Lightweight building systems can’t compare with double skin clay brick construction

The general applicability of the comparative superior thermal performance claims made by various lightweight walled Alternative Building System providers, that assume their walling systems’ higher insulation values [R-values], relative to double skin clay brick walling, translate into superior thermal performance outcomes, is not supported by science and extensive thermal modelling of houses constructed with different wall types here in South Africa.

For South Africa’s climates, thermal modelling studies, supported by extensive empirical research in Australia, validate that while the R-value is a useful measure of thermal resistance of the wall itself, a walling material's R-value is not representative of the thermal value for energy efficient house design properties of a material.

Notably, the research confirms thermal mass [naturally inherent in clay brick], as a critical thermal performance property for optimising thermal performance outcomes in South Africa's climate, where well defined average diurnal temperature swings characterise all six major climatic zones. It is the ability of thermal mass to slowly absorb, store and release heat, in ways that insulated lightweight walling cannot, that make clay bricks valuable in optimising thermal comfort inside houses.

As to be expected, the thermal modelling studies of both 130 m² and 40 m² low cost house types here in South Africa, that are consistent with the findings of 7 years of empirical research undertaken at the Priority Research Centre for Energy at the University of Newcastle in Australia, reinforce the validity of the latest WSP Energy Africa CR Product research, that if homes of the future are to achieve energy reduction targets, external walls must contain reasonable levels of thermal capacity, supplemented by varying levels of thermal resistance depending on the climatic zone. Clay brick brings both properties to the table most cost effectively. Lightweight walls can only bring resistance, and resistance on its own led to sub-optimal thermal performance outcomes for heating and cooling internal spaces in all the studies.

Adding further to this Dr Alec Johannsen of Alec Johannsen Consulting Engineering, in his review of the WSP Energy Africa CR Product study, noted: "There is an additional advantage of heavier walls (not discussed in the CR Product report as it is outside its scope), namely a reduction of the building peak cooling and heating loads."

"This is the combined result of a reduction in the peak heat gain of the wall itself, and a time lag of the peak heat flux on the inside of the wall in relation to the heat flux on the outside, which makes the heat load from the wall out of phase with the other heat loads, resulting in a lower combined peak total heat load."

"The result is a smaller and less expensive cooling and heating plant and a lower electrical demand. The above would indicate that greater 'Cs' (thermal capacity) should be favoured over 'Rs' (resistance) when selecting a required CR Product."

South Africa's benchmark construction methodology provides for optimal thermal outcomes, and cost effectively too. That face brick incurs no future carbon debt adds further environmental value to clay brick walling and drives lowest Life Cycle Costs.