NEWS ARTICLE

NOTHING COMPARES TO CLAY BRICK IN A WALL

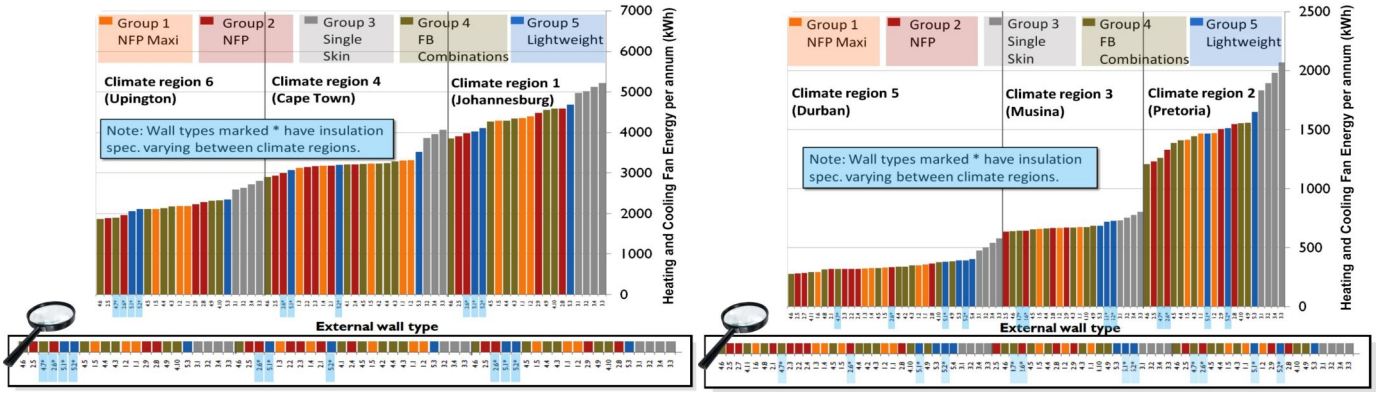
Lightweight Walled Alternate Building Systems No Match to Double Skin Clay Brick Construction

The broad claims made by providers of Alternative Building Technologies around the superior thermal performance of lightweight walled systems compared to clay brick walled houses, has been shown by science and extensive thermal modelling studies of different house types in all six major climatic zones of South Africa, to be pie in the sky.

Typical claims around 'superior thermal performance' based on the 'insulation' values of different walling materials, that have been proven not to be true, generally, for houses in South Africa, include:

- "The exceptional thermal insulation properties in the EPS allows Imison structures to be substantially warmer in winter and cooler in the summer, and up to 67% more energy efficient than a comparable brick and mortar house."
- "Steel frame homes are far more energy efficient. All the added insulation in a steel home's walls and cavities means that the steel frame homeowner can reduce their heating and cooling costs by as much as 35%, when compared to the same home built out of a wood frame. Brick houses without insulation will perform worse."
- "Light Steel Frame Building is more energy efficient than heavy construction methods over the design life."
- "A standard Ikhaya Futurehouse System (IFHS) wall has a thermal insulation value at least six times better than a 230mm plastered brick wall which improves building comfort and reduces energy required for heating and cooling."

The premise that the walls R- value [resistance] alone is the sole determiner of the thermal efficiency and comfort inside a house, has long been debunked, by 8 years of empirical research conducted at the University of Newcastle Priority Energy Research Centre. The research concluded that as a 'steady state' measure, the walls R-value has a role to play in thermal efficiency, but it is certainly not representative of the thermal value for energy efficient house design properties of a material.



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

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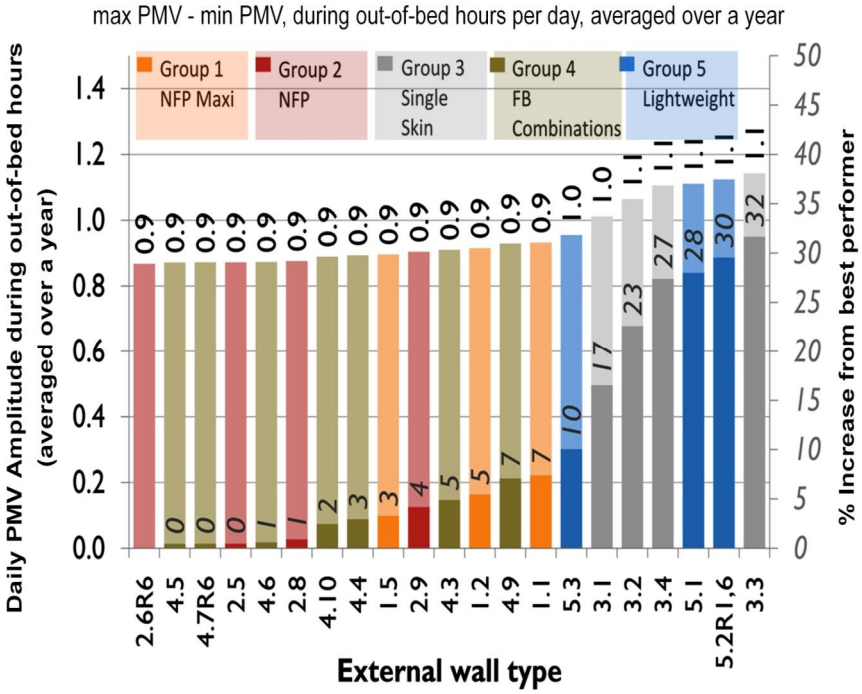
In the study modules constructed of different walling materials, yet with the same R-values, yielded very different thermal comfort levels and required very different energy levels for heating and cooling to maintain comfort levels. Notably double skin clay brick walled modules with insulation in the cavity outperformed insulated lightweight walled modules with the same R-value. The essential differentiator underpinning the superior results was the thermal capacity provided by the clay bricks - their natural ability to slowly absorb, store and release heat, 5 to 7 times more effectively than lightweight walling alternates.

So, while thermal resistance or a walls R-value is an important thermal performance property, particularly in European climates where average diurnal temperature swings are below 7°C and where there are long drawn out winters with low absolute temperatures for long periods and little solar gain, this requires greater levels of insulation to keep the heat in and the cold out. South African climates, with their well defined average diurnal temperature ranges and long hot summer months, requires high thermal mass to achieve optimum thermal outcomes.



Passive Case Thermal Comfort Daily PMV Amplitude ~ Upington

Insulated lightweight walls, on the other hand, have no capacity to self regulate and in the South African climate this led to heat build up in summer, when the heat during the hottest part of the day quickly moved to the inside causing extreme discomfort akin to a hotbox. These long periods of high levels of discomfort led to the highest cooling energy requirements for the lightweight walled system building alternates compared to the clay brick walled houses.

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Science and Thermal Modelling of different house types in South Africa's six major climatic zones that validates the thermal mass of clay brick walls as a critical thermal performance property for optimising thermal comfort in South Africa's climates include:

- CR Product Study – WSP Energy Africa (Prof. D.Holm, H.H.Harris 2010)
- The Prediction of the Thermal Performance of Buildings by the CR Method CSIR Research Report BBR 396 1981, (J.D.Wentzell, R.J.Page-Shipp and J.A.Venter)
- Thermal Modelling of a 132m² CSIR House using Visual DOE (Structatherm Projects – Howard Harris 2009)
- Thermal Modelling of a 40 m² 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)

The WSP Energy Africa study found that using deemed-to-satisfy principals, thermal mass combined with different levels of resistance best optimise thermal comfort for the occupants, yielding the lowest energy consumption for heating and cooling of internal spaces of naturally ventilated buildings in South Africa. The clay brick walls brought both thermal capacity and resistance to the table. Lightweight walls could only provide resistance.

The thermal modelling studies of 132m² CSIR, 40m² low cost and 130m² standard house types here in South Africa, correlated with those of 8 years of empirical research at the University of Newcastle in Australia and the WSP Energy Africa CR Product research. The double skin clay brick walled houses provided the optimal thermal performance outcomes in all six major climatic zones – lowest life cycle energy cost, leaving absolutely no doubt that if homes of the future are to achieve energy reduction targets, external walls must contain reasonable levels of thermal capacity, and where necessary be supplemented by levels of thermal resistance appropriate for the climatic zone. Simply put, clay brick brings both properties to the table most cost effectively. Lightweight walls can only bring resistance, and resistance on its own leads to sub-optimal thermal performance outcomes for heating and cooling internal spaces.

Add the many economic, social and environmental benefits that clay brick walling provides to the superior thermal performance of a house over its life cycle, then there is no debate - clay brick walled houses offer a substantive and holistic sustainable solution for housing throughout South Africa ~ for good.

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