

MUON CRYOSYSTEM DESIGN NOTE 12

SUBSYSTEM: CCM CVM Cryoplant

TITLE: LN₂ Pump Installation and CCM Pit ODHA

AUTHOR(S): R.L. Schmitt *R.L. Schmitt*

DATE: February 27, 1986

OBJECTIVE OF NOTE: Define ODH Classification and Safety Measures

OXYGEN DEFICIENCY HAZARD ANALYSIS IN CCM PIT

The nitrogen circulation pumps and associated valves and piping are located in the CCM pit. During normal operation the nitrogen released by this system is less than 5 SCFH. Abnormal leakage could occur from the pump mechanical seals. This is the biggest and the most likely leak in the area. It could drain the nitrogen separator into the pit. The separator normally contains about three cubic feet of liquid nitrogen. The other potential leaks, such as valve packing or bellows failure are smaller or less likely to occur. Therefore the pump seal leakage is the design condition.

CONDITIONS

Only one pump is filled at any time.

Maximum volume leaked = 2000 SCF.

Pit volume = 5530 cubic feet.

Minimum O₂ partial pressure = 102 mm Hg.

$$F_i = 2.05 \times 10^{-4}$$

Estimated pump seal failure = twice yearly.

$$\phi = P_i F_i = 4.7 \times 10^{-8}$$

In all cases the total volume is limited to the amount of LN₂ in the phase separator. Therefore this is an ODH class 0 area, per Appendix I of the Fermi Safety Manual, Chapter 15.1.

Because of the possible nitrogen leakage we have taken several precautions. A 2500 CFM blower will ventilate the area. An O₂ sensor will be moved from the east side of the pit to between the pumps. The grating will be covered west and north of the magnet. The blower will be activated either manually or by low oxygen concentration. It will normally be off, but will be switched on prior to entry into the pit.

REVIEWED BY:

M E Stone
Name

3/1/86
Date

Name

Date



Fermilab

April 21, 1986

TO: J. O'Meara
FROM: R.L. Schmitt *R. L. Schmitt*
SUBJECT: Design Note 12, CCM Pit

This letter is an amendment to Design Note 12.

Design Note 12 is revised for the new pump location at floor level. A blower will not be provided in the CCM pit as previously planned.

The technical supplement to chapter 15 of the Safety Standard is ambiguous. As you noted in your 4/3/86 letter, paragraph 1.3 says an oxygen partial pressure below 135 mm is deficient, but a Fermi Class 0 can be defined in Appendix I for a lower partial pressure if it occurs infrequently.

The calculations remain valid since the pumps can still leak into the pit. The likelihood of a spontaneous pipe rupture is trivial compared to pump seal leakage.

Last August the pit was designated Class 1, apparently without written justification. Since the experimenters activities are not under our control and since we do not need routine or quick access to the pit the previous designation and installation is acceptable to us.

RLS/tg

cc: R. Dachniwskyj	Panel
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