

Comportement dynamique et Inertie thermique des bâtiments biosourcés,

Thermal performance of bio-based buildings with a focus on summer comfort

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Bio-based buildings, such as massive wood structures or timber-frame constructions, can be very efficient in winter, ensuring excellent thermal comfort with low energy demand for heating.

However, there is still no consensus about their performance in summer. For example, the density of bio-based products is lower than that of the masonry, but their specific heat is higher. In addition, the latent effect related to their hygroscopic behavior may mitigate or accentuate the overheating, depending on specific boundary conditions. These questions will be investigated in this internship, beginning with the impact of thermal inertia of bio-based structures on summer thermal comfort.

This internship will be conducted within the European project Wood Waste Panel, focusing on low-carbon and zero-waste technologies for building construction. This initiative aims to develop an innovative manufacturing technology for bio-based building products—multi-layer panels—crafted from functional bio-composites. These panels will be produced utilizing recycled waste from the production site and wood waste from construction demolition.

The internship will use the results from an experimental test cell constructed and monitored in Latvia. As a first step analyses of monitored data will be performed. Then numerical simulations of this cell will be performed, using a building energy performance software such as EnergyPlus, and compared with the monitored data. Then using numerical simulations, a specific study on thermal comfort will be conducted, by comparing this bio-based structure to a more traditional one and performing a parametric study.

Deeper analyses, using more advanced simulation with thorough representation of coupled heat and mass transfers, and larger variation of boundary conditions (future climate scenarios, stochastic occupants' behavior...) could be proposed as a PhD topic in a continuation of this study.

The intern will be hosted at LOCIE (Laboratoire procédés énergie bâtiment) working on energy aspects and their integration into the building and its environment, both for new and existing buildings. The laboratory, UMR USMB-CNRS is located at INES on Savoie-Technolac campus.

Duration: 3 to 6 months, Master level, beginning: March 2024.

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To apply please send CV + cover letter + recent academic grades