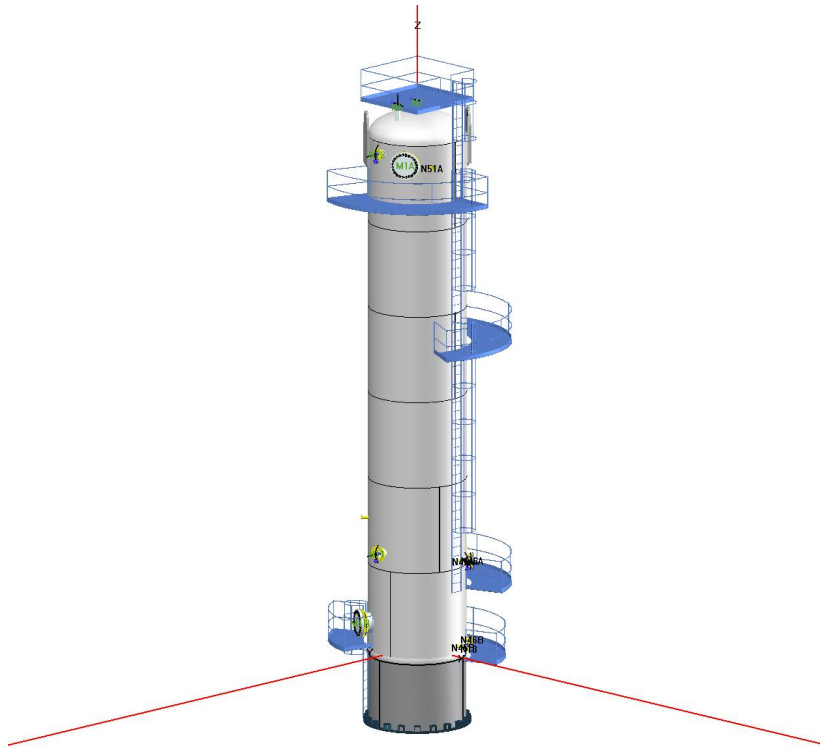


Your Company Name Here

Your Address Here



COMPRESS Pressure Vessel Calculations Rev 1

Contact: Engineer's Name Here

Item: Example Amine Absorber

Drawing No: 12345-1 Rev 3

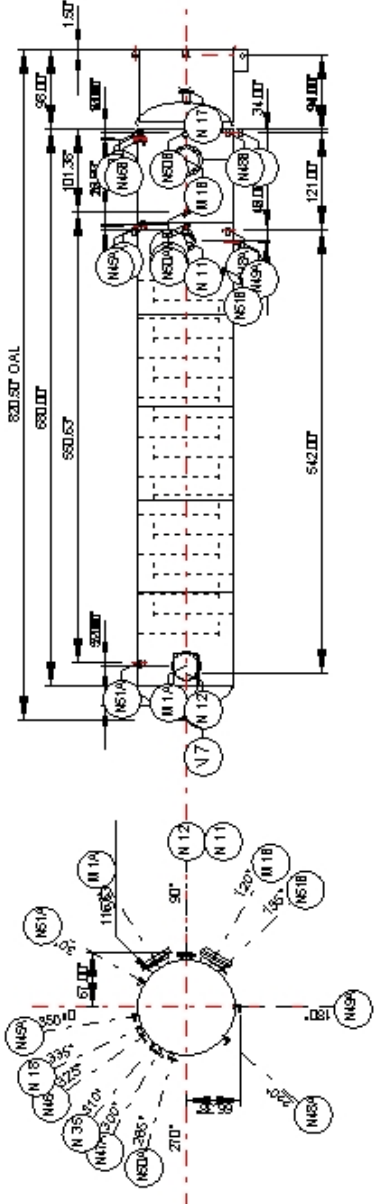
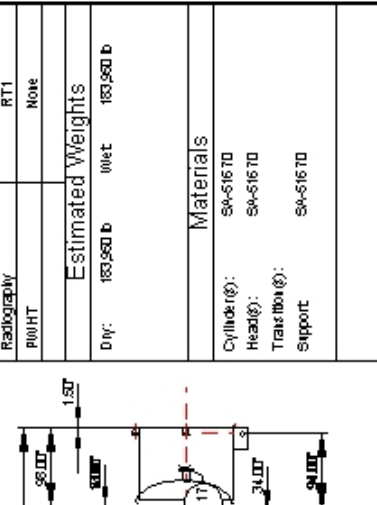
Customer:

Size: 114"ID x 57'-0" Tan/Tan x 400 psig DP @ -20/400 F.

Date: Monday, February 5, 2007

**Vessel is 114"ID x 57'-0" Tan/Tan x 400 psig DP @ -20/400 F.
LIFT LUG CALCULATION INCLUDED**

DESIGN DATA	
Design Pressure	400 psi
Vacuum Pressure	0 psi
Test Pressure (SMF)	539.35 psi
Test Pressure (FKP)	539.35 psi
Design Temperature	400 °F
MDMT	-20 °F
Corrosion Allowance	0"
Radiography	RT1
PIUHT	Note
Estimated Weights	
Dry:	183,950 b
Wet:	183,950 b
Materials	
Cylinder(s):	SA-516 70
Head(s):	SA-516 70
Transition(s):	
Support:	SA-516 70

NOZZLE SCHEDULE										
MARK	NOZZLE	SIZE & SCH	FLANGE	MARK	NOZZLE	SIZE & SCH	FLANGE	REV	DATE	DESCRIPTION
N45A	N45A NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C	N47B	N47B NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C			
N45B	N45B NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C	N47C	N47C NPS 3 RF100	3" 10# A105 C B&E	3" 10# N A350 LF2C			
N51B	N51B NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C	N48	N48 NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C			
N11	N11 NPS 12 RF100	12" X Heavy	12" 10# N A105 C B&E	N35	N35 NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C			
M1A	M1A NPS 24 RF100	24" X Heavy	24" 10# N A105 C B&E	N18	N18 NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C			
N51A	N51A NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C	N47A	N47A NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C			
N12	N12 NPS 8 RF100	8" X Heavy	8" 10# N A105 C B&E	N46A	N46A NPS 3 RF100	3" 10# A105 C B&E	3" 10# N A350 LF2C			
N7	N7 NPS 12 RF100	12" X Heavy	12" 10# N A105 C B&E	N46B	N46B NPS 2 RF100	2" 10# A105 C B&E	2" 10# N A350 LF2C			
N6	N6 NPS 6 RF100	6" X Heavy	6" 10# N A105 C B&E	N50A	N50A NPS 3 RF100	3" 10# A105 C B&E	3" 10# N A350 LF2C			
MARK	NOZZLE	SIZE & SCH	FLANGE	MARK	NOZZLE	SIZE & SCH	FLANGE	REV	DATE	DESCRIPTION

REVISIONS	
DWN BY:	General Arrangement
CHK BY:	
145665-1	
DWG NO.	DATE:
Rev	0

ABC Fabricators Inc.
2600 Washington Blvd.
Dallas, TX, 75204

Am the asserter

Hydrostatic Test

Shop test pressure determination for Chamber bounded by Bottom Ellipsoidal Head #2 and Top Ellipsoidal Head #1 based on MAWP per UG-99(b)

Shop hydrostatic test gauge pressure is 539.36 psi at 68 °F (the chamber MAWP = 414.892 psi)

The shop test is performed with the vessel in the horizontal position.

Identifier	Local test pressure psi	Test liquid static head psi	UG-99 stress ratio	UG-99 pressure factor	Stress during test psi	Allowable test stress psi	Stress excessive?
Top Ellipsoidal Head #1 (1)	543.788	4.428	1	1.30	23,543	34,200	No
Straight Flange on Top Ellipsoidal Head #1	543.788	4.428	1	1.30	20,980	34,200	No
Cylinder #1	543.788	4.428	1	1.30	25,122	34,200	No
Cylinder #2	543.788	4.428	1	1.30	25,122	34,200	No
Cylinder #3	543.788	4.428	1	1.30	25,122	34,200	No
Cylinder #4	543.788	4.428	1	1.30	25,122	34,200	No
Cylinder #5	543.788	4.428	1	1.30	25,122	34,200	No
Cylinder #6	543.788	4.428	1	1.30	25,122	34,200	No
Straight Flange on Bottom Ellipsoidal Head #2	543.788	4.428	1	1.30	20,980	34,200	No
Bottom Ellipsoidal Head #2	543.788	4.428	1	1.30	23,543	34,200	No
M1A NPS 24 RFWN (1.25"wt. 23.25"ID) Manway (M1A)	540.93	1.57	1	1.30	24,231	51,300	No
M1B NPS 24 RFWN (1.25"wt. 23.25"ID) Manway (M1B)	543.36	3.999	1	1.30	24,340	51,300	No
N11 NPS 12 RFWN S/XH(0.5"wt) Vapor Feed Nozzle (N11)	541.938	2.578	1	1.30	22,799	51,300	No
N12 NPS 8 RFWN S/XH(0.5"wt) Amine Feed Nozzle (N12)	541.864	2.503	1	1.30	22,346	51,300	No
N17 NPS 8 RFWN S/XH(0.5"wt) Amine Outlet Nozzle (N17)	541.864	2.503	1	1.30	23,296	51,300	No
N18 NPS 2 RFLWN(0.655"wt) HC liquid Outlet Nozzle (N18)	539.831	0.471	1	1.30	27,013	51,300	No
N35 NPS 2 RFLWN(0.655"wt) Steam Out Nozzle (N35)	540.399	1.039	1	1.30	27,042	51,300	No
N45A NPS 2 RFLWN(0.655"wt) LG-1012 Nozzle (N45A)	539.657	0.297	1	1.30	27,005	51,300	No
N45B NPS 2 RFLWN(0.655"wt) LG-1012 Nozzle (N45B)	539.657	0.297	1	1.30	27,005	51,300	No
N46A NPS 3 RFLWN(0.810"wt) LT-17 Nozzle (N46A)	540.031	0.671	1	1.30	27,693	51,300	No
N46B NPS 3 RFLWN(0.810"wt) LT-17 Nozzle (N46B)	540.031	0.671	1	1.30	27,693	51,300	No
N47A NPS 2 RFLWN(0.655"wt) LSH-48 Nozzle (N47A)	540.704	1.344	1	1.30	27,057	51,300	No
N47B NPS 2 RFLWN(0.655"wt) LSH-48 Nozzle (N47B)	540.704	1.344	1	1.30	27,057	51,300	No
	543.585	4.224	1	1.30	27,201	51,300	No

N48A NPS 2 RFLWN(0.655"wt) LG-105 Nozzle (N48A)							
N48B NPS 2 RFLWN(0.655"wt) LG-105 Nozzle (N48B)	543.585	4.224	1	1.30	27,201	51,300	No
N49A NPS 2 RFLWN(0.655"wt) LI-1011 Nozzle (N49A)	544.122	4.762	1	1.30	27,228	51,300	No
N49B NPS 2 RFLWN(0.655"wt) LI-1011 Nozzle (N49B)	544.122	4.762	1	1.30	27,228	51,300	No
N50A NPS 3 RFLWN(0.81"wt) LT-16 Nozzle (N50A)	541.233	1.873	1	1.30	27,755	51,300	No
N50B NPS 3 RFLWN(0.81"wt) LT-16 Nozzle (N50B)	541.233	1.873	1	1.30	27,755	51,300	No
N51A NPS 2 RFLWN(0.655"wt) PDT-118 Nozzle (N51A)	539.919	0.559	1	1.30	27,018	51,300	No
N51B NPS 2 RFLWN(0.655"wt) PDT-118 Nozzle (N51B)	543.446	4.086	1	1.30	27,194	51,300	No
N6 NPS 6 RFWN(0.432"wt) S/80 Purge Nozzle (N6)	541.83	2.47	1	1.30	23,335	51,300	No
N7 NPS 12 RFWN(0.500"wt) S/XH Vapor Outlet Nozzle (N7)	541.938	2.578	1	1.30	25,078	51,300	No

Notes:

- (1) Top Ellipsoidal Head #1 limits the UG-99 stress ratio.
- (2) P_L stresses at nozzle openings have been estimated using the method described in PVP-Vol. 399, pages 77-82.
- (3) $1.5 \times 0.9 \times S_y$ used as the basis for the maximum local primary membrane stress at the nozzle intersection P_L .
- (4) The zero degree angular position is assumed to be up, and the test liquid height is assumed to the top-most flange.

The test temperature of 68 °F is warmer than the minimum recommended temperature of 6 °F so the brittle fracture provision of UG-99(h) has been met.

Field test pressure determination for Chamber bounded by Bottom Ellipsoidal Head #2 and Top Ellipsoidal Head #1 based on MAWP per UG-99(b)

Field hydrostatic test gauge pressure is 539.36 psi at 68 °F (the chamber MAWP = 414.892 psi)

The field test is performed with the vessel in the vertical position.

Identifier	Local test pressure psi	Test liquid static head psi	UG-99 stress ratio	UG-99 pressure factor	Stress during test psi	Allowable test stress psi	Stress excessive?
Top Ellipsoidal Head #1 (1)	540.894	1.534	1	1.30	23,418	34,200	No
Straight Flange on Top Ellipsoidal Head #1	540.894	1.534	1	1.30	20,868	34,200	No
Cylinder #1	544.989	5.629	1	1.30	25,178	34,200	No
Cylinder #2	549.079	9.719	1	1.30	25,366	34,200	No
Cylinder #3	553.17	13.81	1	1.30	25,555	34,200	No
Cylinder #4	557.26	17.9	1	1.30	25,744	34,200	No
Cylinder #5	561.35	21.99	1	1.30	25,933	34,200	No
Cylinder #6	565.44	26.08	1	1.30	26,122	34,200	No
Straight Flange on Bottom Ellipsoidal Head #2	565.513	26.152	1	1.30	21,818	34,200	No
Bottom Ellipsoidal Head #2	566.544	27.184	1	1.30	24,528	34,200	No
M1A NPS 24 RFWN (1.25"wt. 23.25"ID) Manway (M1A)	542.144	2.784	1	1.30	24,285	51,300	No
M1B NPS 24 RFWN (1.25"wt. 23.25"ID) Manway (M1B)	564.524	25.164	1	1.30	25,288	51,300	No
N11 NPS 12 RFWN S/XH(0.5"wt) Vapor Feed Nozzle (N11)	560.743	21.383	1	1.30	23,590	51,300	No
N12 NPS 8 RFWN S/XH(0.5"wt) Amine Feed Nozzle (N12)	541.537	2.177	1	1.30	22,333	51,300	No
N17 NPS 8 RFWN S/XH(0.5"wt) Amine Outlet Nozzle (N17)	567.245	27.885	1	1.30	24,387	51,300	No
N18 NPS 2 RFLWN(0.655"wt) HC liquid Outlet Nozzle (N18)	565.332	25.972	1	1.30	28,290	51,300	No
N35 NPS 2 RFLWN(0.655"wt) Steam Out Nozzle (N35)	565.296	25.936	1	1.30	28,288	51,300	No
N45A NPS 2 RFLWN(0.655"wt) LG-1012 Nozzle (N45A)	561	21.64	1	1.30	28,073	51,300	No
N45B NPS 2 RFLWN(0.655"wt) LG-1012 Nozzle (N45B)	565.116	25.755	1	1.30	28,279	51,300	No
	561.235	21.875	1	1.30	28,780	51,300	No

N46A NPS 3 RFLWN(0.810"wt) LT-17 Nozzle (N46A)							
N46B NPS 3 RFLWN(0.810"wt) LT-17 Nozzle (N46B)	565.025	25.665	1	1.30	28,975	51,300	No
N47A NPS 2 RFLWN(0.655"wt) LSH-48 Nozzle (N47A)	561.24	21.879	1	1.30	28,085	51,300	No
N47B NPS 2 RFLWN(0.655"wt) LSH-48 Nozzle (N47B)	561.817	22.457	1	1.30	28,114	51,300	No
N48A NPS 2 RFLWN(0.655"wt) LG-105 Nozzle (N48A)	561	21.64	1	1.30	28,073	51,300	No
N48B NPS 2 RFLWN(0.655"wt) LG-105 Nozzle (N48B)	565.368	26.008	1	1.30	28,291	51,300	No
N49A NPS 2 RFLWN(0.655"wt) LI-1011 Nozzle (N49A)	560.459	21.099	1	1.30	28,046	51,300	No
N49B NPS 2 RFLWN(0.655"wt) LI-1011 Nozzle (N49B)	565.368	26.008	1	1.30	28,291	51,300	No
N50A NPS 3 RFLWN(0.81"wt) LT-16 Nozzle (N50A)	561.018	21.658	1	1.30	28,769	51,300	No
N50B NPS 3 RFLWN(0.81"wt) LT-16 Nozzle (N50B)	565.314	25.954	1	1.30	28,990	51,300	No
N51A NPS 2 RFLWN(0.655"wt) PDT-118 Nozzle (N51A)	541.941	2.581	1	1.30	27,119	51,300	No
N51B NPS 2 RFLWN(0.655"wt) PDT-118 Nozzle (N51B)	559.268	19.908	1	1.30	27,986	51,300	No
N6 NPS 6 RFWN(0.432"wt) S/80 Purge Nozzle (N6)	539.937	0.577	1	1.30	23,253	51,300	No
N7 NPS 12 RFWN(0.500"wt) S/XH Vapor Outlet Nozzle (N7)	539.748	0.388	1	1.30	24,977	51,300	No

Notes:

- (1) Top Ellipsoidal Head #1 limits the UG-99 stress ratio.
- (2) P_L stresses at nozzle openings have been estimated using the method described in PVP-Vol. 399, pages 77-82.
- (3) $1.5 \cdot 0.9 \cdot S_y$ used as the basis for the maximum local primary membrane stress at the nozzle intersection P_L .

The test temperature of 68 °F is warmer than the minimum recommended temperature of 6 °F so the brittle fracture provision of UG-99(h) has been met.