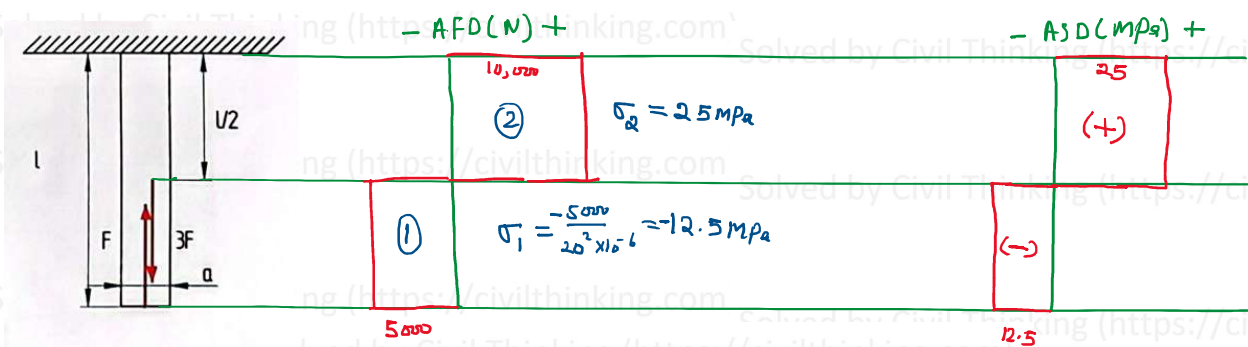
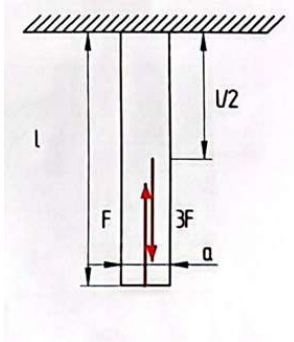


Solid Mechanics: Axial Load Diagram, Axial Stress Diagram: Problem 3 solution

Draw a graph of tensile or compressive forces and stresses and calculate the total deformation of a square steel bar with the given data $l=4\text{m}$ $b=20\text{mm}$ $F=5000\text{N}$ and $E=210\text{ GPa}$ for the following cases:



$$\delta L_{\text{Total}} = \frac{P_1 L_1}{A_1 E} + \frac{P_2 L_2}{A_2 E} = \frac{L}{2AE} (P_1 + P_2) \quad [\text{using ALD}]$$

$$\approx 0.00012 \text{ m} = 0.12 \text{ mm}$$

$$\frac{4}{2 \times 20^2 \times 10^{-6} \times 210 \times 10^9} \times (-5000 + 10000)$$

0.00011904762

$$\delta L_{\text{Total}} = \frac{\sigma_1 L_1}{E_1} + \frac{\sigma_2 L_2}{E_2} = \frac{L}{2E} (\sigma_1 + \sigma_2) \quad [\text{using ASD}]$$

$$\approx 0.00012 \text{ m} = 0.12 \text{ mm}$$

$$\frac{4}{2 \times 210 \times 10^9} \times (-12.5 + 25) \times 10^6$$

0.00011904762

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