

NEWS ARTICLE

CLAYBRICK OPTIMISES THERMAL PERFORMANCE IN WALLING **Clay Brick Walling Ensures Optimal Energy Efficiency of Houses throughout South Africa**

The importance of thermal mass naturally inherent in clay bricks, as a critical thermal performance property for South Africa's climate, where well defined average diurnal temperature swings characterise the six major climatic zones, is a well researched scientifically proven fact.

While being a useful measure of thermal resistance of the wall itself, 8 years of empirical studies at the University of Newcastle, Priority Energy Research Centre in Australia has led to the conclusion that a walling material's R value is not representative of the thermal value for energy efficient house design properties of a material.

The findings of research carried out by WSP Energy Africa for ClayBrick.org endorses the University of Newcastle research that thermal mass, combined with appropriate levels of resistance lead to optimal thermal performance outcomes. In climates typical of South Africa, high R-value lightweight walling does not have the thermal capacity to provide the necessary thermal lag to achieve the requisite thermal comfort and optimal thermal performance.

The WSP Energy Africa research that builds on the equations described in the CR Method, defines how using deemed to satisfy principles, homes built with a good combination of thermal capacity and resistance can best optimise thermal comfort for the occupants yielding the lowest energy consumption for heating and cooling of internal spaces.

This research correlates with the findings of thermal modelling studies of naturally ventilated 132 m² CSIR, 40 m² low cost and 130m² standard house types throughout South Africa's six major climatic zones, making it quite clear that if homes of the future are to achieve energy reduction targets, external walls must contain reasonable levels of thermal capacity [derived from mass] supplemented by varying levels of thermal resistance as appropriate for the climatic zone. Double skin clay brick walling brings both properties to the table cost effectively. Lightweight walling associated with lightweight system type building, such as Light Steel Frame Building, can only bring resistance and such walls consistently led to sub optimal thermal outcomes in all the studies.

So how does thermal mass help to make the thermal performance of a clay brick house so much more superior to highly insulated lightweight walled alternates? It provides the propensity for clay bricks to act as thermal batteries slowly absorbing, storing and then slowly releasing the heat. In summer the thermal mass responds slowly to temperature change compared to lightweight materials; such that the hottest part of the day is often past before the heat reaches the inside, this keeping internal spaces cooler for longer. In winter, radiant heat is slowly absorbed and stored in the internal clay brick walls during the day, this heat slowly released in the evening when it is needed most, keeping internal spaces warmer for longer. The net result is a flatter average thermal response curve, this facilitating superior thermal comfort for longer compared to insulated lightweight alternates and with concomitant lower peak heating and cooling loads.

Conversely, during the long high summer temperature period's, heat passes comparatively quickly through the insulated lightweight walled alternates.

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The high internal temperatures and resultant discomfort are thus experienced for longer with the discomfort becoming accentuated when the peak outdoor temperatures at the hottest part of the day quickly migrate through to the inside creating what may best be described as a 'hotbox'.

The research emphasises the substantive fallacy of the superior comfort and lower heating and cooling energy claims made by the proponents of lightweight walled systems over comparable clay brick walled houses in all climatic zones of South Africa. Clay brick walled houses provide the benchmark for lowest life cycle energy cost outcomes for houses in South Africa and the extreme durability and structural integrity of clay brick walled houses, that afford lifecycles beyond 100 years, thereby obviating the need for 'extreme makeovers' involving the replacement of less durable external walling materials that provide for lesser lifecycles, is a real plus factor in the pursuit of true sustainability.

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Reference Sources:

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- Thermal Modelling of a 132m² CSIR House using Visual DOE (Structatherm Projects – Howard Harris 2009)
- Thermal Modelling of a 40m² NHBRC Subsidy House using Design Builder and Energy Plus (WSP Green by Design 2009 and 2010)
- Thermal Modelling of a 130m² Standard House using Design Builder and Energy Plus (WSP Green by Design 2010)