CIV102F Assignment # 6 – October 20, 2021
Due Wednesday October 27, 2021 at 23:59 Toronto time

General Instructions
- There are three questions on this assignment. All questions must be attempted; however, only one question will be graded.
- Submissions which are incomplete and do not contain a serious attempt to solve each question will receive a grade of 0.
- Intermediate steps must be provided to explain how you arrived at your final answer. Receiving full marks requires both the correct process and answer.
- All final answers must be reported using slide-rule precision (ie, four significant figures if the first digit is a "1", three otherwise), and engineering notation for very large or very small quantities.
- Submissions must be prepared neatly and be formatted using the requirements discussed in the course syllabus. Marks will be deducted for poor presentation of work.

Assignment-Specific Instructions
- Final answers obtained from a truss analysis **must** be provided in a neat sketch of each structure with the member forces written in. Tension members should be indicated as (+) and compression members should be indicated as (-).
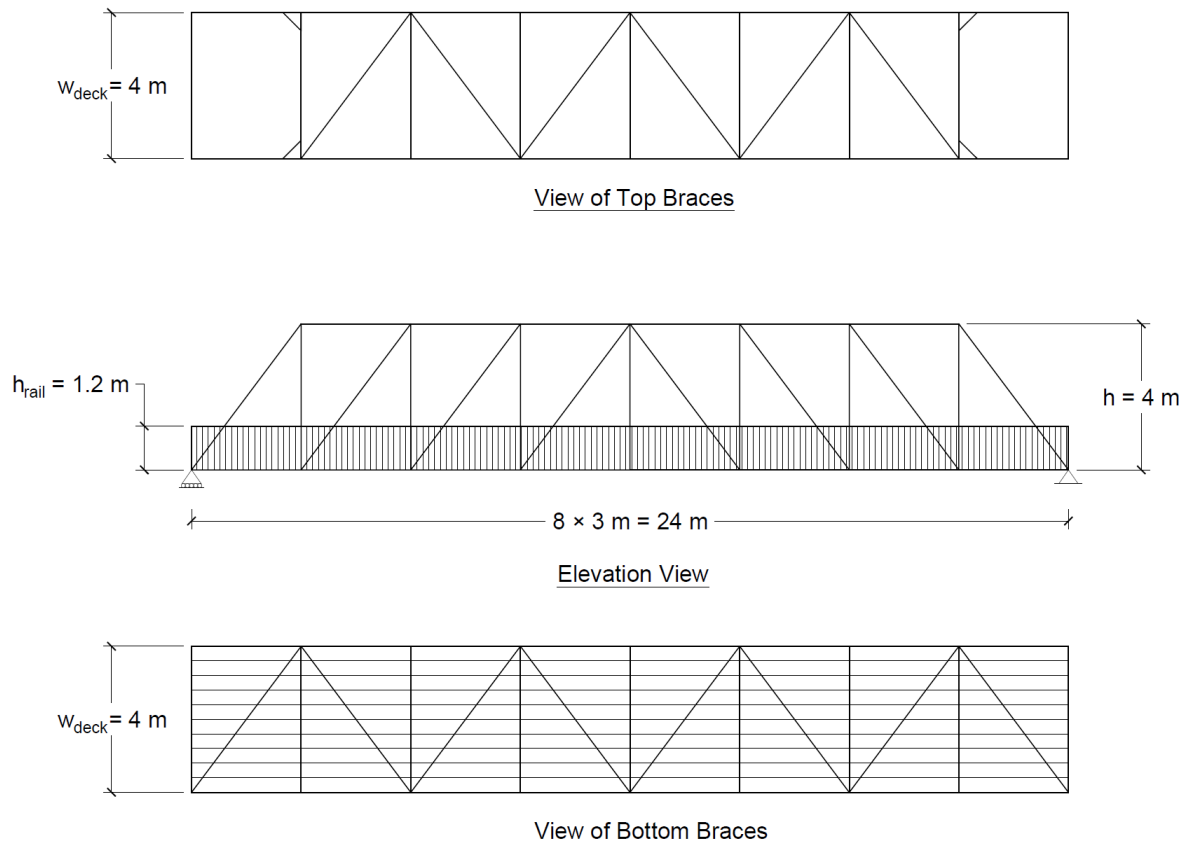
View of Top Braces

Elevation View

$8 \times 3\ m = 24\ m$

View of Bottom Braces

Fig. 1 – Truss Bridge used in Questions 1-2

1. Fig. 1 shows the preliminary geometry of a pedestrian truss bridge. Assume that the bridge shown in Fig. 1 is carrying a gravity load of 10 kPa and a wind load of 2 kPa, perform the following:

   a. Calculate the maximum compressive force in the top chord, which is located near the middle of the bridge, and the maximum compressive force in the webs, which is in the diagonal member directly attached to the roller support. Select the lightest square HSS which can carry these loads. *(Note you do not need to solve the entire truss)*

   b. Assuming that all of the truss members visible from the side view are made from the HSS chosen in part a, calculate the joint loads applied to the top joints by wind forces, and solve for the resulting forces in the top braces. When performing your analysis, it is not necessary to solve for the forces in the horizontal (when looking at the top view) chords caused by the wind.

   c. Select the lightest square HSS which can be used for the bracing on the top of the bridge.

2. Determine the loads applied to the bottom joints caused by wind forces and solve for the resulting forces in the bottom braces. When performing your analysis, it is not necessary to solve for the forces in the horizontal (when looking at the bottom view) chords caused by the wind. Select the lightest square HSS for the bracing on the bottom of the bridge.

3. Calculate the vertical and horizontal displacement of joint E due to the application of the 80 kN loads. The top three members of the truss are HSS 178x178x4.8, the four bottom members are HSS 127x51x4.8 and the eight diagonal members are HSS 127x127x4.8.