

**TEMA 3****DATOS**

$$P := 25 \text{ kN}$$

$$Q_y := P \cdot \cos(45^\circ) = 17,6777 \text{ kN}$$

$$Q_z := P \cdot \sin(45^\circ) = 17,6777 \text{ kN}$$

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

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

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

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

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

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

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

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

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

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

**RESOLUCIÓN****Tensiones debidas a Qz**

$$\tau_1 := \frac{Q_z \cdot \left( \left( \frac{bf}{2} - \frac{t}{2} \right) \cdot t \cdot \left( d - \frac{t}{2} - z_G \right) \right)}{J_y \cdot t} = 0,097 \frac{\text{kN}}{\text{cm}^2}$$

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

$$\tau_2 := \frac{Q_z \cdot \left( bf \cdot t \cdot \left( d - \frac{t}{2} - z_G \right) \right)}{J_y \cdot t} = 0,212 \frac{\text{kN}}{\text{cm}^2}$$

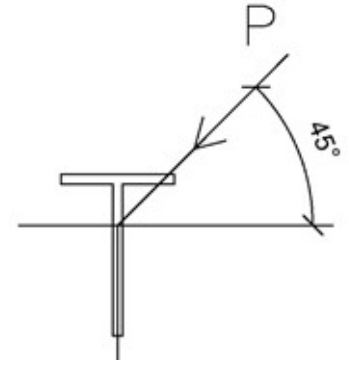
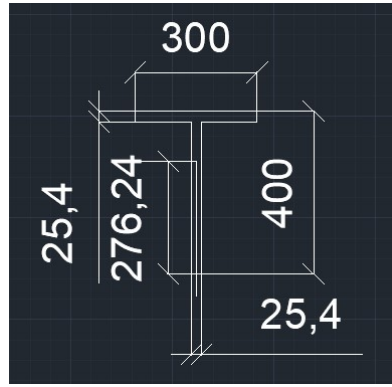
$$\tau_3 := \frac{Q_z \cdot \left( t \cdot z_G \cdot \frac{z_G}{2} \right)}{J_y \cdot t} = 0,2379 \frac{\text{kN}}{\text{cm}^2}$$

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

**Tensiones debidas a Qy**

$$\tau_4 := \frac{Q_y \cdot \left( \left( \frac{bf}{2} - \frac{t}{2} \right) \cdot t \cdot \left( \frac{\left( \frac{bf}{2} - \frac{t}{2} \right)}{2} + \frac{t}{2} \right) \right)}{J_z \cdot t} = 0,3424 \frac{\text{kN}}{\text{cm}^2}$$

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



Tensiones debidas a Mt

Ubicación del CC y Mt debido a Qy excéntrico.

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

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

$$Mt := Qy \cdot d_{CC} = 198,5202 \text{ kN cm}$$

$$\tau_5 := \frac{Mt \cdot t}{Jt} = 1,3702 \frac{\text{kN}}{\text{cm}^2}$$

Posibles puntos de máxima tensión

A: encuentro ala-alma, nodo inferior derecho

$$\tau_A := \tau_1 + \tau_4 + \tau_5 = 1,8097 \frac{\text{kN}}{\text{cm}^2}$$

MAX

B: baricentro (S máx), lado derecho

$$\tau_B := \tau_3 + \tau_5 = 1,6081 \frac{\text{kN}}{\text{cm}^2}$$