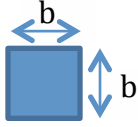
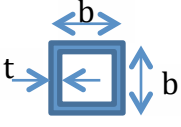




Cross-Sectional & Materials Properties

Cross-Sectional Properties:

Section	Cross-sectional Area (m ²)	Moment of Inertia (m ⁴)
Tube 	$A = b^2$	$I = \frac{b^4}{12}$
Hollow Tube 	$A = b^2 - (b - 2t)^2$	$I = \frac{b^4}{12} - \frac{(b-2t)^4}{12}$
Circle 	$A = \frac{\pi d^2}{4}$	$I = \frac{\pi d^4}{64}$
Hollow Circle 	$A = \frac{\pi d^2}{4} - \frac{\pi (d - 2t)^2}{4}$	$I = \frac{\pi d^4}{64} - \frac{\pi (d-2t)^4}{64}$

Material Properties:

Material	Modulus of Elasticity (E)	Yield or Crushing Stress
Concrete	$20 \times 10^9 \text{ N/m}^2$	$70 \times 10^6 \text{ N/m}^2$
Granite/Stone	$80 \times 10^9 \text{ N/m}^2$	$150 \times 10^6 \text{ N/m}^2$
Plastic	$2 \times 10^9 \text{ N/m}^2$	$50 \times 10^6 \text{ N/m}^2$
Glass	$50 \times 10^9 \text{ N/m}^2$	$50 \times 10^6 \text{ N/m}^2$
Steel	$200 \times 10^9 \text{ N/m}^2$	$250 \times 10^6 \text{ N/m}^2$
Wood	$10 \times 10^9 \text{ N/m}^2$	$30 \times 10^6 \text{ N/m}^2$
Copper	$100 \times 10^9 \text{ N/m}^2$	$150 \times 10^6 \text{ N/m}^2$