FACTSHEET #17

The science of sustainable buildings

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Figure 1 The CSR 8-star House uses 85% less heating and cooling energy that the average home built before 1990. Photograph CSR Limited, Australia

In addition to increased thermal performance and energy efficiency, the four bedroom house also incorporates features to improve acoustic comfort, natural lighting and ventilation to create a healthier home.

The house combines several construction materials including insulated cavity brick walls, a concrete floor slab formed using a stackable polypropylene dome system, and a timber frame structure.

Additional sound screening insulation reduces interior noise.

However it is the "heavyweight" brick walls that slow the passage of heat from the outside in, a process called 'thermal lag'. In comparison, insulated "lightweight" walls (such as those found in Alternative Building Technologies) experience daily temperature swings twice that of insulated cavity brick dwellings during hot conditions.

Australian Home Energy Star Ratings

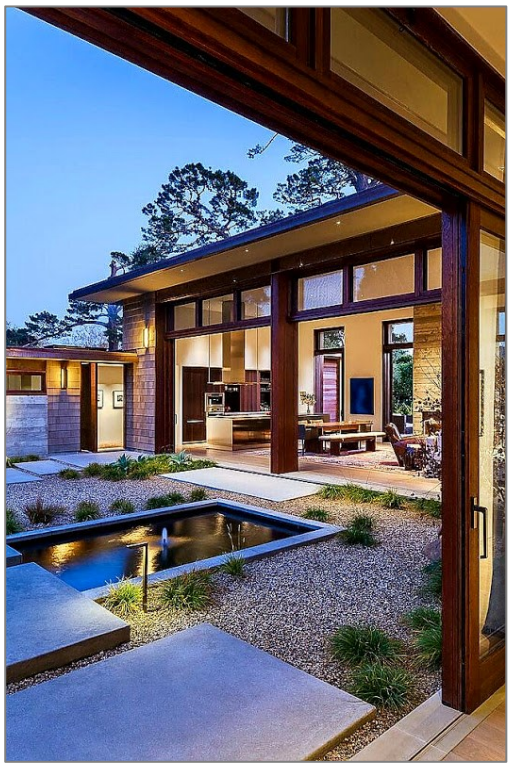
Heating and cooling energy makes up around 40% of the overall energy use in a home. In 2003, the Building Codes Board of Australia introduced 'Star' ratings as an indicator of the heating and cooling energy required to achieve an acceptable level of comfort, based on the Australian climate that is so similar to South Africa.

Most houses built prior to 1990 were rated as 1-Star and today the average Star rating for newer Australian homes is 3-Stars. A 6-Star home uses around 70% less heating and cooling energy than the 1-Star home while this 8-Star home requires 85% less than the average 1-Star home.

Sustainable Design Elements

Sustainably designed buildings are energy efficient, water-efficient and resource-efficient. They address the well-being of the occupants by considering thermal comfort, acoustics, indoor air quality and visual comfort in the design. They also consider the impact of a building's construction, operation and maintenance on the environment, and the environmental impact of the building's constituent materials.

A sustainably designed building considers all of these aspects through the entire life cycle of the building, not just during construction but in the course of operation and maintenance. Every sustainable building is unique, designed specifically for its site and the requirements of the people who will live and work there. The versatility and durability of brick facilitate its use as part of many elements of sustainable design.



Often the tendency is to focus on one aspect of sustainable design, such as energy use or environmental impacts.

This approach leaves out other equally important elements necessary for true sustainability. Truly sustainable design is best described as achieving the "triple bottom line," that balance of environmental goals, societal goals and economic goals.

All high-performance, sustainable buildings should consider the following components of design

- Environmentally responsive construction methods, materials and products
- Energy-efficient building shell based on a scientific Energy analysis
- Thermal comfort
- Acoustic comfort
- Visual comfort & aesthetics
- Renewable energy and the ability to recycle materials
- Superior indoor air quality
- Durability, Safety and security
- High-performance electric lighting and effective use of daylight
- Water efficiency
- Life cycle rather than construction cycle cost analysis

Building for South African Conditions

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, our objective is to cool our homes rather than heat them. South African buildings require high thermal mass to achieve both optimum warmth in winter as well as cooling in summer.

Clay Brick is not only an extremely dense material, but is usually built as a double layer. Therefore a clay brick shell ensures that a brick house remains warm in winter, and in summer it stays cool and comfortable for longer - mitigating the need for expensive heating or air-conditioning. Thermal performance can be further improved by adding a cavity with insulation. Clay brick's outperforms the majority of alternative walling systems in thermal comfort.

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