

Project F4.3 – June 2017 update

Seismic loss assessment to motivate high performance building solutions

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Assistant Leaders: Rajesh Dhakal
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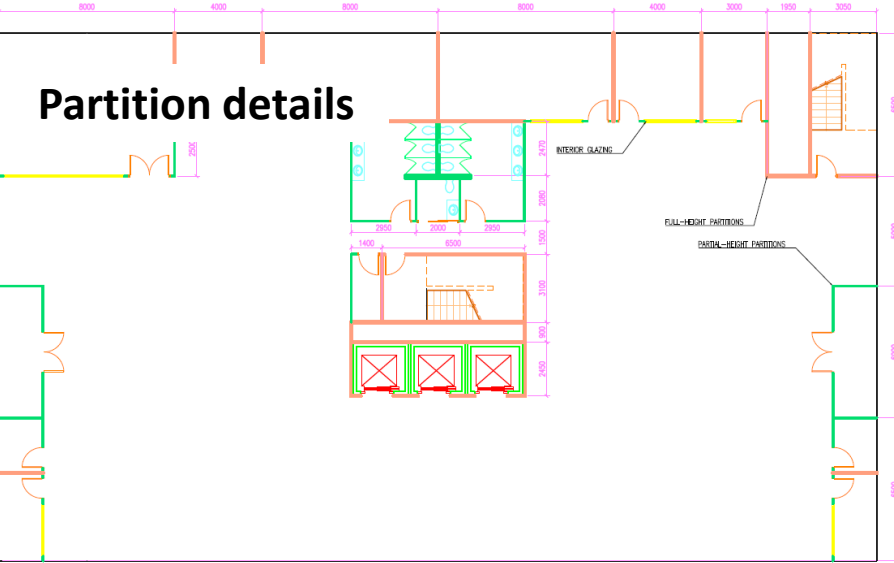
PhD Student: Shreehar Khakurel

Key Objectives

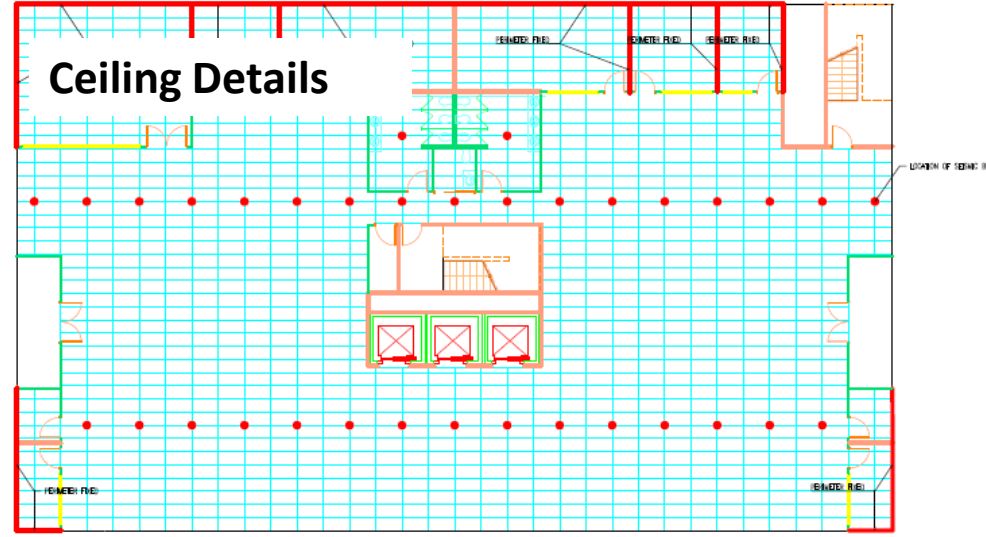
- 1. Demonstrate how loss assessment could be an effective means of quantifying the benefits of innovative construction technologies**
2. Test and develop options for simplified loss-assessment appropriate for preliminary design phase
3. Identify and develop loss functions for non-structural elements for NZ usage
4. Identify functions from literature suitable for NZ construction, and develop fragility functions for components unique to NZ.

Building Layout

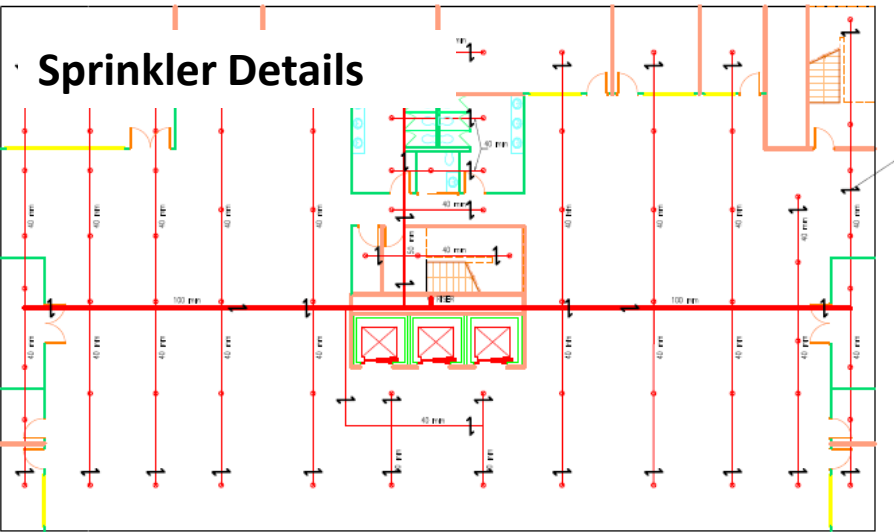
Partition details



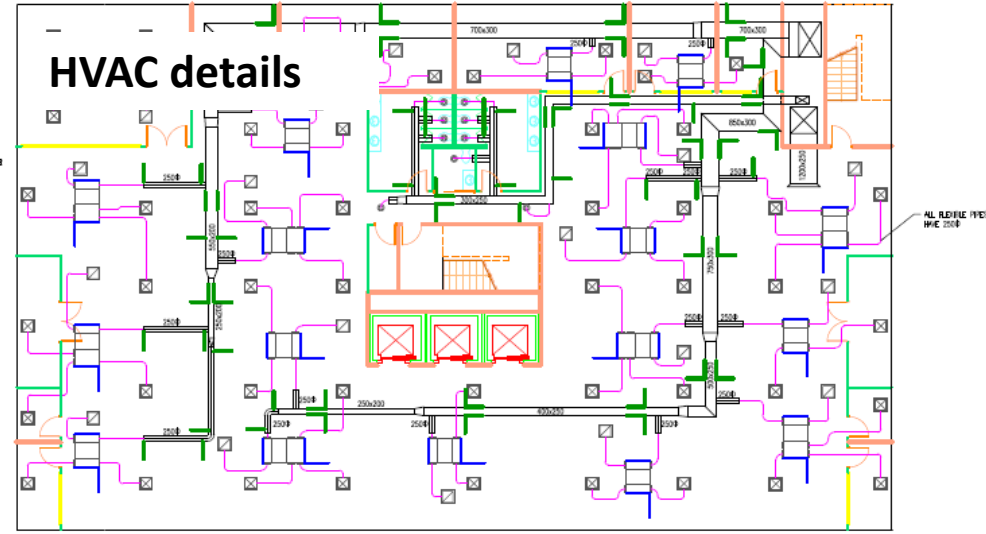
Ceiling Details



Sprinkler Details



HVAC details



Building Layout

UC Wiki Spaces ▾

QuakeCoRE: The Centre for Earthquake Resilience

Blog

CHILD PAGES

- FP4: Next-Generation Infrastructu...
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Project FP4.3 - Usage of Seismic Loss Assessment to Motivate High Performance Building Solutions

Created by Trevor Yeow, last modified on May 25, 2017

Project Title

Usage of Seismic Loss Assessment to Motivate High Performance Building Solutions

Research Team

- Project Leader - Tim Sullivan
- Assistant Leaders - Rajesh Dhakal, Ken Elwood, Quincy Ma
- Postdoc - Trevor Yeow
- PhD students - Shreedhar Khakurel

Project Description

To achieve widespread implementation of low-damage systems, the economic benefits of such systems must be demonstrated. This requires a long term outlook and an assessment of life-cycle costs. To address this need front and long-term costs, including future losses from earthquakes, to a selection of case study buildings realized with different design alternatives, it can be demonstrated that life-cycle cost analysis could be used to effectively. Secondly, in order to assist the NZ engineering profession make a smooth transition towards such probabilistic seismic loss assessment, the project proposes to test and develop different simplified loss assessment methods. Finally, recognizing that the accuracy of any loss assessment will depend on the quality of the inputs used, the project will identify and develop loss and fragility functions for elements typical of NZ construction practice.

Key Objectives

The main objectives of this project are as follows:

1. Demonstrate, via loss-assessment of a selection of case study buildings, how loss assessment could be an effective means of quantifying the benefits of innovative construction technologies.
2. Test and develop options for simplified loss-assessment appropriate for preliminary design phase, thus assisting the NZ engineering profession make a smooth transition towards probabilistic seismic loss assessment.
3. Identify and develop loss functions for non-structural elements that will assist with the application of loss assessment in New Zealand.
4. Review procedures for the definition of fragility functions, identify functions from literature suitable for NZ construction, and develop fragility functions for components unique to NZ buildings.

Case Study Building Plans

Most up-to-date version of the case study building plans are provided below. Past versions will be added if superseded.

Four-Storey Office Building

Summary Report

- In draft

Ground floor drawings

- Floor Plan and Partition Layout
- Above Ceiling Details
- Sprinkler Layout
- HVAC Layout
- Ceiling Layout

Upper floors drawings

- Floor Plan and Partition Layout
- Above Ceiling Details
- Sprinkler Layout
- HVAC Layout
- Ceiling Layout

Roof plant details

- In draft

Drawings available at bottom of project's wikipedia

Key Objectives

1. Demonstrate how loss assessment could be an effective means of quantifying the benefits of innovative construction technologies
2. Test and develop options for simplified loss-assessment appropriate for preliminary design phase
3. Identify and develop loss functions for non-structural elements for NZ usage
- 4. Identify functions from literature suitable for NZ construction, and develop fragility functions for components unique to NZ.**

Fragility Functions

✘/✔ indicates the progress of sourcing/developing fragility and consequence functions for case study layout

Building component	Fragility	Consequence
Structural beam/column/walls	✔	✘
Floor slabs	✘	✘
Stairs	✔	✘
Façade	✔	✔
Partitions	✔	✔
Ceiling	✔	✔
Heavy Plant	✘	✘
Sprinklers	✔	✘
Elevators	✔	✔