



## **KENNETH T. RYBARCZYK MEMORIAL MODEL BRIDGE CONTEST**

[WWW.ABCDWNY.COM](http://WWW.ABCDWNY.COM)

Each year during the months of February through April, the Association for Bridge Construction and Design (ABCD) sponsors multiple balsa wood model bridge contests throughout the Western New York area. Each is open to all middle or high school students who would like to participate. High Schools are strongly encouraged to incorporate the fundamentals of bridge design into their curricula, as this will help students gain the most understanding when developing their contest bridges.

Entries will be scored based on the attached evaluation criteria and trophies will be awarded for the top finishers.

An entry certificate (enclosed) with the name of the individual(s) responsible for the design and construction of the model shall accompany each entry. If there is more than one participant responsible for the design and/or construction of the model, all names shall appear on the entry form. A student (or group of students) may enter only one bridge. No student can be a member of more than one group, nor can a student enter as an individual for one bridge and part of a group for another bridge. No student or group can compete in more than one contest in a given year (i.e. If a student enters the Buffalo Area Contest, they cannot compete in the Rochester Area Contest). The entry certificate shall clearly state the name of the school attended by the participant(s).

## MODEL BRIDGE CONTEST INSTRUCTIONS

The model bridge must be built in accordance with the following instructions:

### REGULATIONS

- A. Have fun and enjoy the design process!
- B. The material to be used for each structure shall consist of balsa wood and glue. The weight of each structure shall be less than 300 grams (10.6 oz.).
- C. See the attached Figures for required bridge dimensions.
- D. The bridge and deck shall have a 1/2" diameter hole at the geometric center of the bridge (center of bridge length & center of bridge width) so there is clearance for a 3/8" diameter rod to extend downward from this hole to facilitate set up of the testing device.
- E. Specific definitions:
  - a. **Failure:** Failure is defined as:
    - (1) The bridge collapsing from the load placed on the test block by the testing device;
    - (2) The superstructure below the deck touching the face of the testing device; or
    - (3) The structure is unable to carry any increased load from the testing device after 5 consecutive rotations of the testing device to apply load.
  - b. **Deck:** The part of the bridge that is meant to be traveled on by a vehicle.
    - (1) The deck must extend the full length of the bridge and maintain a vehicular roadway area **without any obstruction**.
    - (2) The deck shall be constructed using a single, solid balsa wood sheet no more than 1/4" thick.
    - (3) The deck shall be level (or flat) and shall not be curved (or arched).
  - c. **Beams & Girders:** Main horizontal support members for the bridge, which may or may not support other beams or girders.
    - (1) No beam or girder may have a cross-section larger than 1" x 1" square.
    - (2) Beams and girders are to be made of solid balsa wood. The wood shall be non-laminate.
    - (3) Beams and girders may be constructed using multiple pieces of balsa wood, if the intent is to simulate a typical beam shape (I-beam, C-beam, L-beam, etc.), or to create a larger moment of inertia. No built-up beam or girder may be larger than 1" x 1" square.
    - (4) Beams and girders shall not be stacked to increase the cross-section.

- d. **Trusses:** Trusses are main horizontal support members that are built-up from smaller members. Trusses may be above deck, below deck, or a combination of above and below deck.
- No member may have a cross-section larger than 1" x 1" square.
- e. **Arches:** Arch bridges, where the main horizontal support members are arches cut from a larger solid piece of balsa wood or are built-up from multiple thin sections that are laminated together to form an arch are permitted as long as they are within the required bridge dimensions.
- f. **Other Bridges:** Other bridge designs, such as cable stay bridges or other unique designs are permitted as long as they are within the required bridge dimensions.

FIGURE 1

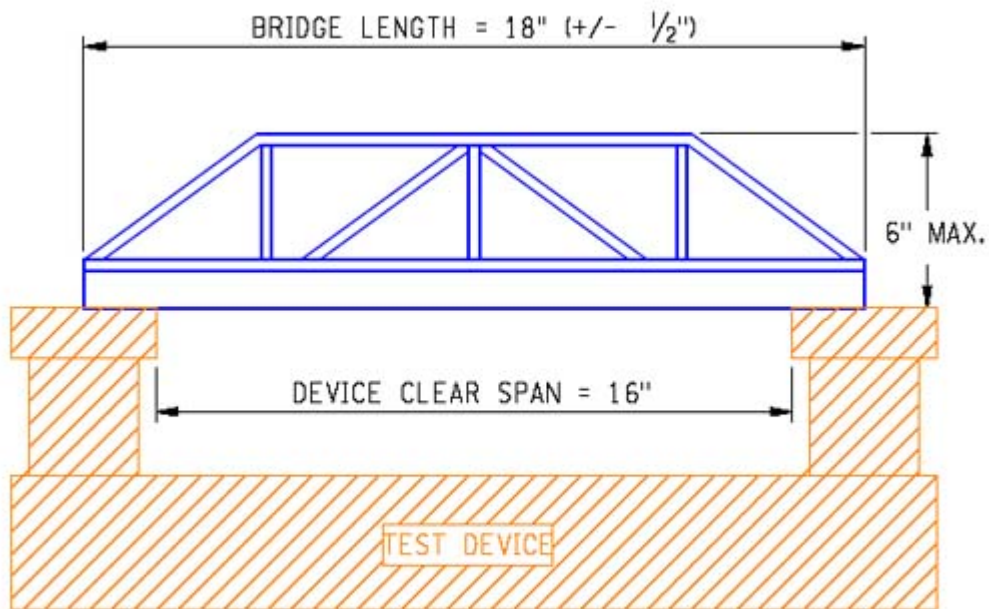


FIGURE 2

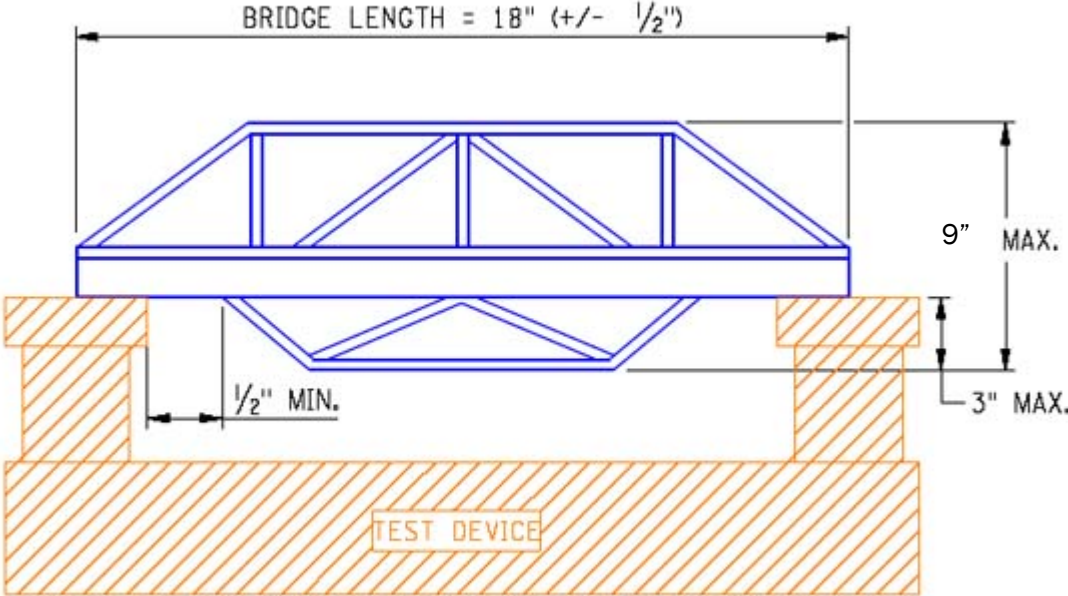


FIGURE 3 (TRUSS EXAMPLE)

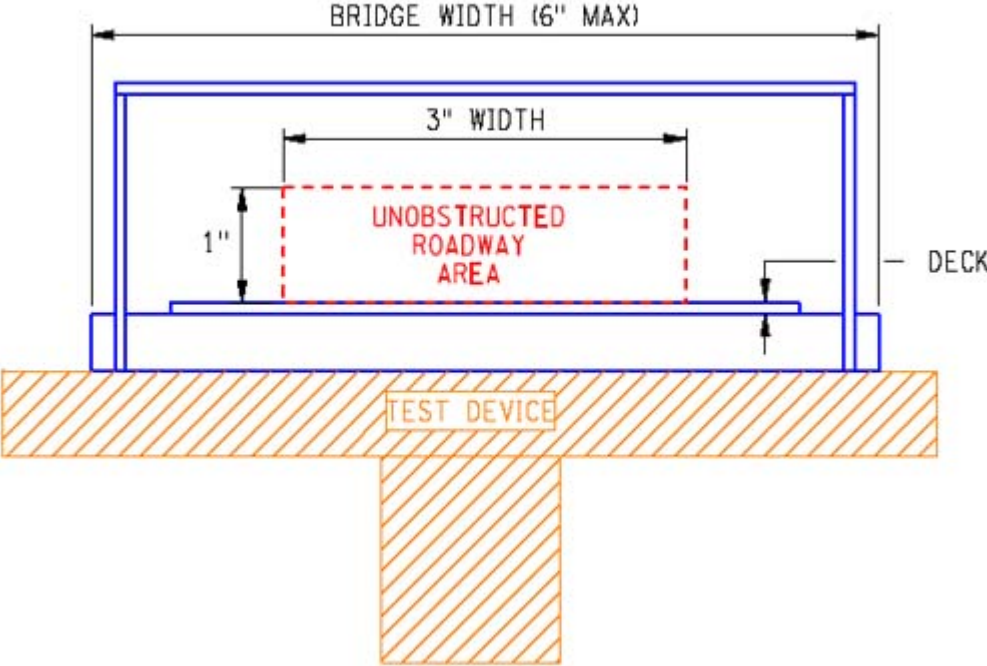
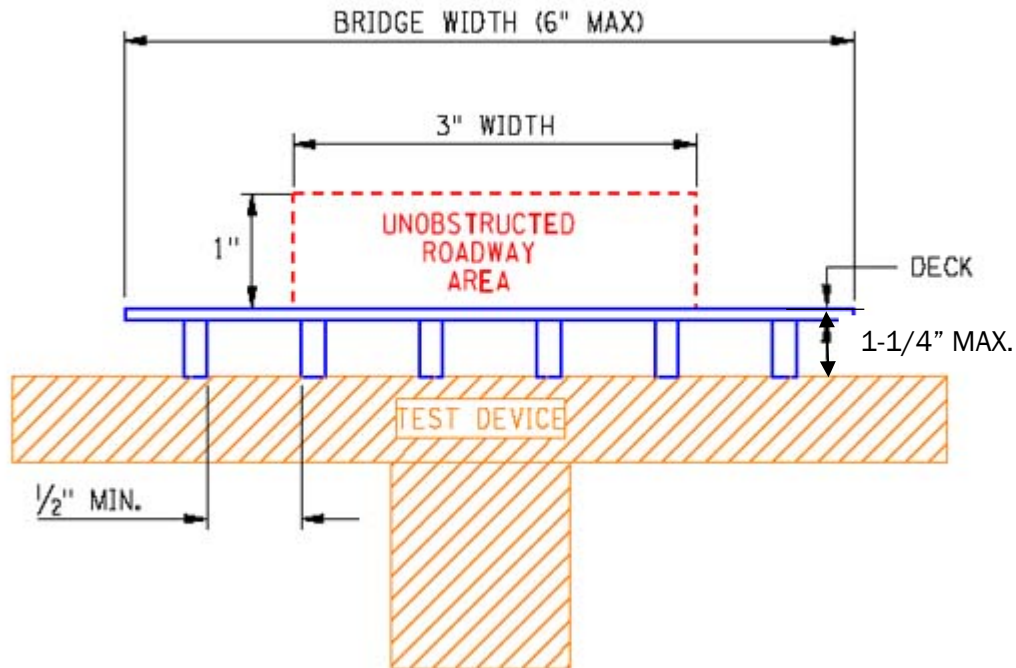


FIGURE 4 (MULTI GIRDER EXAMPLE)



### SUBMISSION AND EVALUATION

- A. Model bridges shall be submitted at the ABCD contest table on the date of the competition. Entries are assessed against the regulations, weighed, judged and load tested.
- B. An increasing load is applied to the structure via the testing device until the structure fails. The load will consist of a uniform load, applied over a 2" wide and 4" long area on the deck at the center of the structure.
- C. The Failure Load is recorded.
- D. The Efficiency is determined by the following equation:  $(\text{Failure Load}) / (\text{Structure Weight})$
- E. The Efficiency is recorded.
- F. The winner is determined by a point system as follows:

- **Complexity, Engineering and Workmanship - 18 pts**

- A judge will rate each bridge based on the following:
- **Complexity** - Members involved in the design with a score as defined below:

Top braced above-deck truss with stringers and floor beams (or bottom braced under-deck truss)	<b>7</b>
A score of 6 is used to shade between 5 and 7 points.	<b>6</b>
Open truss (no top bracing interconnecting each truss)	<b>5</b>
A score of 4 is used to shade between 3 and 5 points.	<b>4</b>
Multi-girder and deck (deck with at least 4 longitudinal girders)	<b>3</b>
A score of 2 is used to shade between 1 and 3 points.	<b>2</b>
Slab bridge	<b>1</b>

- **Engineering** - How much thought is placed into the design, are stringers and floorbeams positioned correctly, are truss members positioned correctly, where are the connection points, how are connections made, are compression members (top chord of a truss) laterally braced, are larger members used at locations of higher force, are efficient member shapes used. **(7 pts.)**

Excellent Engineering	<b>7</b>
A score of 6 is used to shade between 5 and 7 points.	<b>6</b>
Above Average Engineering	<b>5</b>
A score of 4 is used to shade between 3 and 5 points.	<b>4</b>
Average Engineering	<b>3</b>
A score of 2 is used to shade between 1 and 3 points.	<b>2</b>
Poor Engineering	<b>1</b>

- **Workmanship** - “Clean” bridges with neatly glued and sanded edges and members matching at connections will be awarded full credit **(4 pts.)**.

- **Efficiency - 25 pts**

- Calculation from step D, with the highest efficiency in the competition being awarded the full 25 points and the lowest efficiency the least number of points. Efficiency scores will be given only to qualifying bridges that meet the regulations defined on pages 2-4 of these instructions.

G. The best possible score will be 43 points. In case of a tie, the first prize will be awarded to the structure, which in the opinion of the Judges, displays the best application of Civil Engineering principles, innovative ideas, and general overall appearance.

H. **The Judges decisions will be final.**

## TROPHIES

Trophies will be presented at the conclusion of the contest.