Homework #3

Due: Lecture #9

1) For the truss given in Schodek, question (4-5), page 183:

a) If P = 100 kN and a = 5 m, what are the support reactions at A and E?

b) Re-label the problem using Bow's notation and solve for the internal forces in the truss graphically. Label each member as tension or compression, together with the value of axial force. (Give the value of axial force to within one decimal point by accurately computing the length of each vector in the force polygon using trigonometry.)

2) Frank Gehry has asked you to propose a truss for carrying column loads over the 70-foot span above the truck loading zone in his new building. (He liked your arch design so much that he would like to see what other great ideas you have!) As before, the inclined columns carry the weight of five stories above and this load must be transferred over an open space as illustrated in Figure 1. Each column carries an axial load of 400 kips and is inclined at a slope of 4:1 as shown.

a) Label the problem using Bow's notation to facilitate a graphical solution.

b) On a separate piece of paper, draw the load line for the problem using the loads given in Fig. 1. Based on the load line, what is the magnitude of the vertical reaction at each end of the truss? Be sure to include the vertical reactions on the force polygon.

c) Design a truss which produces only vertical reactions at each support due to the column loads. The top chord of the truss should be horizontal at the middle and the maximum depth of the truss should be 12.5 feet or less. (There are many possible solutions here. You may choose whether to have a horizontal bottom chord or not. If the bottom chord is not horizontal, you will need to elevate the supports for your truss on each side of the truck loading zone.)

d) What is the maximum force in the bottom chord of your truss design? What is the area of steel required for the bottom chord of your design if the allowable stress in the steel is 15 ksi?

e) Sketch your truss solution on a separate piece of paper. Be sure to add internal members to triangulate the truss, even if they are unnecessary for the given loading.

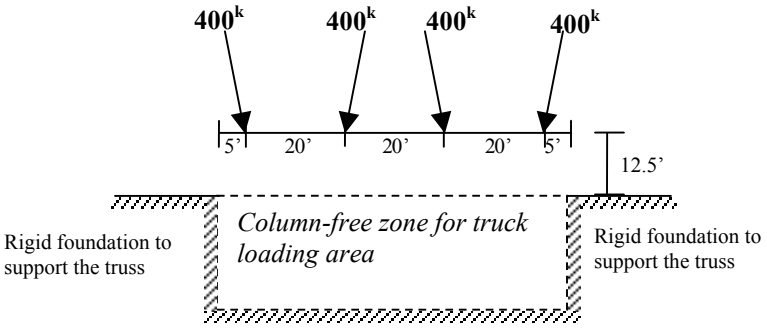

Figure 1