Cooling System Expansion Tank Safety Note

G. S. Ball

01/27/89

D-Zero Engineering Note #3740.510.EN-204

Approved: _____

Kelly H. Hym

1

PRESSURE VESSEL ENGINEERING NOTE
PER MANDATORY STANDARD SD37

Prepared by: Greg Ball 4402 MS-357

Preparation date: January 12, 1989

1 Description and Identification

Fill in the label information below:

This vessel conforms to engineering standard SD37

Vessel Title Cooling System Receiving Tank

Vessel Number RD 4003 NB-5461

Vessel Drawing Number _____

Maximum Allowable
Working Pressure (MAWP) 200 PSI

Working Temperature Range -20 °F 450 °F

Contents 50% Glycol 50% water

Designer/Manufacturer Silvan Industries, Inc.

Test Pressure (if tested at Fermi) Acceptance
Date: _____
PSI, Hydraulic _____ Pneumatic _____

Accepted as conforming to standard by
K.C. Stanfield
of Division/Section Research Div.

NOTE: Any subsequent changes in contents, pressures, temperatures, valving, etc., which affect the safety of this vessel shall require another review and test.

← Obtain from
Division/Section
Safety Officer

Actual signature
required in this
← space

Reviewed by: Russell A. Bucinski Date: January 19, 1989

Director's signature (or designee) if the vessel is for manned areas but doesn't conform to the requirements of the standard.

Date: _____

Lab Property Number(s): _____

Lab Location Code: DAB-AH (obtain from Safety Officer)

Purpose of Vessel(s): Supplies positive pressure to pump and separates air bubbles in pump cooling system and protects against pressure surges

Vessel Capacity/Size: 10 gal Diameter: 12" Length: 22"

Normal Operating Pressure (OP) 15 PSI

MAWP-OP = 185 PSI

Is the above enough to provide relief cracking pressure tolerance plus system uncertainty tolerance per M-9.

As an option, provide a photo of the entire vessel in the Appendix.

5031TA-5

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_____ of Division/Section _____

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As an option, provide a photo of the entire vessel in the Appendix.

List the numbers of all pertinent drawings and the location of the originals.
(Append copies).

<u>Drawing #</u>	<u>Location of Original</u>
<u>See sketch in appendix</u>	

2 Design Verification

Does the vessel(s) have a U stamp? Yes X No . If "Yes", fill out data below and skip page 3; if "No", fill out page 3 and skip this page.

Staple photo of U stamp plate below.

Copy "U" label details to the side if photo is not clear or if copies are unreadable.

Copy data here:

Nat. Bd. No. 5461

Certified by

Silvan Industries Inc.

Marinette, Wisconsin USA

MAWP 200 PSI @ 450 (support
covers "0" in "450")
-20°F at 200 PSI

Year built 1988

Cust. Part No. 461224

Head .094 Shell .095

On the sketch below, circle all applicable sections of the ASME code per Section VIII, Division I. List the results of all calculations. (Insert copies of calculations in the appendix).

Summary of ASME Code

<u>Item</u>	<u>Reference ASME Code Section</u>	<u>CALCULATION RESULT</u> (Required thickness or stress level vs. actual thickness or calculated stress level)
_____	_____	VS. _____
_____	_____	VS. _____
_____	_____	VS. _____
_____	_____	VS. _____
_____	_____	VS. _____

If this vessel is exceptional or had exceptional parts, list their details under 5.6. Yes _____ No _____

- 3 System Venting. Provide the system schematic in the Appendix, if the vessel safety is system sensitive.

Is it possible to isolate the relief valves by a valve from the vessel?

Yes _____ No X

If "Yes", the system must conform to M-5. Provide an explanation on the appended schematic. (An isolatable vessel, not conforming to M-5 violates the Standard.)

Is the relief cracking pressure set at or below the M.A.W.P.?

Yes X No _____ Actual setting 25 PSI
(A no response violates the Standard.)

Is the pressure drop of the relief system at maximum anticipated flow such that vessel pressure never rises above the following? (UG 125)

Yes x No _____
110% of MAWP (one relief)
116% of MAWP (multiple reliefs)
121% of MAWP (unexpected heat source)

Provide test or calculational proof in the Appendix.
(Non-conforming pressure rises violate the Standard.)

List of reliefs and settings:

<u>Manufacturer</u>	<u>Relief</u>	<u>Setting</u>	<u>Flow Rate</u>	<u>Size</u>
Kunkle Valve Co.	Valve	25 psi	358 lb/hr	3/4 inch
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Is the relief device an ASME stamped device? Yes X No _____

- 4 Operating Procedure

Is an operating procedure necessary for the safe operation of this vessel?

Yes _____ No X. If "Yes", please append.

- 5 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 and a copy of the Welding Procedure Specification (WPS) used to weld this vessel.

- 6 Exceptional, Existing, Used, and Non-Manned Area Vessels

Is this vessel or any part thereof in the above categories? Yes _____ No X

If "Yes", follow the Engineering Note requirements for documentation in free form below.

G. B al
1/12/89

From pump curves, pump can't produce >85 ft. head

$$h = \frac{\Delta p g_c}{\rho g}$$

$$\frac{h \rho g}{g_c} = \Delta p$$

$$h = 85 \text{ ft.}$$

$$\rho = 62.4 \frac{\text{lbm}}{\text{ft}^3} \quad (\text{assume } \rho \approx \rho_{H_2O})$$

$$g = 32.2 \text{ ft/s}^2$$

$$g_c = 32.2 \text{ lbm-ft/lbf-s}^2$$

$$\Delta p = 5304 \text{ lbf/ft}^2 = 37 \text{ psi}$$

$$\text{Initial tank pressure} = p_{\text{atm}}$$

$$p_{\text{atm}} + 37 \text{ psi} \ll 200 \text{ psi}$$

Cryo Utility Room Cooling System

Close-Coupled Centrifugal Pumps

Performance Curve

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SECTION 1

MODEL

GL642

METERS FEET