

Repaired Reinforced Concrete Wall Buildings in Chile After 2010 Earthquake

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- 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

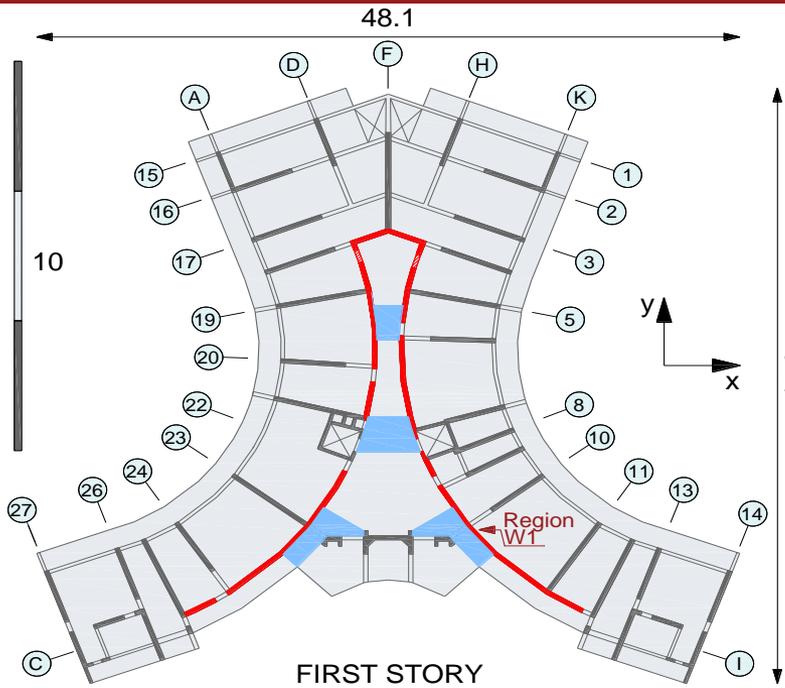


Demolished buildings represent 22% of the inventory of damaged Buildings, but 0.4% of the total inventory of about 2,000 RC wall buildings

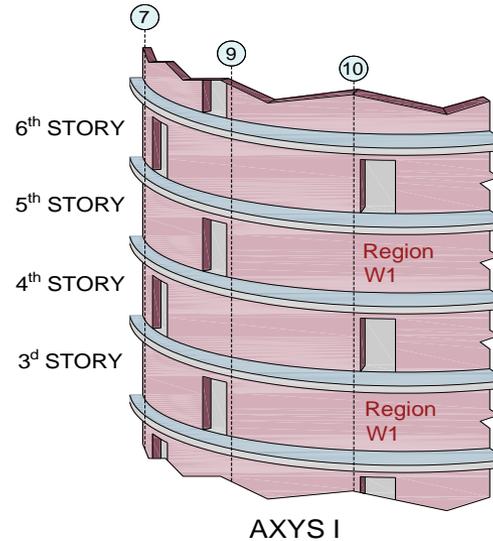
- After 2011 Canterbury earthquakes more than 60% of RC buildings have been demolished. (Marquis et al. 2017)

- 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



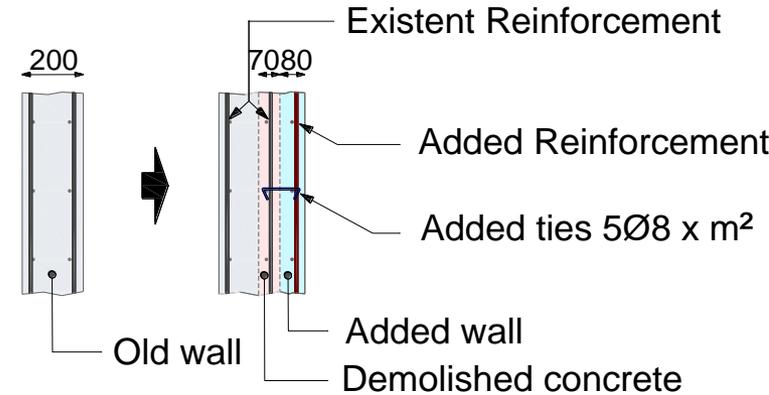
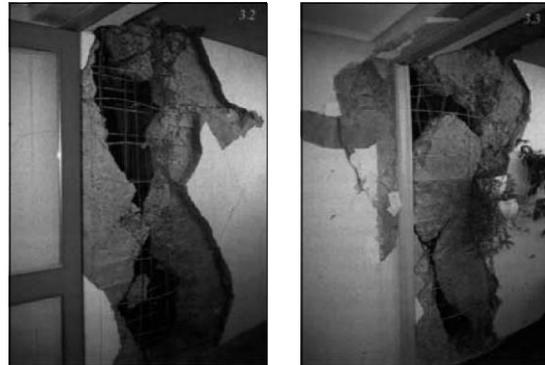
DAMAGED WALLS
AFTER 1985 EARTHQUAKE
DAMAGED SLABS
AFTER 2010 EARTHQUAKE



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

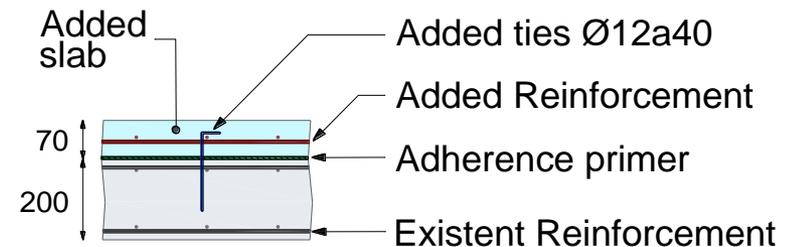
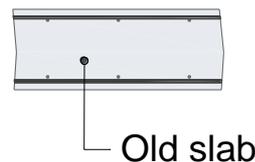
Repair of damaged walls after 1985 earthquake

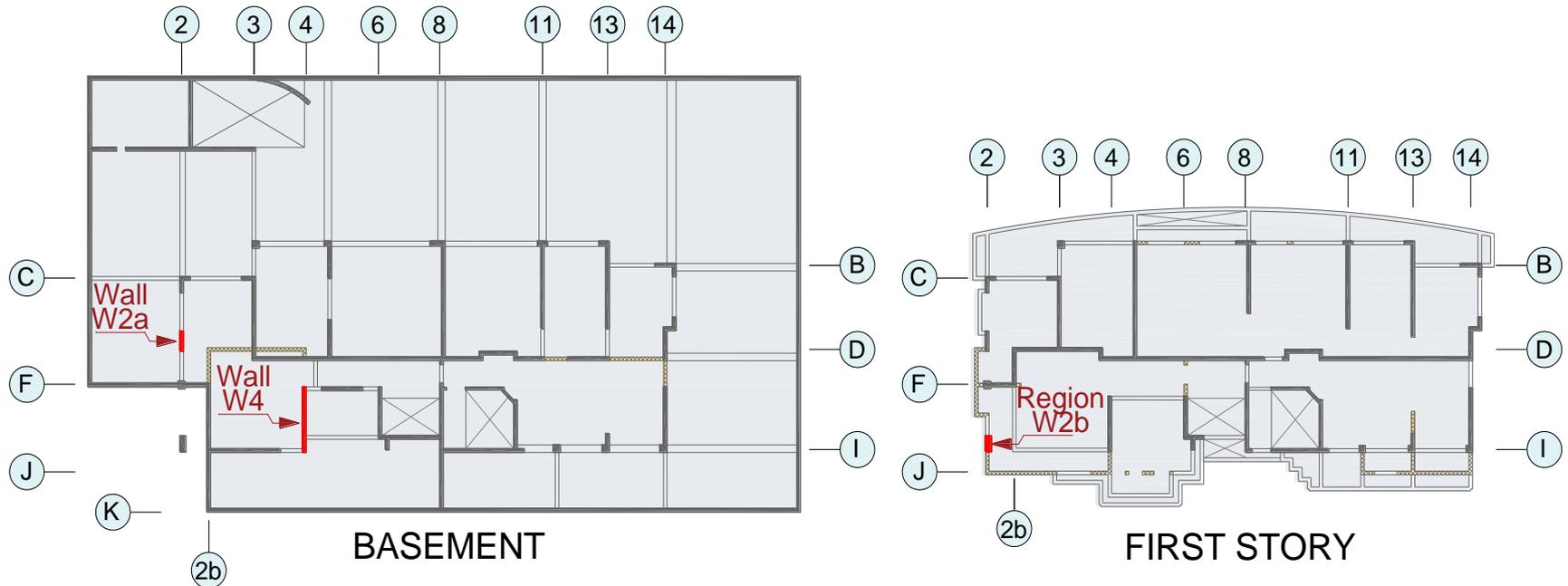
Repair cost: ~33% of building cost



Repair of damaged slabs after 2010 earthquake

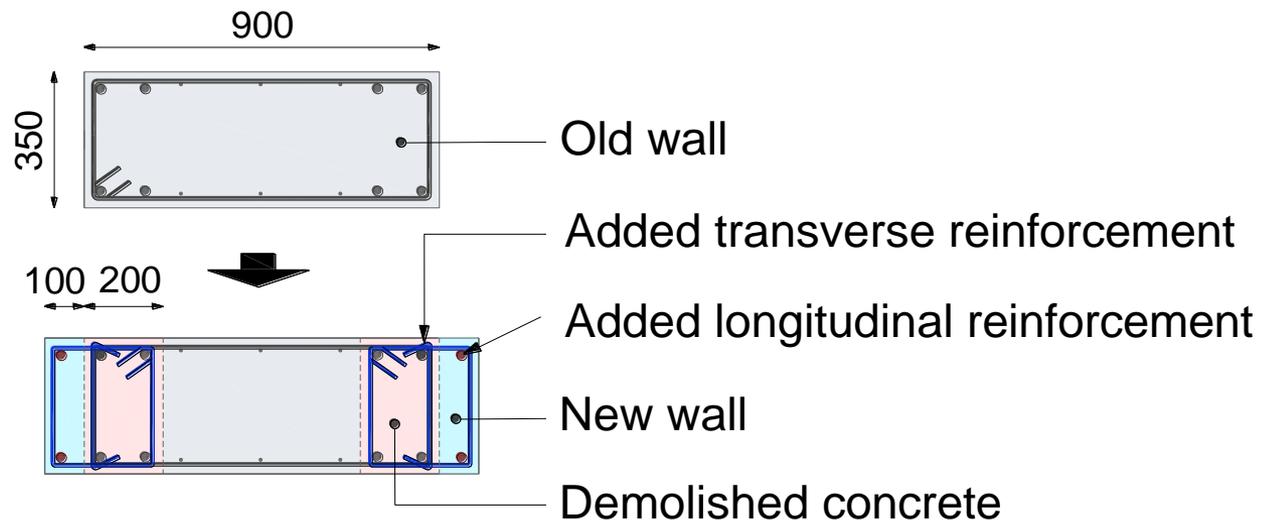
Repair cost: ~5% of building cost





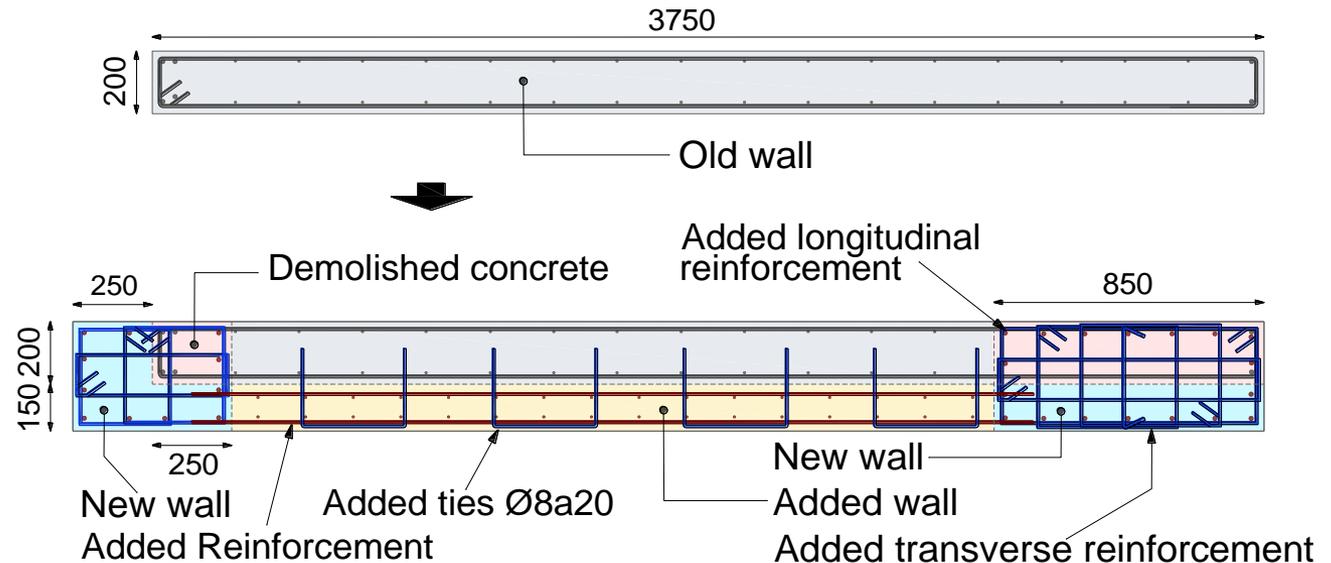
- Located in Viña del Mar
- Built in 1998
- 11 stories and one basement
- Damage concentrated mainly in two walls

- 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

Wall W4



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

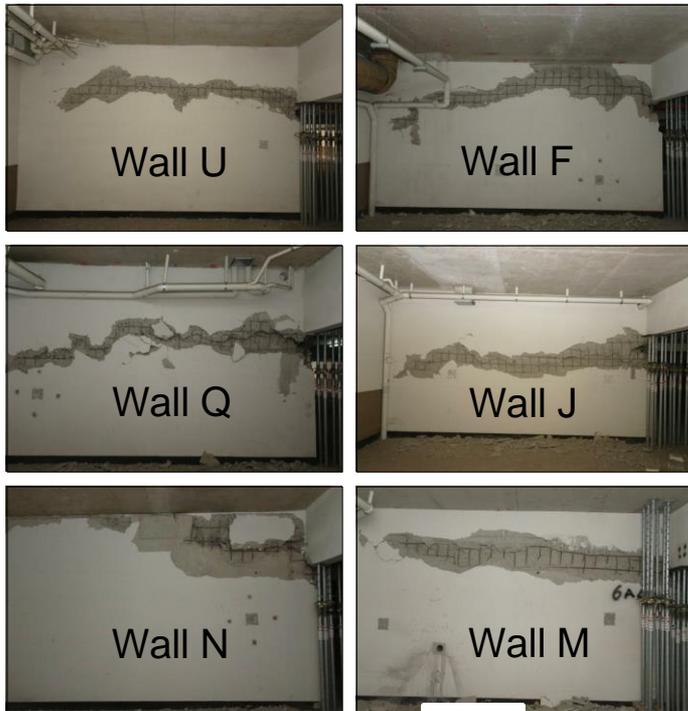


Pictures from Jorge
Carvallo

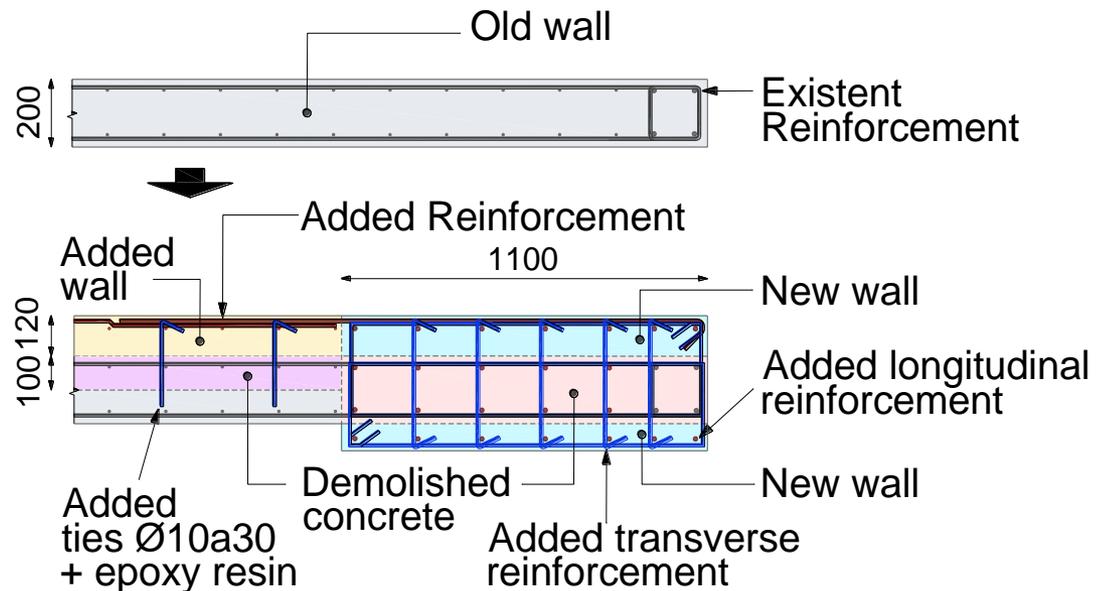


- Two towers of 18 stories and 2 basements
- Built in 2007
- Severe damage in walls

- Walls were repaired and strengthened by adding boundary elements and increasing the wall thickness



(a)



(b)

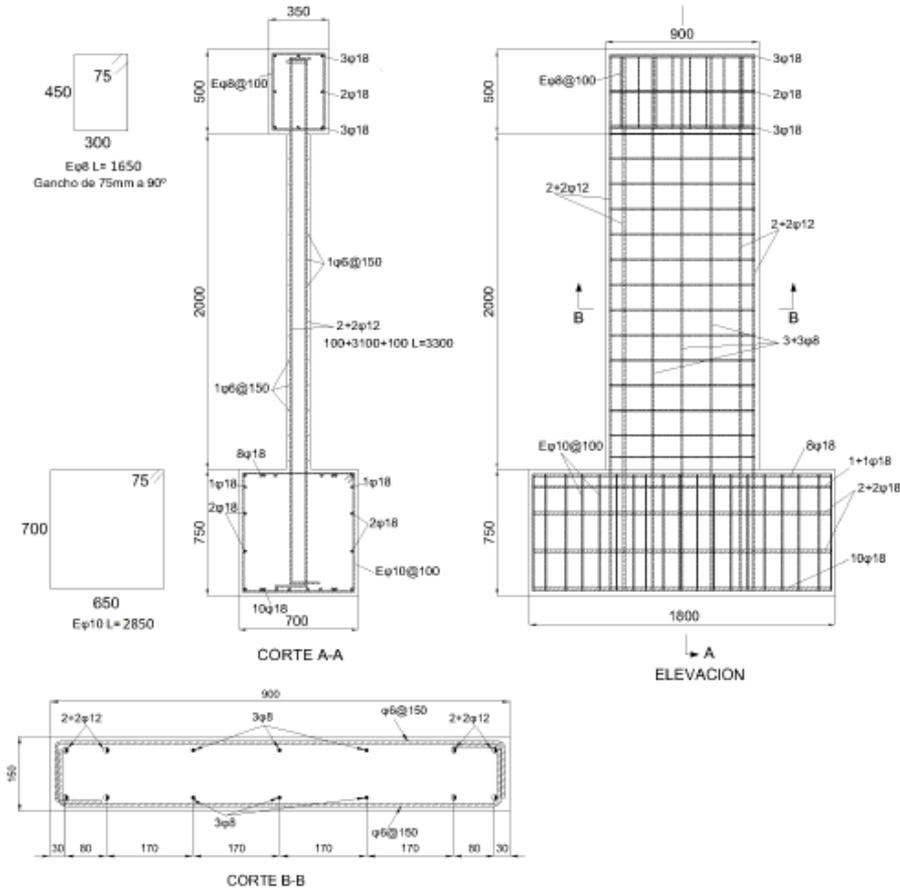


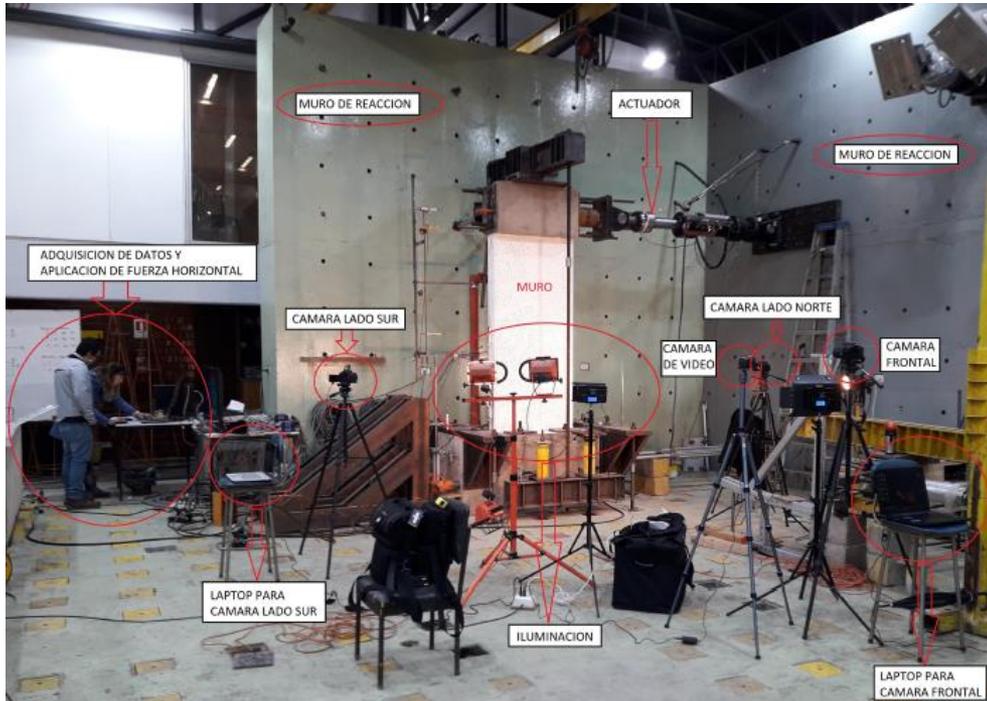
Wall Q



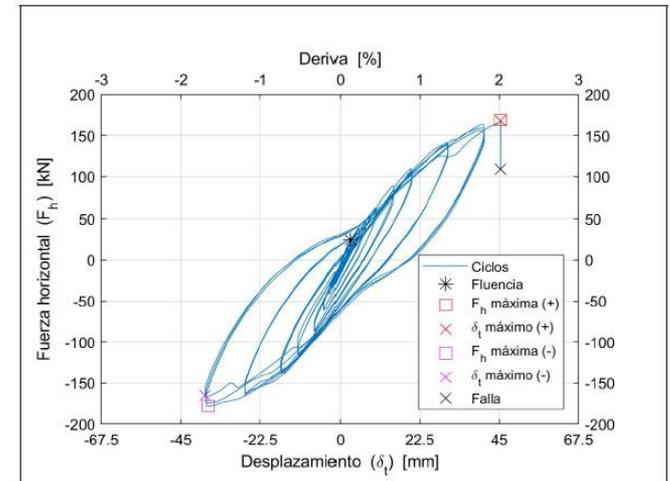
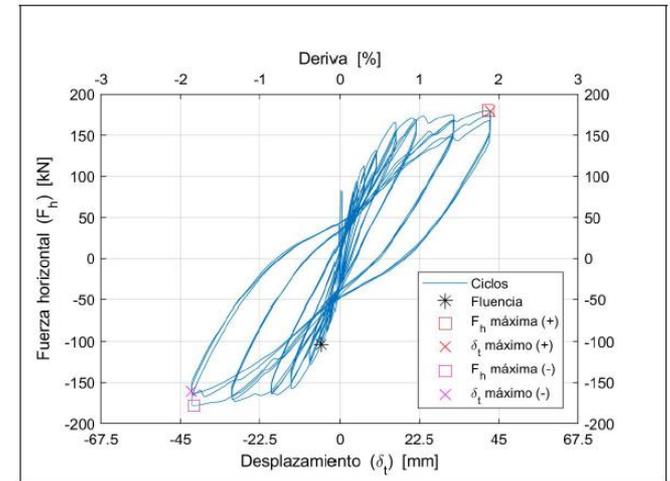
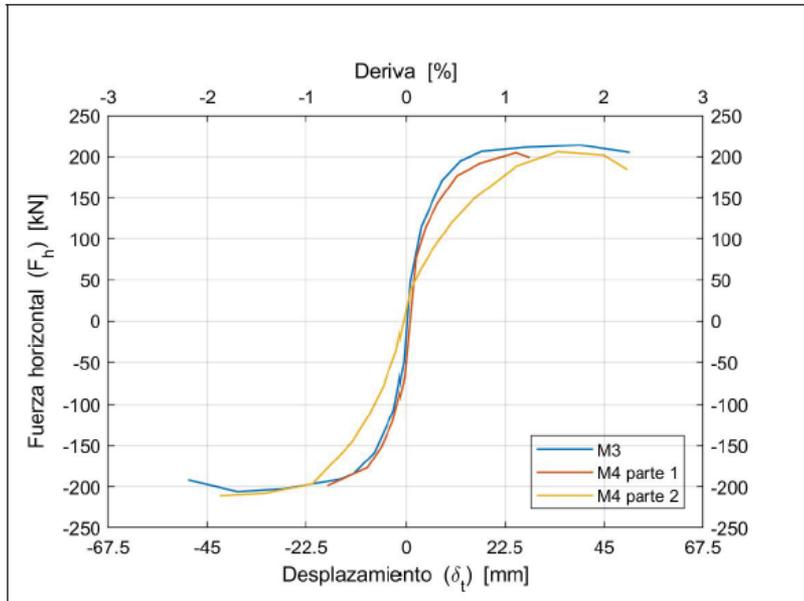
Repaired Wall Q, with
boundary element

- Seismic capacity of repaired reinforced concrete wall buildings, FONDECYT 1171062, CONICYT.
 - PI Matías Hube, CI 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





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





Thank you