2019 National Engineering & Geoscience Week
18th Annual Model Bridge Building Competition

Hosted by the Northwest Territories and Nunavut
Association of Professional Engineers and Geoscientists (NAPEG)

Rules
(Revised September 14, 2018)

1. INTRODUCTION

NAPEG hosts the Annual Model Bridge Building Competition during National Engineering & Geoscience Week, which occurs February 23 to March 2, 2019. Entrants are invited to submit a model bridge for the competition. Please note, we would like to have all entries in by February 22rd, 2019. However, we will accept entries up until March 1, 2019. Winners will be posted on our Website and notified via email with the results.

Please note, there have been minor changes made to the rules this year.

2. ELIGIBILITY

.1 Children in schools and community groups in the Northwest Territories or Nunavut are invited to enter the competition in Categories 1, 2 or 3, depending on their age. There is no entry fee for these categories. Children should be grouped into teams. A maximum of ten (10) bridge entries will be accepted per school, per category.

Up to four (4) bridge entries will be accepted per community group.
No individual entrant in these categories may be age 20 or older.

.2 The General Public is invited to enter the competition in Category 4. Teams entered in this category must have at least one member of age 18 or older. Entrants must reside in the NWT or Nunavut. The entry fee is $20.

.3 Professional Engineers, Technologists, Geoscientists and Architects of the Northwest Territories or Nunavut are invited to enter the competition in Category 5. The entry fee is $20.

3. CATEGORIES

Category 1 School Students in Kindergarten and Grades 1 to 5. This category includes community groups (Brownies, Guides, Cubs, Scouts, etc.)

Category 2 School Students in Grades 6 to 8. This category includes community groups (Pathfinders, Scouts, etc.)

Category 3 School Students in Grades 9 to 12. This category includes community groups (Pathfinders, Senior Branches, Ventures, etc.)

Category 4 The General Public.

Category 5 Professional Engineers, Technologists, Geoscientists and Architects

4. BRIDGE MATERIAL KITS

Each Bridge Material Kit consists of 750 grams of wooden sticks, one bottle of "Aleene's Tacky" white glue, an Entry Form and these Rules / Guidelines. A blank copy of the Judges' Evaluation Sheet is also enclosed for information only (this sheet will be completed by the Judges during the competition).

Kits will be provided free of charge to children in schools and community groups (Categories 1, 2 & 3). Kits will be provided to other entrants upon payment of the entry fee.

5. CONSTRUCTION OF MODEL BRIDGES

Only wooden Popsicle sticks and any brand of **white craft glue** can be used to construct the bridges. No other materials are permitted. Yellow glue, wood glue, carpenter's glue and epoxy glue are **not permitted.** Any type of glue which requires heat in its application is **not permitted**.

The wooden sticks can be cut to fit as desired. The amount of sticks and glue used in the bridge is limited only by the Dimensions and Weight restrictions.

Please note the following when you design and build your bridge:
During the strength test of the bridge, one horizontal metal bar will be placed perpendicularly across the road deck of the bridge, at the center of the bridge. One vertical rod will apply a downward force onto the horizontal bar. (The horizontal bar and vertical rod are components of NAPEG's test apparatus.) By placing the bar across the road deck in this manner, we ensure that the truss members of the bridge are stressed during the strength test. The builder of the model bridge shall ensure that there is one 3cm x 3cm opening, through the side of the bridge structure, immediately above the bridge deck, to accommodate the horizontal bar.

Ensure also that there is room for the down rod (3cm x 3cm) to pass through the top of the bridge structure (to rest on the horizontal bar). Refer to diagram of testing device.

Bridges should be built to ensure that the region underneath the horizontal bar is properly reinforced to distribute the force applied during the test.

Refer to Picture 14. in the Guidelines for an image of the Testing Equipment.

6. DIMENSIONS AND WEIGHT

The length of the bridge must be between 60 cm and 70 cm at its base. This is critical and the bridge will be disqualified if it is shorter than 60 cm and will be penalized if it is longer than 70 cm at the base.

The road surface of the bridge can be curved, if desired, but must be at least 4 cm wide along its entire length. The road surface is the part of the bridge deck available to be used by a model car traveling over the bridge.

Please note, the road must be sufficiently 'smooth' and continuous enough to allow a small model car (ex. Hot Wheels) to travel unobstructed along the length of the bridge.

The overall width of the bridge shall not exceed 14 cm. This is critical and the bridge will be penalized if it is wider than 14 cm.

The overall height of the bridge shall not exceed 14 cm. Overall height means from lowest point to highest point. This is critical and the bridge will be penalized if it is higher than 14 cm.

The weight of the bridge shall not exceed 600 grams. "Weight" means finished weight, including sticks and glue, and includes all attachments submitted with the bridge. Penalties will be assessed against overweight bridges.

7. HOW TO ACCUMULATE POINTS IN THE COMPETITION

1. Keep the glued joints clean and trimmed. At the joints, be sure to overlap the sticks and wipe off excess glue.
2. If the edges of the bridge are intended to be straight, use a straight edge while building the bridge. Edges that are intended to be parallel should look parallel.
3. Keep the structure symmetrical.
4. Try to use some artistic imagination.
5. Try to use engineering principles, to transfer the force from the middle of the bridge to its supports.
6. Comply with the "Weights and Dimensions" restrictions, to avoid penalties.

8. PENALTIES

1. 50 points will be deducted for bridges that do not have a workable, continuous deck that a hot wheel's car can drive across.
2. 1 point will be deducted from the score for each 5 grams that the bridge's weight exceeds 600 grams.
3. 2 points will be deducted from the score if the bridge deck is narrower than 4 cm.
4. 5 points will be deducted for each 1 cm (or portion thereof) that the bridge's height exceeds 14 cm.
5. 1 point will be deducted for each 1 cm that the bridge's width exceeds 14 cm.
6. 1 point will be deducted for each 1 cm that the bridge's length exceeds 70 cm.

9. GROUNDS FOR DISQUALIFICATION

1. Any bridge that cannot stand by itself without falling over, will be disqualified.
2. Entries will be disqualified if they use any material other than white glue and wooden popsicle sticks.
3. Entries will be disqualified if the bridge length is shorter than 60 cm.
4. Entries will be disqualified if there is evidence of heat treating (baking, etc.)

Dimensions and Weight & Penalty Summary

Parameter	**Limit**	**Penalties**
Bridge Weight	Maximum 600 grams	Deduct 1 point for each 5 grams over limit
Roadway Width	Minimum 4 cm	Deduct 2 points if roadway is narrower than 4 cm.
Bridge Height	Maximum 14 cm	Deduct 5 points for each 1 cm in excess of 14 cm.
Bridge Width	Maximum 14 cm	Deduct 1 point for each 1 cm in excess of 14 cm.
Bridge Length	Minimum 60 cm	Disqualified if shorter than 60 cm
Bridge Length	Maximum 70 cm	Deduct 1 point for each 1 cm in excess of 70 cm.
Allowance for test rods		Deduct up to 5 points if the bridge fails to make allowance for the perpendicular test piece or the down rod.
Workable Deck		Deduct 50 points for bridges that do not have a workable, continuous deck that a Hot Wheel's car could drive across

Self-Supporting Bridge		Disqualified, ANY bridge that cannot self-support on the testing equipment (pictured in Guidelines) will be disqualified.

10. LABELING

All finished bridges are to be labeled or identified (ex. Team name, individual's name, SCHOOL and COMMUNITY name, etc.).

11. SHIPPING

1. Bridges should be shipped in the boxes provided with some cushioning to prevent damage during transportation. If any minor damage occurs during shipping, a representative of NAPEG will repair the damage to the best of their ability, without improving on the original structural integrity of the bridge.
2. Bridges should not be shipped while glue is still wet. A 48-hour drying period is recommended before shipping your bridge.
3. **Bridge entries should arrive at the NAPEG office (address listed below) by February 22, 2019**. However, we will accept entries up until March 1, 2019.

   Please send the completed kits to:

   NAPEG Office
   201, 4817-49th Street
   Yellowknife, NT
   X1A 3S7

4. **If you live in a remote northern community, please check with NAPEG, as we may have prior arrangements with your local air service provider for free return shipping.**

12. JUDGING AND TESTING OF BRIDGES

The judging of the bridges is comprised of 4 main areas:
Quality of Construction (12 points maximum);
Application of Engineering Principles (12 points maximum); Aesthetics (6 points maximum); and,
Strength Factor (70 points maximum).

(A Judges' Evaluation Sheet is included in this kit for information only. The sheet will be used by the judges during the competition.)

The 'Quality of Construction', 'Application of Engineering Principles' and 'Aesthetics' aspects of the competition will judge the model bridge on bridge build quality, good engineering design and whether the bridge has artistic merit.

The bridges will then be subjected to a Strength Factor test in which a downward force will be applied to the bridge and the force will be gradually increased until the bridge fails. This force will be recorded on the Evaluation Sheet. A bridge is considered to fail when it breaks or sags more than 9 cm.

During the test, the bridge will rest on two blocks placed exactly 50 cm apart. These blocks are loose and will resist the downward force applied to the bridge. The blocks will not resist any sideways force exerted on them. Therefore, 'arch' style bridges, which normally require an inward force on the ends of the arch for proper support, will not perform well in this competition.

The Strength Factor will be computed using the formula:

$$\text{Strength Factor} = \frac{\text{Applied Force}}{(\text{Mass of Bridge})^2}$$

(Strength Factor equals the Applied Force to break the bridge divided by the square of the mass of the bridge)

The bridge with the highest Strength Factor will be given a score of 70. All other bridge entries within the category will be given a score less than 70, based on the ratio of their Strength Factor score to the highest Strength Factor score.

The bridges will be judged and tested on Saturday, March 2nd, 2019 in Yellowknife from 11:00 am to 3:00 pm.

13. PRIZES –

The following prizes will be awarded to the winning teams in Categories 1, 2, 3 and 4.

Category	1st Place Prize	2nd Place Prize	3rd Place Prize
1. Grades K - 5	$250.	$150.	$75.
2. Grades 6 - 8	$400.	$200	$100.
3. Grades 9 – 12	$500.	$250.	$150.
4. General Public	$200.	$100.	$20 Gift Card
5. Engineers, Technologists, Geoscientists and Architects	n/a	n/a	n/a

For School and Community Team winners, the prize cheque will be made out to the teacher or team leader. There are no prizes for winners in Category 5, other than bragging rights.

The top scoring team in each Category will receive a wall plaque commemorating their achievement.

Winning teams and individuals in all categories will receive a certificate and recognition in the form of a notification in the newspaper. Winners will be notified by email or phone.

Please note, prize cheques will be issued to the individual that is indicated as the Team Leader on the entry forms.

14. GENERAL CONDITIONS

1. All entries become the property of NAPEG upon receipt and will not be returned and no correspondence will be entered into.
2. By entering this Competition, entrants agree to be bound by these Rules.
3. Entrants further agree to be bound by the decisions of the judges, which shall be final and binding in all respects.
4. We desire that children be leaders in the design and construction of their bridge projects. Where, in the opinion of the judges, the construction of a bridge entry in children's Categories 1, 2 or 3 appears to be heavily influenced by an adult, that entry may be placed into Category 4, or may be disqualified, at the discretion of the judges.
5. Youth can apply outside of the school. Please note, they will fall under the applicable age category of the oldest child.
6. Any person is allowed to enter this competition **only once**, either as an individual or as a member of a team.
7. By entering the Competition, the entrant releases and holds harmless NAPEG and its members, employees and volunteers from any and all liability for any injuries, loss or damage of any kind.
8. By entering the Competition, the entrant releases and holds harmless the Owner and Leaser of the venue at which the Competition occurs from any and all liability for any injuries, loss or damage of any kind.
9. NAPEG assumes no responsibility or liability for lost, late, misdirected, incomplete or damaged entries.
10. By entering this Competition, the entrant grants NAPEG the right to use and publish their name, their school, community of residence and final standing in the competition.
11. By entering this Competition, the winner(s) grants permission to NAPEG to use his or her name and/or photograph for publicity and promotional purposes without further compensation.
12. NAPEG reserves the right to amend or terminate all or any portion of this Competition at any time for any reason without prior notice.
13. We will accept all bridges received prior to judging, anything received after will go into next year's competition.