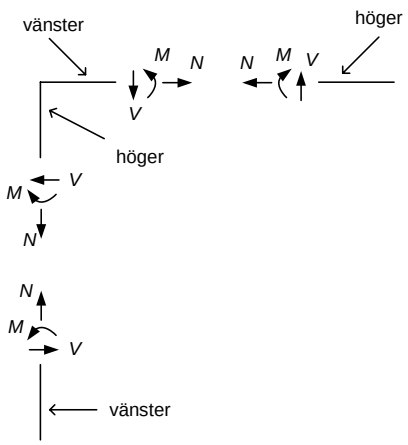
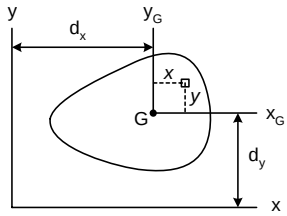
5C1810 Kurs-sammanfattning

Teckenkonvention för N V och M

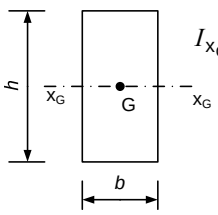


Tvärsnitts egenskaper

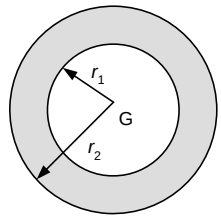


$$I_{X_G} = \int_A y^2 \, dA$$

$$I_x = I_{x_G} + A\, d_y^2$$

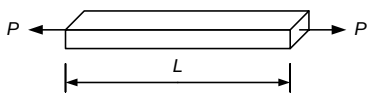


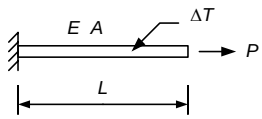
$$I_{x_G} = \frac{b\,h^3}{12}$$



$$I_\rho = 2\, I_X = \frac{\pi}{2}(r_2^4 - r_1^4)$$

Stänger





$$\sigma = \frac{N}{A} \qquad \sigma = E\,\varepsilon \qquad \varepsilon = \frac{\delta}{L} \qquad \varepsilon_t = -\nu\,\varepsilon \qquad \varepsilon = \frac{\sigma}{E} + \alpha\,\Delta T$$

Normalspänning i balkar

$$\sigma = \frac{N}{A} + \frac{M}{I}\,y \quad \text{(y neråt)}$$

Skjuvspänning i balkar

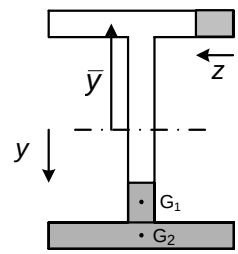
rektangulärt tvärsnitt $\tau = \dfrac{V}{2I}\left(\dfrac{h^2}{4} - y_1^2\right)$ $\tau_{max} = \dfrac{3}{2}\dfrac{V}{A}$

cirkulärt tvärsnitt $\tau_{max} = \dfrac{4}{3}\dfrac{V}{A}$

I tvärsnitt

$$\tau_{liv} = \frac{V\,Q}{I\,b} \qquad Q = y_{G_1} A_1 + y_{G_2} A_2$$

$$\tau_{flä} = \frac{V\,z\,\bar{y}}{I}$$



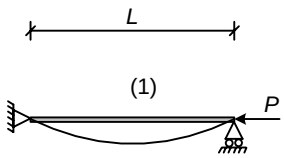
Vridning

$$\tau = \frac{T}{I_\rho}\rho \qquad d\theta = \frac{T\,dx}{G\,I_\rho}$$

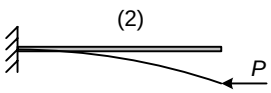
Deformation i balkar

$$EI\,v'' = -M$$

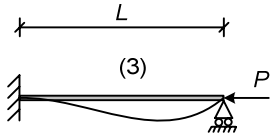
Knäckning



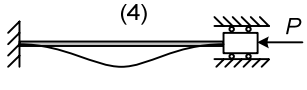
$$P_{cr} = \frac{\pi^2 EI}{L^2}$$



$$P_{cr} = \frac{\pi^2 EI}{4L^2}$$



$$P_{cr} \approx 2.04\,\frac{\pi^2 EI}{L^2}$$



$$P_{cr} = \frac{4\,\pi^2 EI}{L^2}$$