

Assignment #2 – Due Oct 27, 2004

The Taftsville Bridge in New Hampshire is a wooden covered bridge dating from 1836. Figure 1 illustrates the actual structure of the two-span bridge and Figure 2 illustrates an approximate model of the longer span. For the purpose of structural analysis, assume that the bridge truss is 12 feet high and spans 96 feet with eight equal bays of 12 feet. (The actual geometry varies slightly from this and your analysis will be an approximation to the actual structure.) All angles in the approximated truss are 45 degrees.

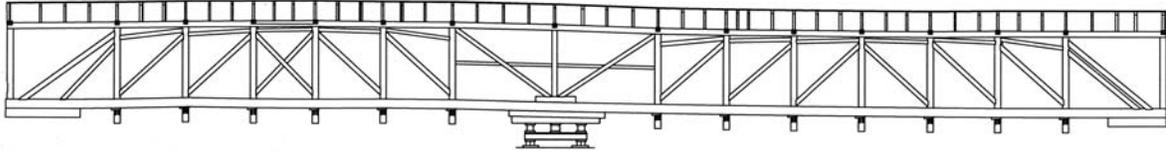


Fig. 1: Taftsville Bridge Structure

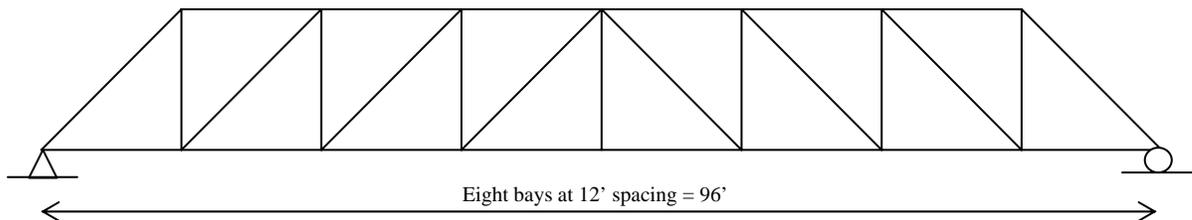


Fig. 2: Approximate Taftsville Bridge Structure

- Assuming that the wooden truss of the bridge shown in Figure 2 must support a total dead and live load of 1,500 pounds/ft, determine the magnitude of the point load applied at each node in Figure 2. (For simplicity, apply all loads to the bottom nodes of the truss.)
- Estimate the internal forces in the truss due to these applied loads and label each element as tension or compression. You may use graphical or numerical methods of truss analysis. Why do you think that all of the diagonal elements in each bay of the truss are inclined towards the middle of the bridge?
- The top and bottom chords of the truss are made of timber elements with a cross sectional area of 12" x 16". What is the maximum stress in each element? Do these values of stress represent a safe working value for timber? (Note: modern allowable stresses are 2400 psi)
- What assumptions did you make in analyzing the bridge in the simplified manner above and what are the implications of those assumptions? Is your analysis accurate?
- Supporting timber arches were added to each span of this structure around 1914. Why do you think they were added? How would this change the behavior of the original bridge?
- Consider the actual bridge structure illustrated in Figure 1. With reference to geometry, design, materials, internal forces, etc., write a paragraph describing what the bridge can teach an observer about the state of construction in 19th century America.