Announcements

- Frame tutorial by Professor Kersh on Course Schedule

- Upcoming deadlines:
- Tuesday (10/16)
  - PL HW & Study Consent Form
- Friday (10/19)
  - Written Assignment

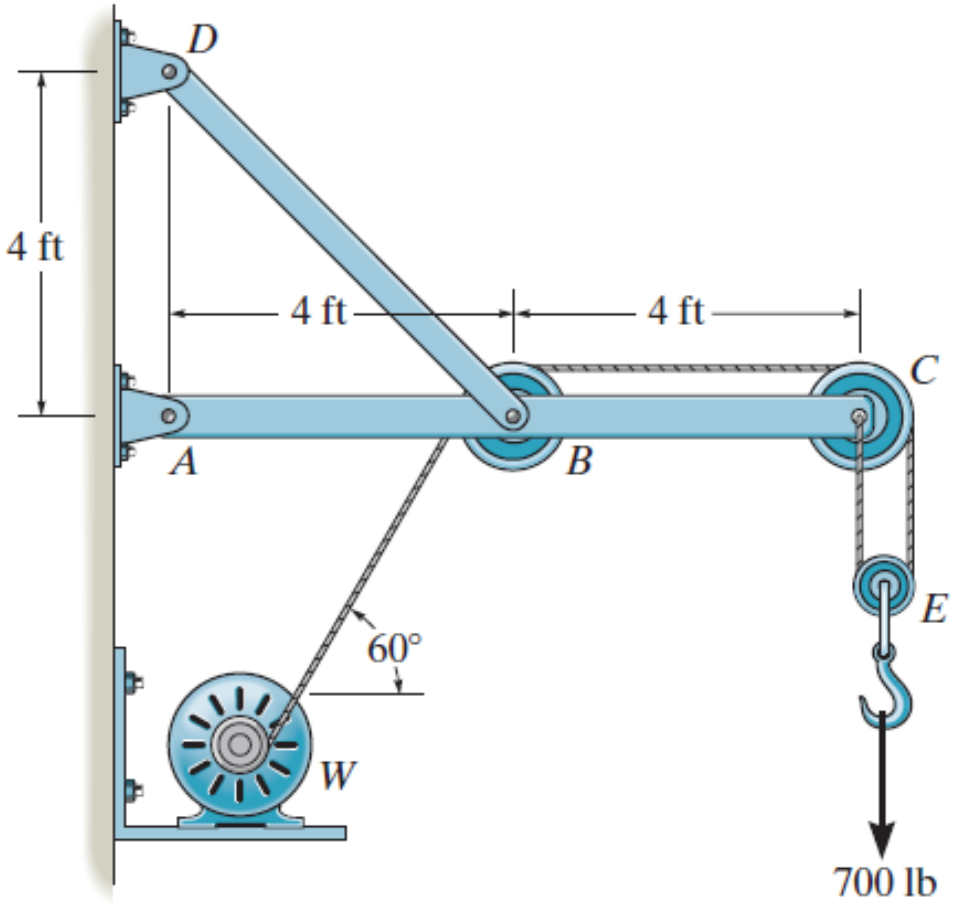
Objectives

- Frame and Machines Example

- Internal Loadings
  - Determine the internal loadings in members using the method of sections

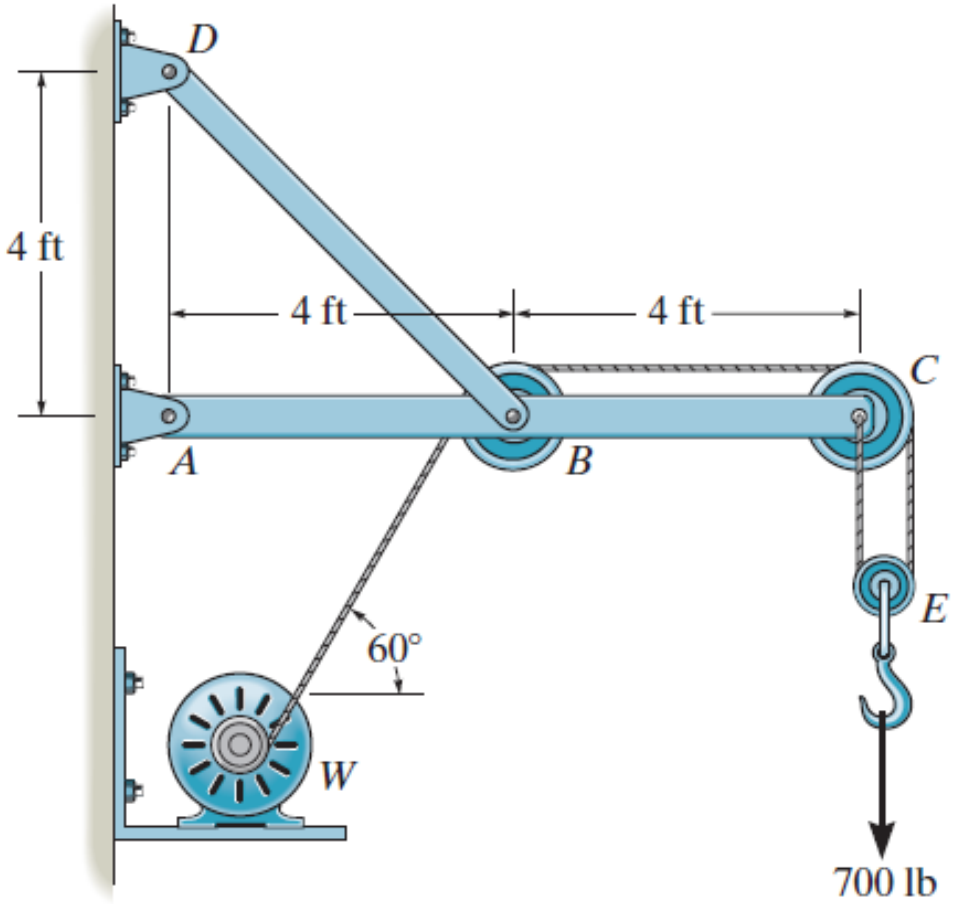
Given: The wall crane supports an external load of 700 lb.

Find: The force in the cable at winch motor *W*.



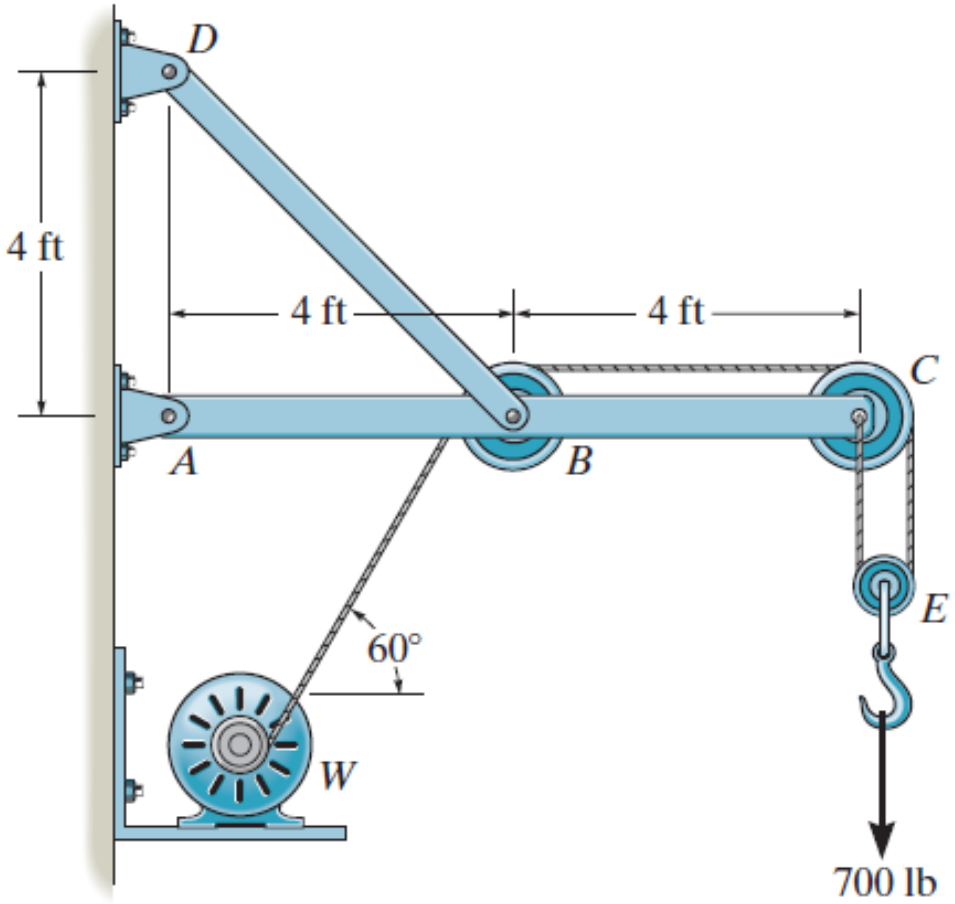
Given: The wall crane supports an external load of 700 lb.

Find: The pin reactions at *A* on beam *ABC*.



Given: The wall crane supports an external load of 700 lb.

Find: The pin reactions at *B* on beam *BD*.



Internal Loadings

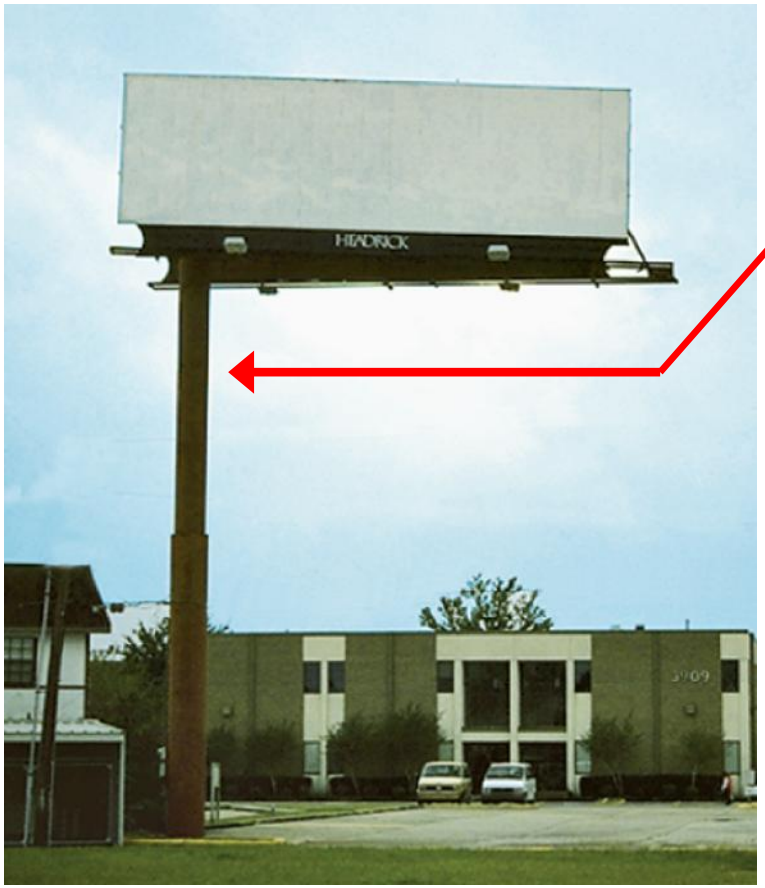
Internal loadings developed in structural members

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.

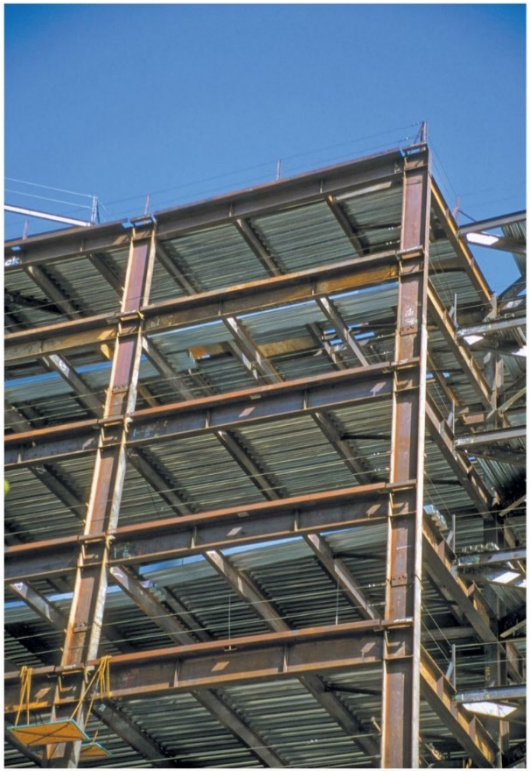
Internal loadings developed in structural members

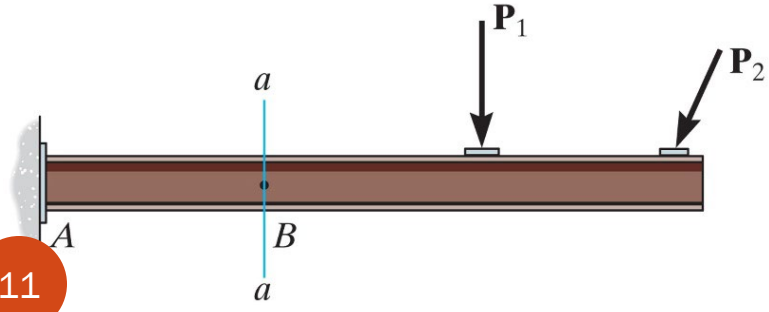


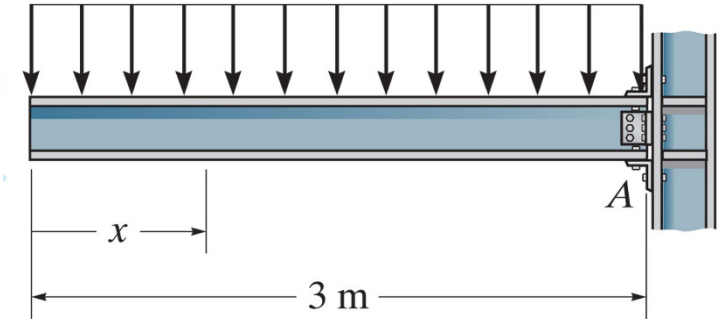
A fixed column supports these rectangular billboards.

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

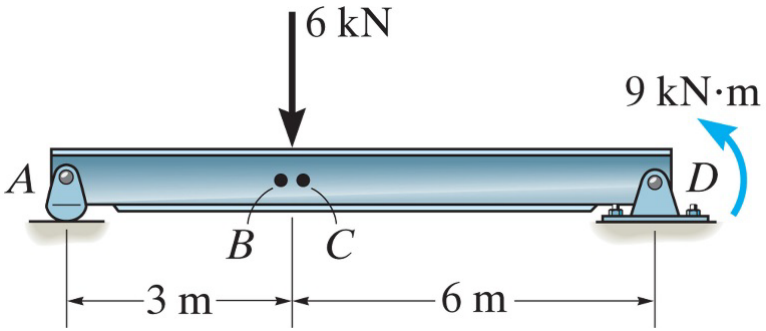
Positive shear force

Positive moment

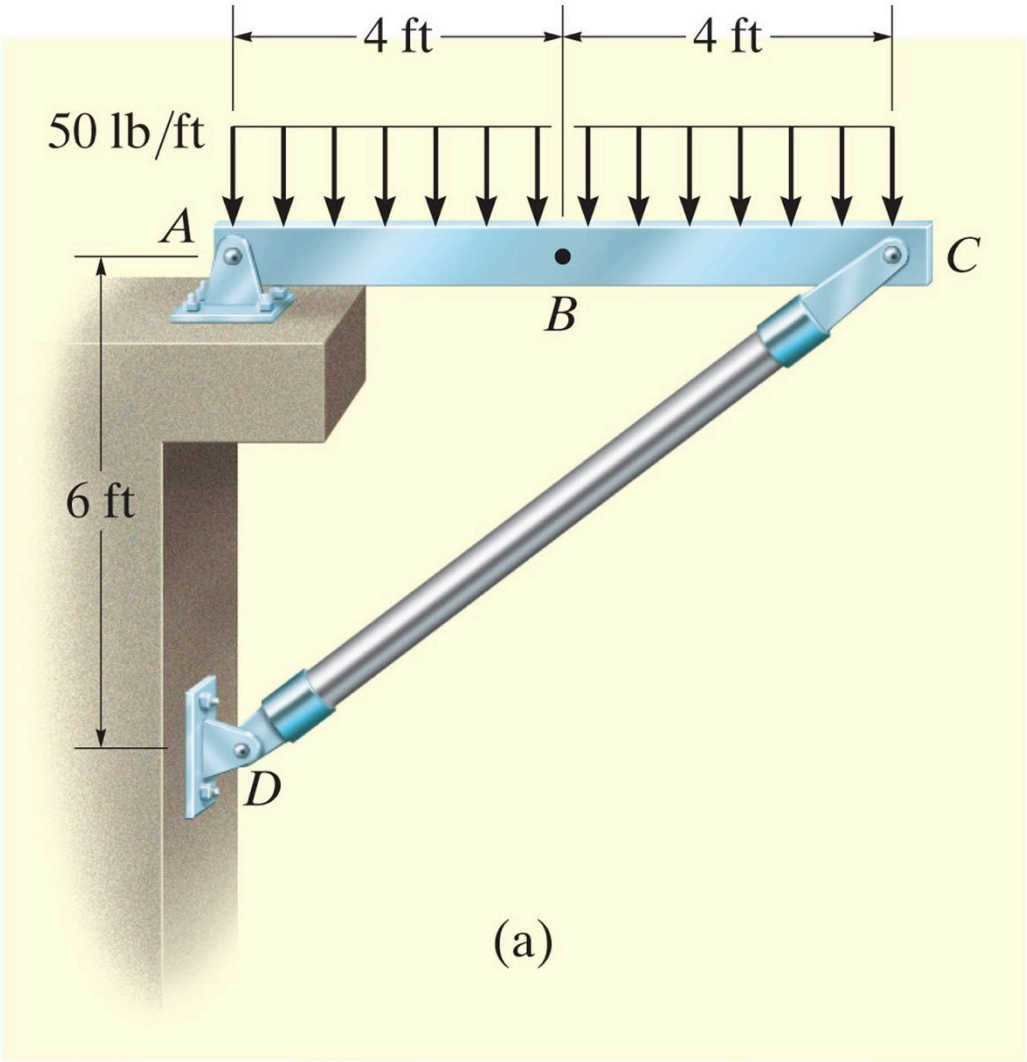
Procedure for analysis

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

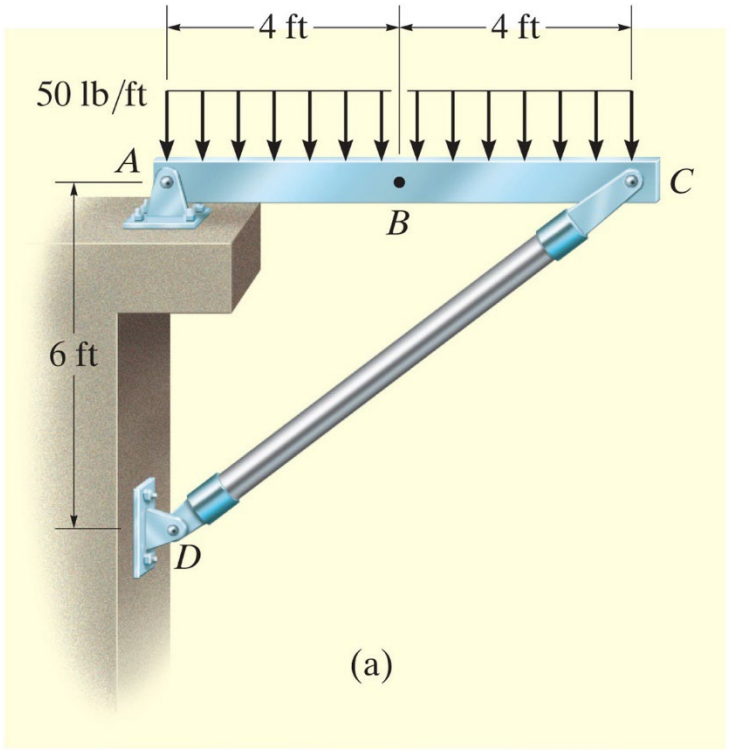
Find the internal forces and moments at B (just to the left of P) and at C (just to the right of P)

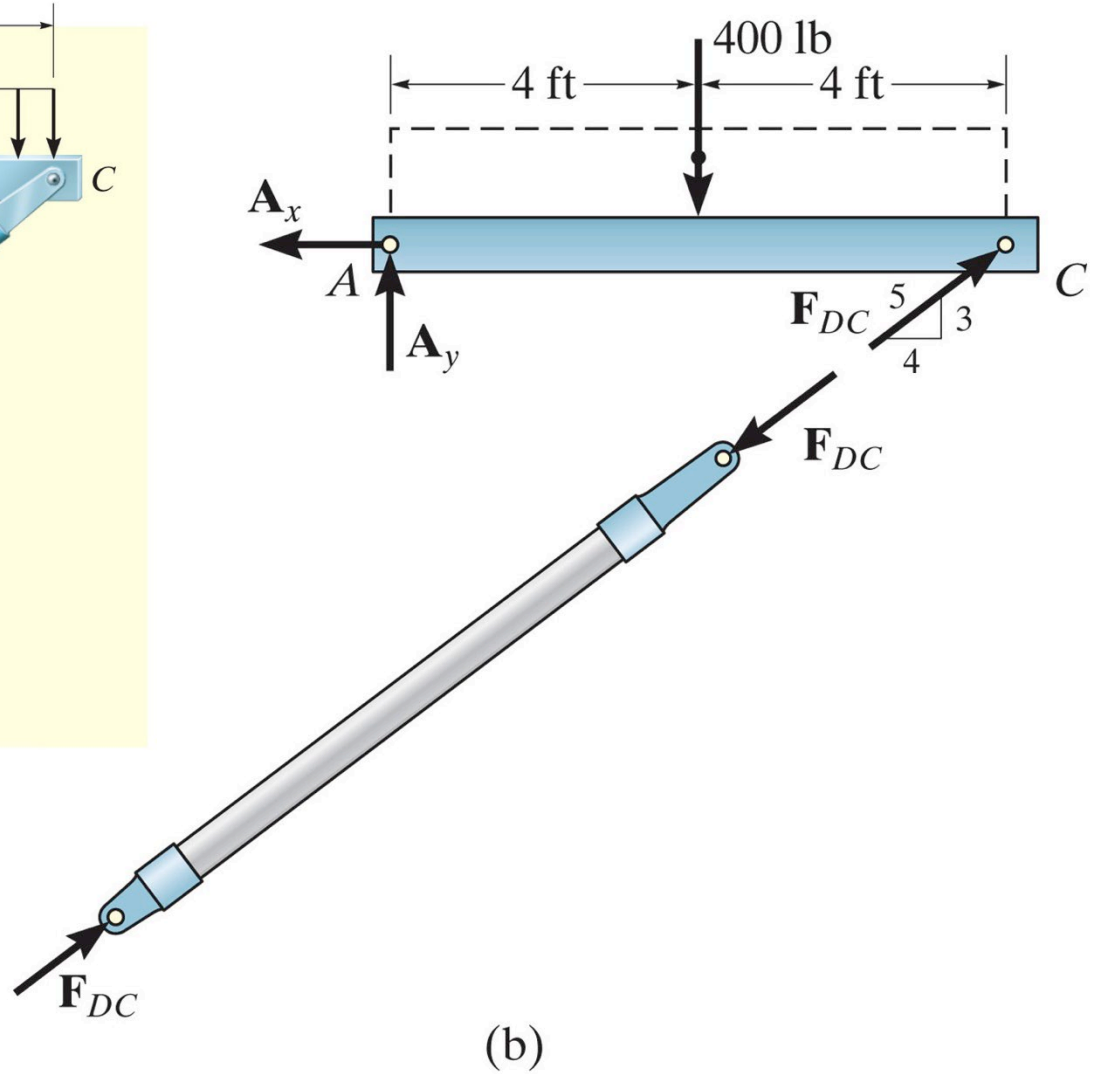


Determine the normal force, shear force, and bending moment at B.

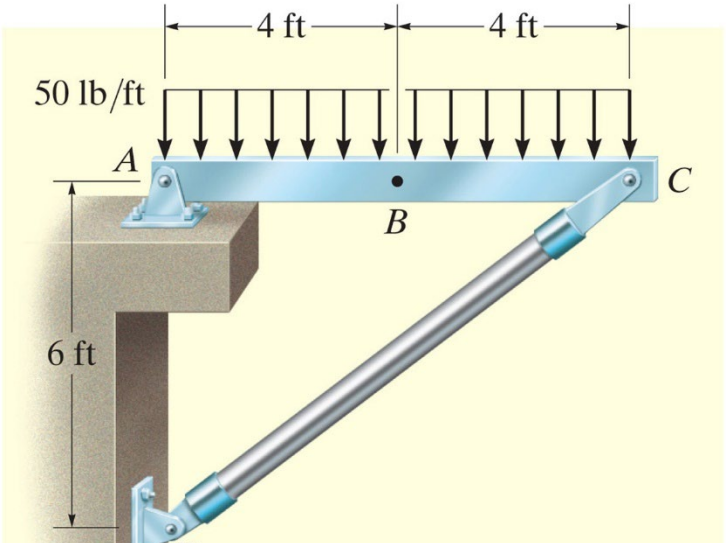


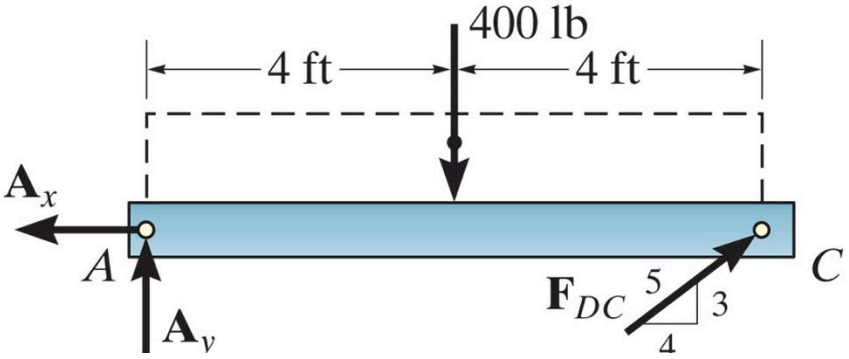
Determine the normal force, shear force, and bending moment at *B*.

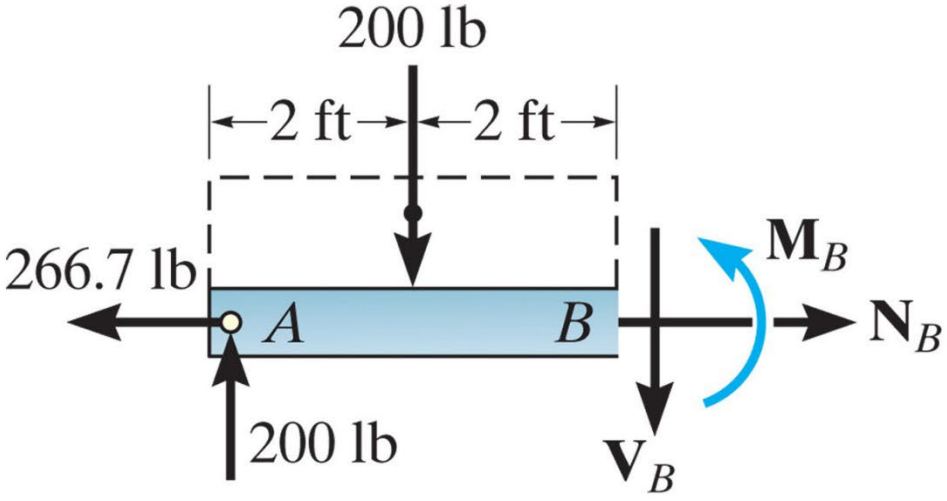


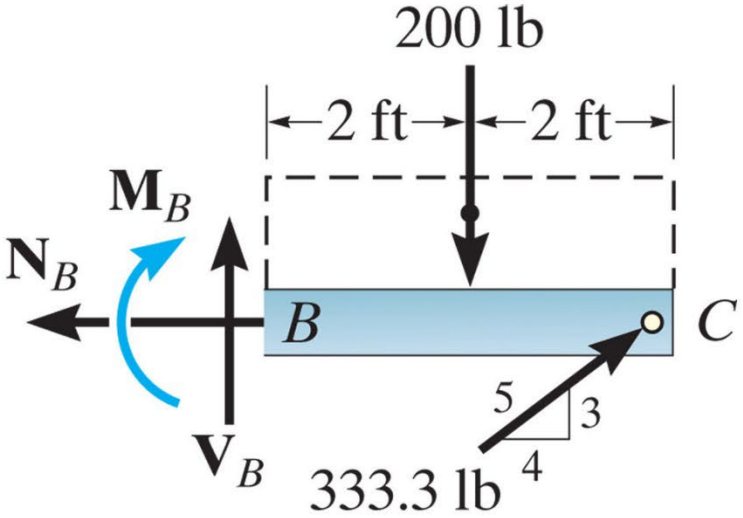


Determine the normal force, shear force, and bending moment at *B*.









(c)

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