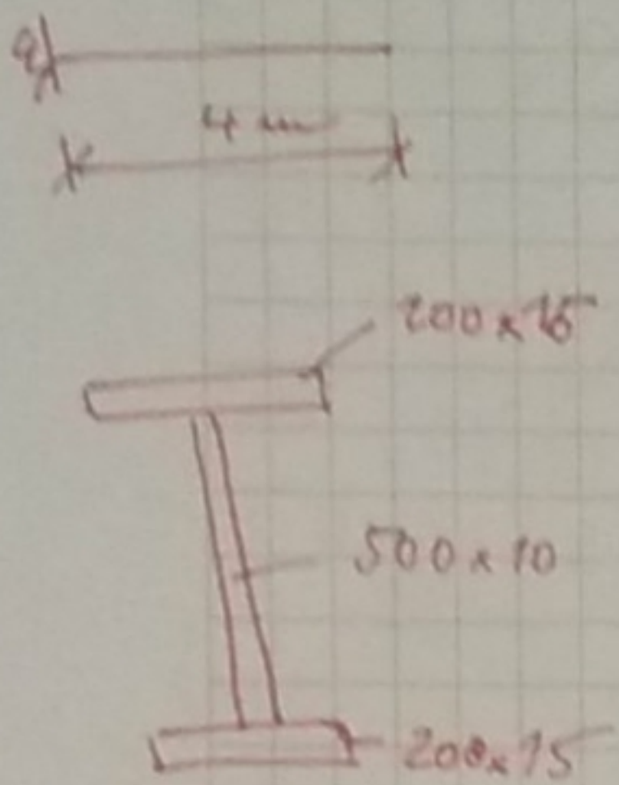
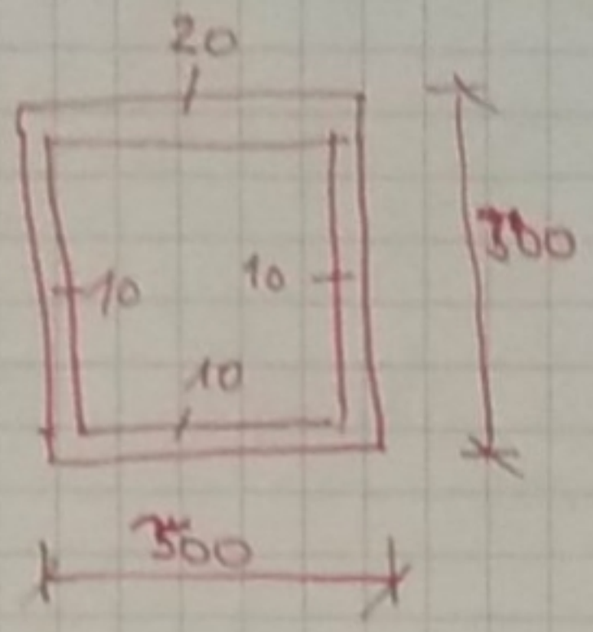
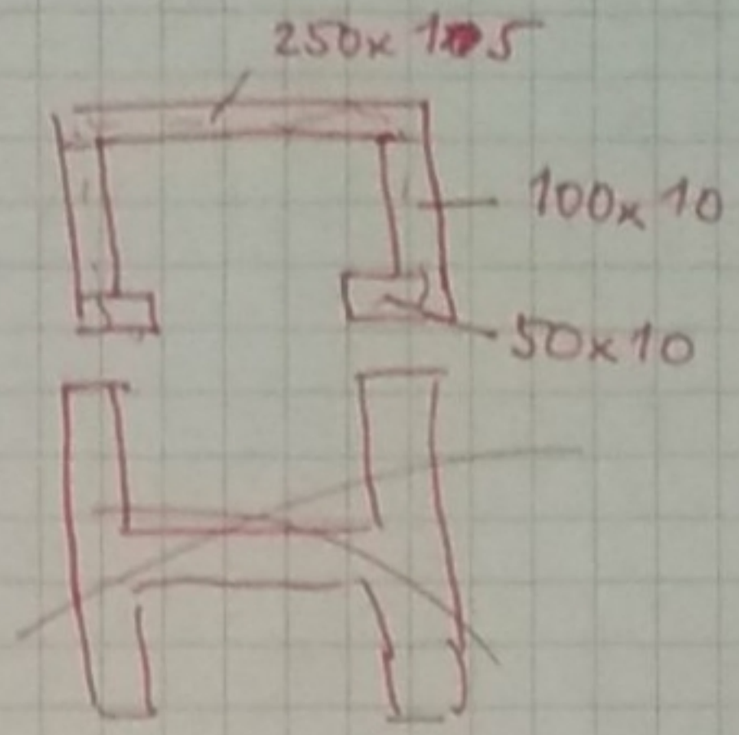
$T = 1\,\text{kNm}$ $\quad G = 81\,\text{GPa}$




$\varphi, \varphi = ?$

$$\varphi_l = \frac{Tl}{GI_t}$$

$$I_t = \frac{1}{3}\sum_{i=1}^{n} t_i h_i$$

$$I_t = \frac{1}{3}(2 \cdot 15^3 \cdot 200 + 10^3 \cdot 500)$$

$$= 616{,}6 \cdot 10^3\ \text{mm}^4$$

$$w_t = \frac{I_t}{t_{max}} = 41{,}1 \cdot 10^3\ \text{mm}^3$$

$$\tau_{max} = \frac{T}{w_t}$$

$$= \underline{24{,}32\ \text{MPa}}$$

$$\varphi_l = \underline{0{,}08\ \text{rad}}$$

$$I_t = \frac{4A_s^2}{\sum_{i=1}^{n} \frac{h_i}{t_i}}$$

$$I_t = \frac{4 \cdot (290 \cdot 285)^2}{2 \cdot \frac{285}{10} + \frac{290}{10} + \frac{290}{20}} =$$

$$= 271{,}88 \cdot 10^6\ \text{mm}^4$$

$$w_t = 2 A_s t_{min}$$

$$w_t = 2 (290 \cdot 285) \cdot 10 =$$

$$= 1653 \cdot 10^3\ \text{mm}^3$$

$$\tau = \frac{T}{w_t} = 604{,}96\ \text{kPa}$$

$$\varphi_l = 1{,}8163 \cdot 10^{-4}\ \text{rad}$$

$$I_t = \frac{1}{3}\left(15^3 \cdot \frac{240}{2} + 10^3 \cdot \frac{90}{2} \cdot 3\right) =$$

$$= \frac{45}{360} \cdot 10^3\ \text{mm}^4$$

$$w_t = \frac{I_t}{t_{max}} = \frac{45 \cdot 10^3}{24}\ \text{mm}^3$$

$$\tau_{max} = \underline{41{,}6\ \text{MPa}}$$

$$\varphi_l = \underline{0{,}737\ \text{rad}}$$