



marketing sustainable concrete through advice, education & information



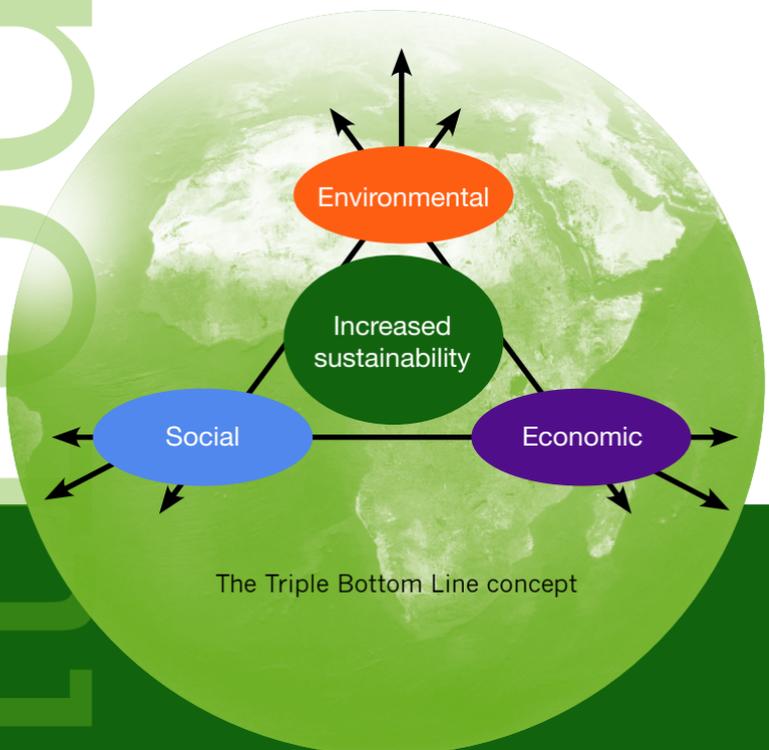
sustainable concrete
for human settlements

The global focus towards **green building design** has seen a rapid increase in the number of **sophisticated** and **expensive** alternative construction technologies aimed at improving the thermal performance of buildings.

Much less attention has been given, however, to the **affordable benefits** of incorporating current building materials and construction technologies that inherently possess **natural** or passive thermal control properties.

For more than 2000 years *, mankind has reaped the social, economic and environmental benefits of using **concrete** to build human settlements. As a result, concrete is the most commonly used building material in the world today.

As humanity faces the global challenge to achieve 'One Planet Living', the inherent sustainable benefits of using concrete in human settlements needs to be harnessed to its full potential in order to create truly sustainable communities.



** Evidence of Romans using lime as cementitious material dates back to 300BC*

eatpraystayplay

infrastructure

Planning for sustainable human settlements begins with the provision of durable and low-maintenance infrastructure.

As a road and pavement solution – whether in-situ or precast – its responsible use could result in a decreased demand for raw materials required for maintenance purposes. Concrete also lends itself to labour-intensive construction methods, creating sustainable low-skilled job opportunities. Concrete therefore makes economic, social and environmental sense for infrastructure provision.



concrete is one of the most durable materials on earth

speed of construction

Various in-situ and precast products are available to speed up the infrastructure delivery process, including electricity and telephone poles, sewer and storm water pipes. Concrete finishes do not emit any toxic or volatile products into the environment.



concrete is therefore an environmentally responsible infrastructure solution



permeable concrete block paving promotes sustainable environmental design

reduced storm water run-off

The continuous growth in urbanization has led to an increase in the number of hard surfaces in urban areas which in turn have resulted in increased pressure on storm water management systems – leading to potentially increased flooding conditions and subsequent damage to surrounding properties.

The **permeable concrete block paving system** has been developed in response to this environmental challenge. The system is essentially a sustainable drainage technology which aims at replicating the natural drainage from a site as closely as possible by managing surface water by attenuation and filtration. The resulting overall objective is to minimize the water runoff quantity, to improve the water quality and to provide amenity and biodiversity, with the added benefit of providing pollution source control.

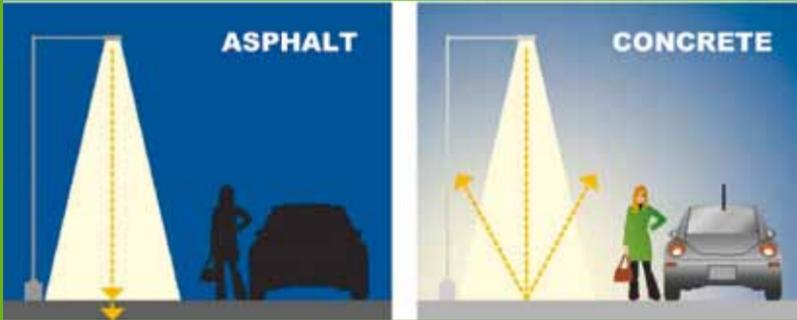
pollution reduction

Concrete containing titanium dioxide has the ability to **reduce air pollution** by decomposing the harmful emissions released into the atmosphere by cars. As a result of the same process, concrete containing titanium dioxide also has the ability to clean itself, reducing maintenance costs across the life span of the pavement or building.

sustainability

light and heat reflectance

Concrete has a natural ability to reflect light, as a result of its light colour. Energy savings can be achieved by building roads and pavements in concrete, resulting in a reduced demand for artificial lighting at night. *



Increased visibility with concrete paved areas

Urbanized areas are generally hotter than the surrounding rural areas, leading to increased demand for artificial cooling. Concrete has the natural ability to reflect solar radiation, as a result of its light colour. Used in large areas, such as parking areas, roads and roof surfaces, the use of concrete could lead to a reduced demand for artificial cooling. *

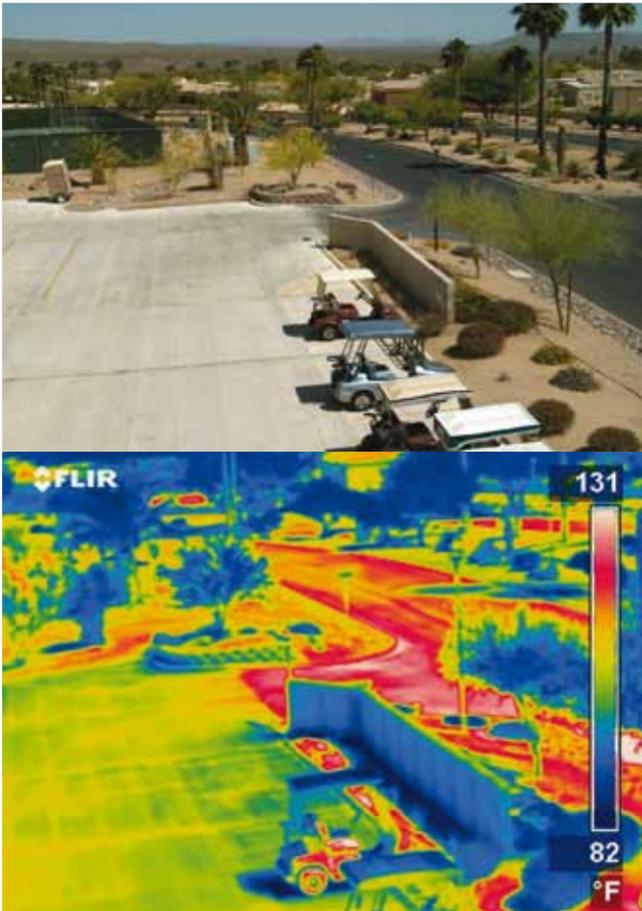


Illustration of the temperature difference between different pavement surfaces in Rio Verde, Arizona

* Refer to C&CI 'Sustainable Concrete' leaflet for more detail

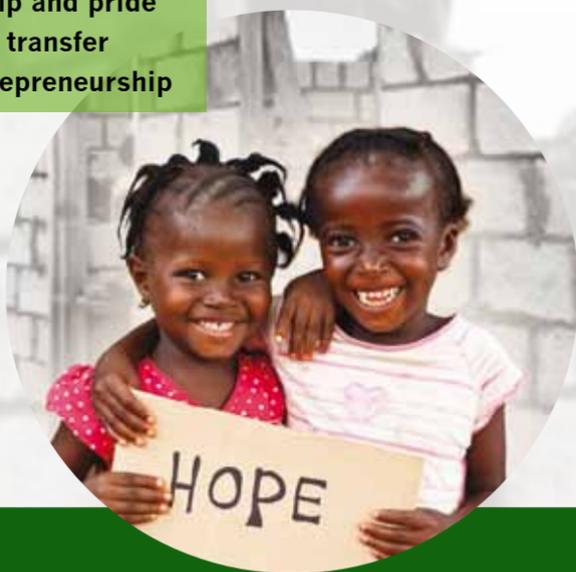
sensible sustainable oppo

Why concrete?

Building concrete homes makes sustainable sense

Empowering local communities with the basic skills of concrete technology has the following long-term benefits:

- sense of ownership and pride
- sustainable skills transfer
- promotion of entrepreneurship



'Getting it right the first time'

Proper planning and design will ensure access to all the inherent benefits that concrete has to offer in and around the house. Care should be taken to consider the following:

- Correct **orientation** of the house on site
- House proportions rationalized to suit **modular dimensions** of blockwork
- Window **opening size and position** relative to sun orientation
- **Roof overhang** sizes relative to **sun orientation**
- **Future** extensions



opportunities for your home

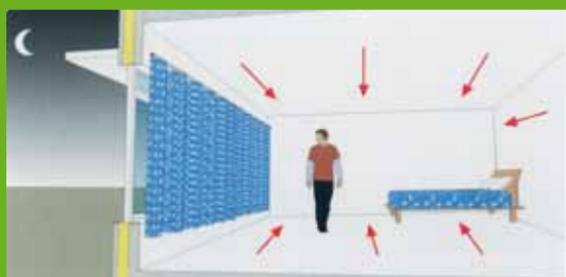
creating a sound foundation for your home

Apart from being one of the most durable, cost-effective and low-maintenance options for the foundation and floor of your home, **the high density of concrete acts as a thermal reservoir** when used effectively in conjunction with ventilation, solar shading and building orientation.



Winter day

- During the cold season in South Africa, the low angle of the sun shines through north-facing windows, and heat is absorbed by thermal mass in the floor and the walls.
- In the evening when the sun goes down and the temperature drops, heat flow is reversed and passes back into the room.



Winter night

- At night, curtains are drawn and windows kept shut to minimise heat loss.
- Heat continues to be released by the thermal mass, and supplementary heating is adjusted so only the minimal amount is used.
- By morning the thermal mass will have given up most of its heat and the occupants rely on supplementary heating until later in the day.

Thermal mass in winter



Summer day

- During very hot weather, windows are kept shut to keep warm air out.
- Overhangs on the north elevation can keep out the high angle of the sun during the hottest part of the day.
- Cooling is provided by thermal mass in the floor and walls.



Summer night

- The windows are opened at night to ventilate the building and cool the thermal masses.
- If another hot day is expected, the windows are closed again in the morning and the cycle is repeated.

Thermal mass in summer

Various alternative concrete floor and foundations systems are available on the market that offers the following additional benefits:

- Reduction in the use of raw materials on site
- Improved thermal insulation
- Speed of construction through precast and readymix solutions.

economies of scale

The increased density of multi-storey housing optimizes and economizes the use of suitably located land and it reduces the amount of infrastructure required per housing unit – reducing cost and demand for un-renewable resources.

Concrete is the logical multi-storey solution

Whether precast or in-situ, suspended concrete floors provide structural integrity, acoustic insulation, and fire and earthquake resistance. Used in conjunction with structural concrete masonry, concrete provides affordable and reliable medium- and high-density accommodation.

real homes for real people

Concrete offers a wide spectrum of **walling solutions**, ranging from cost-effective and **labour-intensive concrete blocks** to advanced factory-controlled **precast** and **tilt-up** systems.

Apart from the social and economic benefits of building with concrete blocks, it has the environmental benefit of having a low embodied energy.

Waste on site and a lack of speed of construction contributes significantly to the cost of building.

By co-ordinating the overall proportions of the house with that of modular block dimensions during the design stage can effectively reduce the impact of these factors by avoiding the unnecessary cutting of blocks on site. This good practice will also improve the moisture tightness of a structure. The local availability of concrete blocks reduces transport costs and their associated CO₂ emissions.

‘covering the nation’

Concrete is an extremely versatile roof covering material. Within the urban context where space is at a premium, flat concrete roofs are proving innovative opportunities to off-set the carbon footprint of a building by re-introducing urban green spaces in the form of roof gardens. At the same time, thermal insulation is also improved.



The timeless aesthetic appeal of concrete roof tiles ultimately transforms a house into a home. It requires no additional finish, is labour-intensive and low-maintenance. The roof pitch enhances interior thermal comfort by encouraging the convectional flow of hot and cold air caused by natural ventilation.

shrinking our carbon footprint

The cement and concrete industry has undertaken several initiatives in order to improve the carbon footprint of concrete.*

concrete is 100% recyclable

In South Africa, many redundant inner city office blocks are currently being transformed into affordable, conveniently located housing.

Re-using, instead of demolishing, existing concrete structures is an economically sensible way of enhancing the sustainability of the city, while saving costs on infrastructure.

At the same time, it conveniently provides people with suitably located housing opportunities within close proximity to social and economic amenities, such as schools, clinics and job opportunities.

recycling makes concrete sense

The demand for non-renewable resources can be reduced by specifying materials containing recycled content.

Demolished structures can be crushed into aggregate, which can be re-used to make concrete blocks. Other second generation materials can also be recycled for use as aggregate in concrete. This practice also reduces the increasing burden on land fill sites and transport costs related to waste removal.

Concrete has the ability to absorb CO₂ from the atmosphere – through a

process called carbonation.

When a concrete product is crushed at the end of its life, this process is accelerated.



** Refer to C&CI 'Sustainable Concrete' leaflet for more detail*

shrinking our ca



conclusion

From the cradle to the grave, the use of concrete can contribute to both the short- and long-term sustainability of human settlements by harnessing concrete's natural qualities in conjunction with best practices and quality construction techniques. As a result, it becomes possible **to improve the quality of human settlements delivered throughout the entire spectrum of the property market; resulting in enhanced quality of life for all.**

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acknowledgments

The Cement and Concrete Institute gratefully acknowledges the use of materials from the Concrete Manufacturers Association and the Concrete Society of Southern Africa.

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 Printing by the Bureau Digital Media (Pty) Ltd