

Civil Structures – Extreme!

Spring Challenge 2026

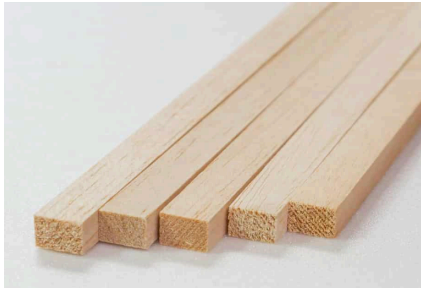
LEVEL:	High School
DIVISION(S):	No divisions, will just be 3 winners per school – 1 st , 2 nd , 3 rd
COMPOSITION OF TEAM:	2-3 of Students per team

OVERVIEW: Students will design and construct a model balsawood bridge from their own plans that will carry a maximum load while using as little wood as possible, stressing neatness, craftsmanship, and creativity. **Bridge testing will happen at your school site. MESA advisors must request a testing day through Pacific MESA.**

- MATERIALS:**
- ¼” x ¼” square balsawood (ten 3 ft lengths usually sufficient)
 - Only water-soluble Elmer’s-type white glue.

GENERAL RULES:

- 1) Civil Structure should be labeled with team members’ name, grade level, school, and MESA Center. There will be a 10% penalty in the strength to weight score for failing to properly label.
- 2) No kits are allowed.
- 3) Excessive glueing is not allowed – glue should only be used at the joints and not coating any other part of the bridge. You can ensure this by sanding areas that get glued on accident.
- 4) Longitudinal lamination is NOT allowed. This means you cannot stack and glue the sticks together long-ways. In the photo sample below, this would be disqualified.



- a.
- 5) The bridge **MUST** meet the following dimension restrictions or it will **not** fit on the tester:
 - a. Maximum length = **40 cm**
 - b. Maximum width = **10 cm**
 - c. Maximum height = **21 cm**
 - d. Minimum clearance = **10 cm**
 - e. Minimum span = **25 cm**
 - f. Maximum Bridge Weight = **95 grams**
 - 6) Members may be carved, notched, or cut anywhere along their length.
 - 7) Pins and/or gussets are not allowed.
 - 8) No material (e.g., paint, varnish, hairspray, etc.) may be applied to the bridge. Ink or pencil is allowed to identify bridge builders, grade level, school, and center.
 - 9) **Maximum allowable weight of completed structure is 95 grams.**
 - 10) Top of bridge **MUST** support a 10 cm x 10 cm plate which will bear the load for testing.

- 11) Bridge **MUST** have supports at least 25 cm apart and must measure at least 10 cm above a flat surface (e.g., an imaginary “river”) at least one point (may be more than one point) between the supports.
- 12) Project must be the original work of student(s).
- 14) Please remember that the purpose of this contest is to use creativity to build the best structure within the framework of the rules. The purpose is not to break the rules and see if you can get away with it.

JUDGING:

- 1) Prior to load testing, the bridge receives a specification check to determine whether it conforms to the weight, dimension, and construction rules.
- 2) The bridge is weighed and its weight recorded.
- 3) The bridge will be tested for load bearing capacity using the set-up shown in Testing Setup & Apparatus. The maximum load recorded by the load testing machine will be used as the load capacity of the bridge, regardless of when failure begins.
- 4) Disqualified bridges are not eligible for awards in any category. However, they may be tested in private, time permitting.
- 5) Strength-to-Weight Ratio: Determined by dividing maximum load at failure by weight of bridge. Bridge with greatest load bearing capacity compared to its weight wins.

Example: Maximum load = 120.0 pounds
 Bridge weight = 20.0 grams
 Ratio = $[120 \text{ pounds} \times 454\text{g/pound}] / 20\text{g} = 2724.0$

AWARDS:

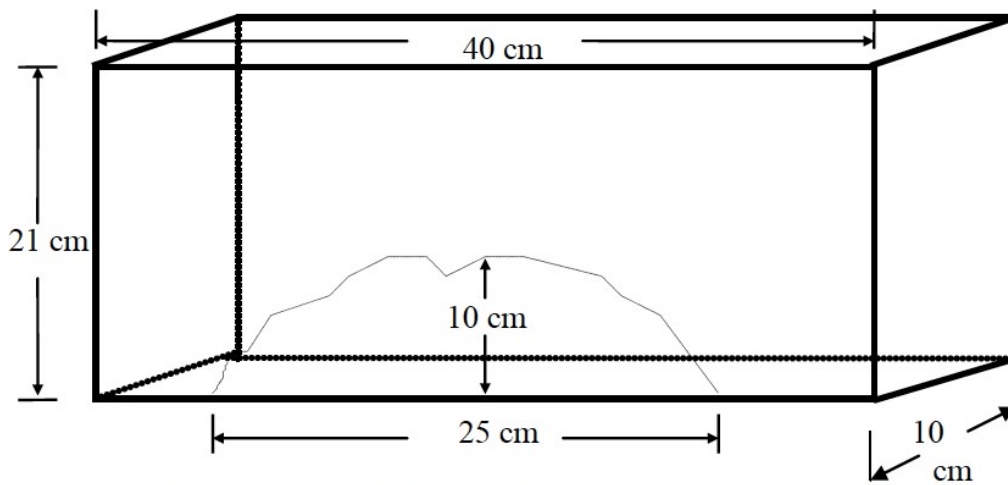
- Awards will be given per school – each school will be awarded separately, there won’t be a center-wide event
- Medals will be awarded for 1st, 2nd, and 3rd place based on the best Strength-to-Weight Ratio.

ATTACHMENTS/APPENDIX:

- A - Testing Setup & Apparatus
- B - Specification Checklist

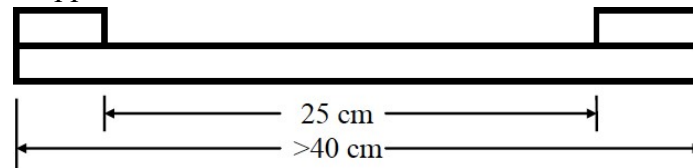
A – TESTING SETUP & APPARATUS

- 1) Figure 1a: Overall Dimension Test: The bridge must fit inside a box with the following dimensions to be considered legal; bridge must also pass the 10 cm clearance test.

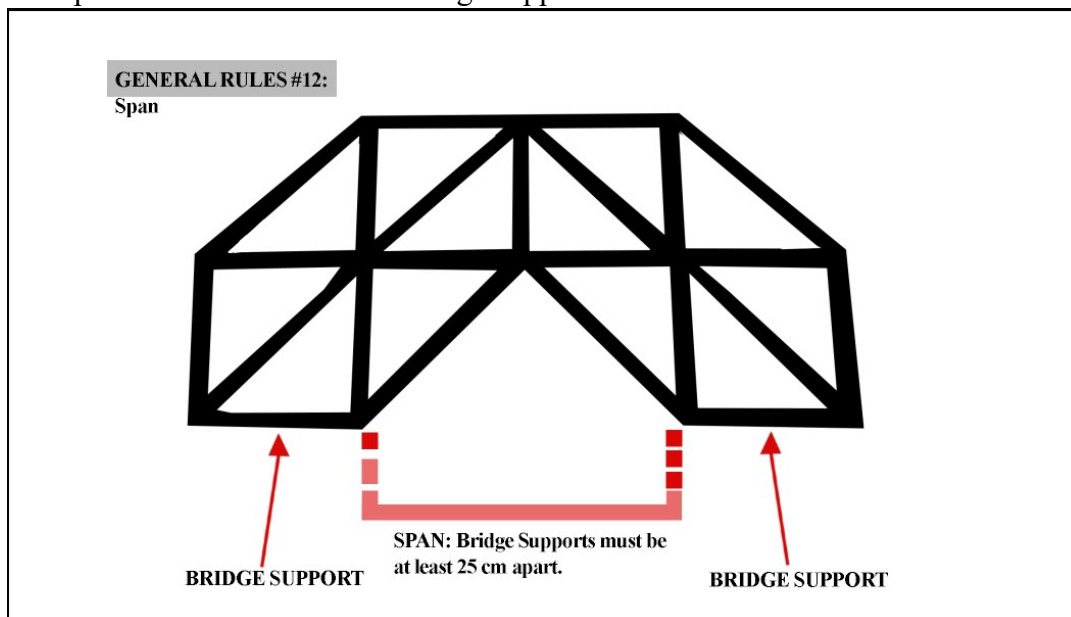


The bridge must clear the 10 cm line at at least one point (above an “imaginary river”) in the 25 cm span.

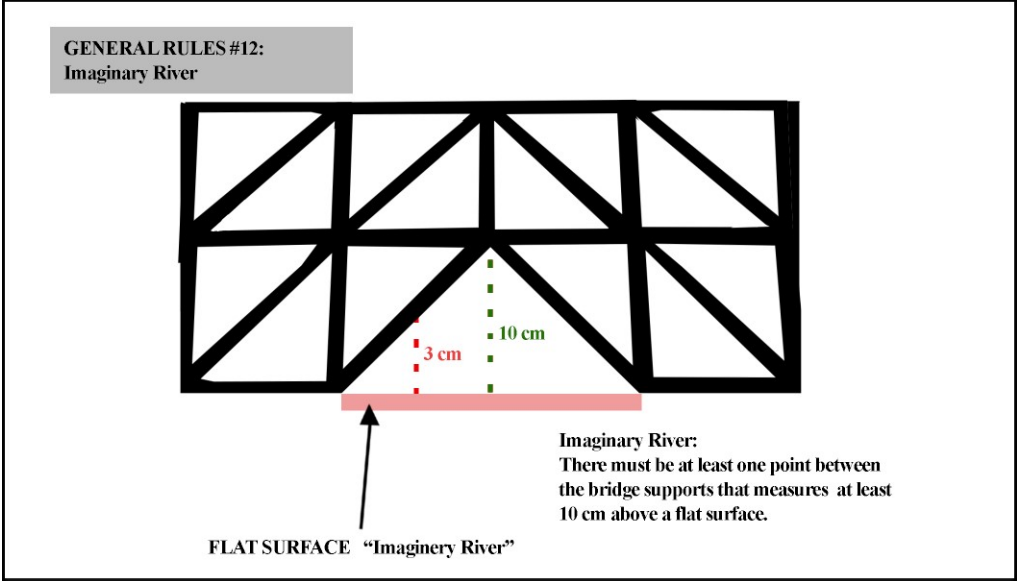
- 2) Figure 1b: The bridge will be supported on both of the blocks as shown:



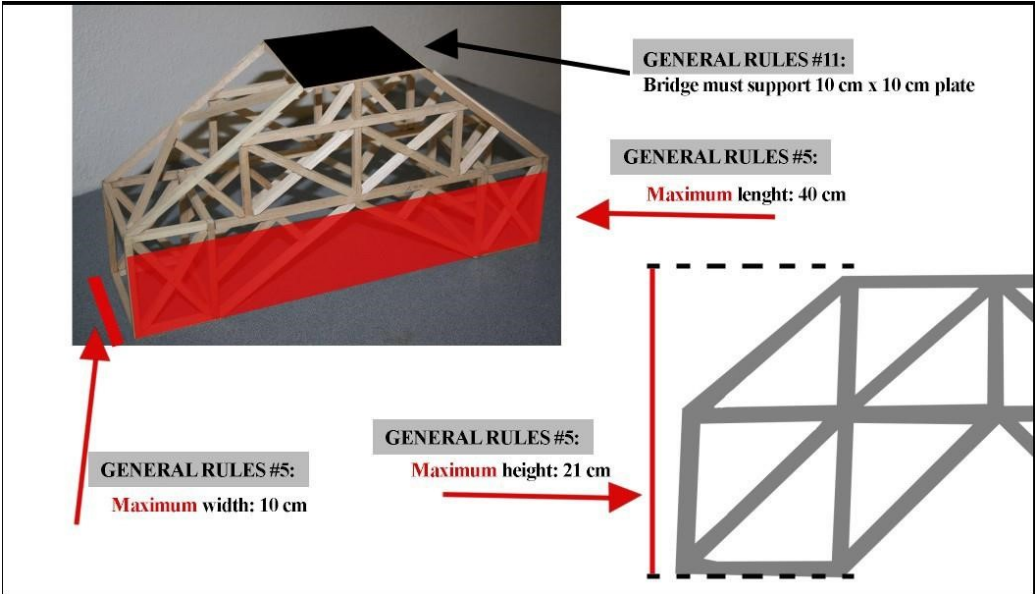
- 3) Figure 1c: Span clarification between bridge supports.



4) Figure 1d: Imaginary River and clearing the 10 cm line.

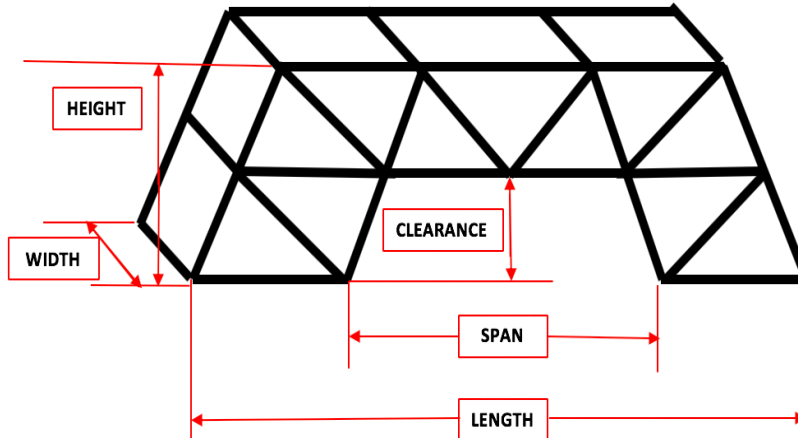


5) Figure 2: The bridge is tested for strength by applying weight (force) to a 10 cm square plate placed on top of the bridge. The bridge is tested for strength while sitting on the blocks. Additionally, note dimension details in the figure below.



B – SPECIFICATION CHECKLIST

**Note: As the name above implies, this list is intended simply as a guide for meeting the required competition specs. It should not be treated as an official judging document.*



- Bridge is properly labeled with team members names, school, and MESA Center
- Material is 1/4" x 1/4" balsawood
- Glue is water soluble Elmer's-type white glue
- Maximum Bridge weight = 95 grams
- Minimum clearance above "river" ≥ 10 cm
- Minimum Span ≥ 25 cm
- Maximum length ≤ 40 cm
- Maximum width ≤ 10 cm
- Maximum height ≤ 21 cm
- No longitudinal lamination
- No excessive gluing (i.e. members are glued only at the joints)
- No pins or gussets used
- Balsawood is not painted or treated
- Top center of Bridge has 10 cm x 10 cm area for placement of the test plate
- Bridge has supports suitable for placement on testing fixture