Rules of the Challenge

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Basics

1. The challenge is open to students in Peel Region schools
   - Bridges should be built using ONLY:
     - Standard wooden popsicle sticks;
     - Glue (any type of glue can be used); and
     - Construction paper.

   Bridge building kits will NOT be supplied.
2. There are two divisions of the challenge:
   - Junior Division - Grades 5 and 6; and
   - Senior Division - Grades 7 and 8.
3. A team may consist of one, two, or three students.
4. Each student on the team should belong to the same division and
5. Each team will be required to pay an entry fee of $10 at the time of registration.
6. Registration is open from January 30 to February 21, 2017. Registration will only be accepted at www.peobrampton.com. Register early as registration is limited to a fixed number of students. Once the number is reached, the registration will close.
7. A signed consent form and checklist must be submitted on the day of the testing event (March 4, 2017) and can be downloaded from www.peobrampton.com.
8. Only one bridge per team can be entered for the challenge.
9. All bridges will be eligible to compete in the following categories of the challenge:
   - Quantitative – Strength performance
   - Qualitative – Knowledge and presentation
10. Bridge specifications/requirements outlined in this document must be met otherwise the bridge will be disqualified from the Quantitative category of the challenge.
11. There will be no refund of registration fees for disqualified bridges.

Visit www.peobrampton.com often for the latest information on this event.

How to Participate

1. Register and pay fees at www.peobrampton.com between January 30 to February 21, 2017
2. Build a bridge as per the bridge specifications provided below.
3. Bring the bridge, signed consent form and checklist on the day of the event.

Bridge Testing Event

When: Saturday, March 4, 2017 – 9 am to 4 pm

Where: **Louis Arbour Secondary School**, 365 Father Tobin Rd, Brampton (click here for a map)

Draft Agenda of the Event day

- Sign-In: 9 to 10 am
- Testing: 9:30 am to 3 pm (first come, first serve)
- Pizza and a drink will be provided to participants at noon
- Prizes Awarded: 3 to 4 pm

Prizes

- Prizes will be awarded for each division;
  - Top 3 bridges in Qualitative category (Knowledge and presentation)
  - Top 3 bridges on Quantitative category (Strength performance)
  - Most adventurous design
- Each contestant will receive a participation certificate.
- A plaque will be awarded to the school with the most participants.

Bridge Specifications

4. The bridge must only be constructed using the following materials (see Appendix A):
   - Standard wooden popsicle sticks;
   - Glue (any type of glue can be used); and
   - Construction paper.

   Construction paper is only to be used for the deck of the bridge, which can be cut to fit the design of the bridge. NOTE: Please refer to Appendix-A for examples of materials to use.

5. The final weight of the bridge must **NOT exceed 250 grams**.

6. The bridge must fit into the illustrated space (all measurements in millimetres):

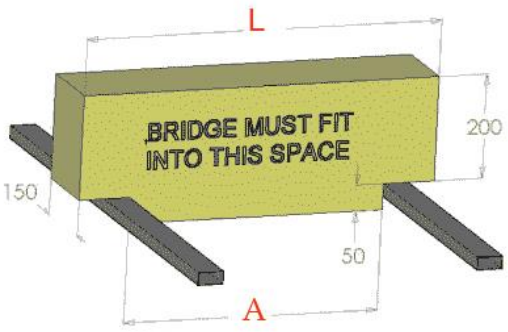


Figure 1

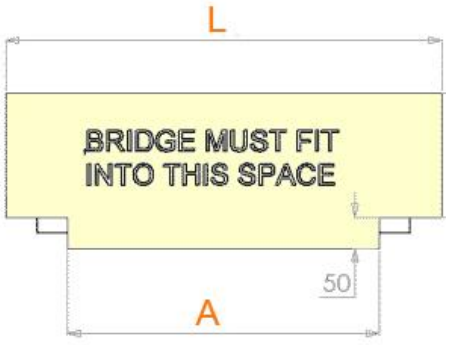


Figure 2

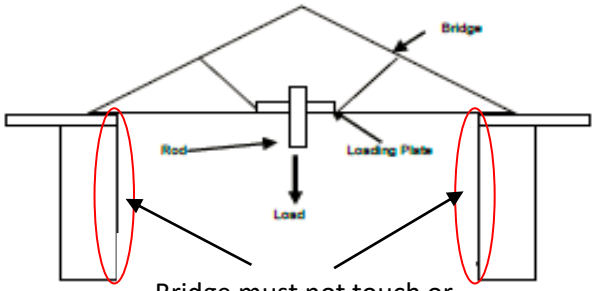
L – Minimum 500 mm and Maximum 700 mm. This is the overall length of the bridge. Your bridge must rest steadily on two supports of the testing machine. The inside distance between these two supports is 400 mm. Design your bridge long enough not to slip or fall through this span under load. Remember that materials bend when a force is applied (again, bridge length should be a minimum of 500 mm).

A – Maximum 400 mm. This is the portion of the bridge that rest between and below the supports. If this portion is greater than 400 mm, it will end up resting on the supports. So, keep this dimension less than 400 mm.

The deck of the bridge or the inside width - Minimum 60 mm and Maximum 150 mm. This is the travel portion of the bridge. These dimensions make the bridge capable of smoothly transporting two matchbox cars across the bridge deck in opposite directions simultaneously (each car's dimensions are approximately 30 mm wide x 70 mm long x 30 mm high).

The height of the bridge - No Maximum. The bridge structure may project above the top of the bridge tester supports with no maximum. Also, the bridge structure may project a **Maximum 50 mm below the top of the supports**.

- **NOTE:** Bridge structures that touch or rest against the inside frame of the tester will be disqualified.



Bridge must not touch or rest against these frames.

7. To test the strength of the bridge, a loading platform (100 mm long x 50 mm wide x 12 mm high) is required to be positioned at the centre of the deck of the bridge. This should be kept in mind while designing and constructing your bridge.

8. At the centre of the bridge, a 20 mm diameter hole must be maintained for attaching the loading platform to the bridge tester in order to apply a test load. Refer to Appendix B to review photographs of a bridge testing machine and a loading platform.

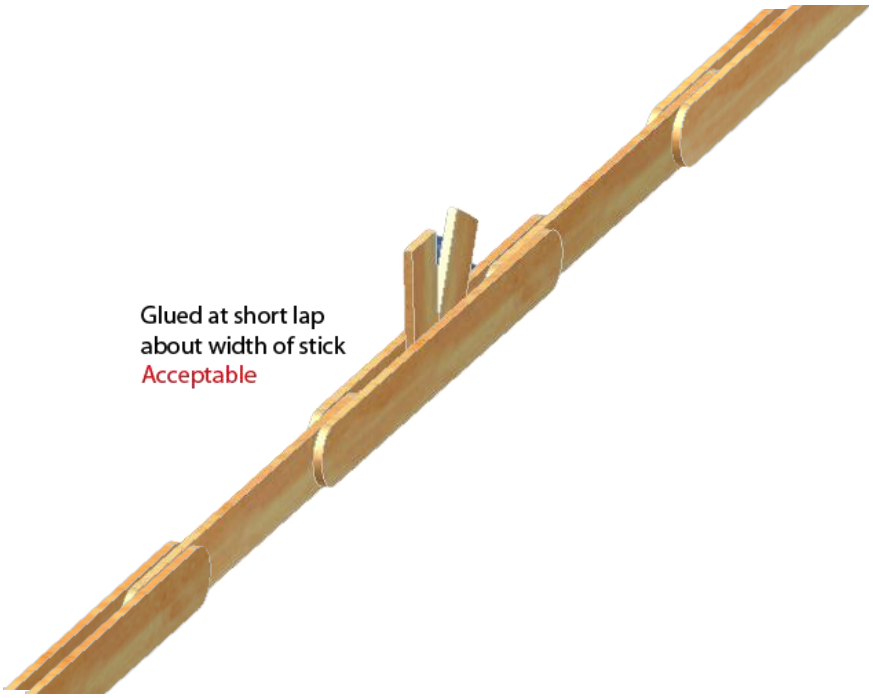
9. The construction paper deck should be continuous. If needed, a hole for the loading platform can be provided.

10. Popsicle sticks must be left whole (sticks cannot be cut or broken to form dowels or any type of fastening joint).

11. To qualify, the **bridge must be tested before** you arrive at the challenge.
    - We require an adult to certify that your bridge has been tested and can support at least a 4 kg load. (Note: past winning bridges supported over 25 times this load!)
    - Please test your bridge early so that you have time to fix any problems you find.
    - A suggested method of load testing is described later in this document.
    - The name of the team and the names of all team members must be clearly written on the bridge.
    - Finally, think, plan ahead and be patient… good bridges take time to build, and glue takes time to dry!

NOTE: Laminating or Doubling popsicle sticks - that is sandwiching by applying glue over the **FULL length** of the popsicle stick and sticking another popsicle stick over the other - is **NOT acceptable** and the bridge will be disqualified for the competition. However, gluing short laps or a **maximum of 1/3 the length** of the stick is acceptable. Please refer to the figures below.

Number of layers of Popsicle Stick glued together forming a solid block of lumber.
NOT Acceptable



Judging Criteria (for the Qualitative Category)

Each bridge will be judged for the Qualitative category based on the following five attributes:

Presentation	*Clarity, poise, confidence, fluency, enthusiasm.* *Did the team explain the construction process well?* *Did the team produce sketches to support the design?* *Is there an understanding of forces, e.g. tension and compression?*
Creativity	*Did the designer use any special techniques?* *Did the designer considered safety aspects? Handrail, lane markings, etc.* *Did the team use any special techniques and why? E.g. beam* *Is this a standard design? (Or, downloaded from Internet)*
Construction Quality	*Are the Popsicle sticks neatly assembled?* *Was glue used carefully and not excessively?* *Is there good fit and finish?*
Construction Technique	*Do the students understand construction principles?* *Beam construction: e.g. I beam, laminated* *Bolts made of popsicle sticks used?* *Does the bridge have special supports?*
Aesthetics	*Does the bridge look unique?* *Is the bridge pleasing to look at?* *Paintwork and other decorations.* *Good use of shape and colour.*

Destructive Testing (for the Quantitative Category)

NOTE: Bridges not meeting the specifications will be disqualified.

- The bridge inspectors will ensure that each entry complies with the rules. Only bridges that conform to all the specifications will be accepted for this category.
- Bridges will be weighed before the destructive test.
- The load will be applied from below at the centre of the deck using a loading platform.
- Testing will consist of the application of an increasing load via the loading platform by the bridge testing machine, until the bridge breaks, or flexes by maximum of 50 mm (whichever is earlier). A visual warning will be indicated by a judge at the testing when a bridge reaches a 50 mm deflection. The peak load recorded up to this point will be considered as the breaking load.
- The winning entry will be the bridge with the highest performance rating. In the event of a tie, the lightest bridge wins. It is up to your team to decide on the optimum balance between mass and strength.

$$\textbf{Performance rating} = \frac{\textbf{Breaking or Peak Load}}{\textbf{Unloaded weight of the bridge}}$$

i.e., the bridge that carries the largest load may lose to a lighter bridge.

- Be aware that all bridges will be destroyed during testing and will not be returned!
- All decisions of the judges are final.

Parental Permission

1. Obtain the Parental Permission Form from our website and complete this form for each competitor. Every competitor must submit a ***signed*** Parental Permission Form during the check-in registration on the day of the competition. Competitors will not be allowed to participate without this form completed by a parent or legal guardian and registration fee will not be refunded.
2. A parent or teacher must certify that the bridges presented consist substantially of the work done by the students in the registered team.
3. A parent or teacher must confirm that your bridge has been tested and can support at least a 4 kg weight.

How to Test Your Bridge at HOME

1. Make a pencil sized hole through the centre of your bridge.
2. Make a loading platform to distribute the load on your bridge. (See Appendix-B for an example)
3. Tie a piece of rope to the centre of your loading platform.
4. Thread the rope through the hole you made in the centre of your bridge.
5. Tie a plastic grocery bag to the other end of the rope.
6. Place two tables 400 mm apart. These will be used to support your bridge.
7. Place your bridge on the tables with the plastic bag hanging below the bridge.
8. Place a 2 kg bag of sugar (or any other non-hazardous material) into the plastic bag.
9. If your bridge looks strong enough, add a second 2 kg bag.
10. If your bridge is still in one piece, congratulate yourself for passing a qualification test.

Contact info

For specific questions, please contact bbc@peobrampton.com

Be creative and have fun!!

We look forward to seeing you and your amazing bridges.

Appendix A

Glue (any type of glue can be used), construction paper and a packet of 200 Popsicle sticks are available at Dollarama, Walmart or similar dollar stores generally for dollar each.

<u>For guidance, the size of each stick is</u>
Length: 115 mm long
Width: 10 mm wide
Thickness: 2 mm thick.
100 sticks weigh about 140 grams.
Remember that popsicle sticks vary in density. Glue and paper add significant weight. Ensure that your bridge does not weigh more than 250 grams.

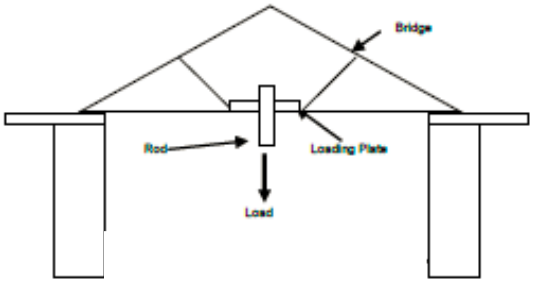
NOTE: Types of paint such as the following are unacceptable for use and will result in disqualification.

a) Oil paint
b) Latex paint
c) Spray Paint
d) Oil/Water based stains

Only water colours or crayons (pencil or wax) are allowed to decorate the bridge

Appendix B

A bridge on the Bridge Testing Machine



A load will be applied at the centre of the bridge using a loading platform that is placed on the deck in the centre of the bridge. The loading platform distributes the load. A bolt will be inserted in the loading plate and will connect the plate to the load applied from the bottom. Your design must allow space (20mm diameter) for this bolt to pass through the bottom of your bridge.

Loading Platform attached to a bridge

Top View

Bottom View