

Mechanical characterization of energy dissipation devices in retrofit solution of reinforced concrete frames coupled with solid wood panels

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ABSTRACT

Deep renovation interventions on existing buildings remain currently unattractive due to technical, financial and cultural/social barriers. Now that the European Union's Energy Performance Directive 2018 aims to "reach the long-term greenhouse gas emission goal and decarbonize the building stock", Member States may use their long-term renovation strategies to address risks also related to fire hazards and seismic loads in addition to energy renovation. This opens a wider market for innovative approaches in retrofit of existing buildings.

The current paper illustrates the first structural/numerical outcomes of an ongoing multidisciplinary research, aiming to integrate energy, seismic and architectural renovation interventions through an innovative and combinable technological solution, applicable to non-historic RC frame buildings (i.e. built after 1950) and easily adaptable to specific climatic conditions, seismicity levels and other boundary conditions. Hence, the proposed solution will contribute to the de-carbonization of the EU building stock, reducing the occurrence of natural hazards related to climate changes, and, at the same time, to the improvement of the social resilience against earthquakes and to the enhancement of buildings' architectural image.

The retrofit technology consists in the external application of modular prefabricated Cross Laminated Timber (CLT) panels on the existing perimetral walls. These panels are connected to the beams of two consecutive floors by means of friction dampers and provide additional lateral stiffness and strength to the existing structure, thus reducing the story drift demand in case of earthquake. The dampers cut the force transmitted by the CLT panel to the structure and dissipate energy, which further reduce the drift demand. Strength, stiffness and dissipation capacity provided by the system are controlled by modulating the thickness and the number of CLT panels, as well as the dampers size.

In this research phase, some damper prototypes have been designed in order to optimize both mechanical performance and production cost. Detailed numerical models allowed to check and verify the hand calculation procedures proposed for the dissipative connections. The results of some preliminary test will be presented and discussed in this paper, also in relation with the future full-scale campaign of the proposed technology.

REFERENCES

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