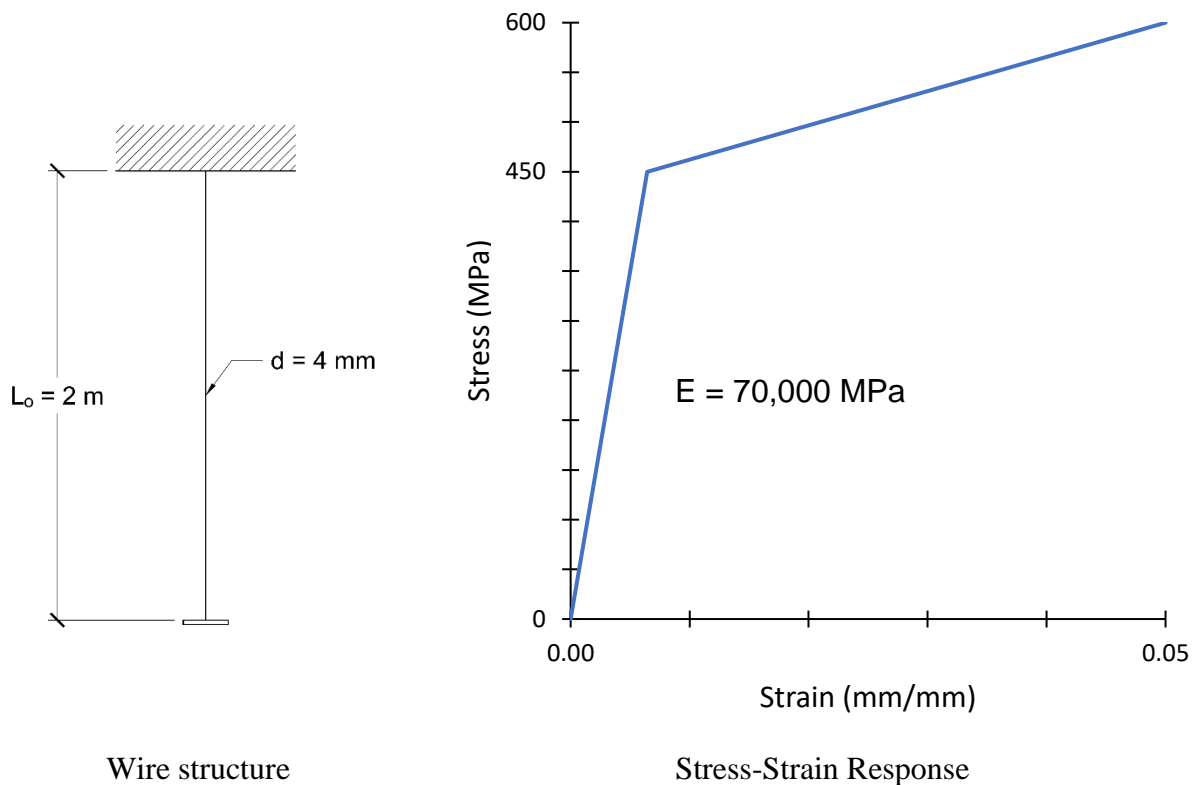# CIV102F Quiz # 4: Friday AM October 9, 2020
Nonlinear Material Behaviour

A 2 m wire holding a catch plate is hung from a ceiling just like in Assignment 3. It is made from a metallic material with the following stress-strain response:

Wire structure   Stress-Strain Response

Using the given geometry of the structure and the stress-strain curve of the material, answer the following:

1. How much longer (i.e. Δl) can the wire be stretched before it breaks? What force will it carry at this point?

2. How much energy can be absorbed by the material before it begins experiencing permanent deformations? Report your answer in J.

3. Suppose the wire was stretched to a strain of $\varepsilon = 0.0282$ mm/mm, which corresponds to a stress of $\sigma = 525$ MPa, and then let go, reducing the stress back to 0. Calculate the permanent deformation in mm caused by doing this.

4. Suppose we dropped a weight onto the flange from a height of 2 m. How heavy must the weight be in order to break the wire in one drop? Report your answer in kg.

5. If we were to hang a weight to the wire, how heavy should it be to vibrate at a natural frequency of $f_n = 6.0$ Hz? Report your answer in kg.