# Wind Engineering Joint Usage/Research Center
# FY2024 Research Result Report

Research Field: Wind Hazard Mitigation
Research Year: FY2024
Research Number: 24242001
Research Theme:
Determination of tornado induced wind loads on a principal building in presence of group of adjoining structures

Representative Researcher: Sabareesh Geetha Rajasekharan

Budget [FY2021]: 3,90,000 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:

To determine the surface pressure characteristics of principal building in presence of adjoining buildings

(1) 4 buildings in proximity
(2) 8 buildings in proximity with two different area density
(a) Regular arrangement (b) zig-zag arrangement
(3) Multiple buildings in proximity

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

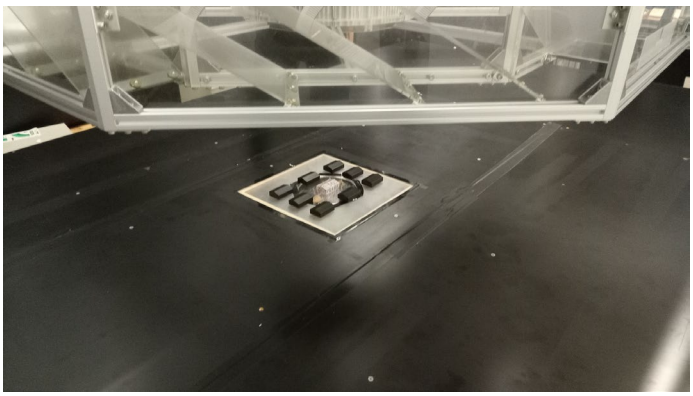
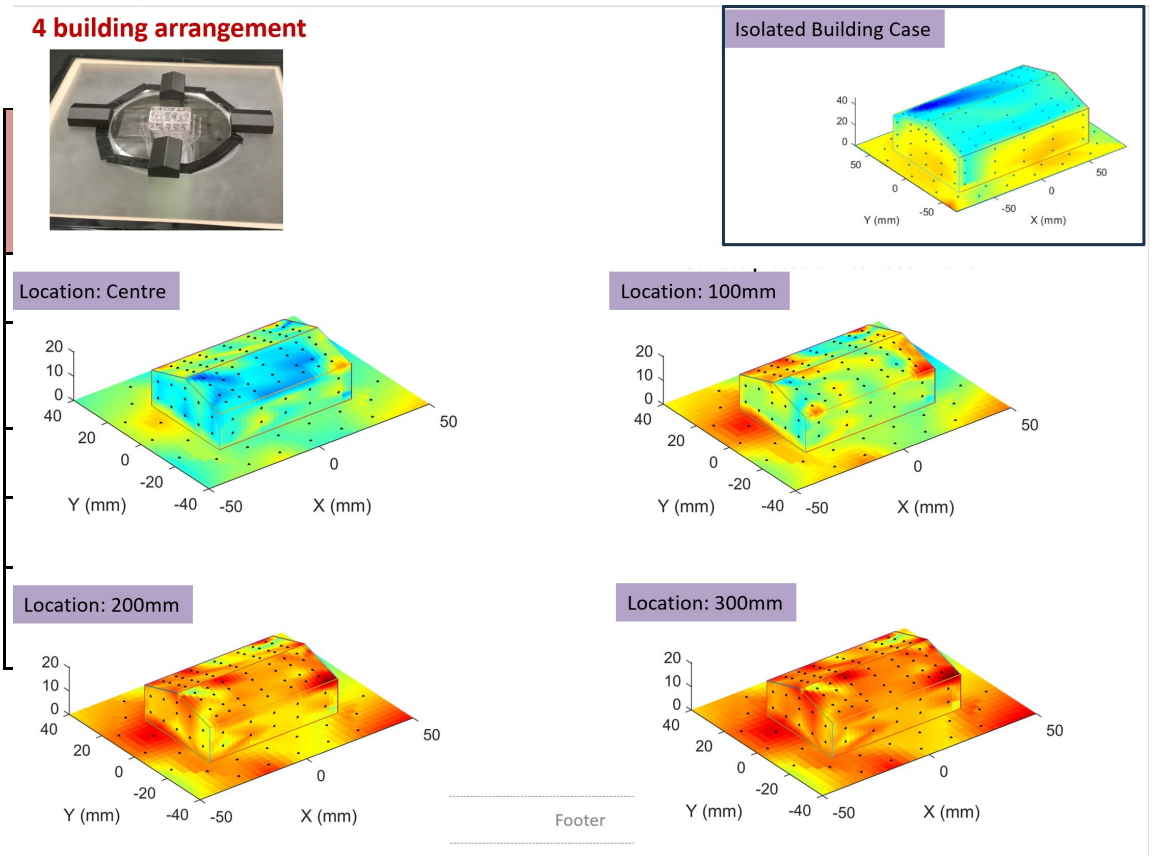


*Fig.1 Building model arrangement in Tornado-like flow simulator*



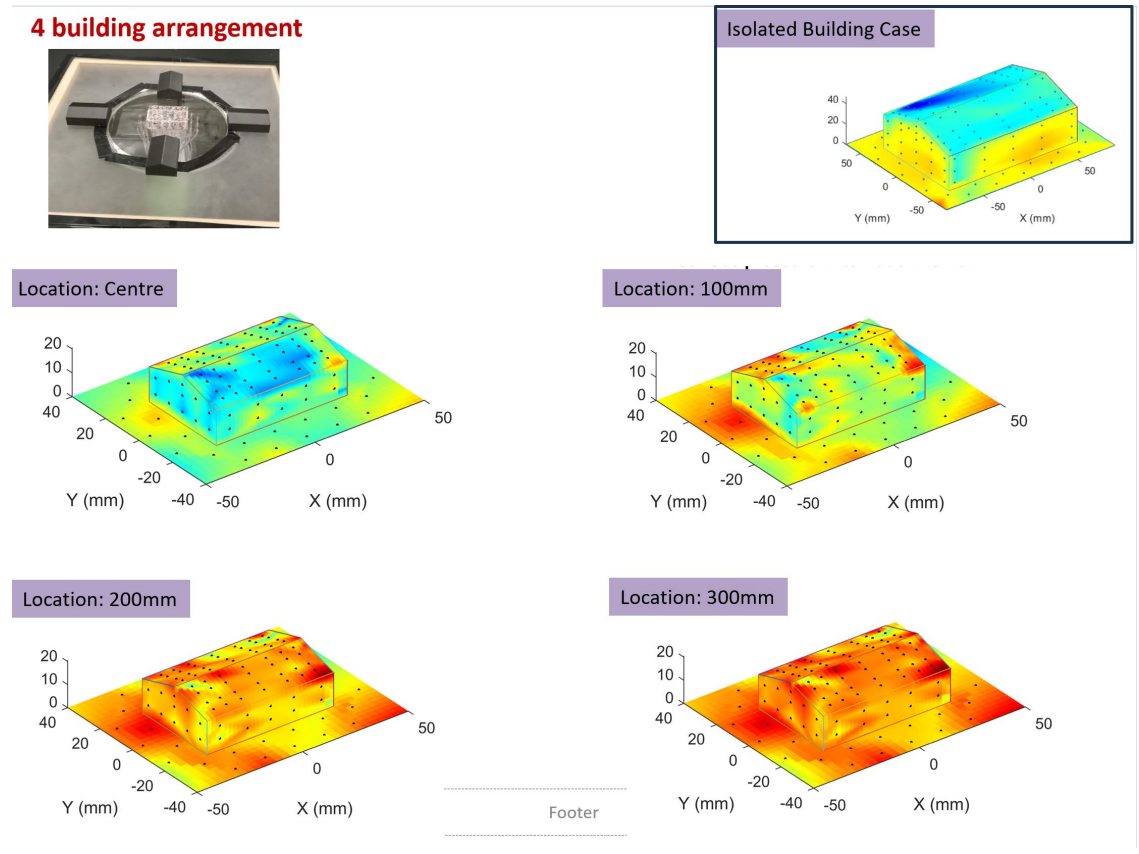




*Fig.2 Surface pressure on building models in presence of 4 adjoining buildings*

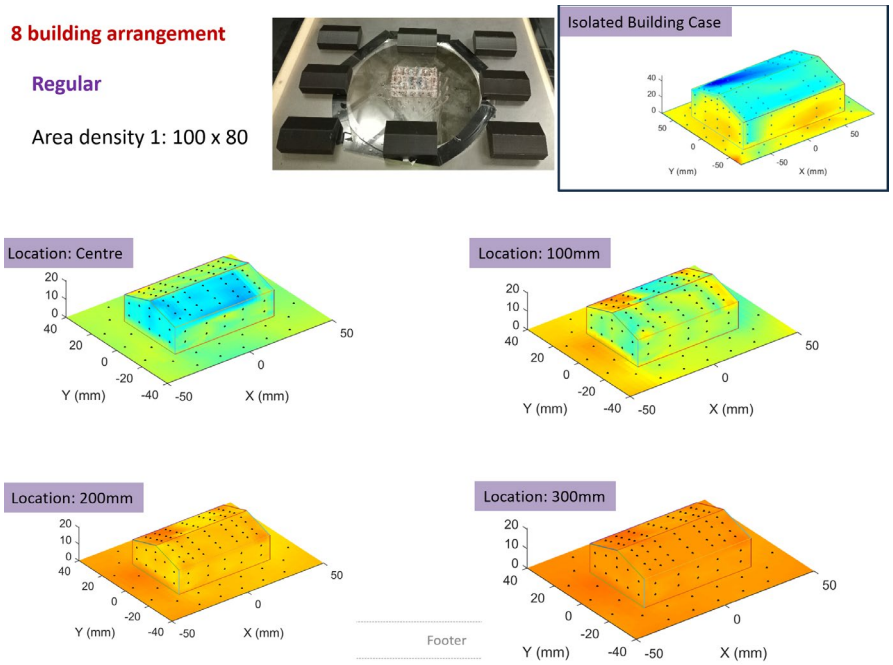



*Fig.3 Surface pressure on building models in presence of 8 adjoining buildings (Regular arrangement)*

The arrangement shown in Figure.3 is that of 8 interfering buildings surrounding the principal building. As can be seen the pressure distribution on roof and walls are considerably different in presence of interfering buildings compared to an isolated building case.

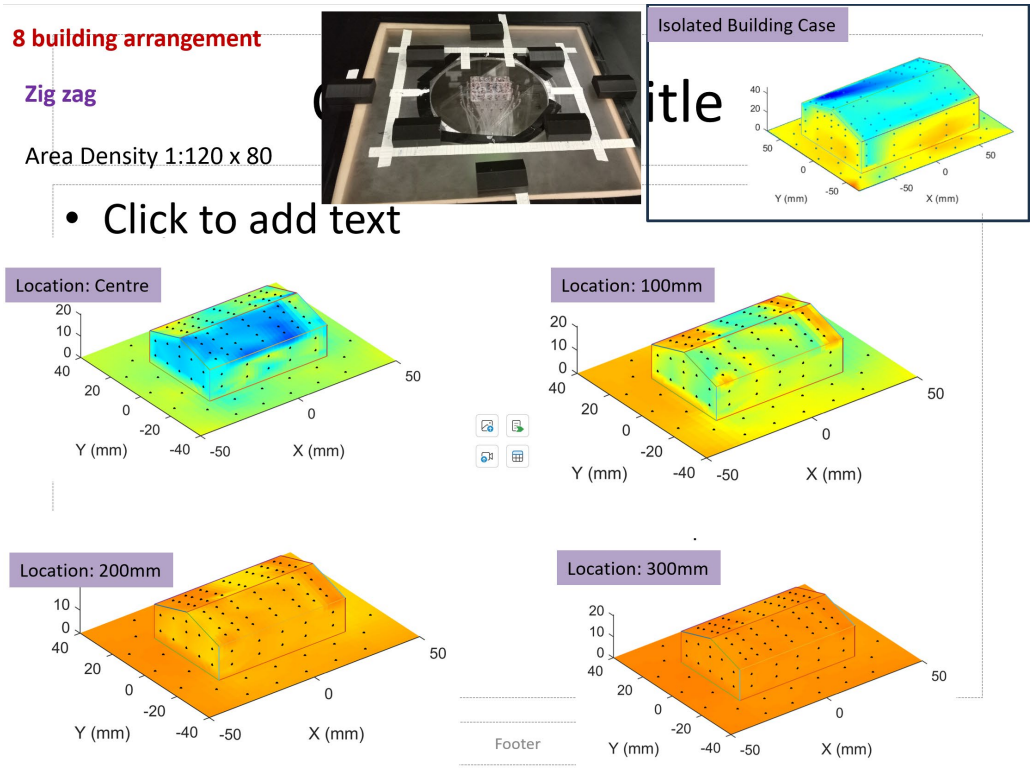



*Fig.4 Surface pressure on building models in presence of 8 adjoining buildings (Zig-Zag arrangement)*

The arrangement shown in figure 4, is when , the interfering buildings are arranged in a zig-zag arrangement compared to regular arrangement. Comparison of surface pressure distribution is made with isolated building case. As observed for 8-building regular arrangement, the pressures are considerably different with respect to the isolated building case.

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 occur in groups and the effect of an adjoining building or group of buildings on tornado indued wind loads on surrounding structures needs to be investigated. With this aim the proposed objectives for the FY 2024 research was

(1) Experimental studies to determine wind pressures on principal building model amidst a group of buildings

(2) Comparison of tornado induced wind loads between isolated building and group of buildings

Scaled models of principle building (a pressure model) already manufactured through earlier JURC projects was used. Further the adjoining building models were fabricated at BITS-Pilani using 3-D printing methods.

Pressures on principal building model were obtained.

Comparison was made between wind loads on isolated building and that of interfering building to understand and estimate how the presence of adjoining building will impact the tornado induced load.

- Principal Building walls showed large pressure fluctuations in presence of interfering buildings.
- Effect on pressure fluctuations on buildings far away from the vortex was negligible.
- Further analysis are required to understand critical distance from vortex centre where the pressure fluctuations are dominant.