

P= AXIAL PULL ON BEAM

A= CROSS SECTIONAL AREA OF BEAM

M= BENDING MOMENT AT A GIVEN SECTION

C= DISTANCE FROM CENTROID TO EXTREME FIBER

I = MOMENT OF INERTIA

S_s SHEAR STRESS

S_T STRESS IN TENSION

S_c STRESS IN COMPRESSION

PER READING SHEAR STRESS 60% OF ULTIMATE STRENGTH
A500 GRADE B TUBE ULTIMATE STRENGTH 58000 PSI YIELD
(SHAPED) 46000 PSI

$$\frac{P}{A} \pm \frac{MC}{I} = S_s$$

$$P = 388.035\# - 1335.0\# = -946.0\#$$

$$\frac{-947.0\#}{1.19\text{IN}^2} \pm \frac{-24360.3''\# * 1.25''}{0.881\text{IN}^4} = S_s$$

$$-796.0\text{PSI} + -34563.0\text{PSI} = S_s = 35359 \text{ PSI}$$

$$\frac{-947.0\#}{1.19\text{IN}^2} \pm \frac{-24360.3''\# * 1.25''}{0.881\text{IN}^4} = S_T$$

$$-796.0\text{PSI} + -34563.0\text{PSI} = S_T = 35359 \text{ PSI}$$

$$\frac{-947.0\#}{1.19\text{IN}^2} - \frac{-24360.3''\# * 1.25''}{0.881\text{IN}^4} = S_c$$

$$-796.0\text{PSI} + -34563.0\text{PSI} = S_c = 33767 \text{ PSI}$$

$$\text{FACTOR OF SAFETY} = N_s = \frac{\text{SHEAR STRESS}}{\text{ALLOWABLE SHEAR STRESS}}$$

$$N_s = \frac{34800\text{PSI}}{35359\text{PSI}}$$

$$N_s = 0.98$$

$$\text{FACTOR OF SAFETY} = N_y = \frac{\text{YIELD STRESS}}{\text{ALLOWABLE YIELD STRESS}}$$

$$N_y = \frac{48000\text{PSI}}{35359\text{PSI}}$$

$$N_y = 1.36$$