ENGR 240

HW # 10

6.24) σ at $F = 24{,}500\ N \Rightarrow \dfrac{24{,}500\ N}{\frac{\pi}{4}(0.010\ m)^2} = 3.11 \times 10^8\ Pa$

$= 311\ MPa$

- UNDER LOAD, no plastic def, so 311 MPa must be $< \sigma_y$

Aluminum, Copper } WON'T WORK!

- also, need strain (elastic) $< \dfrac{0.9}{380} = 2.4 \times 10^{-3}$

required E for that strain $= E = \dfrac{3.11 \times 10^8\ Pa}{2.4 \times 10^{-3}} = 129\ GPa$

Brass - won't work

only thing left is STEEL

6.26) ε under load $= \dfrac{0.425''}{2.36''} = 0.18$

σ to give $\varepsilon = 0.18 =$ (Figure 6.12) $\approx 60{,}000\ psi$

Minimum radius will give $\sigma = 60{,}000\ psi$ at $F = 11{,}240\ lb$

$60{,}000\ psi = \dfrac{F}{A_0} = \dfrac{11{,}240\ lb}{\pi r^2} \rightarrow$ **$r = 0.24$ inch**