

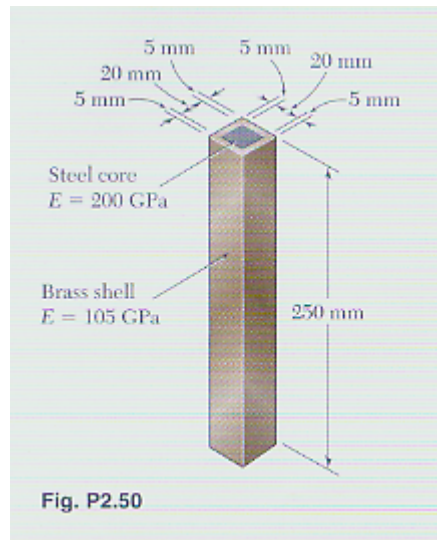
Strength of Materials

HW#3

Due: Wed. February 11, 2009 by class-time

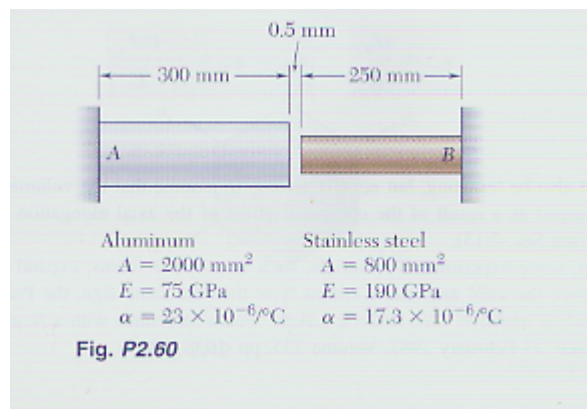
2.50

The brass shell ($\alpha_b = 20.9 \times 10^{-6} / ^\circ\text{C}$) is fully bonded to the steel core ($\alpha_s = 11.7 \times 10^{-6} / ^\circ\text{F}$). Determine the largest allowable increase in temperature if the stress in the steel core is not to exceed 55 MPa.



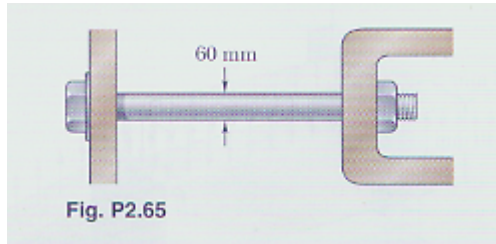
2.60

At room temperature (20°C) a 0.5-mm gap exists between the ends of the rods shown. At a later time when the temperature has reached 140°C , determine (a) the normal stress in the aluminum rod, (b) the change in length of the aluminum rod.

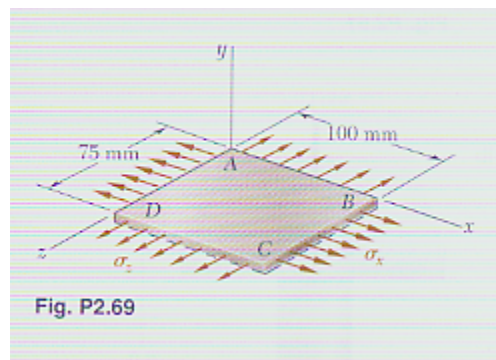


2.65

The change in diameter of a large steel bolt is carefully measured as a nut is tightened. Knowing that $E = 200$ GPa and $\nu = 0.29$, determine the internal force in the bolt, if the diameter is observed to increase by $13 \mu\text{m}$.

**2.69**

A fabric used in air-inflated structures is subjected to a biaxial loading that results in normal stresses ($\sigma_x = 120$ MPa and $\sigma_z = 160$ MPa). Knowing that the properties of the fabric can be approximated as $E = 87$ GPa and $\nu = 0.34$, determine the change in length of (a) side AB , (b) side BC , (c) diagonal AC .



2.80

Two blocks of rubber with a modulus of rigidity $G = 1.50$ ksi are bonded to rigid supports and to a plate AB . Knowing that $b = 8$ in. and $c = 5$ in., determine the largest allowable load P and the smallest allowable thickness a of the blocks if the shearing stress in the rubber is not to exceed 210 psi and the deflection of the plate is to be at least $1/4$ in.

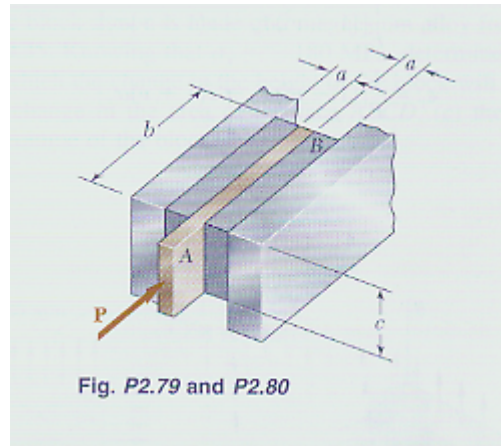


Fig. P2.79 and P2.80

2.97

A hole is to be drilled in the plate at A. The diameters of the bits available to drill the hole range from 12 to 24 mm in 3-mm increments. (a) Determine the diameter d of the largest bit that can be used if the allowable load at the hole is to exceed that at the fillets, (b) If the allowable stress in the plate is 145 MPa, what is the corresponding allowable load P ?

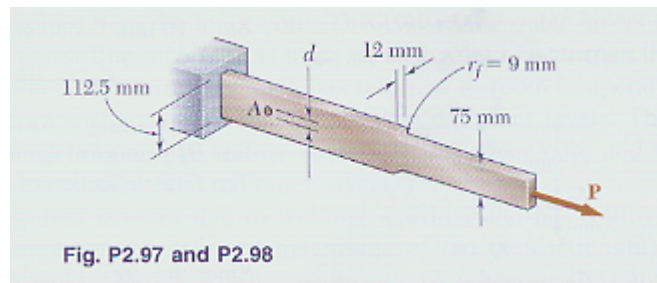


Fig. P2.97 and P2.98