

2023 POPSICLE STICK BRIDGE CONTEST

Overview

The Richmond Branch of the American Society of Civil Engineers (ASCE) is pleased to sponsor the 2023 Virtual Popsicle Stick Bridge Contest on **Sunday, February 12, 2023**. Students will design and build their own bridges out of popsicle sticks and will compete for several awards. The competition will be held at:

Dewey Gottwald Center at the Science Museum of Virginia

2301 W. Leigh St., Richmond, VA

11:30 am to 3 pm (Competition starts at 12:30 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 interested in competing should complete the registration form online at:

www.ascerichmond.org.

The deadline for all team registrations is **February 3, 2023**. The competition is limited to 100 submissions. If this limit is reached before the registration deadline, any additional students wishing to register will be placed on a waiting list. Please direct any questions to:

Isabelle Stern, P.E.

Simpson Gumpertz & Heger

Email: isstern@sgh.com

Phone: (804) 539-3854

Competition

The competition takes place during the Richmond Joint Engineers Council's "**Celebrating Engineering Ingenuity Day**" which will include a variety of STEM-based activities by different Richmond area engineering societies.

Team check-in times and award ceremony times for the event will be announced at a later date. Teams will bring their completed bridge to the announced location at the specified time to be inspected. After the inspection is complete, testing will begin.

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 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 and Certificate
- **Second Highest Efficiency Rating:**
\$50 and Certificate
- **Third Highest Efficiency Rating:**
\$25 and Certificate

Both divisions will compete together for the following awards:

- **Most Aesthetically-Pleasing Bridge*:**
\$100 and Certificate
- **Innovation Contest**:**
\$100 and Certificate
- **Beat-the-Engineer Award:**
A team of qualified ASCE structural engineers will submit one entry into the contest. A certificate will be given to each student that scores higher than the engineers' entry.

All participants will receive a Certificate of Participation

** A team of judges will evaluate each bridge before load-testing.*

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



General Competition Requirements

- **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:

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

- **Maximum Weight of Bridge = 450 g** (about 1 pound, or approximately 250 sticks plus glue)
- **Minimum Length of Bridge = 24 inches** (any portion of the bridge below the supports must not be longer than 20 inches)
- **Required Sticks:** Standard, 4½" x 3/8" 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*).
- Each bridge must be able to hold the weight of the testing equipment, which is about 5 lbs.
- The bridges must be able to stand freely on the supporting bars, spaced 22 inches apart. 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.
- Popsicle sticks are limited to a glued ½" overlap at all connections. Open gaps between adjacent sticks is allowable.
- Bridges will be loaded using a ½" 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.
- **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.

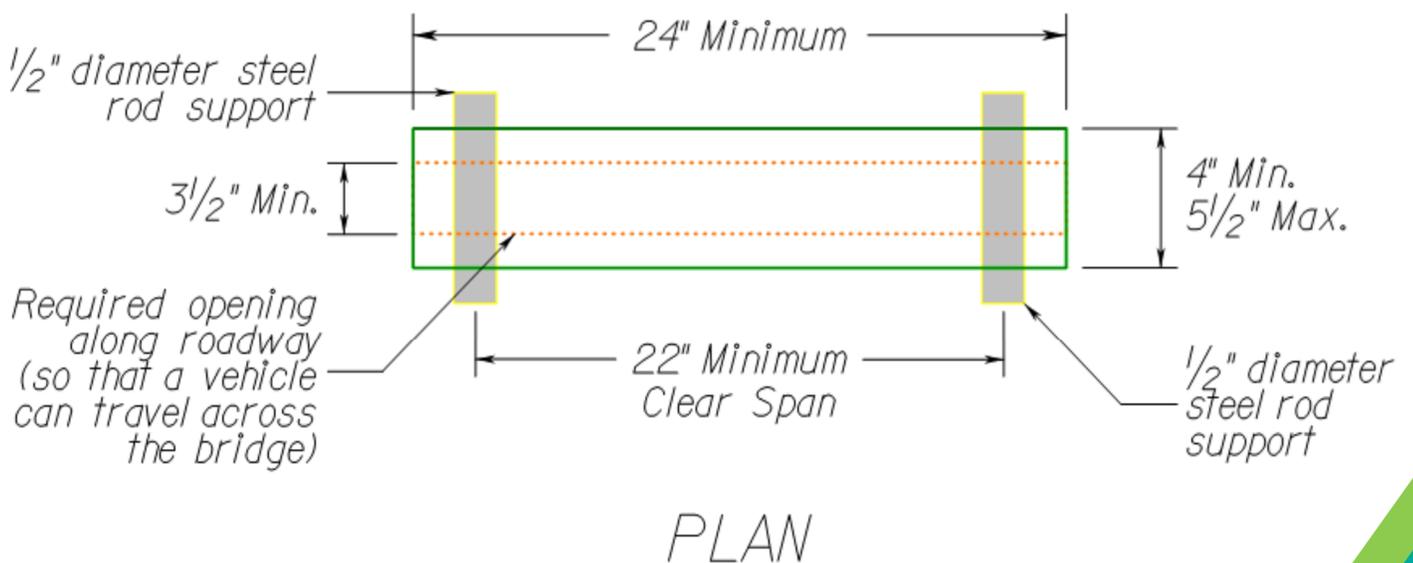
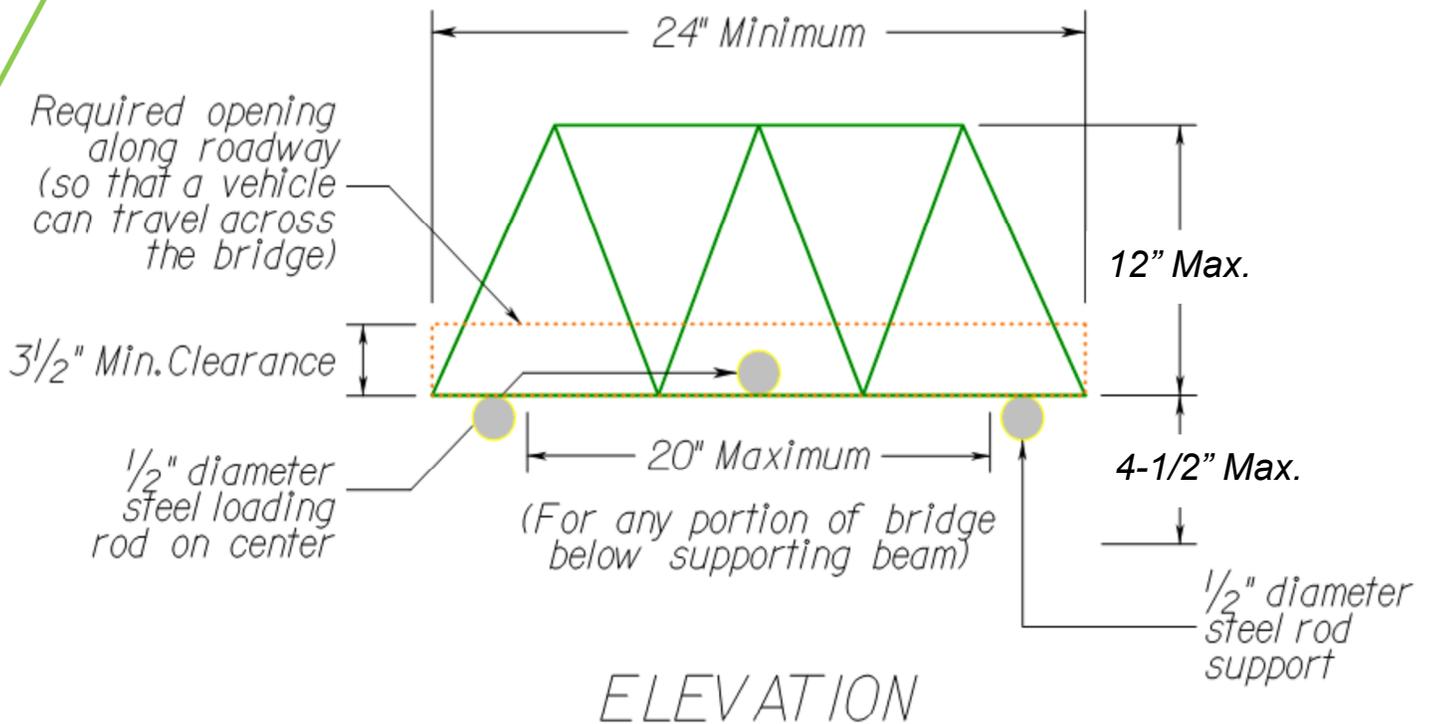
Helpful Hints

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

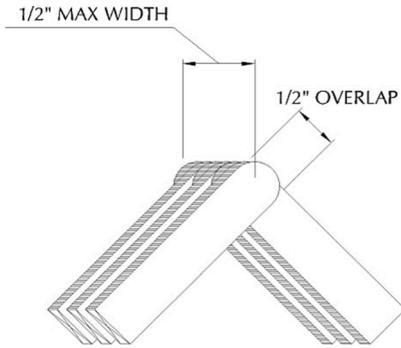
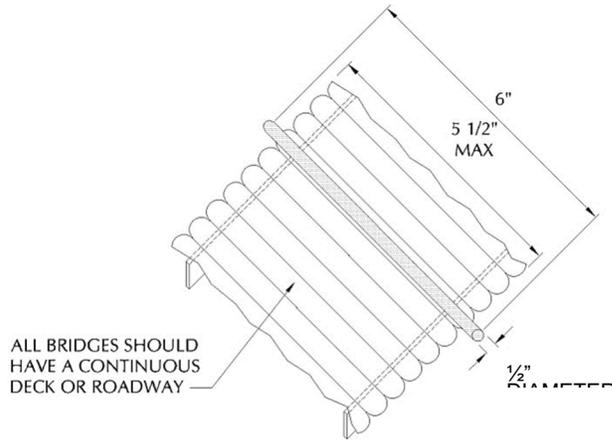
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- All participants are encouraged to view the video below from a previous event in order to preview how the bridges are tested. Note that the manner in which the bridges will be supported during testing this year is different than shown in the video (see “Additional Requirements” section for new supports). The video is available at <http://www.youtube.com/watch?v=s4NqJu52aPU>.



ADDITIONAL REQUIREMENTS



Additional Requirements Cont.

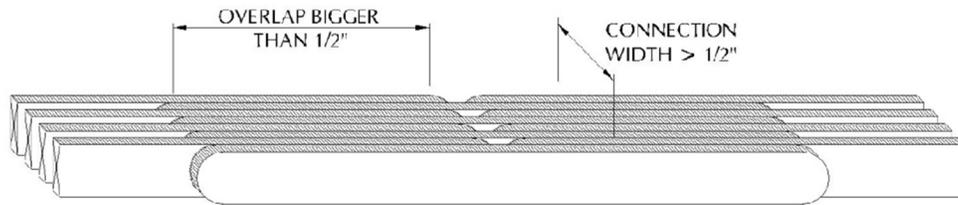


STEEL LOADING ROD (PROVIDED BY ASCE)

- 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

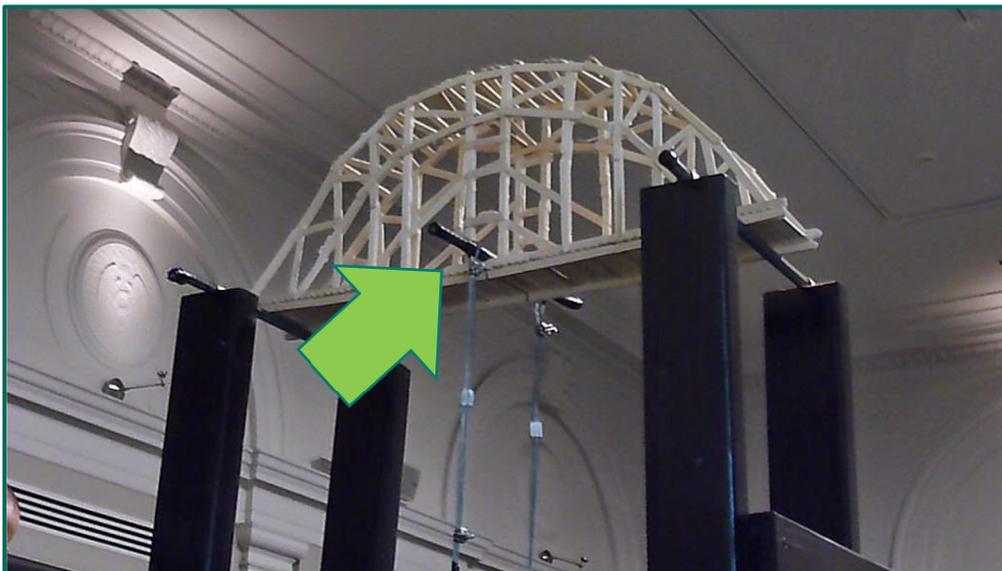
- CONNECTION IS GREATER THAN 1/2" WIDE
- TOO MUCH OVERLAP (> 1/2")



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.)

Innovation Contest

Each team can choose to enter their bridge into a separate Innovation Contest (\$100 prize). Each team wishing to take part in the Innovation Contest can explain the innovation behind their design in a typed report and turn this in on the day of the event. The report should be a **maximum of 2 pages with one additional page for sketches**. 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?
- Did you come up with any other concepts you think would fail? Why did you decide on your final design over other ideas?
- 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?

