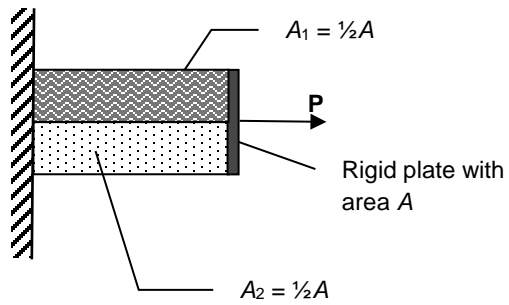
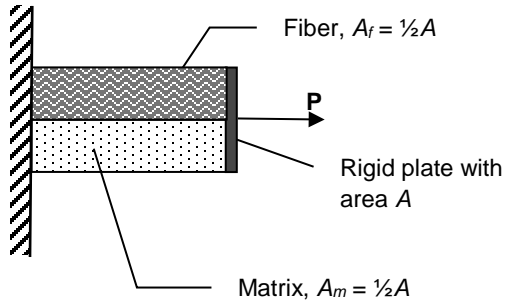

Example

Two deformable bodies are subjected to an axial load of P as shown in the figure. Draw a free body diagram that would help you to determine the load (axial force) in each material.



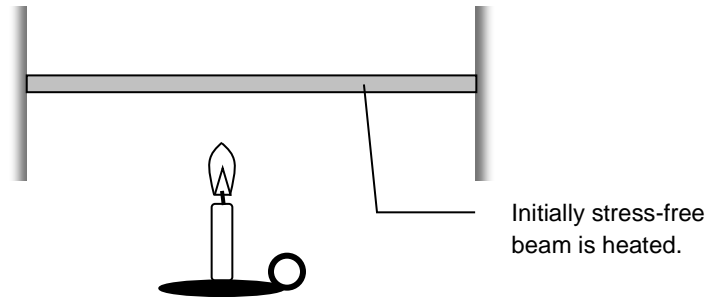
Example

A composite structure made of fiber ($E_f = 231$ GPa) and a matrix ($E_m = 3.4$ GPa) is subjected to an axial load of P as shown in the figure. Find the load carried by the fiber, the load carried by the matrix, and the total deformation of the composite.



Example

A thin rod suspended between two fixed supports is initially in a stress free state. The rod is then uniformly heated resulting in a temperature change of the rod of ΔT . Because of the heating, the rod wants to expand. However, the fixed supports prevent this from happening resulting in a compressive stress in the rod.



- Find an expression for the resulting stress in the rod in terms of Young's modulus E , the thermal expansion coefficient α , and the temperature change ΔT . Assume that the thermal expansion coefficient is constant.
- If the rod is made of SiO_2 with $E = 69 \text{ GPa}$ and $\alpha = 0.55 \times 10^{-6} / ^\circ\text{C}$, what stress will a 10°C temperature change produce? Also, find the force exerted on a rod with a square cross section with side length $a = 10 \mu\text{m}$. ($1 \mu\text{m} = 1 \times 10^{-6} \text{ m}$)