

2019 Popsicle Stick Bridge Contest

Overview

The Richmond Branch of the American Society of Civil Engineers (ASCE) is pleased to sponsor the 2019 Popsicle Stick Bridge Contest on **Sunday, February 17, 2019**. Students will design and build their own bridges out of popsicle sticks and will compete for several awards. The competition will be held at the **Science Museum of Virginia located at 2500 West Broad Street in Richmond, Virginia from 12:00 pm until 4:30 pm**.

Eligibility

The competition is open to all greater Richmond area Middle School students (grades 6th-8th) and High School students (grades 9th-12th). Students may submit entries as individuals or as a team. Team sizes will be limited to three (3) students per team.

Students do not need to be from the same school or in the same age group to be on a team together; however, any team consisting of both middle and high school students will have to compete in the high school division.

Registration

All students (or teams) interested in competing should complete the registration form online at www.ascerichmond.org. The deadline for all team registrations is **February 1, 2019**. The competition is limited to 100 teams. If this limit is reached before the registration deadline, any additional teams wishing to register will be placed on a waiting list. Please direct any questions to:

Hillary Siegall
Dewberry Engineers Inc.
4805 Lake Brook Drive, Suite 200
Glen Allen, VA 23060
Email: hsiegall@dewberry.com
Phone: (804) 205-3348

Competition

Team check-in on the day of the event will be from 11:00 am - 12:30 pm. Testing will begin around 12:30 pm.

The competition takes place during the Richmond Joint Engineers Council's "*Celebrating Engineering Ingenuity Day*" which will include a variety of activities by different Richmond area engineering societies. An awards ceremony will be held for the Popsicle Stick Bridge Contest following testing (approximately 4:30 pm – 5:00 pm), and all other events that are part of the Celebrating Engineering Ingenuity Day will have a separate awards ceremony.

Admission to the competition and the other Celebrating Engineering Ingenuity Day events will be free for participants and one chaperone. Discounted admission will be given to anyone else accompanying participants. Signs and volunteers in the main rotunda of the museum will direct each team to the check-in location on the day of the event.

Awards

The following awards will be given separately to both Middle and High School Divisions:

Highest Efficiency Rating	= \$100/team and Certificate/member
Second Highest Efficiency Rating	= \$50/team and Certificate/member
Third Highest Efficiency Rating	= Certificate/member Only

Both divisions will compete together for the following awards:

Most Aesthetically-Pleasing Bridge*	= \$50/team and Certificate/member
Innovation Contest**	= \$50/team, Certificate/member, and 4 passes/member to Science Museum

Beat-the-Engineer Award – A team of ASCE members will submit one entry into the contest. A certificate will be given to the members of each team that score higher than the engineers' entry.

All participants will receive a Certificate of Participation.

** A team of judges will evaluate each bridge after each team has checked in.*

***Optional – See below for details on the Innovation Contest.*

General Competition Requirements & Helpful Hints

- Objective: To span a clear distance of **22 inches** using a bridge constructed of **only standard, craft-variety popsicle sticks and Elmer's glue**. Each bridge will be scored in accordance to an Efficiency Rating (ER), which will be calculated by the following equation:

$$ER = \frac{\text{Load carried by the Bridge at Failure (lbs)}}{\text{Weight of the Bridge (lbs)}^2}$$

~Note that the score will be very heavily influenced by the weight of the bridge. Try to maximize the strength of the bridge while keeping the weight as low as possible!

- Maximum Weight of Bridge = 450 g** (about 1 pound, or *approximately 250 sticks plus glue*)
- Required Sticks:** Standard, 4½" x ¾" x 1/12" craft-type Popsicle sticks (*readily available at all craft and department stores*).
- Required Glue:** Elmer's® **Glue-All Multi-Purpose Glue** (*This is the white, craft variety of glue. Bridges using any other glue such as wood glue, super glue, epoxy, or any other type of adhesive will be disqualified*).
- Sticks can be cut, sanded, trimmed or colored with colored pencils but **all sticks must be visible** to inspection and may not be painted or stained in anyway. Sticks cannot be coated with glue so as to laminate them either.
- No modifications will be allowed once teams have been checked in on the day of the event.
- The bridges must be able to stand freely on the supporting bars. No hooking, gluing, or otherwise fastening the bridges to the supports will be allowed.
- Bridge **must contain a continuous roadway** capable of allowing a "matchbox" type car to roll completely across the bridge without stopping or falling through.
- Bridges will be loaded using a 1/2" diameter steel rod placed on top of the roadway at the center of the bridge. All bridges must be able to accommodate this rod (refer to the figures and photos shown on the following pages).

- Bridges must meet the additional requirements shown on the following pages for connection and geometric limitations. Please note the **minimum bridge length of 24 inches** to be supported on the supporting bars. **Also note that any portion of the bridge below the supports must not be longer than 20 inches.**
- Additional requirements regarding geometric constraints and connections are shown at the end of the packet.
- *Disqualification:* Bridges not meeting the requirements listed in these rules will be subject to disqualification. Disqualified bridges will still be eligible for the innovation or aesthetic awards but will not be considered for the efficiency score awards. Disqualified bridges will be tested until failure as long as it remains safe to do so. The decision of the judges at the time of the event is final.

Miscellaneous Information

- Each bridge must be able to hold the weight of the testing equipment, which is about 5 lbs.
- The glued connection between the sticks is most likely the weakest link in the bridge so be sure to allow at least 24 hours before the competition for the glue to dry.
- All participants are encouraged to view the video below from a previous event in order to preview how the bridges are tested. Note that the manner in which the bridges will be supported during testing this year is different than shown in the video (see “Additional Requirements” section for new supports). The video is available at <http://www.youtube.com/watch?v=s4NqJu52aPU>.

Innovation Contest

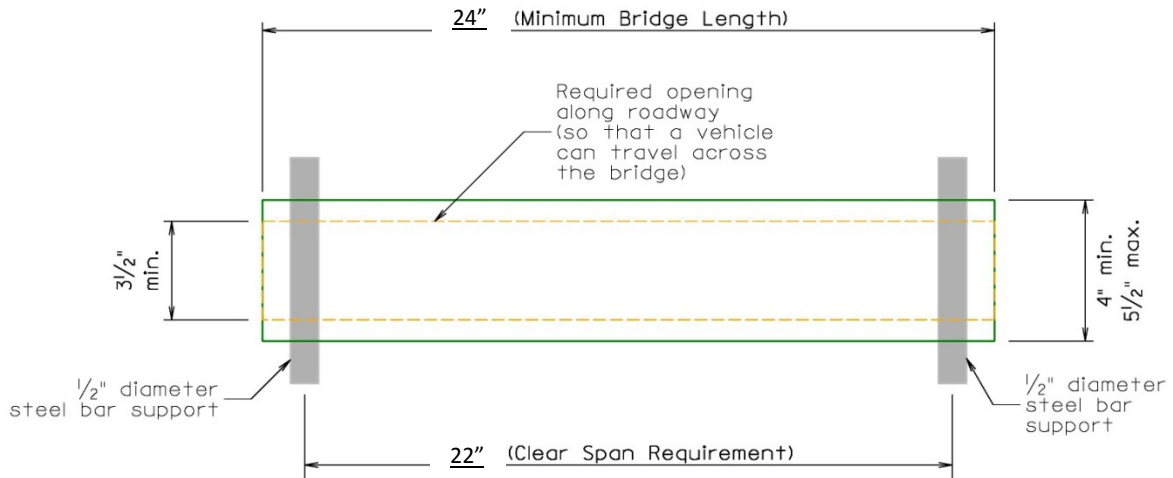
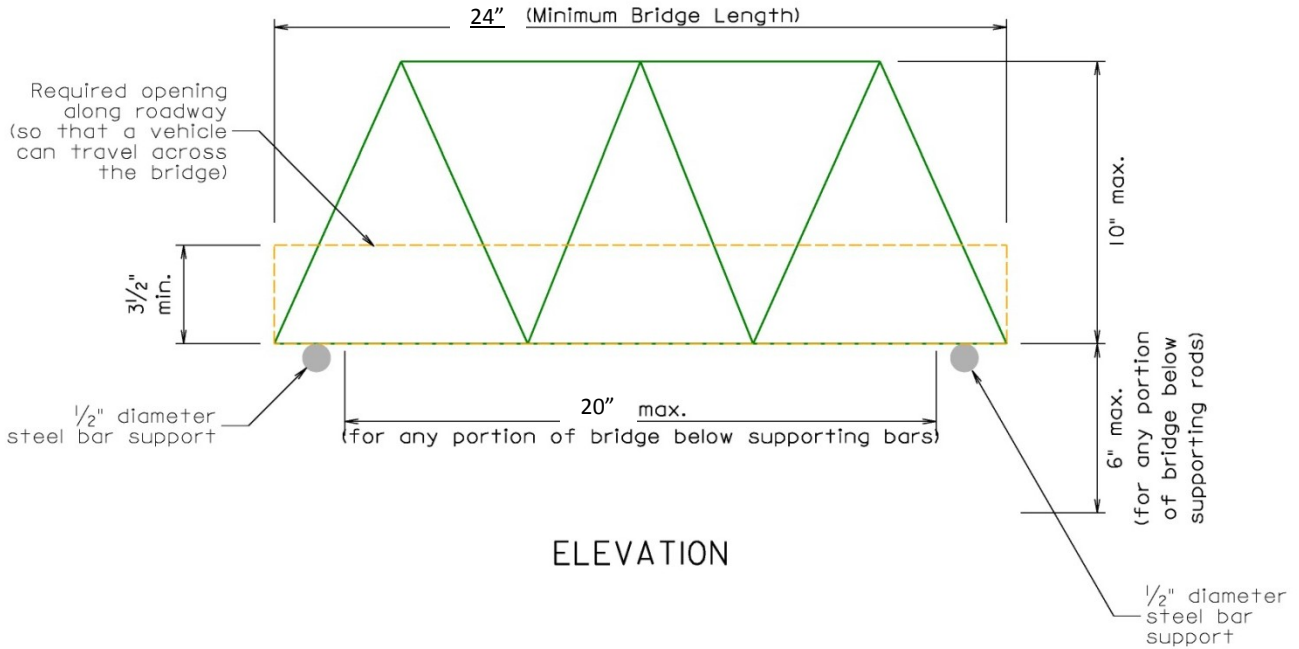
Each team can choose to enter their bridge into a separate Innovation Contest (\$50 prize). Each team wishing to take part in the Innovation Contest needs to explain the innovation behind their design in a typed report (a maximum of 2 written pages, with 1 additional page for sketches, is allowed) and turn this in on the day of the event. Sketches or drawings may be helpful and are encouraged to be used. Some suggestions for items to address in the report are:

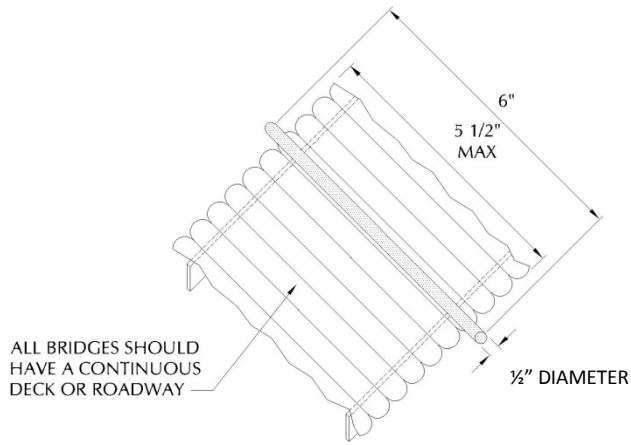
- What strategies or concepts did you use when designing your bridge?
- How much do you predict your bridge will hold and why?
- Where do you think your bridge will break and why?
- If you participated in the contest before, what changes did you make to this year’s design and why?
- If you were allowed to use any other materials besides Elmer’s glue and popsicle sticks, which would you choose?

Additional Requirements:

GEOMETRIC CONSTRAINTS

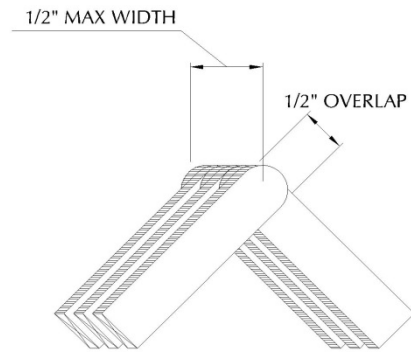
- The bridge must bear on the top surface of a horizontal $\frac{1}{2}$ " diameter bar





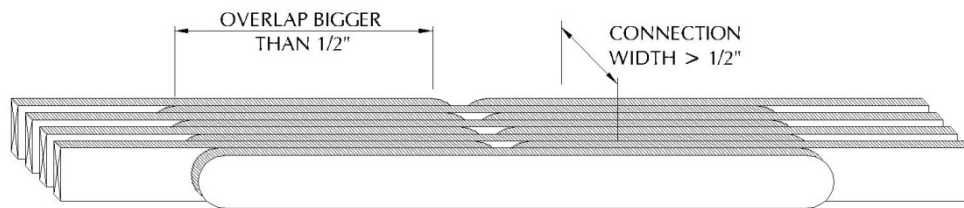
STEEL LOADING ROD (PROVIDED BY ASCE)

- A STEEL BAR WILL BE PLACED AT THE CENTER OF EACH BRIDGE ON TOP OF THE DECK. THIS WILL BE PULLED DOWNWARDS UNTIL THE BRIDGE BREAKS



ACCEPTABLE CONNECTION

- 1/2" MAXIMUM WIDE FOR ANY CONNECTION
- OPEN GAPS BETWEEN ADJACENT PIECES
- 1/2" MAX. OVERLAP



UNACCEPTABLE CONNECTION

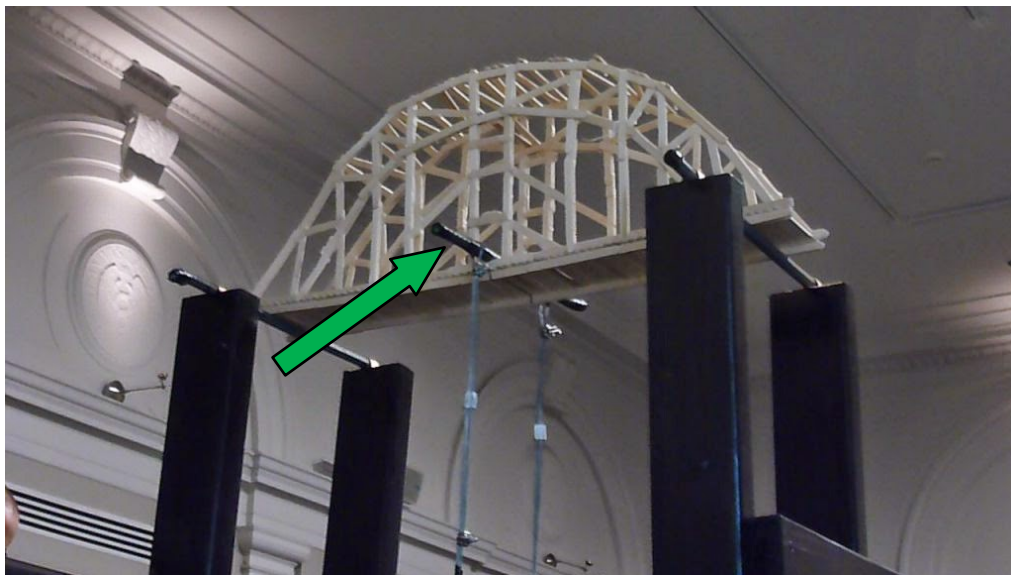
- CONNECTION IS GREATER THAN 1/2" WIDE
- TOO MUCH OVERLAP (> 1/2")

Additional Information:



BRIDGE TESTING APPARATUS

Note how bridge will be loaded and supported.



BRIDGE TESTING APPARATUS

Note how load will be applied with 1/2" diameter steel rod at center of bridge. All bridges must be able to accommodate this rod.