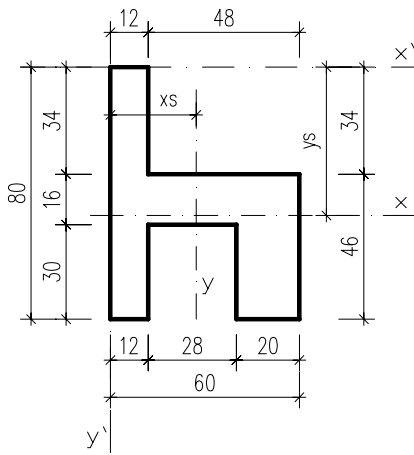


Súlypont, statikai nyomaték, inercianyomaték, inerciasugár, keresztmetszeti tényező



$$A := (12 \cdot 80 + 48 \cdot 16 + 30 \cdot 20) \text{ mm}^2$$

$$A = 2328 \text{ mm}^2$$

$$S_{x'} := (12 \cdot 80 \cdot 40 + 48 \cdot 16 \cdot 42 + 20 \cdot 30 \cdot 65) \text{ mm}^3$$

$$S_{x'} = 109656 \text{ mm}^3$$

$$S_{y'} := (12 \cdot 80 \cdot 6 + 16 \cdot 48 \cdot 36 + 20 \cdot 30 \cdot 50) \text{ mm}^3$$

$$S_{y'} = 63408 \text{ mm}^3$$

$$y_s := \frac{S_{x'}}{A}$$

$$y_s = 47.1 \text{ mm}$$

$$x_s := \frac{S_{y'}}{A}$$

$$x_s = 27.24 \text{ mm}$$

$$I_x := \left[\begin{aligned} & \frac{12 \cdot 80^3}{12} + 12 \cdot 80 \cdot \left(y_s - \frac{80}{2} \right)^2 \dots \\ & + \frac{48 \cdot 16^3}{12} + 48 \cdot 16 \cdot \left(y_s - 34 - \frac{16}{2} \right)^2 \dots \\ & + \frac{20 \cdot 30^3}{12} + 20 \cdot 30 \cdot \left(80 - \frac{30}{2} - y_s \right)^2 \end{aligned} \right] \text{ mm}^4$$

$$I_x = 5988810.89 \text{ mm}^4$$

$$I_y := \left[\begin{aligned} & \frac{80 \cdot 12^3}{12} + 80 \cdot 12 \cdot \left(x_s - \frac{12}{2} \right)^2 \dots \\ & + \frac{16 \cdot 48^3}{12} + 16 \cdot 48 \cdot \left(60 - x_s - \frac{48}{2} \right)^2 \dots \\ & + \frac{30 \cdot 20^3}{12} + 30 \cdot 20 \cdot \left(60 - x_s - \frac{20}{2} \right)^2 \end{aligned} \right] \text{ mm}^4$$

$$I_y = 2705411.63 \text{ mm}^4$$

$$W_{x.f} := \frac{I_x}{y_s}$$

$$W_{x.f} = 127142.63 \text{ mm}^3$$

$$W_{x.a} := \frac{I_x}{80 \text{ mm} - y_s}$$

$$W_{x.a} = 182047.84 \text{ mm}^3$$

$$W_{y.b} := \frac{I_y}{x_s}$$

$$W_{y.b} = 99328.13 \text{ mm}^3$$

$$W_{y.j} := \frac{I_y}{60 \text{ mm} - x_s}$$

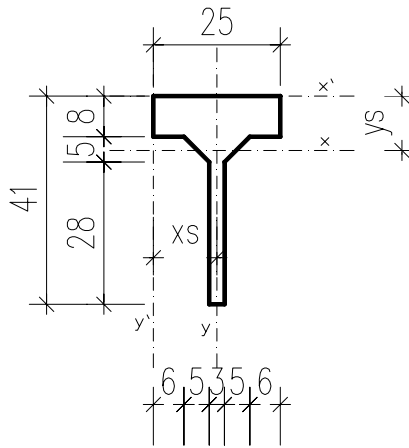
$$W_{y.j} = 82575.5 \text{ mm}^3$$

$$i_x := \sqrt{\frac{I_x}{A}}$$

$$i_x = 50.72 \text{ mm}$$

$$i_y := \sqrt{\frac{I_y}{A}}$$

$$i_y = 34.09 \text{ mm}$$



$$A := \left(25 \cdot 8 + \frac{5 \cdot 5}{2} \cdot 2 + 3 \cdot 33 \right) \text{mm}^2$$

$$A = 324 \text{mm}^2$$

$$S_{x'} := \left[25 \cdot 8 \cdot 4 + 2 \cdot \left[\frac{5 \cdot 5}{2} \cdot \left(8 + \frac{5}{3} \right) \right] \dots \right. \\ \left. + 3 \cdot 33 \cdot \left(8 + \frac{33}{2} \right) \right] \text{mm}^3$$

$$S_{x'} = 3467.17 \text{mm}^3$$

$$S_{y'} := \left[8 \cdot 25 \cdot \frac{25}{2} + \frac{5 \cdot 5}{2} \cdot \left(6 + 2 \cdot \frac{5}{3} \right) \dots \right. \\ \left. + \frac{5 \cdot 5}{2} \cdot \left(6 + 5 + 3 + \frac{5}{3} \right) + 33 \cdot 3 \cdot \frac{25}{2} \right] \text{mm}^3$$

$$S_{y'} = 4050 \text{mm}^3$$

$$y_s := \frac{S_{x'}}{A}$$

$$y_s = 10.7 \text{mm}$$

$$x_s := \frac{S_{y'}}{A}$$

$$x_s = 12.5 \text{mm}$$

$$I_x := \left[\frac{25 \cdot 8^3}{12} + 25 \cdot 8 \cdot \left(y_s - \frac{8}{2} \right)^2 \dots \right. \\ \left. + 2 \cdot \left[\frac{5 \cdot 5^3}{36} + \frac{5 \cdot 5}{2} \cdot \left(y_s - 8 - \frac{5}{3} \right)^2 \right] \dots \right. \\ \left. + \frac{3 \cdot 33^3}{12} + 3 \cdot 33 + \left(41 - \frac{33}{2} - y_s \right)^2 \right] \text{mm}^4$$

$$I_x = 16298.21 \text{mm}^4$$

$$I_y := \left[\frac{8 \cdot 25^3}{12} + 2 \cdot \left[\frac{5 \cdot 5^3}{36} + \frac{5 \cdot 5}{2} \cdot \left(\frac{3}{2} + \frac{5}{3} \right)^2 \right] \dots \right. \\ \left. + \frac{33 \cdot 3^3}{12} \right] \text{mm}^4$$

$$I_y = 10776.33 \text{mm}^4$$

$$W_{x.f} := \frac{I_x}{y_s}$$

$$W_{x.f} = 1523.04 \text{mm}^3$$

$$W_{x.a} := \frac{I_x}{41 \text{mm} - y_s}$$

$$W_{x.a} = 537.91 \text{mm}^3$$

$$W_y := \frac{I_y}{x_s}$$

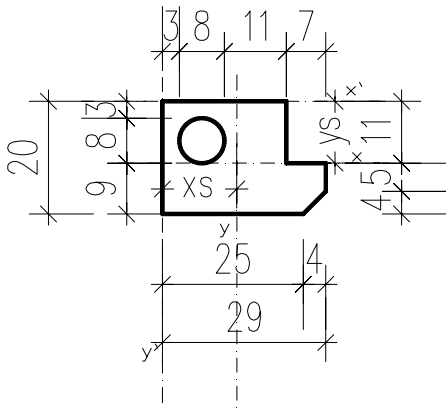
$$W_y = 862.11 \text{mm}^3$$

$$i_x := \sqrt{\frac{I_x}{A}}$$

$$i_x = 7.09 \text{mm}$$

$$i_y := \sqrt{\frac{I_y}{A}}$$

$$i_y = 5.77 \text{mm}$$



$$A := \left(29 \cdot 20 - \frac{8^2 \pi}{4} - 7 \cdot 11 - \frac{4 \cdot 4}{2} \right) \text{cm}^2 \quad A = 444.73 \text{cm}^2$$

$$S_{x'} := \left[29 \cdot 20 \cdot 10 - \frac{8^2 \cdot \pi}{4} \cdot 7 - 7 \cdot 11 \cdot \frac{11}{2} - \frac{4 \cdot 4}{2} \cdot \left(16 + 2 \cdot \frac{4}{3} \right) \right] \text{cm}^3$$

$$S_{x'} = 4875.31 \text{cm}^3$$

$$S_{y'} := \left[20 \cdot 29 \cdot \frac{29}{2} - \frac{8^2 \pi}{4} \cdot 7 - 11 \cdot 7 \cdot 25.5 - \frac{4 \cdot 4}{2} \cdot \left(29 - \frac{4}{3} \right) \right] \text{cm}^3$$

$$S_{y'} = 5873.31 \text{cm}^3$$

$$y_s := \frac{S_{x'}}{A} \quad y_s = 10.96 \text{cm}$$

$$x_s := \frac{S_{y'}}{A} \quad x_s = 13.21 \text{cm}$$

$$I_x := \left[\begin{aligned} & \frac{29 \cdot 20^3}{12} + 29 \cdot 20 \cdot \left(y_s - \frac{20}{2} \right)^2 \dots \\ & + \left[\frac{8^4 \pi}{64} + \frac{8^2 \pi}{4} \cdot \left(y_s - 7 \right)^2 \right] \dots \\ & + \left[\frac{7 \cdot 11^3}{12} + 7 \cdot 11 \cdot \left(y_s - \frac{11}{2} \right)^2 \right] \dots \\ & + \left[\frac{4 \cdot 4^3}{36} + \frac{4 \cdot 4}{2} \cdot \left(20 - \frac{4}{3} - y_s \right)^2 \right] \end{aligned} \right] \text{cm}^4 \quad I_x = 67705.38 \text{cm}^4$$

$$I_y := \left[\begin{aligned} & \frac{20 \cdot 29^3}{12} + 20 \cdot 29 \cdot \left(\frac{29}{2} - x_s \right)^2 \dots \\ & + \left[\frac{8^4 \pi}{64} + \frac{8^2 \pi}{4} \cdot \left(x_s - 7 \right)^2 \right] \dots \\ & + \left[\frac{11 \cdot 7^3}{12} + 11 \cdot 7 \cdot \left(29 - \frac{7}{2} - x_s \right)^2 \right] \dots \\ & + \left[\frac{4 \cdot 4^3}{36} + \frac{4 \cdot 4}{2} \cdot \left(29 - \frac{4}{3} - x_s \right)^2 \right] \end{aligned} \right] \text{cm}^4 \quad I_y = 101871.39 \text{cm}^4$$

$$W_{x,f} := \frac{I_x}{y_s} \quad W_{x,f} = 6176.21 \text{cm}^3$$

$$W_{x,a} := \frac{I_x}{20 \text{cm} - y_s} \quad W_{x,a} = 7491.43 \text{cm}^3$$

$$W_{y,b} := \frac{I_y}{x_s} \quad W_{y,b} = 7713.83 \text{cm}^3$$

$$W_{y,j} := \frac{I_y}{29 \text{cm} - x_s} \quad W_{y,j} = 6450.14 \text{cm}^3$$

$$i_x := \sqrt{\frac{I_x}{A}} \quad i_x = 12.34 \text{cm}$$

$$i_y := \sqrt{\frac{I_y}{A}} \quad i_y = 15.13 \text{cm}$$