## Pipe Wall Thickness Calculation followed ASME B31.3

**Pipe Information**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Position | : | **Outlet Piping** | | | | | |
| Fluid | : | Natural Gas | | | | | |
| Operating Pressure: Min./Nor./Max. | : | 25 | / | 27 | / | 60 | Psig |
| Design Pressure | : | 60 | | | | | Psig ; (Max. SSV Run B) |
| Design Temperature | : | 60-120 | | | | | $^{O}$F |
| Sum of mechanical allowances | : | 3 | | | | mm. ; 0.118 inch | |
| Pipe Material | : | *API 5L Gr.B* | | | | *Sch.80* | |
| Pipe Diameter | : | *1* | | | | inch | |
| Outside diameter (D) | : | 1.315 | | | | inch | |
| Wall Thickness (tselect) | : | 0.179 | | | | inch | |
| Stress Value for Material (Psig) | : | 20000 | | | | Psig ; (20 KSI) | |

**Calculation**

304.1.2 : Strainht Pipe under Internal Presure, Minimum Required Thickness for pipe is determined
by the following formula from ASME B31.3 Process Piping, para 304.1

$$t_{design} = \frac{PD}{2(SEW+PY)} \;\; ; (3a) \qquad or \qquad t_{design} = \frac{P(d+2c)}{2[SEW-P(1-Y)]} \;\; ; (3b) \qquad \textit{(ASME B 31.3)}$$

tdesign = Pressure design thickness, inch.

D = Outside diameter of pipe, inch.

d = Max. inside diameter of pipe, inch.

E = Quality factor, Table A-1A or A-1B

S = Stress Value for Material (Psig)

P = Internal Gauge Pressure (Psig)

W = Weld Joint Strength Reduction factor, para 302.3.5(e)

Y = Coefficient, Table 304.1.1

c = Sum of mechanical allowances (inch)

When;

| | | | | |
|---|---|---|---|---|
| tselect | = | 0.179 | inch | |
| D | = | 1.315 | inch | |
| d | = | 0.957 | inch | |
| E | = | 0.85 | | |
| S | = | 20000 | Psig | |
| P | = | 60 | Psig | |
| W | = | 0.7 | | |
| Y | = | 0.4 | | |
| c | = | 0.118 | inch | |

| | | | | |
|---|---|---|---|---|
| **tdesign** | **=** | **0.003** | **inch** | ; (3a) |
| **tdesign** | **=** | **0.003** | **inch** | ; (3b) |

[tselect ( 0.179 inches) > tdesign Max.(3a,3b)]  **PASS**

## FITTING Wall Thickness (ELBOW, TEE REDUCER) followed ASME B31.3

### Pipe Information

| | | | |
|---|---|---|---|
| Position | : | **Outlet Piping** | |
| Fluid | : | Natural Gas | |
| Operating Pressure: Min./Nor./Max. | : | 25 / 27 / 60 | Psig |
| Design Pressure | : | 60 | Psig ; (Max. SSV Run B) |
| Design Temperature | : | 60-120 | O F |
| Sum of mechanical allowances | : | 3 | mm. ; 0.118 inch |
| Fitting Material | : | *Fitting Material ASTM A234 WPB* | |
| Pipe Diameter | : | *1* | inch |
| Outside diameter (D) | : | 1.315 | inch |
| Wall Thickness (tselect) | : | 0.179 | inch |
| Stress Value for Material (Psig) | : | 20000 | Psig ; (20 KSI) |

### Calculation

304.1.2 : Strainht Pipe under Internal Presure, Minimum Required Thickness for pipe is determined
by the following formula from ASME B31.3 Process Piping, para 304.1

$$\text{tdesign} \quad \frac{PD}{2(SEW+PY)} \quad ; (3a) \qquad \text{or} \qquad \text{tdesign} \quad \frac{P(d+2c)}{2[SEW-P(1-Y)]} \quad ; (3b) \quad \textit{(ASME B 31.3)}$$

tdesign = Pressure design thickness, inch.

D = Outside diameter of pipe, inch.

d = Max. inside diameter of pipe, inch.

E = Quality factor, Table A-1A or A-1B

S = Stress Value for Material (Psig)

P = Internal Gauge Pressure (Psig)

W = Weld Joint Strength Reduction factor, para 302.3.5(e)

Y = Coefficient, Table 304.1.1

c = Sum of mechanical allowances (inch)

When;

| | | | |
|---|---|---|---|
| tselect | = | 0.179 | inch |
| D | = | 1.315 | inch |
| d | = | 0.957 | inch |
| E | = | 0.85 | |
| S | = | 20000 | Psig |
| P | = | 60 | Psig |
| W | = | 0.7 | |
| Y | = | 0.4 | |
| c | = | 0.118 | inch |

| | | | | |
|---|---|---|---|---|
| **tdesign** | **=** | **0.003** | **inch** | ; (3a) |
| **tdesign** | **=** | **0.003** | **inch** | ; (3b) |
| **[tselect** | **(** | **0.179** | **inches) > tdesign Max.(3a,3b)]** | **PASS** |

| Pipe Size (inch) | OD (Inch) | 5S | 10S | 10 | 20 | 30 | STD | 40S | 40 | 60 | XS | 80S | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 0.405 | | 0.049 | | | | 0.068 | 0.068 | 0.068 | | | | 0.095 | |
| 1/4 | 0.540 | | 0.065 | | | | 0.088 | 0.088 | 0.088 | | | | 0.119 | |
| 3/8 | 0.675 | | 0.065 | | | | 0.091 | 0.091 | 0.091 | | | | 0.126 | |
| 1/2 | 0.840 | 0.065 | 0.083 | | | | 0.109 | 0.109 | 0.109 | | | | 0.147 | |
| 3/4 | 1.050 | 0.065 | 0.083 | | | | 0.113 | 0.113 | 0.113 | | | | 0.154 | |
| 1 | 1.315 | 0.065 | 0.109 | | | | 0.133 | 0.133 | 0.133 | | | | 0.179 | |
| 1 1/4 | 1.660 | 0.065 | 0.109 | | | | 0.140 | 0.140 | 0.140 | | | | 0.191 | |
| 1 1/2 | 1.900 | 0.065 | 0.109 | | | | 0.145 | 0.145 | 0.145 | | | | 0.200 | |
| 2 | 2.375 | 0.065 | 0.109 | | | | 0.154 | 0.154 | 0.154 | | | | 0.218 | |
| 2 1/2 | 2.875 | 0.083 | 0.120 | | | | 0.203 | 0.203 | 0.203 | | | | 0.276 | |
| 3 | 3.500 | 0.083 | 0.120 | | | | 0.216 | 0.216 | 0.216 | | | | 0.300 | |
| 3 1/2 | 4.000 | 0.083 | 0.120 | | | | 0.226 | 0.226 | 0.226 | | | | 0.318 | |
| 4 | 4.500 | 0.083 | 0.120 | | | | 0.237 | 0.237 | 0.237 | | | | 0.337 | |
| 5 | 5.563 | 0.109 | 0.134 | | | | 0.258 | 0.258 | 0.258 | | | | 0.375 | |
| 6 | 6.625 | 0.109 | 0.134 | | | | 0.280 | 0.280 | 0.280 | | | | 0.432 | |
| 8 | 8.625 | 0.109 | 0.148 | | 0.250 | 0.277 | 0.322 | 0.322 | 0.322 | | | | 0.500 | |
| 10 | 10.750 | 0.134 | 0.165 | | 0.250 | 0.307 | 0.365 | 0.365 | 0.365 | | | | 0.594 | |
| 12 | 12.750 | 0.156 | 0.180 | | 0.250 | 0.330 | 0.375 | 0.375 | 0.406 | | | | 0.688 | |
| 14 | 14.000 | 0.156 | 0.188 | 0.250 | 0.312 | 0.375 | 0.375 | | 0.438 | | | | 0.750 | |
| 16 | 16.000 | 0.165 | 0.188 | 0.250 | 0.312 | 0.375 | 0.375 | | 0.500 | | | | 0.844 | |
| 18 | 18.000 | 0.165 | 0.188 | 0.250 | 0.312 | 0.438 | 0.375 | | 0.562 | | | | 0.938 | |
| 20 | 20.000 | 0.188 | 0.218 | 0.250 | 0.375 | 0.500 | 0.375 | | 0.594 | | | | 1.031 | |
| 22 | 22.000 | 0.188 | 0.218 | 0.250 | 0.375 | 0.500 | 0.375 | | | | | | 1.125 | |
| 24 | 24.000 | 0.218 | 0.250 | 0.250 | 0.375 | 0.562 | 0.375 | | 0.688 | | | | 1.219 | |
| 26 | 26.000 | | | 0.312 | 0.500 | | 0.375 | | | | | | | |
| 28 | 28.000 | | | 0.312 | 0.500 | 0.625 | 0.375 | | | | | | | |
| 30 | 30.000 | 0.250 | 0.312 | 0.312 | 0.500 | 0.625 | 0.375 | | | | | | | |
| 32 | 32.000 | | | 0.312 | 0.500 | 0.625 | 0.375 | | 0.688 | | | | | |
| 34 | 34.000 | | | 0.312 | 0.500 | 0.625 | 0.375 | | 0.688 | | | | | |
| 36 | 36.000 | | | 0.312 | 0.500 | 0.625 | 0.375 | | 0.750 | | | | | |
| 38 | 38.000 | | | | | | 0.375 | | | | | | | |
| 40 | 40.000 | | | | | | 0.375 | | | | | | | |
| 42 | 42.000 | | | | | | 0.375 | | | | | | | |
| 44 | 44.000 | | | | | | 0.375 | | | | | | | |
| 46 | 46.000 | | | | | | 0.375 | | | | | | | |
| 48 | 48.000 | | | | | | 0.375 | | | | | | | |

Location Class
Class 1, l0.80
Class 1, l0.72
Class 2   0.60
Class 3   0.50
Class 4   0.40