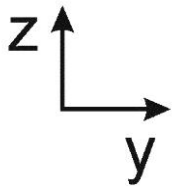
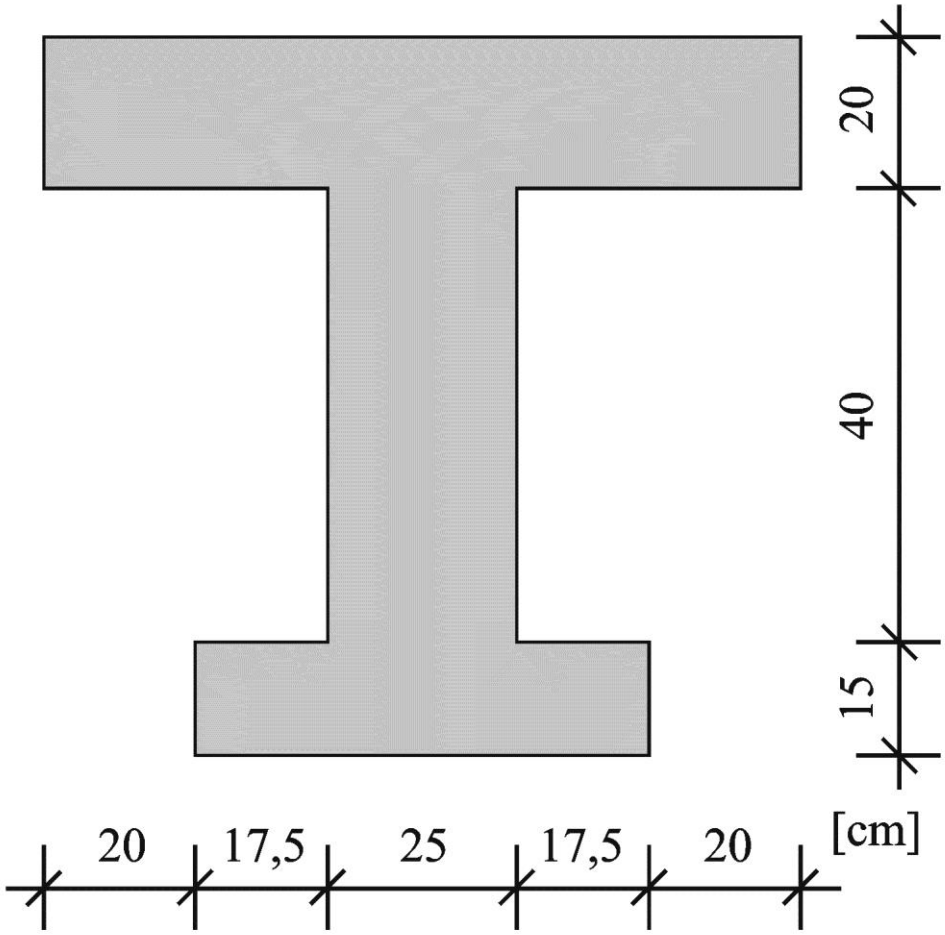
Průřezové charakteristiky

Vypočtěte průřezové charakteristiky zadaného průřezu:

1) Polohu těžiště
2) Momenty setrvačnosti k těžišťové ose
3) Moduly průřezu

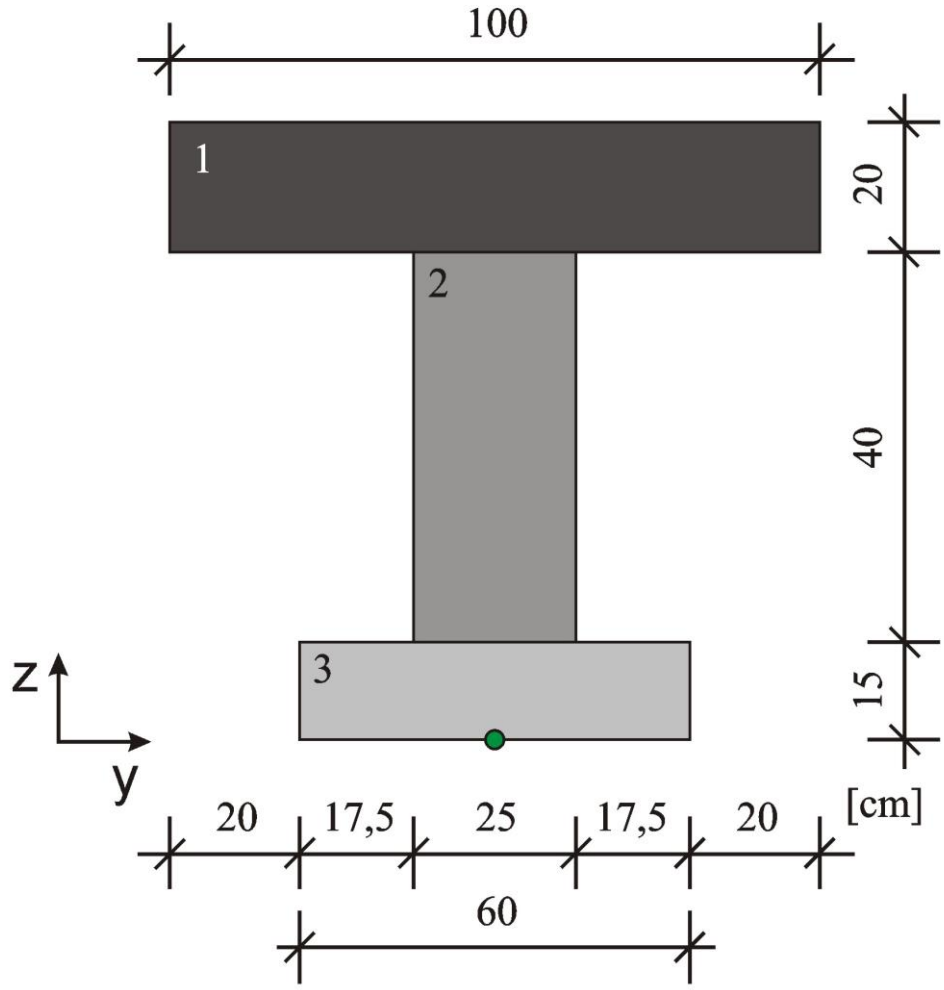




Poloha těžiště:

$$y_t = 0\ cm$$

$$z_t = \frac{\sum A_i \cdot z_i}{\sum A_i}$$

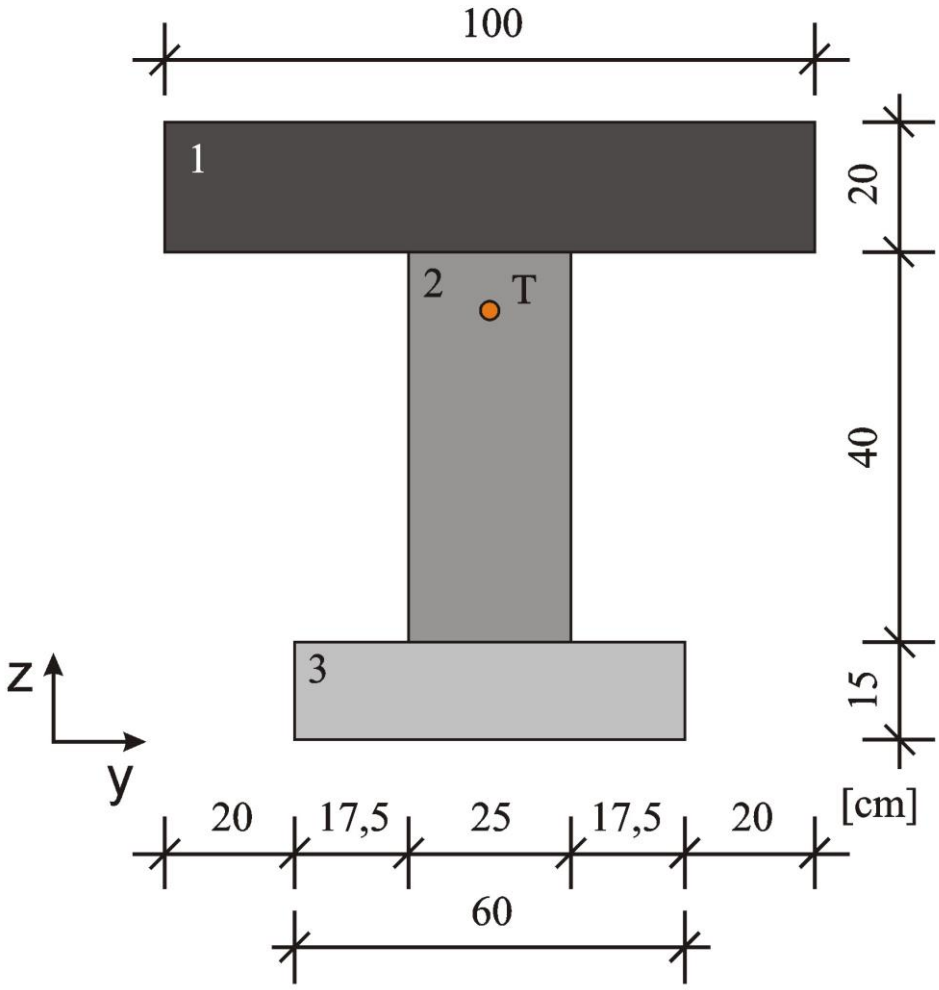


$$z_t = \frac{100 \cdot 20 \cdot 65 + 25 \cdot 40 \cdot 35 + 60 \cdot 15 \cdot 7{,}5}{100 \cdot 20 + 25 \cdot 40 + 60 \cdot 15} = 44\ cm$$

Momenty setrvačnosti:

$$I_y = \sum I_{y,i} + \sum A_i \cdot z_i{}^2$$

$$I_z = \sum I_{z,i} + \sum A_i \cdot y_i{}^2$$



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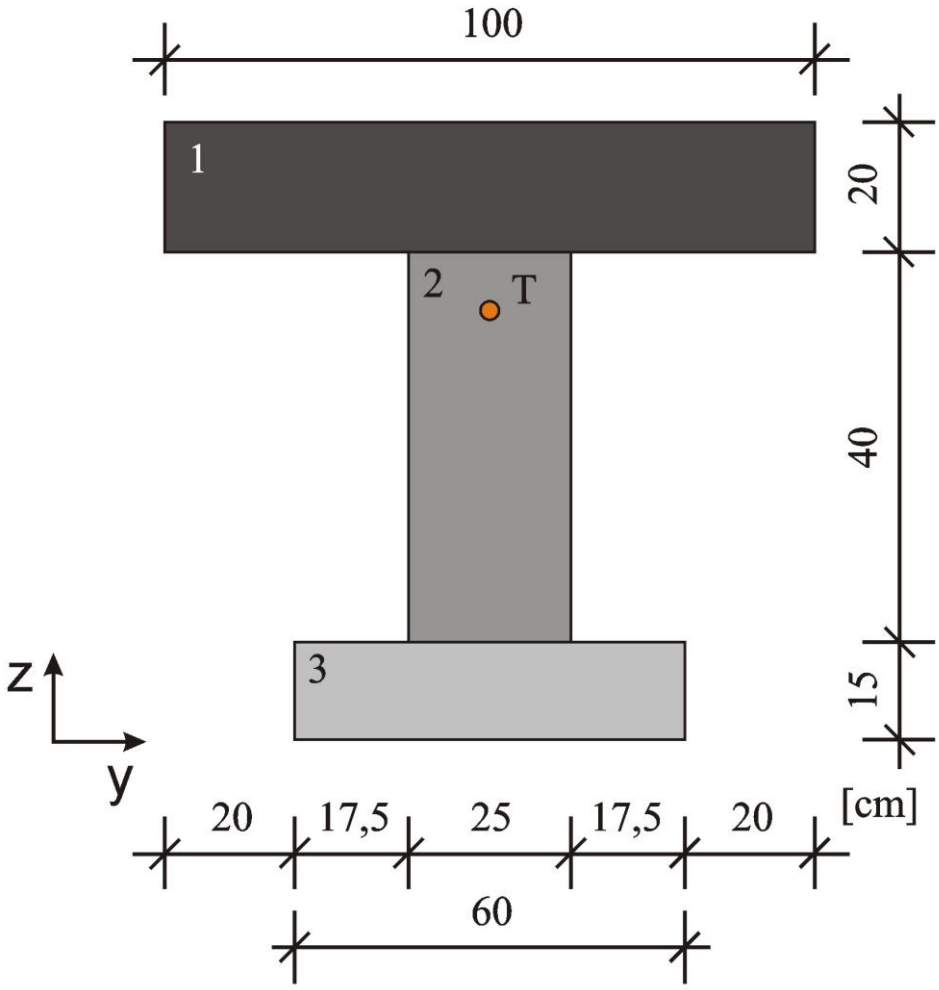

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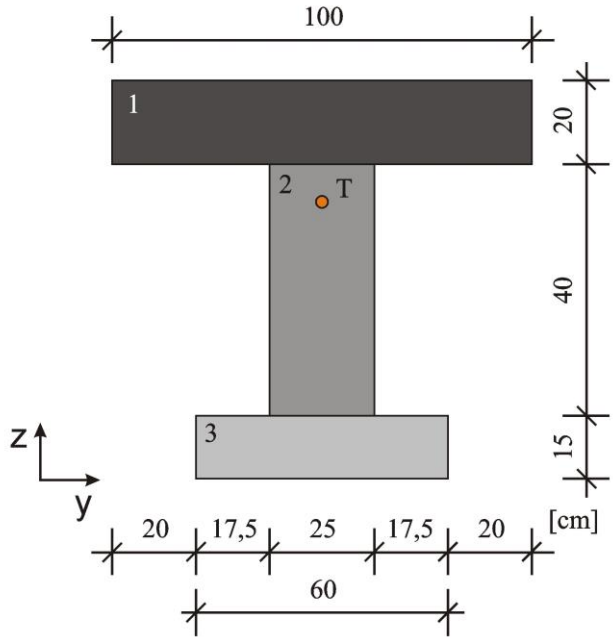


$$\boldsymbol{I_y} = \frac{1}{12} \cdot 100 \cdot 20^3 + \frac{1}{12} \cdot 25 \cdot 40^3 + \frac{1}{12} \cdot 60 \cdot 15^3 +$$
$$+100 \cdot 20 \cdot (65 - 44)^2 + 25 \cdot 40 \cdot (44 - 35)^2 + 60 \cdot 15$$
$$\cdot (44 - 7{,}5)^2 = \boldsymbol{2378900\ cm^4}$$

$$\boldsymbol{I_z} = \frac{1}{12} \cdot 20 \cdot 100^3 + \frac{1}{12} \cdot 40 \cdot 25^3 + \frac{1}{12} \cdot 15 \cdot 60^3 +$$
$$+100 \cdot 20 \cdot 0^2 + 25 \cdot 40 \cdot 0^2 + 60 \cdot 15 \cdot 0^2 = \boldsymbol{1988750\ cm^4}$$

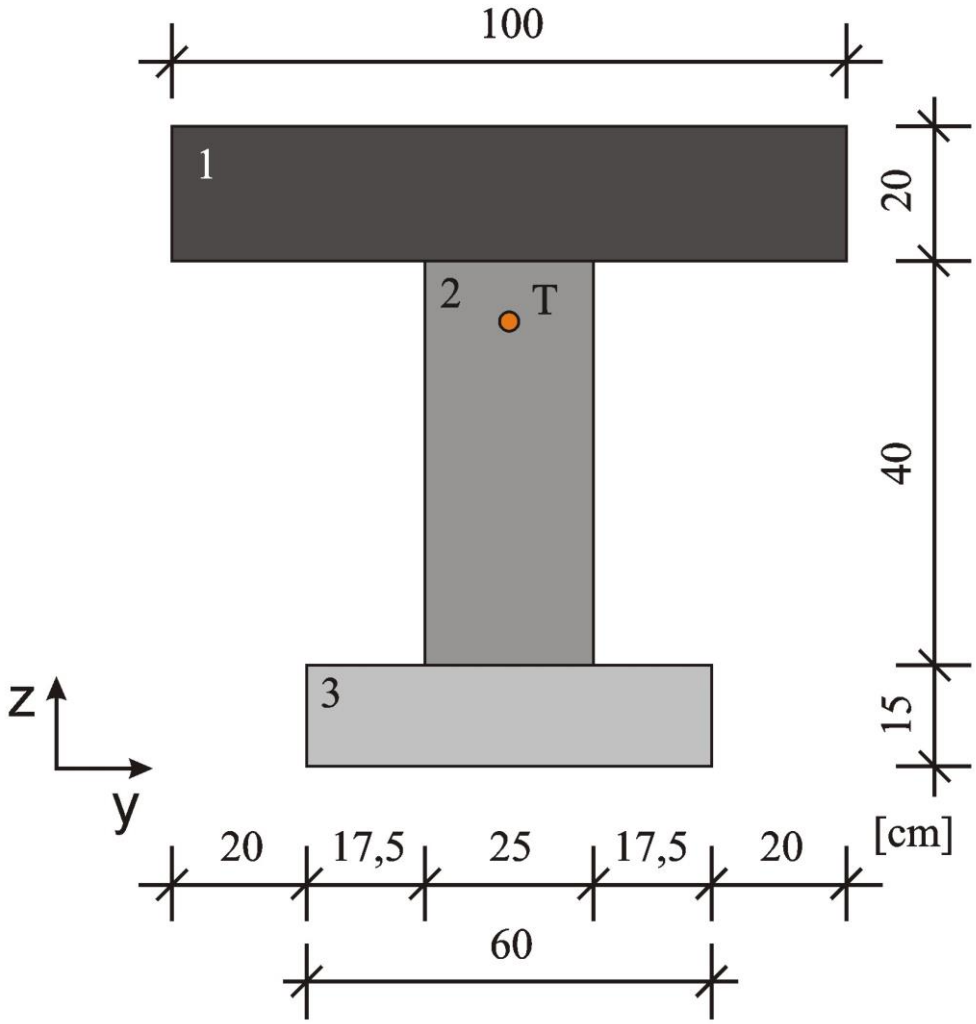
Moduly průřezu:

$$W_{y,h} = \frac{I_y}{z_h}$$

$$W_{y,d} = \frac{I_y}{z_d}$$

$$W_{z,l} = \frac{I_z}{y_l}$$

$$W_{z,p} = \frac{I_z}{y_p}$$



Moduly průřezu:

$$\boldsymbol{W_{y,h}} = \frac{I_y}{z_h} = \frac{2378900}{75-44} = \boldsymbol{76738,7\ cm^3}$$

$$\boldsymbol{W_{y,d}} = \frac{I_y}{z_d} = \frac{2378900}{44} = \boldsymbol{54065,9\ cm^3}$$

$$\boldsymbol{W_{z,l}} = \frac{I_z}{y_l} = \frac{1988750}{50} = \boldsymbol{39775\ cm^3}$$

$$\boldsymbol{W_{z,p}} = \frac{I_z}{y_p} = \frac{1988750}{50} = \boldsymbol{39775\ cm^3}$$