

2023 Gulf Coast ASCE Student Symposium Balsa Bridge Over Mobile Bay Competition March 9-11, 2023

Overview:

Teams will compete to construct a bridge from Balsa Wood. This competition is meant to test students' creative problem-solving ability while working under geometric constraints. All bridges will be loaded until failure to test the overall strength of each bridge. See the "Materials" section for the list of approved materials to be used in construction.

Bridges will be submitted to the judges to confirm that the bridge meets geometric and materials standards as well as weight limit.

Each team will also need to submit a short, one page report detailing the design rationale for the bridge. This report should include why the bridge design was chosen and describe the load path.

Teams:

Each school can have one team, and only one bridge will be scored. Each school can build as many bridges as they like to test various designs, but only one final bridge will be submitted for scoring. There is no maximum number of people allowed for building the bridge, however only two people are allowed to be present for testing. Each team should follow their schools' safety guidelines, and must follow any meeting capacity restrictions when designing, building & testing the bridge.

Competition Schedule:

The Balsa Wood Bridge competition will take place at the 2023 Gulf Coast ASCE Student Symposium. Each school will be building the bridge at their home campus and meeting according to their operating procedures. The judging of the bridge will take place at the University of South Alabama.

The finalized report will need to be submitted by February 17th, 2023 at 5 p.m CT to asceadvisor@southalabama.edu. Judges will review these reports prior to the awards ceremony.

Results will be announced at the awards ceremony, with full results being made available to all schools at the conclusion of the conference.

Materials:

The following list is the materials allowed for construction of the balsa bridges. Materials listed here are widely commercially available. Failure to adhere to these material specifications will result in disqualification. The use of basswood or any wood other than balsa will result in disqualification.

- Balsa Wood
- Glue/Epoxy

Construction:

There is no time constraint for the construction of the bridge. Only materials listed above by the host school (University of South Alabama) may be used for bridge construction. The bridge may not be coated or laminated in paint, glue, etc. Bridge members may not be internally reinforced in any way. All bridges will comply with the required dimensions under “Bridge Dimensions” section. Any bridges that do not meet these dimension requirements will be disqualified from the competition.

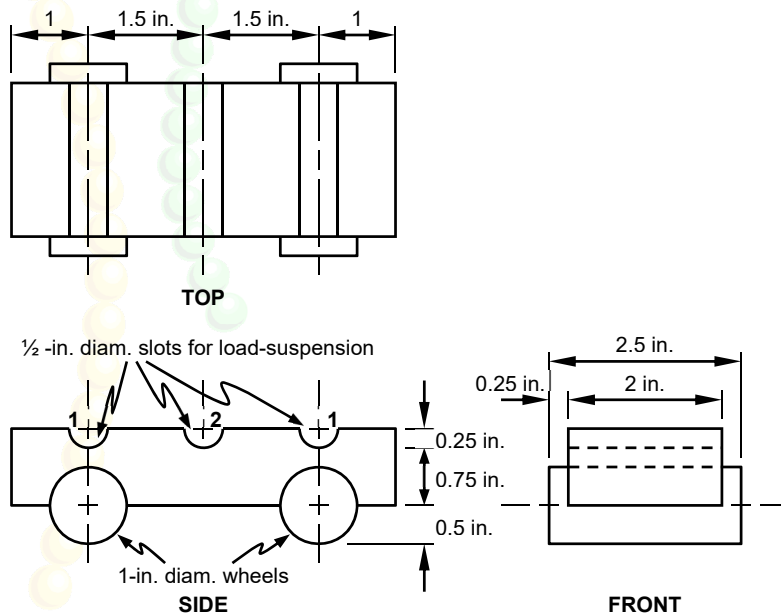
Bridge Dimensions:

The constructed bridge must be able to span a gap of 18”, with a max length of 20”. There must be a clear path for traffic on the bridge deck of at least 3”. wide and 3”. high. Maximum out-to-out bridge dimensions are 6”. A vertical clearance of 3” is required for a 3” wide ship channel under any portion of the bridge.

Constraints:

1. No fastening mechanisms other than glue/epoxy of balsa elements is allowed.
2. The bridge cannot weigh more than 150 grams.
3. Member size is constrained as follows:
 - a. Type 1 – at least two orthogonal dimensions no greater than 3/8 in.
 - b. Type 2 – element has at least one dimension no greater than 1/16 in.
4. The bridge shall stand freely on a flat surface.
5. When placed on a flat surface, the supports on one end of the bridge shall not touch that surface within 18” of the supports on the other end of the bridge.
6. A miniature car with a width of up to 3” shall be able to freely pass along the extent of the roadway.
7. The bridge shall be constructed in such a manner that it is able to be loaded using either Configuration 1 or Configuration 2, as seen in Figure 1.

Figure 1: Standard Load-Testing Vehicle



Loading:

The bridge must accommodate the loading vehicle seen in Figure 1. The bridge must be constructed in such a way that the bridge can be loaded using Configuration 1 or Configuration 2. Configuration 1 consists of a bucket being suspended from two bolts in the slots labeled in Figure 1. Configuration 2 consists of a bucket being suspended from one bolt in the slot labeled in Figure 1. The bridge

must support a minimum combined live load (design vehicle with bolts + bucket + additional weight added) of 35 lb. Judges may load the bridge at the point where it is most likely to cause failure of the bridge. After determining that the bridge has met the minimum qualifications, it may be loaded until failure. Failure criteria is as follows:

- Bridge fails to hold additional weight added for more than 5 seconds
- Deflection of more than ½” occurs

Judging:

Judges for the Balsa Wood competition are appointed by the host school (University of South Alabama). Judges will make the final determination on compliance with the rules outlined in this handout and penalties for the rule violations. Judges also must make interpretations of the rules in the scenario that questions arise. The decision of the judges will be final, and no appeals will be considered.

Scoring:

Teams will be ranked in order of best Overall Score. Overall Score is based on the combined score of the Structural Efficiency Rating (SER) and the Design Report. Structural Efficiency Rating is based on a ratio of total live load at failure to bridge weight (lbs/gram). SER for qualifying bridges will be normalized and scored out of 100 points (best SER awarded 100 points, lowest SER awarded 0 points). All qualifying bridges' Design Score is based on the judges' grading of the design reports and can be awarded a maximum of 10 points. Design reports will be judged based on technical writing ability, clarity of writing, and ability to accurately explain the design rationale of the chosen design. In the event of a tiebreaker, the winner will be selected by best SER.