

# Popsicle Stick Bridge Competition 2020

## Rules and Guidelines

### Background

Bridges have fascinated people since the dawn of time when nature itself built many bridges in the form of fallen trees over rivers or ancient icicle arches. As technology developed, people began to build artificial bridges where nature had not. Advances in bridge design, engineering, and construction have made many types of bridges possible and utilizing numerous materials. Today, bridges can be of the arch, beam action, cable stay, suspension, or truss type. Materials used throughout history include wood, masonry, cast iron, wrought iron, concrete, steel, reinforced concrete, alloy and silicon steel, pre-stressed concrete, carbon fiber, and aluminum.

# 1 Purpose

To use math and science to implement engineering concepts in the design and construction of a model bridge from your own plans that will carry a maximum load while using as few craft-sticks as possible; and, to develop neatness, craftsmanship and creativity.

# 2 Resources

Instructors should refer to the instructional PowerPoint provided by the PSBC Committee.

Additional resources are:

[https://www.hasd.org/cms\\_files/resources/Popsiclebridge5-9.pdf](https://www.hasd.org/cms_files/resources/Popsiclebridge5-9.pdf)

<http://www.42explore.com/bridge.htm><http://pages.jh.edu/~virtlab/bridge/truss.htm>

<https://www.usbr.gov/lc/region/programs/bridgebuilding/Presentation.pdf>

<http://pages.jh.edu/~virtlab/bridge/truss.htm>

# 3 The Event

1. When the students arrive, they will be directed to the **check-in station** and:
  - Registered with their team name and school
  - The bridge will be measured for length, width, height, and weight.  
(**Any bridge not meeting the requirements will be DISQUALIFIED from winning awards.**)
  - If the students consent, a team picture will be taken with the students holding their bridge. The picture will be used for the aesthetic grading.
  
2. The bridge will be tested at the **testing station** in one of the following three categories:
  - (a) Elementary
  - (b) Middle School
  - (c) High School
  
3. The students will be sent to the **check-out station** where their team will receive a certificate stating their team name and scaled bridge load result.

## 4 BRIDGE REQUIREMENTS

### 4.1 MATERIALS

#### 4.1.1 POPSICLE STICKS

- Cut / notched at any angle.
- Bent or curved (sticks may be soaked in water ONLY to curve).
- Marked on the face for decoration using only markers, crayons and/or colored pencils.
- Sticks may NOT be altered in the following ways: Soaked in any material besides water; painted or coated except with markers, crayons or colored pencils on the stick for decoration only.
- The following is the maximum number of popsicle sticks each category can use:
  - (a) Elementary: MAX 200
  - (b) Middle School: MAX 250
  - (c) High School: MAX 300

Note: The fewer number of sticks used and the stronger the bridge the better the score. Since the grading will consider the SCALED weight, any extra weight added to the bridge will lower the students overall score, so a balance of strength to weight is recommended.

#### 4.1.2 ELMER'S WHITE GLUE

- ONLY water-soluble white Elmer's glue can be used as an adhesive.
- Yellow wood glue, or glues containing resin adhesives or other cement binders are NOT allowed

## 4.2 Bridge Dimensions

Every bridge will be tested in the category that it falls in.

*Example:* A bridge of length **18 inches** would be tested in the **Middle School** category, and a bridge of **23 inches** in the **High School** category.

ALL bridges must be at least **4 inches wide** and **13 inches long** to be tested, as this is a requirement of the testing apparatus:

### 4.2.1 Elementary

WIDTH: 4 in - 5 in Wide (1 POPSICLE STICK)  
LENGTH: 13 in - 15 in Long (3 POPSICLE STICKS)

### 4.2.2 Middle School

WIDTH: 4 in - 5 in Wide (1 POPSICLE STICK))  
LENGTH: 17 in - 19 in Long (4 POPSICLE STICKS)

### 4.2.3 High School

WIDTH: 4 in - 5 in Wide (1 POPSICLE STICK)  
LENGTH: 22 in - 24 in Long (5 POPSICLE STICKS)

## 4.3 Additional Bridge Requirements

The top of the bridge must have a clearance big enough for the compression plate to fit through. The compression plate is a rectangular metal plate (**2 inches** wide x **5 inches** long) as shown in (Figure 1) that distributes the load along the length of the bridge.

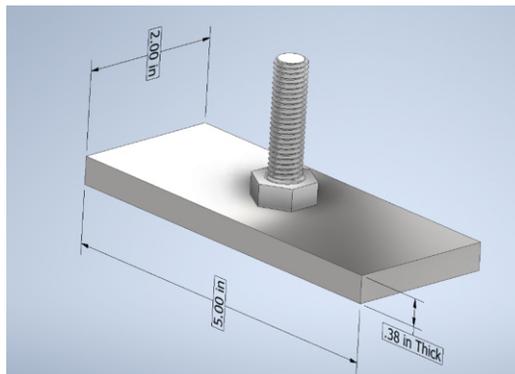


Figure 1: Compression Plate

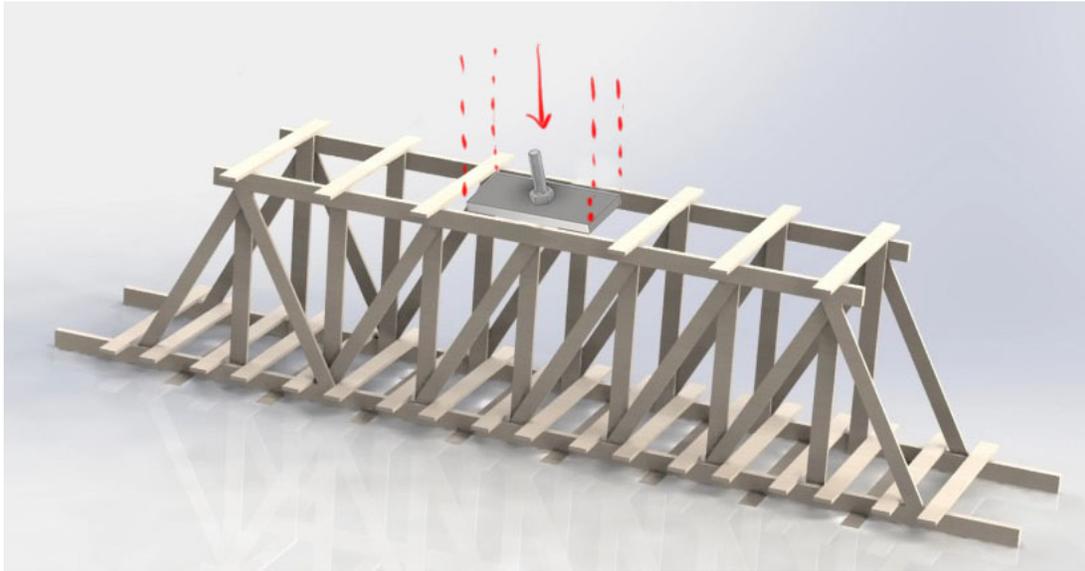


Figure 2: Clearance on Bridge

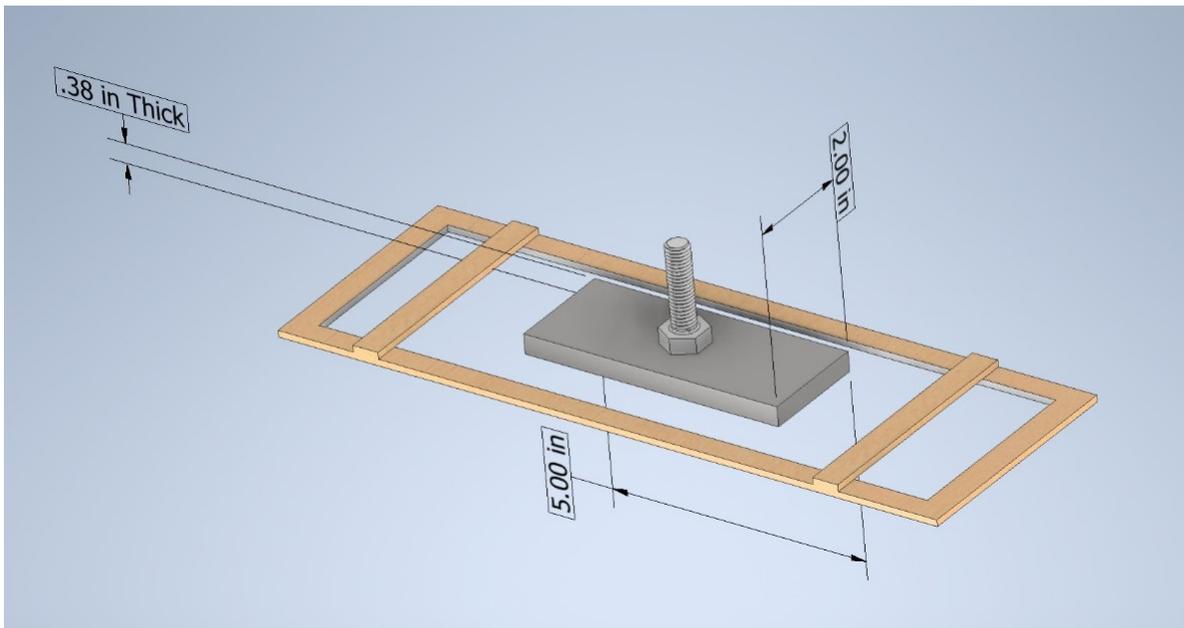


Figure 3: Close up of clearance