

**PRESSURE VESSEL ENGINEERING NOTE**  
**FOR**  
**CHAMPION AIR COMPRESSOR**  
**RECEIVING TANK, #RD-4027**

**D-ZERO ENGINEERING NOTE # 3740.530-EN-376**

**Oct. 8, 1993**

**Russ Rucinski**  
**RD/DØ Mechanical**

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# PRESSURE VESSEL ENGINEERING NOTE PER CHAPTER 5031

Prepared by: STEVEN SAKLA  
Preparation date: 7/21/93  
CHECKED BY: Russ Rucinski 8/18/93

1. Description and Identification  
Fill in the label information below:

This vessel conforms to Fermilab ES&H Manual Chapter 5031

Vessel Title AIR RECEIVING TANK

Vessel Number RD-4027

Division/Section \_\_\_\_\_

Vessel Drawing Number —

Maximum Allowable Working Pressure (MAWP) 200 PSI

Working Temperature Range 20 °F 450 °F

Contents AIR

Designer/Manufacturer Brunner Eng'g Mfg. Inc.

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Test Pressure (if tested at Fermi) Acceptance Date: \_\_\_\_\_

— PSI Hydraulic — Pneumatic —

Accepted as conforming to standard by [Signature]

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of Division/Section RD Date: 10/6/93

Obtain from Safety Officer

Document per Chapter 5034 of the Fermilab ES&H Manual

Actual signature required

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

Reviewed by: [Signature] Date: 9-30-93

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

\_\_\_\_\_ Date: \_\_\_\_\_

Amendment No.:	Reviewed by:	Date:
_____	_____	_____
_____	_____	_____

Lab Property Number(s): NONE

Lab Location Code: DAB (obtain from safety officer)

Purpose of Vessel(s): Holding tank for compressed air

Vessel Capacity/Size: 53.9 ft<sup>3</sup> Diameter: 30 in. Length: 92 in.

Normal Operating Pressure (OP) 175 PSI

MAWP-OP = 25 PSI

List the numbers of all pertinent drawings and the location of the originals.

<u>Drawing #</u>	<u>Location of Original</u>

2. Design Verification

Does the vessel(s) have a U stamp? Yes  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.

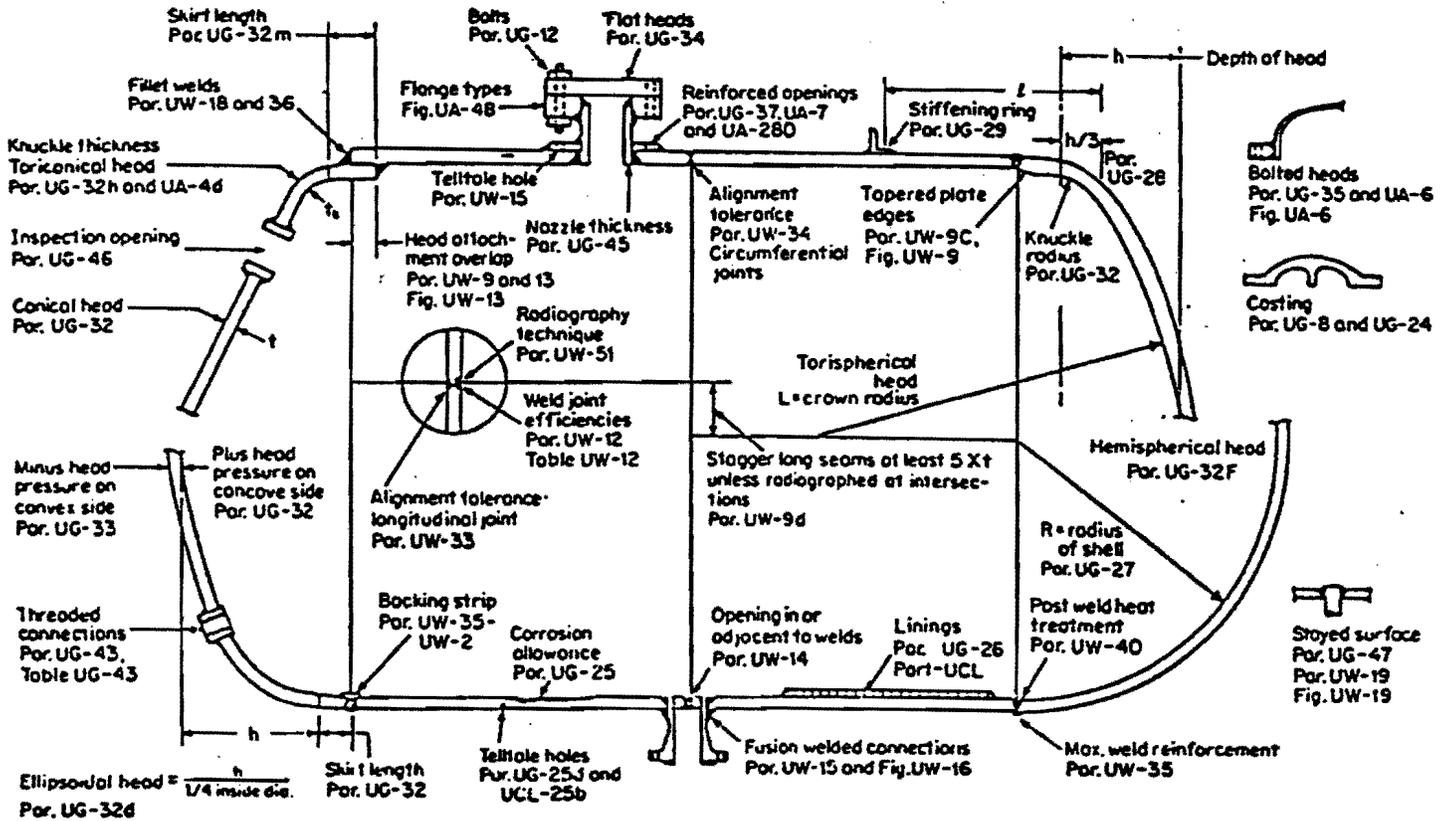
Copy "U" label details to the side

Copy data here:



NATL. BD. 11720 E  
BRUNNER ENG. & MFG. INC.  
DIV. I BEDFORD, INDIANA  
Max. W.P. 200 psi. at 450°F  
W.C. 250 Gm. MFG. SER.  
TARE WT. LBS. SA. SQ. FT.  
AD. 30 O.L. 92 HD. 2:1 YR. 1987  
SH. TH. .227 HD. TH. .197  
STEEL P-5763D

Provide ASME design calculations in an appendix. On the sketch below, circle all applicable sections of the ASME code per Section VIII, Division I. (Only for non-coded vessels)



Summary of ASME Code

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

<u>Item</u>	<u>Reference ASME Code Section</u>	<u>vs</u>
_____	_____	_____ vs _____
_____	_____	_____ vs _____
_____	_____	_____ vs _____
_____	_____	_____ vs _____
_____	_____	_____ vs _____

3. System Venting Verification Provide the system schematic in the Appendix.

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

Yes  No

If "Yes", the system must conform to code rules. Provide an explanation on the appended schematic. (An isolatable vessel, not conforming to code rule is non-compliant under this chapter.)

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

Yes  No  Actual setting 200 PSI

(A "No" response violates this chapter.)

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 is non-compliant under this Chapter.)

List of reliefs and settings:

<u>Manufacturer</u>	<u>Model #</u>	<u>Set Pressure</u>	<u>Flow Rate</u>	<u>Size</u>
<u>F.C. KINGSTON</u>	<u>112C</u>	<u>200 psi</u>	<u>118 CFM</u>	<u>1/4 in.</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Does the primary relief device follow UG-129? Yes  No   
(A "No" response is non-compliant under this chapter)

4. Operating Procedure

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

Yes  No  (If "Yes", it must be appended)

5. Welding Information

Has the vessel been fabricated in a non-code shop? Yes  No   
If "Yes", append a copy of the welding shop statement of welder qualification (Procedure Qualification Record, PQR) which references the Welding Procedure Specification (WPS) used to weld this vessel.

6. Exceptional, Existing, Used and Unmanned Area Vessels

Is this vessel or any part thereof in the above categories?

Yes  No

If "Yes", follow the Engineering Note requirements for documentation and append to Note.

**THIS VESSEL CONFORMS TO ROOM TEMPERATURE PRESSURE VESSEL ENGINEERING STANDARD SD 37**

Vessel Title AIR RECEIVING TANK

Vessel Number RD-4027

Vessel Drawing Number —

Maximum Allowable Working Pressure

(MAWP) 200 PSI

Working Temperature Range 20 °F 450 °F

Contents AIR

Designer ERUNNER ENG. & MFG. INC.

Test Pressure (if tested at Fermi) . DATE F 1

— PSI, Hydraulic — Pneumatic —

Accepted as conforming to standard/exception granted by

Eric Haggard Richard

Of Division/Section TS/SC RD

NOTE: Any subsequent changes in content, pressures, temperatures, valving, etc. which affect the safety of this vessel shall require another review and test. (REV. 7/83)



## SYSTEM VENTING VERIFICATION

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The Champion pressure vessel is an existing commercial air compressor package which is located on the 3rd floor of the D0 Assembly Building under the staircase leading to the cryo control room. The air receiving tank has a maximum allowable working pressure of 200 psi. The normal operating pressure of the system is 175 psi. Two Champion R30D air compressors provide the necessary pressure for the air receiving tank. The 1/4 in. F.C. Kingston relief valve opens at 200 psi. and has a maximum flow capacity of 118 cfm. The compressor speed is configured by 6" and 18" pulleys. Based on a maximum motor speed of 1760 rpm, the compressor speed is configured to  $6/18(1760 \text{ rpm}) = 587 \text{ rpm}$ . Since the compressor speed is configured to 587 rpm, using a flow rate value at 1000 rpm is conservative. Also, since the performance curve supplied by the manufacturer only shows flow rates for a maximum pressure of 175 psig using this maximum value is conservative since the flow rate at the relieving pressure (200 psi) would be smaller. Because the relief valve relieves at a pressure equal to the MAWP (200 psi) and has a flow capacity higher than the two compressors combined can deliver (41 cfm each); the air receiving tank will never reach a pressure above its maximum allowable working pressure of 200 psi.

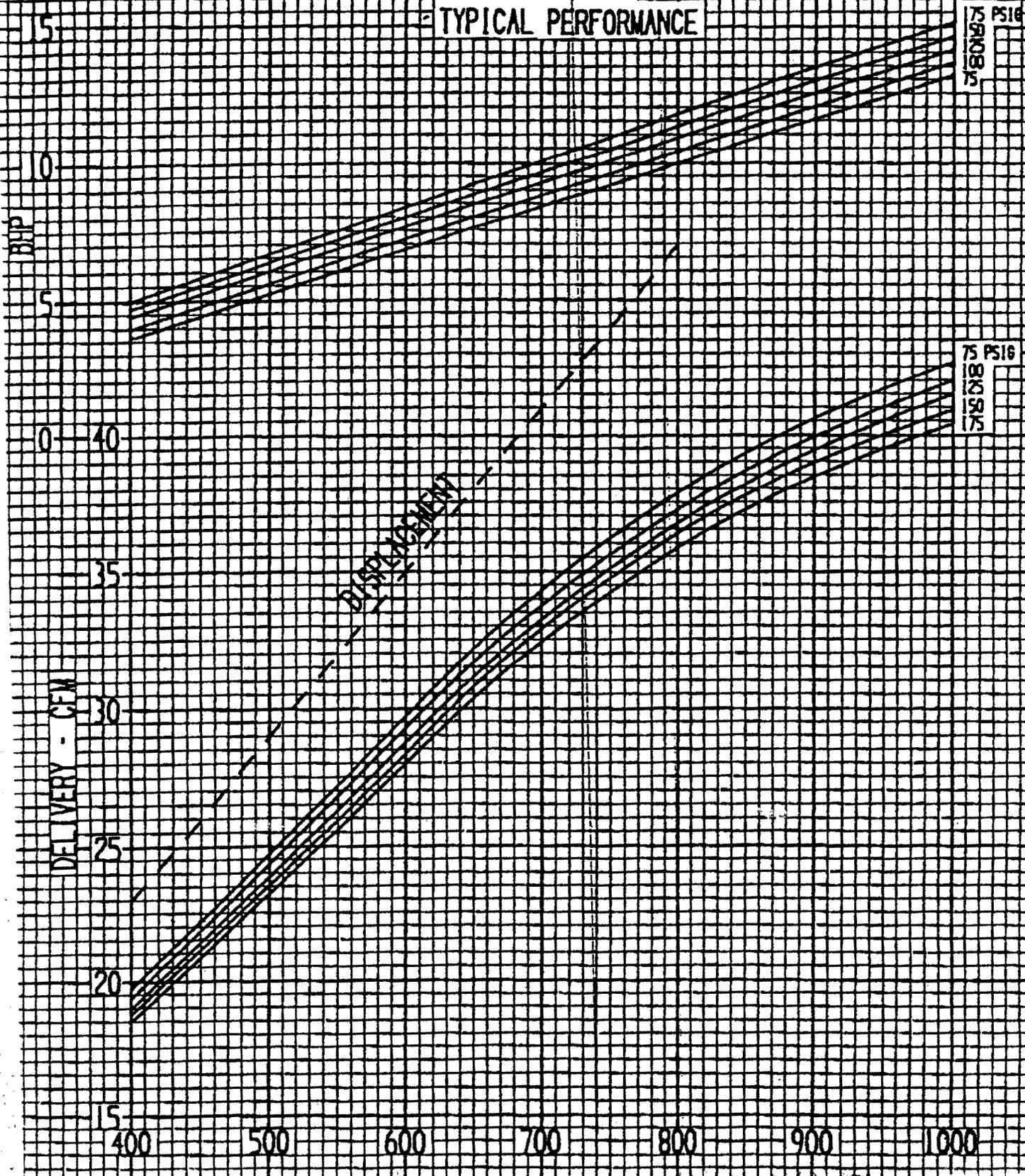
### PARAMETERS:

- MAWP of air receiving tank = 200 psi
- Relief Valve Capacity = 118 cfm at 200 psi
- Air Compressor at Max. Performance<sup>1</sup> = 41 cfm. x 2 = 82 cfm  
(two compressors, see attached performance curve)

1. Champion Pneumatic Machinery Co., Inc.  
Princeton, IL (815) 875-3321  
Model No: R30D      Serial No: R30D14701

# R300 PUMP

## TYPICAL PERFORMANCE



FROM PECO

