



2026 WV Bridge Design and Build Contest

State Finalist

Balsa Bridge Rules and Specifications

SPONSORS: West Virginia Department of Transportation
West Virginia University Institute of Technology

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OVERVIEW:

Welcome to the world of Balsa Wood Bridge design! In this exciting project, students 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. Mark your calendars for the pre-inspection event on Friday April 17th and the thrilling loading test on Saturday April 18th, where these ingeniously designed bridges

will face the ultimate test of performance. Get ready to showcase your engineering prowess and artistic flair in this Balsa Wood Bridge adventure!

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 **wood glue**. WVU TECH will supply the necessary materials, dispatching them **to the school addresses** provided during registration. 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.

The project must represent the unique and original work of the student(s). Judges reserve the right to inquire to verify its authenticity. This competition welcomes both individual students and teams of two. Bridge scoring remains independent of the number of builders involved.

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.

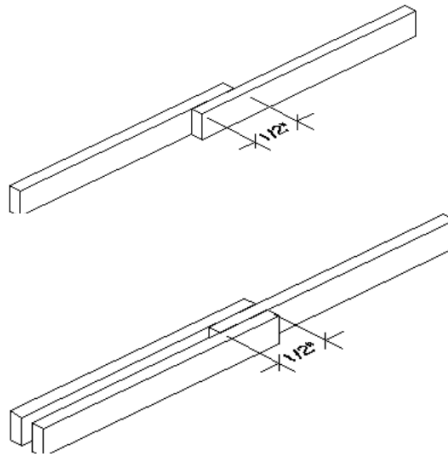


Figure 1: Diagrams of Acceptable Joints

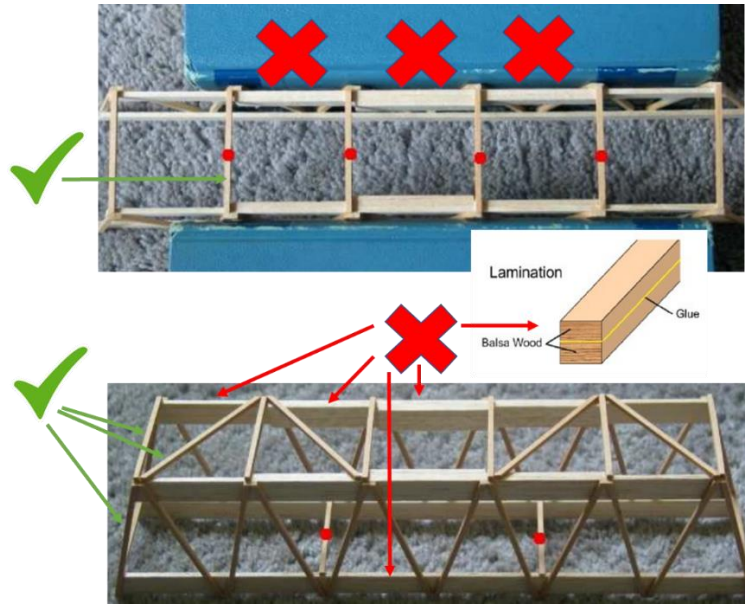


Figure 2: Multiple-ply Laminated Beams are not allowed

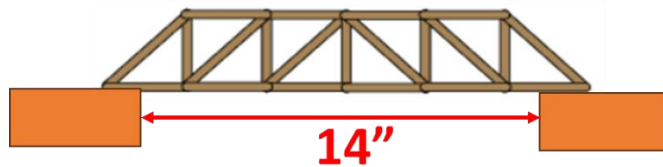
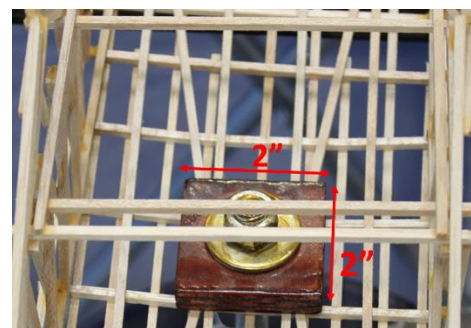


Figure 3: Minimum Dimensions for the Bridge



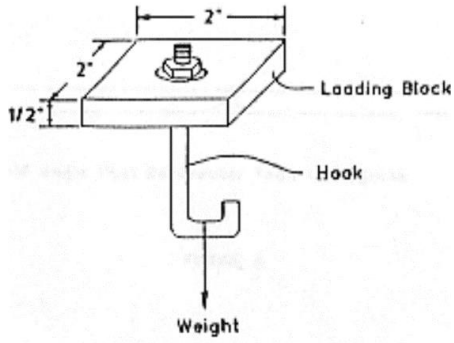


Figure 4: Deck required to hold a rectangular loading plat (2" × 2" × 1/2") for the loading mechanism

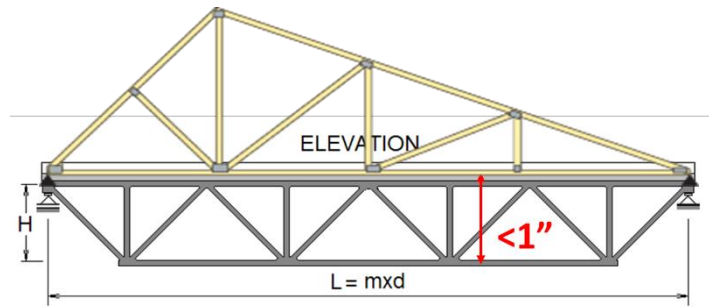


Figure 5: Limitation for substructure

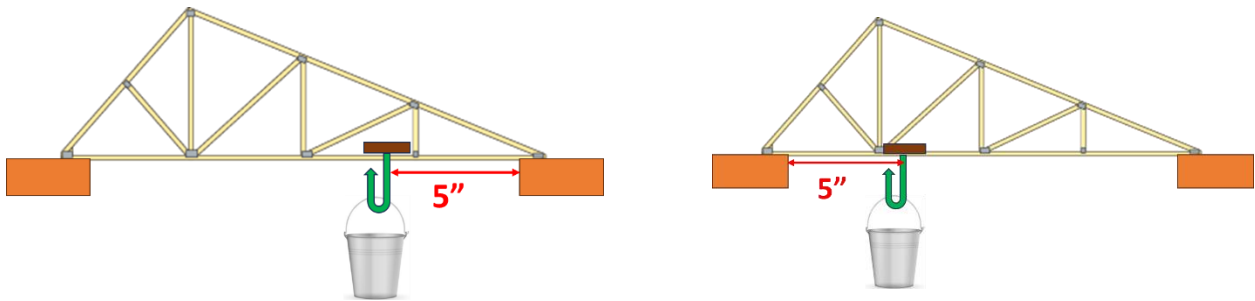


Figure 6: Loading Plat position.

(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. [70%]

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

Example: Maximum load = 1812.6 g

Bridge weight = 45.7 grams

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

7. Creativity & Engineering Design: Finest workmanship, including neatness and innovation of design. [20%]
8. Q & A response to the judges [10%]

AWARD:

Top 3 places – Lowest Strength-to-Weight Ratio

Special Award - Recognizing Innovation in Design, Creativity in Bridge Construction, and Outstanding Teamwork!

REFERENCE:

The following video is **ONLY** a guide to making the Balsa bridge. Please follow the competition rules to build your bridge.

How to build a Balsa bridge? <https://youtu.be/AO8hSk09Wz0>