## Cylindrical Shell - Internal pressure

Date: 25-May-10 Page 1 of 2

ASME Code VIII Div I

| | | | |
|---|---|---|---|
| Petrogas Energy Services Ltd. | <- Client | CRN: | H5920.2 |
| V-303 Ethane Storage | <- Vessel | Mfg. S/N: | 3142 |
| VIII div. 1 | <- Section | Dwg. No: | 3142 |
| Sweet | <- Service | Jurisdiction No: | A2501321 |
| Full | <- RT Examination | Year of Mfg: | 1989 |
| Terry Williams P. Eng. | <- Designed/Verified | Job No: | 10-1093 |
| | <- Reviewed by | ASME Code: | UW 12 (a) 1989 |

**Comment:** No comments

**Recommendation:** No concerns

***Dimensions:***

| | | Metric |
|---|---|---|
| 148.000 | <- Do - Outside diameter, in. | 3759.20 mm |
| 2.0000 | <- tw Nominal wall thickness, in. | 50.80 mm |
| 96.000 | <- L, Length, in. | 2438.40 mm |
| 0.063 | <- C.A, Corrosion Allowance, in. | 1.59 mm |
| 0.000% | <- UT, Undertolerance, % | 0.00% |

***Material properties:***

| | | |
|---|---|---|
| SA 516 70N | <- Material | SA 516 70N |
| 17500.000 | <- S, Allowable Stress Level, psi | 120.66 MPa |
| 38000.000 | <- Sy, Allowable Yield Stress Level, psi | 262.01 MPa |
| 451.000 | <- P, Design Pressure, psig | 3.11 MPa |
| -20.000 | <- MDMT, $^0$F | -28.89 °C |
| 200.000 | <-T, Maximum Design Temperature, $^0$F | 93.33 °C |
| 1.000 | <- Joint Efficiency - Elong - Longitudinal Seam | 1.00 |
| 1.000 | <- Joint Efficiency - Ecirc - Circular Connecting Weld | 1.00 |

***Variables:***

| | | |
|---|---|---|
| 1563457.566 | <- V, Inside volume without corrosion allowance (PI()*(Do-2*tw)^2/4*L), in^3 | 25.62 m^3 |
| 72.063 | <- Ri, Inside radius with corrosion allowance (Do/2- tw + C.A), in | 1830.39 mm |
| 1.938 | <- t, Actual available thickness (tw - C.A - UT*tw), in | 49.21 mm |

***Required Wall Thickness*** UG-27 (c) (1-2)

Here, 0.385*S*Elong= 6737.5 >P ? **Yes**

$$tlong. = \frac{P*Ri}{S*Elong - 0.6*P} = \frac{451 * 72.0625}{17500 * 1 - 0.6*451}$$

tlong = 1.8863 in 47.91 mm

Here, 1.25*S*Ecirc= 21875 >P ? **Yes**

$$tcirc = \frac{P*Ri}{2*S*Ecirc + 0.4*P} = \frac{451 * 72.0625}{2 * 17500 * 1 + 0.4 * 451}$$

tcirc = 0.924 in 23.46 mm

**Okay** Minimum Required Thickness, Tmin = **1.8863** in **47.91** mm

Minimum required thickness with corrosion allowance, Tr = Tmin+C.A, Tr = 1.9488 in **49.50** mm

***Maximum Working Pressure*** UG-27 (c) (1-2)

$$P_{max(long.)} = \frac{S*E_{long}*t}{R_i + 0.6t} = \frac{17500 * 1 * 1.938}{72.0625 + 0.6 * 1.938}$$

Pmax(long.) = 463 psig 3.19 MPa

$$P_{max(circ.)} = \frac{2SE_{circ}*t}{R_i - 0.4t} = \frac{2 * 17500 * 1 * 1.938}{72.0625 - 0.4 * 1.938}$$

Pmax(circ.) = 951 psig 6.56 MPa

**Okay**

Pmax = **463** psig **3.19** MPa

Phydro = 1.3*P = 451 * 1.3

Phydro = **586** psig **4.04** MPa

**Pmax < Phydro**

***Maximum Stress for test pressure =***

$$S_{circ} = \frac{P_{hydro}* [R_i + 0.6t]}{E_{long} * t} = \frac{586.3* [72.0625 + 0.6 * 1.938]}{1 * 1.938}$$

Scirc = ***22,158*** psi 153 MPa

$$S_{long} = \frac{P_{hydro} * (R_i - 0.4t)}{2 * E_{circ} * t} = \frac{586.3* [72.0625 - 0.4 * 1.938]}{2 * 1.938}$$

Slong = ***10,786*** psi 74 MPa

Allowable Stress Level, S = 17,500 psi 121 MPa

Yield Stress Level, Sy = 38,000 psi 262 MPa

Smax = Maximum(Scirc,Slong)

Smax = ***22,158*** psi 153 MPa

Design Criteria **Okay**

Yield Criteria **Okay**

% Yield = **58%**