

Any elongates section or thin open tube

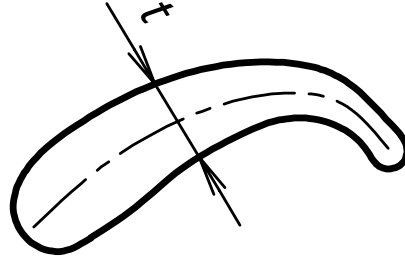


Fig. 1 - Any elongates section or thin open tube

Values for calculation:

Twisting moment	T	1000	Nm
Length of median boundary	U	200	mm
Profile area	A	2000	mm ²
Thickness normal to median line	t	20	mm
Diameter of largest inscribed circle	D	20	mm
Radius of curvature of boundary at the point	r	10	mm
Length	L	1000	mm
Modulus of rigidity	G	80000	MPa

$$F = t^3 U = 20^3 \cdot 200 = 1600000$$

$$C = \frac{D}{1 + \frac{\pi^2 D^4}{16A^2}} \left[1 + 0.15 \left(\frac{\pi^2 D^4}{16A^2} - \frac{D}{2r} \right) \right]$$

$$= \frac{20}{1 + \frac{\pi^2 \cdot 20^4}{16 \cdot 2000^2}} \left[1 + 0.15 \left(\frac{\pi^2 \cdot 20^4}{16 \cdot 2000^2} - \frac{20}{2 \cdot 10} \right) \right] = 16.663$$

Polar moment of inertia:

$$K = \frac{F}{3 + 4F/(AU^2)} = \frac{1600000}{3 + 4 \cdot 1600000/(2000 \cdot 200^2)} = 519480.5 \text{mm}^4$$

Angle of twist:

$$\theta = \frac{T \cdot 10^3 \cdot L}{KG} = \frac{1000 \cdot 10^3 \cdot 1000}{519480.5 \cdot 80000} = 0.024 \text{rad}$$

Torsion stress:

$$\tau_{max} = \frac{10^3 T}{K} C = \frac{10^3 \cdot 1000}{519480.5} 16.663 = 32.1 \text{MPa}$$