4 Roof Design

4.1 Roof Loads

Dead loads

plate: t = 5 mm

$$G = 0.005 \cdot \pi \cdot \frac{53.035^2 \cdot \pi}{4} \cdot 78.5 = 866 \text{ kN}$$

stiffeners:

$$\sim 56 \cdot \left(\frac{53.03 - 4.0}{2}\right) \cdot 60 \cdot 10^{-2} = 823 \text{ kN}$$

Top roof girder:

$$4.0 \cdot \pi \cdot 2.0 = \sim 25 \text{ kN}$$

Top Angle:

$$53.035 \cdot \pi \cdot 1.0 = 167 \text{ kN}$$

Insulation deck

$$\frac{53.035^2 \cdot \pi}{4} \cdot 0.4 = 883 \text{ kN}$$

Live loads:

pressure: 2" H_2O : $P_1 = 0.51 \cdot \frac{53.035^2 \cdot \pi}{4}$

$= 1{,}126$ kN

1 psi : $P_2 = -6.9 \cdot \frac{53.035^2 \cdot \pi}{4}$

$= -15{,}235$ kN

live load : $1.2 \cdot \frac{53.035^2 \cdot \pi}{4} = 2{,}650$ kN

wind : -1,247 kN

max Q = 866 + 823 + 25 + 883 + 2,650 + 1,126
= 6,373 kN

min Q = 866 + (823 + 25 + 883) · 0.8 - 15,235
- 1,247 = -14,231 kN

$$\max q_{roof} = \frac{6{,}373 \cdot 4}{\pi \cdot 53.035^2} = 2.89 \text{ kN/m}^2$$

$$\min q_{roof} = \frac{-14{,}231 \cdot 4}{\pi \cdot 53.035^2} = -6.45 \text{ kN/m}^2$$