



Honors + AP Physics 2nd Quarter Extra Credit Project

9th Annual Bridge Building Competition

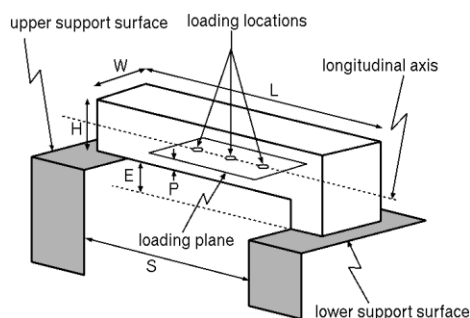


These rules have been developed by the Chicago Regional Bridge Building Committee for the **Thirty Sixth Chicago Regional Bridge Building Contest** to be held on **Tuesday, January 29th, 2019** at Illinois Institute of Technology, Chicago IL 60616, USA.

The object of this contest is to see who can design, construct and test the **most efficient** bridge within these specifications. Model bridges are intended to be simplified versions of real-world bridges, which are designed to accept a load in any position and permit the load to travel across the entire bridge.

1. Materials

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



2. Construction

- The bridge mass shall be no greater than 25.00 grams.
- The bridge shall rest on two support surfaces separated in elevation (**E**) by 10. mm and horizontally by a gap (**S**) of 300. mm (see Figure 1).
- The bridge (see Figure 1) must span a gap (**S**) of 300. mm, be no longer (**L**) than 400. mm, be no taller (**H**) than 150. mm above the upper support surface, and no wider (**W**) than 80. mm at the loading surface.
- The bridge must be constructed to provide a horizontal support for the load (see **3b**) at each of the three possible loading locations. The bridge structure must allow the loading rod to be mounted from below and any portion of the structure above the loading plane must allow clearance for the plate to be lowered from above (see Figure 2).
- The bridge must be constructed to allow a 48 mm diameter, 300. mm long pipe (1.5 inch schedule 40 PVC pipe) to be passed horizontally across the bridge with the pipe's lower surface on the loading plane (**P**) between 30. and 50. mm above the upper support surface. This pipe must touch all three loading locations simultaneously.
- No part of the bridge may extend below the upper support surface within the span (see Figure 1).

3. Loading

- Competition loading will stop at 50. kg, loading will continue until bridge failure (see **4d**)
- The load will be applied by means of a 40. mm square plate (see Figure 2) with a thickness (**t**) of at least 6 mm but less than 13 mm. A 9.53 mm (3/8 inch) diameter eyebolt is attached from below

to the center of the plate. The plate will be horizontal and will be mounted with its edges parallel to the longitudinal axis of the bridge. Masses will be supported on a vertical loading rod suspended from the eyebolt. The minimum initial load will be 2. kg.

- c. The load will be applied with the center of the plate at one of three (3) possible loading locations on the longitudinal axis of the bridge: The center and 30. mm to either side of the center of the bridge span (see Figure 1).
- d. On the day of the competition, the judges will decide which one of the three loading locations will be used; it will be the same for all bridges.

4. Testing

- a. On the day of the contest, contestants will center their bridge on the loading surfaces. They will have previously located the loading plate and 3/8 inch eye bolt to the selected loading position with the edges of the plate parallel to the longitudinal axis of the bridge.
- b. The load will be applied from below, as described in section 3 above. Competition loading will stop at 50. kg. However, loading will continue until bridge failure (see 4d).
- c. Bridge failure is defined as the inability of the bridge to carry additional load, or a load deflection of 25.4 mm under the loading location, whichever occurs first.
- d. The bridge with the highest structural efficiency, E , will be declared the winner. Bridges failing above 50. kg will be considered to have held 50. kg for efficiency calculation.

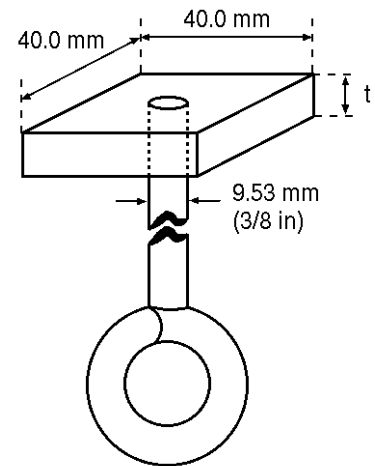


Figure 2. Loading Plate Detail

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

5. Qualification

- a. All construction and material requirements will be checked prior to testing. Bridges failing to meet these specifications at the conclusion of the allowable time for checking-in 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 exhibition bridge as stated above.
- c. Decisions of the judges are final; these rules may be revised as experience shows the need. Please check our web site, <http://bridgecontest.phys.iit.edu> after January 5, 2018, to learn whether any changes have been made.