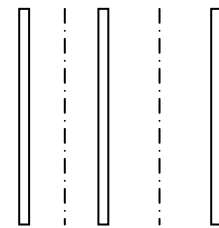
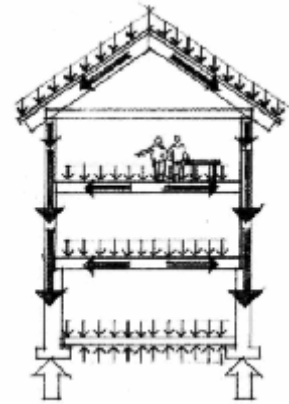


Loads – Tracing, Concentrated and Distributed

Load Tracing

- LOAD TRACING is the term used to describe how the loads on and in the structure are transferred through the members (*load paths*) to the foundation, and ultimately supported by the ground.
- It is a sequence of **actions**, NOT reactions. Reactions in statically determinate members (using FBD's) can be solved for to determine the actions on the next member in the hierarchy.
- The *tributary area* is a loaded area that contributes to the load on the member supporting that area, *ex.* the area from the center between two beams to the center of the next two beams for the full span is the load on the center beam
- The *tributary load* on the member is found by **concentrating (or consolidating)** the load into the center.



plan

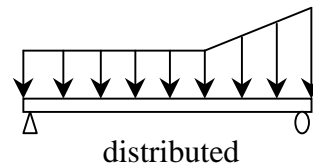
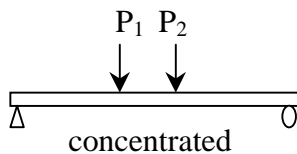
$$w = \left(\frac{\text{load}}{\text{area}}\right) \times (\text{tributary width})$$

where:

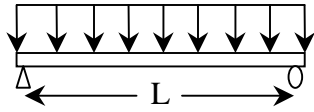
w = distributed load in units of load/length

Support Conditions & Loading

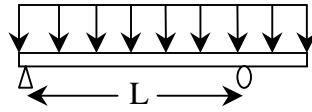
- Types of loads:
 - Concentrated – single load at one point
 - Distributed – loading spread over a distance or area



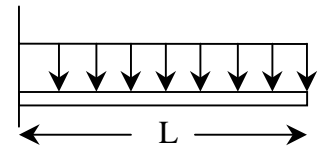
- Types of supports:
 - statically determinate
(number of unknowns \leq number of equilibrium equations)



simply supported
(most common)

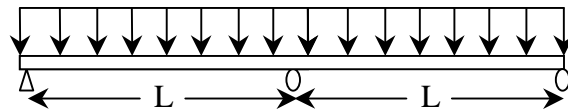


overhang



cantilever

- Statically indeterminate:

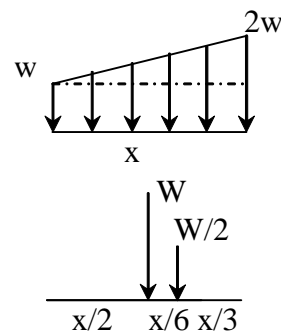
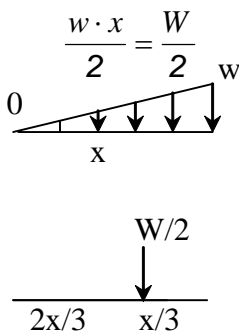
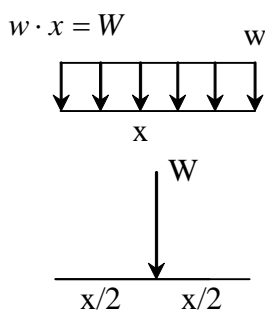


continuous
(most common case when $L_1=L_2$)

Distributed Loads

Distributed loads may be replaced by concentrated loads acting through the balance/center of the distribution or *load area*: THIS IS AN **EQUIVALENT** FORCE SYSTEM.

- w is the symbol used to describe the *load* per unit **length**.
- W is the symbol used to describe the *total load*.

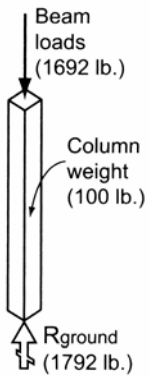
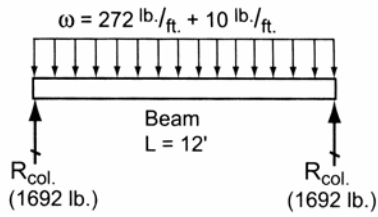
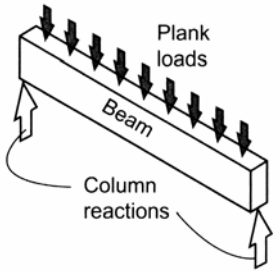
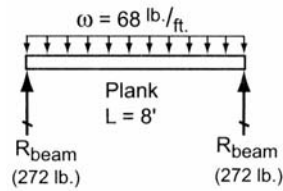
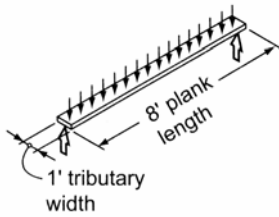
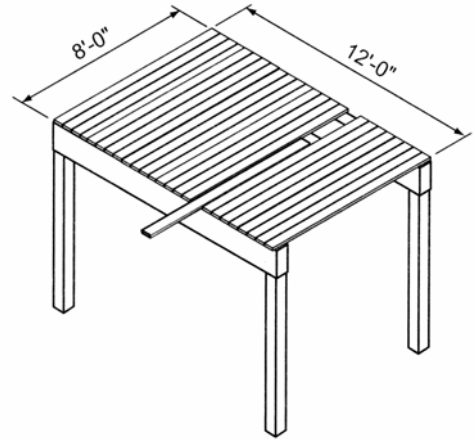


Example 1 (pg 168)

Example Problem 5.2

In the single-bay, post-and-beam deck illustrated, planks typically are available in nominal widths of 4" or 6", but for the purposes of analysis it is permissible to assume a unit width equal to one foot. Determine the plank, beam, and column reactions.

The loads are: 60 lb/ft² live load, 8 lb/ft² dead load, 10 lb/ft self weight of 12' beams, and 100 lb self weight of columns.

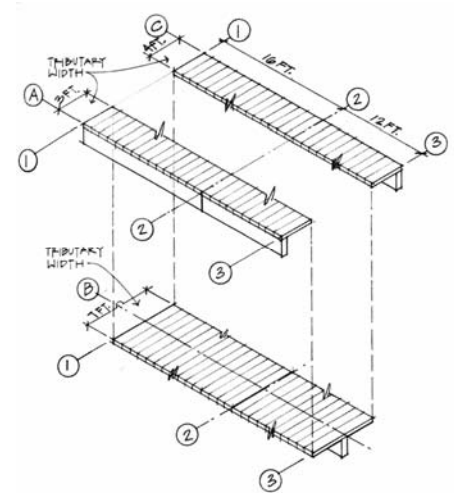
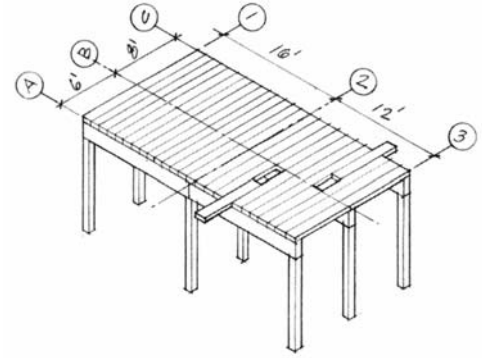


Example 2 (pg 172)

Example Problem 5.3b (Alternate Method)

Another technique may be employed in determining the beam reactions without going through an analysis of the planks. This may be accomplished by evaluating the tributary widths of load for each beam and directly calculating the w for each beam.

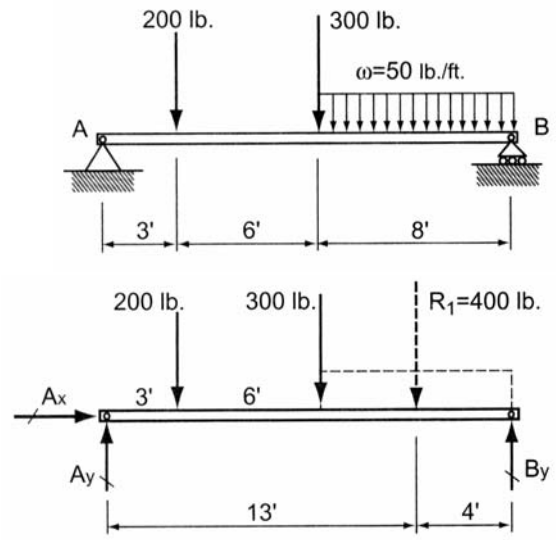
Determine the loads developed in each column support. Assume that columns are located at grids 1-A, 2-A, 3-A, 1-B, 2-B, 3-B, 1-C, 2-C and 3-C. The live load is 60 lb/ft^2 , and the dead load is 8 lb/ft^2 . Beam self weight is 10 lb/ft .



Example 3 (pg 70)

Example Problem 3.12—Simple Beam

A simple beam supports two concentrated loads and a uniformly distributed load over 8 ft. of the span. See Figure 3.40. Construct a FBD of the beam and solve for the support reactions at *A* and *B*.



Example 4 (pg 71)

Example Problem 3.13—Overhang Beam (Figure 3.41)

A single overhang beam supports a uniformly distributed load over an 8-ft. section and a triangular distribution over the remaining 12 ft. Draw the appropriate FBD and solve for the support reactions at *A* and *B*.

