Modular mastery

Why wait months for a home when you can have one in days? This high-tech building system reimagines residential construction with prefabricated elements that lock together for a faster, stronger build.

WORDS BY CHLOE HAVA

Australia is in the middle of an unprecedented housing shortage crisis. Our growing population, along with domestic and international investment, has driven strong demand for housing and pushed prices sky high. New construction often falls short of this demand – slowed by zoning regulations, limited land releases and construction labour shortages – leaving supply unable to keep up.

However, one Perth-based company offering a potential solution is NXT TEC, whose approach speeds up residential construction and reduces costs.

NXT TEC's structures include granny flats, residential housing, flat-pack homes and larger-scale commercial or multi-unit developments. Its prefabricated construction method makes it an adaptable building solution for a range of projects.

ABOVE: Anthony Piccoli, NXT TEC.

Each step – piling, footing, columns, beams, suspended floors and roofing – uses purpose-built pieces. And because each concrete or steel element is produced offsite, the structure can be assembled rapidly on location with minimal disruption, said Anthony Piccoli, Director of NXT Builds.

"It's more affordable and allows people to get in their houses at a much quicker speed," Piccoli said.

Designing a "superstructure"

The NXT building system is designed around 11 interlocking technologies using concrete and steel components connected by mechanical locking methods, Piccoli told *create*.

"It starts from the foundation to the building and the roof," he said.

The "superstructure" features a screw pile foundation and precast footings and columns, forming the core structure of the building.

"From there, it tees off to beams, suspended floor systems and an insulated roof."

The materials used in the structures are typically recycled or fibre cement sheets.

"They're all durable and certified products. In terms of the longevity of the product, we're talking about 100 years."

All components are prefabricated offsite and assembled onsite. "We use precast concrete panels, which means we can assemble a house from slab to structural lock-up within four days."

By standardising designs, the system also keeps timeframes and costs predictable.

"We know the exact amount of steel or concrete required. So we can provide accurate quotes without large contingencies."

A solid foundation

Rather than being hammered or vibrated, the NXT screw piling system is screwed into place.

Unlike deep footings that require bulk excavation, the screw piling technology ensures minimal ground disturbance, high load capacity and accurate vertical alignment, Technical Director and system inventor Mataki O'Goshi Lim said.

"You go down, screw in the blade, and it gets tighter and tighter to retain the density," he said.

The helix size and configuration can be tailored to suit specific >

BY THE NUMBERS

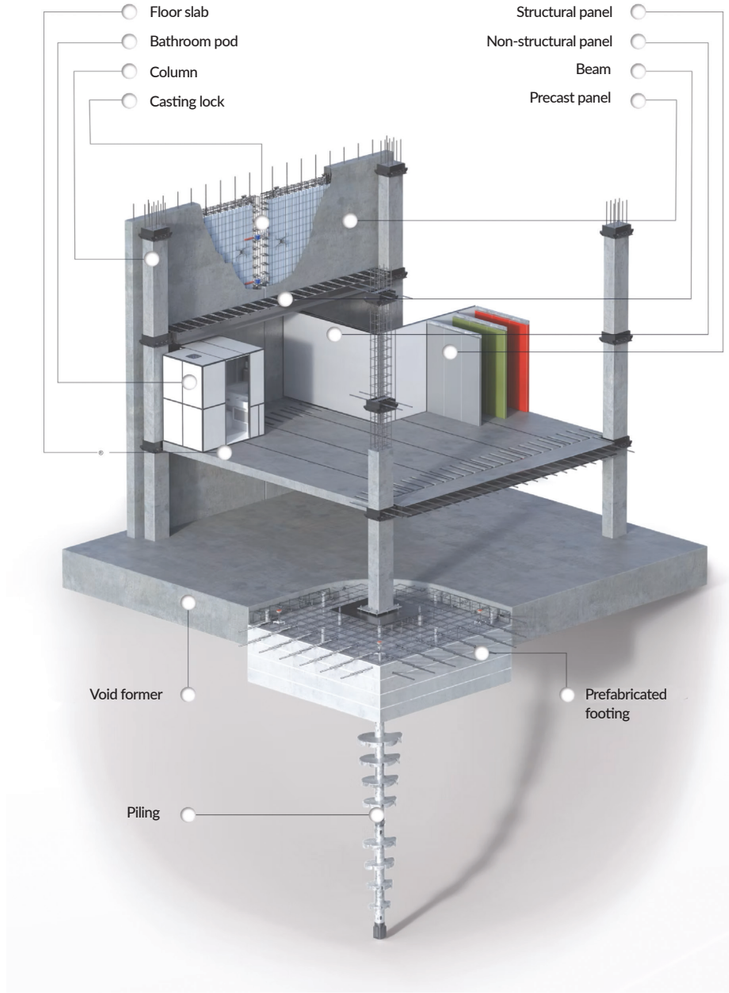
BUILDING THE CONCRETE PANELS AND STRUCTURAL STEEL OFFSITE TAKES

2-5 weeks

IT TAKES JUST

5 hours

FOR A STANDARD FOUR-BEDROOM, TWO-BATHROOM HOUSE TO BE BUILT



ABOVE: NXT TEC's standardised building system.

"There's no earthworks to take out, which saves time, materials cost of concrete and casing – and the hassle of casting all the existing clay to landfill."

load and soil requirements.

"There's no earthworks to take out, which saves time, materials cost of concrete and casing – and the hassle of casting all the existing clay to landfill."

The slab is then poured – taking five hours for a standard four-bedroom, two-bathroom house – and is left for about a week to cure.

Precision in prefabrication

Although onsite work for standard residential projects is measured in days, shop drawings are produced for all components and then the prefabrication of concrete panels and structural steel offsite takes two to five weeks.

During that time, developers can secure the necessary permits, so once approvals are in hand, everything is ready to go.

"We fabricate concrete panels in our manufacturing facility and deliver those panels to the site," Piccoli said.

"We then use a crane to erect all the panels and stand them up.

"For larger scale commercial or multi-unit developments, we use our precast columns – at a maximum height of four stories (12m), that are then installed and connected to the beams via mechanical locking

"Also for larger scale commercial or multi-unit developments, we have an entire bathroom suite that is prefabricated, down to the waterproofing and tiling.

"The bathroom pod is lifted up like a box on a crane and dropped down and pushed in," O'Goshi Lim said. "The plumber then just has to connect the pod."

Other prefabricated systems or solutions tend to use steel, timber or double-brick framing. But, according to Piccoli, concrete precast panels tend to be more durable.

"They're more robust, not just because of the concrete and the steel. It's how they're connected and how all the material is used," he said.

This approach can alleviate pressure on builders and help maintain quality.

"Then the builder isn't rushing at the end to meet deadlines. There's time to deliver a better finish."

Integrating utilities

Despite its prefabricated nature, the NXT system incorporates standard utilities.

When the walls go up, meter boxes are attached and service connections made. Gas, for instance, can take up to 21 days to connect – aligning with the usual timelines in conventional developments. Each trade – electrician, plumber, gyprocker – comes in at separate intervals post lock-up.

Both the electrician and plumber will visit the site three times.

"The plumber does a prelay, and, once we lock up, the plumber installs all the pipes, and then comes back and connects the fit-out, such as the taps," O'Goshi Lim said.

Testing and validation

All NXT structures undergo rigorous certification by both internal and external engineers, ensuring they are cyclone-rated and compliant with industry standards.

"The method of connecting concrete panels together offers significant ratings for buildings," Piccoli said.

Energy efficiency is another standout feature. "In WA, the NatHERS energy rating requirement will increase from 6-stars to a minimum of 7-stars, but we've achieved 7.8 stars, with one of our homes even reaching 8.2 stars, thanks to our advanced materials and technology." he added.

The NXT building system meets all compliance codes, with extensive research and testing conducted on every connection.

"We've tested numerous prototypes to ensure they meet strict safety factors."

Critical assessments, including composition, fire rating, acoustic performance and beam bending tests, are conducted in Australia through Griffith University and CSIRO. "All tests surpass the Building Code of Australia requirements," O'Goshi Lim said.

A portable solution

Once finished, an NXT house functions like any standard home. However, walls can be reconfigured without structural approval, with the load-bearing columns engineered to allow for open-plan flexibility. One could, for instance, convert two bedrooms into a larger master suite simply by removing a non-load-bearing partition.

Even more intriguing is the potential for large-scale manufacturing of flat-pack houses, delivered to remote regions, construction sites or areas where moving entire dwellings might be necessary.

"The granny flats and flat-pack houses are movable," O'Goshi Lim said. "Because they are not built of bricks, these structures can be lifted via crane, placed on a big semi-trailer and moved to a new location."

By reducing onsite labour, standardising components and allowing for structural flexibility, this approach allows for a more nimble response to market demands or land development constraints than many traditional methods.

"We want speed, quality, budget certainty and a greener footprint," O'Goshi Lim said. □

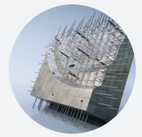
How to assemble a house in four days

In conventional double-brick construction, the walls alone can take four to six months to finish – with an extra month required to affix the roof.

But applying a standardised design approach and manufacturing panels, and structural steel elements offsite allows for rapid construction.

Up to 400 homes in one Perth suburb are already being developed using the NXT building system, which shortens total construction time from months to days.

The four-day onsite assembly entails:



Day 01

Up to 20 precast panels per home arrive onsite and are erected.

Day 02

Structural steel elements – struts, columns and beams – are installed and fixed to the panels.

Day 03

The prefabricated insulated roof panels are craned in place, immediately providing an insulated cover.

Day 04

Doors and windows are fitted, completing the structural lock-up phase.

BELOW: NXT TEC techniques in action.

"The granny flats and flat-packs houses are movable. Because they are not built of bricks, these structures can be lifted via crane, placed on a big semi-trailer and moved to a new location."

ABOVE: Mataki O'Goshi Lim NXT TEC.