2025 ASCE Student Symposium

Balsa Wood Bridge Competition

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OVERVIEW:

Welcome to the Balsa Wood Bridge contest! In this project, your team will embark on the journey of creating a Truss Balsa Wood bridge, meticulously crafting it based on their unique plans. The challenge lies in constructing a bridge that not only supports a maximum load but also utilizes minimal wood, emphasizing the importance of precision, skill, and innovation. To excel in this endeavor, each team is encouraged to delve into research on bridge types and designs, conduct experiments to determine the optimal strength-to-weight ratio, and subsequently develop a competition-worthy bridge. Each school may have one bridge with up to 2 students to conduct the final load test.

MATERIALS (*Balsa Bridge Kits*):

Build your bridge using 1/8” by 1/8” square cross-section balsa wood sticks, each measuring 12” in length, and adhere them together using Elmer’s wood glue. WVU Tech will supply the necessary materials, mailing them to the addresses provided by teams. It's crucial to note that only the original balsa materials provided in the kit should be used for constructing the competition bridge. Any alterations to the structural properties of the balsa wood are strictly prohibited, and the use of alternative glue types is not allowed. ***Please email James Hoffman by January 31, 2025 with the recipient's name and the mailing address at which the post service can be reached.***

RULES:

1. **Joint Limitation**
    a. Glue may only be applied to joints. Do not use glue as a structural member.
    b. Members are permitted to overlap, but the overlap should not exceed 1/2 inch, as illustrated in Figure 1.
    c. Pins and/or gusset plates are not allowed.

2. **Member Limitation**
    a. Member may be carved, notched, or cut anywhere along their length.
    b. The use of any processing methods on members, whether chemical or physical, is strictly prohibited.
    c. The construction of structure members using multiple plies of laminated beams glued together is prohibited as depicted in Figure 2. Nonetheless, joints may have increased thickness to facilitate the connection of wooden pieces in accordance with the guidelines outlined in "Joint Limitation."
    d. No material (e.g., paint, varnish, hairspray, etc.) may be applied to the bridge.

3. **Bridge Regulation**
    a. The bridge must stand independently and cover a span exceeding 14 inches, with no specified limit on the total length. Please ensure a suitable contact length for the bridge to rest on the testing apparatus supports. The maximum load will be considered a result of either structural failure or the bridge slipping off the supports. (Figure 3)
    b. The bridge's width must exceed 3 inches, with no restriction on the total height. (Figure 3)
    c. The bridge must incorporate a balsa wood deck capable of supporting the 2” x 2” loading plate. The loading plate should be positioned on the deck at the same level as the support ends, as illustrated in Figure 4.
    d. Substructure is permitted, but the depth is restricted to a maximum of 1 inch, as depicted in Figure 5. The substructure members must not obstruct the arrangement of the bridge on the loading platform.

4. **Loading Regulation**
    a. The load will be applied by a 2” x 2” x 1/2” rectangular load plate with a mount for the loading mechanism to be applied. (Figure 4)

b. **The loading plate will be positioned 5” (inches) from the support end, not at the center of the bridge**, as illustrated in Figure 6. Students have the flexibility to choose on which side of the bridge to place it.

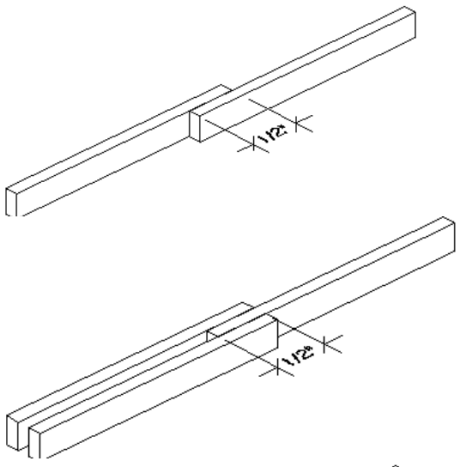

Figure 1: Diagrams of Acceptable Joints

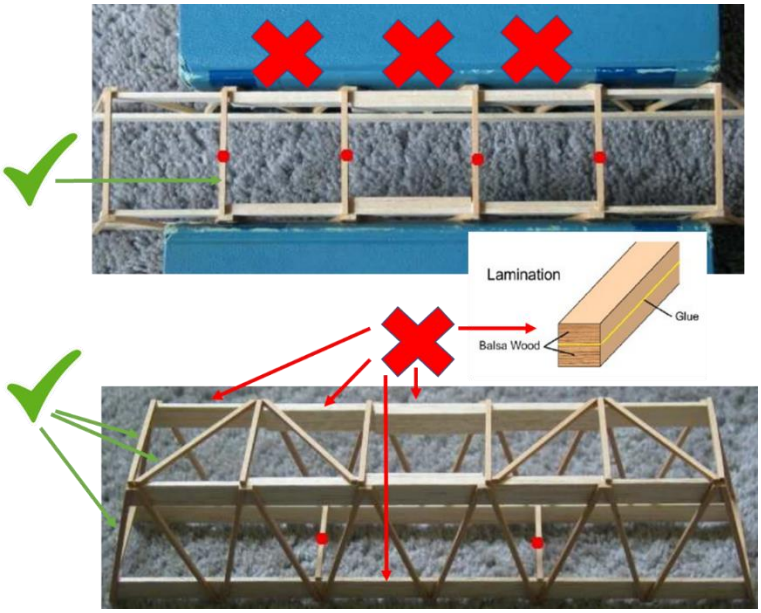

Figure 2: Multiple-ply Laminated Beams are not allowed

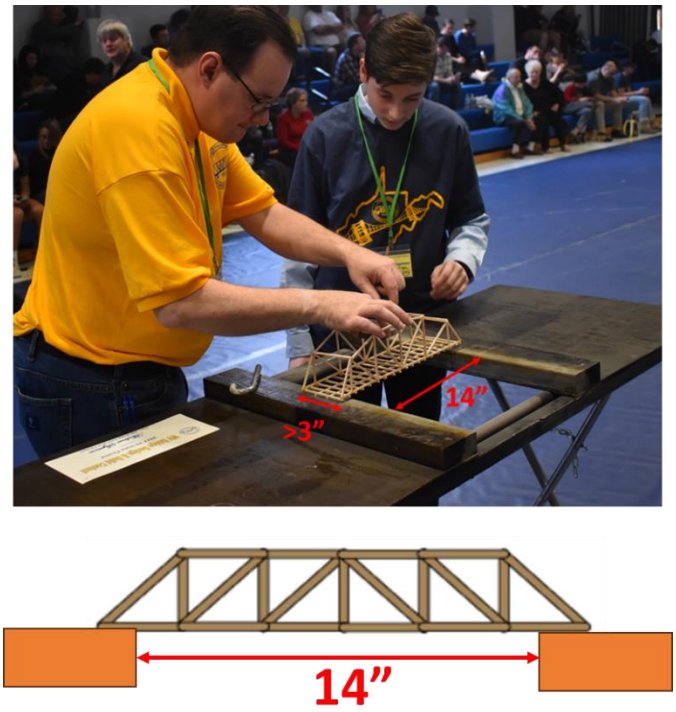

Figure 3: Minimum Dimensions for the Bridge

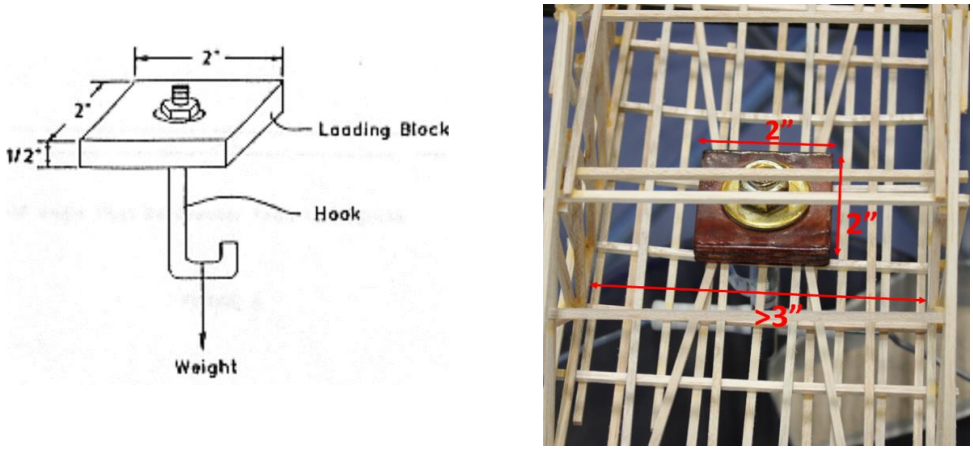

Figure 4: Deck required to hold a rectangular loading plate (2” × 2” × ½”) for the loading mechanism

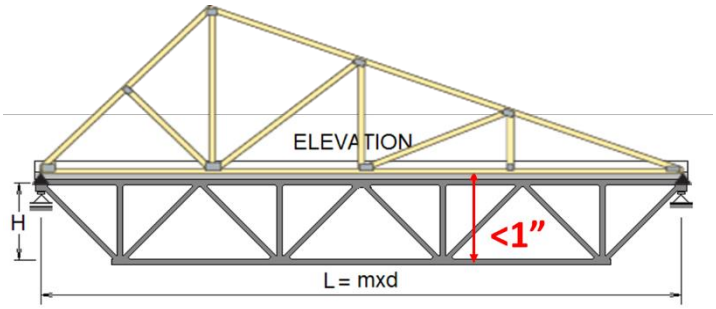

Figure 5: Limitation for substructure

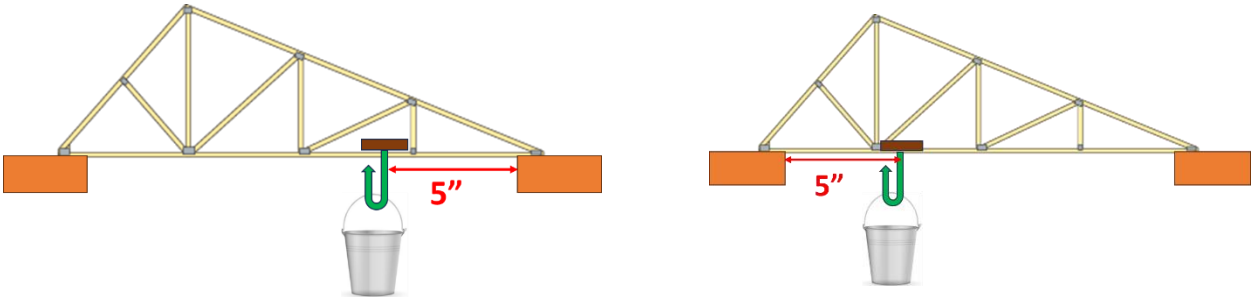

Figure 6: Loading Plat position.

(Students are free to choose the side of the bridge on which to place it.)

JUDGING:

1. Before undergoing load testing, the bridge undergoes a specification check to ensure compliance with weight, dimension, and construction rules.
2. The bridge is weighed, and its weight is recorded.
3. Assessment for neatness, craftsmanship, and creativity is conducted on the bridges before testing.
4. The bridge's load-bearing capacity is evaluated using the configuration outlined in Figure 6. The load testing machine records the maximum load, which is considered the bridge's load capacity, irrespective of when failure occurs.
5. Disqualified bridges are ineligible for awards in any category. However, time permitting, they may undergo testing at the end of the contest.
6. Strength-to-Weight Ratio is calculated by dividing the maximum load at failure by the bridge's weight.

   The bridge with the greatest load-bearing capacity compared to its weight wins.

   Example: Maximum load = 1812.6 g

   Bridge weight = 45.7 grams

   Ratio = $\frac{Max.\ Load\ 1812.6\ g}{Bridge\ weisht\ 45.7\ g} = 39.66$