Structural Engineering Competition for the Youth
Ultimate Paper Tower Challenge
折紙擎天：極限高塔大作戰

Co-organized by
Structural Division of The Hong Kong Institution of Engineers
Department of Civil Engineering, The University of Hong Kong
Department of Construction, Environment and Engineering, Technological and Higher Education Institute of Hong Kong

Supported by
City University of Hong Kong
The Hong Kong Polytechnic University
The Hong Kong University of Science and Technology

Date: **13 June 2025 (Registration deadline)**
20 June 2025 (Briefing); 10:00am -11:30am
4 July 2025 (Competition); 8:45 am - 5:00 pm

Venue: **Briefing:**
Lecture Theatre 5,
Technological and Higher Education Institute of Hong Kong (THEi)
20A Tsing Yi Road, Tsing Yi

Competition:
The Tam Wing Fan Innovation Wing, University of Hong Kong

Organizing Committee

Ir Dr Ray Su
Ir SP Chin
Ir Dr Simon Wong
Ir Jesse Chan
Ir Dr Paul Lam
Ir Prof Ben Young
Ir Prof J G Dai

Target participants

Secondary school students (Form 4 to Form 5 students only). Each team consists of four students. Each secondary school may form only one team for the competition.

Description of the competition

The main purpose of this competition is to raise secondary school students' understanding and interest in structural engineering through the design and construction of a paper tower subjected to

gravity and wind loads. Hopefully, this competition can provide students with valuable experience which can facilitate the career planning of students and enrich them the knowledge of engineering industry or the career paths of engineers.

The model competition involves the design, fabrication and testing of a **tower**. The model shall be assembled / fabricated with A4 paper and adhesive tape as per provided by the organizer.

Regulations

The regulations consist of two parts. model requirements and competition rules.

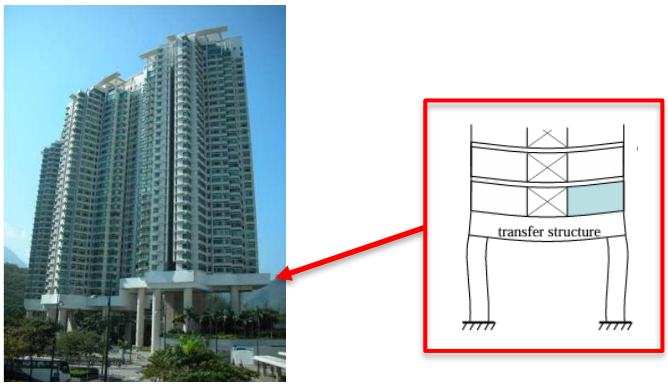
Model Requirements

1. The design of the tower must be innovative and aesthetic pleasing. It should be structurally stable and effective.

2. The tower must be constructed using only the materials provided by the organizer.

3. The tower must consist of five circular columns at the base with structural transfers (a maximum of five transfers). It should have a cantilever beam (up to 50 cm) at the top of the building. The tower is designed as an iconic structure to celebrate the 50th anniversary of HKIE.

   Remark: A structural transfer can be in the form of beam, plate or truss. The concept is to change the gravity load path i.e. change the location/spacing/number of column or wall. It can be observed in many buildings in Hong Kong.



4. The total height of tower should be between 1.0 m to 1.5 m. As illustrated in **Figure 1**, the length and width of the base shall not exceed 50 cm (A 50 cm x 50 cm square will be shown on the baseboard). The length of the cantilever beam is between 10 cm and 50 cm (which is measured from the edge of the base to the loading point). Towers that do not meet these size requirements will be disqualified.

   The headroom below the cantilever beam must be at least 50cm (which is measured from the lowest point of the cantilever arm to the base). The loading point of the cantilever beam must be designed by the students.

5. A loading test will be carried out by progressively adding weight to a hanger (to be provided by the organizer). The structure will be considered a failure if the hanger touches the ground within

10 seconds after adding weight.

6. The paper tower must be firmly fixed to the wooden baseboard provided the organizer by adhesive tape as per provided.

7. Each team must an A4-sized poster in A4 present their design ideas. The poster may be prepared before the competition.

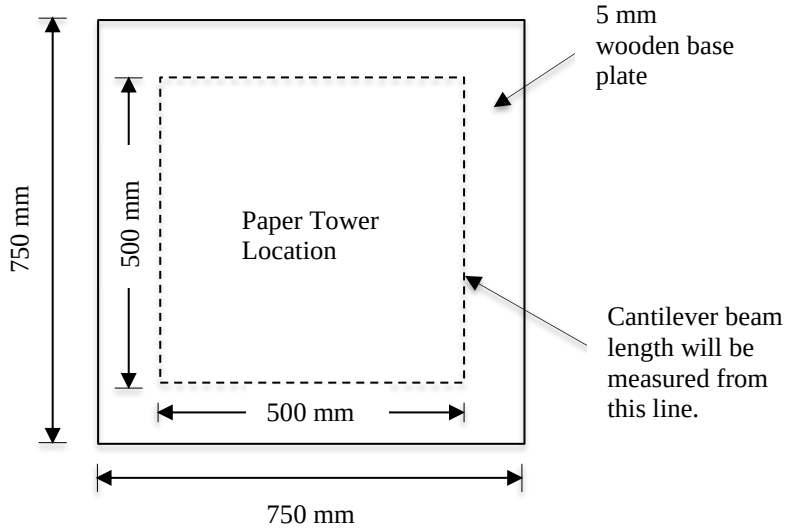


Figure 1: The base limit of paper tower

Rules

1. If a team uses materials not provided by the organizer (or uses the provided tools as part of the model), the team will be disqualified.
2. Misconduct by any one of the team members will result in the disqualification of the entire team.
3. Team members must move the model from the fabrication location to the loading area.
4. If there is any damage caused to the model during the checking, transportation, and installation process, the team members will be held responsible.
5. Teachers are not allowed to enter the fabrication area or to communicate with students by electronic devices or other means during the competition.
6. Teams are not allowed to bring their trial models to the fabrication area.
7. Teams can bring their design drawings to the fabrication area.
8. Modification of the model after the dimension check is not allowed.
9. Teams are not allowed to damage the baseboard.

Materials for each team
4 rolls of adhesive tape
200 pieces of A4 paper (75 – 80 gsm)

Upon completion of the modelling, each team must return ALL unused materials to the collection box.

Each team may bring along scissors, cutters, rulers and pens.

Judging Criteria

The competition is assessed by a judging panel to be assigned by the organizer. The Judging panel will comprise of engineers and academic staff.

(1) Height
The height of the paper tower is between 1.0m and 1.5m. It is measured from the top level of the cantilever beam to the base of the tower. The total height of the tower should not exceed 1.5m.

The height of the paper tower will be measured and marks will be granted according to Table 1 and illustrated in Figure 3.

(2) Base length and width
As illustrated in Figure 2, the base of the tower should not exceed the boundary defined by a 500mm x 500mm square. If the base of the tower lies outside this boundary, the team will be DISQUALIFIED.

The length and width of the tower above the ground level will not be limited (except the dimension criteria in cantilever beam).

(3) Cantilever beam
The length of the cantilever beam is taken as the distance from the edge of the tower to the point where the load is hung, as shown in Figure 3. The length of the cantilever beam is between 10 cm and 50 cm. If the length of the cantilever beam is outside the range, it will be DISQUALIFIED. If the length of the cantilever beam is longer than 20 cm, marks will be awarded according to table 1.

The headroom of the cantilever beam (which is measured from the lowest point of the cantilever beam to the base) as shown in Figure 3, must be at least 50cm. If the headroom is more than 60cm, points will be granted according to table 1.

(4) Loading
During the loading test, member(s) from the team will add weight to the hanger which is attached to the model. Wind load (wind speed = 4 m/s) will be applied to tower first, and weight will be added to the cantilever beam afterward. The loading point of the cantilever arm should be designed by students; each team is given a 25 mm long hook-and-loop fasteners (黏扣带) for the students to connect the end of their cantilever beam to the hanger for loading. In case the tower could not resist wind load or could not hang up any load with the fastener, the team will be DISQUALIFIED.

Figure 2 Fastener for hanger load

If the hanger of the structure touches the ground within 10 seconds after weights are added, it will be classified as a "failure". In such cases, the previous weight will be used for scoring, following the guidelines provided in Table 1. It is important to note that the maximum weight that can be added to the structure is 800g.

(5) Lightness

The assessment will involve weighing the model created by each team. The team with the lightest structure will receive 100 points for this part of the evaluation. Points will be awarded based on the criteria outlined in Table 1. Furthermore, the team that achieves the lightest model capable of supporting a minimum weight of 400g will be awarded the "Commendation on Lightest" distinction.

(6) Aesthetic and Innovative

The tower will be assessed for aesthetic appeal and innovation. Each team should prepare a poster in A4 size to explain their design idea. The poster can be prepared before the competition and it must be self-standing. The judging panel will rank the towers based on the poster, the innovative structural form and the aesthetic overall outlook. The team with the highest rank will get 50 points from this part of the assessment. “Commendation on Aesthetic and Innovative” will be given to the team with the highest rank in aesthetic and innovation.

(7) Transfer of Structures

In structural engineering**,** transfer refers to the redistribution of loads from one structural element to another. It enables large open spaces by shifting loads away from obstructive columns. In other words, the column does not align at the location of transfer. It is common in tall buildings to have a transfer beam or transfer plate. In the paper tower, you are required to involve at least one transfer. If the number of transfer is more than one, marks will be granted according to table 1. If more than one transfer element is present in the same level, it will be treated as one transfer for scoring purposes only.

Safety and Security

During the competition, the organizer will take every possible precaution to ensure the safety of the participants and the spectators. However, participants and spectators shall be responsible for their own safety and personal properties.

Adverse Weather Arrangements

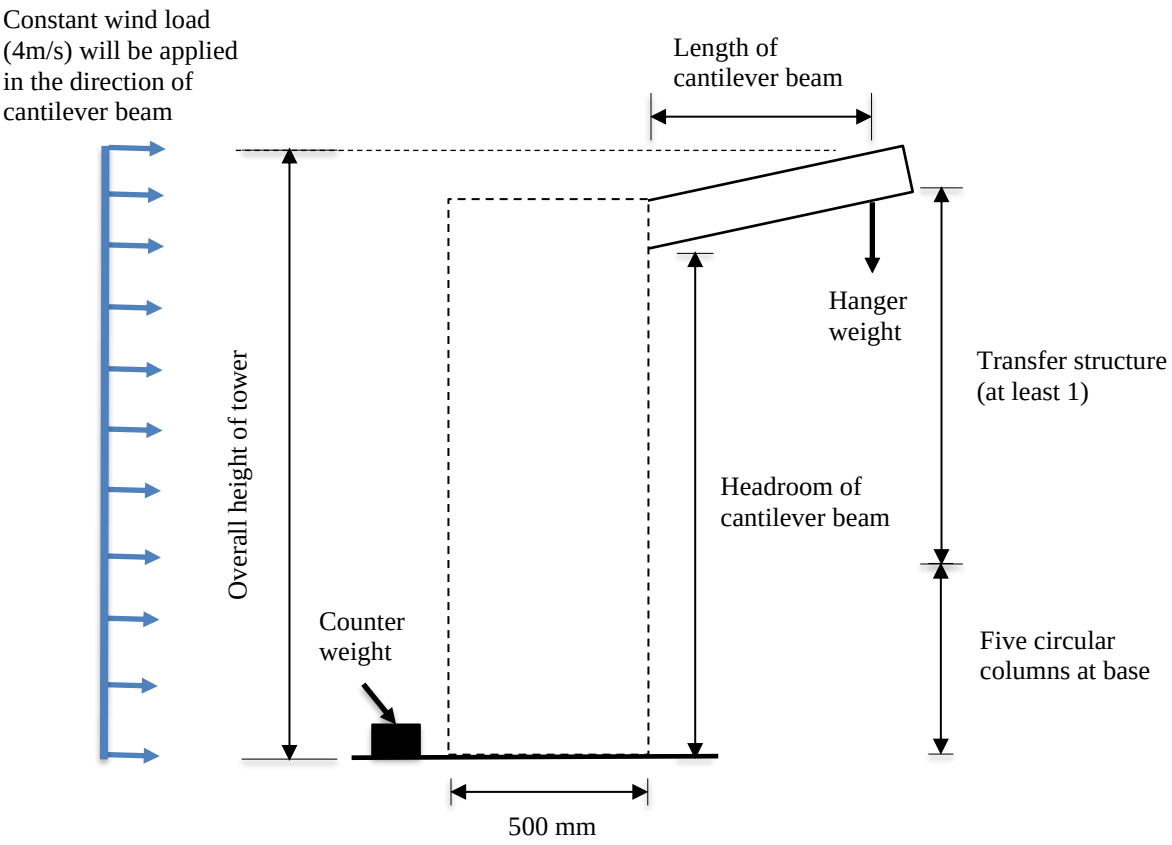
If a Pre-No. 8 typhoon warning signal (預告懸掛八號颱風訊號) or above remains hoisted at 7:00 a.m. on 4 July 2025, the competition will be postponed. The arrangements are also applicable when a black rainstorm warning signal is hoisted.

Please note that public announcements made by the Government's Education Department affecting primary and secondary schools, technical institutes and post-secondary colleges will also apply to the competition.

Table 1 Scoring System

Items	Criteria	Score
Height (from the top level of cantilever beam to the base of tower)	<1.0m	Disqualified
	1.0 - 1.1m (1.1m inclusive)	20
	1.1 - 1.2m (1.2m inclusive)	40
	1.2 - 1.3m (1.3m inclusive)	60
	1.3 - 1.4m (1.4m inclusive)	80
	1.4 - 1.5m (1.5m inclusive)	100
	> 1.5 m	Disqualified
Total height of tower	>1.5m	Disqualified
Headroom of cantilever beam (from the lowest point of cantilever of tower crane)	< 50cm	Disqualified
	50 - 60cm (60cm inclusive)	0
	60 - 70cm (70cm inclusive)	20
	70 - 80cm (80cm inclusive)	40
	80 - 90cm (90cm inclusive)	60
	90cm - 100cm (100cm inclusive)	80
	>100cm	100
Cantilever length	<10cm	Disqualified
	10 - 20cm (20cm inclusive)	0
	20 - 30cm (30cm inclusive)	30
	30 - 40cm (40cm inclusive)	90
	40 - 50cm (50cm inclusive)	120
	>50cm	Disqualified
Loading		In case the paper tower could not hang up any weight above the ground, the team will be DISQUALIFIED.
	10 points per 10 g (maximum loading: 800g)	0 - 800
Lightness	the lightest tower	100
	the 2nd lightest tower	90
	…	…
	the 10th lightest tower	10
	the 11st lightest tower and afterwards	0

Aesthetic and Innovation	the highest rank	50
	the 2nd	40
	…	…
	the 5th	10
	the 6th and afterwards	0
Transfer of structural system	1	Basic Requirement
	2	60
	3	120
	4	180
	5	240



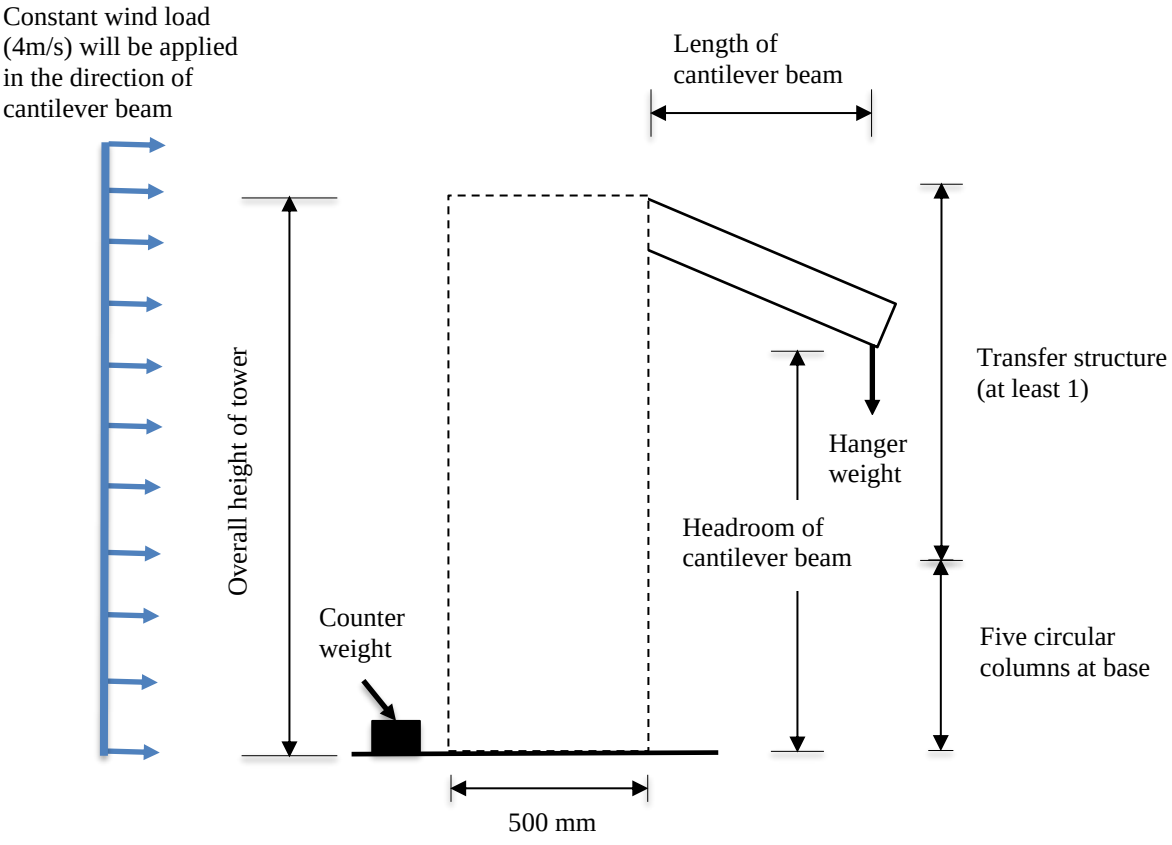


Figure 3 Measurement of overall height, headroom and cantilever beam length

Important Dates:

Registration deadline: 13 June 2025 (Friday)

Briefing: 20 June 2025 (Friday)

Venue:	**Lecture Theatre 5,** **Technological and Higher Education Institute of Hong Kong (THEi)** **20A Tsing Yi Road, Tsing Yi**

Competition: 4 July 2025 (Friday)

Venue:	**The Tam Wing Fan Innovation Wing, HKU**

Certificates

An attendance certificate will be issued for each participant.

Prizes

Prizes will be presented to the Champion ($3,000), First Runner-up ($2,000), Second Runner-up ($1,000)
Commendation on Lightest ($1,000)
Commendation on Aesthetic and Innovative ($1,000).

Competition Schedule:

Time	Program
8:45 am	**Registration**
9:15 am	**Opening address**
9:45 am	**Model fabrication**
12:45pm	**1. Return and the unused materials** **2. Submissions of Model** **3. Height and weight measurement**
1:00 pm	**Lunch** **(Judging panel assesses the structure models)**
2:30 pm	**Competition** **Loading tests**
4:30 pm	**Prize Presentation and Photos**
5:00 pm	**End**

Notes

1. The judging panel reserves the right to make the final decision and other interpretations.
2. For enquiry, please email to: ptcchkie@gmail.com