atmosphere is fouled by combustion or otherwise. A risk assessment shall be performed to determine the breathing apparatus is appropriate for the potential hazards identified.

Statement of Problem and Substantiation for Public Input

Breathing apparatus for protecting workers from hazards must be appropriate for the hazard identified especially if the hazard is immediately dangerous to life or health (IDLH). Utilizing the wrong breathing apparatus for an identified hazard could make it impossible for the user to function and possibly lead to death.

OSHA 29 CFR 1910.134(d)
This paragraph requires the employer to evaluate respiratory hazard(s) in the workplace, identify relevant workplace and user factors, and base respirator selection on these factors. The paragraph also specifies appropriately protective respirators for use in IDLH atmospheres, and limits the selection and use of air-purifying respirators.

Submitter Information Verification

Submitter Full Name: Greg Raleigh
Organization: Retired
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 18 21:56:45 EDT 2021
Committee: HEA-HYP

Public Input No. 108-NFPA 99-2021 [Sections 14.2.5.1, 14.2.5.2]

Sections 14.2.5.1, 14.2.5.2

14.2.5.1

Class A chambers shall be capable of depressurizing from 3 ATA (304.~~0 kPa~~ 0 kPa absolute) 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~~ 0 kPa absolute) to ambient pressure in not more than 2 minutes.

Statement of Problem and Substantiation for Public Input

This change clarifies that 304 kPa is not gauge pressure but absolute pressure. If we intend to use gauge pressure we should uses 202.2 kPa.

Submitter Information Verification

Submitter Full Name: James Bell
Organization: Fink Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 05 15:18:04 EST 2021
Committee: HEA-HYP

Public Input No. 37-NFPA 99-2020 [New Section after 14.2.6]

General notes to this section

These notes apply to the suggested amendments that follow under 14.2.6.

Additional Proposed Changes

File Name	Description	Approved
Public_input_fire_deluge_systems.docx	Explanatory notes to all suggested amendments to the fire suppression system.	

Statement of Problem and Substantiation for Public Input

The proposed changes address some shortcomings that I find in this section together with modernization of the requirements. I have suggested a more performance-based approach rather than just following a series of rules, where no substantiating research appear to exist in any of the NFPA hyperbaric standards that I can find - starting with NFPA 56D 1968.

The explanatory notes in the attachment should hopefully provide some background to my proposals.

Lastly, the EN 16081 standard on hyperbaric fire extinguishing is a useful document some of the considerations should be integrated into our standard.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:40:46 EST 2020
Committee: HEA-HYP

Fire Suppression:

The European Norm EN 160814:2011+A1:2014 provides guidance on actually qualifying a hyperbaric fire deluge system rather than simply stating flow and coverage criteria.

It is a performance-based standard that provides desired outcomes and includes the requirement to prove that the system can achieve these.

Primarily, validation of the system design must be done by means of a 'hot' test, where dummies in specified clothing products are ignited, and the deluge system activates when the temperature at shoulder level reaches 212°F (100°C). The deluge system should then reduce the heat on the dummies to 122°F (50°C) within 20 seconds of ignition, and completely extinguish the fire within 40 seconds. A range of pressures and oxygen levels need to be tested – including 30% oxygen at 2.5 ATA.

No chamber pressure increase is allowed at any stage.

This 'hot' test qualifies the deluge system for each chamber size and internal configuration. The subsequent 'wet' test then assures compliance of full function as well as with the technical requirements.

The following table illustrates the essential differences on specific aspects of the two documents:

NFPA 99 Chpt 14, 14.2.6	EN 16081: 2011+A1: 2013
Only water is allowed.	Any compatible fluid may be used.
Must flow ≤ 3 seconds after activation.	Must flow ≤ 2 seconds after activation.
Stated deluge coverage & flow based on actual or specifically determined floor area	Coverage and flow requirements based on the position of all occupants (e.g. a lying pt is considered as 3 seated pts). In addition, unoccupied areas must be deluged at 50% of the flow capacity for occupied areas
Duration: 1 minute or 15 seconds under power loss conditions.	At least 1 minute or as determined by actual testing, which-ever is the larger. Full deluge performance function must be assured.
Only treatment compartment requires deluge.	All compartments require deluge.
Handlines to be installed.	Manual hyperbaric fire extinguisher mandated for each compartment.
Internal deluge deactivation required.	No internal deluge deactivation allowed.
Not applicable.	No chamber pressure increase is allowed during any 'hot test.

I would like to open this up to the committee for discussion, but as it needs to be done through the PI process, I will do it as follows:

(1) 14.2.6.1.1 *A fire suppression system consisting of independently supplied and operating handline- and deluge-type water (<u>or suitable, human-safe alternative</u>) spray systems shall be*

installed in all Class A chambers. A suitable portable hyperbaric fire extinguisher may be used instead of or in addition to a handline. [We should leave the door open for other types of deluge media; the option of a portable extinguisher means that we could use something more compatible with the type of fire – such as electrically-caused or Li-ion battery fires. I would not suggest changing further references to handlines in 14.2.6.1 General, as allowing an alternative to a handline, or having both portable and handline options, would not invalidate the remaining paragraphs in this section.]

(2) 14.2.6.1.4.1 *Activation of the fire suppression system shall notify the facility's central fire alarm system, if present. The use of handlines or portable fire extinguishers shall require manual notification.*

(3) 14.2.6.1.8 *A water-based fire suppression system shall be permitted to be supplied from the local potable water service.* [Allowing for water to be only one option.]

(4) 14.2.6.2 *Deluge System. A fixed deluge extinguishing system shall be installed in all chamber compartments that are designed for manned operations.* [Word 'water' removed.]

(5) ~~14.2.6.2.3 Fixed deluge systems shall not be required in chamber compartments that are used strictly as personnel transfer compartments (locks) and for no other purposes~~. My concern here is that transfer compartments must be fitted with BIBS, at least to allow safe decompression of the person(s) being locked out. Once on oxygen, this becomes the use of a drug and hence (surely) is considered to be a treatment. The simple fact that there is an oxygen supply system in the transfer compartment requires additional precautions. Here a handline or portable extinguisher would not work if it was one person only. Finally, I have seen transfer locks being used for treating where, in an emergency, more treatments were required than BIBS masks were available in the primary treatment lock.

(6) 14.2.6.2.5 *Extinguishing media shall be delivered from the fixed discharge nozzles as specified in 14.2.6.2.7 within 3 seconds of activation*. [While I am not sure where the 3 seconds comes from, I do not see any reason to change this.]

(7) *14.2.6.2.6 Average spray density at floor level shall be not less than 81.5 L/min/m^2 (2 gpm/ft^2), with no floor area larger than 1 m^2 (10.76 ft^2) less than 40.75 L/min/m^2 (1 gpm/ft^2). Alternatively, the manufacturer may utilize the qualification process contained in EN 16081 to determine more suitable deluge parameters. This would allow for more complicated configurations to be considered*. [It would also allow for other media to be used.]

(8) 14.2.6.2.*7 Water (or appropriate media) shall be available in the deluge system to maintain the flow specified in 14.2.6.2.6 simultaneously in each chamber compartment (lock) containing the deluge system for 1 minute.* [EN 16081 specified that the fire must be out in no longer than 40 seconds – I am assuming 43 seconds of initiation. This does therefore not contradict the stated 1 minute requirement.]

(9) *14.2.6.2.8 The deluge system shall have stored pressure to operate for the full duration of designed deluge (1 minute) without electrical branch power.* [I do not understand why 15 seconds is mentioned – unless there is data to show that the fire can be contained in 15 seconds.]

(10) 14.2.6.2.9 *All dedicated storage vessels used to provide the deluge system with liquid extinguishing media shall be fitted with a suitable level indicator, with the level displayed at the chamber console.*

(11) 14.2.6.2.10 *Deluge systems using pressurized fluid storage vessels shall be designed to prevent the driving gas supply from pressurizing the hyperbaric chamber if all the fluid is driven out of the storage vessel.*

(12) (New) 14.2.6.2.11 *Deluge storage vessels capable of producing or containing corrosion or other products, capable of blocking deluge outlet nozzles, shall be fitted with a suitable strainer where the fluid exists the vessel. The strainer shall be capable of being opened to inspect and clean the filter device during periodic system maintenance inspections.*

(13) 14.2.6.3.7 *The extinguishing media supply for the handline system shall be designed to ensure a 345 kPa (50 psi) minimum water pressure above the maximum chamber pressure*.

Public Input No. 31-NFPA 99-2020 [Section No. 14.2.6.1.1]

14.2.6.1.1

~~A fire suppression system consisting of independently supplied and operating handline- and deluge-type water spray systems shall be installed in all Class A chambers.~~ *Water (or appropriate media) shall be available in the deluge system to maintain the flow specified in 14.2.6.2.6 simultaneously in each chamber compartment (lock) containing the deluge system for 1 minute*

Statement of Problem and Substantiation for Public Input

14.2.9.3.3 What about patient entertainment systems? This par. only refers to equipment needed for safe operation and patient care. Perhaps one could consider: Only electrical equipment necessary for the safe operation of the chamber, required patient care and limited patient entertainment shall be permitted in the chamber.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:25:45 EST 2020
Committee: HEA-HYP

Public Input No. 132-NFPA 99-2021 [Section No. 14.2.6.1.3]

14.2.6.1.3

System design shall be such that activation of either the ~~handline or the deluge~~ deluge system shall automatically cause the following:

(1) Visual and aural indication of activation shall occur at the chamber operator's console.

(2) All ungrounded electrical leads for power and lighting circuits contained inside the chamber shall be disconnected.

(3) Emergency lighting *(see 14.2.3.2)* and communication, where used, shall be activated.

14.2.6.1.3.1

Intrinsically safe circuits, including sound-powered communications, shall be permitted to remain connected ~~when either the handline or the~~ when the deluge system is activated.

Statement of Problem and Substantiation for Public Input

Delete either the handline from this sentence, we focus on the deluge and not the handlines as a means of extinguishing a fire in the chamber. This change came into play in the 2012 edition, It was not in the 2005 edition and we skipped the 2009. I see no need to require this for the Handlines, it adds expense and complexity to the handline system.
I searched the history to see where this change came from and was unable to find anything. Was this an editorial add? The current use of HH is secondary to the deluge.

Submitter Information Verification

Submitter Full Name: James Bell
Organization: Fink Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 04 14:46:21 EDT 2021
Committee: HEA-HYP

Public Input No. 133-NFPA 99-2021 [Section No. 14.2.6.1.4.1]

14.2.6.1.4.1

Activation of the ~~fire suppression~~ deluge system shall notify the facility's central fire alarm system, if present.

Statement of Problem and Substantiation for Public Input

This change clarifies the intent that this requirement is for the deluge and not the handline.

Submitter Information Verification

Submitter Full Name: James Bell
Organization: Fink Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 04 14:55:42 EDT 2021
Committee: HEA-HYP

Public Input No. 24-NFPA 99-2020 [Section No. 14.2.6.1.4.1]

14.2.6.1.4.1

Activation of the fire suppression system shall notify the ~~facility's~~ *facility's central fire alarm system, if present. The use of handlines or portable fire extinguishers shall require manual notification .*

Statement of Problem and Substantiation for Public Input

I have suggested the use of portable extinguishers and these would require manual activation of an alarm system.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:18:38 EST 2020
Committee: HEA-HYP

Public Input No. 25-NFPA 99-2020 [Section No. 14.2.6.1.8]

14.2.6.1.8

~~The~~ *A water-based fire suppression system shall be permitted to be supplied from the local potable water service.*

Statement of Problem and Substantiation for Public Input

(3) 14.2.6.1.8 A water-based fire suppression system shall be permitted to be supplied from the local potable water service. [Allowing for water to be only one option.]

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:19:35 EST 2020
Committee: HEA-HYP

Public Input No. 26-NFPA 99-2020 [Section No. 14.2.6.2 [Excluding any Sub-Sections]]

A fixed ~~water~~ *deluge extinguishing system shall be installed in all chamber compartments that are designed for manned operations.*

Statement of Problem and Substantiation for Public Input

14.2.6.2 Deluge System. A fixed deluge extinguishing system shall be installed in all chamber compartments that are designed for manned operations. [Word 'water' removed.]

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:20:33 EST 2020
Committee: HEA-HYP

Public Input No. 27-NFPA 99-2020 [Section No. 14.2.6.2.3]

14.2.6.2.3

~~Fixed deluge systems shall not be required in chamber compartments that are used strictly as personnel transfer compartments (locks) and for no other purposes~~ Delete .

Statement of Problem and Substantiation for Public Input

14.2.6.2.3 Fixed deluge systems shall not be required in chamber compartments that are used strictly as personnel transfer compartments (locks) and for no other purposes.
My concern here is that transfer compartments must be fitted with BIBS, at least to allow safe decompression of the person(s) being locked out. Once on oxygen, this becomes the use of a drug and hence (surely) is considered to be a treatment. The simple fact that there is an oxygen supply system in the transfer compartment requires additional precautions. Here a handline or portable extinguisher would not work if it was one person only. Finally, I have seen transfer locks being used for treating where, in an emergency, more treatments were required than BIBS masks were available in the primary treatment lock.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:21:47 EST 2020
Committee: HEA-HYP

Public Input No. 28-NFPA 99-2020 [Section No. 14.2.6.2.5]

14.2.6.2.5

~~Water~~ *Extinguishing media shall be delivered from the fixed discharge nozzles as specified in 14.2.6.2.7 within* ~~3 seconds~~ *3 seconds of activation* ~~of any affiliated deluge control~~ .

Statement of Problem and Substantiation for Public Input

(6) 14.2.6.2.5 Extinguishing media shall be delivered from the fixed discharge nozzles as specified in 14.2.6.2.7 within 3 seconds of activation. [While I am not sure where the 3 seconds comes from, I do not see any reason to change this.]

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:22:29 EST 2020
Committee: HEA-HYP

Public Input No. 29-NFPA 99-2020 [Section No. 14.2.6.2.6]

14.2.6.2.6*

Average spray density at floor level shall be not less than 81.5 L/min/m^2 (2 gpm/ft^2), with no floor area larger than 1 m^2 (10.76 ft^2) receiving less than 40.75 L/min/m^2 (1 gpm/ft^2).*Alternatively, the manufacturer may utilize the qualification process contained in EN 16081 to determine more suitable deluge parameters. This would allow for more complicated configurations to be considered* .

Statement of Problem and Substantiation for Public Input

14.2.6.2.6 Average spray density at floor level shall be not less than 81.5 L/min/m2 (2 gpm/ft2), with no floor area larger than 1 m2 (10.76 ft2) less than 40.75 L/min/m2 (1 gpm/ft2). Alternatively, the manufacturer may utilize the qualification process contained in EN 16081 to determine more suitable deluge parameters. This would allow for more complicated configurations to be considered. [It would also allow for other media to be used.]

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:23:18 EST 2020
Committee: HEA-HYP

Public Input No. 30-NFPA 99-2020 [Section No. 14.2.6.2.7 [Excluding any Sub-Sections]]

Water (or appropriate media) shall be available in the deluge system to maintain the flow specified in 14.2.6.2.6 simultaneously in each chamber compartment (lock) containing the deluge system for ~~1 minute.~~ 1 minute

Statement of Problem and Substantiation for Public Input

14.2.6.2.7 Water (or appropriate media) shall be available in the deluge system to maintain the flow specified in 14.2.6.2.6 simultaneously in each chamber compartment (lock) containing the deluge system for 1 minute. [EN 16081 specified that the fire must be out in no longer than 40 seconds – I am assuming 43 seconds of initiation. This does therefore not contradict the stated 1 minute requirement.]

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:24:16 EST 2020
Committee: HEA-HYP

Public Input No. 32-NFPA 99-2020 [Section No. 14.2.6.2.8]

14.2.6.2.8

The deluge system shall have stored pressure to operate for ~~at least 15 seconds~~ *the full duration of designed deluge (1 minute) without electrical branch power.*

Statement of Problem and Substantiation for Public Input

14.2.6.2.8 The deluge system shall have stored pressure to operate for the full duration of designed deluge (1 minute) without electrical branch power. [I do not understand why 15 seconds is mentioned – unless there is data to show that the fire can be contained in 15 seconds.]

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:28:14 EST 2020
Committee: HEA-HYP

Public Input No. 33-NFPA 99-2020 [Section No. 14.2.6.2.9]

14.2.6.2.9

All dedicated storage vessels used to provide the deluge system with ~~water~~ *liquid extinguishing media shall be fitted with a suitable* ~~water~~ *level indicator, with the level displayed at the chamber console.*

Statement of Problem and Substantiation for Public Input

We should allow for other liquid media - rather than just water.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:28:59 EST 2020
Committee: HEA-HYP

Public Input No. 121-NFPA 99-2021 [New Section after 14.2.6.2.10]

14.2.6.2.11 Overhead deluge media supply pressure

The water supply for the deluge system shall be designed to ensure a 345 kPa (50 psi) minimum water pressure above maximum chamber pressure.

Statement of Problem and Substantiation for Public Input

Research published by Eggleston in 1967: Evaluation of fire extinguishing systems for use in oxygen rich atmospheres (page 25) and published again in 1976 in The Underwater Handbook (Shilling et al: page 662) states as follows:
The pressure at the spray nozzles must be about 50 psi above chamber pressure to produce the desired degree of atomization and droplet velocities.
Eggleston goes on to state that allowing for pressure losses in piping, a typical water system would require a supply adequate for about one minute discharge at 150 psig.
Then according to Ault and Carter, 1967 and again in Shilling (pg 663): Spray pattern of nozzles might be affected by chamber pressure. To compensate for the reduced coverage at elevated pressures, design of the system must provide an adequate number of strategically located nozzles to wet all possible exposures areas in the chamber.
The requirement for 345 kPa (50 psi) appears in 14.2.6.3.7 under Handlines but not for the deluge system.
While this requirement might have been amended in favor of the requirement for a specific coverage area, determined at maximum operating pressure, we again read in Shilling: 1.25 gpm/ft² puts a fire out in 2 minutes in 100% oxygen at 1 ATA (NFPA 1969). This appears before the requirement for 50 psi. It draws into question that flow rate alone will be effective enough: it appears to be based on pressure to produce the required atomization and droplet velocities.
Once again I would advocate for testing by the manufacturer to actually prove extinguishment of a fire inside a chamber at elevated oxygen levels within the 1 minute requirement stated under 14.2.6.2.7.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 35-NFPA 99-2020 [New Section after 14.2.6.2.10]	

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Apr 19 13:47:48 EDT 2021
Committee: HEA-HYP

Public Input No. 35-NFPA 99-2020 [New Section after 14.2.6.2.10]

Deluge media strainer

(1) 14.2.6.2.11 *Deluge storage vessels capable of producing or containing corrosion or other products, capable of blocking deluge outlet nozzles, shall be fitted with a suitable strainer where the fluid exists the vessel. The strainer shall be capable of being opened to inspect and clean the filter device during periodic system maintenance inspections.*

Type your content here ...

Statement of Problem and Substantiation for Public Input

(New) 14.2.6.2.11 Deluge storage vessels capable of producing or containing corrosion or other products, capable of blocking deluge outlet nozzles, shall be fitted with a suitable strainer where the fluid exists the vessel. The strainer shall be capable of being opened to inspect and clean the filter device during periodic system maintenance inspections.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 121-NFPA 99-2021 [New Section after 14.2.6.2.10]	

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:30:00 EST 2020
Committee: HEA-HYP

Public Input No. 34-NFPA 99-2020 [Section No. 14.2.6.2.10]

14.2.6.2.10

Deluge systems using pressurized ~~water~~ *fluid storage vessels shall be designed to prevent the driving gas supply from pressurizing the hyperbaric chamber if all the* ~~water~~ *fluid is driven out of the* ~~water~~ *storage vessel.*

Statement of Problem and Substantiation for Public Input

Allowing for other media rather than just water.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:29:22 EST 2020
Committee: HEA-HYP

Public Input No. 36-NFPA 99-2020 [Section No. 14.2.6.3.7 [Excluding any Sub-Sections]]

The ~~water~~ *extinguishing media supply for the handline system shall be designed to ensure a* ~~345 kPa~~ *345 kPa (* ~~50 psi~~ *50 psi) minimum water pressure above the maximum chamber pressure* .

Statement of Problem and Substantiation for Public Input

Allowing for other media and not just water.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 09:31:14 EST 2020
Committee: HEA-HYP

Public Input No. 61-NFPA 99-2020 [Section No. 14.2.9.3]

14.2.9.3* Wiring and Equipment Inside Class A Chambers.

The general rules of 14.2.9.3.1 through 14.2.9.3.16.5 shall be satisfied in the use of electrical devices and equipment. These requirements are intended to protect against the elevated fire risks known to exist in a pressurized air environment and shall not be construed as classifying the chamber interior as a Class I (as defined in Article 500 of *NFPA 70*) hazardous location.

14.2.9.3.1

Equipment or equipment components installed in, or used in, the chamber shall not present an explosion or implosion hazard under the conditions of hyperbaric use.

14.2.9.3.2

All equipment shall be rated, or tested and documented, for intended hyperbaric conditions prior to use.

14.2.9.3.3

Only the electrical equipment necessary for the safe operation of the chamber and for required patient care shall be permitted in the chamber.

14.2.9.3.4

Only portable equipment necessary for the logistical and operational support shall be permitted in the chamber during manned pressurization.

14.2.9.3.5 Wires and Cables.

Wires and cables used inside the chamber shall be resistant to the spread of fire by complying with 14.2.9.3.5.1 or shall be contained within equipment described in 14.2.9.3.5.2.

14.2.9.3.5.1

Wires and cables shall comply with the spread of fire requirements of “UL Flame Exposure, Vertical Tray Flame Test” in UL 1685, *Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables*, or shall exhibit damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the CSA “Vertical Flame Test — Cables in Cable Trays,” as described in CSA C22.2 No. 0.3, *Test Methods for Electrical Wires and Cables*.

14.2.9.3.5.2

Wires and cables that form an integral part of electrical equipment approved or listed specifically for use inside hyperbaric chambers, including patient leads, shall not be required to comply with the requirements of 14.2.9.3.5.1.

14.2.9.3.6 Wiring Methods.

14.2.9.3.6.1

Fixed wiring shall be installed in conduit utilizing the following waterproof components:

(1) Threaded metal joints

(2) Fittings

(3) Boxes

(4) Enclosures

14.2.9.3.6.2

A continuous ground shall be maintained between all conductive surfaces enclosing electrical circuits and the chamber hull using approved grounding means.

14.2.9.3.6.3

All threaded conduit shall be threaded with an NPT standard conduit cutting die that provides a 19 mm taper per 0.3 m (0.75 in. taper per 1 ft).

14.2.9.3.6.4

All threaded conduit shall be made wrench-tight to prevent sparking when fault current flows through the conduit system.

14.2.9.3.6.5

Wiring classified as intrinsically safe for any group location and installed in accordance with Article 504 of *NFPA 70* shall be permitted.

14.2.9.3.6.6

Threaded, liquidtight flexible metal conduit installed in accordance with Article 350 of *NFPA 70* shall be permitted when protected from damage by physical barriers such as equipment panels.

14.2.9.3.7 Drainage.

Means of draining fixed conduit and fixed equipment enclosures shall be provided.

14.2.9.3.8 Flexible Electrical Cords.

Flexible cords used to connect portable utilization equipment to the fixed electrical supply circuit shall meet all the following requirements:

(1) They shall be of a type approved for extra-hard use in accordance with Table 400.4 of *NFPA 70*.

(2) 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*.

14.2.9.3.8.1

The normal cord supplied with the portable utilization equipment shall be permitted when the portable device is rated at less than 2 A and the cord is positioned out of traffic and protected from physical abuse.

14.2.9.3.9* Receptacles Installed Inside the Chamber.

14.2.9.3.9.1

Receptacles shall be waterproof.

14.2.9.3.9.2

Receptacles shall be of the type providing for connection to the grounding conductor of the flexible cord.

14.2.9.3.9.3

Receptacles shall be supplied from isolated power circuits meeting the requirements of 14.2.9.4.2.

14.2.9.3.9.4

The design of the receptacle shall be such that sparks cannot be discharged into the chamber environment when the plug is inserted or withdrawn under electrical load.

14.2.9.3.9.5

One of the following shall be satisfied to protect against inadvertent withdrawal of the plug under electrical load:

(1) The receptacle–plug combination shall be of a locking type.

(2) The receptacle shall carry a label warning against unplugging under load, and the power cord shall not present a trip hazard for personnel moving in the chamber.

14.2.9.3.10 Switches.

Switches in the fixed wiring installation shall be waterproof.

14.2.9.3.10.1*

Switch make and break contacts shall be housed in the electrical enclosure so that no sparks from arcing contacts can reach the chamber environment.

14.2.9.3.11* Temperature.

No electrical equipment installed or used in the chamber shall have an operating surface temperature in excess of 85°C (185°F).

14.2.9.3.12 Exposed Live Electrical Parts.

No exposed live electrical parts shall be permitted, except as specified in 14.2.9.3.12.1 and 14.2.9.3.12.2.

14.2.9.3.12.1

Exposed live electrical parts that are intrinsically safe shall be permitted.

14.2.9.3.12.2

Exposed live electrical parts that constitute patient monitoring leads, which are part of electromedical equipment, shall be permitted, provided that they meet the requirements of 14.2.9.3.16.

14.2.9.3.13* 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*.

(2) They shall be totally enclosed in accordance with 501.125(A)(2) or 501.125(A)(3) of *NFPA 70*.

14.2.9.3.14* Lighting.

14.2.9.3.14.1

Lighting installed or used inside the chamber shall be of a type that is not damaged by exposure to 1½ times the maximum allowable working pressure (MAWP).

14.2.9.3.14.2

Permanently installed fixtures shall meet the following requirements:

(1) They shall be rated and approved for Class I (Division 1 or 2) classified areas.

(2) They shall have lens guards installed.

(3) They shall be located away from areas where they would experience physical damage from the normal movement of people and equipment.

14.2.9.3.14.3

Ballasts and other energy storage components that are part of the lighting circuit shall be installed outside the chamber in accordance with 14.2.9.1.4.

14.2.9.3.14.4

Portable fixtures intended for spot illumination shall be shatterproof or protected from physical damage.

14.2.9.3.15 Low-Voltage, Low-Power Equipment.

The requirements of 14.2.9.3.15.1 through 14.2.9.3.15.5 shall apply to sensors and signaling, alarm, communications, and remote-control equipment installed or used in the chamber for operation of the chamber.

14.2.9.3.15.1*

Equipment shall be isolated from main power by one of the following means:

(1) Design of the power supply circuit

(2) Opto-isolation

(3) Other electronic isolation means

14.2.9.3.15.2

Circuits such as headset cables, sensor leads, and so forth, not enclosed as required in 14.2.9.3.6, shall meet one of the following requirements:

(1) They shall be part of approved intrinsically safe equipment.

(2) They shall be limited by circuit design to not more than 28 V and 0.5 A under normal or circuit-fault conditions.

14.2.9.3.15.3

Chamber speakers shall be of a design in which the electrical circuitry and wiring is completely enclosed.

14.2.9.3.15.4

The electrical rating of chamber speakers shall not exceed 28 V rms and 25 W.

14.2.9.3.15.5

Battery-operated, portable intercom headset units shall meet the requirements of 14.2.9.3.16.4 for battery-operated devices.

14.2.9.3.16 Portable Patient Care–Related Electrical Appliances.

14.2.9.3.16.1

The appliance shall be designed, constructed, inspected, and maintained in accordance with Chapter 10.

14.2.9.3.16.2

The electrical and mechanical integrity of the appliance shall be verified and documented through an ongoing maintenance program as required in Chapter 10.

14.2.9.3.16.3

Appliances that utilize oxygen shall not allow oxygen accumulation in the electrical portions of the equipment under normal and abnormal conditions.

14.2.9.3.16.4 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.

14.2.9.3.16.5 Cord-Connected Devices.

Cord-connected devices shall meet the following requirements:

(1) All portable, cord-connected equipment shall have an on/off power switch.

(2) The equipment electrical rating shall not exceed 120 V and 2 A, unless the electrical portions of the equipment are inert-gas purged.

(3) The plug of cord-connected devices shall not be used to interrupt power to the device.

14.2.9.3.17* Gas Purging.

Gas purging of AC and DC equipment used inside the chamber shall be permitted using inert gas or air.

Statement of Problem and Substantiation for Public Input

General comments:
There is, in my view, much confusion when it comes to this entire section. It appears to be prefaced on following the NFPA 700 code with only deviations, exemptions and additional requirements added. In short, an amended version of NFPA 70 but lacking cohesion and hard to apply.
NFPA 700 on its own is a stand-alone standard that has been carefully considered in its entirety. Referring to only individual sections does not guarantee that the rest of it will work as intended.
It would be preferable for someone with electrical engineering experience to re-write this as a stand-alone (meaning stand-alone from NFPA 70) section under chapter 14, with only very specific references to NFPA 70 where really necessary and carefully considered.
I would agree that everything outside the hyperbaric chamber, including power to ancillary devices but excluding the subsequent power/signal transmission into or out of the chamber (between the device and the chamber) needs to be regarded as would apply to any healthcare facility (NFPA 571). However, anything connected to the chamber needs to meet chamber-specific requirements.
I have in the past tried to correct broken links (ghost references to NFPA 70) and insert words that ensure that the requirements make sense – such as where the installation of a LIM would actually make sense. However, there is much more to this than individual comments, questions or recommendations.
Here follows a list of specific sections that perhaps require adjustment; however, a more global review by an expert in power systems for low voltage, contained environments is really needed.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:28:47 EST 2020
Committee: HEA-HYP

Public Input No. 41-NFPA 99-2020 [Section No. 14.2.9.3.3]

14.2.9.3.3

Only ~~the~~ *electrical equipment necessary for the safe operation of the chamber* ~~and for~~ *, required patient care and limited patient entertainment shall be permitted in the chamber.*

Statement of Problem and Substantiation for Public Input

14.2.9.3.3 What about patient entertainment systems? This par. only refers to equipment needed for safe operation and patient care.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:11:40 EST 2020
Committee: HEA-HYP

Public Input No. 42-NFPA 99-2020 [Section No. 14.2.9.3.4]

14.2.9.3.4

Only portable equipment necessary for ~~the~~ *logistical , operational and* ~~operational~~ *patient-care support shall be permitted in the chamber* - ~~during manned pressurization~~ .

Statement of Problem and Substantiation for Public Input

14.2.9.3.4 What about patient care?

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:12:19 EST 2020
Committee: HEA-HYP

Public Input No. 62-NFPA 99-2020 [New Section after 14.2.9.3.5]

Explanatory notes to section 14.2.9 proposed amendments

Additional Proposed Changes

File Name	Description	Approved
Public_input_electrical_requirements.docx	Explanatory notes to electrical section	

Statement of Problem and Substantiation for Public Input

The electrical section has many confusing requirements. While I am not an expert in electrical systems, I hope that the explanatory notes provided and the proposed amendments will make compliance with this section more achievable and realistic.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:29:18 EST 2020
Committee: HEA-HYP

14.2.9 Electrical Systems:

General comments:

There is, in my view, much confusion when it comes to this entire section. It appears to be prefaced on following the NFPA 700 code with only deviations, exemptions and additional requirements added. In short, an amended version of NFPA 70 but lacking cohesion and hard to apply.

NFPA 700 on its own is a stand-alone standard that has been carefully considered in its entirety. Referring to only individual sections does not guarantee that the rest of it will work as intended.

It would be preferable for someone with electrical engineering experience to re-write this as a stand-alone (meaning stand-alone from NFPA 70) section under chapter 14, with only very specific references to NFPA 70 where really necessary and carefully considered.

I would agree that everything outside the hyperbaric chamber, including power to ancillary devices but excluding the subsequent power/signal transmission into or out of the chamber (between the device and the chamber) needs to be regarded as would apply to any healthcare facility (NFPA 571). However, anything connected to the chamber needs to meet chamber-specific requirements.

I have in the past tried to correct broken links (ghost references to NFPA 70) and insert words that ensure that the requirements make sense – such as where the installation of a LIM would actually make sense. However, there is much more to this than individual comments, questions or recommendations.

Here follows a list of specific sections that perhaps require adjustment; however, a more global review by an expert in power systems for low voltage, contained environments is really needed.

(1) 14.2.9.3.3 What about patient entertainment systems? This par. only refers to equipment needed for safe operation and patient care. Perhaps one could consider: *Only electrical equipment necessary for the safe operation of the chamber, required patient care and limited patient entertainment shall be permitted in the chamber.*

(2) 14.2.9.3.4 What about patient care? Perhaps one could consider: *Only portable equipment necessary for logistical, operational and patient-care support shall be permitted in the chamber.*

(3) 14.2.9.3.6.1 I am not sure how a fitting or joint can be waterproof. Perhaps watertight (once assembled of course). Suggest: *Fixed wiring shall be installed in conduit utilizing the following components and be water-tight after installation*:

(4) 14.2.9.3.6.2 Why would we ground all housings inside the chamber unless these are coupled to a LIM system (meaning that they would be supplied from an AC power supply)? One should bear in mind that grounding can result in for noise interference/feedback to be introduced. Some devices need to be grounded to the external supply system to ensure no noise transmission – thinking here of the AMCOM comms devices of old. You have to use dedicated ground wiring inside the chamber and that does not touch the chamber shell – if not then you get dreadful feedback. I don't know if the LIM requires a specific ground connection to determine leakage (the power to the device needs to be ungrounded for the LIM to work).

We should take specialist advice here but would at least suggest: *A continuous ground shall be maintained*

between all conductive surfaces enclosing electrical circuits and the chamber hull using approved grounding means. An exception to grounding to the chamber hull may be made where electrical circuits require an independent ground.

(5) 14.2.9.3.6.3 Here we refer to an NPT thread type and yet the primary units provided are metric. NPT is an imperial (ANSI) thread type. Suggest: *All threaded conduit shall be threaded with an NPT standard conduit cutting die that provides a 0.75 in. taper per 1 ft or the equivalent tapered metric thread to ISO 724*.

(6) 14.2.9.3.7 Drainage. This appears to be superfluous in terms of 14.2.9.3.6.1 where waterproof components are required. Surely if the system is waterproof it does not require drainage? Of course, if it means that in the case of any water ingress you need to drain the system then fair enough. One would need to consider that an effective drainage capability would be required – meaning that all parts of the system where water can collect and remain there would need to have such capabilities.

Suggest: *Means of draining fixed conduit and fixed equipment enclosures shall be provided with due attention paid areas where fluids can collect due to gravity*.

(7) 14.2.9.3.8 (2) Electrically conductive casings of all portable equipment for use inside the chamber shall be grounded. Not all power cables (thinking say 12 Vdc now) have a grounding wire. Grounding the equipment casing to the chamber hull is not always wise either. The DC power into the chamber is meant to be ungrounded (not like in a motor vehicle which uses the car body as the negative conductor). If we are catering for the case of a portable, AC-powered device, then (4) above where it refers to noise screening applies.

Suggest adding: *Electrically conductive casings of all portable equipment using external power for use inside the chamber shall be grounded by means of a dedicated, isolated conductor attached to the external power supply, except* where battery powered.

(8) 14.2.9.3.9.2 Caution here: the body of the receptable <u>should not</u> be considered as the default ground connection. To prevent noise and other interference, you need a ground wire that does not touch the chamber shell in any way. Also (7) above refers where not all DC powered devices have a grounding conductor in the power cable.

Suggest: *Where a power, communications or signal cable has a ground conductor, the receptacles shall be of the type providing for an independent grounding connection, isolated from any common ground.*

(9) 14.2.9.3.9.3 states: Receptacles shall be supplied from isolated power circuits meeting the requirements of 14.2.9.4.2 which sounds like the receptable is powered.

Suggest: *Receptables shall capable of conducting ungrounded power between each isolated external power supply and the device on the inside.*

(10) 14.2.9.3.9.4 I am not sure how a receptable would preventing sparking when disconnected under load. I would suggest *deleting this requirement* as the next one, 14.2.9.3.9.5 endeavors to prevent inadvertent disconnection under load.

(11) 14.2.9.3.9.5 (2) states: The receptacle shall carry a label warning against unplugging under load, and the power cord shall not present a trip hazard for personnel moving in the chamber. I do not believe that the trip hazard belongs here – it has nothing to do with the inadvertent withdrawal of

the plug. Suggest deleting: *and the power cord shall not present a trip hazard for personnel moving in the chamber*.

(12) 14.2.9.3.10 Switches: I suggest we insert the words *installed in the chamber* in the title here to make it relevant.

(13) 14.2.9.3.13 Motors: The references to NFPA 70 essentially require that a motor be required to comply with Class I requirements. See also the next item below – (14). We certainly see fan motors in chambers that are not enclosed in housings, nor purged, nor using inert gas - never mind not being energised when not purged, etc. These motors are also not part of any medical equipment. However, what is complied with in the main is that these motors are brushless DC motors. I am not the expert, but I suggest we add *(3) Or they shall be of the brushless DC type, with no hydrocarbon or other unsuitable lubricants in their bearings or on any surfaces; any internal control circuitry attached to the motor shall be potted in an oxygen-safe compound to prevent any exposure to chamber atmosphere; and no powered switches shall be allowed inside the chamber*. See also NFPA 70 501.125 (B) where brushless or certain types of induction motors are allowed.

(14) 14.2.9.3.14.2 (1) We previously stated in 14.2.9.3 Wiring and Equipment Inside Class A Chambers that "The general rules of 14.2.9.3.1 through 14.2.9.3.17.6 shall be satisfied in the use of electrical devices and equipment. These requirements are intended to protect against the elevated fire risks known to exist in a pressurized air environment and shall not be construed as classifying the chamber interior as a Class I (as defined in NFPA 70, Article 500) hazardous location."

Here we now require that "They shall be rated and approved for Class I (Division 1 or 2) classified areas."

In the main we see either external lighting with light pipes, or internal LED lighting used. In either case, what is a lens-guard on the inside? I am not sure what to suggest here in the place of Class I unless we require that any electrically powered fixtures on the inside of the chamber need to be compliant with Class I requirements.

I would suggest the following here:
14.2.9.3.14.2 Permanently installed fixtures shall meet the following requirements:
(1) They shall be rated and approved for Class I (Division 1 or 2) classified areas unless they comply with the wiring requirements contained in 14.2.9.3.6, the operating surface temperature restriction specified in 14.2.9.3.11, and exposed live parts specified in 14.2.9.3.12.

(15) 14.2.9.3.15.3 Does one see speakers with wiring that is completely enclosed? Usually two communications wires are soldered to lugs at the back of the speaker, which are in turn flexible braided conductors attached to the speak cone. If this is intended to mean that the complete speaker itself is totally enclosed (meaning in a housing preventing access to the wiring connections) then should we not be including requirements such as being water-proof/explosion-proof or preventing the potential ingress of enriched air into the enclosure?

Suggest adding: *unless compliant with 14.2.9.3.12*

(16) 14.2.9.3.15.4 Comment: 25 watts is a lot of power for a speaker. Is this based on a specific requirement or has this been tested? Or is it allowed as long as everything is enclosed? What makes me afraid is the Florida fire where I am sure that the first started with the speakers and these were not 25 W speakers.

(17) 14.2.9.3.16.5 Here the power limit is 120 V and 2 amps – meaning ± 240 W. Above we state 12 V and 48 W for a battery-powered device. (Not sure why the inconsistency: V and W for one and V

and A for the other – unless there are electrical engineering safety reasons for this.) 120 V is clearly 120 Vac and hence the LIM requirement contained in 14.2.9.4.2 should apply. Also, is the intention in (1) to allow an internal power switch?

I realise that NFPA is intended as a US code, but in other countries, 220/240 Vac are the standard power supply systems. We do not allow for this in the code although we do use metric values.

Suggest:

(1) All portable, cord-connected equipment shall have an on/off power switch located outside the chamber.

(2) The equipment electrical rating shall not exceed 120 V and 2 A, unless the electrical portions of the equipment are inert-gas purged, and compliant with the requirements of 14.2.9.4.2 and 6.3.2.9.

(18) 14.2.9.4.1.3 Where does this figure of 1 ohm come from? We know that there are places where the grounding resistance is much higher…. For example, 500 ohms between the stretcher wheels and the rails in a monoplace chamber; or 50 ohms between the chair hinges and the chamber. My question is whether this is an absolute value or just an *as low as possible requirement – meaning connected to building ground*. I am assuming it comes from history where we saw ICU work being done in a chamber and where the LIM requires a solid ground in order to work effectively in determining current leakage (total hazard current). For chambers with no AC systems, what is it intended to achieve? Static is perhaps an issue in a monoplace chamber but for a multiplace chamber, the only ground requirement I can see is for an AC powered device or external electrocution protection where a GFIC is required.

No suggestions; just wanting to understand that even with a 1-ohm resistance difference between the chamber hull and the electrical (supply) ground, one can allow up to 10MΩ between a patient and electrical ground.

Recommend we add the words supply system to electrical ground: *The resistance between the grounded chamber and electrical supply system ground shall not exceed 1 ohm*.

(19) 14.2.9.6.1 I believe the time has come for us to allow a thorough risk assessment to decide what electrical items are allowed inside <u>any</u> chamber. Intrinsically safe devices, pressure-proof, potted and sealed circuitry and coin batteries, complying with the temperature requirements and perhaps no more than 48 watts for portable equipment should at least be considered. If we allow the TCOM probe to reach 4 watts of power and yet not be certified as Class I compliant or intrinsically safe, then why not say a 3 V capnograph or BGM patch (3 V and 0.4W).

Suggest considering the following as 14.2.9.6.4: *Where a risk assessment deems that equipment that is specifically required for operational and patient-care purposes, is not in strict compliance with the requirements of 14.2.9.6 above, but (1) is intrinsically safe, pressure-proof, or otherwise compliant with the Class1 requirements specified in NFPA 70 Article 500 or (2) can be rendered safe for use though potted and sealed circuitry, coin batteries that are sealed from the chamber environment and with a maximum voltage of 3 V, with a power requirement no more than 4 W, and with no hydrocarbon or volatile based lubricants, then such equipment may be used in a monoplace chamber with the approval of the medical and safety directors, who shall take responsibility for such decisions.*

Public Input No. 43-NFPA 99-2020 [Section No. 14.2.9.3.6.1]

14.2.9.3.6.1

Fixed wiring shall be installed in conduit utilizing the following ~~waterproof~~ *components and be water-tight after installation* :

(1) Threaded metal joints

(2) Fittings

(3) Boxes

(4) Enclosures

Statement of Problem and Substantiation for Public Input

14.2.9.3.6.1 I am not sure how a fitting or joint can be waterproof. Perhaps watertight (once assembled of course).

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:12:59 EST 2020
Committee: HEA-HYP

Public Input No. 44-NFPA 99-2020 [Section No. 14.2.9.3.6.2]

14.2.9.3.6.2

A continuous ground shall be

~~maintained~~

maintained between all conductive surfaces enclosing electrical circuits and the chamber hull using approved grounding means. An exception to grounding to the chamber hull may be made where electrical circuits require an independent ground .

Statement of Problem and Substantiation for Public Input

14.2.9.3.6.2 Why would we ground all housings inside the chamber unless these are coupled to a LIM system (meaning that they would be supplied from an AC power supply)? One should bear in mind that grounding can result in for noise interference/feedback to be introduced. Some devices need to be grounded to the external supply system to ensure no noise transmission – thinking here of the AMCOM comms devices of old. You have to use dedicated ground wiring inside the chamber and that does not touch the chamber shell – if not then you get dreadful feedback. I don't know if the LIM requires a specific ground connection to determine leakage (the power to the device needs to be ungrounded for the LIM to work).
We should take specialist advice here but would at least suggest: A continuous ground shall be maintained between all conductive surfaces enclosing electrical circuits and the chamber hull using approved grounding means. An exception to grounding to the chamber hull may be made where electrical circuits require an independent ground.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:13:55 EST 2020
Committee: HEA-HYP

Public Input No. 45-NFPA 99-2020 [Section No. 14.2.9.3.6.3]

14.2.9.3.6.3

All threaded conduit shall be threaded with an NPT standard conduit cutting die that provides a ~~19 mm taper per~~ *0.* ~~3 m (0.75 in. taper per 1 ft)~~ *75 in. taper per 1 ft or the equivalent tapered metric thread to ISO 724* .

Statement of Problem and Substantiation for Public Input

14.2.9.3.6.3 Here we refer to an NPT thread type and yet the primary units provided are metric. NPT is an imperial (ANSI) thread type.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:14:49 EST 2020
Committee: HEA-HYP

Public Input No. 46-NFPA 99-2020 [Section No. 14.2.9.3.7]

14.2.9.3.7 Drainage.

Means of draining fixed conduit and fixed equipment enclosures shall be provided with due attention paid areas where fluids can collect due to gravity .

Statement of Problem and Substantiation for Public Input

4.2.9.3.7 Drainage. This appears to be superfluous in terms of 14.2.9.3.6.1 where waterproof components are required. Surely if the system is waterproof it does not require drainage? Of course, if it means that in the case of any water ingress you need to drain the system then fair enough. One would need to consider that an effective drainage capability would be required – meaning that all parts of the system where water can collect and remain there would need to have such capabilities.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:15:19 EST 2020
Committee: HEA-HYP

Public Input No. 47-NFPA 99-2020 [Section No. 14.2.9.3.8 [Excluding any Sub-Sections]]

Flexible cords used to connect portable utilization equipment to the fixed electrical supply circuit shall meet all the following requirements:

(1) They shall be of a type approved for extra-hard use in accordance with Table 400.4 of *NFPA 70*.

(2) *Electrically conductive casings of all portable equipment using external power for use inside the chamber shall be grounded by means of a dedicated, isolated conductor attached to the external power supply, except* where battery powered .

(3) They shall meet the requirements of 501.140 of *NFPA 70*.

Statement of Problem and Substantiation for Public Input

14.2.9.3.8 (2) Electrically conductive casings of all portable equipment for use inside the chamber shall be grounded. Not all power cables (thinking say 12 Vdc now) have a grounding wire. Grounding the equipment casing to the chamber hull is not always wise either. The DC power into the chamber is meant to be ungrounded (not like in a motor vehicle which uses the car body as the negative conductor). If we are catering for the case of a portable, AC-powered device, then (4) above where it refers to noise screening applies.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:16:05 EST 2020
Committee: HEA-HYP

Public Input No. 48-NFPA 99-2020 [Section No. 14.2.9.3.9.2]

14.2.9.3.9.2

~~Receptacles~~ *Where a power, communications or signal cable has a ground conductor, the receptacles shall be of the type providing for* ~~connection to the grounding conductor of the flexible cord~~ *an independent grounding connection, isolated from any common ground .*

Statement of Problem and Substantiation for Public Input

14.2.9.3.9.2 Caution here: the body of the receptacle should not be considered as the default ground connection. To prevent noise and other interference, you need a ground wire that does not touch the chamber shell in any way. Also (7) above refers where not all DC powered devices have a grounding conductor in the power cable.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:16:53 EST 2020
Committee: HEA-HYP

Public Input No. 49-NFPA 99-2020 [Section No. 14.2.9.3.9.3]

14.2.9.3.9.3

Receptacles shall ~~be supplied from isolated power circuits meeting the requirements of 14.2.9.4.2~~ . *capable of conducting ungrounded power between each isolated external power supply and the device on the inside.*

Statement of Problem and Substantiation for Public Input

14.2.9.3.9.3 states: Receptacles shall be supplied from isolated power circuits meeting the requirements of 14.2.9.4.2 which sounds like the receptacle is powered.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:17:31 EST 2020
Committee: HEA-HYP

Public Input No. 51-NFPA 99-2020 [Section No. 14.2.9.3.9.4]

14.2.9.3.9.4

~~The design of the receptacle shall be such that sparks cannot be discharged into the chamber environment when the plug is inserted or withdrawn under electrical load.~~

Statement of Problem and Substantiation for Public Input

14.2.9.3.9.4 I am not sure how a receptacle would preventing sparking when disconnected under load. I would suggest deleting this requirement as the next one, 14.2.9.3.9.5 endeavors to prevent inadvertent disconnection under load.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:18:14 EST 2020
Committee: HEA-HYP

Public Input No. 52-NFPA 99-2020 [Section No. 14.2.9.3.9.5]

14.2.9.3.9.5

One of the following shall be satisfied to protect against inadvertent withdrawal of the plug under electrical load:

(1) The receptacle–plug combination shall be of a locking type.

(2) The receptacle shall carry a label warning against unplugging under load~~, and the power cord shall not present a trip hazard for personnel moving in the chamber~~ .

Statement of Problem and Substantiation for Public Input

14.2.9.3.9.5 (2) states: The receptacle shall carry a label warning against unplugging under load, and the power cord shall not present a trip hazard for personnel moving in the chamber. I do not believe that the trip hazard belongs here – it has nothing to do with the inadvertent withdrawal of the plug.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:19:33 EST 2020
Committee: HEA-HYP

Public Input No. 53-NFPA 99-2020 [Section No. 14.2.9.3.10]

14.2.9.3.10 ~~Switches.~~ Switches *installed i n the chamber*

Switches in the fixed wiring installation shall be waterproof.

14.2.9.3.10.1*

Switch make and break contacts shall be housed in the electrical enclosure so that no sparks from arcing contacts can reach the chamber environment.

Statement of Problem and Substantiation for Public Input

14.2.9.3.10 Switches: I suggest we insert the words installed in the chamber in the title here to make it relevant.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:20:27 EST 2020
Committee: HEA-HYP

Public Input No. 54-NFPA 99-2020 [Section No. 14.2.9.3.13]

14.2.9.3.13* 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*.

(2) They shall be totally enclosed in accordance with 501.125(A)(2) or 501.125(A)(3) of *NFPA 70*.

(3) *Or they shall be of the brushless DC type, with no hydrocarbon or other unsuitable lubricants in their bearings or on any surfaces; any internal control circuitry attached to the motor shall be potted in an oxygen-safe compound to prevent any exposure to chamber atmosphere; and no powered switches shall be allowed inside the chamber .*

Statement of Problem and Substantiation for Public Input

14.2.9.3.13 Motors: The references to NFPA 70 essentially require that a motor be required to comply with Class I requirements. See also the next item below – (14). We certainly see fan motors in chambers that are not enclosed in housings, nor purged, nor using inert gas - never mind not being energised when not purged, etc. These motors are also not part of any medical equipment. However, what is complied with in the main is that these motors are brushless DC motors. I am not the expert, but I suggest we add (3) Or they shall be of the brushless DC type, with no hydrocarbon or other unsuitable lubricants in their bearings or on any surfaces; any internal control circuitry attached to the motor shall be potted in an oxygen-safe compound to prevent any exposure to chamber atmosphere; and no powered switches shall be allowed inside the chamber. See also NFPA 70 501.125 (B) where brushless or certain types of induction motors are allowed.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:21:23 EST 2020
Committee: HEA-HYP

Public Input No. 55-NFPA 99-2020 [Section No. 14.2.9.3.14.2]

14.2.9.3.14.2

Permanently installed fixtures shall meet the following requirements:

(1) *They shall be rated and approved for* ~~Class I~~ *Class I (Division 1 or 2) classified areas unless they comply with the wiring requirements contained in 14 . 2.9.3.6, the operating surface temperature restriction specified in 14.2.9.3.11, and exposed live parts specified in 14.2.9.3.12 .*

(2) They shall have lens guards installed.

(3) They shall be located away from areas where they would experience physical damage from the normal movement of people and equipment.

Statement of Problem and Substantiation for Public Input

14.2.9.3.14.2 (1) We previously stated in 14.2.9.3 Wiring and Equipment Inside Class A Chambers that "The general rules of 14.2.9.3.1 through 14.2.9.3.17.6 shall be satisfied in the use of electrical devices and equipment. These requirements are intended to protect against the elevated fire risks known to exist in a pressurized air environment and shall not be construed as classifying the chamber interior as a Class I (as defined in NFPA 70, Article 500) hazardous location."
Here we now require that "They shall be rated and approved for Class I (Division 1 or 2) classified areas."
In the main we see either external lighting with light pipes, or internal LED lighting used. In either case, what is a lens-guard on the inside? I am not sure what to suggest here in the place of Class I unless we require that any electrically powered fixtures on the inside of the chamber need to be compliant with Class I requirements.
I would suggest the following here:
14.2.9.3.14.2 Permanently installed fixtures shall meet the following requirements:
(1) They shall be rated and approved for Class I (Division 1 or 2) classified areas unless they comply with the wiring requirements contained in 14.2.9.3.6, the operating surface temperature restriction specified in 14.2.9.3.11, and exposed live parts specified in 14.2.9.3.12.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:22:24 EST 2020
Committee: HEA-HYP

Public Input No. 56-NFPA 99-2020 [Section No. 14.2.9.3.15.3]

14.2.9.3.15.3

Chamber speakers shall be of a design in which the electrical circuitry and wiring is completely enclosed *unless compliant with 14 . 2.9.3.12 .*

Statement of Problem and Substantiation for Public Input

14.2.9.3.15.3 Does one see speakers with wiring that is completely enclosed? Usually two communications wires are soldered to lugs at the back of the speaker, which are in turn flexible braided conductors attached to the speak cone. If this is intended to mean that the complete speaker itself is totally enclosed (meaning in a housing preventing access to the wiring connections) then should we not be including requirements such as being water-proof/explosion-proof or preventing the potential ingress of enriched air into the enclosure?
Suggest adding: unless compliant with 14.2.9.3.12

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:23:26 EST 2020
Committee: HEA-HYP

Public Input No. 57-NFPA 99-2020 [Section No. 14.2.9.3.16.5]

14.2.9.3.16.5 Cord-Connected Devices.

Cord-connected devices shall meet the following requirements:

(1) All portable, cord-connected equipment shall have an on/off power switch located outside the chamber .

(2) The equipment electrical rating shall not exceed

~~120 V~~

120 V and

~~2 A~~

2 A , unless the electrical portions of the equipment are inert-gas purged , and compliant with the requirements of 14 . 2.9.4.2 and 6.3.2.9.

(3) The plug of cord-connected devices shall not be used to interrupt power to the device.

Statement of Problem and Substantiation for Public Input

14.2.9.3.16.5 Here the power limit is 120 V and 2 amps – meaning ± 240 W. Above we state 12 V and 48 W for a battery-powered device. (Not sure why the inconsistency: V and W for one and V and A for the other – unless there are electrical engineering safety reasons for this.) 120 V is clearly 120 Vac and hence the LIM requirement contained in 14.2.9.4.2 should apply. Also, is the intention in (1) to allow an internal power switch?
I realise that NFPA is intended as a US code, but in other countries, 220/240 Vac are the standard power supply systems. We do not allow for this in the code although we do use metric values elsewhere in the codes - meaning we acknowledge systems/units outside the US.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:24:20 EST 2020
Committee: HEA-HYP

Public Input No. 58-NFPA 99-2020 [Section No. 14.2.9.4.1.3]

14.2.9.4.1.3

The resistance between the grounded chamber ~~hull~~ *and* ~~the~~ *electrical supply system ground shall not exceed* ~~1 ohm~~ *1 ohm* .

Statement of Problem and Substantiation for Public Input

14.2.9.4.1.3 Where does this figure of 1 ohm come from? We know that there are places where the grounding resistance is much higher…. For example, 500 ohms between the stretcher wheels and the rails in a monoplace chamber; or 50 ohms between the chair hinges and the chamber.
My question is whether this is an absolute value or just an as low as possible requirement – meaning connected to building ground. I am assuming it comes from history where we saw ICU work being done in a chamber and where the LIM requires a solid ground in order to work effectively in determining current leakage (total hazard current).
For chambers with no AC systems, what is it intended to achieve? Static is perhaps an issue in a monoplace chamber but for a multiplace chamber, the only ground requirement I can see is for an AC powered device or external electrocution protection where a GFIC is required.
No suggestions; just wanting to understand that even with a 1-ohm resistance difference between the chamber hull and the electrical (supply) ground, one can allow up to 10MΩ between a patient and electrical ground.

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:25:41 EST 2020
Committee: HEA-HYP

Public Input No. 59-NFPA 99-2020 [New Section after 14.2.9.6.3]

New par. 14.2.9.6.4: Assessment of electrical equipment for use inside a hyperbaric chamber.

Where a risk assessment deems that equipment that is specifically required for operational and patient-care purposes, is not in strict compliance with the requirements of 14.2.9.6 above, but (1) is intrinsically safe, pressure-proof, or otherwise compliant with the Class1 requirements specified in NFPA 70 Article 500 or (2) can be rendered safe for use though potted and sealed circuitry, coin batteries that are sealed from the chamber environment and with a maximum voltage of 3 V, with a power requirement no more than 4 W, and with no hydrocarbon or volatile based lubricants, then such equipment may be used in a monoplace chamber with the approval of the medical and safety directors, who shall take responsibility for such decisions.

Statement of Problem and Substantiation for Public Input

14.2.9.6.1 I believe the time has come for us to allow a thorough risk assessment to decide what electrical items are allowed inside any chamber. Intrinsically safe devices, pressure-proof, potted and sealed circuitry and coin batteries, complying with the temperature requirements and perhaps no more than 48 watts for portable equipment should at least be considered. If we allow the TCOM probe to reach 4 watts of power and yet not be certified as Class I compliant or intrinsically safe, then why not say a 3 V capnograph or BGM patch (3 V and 0.4W).

Submitter Information Verification

Submitter Full Name: Francois Burman
Organization: Divers Alert Network
Street Address:
City:
State:
Zip:
Submittal Date: Mon Dec 21 12:26:14 EST 2020
Committee: HEA-HYP

Public Input No. 322-NFPA 99-2021 [Section No. 14.3.1.3.2 [Excluding any Sub-Sections]]

Each hyperbaric facility shall designate ~~an on-site~~ a hyperbaric safety director to be in charge of all hyperbaric equipment and the operational safety requirements of this chapter.

Statement of Problem and Substantiation for Public Input

The term “on-site” is not defined. This leads to an interpretation that an HSD must be on-site at all times.

Submitter Information Verification

Submitter Full Name: Richard Barry
Organization: Healogics
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 31 14:35:28 EDT 2021
Committee: HEA-HYP

Public Input No. 325-NFPA 99-2021 [Section No. 14.3.1.3.2.1]

14.3.1.3.2.1

The hyperbaric safety director shall participate with facility management personnel and the hyperbaric physician(s) in developing procedures for operation and maintenance of the hyperbaric facility.

Statement of Problem and Substantiation for Public Input

The word “hyperbaric” should precede the term “safety director,” to avoid confusion with others in health care that hold the title of safety director.

Submitter Information Verification

Submitter Full Name: Richard Barry
Organization: Healogics
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 31 14:41:07 EDT 2021
Committee: HEA-HYP

Public Input No. 326-NFPA 99-2021 [Sections 14.3.1.3.2.1, 14.3.1.3.2.2, 14.3.1.3.2.3]

Sections 14.3.1.3.2.1, 14.3.1.3.2.2, 14.3.1.3.2.3

14.3.1.3.2.1

The hyperbaric safety director shall participate with facility management personnel and the hyperbaric physician(s) in developing procedures for operation and maintenance of the hyperbaric facility.

14.3.1.3.2.2

The hyperbaric safety director shall make recommendations for departmental safety policies and procedures.

14.3.1.3.2.3

The hyperbaric safety director shall have the authority to restrict or remove any potentially hazardous supply or equipment items from the chamber.

Statement of Problem and Substantiation for Public Input

The word “hyperbaric” should precede the term “safety director,” to avoid confusion with others in health care that hold the title of safety director.

Submitter Information Verification

Submitter Full Name: Richard Barry
Organization: Healogics
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 31 14:46:21 EDT 2021
Committee: HEA-HYP

Public Input No. 330-NFPA 99-2021 [Section No. 14.3.1.3.3]

~~14.3.1.3.3~~ ~~*~~ –

~~The governing board shall be responsible for the care and safety of patients and personnel.~~

Statement of Problem and Substantiation for Public Input

The term "governing board" is not defined; either define or remove.

Submitter Information Verification

Submitter Full Name: Richard Barry
Organization: Healogics
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 31 14:51:49 EDT 2021
Committee: HEA-HYP

Public Input No. 332-NFPA 99-2021 [Section No. 14.3.1.3.4.1]

14.3.1.3.4.1

The safety director shall participate in the ~~development~~ enforcement of these regulations.

Statement of Problem and Substantiation for Public Input

"Enforcement" is a better term than "development" as a complement to 14.3.1.3.4.

Submitter Information Verification

Submitter Full Name: Richard Barry
Organization: Healogics
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 31 14:56:53 EDT 2021
Committee: HEA-HYP

Public Input No. 333-NFPA 99-2021 [Section No. 14.3.1.4.2]

14.3.1.4.2

The ~~medical director~~ physician in charge of hyperbaric medicine and the safety director shall jointly develop the minimum staff qualifications, experience, and complement based on the following:

(1) Number and type of hyperbaric chambers in use

(2) Maximum treatment capacity

(3) Type of hyperbaric therapy normally provided

Statement of Problem and Substantiation for Public Input

By using the term “Medical Director” the document assumes all hyperbaric facilities have a designated Medical Director, but no where does the document require a designated Medical Director. Also, the document uses the terms, physician in charge, physician, surgeon, and medical director. For consistency, one term should be utilized.

Submitter Information Verification

Submitter Full Name: Richard Barry
Organization: Healogics
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 31 15:05:47 EDT 2021
Committee: HEA-HYP

Public Input No. 107-NFPA 99-2021 [Section No. 14.3.1.6.4.3]

14.3.1.6.4.3*

The physician in charge, with the concurrence of the safety director, shall be permitted to approve the use

~~of the following~~
of prohibited items in the chamber:

Examples include

(1) Suture material
(2) Alloplastic devices
(3) Bacterial barriers
(4) Surgical dressings
(5) Biological interfaces
(6) Synthetic textiles
(7) Items that contain alcohol

Statement of Problem and Substantiation for Public Input

This paragraph has been used to allow the medical director and safety director to allow prohibited items. The change clarifies the intent and allows for other items not listed.

Submitter Information Verification

Submitter Full Name: James Bell
Organization: Fink Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 05 15:04:59 EST 2021
Committee: HEA-HYP

Public Input No. 334-NFPA 99-2021 [Sections 14.3.1.6.4.3, 14.3.1.6.4.4]

Sections 14.3.1.6.4.3, 14.3.1.6.4.4

14.3.1.6.4.3*

The physician in charge, with the concurrence of the safety director, shall be permitted to approve the use of the following prohibited items in the chamber:

(1) Suture material

(2) Alloplastic devices

(3) Bacterial barriers

(4) Surgical dressings

(5) Biological interfaces

(6) Synthetic textiles

14.3.1.6.4.4

Physician in charge and safety director approval to use prohibited items shall be stated in writing for all prohibited materials employed. *(See A.14.3.1.3.2.)*

Statement of Problem and Substantiation for Public Input

By using the term “Medical Director” the document assumes all hyperbaric facilities have a designated Medical Director, but no where does the document require a designated Medical Director. Also, the document uses the terms, physician in charge, physician, and medical director. For consistency, one term should be utilized.

Submitter Information Verification

Submitter Full Name: Richard Barry
Organization: Healogics
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 31 15:11:14 EDT 2021
Committee: HEA-HYP

Informational Only - Designated to HEA-ELS

Public Input No. 85-NFPA 99-2021 [Global Input]

Coordinate terminology with the NEC. Replace terms such as emergency power and auxiliary power with "alternate power source" where appropriate.

Additional Proposed Changes

File Name	Description	Approved
NEC_Terminology.xlsx	This document identifies the similar terms that are used throughout NFPA 99, 70 and 101. Where possible these terms should be consistent between documents.	

Statement of Problem and Substantiation for Public Input

There are a lot of inconsistencies of terminology used between NFPA 70, 99, 101, 110 and 111. Many terms are very similar, but not the same. This creates confusion for the users - who don't know if there is an intended difference between the terms. for example:
alternate power source(s),
alternate source(s),
auxiliary power supply
and
emergency power system
emergency source of power
emergency source(s)
emergency supply
emergency supply source
emergency system

If there is an intent or need to have these terms be different, then they should be defined so the difference can be understood. other terms to look at:
normal electrical service
normal power
normal power distribution system
normal power source
normal power supply
normal power system
normal source
normal source(s) of power
normal supply
optional loads
optional standby power source
optional standby source
primary power source
primary source
primary source of power
standby generator
standby power
standby power source
standby power system
standby source

Submitter Information Verification

Submitter Full Name: Chad Beebe
Organization: ASHE - AHA
Street Address:
City:
State:
Zip:
Submittal Date: Thu Feb 04 22:00:57 EST 2021
Committee:

Code	Section	**Existing Definition**
NEC	424.101(B)	**alternate energy source**
NEC	250.30 Info Note 517.2 (Alt Pwr Source) 517.2 (Critical Branch) 517.2 (Equip Branch) 517.2 (Life Safety) 517.30(B)(1) 517.30(B)(2) 517.30(B)(3) 517.30(C)(2) 517.31(D) 517.31(F) 517.32(B) 517.35 517.35(A) 517.35(B) 517.41(B) 517.41(C) 517.43 517.43(G) 517.44 517.44(A) 517.44(B) 517.45(E) 551.31(A) 551.31(C) 695.4(B)(3) 700.3(F) 700.4(C) 700.7(B) 701.4(C) 701.7(B)	**alternate power source(s)**

	702.7(B) 708.21 708.22(A) 708.22(B) 708.22(C) 750.20	
NEC	702.1	**alternate power supply**
NEC	517.45(A)	**alternate power system**

NEC	517.43695.3(C)(2)695.3(D)700.3(F)	**alternate source(s) of power**
NEC	250.30 517.2 (Alternate Power) 517.2 (Equip Branch) 517.30(A) 517.30(B)(2) 517.30(B)(3) 517.30(C)(2) 517.31(D) 517.31(F) 517.35(B) 517.41(A) 517.41(B) 517.43 551.33 695.3(C)(2) 695.3(D) 695.3(F) 700.3(F) 700.31 701.4(C) 701.5(A) 701.7(B) 701.31 702.2 (Opt Std Info Note) 702.7(B) 708.52(D) Info Note	**alternate source(s): One or more generator sets, or battery systems where permitted, intended to provide power during the interruption of the normal electrical service; or the public utility electrical service intended to provide power during interruption of service normally provided by the generating facilities on the premises. [99:3.3.4]**
NEC	640.9(B) 700.12(D)(4)	**auxiliary power supply**

NEC	210.8(B) 517.2 Def (Patient Bed Loc) 517.2 Def (Cat 1) 517.17(A) 517.19 Title 517.19(A) 517.19(F) 517.21 Title & Text 517.29(A) 517.29(B) 517.31(C)(1) 517.34(A) 517.40 517.40(B) Title 517.45(C) Title & Text	**Category 1 (critical care):** **Space in which failure of equipment or a system is likely to cause major injury or death of patients, staff, or visitors. [99:3.3.136.1]**
NEC	210.8(B)517.2 Def (Cat 2)517.18 Title517.18(A)517.18(C) Title517.21 Title & Text517.29(A)517.31(C)(1)517.40517.40(A)517.45(D) Title & Text	**Category 2 (general care):Space in which failure of equipment or a system is likely to cause minor injury to patients, staff, or visitors. [99:3.3.136.2]**
NEC	517.2 Def (Cat 3) 517.29(A) 517.45(A)	**Category 3 (basic care):** **Space in which failure of equipment or a system is not likely to cause injury to the patients, staff, or visitors but can cause**

		patient discomfort. [99:3.3.136.3]
NEC	517.2 Def (Cat 4) 517.29(A)	**Category 4 (support): Space in which failure of equipment or a system is not likely to have a physical impact on patient care. [99:3.3.136.4]**
NEC	517.2 Def 517.18(A) 517.19(A) 517.19(B)(1) 517.19(C)(1) 517.31(C)(1) 517.32(A) Title 517.32(B) Title 517.33(C) 517.34 Title 517.34(A) 517.34(B) 517.34(C) 517.35(A) 517.44(B)	**Critical Branch: A system of feeders and branch circuits supplying power for task illumination, fixed equipment, select receptacles, and select power circuits serving areas and functions related to patient care that are automatically connected to alternate power sources by one or more transfer switches during interruption of the normal power source. [99:3.3.30]**

NEC	230.82 625.48 626.27 705.1 705.6 705.11 705.40 Info Note 705.50 706.1 706.16(D) 712.3	**electric power production source(s)**
NEC	100 Def (Interactive Sys)700.5(A) 701.5(A) 702.5(E)708.24(A)	**electric power production system**
NEC	100 100 (Hybrid Sys) 100 (Island Mode) 100 (Stand-Alone Sys) 690.1 692.1 705.20 705.40 705.50 706.2 (ESS) 706.33(B)(3) 710.1	**Electric Power Production: Electric Power Production and Distribution Network. Power production, distribution, and utilization equipment and facilities, such as electric utility systems that are connected to premises wiring and are external to and not controlled by an interactive system. (CMP-13)**

NEC	700.12 700.12(A) Title 700.18	**emergency power**
NEC	700.3(F) 700.7(A)	**emergency power source**
NEC	700.3(F) 700.3(F) Info Note Fg 700.7(A)	**emergency power source**
NEC	700.3(E) Info Note 701.3(E) Info Note 708.6(E) Info Note	**emergency power supply**
NEC	701.3(E) Info Note 708.6(E)	**emergency power supply system**
NEC	700.12(D)(2)	**emergency power system**
NEC	700.3(F) 700.12(A) 700.12(F)	**emergency source of power**

NEC	701.6(D)700.3(F)700.5(A)700.6(A)700.6(B)700.6(D)700.7(A) 700.10(B)700.12(A)700.12(F) 700.23700.31701.6(D)	**emergency source(s)**
NEC	700.2 (Branch-Cir) 700.18	**emergency supply**
NEC	700.18	**emergency supply source**

NEC	517.31(C)(3) 620.51(E) 700.3(C) 700.3(F) Info Note 700.3(F) Fig 700.4(A) 700.4(B) 700.5(A) 700.10 Title 700.10(A) 700.10(B) Info Note 700.10(B)(a) Fig 700.12(D)(3) 700.12(D)(4) Art 700 Part IV. Title 700.16(B) 700.16(D) 700.17 700.32 Info Note 700.32 Fig 701.5(A)	**emergency system**
NEC	700.3(F)	**emergency system source**

NEC	225.30(A)230.2(A)230.72(B)517.31(C)(3)518.3(C)520.8540.11(C)551.30(B)551.33620.51(E)700.1700.2700.3(C)700.3(F)700.4(A)700.4(B)700.5(A)700.6(D)700.8700.10(B)700.10(D)(1)700.12(D)(3)700.12(D)(4)700.12(E)700.12(G)700.12(H)700.16(B)700.16(D)700.17 700.23700.24700.31700.32701.2 (Legally)701.5(A)750.20750.30(A)	**Emergency System(s):Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction. These systems are intended to automatically supply illumination, power, or both, to designated areas and equipment in the event of failure of the normal supply or in the event of accident to elements of a system intended to supply, distribute, and control power and illumination essential for safety to human life.**

NEC	517.2 Def (Equip Branch) 517.18(A) 517.31(C)(1) 517.35 517.42(A) 517.42(D) 517.43 Title 517.44 517.44(A) 517.44(B)	**equipment branch**

NEC	517.14517.17(B)517.18(A)517.25 Title & Info Note517.26517.29(B)517.30(B)(2) 517.30(B)(3)517.30(C) Title & Text517.31517.31(B) Info Note 517.31(a) FigInfo Note 517.31(b) Fig517.31(C)(1)517.31(C)(3) Title517.31(D)517.31(F)517.31(G)517.32(A) 517.33(E) 517.40517.40(B) 517.41(C)517.42(A) 517.42(B) Info Note 517.42(a) FigInfo Note 517.42(b) Fig517.42(C)517.43(E)	**Essential Electrical System:A system comprised of alternate sources of power and all connected distribution systems and ancillary equipment, designed to ensure continuity of electrical power to designated areas and functions of a health care facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system. [99:3.3.51]**
NEC	692.53	**fuel cell power source(s)**
NEC	692.41(C) 692.56	**fuel cell power systems**

NEC	100 Def (Fuel Cell Sys)100 Def (Power Production Equip)230.82517.30(B)(2) TitleARTICLE 692 Title692.1692.2 Def (FC Output Cir)692.4(A) Title & Text692.4(B)692.4(C)692.6692.8(B)692.8692.8(C)692.9(A) 692.13692.31692.53692.56692.59692.60692.62700.12(G) Title & Text701.12(H) Title & Text708.20(H) Title & Text	**Fuel Cell System:The complete aggregate of equipment used to convert chemical fuel into usable electricity and typically consisting of a reformer, stack, power inverter, and auxiliary equipment. (CMP-4)**
NEC	100 Def (EV) 100 Def (Fuel Cell) 200.3 Exc 692.8(A) 692.8(C) 706.2 Def (Flow Battery)	**Fuel Cell:** **An electrochemical system that consumes fuel to produce an electric current. In such cells, the main chemical reaction used for producing**

		electric power is not combustion. However, there may be sources of combustion used within the overall cell system, such as reformers/fuel processors. (CMP-4)
NEC	501.125(B) Info Note 505.22 Info Note 700.12(D)(2) 701.12(D)(2) 708.20(F)(7)	**Internal combustion engines**
NEC	225.30(A)230.2(A)701.1 701.2 (Legally Req)701.3(C)701.3(E)701.4(A)701.4(B)701.6(D) 701.10701.12(E)701.12(H)701.12(I)701.31701.32705.40750.20750.30(A)	**Legally Required Standby System(s):Those systems required and so classed as legally required standby by municipal, state, federal, or other codes or by any governmental agency having jurisdiction. These systems are intended to automatically supply power to selected loads (other than those classed as emergency systems) in the event of failure of the normal source.**

NEC	517.1 Def (Life Safety Br) 517.26 517.31(C)(1) 517.32(A) 517.33 Title & Text 517.33(C) 517.33(F) 517.42(A) 517.42(D) 517.43	**life safety branch**
NEC	710.15(A)	**microgrid power source**
NEC	710.15(G)	**microgrid supply**
NEC	700.12(H) Title & Text 701.12(I) Title & Text 705.2 Def (Microgrid Inter) 705.2 Def (Microgrid Sys) 705.50 705.60 705.70 712.10(B) 712.72	**Microgrid System: A premises wiring system that has generation, energy storage, and load(s), or any combination thereof, that includes the ability to disconnect from and parallel with the primary source.**
NEC	100 Def (Island Mode) 705.2 Def (Microgrid Inter) Info Note 712.2 Def (DC Microgrid) 712.2 Def (Primary DC Source) 712.4 712.30 712.57 712.65(A) 712.72	**Microgrid:**

NEC		Normal Electrical Service
NEC	517.30(C)(2) Info Note 517.35(B) 517.44(B) 695.14(F) 700.2 (Emergency Lum) 700.23 700.24	**normal power**
NEC		Normal Power Distribution System
NEC	517.2 (Critical Branch) 517.2 (Essential) 517.2 (Life Safety) 517.2 (Selected Recepts) 517.30(B)(2) 695.4(B)(3) 700.3(F) 700.7(B) 700.10(B) 700.17 701.7(B) 702.7(B)	**normal power source**
NEC		Normal Power Supply
NEC	620.91(C)	**normal power system**

NEC	517.30(A) 517.30(B)(1) 517.30(C)(2) 517.32(B) 517.35(B) 517.41(A) 517.41(B) 517.43 517.44(B) 695.3(C)(2) 700.5(A) 700.12(D)(1) 701.2 (Legally) 701.5(A) 701.12(D)(1) 702.5(E) 708.20(C) 708.20(F)(1) 708.24(A)	**normal source**
NEC	517.30(C)(2) 695.3(C)(2)	**normal source(s) of power**

NEC	225.34(B)410.130(E)(4)517.26 695.2 (On-Site)700.2 (Branch-Cir)700.2 (Em Sys)700.2 (Relay)700.12700.12(G)700.12(H)700.17700.18700.26701.12701.12(H)701.12(I)702.5(A)708.20(A)	**normal supply**
NEC	517.31(B)(1) 517.40(C) Info Note 708.22(B)	**optional loads**
NEC	702.7(A)	**optional standby power source**
NEC	702.6(A) 702.6(B) 702.11(A) 702.11(B)	**optional standby source**

NEC	225.34(B) 625.48 626.27 700.4(C) 701.4(C) 702.2 702.4(A) 702.4(B)(1) 702.4(B)(2) 702.10	**Optional Standby Systems:** **Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated or stored power to selected loads either automatically or manually.**
NEC	142 Locations…	**power source(s)**
NEC	100 Def (Island Mode) 705.2 Def (Microgrid) 705.12(B)(3) 705.60 Title 705.65 Title 705.70	**primary power source**
NEC		Primary Source
NEC	705.50 706.16(C)	**primary source of power**
NEC	700.12(D)(1) Title701.12(D)(1) Title708.20(F)(1) Title	**prime mover-driven**

NEC	700.12(D)(2) 701.12(D)(3) Title	**public gas system**
NEC	700.12(D)(2) 701.12(D)(3) 708.20(F)(3)	**public utility gas system**
NEC		Public Utility Source
NEC	701.7(A)	**required standby power source**
NEC	701.6(D) 701.12(A) 701.31	**required standby source**
NEC	661 Locations…	**Service:** **The conductors and equipment connecting the serving utility to the wiring system of the premises served. (CMP-10)**
NEC	695.2 (On-Site Standby) 695.3(B)(2) 695.3(D) 695.4(B)(1) 695.4(B)(2) 695.4(B)(3) 695.6(A)(2) 695.6(C) 695.14(F) 700.3(F)	**standby generator**
NEC	701.12 701.12(F)	**standby power**

NEC	701.7(A) 702.7(A) 702.6(B)	**standby power source**
NEC	230.82517.26 Info Note517.30(B)(3) Info Note620.91620.91(B) 620.91(C)700.1 Info Note #4700.3(E) Info Note701.1 Info Note #1 & #3701.3(E) Info Note701.6(C) Info Note701.6(D) Info Note701.12(D)(2) 708.1 Info Note #3708.6(E)708.21 Info Note	**standby power system**
NEC	701.6(A) 701.6(B) 701.6(D) 701.12(A) 701.31 702.4(B)(2) 702.5(A) 702.6(A) 702.6(B) 702.11(A) 702.11(B)	**standby source**
NEC	517.29(B) Title & Text Info Note 517.31(a) Fig nfo Note 517.31(b) Fig	**type 1 essential electrical system**

NEC	517.29(B) 517.32(B) Title	**type 2 EES**
NEC	100 Def (Pwr Production Eq) 517.41(B) 517.30(B)(1) 690.12(A) Info Note 692.59 694.2 Def (Diversion Charge) 694.2 Def (Diversion Load) 694.7(C) 706.2 Def (Diversion Charge) 700.3(F) Exc	**utility service**
NFPA99	6.7.1.1, 6.7.1.2, 6.7.1.2.2.1, 6.7.1.2.3.1, 6.7.1.3.4.2,6.7.1.5.1	**alternate power source(s)**
NFPA99	6.2.4.3, 6.7.1.1.2, 6.7.1.1.3, 6.7.3.3, 6.7.5.1.4.4, table 6.9.4.1	**alternate source(s)**
NFPA99	not used	**auxiliary power supply**
NFPA99	not used	**Electric Power...Electric Power Production and Distribution Network.Power production, distribution, and utilization equipment and facilities, such as electric utility systems that are connected to premises wiring and are external to and not controlled by an**

		interactive system. (CMP-13)
NFPA99		**emergency power**
NFPA99	6.7.2.1.2.14, 6.7.3.6	**emergency power source**
NFPA99	6.7.2.1.2.1 (A)(1), 6.3.2.6.4	**emergency power supply**
NFPA99	6.7.1.2.3.1 (B), 6.11	**emergency power supply system**
NFPA99	not used	**emergency power system**
NFPA99	not used	**emergency source of power**
NFPA99	6.7.1.2.3.6, 6.7.1.3.6(2)	**emergency source(s)**
NFPA99	not used	**emergency supply**
NFPA99	not used	**emergency supply source**
NFPA99	6.7.5.1.2.1	**emergency system**
NFPA99	used extensivly (19)	**equipment branch**
NFPA99	used extensivly (39)	**Essential Electrical System: A system comprised of alternate sources of power and all connected distribution systems and ancillary equipment, designed to ensure continuity of electrical power to**

		designated areas and functions of a health care facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system. [99:3.3.51]
NFPA99	not used	**fuel cell power source(s)**
NFPA99	not used	**fuel cell power systems**
NFPA99	6.7.1.5, 6.7.1.5.1,	**Fuel Cell System: The complete aggregate of equipment used to convert chemical fuel into usable electricity and typically consisting of a reformer, stack, power inverter, and auxiliary equipment. (CMP-4)**
NFPA99	not used	**Fuel Cell: An electrochemical system that consumes fuel to produce an electric current. In such cells, the main chemical reaction used for producing electric power is not**

		combustion. However, there may be sources of combustion used within the overall cell system, such as reformers/fuel processors. (CMP-4)
NFPA99	used extensivly (30)	**health care microgrid**
NFPA99	6.7.1.3.5, 6.7.1.3.8.1,	**Internal combustion engines**
NFPA99	not used	**Legally Required Standby System(s): Those systems required and so classed as legally required standby by municipal, state, federal, or other codes or by any governmental agency having jurisdiction. These systems are intended to automatically supply power to selected loads (other than those classed as emergency systems) in the event of failure of the normal source.**
NFPA99	used extensivly (15)	**life safety branch**
NFPA99	not used	**microgrid power source**
NFPA99	not used	**microgrid supply**

NFPA99	not used	**Microgrid System: A premises wiring system that has generation, energy storage, and load(s), or any combination thereof, that includes the ability to disconnect from and parallel with the primary source.**
NFPA99	not used	**Microgrid:**
NFPA99	6.2.4.2	**normal electrical service**
NFPA99	6.7.1.1, 6.7.6.2.1.6(E)(1)©,	**normal power**
NFPA99	6.4.3, 6.5.2	**normal power distribution system**
NFPA99	6.7.3.2, 6.7.3.5, 6.7.3.6, 6.7.3.7	**normal power source**
NFPA99	6.11.1	**normal power supply**
NFPA99	not used	**normal power system**
NFPA99	6.7.1.1.2, 6.7.2.1.2.14, 6.7.2.2.2, 6.7.3.3, 6.7.3.7, 6.7.5.1.4.4, 6.7.5.3.1, 6.7.6.2.1.6 (E) (1), 6.7.6.4.1, 6.10.3.2	**normal source**
NFPA99	6.7.1.1.3	**normal source(s) of power**
NFPA99	6.7.5.1.2.2(3), 6.7.6.2.1.5(B)(3)	**normal supply**
NFPA99	6.7.1.2.2.3 (A), 6.7.1.2.2.3(B), 6.7.1.2.2.3(C), 6.7.1.2.2.4	**optional loads**
NFPA99	not used	**optional standby power source**
NFPA99	not used	**optional standby source**

NFPA99	not used	**Optional Standby Systems: Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated or stored power to selected loads either automatically or manually.**
NFPA99	6.3.1	**power source(s)**
NFPA99	6.7.2.2.10, 6.7.2.1.2.17 (A), 6.7.2.1.4.2	**primary power source**
NFPA99	6.7.2.1.2.1 (2), 6.7.2.1.2.4, 6.7.2.1.2.7, 6.7.2.1.2.8(A), 6.7.2.1.2.8 (B)	**primary source**
NFPA99	6.7.2.1.2.1(A), 6.7.2.1.2.8	**primary source of power**
NFPA99	6.7.1.3.6, 6.7.2.1.2.9(A)	**prime mover**
NFPA99	not used	**prime mover-driven**
NFPA99	not used	**public gas system**
NFPA99	not used	**public utility gas system**
NFPA99	6.7.2.1.2.1(E)	**public utility source**
NFPA99	not used	**required standby power source**
NFPA99	not used	**required standby source**

NFPA99	not used in this context	**Service:** **The conductors and equipment connecting the serving utility to the wiring system of the premises served. (CMP-10)**
NFPA99	not used	**standby generator**
NFPA99	not used	**standby power**
NFPA99	not used	**standby power source**
NFPA99	not used	**standby power system**
NFPA99	not used	**standby source**
NFPA99	6.5.1, 6.5.2	**type 1 essential electrical system**
NFPA99	6.5.1, 6.5.2	**type 2 EES**
NFPA99	6.7.1.1.3	**utility service**
NFPA 101	7.2.3.12	Emergency Power Supply System (EPSS)
NFPA 101	7.2.3.12	standby power generator
NFPA 101	7.9.1.1(5)	standby generator
NFPA 101	7.9.2.2	emergency power
NFPA 101	used extensivly (43)	standby power
NFPA 101	11.3.4.2, 11.8.5	emergency and standby power

Public Input No. 3-NFPA 99B-2021 [Section No. 2.3.2]

2.3.2 ASTM Publications.

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

ASTM D2863, *Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index),* ~~2017a~~ 2019 .

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2019a~~ 2021a .

ASTM E648, *Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source*, ~~2017a~~ 2019a e1 .

Statement of Problem and Substantiation for Public Input

date updates

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
Organization: GBH International
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 21 18:16:32 EDT 2021
Committee: HEA-HYP

Public Input No. 4-NFPA 99B-2021 [Section No. 4.2.2]

4.2.2

Flooring of Class D and E chambers shall be of noncombustible material, as defined in 4.4.1 of NFPA 99, or a material that is reported as meeting or exceeding the criteria for a ~~Class 1 certification when tested~~ Class I certification, in accordance with ~~NFPA 253~~ NFPA 101, based on test results from NFPA 253 or ASTM E648, *Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source*.

4.2.2.1*

In a hypobaric chamber, if a bilge pump is installed, the floor overlying it shall be removable for cleaning the bilge.

Statement of Problem and Substantiation for Public Input

Neither ASTM E648 nor NFPA 253 contain information about classification. That information is contained in NFPA 101 and the class mentioned is a Class I and not a Class 1.

Separately: is it really the intent of the committee to allow carpets (such as wool carpets) in the floor of the chamber? Wool carpets easily achieve a Class I in this test. A Class I requires a critical radiant flux of no less than 0.45 W/cm2. As an example of a different occupancy that uses ASTM E648/NFPA 253 for classification of interior floor finish, NFPA 130 requires that floors meet a classification of not less than 0.8 W/cm2 in ASTM E648/NFPA 253. Such a requirement would eliminate most, if not all, carpets. If that is the committee's wish, perhaps you can change the language to read:

4.2.2
Flooring of Class D and E chambers shall be of noncombustible material, as defined in 4.4.1 of NFPA 99, or a material that is reported as exhibiting a critical radiant flux of not less than 0.8 W/cm2, when tested in accordance with NFPA 253 or ASTM E648, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
Organization: GBH International
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 21 18:21:12 EDT 2021
Committee: HEA-HYP

Public Input No. 5-NFPA 99B-2021 [Section No. 4.2.3.1]

4.2.3.1

Interior paint/coating shall meet the performance criteria of a Class A interior finish according to NFPA *101* when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, using as substrate a material of the same type as the chamber wall material .

Statement of Problem and Substantiation for Public Input

The way this section is worded, the paint itself would have to be tested (using ASTM E84 or UL 723 or NFPA 286, per NFPA 101). Typically that means that the paint manufacturer will conduct a test (using ASTM E84) of painted cement with the paint to be evaluated. Experience shows that in such a test a Class A classification is almost inevitable, however adequate the paint is, so that the test is actually pretty meaningless. Almost no paint will fail to get a Class A when tested over cement. This requirements is pretty meaningless unless the test is conducted using as substrate the same material that the chamber is to be built of.

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
Organization: GBH International
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 21 18:35:40 EDT 2021
Committee: HEA-HYP

Public Input No. 1-NFPA 99B-2021 [Section No. 4.3.9 [Excluding any Sub-Sections]]

Portable spot illumination, if used, shall be shatterproof or otherwise protected from physical damage, and the electrical circuit shall comply with 4.7.2. ~~5.~~

Additional Proposed Changes

File Name	Description	Approved
99B_PC_3.pdf	99B_PC 3	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as “Reject but Hold” in Public Comment No. 3 of the (A2020) Second Draft Report for NFPA 99B and per the Regs. at 4.4.8.3.1.

The reference should be to the entire section 4.7.2 and not just to 4.7.2.4.

Submitter Information Verification

Submitter Full Name: Tc On Hea-Hyp
Organization: NFPA
Street Address:
City:
State:
Zip:
Submittal Date: Thu Feb 11 07:53:50 EST 2021
Committee: HEA-HYP

Public Comment No. 3-NFPA 99B-2019 [Section No. 4.3.9]

4.3.9*

Portable spot illumination, if used, shall be shatterproof or otherwise protected from physical damage, and the electrical circuit shall comply with 4.7.2.4.

4.3.9.1

If portable spot illumination is used, the flexible cord shall be of the type designated for extra-hard usage as defined in Section 501.140 of *NFPA 70*.

4.3.9.2

If portable spot illumination is used, the flexible cord shall contain a grounding conductor.

Statement of Problem and Substantiation for Public Comment

The reference should be to the entire section 4.7.2 and not just to 4.7.2.4.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 1-NFPA 99B-2019 [Section No. 4.7.2]	

Related Item

- pi7

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
Organization: GBH International
Street Address:
City:
State:
Zip:
Submittal Date: Mon Apr 15 19:18:46 EDT 2019
Committee:

Committee Statement

Committee Action: Rejected but held

Resolution: This material was new material and not addressed by a PI or CI in the first draft. The committee wants to address the apparant conflict between 4.3.9 and it's annex material in the next cycle.

Public Input No. 2-NFPA 99B-2021 [Section No. 4.5.1.7]

4.5.1.7

System design shall be such that activation of ~~either~~ the ~~handline or the~~ deluge system shall automatically cause the following:

(1) Visual and audio alarm indicators shall be activated at the chamber operator's console.

(2) All ungrounded electrical leads for power and lighting circuits contained inside the chamber shall be disconnected.

(3) Emergency lighting and communication, where used, shall be activated.

Statement of Problem and Substantiation for Public Input

Delete either the handline from this sentence, we focus on the deluge and not the handlines as a means of extinguishing a fire in the chamber. This change came into play in the 2012 edition, It was not in the 2005 edition and we skipped the 2009. I see no need to require this for the Handlines, it ads expense and complexity to the handline system.

Submitter Information Verification

Submitter Full Name: James Bell
Organization: Fink Engineering
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 04 14:59:58 EDT 2021
Committee: HEA-HYP

Public Input No. 6-NFPA 99B-2021 [Section No. 5.1.7]

5.1.7 Textiles.

5.1.7.1 ~~–~~

~~Silk, wool, or synthetic textile materials commonly found in clothing shall not be permitted in Class E chambers, unless the fabric meets the requirements of 5.1.7.4 .~~ Textiles used for clothing, seat covers, sheets, drapes, blankets, or other products, for use in Class E chambers, shall meet the flame propagation requirements contained in Test Method 1 or Test Method 2, as appropriate, of NFPA 701.

5.1.7.2 ~~–~~

~~Garments fabricated of 100 percent cotton or a blend of cotton and polyester with no more than 50 percent polyester fabric shall be permitted in Class E chambers equipped with fire protection as specified in Section 4.5 .~~

~~**5.1.7.3** –~~

~~Any paper and plastic devices or otherwise restricted materials shall~~ Any materials that do not comply with the requirements of 5.1.7.1 shall be permitted to be used in Class E chambers ~~at~~ by the ~~direction~~ written endorsement of the person in charge with the concurrence of the ~~safety director.~~

~~**5.1.7.4** –~~

~~Permission to use restricted materials in Class E chambers shall be by the written endorsement of the person in charge and the~~ designated safety director.

~~**5.1.7.5** * –~~

~~Fabric used in Class E chambers shall meet the flame propagation requirements contained in Test Method 1 or Test Method 2, as appropriate, of NFPA 701.~~

~~**5.1.7.6** –~~

~~Items such as seating covers, sheets, drapes, and blankets used in Class E chambers shall be made of materials that meet the requirements of 5.1.7.5 .~~

Statement of Problem and Substantiation for Public Input

This section is not very logical. Typically, silk and wool exhibit better performance in flame propagation testing that cotton or cotton/polyester blends (irrespective of the polyester content). Also, the polyester content of a cotton/polyester blend is not an indication of whether the material will exhibit better or worse flame propagation performance.

If the intent is (which is very reasonable) to require that fabrics inside the chambers need to have flame propagation performance better than typical clothing, then requiring that the fabrics (or textiles) meet NFPA 701 is a good idea. However, that test can be applied to any fabric. Allowing 100% cotton fabrics or polyester/cotton blends with over 50% cotton without testing makes no sense because they are likely to fail the NFPA 701 test, unless they have been treated to meet the requirements. Also, banning fabrics made of silk, cotton and synthetic materials irrespective of whether they do or don't meet NFPA 701 also seems arbitrary.

With regard to 5.1.7.3 and 5.1.7.4, the section does not provide guidance to decide when fabrics (or other materials) are acceptable or not.

I recommend that the annex not from 5.1.7.1 be used for 5.1.7.1.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 7-NFPA 99B-2021 [Section No. 5.2.1.4]	

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
Organization: GBH International
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 21 18:45:37 EDT 2021
Committee: HEA-HYP

Public Input No. 7-NFPA 99B-2021 [Section No. 5.2.1.4]

5.2.1.4*

Combustible paper items such as cups, towels, or tissues shall not be brought into a Class E hypobaric chamber except as provided for in 5.1.7.4 2 .

Statement of Problem and Substantiation for Public Input

PI 6 recommends revising the referenced section and the section number would change.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 6-NFPA 99B-2021 [Section No. 5.1.7]	

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
Organization: GBH International
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 21 19:10:34 EDT 2021
Committee: HEA-HYP

Minutes

Correlating Committee on Health Care Facilities

(HEA-AAC)

November 7, 2019

Second Draft Meeting

1. **Call to Order**. The meeting was called to order at 8:00am MST on November 7, 2019 by Chairman, Michael Crowley.

2. **Chairman Comments**. Mr. Crowley discussed the purpose of the meeting, which is to review the work of the Technical Committees from their Second Draft meetings and develop Second Correlating Revisions as needed.

3. **Introductions and Attendance**. Those members who were in attendance are listed below.

Name	Organization
Michael Crowley	Jensen Hughes
Chad Beebe	ASHE
Wayne Brannan	America Society of Safety Professionals
Keith Ferrari	Praxair, Inc
Ken Gregory	TSIG Consulting
Denise Pappas	NEMA
Robert Sontag	Fire Marshal's Association of Colorado
Richard Barry	TC on Hyperbaric and Hypobaric Facilities
David Klein	TC on Fundamentals
James Lathrop	TC on Piping Systems
Chad Kennedy (guest)	Schneider Electric
Brian O'Connor-Staff	NFPA
Richard Bielen-Staff	NFPA

4. **Preparation of the Second Draft**. The committee reviewed the Second Draft report as balloted by the Technical Committees and developed several Correlating Second Revisions.

5. **Discussion.** The Committee discussed Durable Medical Equipment (DME) and the need to address it in NFPA 99. One question that was discussed was if DME is covered under the existing scope of the Correlating Committee or if the scope needs to be changed through the Standards Council.

The Committee also discussed the use of oxygen concentrators in houses at high elevations. There is a need to investigate this practice for any potential hazards or to generate requirements. The Hyperbaric and Hypobaric Committee will review this topic.

6. **Adjournment**. The meeting around 1:00 pm on November 7, 2019.