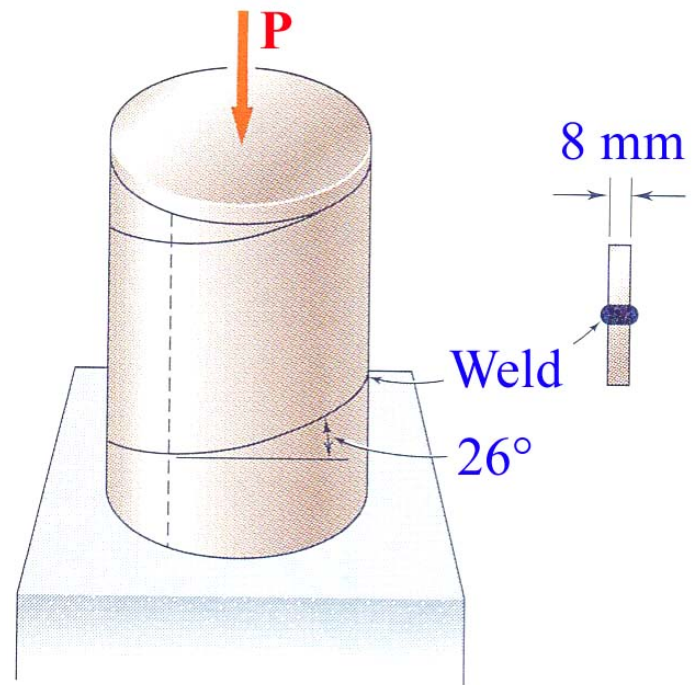


MEEG 3013 Quiz #1.m03.072

A steel pipe of 300-mm outer diameter is fabricated from 8-mm-thick plate by welding along a helix that forms an angle of 26° with a plane perpendicular to the axis of the pipe. Knowing that the maximum allowable normal and shearing stresses in the weld are $\sigma = 50$ MPa and $\tau = 24$ MPa, determine the maximum magnitude P of the axial force that can be applied to the pipe.



$$A_{\text{net}} = \pi \left[(0.15)^2 - (0.142)^2 \right] \text{ m}^2 = 2.336\pi \times 10^{-3} \text{ m}^2 \quad \textcircled{2}$$

$$\frac{P_{\sigma} \cos 26^\circ}{A_{\text{net}} / \cos 26^\circ} = 50 \times 10^6 \quad P_{\sigma} = 454.226 \times 10^3 \text{ N} \quad \textcircled{3}$$

$$\frac{P_{\tau} \sin 26^\circ}{A_{\text{net}} / \cos 26^\circ} = 24 \times 10^6 \quad P_{\tau} = 447.025 \times 10^3 \text{ N} \quad \textcircled{3}$$

$$P_{\text{max}} = 447 \text{ kN} \quad \textcircled{2}$$