

Dished End Calculations

Calculations for dished ends to *sub-section 3.5.2*

3.7.3.1 Ellipsoidal End (2 to 1)

Design pressure	p	=	1.35 N/mm ²
Design temperature		=	150 °C
Corrosion allowance	c	=	3.0 mm
Design stress at 20°C	f_a	=	160 N/mm ²
Design stress at 150°C	f	=	140 N/mm ²
Outside diameter	D	=	2540.0 mm
New thickness		=	20.0 mm
Thinning allowance		=	2.0 mm
After forming thickness	t	=	18.0 mm
Analysis thickness	e_a	=	15.0 mm
Corroded inside diameter	D_i	=	2510.0 mm

Minimum thickness for pressure for dished end to clause 3.5.2.3.2

External dished end height $h = D/4 = 2540/4 = 635$ mm

Effective dished end height $h_e = h = 635$ mm

Ratio $p/f = 1.35/140 = 0.009643$ Ratio $h_e/D = 0.25$

From Figure 3.5-2: ratio $e/D = 0.0053$

Alternatively, obtain ratio e/D from Table 3.5-2 by logarithmic interpolation

For $h_e/D = 0.25$ and $p/f = 0.006$, value of $e/D \times 10^3 = 3.56$

For $h_e/D = 0.25$ and $p/f = 0.010$, value of $e/D \times 10^3 = 5.5$

For $h_e/D = 0.25$ and $p/f = 0.009643$

$$\log(e/D \times 10^3) = \log 3.56 + \frac{(\log 0.009643 - \log 0.006)}{(\log 0.01 - \log 0.006)} \times (\log 5.5 - \log 3.56) = 0.726919$$

$$\therefore e/D = 0.00533235$$

Minimum required thickness of knuckle

$$e = 0.00533235 \times 2540 = 13.544 \text{ mm}$$