

AS4041 Pressure Piping - Required Pressure Design Wall Thickness for Bends

Weld joint factor
AS4041 Table 3.12.2 or D12 $e := 1.00$

Class design factor
AS4041 Table 3.12.3 $M := 1.0$

Design temperature (C) $T := 525.00$

Weld joint strength reduction factor
AS4041 Table 3.1 $W := \begin{cases} 1 & T < 510.01 \\ 1 - \frac{T - 510}{610} & \text{otherwise} \end{cases} = 0.975$

Bend radius, measured to pipe centerline (mm) $R_1 := 1270$

Material design strength (MPa)
AS4041 Appendix D $f := 82.68$

Pipe outside diameter from pipe charts (mm) $Dia := 273.2$

Manufacturing tolerance
10% Australian pipes, 12.5% American pipes $tol := 12.5$

Corrosion allowance (mm) $C := 1.6$

Depth of threading, grooving or
machining (mm) $D_{tgm} := 0$

Design pressure (MPa) $P := 5.82$

I at the intrados $I_{\text{intrados}} := \frac{4 \cdot \frac{R_1}{Dia} - 1}{4 \cdot \frac{R_1}{Dia} - 2} = 1.060$

I at the extrados $I_{\text{extrados}} := \frac{4 \cdot \frac{R_1}{Dia} + 1}{4 \cdot \frac{R_1}{Dia} + 2} = 0.951$

Pressure design wall thickness at intrados

$$t_{f_intrados} := \frac{P \cdot Dia}{2 \cdot f \cdot e \cdot M \cdot I_{intrados} \cdot W + P} = 8.992$$

Pressure design wall thickness at extrados

$$t_{f_extrados} := \frac{P \cdot Dia}{2 \cdot f \cdot e \cdot M \cdot I_{extrados} \cdot W + P} = 9.982$$

Required wall thickness at intrados (mm)

$$t_{m_intrados} := \frac{100 \cdot (t_{f_intrados} + D_{tgm} + C)}{100 - tol} = 12.105$$

Required wall thickness at extrados (mm)

$$t_{m_extrados} := \frac{100 \cdot (t_{f_extrados} + D_{tgm} + C)}{100 - tol} = 13.237$$