CLAYBRICK for good

THE VOICE OF THE CLAY BRICK INDUSTRY

Environmentally Friendly

NEWS ARTICLE

Clay Brick Walling Materials

Pre-Eminent Performance for House Construction

Prepared by:
Peter Kidger
On behalf of:
The Clay Brick Association

www.claybrick.org

NEWS ARTICLE

The Pre-Eminent Walling Material for House Construction

Clay Brick is confirmed as intrinsically 'perfect' for defining a sustainable and more energy efficient future.

The ante towards building greater sustainability into the built environments with materials that have lower impacts on the natural environment is growing exponentially. Old materials, technologies and component parts of buildings are continually being evaluated and compared with the new, to better understand relative value for achieving more sustainable outcomes cost effectively.

Clay Brick, that has long been regarded as a superior building material for house construction has not evaded scrutiny. Notwithstanding that the materials performance attributes [sound transmittance, fire resistance to name a few], define the benchmark values in various building standards and codes of practice for alternate walling systems to aspire.

Historically, factors such as durability as a structural and aesthetic walling element, longevity, colour fastness and maintenance-free qualities as a face brick have been used to reference the superior sustainability attributes of Clay Brick. These of course are fundamental building blocks for pursuing a sustainable future and for which Clay Brick has no peers in terms of its offering.

Sustainability however, particularly in the environmental context, has progressed to also include how building materials and building systems compare in respect of supporting healthier indoor living environments and in lowering operational energy consumption of houses.

The Clay Brick industry chose a long time back not to take the recognised thermal property of thermal mass in clay bricks, widely recognised for moderating indoor temperatures and the benign qualities of fired clay that assure no negative impact on indoor air quality, for granted.

To better understand the added value Clay Brick construction is able to contribute towards facilitating healthy indoor environments with lowest operational energy usage and lowest lifecycle greenhouse gas emission outcomes, extensive research provides the answers.

In the case of human health it is recognised that harmful chemical substances in the indoor air, dust and mould spores, high levels of carbon di-oxide, can lead to long term health problems. Research in Germany of materials and their impacts on indoor air quality has concluded that Clay Brick is one of the few man-made building materials whose mineral properties meet 'all necessary requirements for healthy living'.

In the first instance the inorganic or inert qualities of fired clay release insignificant or minuscule volatile organic compounds (VOC's) or toxic fumes under normal or fire conditions to have any negative impact on air quality.

In the second instance, fired clay is a dry material that has a natural propensity to absorb and release humidity from the atmosphere to help keep humidity at a required 40-60 per cent level for healthy living, and in the third instance it is not a food source for mould widely associated with 'sick building syndrome'.

It is not by chance therefore, that what became known as the “Healthy brick building“ in Thalheim, Germany, built by KHB-Creativ Wohnbau GmbH in 2008, was the first single-family home certified by the Sentinel-Haus® Institut.

As for providing indoor thermal comfort and the lowering of operational energy usage for heating and cooling, Clay Brick construction brings the X factor to the thermal efficiency equation.

Notably, for achieving superior thermal comfort in climates unique to South Africa characterised by long hot summers and well defined average diurnal temperature swings, the challenge of walling materials is to moderate external temperature amplitudes to more bearable levels indoors whilst also ensuring that the average indoor temperature remains at an acceptable level indoors. Clay Brick brings to wall construction this ability to self-regulate, an important function that eludes lightweight walling associated with alternate lightweight building systems.

The bricks essentially perform like thermal batteries, slowly absorbing, storing heat during the day over a 6 to 8 hour period, and then releasing that heat when it is needed most. This time lag for the sun’s heat to pass from the outside to the inside, referenced as ‘thermal lag’, is what helps moderate internal temperature conditions for longer during the hottest periods of summer days. In winter the internal high mass brick walls that have slowly absorb radiant heat during the day, release that stored heat to the cold evening air helping keep internal thermal conditions comfortable for longer.

The extensive research findings out of both Australia and South Africa correlate confirming that simple Clay Brick construction - double skin with appropriate levels of insulation between the brick skins for the climatic zone - affords superior thermal comfort with lower heating and cooling energy usage than comparable lightweight walling envelopes with the same steady state R-value [resistance].

Studies peculiar to South Africa also confirm that Clay Brick construction does this more cost effectively than alternate building technologies such as Light Steel Frame Building, SANS 517 and SANS 204 compliant, over a 50 year lifecycle.

The research in Australia, notably the full Life Cycle Assessment by Energetics went further to demonstrate how by combining Solar Passive Design principles [orientation, shading, insulation and ventilation for the climatology of the location] with the use of thermal mass such as Clay Brick walls in the building envelope, the latter enhancing the propensity to take best advantage of the suns energy, provided for optimal thermal solutions. In fact the operational energy savings provided by the Clay Brick walled houses proved sufficiently significant to afford a lower total energy [embodied and operational] energy usage with lower total greenhouse gas emissions than a lower embodied timber frame insulated weatherboard house with the same steady state R-value, over a 50 year lifecycle.

These findings were mirrored in South African research of a 40m² house where the Clay Brick house afforded a lower total energy outcome over a 40 year lifecycle than the SANS 204 compliant LSF alternate.

The research simply highlights the inappropriateness of comparing the embodied energy values of different walling materials as a measure of comparative ‘greenness’ and that only a full lifecycle analysis of materials used as walling systems fulfilling the same purpose, as done by Energetics Australia, can provide for competent comparison.

A clear demonstration of the application of sound Passive Solar Design techniques and the superiority of Clay Brick construction in providing for optimal energy efficiency was the 8 Star Perth House by Jade Projects. This double skin Clay Brick house was the one and only of a 10 Show House project coordinated by LandCorp Western Australia, for different housing providers in Western Australia to put forward their best offering in terms of environmental compliance. The Building Energy Rating System [BERS] of Australia was used as the energy rating tool. The other nine Show Houses, of which seven comprised steel frame with different highly insulated lightweight walling composites, some also being designed on Passive Solar Design Principles, achieved energy ratings of 5 or 6 Stars, the difference in rating essentially defining the added value of well-placed thermal mass and insulation in the building envelope.

While the full Life Cycle Assessment established the heating and cooling energy benefits and the low lifecycle impacts Clay Brick construction provides, it also highlighted that a comprehensive approach to sustainability requires that we continue to build houses able to endure, with little maintenance and definitely no materials replacement, way beyond a 100 year lifecycle. Clay Brick is the one man-made walling material that has proven to be more than up to the task with the thermal efficiency benefits enduring way beyond the limited lifecycle of less durable alternate lightweight walling.

Combine the thermal benefits of Clay Brick construction with the basket of other sustainability attributes, such as the low maintenance qualities of face brick that mitigate future carbon debt associated with a lifetime of maintenance, the longevity that mitigates future carbon debt associated with refurbishment and replacement of less durable materials/systems and that Clay Bricks are reusable as masonry or pavers and/or recyclable as aggregate for concrete manufacture, road building and ground cover, and therefore Clay Brick finds itself in a unique space for defining a more sustainable future with low environmental impacts.

ENDS.

Reference Sources:

a) LandCorp Western Australia 10 Show House Environmental Compliance Project in Perth incorporating Jade Projects 8 Star Energy Rated House

b) “A Study of the Influence of the Wall R-value on the Thermal Characteristics of Australian Housing”- University of Newcastle, Australia (Prof. A. Page, Prof. B. Moghtedari, Dr. H. Hugo, S. Hands 2009)

c) Full Life Cycle Assessment by Energetics (Pty) Ltd, Australia (2010) for Think Brick Australia - http//Thinkbrick.com.au

d) 40m² Low Cost House Energy Modelling Project - WSP Green by Design (2009/2010) using DesignBuilder Energy Plus software.

e) 130m² Standard House Energy Modelling Project - WSP Green by Design (2010) using DesignBuilder Energy Plus software.

f) Thermal Modelling of a 132m² CSIR house by Structatherm Projects (H. Harris 2009) using Visual DOE software.

g) C.R. Product Research “A Novel Algorithm for the Specification of Thermal Capacity and Resistance in External Walling for the South African Energy Efficient Building Standards - WSP Energy Africa - (Prof. D Holm and H Harris April 2010)

h) Koch, Gerhard - 'Indoor air quality - a new important criterion for the sustainability of houses' - Technical Paper, Austrian Association of Clay Bricks and Roof Tiles Manufacturers

i) German Sentinel-Haus ® Institute, www.sentinel-haus.eu, 7th April 2011