Division of Engineering
Brown University

EN0310: Mechanics of Solids and Structures

Homework #2: Stress and Strain

Due on Friday, 09/25/09, 4pm outside Dr. Gao's office (BH610) in a box labeled EN 31.

Problem 1.53. In the steel structure shown, a 6-mm-diameter pin is used at *C* and 10-mm-diameter pins are used at *B* and *D*. The ultimate shearing stress is 150 MPa at all connections, and the ultimate normal stress is 400 MPa in a link *BD*. Knowing that a factor of safety of 3.0 is desired, determine the largest load **P** that can be applied in *A*. Note that link *BD* is not reinforced around the pin holes.

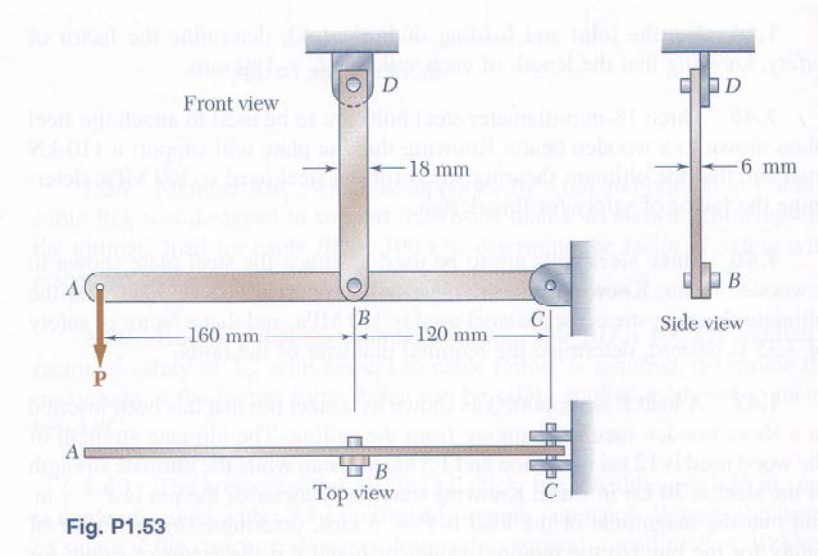

Fig. P1.53

Problem 1.54. Solve Prob. 1.53, assuming that the structure has been redesigned to use 12-mm-diameter pins at *B* and *D* and no other change has been made.

Problem 2.3. A 60-m-long steel wire is subjected to 6-kN tensile force. Knowing that $E = 200$ GPa and that the length of the rod increases by 48 mm, determine (*a*) the smallest diameter that may be selected for the wire, (*b*) the corresponding normal stress.

Problem 2.19. Bothe portions of the rod *ABC* are made of an aluminum for which $E = 70$ GPa. Knowing that the magnitude of **P** is 4 kN, determine (a) the value of **Q** so that the deflection at *A* is zero, (b) the corresponding deflection of *B*.

Fig. P2.19 and P2.20

Problem 2.20. The rod *ABC* is made of an aluminum for which $E = 70$ GPa. Knowing that $P = 6$ kN and $Q = 42$ kN, determine the deflection of (*a*) point *A*, (*b*) point *B*.

Problem 2.23. Members *AB* and *CD* are 1⅛-in.-diameter steel rods, and members *BC* and *AD* are ⅞-in.-diameter steel rods. When the turnbuckle is tightened, the diagonal member *AC* is put in tension. Knowing that $E = 29\times10^6$ psi and h = 4 ft, determine the largest allowable tension in *AC* so that the deformation in members *AB* and *CD* do not exceed 0.04 in.

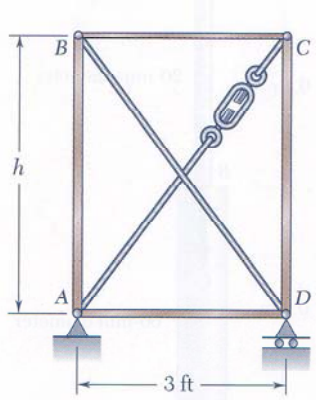

Fig. P2.23

Problem 2.28. The length of the 2-mm-diameter steel wire *CD* has been adjusted so that with no load applied, a gap of 1.5mm exists between the end *B* of the rigid beam *ACB* and a contact point *E*. Knowing that $E = 200$ GPa, determine where a 20-kg block should be placed on the beam in order to cause contact between *B* and *E*.

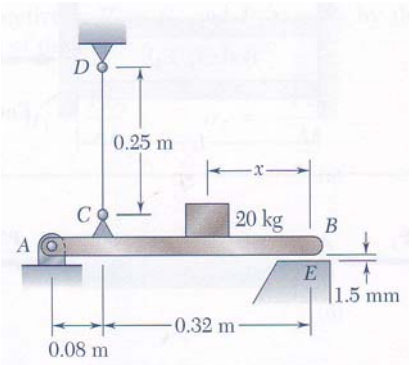

Fig. P2.28