Trusses are generally made up of **pin-connected members**. A pin connection does not transfer bending moment. Many real trusses, roof trusses for example, have joints where one of the members is continuous through the joint. In the wood roof truss shown below, the top and bottom chords are continuous at the web to chord connections.

![Image of a typical wood roof truss](image)

**Figure 1.** Typical wood roof truss

We will assume that all connections are pin connections for this portion of the course (analysis of trusses). The truss above would be modeled as shown in Figure 2 below. The little circles at the end of each member indicate a pin connection.

![Image of a model of structural response of a roof truss](image)

**Figure 2.** Model of structural response of roof truss in Figure 1.

Another assumption we will make when analyzing trusses is that the **internal forces in the members consist of axial forces only**. This is true when the truss is loaded at the connections only. The roof truss shown in Figure 1 is loaded all along its top chords. These members therefore have shear and bending moment as well as axial force. An example of truss loaded at the connections only is the steel bridge truss shown in Figure 3 below. The illustration in Figure 3b shows that the vehicle weight is supported by the deck, which is supported by the stringers, which in turn are supported by the floor beams. The floor beams are located only at “panel points” (chord connections).

The first step in analyzing a truss is to calculate the loads on the truss. Unlike with typical text book problems, calculating the loads on a structure is a significant task. Loads are categorized as dead loads, live loads, wind loads, etc. Typically, dead loads are the weight of the structure itself, whereas live loads represent the weight of the "contents" (people for an office building, freight for a warehouse, or trucks for a highway bridge.) Typical **dead loads** and **live loads** are provided in tables in the International Building Code (IBC) and copied on the class web site.
Dead loads and live loads are combined in load combinations specified in the IBC. For roof trusses, we will use Load Combination 3 in the IBC (shown below). For floor trusses or bridge trusses we will use other applicable load combinations.

\[ 1.2D + 1.6L_r \]

The load factor for roof live load is larger than the load factor for dead load because there is more uncertainty associated with live loads.
The factored axial compressive force in a member is calculated from:

\[ P_u = 1.2 \, P_D + 1.6 \, P_{L_r} \]

where

- \( P_D \) is the axial force due to dead loads
- \( P_{L_r} \) is the axial force due to roof live loads

The available axial strength of the member must be greater than or equal to the factored axial force, as indicated in the following equation

\[ \phi_c \, P_n \geq P_u \]

where

- \( \phi_c \) is the strength reduction factor for compression = 0.90
- \( P_n \) is the nominal compressive strength of the member
- \( P_u \) is the factored “ultimate” compressive force in the member