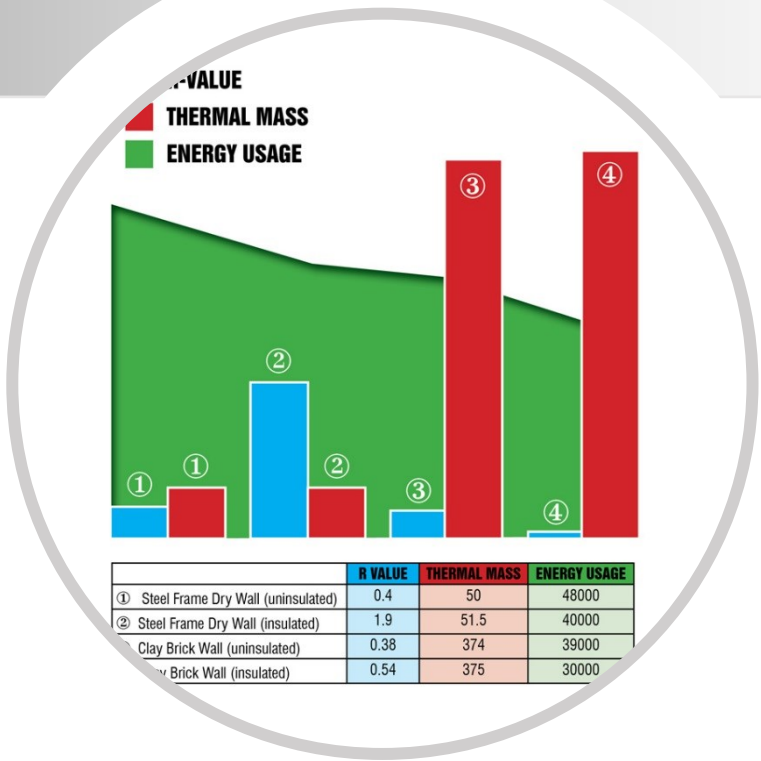

	R VALUE	THERMAL MASS	ENERGY USAGE
① Steel Frame Dry Wall (uninsulated)	0.4	50	48000
② Steel Frame Dry Wall (insulated)	1.9	51.5	40000
Clay Brick Wall (uninsulated)	0.38	374	39000
Brick Wall (insulated)	0.54	375	30000

FACTSHEET #06

Energy Efficiency is more than an R-Value

In many countries, wall thermal resistance (R-value) is the sole determinant of energy efficiency. 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.

TECHNICAL CONTRIBUTOR

Peter Kidger
CBA Technical Consultant

THE VOICE OF THE CLAY BRICK INDUSTRY
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BUILD A LASTING LEGACY

ENERGY EFFICIENCY IS MORE THAN AN R-VALUE

Although South Africans think of their weather as mild in comparison to countries in the northern hemisphere, in reality our macroclimate has its own unique complications when it comes to construction. Buildings in Europe focus on dealing with extreme cold – most energy costs are used in keeping warm - so double glazing, insulated walls and roofs and tight sealing of windows and doors are all critical.

Here in South Africa, winter temperatures in the Highveld approach zero at night, but the following day can easily reach 25°C. In summer, nights are hot but days are truly blistering with temperatures as high as 40°C at midday.

We cannot design and build our homes and offices to keep heat inside, because for at least 6 months of the year, our biggest issue is keeping the heat out!

In many countries, wall thermal resistance (R-value) is the sole determinant of energy efficiency. Because they are not designed for South African conditions, many Innovative Building Technologies (IBTs) such as lightweight walling panels cite their R-value measurement as proof of energy efficiency. However R-values have shortcomings.

Over a decade of empirical study at the University of Newcastle in Australia into the thermal performance of different wall construction materials gives statistics under "real world" conditions, in a climate that is very similar to South Africa.

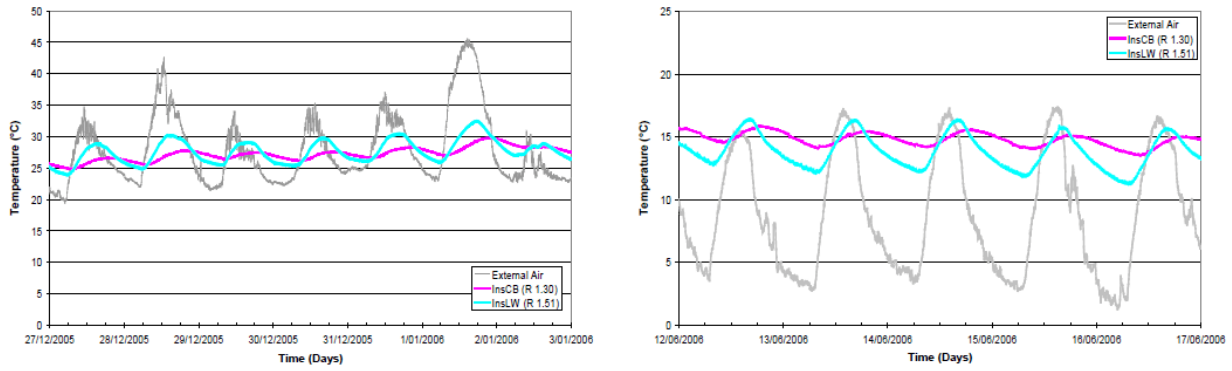
In the study, dwellings that were constructed of different walling materials yielded a wide range of thermal comfort levels, even though they all had the same R-Values.

They were also shown to need very different energy levels for heating and cooling to maintain a feeling of comfort for inhabitants.

The empirical research compared insulated lightweight walling in compliance with Australian building regulations, with double clay brick cavity walls, the same with insulation in the cavity, and brick veneer (an external skin of brick applied to lightweight interior walls) and reverse brick veneer (a clay brick skin applied to the internal skin of the external wall).

Table 3.1 Wall Type, Element Thickness and R-Values (surface-to-surface)

Wall Type	Element Thickness (mm)	R-value ($m^2.K/W$) $\Delta T=18^oC$
Cavity Brick + Internal Render	280	0.44
Insulated Brick Veneer	260	1.58
Insulated Cavity Brick + Internal Render	310	1.30
Insulated Reverse Brick Veneer	240	1.57
Insulated Lightweight	110	1.51



a) Hot conditions (January, 2006)

b) Cool conditions (June, 2006)

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

Despite have a good R-Value, 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.

Despite have a lower R-Value, 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.

When clay brick walls were applied inside the building modules the thermal comfort and energy efficiency levels improved no matter the external wall construction type. When the insulated lightweight walled module was fitted with brick partition walls, energy efficiency was improved by 20%.

In conclusion, this study found that:

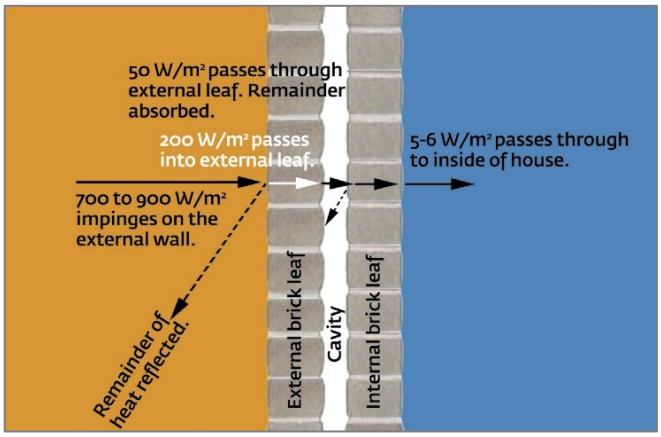
- The Lightweight building (high R-value but no thermal mass in the walls) was the worst performer in all seasons.
- Brick veneer (one skin of brickwork on external walls) performed better than lightweight.
- Insulated cavity brick performed the best. Notably double skin clay brick walled modules with cavity insulation outperformed insulated lightweight walled modules with the same R-value.
- In the case of building modules with lightweight external walling, internal brick partition walls enhanced energy efficiency by 20%.

(Reference: www.thinkbrick.com.au - The case for Clay Brick, Edition 4)

This research adds further credence to clay brick's undisputed status as the benchmark for energy efficient house construction in South Africa.

About Double leaf walling

A double-skin walling system based on standard size bricks sees two separate walls with an insulation gap in between. This ensures that no moisture from the exterior is able to penetrate the interior of the home, and also provides superior energy efficiency by providing the correct combination of thermal capacity and thermal resistance. Double leaf walling systems are the best buffer against exterior temperature extremes.



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.

100% Sustainable

Property developers and architects need to consider the long term costs in terms of energy efficiency, maintenance and operation

Once laid, facebrick withstands fire, rain, hail and intense heat – remaining beautiful indefinitely without maintenance.

Clay bricks are entirely natural, contain no pollutants or allergens and are resistant to ants, borer and termites.

5-star rated Green Building - KZN Department of Public Works' Sisonke District Office in Ixopo (Photograph courtesy of Corobrik)

Clay Bricks are also recyclable or reusable, and can be returned to the earth at their end of their useful life. Clay bricks are truly sustainable – and are trusted to create environmentally responsible living and workspaces for today's generation and beyond.

For further information:
The Clay Brick Association of South Africa
Website: www.claybrick.org