FINDINGS

Bracings, walls, and both elements used together can be very effective in increasing the capacity and performance levels of limited ductility RC buildings.

Retrofitting Strategy for Limited Ductile Reinforced Concrete Buildings in Australia

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Most Australian reinforced concrete (RC) buildings have not been designed to withstand seismic actions, and are considered to have limited ductility. This paper is to present the findings of the Bushfire and Natural Hazards CRC funded research project which is aimed at evaluating the seismic performance of some selected Australian RC buildings for considerations of applying cost effective retrofitting measures. This research contributes to "Cost-effective mitigation strategy development for building-related earthquake risk."

Introduction

This research was established with the aim of assisting with risk mitigation decisions by providing practical retrofit solutions to the identified vulnerable buildings. Several retrofit options for a 2-storey limited ductile reinforced concrete building are presented. The building has been identified to be vulnerable in previous studies (Amirsardari, 2018). The retrofitting options have shown an improvement in the behaviour of the buildings. The retrofit options explored were simple with the purpose of being cost effective and easy to implement. In addition, it can be used as a preliminary study for the development of Australian seismic evaluation and retrofit standards of the existing buildings.

Methods

To determine the most appropriate retrofit method, a seismic assessment of the structure must first be undertaken. For this purpose, SeismoStruct software was utilized. A nonlinear pushover analysis, applying triangular loads, was performed on the structures. This is because triangular loads simulate the earthquake loads better than uniform load applications. The buildings are pushed until collapse occurs, as this provides a better understanding of how the failure mechanism develops

Results

Several retrofitting options were investigated following the same methods. These options Included bracings, walls and a combination of walls and bracings, as seen in figure 1. The performance level of each retrofit can be seen from figure 2.

Discussion

- Bracings are recommended if the purpose is to ensure that collapse occurs at a higher seismic hazard value and that an increase in torsional stiffness is required.
- Walls are recommended if the purpose is to ensure better behaviour across all performance levels, although brittle collapse of structure might be expected.
- Bracings and walls used together are recommended if better performance levels are required at higher seismic hazard values, for high importance structures, as well as increasing torsional stiffness and reducing the chances of brittle failure as ductility increase.

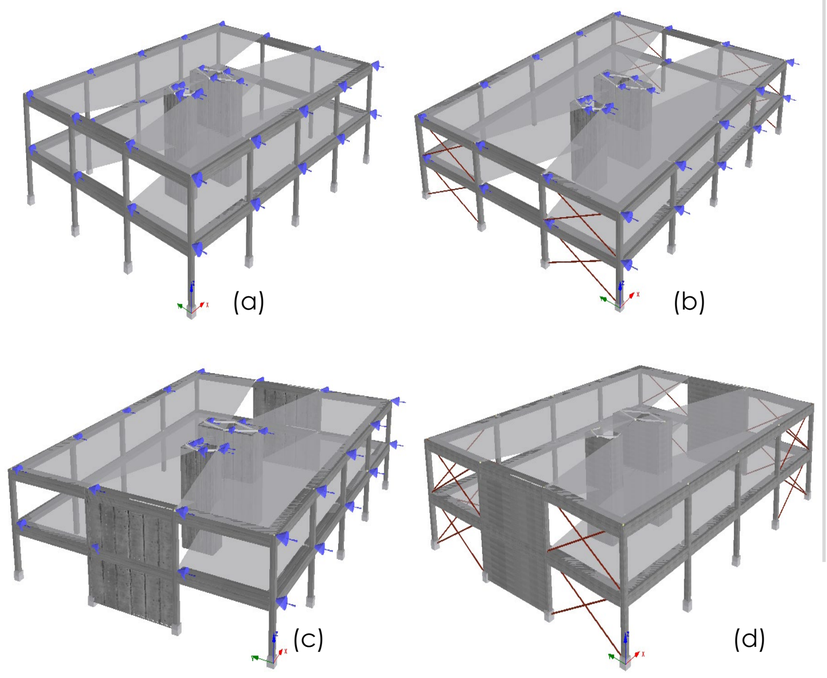
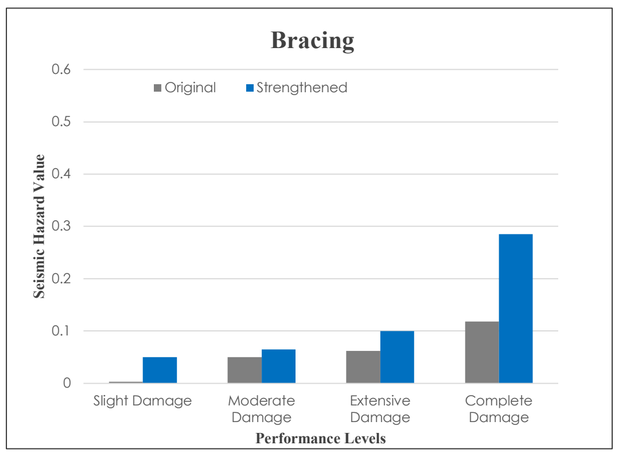
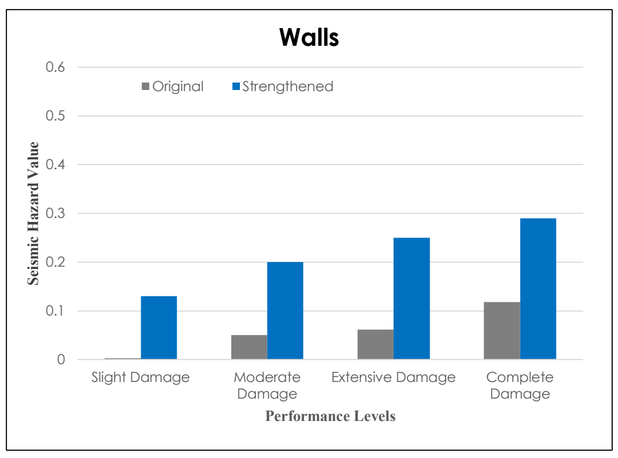


Figure1: Building models with pushover loads assigned (a) unstrengthened (b) bracing retrofit (c) wall retrofit (d) wall and bracing retrofit





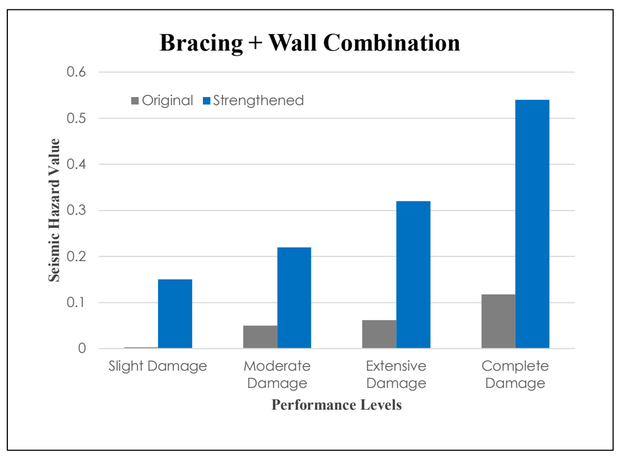


Figure 2: Performance levels of Different retrofit techniques vs. unstrengthened building

For more information, please email
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