Passive Solar Design and Clay Masonry

BUILDING A SUSTAINABLE FUTURE

Environmentally Friendly

CLAYBRICK for good





No person has the expectation or desire to be more comfortable than in the security of their own home. Research shows that people spend up to 90% of their time indoors. Through intelligent construction in accordance with the principles of Passive Solar Design, and in conjunction with an enduring building material like Clay Brick, achieving thermal comfort in your home or workplace can be relatively straightforward.

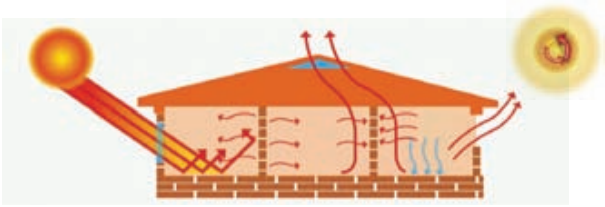
SUSTAINABILITY THROUGH PASSIVE SOLAR DESIGN

Passive Solar Design aims at realising thermal comfort in a building through correct design and operating it with nature in mind. By combining natural energy, from elements like heat from the sun, with a thermally efficient material like Clay Brick, the building responds passively, resulting in a minimal amount of imported energy required. Not only does this result in significant cost savings over the life cycle of the building, it also lightens the burden on the environment through reduced energy consumption.

Another way of looking at Passive Solar Design is to find the sweet spot between the sciences of climatology, heat transfer (thermodynamics) and the theory of thermal comfort.

THERMODYNAMICS

A building collects, stores and distributes heat from solar energy primarily in three different ways.



Think Brick, Australia

• RADIATION

Sunlight filtering through windows or openings warm objects, such as furniture, floors, walls, etc, which in turn radiates heat into the interior.

• CONDUCTION

Heat transfers through materials in direct contact with one another.

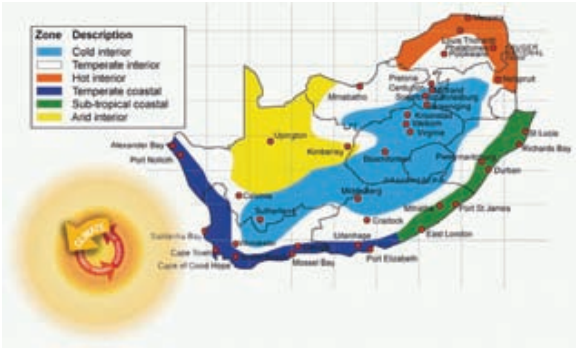
• CONVECTION

Heated surfaces like floors and walls, warm the air around them. The warm air rises and cool air replaces it.

These heat transfer mechanisms occur at all times and can be used to our advantage.

CLIMATOLOGY

The current climate map of South Africa divides the country into 6 regions. Sufficient climatic data is easily available for most locations to plan the correct orientation and design of one's house or building and make the most effective use of the natural elements.

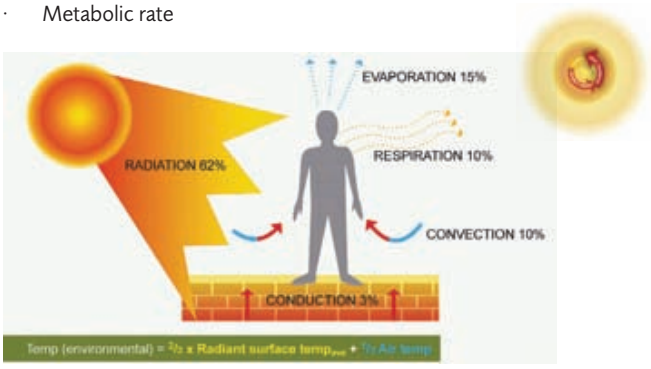


THERMAL COMFORT

From a thermal comfort point of view, people experience heat in different ways, but predominantly through radiation. Hence, your choice of building material plays a large role in determining interior thermal comfort due to their capacity to absorb, retain and release heat.

Other factors that influence an individual's experience of heat include:

- Clothing
- Age
- Body type
- Health conditions
- Metabolic rate



An acceptable thermal comfort range is ultimately what the building envelope is aiming to achieve. The building interacts with the environment and transfers the environmental conditions to the interior, therefore influencing the thermal comfort experienced by the occupants, directly.

Thermal comfort targets vary according to external weather conditions and the type of ventilation the building requires. Through intelligent design and using a product with high thermal mass like Clay Brick, a consistently comfortable range of temperatures can be maintained. The findings of recent independent research undertaken by WSP Green by Design on both 40m^2 and 130m^2 house types, where Clay Brick walls were compared with insulated lightweight walling and through the wall construction, confirmed that Clay Brick walled houses consistently led to lower energy requirements for heating and cooling.

ESSENTIAL ELEMENTS OF PASSIVE SOLAR DESIGN

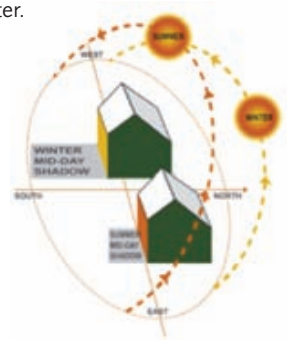
Passive Solar Design buildings are constructed on the pillars of correct orientation, appropriate ventilation with windows and doors, careful use of insulation, adequate shading and most importantly, the extensive use of building materials with *high thermal mass*.

ORIENTATION

Buildings need to be orientated with nature and the position of the sun in mind. In the southern hemisphere, the north facing side of the building gets the most sun and therefore those rooms desired to be warmest should be positioned here, such as; bedrooms, lounges and other living areas. More functional rooms can get away with being positioned towards the cooler south facing side.

VENTILATION

Ventilation can also be used in a sensible way, by means of utilising the natural flows of wind and air movement in relation to the location as a means of cooling the building. Using seasonal wind data it is easy to plan the positioning of openings to maximise air flow during summer and minimise it in winter.

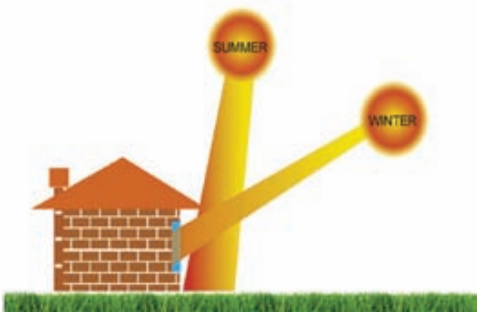


INSULATION

Buildings should be well sealed, and in certain location/building-type combinations it's important to add insulation to existing thermal mass. Insulation, in combination with thermal mass in climates like South Africa where diurnal temperature swings are pronounced, increases occupancy comfort and contributes towards reduced energy consumption.

SHADING

Shading has a role to play in moderating building temperatures. By taking the 47° altitude difference in the angle of the sun between noon in summer and noon in winter, the exact necessary length of the eaves of the roof can be determined to protect the walls and windows from direct sunlight in summer, and expose them during winter.

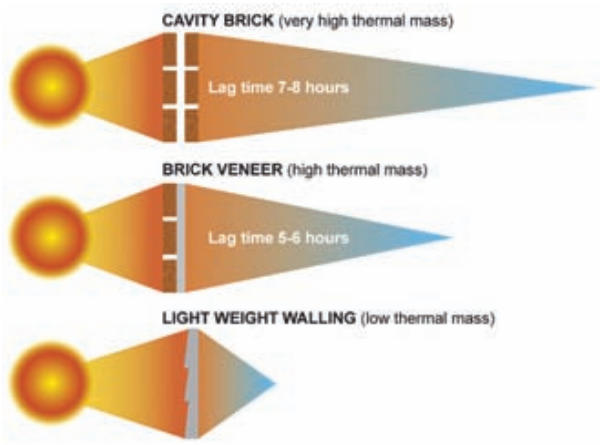


Primer for Energy Conscious Design
- Professor Dieter Holm & Reinold Viljoen 1996

THERMAL MASS

South Africa is a climate that is characterised by high diurnal temperature swings - the difference in temperature between day and night – and also relatively high absolute summer temperatures. Thermal mass works particularly well in these types of climates, storing heat energy during the day and releasing it at night. Your choice of building material can play an instrumental role in regulating internal temperatures.

A high thermal mass product like Clay Brick, especially when used in a cavity wall for example, can delay the transfer of heat up to 8 hours, reducing peak daytime temperatures and preserving the warmth well after the sun goes down.



Think Brick, Australia

LIFE CYCLE OF CLAY BRICK BUILDINGS

Clay Bricks boast an extensive life span exceeding 100 years. The overall life cycle of a Clay Brick building is measured by its impact on the environment from the early stages of production; from the sourcing of raw materials to producing the end product, construction of the building and its in-use phase up to final demolition. Besides the energy efficiency gains of thermal mass, Clay Bricks are inert, non-toxic, highly durable, long lasting and require very little maintenance. They are also fully recyclable. Clay Bricks also allow for flexibility in design and layout at any time during construction of the building and its life.

SUSTAINABILITY VS. AFFORDABILITY

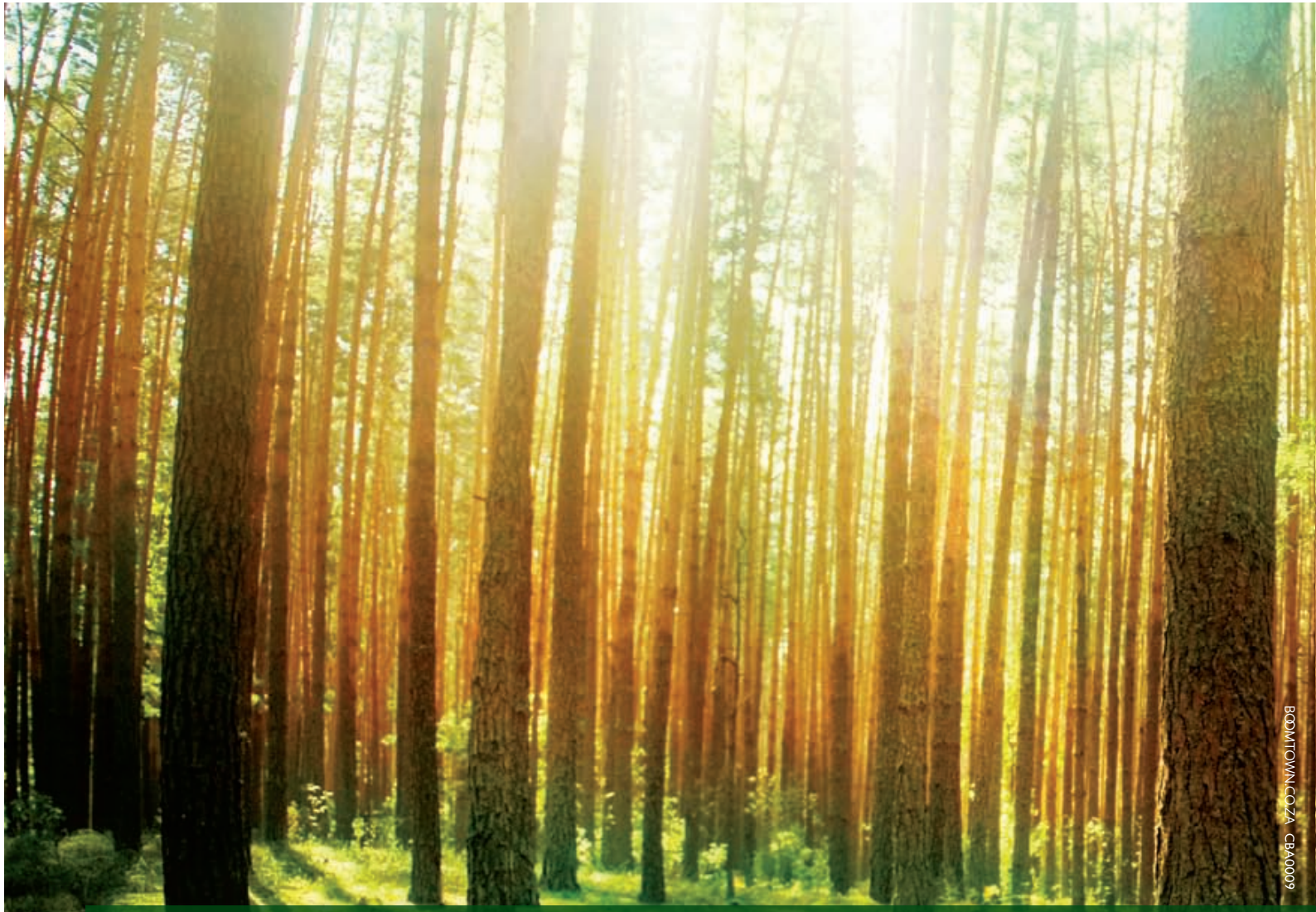
Clay Bricks have an inherent thermal mass, which means, when used in accordance with proper sustainable design principles they retain much of the energy they absorb. This cuts down on a building's need for mechanical heating and cooling. Recent studies undertaken by WSP Green by Design confirm that Clay Brick walls provide the lowest life cycle energy costs and lowest life cycle costs over a 50 year life cycle. The long term benefits of building with Clay Bricks, both financially and environmentally are irrefutable.

ROLE IN UPLIFTING COMMUNITIES

Genuine Clay Bricks have been playing a vital role since earliest house construction in South Africa. The phenomenal structural integrity and longevity of Clay Brick means that our homes are of substance and built to last for many generations, and in a very real sense adds to the investment value and upliftment of sustainable communities. Clay Brick in housing is not only a pillar of our great history, but will also be a pillar of our greater future.

Insist on clay bricks produced by a member of ClayBrick.org - It is your assurance of quality.

Build Dignity. Build with ClayBrick ~ for good



Tel +27 11 805 4206
Fax +27 11 315 3966
PO BOX 1284, HALFWAY HOUSE, SOUTH AFRICA 1685
2 SUPERIOR ROAD, MIDRAND, SOUTH AFRICA
www.claybrick.org.za

Environmentally Friendly

CLAYBRICK
for good

BOOMTOWN.CO.ZA CBA0009