

Progetto DPC-ReLUI5 2024-2026 WP 5

Task 5.1 Interventi integrati e sostenibili per la riqualificazione di edifici esistenti

Sustainable masonry retrofitting system

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The UniCA research team conducted an extensive experimental campaign at the Materials Testing Laboratory of the Department of Civil and Environmental Engineering and Architecture, University of Cagliari. A total of 39 masonry wall specimens were constructed, using two different dimensions:

1.20 m × 1.20 m wall specimens (in accordance with ASTM E519) for diagonal compression tests,

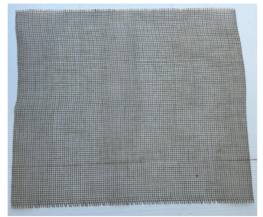
0.60 m × 0.60 m wall specimens, for both thermal conductance tests and subsequent diagonal compression tests to assess scaling effects.

All specimens were built with solid clay bricks (250 mm × 120 mm × 50 mm) using lime-based mortar and natural sand. Six retrofitting configurations were tested, employing flax fiber nets, jute fiber diatons, Sardinian sheep wool fiber (for composite mortar preparation), and a 70:30 mix of natural and recycled sand.

The results provide insights into the integrated improvement of the **structural and thermal behavior** of masonry walls reinforced with sustainable TRM systems. This work contributes to the development of **low-carbon, resource-efficient solutions** for the seismic and thermal upgrading of existing buildings, fully in line with the objectives of ReLUI5 WP5 – Task 5.1.



Bricks (25 cm x 12 cm x 50 cm)



Flax fiber nets



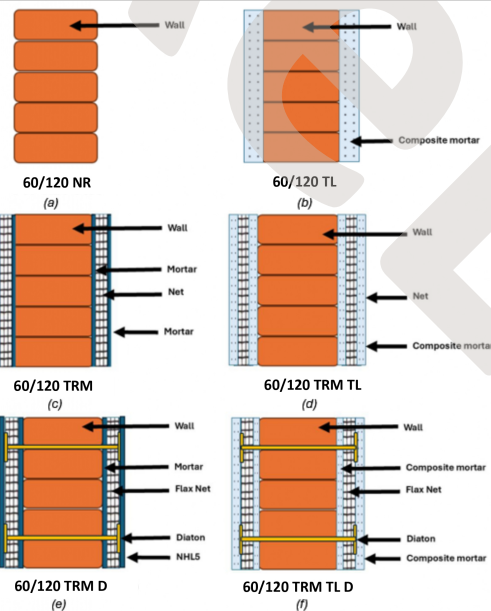
Jute fiber diatons



Chopped sheep wool fiber



Composite mortar (Natural sand (NS), recycled sand (RS), NHL (mortar), chopped sheep wool fiber)



(a) Non-retrofitted wall, (b) Retrofitted wall with thermal layer, (c) retrofitted wall with TRM system, (d) retrofitted wall with TRM system and thermal layer, (e) retrofitted wall with TRM system and diatons, and (f) retrofitted wall with TRM system, diatons and thermal layers.

Nomenclatures used for nominating the masonry walls.	
Nomenclatures	Full form/meaning
60	0.6 m × 0.6 m
120	1.2 m × 1.2 m
NR	Non-retrofitted
TL	Thermal Layer
TRM	Textile Reinforced Mortar
TRM TL	Textile Reinforced Mortar, Thermal layer
TRM D	Textile Reinforced Mortar, Diaton
TRM TL D	Textile Reinforced Mortar, Thermal layer and Diaton

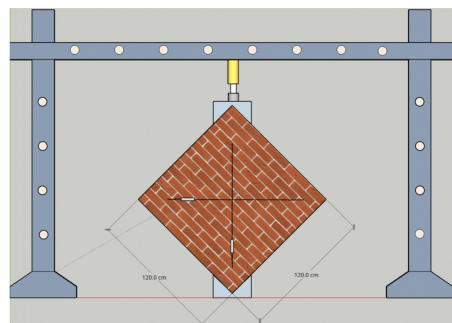


Masonry wall construction: (a) 0.60 m x 0.60 m, and (b) 1.2 m x 1.2 m.



Some masonry walls: (a) Un-strengthened masonry wall, (b) masonry wall retrofitted with TRM system, and (c) masonry wall retrofitted with TRM, diatons and thermal layers.

Integrated (structural and thermal) property evaluation



diagonal compression test



Thermal conductance test: (a) Climate chamber, and (b) masonry wall specimens placed at the central wall.

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