

Summary: shear stresses in beams

- *General loading*: For a general resultant pair of V and M at a cross-section, the normal stress is approximately that of pure bending, $\sigma = -\frac{My}{I}$, and the shear stress is given by:

$$\tau = \frac{VA^*\bar{y}^*}{It}$$

with A^* and \bar{y}^* are the area and centroid of the cross-section above “ y ”, respectively, and t is the depth thickness of the beam at “ y ”.

- Special cases:
 - Rectangular cross-section:

$$\tau_{max} = \frac{3V}{2A} = \frac{3V}{2bh}$$

- Circular cross-section:

$$\tau_{max} = \frac{4V}{3A} = \frac{4V}{3\pi R^2}$$

