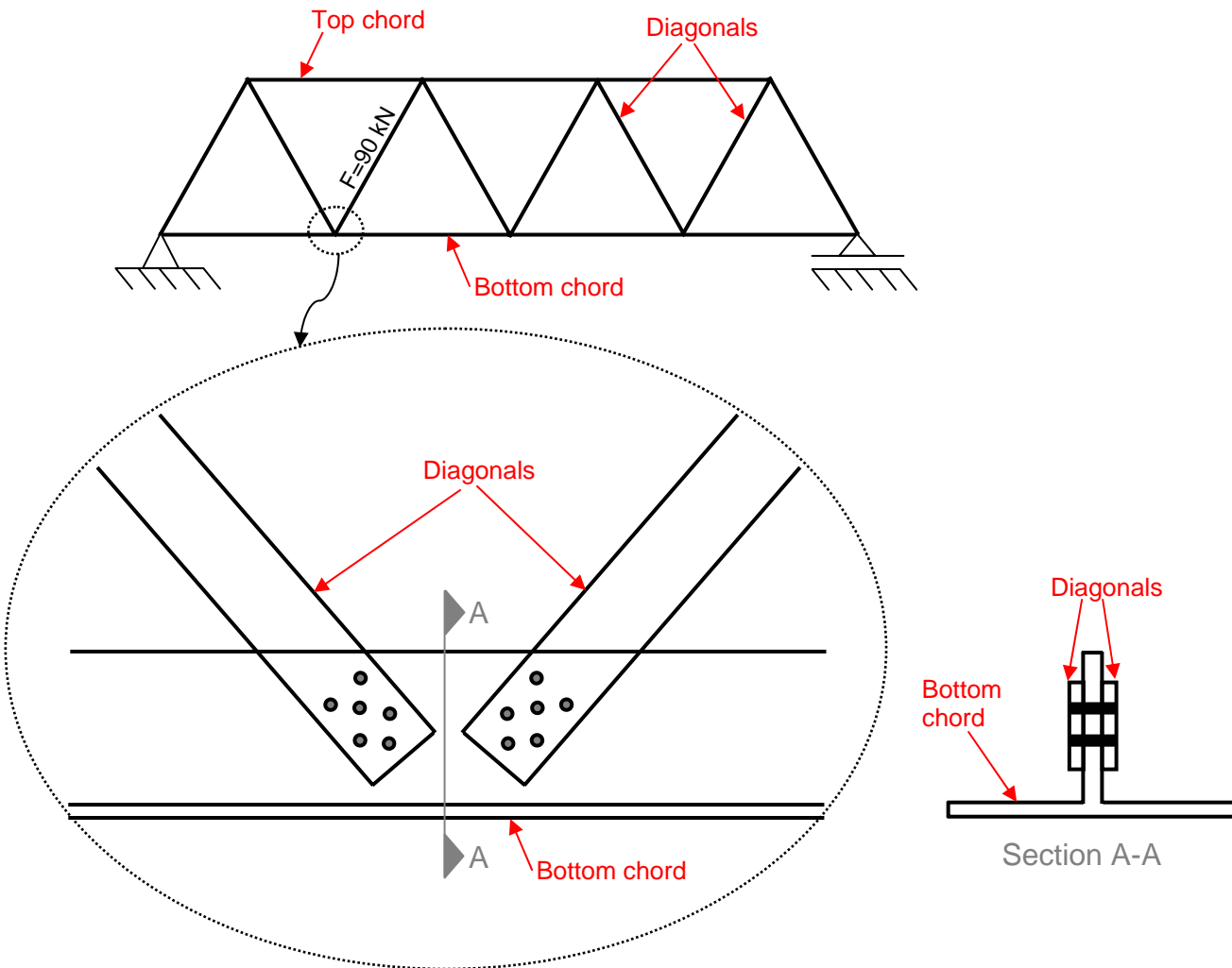


CE-204 Mechanics of Materials  
 2007-2008 Spring Semester  
 Homework #1  
 Due: March 6<sup>th</sup>



Background information:

As you all know, trusses are structural systems that efficiently carry loads. A truss is composed of a bottom chord, a top chord, and a series of diagonals that are connected to the top and bottom chords at the ends. Under gravity loads, in a simply-supported truss, the bottom chord will be in tension, the top chord will be in compression, and the diagonals can be either in tension or compression.

Question:

The truss shown is subjected to a loading that produced 90 kN of force in one of the diagonals, as indicated on the drawing. The detail of the connection between this diagonal and the bottom chord is as shown. The bottom chord has the shape of a “T”, while the diagonals are made of double-plates each of which is 8 mm thick and 80 mm wide. The diagonals are connected to the bottom chord with six 10 mm-diameter bolts that are oriented as shown in the close-up detail.

The allowable material properties are as follows:

$$\tau_{\text{allowable}} = 110 \text{ MPa}, (\sigma_{\text{tension}})_{\text{allowable}} = 110 \text{ MPa}, (\sigma_{\text{bearing}})_{\text{allowable}} = 110 \text{ Mpa}.$$

Determine if the diagonal shown and its connection to the bottom chord are safe for the force given. Assume that the bottom chord has sufficient capacity, which means that you do not have to consider any failure mode for the bottom chord. Assume all bolts carry equal load.