Answer on Question #37964, Physics, Mechanics

Question:

a 200 kg load is hung on a wire of length of 4.00 m, cross sectional area 0.200 x 10^-4 m ^2 ,and Young's modulus 8.00 x 10^10 N/m^2.What is its increase in length?

Answer:

Hooke's law can be expressed in equation form as follows:

$$\frac{F}{A} = E\frac{\Delta l}{l}$$

where E is Young`s modulus, A - cross section area, l – length of the wire, F – force, Δl is increase in length.

In our case force equals weight: $F = mg$

Therefore, stretch of the wire equals:

$$\Delta l = \frac{mg}{A}\frac{l}{E} \cong 4.91\ mm$$

Answer: $4.91\ mm$