Given: Square rod shown below. Cross-section is 0.7 in $\times$ 0.7 in. Original length is 2.642 in. Compressive force of 10,000 lb is applied. Poisson's ratio is 0.3. Final length is 2.632 in.

Find: Axial strain and final width of bar

Soli'n:

\[ L_0 = 2.642'' \]
\[ L_f = 2.632'' \]
\[ E_a = \frac{L_f - L_0}{L_0} = \frac{2.632 - 2.642}{2.642} \]
\[ E_a = -0.003785 \text{ in/in} \]

\[ \nu = -\frac{E_{\text{Lateral}}}{E_{\text{Axial}}} \Rightarrow E_{\text{Lateral}} = -\nu E_{\text{Axial}} \]

\[ E_{\text{Lateral}} = -0.3 \times (-0.003785 \text{ in/in}) = 0.001136 \text{ in/in} \]

(Note: '+' means x-section getting bigger)

\[ E_{\text{Lateral}} = \frac{W_f - W_0}{W_0} \Rightarrow \Delta w = E_{\text{Lateral}} \cdot W_0 \]

\[ \Delta w = 0.001136 \text{ in/in} \times 0.7 \text{ in} = 0.000795 \text{ in} \]

\[ W_f = W_0 + \Delta w = 0.7 + 0.000795 \]

\[ W_f = 0.700795 \text{ in} \]

\[ h_f = h_0 + \Delta h = 0.7 + 0.000795 \]

\[ h_f = 0.700795 \text{ in} \]