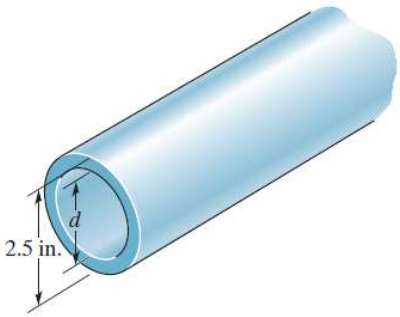
Torsion in Shafts. Question 5-43 Solution

Tuesday, 11 March, 2025 09:21 AM

5-43. A steel tube having an outer diameter of 2.5 in. is used to transmit 35 hp when turning at 2700 rev/min. Determine the inner diameter d of the tube to the nearest in. if the allowable shear stress is Tallow 10 ksi.

5–43. A steel tube having an outer diameter of 2.5 in. is used to transmit 35 hp when turning at 2700 rev/min. Determine the inner diameter d of the tube to the nearest $\frac{1}{8}$ in. if the allowable shear stress is $\tau_{allow} = 10$ ksi.



$$\frac{\tau}{\rho} = \frac{T}{J} \Rightarrow \frac{10 \times 10^3}{\frac{2.5}{2}} = \frac{\frac{35 \times 550}{2\pi \times 2700/60}}{\frac{\pi}{2}\left((1.25)^4 - \left(\frac{d}{2}\right)^4\right)}$$

$$\Rightarrow d = 2.5 \text{ inch} = 2\frac{1}{2} \text{ inch Ans.}$$

[i know i haven't explained the solution much, if you don't understand, please contact the civil thinking with the screenshot of this problem and i will help you.]