



## Bridge Engineering

(Individual Or Team; Competitive; On-Site Testing)

### DESCRIPTION:

The purpose of this contest is to provide an opportunity for students to demonstrate their ability to design and construct a bridge capable of withstanding as great a compressive load as possible. With assigned span and width specifications, bridges will be stressed to their failure point. A team may consist of no more than five members.

### GENERAL RULES AND REGULATIONS:

1. The student entering the bridge must provide the following:
  - a. A full size set of elevation drawings of the proposed bridge.
  - b. A bridge corresponding to the set of drawings for testing.
2. The bridge must be constructed from materials specified (16 pieces of 3/32" x 3/32" x 24" basswood). Any common bonding materials (glue) may be used. No other materials may be used.
3. The bridge must be symmetrical in all respect to a vertical axis through its geometric center.
4. Outriggers are not allowed. Outriggers are any structures added to a bridge to mainly satisfy dimensional constraints.
5. The bridge must be designed around a horizontal "roadway" with a minimum width of 50 mm and a minimum **length of 300 mm**.
6. The top of the roadway must be at a height no greater than **18 mm** above grade. Grade is defined as the level of the top surface of the test support.
7. **The bridge is required to have a substructure with a minimum length 248 mm and a maximum length of 260 mm. The depth of the substructure cannot exceed 30 mm below grade or be less than 16 mm below grade.**
8. Note that the roadway need not be as long as the bridge.

The bridge must be designed so that a 50 mm x 50 mm x 30 mm "vehicle" can pass through the bridge.
9. Bridge mass cannot be greater than 28 grams.
10. Bridge length cannot exceed 300 mm.
11. Roadway length cannot exceed 300 mm.
12. Roadway height cannot exceed **18 mm**.
13. There is no limit on overall bridge height, nor is the bridge required to have a super structure.
14. Lengthwise laminations of more than 2 pieces of basswood are not allowed.

Lengthwise is defined as the length of the beams.
15. No coating of surfaces with glue will be allowed, glue only allowed at joints.

### CRITERIA FOR JUDGING:

The test load will be applied to the bridge by means of a 7 mm x 50 mm x 50 mm plate placed on the roadway with its edges parallel to the sides of the bridge.

The plate will be located at the center of the bridge, or at some integral multiple of 3.5 cm from the bridge center along the roadway axis.

During testing the bridge abutments (blocks the bridge will set upon during testing) will be no further than **260 mm apart nor closer than 248 mm apart**. Refer to example below.

**Any Rules or Regulation Violation = -20% For Each Violation In Bridge Efficiency, More Than 3 Violations Will Result In Total Disqualification**

A container will be suspended from the loading plate and will be filled by the test officials or the student entrant with sand until the bridge fails.

Bridge efficiency will be determined by this formula:

$$\text{Bridge Efficiency} = \frac{\text{Weight Supported in Grams}}{\text{Weight of Bridge in Grams}}$$

### Awards in Levels II and I.

