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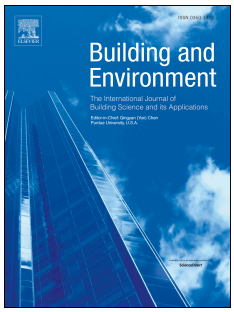

The modelling gap: Quantifying the discrepancy in the representation of thermal mass in building simulation

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The modelling gap: quantifying the discrepancy in the representation of thermal mass in building simulation

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KEYWORDS

Insulating Concrete Formwork; Building Performance Simulation; Default Settings; Modelling Uncertainty; Impact of Wind Variations; Solar Timing

ABSTRACT

Enhanced fabric performance is fundamental to reduce the energy consumption in buildings. Research has shown that the thermal mass of the fabric can be used as a passive design strategy to reduce energy use for space conditioning. Concrete is a high density material, therefore said to have high thermal mass. Insulating concrete formwork (ICF) consists of cast in-situ concrete poured between two layers of insulation. ICF is generally perceived as a thermally lightweight construction, although previous field studies indicated that ICF shows evidence of heat storage effects.

There is a need for accurate performance prediction when designing new buildings. This is challenging in particular when using advanced or new methods (such as ICF), that are not yet well researched. Building Performance Simulation (BPS) is often used to predict the thermal performance of buildings. Large discrepancies can occur in the simulation predictions provided by different BPS tools. In many cases assumptions embedded within the tools are outside of the modeller's control. At other times, users are required to make decisions on whether to rely on the default settings or to specify the input values and algorithms to be used in the simulation. This paper investigates the "modelling gap", the impact of default settings and the implications of the various calculation algorithms on the results divergence in thermal mass simulation using different tools. ICF is compared with low and high thermal mass constructions. The results indicated that the modelling uncertainties accounted for up to 26% of the variation in the simulation predictions.