



Stability Investigation of Baltimore Truss Bridge

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Introduction

The load-bearing structures of a truss bridge are made up of a series of wooden or metal triangles known as trusses. A truss provides a solid structure capable of carrying significant external loads over a long span since a triangle cannot be bent by stress. Baltimore truss: similar to Pratt truss, but with extra bracing in the bottom portion to prevent compression components from buckling. Bollman truss: an all-metal truss with several separate tension components that results in a sturdy, easy-to-assemble bridge. Dravo Contracting and American Bridge Company constructed the structure in 1927. The Vincennes Bridge Company built the U.S. 119 Bridge in 1924-1925, with the former U.S. 421 connection on the north end. Squire Whipple invented and patented it in the 1840 Baltimore truss.³

Different types of the truss bridge.

- ❖ Warren
- ❖ Pratt
- ❖ Howe
- ❖ K Truss



Figure 1: Truss Bridge

Background

Our group became with an idea with the help of Dr. Seitllari to make a structural truss bridge. Overall, idea was to check where bending, stress, strain, compression, tension, and load are.

Materials

- ❖ Screws
- ❖ Screwdriver
- ❖ Joints
- ❖ Sticks in different sizes
- ❖ Scale
- ❖ Measuring tape
- ❖ Concrete Cylinder
- ❖ Plastic Jars



Figure 2: Baltimore Bridge: made in class

Procedure

- ❖ Design the bridge on paper or use CAD drawing
- ❖ Measure the length of the specimen
- ❖ Started the base, after the design and calculation
- ❖ Made a deck and add some truss on the side
- ❖ Assemble the sides
- ❖ Add truss together on the sides
- ❖ Used screw and joints to assemble the whole bridge¹

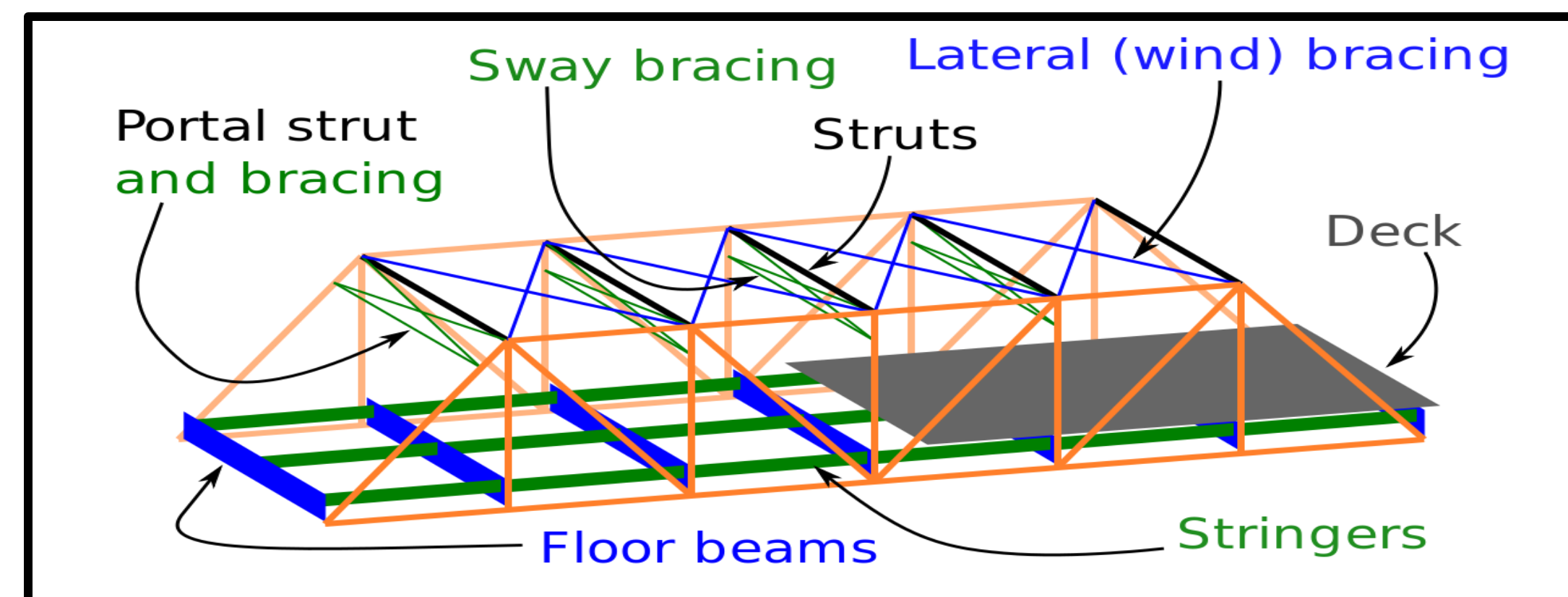


Figure 3: Structural Design

How does a truss bridge work?

There's a lot of tension in the deck. The trusses are designed to withstand both tension and compression, with the diagonal trusses in tension and the vertical trusses in compression. An arch bridge distributes compression across and down the arch to sustain loads.³

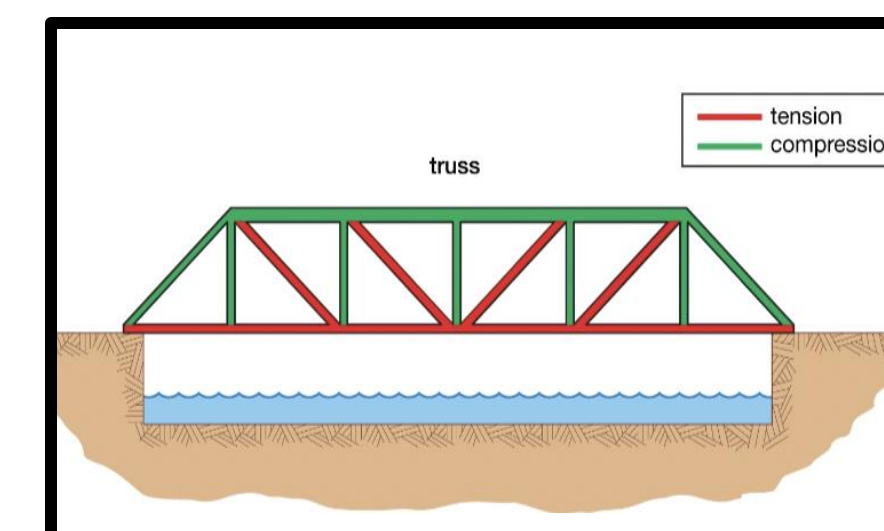


Figure 4: Where is tension and compression

Advantages and Disadvantages

Advantages²

- ❖ Very Strong
- ❖ Road placement
- ❖ Economical to build
- ❖ Affordable

Disadvantages²

- ❖ Time require
- ❖ A lot of maintenances
- ❖ A lot of engineers and architectures specialties required



Figure 5: Maintenances work going on

Results and Discussion

- ❖ 55.8 lbs weight was added to the bridge. The bridge holds all the weight.
- ❖ The bridge stayed stable and did not lift any side down and brake.
- ❖ Used sensors to check when weight was added to the bridge to see if there is any change coming.

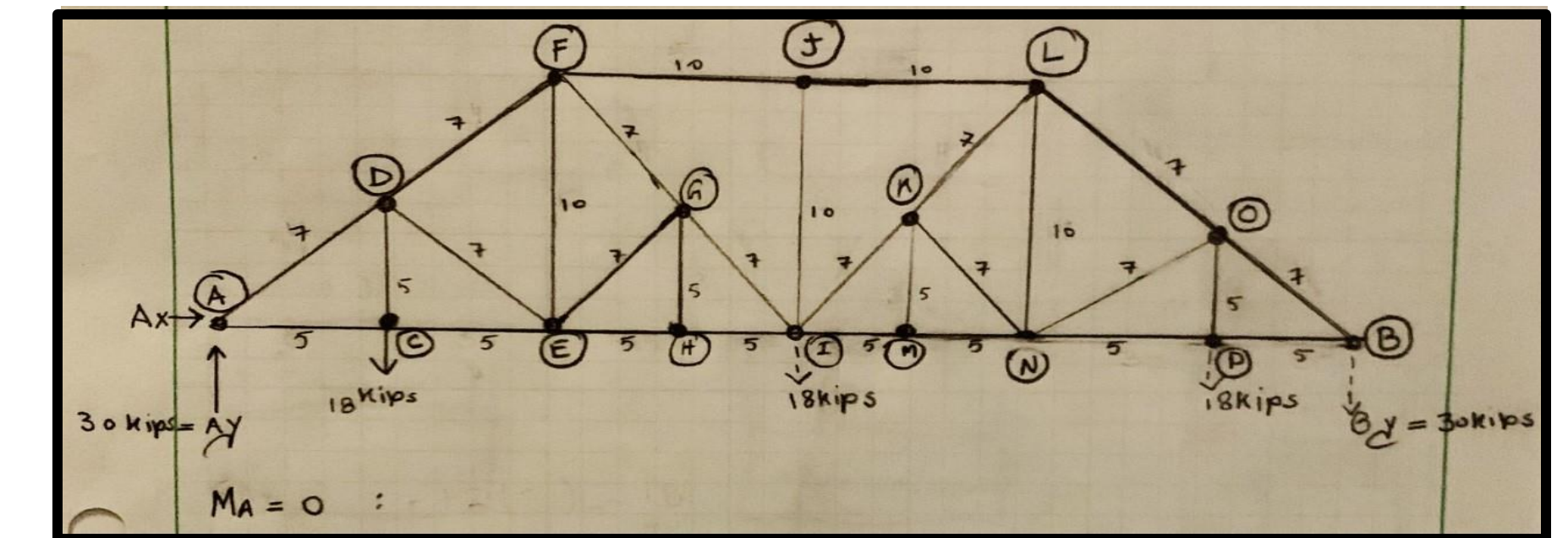


Figure 6: hand diagram



Figure 7: Bridge with loads

Conclusions

The truss bridge is a very strong bridge. It holds a lot of tension on the deck and the trusses are designed to hold tension and compression. This is affordable to build.



Figure 8: Close view of the bridge from the side

References

- ¹Axel, 2022. Strength of material lab manual.
- ²Miller, 2019. Green Garage, Truss Bridges Advantages, and Disadvantages. <https://geengara.geblorg/14-truss-bridges-advantages-and-disadvantages#:~:text=The%20most%20significant%20advantage%20of,structure%20impact%20the%20surrounding%20environment.>
- ³The efficient engineers, 2022. First law comic. [https://firstlawcomic.com/what-is-the-Baltimore-truss-bridge-made-of/.](https://firstlawcomic.com/what-is-the-Baltimore-truss-bridge-made-of/)