

EARTH

Composites – the way forward?

Wood-cement composites may become a new option in building materials.

BUSINESS SOLUTION

Using wood waste to create light but durable building bricks could afford the building industry new options when choosing materials. These products could be cheaper and faster to make while supporting the environment by using waste in a constructive way.

The Department of Science & Technology is funding a feasibility study to assess the business potential of two wood-cement composite products: insulated concrete form (ICF) and wood-wool cement (WWC) panels.

About half of the total composition of wood-cement composite materials comprises wood waste and the balance cement binder. Fly ash may be added as an extender and an additive may be used to promote binding between the cement and wood particles, and cement curing. One of the main advantages afforded by the building materials is that they are apparently easy to use as they are extremely lightweight. This accelerates building time considerably and lowers costs associated with construction, including the cost of transportation.

What's more, the technology claims to be extremely thermally-efficient with obvious positive spin-offs in terms of energy management and efficiency of the completed structure.

TESTING VIABILITY

The feasibility study is being led by Meeting of Minds, a management consultancy.

The study focuses on the Pietermaritzburg-Msunduzi region of KwaZulu-Natal and has been endorsed by the University of KwaZulu-Natal, the Pietermaritzburg Chamber of Business and the Msunduzi Local Municipality.

A key element of the feasibility study is to establish whether or not the South African market would be receptive to wood-cement composite material. Sufficient material has been imported to build a number of demonstration structures. The first of these is a biological science laboratory at the Qoqisizwe Secondary School (Q High).

The science laboratory is being constructed alongside a physical-science laboratory with conventional building materials. This will enable a direct comparison between the wood composites and conventional materials.

Design and construction have been tasked to FC Consulting Engineers and building to Safika.

EXTERIOR AND INTERIOR WALLS

ICFs are being used for exterior and interior walls. The Izobloks have been imported from Czech-based Morfico. Similar products are manufactured in Europe and North America under various other trade names. For the demonstration, three forms of moulded block, machine-shaped to a dimensional precision of about 1%, are being used. They include:

- 1 000 mm-long x 250 mm-high x 200 mm-wide basic blocks for the exterior walls;



- 950 mm-long x 250 mm-high x 200 mm-wide blocks for the outside corners; and
- 1 000 mm-long x 250 mm-high x 150 mm-wide blocks for an interior wall.

FASTER AND MORE COST-EFFECTIVE BUILDING

The blocks are light. The larger blocks weigh in at about 13 kg.

When using the blocks, it is important foundations are level. After placing the normal damp course, the blocks are then dry-stacked and form permanent shuttering. Typically, four courses of blocks are laid before filling the voids with standard concrete (15 MPa), which provides structural strength to the wall.

Four basic blocks can be used to build a 1 m² wall while 0,1 m³ of concrete is required to fill 1 m² of wall. If necessary, blocks may be cut using an ordinary hand saw or circular saw.

AN ARRAY OF ADVANTAGES

There is an array of advantages offered by the building methodology. This includes:

- **Finish:** the blocks readily accept mortar, stucco, plaster and other finishes as a skim or normal finish without cracking or flaking. The finish can be painted.
- **Resistance to fire:** four- to six-hour rating with zero flame spread and zero smoke or fuel contribution.
- **Moisture and rot resistance:** a high pH inhibits fungal growth.
- **Air quality:** there are no volatile organic compounds and there is no off-gassing.
- **Termite-resistance:** tested for less than six years on an infested site.
- **Sound-resistance:** the building materials boast a sound resistance of between 50 dB to 59 dB.

Over and above the abovementioned benefits, ICFs are favoured for their thermal energy efficiency (R=2,7 m² to 3,32 m² kW), which

Imported wood-cement composites are under trial in a KwaZulu-Natal building project. The results of the feasibility study may result in the establishment of local insulated concrete forms and wood-wool cement-panel production capacity.

improves a building's living environment and operating costs.

When it is warmer in winter and cooler in summer, a building's energy requirements and costs are lowered. In cases where fossil fuels are used for space heating, air quality is improved and respiratory diseases are reduced.

WOOD-CEMENT COMPOSITE PANELS

Wood-cement composite panels or wood-wool cement panels can be used for ceilings, room partitions, roofing, cladding and weatherboards. To demonstrate the technology in South Africa, Omniboard panels were imported from Earn Corporation, a company based in the Philippines. The demonstration products include two forms of moulded and machine-shaped panels – each 2 440 mm long x 610 mm wide. They include:

- 10 mm-thick, medium-density (600 kg/m³) panels for ceilings; and
- 40 mm-thick, low-density (325 kg/m³) panels for room partitions.

These panels can be cut to size. However, if they were manufactured locally, they could be produced to appropriate metric sizes. Ordinary nails or screws can be used to secure panels to a frame or attach items to panel walls.

MORE ICF STRUCTURES?

Sufficient material has been imported to build a number of other demonstration structures. A proposal has been submitted to the KwaZulu-Natal Department of Housing to build a low-cost house as part of a development in Sinathing, Edendale. Umgeni Water has agreed to test ICFs in sanitation and, as requested by the Department of Science & Technology, a proposal has been submitted for the construction of two demonstration structures in Mthimkhulu Village Centre, which is a training and education centre being established by The Grail Centre Trust in Kleinmond, Western Cape. ■