

4.3 Potrebno je odrediti dimenzije pravokutnog poprečnog presjeka prema teoriji plastičnosti, za sustav prikazan na slici, ako je poznato:

$$H_1 = 4 \text{ m}$$

$$H_2 = 3 \text{ m}$$

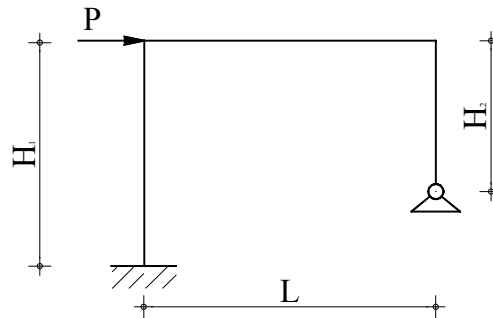
$$L = 4 \text{ m}$$

$$P = 100 \text{ kN}$$

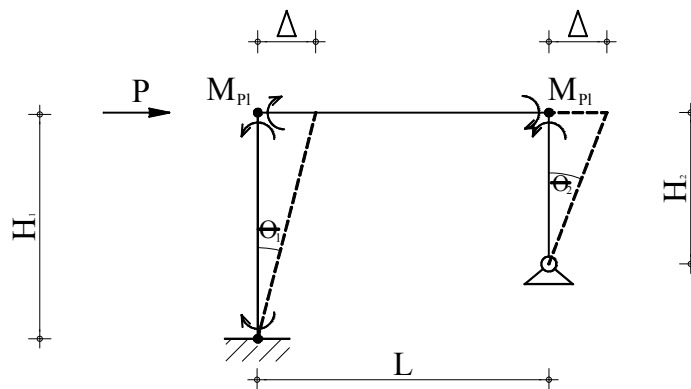
$$b/h = 1/3$$

$$\sigma_R = 24.0 \frac{\text{kN}}{\text{cm}^2}$$

$$\nu = 2.5$$



Kinematski princip /princip virtualnih radova/



$$P \cdot \Delta - M_{pl} \cdot \Theta_1 - M_{pl} \cdot \Theta_1 - M_{pl} \cdot \Theta_2 = 0$$

$$P \cdot \Theta_1 \cdot H_1 - 2M_{pl} \cdot \Theta_1 - M_{pl} \cdot \Theta_2 = 0$$

$$P \cdot \Theta_1 \cdot H_1 - 2M_{pl} \cdot \Theta_1 - M_{pl} \cdot \frac{4}{3} \Theta_1 = 0$$

$$P \cdot H_1 = \frac{10}{3} M_{pl} \Rightarrow M_{pl} = \frac{12}{10} P \cdot m = 120 \text{ kNm}$$

Uvjet

$$M_{pl} \leq M_{pl.dop} = \frac{\sigma_R \cdot W_{pl}}{\nu}$$

$$W_{pl} \geq \frac{\nu \cdot M_{pl}}{\sigma_R}$$

$$\frac{\nu \cdot M_{pl}}{\sigma_R} = \frac{2.5 \cdot 120 \text{ kN} \cdot 100 \text{ cm}}{24 \frac{\text{kN}}{\text{cm}^2}} = 1250 \text{ cm}^3$$

$$W_{pl} = \frac{b \cdot h^2}{4} = \frac{b \cdot (3b)^2}{4} = \frac{9b^3}{4}$$

$$\frac{9b^3}{4} \geq 1250 \text{ cm}^3 \Rightarrow b \geq 8.22$$

Odabrano:

$$b = 9 \text{ cm}$$

$$h = 27 \text{ cm}$$