

Title: Mitigating Effects of Wind and Seismic Hazards on Tall Buildings

Duration: April 2023 to March 2026

Objectives:

To improve the resilience of tall buildings subject to wind and seismic hazards

- Design framework for assessment of wind-induced cross-wind and torsional effects on tall rectangular buildings
- Strategies for aseismic engineering of tall buildings

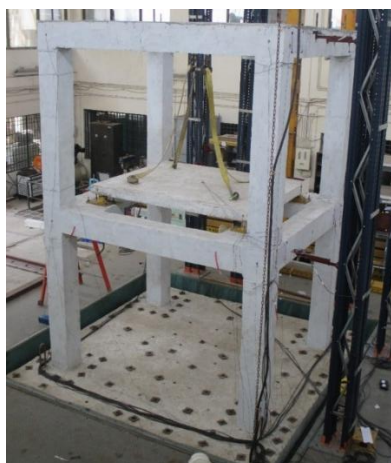
Progress Highlights:

Vertical 1

- ❖ Characterisation of exposure/inflow conditions for wind tunnel investigation of tall rectangular buildings
- ❖ Wind tunnel investigation on tall rectangular buildings with identified geometric proportions for various angles of wind incidences and terrain categories
- ❖ Numerical investigations on benchmark tall building using LES under turbulent inflow condition
- ❖ Prediction of wind pressure coefficients on tall buildings using machine learning

Vertical 2

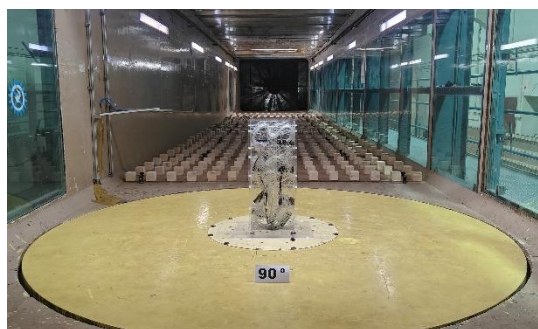
- ❖ Numerical analysis and validation of an RC column nonlinear model with and without influence of P-V-M stresses
- ❖ Evaluation of risk of the identified tall building configurations considering the hazard level of site and the fragility
- ❖ Development of manufacturing process of Energy Dissipating Interlocking Masonry (EDIM) blocks
- ❖ Numerical and Analytical studies on floor mass isolation technique for seismic response control



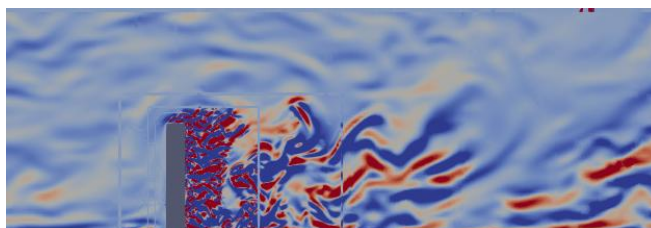
Shake table testing of building frame with floor mass isolation robes



Characterisation of exposure/inflow using multi-hole velocity probes robes



Wind tunnel testing of 1:4:7 rectangular building model



CFD simulation on a tall building model using LES

Future Programme:

- Experimental investigations on tall buildings under different exposure conditions towards evaluation of crosswind and torsional spectra
- LES simulations on tall rectangular buildings of varying geometric proportions
- Application of machine learning model for prediction of crosswind and torsional spectra of tall rectangular buildings
- Estimation of quantitative damage limit states and fragility analysis of columns in different failure modes with influence of P-V-M stresses
- Demonstration of energy dissipation characteristics of EDIM wallets
- Analytical studies to study the higher mode effects on the floor isolation

PI and Co-PI

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Team:

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Date: December 2024