



Hyperbaric Facility Design Guidelines

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Compiled by
UHMS Associates Facility Design Committee

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Introduction

As more state and federal agencies develop a regulatory interest in hyperbaric facilities, questions arise regarding the physical design of these units. Though there are technical standards for both chamber and facility construction embodied in ASME and NFPA codes, there is no national standard for the design of a hyperbaric facility.

The American Institute of Architects has expressed interest in hyperbarics, as evidenced by their addition of a “Hyperbaric Suite” standard in the most recent edition of the AIA 2001 Health Care document. Though the standard as written does not contain any “code” language, it does contain an Appendix which is identical to a Texas Department of Health guideline for “Hyperbaric Suite” monoplace facilities, some of whose provisions may significantly increase the cost of implementing a facility, without necessarily improving patient care. There is little evidence that any hyperbaric professionals have been involved in the promulgation of the TDH/AIA language, due to several glaring errors in descriptive language. Even though the current AIA language is not fully implemented, some local authorities, in the absence of any other national guidelines beyond manufacturers’ recommendations, may attempt to impose the appendix language as a standard.

Though the AIA language addresses some issues related to facility design and layout such as chamber spacing, and ancillary support areas, it is silent in several areas that should be of concern, including: spacing and clearance of Class A chambers; standard and emergent egress from the facility, accessibility of critical controls and shutoff valves; and issues relevant to hyperbaric facilities that are incident to other services, such as wound care. The AIA is cognizant of the need for expert input into the revision of these guidelines, and have expressed interest in any recommendations that might be offered towards revision of their document.

In response to the need for guidelines, during the 2003 Annual Meeting, the UHMS Associates’ Executive Board authorized the organization of a committee to develop a set of facility design recommendations for clinical hyperbaric facilities (both Class A and Class B). The committee chair is Steve Wood, RRT, CHT, and committee membership represent chamber operators, manufacturers, and clinicians. Requests for comments and suggested language for the guidelines was solicited from the committee membership as well as from the hyperbaric community at large.

Comments were compiled into this draft document that was sent to committee members and other interested parties for review and comment.

Notes Regarding General Facility Requirements

Appropriate guidance for the design and construction of hyperbaric chambers can be found in ASME Boiler and Pressure Vessel Code, ASME PVHO (Pressure Vessel for Human Occupancy), and NFPA 99. The chamber manufacturer should provide evidence of compliance with these standards. Hyperbaric chambers sold in the United States must be cleared for sale by the Food and Drug Administration through a process called 510(k) Premarket Notification*. The chamber manufacturer should provide evidence of compliance with this requirement. A prudent hyperbaric chamber user should verify that the above standards (or comparable standards) have been met to ensure that the chamber was designed and built safely.

When a new hyperbaric facility is designed or an existing one is renovated, appropriate guidance for design of hyperbaric facilities can be found in NFPA 99. This document has specific standards for rooms housing hyperbaric chambers, ancillary equipment spaces, medical gas piping, and medical gas storage. Whenever any construction or renovation is performed, the local Authority Having Jurisdiction (AHJ) will require compliance with at least some general building code (i.e. The Uniform Building Code, NFPA 101) and perhaps other standards (i.e. NFPA 99). A prudent hyperbaric facility designer should ensure compliance with the requirements of the above mentioned standards (or comparable standards) to ensure that the hyperbaric facility is designed safely.

To help AHJs ensure that new hyperbaric facilities are designed safely, the important safety standards have been cross-referenced. For example, NFPA 99 requires that a hyperbaric chamber comply with ASME PVHO standards. NFPA 101 requires that any building housing a hyperbaric chamber comply with NFPA 99 standards. The intended result is that wherever there is a hyperbaric chamber, the facility and the chamber are designed to appropriate safety standards. For further information regarding the standards discussed here, please refer to the list of references included in these Guidelines.

* Hyperbaric chamber designs originating before the 510(k) Premarket Notification process began are exempt from this requirement.

1.0 Applicability

- 1.1 These guidelines are intended for new hyperbaric facilities designated principally for clinical hyperbaric oxygen therapy, including hospital-affiliated and freestanding facilities, and shall apply only to facilities constructed after the adoption of these guidelines.
- 1.2 These guidelines shall not apply to trailer or mobile hyperbaric facilities utilized only for the emergent treatment of decompression sickness or research.

2.0 Architectural requirements.

2.1 The following service areas should all be provided for the hyperbaric facility. If the hyperbaric facility is included as an integral portion of another service such as a wound care department, service areas may be shared:

- 2.1.1 Reception/Control Desk
- 2.1.2 Patient Waiting Area. The waiting area should be large enough to accommodate the anticipated patient load. The area should all be out of traffic, under staff control, and have seating to meet the needs of the functional program. Patient waiting areas may be omitted for facilities equipped with a single Class B hyperbaric chamber and providing hyperbaric services only.
- 2.1.3 Holding Area. The area should be out of traffic flow from the chamber and not obstruct access to the exits, and meet the same ADA entrance requirements as the waiting area. A holding area under staff control shall accommodate inpatients on stretchers or beds. Stretcher patients should be out of the direct line of normal traffic. The patient holding area may be omitted for facilities equipped with a single Class B hyperbaric chamber and providing hyperbaric services only.
- 2.1.4 Medical Record Storage Area. An area should be provided, that is out of traffic flow and under the staff control, where patient records can be secured and maintained in accordance with the Health Information Portability and Accountability Act (HIPAA).
- 2.1.5 Patient Toilet Rooms. At least one toilet room should be easily accessible from the hyperbaric room. Toilet rooms should be provided with hand washing fixtures with hands-free operable controls. At least one toilet room should be provided to accommodate wheelchair patients.
- 2.1.6 Patient Dressing Rooms. Dressing rooms for outpatients should be provided and should include a seat or bench, mirror, and provisions for hanging patients' clothing and for securing valuables. At least one dressing room should be provided to accommodate wheelchair patients. Dressing rooms should be easily accessible from the chamber room and may be incorporated into the patient toilet.
- 2.1.7 Staff Toilet Facilities. Toilets with hand washing fixtures with hands-free operable controls may be outside the suite but should be convenient for staff use. Toilets may be shared by staff and patients.
- 2.1.8 Consultation/Treatment Rooms. At least one private room for individual consultation and treatment should be provided. This room should be provided with hand washing facilities. Patient care rooms should be configured to assure patient privacy
- 2.1.9 Storage Space. A clean storage space, which may be shared with other departments, should be provided for clean supplies and linens.

- 2.1.10 Soiled Holding Area. A soiled holding room, which may be shared with other departments, should shall be provided with waste receptacles and soiled linen receptacles.
 - 2.1.11 Hand Washing Stations. A lavatory equipped for hand washing with hands-free operable controls shall should be located in the room where the hyperbaric chambers are located.
 - 2.1.12 Housekeeping Room. The housekeeping room may be combined with the Soiled Holding area and should contain a floor receptor or service sink, storage space for housekeeping supplies and equipment, and be located near the hyperbaric room.
- 2.2 The following spaces may be required:
- 2.2.1 Gas Cylinder Room. This room should be large enough to accommodate the storage of the reserve breathing gases required for chamber operations and, if the quantity of stored gases warrants, conform to the requirements of NFPA 5.
 - 2.2.2 Compressor Room. This area should be large enough to house the components designed to be installed within the space and meet the requirements of the NFPA 99 chapter on Hyperbaric Facilities, as applied to the requirements.

Notes Regarding Class A (Multiplace) Chambers

Class A chambers are complex, often custom designed systems incorporating not only the chamber itself (which may contain multiple compartments and exits), but support equipment (including compressors, gas storage and fire suppression systems). The facility housing a Class A chamber should not only be designed to accommodate the chamber and support equipment, but the design should also incorporate features that enhance operational efficiency and safety.

The facility designer should work closely with the chamber manufacturer to assure that adequate clearances are provided to allow patient and staff both unimpeded egress as well as access to critical components and controls as described in this section.

3.0 Multiplace (NFPA Class “A” Chamber) Facilities

- 3.1 The issue of egress is a primary life safety concern in all health care facilities. Decompression of the hyperbaric chamber and subsequent removal of chamber occupants will lengthen the total egress time. The facility housing a Class A chamber should be designed not to impede egress of patients and staff.
- 3.2 In the case of multiple Class A chambers installed in a single setting, or a Class A chamber that contains multiple compartments, the rapid or emergency re-

removal of a patients or personnel from one chamber/compartments should not restrict the orderly, rapid, and simultaneous removal of patients or personnel from all other chambers/compartments acceptable to facility evacuation policy and procedure.

- 3.3 Doorways in a means of egress should have a minimum opening of 41.5 inches.
- 3.4 Placement of doorways in a means of egress and the direction of door swing should be designed not to impede the removal of patients or personnel from any chamber/compartments.
 - 3.4.1 A minimum of two exits should be provided for the chamber room unless a single exit opens n exit opening directly to a primary evacuation route is desirable to enhance ease of egress.
 - 3.4.2 The number of exits from the hyperbaric space should conform to the requirements of NFPA 101.
- 3.5 The space required to house Class A chambers and supporting equipment is defined by the NFPA 99, Chapter 19 or 20 chapter on Hyperbaric facilities and the equipment manufacturer, but in any case should not be less than the following:
 - 3.5.1 Hyperbaric Chamber Clearances – refer to diagram “A”: Minimum clearances in the vicinity of a Class A hyperbaric chamber should be as follows:
 - 3.5.1.1 There should be a minimum clearance of 8 feet in front of a chamber entry door that is intended for gurney/stretchers access.
 - 3.5.1.2 Entries designed for wheelchairs or wheeled gurneys should have access ramps. A ramp should be a minimum width of 44 inches, a maximum of height of 30 inches, have a maximum slope of 1 in 12, and have handrails on both sides. These ramp specifications are not necessary if the slope of the ramp is no steeper than 1 in 20.
 - 3.5.1.3 There should be a minimum of 36 inches clearance around any part of the chamber system that defines an exit pathway.
 - 3.5.1.4 If the chamber control console is immediately adjacent to the chamber, there should be a minimum clearance of 36 inches between the control console and any obstruction.
 - 3.5.1.5 There should be a minimum clearance of 24 inches in a pathway that allows access to valves used in chamber operation.
 - 3.5.1.6 There should be a minimum clearance of 24 inches in a pathway that allows access to areas of the chamber that require cleaning or maintenance.

4.0 Monoplace (Class B) Facilities

- 4.1 The issue of egress is a primary life safety concern in all health care facilities. Decompression of the hyperbaric chamber and subsequent removal of chamber occupants will lengthen the total egress time. The facility housing a Class B chamber should be designed not to impede egress of patients and staff.

Notes Regarding Class B (Monoplace) Chambers

Unlike Class A chambers, which due to their size and weight are typically firmly affixed to the building foundation, many manufacturers of Class B chambers integrate casters into the chamber design. The mobility afforded by the casters allows the user to easily reposition or relocate the chamber as required for maintenance.

In designing a facility to accommodate Class B chambers, the designer should consider positioning of controls and gas connections in addition to the need to periodically perform inspections, housekeeping and maintenance.

Many Class B chambers have gas connections at the foot end of the chamber. It is good practice to leave at least 12” clearance between the chamber and a wall or other obstruction to allow access to these connections.

- 4.2 In the case of multiple Class B chambers installed in a single setting, the rapid or emergency removal of a patient from one chamber shall not restrict in any way the rapid and simultaneous removal of patients from anyall other chambers.
- 4.3 Exit doorways in a means of egress should have a minimum opening of 41.5 inches.
- 4.4 The space required to house Class B chambers and supporting equipment should be defined by the equipment manufacturer, but in any case shall not be less than the following:
 - 4.4.1 The space housing Class B chambers shall conform to the requirements of the NFPA 99 chapter on Hyperbaric Facilities
 - 4.4.2 Hyperbaric Chamber Clearances – refer to diagram “B”. Minimum clearances between individual (Class B) hyperbaric chambers should be as follows:
 - 4.4.3 There should be a minimum clearance of 36 inches around any part of the chamber system that defines an exit pathway. If the chamber has a patient loading device, this clearance should be maintained when the patient loading device is extended out of the chamber.
 - 4.4.4 If the chamber control console is integrated into or immediately adjacent to the chamber, there should be a minimum clearance of 36 inches between the control console and any obstruction.
 - 4.4.5 There should be a minimum clearance of 24 inches in a pathway that allows access to valves or controls used in chamber operation. If the chamber has a patient loading device, this clearance should be maintained when the patient loading device is extended out of the chamber.
 - 4.4.6 Any part of the chamber that must be accessed should be at least 12 inches away from any obstruction, unless the chamber is fitted with casters.

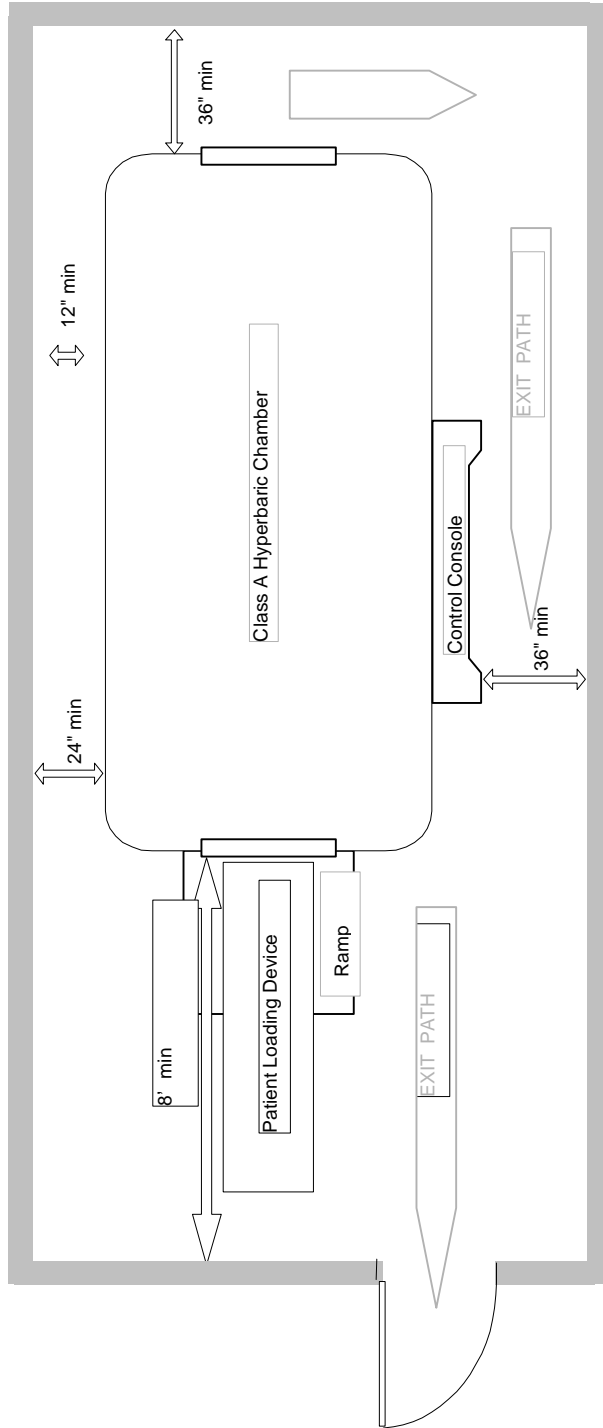
- 4.5 There should be an oxygen shut-off valve for each chamber that is accessible to the chamber operator.
- 4.6 Any electrical service outlets located within 10 feet of the Class B chamber entrance should be located no less than 3 feet above floor level.
- 4.7 Lighting over the Class B chamber should be incandescent, preferably with dimmer control.
 - 4.7.1 Fluorescent lighting installed in rooms housing Class B chambers should not be located directly over the chambers.
- 4.8 If the room housing Class B chambers has windows, the chambers should be protected from direct exposure to sunlight.

5.0 REFERENCES

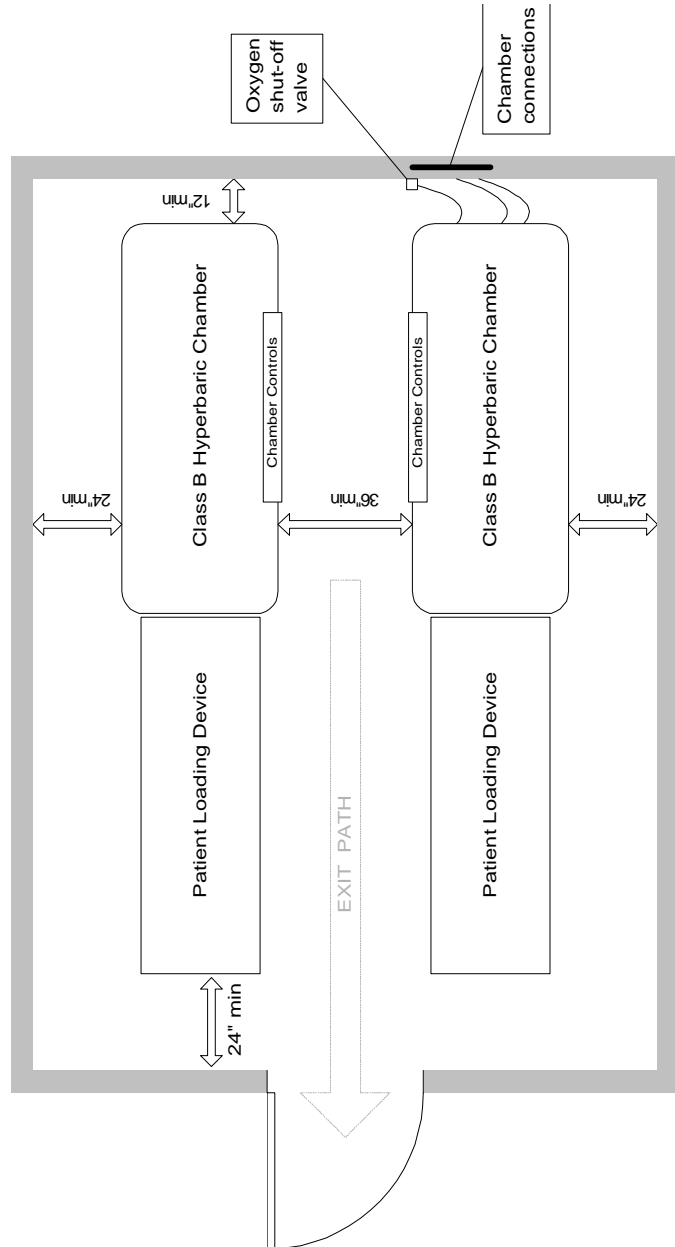
- 5.1 *NFPA 101: Life Safety Code*. (2000). Quincy, MA: National Fire Protection Association.
- 5.2 *NFPA 99: Health Care Facilities*. (2002). Quincy, MA: National Fire Protection Association.
- 5.3 *Hospital Licensing Rules* (§133.163 “Hyperbaric suite”, “Outpatient suite”). Texas Department of Health.

6.0 Diagrams:

6.1 Diagram A: Example of a typical Class A hyperbaric facility



6.2 Diagram B: Example of a typical facility with two Class B chambers:



6.3 Diagram C: Example of a typical facility with three Class B chambers:

