

# MASTER BUILDER

## Introduction

From **Krishna's butter ball** in Mahabalipuram (a staggering boulder approximately 6m high and 5m wide resting on a steep slope without any support) to a tree trunk being wider at bottom and tapering towards top to ensure greater stability, nature has proved that it is the true master builder in every sense. Man, too has tried understanding and replicating these nature's marvels. Breathtaking skyscrapers standing even above the clouds has been an astounding outcome of such efforts.

The advantages of these tall buildings are multifold. They save space and accommodate more residents compared to shorter buildings, the higher floors are relatively airier and receive more sunlight. Given the mind-boggling land prices, they are much more economical as buying a small land and constructing a tall building is more affordable than buying a widespread land. These engineering marvels have their own share of constraints to be kept in mind while designing them. The taller we go, the stiffer and stronger the structure needs to be as unobtrusive as possible to maximize usable space and uninterrupted views.



## Description

This year Participants have to build a structure which has maximum stability against **toppling**.

Participants have to keep in mind the following:

- Base area of the building
- Slenderness ratio of the building
- Stability of the building
- Self-weight of the building

The following materials can be used by participants

- Aluminium sections (angle, channel, box)
- Nuts and Bolts or electrical screws
- Stationery items (pen, pencil etc.)

## Specifications

- Participants have to build the superstructure of the building.
- The superstructure can have a **maximum base area** of **30700 mm<sup>2</sup>** with no tolerance.
- The participants will be equipped with a hacksaw, a drill machine and a filer to work with.
- The participants have to give details of the required material (length and numbers of Aluminium sections) while submitting the design of their model.

## Testing

- The testing will be done by resting the structure on a **tilt table**.  
(**Note**: There won't be any bolted connection between the structure and the table)
- To restrain the structure from sliding, **stoppers** are provided on the table, which allow toppling.
- Teams will be given 5 minutes to make their final changes in their building before testing.

- Once the changes are done, the building will be weighed (W) and its dimensions are noted. After that no changes will be allowed.
- The table is then tilted progressively at intervals of **5 degrees** till the structure topples completely.  
(**Note**: The structure is tested for toppling about the side which has maximum slenderness ratio)
- The teams are given 10 minutes to explain their design. The marks will be awarded by a judge

### Evaluation Criteria

The structure will be judged based on the following criteria:

- The angle ( $\Theta$ ) at which the structure topples completely
- Base area of the structure.
- Slenderness ratio  
(**Note**: slenderness ratio =  $\max \{\text{height}/\text{base length}, \text{height}/\text{base breadth}\}$ )
- (height/weight) ratio of the structure

✕All points awarded will be subjected to normalization✕

Total points=  $C_1+C_2+C_3+C_4$

Where,

**C<sub>1</sub> (30%)**: points awarded for the angle at which the structure topples completely (the **higher** the angle, more the number of points awarded)

**C<sub>2</sub> (30%)**: points awarded for the efficient use of space (the **lesser** the base area, more economical and hence more number of points awarded)

**C<sub>3</sub> (20%)**: points awarded for the slenderness ratio (**higher** the slenderness ratio, more number of points awarded)

**C<sub>4</sub> (20%)**: points awarded for the height/weight ratio (**higher** the ratio, more number of points awarded as for a given height, a structure with lesser weight is more effective in taking seismic loads)

## Rules and Regulations

- Each team consists of a maximum of **4 members**. Cross college teams are allowed.
- Each team should submit their design beforehand through mail which will be kept confidential.
- All decisions made by the coordinators are final.
- Time allotted to each team is **4 hours**.

## Contacts

Please email all your queries to **mb18.ceaiitm@gmail.com** or contact the event coordinators:

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## Disclaimer

The authenticity of any action not provided in this rule book shall be subject to discretion of referee. Any addition or correction to this rule book will be updated in the site. Mail your queries to **mb18.ceaiitm@gmail.com**. Please mention your Name, College and Contact number in all your mails. Also refer the FAQ section on the website for some of the further clarifications.

Problem Statement, Rules and Scoring may change and all changes shall be reflected in the CEA website. And hence, the teams are responsible for keeping themselves well informed about the event. Keep visiting the website [www.ceaiitm.org](http://www.ceaiitm.org) for updates regarding the event. For any queries please mail **mb18ceaiitm@gmail.com** with the subject as “Query :< query-topic>”.