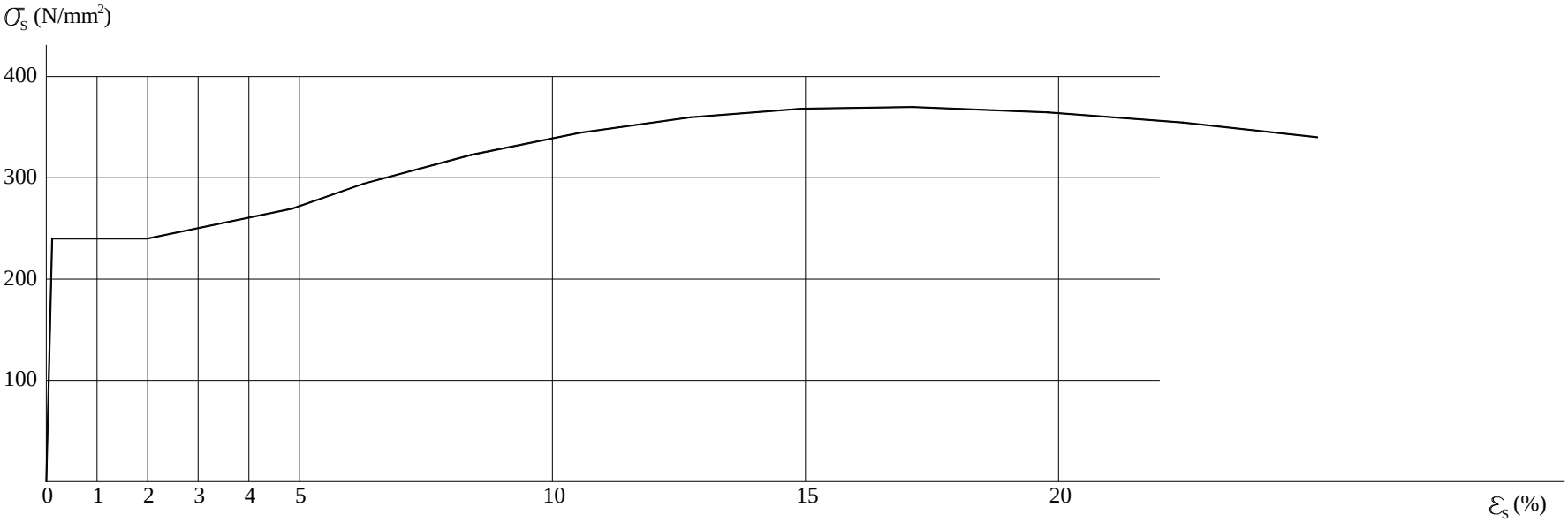
Statically determinate trusses

- static analysis
  stability evaluation
  resistance evaluation
  (ultimate limit states)

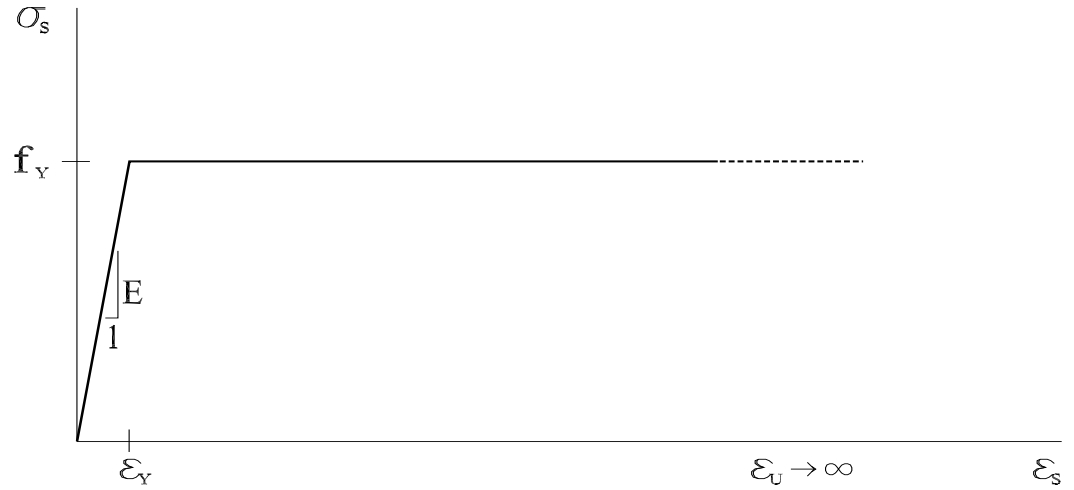
- kinematic analysis
  axial deformations
  deflections / movements
  (serviceability limit states)

stress-strain curve of structural steel

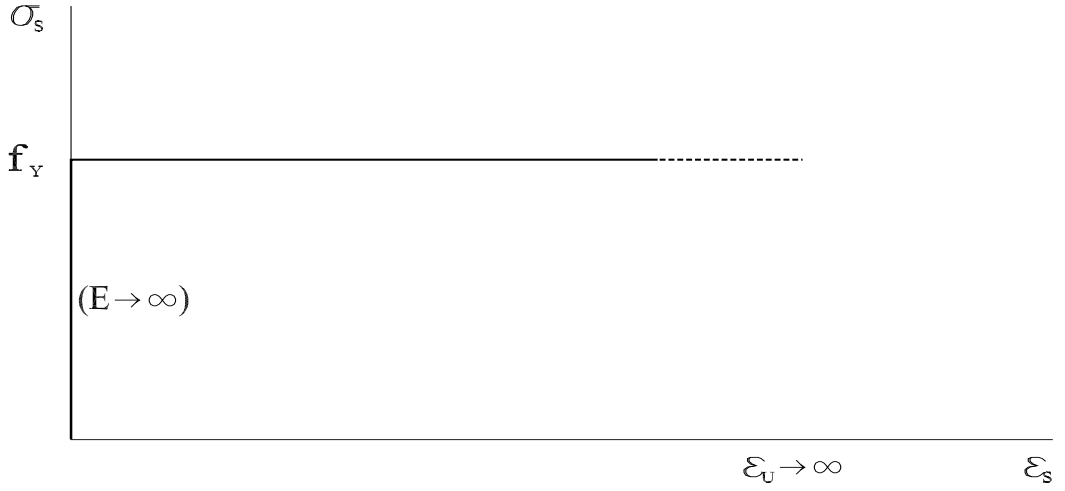


idealized stress-strain curves for steel

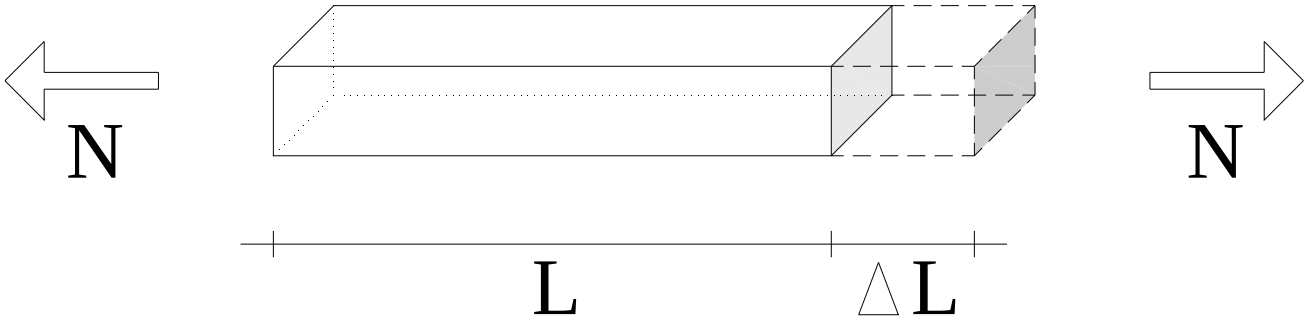
ELASTO-PLASTIC



RIGID-PLASTIC



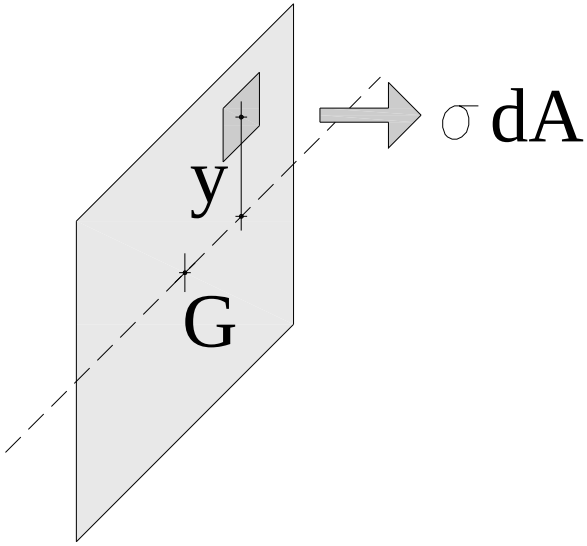
axial loading stress, strain and deformation



EQUILIBRIUM :

$$\int_A \sigma \cdot dA = N$$

$$\int_A \sigma \cdot y \cdot dA = 0$$



PLANE CROSS-SECTION HYPOTHESIS (NAVIER) :

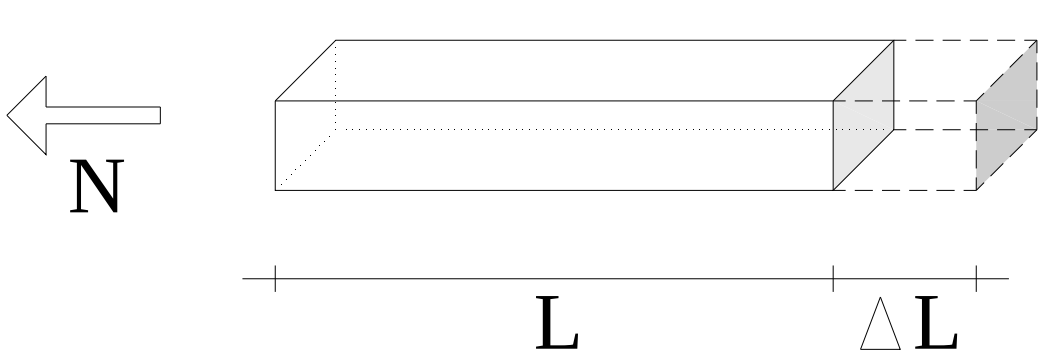
$$\epsilon = \epsilon_G + C \cdot y$$

ELASTIC-LINEAR MATERIAL (YOUNG) :

$$\sigma = E \cdot \epsilon$$

$$\boxed{\sigma = \frac{N}{A}} \quad \boxed{\epsilon = \frac{N}{EA}}$$

characteristic tension resistance of a constant cross-section bar



$$\sigma = \frac{N}{A}$$

$$N = \sigma \cdot A$$

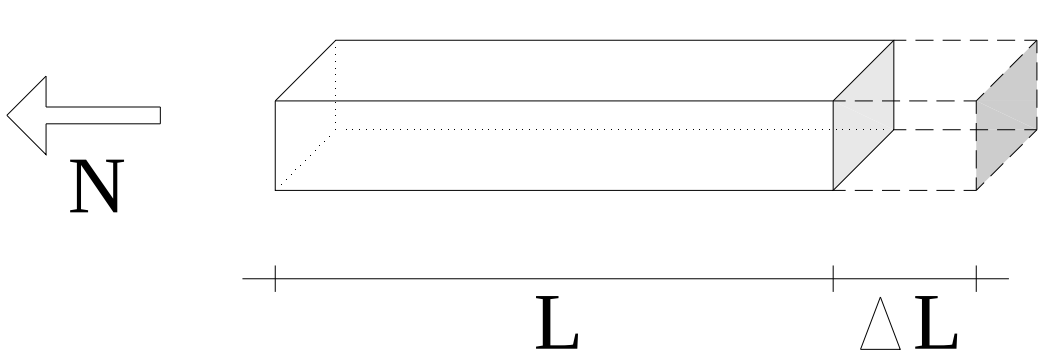
ELASTIC CHARACTERISTIC RESISTANCE ($\sigma = f_y$) :

$$N_y = f_y \cdot A$$

ULTIMATE CHARACTERISTIC RESISTANCE ($\sigma = f_u$) :

$$((N_u = f_u \cdot A))$$

design tension resistance of a constant cross-section bar



$$\sigma = \frac{N}{A}$$

$$N = \sigma \cdot A$$

DESIGN TENSION RESISTANCE ($\sigma = f_{yd}$)

$$N_{Rd} = f_{yd} \cdot A = \frac{f_y}{\gamma_M} \cdot A$$

design buckling resistance of a constant cross-section bar

$$\frac{N_{E_d}}{N_{b,R_d}} = \frac{N\,\gamma_F}{\chi\,A\,f_y\,/\gamma_M} \leq 1$$

buckling reduction factor χ

$$\chi = \chi\,(E\,,\,f_y\,,\,\alpha\,,\,I\,,\,A\,,\,L_k)$$

$$\chi = \chi\left(\lambda_r\,,\,\alpha\,,\,\boxed{\lambda = \mathbf{L_k/i}}\right)$$

$\gamma_F = 1,5\,;\ \gamma_M = 1,05\,;\ f_y = 275 N/mm^2\,;\ E = 210000 N/mm^2\,;\ \alpha = 0,49$