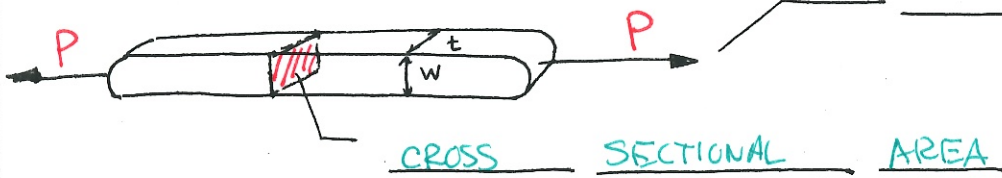


STRESS, STRAIN & OTHER Ss

NORMAL STRESS IN MEMBERS



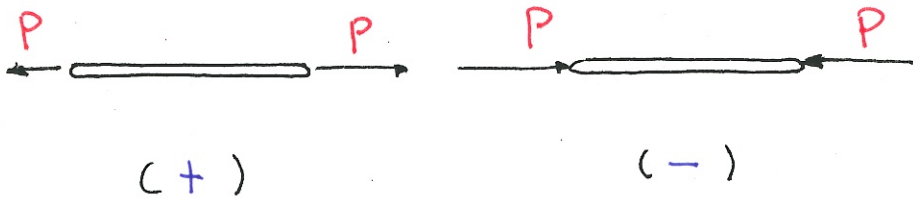
$$A = w \cdot t$$

$$\sigma = \frac{P}{A} \equiv \text{NORMAL STRESS}$$

UNITS: DIMENSIONS

$$\frac{[\text{FORCE}]}{[\text{AREA}]} \Rightarrow \frac{\text{N}}{\text{m}^2} \equiv \text{Pa} \quad \text{OR} \quad \frac{\text{lbs}}{\text{in}^2} \quad \text{OR} \quad \frac{\text{Kips}}{\text{in}^2}$$

SIGN CONVENTION



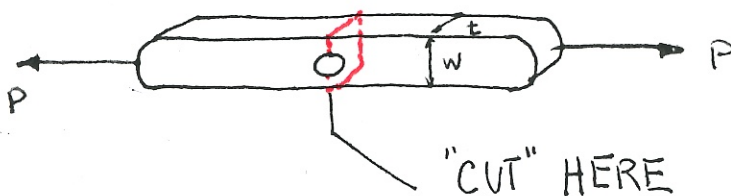
TENSION

COMPRESSION

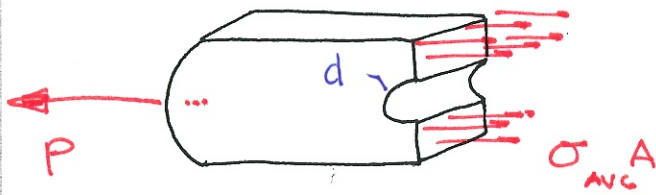
TENSION HEADACHE

THINGS BREAK WHEN STRESS NOT FORCE IS TOO HIGH.

WHAT IF THERE IS A HOLE IN BAR?



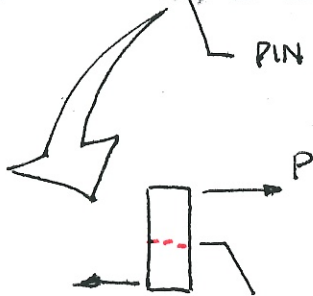
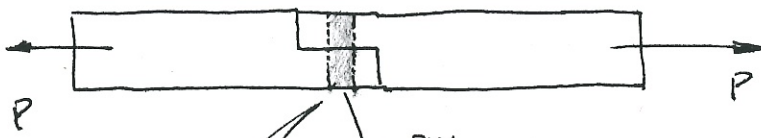
DRAW F.B.D. FOR SECTION LEFT of "CUT"



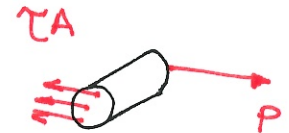
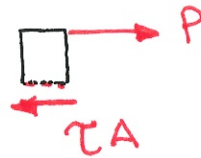
$$\sigma_{avg} = \frac{P}{(w-d)t}$$

SO STRESS HERE IS GREATER. MORE LIKELY TO FAIL HERE.

SHEAR STRESS IN CONNECTIONS



"CUT" HERE



ISO VIEW

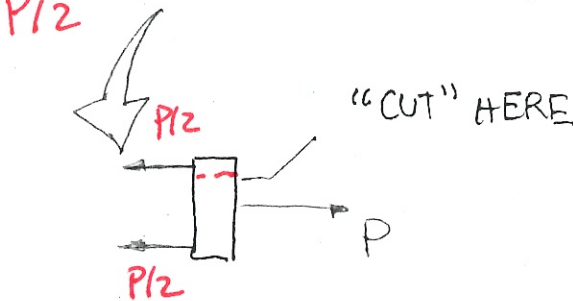
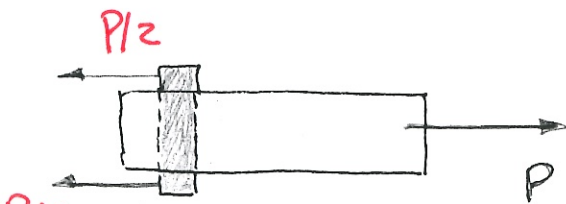
SINGLE SHEAR

$$\tau_{av} = \frac{P}{A} \equiv \text{SHEAR STRESS}$$

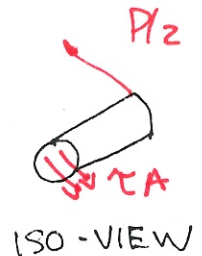
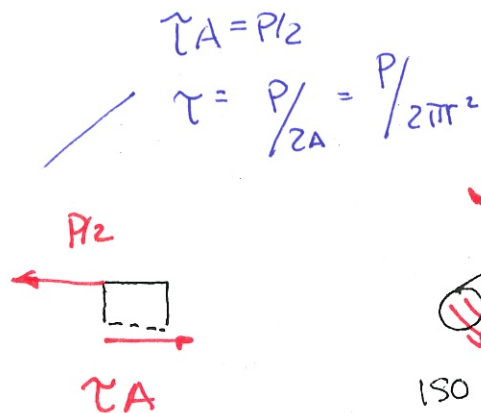
$$= \frac{P}{\pi r^2}$$

NOT P IS TAN TO AREA, NOT NORMAL.

DOUBLE SHEAR



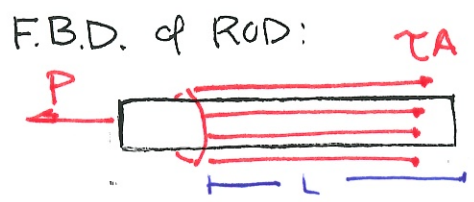
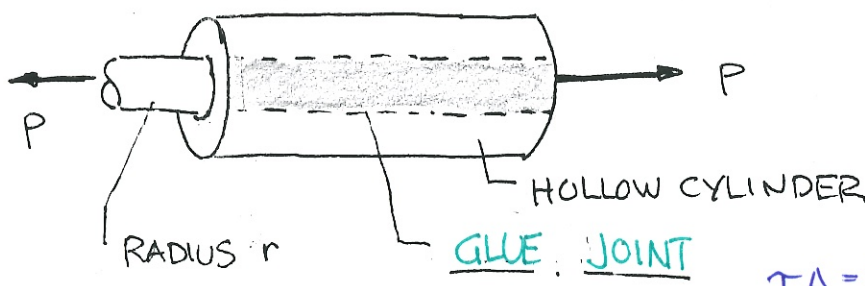
"CUT" HERE



ISO-VIEW

$$\tau A = P/2$$

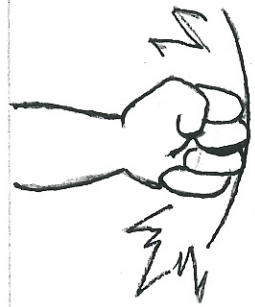
$$\tau = \frac{P/2}{2A} = \frac{P}{4A}$$



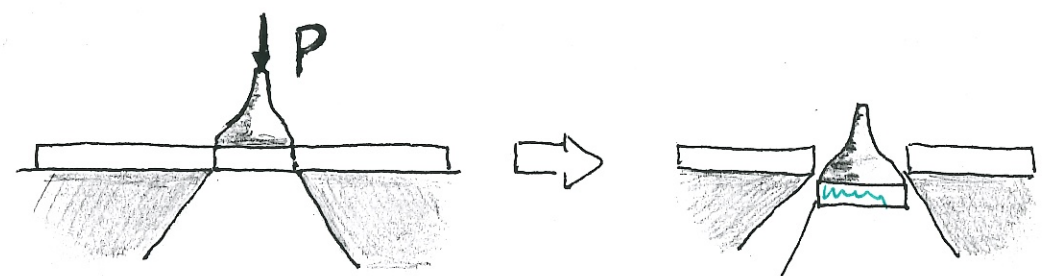
$$\tau A = P$$

$$\tau = P/A = P/2\pi r L$$

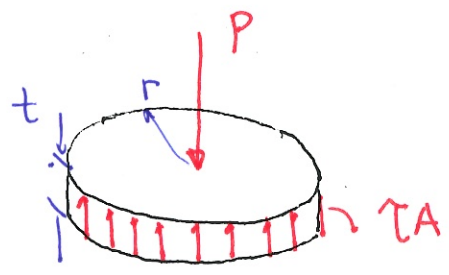
CONTACT AREA
IMPURTANT



PUNCHING SHEAR STRESS



FBD PUNCHED DISK



$$\tau A = P$$

$$\tau = P/A = P/2\pi r t$$

SUMMARY

- STRESS IS "FORCE PER AREA"
- 1. NORMAL (σ) \Rightarrow F \perp TO AREA
- 2. SHEAR (τ) \Rightarrow F \parallel " "
- DRAW FBD!! NOW W/ STRESS & AREA.