

Element Z

Room Standards

General Design Requirements

Z4055 Liquid Nitrogen Cylinder Storage Rooms

PART 1 - GENERAL

1.01 OVERVIEW

- A. This document provides design and construction criteria for rooms containing portable liquid cylinders for the purpose of dispensing liquid nitrogen at The University of Texas MD Anderson Cancer Center (Owner). Refer to Owner's Design Guideline Element Z4050, Liquid Nitrogen Freezer Rooms, for guidelines for rooms with liquefied nitrogen vessels containing biological material

PART 2 - DESIGN CRITERIA

2.01 GENERAL

- A. Design of liquid nitrogen (LN2) supply storage rooms shall comply with applicable requirements of NFPA 55, latest edition adopted by Owner, as well as requirements contained in this Design Element. Deviations from this standard must be approved in writing by Owner's Environmental Health and Safety department.
- B. Requirements with the exception of finishes, also apply to location of liquid cylinders for the purpose of dispensing argon, carbon dioxide, nitrogen, or oxygen gas. Provide carbon dioxide detection where storing carbon dioxide.
- C. Access to the room shall be provided by an outward opening 36" active leaf door with lite, in combination with an 18" inactive leaf. Provide exit device hardware at the active leaf, and card reader for secure entry.
- D. Finishes for rooms located in research, as well as patient care areas, shall include a colored fluid-applied epoxy flooring with integral 6" coved base, semi-gloss interior latex paint at walls, and 2'x2' lay-in fissured acoustical tile ceiling. Walls shall be of concrete masonry unit or drywall construction. Where drywall is used, provide a 0.60 vinyl/acrylic panel wainscot to 60" A.F.F. at all walls.
- E. Where containers subject to shifting or upset will be stored, provide a means for securing them to walls.
- F. LN2 supply storage rooms shall be climate controlled to the same design temperatures as other normally occupied spaces. Rooms shall operate at a negative pressure in relationship to the surrounding area. Exhaust ductwork shall be galvanized and routed to the general exhaust air system. The exhaust system shall operate, at a minimum, during the time the room, and building in which it is located, is occupied. Owner approval is required for designs where the exhaust system will not operate at all times.

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- G. The location of exhaust and supply air openings shall be designed to provide air movement effectively across all portions of the floor or room to prevent the accumulation of vapors. Locate the bottom of exhaust air grilles within 12" above finished floor. Balance all exhaust grilles to equal velocity. Supply air grilles shall be placed in the ceiling. The minimum quantity of air to be exhausted from the room, whether occupied or unoccupied, shall be 6 AC/hr. or 1 cfm/sf., whichever is greater.
- H. Provide an oxygen (O₂) detection system with multi-channel controller panel, non-latching alarms, and multiple O₂ transmitters having zirconium oxide sensors. The controller panel is to contain a red strobe and 85 dB horn, and shall send an alarm signal to the Building Automation System (BAS). The controller panel shall be mounted outside the room above the main entrance door at an easily visible location. Oxygen sensors, mounted at 42" AFF, shall be provided throughout the room at locations as required to obtain representative air quality sampling coverage. A separate strobe and horn unit is to be similarly provided inside the room, as well as outside any additional entrance door(s). Preferred installation for these panels/devices is flush or semi-recessed mounting, and must meet Texas Accessibility Standard (TAS) requirements. At 19.5% O₂ level and lower, the detection system shall activate the strobes. Additionally, at 17.5% O₂ level and lower, the detection system shall activate the horns and signal the BAS alarm. Once a normal oxygen level is again detected, the system is to reset, stopping the alarm.
- I. Provide lighting per Owner Design Guideline D5020. Selected light fixtures shall be circuited to emergency power to meet basic egress requirements. Provide 25 to 35 foot candle light level, not to exceed the lighting power density requirements of the latest adopted ANSI/ASHRAE/IESNA 90.1 Standard for "storage space".
- J. Coat hooks and a 3 foot long shelf shall be provided along one wall. Owner-provided signage at door shall read: *"CAUTION: LIQUID NITROGEN STORED IN THIS AREA- ASPHYXIAH HAZARD"*. The sign shall also include emergency contact and phone number.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

- A. Require a Shop Drawing submittal which describes oxygen detection components and indicates detection system relationship to other building systems.
- B. Fully detail means for securing loose cylinders to wall.

PART 4 - PRODUCTS

4.01 GENERAL

- A. Refer to Master Construction Specifications Divisions 20-28.
- B. Refer to Owner's Interior Finishes Standards for finish materials and colors to be used.

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- C. Provide cryogenic oxygen detection system controller panel and transmitters by GfG Instrumentation Inc.: 4421-1-X, based on multi-channel controller panel, with #2210009 ZD 21 oxygen transmitters and #1301-007 horn and strobe unit(s), quantities as required to enunciate alarm inside and immediately outside the room at all doors.
 - 1. Single-channel oxygen detection system (4101-1-1) option is available where only one ZD-21 sensor is required.

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PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Revised By
	20190301	Original Issuance	
Rev. 1	20220729	Revised 2.01G from “within 12” of the floor” to “within 12” above finished floor”	Richard Fitzgerald, FPDC per non-ODG revision request by Rodney Smalligan, FPDC

END OF ELEMENT Z4055