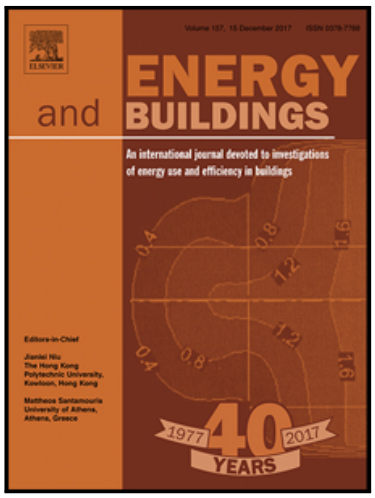


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# Thermal insulation performance of bamboo- and wood-based shear walls in light-frame buildings

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**Abstract**

Light-frame buildings commonly employ shear wall realized by framing and sheathing panels made of wood materials. Recently, much research has focused on the use of engineered bamboo composites to substitute wood in light-frame buildings. The aim of this study is to investigate the thermal insulation performances of bamboo- and wood-based shear walls in light-frame buildings. First, an archetype wall with characteristics similar to those commonly employed in wood shear walls was defined. Starting from the archetype wall, four specific configurations representing one classical full wood-based configuration, one hybrid bamboo-wood-based configuration and two full bamboo-based configurations with different studs thickness were identified to be tested.

The thermal conductivity of the materials composing the wall was measured using a hot plate apparatus varying the temperature in the range of 10 to 50°C. The anisotropy of the thermal conductivity was analyzed for the wood and bamboo materials. The four specific configurations of the archetype wall were tested in a guarded hot box apparatus in order to determine the thermal resistance and transmittance. The experimental results were compared with the estimates obtained using the ISO 6946 procedure and a Finite Element (FE) model of the wall, both adopting the thermal conductivity previously measured. A good agreement between the experiments and the models was found with the better results obtained with the FE model. Finally, the so-validated FE model was used to optimize the archetype wall with only bamboo-based materials to the Chinese thermal regions, showing the possibility of real application in the practice.

All the results indicate that the thermal insulation performances of engineered bamboo composites are slightly lower compared with wood ones, both at the material and the shear wall levels. This indicates that there is the possibility of using bamboo-based shear walls in light-frame buildings ensuring thermal insulation performances similar to classical wood-based one.

*Keywords:* Shear walls; Bamboo; Wood; Thermal insulation; Building energy; Building envelopes; Light-frame buildings.

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