

Z4050 Liquid Nitrogen Freezer Rooms**PART 1 - GENERAL****1.01 OVERVIEW**

- A. This document provides design and construction criteria for rooms containing liquified nitrogen-based freezers at The University of Texas MD Anderson Cancer Center.

PART 2 - DESIGN CRITERIA**2.01 GENERAL**

- A. Locate liquid nitrogen (LN2) freezer rooms typically on the first floor, and in close proximity to the bulk LN2 storage tank serving them, to minimize the length and complexity of connecting piping and to maximize system efficiency.
- B. Provide access to room by an outward opening 36" active leaf door with lite, in combination with a 36" inactive leaf. Provide exit device hardware at the active leaf, and card reader for secure entry.
- C. Suggested minimum width for space modules consisting of freezers located on either side of an access corridor is 11 feet. Confirm with Owner's project manager the sizes of freezers to be used, and if module width should be increased.
- D. Finishes in the room shall include a colored fluid-applied epoxy flooring with integral 6" covered base, semi-gloss interior latex paint at walls, and 2'x2' lay-in fissured acoustical tile ceiling. Where drywall is used, provide a 0.60 vinyl/acrylic panel wainscot to 60" A.F.F. at all walls.
- E. Locate a connection/station for filling dewars (manual fill freezers) near the entrance to the room. Provide a wall-mounted push-button at 48" AFF with identifying signage, to actuate the pneumatically powered, normally closed filler valve. Pressing the push-button shall allow LN2 flow, and releasing it shall cause flow to stop. Provide a minimum 5' x 5' stainless steel protection sheet at floor and a 24" x 24" x 6" high x 18 ga. stainless steel pan directly under the filling connection. Walls adjacent to the connection shall be provided with a stainless steel sheet wainscot to 6' AFF.
- F. Connection manifolds for freezers located against a wall shall be mounted on stainless steel Unistrut supports which are anchored to the wall with stainless steel hardware. Provide blocking in walls as required. Connection manifolds for freezers located at islands shall be mounted to painted steel tube posts attached to the floor. Mount manifolds at 60" AFF.
- G. LN2 freezer room exhaust ductwork shall be galvanized and routed to the general exhaust air system. Exhaust systems for these rooms shall not be housed in the same chase that contains environmental air, as described in NFPA 90A, section 5.3.4.5
- H. Locate the bottom of exhaust air grilles low to the floor where they can function most efficiently to capture vaporized (cold) nitrogen gas frequently vented when freezers automatically fill, as well as any vapor from a leak in the system. Balance all exhaust grilles

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to equal velocity. Supply air grilles shall be placed in the ceiling. Quantity of air to be exhausted from the room shall be based on the following air change rates:

Room Description	Occupied AC/hr (minimum)	Unoccupied AC/hr (minimum)	Vacant AC/hr (minimum)
LN ₂ Freezer Room	17	17	17

- I. Provide an automatic shut-off valve on the vacuum insulated (LN₂) piping inside the building, near its entry point to the building. This pneumatically powered, normally closed valve is to be actuated by 120 volt signal from contacts in the oxygen detection system controller panel, as well as from an emergency power-off (EPO) button positioned inside the room. The EPO button is to be a push-pull type allowing the valve to close and signaling an alarm when pushed in, and allowing reset of the valve and alarm system when pulled out. The EPO button shall be located near the door to the room at 48" AFF and labeled with identifying signage. Similarly locate any additional EPO buttons with signage as design dictates.
- J. 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, be integrated with EPO button(s) to control the automatic shut-off valve, and 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 adjacent to the fill station and 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 where visible throughout 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 17.0% O₂ level and lower, the detection system shall activate the horns, allow the shut-off valve to close, and signal the BAS alarm. Once a normal oxygen level is again detected, the system is to reset, stopping the alarm and returning the shut-off valve to a powered open state.
- K. Design and planning for routing of vacuum insulated piping shall be accomplished early-on in a Project, with assistance from a consultant with cryogenic expertise, and with close participation by Owner. Consideration is to be given to line slope, distances between end points, cryo-vent locations, need for expansion/flex of the piping, and piping design relative to environmental placement (heat gain potential). Route piping in shaded, sheltered or conditioned space where possible. Vacuum insulated piping segment lengths are to be limited such as to afford access, service, and replacement after the building is fully occupied. Where ceilings are present and the space above is not conditioned, locate piping below ceiling level a sufficient distance as to accommodate test connections or other appurtenances on the piping and their access. All valves are to be vacuum insulated. Each piping freezer service point shall be designed to accommodate two to four freezers on approximately, but not less than 3 ft center as design dictates. Cryo-vents shall have emergency powered 120 volt exhaust heaters and shall be routed to the outside of the building or to general exhaust ductwork. Provide one L5-20-R receptacle and one critical alarm point terminated in an RJ45 receptacle for each space designed to receive an auto-fill

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freezer. Each 20 amp circuit may serve up to four freezers. Provide auto-fill freezer power and critical alarm outlets in a ceiling utility panel. Locate the electrical distribution panel for the LN2 freezer room outside, and in close proximity to the room, such as in the entry alcove. All electrical devices which serve the LN2 system, including receptacles, critical alarm, and safety devices, shall be circuited on emergency power.

- L. Provide lighting per Owner Design Guideline D5020, with alternating ceiling fixtures on emergency circuiting, designed to provide even lighting level on loss of normal power. Provide 60-80 foot candle light level, not to exceed lighting power density requirements of ANSI/ASHRAEIESN A 90.1.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.01 GENERAL

- A. If vacuum insulated (liquid nitrogen) piping is not to be installed during an early construction phase, indicate final pipe routing and provide PVC piping as a place holder, with explanation/instructions for all trades to maintain it, as well as access space around it, undisturbed.
- B. Require an initial schematic Shop Drawing submittal which indicates general intent for routing as related to placement of any cryo-vents, drops, traps, freezer service points and/or other appurtenances. Additionally, require that the final, detailed submittal for the entire system, complete with system isometric and component/spool fabrication drawings, is to be provided electronically and approved, without changes, prior to starting fabrication.
- C. Require as-built drawings in electronic form, preferring AutoCAD compatibility when possible, to include complete system piping isometric drawings and a full set of the scaled component and spool drawings prepared by the manufacturer for use in fabrication.

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PART 4 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	020190301	Original Issuance	
Rev. 1			
Rev. 2			
Rev. 3			
Rev. 4			
Rev. 5			

END OF ELEMENT Z4050