BRIDGE IT

Team Event (Open to all)   **Points: 20**

PROBLEM STATEMENT

Design a **truss bridge** using Popsicle sticks (ice cream sticks) satisfying the stated constraints.

1. Event Structure

- Round 1: Teams should submit an abstract on or before 2nd September. The abstract will be having the one sided truss design of the model on an A3 sheet.
- Round 2: The structures made will be tested on the day of the event.

2. Materials

- Use Popsicle sticks provided by the club. Sticks can have the following maximum dimensions:
    - O Length = 11 cm
    - O Breadth = 1.2 cm
    - O Width = 0.2 cm
- Sticks can be altered physically by cutting or notching at any angle.
- Only Fevicol can be used as adhesive, use of other adhesives will lead to disqualifications.
- Threads can be used during construction, however should not be present in the final structure.

2. Overall Dimensions

- The Popsicle Bridge dimensions should be within the specified limits of:
    1. Length = 56-60 cm
    2. Width = 10-11 cm
    3. Height = 12-16 cm
- The members of the bridge can be built by grouping a maximum of 3 sticks together.
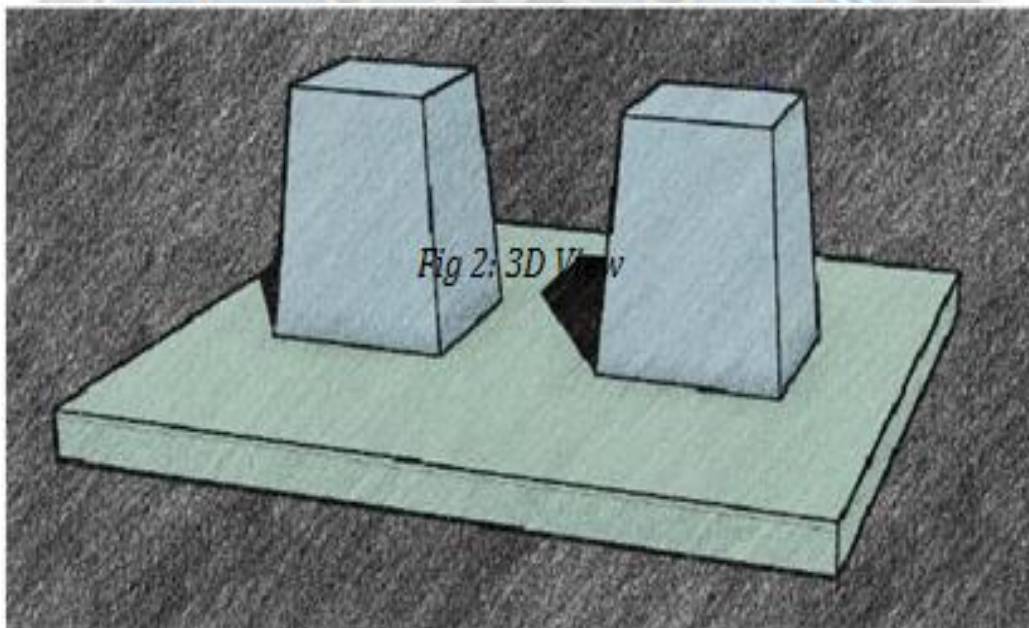
4. Weight

The bridge must weigh 300 grams or less.

5. Configuration of Models

Clear distance: An 8cm high by 10cm wide clearance must be provided along the entire length of the bridge.
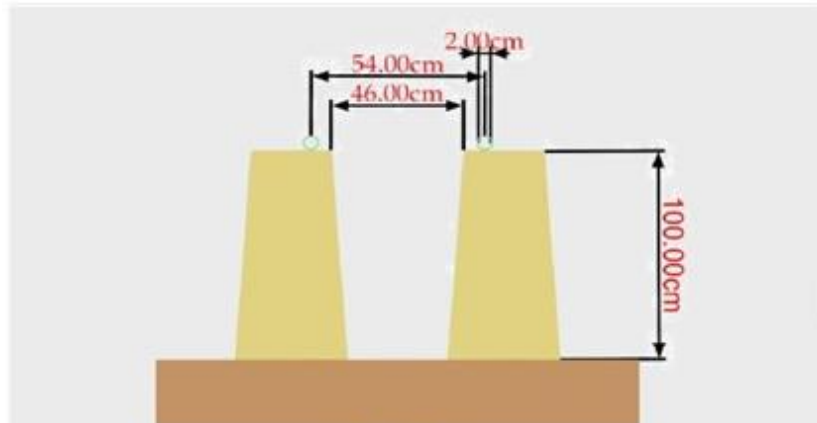
6. Platform specification:

Fig 2: 3D View

Fig3: Front View

7. **Testing the bridge**
   - The load will be applied through a hook that connects a steel platform that will be laid upon the span of the bridge.
   - The platform will be stretched from each ends and will be connected through the hooks which will be continuously increased through the manual jack.
   - The platform will be same for every team and will be placed at the middle of the structure.
   - The bridge model will be loaded till failure. The maximum deflection at the point of yielding and the load at that moment will be used to evaluate the structure.
   - If it happens that the structure reaches the threshold deflection of 1.0 cms then the jack will be stopped and the evaluation will be made on the same load. At this case the structure will not be tested further.

Fig 4. Loading by hook

8. **Team Size:**
3 – 5 students per team.

9. **Open event:**
Any number of teams can participate in the event from different pools but a minimum of two structures from every pool is must.

10. **Construction:**

Sticks can be stacked together length-wise to form stronger structural elements or to make long span elements. The overlapping between two sticks should be more than 40%. Maximum number of sticks that can stack together is **three**.
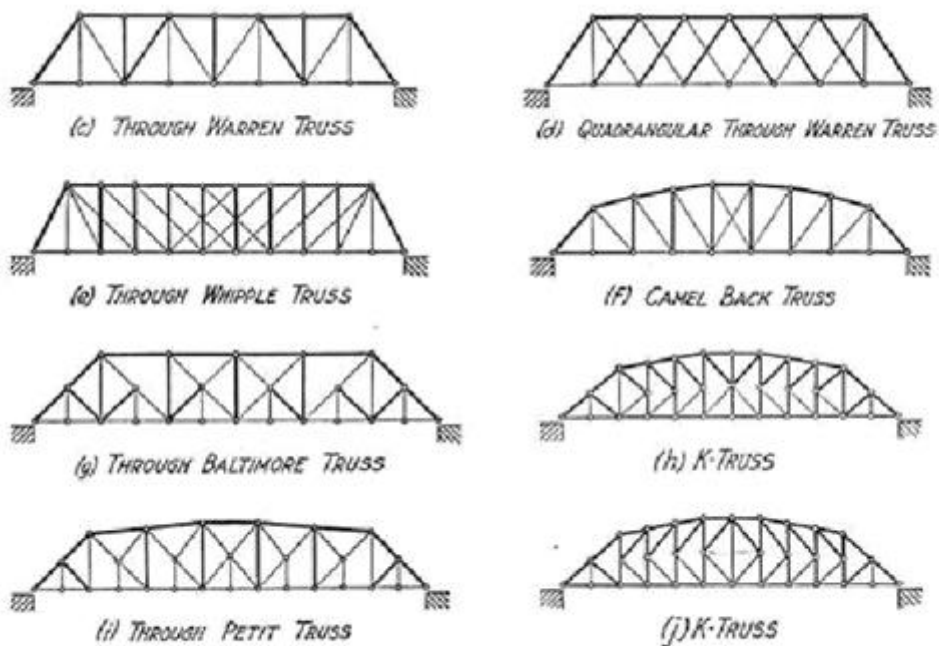
11. **Examples of kinds of trusses:**

Fig5. Types of trusses

12. **Judging and Scoring**

First the structure will be reviewed to check if it violates any rules mentioned above.
The scoring of the structure will be based on performance as well as aesthetics:

- The bridge will be scored on how well the material has been used to support the load. The efficiency will be calculated as the ratio of ultimate load capacity and the bridge weight.

In engineering, the best solution may not always be the biggest or strongest bridge.

- The bridge will also be scored on aesthetics. The judges will judge the bridge based on the detail to connections and members, the uniqueness of the design and its overall look.
- The deflection of the bridge at yielding will be noted. If the deflection increases more than 10 mm, then the load at that deflection will be taken as the ultimate load.
- Scoring Criteria

  Deflection at yield (d) = 20%
  Efficiency (e) = 50%
  Aesthetics (a) = 30%

Total Score (S) = d + e + a

Violating any of the conditions mentioned underneath, penalty will be imposed according to the judges and may lead to disqualification:

- Weight exceeds the limit (**Penalty of 20% of the total score**)
- Dimensional specifications are not met (**Penalty of 10% of the total score**)
- Use of material, except the ones stated in rules **(Penalty of 50% of the total score or can lead to disqualification as decided
  By the judges**)
- In case of any discrepancies, the decision taken by the judges and the council will be the final verdict.

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