MUON CRYOSYSTEM DESIGN NOTE 29

SUBSYSTEM [ ] CCM [X] CVM [ ] Cryoplant

TITLE: CVM Pump Dewar - Vacuum Vessel

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DATE: June 12, 1986

Vacuum Vessel Engineering Note
(per Mandatory Standard SD-41)

Prepared By R.W. Fast Date 1/4/86 Div/Sect RD/Cryo

Reviewed By E O'Meara Date 1 July 86 Div/Sect RD/CDF

Div/Dept Head Not Required Date _____ Div/Sect _____

I. Identification and Verification of Compliance

Fill in the Fermilab Engineering Conformance Label information below:

Vessel Title CVM Pump Dewar - outer (vacuum) Vessel

Vessel Number CERN RP-156 ; Fermilab 1142-RD

Vessel Drawing Number CERN 30-36-05

Working Temperature Range -20 ^{0}F 100 ^{0}F

Designer/Manufacturer Cryodiffusion - France

Date of Manufacture 1977

Acceptance Date N/A

Director's signature (or designee) if vessel is for manned area and requires an exception to the provisions of this standard.

Not Required

Amendment No.:	Reviewed By:	Date:

II. Description of Vessel and Relief System

Laboratory location code NEU NMS

Laboratory property number N/A

Purpose of vessel Vacuum jacket for liquid helium vessel

List all pertinent drawings (append copies)

Drawing No.:	Location of Original:
CERN 30-36-05	Original at CERN, copy at WH-11E, RD/Cryo

Is an operating procedure necessary for the safe operation of this vessel? no

If yes, supply the written procedure with this Engineering Note.

List all reliefs and settings. Provide a schematic of the relief system components, and appropriate calculations or test results to prove that overpressurization beyond the maximum allowable internal pressure will not occur.

Manufacturer	Relief	Setting	Area	Size	ASME Stamped Device Yes/No
Cryodiffusion-Parallel Plate	SV-056-V	few inches of water	6.328 $in.^2$	2.83"	No

Welding Information

Has the vessel been fabricated in a Fermilab shop? Yes ____ No X

If "Yes", append a copy of the welding shop statement of welder qualification.

VOLUME OF INSULATING VACUUM SPACE

Overall Volume of Vacuum Vessel

Lower dished head. Assume to be an ASME head, 1100 mm O.D. x 6 mm wall. Volume of head without straight flange, interpolating Brighton data = 27.5 gal. = 3.67 ft^3.

Cylindrical shell. 1088 mm I.D. x 1950 mm long. Volume = 64.00 ft^3.

Total volume of vacuum vessel = 67.67 ft^3.

Volume of Helium Vessel

Lower dished head. 800 mm O.D. x 4 mm wall. Volume without straight flange (from Brighton catalog) = 10.2 gal. = 1.36 ft^3.

Lower cylindrical shell. 800 mm O.D. x 2 mm wall x 812.5 mm long. Volume = 14.28 ft^3.

Upper cylindrical shell and reducer. 600 mm I.D. x 1050 mm long. Volume of cylinder = 10.48 ft^3.; volume of triangular annulus = 0.58 ft^3, total volume = 11.06 ft^3.

Total volume of helium vessel = 26.70 ft^3.

Net Volume of Insulating Vacuum Space

Total volume of vacuum vessel - total volume of helium vessel = 40.97 ft^3.

APPLICABLE VESSEL STANDARD

Since the volume of the vacuum space is less than 50 ft^3, the provisions of SD-41, "Vacuum Vessel Standard," do not apply.

SAFETY RELIEF DEVICE

Applicable Standard

The generally accepted standard for relief devices on the outer shell of a vacuum insulated vessel, CGA-341 "Insulated Tank Truck Specification for Cold Liquefied Gases," will be applied to this vessel.

Required Area

The discharge area of the relief device must be at least 0.00024 $in.^2$ per pound of water capacity of inner vessel. The volume of the inner vessel is 26.6 ft^3 or 1660 pounds water capacity. The required area is 0.398 $in.^2$.

Provided Area

Each of the two parallel plate relief devices is 72.1 mm (2.84 in.) in diameter and has a discharge area of 6.3 $in.^2$ - far in excess of the requirement.