材料力學　作業 8

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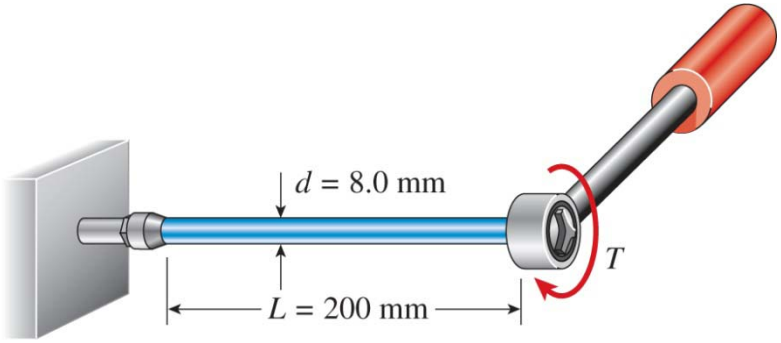
3.3-6 The steel shaft of a socket wrench has a diameter of 8.0 mm. and a length of 200 mm (see figure).

If the allowable stress in shear is 60 MPa, what is the maximum permissible torque T_{max} that may be exerted with the wrench?

Through what angle ϕ (in degrees) will the shaft twist under the action of the maximum torque? (Assume $G = 78\,\text{GPa}$ and disregard any bending of the shaft.)

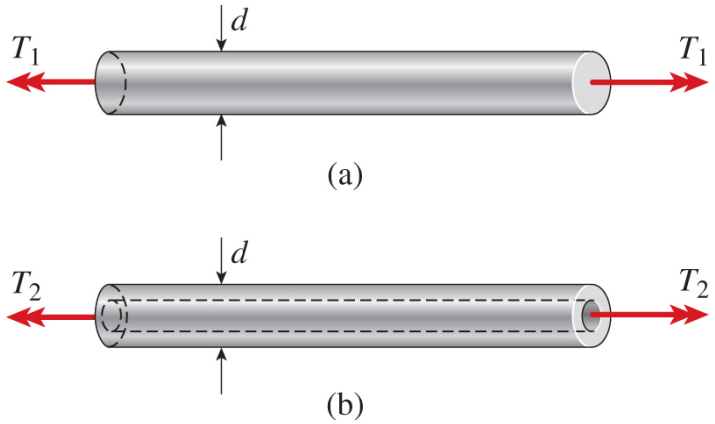


3.3-15 A solid brass bar of diameter $d = 30$ mm is subjected to torques T_1, as shown in part a of the figure. The allowable shear stress in the brass is 80 MPa.

(a) What is the maximum permissible value of the torques T_1?

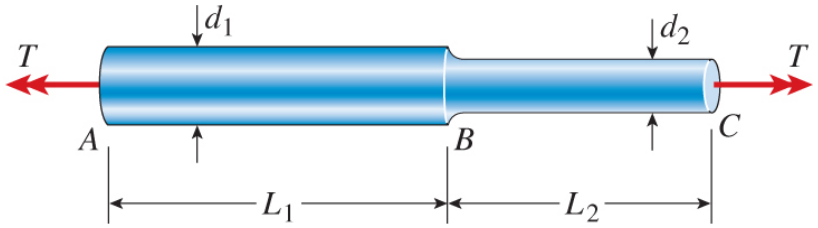
(b) If a hole of diameter 15 mm is drilled longitudinally through the bar, as shown in part b of the figure, what is the maximum permissible value of the torques T_2?

(c) What is the percent decrease in torque and the percent decrease in weight due to the hole?



3.4-4 A solid circular bar *ABC* consists of two segments, as shown in the figure. One segment has diameter $d_1 = 56\,\text{mm}$ and length $L_1 = 1.45\,\text{m}$; the other segment has diameter $d_2 = 48\,\text{mm}$ and length $L_2 = 1.2$.

What is the allowable torque T_{allow} if the shear stress is not to exceed 30 MPa and the angle of twist between the ends of the bar is not to exceed 1.25°? (Assume $G = 80\,\text{GPa}$.)



3.4-7 Four gears are attached to a circular shaft and transmit the torques shown in the figure. The allowable shear stress in the shaft is 70 MPa.

(a) What is the required diameter *d* of the shaft if it has a solid cross section?

(b) What is the required outside diameter *d* if the shaft is hollow with an inside diameter of 40 mm?