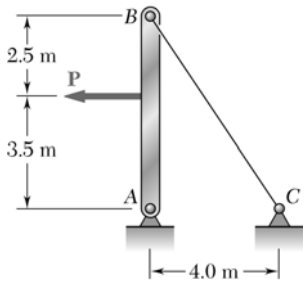
EN0310: Mechanics of Solids and Structures

Homework 2: Stress and Strain – Axial Loading

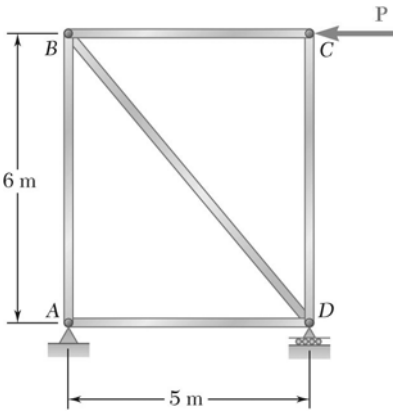
Due on Friday, 09/30/11, at 1pm outside Prof. Shenoy's office (BH604) in a box labeled EN31----Drop Off (on the top of white cabinet).

From textbook "Mechanics of Materials" by Beer, Johnston, DeWolf and Mazurek, 6th Edition, McGraw-Gill.



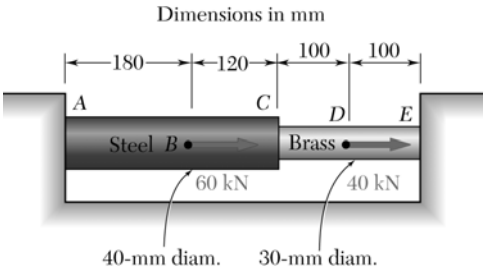
PROBLEM 2.13

The 4-mm-diameter cable *BC* is made of a steel with $E = 200$ GPa. Knowing that the maximum stress in the cable must not exceed 190 MPa and that the elongation of the cable must not exceed 6 mm, find the maximum load **P** that can be applied as shown.



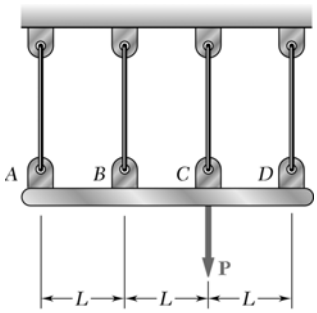
PROBLEM 2.22

The steel frame (E = 200 GPa) shown has a diagonal brace BD with an area of 1920 mm^2. Determine the largest allowable load **P** if the change in length of member BD is not to exceed 1.6 mm.



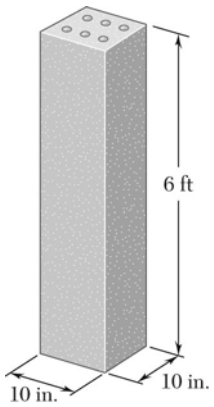
PROBLEM 2.41

Two cylindrical rods, one of steel and the other of brass, are joined at C and restrained by rigid supports at A and E. For the loading shown and knowing that $E_s = 200$ GPa and $E_b = 105$ GPa, determine (*a*) the reactions at A and E, (*b*) the deflection of point C.



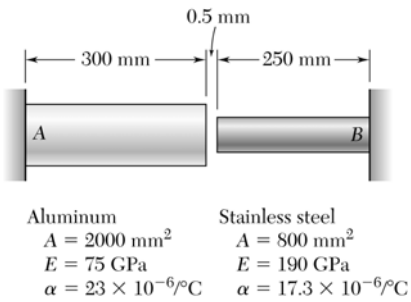
PROBLEM 2.43

The rigid bar *ABCD* is suspended from four identical wires. Determine the tension in each wire caused by the load **P** shown.



PROBLEM 2.47

The concrete post ($E_c = 3.6 \times 10^6$ psi and $\alpha_c = 5.5 \times 10^{-6}/°\text{F}$) is reinforced with six steel bars, each of $\frac{7}{8}$-in. diameter ($E_s = 29 \times 10^6$ psi and $\alpha_s = 6.5 \times 10^{-6}/°\text{F}$). Determine the normal stresses induced in the steel and in the concrete by a temperature rise of 65°F.



PROBLEM 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.