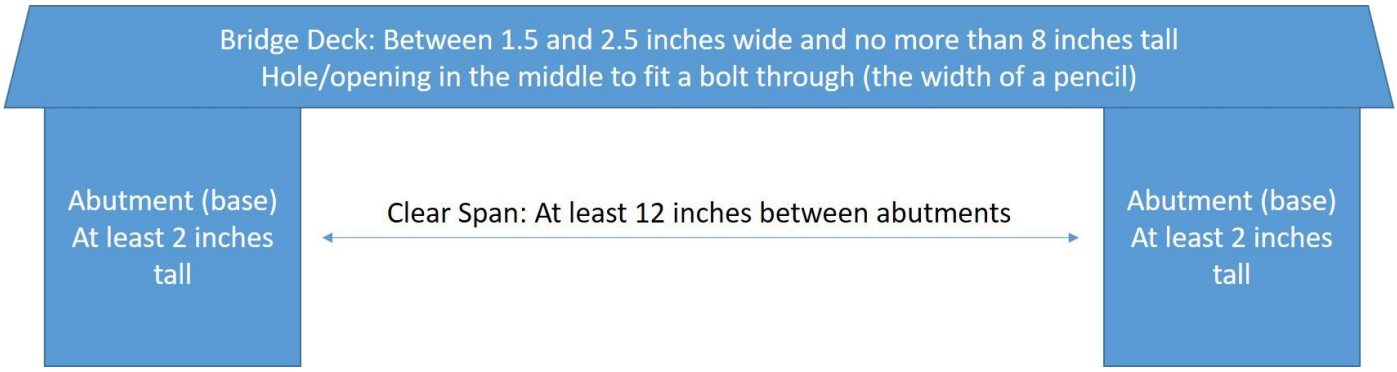
Toothpick Bridge Challenge DUE DATE: NOVEMBER 5th

The Challenge: Your challenge is to construct a bridge that will serve as a route over a waterway. The goal is to design and create the most efficient and aesthetic (nicest looking) bridge possible **using only toothpicks and glue**.

The Criteria: The structural efficiency is equal to the weight supported by the bridge. In the event of a tie the lightest bridge will be the winner. The aesthetics of the bridge will be determined through visual appeal, uniqueness, neatness and symmetry.

The Specifications: (In Science we use the metric system, but for this challenge we will use the United States Customary System. Inches please!)

- **Span:** The Bridge must have a minimum clear span of 12 inches in length, and rest on abutments on either side of the river. The abutments are to be part of the bridge.
- **Bridge Vehicle Deck:** The bridge deck must be at least 1.5 inches wide. This will be tested with a matchbox car. The deck must be solid so that the car can travel the length of the bridge, with the exception of a hole in the center, large enough for a ¼ inch rod to pass through.
- **Bridge Clearance:** The Bridge must be more than 2 inches above the "water". A 2 inch high boat must pass unobstructed underneath the bridge.
- **Bridge Height:** The maximum height of the bridge is 8 inches from the river surface.
- **Loading Connection: A hole in the center of the bridge must allow for a ¼ inch rod to pass through the vehicle deck.**



Material Specifications:

- Round uncoated toothpicks (maximum 1000 toothpicks)
- Elmer's white glue. **Epoxy, wood glue, hot glue, paint and super glues are not permitted.**
- Do not coat bridge with any material (paint, stain or glue)
- Any bridge not meeting the material specifications will be penalized.

Testing Procedures:

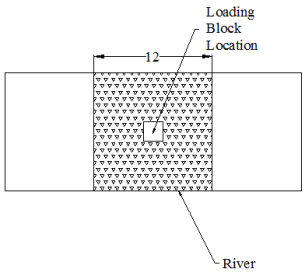
1. All bridges will be weighed and measured for compliance with the bridge specifications. Bridges that are completed but do not meet the bridge specifications can be penalized up to ten points.
2. The loading block and testing apparatus will be provided and may not be altered.
3. During the testing of the bridge, the bridge will be placed in the center of the testing apparatus.
4. A hole in the center of the bridge must allow a ¼ inch rod to pass through the bridge.
5. Pulling force will be applied straight down by a bucket hanging from a bolt until the structure exceeds the acceptable deflection (.75 inches at the center) or until obvious structural collapse. The total load incorporates the total mass of the loading apparatus, bucket and weights.

The Competition:

On the day of the competition, your bridge will be examined for appearance, adherence to bridge specifications, and strength.

Your bridge will be evaluated on each of the following categories:

1. Aesthetics - visual appeal, uniqueness, neatness and symmetry (5 pts)
2. Bridge Specifications (10 pts)
   a. Clear span (needs to be at least 12 inches)
   b. Bridge width (needs to be at least 1.5 inches, maximum width is 2.5 inches wide)
   c. Boat Clearance (at least 2 inches clear distance from table top)
   d. Bridge Height (maximum of 8 inches tall)
   e. Loading Connection (accommodates the loading block on top of vehicle deck)
3. Strength (10 points) must be able to hold the loading connection
4. Winner will be determined by dividing the weight held, by the weight of the bridge. In the event of a tie the lightest bridge will be the winner.
5. Bridges will be accepted late, however they will not be part of the class competition, and a full letter grade will be taken off of their score.



Plan View

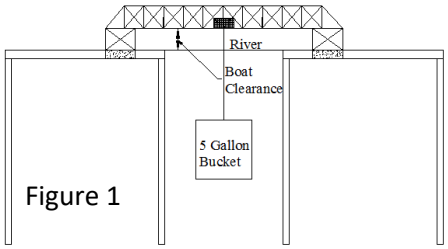


Figure 1

Profile View

Hints:

Sometimes a simple structure is stronger than a complicated one.

Your first plan may not work as well as you had hoped. Start your project early to give yourself time to recover from your mistakes as you learn!

It will take quite a while for the glue to dry enough to be strong, especially if it is humid or rainy – plan ahead! Do not wait until the last weekend of the project. Make a few parts of your bridge at a time to let them dry all the way.

Done is better than perfect – Turn your bridge in on time!

Scientists always research what has been done in the past before beginning a project to learn from others. Feel free to use the internet to research bridges ☺