MSET - BUCKLING

Purpose

Examine the effects of loading materials in compression with a length and diameter that causes buckling

Columns

Columns are structural components used in engineered projects to support vertical loads. A building for example is fabricated with columns to support the weight of the entire structure built on top it. If columns are not properly sized the structure can collapse by buckling upon itself.

Theory

The critical load "F" that causes a column to buckle, or fail can be calculated with a known stiffness "E", moment of inertia "I", length "L", and correction factor "C".

$$F = \frac{\pi^2 EI}{(LC)^2}$$

The equation can be generalized for different geometries by calculating stress "S"

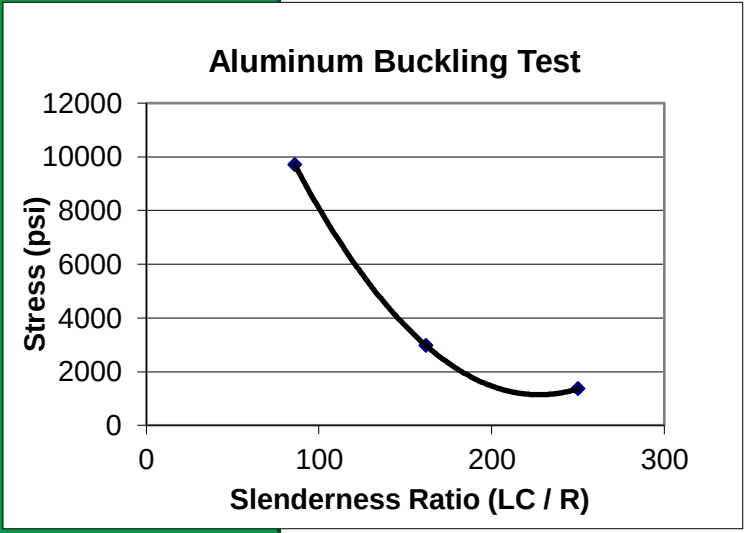
$$S = \frac{\pi^2 E}{(LC/R)^2}$$

The denominator (LC/R) is known as the slenderness ratio and is calculated with "R" the radius of gyration, and "A" the cross sectional area

$$R = \sqrt{\frac{I}{A}}$$

Setup

Results



Results will show longer and smaller cross sectional area columns will fail at lower loads, and that the relationship is nonlinear