



## **34th Annual Model Bridge Competition**

### **2024 - 2025 Technical Specifications**

**LIVE! Watson Hall, Wentworth Institute of Technology**

**Competition Date: Saturday, February 1st, 2025**

**(Pre-recorded Teams need to arrange testing by 1/19/2025)**

**DOCUMENT LAST MODIFIED: 10/20/2024**

**Register for the competition at [www.engineeryourfuture.org](http://www.engineeryourfuture.org)**

**Direct link: [CLICK HERE](#)**



## **WELCOME TO THE 34th ANNUAL MODEL BRIDGE COMPETITION!**

The Boston Society of Civil Engineers Section (BSCES) is proud to present the THIRTY-FOURTH annual Model Bridge Contest. This competition serves the important role of introducing students to the world of engineering and design. Through this contest, the BSCES hopes to provide positive role models for the students and allow students to visualize future opportunities in the STEM and engineering fields.

First, thank you for your interest in the BSCES Model Bridge Competition. This document contains all you will need to know regarding model bridge specifications, basic bridge design concepts, and competition schedule including materials delivery and built bridge delivery information (for remote teams only). The following are the rules and regulations for the Model Bridge Contest. It is the responsibility of the contestants to follow and construct their bridges in accordance with the rules contained herein.

While in general, teams competing simply bring their models on February 1st, 2025 at 8:30 AM to Watson Hall, any team being pre-recorded should act early to arrange testing. This would involve contacting [reed.brockman@aecom.com](mailto:reed.brockman@aecom.com), and acceptable arrangements include setting up the device at a school/program, or by visiting AECOM at 1 Federal Street in Boston (all testing must be done in the presence of an official judge/coordinator). Students, in this case, will need to finish their models before their testing day and that day must be arranged before January 19, 2025. There are no real rule changes from last year, but several changes were instituted last year and we want to bring attention to them. First, to allow teams to better explain the details to the judges in selecting the most aesthetic model, students may submit an information sheet (1 sheet, maximum 11x17, no fonts smaller than 10) with images and words to better inform the judges of the composition of the bridge in assessing the aesthetics. Second, we are doing away with the concept of shipping bridges. It is preferred that all teams come to the competition. Teams that cannot attend must arrange with Reed Brockman how the bridges will be tested on video (video will be shown during the competition) before January 19, 2025 (in most cases, Reed Brockman or another judge will need to travel with weights/loading device, which can get complicated). Third, any organization should only have a maximum of one team with three competitors, and better to have all teams of two. This is not a strict rule, as we realize that there may be good reasons for teams of three, such as storage space for the models, and our goal is to not make any rules that may be prohibitive. We have realized over time that students working in teams of two works best in terms of a learning experience in this competition. Lastly, we added clarifications about other students testing for students that cannot make it to the competition. This is acceptable but the tester needs to be another student, not a parent or educator.

After-the-fact last year, we gave out prizes in 2 additional categories: high school level and middle school level. The “cash prizes” will remain the overall winners (1st through 3rd) in the efficiency and aesthetic categories, but trophies will be given this year for the middle and high school levels. Teams will also be invited to vote for their favorite bridges during the contest (nobody can vote for a bridge from their own program) and we will have a single “People’s Choice” trophy.

This should be a fun one this year. We are excited about the materials and we hope you all are also!

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## BRIDGE SPECIFICATIONS CHECKLIST

This checklist is to help you make sure your bridge complies with specifications. Make sure you read through the full specification!

☐ The bridge is completely made of these 3 materials:

### **6" wood rulers (each team will get approximately 96 rulers)**

- [https://www.amazon.com/gp/product/B0C64JTT41/ref=ppx\\_yo\\_dt\\_b\\_asin\\_title\\_o00\\_s05?ie=UTF8&th=1](https://www.amazon.com/gp/product/B0C64JTT41/ref=ppx_yo_dt_b_asin_title_o00_s05?ie=UTF8&th=1)
- Material: pine
- Thickness: 0.12 inch / 0.32 cm
- Length: 6 inch / 15 cm
- Width: 1 inch / 2.5 cm
- 72 rulers weigh 1 lb
- 1 face beveled, 1 face flat

### **4.5" craft (popsicle) sticks (each team gets 400)**

- [https://www.amazon.com/dp/B0DBYJ2WCH?ref=ppx\\_yo2ov\\_dt\\_b\\_fed\\_asin\\_title&th=1](https://www.amazon.com/dp/B0DBYJ2WCH?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1)
- natural birch
- 0.39" wide
- 1/16" thick (can vary slightly)
- 371 sticks weigh 1 lb

### **Elmer's white school glue (each team gets 4 oz.)**

- [https://www.amazon.com/dp/B072J37ZZD?ref=ppx\\_yo2ov\\_dt\\_b\\_fed\\_asin\\_title&th=1](https://www.amazon.com/dp/B072J37ZZD?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1)

### **FOR CLAMPING PURPOSES ONLY - NOT FOR FINAL BRIDGES: Small binder clips (each team gets 12)**

- [https://www.amazon.com/dp/B074XTRX7G?ref=ppx\\_yo2ov\\_dt\\_b\\_fed\\_asin\\_title&th=1](https://www.amazon.com/dp/B074XTRX7G?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1)
- each opens 0.3" max
- 3/4" long each
- grips approximately 1/2" from edge max

### **FOR SANDING PURPOSES ONLY - NOT FOR FINAL BRIDGES:**

- 180 grit 2-sided emery boards (each team gets 8)

- **The bridge weighs 24 ounces (1.5#) or less.** The “MOST EFFICIENT” winner is determined by efficiency ratio (**see the Bridge Specifications Section 1**). You do not need to build up to the weight limit – there is no minimum bridge weight. Lower weight bridges taking higher loads will have high efficiency ratios.
- The bridge height is not greater than 23”. The maximum model dimension is 7” wide x 23” tall x 47” long. The minimum model dimension is 4 1/4” wide x NO MINIMUM HEIGHT x 38” long. All dimensions above will be verified square to the bridge and the minimum at any point will be considered for the minimum allowable, and the maximum at any point will be considered for the maximum allowable.
- The bridge length must be greater than or equal to 38”. If the bridge is to be placed on the table surface in between the concrete blocks it must also be less than 40” in length. The bridge length should be greater than 42” if the bridge is to be placed on top of the concrete blocks. **See the Bridge Specifications Section 3.3** for a figure explaining the bridge lengths and load test setup. Bridges under 38” in length may not test well because the bearing area will be short. Similarly, bridges should not be between 40” and 42” long, as the bridge will have a very short bearing area on top of the concrete blocks.
- The bridge shall have a roadway that either runs through the bridge or runs over the top side of the bridge. The roadway must be along the entire length of the bridge so that a scale truck (4” wide by 4” tall by 8” long, with a transfer bar above, **see figures 3A and 3B**) could drive from start to end over or through the bridge. The roadway does not need to be a continuous surface, but make sure there are strong supports for the truck to be placed on at any point along the bridge roadway length!
- If the roadway goes through the bridge (like a through truss or through arch), the scale truck shall fit along the length of the roadway, and the loading apparatus bars shall extend out the sides of the truck (**see figures 3A and 3B**).
- The bridge shall be at least 4 1/4” wide, but not wider than 7”. Bridges wider than 7” may interfere with the loading device chains, which could cause the bridge to fail. If the bridge is a through truss or through girder type, the roadway between the main carrying members must be 4 1/4” wide.
- **If being tested remotely, each educator must coordinate the logistics with Reed Brockman reed.brockman@aecom.com well before January 19th, 2025.**

## SECTION 1: INTRODUCTION

The goal of this competition is to design and construct a structure with the specified materials that can adhere to the following:

- Span a gap between 2 tables spaced 36 inches apart (to avoid length issues, all bridges must be at least 38" long). This can be done in one of three ways:
  - 38" – 39 ¾" without packing shims made of index cards between the bridge and the concrete blocks at the back of the loading device, which are 40" apart, as horizontal end restraints.
  - 39 ¾" to 40" using index cards packed between the bridge and the concrete blocks to provide horizontal end restraint.
  - 42" to 47" sitting on top of the concrete blocks. (Lengths between 40 and 42" have short bearing areas and may fail by sliding off under deflection).

**See Section 3.3: Bridge Span for more information.**

- Fit a model truck (4" wide x 4" tall) through the bridge or along the topside of the bridge. To accomplish this with the truck interior to the bridge cross section, the bridge roadway (space between trusses or through girders) must be minimum 4 ¼".

**See Section 3.4 & 3.5 for more information.**

- Hold at least the weight of the model truck plus loading device (which is approximately 9 ½ lbs.).
- Weigh at most 24 ounces. Data about material weights is stated elsewhere in these rules/specifications.

Prizes will be awarded in the following categories:

- **Most Efficient:** Bridge efficiency is defined as the ratio of total load supported to self-weight of the bridge. The winner of this award will be the bridge with the highest efficiency value. In the event of a tie, the bridge with the higher aesthetic ranking will be declared the winner.
- **Most Aesthetic:** Aesthetics is based on craftsmanship, creativity, and display of sound design principles. The winner will be determined by the judges. In the event of a tie, the more efficient bridge will be declared the winner. As it pertains to remote teams, all qualifying failed models will be brought to the competition for aesthetic judging. Teams will be allowed to do cosmetic repairs. This year, teams are encouraged to take pictures while building their bridges and create an information sheet about their bridge. We realize that there may be details not readily evident to judges, and we want each team to be able to show that off. It can be a maximum of 1 single 11x17 page with fonts or lettering at least that of a 10 font. The judges will only be using the information on the sheet to help judge the aesthetics – the sheet itself will not be judged on its own aesthetics.

## SECTION 2: COMPETITION PARTICIPANTS

This competition is available for students Between the 5<sup>th</sup> grade and 12<sup>th</sup> grade in the greater Massachusetts area. **TEAMS MUST BE EITHER 2 OR 3 PARTICIPANTS. No teams bigger than 3 and no teams of 1. WHILE THIS IS NOT A RULE, IT IS THE PREFERENCE OF OUR PROGRAM TO HAVE TEAMS OF TWO OVER TEAMS OF THREE.** BSCES strives to emphasize the importance of working in a group which is essential to engineering. Participants shall not be on multiple teams and no team may register more than one bridge for the competition.

All design and construction work for the model bridge (including devices that assist in fabrication, such as templates) shall be done only by the team members. Teachers, parents, and mentors are encouraged to provide education and guidance; however, they should not take control of design and construction. The overall goal of the competition is for students to learn how to think like an engineer and feel the pride that an engineer feels as they successfully build a model bridge of their own design.

There is no upper cap on the number of teams competing from one school, but we know we cannot handle more than 100 teams total in the competition. It is also the preference of the organizers that teams compete live at the event as opposed to being remotely on video. We will visit schools or work to have schools bring the models to us to be tested prior to the competition, but we encourage any team that can make it to the actual competition to attend, as we know it is a wonderful experience.

## SECTION 3: BRIDGE SPECIFICATIONS

All the rules and specifications within this section must be followed to qualify for this contest. **BSCES will allow testing of all bridges, but if specifications are not met, bridge will not qualify for prizes.**

### 3.1 Materials

Bridges shall be built entirely of the following materials:

#### 6" wood rulers (each team will get approximately 96 rulers)

- [https://www.amazon.com/gp/product/B0C64JTT41/ref=ppx\\_yo\\_dt\\_b\\_asin\\_title\\_o00\\_s05?ie=UTF8&th=1](https://www.amazon.com/gp/product/B0C64JTT41/ref=ppx_yo_dt_b_asin_title_o00_s05?ie=UTF8&th=1)
- Material: pine
- Thickness: 0.12 inch / 0.32 cm
- Length: 6 inch / 15 cm
- Width: 1 inch / 2.5 cm
- 1 face beveled, 1 face flat

#### 4.5" craft (popsicle) sticks (each team gets 400)

- [https://www.amazon.com/dp/B0DBYJ2WCH?ref=ppx\\_yo2ov\\_dt\\_b\\_fed\\_asin\\_title&th=1](https://www.amazon.com/dp/B0DBYJ2WCH?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1)
- natural birch
- 0.39" wide
- 1/16" thick (can vary slightly)

#### Elmer's white school glue (each team gets 4 oz.)

- [https://www.amazon.com/dp/B072J37ZZD?ref=ppx\\_yo2ov\\_dt\\_b\\_fed\\_asin\\_title&th=1](https://www.amazon.com/dp/B072J37ZZD?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1)
- binder clips are supplied for clamping **ONLY** - no final bridges can have binder clips

Use of any other material may be grounds for disqualification. Before structures can be admitted officially in the testing corral, official BSCES volunteers running the registration will ensure that all officially accepted bridges meet length, width, height and weight restrictions. We will, after all official bridges are tested, load the bridges not meeting specifications, but they will not be eligible for any prize but the "People's Choice Award".

Structures may not be brushed, sprayed, or dipped in any coating material. This includes, but is not limited to, coatings such as stickers, glue, fabric, or any film-like coating. Non-structural decoration (tempura or watercolor paint, markers, pens, pencils, crayons, etc.) of the bridges is allowed. All questionable materials should be checked with the model bridge coordinator ([reed.brockman@aecom.com](mailto:reed.brockman@aecom.com)) before being used. BSCES requests that any decorations be tasteful and appropriate. Inappropriate markings on the bridges will be grounds for disqualification at the judging panel's discretion.

NOTE TO EDUCATORS/MENTORS: Our program is all about having the students do their own exploration and design, and that regardless of how well equipped a school may be and how surrounded a group may be with experts in skills or knowledge, we want a level playing field. Please refrain from using laser cutters for anything more than straight cuts. Please refrain from building jigs or clamping devices for the teams. Absolutely do not provide any design details/templates or construct any portion of any bridge. We know we have a wide range of ages/abilities of students and safety is of course a top priority. The popsicle sticks were tested extensively and an eighth grader had no issues cutting them with a standard pair of scissors (both the small safety ones and 8" scissors). The rulers will not cut with standard scissors but easily snap into pieces if an X-Acto or utility knife is used by placing a modicum of force on the blade (easily applied by an 8th grader) and slicing along a cut line a minimum of four times on each face. Test subjects pre-drew cut lines on each face with a pencil and used another ruler as a straight edge for cutting. **ANY SCHOOL NEEDING UTILITY KNIVES, SCISSORS OR CUTTING**



**BOARDS – PLEASE REACH OUT IMMEDIATELY AND THESE WILL BE PROVIDED.** We know in the past we sent everything needed to all teams with the materials, but many schools told us this was not necessary and to better utilize our funds we chose to only send them to those with need.

Once the bridges are loaded, another inspection of the bridges by the judging panel can be made to ensure that the proper materials were used that were not visible prior to testing.

In general, all students should follow this as a rule of thumb: if you feel you are bending the rules, please don't. Which leads us to the last rule:

**ALL DECISIONS OF THE JUDGES ARE FINAL.** During the building, if you have any questions or need any clarification about rules or specifications, please contact reed.brockman@aecom.com.

### **3.2: Bridge Weight Limit**

The total weight of the structure shall be no more than 24 ounces. Bridges at the competition have until 10 AM to comply and can return to the model registration tables repeatedly before that time to check conformance. Not giving too much of a hint here, but it is sometimes strategic to make bridges well under the weight limit.

### **3.3: Bridge Span**

The bridge will span between tables that are 36 inches apart. There will be 7 5/8" tall concrete (CMU) blocks that will be secured to each table 2" from the edge. The bridge may rest on the top surface of the table between the concrete blocks OR may sit on top of the concrete blocks. The bridge cannot be adhered or attached to the blocks in any way, however it may contact and bear on the blocks. The bottom of the bridge ends (the bearing area) must be level and stable and the bridge must be able to stand on its own under the effects of gravity when supporting the loading device.

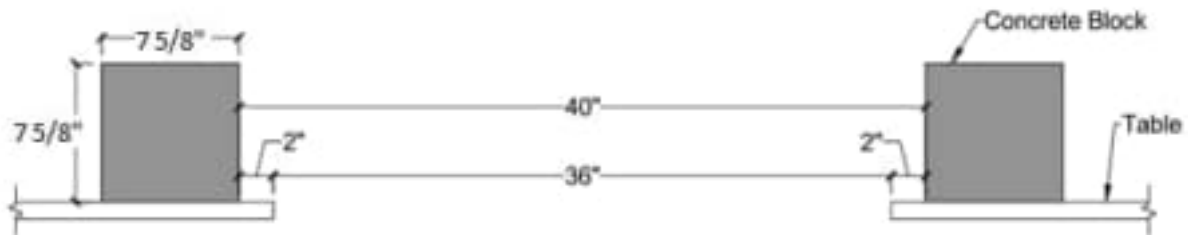


Figure 1: Span of Bridge

#### **Bridges Placed on the Table Surface**

If the bridge rests on the table surface, it will need to span across the 36" gap, but shall be less than 40". It is recommended that bridges designed for this setup be at least 38" in length to allow for proper bearing area on the table. If a model is between 39 3/4" and 40", the ends can be shimmed with index cards to resist horizontal thrust.

#### **Bridges Placed on Top of Concrete Blocks**

If the bridge rests on top of the concrete blocks instead of the table, it will need to span across the 40" between blocks. This means that the bridge deck will need to be longer than 42", having enough length to rest on each block. Models can be no longer than 47".

### 3.4: Bridge Configuration

#### Top of Bridge

No portion of the bridge shall extend more than 23" above the table surface (15" above the top surface of the concrete blocks). The minimum height shown in Figure 2 only applies to trucks placed inside the bridge. There is no minimum height for trucks on top of the bridge.

#### Bottom of Bridge

No portion of the bridge shall extend below the top surface of the table. Bridges will be permitted to extend below the top surface of the table only if it is due to incidental deflection of the bridge under loading (but note the amount of deflection permitted due to load is limited). **See Failure of Bridge Section 3.6** for more information.

#### Bridge Width

The overall width is limited to 7 inches maximum. The roadway width shall be a minimum of 4 1/4 inches. The roadway is defined as the distance between the interior edges of the bridge (in the case of a through truss) or the overall width of the bridge when the roadway is on top of the bridge. **See Figure 2.**

The 4 1/4" minimum shown in Figure 2 shows a roadway inside the bridge. The same width rule of 4 1/4" minimum applies if the roadway is on top, which coincides with the minimum width rule for a bridge being 4 1/4". **See Figure 3.**

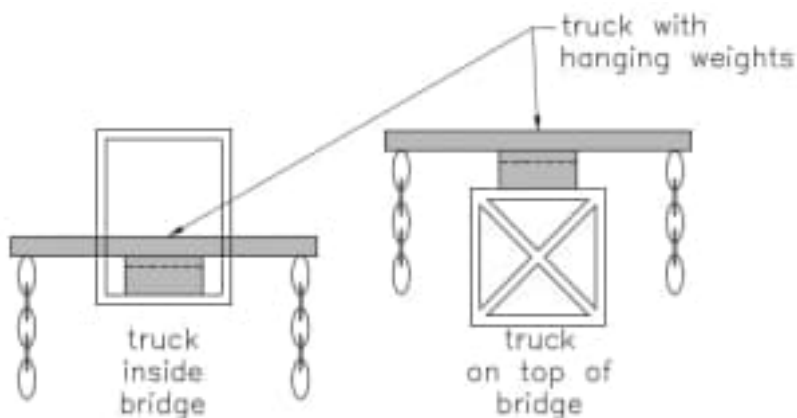
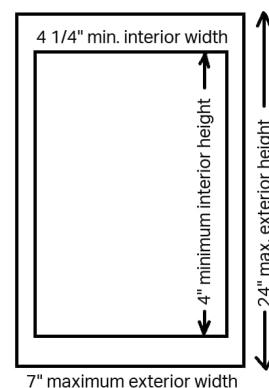


Figure 3: Different Ways to Load the Bridge - Section Views

#### Truck Support Along Span

The roadway/loading surface must be provided at all potential wheel support locations (**see Figure 7**). Since the truck that is loaded has "wheels" that are each 2" wide, the roadway shall have enough material to prevent the wheel from falling through. There should not be any obstructions that would prohibit the truck from "driving" across the bridge span.

#### Geometry Verification

When teams arrive at the competition, they visit a registration table, and all models are checked to see that they meet specifications. If they do not, modifications are allowed until 9:30 AM – at that time all models must be in the "corral" for the judges to perform a review. There is no limit to the number of times a model can be revised from 8:30 to 9:30. Teams can also give an up to 11x17 page to the judges with their model showcasing details of their design.

### 3.5: Loading the Bridge

We are well aware that this particular section gets a little abstract, , but reading this section carefully will allow the bridges to be safely loaded and also help students avoid deductions.

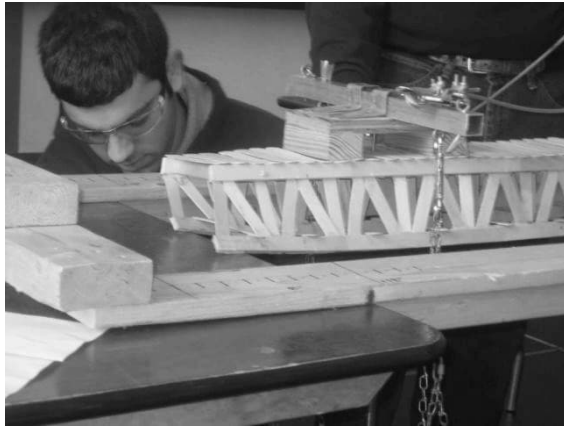


Figure 3a: Different Ways to Load the Bridge

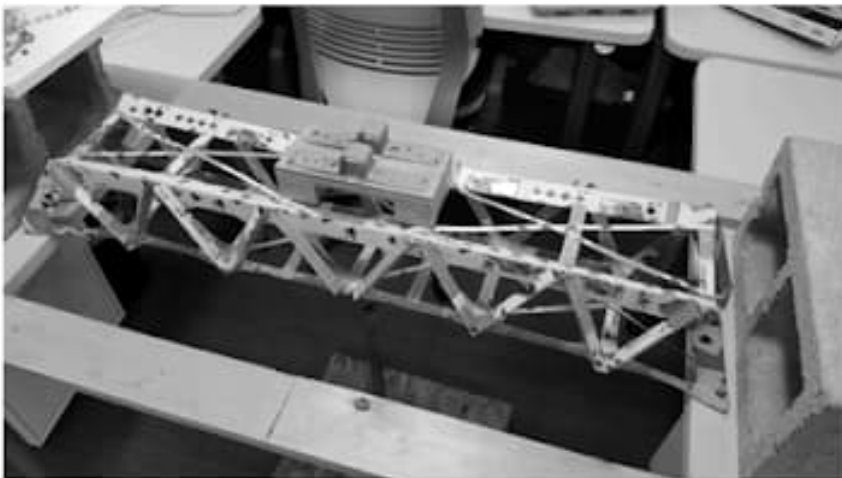


Figure 3b:

Top: Example of Loading device placed on top of bridge.



Bottom:  
Example of loading device located inside the bridge. There must be room for the loading device to fit inside the structure as well as room for the transfer bar to fit in between truss members.

1. In order to be loaded, the bridge shall (at a minimum) be capable of supporting an initial weight of the loading apparatus (approximately 2 lb truck + 7.5 lb loading platform = 9.5 lbs).
2. The truck will be placed on the loading surface at a point that will be determined by the roll of a die, which will take place at the time all bridges are received (see Figure 7). The random point will remain the same for all teams. A load transfer bar will be placed across the top of the truck with chains suspending a loading platform beneath the bridge. The loading platform is set on 4" tall blocks to assure that when the platform touches the base, the deflection of 4" has been exceeded. Participants will test each structure by placing the supplied weights onto the loading platform until failure. All bridges will be checked to assure the crossbar will fit prior to the competition.

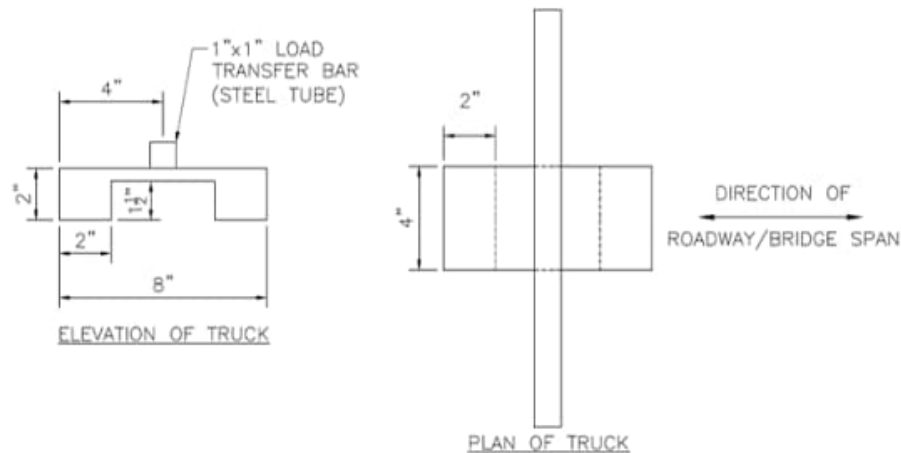


Figure 4: Details of Truck

3. Loading is limited to 250 lbs. of free weights. Loading is also limited to the top of the center support pole (18.5"). As a little advice when loading, numerous lighter weights, when stacked, will take up more height on the pole than fewer heavier weights, when stacked. This should play a role during your loading session. Once loads are applied (touch the weight below), they cannot be removed. Any new load being applied at the time of bridge failure will not be counted towards the recorded loading. At the moment a newly applied weight touches the weights below it all weights below are official. It is completely the responsibility of the design team to decide how best to apply the loads, and they can communicate their plans for loading through the linked form. Down at the level of the loading platform, if that platform becomes out of plane, a judge will hook an outer edge of the platform to prevent the edge from touching the base but the "truck" will not be repositioned on the bridge once loading is underway.
4. The loading apparatus (truck + loading platform) must be capable of being supported on the loading surface (roadway) as shown in the diagram. This means that your structure MUST have enough roadway surface for the truck to be placed at one of the six locations along span (see Figure 7), but each bridge does not need a continuous surface. The roadway should be reasonably level (some arch is permitted) from one end of the bridge to the other without obstruction. Bridges with roadways that have excessive slope causing the truck to slide off of the bridge will not be aided in the loading process and tested as best possible.

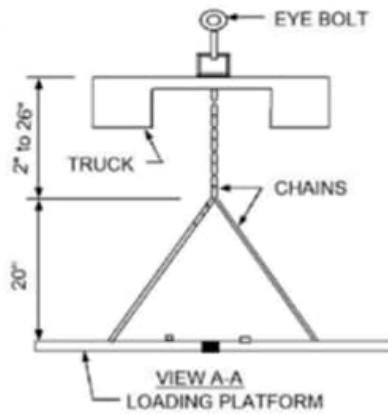


Figure 5: Loading Apparatus with Truck

5. If the roadway surface is not along the top of structure, the design must allow for a 1" x 1" load transfer bar (see Figure 4) to be passed through the bridge transversely with the bar's underside 2" above the loading surface, without causing interference with the structure during testing. The design must accommodate the truck being placed in any of the possible loading areas.

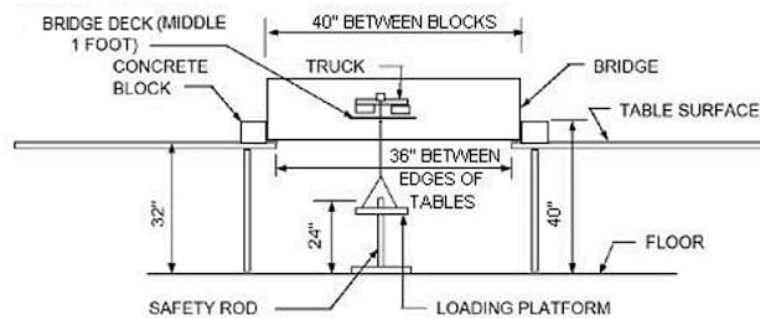


Figure 6: Sketch of Bridge with Roadway Surface through Bridge

6. The concrete blocks provided on the loading tables are there for bridges that exert a horizontal force (e.g. arch bridges). These concrete blocks will be restrained and unable to slide apart. In cases where the bridge exerts a horizontal force on the blocks (e.g. thrust from arch bridges), the blocks can be counted on to resist horizontal forces. If your design intent is to utilize the concrete blocks to resist horizontal thrust, please limit the end to end length of your structure to be under 40" by at least 1/16". The judges will fill the small gap with index card shims. It is the responsibility of the designers to have gaps of consistent width. Each shim will be placed alongside and parallel to each other.
7. Make sure your bridge fits between the concrete blocks or on top of them. The blocks will be placed in the loading frame on the tables and will not be removed at any time during the competition.
8. In order for a bridge to be selected as the most aesthetically pleasing bridge, it must carry the minimum specified weight (9.5 lbs = loading device + truck).

The random loading points shall be as shown in the figure below:

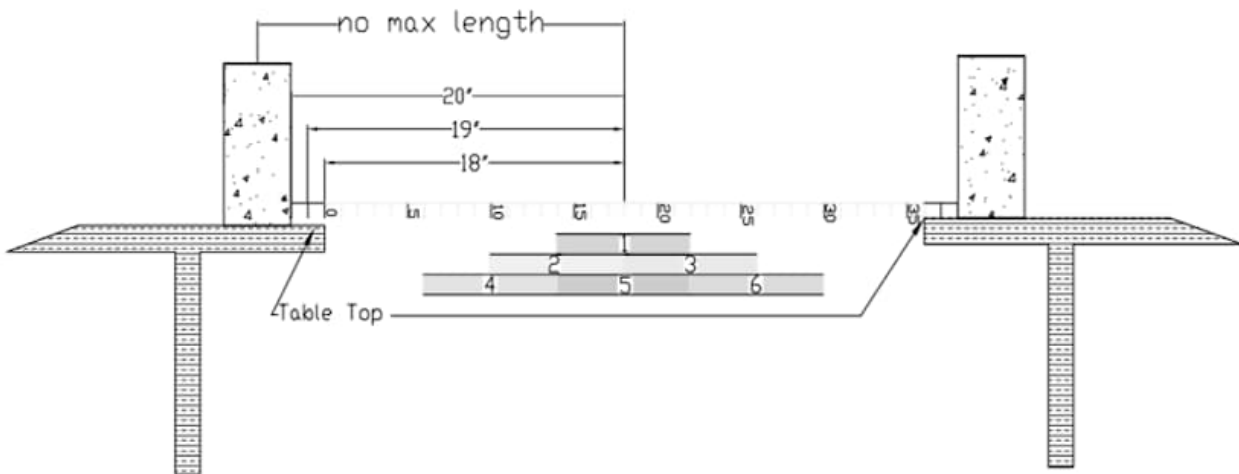


Figure 7: Possible Loading Positions

A roll of 1 or 5 will be centered. A roll of 2 or 3 will be offset 4" from midspan. A roll of 4 or 6 will offset 8" from the center.

### 3.6: Failure of the Bridge

1. Failure is defined as a fracture of primary members causing either the "truck" to not bear on the roadway or an abrupt drop in elevation for a truck that would be extremely hazardous for a driver. It is also considered failure if the deflection of the structure causes the truck to settle more than 4" (dropping the weights to the base). Slippage from the bearings or overturning of the structure is also considered failure.
2. Settlement is measured by the distance of the underside of the loading platform to the top surface of the centering device. Upon placing the loading device on the bridge, the cables are set snug with 4" blocks holding a 4" space available for deflection. BSCES officials will have a stick to pick up the exterior edge of the loading platform if the loading device rotates as the bridge is loaded, but it will only be used to keep the edge from touching and never pick up the actual load of the weights.

The bridge fails when any of the above criteria is exceeded (the bridge fractures, slips off bearings, overturns sideways or deflects out).

### 3.7: Disqualification

There will be no deductions. Bridges need to conform to specifications by 10 AM. These methods of disqualification still apply:

INAPPROPRIATE OR DISRESPECTFUL MARKINGS ON A BRIDGE MODEL – Disqualification.

CHEATING – Using a stronger material in a clandestine manner, using any high strength epoxy in lieu of Elmer's school glue, or any other action that upon judge review is considered cheating is grounds for disqualification. Please, don't cheat.

INAPPROPRIATE OR DISRESPECTFUL BEHAVIOR OR INTENTIONALLY NEGATIVELY AFFECTING ANY TEAM DURING LOADING OR ANY OTHER TEAM'S BRIDGE AT ANY TIME - Disqualification.

## **Section 4: Materials Delivery, Pre-Competition Deliverables / Requirements**

### **Materials Delivery**

Around Halloween, materials will be delivered to each educator. It is up to the educator to distribute materials to students. To avoid shipping costs, BSCES may contact educators to deliver materials, but many may be shipped. For every model, the following will be supplied:

- 8 emery boards for sanding edges
- 12 small binder clips for clamping during the setting of the glue
- 4 ounce bottle of Elmer's school glue
- 400 popsicle sticks
- 86 rulers
- Cutting devices (scissors or utility knives) will only be send upon special request.

**\*NOTE: Educators may purchase additional materials. The amazon products have links earlier in these rules. BSCES is only supplying the materials listed above for each team.**

### **Registration**

It is up to the teachers to assure all students are correctly registered at <https://forms.gle/39B8Nb2TteGvbyWp8>

### **Post-Competition Package Delivery from BSCES**

Prizes, results, T-shirts, etc. will be sent within 2 weeks after the competition (I deeply apologize for last year). All packages will be delivered to the teachers for distribution. Model bridges will not be returned to students participating remotely.

## **Section 5: Most Aesthetic Model Judging**

The aesthetics will be judged in person by judges at the competition. For the first time, judges may also review one additional page submitted by each team showcasing design details that may not be obvious to the judges, such as internal details not visible on the surface. One page, one sided, no lettering smaller than a 10 font. Images/sketches are encouraged. **A sample of the Aesthetic Judging Form is included on page 19.**

The judges in general consider the following factors equally in judging this award:

- Craftsmanship (symmetry where appropriate, precision cutting/folding/connecting)
- Sound design practices (wider hollow members in compression areas and thinner in tension areas, adequate bracing, high moments of inertia of areas in high bending, thickened cross sectional members in areas of high shear / crushing, etc.)
- Visual appearance

## Section 6: Competition Day

February 1st, 2025, 8:30 AM – noon (registration table opens at 8:30 and testing begins at 10 AM). Parking will be available in both the east and west lots. A map is included in Appendix C. Parking is free. Wentworth does an amazing job with signage to guide you but both lots are right by Watson Hall. Buses will fit in these lots.

**All bridges will be weighed, measured, checked/scored for deductions, and judged for the “Most Aesthetic” award prior to the start of the competition at 10 AM.**

### Format:

The competition will be live with a camera showing the competition via a Teams meeting. Virtual teams will be tested by judges/volunteers first, followed by the in person participants. Our hope is that this contest will be viewable by the entire public, so we will not mention full names of students in the broadcast.

### Challenges:

It must be clear that the volunteers are doing the best they can, have no bias.

**Any CHALLENGES during the competition must be brought up immediately. A STUDENT must present the challenge directly to the contest coordinator, Reed Brockman, at the time it is recognized as an issue. The competition will pause, and the issue will be discussed by the judges.**

The judges’ decisions will be final. Any challenges, complaints, or appeals after the competition will not be allowed.

### Aesthetics:

The bridges will be examined for the most aesthetic award (see criteria elsewhere in this handbook) before any bridges are load tested. Please note that for a bridge to be selected as the most aesthetic bridge, it must carry the minimum load of **9.5 lbs (the weight of the loading apparatus)**.

### Load Testing:

Each bridge (aside from those requested not to be tested fully) will be loaded as previously described until failure. Individuals that do not want their bridge tested to failure may request this on competition day. We recommend loading the bridges to failure. There is no set plan for preserving bridges after the competition anyway, other than in video and photographic form.

### Prizes:

Each overall first place team member receives \$100 Amazon card, each 2nd place team member receives a \$75 Amazon card, each 3rd place team member gets a \$50 Amazon card. Prizes for high school level, middle school level will be only as trophies or similar.

## Section 7: Finding a Mentor and Other BSCES Assistance

Schools wanting mentors can request this of BSCES. Overall, it works best to keep them virtual.

While we expect that your school will CORI check volunteers, we also check on our volunteers and have them take a training about working with school children (see the “[Flip the Switch](https://www.fliptheswitchcampaign.org/)” effort, sponsored by gymnast Aly Raisman). <https://www.fliptheswitchcampaign.org/>

In general, it is between the educator and mentor to arrange virtual meetings with competitors. Mentors are not to be working with competitors without an educator involved.

The BSCES also runs hands-on activities to help teach about a wide variety of bridges and run tours of the bridges in Boston. We are back doing this full force!



As an added bonus for those who read things until the end, here are some helpful hints that the volunteers developing this year's rules came up with:

- Look at the wood grain – is any direction stronger than another?
- Look up the phrase “development length”.
- This material sounds easy but it has its challenges, so take the time to experiment and see how it behaves.
- The rulers and popsicle sticks behave differently, and one may be favored over the other for a beam depending on if it will be in tension or compression.
- The popsicle sticks can be cut with standard scissors, but scissors will not cut the rulers.
- Thin members buckle if they have excessive unbraced lengths.
- Did you test the glue? Is there any advantage of a thin layer over thick? Even spread over stripes?
- How much does glue weigh? Does its weight add up fast?
- Are there any advantages to using long overlaps in the wood for more glued surfaces?
- Think about where exactly the truck may be placed. Are there ways to make the bridge stronger at those locations?
- Does the loading device fit through at every location?
- Can you bend the popsicle sticks without breaking them? What if they are wet?
- Think like an engineer, do the research on all tips listed above, sketch out designs, make test models (as best you can) and improve on what you have, work together as a team and talk ideas through.

## ● **HAVE FUN WITH IT!**

## APPENDIX A: JUDGING FORM - LOAD TESTING

FOR JUDGES ONLY:

### WEIGHT

BRIDGE WEIGHT (POUNDS, 2 DECIMALS)	POUNDS
DEVICE WEIGHT (depends on which loading rig, approx. 9.50#)	POUNDS
APPLIED LOAD WITHOUT WEIGHTS (SUM OF ABOVE)	POUNDS

### FOR JUDGES – COMPETITION DAY

BRIDGE NAME	
SCHOOL	
PARTICIPANTS	
GRADES	
EDUCATOR	
ROADWAY LOCATION	
SELF-WEIGHT	
AESTHETIC RANK (N/A IF NOT TOP 5)	
TOTAL WEIGHTS APPLIED (Last weight added at failure does not count)	POUNDS
TOTAL LOAD APPLIED (TLA) (SELF WEIGHT, LOADING DEVICE AND WEIGHTS)	POUNDS
EFFICIENCY RATIO (COMPETITION WEIGHT / SELF WEIGHT OF BRIDGE)	

## APPENDIX B: JUDGING FORM - AESTHETICS (PARTIAL CLIP)

Aesthetics Judging Sheet						
Judge Name:						
Team Number	Complexity	Structural	Craftsmanship	Originality	Overall Aesthetics	Total Points
	1 - 5	1 - 5	1 - 5	1 - 5	1 - 5	SUM
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						

