# Design of Seismic Resilient Concrete Buildings

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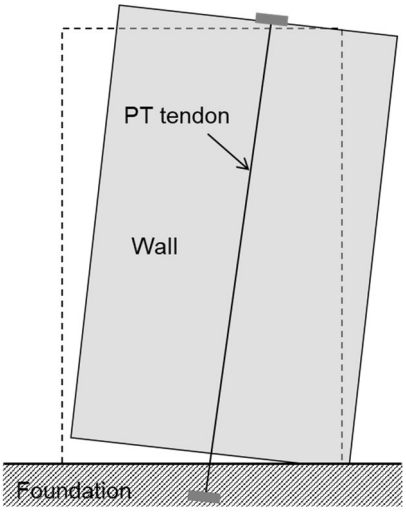
**SUMMARY**

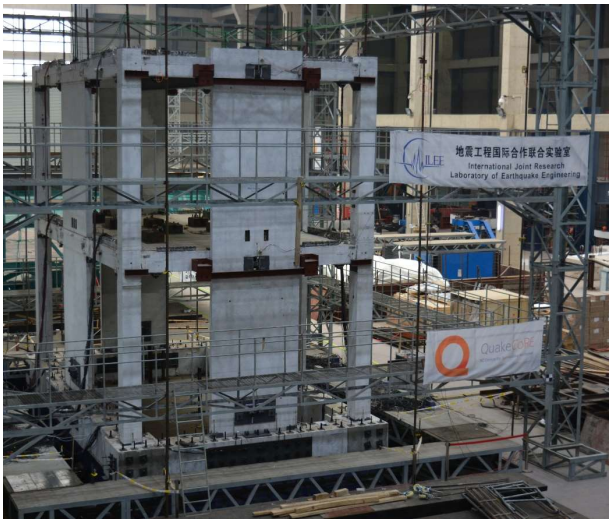
Resilient structures that can not only survive large earthquakes but also allow for rapid recovery of their occupancy and functionality are critical to improving societal outcomes. In addition to satisfying the basic life-safety design objectives, structures are increasingly being designed to higher performance objectives that specifically target reduced damage, repairability, and rapid reoccupancy and functionality. Innovative technologies and novel materials continue to be developed to design resilient seismic resisting structural systems. Resilient or low-damage precast concrete systems that utilize jointed designs have been developed and researched for several decades. Examples include post-tensioned wall and frame systems that evolved from the PRESSS research programme, precast wall panels with debonded reinforcement, and slotted beams that eliminate axial elongation and associated floor damage. New Zealand has been at the forefront of the development and implementation of low-damage precast concrete systems. Many of these systems have been implemented into buildings, where lessons were learnt regarding practical design and detailing methods. Beyond the component design, the performance of the entire structure including the interactions between structural systems must be considered to meet the required performance outcomes.

This seminar is targeted at students and professional engineers who are new to the concepts of low-damage structural systems. Topics covered will include the following:

- Introduction to seismic resilient design concepts
- Post-earthquake repairability of conventional reinforced concrete structures
- State-of-art review of resilient or low-damage concrete structural systems
- Analysis and design of unbonded PT walls and slotted beams
- Implementation of resilient or low-damage concrete structural systems and system level shake-table tests to verify their performance
- Design of seismic resilient buildings, including analysis and interaction of structural systems and components, and connection detailing




Unbonded post-tensioned concrete wall



ILEE-QuakeCoRE low-damage concrete building test

Tūranga library - Christchurch

## BIOGRAPHY

**Rick Henry** is an Associate Professor and Deputy Head in the Department of Civil and Environmental Engineering at the University of Auckland. His areas of research include the seismic design of reinforced and prestressed concrete structures, precast concrete construction, and seismic resilient design. He received his BE (Civil) and PhD from the University of Auckland. Rick is a QuakeCoRE Programe Area Lead for Disipline Theme 2 – Whole of buildng seismic performacne. He is an Associate Editor of Resilient Cities and Structures. Rick is President of the Concrete NZ – Learned Society. He a has served as a member of the technical committee for the NZ Concrete Structures Standard (NZS 3101:2006) and is a current member of ACI 318-H seismic sub-committee.