MEDIA RELEASE

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ENERGY EFFICIENCY CLAIMS OF FRAME TYPE LIGHTWEIGHT BUILDING SYSTEMS SIMPLY NOT TRUE

The Institute of Timber Frame Builders makes the comparative claim on the website www.itfrb.co.za : "that timber buildings …thermal efficiency is as much as 6-8 times greater than of masonry construction." This by extension implies that timber frame insulation weatherboard houses are generally more thermally efficient than comparable clay brick constructed houses, offer as much as 6-8 times greater thermal comfort and therefore 6-8 times lower energy usage for heating and cooling.

Arcelor Mittal – Skills on Site -February 2011, in support of steel frame building over conventional building [clay brick construction falls within convention] for houses, make the comparative general claims that, "Steel frame houses are very well insulated so that heating and cooling costs will be lower" and that they are "easier to heat or cool in severe climates."

The findings of comparative research into the contribution of different walling envelopes to thermal comfort and energy efficiency of houses paint an opposite picture, that such claims cannot be true.

In the first instance the algorithm pertaining to the CR Product [WSP Energy Africa] has established that thermal comfort optimisation requires combinations of thermal capacity [C] and resistance [R]. Lightweight walling envelopes that offer a high R-value [Resistance] but little or no thermal capacity [C] cannot provide optimal thermal efficiency in South Africa's major climatic zones characterised by well defined diurnal temperature swings.

Eight years of empirical research at the University of Newcastle Priority Centre for Energy into 'the Influence of Wall R-value on the Thermal Characteristics of Australian Housing' have produced findings that are no less unambiguous. Simply put, insulated lightweight walls as offered by both Timber Frame and Light Steel Frame building have no capacity to self regulate. While the resistance of insulation of course is important, particularly in blocking cold and keeping the hot air in during cold winter nights, the inability of insulated lightweight walls to self regulate in summer means that heat from the sun is able to pass through such walls relatively quickly [within 1 to 2 hours] leading to a 'hotbox' effect during the hours when the peak solar radiation falling on the exterior of the wall and the peak indoor temperatures coincide.

Clay bricks on the other hand, provide the wall with the necessary thermal capacity [C] in South Africa's long hot summer days to naturally slow the movement of heat through the wall [by between 6 and 8 hours] such that the hottest part of the day is past before the heat begins to impact on temperatures inside.

Nett benefit - double skin clay brick walls with different levels of resistance [resistance provided by the bricks themselves, the cavity between the brick skins and added insulation depending on the climatic zone] provide longer periods of target thermal comfort conditions and less cooling energy requirements.

The comparative superior thermal efficiency provided by different double skin clay brick wall alternates is confirmed by no less than 3 significant thermal modeling studies here in South Africa. All studies show clay bricks thermal mass provide walls with the energy efficiency edge and lowest life cycle energy usage and cost.

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To illustrate the point, in the 130m² Standard House study double skin clay brick walling outperformed LSFB as follows:

THERMAL PERFORMANCE OF WALLING ENVELOPES

ANNUAL ENERGY USAGE COMPARISON

DOUBLE SKIN CLAY BRICK WALLING VERSUS LSFB

130M² STANDARD HOUSE

Climate Region	Annual Heating & Cooling Fan Energy Use, Best LSFB	Annual Heating & Cooling Fan Energy Use, Best Insulated Brick Wall	% Improvement of Best Insulated Brick Wall on Best LSFB
	kWh	kWh	%
Johannesburg	4027	3849	4%
Pretoria	1469	1208	18%
Musina	719	637	11%
Cape Town	3073	2905	5%
Durban	381	277	27%
Upington	2058	1869	9%

In this study only cooling 'fan' energy was considered. It is expected that the value of clay brick walls would be somewhat more pronounced should air-conditioning energy have been taken in to account.

The findings of the three South African thermal modeling studies correlate with those of two important Australian studies.

The Parametric Study that investigated "The potential for increasing thermal comfort through selection of construction types in Brisbane" by B J Williamson and F N Denirbilek School of Design and Build Environment Queensland University of Technology, specifically explored the potential for reducing cooling and heating loads through changes in construction type for dwellings in Brisbane.

The study found that the clay brick walling alternates compared to insulated timber frame weatherboard walled house afforded better and best thermal comfort and less dependence on mechanical heating and cooling systems.

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The more substantive Thermal Modelling conducted for Think Brick Australia, and incorporated into Full Life Cycle Assessment study by Energetics, that modelled two different house flooring plans [Verdant and Sirocco house types], in three climatic zones, and four different orientations with five different walling solutions [lightweight walling represented by timber frame insulated weatherboard], found that the double skin clay brick options considerably outperformed insulated timber frame lightweight walled houses in terms of thermal comfort and energy required for artificial heating and cooling to achieve thermal comfort conditions.

The difference in annual energy usage over a hypothetical 50 year life cycle for the Verdant house plan was as follows:

TOTAL ANNUAL (HVAC) HEATING AND COOLING ENERGY IN kWh

(AS EXTRACTED FROM "ENERGETICS" LIFECYCLE ASSESSMENT

FOR THINK BRICK AUSTRALIA)

Location	Orientation	Uninsulated Double Brick	Insulated Double Brick (R1.3)	Insulated Timber Frame	Insulated Timber more/(less) HVAC Energy than Double Brick	Insulated Timber more/(less) HVAC Energy than Double Brick Insulated R1.3
Newcastle Climatic Zone	East	1025	966	1302	9.46%	34.80%
	North	1140	1046	1398	26.60%	33.60%
	South	1041	1001	1269	21.90%	26.80%
	West	1140	1054	1345	17.98%	27.60%
Melbourne Climatic Zone	East	1014	863	1123	10.70%	30.10%
	North	1144	995	1277	11.60%	28.30%
	South	1053	917	1119	6.30%	22.00%
	West	1159	996	1215	4.80%	22.00%
Brisbane Climatic Zone	East	1144	1126	1394	21.85%	23.80%
	North	1199	1175	1478	23.30%	25.80%
	South	1062	1053	1263	18.90%	19.90%
	West	1181	1140	1391	17.80%	22.00%

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Whilst the researchers caution that different technical assumption and floor plans can lead to different results, the fact of the matter is that these findings in favour of clay brick walling for energy efficient house construction correlate with all the available other research.

In both the WSP Green by Design and LCA by 'Energetics' the researchers also noted that the Design Builder and Energy Plus Software provided for "conservative" findings in the case of the clay brick alternates. Accurate modeling software provided even more favorable findings for clay brick walling alternates over Timber Frame.

In pursuit of balance and understanding ClayBrick.org has searched for, but has yet to come across, a study that contradicts the fact that the thermal mass inherent in double skin clay brick walling 'adds the value' here in South Africa, to provide the superior thermal performance that the marketers of lightweight frame solutions aspire to, but cannot provide.

Thermal mass, incidentally, is fundamental in the application of Passive Solar Design principles [designing with nature in mind] so important for enhancing sustainability in South African environments. Orientating the house to the north, using the suns light to best advantage, shading windows from the summer sun, the placing of windows to best capture the prevailing breezes and to provide cross ventilation, and the correct placement of thermal mass in the floor slabs, walls and roofing envelopes will widely suffice to provide excellent thermal comfort with artificial energy requirements for either heating and cooling limited only to those days of extreme weather conditions.

ENDS.

Reference Sources:

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