

2017 East TN Regional Model Bridge Building Contest



Objective: To build a model bridge, according to prescribed size and weight specifications, that is capable of supporting the greatest load per unit of mass.

Location: American Museum of Science & Energy
300 South Tulane Avenue, Oak Ridge, TN 37830 Fax (865) 576-6024
AMSE Contact – Corwin Witt (865-241-2148) cwitt@amse.org

Eligibility: Students in grades 7-12

Schedule: March 1, 2017 - Send pre-registration forms to AMSE
March 4, 2017 - Contest Date
8:00 a.m.-10:00 a.m. EST Registration
Testing begins when a bridge is qualified.
Award presentation at completion of all bridge testing.

Construction: In accordance with the attached Model Bridge Building Specifications

Sponsors: American Museum of Science & Energy, American Society of Civil Engineers, Tennessee Society of Professional Engineers, and American Society of Mechanical Engineers, AMSE Foundation

Prizes: Prizes will be awarded in each division for first, second, and third place for the bridges with the highest structural efficiency (E= maximum load/model mass)

Senior High Division (grades 9*-12)

1st place – Trophy & \$150.00 to student & \$150.00 to school
2nd place – Trophy & \$100.00 to student & \$100.00 to school
3rd place – Trophy & \$50.00 to student & \$50.00 to school

Junior High Division (grades 7-9*)

1st Place – Trophy
2nd Place – Trophy
3rd Place – Trophy

Most Aesthetic Bridge will receive a trophy & \$100.00**

Bridge Contest Rules:

1. The contest is open to high school and junior high school students grades 7-12.
2. Bridges must meet all specifications of the Model Bridge Building Contest. Those bridges not meeting specifications may be tested, but results will not count.
3. ****A bridge must also meet specifications to qualify for the Aesthetics award. Bridges in Aesthetic category should be registered and qualified for testing before the 10:00 a.m. Aesthetic competition. Bridges for the Aesthetics award will be selected by the judges during the registration and checking of the bridges.**
4. Bridges may be entered in person on the day of the contest. All bridges must be entered between 8:00 a.m. and 10:00 a.m. EST.
5. Models will be tested in the museum auditorium on the contest day. Students and parents are encouraged to attend.
6. Judges will be provided by the contest sponsors. All decisions of the judges will be final.
7. Please check with website periodically for any corrections to rules and regulations and frequently asked questions. www.amse.org
8. *Ninth grade students may compete in either division; however, cash prizes are awarded only in the senior high division.
9. Any modification to the contest bridge must be done by the actual bridge builder.

2017 East TN Regional Model Bridge Building Contest Bridge Specifications



1. Materials

- a. The bridge must be constructed from 3/32 inch square cross-section basswood and any commonly available adhesive.
- b. The basswood may be notched, cut, sanded or laminated in any manner but must still be identifiable as the original wood.
- c. No other materials may be used. The bridge may not be stained, painted or coated in any fashion with any foreign substance.

2. Construction

- a. The bridge mass shall be no greater than 30.00 grams.
- b. The bridge (see Figure 1) must span a gap (**S**) of 300. mm, be no longer (**L**) than 400. mm, have a maximum width (**W**) of 80. mm, and be no taller (**H**) than 150. mm above the support surfaces. The bridge must be constructed to permit a 20. mm clearance (**C**) above the support surface at the midpoint of the span. No part of the bridge may extend below the support surface.
- c. The loading plane (P) shall be horizontal and shall lie between 30. mm and 40. mm above the support surfaces.
- d. The bridge must be constructed to provide for the placement of the loading plate (see section 3, below) at each of the two loading points. Any portion of the structure *above or below* the loading plane must provide clearance for the loading rod at the two loading point locations.

3. Loading

- a. The load will be applied by means of a 40. mm square plate that is 6.35 mm (1/4 inch) in thickness. A 9.53 mm (~3/8 inch) diameter loading rod is attached from above to the center of the plate (see Figure 2). The plate will be horizontal, will not pivot on the loading rod, and the sides of the plate will be placed parallel to the longitudinal axis of the bridge. Force will be applied to the loading plate from above through a mechanical testing machine.
- b. The load will be applied at one of two loading points: 60. mm to one side, and 20. mm to the other side of the center of the 300. mm span. Note these are not symmetrically located on the bridge.

4. Testing

- a. On the day of the contest, judges will decide the exact loading location to be used. It will be the same for all bridges.
- b. The bridge will be **centered** on the support surfaces.
- c. The loading plate will be placed on the bridge at the specified loading location and the load will be applied from above as described in section 3. above.

2017 East TN Regional Model Bridge Building Contest Bridge Specifications



- d. Competition loading will stop at 50 kg. However, loading will be allowed to continue until the bridge experiences failure. Bridges failing above 50 kg will be considered to have held 50 kg for the efficiency calculation. Bridge failure is defined as the inability of the bridge to carry additional load, or a load deflection of 25 mm under the loading location, whichever occurs first.
- e. The bridge with the highest structural efficiency, E , will be declared the winner.

$$E = \text{Load supported in grams (50,000g maximum)} / \text{Mass of bridge in grams}$$

5. Qualification

- a. All construction and material requirements will be checked prior to testing by the judges. Bridges that fail to meet these specifications at the conclusion of the allowable time for checking will be disqualified. Bridges disqualified prior to the start of the contest may be tested as unofficial bridges at the discretion of the builder and the contest directors.
- b. If, during testing, a condition becomes apparent (i.e., use of ineligible materials, inability to support the loading plate, bridge optimized for a single loading point, etc.) which is a violation of the rules or prevents testing as described above in Section 4, that bridge shall be disqualified. If the disqualified bridge can accommodate loading, it may still be tested as an unofficial bridge as stated above.
- c. Decisions of the judges are final; these rules may be revised as experience shows the need. **Please check The American Museum of Science & Energy Bridge Contest website at www.amse.org, after January 31, 2017, to learn whether any rule changes or clarifications have been made.**

FIGURE 1: Bridge Schematic (not to scale)

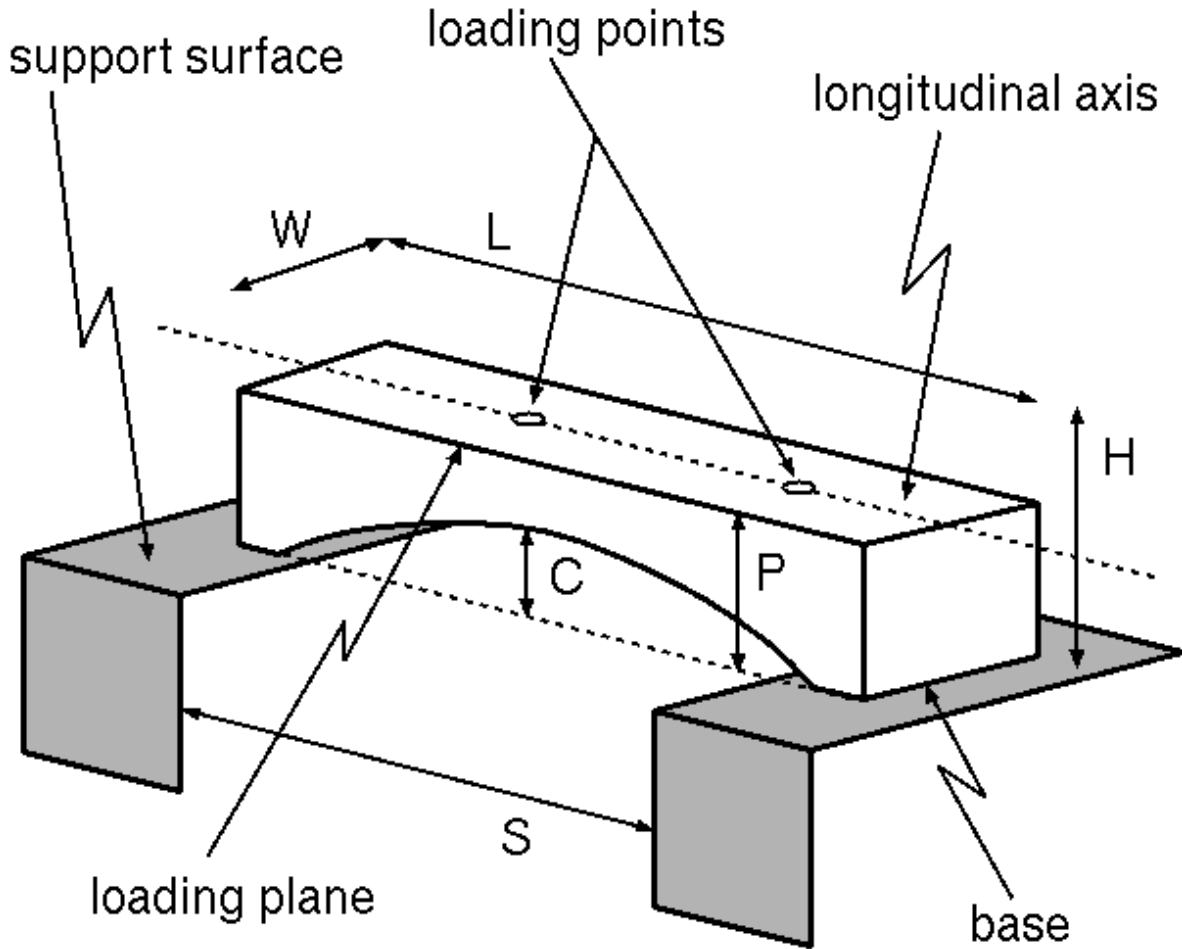


Figure 1: Detail of Bridge Configuration (not to scale). The dimensions marked in the figure are as follows:

- | | | |
|------------------------------|--------------------|---------------------|
| L = 400 mm MAXIMUM | W = 80 mm MAXIMUM | S = 300 mm |
| C = 20 mm MINIMUM AT MIDSPAN | H = 150 mm MAXIMUM | 30. mm ≤ P ≤ 40. mm |

Loading point are located at 60 mm & 20 mm on opposite sides of the center of the bridge.

FIGURE 2: Loading Plate & Rod (not to scale) Load applied downward (from above)

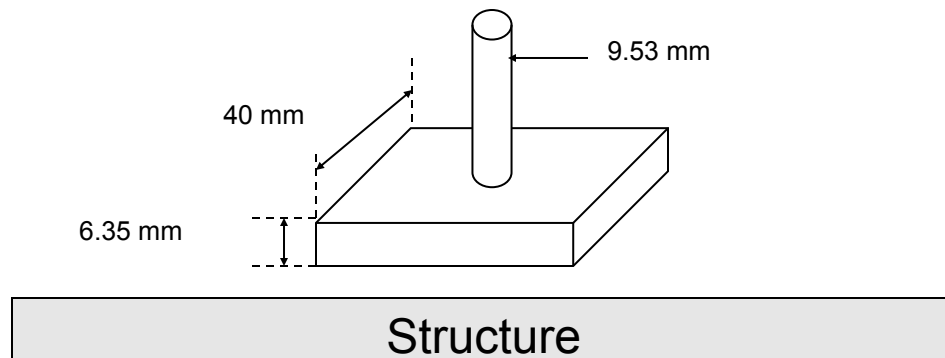


Figure 2: Loading Plate Detail (not to scale). The loading plate is 40 mm square, and 6.35 mm thick with a 9.53 mm diameter rod attached in the center.

**Mail to: The 2017 Model Bridge Building Contest
c/o AMSE
300 South Tulane Avenue
Oak Ridge, TN 37830**

**REGISTRATION FORM
(May be duplicated as needed)
PLEASE COMPLETE FULLY & RETURN
BY March 1, 2017**

Student's Name: _____ **Grade:** _____

Home Address: _____
Street City State ZIP

Home Phone: _____ **School Phone:** _____

Name of School: _____ **County:** _____

School Address: _____
Street City State ZIP

Teacher Name: _____ **Teacher's e-mail:** _____

Circle the division & category you will be competing in: (competitors may compete in both structural and aesthetic categories in their division)

Structural: Senior High Junior High Aesthetic: Senior High Junior High

I certify that I will have built the bridge entered in my name: _____
Student's signature



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