

# Seismic Assessment and Design Philosophy of Reinforced Concrete Walls in Australia

## Introduction

Australia is contained completely within the Indo-Australian plate, making it a region of low to moderate seismicity. However, the Australian continent is the most active intra-plate region for earthquakes in the world. Historical events have shown that these intra-plate earthquakes can cause moderate to high magnitude and shallow depth earthquakes, similar to what has been observed in the Christchurch earthquake event in 2011, which has the potential to cause a catastrophic destruction.

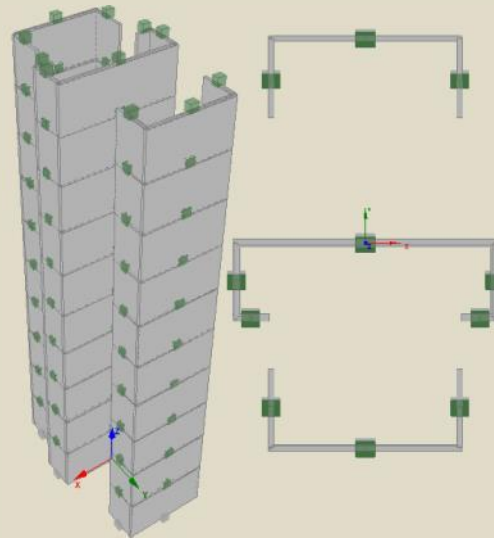
Non-ductile reinforced concrete structures were observed to perform poorly in the Christchurch earthquake, and were largely responsible for the 181 deaths caused in the event. Buildings with lateral force-resisting systems consisting of non-ductile reinforced concrete walls represent a great majority of the building stock in Australia and other low-to-moderate regions.

This research is focused on the assessment of the performance of existing typical reinforced concrete walls and cores in Australia in response to rare and very rare earthquake events.

## Research Problem

There is currently a lack of knowledge on the performance of typical reinforced concrete (RC) shear walls and cores in Australia in response to a very rare earthquake.

Due to the low earthquake return period used in design and the low standard of detailing required in the current material standards in Australia, it is anticipated that most of these RC walls and cores embedded within structures around Australia are “non-ductile”.



## Research Aim

The aim of this research is assess the seismic performance of typical RC walls and cores in Australia to ultimately recommend changes in detailing provisions for the next revision of the Concrete Structures and Earthquake Actions Australian Standards. The over-arching design philosophy will be reassessed and recommendations will be made both for new buildings and existing structures.

## Research Objectives

This research project will address the following questions:

- How do typical RC walls and cores in Australia perform in a 2500-year return period earthquake event?
- What parameters effect the moment and curvature capacity of the walls, and ultimately the ductility?
- What is the performance of these typical buildings for shear, torsion and drifts under a 2500-year return period earthquake event?
- What are the probabilities of these typical buildings reaching a particular Performance Level (Damage State) for a given earthquake intensity event?
- What recommendations or design alternatives can be made from the results for a more robust building stock that is economically viable?



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