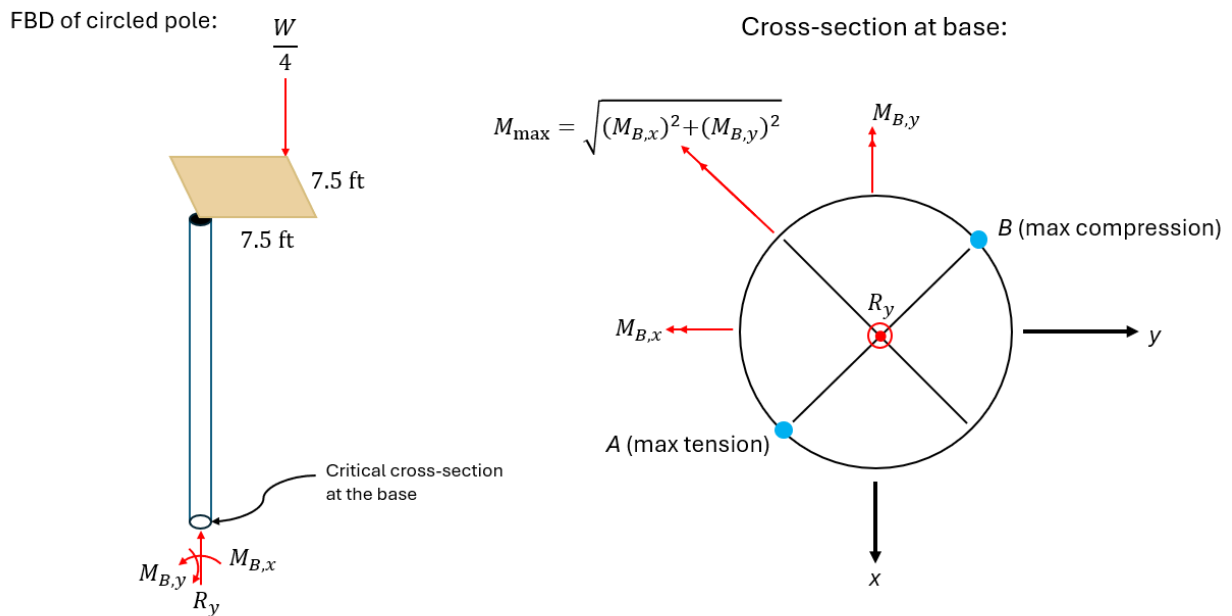


INSTRUCTIONS:

This quiz is open-book and open-note. Please answer all questions and show all of your work.

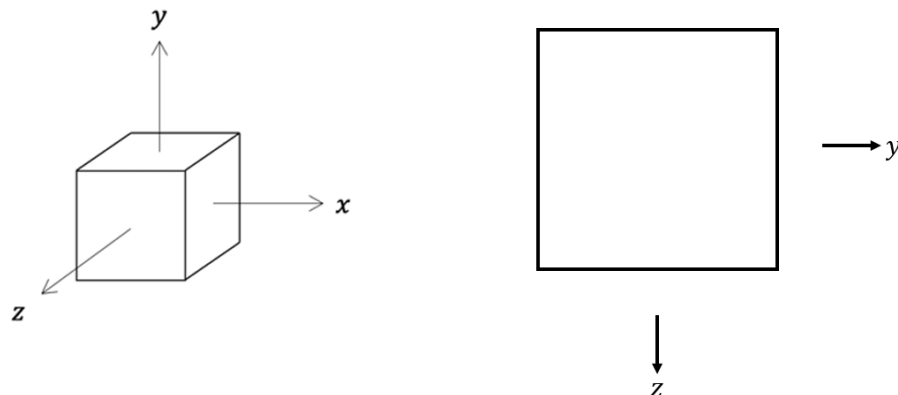
GIVEN:

Recall the shelter and pole from In-Class Quiz 1, illustrated below with the forces and moments acting at the cross-section of the pole at the base. Recall that point A was a critical point on the cross section.



FIND:

- 1) (10 points) Draw the stresses on the element below in 3D and in 2D (assuming plane stress).



- 2) (10 points) Given that $M_{\max} = 132.6 \text{ ft} \cdot \text{lbf}$ and $R_y = 12.5 \text{ lbf}$, calculate the numerical values of each stress acting on the stress element.
- 3) Assume that the pole is a ductile hot-rolled steel bar with a minimum yield strength in tension and compression of 50 ksi. Determine the factor of safety at point A using:
- ☐ (20 points) The distortion-energy (DE) theory
 - ☐ (20 points) The maximum-shear-stress (MSS) theory
- 4) Assume that the pole is a (brittle) gray cast iron bar with a minimum ultimate strength in tension of 30 ksi and a minimum ultimate strength in compression of 130 ksi. Determine the factor of safety at point C using:
- ☐ (20 points) The brittle Coulomb-Mohr (BCM) theory
 - ☐ (20 points) The modified-Mohr (MM) theory

BONUS: (10 points) Which material is the best choice for this application (the ductile HR steel or the brittle gray cast iron)? Explain your reasoning.