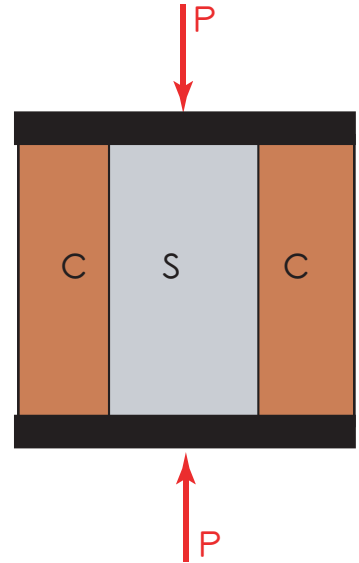# Example

A solid steel rod S is placed inside a copper pipe C having the same length.  The coefficient of thermal expansion of copper is larger than the coefficient  of steel.  After being assembled, the cylinder and tube are compressed between two rigid plates by forces P.  Obtain a formula for the increase in temperature that will cause all of the load to be carried by the copper tube.  Units: k (kips), in.

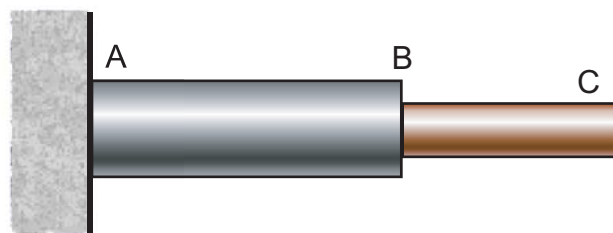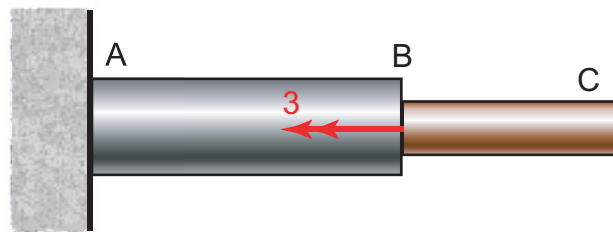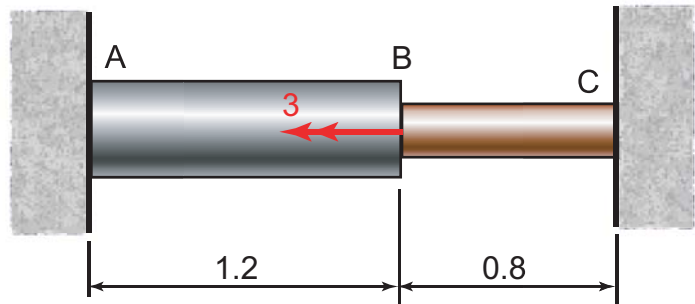# STATICALLY INDETERMINATE SHAFTS

## Example

The steel shaft AB has a diameter of 60 mm and the copper shaft BC
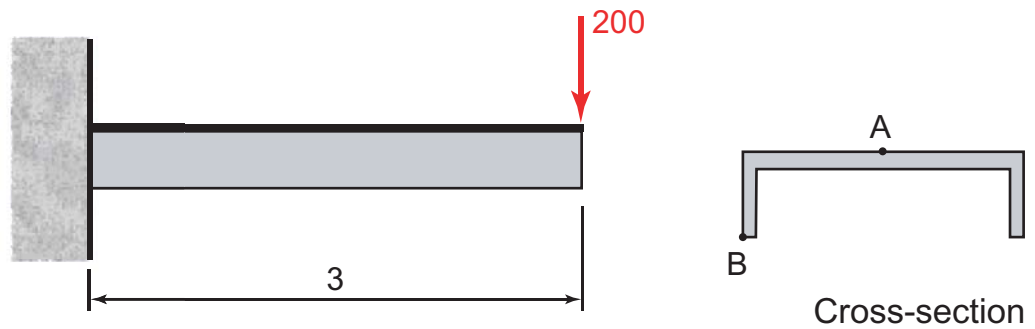has a diameter of 45 mm.  Determine the reactions at A and C.

Units: kN•m, m.

G (steel)= 77.2 GPa

G (copper)= 44 GPa.

# Example

Find the bending stresses at the wall at points A and B for the C6x13 beam.  Units: lb, ft.

200

3

A

B

Cross-section

## C6x13

Area, $A = 3.83^{in^2}$

Depth, $d = 6.00^{in}$

Flange Width, $b_f = 2.16^{in}$

Flange Thickness, $t_f = 0.343^{in}$

Web Thickness, $t_w = 0.437^{in}$

$I_x = 17.4^{in^4}$

$I_y = 1.05^{in^4}$

$S_x = 5.80^{in^3}$

$S_y = 0.642^{in^3}$

$\bar{x} = 0.514^{in}$

# Example

The built-up box beam is constructed by nailing four 2"x6" (nominal size) boards together. If each nail can support a shear force of 70 lb, determine the maximum spacing s of nails at A and B. Units: lb, in.

150

3 ft

B

A

5.5

1.5

Cross-section