

POPSICLE STICK BRIDGE

"The oldest engineering work devised by man, the bridge is the only one universally employed by him in his pre-civilized state."

Joseph Gies, Bridges and Men

Background

Bridges have fascinated people since the dawn of time when nature built many bridges in the form of trees fallen over rivers. As technology developed, people began to build artificial bridges where nature had not. Advances in bridge design, engineering, and construction have made possible many types of bridges using various types of material.

Today, bridges can be of the simple span, arch, or suspension 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.

The Contest

One of the traditional competitions in the civil engineering community is the Popsicle Stick Bridge Contest. Teams build bridges using only popsicle sticks and hot glue as building materials. Bridges are loaded until the bridge collapses. (In the past, bridges weighing between 200 and 400 grams [7 to 14 ounces] have carried loads ranging from a hundred pounds to over a ton!)

Why Popsicle Sticks?

Popsicle sticks are imperfect. Some may be bent, warped, or knotty; while others may be brittle, thin, or cracked. Visual inspection will weed out grossly deformed sticks, but students must deal with the slight imperfections present in all sticks. This is true in the real world where perfect materials are not available and careful thought must be given to the reliability of the construction materials. Engineers must attempt to quantify and account for deficiencies in both initial and post-construction material properties.

Popsicle sticks are limited to a standard size that falls short of the overall bridge dimensions. In order to span a distance of 12 inches, several sticks must somehow be connected together in a straight line. Again, this reflects real design problems where

materials are finite in dimension and must be assembled in some manner to meet the engineer's needs.

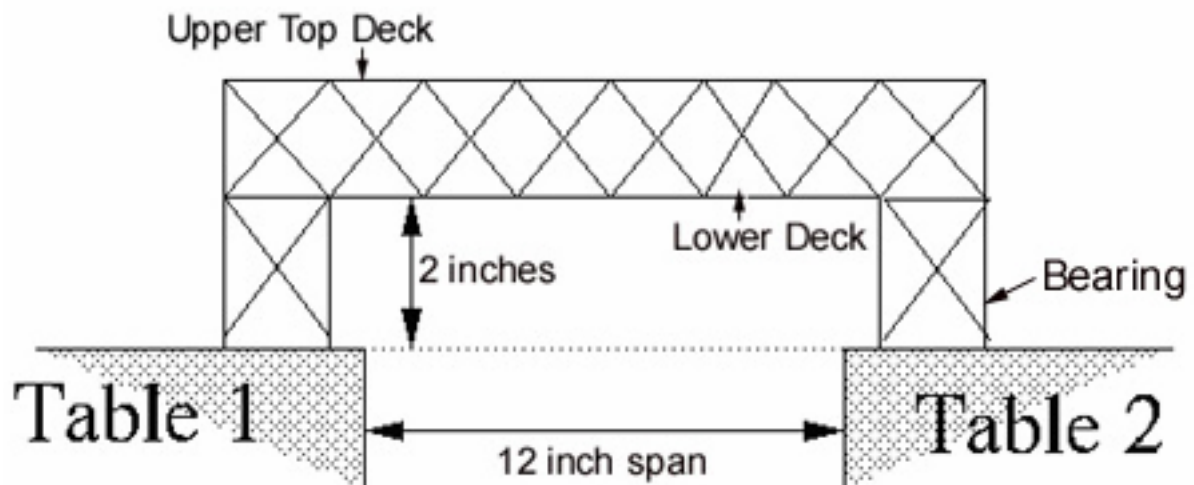
By being limited to only two allowable materials - wood popsicle sticks and white glue - students will need to use creativity, ingenuity, and resourcefulness in order to maximize the strengths and minimize the inherent shortcomings of each material.

A. Building Materials: (All materials provided)

1. Popsicle sticks.
2. Paper.
3. Glue guns and glue sticks

B. Dimensions:

1. Min Span Length – 12 inches - min. There will be a 12 inch "gap" which must be spanned by the bridge.
2. Max Bridge Width – 3 inches. Min Bridge Width – 2 inches
3. Min Bridge Height - 3 cm - min. There must be a minimum 2 inches between the table surface and the lowest point on the bridge span.
4. Diagram presented for clarification:



5. The bridge must be able to stand on its own.
6. The bridge must be able to support the load at the loading point. There will be one central loading point at the lower deck level, at the mid-point of the span.

C. The Competition

1. Inspection will test that the construction rules were followed and will record the mass of the bridge.
2. Bridges will be placed over "Crusher Canyon" by the team members, who may make final adjustments in its position. The canyon will consist of a 24 in space between two flat desktops. Nothing will be provided to keep the base of the bridge in place during loading.
3. Once the bridge is in position, bridges will then be subjected to loading. Bridge failure will be considered the point at which the bridge breaks

D. Judging and Scoring

1. The greatest load prior to failure will be a bridge's capacity.
2. The capacity divided by the bridge mass will be the bridge's score.
3. The bridge with the highest score wins the event.