$t_a = 28mm$

$H = 25m$

$f = 100MPa$

Design Press. $= 1.05 \times 2\,MPa = 2.1\,MPa$

Corroded Shell Thickness $= 25mm$

$D_i = 2m$

$\gamma_s = 7.7 \times 10^4\,N/m^2$

$$W_{min} = \pi (D_i + t_a)\, t_a\, H\, \gamma_s$$

$$= \pi (2 + 28 \times 10^{-3})(28 \times 10^{-3})(25) \times 7.7 \times 10^4$$

$$= 343\,KN$$

$$W_l = \text{Weight of Water} = \frac{\pi D_i^2}{4} \times h_{shell} \times g \times \rho_w$$

$$= \frac{\pi}{4} \times 2^2 \times 25 \times 9.81 \times 1000$$

$$= 770\,kN$$

$$W_{max} = 343 + 770 = 1113\,kN$$

$$T_{min} = 6.35 \times 10^{-5} \times \left(\frac{H}{D}\right)^{\frac{3}{2}} \times \left(\frac{W_{min}}{t}\right)^{\frac{1}{2}}$$

$$= 6.35 \times 10^{-5} \times \left(\frac{30}{2}\right)^{\frac{3}{2}} \times \left(\frac{334}{0.026}\right)^{\frac{1}{2}}$$

$$= 0.42 \text{ sec} < 0.5 \text{ sec}, \quad K_1 = 1$$

$$T_{max} = 6.35 \times 10^{-5} \times \left(\frac{30}{2}\right)^{\frac{3}{2}} \times \left(\frac{1113}{0.026}\right)^{\frac{1}{2}}$$

$$= 0.76 \text{ sec} > 0.5 \text{ sec}, \quad K_2 = 2$$

$$P_w = K_1 K_2 P_w H D$$

$$P_{w(min)} = 0.7 \times 1 \times (0.05 \times 150^2) \times 2 \times 30$$
(0.1)

$$= 47.2 \text{ kN}$$

$$P_{w(max)} = 0.7 \times 2 \times (0.05 \times 150^2) \times 2.056 \times 30$$
(0.1)

$$= 97.1 \text{ kN}$$

$$M_{w(min)} = \underset{(P_{w(min)})}{47.2} \times \underset{(h/2)}{\frac{30}{2}} = 708 \text{ kNm}$$

$$M_{w(max)} = \underset{(P_{w(max)})}{97.1} \times \underset{(h/2)}{\frac{30}{2}} = 1456.5 \text{ kNm}$$

$$\sigma_{z\,wm\,(min)} = \frac{4 M_{w(min)}}{\pi D^2 t} = \frac{4 \times 708}{\pi \times 2^2 \times t}$$

$$= \frac{225.36}{t} \text{ kPa}$$

$$\sigma_{z\,wm\,(max)} = \frac{4 M_{w(max)}}{\pi D^2 t} = \frac{4 \times 1456.5}{\pi \times 2^2 \times t}$$

$$= \frac{463.6}{t} \text{ kPa}$$

$$\sigma_{z\,(min)} = \frac{W_{min}}{\pi D_o t} = \frac{343}{\pi \times 2 \times t} = \frac{54.5}{t} \text{ kPa}$$

$$\sigma_{z\,(max)} = \frac{W_{max}}{\pi D_o t} = \frac{1113}{\pi \times 2 \times t} = \frac{176.85}{t} \text{ kPa}$$

Max. Tensile Stress :-

$$\sigma_z = \sigma_{zwm}^{(max)} + \sigma_{zsm}^{(max)} - \sigma_{zw}^{(min)} = f_J$$

$$= \frac{463.6}{t} + \frac{362.8}{t} - \frac{54.5}{t} = 0.85 \times 100 \times 10^3$$

$$\Rightarrow t = 9.08 \text{ mm}$$

Max. Compresible stress :-

$$\sigma_z = \sigma_{zwm}^{(max)} + \sigma_{zsm}^{(max)} + \sigma_{zw}^{(max)} = \frac{0.125 E t}{D_o}$$

$$\Rightarrow \left[\frac{463.6}{t} + \frac{362.8}{t} + \frac{176.85}{t}\right] \times 10^3 = \frac{0.125 \times 2 \times 10^5 \times t \times 10^6}{2}$$

$$\Rightarrow t = 8.46 \text{ mm}$$

$\therefore$ Skirt Thickness = 9.08 mm

Actual skirt thickness = 9.08 + 2 = 11.08 mm

Standard skirt thickness = 12 mm
(Next highest)