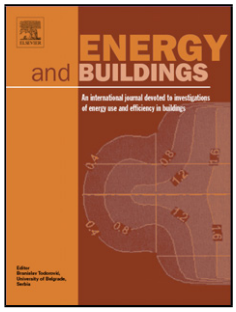

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Suspended timber ground floors: heat loss reduction potential of insulation interventions

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Abstract

There are approximately 10 million suspended timber ground floor constructions in the UK and millions more globally. However, it is unknown how many of these floors are insulated and their performance has not been widely investigated. This study investigates the impact of retrofitting insulation on the thermal performance of suspended timber ground floors through the detailed investigation of a UK case study dwelling. Practical and buildable interventions were undertaken: fully-filling the floor void with EPS beads, and 100mm woodfibre insulation between the joists. The performance of both interventions was monitored by high-resolution in-situ heat-flow monitoring in 27 floor locations, allowing for comparison with the uninsulated floor and with modelled results. While floors often remain uninsulated due to the disruption of retrospective works, this study highlighted potentially significant heat loss reductions: the mean whole floor U-value dropped by 65% for woodfibre insulation and 92% for bead-insulation which also benefited from sealed airbricks. A disparity between the in-situ measured and modelled performance was observed; this gap reduced the better insulated the floor was. The findings have implications for policy, retrofit decision-making and carbon emission reduction stock models, especially given the modelled underestimation of floor heat loss, impact of interventions and assumed financial payback for this study.

Keywords: *in-situ U-values; pre-1919 housing; retrofit; suspended timber ground floors; thermal performance; insulation interventions*

Nomenclature	
U, U_{mean}, U_p, U_{wf}, U_{avg}	Thermal transmittance or U-value, $Wm^{-2}K^{-1}$; U_{mean} is the estimated in-situ U-value obtained from a mean of ratios of point U-values (U_p). U_p is a point U-value and is the term used as a generic description of the small area-based in-situ U-value measurement on a certain location on the floor. U_{wf} is the in-situ estimated whole floor U-value derived from area-weighted U_p-values. U_{avg} is the in-situ estimated whole floor U-value derived from a simple average of all U_p-values.
HF1, HF2,…	Heat flux sensor location 1, 2,…