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TEXTILE REINFORCED MORTAR STRENGTHENING OF A PRECAST REINFORCED CONCRETE WALL PANEL USING CARBON FIBER GRID

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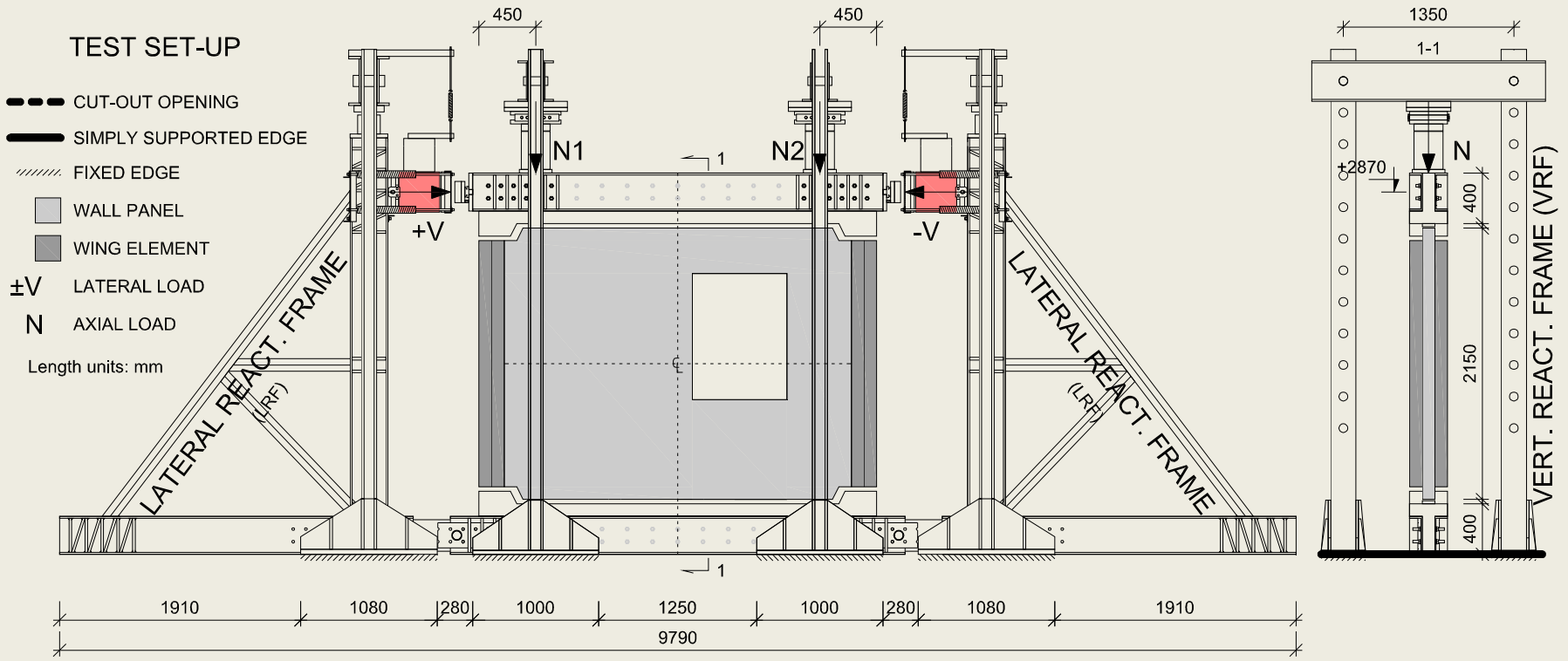
1. Motivation

- Large number of PRCLWP buildings across the country
- Interventions on them become more and more necessary after 50 years of existence
- Determine the seismic performance of the PRCWP
- Investigate the weakening induced by cut-outs in walls due to various reasons

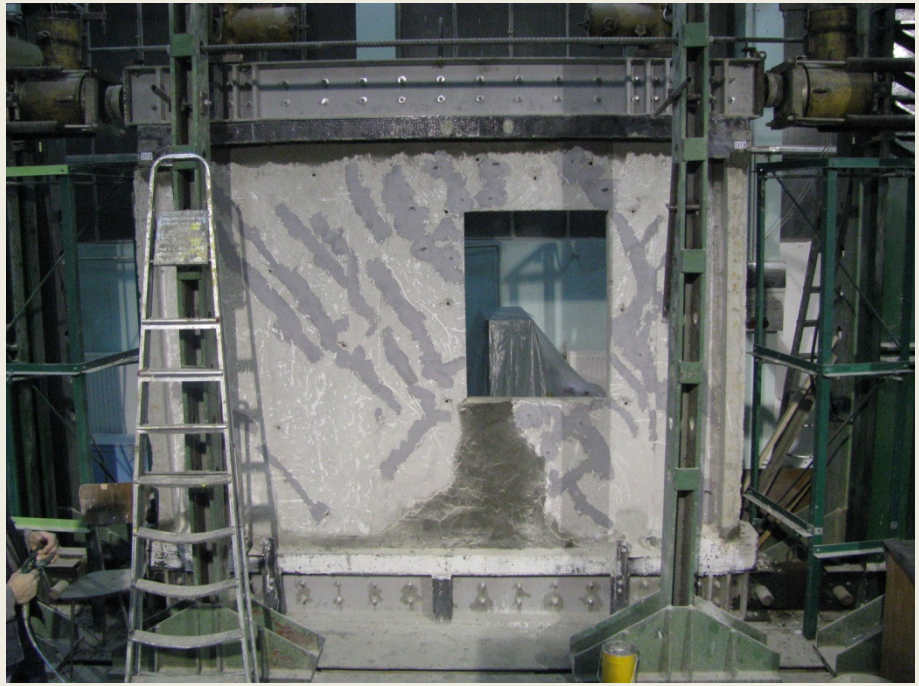
- Analyse various strengthening systems for initial load bearing capacity restoration of the elements
- Evaluate the material and labour costs for each strengthening system since few literature is known on this aspect

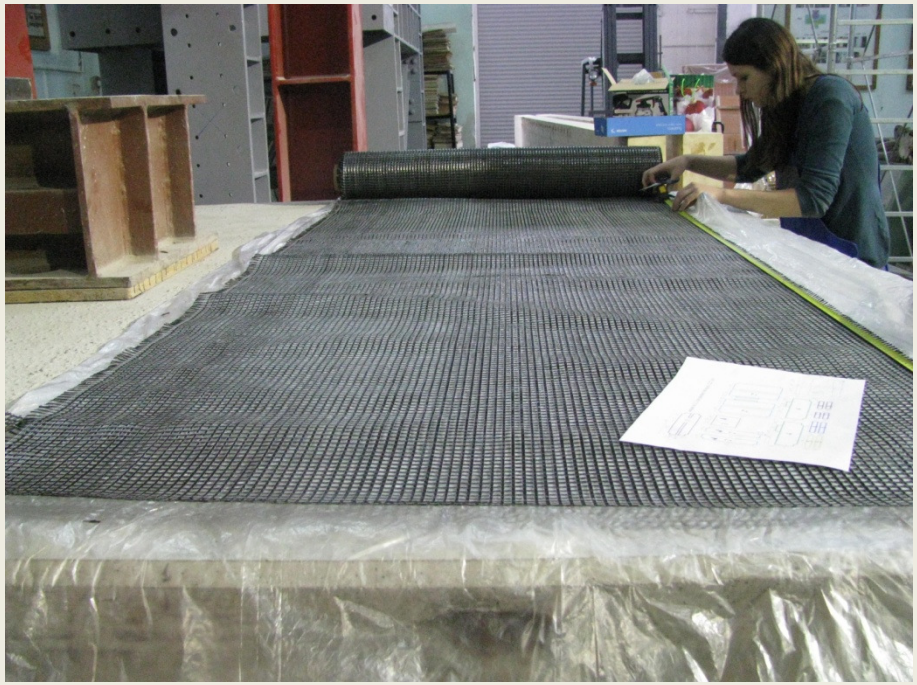
2. Experimental program description


TEST SET-UP
CUT-OUT OPENING
SIMPLY SUPPORTED EDGE
FIXED EDGE
WALL PANEL
WING ELEMENT
±V LATERAL LOAD
N AXIAL LOAD
Length units: mm
450
450
N1
N2
+V
-V
1
1
LATERAL REACT. FRAME (LRF)
LATERAL REACT. FRAME (LRF)
1910
1080
280
1000
1250
1000
280
1080
1910
9790
1350
1-1
N
+2870
400
2150
400
VERT. REACT. FRAME (VRF)

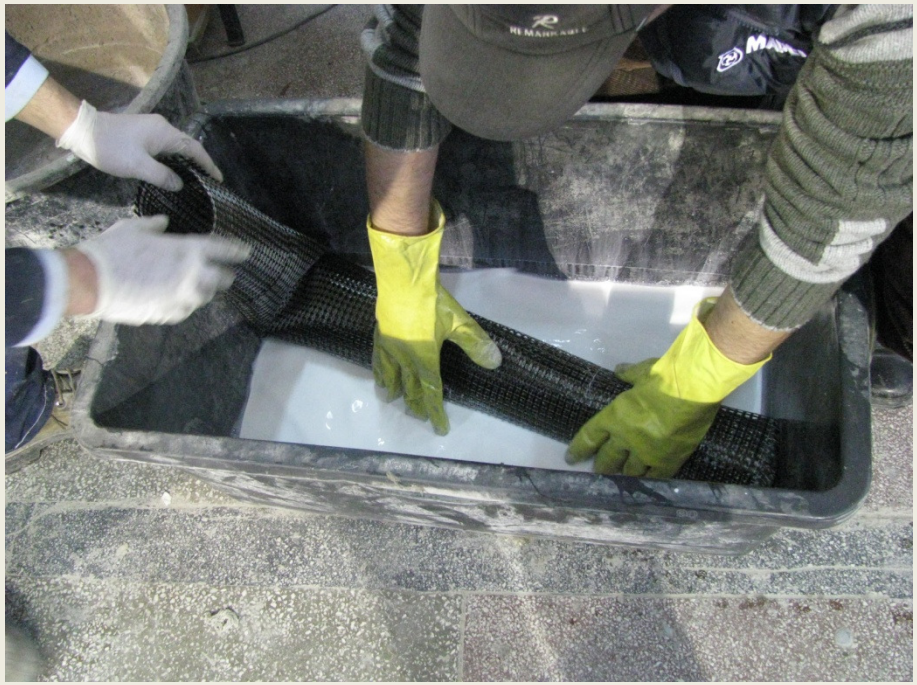
3. The strengthening strategy

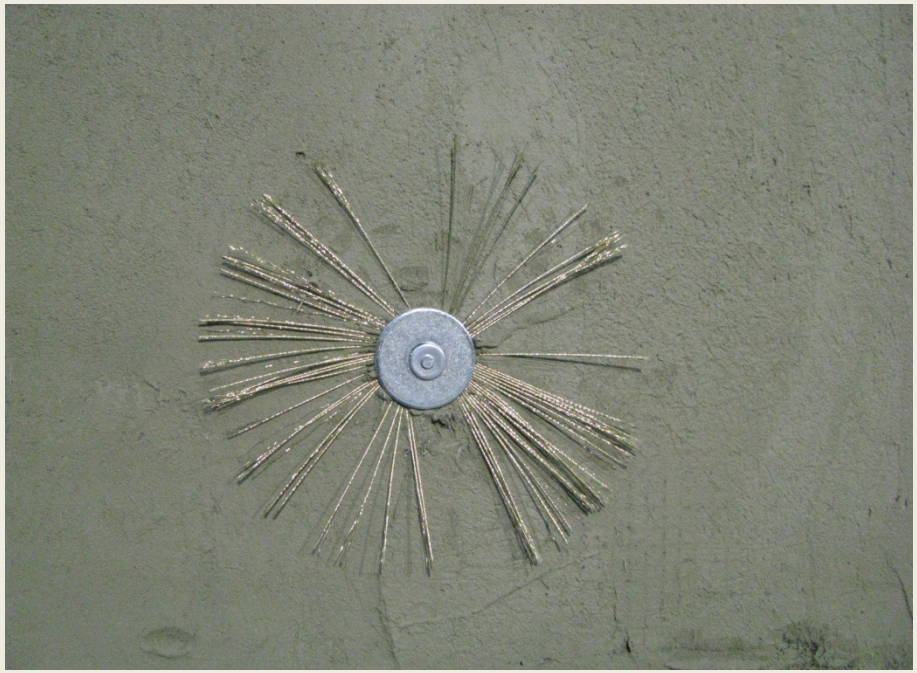
2 PRCWP DRIFT
11-L1-T 15.05 mm

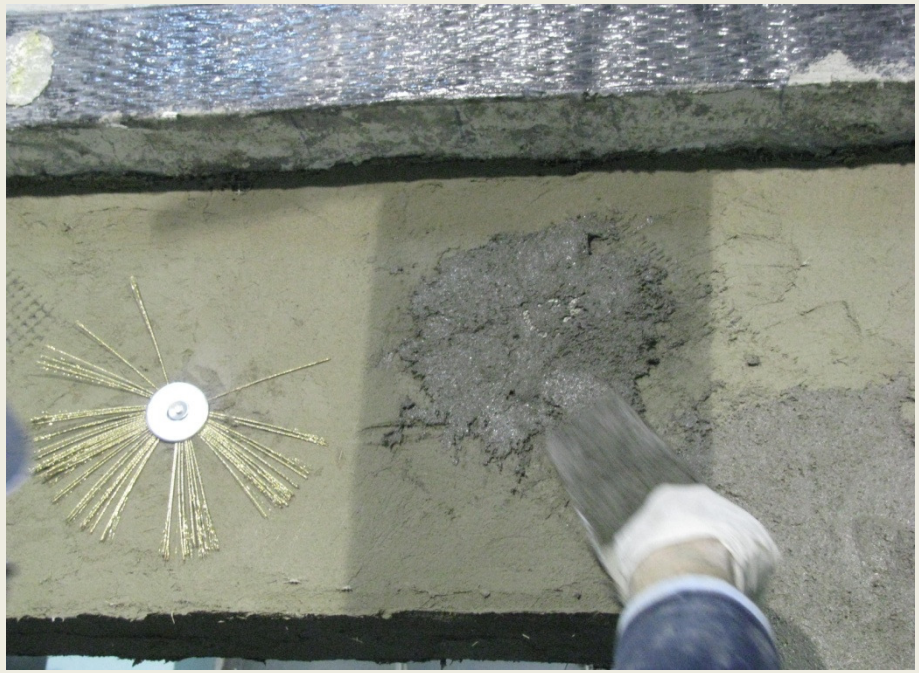


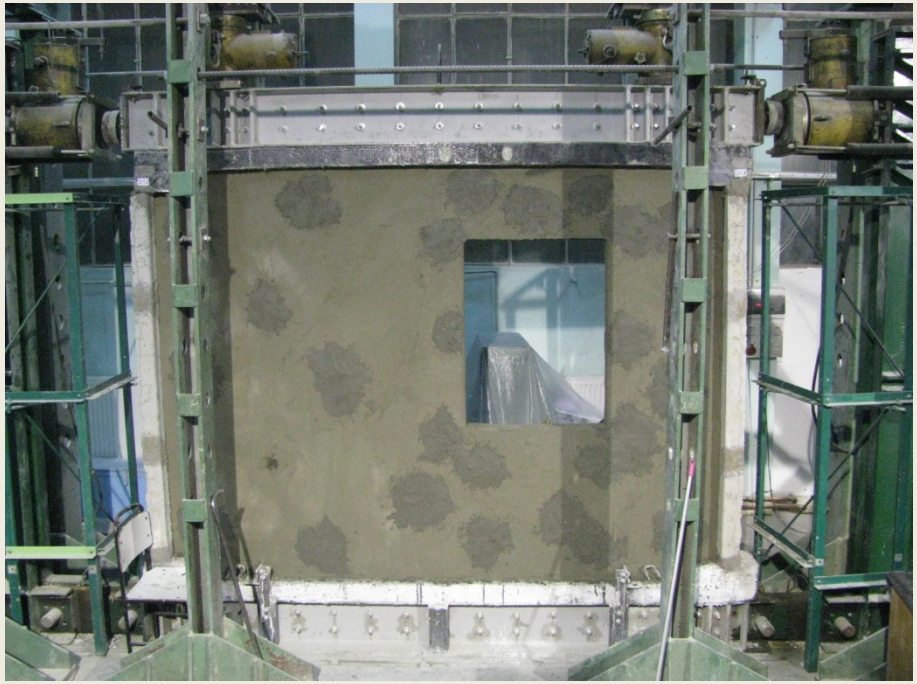


MAPEI



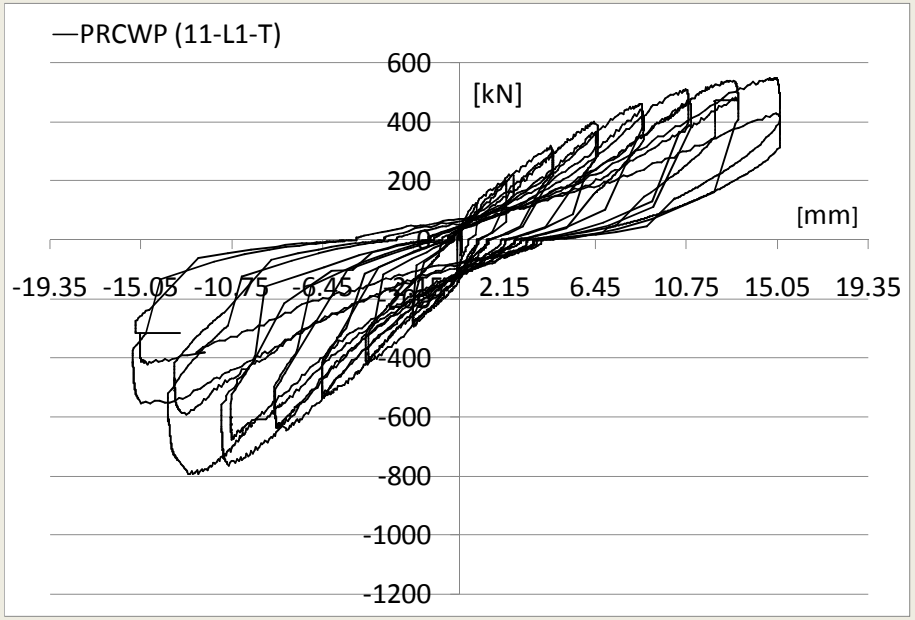


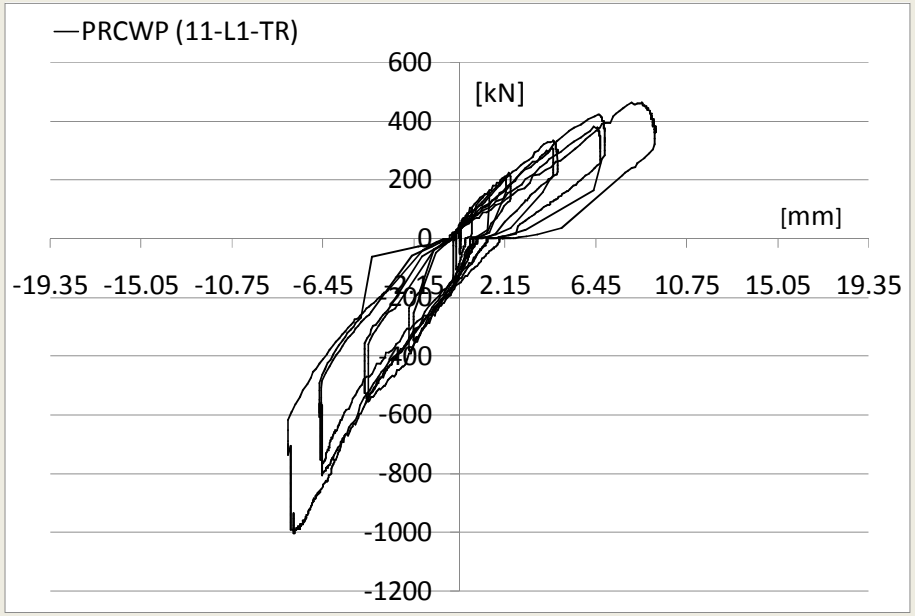


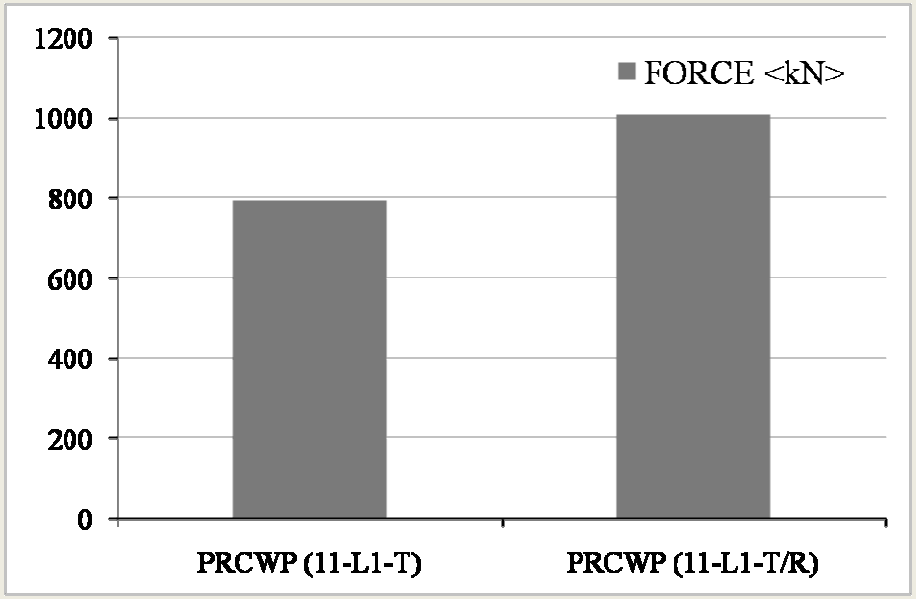


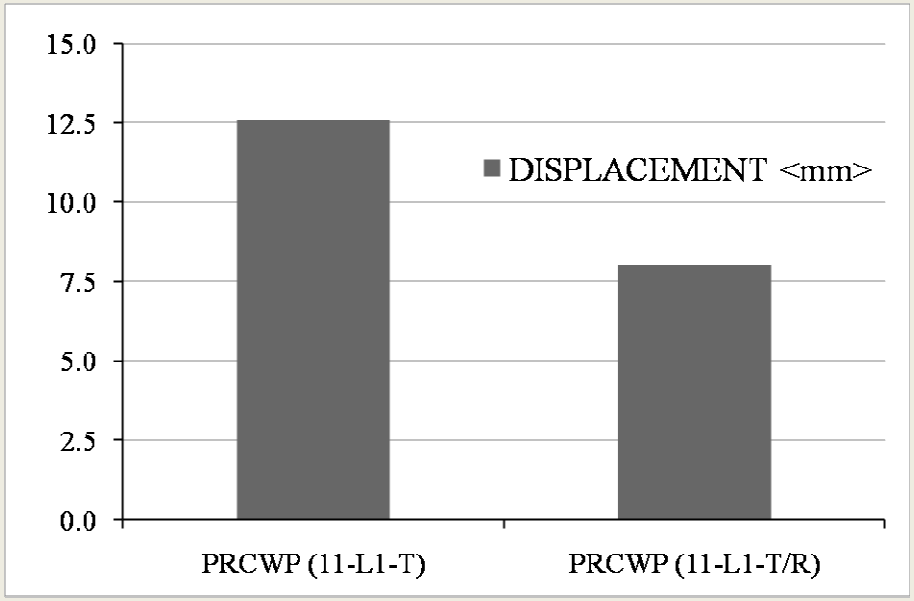
2
PRCWP DRIFT
11-L1-T/R 8.6 mm

4. Results


—PRCWP (11-L1-T)
[kN]
[mm]
600
400
200
0
-400
-600
-800
-1000
-1200
-19.35
-15.05
-10.75
-6.45
2.15
6.45
10.75
15.05
19.35


—PRCWP (11-L1-TR)
[kN]
[mm]
600
400
200
0
-400
-600
-800
-1000
-1200
-19.35
-15.05
-10.75
-6.45
2.15
6.45
10.75
15.05
19.35


1200
1000
800
600
400
200
0
FORCE <kN>
PRCWP (11-L1-T)
PRCWP (11-L1-T/R)


15.0
12.5
10.0
7.5
5.0
2.5
0.0
DISPLACEMENT <mm>
PRCWP (11-L1-T)
PRCWP (11-L1-T/R)

5. Conclusions

- In terms of maximum load supported by the element the PRCWP (11-L1-T) recorded 793.5 kN , while PRCWP (11-L1-T/R) 1007.5 kN.
- Drift level corresponding to the maximum load was 12.59 mm for the unstrengthened wall while for the post-damage strengthened one 8.02 mm.
- The PRCWP (11-L1-T/R) could not be taken to failure due to the available capacity of the testing facility, but analyzing the data one can remark that at a displacement level of 8.02 mm we have an increase in load bearing capacity of 60%.
- The strengthening system using TRM with CF grid proved to be the most expensive in the current experimental program (276.42 EUR/ m^2), but we have to take into consideration the fact that the crack injection was not performed in the other cases and also the idea of strengthening versus retrofitting implying the carbon fiber grid wraps raised the total price.

Thank you for your kind attention!