# Beam Bending: Wood vs. Aluminum

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# Calculating Deflection

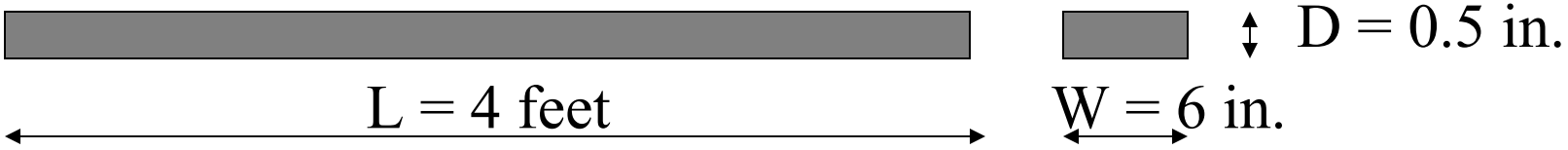

$$\delta = \frac{PL^3}{4EWD^3}$$

$\delta$ = deflection
P = load
E = stiffness of material
L = length of beam
W = width of beam
D = depth of beam

# Comparing
# Pine and Aluminum Beams

Pine


Aluminum




Weight: both beams about the same at 12 pounds each!

Let’s see how they perform…

DEMONSTRATION

# Calculated Deflections

$\delta_{wood} = 0.22$ inches
($E_{wood} = 1.5$ million pounds per square inch)

$\delta_{Al} = 0.52$ inches
($E_{Al} = 10$ million pounds per square inch)

Wood deflects less than aluminum, for same weight beam of same cross sectional shape.

# Why use aluminum?

- Aluminum can be made into any shape we want; it is more difficult to shape wood
- Aluminum is isotropic: it has the same properties in all directions. Wood performs better along the grain than across the grain.
- Wood can rot and can be attacked by insects.