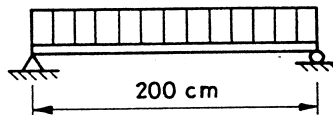
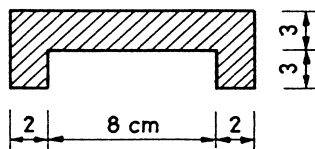


TMKS0700 STATIIKKA JA LUJUUSOPPI

Tehtävä L3-7

Miten suuren tasaisen kuormituksen oheiselle palkille voi panna, jos sallittu taivutusjännitys on σ ? Kuormitus kohdistuu poikkileikkaukseen kuvan asennossa päältäpäin.

$$\sigma = \quad \mathbf{150 \text{ MPa}}$$

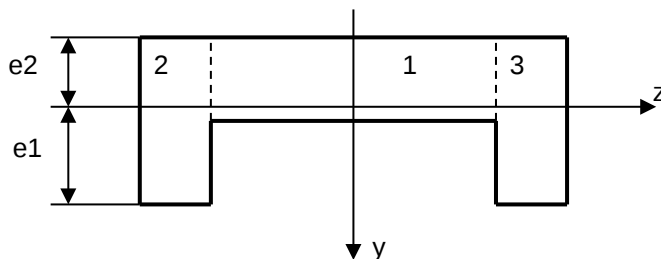


Palkin max. normaalijännitys

$$\sigma_{\max} = M_{\max} / W_z$$

$$\Rightarrow M_{\max} = \sigma_{\max} W_z$$

$$\sigma_{\max} = \sigma_{\text{sall}} = \quad \mathbf{150 \text{ MPa}}$$



$$A_1 = 80 \cdot 30 = \quad \mathbf{2400 \text{ mm}^2}$$

$$A_2 = 20 \cdot 60 = \quad \mathbf{1200 \text{ mm}^2}$$

$$A_3 = A_2 = \quad \mathbf{1200 \text{ mm}^2}$$

$$y_{l1} = \quad \mathbf{15 \text{ mm}}$$

$$y_{l2} = y_{l3} = \quad \mathbf{30 \text{ mm}}$$

$$e_2 = (A_1 y_{l1} + 2A_2 y_{l2}) / (A_1 + 2A_2)$$

$$\Rightarrow e_2 = \quad \mathbf{22,5 \text{ mm}}$$

$$e_1 = H - e_2$$

$$H = \quad \mathbf{60 \text{ mm}}$$

$$\Rightarrow e_1 = \quad \mathbf{37,5 \text{ mm}}$$

$$I_z = I_1 + A_1(e_2 - y_{11})^2 + 2I_2 + 2A_2(y_{12} - e_2)^2$$

$$I_1 = 80 \cdot 30^3 / 12 = 180000 \text{ mm}^4$$

$$I_2 = 20 \cdot 60^3 / 12 = 360000 \text{ mm}^4$$

$$\Rightarrow I_z = 1170000 \text{ mm}^4$$

$$W_z = I_z / e_{\max}$$

$$e_{\max} = e_1$$

$$\Rightarrow W_z = 31200 \text{ mm}^3$$

$$\Rightarrow M_{\max} = 4680 \text{ Nm}$$

$$M_{\max} = qL^2 / 8$$

$$\Rightarrow q = 8M_{\max} / L^2$$

$$L = 2 \text{ m}$$

$$\Rightarrow q = 9360 \text{ N/m}$$

$$V: \quad q_{\text{sall}} = 9,36 \text{ kN/m}$$