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Measured and simulated thermal behaviour in rammed earth houses in a hot-arid climate. Part B: Comfort

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Abstract

Heating and cooling of residential buildings consumes around ten percent of the world's energy. One approach for reducing these costs is solar passive design using building materials with high thermal mass such as Rammed Earth (RE). Several studies have examined the performance of small RE structures or individual rooms within RE dwellings and have demonstrated the material's capacity to provide comfortable internal conditions passively. However, there is a lack of scientific evidence about the performance of full RE houses in real-world settings spanning several seasons. This research investigated the thermal performance of RE structures prior to occupancy and over the course of an occupied year. Two custom-designed houses were built in the hot-arid city of Kalgoorlie-Boulder, Western Australia: one with traditional solid RE walls and the other with walls with an insulating polystyrene core (iRE). Otherwise the houses were identical in orientation and design.

This study is presented in two Parts. Part A examined the houses' performance without occupants: This Part examines their occupied behaviour in terms of the occupants' thermal comfort. Comfort was examined using qualitative and quantitative data from sensor measurements as well as occupant surveys and