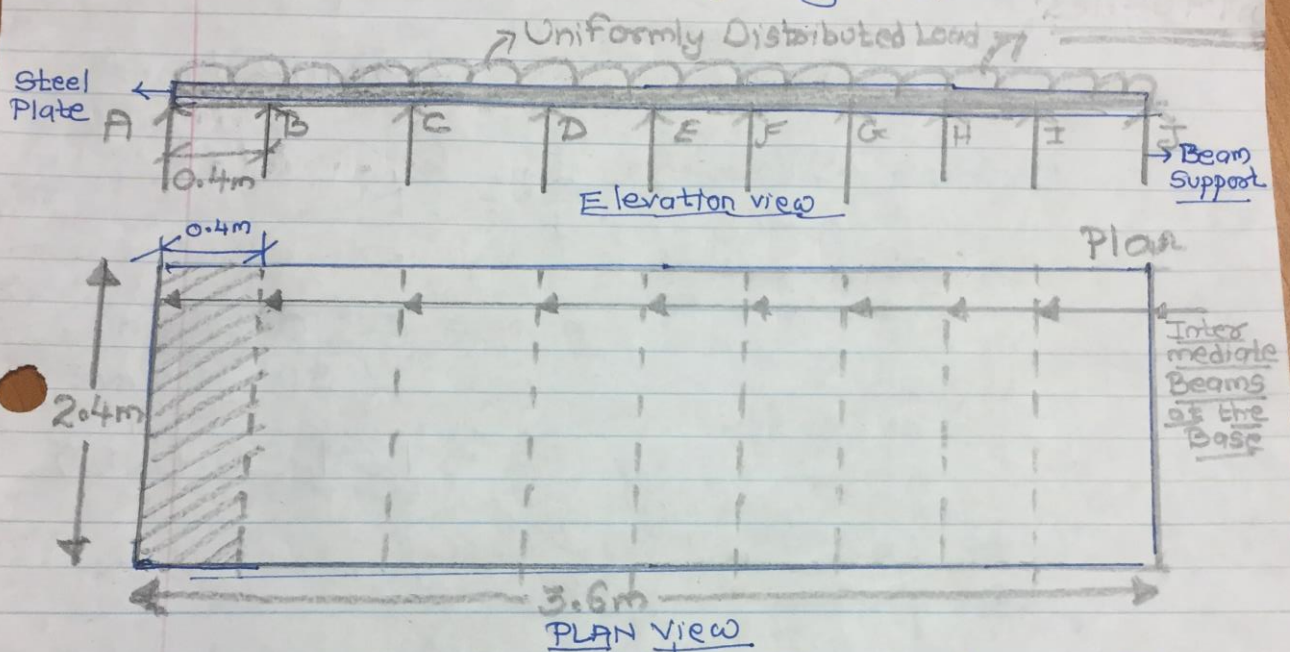


Floor Plate Design Thickness Calculation

⇒ Considering Plate as Beam
(Floor Plate)
supported on 02 Edges only
(in long direcⁿ)



$$\frac{L_y}{L_x} = \frac{2.4}{0.4} = 6$$

$$\frac{L_y}{L_x} = \frac{3.6}{2.4} = 1.5$$

Load = $w = 300 \text{ kN}$

Maximum mid span moment

$$M = \frac{w l^2}{8}$$

$$= \frac{(300)(0.4)^2}{8}$$

$$= 6 \text{ kNm}$$

Maximum deflection

$$\Delta_{\text{max}} = \frac{5 w l^4}{384 E I}$$

Section Modulus

$$S_{\text{min}} = \frac{M}{0.9 * F_y}$$

$$= \frac{6 * 10^3 * 10^3 \text{ N}\cdot\text{mm}}{0.9 * 250 \text{ N/mm}^2}$$

$$= 26,666.67 \text{ mm}^3$$

Thickness

$$t_{\text{min}} = \sqrt{\frac{6 * S_{\text{min}}}{b = 0.4 \text{ m}}} = 20 \text{ mm}$$

Choose 1" thick Plate

$$t = d = 25.4 \text{ mm}$$

Cross-check

$$\text{Elastic Section} = S = \frac{b d^2}{6}$$

Modulus

$$= \frac{(400)(25.4)^2}{6}$$

$$= 43610.67 \text{ mm}^3$$

Bending Stress

Stress

$$f_b = \frac{M}{S}$$

$$\left(\sigma = \frac{M y}{I} \right)$$

$$= \frac{6 \times 10^6 \text{ N}\cdot\text{mm}}{43610.67 \text{ mm}^3}$$

$$= \underline{\underline{139.50 \text{ N/mm}^2}}$$

Yield Stress

$$\text{for plate} = F_y = 250 \text{ MPa}$$

$$\phi F_y = 0.75 \times 250$$

$$= \underline{\underline{187.5 \text{ MPa}}}$$

$$f_b < F_y \Rightarrow \underline{\underline{\text{OK}}}$$

$$\text{Deflection} = \frac{5 \omega l^4}{384 E I}$$

$$= \frac{5 \times (300)(400)^4}{384 \times (200000) \times (546235.5)}$$

$$= 0.9153 \text{ mm} < \frac{L}{360} \rightarrow \underline{\underline{\text{OK}}}$$