Axial Stress Question Solution

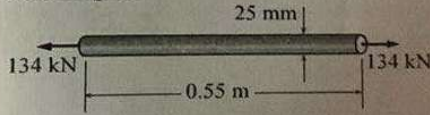**Question 2**
A 25 mm diameter steel rod ($E = 200$ GPa) must carry a load in tension of 134 kN (see figure). If the initial length of the stressed portion of the rod is 0.55 m, what is its final length?

$$\sigma = E \times \varepsilon \quad [\text{Hook's law}]$$

$$\frac{P}{A} = E \times \frac{\Delta L}{L_0}$$

$$\frac{134 \times 10^3 \, N}{\frac{\pi}{4}(0.025m)^2} = 200 \times 10^9 \frac{N}{m^2} \times \frac{\Delta L}{0.55 \, m}$$

$$\Rightarrow \Delta L = 0.00075 \, m$$

$$L_f = L_0 + \Delta L = 0.55m + 0.00075m = 0.55075 \, m$$
$$\text{ANS}$$