Cooling System Expansion Tank Safety Note

G. S. Ball

01/27/89

D-Zero Engineering Note #3740.510.EN-204

Approved: [Signature]
# Description and Identification

Fill in the label information below:

<table>
<thead>
<tr>
<th>Description</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>This vessel conforms to engineering standard SD37</td>
<td></td>
</tr>
<tr>
<td>Vessel Title</td>
<td>Cooling System Receiving Tank</td>
</tr>
<tr>
<td>Vessel Number</td>
<td>RD 4003</td>
</tr>
<tr>
<td>Vessel Drawing Number</td>
<td></td>
</tr>
<tr>
<td>Maximum Allowable Working Pressure (MAWP)</td>
<td>200 PSI</td>
</tr>
<tr>
<td>Working Temperature Range</td>
<td>-20 °F to 450 °F</td>
</tr>
<tr>
<td>Contents</td>
<td>50% Glycol 50% water</td>
</tr>
<tr>
<td>Designer/Manufacturer</td>
<td>Silvan Industries, Inc.</td>
</tr>
<tr>
<td>Test Pressure (if tested at Fermi)</td>
<td></td>
</tr>
<tr>
<td>Acceptance Date</td>
<td></td>
</tr>
<tr>
<td>PSI, Hydraulic</td>
<td></td>
</tr>
<tr>
<td>Pneumatic</td>
<td></td>
</tr>
<tr>
<td>Accepted as conforming to standard by</td>
<td>K. C. E. Bennett</td>
</tr>
<tr>
<td>of Division/Section</td>
<td></td>
</tr>
<tr>
<td>Research Division</td>
<td>UV.</td>
</tr>
<tr>
<td>NOTE: Any subsequent changes in contents, pressures, temperatures, valving, etc., which affect the safety of this vessel shall require another review and test.</td>
<td></td>
</tr>
</tbody>
</table>

Reviewed by: Russell A. Oroszki

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.

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.
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

Vessel Drawing Number:

Maximum Allowable
Working Pressure (MAWP): 200 PSI

Working Temperature Range: 
-20°F to 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

of Division/Section

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

Reviewed by: ____________________________________________________________________ Date: _______________________

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

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: 20 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.
List the numbers of all pertinent drawings and the location of the originals. (Append copies).

<table>
<thead>
<tr>
<th>Drawing #</th>
<th>Location of Original</th>
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<tbody>
<tr>
<td>See sketch in appendix</td>
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</table>

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 of 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Reference ASME Code Section</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

CALCULATION RESULT
(Required thickness or stress level vs. actual thickness or calculated stress level)

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 ____

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 ____ 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 ____ 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:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Relief</th>
<th>Setting</th>
<th>Flow Rate</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kunkle Valve Co.</td>
<td>Valve</td>
<td>25 psi</td>
<td>358 lb/hr</td>
<td>3/4 inch</td>
</tr>
</tbody>
</table>

Is the relief device an ASME stamped device? Yes ____ No ____

4 Operating Procedure

Is an operating procedure necessary for the safe operation of this vessel? Yes ____ No ____

If "Yes", please append.

5 Welding Information

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

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 ____

If "Yes", follow the Engineering Note requirements for documentation in free form below.
From pump curves, pump can't produce $>85$ ft. head

\[ h = \frac{\Delta p g_c}{p g} \]

\[ h_{pg} = \frac{\Delta p}{g_c} \]

\[ h = 85 \text{ ft.} \]

\[ p = 62.4 \frac{\text{lb}}{\text{ft}^3} \text{ (assume } p_B \text{)} \]

\[ g = 32.2 \frac{\text{ft}}{\text{s}^2} \]

\[ g_c = 32.2 \frac{\text{lbm-ft}}{\text{lb-f-s}^2} \]

\[ \Delta p = 5304 \text{ lb/ft } < 37 \text{ psi} \]

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

\[ p_{\text{atm}} + 37 \text{ psi } \ll 200 \text{ psi} \]
Cryo Utility Room Cooling System

Expansion Tank

Utility Vacuum Pump
Cryostat Vacuum Pump

Air Compressor
(After Cooler)
(Oil Cooler)

Trim Cooler

Pond Water Supply

Boost Pump

Return