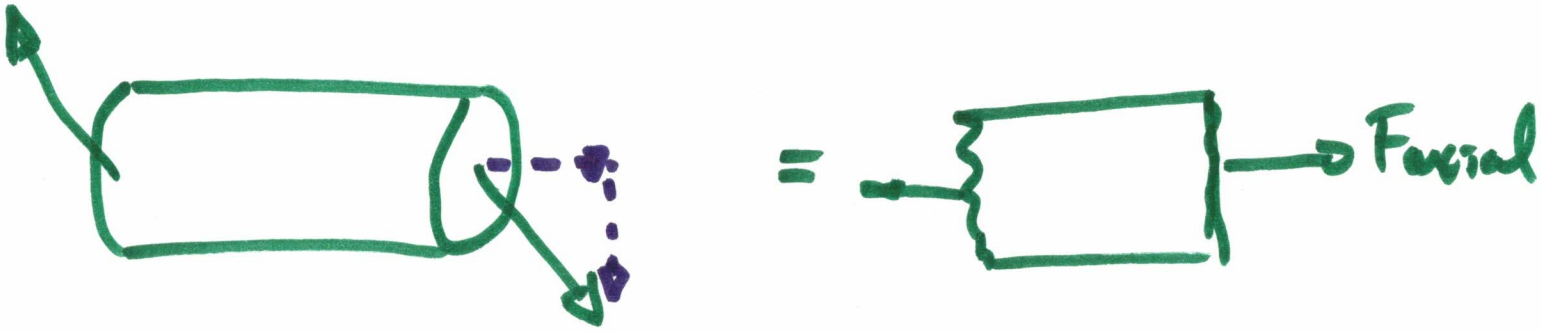
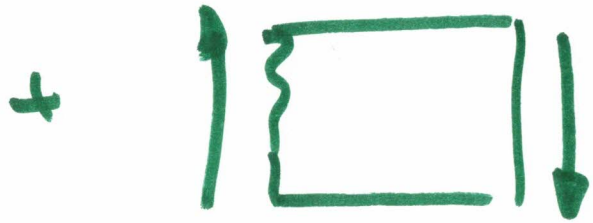
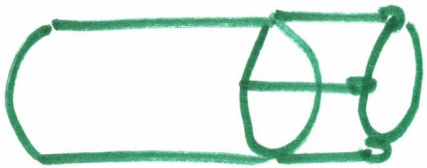
G. Shear Stress

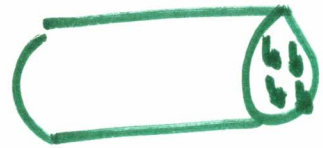
Forces are not always axial.





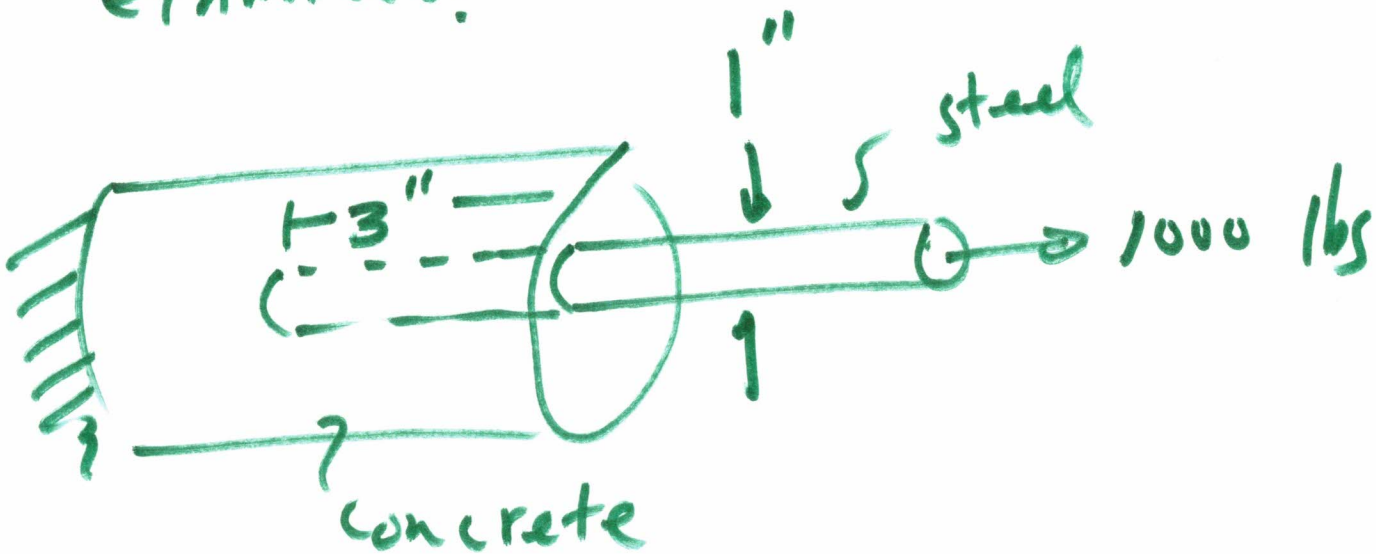


$$\sigma_{axial} = \frac{F_{axial}}{A_{x\text{-}section}}$$

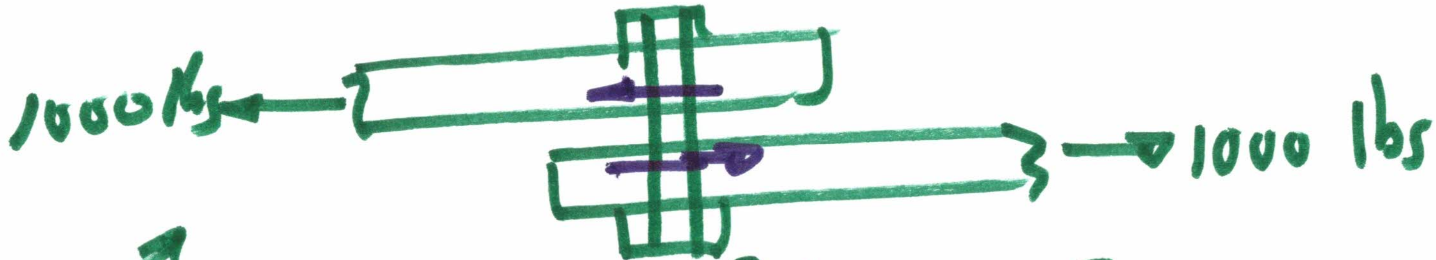


$$\tau = \frac{F_{shear}}{A_{x\text{-}section}}$$

EXAMPLES:

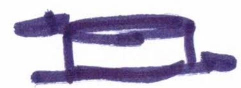


$$\tau_{avg} = \frac{1000 \text{ lbs}}{2\pi (0.5)(3) \text{ in}^2}$$

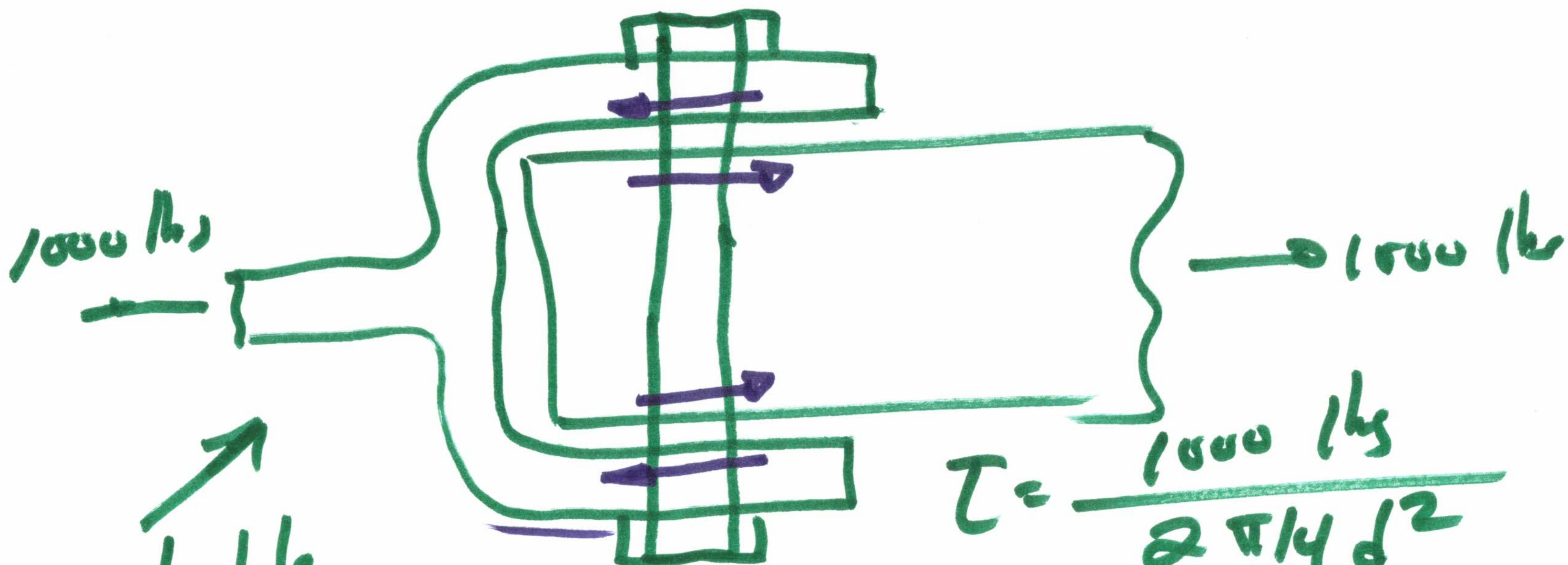


single shear

dia = 0.5 in



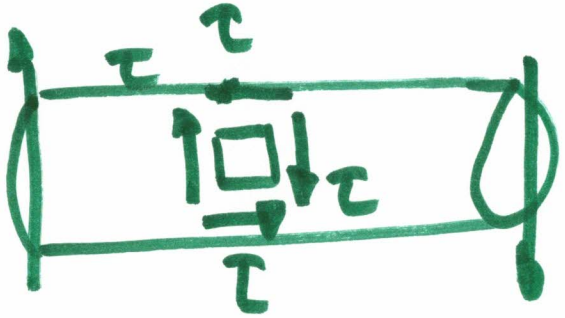
$$\tau = \frac{1000}{\pi/4\,(0.5)^2}\ \frac{lbs}{in^2}$$



double shear

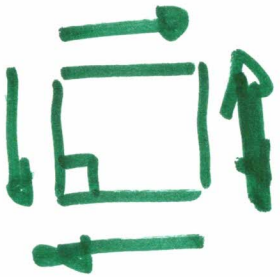
$$\tau = \frac{1000\ lbs}{2\,\pi/4\,d^2}$$

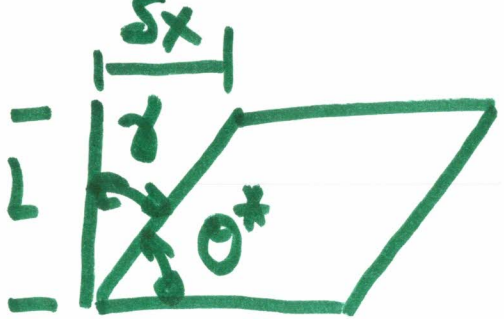
A. Equilibrium Requirement of shear stress



} shear stresses always act as a set

I. shear strain



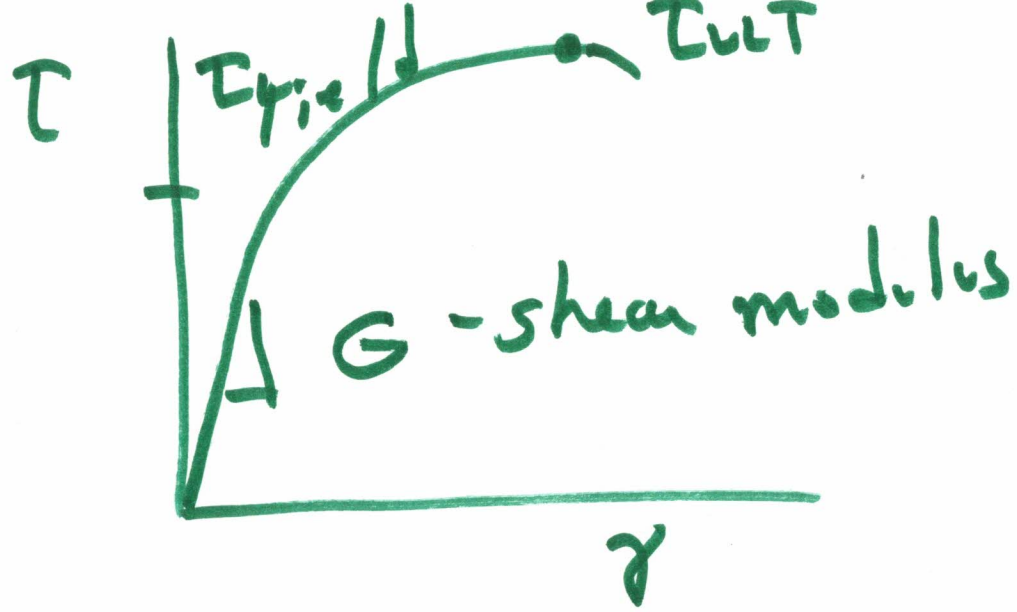


$$\gamma = \frac{\pi}{2} - \theta^*$$

$$\gamma \approx \frac{\delta x}{L}$$

$$\tan\gamma = \frac{\delta x}{L}$$

$$\tan\gamma \approx \gamma$$



$\sigma = E\epsilon$

$\tau = G\gamma$

Hooke's Law in shear