

Beam Loadings

What is a beam?

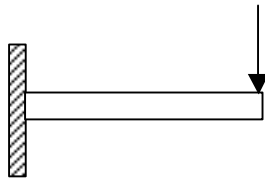
- A member subjected to loads applied transverse to the long dimension of the member and which causes the member to bend

What is the justification for studying beam analysis so thoroughly?

- Bending, or flexure, is the most common mode of loading encountered in design.
 - Shafts, springs, gear teeth, cranks, etc. are modeled as beams

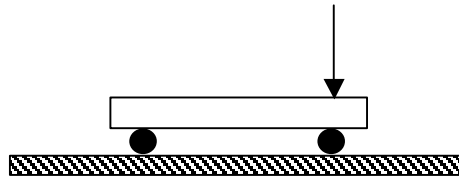
Types of beam models

Cantilevered



- One end is fixed so that it can not move transversely or rotate; it is built into the support structure

Simply Supported

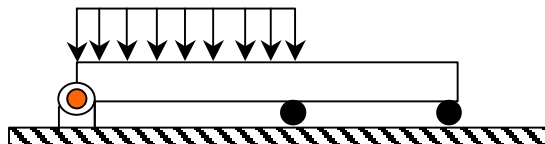


- Supported by a pin, roller or smooth surface at the ends and having one span

Cantilevered and simply supported beams are **statically determinate** since equations of equilibrium are sufficient to solve for reactions.

Beams with more than two reaction components are called **statically indeterminate**.

Statically indeterminate



Examples:

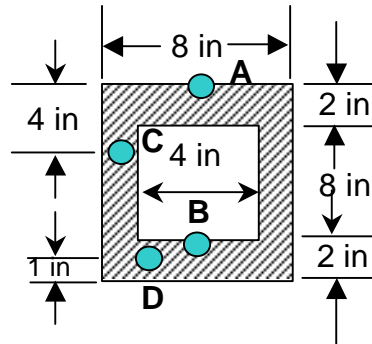
A timber beam consists of four 2 x 8 inch planks fastened together to form a box section 8 in. wide by 12 in. deep. If the resisting moment at the is is 200 000 in-lb, determine:

The bending stress at point A

The bending stress at point B

The bending stress at point C

The bending stress at point D



A beam has the cross-section shown below. On a section where the moment is $-75 \text{ kN} \cdot \text{m}$, determine the maximum tensile and compressive stresses.

