CIV102 – Matboard Bridge Design Project – Frequently Asked Questions:

What is different about Concept I and Concept II?

Concept I is a simply supported beam which is seated on a pin and roller on its two ends. Concept II on the other hand must incorporate an intermediate support at the midspan. You must design the column which runs from the support below to the underside of your bridge. Some built examples of the two concepts are shown below:

Example of a "Concept I" bridge

Example of a "Concept II" bridge

Note that each concept must be constructable using one sheet of matboard each. Furthermore, the material used to build the column in Concept II must be included in your usage of the matboard.

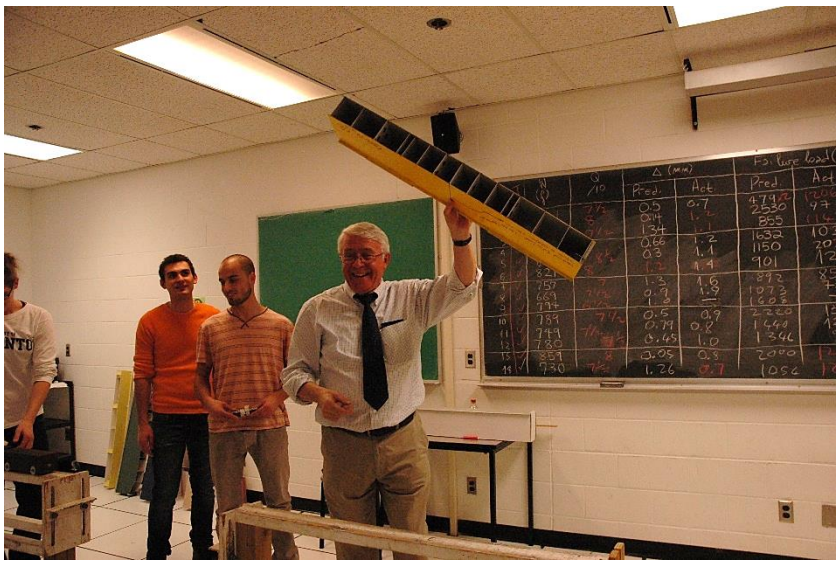
What does "The deck of the bridge must be horizontal, be at least 100 mm wide, and permit unhindered passage of a vehicle over it. "mean?

Historically we loaded the bridges by running steel trains over the top. Your bridge should be designed to accommodate this train load to be consistent with designs made in previous years:

Bridge being subjected to the "Train Test"

What are diaphragms? Why do we need them?
Diaphragms are required to prevent the bridge from collapsing under point loads/reaction forces, and to restrain the webs from shear buckling.

In the photo shown below, you can see the inside of a bridge which had a “pi” shaped cross section. Periodically along the span, the group inserted diaphragms which “filled in” the cross section, providing rigidity to the cross section, and helping avoid shear buckling. Your bridge must also have diaphragms, with a minimum of two at each support/ point load.


The insides of a “pi-shaped” beam, showing its diaphragms

Can we build a different shape instead of a box girder?
Yes you can! You will need to check its strength for the usual failure modes (tension, compression, shear, etc.) as well as the plate buckling loads. An example of an I beam is shown below:


An I-beam concept used in previous years

Do we need to check for plate buckling?

Yes you do! Plate buckling is the main reason these bridges fail and has led to some spectacular failures in the past.

Web buckling under high moments and shears

Catastrophic failure of a bridge

How interesting does your bridge have to be to qualify for a bonus?

A common example of an "interesting" bridge would be a variable depth bridge whose height changes along the span to account for the varying moment. If you do use a conventional design (i.e. box, or "pi" shaped beam), then you can still qualify for a bonus if you do multiple rounds of iteration on your design (and show us the evidence too) to make it better.

Are we building these bridges?

Unfortunately not, since the course is being held online due to COVID-19. To demonstrate the feasibility of your designs, you will instead need to explain how you will assemble your bridge using the provided materials in your report/drawings.