Teachers Aid for Building a Bass Wood Bridge

The purpose of this hand-out is to aid teachers in the understanding of basic engineering principles and bass wood bridge construction techniques. In no way is this hand-out meant to be an engineering solution to the design or construction of student model bridges. This hand-out should not be distributed to the students, but rather serve as a reference for teachers to answer student questions. Please respect the integrity of the contest by allowing the students to be creative and develop their own design ideas and construction practices. Additionally, make sure to check the FAQ on our website regularly for answers to incoming questions from participating teachers.

DEFINITIONS

***1:1 Bridge Schematic*: schematic bridge size equal to constructed bridge size.**

***Load Transitions*: The transferring of load between two structural members.**

***Square-Beam*: Unmodified bass wood stick.**

***Laminated Beam*: Two or more bass wood stick surface's glued on top of each other.**

***L-Beam*: A load carrying structure with an L-shape cross section.**

***T-Beam*: A load carrying structure with a T-shape cross section.**

***Joint*: The point at which two or more beams come together.**

***Truss*: A structure that spans and distributes loads across a gap.**

***Lateral Bracing*: A structural member that helps keep the upper *chord* from bending horizontally.**

***Chord*: Horizontal structural members connected between connection joints.**

***Compression & Tension*: (See Figure 2)**

Design

Students should…

- …draw out their bridge schematic on graph paper to visualize and compare design alternatives. They should try using a paper large enough to allow them to draw a *1:1 bridge schematic* such as 11″ x 17″ graph paper. Additionally, they should try drawing the bridge from multiple view points (front, side and top views) to account for all *loading transitions*.
- …experiment with different beam types: *Laminated bass wood beams* are stronger, but heavier. An *L-beam* or *T-beam* is more efficient than a *square-beam*, but harder to build.
- …experiment with different joint types. Maximizing the surface contact between two connecting members will increase the strength of that *joint*. They should use lap joints whenever possible to get the most strength at a connection. (Figure 1)
- …experiment with different *truss* designs. Different trusses have different ways of spreading out the load. They should understand to include truss members only where they are structurally necessary, and that adding unnecessary truss members will cause an increase in the bridge weight and ultimately affect their overall efficiency rating.
- …understand to keep their bridge from twisting that they may need to add *lateral bracing*. (Figure 3)

Construction

Students should…

- …always keep their hands clean! Oils and grease from their skin can ruin their glue joints.
- …follow this simple rule: Measure twice and cut once.
- …always keep safety in mind when using sharp tools. Most mistakes are made when you aren't paying attention.
- …have good lighting when working to help them perfect those little details.
- …understand that practice makes perfect. The more bridges they build, the better their construction skills will become. So they should keep notes, dimensions and schematics of every bridge they make, including those from previous years to help them in the future. Why? Because THEY WILL NOT REMEMBER THOSE DETAILS LATER ON, no matter how "great" they say their memory is.
- …understand that by cutting a piece in half, they more than double its strength in *compression* (Figure 2).
- …understand that wood has about the same strength in *tension,* no matter how long it is.

- …understand that sanding is a great way to shed extra weight and clean up unnecessary glue push out. Bass wood sands very easily, so be careful not to sand off too much.

Glue

Students should…

- …go easy with the glue bottle. As a general rule of thumb, if they can see it, then they are using too much.
- …know that they can mix wood glue with water to cut down on its weight. Doing this also helps the glue to seep into the wood, creating a stronger joint.
- …remember to close their glue bottle when they are done using it.
- …know what to look for in glue: drying time, price, weight, and strength.

Storage

- Students should always keep their bridge in a closed container with a few grains of rice or some silica gel packets. Humidity affects the weight of your bridge.

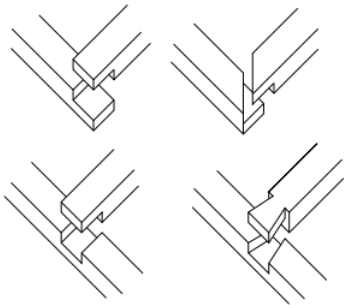

Figure 1: Lap Joints

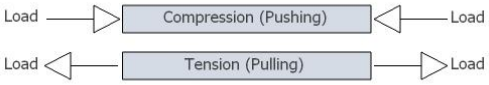

Figure 2: Compression/Tension

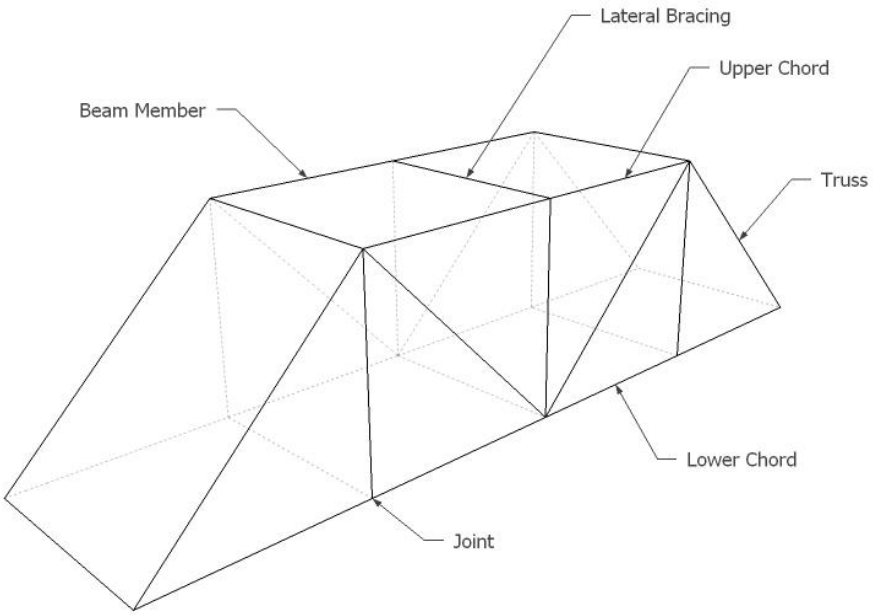

Figure 3: Bridge Construction Terminology