

Daniela BESANA, Elisabetta DORIA
Alessandro GRECO, Marco MORANDOTTI

BEYOND THE PROJECT

EXPLORING KNOWLEDGE, COMPLEXITY AND INNOVATION IN BUILDING

BOOK OF ABSTRACTS



Colloqui.AT.e 2026

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Exploring knowledge, complexity and
innovation in building
Pavia, 17-19 June 2026

Daniela BESANA, Elisabetta DORIA, Alessandro GRECO,
Marco MORANDOTTI

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BEYOND THE PROJECT

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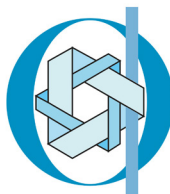
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A-CONSTRUCTION AND CONSERVATION HISTORY



D. Molin.

PRELIMINARY PERFORMANCE-BASED EVALUATION FRAMEWORK FOR THE STRENGTHENING OF THIN MASONRY VAULTS USING RECYCLED POLYMER COMPOSITE STRIPS

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Thin masonry vaults represent a structurally efficient historical construction system widely diffused throughout the Mediterranean basin. Their mechanical behaviour is primarily governed by geometry-driven form resistance and interlayer cohesion, while collapse mechanisms are typically associated with instability phenomena triggered by support settlements, horizontal actions, and lack of maintenance. In recent decades, externally bonded Fibre Reinforced Polymer (FRP) systems have been extensively adopted to enhance vault performance by increasing load-bearing and global stiffness. However, such systems may modify the original membrane-based behaviour of thin vaults, introducing stiffness increments that alter stress redistribution between layers. Furthermore, their reliance on virgin materials and high embodied energy raises additional concerns within the transition towards circular construction practices. This study proposes a

preliminary performance-based framework to investigate recycled polymer composite strips, manufactured from recycled poly-propylene (PP) derived from waste fishing nets and marble powder waste, as an alternative strengthening solution for thin masonry vaults. A comparative finite element modelling approach is adopted to analyse structural response and stress redistribution in unreinforced, FRP-strengthened, and recycled composite strips configurations. Rather than pursuing mechanical equivalence with conventional FRP systems, the framework explores the controlled elasticity of the recycled composite as a design parameter to mitigate excessive stiffness increases and preserve the original structural behaviour. By linking material properties, reinforcement layout, and global response indicators, the study contributes to the development of performance-oriented and circular strengthening strategies for historical masonry vaults.

KEYWORDS

THIN VAULTS, CONSOLIDATION, FRP, COMPOSITE MATERIAL, CIRCULARITY



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