

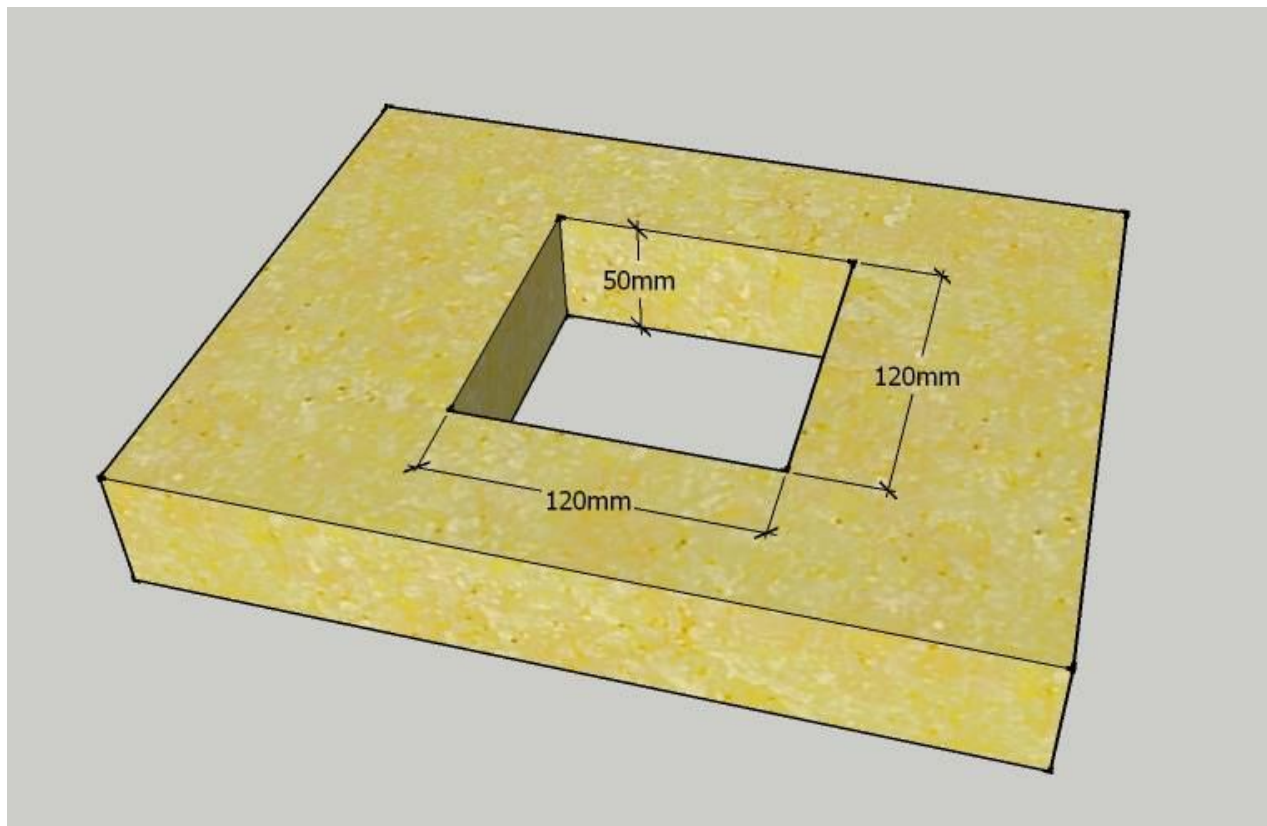
SKYSCRAPER

Task:

Design a **Chimney Tower** using Popsicle sticks and Fevicol as adhesive that can sustain the maximum possible horizontal load (practically, load of winds) with minimum deflection, satisfying all the understated constraints.

Specifications:

ARENA:



Depth : 50mm

Cross-Section : 120mm*120mm

A Chimney is to be constructed such that the footing is supported only by this provided base

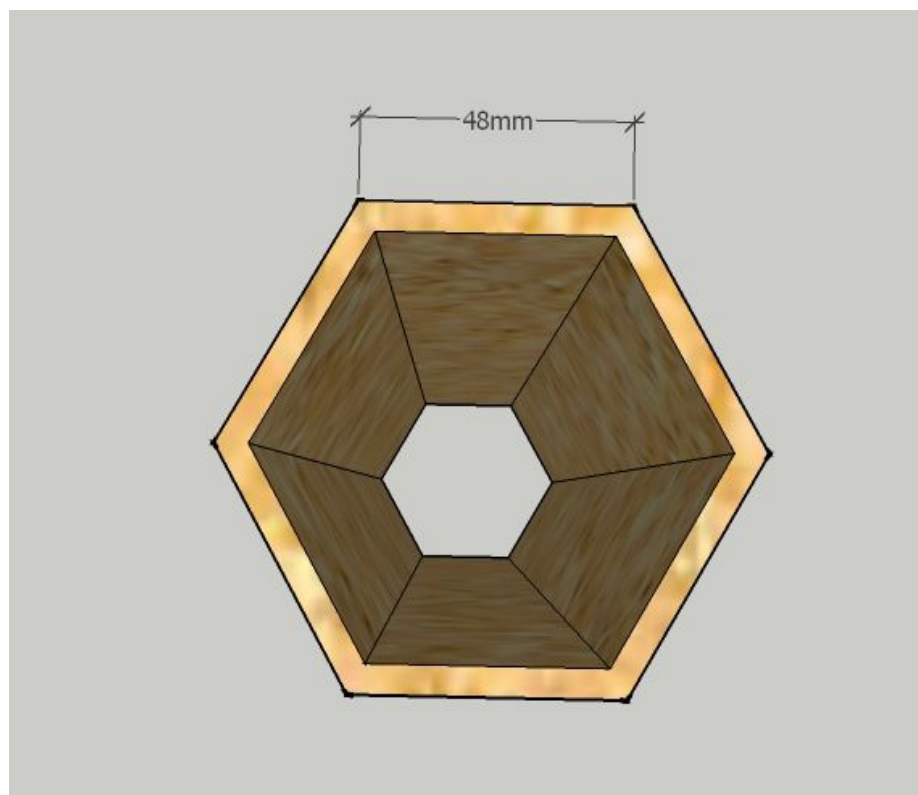
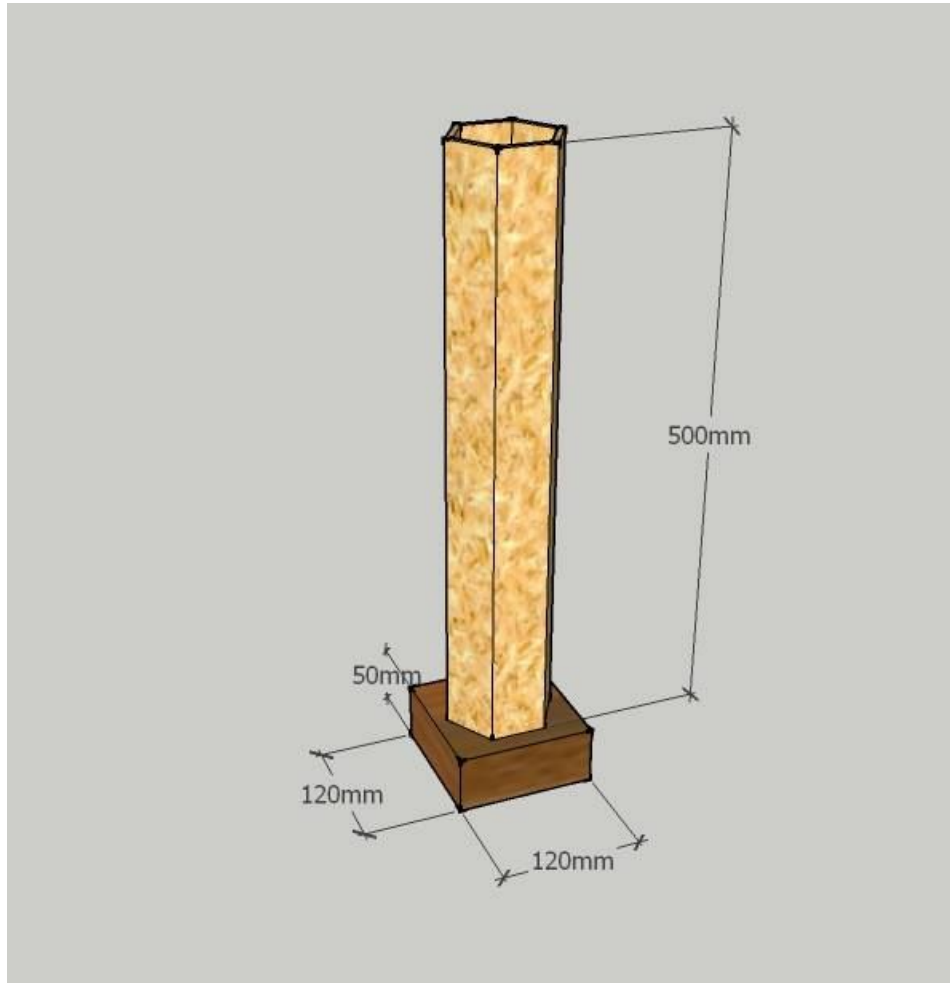
Design Constraints:

Chimney in General:

- The **vertical height (h)** of chimney must be **550 mm** (Above Ground Level) with a tolerance of **+/- 10 mm**.
[Penalty : 10% of final load taken by the Chimney tower will be deducted for breaking this rule]
- The tower cross-section must be hexagonal in shape with a **maximum width (W)** of each side be **48mm** with a tolerance of **+/- 5%**.
- The tower must have the inner cross-section such that a pipe of **2”(Two inches ~ 50mm)** in diameter passes vertically through it smoothly
[Penalty: Participants will be disqualified if any of the above four rules is violated. Practically minimum area of cross-section required for proper flow of hot gases through the chimney tower]
- The Chimney should have **square/rectangular footing** that fits in the base of **120mm x 120mm x 50mm** as shown in figure
- The dead mass of the should not exceed 1.5 kg
Note: i) Please read the text carefully as well along with the images shown.
ii) Please carefully go through this document i.e. check every detail in every text as well as every images to avoid any confusion

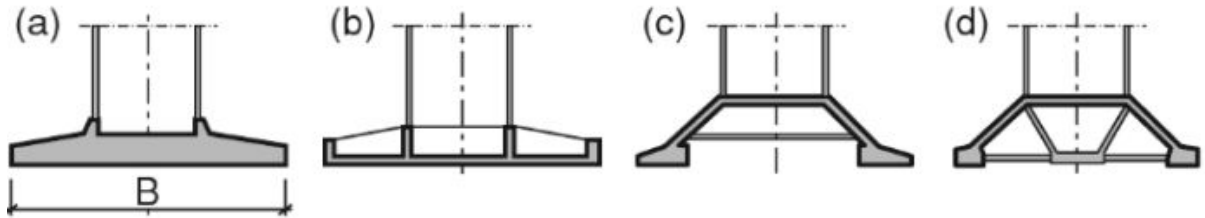
Tower

- The vertical height of the tower should be **500mm +/-10mm**
- The tower must have hexagonal horizontal cross-section
- The tower must have the inner hexagonal cross-section such that a pipe of **2”(Two inches ~ 50mm)** in diameter passes vertically through it smoothly
- The **maximum width** of a side of hexagonal chimney tower the chimney should be **48mm** with a tolerance of **+/-5mm**.
- 2 opposite sides among the 6 sides of Hexagon should be parallel to 2 opposite sides among 4 sides of the Arena Base provided
- Two side faces of the Hexagonal tower should have a **10 mm diameter circular hole** at the height of **300 mm** and at the centre of the side from base through the two sides which are parallel to the sides of base

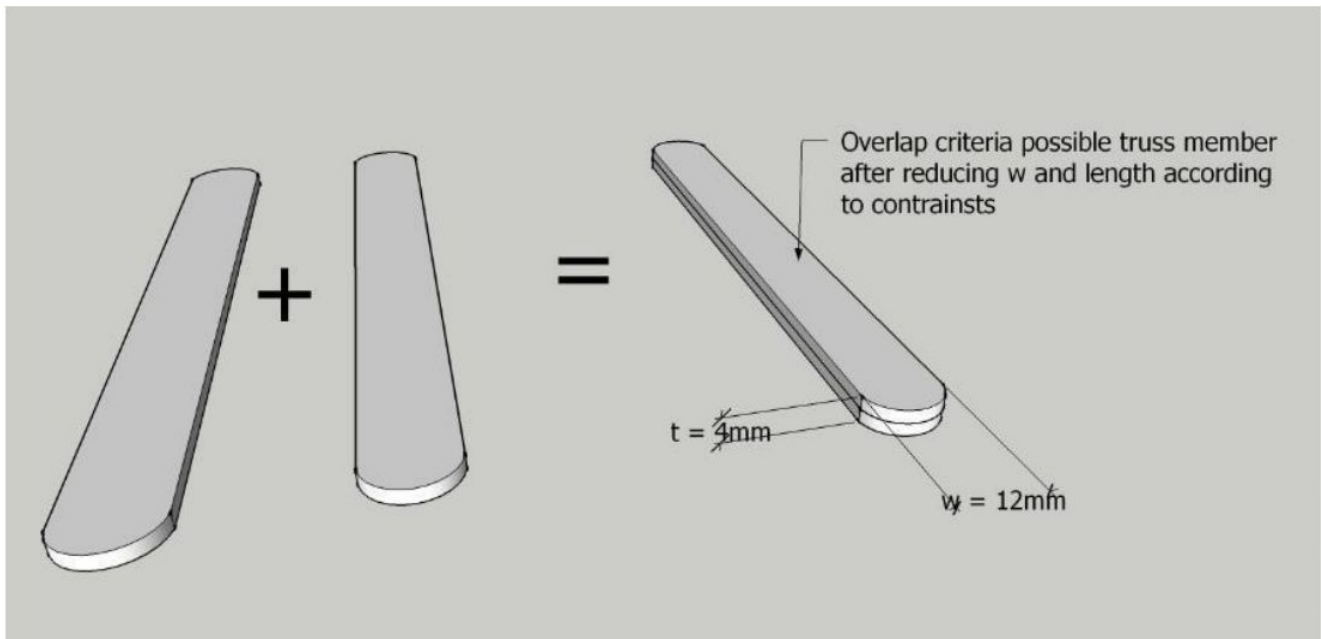


Base

- The footing of the chimney can be made in different shapes as shown in the figure or any new innovative way that the participant comes up with below. But, It should fit into the cuboidal shape of **120mm x 120mm x 50mm (D x B1 x B2)**



Overlap criteria for members - Not more than two Popsicle sticks should be overlapped longitudinally to make a member i.e. the maximum thickness(t) of a truss member should be 5mm and maximum width(w) is 12mm as shown below



Note: The dimensions shown in the pictures are just for a sample chimney. Your dimensions can be different but you should stick to the constraints given in the problem statement. The chimney (the footings) should strictly be able to fit into the arena shown above

Material Constraints:

1. **Popsicle** sticks (maximum length 120 mm, width 12 mm and thickness 2 mm) and **Fevicol MR White** adhesive should only be used to build the structure. The Popsicle sticks can be cut or trimmed to any shape or size.
2. Adhesive can only be used to join Popsicle sticks together; Adhesives cannot be applied on the free surface of a member made of Popsicle sticks that leads to increase in its strength and misleading the results.
3. Any kind of coloring or painting the structure is not allowed
4. The team will be disqualified if found using any other material other than those mentioned in any part of the structure.

Gameplay:

Testing:

1. Teams will be given 5 minutes to make final changes in their structure before the testing, and once the changes are done, the structure will be weighed. After weighing is done no changes can be made in the structure
2. The dimensions of the structure will be measured.
3. All construction and material requirements will be checked prior to testing. chimneys failing to meet these requirements and constraints will be disqualified or penalized accordingly.
4. The base of the chimney tower will be placed in the grove as shown in the figures in Arena section
5. Loading will be done using a hook at the center of the chimney tower. The loading would be done on the chimney tower using a 5cm x 10cm loading plate-connecting hook system. The plate would rest on a side of hexagonal tower while the hook connected to the plate would go through the tower horizontally through two parallel sides of hexagonal tower and down through the pulley where it is loaded. For this the chimney tower should have a **10 mm diameter circular hole** at the height of **300 mm** from base through the two sides which are parallel to the sides of base. (**Note** that the loading mechanism might change according to the circumstances during the competition but the mechanism wouldn't affect the results. **However, making the central hole in the two parallel sides of the tower is compulsory.**)

Definition of failure:

The structure is considered failed when any of the following happens:

1. The loading machine registers maximum load or the chimney tower or any other part of structure fails to follow any of the mentioned constraints
2. Horizontal deflection of the top end of the chimney tower exceeds 40mm.

Rules:

1. Once the structure is weighed, you are not allowed to modify your structure in any way
2. If any of these constraints are not met, point deductions (as mentioned) or disqualification may be imposed at the sole discretion of the organizers
3. Any team that is not ready at the time specified will be disqualified immediately
4. Judges' decision shall be final and binding on all
5. The organizers reserve all rights to change any or all of the above rules as they deem fit.
6. Change in rules, if any will be highlighted on the website and will be mailed to all the registered participants.

Judging Criteria:

The judging of the structure is based on 3 important criteria:

Dead mass of the Chimney Tower (M) in kg

Horizontal Deflection of the top of the chimney tower during failure (D) in mm

Load carried by the structure before failure (L)

1. If the structure carries 'X' kg load before failure and has incurred a penalty of 'P' kg, the corresponding team will be awarded the 'E' score where Structural Efficiency $E = (X-P)/M$ points. Chimneys will be ranked according to 'E'
2. If the E is same then the deflection D and design constraints followed by both teams will be checked and ranking will be done at the sole discretion of the organizers.

Team Specifications:

A team may consist of a maximum of 4 members. Students from different educational institutes can form a team.

Eligibility

All students with a valid identity card of their respective educational institutes are eligible to participate in this competition at Techfest 2016-17

Compliance

At check-in, event organizers will evaluate each structure. Structures will be weighed, measured, and reviewed for compliance with rules regarding materials. If a structure does not comply with any of the rules

1. Structures that are completed but do not meet the construction guidelines will be given a chance to make any necessary alterations
2. No alterations will be allowed unless deemed necessary by the Judges. If such alterations are required, the team will be allowed thirty (30) minutes to complete them. The decisions of the organizers are final.

Certificate Policy

1. Certificate of excellence will be given to the top 3 winners
2. Certificate of participation will be awarded to the top 40 teams other than the top 3 teams.
3. Disqualified teams will not be considered for any certificates.