

MSET – CANTILEVER FLEXURE

Purpose

Perform a strain gage system calibration that will be used to determine the flexural stiffness of a cantilever beam .

Cantilever Beam



Cantilever beams are used in a variety of engineering applications. As an example, aircraft are designed with complex geometric cantilever beams called wings.

Theory

A cantilever beam has clamped - free boundary conditions. When a force "P" is applied to the free end of the beam it deflects an amount " δ ", that depends on the beam length "L", stiffness "E", and the moment of inertia "I".

$$\delta = \frac{PL^3}{3EI}$$

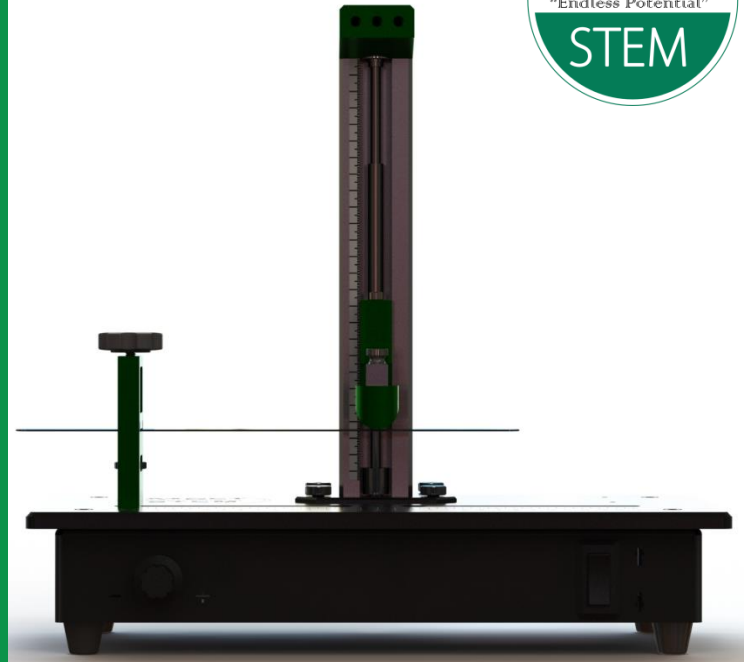
A beam of thickness "h" is strained an amount "e" as the load is applied at a point from the location of interest "X".

$$\epsilon = \frac{3hx}{2L^3} \delta$$

The stress "S" carried by the beam is given as

$$\sigma = \frac{Px(C)}{I}$$

Setup



Theory

Where "C" is the distance from the neutral axis to the surface of the beam, simplified as "h/2". The flexural stiffness is obtained by determining the slope of the stress and strain data expressed as:

$$E = \sigma / \epsilon$$

Results

Aluminum 6061-T6 Flexural Stiffness

