\[ \begin{align*}
\{ \mathbf{F} \} \cdot \mathbf{u} &= -P + V = 0 \\
V &= P
\end{align*} \]

\[ p = R = 0.8 \text{ in} \] — the radius of the "head" of the rod.

If \( p \) is less than \( R \), shear force \( V \) will be less than \( P \).

If \( p \) is greater than \( R \), cross-sectional area is not minimized.

\[ T = \frac{V}{A} \] \( T_{\text{max}} \) occurs when \( V \) is maximized and when \( A \) is minimized.

\[ T_{\text{max}} = \frac{P}{2\pi R d} \Rightarrow 10 \text{ ksf} = \frac{P}{2\pi (0.8 \text{ in})(0.25 \text{ in})} \Rightarrow P = 12.57 \text{ kips} \]
Steel Rod "head"

\[ \sum F_j \delta = V - P = 0 \]
\[ V = P \]

\[ P = r \}

- the radius of the hole in the plate and
- (assuming that there is no gap)
- the diameter of the rod shaft.

\[ T_{\text{max}} = \frac{V}{A} = \frac{P}{2 \pi r t} = \frac{P}{2 \pi (0.3 \text{ in}) (0.04 \text{ in})} = 18 \text{ ksi} \]

\[ \Rightarrow P = 13.57 \text{ kips} \]

\[ \text{max } P = \begin{cases} 12.57 \text{ kips for aluminum plate} \\ 13.57 \text{ kips for steel rod head} \end{cases} \]

\[ \text{max } P \text{ allowable is } P = 12.57 \text{ kips} \]

Before aluminum plate fails.

Note: If you examine the steel rod shaft,

\[ \sum F_j \delta = 0 = R_s - P \Rightarrow R_s = P \]

Tensile loading \( \Rightarrow T_{\text{max}} \theta = 45^\circ \)

\[ T_{\text{max}} = \frac{P}{2A_0} = \frac{P}{2 \pi r^2} = \frac{P}{2 \pi (0.3 \text{ in})^2} \]

\[ = 18 \text{ ksi} \]

\[ \Rightarrow P = 10.18 \text{ kips} \]