NEWS ARTICLE

CLAY BRICK ~ MORE THAN JUST ANOTHER BRICK IN THE WALL

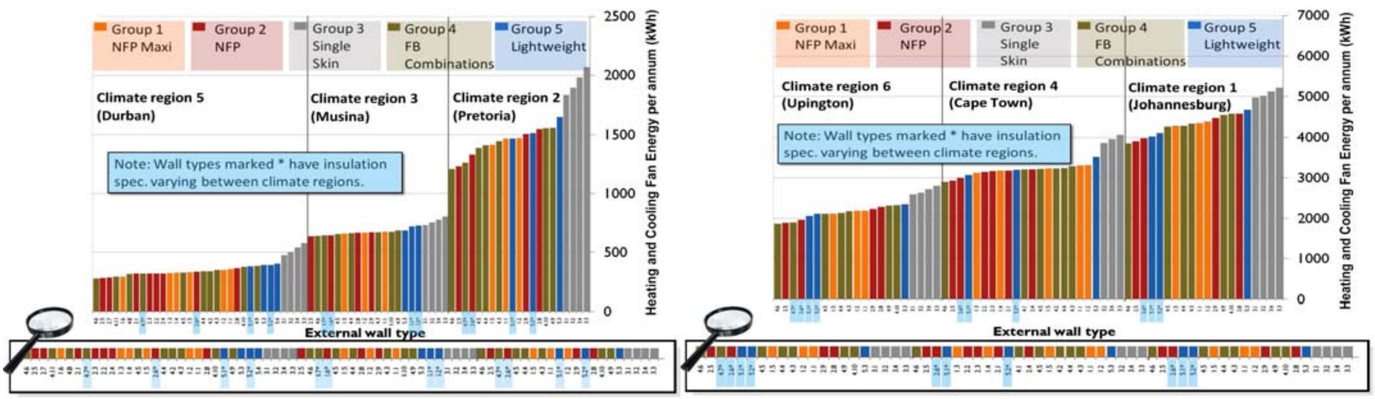
Clay Brick Walling for Optimal Energy Efficiency of Houses throughout South Africa

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 and 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's 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'.



Annual Heating & Cooling Energy Use According to Climatic Regions in South Africa

This research correlates with the findings of thermal modelling studies of naturally ventilated 132m² CSIR, 40m² low cost and 130m² standard house types in 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?

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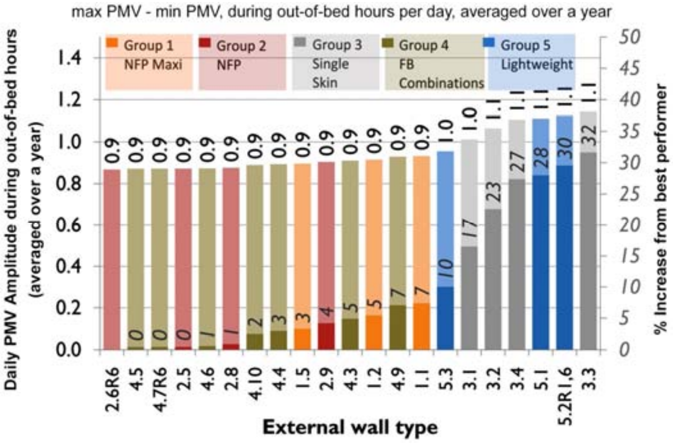
It provides the propensity for clay bricks to act as thermal batteries by slowly absorbing, storing and releasing heat energy. In summer, the thermal mass responds slowly to temperature changes compared to lightweight materials, such that the hottest part of the day is often past before the heat reaches the inside, thus 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 is 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, thus facilitating superior thermal comfort for longer compared to insulated lightweight alternates and with concomitant lower peak heating and cooling loads.



Left: Passive Case Thermal Comfort Daily PMV Amplitude ~ Upington

Vast daily PMV amplitude (measuring thermal discomfort) explains why single skin and lightweight walling consume so much more energy than cavity brick, double skin or insulated brick walls; they have to compensate by importing heating and cooling energy.

Conversely, during the long high summer temperature periods, heat passes comparatively quickly through the insulated lightweight walled alternates. The high internal temperatures and resultant discomfort are thus experienced for longer, with discomfort levels becoming accentuated when the peak outdoor temperatures at the hottest part of the day quickly migrates 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 the lowest life cycle energy cost outcomes for houses in South Africa. The extreme durability and structural integrity of clay brick walled houses afford lifecycles way beyond 100 years, thereby obviating the need for ‘extreme makeovers’ involving the replacement of less durable external walling materials that provide for lesser lifecycles - a real plus factor in the pursuit of true sustainability.

ENDS.

Reference Sources:

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