

**35.9** A  $\frac{3}{8}$ in diameter steel threaded rod (Poisson's Ratio = 0.3) has been installed to support a 300lb load to be hung 4ft below. The lateral strain on the rod is  $-0.1\%$ . How much will the rod elongate when the load is added?

- A. 0.05in
- B. 0.1in
- C. 0.2in
- D. 0.5in

Recall that **Poisson's Ratio** is lateral strain divided by longitudinal strain. The negative sign is included because the rod contracts laterally and expands longitudinally (axially).

Find the longitudinal strain:

$$\nu = -\frac{\text{lateral strain}}{\text{longitudinal strain}} = 0.3$$
$$\nu = \frac{-0.001}{\varepsilon_{\text{long}}} = 0.3 \rightarrow \varepsilon = 0.00333$$

Under **Uniaxial Loading and Deformation**, find the formula relating strain, elastic longitudinal deformation, and the original length of the rod. The elongation is the longitudinal deformation.

$$\varepsilon = \frac{\delta}{L}$$

$$\delta = \varepsilon L = (.00333)(4ft) \left( \frac{12in}{1ft} \right) = 0.16in$$

**Answer C**