Answer on Question #69294-Physics-Other

A solid cylindrical steel column, (E = 62.1 x 109 N/m2) is 2.1 m long. If the column compresses 16.9 μm when a 16,000 kg mass is placed on top, the radius of the column must be _____ cm. (1x106μm = 1m; 100cm = 1m)

Solution

$$e = \frac{Fl}{EA}$$

$$F = mg$$

$$A = \pi r^2$$

$$e = \frac{mgl}{E\pi r^2}$$

The radius of the column must be

$$r = \sqrt{\frac{mgl}{\pi eE}} = \sqrt{\frac{(16000)(9.8)(2.1)}{\pi(16.9 \cdot 10^{-6})(62.1 \cdot 10^{9})}} = 0.316\ m = 31.6\ cm.$$