Hyperbaric Chamber Fire Deluge Requirements

Is the Standards Organization or the Manufacturer Responsible for the Effective Functioning of a Compliant Fire Deluge System?

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Safety Report

News from the Safety Committee

The concepts "compliance" and "responsibility" are not always suitably addressed where an international standards organization has been tasked to issue a documented, industry-moderated set of requirements. It is therefore of interest to note the differences in approach as well as manufacturers' responsibility between NFPA 99: Chapter 14: Hyperbaric Facilities [1] and EN 16081 [2], with specific reference to fire deluge requirements.

Which is the wiser path to follow?

The US NFPA 99 code may be enforced only by the relevant Authority Having Jurisdiction (AHJ). Once enforced, compliance with the letter of the code is mandated. If not enforced, then the code may be used as a guideline, depending on the AHJ.

European Standards (EN) are mandated as national standards in all EU participating countries. Once enforced, documented requirements generally demand compliance.

While the NFPA leaves little for the manufacturer to do other than to meet the stated design and functional requirements, the EN standard additionally requires the manufacturer to take responsibility for effective performance.

NFPA 99 Chpt 14, 14.2.5	**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 requirements determined floor area.	Coverage and flow requirements based on the position of all occupants. 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.	No minimum requirement stated: full deluge 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 [3].
Not specified.	Deluge fluid level to be actively monitored.
Not specified.	System to deactivate when fluid tank empty.
Internal deluge deactivation required.	No internal deluge deactivation allowed.

Let us review the fundamental differences between the responsibilities of a hyperbaric chamber manufacturer complying with either of these documents.

While the overall *technical* requirements are similar, there are some distinct variations in the actual deluge function. Note the chart above.

From a system *functional* perspective, there is a major philosophical shift in requirements.

NFPA 99 only requires testing that confirms that the stated coverage and flow parameters are met, at both surface and maximum operating pressure, for both new or modified deluge systems.

EN 16081, however, requires the manufacturer to prove that the deluge *system design* can control and extinguish a fire, based on actual maximum occupancy, at various operating pressures, in addition to meeting the stated technical requirements. The system functional test on a final chamber product (the "wet" test) resembles the NFPA testing requirement.

References

1. NFPA 99: 2015: Healthcare Facilities, Chapter 14: Hyperbaric Facilities, section 14.2.5, 2015.
2. EN 16081: 2011 + A1: 2013, Hyperbaric chambers – Specific requirements for fire extinguishing systems - Performance, installation and testing. September 2013.
3. EN 19431:2006, Pressure Vessels for Human Occupancy (PVHO) – Multiplace pressure chamber systems for hyperbaric therapy, 2006.

SAFETY: Chamber fire deluge requirements — *continued from previous page*

EN 16081 mandates 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. No chamber pressure increase is allowed at any stage. Other design features (for example, oxygen level control, breathing gas changeover, deactivation of ancillary heat sources) may be used by the manufacturer to ensure that the fire is contained appropriately.

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.

Do you know whether your fire deluge system will actually put out a fire?

Is it time to require that the manufacturer test the system to prove its ability to extinguish a fire, or do we continue to assume that it will extinguish a fire just because it complies with the letter of the code?

About the author: François Burman is Director of Underwater and Hyperbaric Safety at Divers Alert Network.

IN OTHER SAFETY-RELATED NEWS . . . O_2

ASM SAFETY COURSE PREVIEW

Looking to meet the new National Board of Diving and Hyperbaric Medical Technology requirements for recertification as Certified Hyperbaric Technologist?

Consider attending the UHMS *Hyperbaric Oxygen Safety: Clinical and Technical Issues*, June 28, prior to this summer's 50th Annual Scientific Meeting.

The NBDHMT April 2017 monthly briefing (*www.nbdhmt.org/monthly_briefing.asp*) requires that, going forward, certified hyperbaric technicians applying for recertification will need to have at least nine Category A credits that are directly related to technical, operations and safety.

The live activity *Hyperbaric Oxygen Safety: Clinical and Technical Issues* has been approved by the NBDHMT for eight Category A credits.

The purpose of this course is to provide current information related to the clinical and technical safety of clinical hyperbaric oxygen therapy. Organized by both regular and associate members, sessions will be of special interest to clinicians and technical staff and is provided in response to requests from the membership for a pre-course related to safety aspects of clinical hyperbaric oxygen therapy.

See all available course credits, on Page 37.

SCHEDULE

0800-0815: **Introductions/Welcome** – Marc Robins / Jim Bell

0815– 0915: **1.** "Thirty Years of Critical Care in the Monoplace" – Lindell Weaver

0915-1015: **2.** Risk Assessment Through Interactive Case Discussion. Moderator, Marc Robins. Panel discussion – Lin Weaver, Enoch Huang, Jim Bell, Richard Barry, et al.

1015 1030: **Break**

1030-1050: **3.** 2012-2015 Hyperbaric Adverse Events: Data from 2012 to 2015 – Terry Beard, Hanna M. Gordon

1050-1110 **4.** Infection Control – Jolene Cormier

1110-1130 **5.** The Importance of Completing Checklists to Ensure Safe Patient Care – John Duffy Jr.

1130-1200: **6.** Title: Panel Q&A from the morning session – Jim Bell

1200-1300: **Lunch**

1300-1445: **7.** Material selection for hyperbaric use, past and present – Rob Sheffield 1300-1350, Richard Barry 1350-1445

1445-1500: **Break**

1500-1530: **8.** Understanding static electricity – Nicholas Linley from WHA International

1530-1600: **9.** Understanding flammability testing – Gwenael Chiffoleau from WHA International

1600-1645: **10.** Material selection: Putting new information into practice – Richard Barry

1645-1715: **11.** Panel Q & A from the afternoon session – Moderator, Richard Barry

1715-1730: **Closing/Course evaluations/Questions** – Marc Robins / Jim Bell