

The CLT panels in structural restoration: characteristics and sustainability

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ABSTRACT

Wood can represent a valid and important alternative to the most commonly used structural materials for the restoration of masonry buildings, with a view to efficient, effective and "conscious" renovation. Today, the modern technologies allows to overcome the structural limits of solid wood due to its own anisotropy. The use of composite wood elements makes possible to obtain excellent mechanical performances that consent to evaluate aspects such as the use of low environmental impact retrofit strategies.

The aim of this work is the analysis of mechanical parameters related to CLT (cross laminated timber) panels in order to determine their possible use in the structural restoration of masonry buildings.

The CLT panels consist of solid wood planks superimposed so that each layer has the fibres rotated ninety degrees with respect to the adjacent layer. The layers (always in odd number and at least three) can be connected by discrete joints, pins and nails, or glued together. This configuration enables to product large structural elements with considerable thickness.

Two different experimental test campaigns were carried out on samples of panels with three and five glued layers. The purpose of experimentation activities was to evaluate the bending deformation of the wooden elements and shear strength of the bonding sections. All the tests were processed according to the provisions contained in the UNI standards. The test results were then compared with different theoretical calculation models to determine the one that best represents the tested material.

The tests outcomes have shown that some characteristics of the material, such as the remarkable ductility, open different scenarios of use for the CLT panels in the field of structural restoration of masonry buildings.

REFERENCES

- [1] Frunzio, G., D'Agostino, S. (2015) 'Between mechanics and architecture: the quest for the rules of the art', in *Masonry Structures: Between Mechanics and Architecture*, pp.1-19, Springer International Publishing
- [2] Benedetti, A., Cennamo, C, Monaco, M. (1999). *Evoluzione del concetto di consolidamento alle strutture murarie attraverso le innovazioni tecnologiche*, In: *Atti del III Convegno Nazionale Arco, Manutenzione e Recupero della Città Storica, Conservazione e Sicurezza*, Roma, Italy: Gangemi Editore.
- [3] BOSCOLO BIELO, Marco. *La Progettazione delle strutture in legno*. ed. Roma: Legislazione Tecnica s.r.l. 2014