

Answer on Question #69295-Physics-Other

Two poles (as shown below) are separated by 13.2 m and connected by a massless wire. An object of mass 2.4 kg is placed at the center of the wire and causes the wire to sag 0.7 m. The tension in the wire is ___ N.

Solution

From the Second Newton's law:

$$ma_y = 2T \sin \alpha - mg$$

Now

$$\tan \alpha = \frac{h}{\frac{d}{2}} = \frac{0.7}{\frac{13.2}{2}} = 0.106 \rightarrow \alpha = \tan^{-1} 0.106 = 6.05^\circ.$$

For the equilibrium:

$$ma_y = 0$$

$$0 = 2T \sin \alpha - mg$$

The tension in the wire is

$$T = \frac{mg}{2 \sin \alpha} = \frac{(2.4)(9.8)}{2 \sin 6.05^\circ} = 112 \text{ N.}$$

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