

# Announcements

- Quiz 4 this week
- Frame tutorial by Professor Kersh on Course Schedule

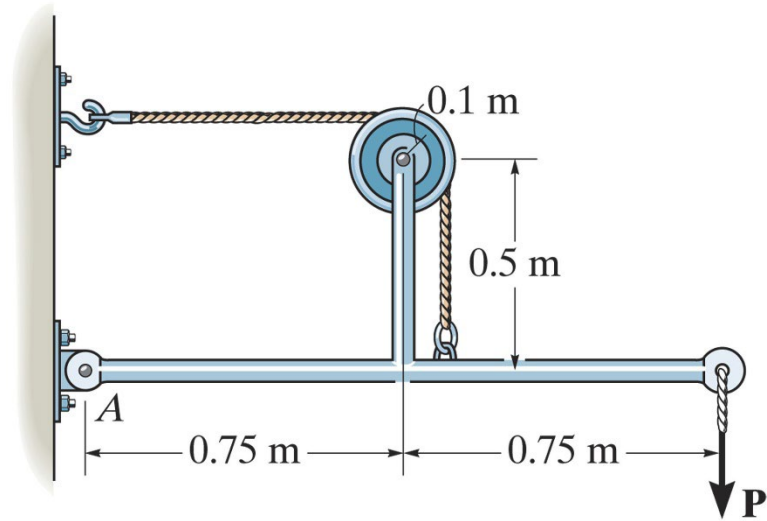
## □ Upcoming deadlines:

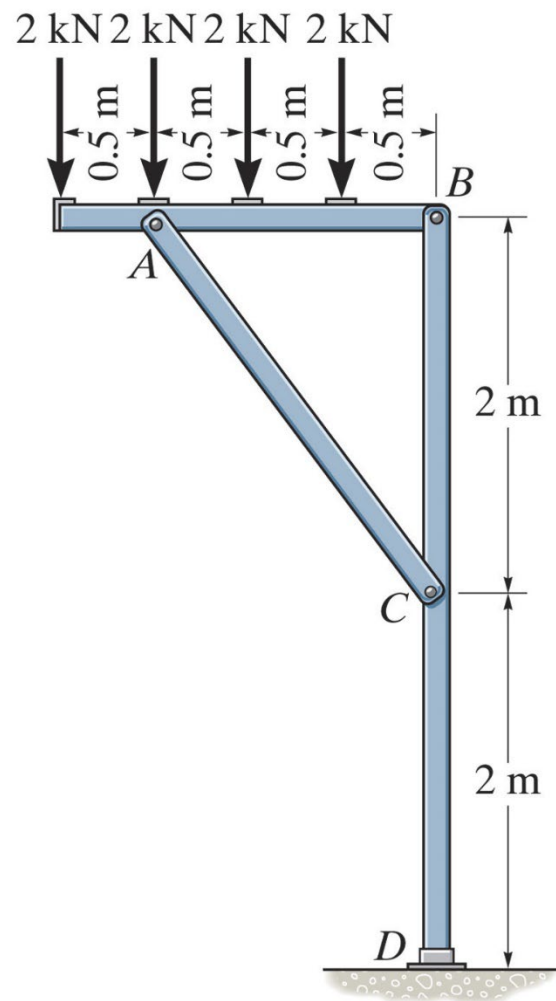
- Tuesday (3/5)
  - PL HW
- Friday (3/8)
  - Written Assignment

# Objectives

- Frame and Machines: Examples
- Internal Loadings
  - The method of sections

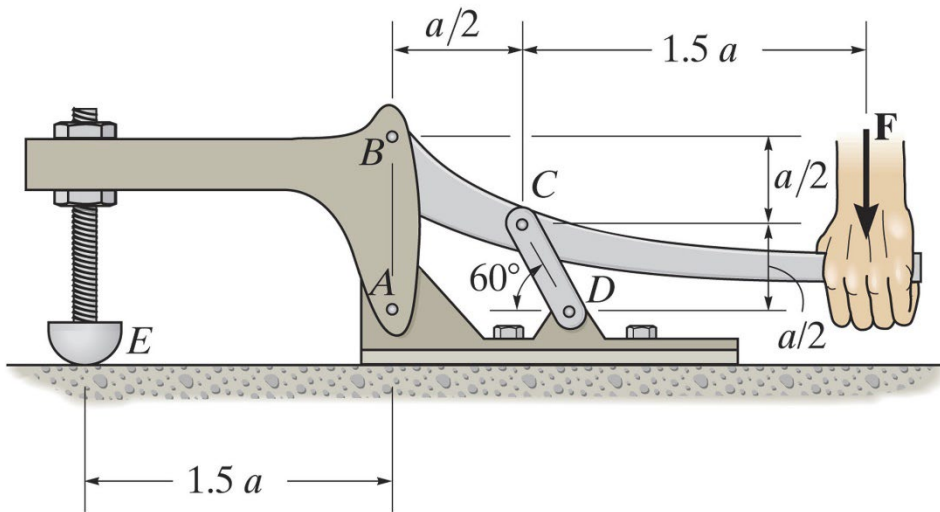
Find the force in the cable fastening the frame to the wall.





Find the force in member  $AC$ .

Find the clamping force at  $E$ .



# Chapter 7: Internal Loadings

# Internal loadings developed in structural members

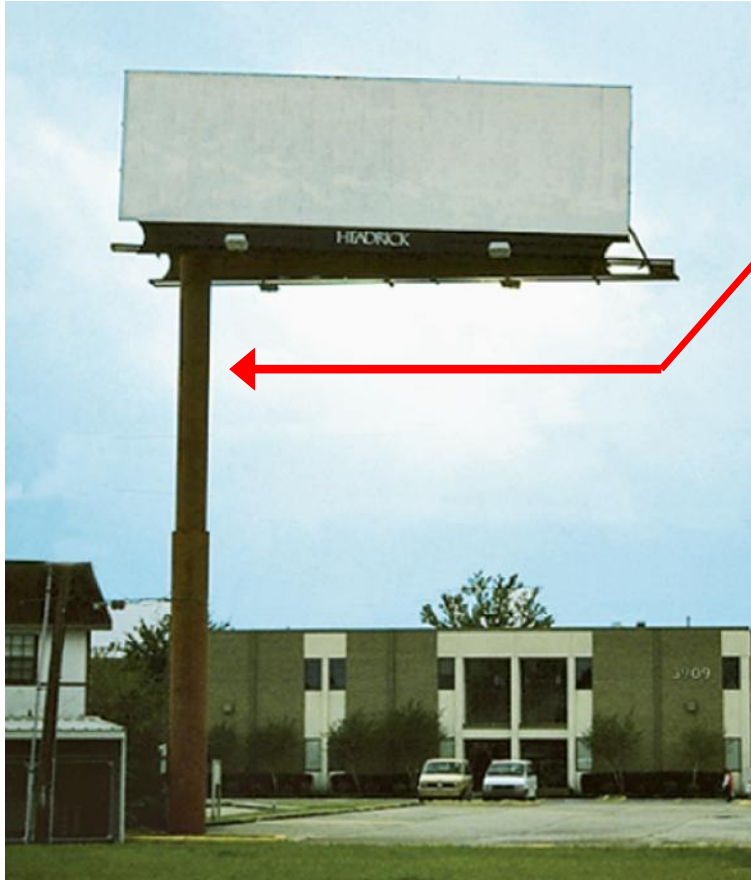


Beams are structural members designed to support loads applied perpendicularly to their axes.

Beams can be used to support the span of bridges. They are often thicker at the supports than at the center of the span.

Why are the beams tapered? Internal forces are important in making such a design decision.

# Internal loadings developed in structural members

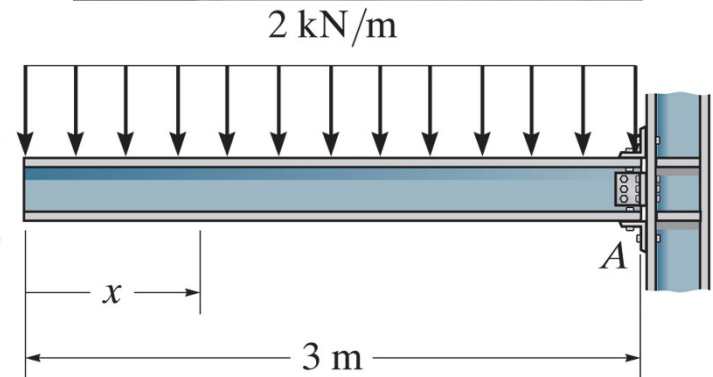
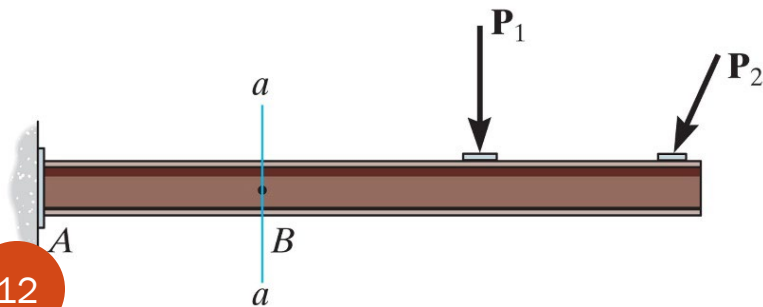


A fixed column supports these rectangular billboards.

Usually such **columns** are **wider/thicker** at the bottom than at the top. Why?



# Internal loadings developed in structural members



# Internal loadings developed in structural members

Structural Design: need to know the loading acting within the member in order to be sure the material can resist this loading

**Cutting** members at internal points reveal **internal forces and moments**.



# Sign conventions

Positive normal force

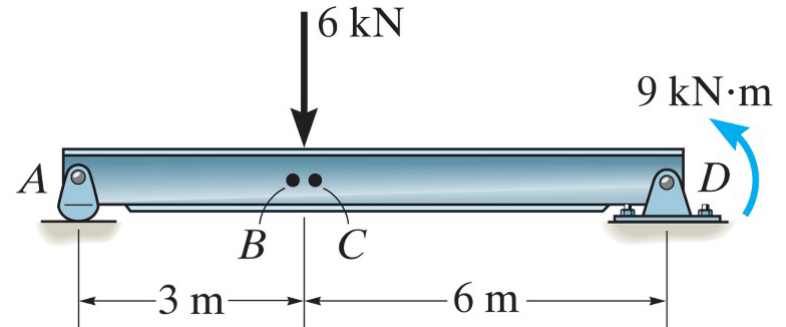
Positive shear force

Positive moment

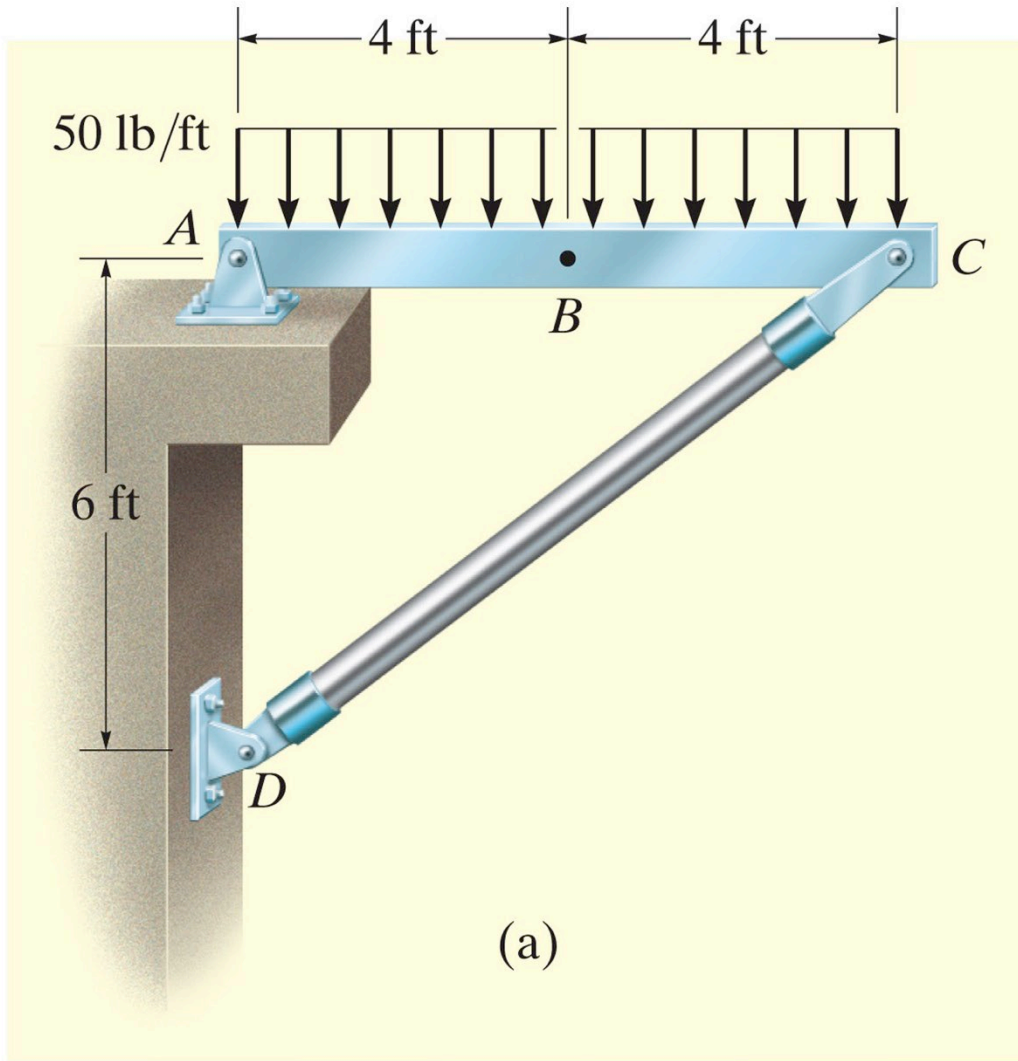
# Procedure for analysis

1. Find support reactions (free-body diagram of entire structure)
2. Pass an imaginary section through the member
3. Draw a free-body diagram of the segment that has the least number of loads on it
4. Apply the equations of equilibrium

Find the internal forces and moments at B (just to the left of P) and at C (just to the right of P)



Determine the normal force, shear force, and bending moment at  $B$ .



Determine the normal force, shear force, and bending moment at  $D$ .

