Repaired Reinforced Concrete Wall Buildings in Chile After 2010 Earthquake

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Motivation

• 1985 and 2010 Chile earthquakes provides fundamental information regarding the decision-making process adopted for repairing RC wall buildings.
• After 1985 earthquake damaged RC wall buildings were repaired and only one building was demolished.
• After 2010 earthquake:

  Inventory of 36 buildings (Jünemann et al. 2015)

  25: Repaired
  8 : Demolished
  2 : Waiting for final decision

  Demolished buildings represent 22% of the inventory of damaged Buildings, but 0.4% of the total inventory of about 2,000 RC wall buildings

• After 2011 Canterbury earthquakes more than 60% of RC buildings have been demolished. (Marquis et al. 2017)
Objectives

- Summarize the observed damage and adopted repair techniques in selected buildings.
- Provide evidence of repaired buildings.
- Show preliminary results of current research project.
Building 1

- Located in Viña del Mar
- 15 story
- Constructed in 1970
- Damaged after 1985
- Suffered less damage after 2010 earthquake
Repair of damaged walls after 1985 earthquake

Repair cost: ~33% of building cost

Repair of damaged slabs after 2010 earthquake

Repair cost: ~5% of building cost
Building 2

- Located in Viña del Mar
- 11 stories and one basement

- Built in 1998
- Damage concentrated mainly in two walls
• Flexural strength and deformation capacity of unconfined walls was improved by adding special boundary elements.
• Shear strength was improved by increasing the wall thickness or using FRP.

• Repair cost: ~33% of new building (40% of repair cost attributed to structural elements)
Building 2

Pictures from Jorge Carvallo
• Two towers of 18 stories and 2 basements
• Built in 2007
• Severe damage in walls
• Walls were repaired and strengthened by adding boundary elements and increasing the wall thickness
Wall Q

Repaired Wall Q, with boundary element
Current research

- Seismic capacity of repaired reinforced concrete wall buildings, FONDECYT 1171062, CONICYT.
  - PI Matías Hube, Cl Hernán Santa María, Rosita Jünemann
  - Students Jorge Moscoso, Jaime Amón, Héctor Gálvez

- Objectives
  - To evaluate the residual capacity of damaged walls
  - To evaluate the seismic capacity of repaired walls
  - Test 6 walls
Current research
### Current research

**Wall Test** | **Drift level (%)**
---|---
M1 | 2.0
M2 part 1 | 2.0
M2 part 2 | 3.0
M3 | 3.0
M4 part 1 | 1.5
M4 part 2 | 3.0
Current research
Thank you