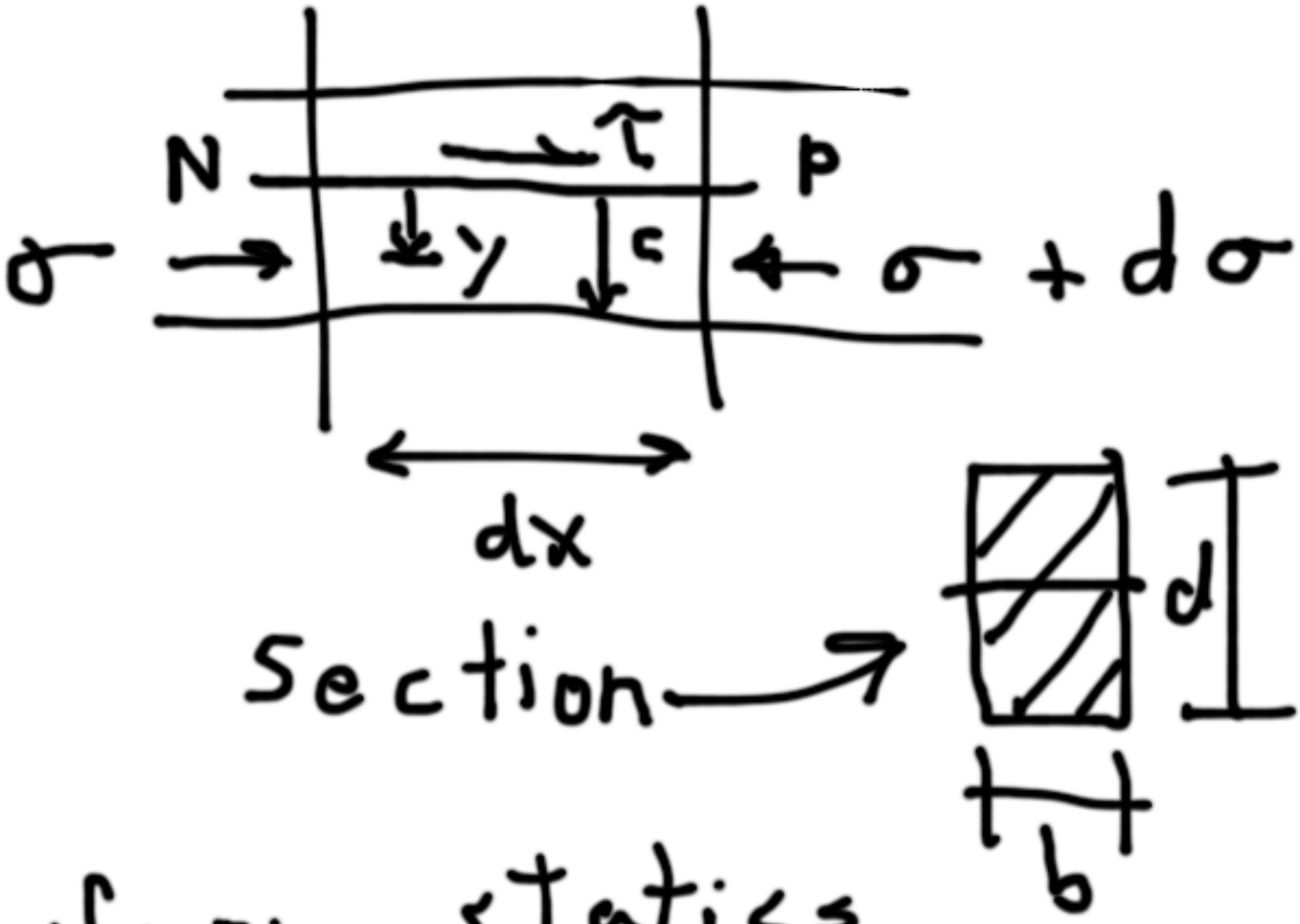
HORIZONTAL SHEAR STRESS IN BEAMS



from statics

$$d\sigma \cdot dA = d\tau \, dx \cdot b$$

$$\frac{d\sigma}{dx} \cdot dA = d\tau \cdot b$$

$$d\tau = \frac{d\sigma}{dx}\frac{dA}{b}$$

$$= \frac{dM \cdot y}{dx\, I}\frac{dA}{b}$$

$$= V \cdot \frac{y\, dA}{I\, b}$$

$$\max Q = \int y \cdot dA$$

$$= \int y \cdot b\, dy$$

$$= \frac{y^2 b}{2}\Big|_0^{d/2}$$

$$\therefore \tau = \frac{V Q}{I b}$$

$$\max \tau = \frac{V Q_{max}}{I b}$$

for rectangular section

$$\max \tau = \frac{V \frac{bd^2}{8}}{\frac{bd^3}{12} \cdot b}$$

$$= \frac{3}{2} \frac{V}{bd} = \frac{3}{2} \frac{V}{A}$$

Where?

τ_{max} at N.A.

$\tau = 0$ at top and bottom of beam.