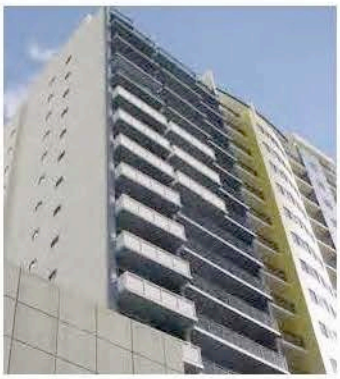

Key concepts

Mi Panel
Systems approval
Product approval
Cementitious core
Fibre coating
Delaminating overcome
Factory curing
Highest international standards
Improved manufacturing output
Increased floor space
Overall optimal systems performance

Mi Panel

Minding your 'l's

Mi Panel passed the toughest international tests – withstanding a 7,9 Richter scale seismic event. Hillary Erasmus finds out that they are about to be manufactured locally.

A systems-approval test reveals far more about a building product than a product-approval test yet brick and mortar is exempt from systems-approval testing. The manufacturers of Mi Panel are intent on providing a building system that meets the highest international standard of any given system test parameter. In some cases, Mi Panel has surpassed even the most stringent testing parameters.

The lightweight interlocking panels comprise two facings of 4,5 mm-thick fibre-cement sheeting with a low-density concrete core mix in the centre.

Withstanding forceful acts of nature would be an effective seal against the top ratings from lab tests: Mi Panel structures withstood an earthquake that measured 7,9 on the Richter scale and killed 22 000 people in India in 2003. "Amid the rubble, only Mi Panel structures were left standing fully intact," says Pragasan Chetty, CEO of MiBT. "As a result of a report commissioned by the Indian government to investigate the reason for the strength of the Mi Panel, major government contracts were awarded for reestablishing infrastructure using Mi Panels." The report found that the flexibility of the Mi Panel joints, combined with a tongue-and-groove system, allows lateral move- ments to take place. This enables the structure to withstand seismic events and cyclones. "The contracts were for putting up medical centres, over 200 schools, police stations, railway stations, electricity sub-stations, and telecommunications."

But let's face it, who cares for a tough product when we could safely stick to good old solid brick and mortar? Unless, of course, construction time is min-imised and pricing is competitive. According to Chetty, the cost-saving figures are fairly significant because the panels provide greater lettable area in commercial areas, approximately three-times faster construction times and significantly reduced labour rates.

"Ostensibly, construction is almost three times faster, which translates into labour-saving costs," says Chetty. "So what could be done in one-month con-struction, we can potentially do in eight days."

Some 700 rooms were put up in 90 days at a min-ing residential camp in India for Reliance Oil. "A brick-work wall will go up at around 30 m²/day to 35 m²/day using skilled labour whereas we put up 100 m²/day using just a team of 4." At the Diamond Beach luxury holiday resort in Australia, 19 duplexes, measuring 120 m² each, were completed in four months using Mi Panels. "One of the major advantages of the system is the elimination of wet works on site – a major time constraint in the con-struction industry," Chetty points out. "Not only do we go up three times faster, we give greater liveable area, which is significant for retail markets where floor space is an important factor." The walls of the turbine hall for the Neyveli Power Plant in India were completed three months before schedule. Panels of 75 mm thick and 20 m to 40 m high were fixed to the steel structure of the turbine hall rather than using 230 mm brickwork. "On a 130 m² house, you are looking at, on average, a 9% increase in liveable area and approximately 27% on a 40 m² house, compared to double clay-brick or hollow block, which is considerable." Since it was adopted in Australia in 1971, hundreds of thousands of Mi Panel structures – from stadiums to casinos and houses – have gone up in Australia, India, Malaysia, Indonesia, the United Arab Emirates, Yemen, the Solomon Islands, the Tiwi Islands and Sudan, Chetty informs Building Africa. In South Africa,

25% less embodied energy

"Our licence on Mi Panels extends throughout south-ern Africa," says Chetty. "One of the greatest explo-sions or urbanisation is expected in this region yet we have some of the worst-performing building materials with erratic supply due to production and transport factors. Preliminary analysis indicates that Mi Panels have 25% less embodied energy than cement bricks since electricity is not used to cure the panels as opposed to condensation for cement blocks and bak-ing for clay brick."

Factory in Gauteng

Mi Building Technology intends to partner with Construction Industry Development Board Level 7+ contractors on developments. The panels will be initially manufactured at a factory in Gauteng and then other factories will be identified in the Western Cape, KZN, the Eastern Cape and Mozambique. Chetty believes that the appetite for Green building will only increase as more people become aware of the intended consequences of SANS 10 400, the standard intended to achieve energy efficiency and a reduction in waste on construction sites and which he anticipates will be adopted as a standard soon.

Exceeds highest rates on individual tests related to panels

- Tested against highest international systems approval per parameter
- Excellent overall system performance
- Tongue-and-groove jointing system allows faster construction
- Factory-cured panels eliminate on-site curing
- Lightweight panels are easy to handle and erect
- Special tools and skills not required
- Cooler in summer or tropical zones and warmer in winter
- Strong and durable
- Excellent water, termite- and fire-resistant properties
- Suitable for cyclone- and seismic-prone zones
- Excellent thermal- and sound-insulation properties
- Extra usable floor space

No buckling at 163 kN

Highest international standards

No buckling at 163 kN

Since the US standards for vertical compression were the highest internationally, Mi Panel was tested against ASTM E72. The panel surpassed the 80 kN test without any sign of buckling at 163 kN.

138-minute fire test

Mi Panel was selected for a hospital in Jakarta, particularly for the lift wells – the panels surpassed the two-hour Australian rating for fire testing.

Flotation prevented

The cementitious and micaceous core contain expanded-polystyrene beads. Added chemicals allow for bonding between the core and the two compressed fibre-cement sheets (4,5 mm each) and prevent 'flotation' when the mixture is being poured.

138-minute fire test

Flotation prevented

Cost below subsidy grant, including solar

"This year, we have submitted an application for the construction of a 40 m² Breaking New Ground (BNG) house and a 56 m² affordable house in Wellington for the Absa/Concor Housing Innovation competition," says Siza Khampepe, chairman of the board of Mi Building Technology South Africa. "We are one of the few entrants in the entire competition to be granted two stands because of our competitive edge in terms of pricing and product. There are very few solutions like ours, which are below the subsidy grant for BNG housing. Our pricing includes 100 ℓ evacuated-tubing solar water-heated geysers and LED lighting."

Beating international standards

The Mi Panel product range has been certified by Agrément, as foreseen by Khampepe and Chetty who were confident that the panels would exceed requirements.

"Over the years, our partners have tested the panels to the highest international standards related to systems approval," states Chetty. "The panels have been subjected to every test associated with panels – vertical compression, bending, bending plus axial, compressive strength, water penetration, soft- and hard-body impact tests, racking and fire tests, and we have always met with systems approval."

Systems approval – the real test

"Before new products are launched into the building sector, they need to receive two stamps of approval: systems approval and product approval," explains Chetty. Standard hollow-block or clay-brick and mortar are, however, exempt from the systems-approval process although the parameters are much higher than for product approval. "The problem with brick and mortar needing to meet product-approval standards is that, while the bricks may meet the required strength, the actual mortar strength may be of a lesser standard," says Chetty. "So, if you exceed that particular MPa under a certain wind load, you could potentially have numerous failure points in the system, and a system is only as strong as its weakest element."

Buckling – withstands double the minimum

Since the US standards for vertical compression are the highest internationally, Mi Panel was tested at the University of New South Wales for ASTM E72 – the US standard test method for panels. "We set up a hydraulic jack, positioned on load cells, and tested

Factory in Bronkhorstspruit

Factory-controlled curing

Strong and quick

the panels for up to 100 kN, which was the limit although we only had to meet about 80 kN according to the standard," recounts Chetty. The panel surpassed the 80 kN requirement by more than double. "The deflection in the centre was less than 1 mm and vertical compression was less than 1,8 mm at 100 kN. We repeated the test, to build up a sample base, with almost identical results. The next day, we adjusted the jack and tested at 163 kN – now double the minimum standards – and there was still no sign of buckling failure."

Fire-resistant

Fire testing was compared against the Australian standards, which hold the highest international standards for fire testing – AS1530, parts 21 and 22. Combustibility was tested against the highest international parameters for that – the British standards – BS476 Part 4. "For the fire test at the Commonwealth Science & Industrial Research Organisation in Australia, I went in and built an entire 3 m x 3 m wall consisting of five panels," says Chetty. "There was zero flame penetration in the joints even after two hours and 18 minutes; surpassing the stringent two-hour fire rating." This far exceeds the South African requirements for external walls of 30 minutes and 20 minutes on internals.

Irrespective of the local building standards, the panels will be produced to meet the highest international system-process testing. The formulae could be adjusted to meet to the lower regional system standards, comments Chetty, thereby reducing manufacturing costs. "We can't be world leaders if we simply adjust the product formulae to meet the lower standards to produce it cheaper," he says. "We will never compromise product integrity."

Flotation prevented

Delamination, typically associated with panelised systems, was a key reason for developers shying away from them. Mi Panels contain expanded-polystyrene (EPS) beads – isopantane in raw form. The addition of chemicals to the cementitious and micaceous core has helped to eliminate this problem. The chemicals allow for bonding between the core and the two compressed fibre-cement sheets (4,5 mm each). The chemicals also promote consistency through the EPS in the core mix. "Vibration would be used to eliminate air pockets, which are potential weak points, but this would have the undesired effect of causing the EPS beads to rise," explains Chetty. "As a result, the uniformity of the beads through the mix is disturbed. This, in turn, compromises the load-bearing capacity of the core, and the acoustic and thermal transmission."

The factory process

Factory in Gauteng

At a planned factory in Gauetng, automated production processes will be introduced.

Factory-controlled curing

In the first three days of wet curing beneath a tarpaulin, chemicals in the core promote bonding between fibre sheets and wet core to prevent delamination; typical of panelised systems.

Strong and quick

Lightweight interlocking panels consist of two facings of 4.5 mm- thick fibre-cement sheet with a low-density concrete core mix. The interlocking system assists in resistance to seismic and cyclonic events, and it enables rapid construction.