



FACTSHEET #13

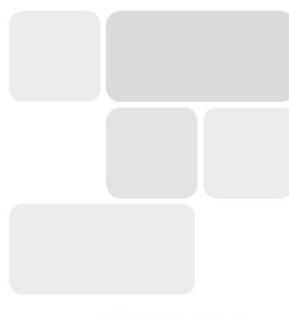
Energy-efficiency at Stand 47 Monaghan Farm

In launching the ABT house at Stand 47 Monaghan farm, it was proposed that high levels of energy efficiency could be expected due to its lightweight partition walling envelope and internal walls.

Technical Specialist Peter Kidger reviews this assertion. So would the home on Stand 47 Monaghan Farm would be even more energy efficient if built from clay brick?

TECHNICAL CONTRIBUTOR

Peter Kidger
CBA Technical Consultant



		SECURE	SAVE	SUSTAIN	STYLE	 environment-friendly
						

CLAYBRICK.ORG
BUILD A LASTING LEGACY



ENERGY EFFICIENCY AT STAND 47 MONAGHAN FARM

Stand 47 Monaghan Farm has been presented by the material supplier Saint Gobain as the solution to energy efficiency in residential homes. Michelle Cerruti, head of residential at Saint Gobain, claims that the Light Steel frame (LSF) house achieved high levels of energy efficiency due to the exclusion of thermal mass from the walling envelope and internal partition walls (Business Day Home Front, 20 February 2015 article 'A testament to modern materials').

She references the findings of a 2012 CSIR study to declare:

“The significant amount of electricity required to heat and cool the internal spaces of a brick building can be ascribed to its thermal mass. Apart from having to heat the air inside the building, the walls of the masonry building absorb some of the heat, resulting in additional energy consumption. The inverse happens during cooling, when the heavy masonry walls have to be cooled down along with the air inside the building”.

Her assertions contradict the findings of both international and South African research.

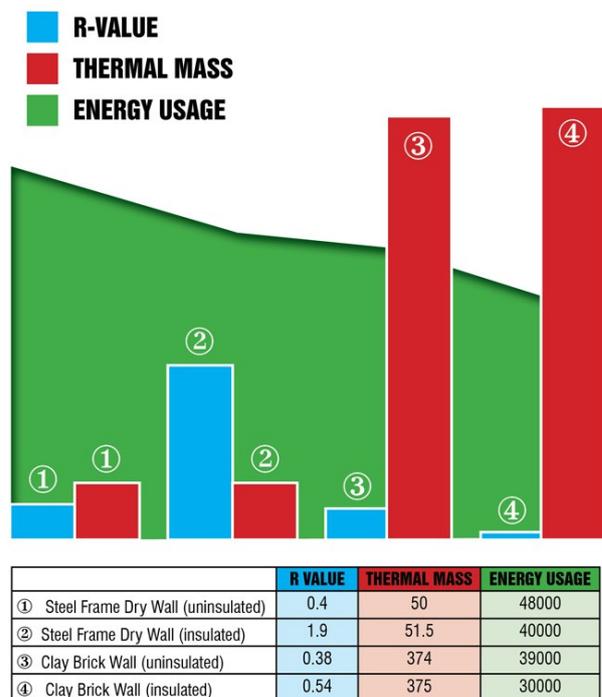
INTERNATIONAL RESEARCH BACKGROUND

An eight-year empirical Research Study at the University of Newcastle Australia, continually measured internal temperatures of identical houses with different wall construction types under real world conditions.

The findings were emphatic - walling with thermal mass consistently provided superior levels of thermal comfort and lower energy usage than the lightweight walling alternates.

For more detail please reference www.thinkbrick.com.au (Energy efficiency and the environment) - Edition 4.

The Thermal mass of clay brick keeps indoor temperatures within the comfort range for much longer in summer than insulated lightweight external walling is able to do. This results in less cooling energy used. In winter heat absorbed by the internal brickwork during the day, is then slowly released at night, reducing heating required.

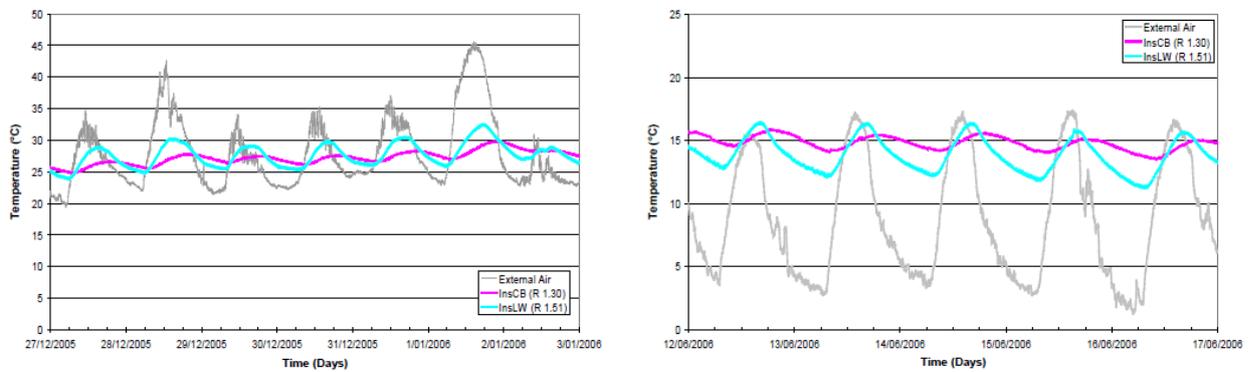




In comparison the lightweight walls provide a hotbox effect as midday approaches on summer days adding to the cooling bill, and then cool down just as quickly after sunset requiring extra heating energy in winter.

The findings of the Newcastle studies correlate with a numerous thermal modelling studies undertaken in both South Africa and Australia, who share similar climates.

The insulated lightweight external walled building was the worst performer - the blue line above shows significant temperature fluctuations with daily temperatures reaching an uncomfortable 30°C indoors during summer. The insulated clay brick was the best performer - the pink line shows that clay brick buffered internal temperature fluctuations in both summer and winter seasons.



a) Hot conditions (January, 2006)

b) Cool conditions (June, 2006)

Figure 3.5 – Internal and external temperature for InsLW and InsCB modules (6)

UNIVERSITY OF PRETORIA RESEARCH

The findings of the University of Pretoria research, “A thermal performance comparison between six wall construction methods frequently used in South Africa”, done as part of a full Lifecycle Assessment of clay bricks correlated with these Newcastle findings concluding “That there is a significant energy cost premium associated with the use of lightweight partitioning systems in all three building typologies modelled”

Visit the CBA [website](#) to download a Technical Sheet on the detailed findings of this research.



SO WHAT IS RESPONSIBLE FOR THIS HOME'S THERMAL PERFORMANCE?

Rather, congratulate the architect! The design and the application of intelligent Solar Passive Design interventions such as:

- orientation of the home on the site resulting in natural shading,
- placement of windows and door openings to capture the prevailing breezes and flush out the heat,
- the effectively sealing of door and window openings,
- the use of insulation in the building envelope,
- the use of double glazing with a 6mm cavity and
- the incorporation of alternate energy systems.

Using the sun's energy more effectively and optimising passive solar design principles have added real long term value to this home.

In conclusion, thermal resistance or a walls R-value is an important thermal performance property in European climates where temperatures average less than 7°C throughout long, drawn out winters. Here in South Africa, R-values are only one measurement to consider. South African buildings exposed to long hot summer months require high thermal mass to achieve both optimum warmth in winter as well as cooling in summer.

WHY DOES THE CSIR STUDY CONTRADICT ALL OTHER RESEARCH?

While assessing the energy efficiency of this home, the CSIR made use of Ecotect™ V5.6 modelling software which is not ASHRAE compliant.

In her book 'Introduction to Ecotect™ V5.6 modelling software', 2007 Professor Juintow Lin states: "Ecotect™ V5.6 is a tool for architects to test their designs. It is not a validation tool to extract absolute values. It should not be used to determine the amount of energy used i.e. "watt per day etc." She further noted: "Ecotect™ V5.6 uses a simpler algorithm Admittance Method for its thermal calculations compared to DOE-2 and Energy Plus that use ASHRAE formulas".

A report by Rees et al. 2000 noted that in the application of the Admittance method (as applied in Ecotect), the methods used to treat solar heat gains "are very simplified by current standards and cannot be expected to give accurate results except in a limited range of circumstances".

Due to limitations in the software used to perform the calculation, it is therefore not surprising that the CSIR findings do not correlate with the results of the five other thermal modelling studies, (four in South Africa and one in Australia) that used ASRAE compliant software.

For further information:

The Clay Brick Association of South Africa

Website: www.claybrick.org