Mechanics of Materials I:

Fundamentals of Stress & Strain and Axial Loading

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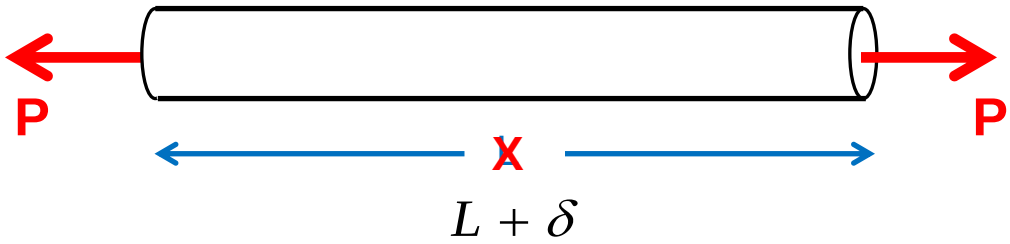
Module 8 Learning Outcome

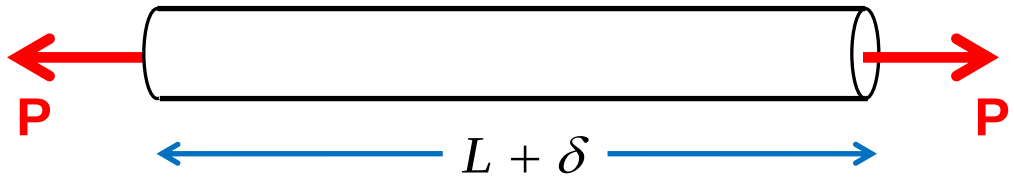
- Define/Discuss Normal Strain

Axial Centric Loading



Insert axial test clip from 0:17 to 0:21

Axial Centric Loading



Normal Strain

Elongation per unit length

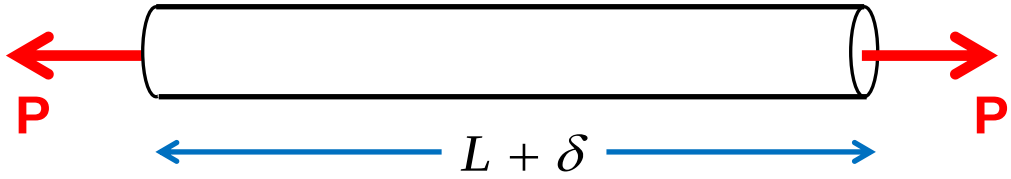
$$\varepsilon = \frac{\delta}{L}$$

[dimensionless]

Sign Convention

(+) Tension causes **(+)** elongation

(-) Compression causes **(-)** shortening



Normal Strain

Elongation per unit length

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

[dimensionless]

Nominal Strain (Engineering Strain)

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

initial length

True Strain

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

smaller

Worksheet:

A flat steel alloy bar has an initial length of 900 mm. When subjected to a total axial load in tension of 60 kN, the bar elongates by 0.45 mm.
Determine the nominal axial strain (engineering strain) in the bar.

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$$\epsilon = \frac{\delta}{L_o} = \frac{0.45\,mm}{900\,mm} = \underline{\underline{0.0005}}\ ANS$$