CNC/Laser-Cut Bridge Competition 2024

contact: Jamie Francisco at jfrancisco@silvercreekschools.org

Goal: Engineer and construct the strongest, yet most efficient bridge for the appropriate span, using 5mm. (0.197") Luan laminate and 1/8"x 1/8" balsa or basswood members and glue.

Middle School:	**16" free span between testing blocks.**
High School:	**18" free span between testing blocks.**

★ ***Efficiency* will be measured by comparing the measured lbs. of weight *held* divided by the *weight of the actual* bridge in grams.**

$$\frac{\textbf{Weight held (lbs.)}}{\textbf{Weight of Bridge}} = \textbf{E}_{Br}\ \textbf{lbs./gram}$$

Example: A HS bridge spanning 18" weighs 22.5 grams and holds 62 lbs. will perform at 2.75 lbs./gram. A second HS bridge spanning 18" weighs 19.75 grams and holds 58 lbs. will perform at 2.936 lbs./gram. The bridge supporting 58 lbs. will be the winner as a more efficient design holding more lbs. of weight per gram of material used.

Design Requirements:

1. Dimension Requirements
    a. Overall Width must be between 3"minimum - 5" maximum.
    b. Overall Height must be between 2" min. - 6" maximum.
    c. Overall Length should be between 16"- 22".
    --overall bridge length must be greater than span to support the bridge on the testing blocks.
    d. **Top chord** max. height: 1/4" **Bottom chord** max. height: 3/8"
2. The bridge must allow a 1-1/2" wide by 2" loading block to descend to the deck surface (roadway) for testing. Loading is applied from below at the center of the spans (see photo page 2).
3. Bridge must have a 1/2" diameter hole at the center of the deck to allow for testing device
4. ***Construction: Side trusses*** of bridge must be 5mm Luan laminate only. Trusses must be laser-cut from one contiguous piece of laminate.
   Bottom deck and top bracing must be single 1/8" x 1/8" balsa or basswood members and glue.
    - All interconnecting elements must be single pieces – no laminations allowed
5. The bridge does not need to have a solid "deck" or "roadway" surface, but merely "deck level bracing" for the testing block to bear on.

6. Wood joints may be notched if desired.
7. Any adhesive/glue may be used at the joints of the members.
8. Cantilever supports are allowed to descend up to 1 inch below the surface of either the 16 or 18" span.
9. Any combination of balsa or basswood species may be used in construction of the deck or top braces of bridge. (*Note to Educators: Field's Hobby in Amherst has low prices on bulk supplies of balsa and basswood stock*.)
10. There is no limitation on the mass of the bridge: however, the most efficient bridges are typically less than 40 grams. CNC Luan bridges are typically heavier than pure basswood.
11. Weight of bridge, in grams, must be done prior to student registration at STEM Wars on May 23rd. Weight must be written legibly on bridge. There will be balances/scales present for judges confirmation, but weighing at registration will slow down the testing process.

Awards: Middle and High Schools: First, Second and Third place rated for **Efficiency**.

Individual Awards for **Highest Weight Held**.

Judges Awards for **Excellence in Craftsmanship**

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