

Homework 7

JHU Department of Civil Engineering

560.141 Perspectives on the evolution of structures

In class assignment: The San Martin Bridge

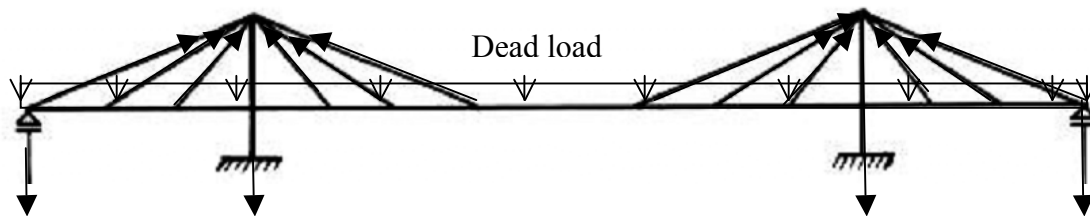
Names:

Today we will visit the new pedestrian bridge over San Martin Drive at the western edge of campus. You are to complete 5 tasks in your small groups.

1. Produce sketches of the overall structural form both from the side (elevation), and from a point near where the main spans “lands” on the campus side of the road. You may attempt a 3D drawing if you want.
2. On a copy of your elevation (photocopy/scan it), draw the load path for a uniformly distributed live load along the walkway.
3. Investigate the base of the tower of the bridge. Draw the connection of the tower to the foundation. Is this meant to look like a hinge? Is it actually a hinge?
4. Study the tower carefully, noting that it is connected to the steel frame adjacent to it. What do you think of the design of this member?
5. Additional comments on the form and function of the bridge.
There are many other things to think about with regard to the San Martin Bridge in answering (5). What are the structural and aesthetic implications of the asymmetries? Why is the stairway/elevator building so large? Does the size of the steel members in this building seem reasonable? What kind of forces do you think are moving through the building? Is the entire tower really necessary as a separate element, or could part of the building structure have been used?
6. (Small Extra Credit) Make a working MASTAN model of the bridge and comment on the force distribution and efficiency of the structure.

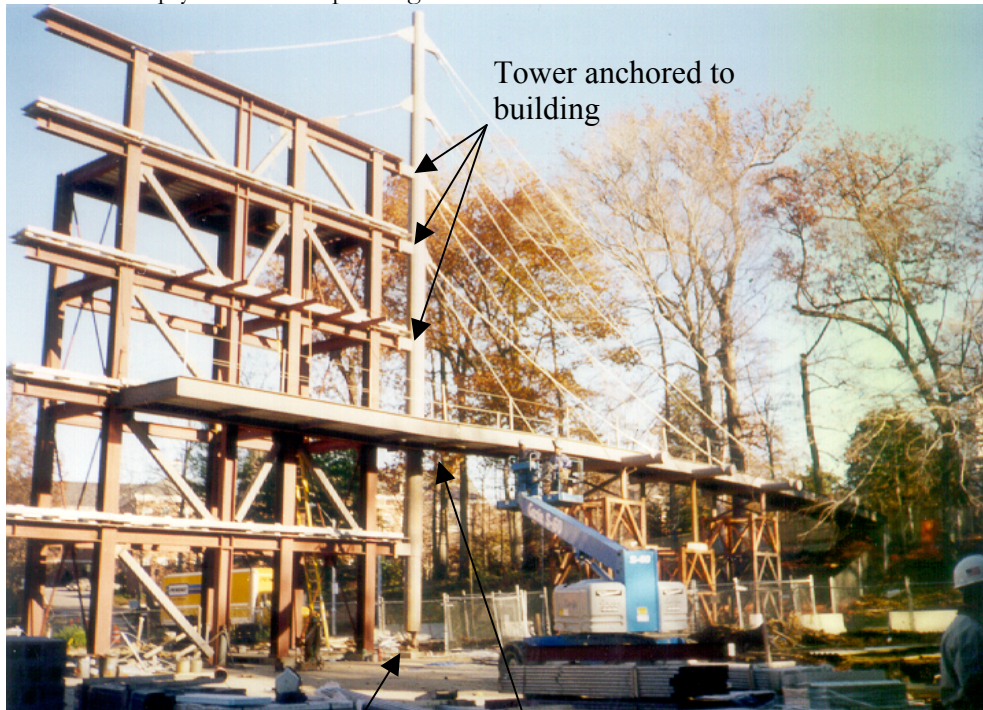
Feel the cables and try to move them. Do you think you can tell anything about the force in the cables from this experiment?

To help you understand this bridge, below is the sketch of the dead load path for a typical cable-stayed bridge.



The load travels up the cables via tension, and then down to the foundations through the towers by compression. Some of the load is carried by the deck in bending directly to the abutments.

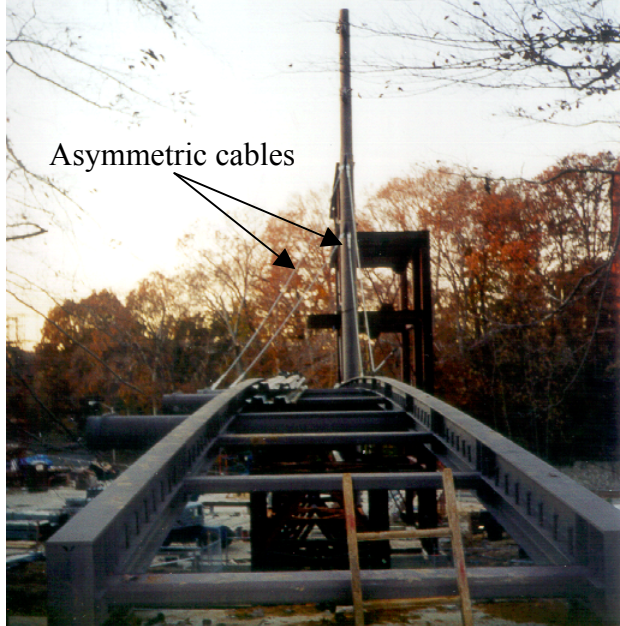
This photograph of the San Martin Bridge under construction has the relevant parts of the structure labeled to help you in accomplishing the tasks listed above.



Tower base

Tower asymmetric
to deck

This image gives a better idea of the overall asymmetry of the structure. What do you think this might mean for the structural behavior of the bridge?



Asymmetric cables