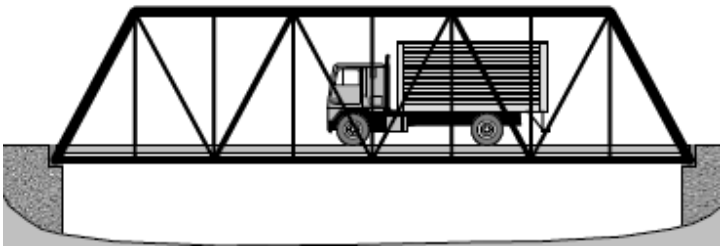
Truss Bridges

What is a Truss?

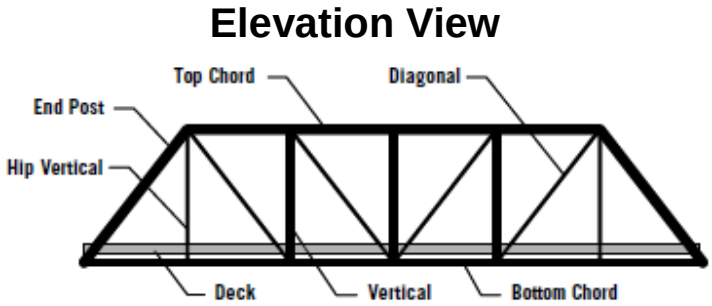
A **truss** is a structure composed of members connected together to form a rigid framework. **Members** are the load-carrying components of a structure. In most trusses, members are arranged in interconnected triangles, as shown below. Because of this configuration, truss members carry load primarily in **tension** and **compression**. Because trusses are very strong for their weight, they are often used to span long distances. They have been used extensively in bridges since the early 19th century; however, truss bridges have become somewhat less common in recent years. Today trusses are often used in the roofs of buildings and stadiums, in towers, construction cranes, and many similar structures and machines.



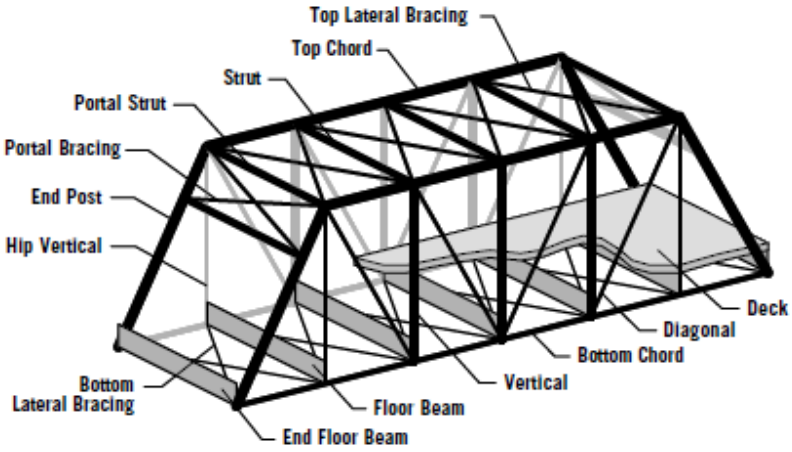
Trusses, like all structures, are designed by civil engineers with special expertise in structural analysis and design. These men and women are called `structural engineers`.

Component Parts

The major components of a typical truss bridge are illustrated in the two diagrams below. The **elevation view** shows the bridge from the side. The **isometric view** is a three-dimensional representation of the structure. Note that certain members are only visible in the isometric view



Isometric View



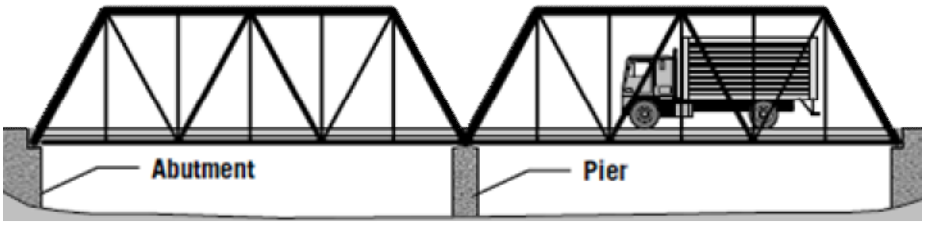
The three-dimensional bridge structure has two main load-carrying trusses. Each truss is composed of a top chord, a bottom chord, and several verticals and diagonals. The two trusses are connected together by a series of transverse members - struts, lateral bracing, and floor beams.

In early truss bridges, all of these members would have been made of wood or iron. Today they are usually made of steel. Modern steel truss members are manufactured in a wide variety of shapes and sizes.

Foundations

Every structure must be supported on a firm foundation, which distributes the weight of the structure to the soil or rock below it. Bridges use two different types of foundations. The ends of a bridge usually rest on abutments, which serve two functions simultaneously—they support the bridge and also hold back the soil that is filled in behind them. If the bridge requires additional support in the middle of the gap, one or more piers are used, as shown below. Abutments and piers are normally made of concrete.

All structural foundations are designed by civil engineers with special expertise in soils and foundations. These men and women are called geotechnical engineers.



Types of Truss Bridges

Truss bridges are grouped into three general categories, based on their deck location. If the deck is located at the level of the bottom chord, the bridge is called a through truss. A pony truss looks just like a through truss, except it is not as high and has no lateral bracing between the top chords. If the deck is located at the level of the top chord, the bridge is called a deck truss.

Trusses are also classified according to the geometric arrangement of their chords, verticals, and diagonals. The diagrams below show 15 of the most common truss configurations, many of which were named for the 19th century engineers who developed them. On each diagram, the solid lines represent the main structural members in the truss. The dotted lines shown on some trusses represent supplemental members that may or may not be present on a particular bridge of this type. Designers sometimes use these lightweight diagonal members to more efficiently carry the weight of moving vehicles. The classification of a bridge is not affected by the presence or absence of these supplemental members.

Common Truss Bridges