TECHNICAL APPENDIX FORM (TA5031) FOR PRESSURE VESSELS
PRESSURE VESSEL ENGINEERING NOTE PER CHAPTER 5031

Prepared by: Ron Williams
Preparation date: 6/18/2012

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

THIS VESSEL CONFORMS TO FERMILAB ES&H MANUAL CHAPTER 5031

Vessel Title: Vacuum lifter 4 tank two

Vessel Number: 4-2 ←Obtain from Division/Section Safety Officer

Vessel Drawing No.: Not Applicable

Maximum Allowable Working Pressure (MAWP)

Internal Pressure: 175

External Pressure: Not rated for external pressure

Working Temperature Range: -20 °F 400 °F

Contents: Compressed Air

Designer / Manufacturer: Speedair

Test Pressure (if tested at Fermilab) Acceptance Date: N/A ← Document per Chapter 5034 of the Fermilab ES&H Manual

_____ PSIG, Hydraulic ___ Pneumatic ___

Accepted as conforming to standard by

_____ ←Actual signature required

Of Division / Section _____ Date: _____

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

Reviewed by: DAVE PUSHKA (Print Name)

Signature: _____ Date: 7-2-2012

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

Signature: _____ Date: _____

Amendment No.: Reviewed by: Date:

_____ _____ _____

_____ _____ _____

Lab Property Number(s):_____
Lab Location Code:_____ (obtain from safety officer)
Purpose of Vessel(s):One of two tanks supplying compressed air to the lifting fixture_____
_____
Vessel Capacity/Size:6 Gallons____ Diameter:10 inches_ Length:20 inches_____
Normal Operating Pressure (OP)95_____
MAWP-OP =175_____PSI

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

Drawing #	Location of Original
None; vessel is commercially made	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

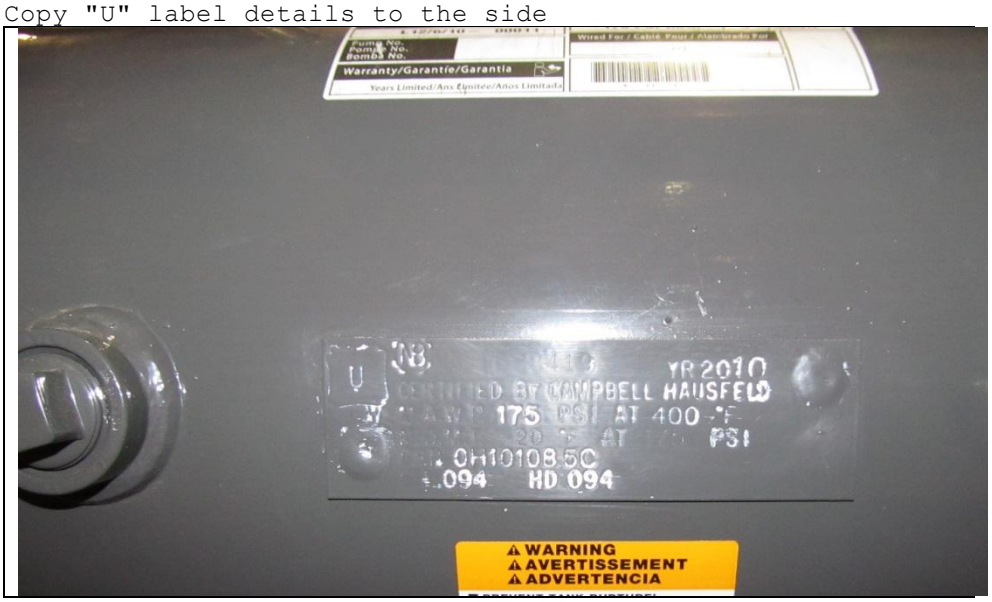
2. Design Verification

Is this vessel designed and built to meet the ASME BPVC or "Experiment Vessel" requirements?
Yes___X__ No_____.

If "No" state the standard that was used _____.
Demonstrate that design calculations of that standard have been made and that other requirements of that standard have been satisfied.
Skip to part 3 "system venting verification."

Does the vessel(s) have a U stamp? Yes__X___ No_____. If "Yes", complete section 2A; if "No", complete section 2B.

A. Staple photo of U stamp plate below.
Copy "U" label details to the side



Copy data here:
U Stamp NB 1688419
Certified by Campbell Hausfeld
MAWP 175 PSI at 400 F
MDMT 200 PSI at -20 F
CRN 0H10108.5C
SH .094 HD .094

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)

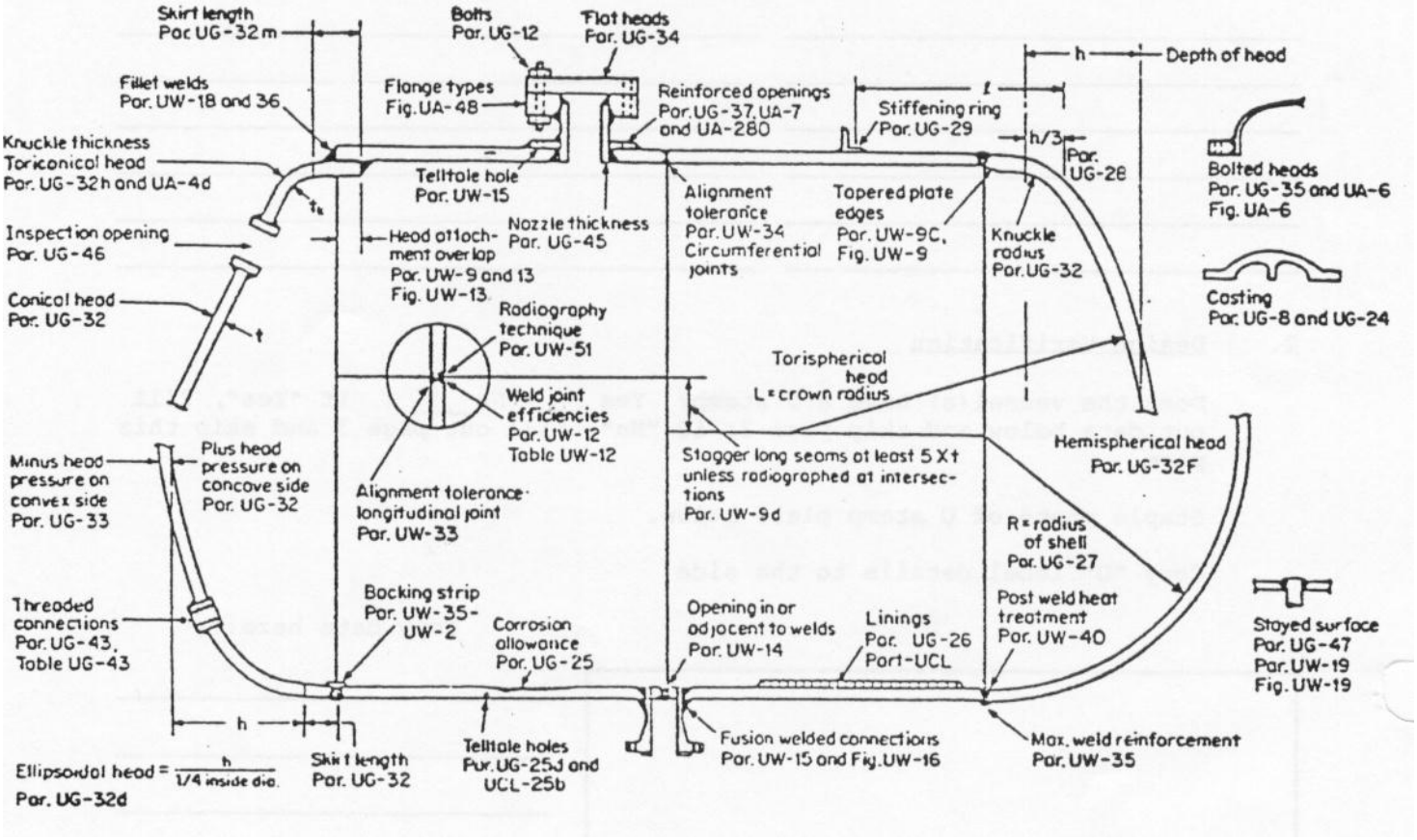


Figure 1. ASME Code: Applicable Sections

2B.

Summary of ASME Code

Item	Reference ASME Code Section	CALCULATION RESULT (Required thickness or stress level vs. actual thickness calculated stress level)
_____	_____	_____ vs _____
_____	_____	_____ vs _____
_____	_____	_____ vs _____

_____ _____ _____ vs _____
_____ _____ _____ vs _____

3. System Venting Verification Provide the vent system schematic.

Does the venting system follow the Code UG-125 through UG-137?
Yes_X__ No___

Does the venting system also follow the Compressed Gas Association Standards S-1.1 and S-1.3?
Yes ___X__ No_____ (S-1.1 applies to DOT cylinders S-1.3 calculations appended at the end of this document)

A "no" response to both of the two proceeding questions requires a justification and statement regarding what standards were applied to verify system venting is adequate.

List of reliefs and settings:

Manufacturer	Model #	Set Pressure	Flow Rate	Size
F.C. Kingston	CRNOG3144.1C	105 PSI	102 SCFM	½ inch

4. Operating Procedure

Is an operating procedure necessary for the safe operation of this vessel?
Yes_____ No___X__ (If "Yes", it must be appended)

5. Welding Information

Has the vessel been fabricated in a non-code shop? Yes_____ No__X___
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. Existing and Unmanned Area Vessels

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

If "Yes", follow the requirements for an Extended Engineering Note for Existing and Unmanned Area Vessels.

7. Exceptional Vessels

Is this vessel or any part thereof in the above category?
Yes_____ No___X____

If "Yes", follow the requirements for an Extended Engineering Note for Exceptional Vessels.

ASME-Code Brass Pop-Safety Valves

A

B

C

- Meet ASME Code Section VIII for Air and Inert Gas
- Temp. Range:
  Styles A&C: -40° to +400° F
  Style B: -15° to +250° F

Protect against damage in air lines and air-powered equipment, such as air receivers and compressor tanks. Valves meet ASME standards for compressed air.

Body is brass. Valves exhaust to the atmosphere. Pipe connection is NPT male. **High-flow valves** have twice the flow capacity of medium-flow valves.

(A) Valves with Test Ring—Seal is brass. Vent is on the side.

(B) Extended-Life Valves with Test Ring—Seal is silicone for a longer service life in applications that operate close to the set pressure. Vent is on the side.

To Order: For **Styles A and B**, please specify set pressure: from 25 to 150 psi in 5 psi increments or from 175 to 300 psi in 25 psi increments, unless noted.

(C) Valves with Test Lever—Seal is brass. Vent is on the top.

To Order: For **Style C**, please specify set pressure: 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, 110, 125, 130, 140, 150, 175, or 200 psi.

View flow capacities for these valves.

Pipe Size	Ht.		Each
(A) Valves with Test Ring			
Medium Flow			
1/8	2 1/8"	9889K15*	$9.19
1/4	3 1/8"	9889K19	18.98
3/8	3 1/8"	9889K29	20.98
1/2	3 3/4"	**9889K39**	36.34

Catalog Page | Bookmark

ASME-Code Brass Pop-Safety Valve w/ Test Ring Medium Flow, 1/2 NPT Male

Each

ADD TO ORDER

Air Flow Capacities for Brass ASME Pop-Safety Valves

Set Pressure:

Select from list...

SPEEDAIRE Air Tank, Stationary, 175 PSI, 6 Gal, Horiz

Pneumatics > Air Compressor Accessories > Stationary Air Tanks

☆☆☆☆☆ | Write a Review | Read all Reviews | Read all Ask & Answer

Air Tank, Stationary, Steel, Capacity 6 Gal, Working Pressure 175 PSI, Tank Type Horizontal, Dia 10 In, Length 20 In, Height 12 In, Standards ASME U Code

Grainger Item #	1TZY8
Price (ea.)	**$298.50**
Brand	SPEEDAIRE
Mfr. Model #	1TZY8
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	32.5
Availability	**Ready to Ship**
Catalog Page No.	3728
Country of Origin **(Country of Origin is subject to change.)**	USA

Enlarge Image

Qty.

Add Grainger TripleGuard® repair & replacement coverage for $55.95 each.

Add to Order | Add to Personal List | Compare Alternates

Price shown may not reflect your price. Sign in or register.

When can I get it? Use your ZIP code to estimate availability.

Qty: ZIP code: Go

Tech Specs | Additional Information | Compliance & Restrictions | MSDS | Required Accessories | Optional Accessories | Alternate Products | Repair Parts

Item	Air Tank
Type	Stationary
Material	Steel
Capacity (Gal.)	6
Working Pressure (PSI)	175
Tank Type	Horizontal
Dia. (In.)	10
Length (In.)	20
Height (In.)	12
Standards	ASME U Code

THIS VESSEL CONFORMS TO FERMILAB ES&H MANUAL CHAPTER 5031

Vessel Title Vacuum lifter 4 tank two

Vessel Number 4-2

Vessel Drawing No. n/a

Maximum Allowable Working Pressure (MAWP)

Internal Pressure 175

External Pressure Not rated for external pressure

Working Temperature Range -20 ˚F 400 ˚F

Contents Compressed air

Designer / Manufacturer Speedaire

Test Pressure (if tested at Fermilab) Acceptance Date n/a

_____ PSIG, Hydraulic _____ Pneumatic _____

Accepted as conforming to standard by

_____

Of Division / Section _____

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

Figure 2. Sample of sticker to be completed and placed on vessel.

Kingston Safety & Relief Valves

Kingston Model 112CSS

ASME Code Safety Valve
Brass, Stainless Steel Ball

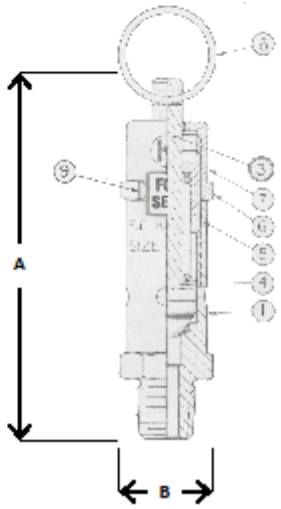
Features:

- Precision Machined Hard Seat
- Brass Construction
- Stainless Steel Ball & Spring
- Pull Ring for Manual Testing
- Three Sizes: 1/4 NPT, 3/8 NPT & 1/2 NPT
- ASME Certified - Stamped UV + NB
- Registered in All Canadian Provinces & Territories
- Maximum Temperature 400°F
- Set Pressure Range 25-300 PSIG
- Every Safety Valve Factory Set and Tested

Model	Available Sizes	Orifice	Figure/Part No	Dimensions (inches) Height (A)	Hex (B)	Set Pressure Range PSIG	Approximate Ship Weight	Max Temp
112CSS	1/4 NPT	.250	112CSS-2-000	3 1/8	3/4	25-300	4 oz	400°F
	3/8 NPT	.250	112CSS-3-000	3 1/8	3/4		4 oz.	
	1/2 NPT	.375	112CSS-4-000	3 3/4	7/8		7 oz.	

Materials

No.	Part Name	Materials
1	Body	Brass
3	Stem Assembly	Brass Stem, Stainless Steel Ball
4	Spring	Stainless Steel
5	Adjusting Screw	Brass
6	Lock Nut	Brass
7	Cap	Brass
8	Pull Ring	Stainless Steel
9	Seal	Vinyl



www.KingstonValves.com
KINGSTON
Storm Manufacturing Group
23201 Normandie Ave., Torrance CA 90501-5050
Toll Free: 866-628-8287 Fax: 800-997-0500 Direct: 310-326-8287

Relief Valve Sizing Calculations:

Source of pressure in the vessel is only the house air compressor.

Lifting fixture (and therefore this pressure vessel) is in a building with fire detector and fire suppressions systems. Engulfment in fire is not a credible source of vessel pressurization. This addresses paragraph UG-125 (2).

House Air Compressor has a capacity of 34.8 cfm at 175 psig according to the name plate data read by Ron Williams at the Far Detector Building in Ash River

House Air Receiver has a Relief valve information capacity of 178 cfm at 200 psig.

The lifting fixture compressed air tank has a relief valve capacity of 102 scfm.

Therefore, the relief valve capacity exceeds the capacity of the air source and this satisfies UG-133

Relief valve set point (105 psig) is less than the vessel MAWP (175 psig). This is acceptable per ASME B&PV code paragraph UG-125 (3) (b) and UG-134.

Relief valve is mounted directly on the vessel as required by UG-135. Relief valve discharges directly to the room air, no discharge piping is used.

UG-127 does not apply as a rupture disk is not used.
UG-128 does not apply as the vessel is not filled with liquid.
UG-129 has been satisfied by the relief valve manufacture with the data stamped on the relief valve.
UG-130 has been satisfied by the relief valve manufacture with the data stamped on the relief valve.
UG-131 has been satisfied by the relief valve manufacture.
UG-132 does not apply as a non-reclosing pressure relief is not used.
UG-133 has been satisfied as described above.
UG-134 has been satisfied as the relief valve set point does not exceed the vessel MAWP
UG-135 has been satisfied as the relief in on the top of the vessel.
UG-136 has been satisfied by the relief valve manufacture.
UG-137 does not apply as a rupture disk is not used.

CGA S-1.1 and S-1.3: CGA S-1.1 applies to compressed gas cylinders. This vessel is not a compressed gas cylinder. CGA S-1.3 has two paragraphs applicable to the relief valve sizing for this vessel. Installed relief has more capacity than required by this calculation.

CGA 1.3 paragraph 6.2.1 Minimum Required flow capacity for an uninsulated container of non-liquefied compressed gas

Symbol	description	Units	Value	Comments
Qa	Required Flow capacity	cfm	0.01957	
P	MAWP in absolute units	psia	189.4	
V	Receiver Volume	ft3	0.802083	
C	Gas Constant	n/a	356	for air and k = 1.4
M	molecular weight	n/a	29	for air
Z	Compressibility factor	n/a	0.9958	for air at 200 psi and 68 F

CGA 1.3 paragraph 6.3.1 Minimum Required flow capacity for an uninsulated container of non-liquefied compressed gas under fire conditions

Symbol	description	Units	Value	Comments
A prd	Required relief device flow area	in^2	**0.001221**	must be larger than 0.003
S	Safegarding Factor	n/a	0.3	0.3 for vessels in water fire protection, 1 otherwise
A	Container exterior area	ft^2	5.5	
k	ratio of specific heats	n/a	1.4	for air
M	molecular weight	n/a	29	for air
C	Gas Constant	n/a	356	for air and k = 1.4
Kd	Discharge Coefficient	n/a	0.975	for gas
P	MAWP in absolute units	psia	189.4	
D	Diameter	0.833333	ft	
H	Height	1.666667	ft	
A shell	Shell Area	4.4	ft^2	
A End	End Area	0.5	ft^2	
A total	Total area	5.5	ft^2	

Relief Orifice Area

	Inlet Hole diameter	inches	0.375
	Inlet Orifice area	in^2	0.110447
	Plunger displacement	inches	0.0625
	Seat area at above displacement	in^2	0.073631
	Number of outlet holes		4
	Outlet hole diameter	inches	0.25
	Outlet Hole area	in^2	0.785398

See FC Kingston data sheet for orifice dimensions
The outlet area on the same valve is four holes, each 0.25 inches in diameter.
The area across the valve seat depends on the amount of displacement on the valve.

The seat displacement is measured to be at least 1/16th of an inch