Answer on Question #72804-Physics-Other

A 100 N traffic light is supported at the midpoint of a 20m length of cable between two poles. Find the tension in each cable segment if the cable sags a vertical distance of 0.5m

Solution

For the equilibrium:

$$W = 2T \sin \alpha$$

The tension in each cable segment is

$$T = \frac{W}{2 \sin \alpha}$$

$$\sin \alpha = \frac{h}{\frac{l}{2}} = \frac{2h}{l}$$

Thus,

$$T = \frac{W}{2\frac{2h}{l}} = \frac{Wl}{4h}.$$

$$T = \frac{(100)(20)}{4(0.5)} = 1000\ N.$$

Answer: 1000 N.