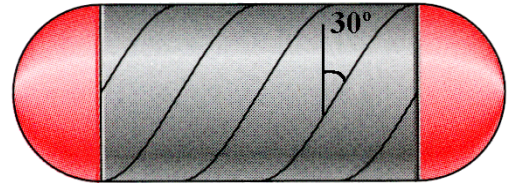


A steel boiler with a 1 m outer diameter is welded using a spiral seam that makes an angle of 30° with respect to a transverse plane of the boiler, as shown below. For an internal pressure of 925 kPa and a wall thickness of 50 mm, determine the maximum shearing stress in the boiler.

Show all work and write your answer with units in the box below.



$$\sigma_h = \frac{925,000 \left(\frac{1}{2} - 0.05\right)}{0.05}$$

$$\sigma_h = 8.325 \text{ MPa}$$

$$\sigma_a = \frac{925,000 \left(\frac{1}{2} - 0.05\right)}{(0.05)(2)}$$

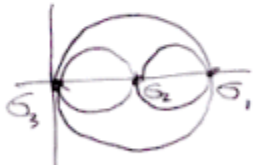
$$\sigma_a = 4.163 \text{ MPa}$$

Surface

$$\sigma_1 = 8.325 \text{ MPa}$$

$$\sigma_2 = 4.163 \text{ MPa}$$

$$\sigma_3 = 0$$



$$\tau_1 = \frac{8.325 - 0}{2} = 4.163 \text{ MPa}$$

$$\tau_2 = \frac{8.325 - 4.163}{2} = 2.082 \text{ MPa}$$

$$\tau_3 = \frac{4.163 - 0}{2} = 2.081 \text{ MPa}$$

Inside

$$\sigma_1 = 8.325 \text{ MPa}$$

$$\sigma_2 = 4.163 \text{ MPa}$$

$$\sigma_3 = -0.925 \text{ MPa}$$



$$\tau_1 = \frac{8.325 - (-0.925)}{2} = 4.625 \text{ MPa}$$

$$\tau_2 = \frac{8.325 - 4.163}{2} = 2.544 \text{ MPa}$$

$$\tau_3 = \frac{4.163}{2} = 2.081 \text{ MPa}$$

$\tau_{\max} =$