

# Wind Engineering Joint Usage/Research Center FY2025 Research Result Report

Research Field: Wind Hazard Mitigation

Research Year: FY2025

Research Number: 252001

Research Theme:

DETERMINATION OF EFFECT OF SIZE OF BUILDING ON SURFACE PRESSURES  
ACTING ON A BUILDING MODEL SUBJECTED TO TORNADO-LIKE FLOW

Representative Researcher: Sabareesh Geetha Rajasekharan

Budget [FY2025]: 2,40,000 Yen

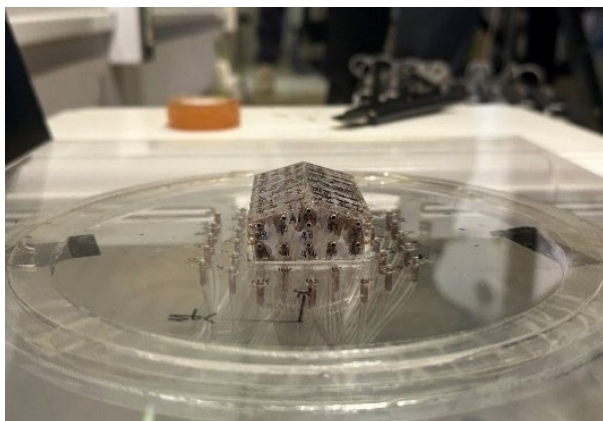
- \*There is no limitation of the number of pages of this report.
- \*Figures can be included to the report and they can also be colored.
- \*Submitted reports will be uploaded to the JURC Homepage.

## 1. Research Aim:

DETERMINATION OF EFFECT OF SIZE OF BUILDING ON SURFACE PRESSURES  
ACTING ON A BUILDING MODEL SUBJECTED TO TORNADO-LIKE FLOW

- ## 2. Research Method: Tornado simulator experiments on a principle building model in presence of adjoining building models exposed to tornado like flow

## 3. Research Result



Small Model



Large Model

### Small Model Dimensions

B:D:H=40 mm: 60 mm: 20.4mm

Number of measuring points= 130, Roof and Side walls: 99 points

Floor: 31 points

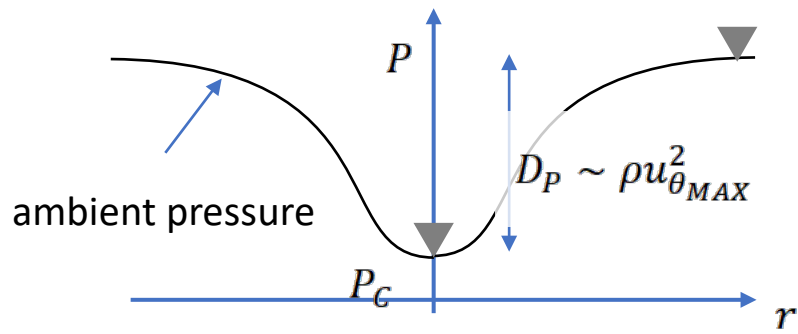
### Large Model Dimensions

B:D:H=91 mm: 137 mm: 46.55 mm (2.3 times of small model)

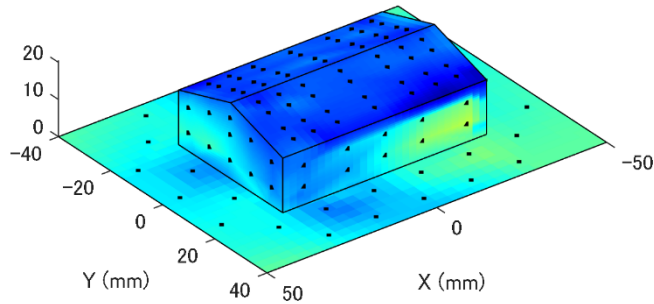
Number of measuring points= 160, Roof and Side walls: 128 points

Floor: 32 points

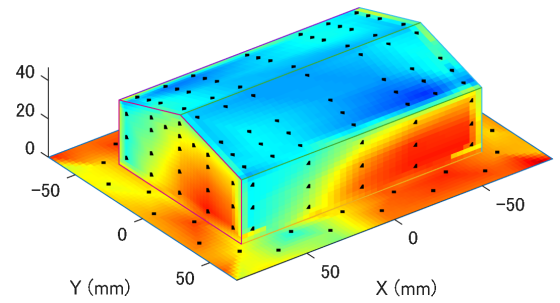
Definition of pressure coefficient



Surface Pressure Coefficients



Small Model



Large Model

*Small Model*

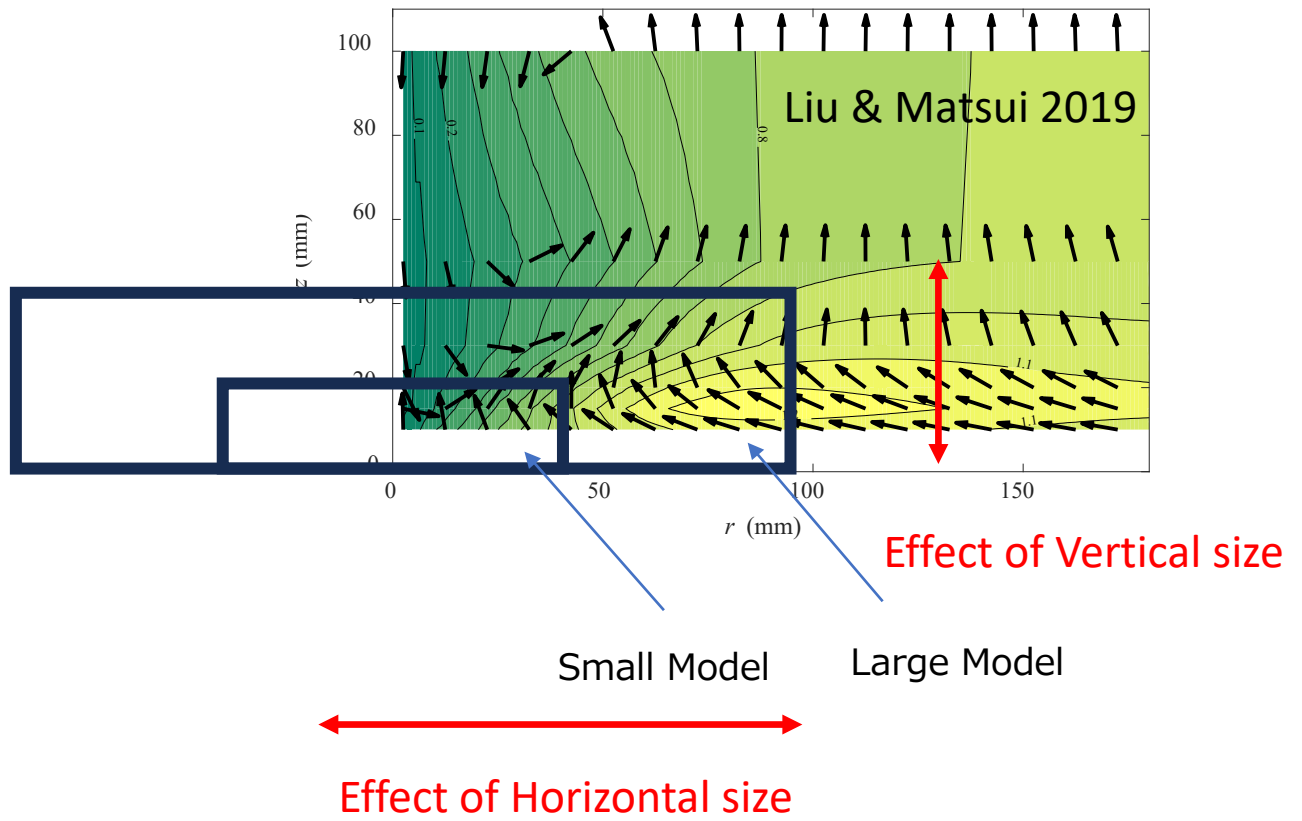
*$C_p$  avg= -2.5 to -1*

*Large Model*

*$C_p$  avg= -2 to -0.5*

*Structures located at the centre of a tornado experience stronger negative pressures in a small sized model compared to a large sized model.*

*Relative Model Scale to Flow Field*



*Summary*

- This study investigated the influence of structure size on the wind pressure coefficient acting on a structure in a tornado like flow field.
- Structures located at the centre of a tornado experience stronger negative pressures in a small sized model compared to a large sized model.
- Comparing the relative sizes of the tornado-like airflow and the model suggests the influence of horizontal and vertical size, but this has not been confirmed
- Therefore, we are currently planning experiments using a model in which the vertical and horizontal sizes can be independently changed

5. Research Group

1. Representative Researcher: Sabareesh Geetha Rajasekharan

2. Collaborate Researchers

1. Prof Masahiro Matsui, TPU, Japan

## 6. Abstract (half page)

Research Theme: Wind Hazard Mitigation

Representative Researcher (Affiliation): BITS-Pilani Hyderabad campus

In real time situations buildings are of different sizes , which demands the need for establishing the effect of size of building on surface pressure coefficients under tornado like flow . With this aim the proposed objectives for the FY 2025 research was

Determination of effect of size of building on surface pressures acting on a building model subjected to tornado-like flow

Scaled models of two buildings were used for comparison (a pressure model)

Structures located at the centre of a tornado experience stronger negative pressures in a small sized model compared to a large sized model.

Comparing the relative sizes of the tornado-like airflow and the model suggests the influence of horizontal and vertical size, but this has not been confirmed