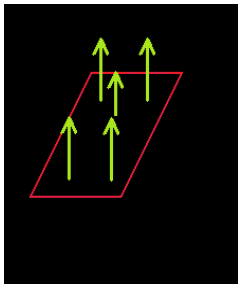
Ambar Mitra

Stresses in a Shaft with Non-Circular Cross-section

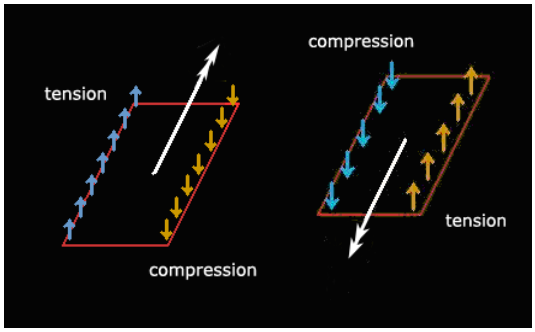
Axial Loading



Normal stress = σ
Area = A
Force = P

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

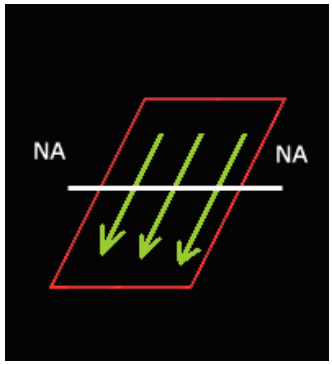
Bending



Normal stress at a point = σ
Moment = M
Distance of point from neutral axis = D
2nd Moment of area about the neutral axis = I

$$\sigma = \frac{MD}{I}$$

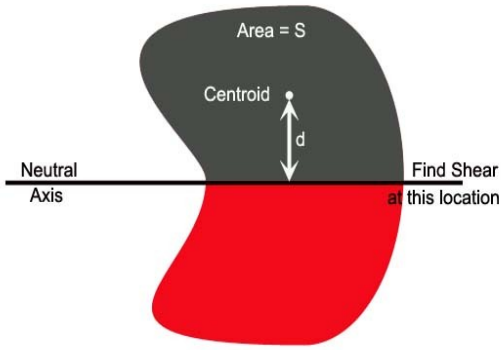
Shear

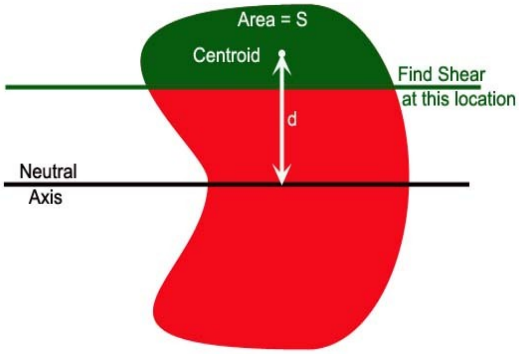


Shear stress at neutral axis = τ
Force = V
Thickness at neutral axis = t
1st Moment of area at neutral axis (see below for more info.) = Q
2nd Moment of area about the neutral axis = I

$$\tau = \frac{VQ}{It}$$

Q – Calculation





$$Q = Sd$$