(1-71) $\sigma_t = \frac{N}{A_{bolt}}$, $18\times10^3 \frac{lb}{in^2} = \frac{N}{\frac{\pi}{4}(0.31\,in)^2} \rightarrow N = 1{,}358.6\,lb$

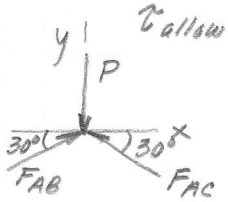
$\sigma_b = \frac{N}{A_{(dia\ washer)} - A_{(dia\ hole)}}$, $2\times10^3 \frac{lb}{in^2} = \frac{N}{\frac{\pi}{4}\left((0.75in)^2 - (0.50in)^2\right)} \rightarrow N = 490.9\,lb$

max allowable tension = **491 lb**

(1-89) F.S. = 2, $F.S. = \frac{\sigma_{fail}}{\sigma_{allow}} \rightarrow \sigma_{allow} = \frac{6\,ksi}{2} = 3\,ksi$

$F.S. = \frac{\tau_{fail}}{\tau_{allow}} \rightarrow \tau_{allow} = \frac{1.5\,ksi}{2} = 0.75\,ksi$

joint A:



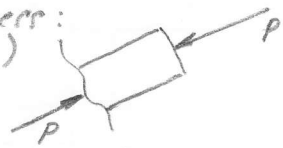

$\sum F_x = 0,\ F_{AB} = F_{AC}$

$\sum F_y = 0,\ -P + F_{AB}\sin 30° + F_{AC}\sin 30° = 0$

$2F_{AB}\sin 30° = P$

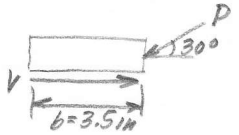
$F_{AB} = P$

normal stress (member AB):




$\sigma_{allow} = \frac{N}{A} \rightarrow 3\,ksi = \frac{P}{(3\,in)(1.25\,in)}$, $P = 11.25\,kip$

shear stress (at B):




$\tau_{allow} = \frac{V}{A} \rightarrow 0.75\,ksi = \frac{P\cos 30°}{(3in)(3.5in)}$, **P = 9.09 kip**

(1-91) vertical (gray) member:

max $\sigma$ (smallest area): $(\sigma_t)_{allow} = 150\times10^6 \frac{N}{m^2} = \frac{P}{(0.006m)(0.075m)}$

$P = 67{,}500\,N$ or $67.5\,kN$

bearing of pin (upward): $(\sigma_b)_{allow} = 220\times10^6 \frac{N}{m^2} = \frac{P}{(0.025m)(0.020m)}$

$P = 110{,}000\,N$ or $110\,kN$

pin:

double shear: $(\tau)_{allow} = 130\times10^6 \frac{N}{m^2} = \frac{\frac{P}{2}}{(0.010m)(0.025m)}$

$P = 65{,}000\,N$ or $65.0\,kN$

pin bearing (downward) on horizontal member:

$(\sigma_b)_{allow} = 220\times10^6 \frac{N}{m^2} = \frac{\frac{P}{2}}{(0.005m)(0.025m)}$

$P = 55{,}000\,N$ or **55.0 kN**