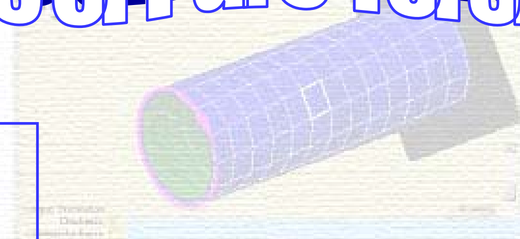
Analysis of Pure Torsion



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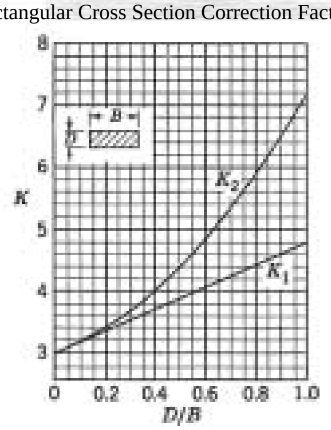
Common Torsion Analysis:

General Assumptions:

Uniform Material Properties
Uniform Cross-Sectional Area
Static Loading

Shape	Area A	Maximum Shear Stress τmax	Rate of Twist θ = dΦ/dl Φ = radians (57.3°)
d	$\frac{\pi \cdot d^2}{4}$	$\frac{16 \cdot T}{\pi \cdot d^3}$	$\frac{32 \cdot T}{\pi \cdot d^4 \cdot G}$
di do	$\frac{\pi \cdot (do^2 - di^2)}{4}$	$\frac{16 \cdot T \cdot D}{\pi \cdot (do^4 - di^4)}$	$\frac{32 \cdot T}{\pi \cdot (do^4 - di^4) \cdot G}$
d	$\pi \cdot d \cdot t$	$\frac{2 \cdot T}{\pi \cdot \bar{d}^2 \cdot t}$	$\frac{4 \cdot T}{\pi \cdot \bar{d}^3 \cdot t \cdot G}$
W, L	$\frac{\pi \cdot L \cdot W}{4}$	$\frac{16 \cdot T}{\pi \cdot L \cdot W^2}$	$\frac{(L^2 + W^2) \cdot T}{16 \cdot \pi \cdot L^3 \cdot W^3 \cdot G}$
L	L^2	$4.8 \cdot \frac{T}{L^3}$	$7.2 \cdot \frac{T}{L^4 \cdot G}$
W, L	$L \cdot W$	$K_1 \cdot \frac{T}{L \cdot W^2}$	$K_2 \cdot \frac{T}{L \cdot W^2}$
L	$0.433 \cdot L^2$	$20 \cdot \frac{T}{L^3}$	$8.8 \cdot \frac{T}{L^4 \cdot G}$
L	$0.866 \cdot L^2$	$20 \cdot \frac{T}{L^3}$	$8.8 \cdot \frac{T}{L^4 \cdot G}$

Rectangular Cross Section Correction Factor (K)



Complex Torsion Analysis:

Common Situations:

Thin walled members
Irregular cross sections
Non-prismatic members

Round Sections, variable thickness	Thin-walled sections, any shape	Noncircular thick sections (membrane analogy)
[illegible]	s = perimeter; [A]	Membrane
Distributed Force: (Not used in this case) Shear Stress: [illegible]	Distributed Force: [illegible] [A] = area enclosed by median line. Shear Stress: [illegible] t = thickness at a given point	Distributed Force: [illegible] Shear Stress: [illegible] Approximate formula: * [illegible]
Deflection (twist), radians [illegible]		
[illegible]	[illegible] For constant t [illegible]	[illegible]
Strain Energy		
[illegible]	[illegible]	[illegible]

Poster supplemented by handout. See Dr. Odom for more information

Supplement includes: Examples and Complex Analysis Theory

$$* \quad B_e = \sqrt{\frac{\pi}{4}} B$$