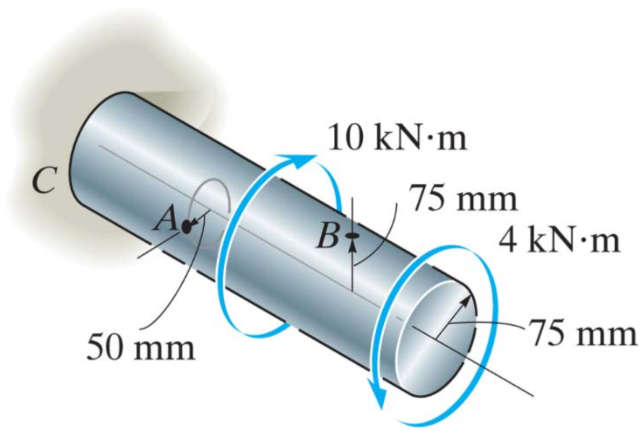
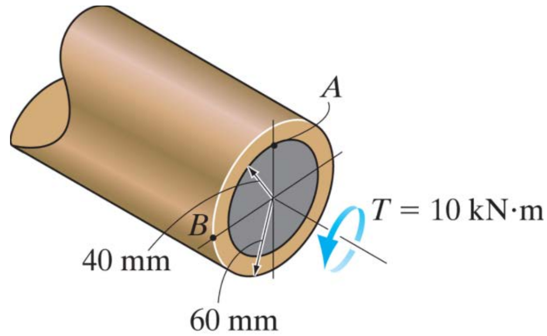
Example 1

The solid shaft is fixed to the support at C and subjected to the torsional loadings shown. Determine the shear stress at points A and B and sketch the shear stress on the volume elements located at these points.



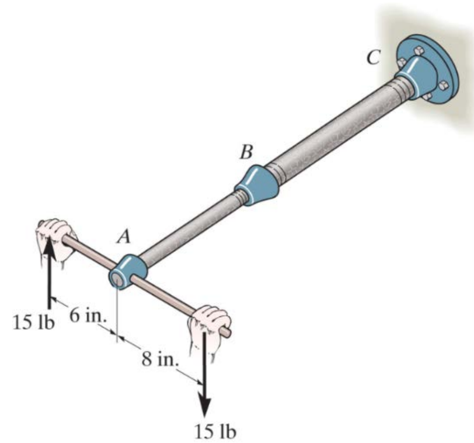
Example 2

The hollow circular shaft is subjected to an internal torque of T=10 kNm. Determine the shear stress developed at points A and B. Represent each state of stress on a volume element.



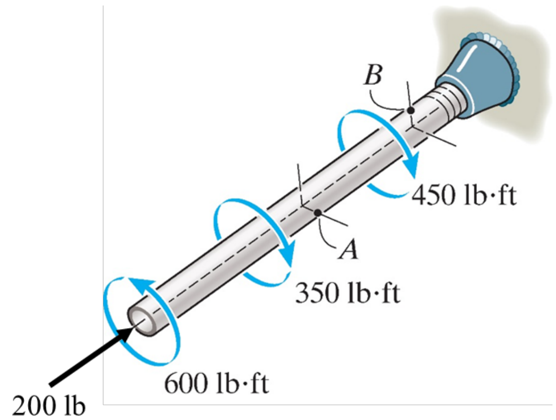
Example 3

The assembly consists of two sections of galvanized steel pipe connected together using a reducing coupling at B. The smaller pipe has an outer diameter of 0.75 in and an inner diameter of 0.68 in, whereas the larger pipe has an outer diameter of 1 in and an inner diameter of 0.86 in. If the pipe is tightly secured into the wall at C, determine the maximum shear stress developed in each section of the pipe when the couple shown is applied to the handles of the wrench.

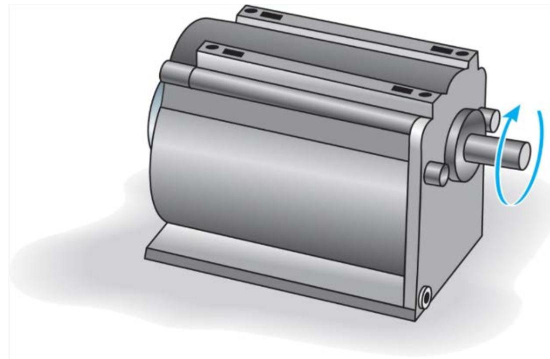


Example 4

The copper pipe has an outer diameter of 2.50 in and a wall thickness of 0.1 in. If it is tightly secured to the wall and three torques and one compressive force are applied to it, determine the stress developed at points A and B. These points lie on the pipe's outer surface. Sketch the stress on a volume element for each point.



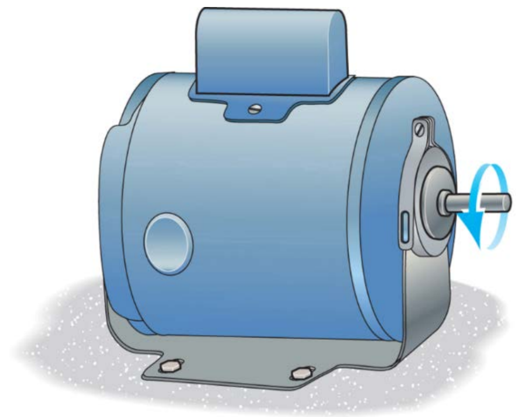
Example 5



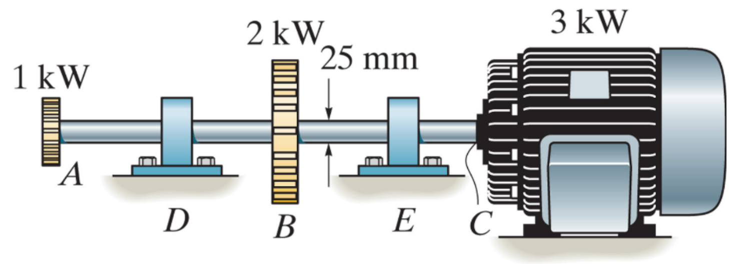
The gear motor can develop 3 hp when it turns at 150 rev/min. If the allowable shear stress for the shaft is τ_{allow}=12 ksi, determine the smallest diameter of the shaft to the nearest 1/8 in that can be used.

Example 6

The 25 mm diameter shaft on the motor is made of a material having an allowable shear stress of τ_{allow}=75 MPa. If the motor is operating at its maximum power of 5 kW, determine the minimum allowable rotation of the shaft.



Example 7



The solid steel shaft AC has a diameter of 25 mm and is supported by smooth bearings at D and E. It is coupled to a motor at C, which delivers 3 kW of power to the shaft while it is turning at 50 rev/s. If gears A and B remove 1 kW and 2 kW, respectively, determine the maximum shear stress developed in the shaft within regions AB and BC. The shaft is free to turn in its support bearing D and E.

Example 8

The step shaft is to be designed to rotate at 720 rpm while transmitting 30 kW of power. Is this possible? The allowable shear stress is τ_{allow}=12 MPa and the radius at the transition on the shaft is 7.5 mm.