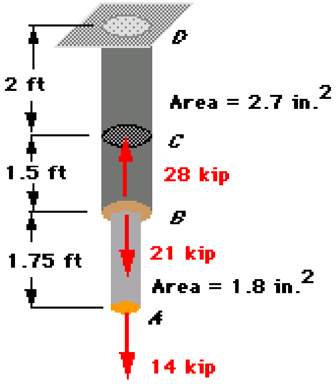
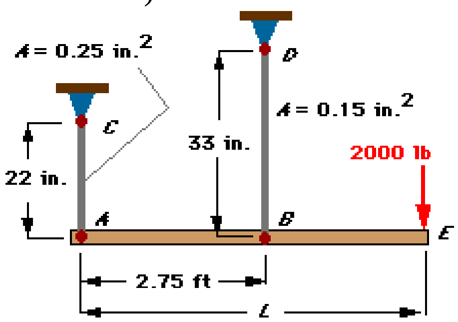
1)

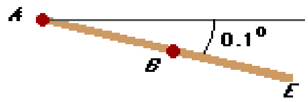



Rod *ABCD* is made from aluminum ($E = 10 \times 10^6$ psi) and is subjected to the three applied forces shown. Neglect the weight of the rod, and determine the displacement of point *A*.

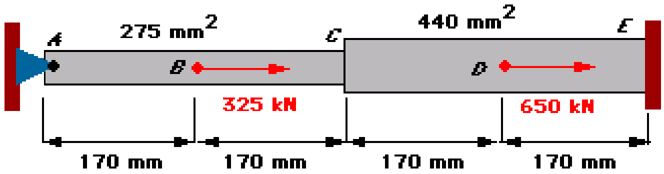
2)




Rigid beam *ABE* is supported by two steel rods ($E = 30 \times 10^6$ psi) and subjected to a 2000-lb load applied at *E*. Determine the length (*L*) of beam *ABE* so that the angle formed by the beam and a horizontal reference line does not exceed 0.1°.

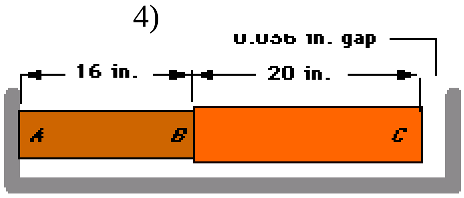



3)




The stepped steel rod ($E$ = 200 GPa) shown is subject to intermediate loads of 325 kN and 650 kN. We wish to determine the reactions at *A* and *E*.

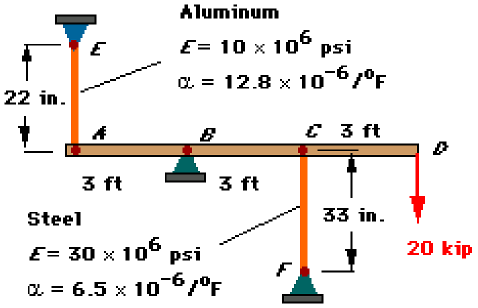
4)




| Steel | Aluminum |
|---|---|
| $A$ = 2.5 in.$^2$ | $A$ = 3.75 in.$^2$ |
| $E = 30 \times 10^6$ psi | $E = 10 \times 10^6$ psi |
| $\alpha = 6.5 \times 10^{-6}/°F$ | $\alpha = 12.8 \times 10^{-6}/°F$ |

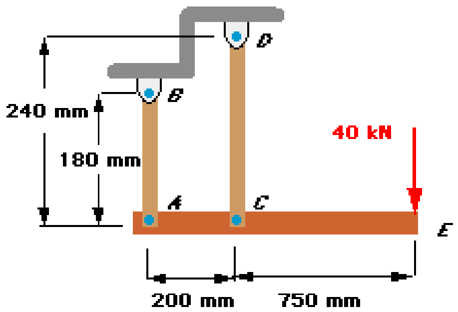
Steel (*AB*) and aluminum (*BC*) bars are connected at *B* and placed between two fixed supports. There is a 0.036-in. gap between the aluminum bar and the support on the right. Determine the compressive stress in each bar after a temperature change of 300°F.

5)




Rigid beam (*ABCD*) is supported by a pinned connection at *B*, an aluminum rod (*AE*), and a steel rod (*CF*). The cross-sectional area of both rods is 2.5 in.$^2$. A 20-kip load is applied at *D*. If both rods are heated from room temperature (70°F) to 170°F, determine the compressive force in rods *AE* and *CF*.

6)



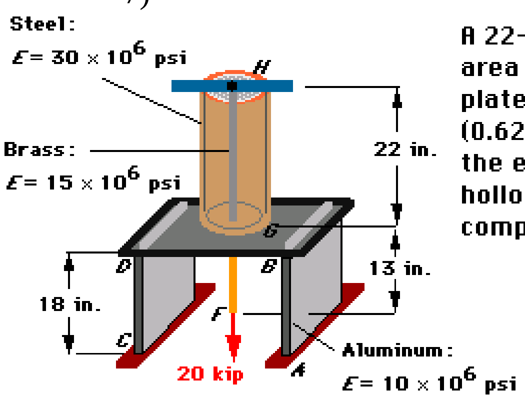

Rigid bar *ACE* is supported by links *AB* and *CD*. Both links experience a temperature change of $\Delta T = 100°C$. Determine the deflection of points *A*, *C*, and *E* if a force of 40 kN is applied at *E* and

$$(\alpha)_{AB} = 24 \times 10^{-6} \text{ mm/mm/°C}$$

$$(\alpha)_{CD} = 12 \times 10^{-6} \text{ mm/mm/°C}$$

$(AE)_{AB} = 12 \times 10^6$ N $\quad (AE)_{CD} = 32 \times 10^6$ N

7)




A 22-in. section of steel with a 1.375-in.$^2$ cross-sectional area rests on a rigid platform supported by two aluminum plates (1.5 × 7.5 × 18 in.). A 35-in.-long brass rod (0.625-in. diameter) supports a 20-kip load at *F*, while the end is attached to a rigid bar (*H*) resting on the hollow steel cylinder. Neglect the weight of each component and determine the deflection of point *F*.