

TEMA 4**DATOS**

$$P := 40 \text{ kN}$$

$$Q_y := P \cdot \cos(45^\circ) = 28,2843 \text{ kN}$$

$$Q_z := P \cdot \sin(45^\circ) = 28,2843 \text{ kN}$$

$$t := 1 \text{ in} = 25,4 \text{ mm}$$

$$bf := 300 \text{ mm}$$

$$d := 400 \text{ mm}$$

$$A_g := bf \cdot t + (d - t) \cdot t = 171,3484 \text{ cm}^2$$

$$z_G := \frac{bf \cdot t \cdot \left(d - \frac{t}{2}\right) + t \cdot (d - t) \cdot \left(\frac{d - t}{2}\right)}{A_g} = 276,2416 \text{ mm}$$

$$z_G := 275 \text{ mm}$$

$$J_{y_{calc}} := \frac{bf \cdot t^3}{12} + \left(\left(d - \frac{t}{2} - z_G \right)^2 \cdot bf \cdot t \right) + \frac{t \cdot (d - t)^3}{12} + \left(\left(z_G - \frac{d - t}{2} \right)^2 \cdot t \cdot (d - t) \right) = 28095,3387 \text{ cm}^4$$

$$J_{z_{calc}} := \frac{bf^3 \cdot t}{12} + \frac{t^3 \cdot (d - t)}{12} = 5766,155 \text{ cm}^4$$

$$J_{t_{calc}} := \frac{1}{3} \cdot bf \cdot t^3 + \frac{1}{3} \cdot (d - t) \cdot t^3 = 368,4904 \text{ cm}^4$$

$$J_y := 28095 \text{ cm}^4 \quad J_z := 5766 \text{ cm}^4 \quad J_t := 368 \text{ cm}^4$$

RESOLUCIÓN**Tensiones debidas a Qz**

$$\tau_1 := \frac{Q_z \cdot \left(\left(\frac{bf}{2} - \frac{t}{2} \right) \cdot t \cdot \left(d - \frac{t}{2} - z_G \right) \right)}{J_y \cdot t} = 0,1552 \frac{\text{kN}}{\text{cm}^2}$$

$$d - \frac{t}{2} - z_G = 112,3 \text{ mm}$$

$$\tau_2 := \frac{Q_z \cdot \left(bf \cdot t \cdot \left(d - \frac{t}{2} - z_G \right) \right)}{J_y \cdot t} = 0,3392 \frac{\text{kN}}{\text{cm}^2}$$

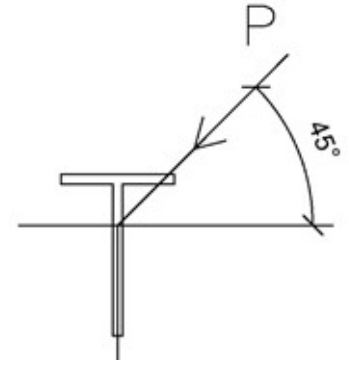
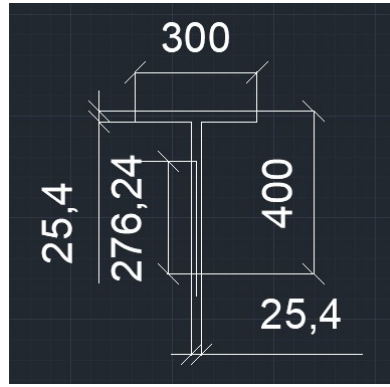
$$\tau_3 := \frac{Q_z \cdot \left(t \cdot z_G \cdot \frac{z_G}{2} \right)}{J_y \cdot t} = 0,3807 \frac{\text{kN}}{\text{cm}^2}$$

$$\tau_{3_aux} := \frac{Q_z \cdot \left(\left(bf \cdot t \cdot \left(d - \frac{t}{2} - z_G \right) \right) + \left(t \cdot (d - t - z_G) \cdot 49,17 \right) \right)}{J_y \cdot t}$$

Tensiones debidas a Qy

$$\tau_4 := \frac{Q_y \cdot \left(\left(\frac{bf}{2} - \frac{t}{2} \right) \cdot t \cdot \left(\frac{\left(\frac{bf}{2} - \frac{t}{2} \right)}{2} + \frac{t}{2} \right) \right)}{J_z \cdot t} = 0,5479 \frac{\text{kN}}{\text{cm}^2}$$

$$\frac{\left(\frac{bf}{2} - \frac{t}{2} \right)}{2} + \frac{t}{2} = 81,35 \text{ mm}$$



Tensiones debidas a Mt

Ubicación del CC y Mt debido a Qy excéntrico.

$$z_{CC} := d - \frac{t}{2} = 387,3 \text{ mm}$$

$$d_{CC} := z_{CC} - z_G = 112,3 \text{ mm}$$

$$Mt := Qy \cdot d_{CC} = 317,6324 \text{ kN cm}$$

$$\tau_5 := \frac{Mt \cdot t}{Jt} = 2,1924 \frac{\text{kN}}{\text{cm}^2}$$

Posibles puntos de máxima tensión

A: encuentro ala-alma, nodo inferior derecho

$$\tau_A := \tau_1 + \tau_4 + \tau_5 = 2,8955 \frac{\text{kN}}{\text{cm}^2}$$

MAX

B: baricentro (S máx), lado derecho

$$\tau_B := \tau_3 + \tau_5 = 2,573 \frac{\text{kN}}{\text{cm}^2}$$