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Issue 1

timber UPdate

2016 National Construction Code Change

- NCC changes allow wood construction to 25m - Class 2, 3 and 5 buildings
- Explanations and opinions from design and construction industry participants
- Wood encouragement policies gaining traction in Australia
- Australia joins world leaders in allowing tall timber construction
- Massive promise from new thinking on pre-fabricated timber.

Code change creates exciting new opportunities according to architects and engineers

Architects, developers, building designers, engineers and builders have welcomed changes to the National Construction Code which allow massive timber and lightweight timber construction of buildings up to 25 m – effectively eight storeys in height.

Gone are the "Alternative Solutions" provisions and other obstacles. Construction costs for mid-rise suburban apartments aimed at 'middle Australia' are expected to drop by up to 25 per cent, while meeting or exceeding the fire safety, acoustic and thermal performance of traditional building methods.

The changes – effective from May 1st 2016 – follow a two-year consultation and research process spearheaded by industry services group Forest and Wood Products Australia Ltd (FWPA), and will allow mid-rise timber buildings that meet specified new requirements.

So what does it mean for Australia's urban environments?

According to a range of design and construction professionals, fabulous opportunities abound. There is enthusiasm to create interesting design solutions for residential apartments and community facilities using speedy prefabrication systems with a reduced environmental footprint - thanks to timber's capacity to store carbon. As one architect says, "the advance in our understanding of the potential of engineered timber allows architects to build tall in an environmentally responsible material".

One fan has been watching the growth of mid-rise timber construction for many years. Andrew Waugh of England's Waugh Thistleton Architects says Australian cities, like others around the world, need to embrace the opportunity.

"The growth in the world's population is principally concentrated in urban areas," Waugh says from London.

"In Australia, as elsewhere, we need to increase the density of our cities. We also need to reduce our reliance on heavy, polluting construction materials. Engineered timber allows us to build tall residential buildings in urban contexts, without costing the earth!"

Structural engineer with Aecom, Nick Hewson agrees. "The changes will make it easier for builders and designers to consider timber construction and removes another barrier to the approval of timber buildings. It'll give more confidence to developers to pursue timber as a construction method without the potential risk and additional time required to pursue Alternative Solutions".

Aecom was recently recognised by Fortune magazine as the globe's most admired company for its commitment to making the world a better place by bringing professionals from different disciplines together on major projects.

Hewson is a fan of the building process saying construction in timber is typically significantly faster and quieter than more traditional construction methods. This will provide opportunities to build using timber around sensitive locations, reducing disruption to surrounding facilities – perhaps next to hospitals or schools. "The more sensitive and constrained the site the more economic timber construction will tend to be," Hewson says.

In terms of urban design of middle suburbia, Hewson says the lightweight nature of timber will be a huge benefit when designing developments over rail lines and stations. "There are huge amounts of valuable air-space real estate across our major cities above existing rail lines and infrastructure. In Australia, we are lagging behind the rest of the world in capturing the value in these spaces."

As Melbourne embarks on a series of level crossing removals across the city, designers might consider some locations for new buildings. The lightweight nature of timber will fit neatly over the massive decks created above the train lines.

Australia's most successful and high-profile residential building relying on engineered timber products is Lend Lease's Forte. At ten storeys, it was until recently the world's tallest high-rise apartment building using mass timber construction. Based in Victoria's inner-city Docklands, its 'pre-cast jumbo plywood' cross laminated timber (CLT) panels allowed fast, light and cost-effective construction.

Says Waugh: "The change in the National Construction Code will allow architects to better explore and demonstrate the potential of engineered timber, while also increasing the use of traditional timber framing. This will allow the pioneering work done by Lend Lease on their Forte building to be emulated throughout Australia".

Lend Lease has made a significant commitment to driving innovation in construction materials with the company's recent launch of a factory producing prefabricated building materials in western Sydney. As well, StrongBuild is expanding its offsite prefabrication capacity with a new facility in Baulkham Hills.

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Sydney based architectural studio, Fitzpatrick+Partners, is considered one of the industry leaders in the design and systems for engineered timber construction.

James Fitzpatrick, managing partner and head of design says:

"We identified the opportunities of constructing medium height residential and office buildings several years ago. With the clear precedents in Europe it is clear that this construction system allows us to develop built solutions which offer better environmental, safety and cost outcomes. We strongly believe that in the very near future the timber solution will be the obvious solution."

Fitzpatrick says the current generation has generally survived by using solutions and systems developed by previous generations, and that medium rise engineered timber construction systems are now being seen by the Australian construction industry as a potential response to the new environmental, cost and safety demands of industry.

"We spoke at 10 different timber industry events in Australia and New Zealand to over 2000 interested parties last year. The industry response has been cautious but very optimistic. This code change demonstrates to the market that the industry is moving forward, and that future has arrived," says Fitzpatrick.

Fitzpatrick considers the opportunities offered by this construction methodology will open up new and exciting opportunities for suppliers, fabricators, contractors and designers, and they have no doubt that we will see the establishment of prefabrication and modular plants utilising timber construction, fabricating building components for both low-rise and high-rise construction.

Developers and others wanting to build with timber will no longer need to endure the arduous approval processes of the past. As people in the industry become more familiar with building mid-rise projects with timber, the design and production of new residential buildings in inner and mid-suburban environments will rise accordingly. But one architect sounds a warning.

Peter Maddison is a director of Maddison Architects, a practice he started in 1989. Among his many roles, he advises the Heritage Council of Australia and various schools of architecture. He is an ambassador for Planet Ark and is the host of the Australian production of Grand Designs. He is a self-described passionate advocate of CLT and has visited the UK and Europe on study tours with FWPA's WoodSolutions, investigating the advantages of CLT construction.

Peter welcomes the arrival of CLT construction to Australian cities but he hopes urban planners will think carefully about the need to enhance inner and middle suburban landscapes.

"When you have a low-rise next to a high-rise which is next to a ground level car park... you get very lumpy cities. Spikiness in an urban setting is not a good thing," Maddison says. "You get wind tunnels and disconnected communities."

He likes the idea of timber-built mid-rise residential buildings next to each other, each four, five, six or seven storeys. "A connection between the people and the ground develops. It's really nice when the apartments are at the height of the trees so there is a connection to the earth. You want to be able to wave to someone on the ground."

ALL IMAGES BELOW [LIBRARY AT THE DOCK [CLARE DESIGN, HAYBALL [PHOTOGRAPHY: EMMA CROSS

On the other hand, he says, higher apartment blocks isolate residents, especially when they look down at people "who seem to be like ants – it's as though the residents are watching a TV screen. They're quite disconnected from their community".

"There are plenty of precedents out there," Peter said, "and Australia has been a bit slow off the blocks but the situation is changing rapidly and we're watching a natural evolution. It's such a viable way of building and is so sustainable."

Public buildings in the suburbs face transformation as mass wood construction becomes more common.

Hewson is particularly passionate about the potential for schools to be designed innovatively.

"As Australian suburbs start to become ever denser and more facilities need to be built, we'll see a change in the traditional school construction to more multi-storey buildings or 'vertical schools'," he says. Prefabricated timber construction will allow entire buildings to go up during school holidays. As well, he is excited by research that suggests children are happier, learn more and are relaxed surrounded by natural materials.

Maddison points to the Library at the Dock, a three-storey community hub and library in Melbourne's inner–city Victoria Harbour, designed by Clare Design and Hayball. It's the nation's first public building to be built from massive timber. The $23 million project was awarded Australia's first 6-star green star rating for a public building. The structure was light, reducing the need for new foundations and allowing the library to be built just eight metres from the water on a 75-year old wharf. The CLT and Glulam offer superb thermal performance and require less energy to heat and cool than other materials – all significant long-term benefits for a public building.

The Docklands precinct presents a particularly challenging environment for developers. Hewson believes the new code provides the first opportunity for buildings on sites with poor ground conditions - characterised by either low strength soils or ground contamination.

"Melbourne's Docklands, for example, is largely built on Coode Island silt which is very low strength and significant money and materials are spent on foundations alone. The average timber building could weigh half as much as an equivalent concrete building and large savings are possible in the foundations."

Both Hewson and Maddison agree there are few impediments to medium-rise construction in timber other than those based largely on preconceptions and prejudices.

Hewson: "I hope this change will start to win over the hearts and minds of more people in the construction industry. My own experience has shown that once people have experienced a large-scale timber construction project, they are often converted and wonder why they didn't build that way before."

Environmental issues are also top of mind for both.

As Hewson says: "I am very passionate about reducing our impact on the planet and there is a huge role for timber to play in that. A project we're working on in south-west Sydney is just about to start on-site and we have calculated that the amount of CO_2 saved by using a timber structure compared to a concrete one is equivalent to removing 500 cars from our roads for a year. If we can build more buildings using sustainably-sourced timber then we can start to try and offset some of the damage we're doing to the planet by other means".

As Maddison says, 50 per cent of the timber's weight is stored carbon – and it can be recycled. As the general public gradually understands the benefits of responsible management of timber harvesting, buildings like the library, he believes, will be embraced.

The code change could be the catalyst for a more interesting and affordable built environment – says a quantity surveyor

"We might start seeing more interesting buildings," said Richard Smith, an associate director and quantity surveyor at MBM construction consultants, discussing the recent changes to the National Construction Code (NCC).

Quantity surveyors, one of the members of the team of building professionals on every development, are in a position to significantly influence the specification of building materials.

The changes to the NCC will, from May 1st, allow buildings in Classes 2 (apartments), 3 (hotels), and 5 (offices), to be more easily and affordably built in timber, up to an effective height of 25 metres. Buildings of this height are typically up to eight storeys and referred to as mid-rise construction. The changed provisions in the code address both traditional timber-frame and new massive timber systems.

Looking at what the changes might mean to the design and construction industry, Richard said, "We might start building more interesting buildings. Concrete and steel are never going to disappear, they've been around for thousands of years in one way or another, as has timber, but now there'll be new options. What I hope happens, is that all three materials can start working together to create some more innovative and interesting structures in our built environment."

Quantity surveyors are often cast as the accountants of the construction industry, material pragmatists whose costings stifle creativity and encourage the conventional, at the expense of innovative design. However, when it comes to timber, Richard's thoughts are far removed from clichéd expectations.

"In terms of the code change and future projects, our first job as a QS is to get timber into the development and design conversations earlier. I think it needs to be assessed side-by-side with concrete and steel, which are the traditional options."

When asked what is behind his evident enthusiasm for timber, Richard's answer was simple – and unexpected – cost, and that the savings can be significant. While independent comparative costing research available from WoodSolutions suggests a differential of around 2% on residential projects, Richard's experience with cross laminated timber (CLT) showed savings of up to 10-12% against traditional materials.

"I've actually costed a residential project with six, seven and eight storey buildings, some 100 units overall, where we asked builders to give us two prices; one for timber and another for conventional materials. The hard data that we got back, without being sensationalist, showed that timber wasn't only cheaper, but smashed the traditional materials out of the water. These weren't figures pulled from the air either, they were prices from reputable builders around New South Wales."

Richard continued to explain that even if the savings were only 1% or 2%, on a 100 million dollar project, which most of the residential projects he deals with are, the savings run into millions of dollars, which is a bonus for any developer.

"To me, the pursuit of timber in this type of construction seems inarguable," he said, "I see the role of the QS as advocating these new lower cost options to other professionals, architects, engineers, builders and developers, to get them to start really taking it on board."

Looking ahead, Richard predictably sees a bright future for timber in mid-rise construction.

"As a result of the code change, which you could say has 'legitimised' timber solutions, I think we're going to find they will be embedded in the construction landscape. As a QS I'll be able to walk into any planning discussion, especially those dealing with problems and say, "Let's just review this design with a timber option." I'm even tempted to revisit some old feasibilities from years ago that didn't stack up, especially on complex sites, and say, "Let's review these with a timber solution," because the data we've got back so far from the real jobs is telling me that there are decision-changing savings to be made. And that's a game-changer."

Code changes & multi-storey timber, a brief international overview

TOP [DALSTON LANE
[WAUGH THISTLETON ARCHITECTS

MIDDLE [SKY BELIEVE IN BETTER BUILDING
[ARUP ASSOCIATES
[PHOTO: SIMON KENNEDY

BOTTOM [WHITMORE ROAD
[WAUGH THISTLETON ARCHITECTS

From a position of lagging behind other countries, Australia's recent code changes puts us up front with the leaders, as this article explains.

The coming changes to the Australian Building Code will simplify the process of building mid-range multi-storey buildings with timber framing or massive timber as the dominant structural material. However, it is worth looking at similar codes and the changes that have been enacted in other countries in recent years to see their level of success in encouraging wood construction.

Many building codes around the world try not to discriminate based on materials, preferring a judgment based on function alone. Throughout the EU the materials are unimportant as long as the design fulfils the six essential requirements of stability, fire safety, safety in use, noise protection, energy economy and health/ environmental concerns.

However, traditionally multi-storey projects in the EU and UK have not used wood due to concerns about its ability to meet acoustic and fire safety ratings.

In countries without extensive traditions in wood construction such as the UK, where concrete and steel have become the norm, a lack of labour skilled in working with timber building systems has also restricted the growth of the use of wood in larger buildings.

More recently the UK has seen an increase in multi-storey timber buildings, especially for residential and education applications, often due to carbon footprint requirements, imposed by various levels of government.

In Canada, a multitude of code changes was instigated in 2009 by the province of British Colombia. They raised the maximum height for wood-framed residential buildings from four to six stories and enacted the Wood First Act, where government-funded building projects were required to be constructed from wood wherever possible.

This change to the code and the culture began a vast increase in the number of wood-constructed projects, with over 250 either completed or begun in the intervening period. The success of these efforts has seen other Canadian provinces enact similar reforms to their building codes.

By 2010, two Scandinavian countries had also changed their building codes to allow taller residential structures built with wood framing or out of mass timber products such as cross-laminated timber (CLT). The code in Sweden allows for apartments of up to eight stories to be built from wood, many of which achieve passive house energy classification.

Finland soon followed suit in changing their codes to more closely align with their neighbour, allowing for wood-frame structures of up to the same eight storey mark as long as suitable fire-resistance measures were put in place.

This, again combined with government encouragement towards building more wood buildings and a healthy familiarity with wood construction in these countries, has seen a large increase in the number of buildings with wood as the structural material.

The USA has a long history of wood construction in single-family dwellings, but their building codes have always been fragmented and under the overview of individual cities. There is a current trend towards adopting model codes such as the International Building Code (IBC). However, cities adopt versions of this code from different years, exclude parts of the code that are unsuitable or unwelcome and adjust sections to suit their preferences. While sensible to modify the code for their specific requirements, it does result in a confusing system that cannot accept large changes over the multitude of codes.

These examples from different countries show that, for a significant shift from concrete/steel structures to ones of mass timber or timber-framed construction, changes to the building codes often do not come alone. Instead, they are frequently accompanied by a corresponding encouragement from the governing body towards builders and designers to use wood in their buildings. This was seen in Canada in 2009 with the Wood First Act and in Finland the following year.

More advanced wood building systems are continually being developed and refined, and so around the world we see building codes shifting to avoid discrimination based on material and instead judged solely on performance.

Today, Australia joins the many countries around the world allowing their citizens, economies and environments to benefit from the advantages of multi-storey timber construction.

Wood Encouragement Policies accelerated by Code change – Australian local councils lead the way

Led by Victoria's Latrobe City Council and supported by bodies including leading environmental organisation, Planet Ark, Wood Encouragement Policies are gaining traction throughout Australia – and being reflected elsewhere in the world.

Few people would say they like living near a conventional building site, and for councils approving developments hearing from those who don't is almost inevitable when a development application for a large conventional concrete and steel building goes on display.

But if they follow through on the resolution passed at last year's National Congress of the Australian Local Government Association (ALGA) to adopt wood encouragement policies, they may find those issues evaporate faster than CO_2 getting sucked into a river red gum.

What many builders, councils and even foreign sovereign wealth funds are starting to recognise is that growing trees and then turning them into buildings, internal fitouts, furniture and fixtures is a major opportunity to resolve a whole raft of pressing issues.

Latrobe City Council's Councillor Sandy Kam initiated her council passing Australia's first local government Wood Encouragement Policy in December 2014. Ms Kam also promoted the idea to other councils and proposed the resolution passed by ALGA.

She pointed out that a typical urban infill apartment development, for example, built using concrete and steel means a massive workforce, lots of noise, dust and mess, concrete trucks and other suppliers coming and going and a major impost on the amenity of everyone nearby for months on end.

By comparison, the 10-storey Forte building at Docklands was assembled from pre-fabricated cross laminated timber (CLT) panels by four carpenters in 40 days.

Study after study is showing that these buildings are not only faster and easier to build, they are also cheaper – which is good news for both builders and those commissioning them.

Wood encouragement policies adopted to date are in council areas where there is an existing resource and timber industry.

Kyogle Shire, for example, passed its policy in November 2015. The Council felt it made sense to promote the use of its local resource and industries, which include the Hurfords, Hogans and Boral mills. All are producing hardwood products suitable for construction or fitout.

Wattle Range Shire Council in South Australia and Wellington Shire Council in Victoria have also formally adopted similar policies.

Brad Gray, director of campaigns for Planet Ark, said Bunbury Shire Council in Western Australia is currently looking to develop a policy, and Tumut and Tumbarumba Shire Councils on the edge of the NSW Snowy Mountains have also drafted policies.

Mr Gray said for these councils there is an economic motive, but there are other councils where it is coming to be seen as a way of meeting published sustainability targets.

City of Sydney, for one, is warming to the idea and getting an understanding of the benefits of wood Mr Gray said.

Ms Kam said her passion for timber comes from a wish to see her local area better utilising the resource on its doorstep.

"It's a resource that has a number of applications," Ms Kam said. But it wasn't a resource the council had been asking consultants on its projects to consider before the policy was put in place.

Now, timber, including engineered timbers, must be considered for any suitable application in a council building, and where it meets the required codes and standards it is to be used in preference to conventional steel and concrete construction.

"I thought, let's be fair. We have all these resources around us, let's make it a level playing field."

Ms Kam said the shift towards timber is also about "celebrating the beautiful architecture" it can deliver.

The need now, she said, is for more education of builders, developers and the general community around the benefits of timber and the possibilities the new engineered timbers such as CLT, LVL and glulam offer.

There are other potentials too, such as nanocrystalline cellulose derived from timber, which is being investigated for advanced manufacturing to replace metals, glass and plastics in some applications.

Timber is also a material that can help mitigate climate change and improve sustainability. Overseas, she said, there are places where it is being mandated that open spaces be planted with trees for future use in construction.

Another consideration for her council is the need to transition to a low carbon economy, which could see the region's coal mining industry scale back. Value-adding to a resource like timber is possibly a way forward.

Ms Kam said it is important that any construction project using timber ensures it is using products that are certified, so users can be certain they have the right product for the job. At Latrobe, the preference is to first look to procuring products locally, then if required on a state level, or a national level. Imported products are their last resort.

She said she wants to see the governments at a state and federal level coming on board with wood encouragement.

Planet Ark's CEO Paul Klymenko, said Northern Europe in particular is more advanced in its use of timber for tall buildings. This is not only because those countries developed the mass engineered timbers like LVL and CLT, but also because they have taken the issue of climate change quite seriously early on.

"Europe has had a net increase in forest cover about the size of Austria and Germany combined," Mr Klymenko said.

"They are always looking for low emission materials that also emit less carbon during manufacture.

"The tree is a master of photosynthesis, taking carbon out of the atmosphere and storing it in their trunks."

Mr Klymenko said that as momentum in Australia builds around the need for European-style multi-use, medium density urban development around transport hubs, he hopes to see them being built of sustainable timber, not concrete and steel.

"It is such a compelling case for timber. It meets the sustainability criteria that investors are increasingly having to meet.

It's also cost-effective, and technically much more attractive, for example truck numbers are reduced, and you can prefabricate offsite," he said.

"It's also better for the environment. There are very few things that can tick all those boxes.

Planet Ark Research Director Sean O'Malley said that when people in Europe are asked about the issue of fire safety in timber buildings, they "roll their eyes".

"It's been tested, and tested, and tested," he said.

"In a bushfire, what survives is the big trees. They char on the outside, and that protects them."

The same effect has been observed with mass timbers. They char very slowly on the outside, but retain their structural strength.

By comparison, steel is "quite unpredictable", he said. When it is heated it loses strength, but there is no certainty about when it will collapse. It is also prone to buckling in a fire, and it is a far more difficult matter to repair fire damaged steel and concrete than damaged CLT or LVL components.

Mr Klymenko said that now there needs to be more investment in planting forests.

"With just a 10 percent increase in planting trees for sustainable harvesting, we could meet all of our country's construction needs, which includes the need to house three billion more people by 2050," he said.

"At the end of the day, we have to create a sustainable society, and that includes environmentally, socially and economically sustainable."

Mr Klymenko said the forestry industry has a renewed social license to operate due to two factors – the need to tackle climate change, and improved practices that demonstrate that forestry is not deforestation, it is rather, a process of cyclic rebirth.

Mr Gray said that wood construction in Australia is "coming in around the side entrance." The sustainability aspects are only one part of the equation.

"There are other benefits that are giving wood a leg up," he said.

The decision to use timber for the award-winning Library at the Dock in Melbourne was motivated by the difficult geotechnical conditions of the site. The lightness of mass timber construction compared to steel and concrete took away the need for deep foundations, creating both a cost and time saving.

"The momentum is building with architects and builders, there are a few that have the expertise and understanding," Mr Gray said.

The two barriers he sees are financiers of projects that do not understand the material, and concerns around fire, something he said insurers have also raised.

But with Australian CLT factories coming on line in the near future, one by Lend Lease that will use CLT from offshore to prefabricate building components, and one being launched by New Zealand's XLAM that will produce a domestic CLT product, he believes the momentum will escalate.

"One of the benefits of engineered timber is it doesn't need highly specialised wood. In Australia for producing CLT you only need to grow the pines for 15 years, whereas it takes 30 years in Europe due to different growing seasons," Mr Gray said.

"The Australian plantation industry is well set up for dealing with this stuff. The industry will benefit from this – it is such a great opportunity."

Mr Gray said that in contrast to fossil fuel investments, which are now rated as risky, forestry is being viewed as a good investment. There are many overseas sovereign wealth funds and superannuation and pension funds looking at investing in forestry, he said.

New timber-related requirements help our building code remain at the forefront of innovative design and construction solutions

Greg du Chateau, a principal of building surveyors, du Chateau Chun, discusses the implications of the recent timber-related changes to the National Construction Code (NCC) and how they affect different parts of the design and building process.

Changes to the National Construction Code (NCC) Building Code of Australia (BCA), effective from May 1st, will enable buildings of up to 25m in Classes 2 (apartments), 3 (hotels), and 5 (offices), to use Deemed-to-Satisfy (DtS) provisions rather than the potentially more onerous and costly Alternative Solutions or performance solutions for both timber framing and massive timber building systems. Typically up to 8 storeys and referred to as mid-rise construction, the residential applications of these buildings are expected to play a significant role in urban infill in Australia's larger cities.

Building surveyors, through the Australian Institute of Building Surveyors (AIBS), are part of the Australian Building Codes Board (ABCB) and sit on the the committees that manage and approve proposals for changes to the BCA.

Commenting on the recent changes involving timber construction, Greg du Chateau, a principal at building surveyors, du Chateau Chun said that it was a new initiative in the BCA which building surveyors will need to become familiar with, particularly the new deemed to satisfy provisions.

"You'll find differing views in the industry, he said, but I'm an advocate for prescriptive, DtS solutions," he said, "because they are usually easier for designers, engineers and builders to understand and implement.

"In terms of the recent changes relating to timber framing and massive timber systems, it's important that the building code and the DtS provisions are updated and that the code remains at the forefront of innovative and design solutions so that they don't need to be separately assessed as alternative solutions.

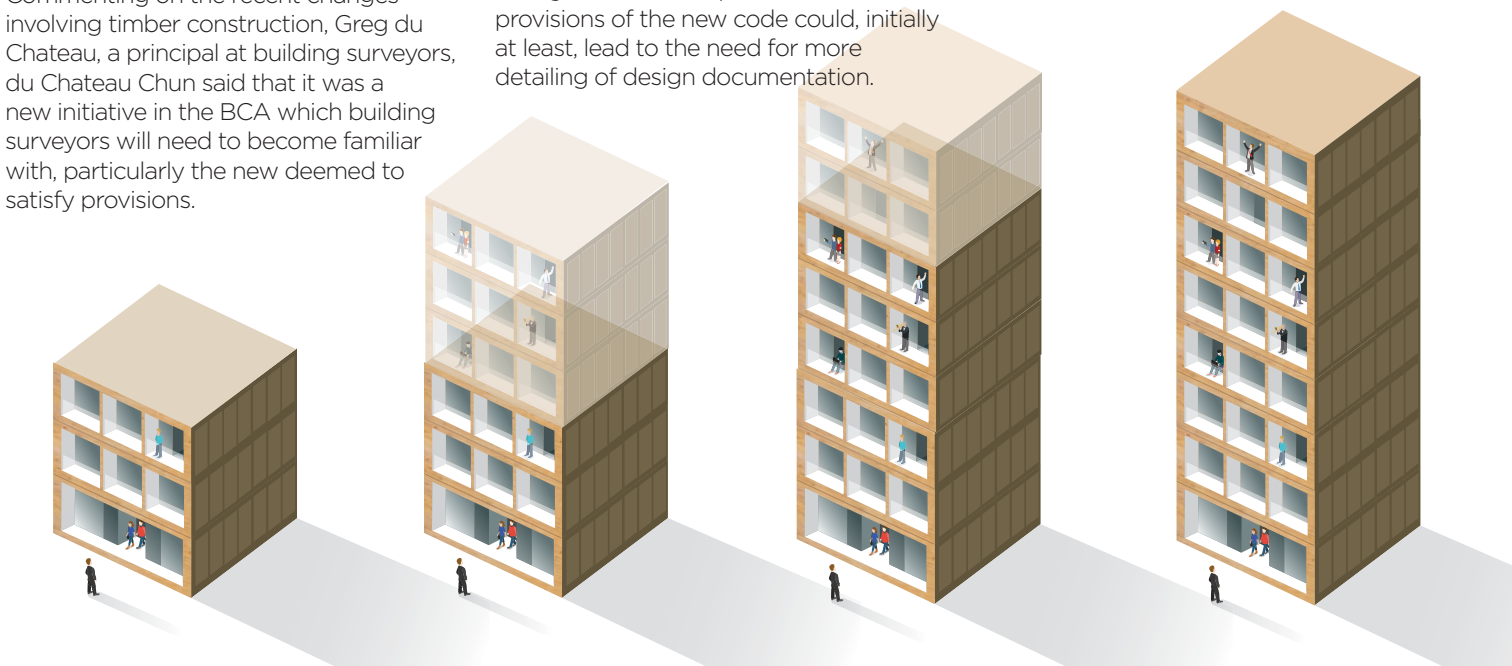
Asked about the expected uptake of the changes to the code, Greg said that experience showed it was up to the market to determine, but there are a range of benefits in using timber frame and massive timber construction, which will initially be assessed and evaluated. Similar situations in the past have, owing to planning and other approval processes, have led to a time lag of up to two years or more before the changes fully flow through the design and build system.

Greg also added that the nature of the changes, and the requirements of the DtS provisions of the new code could, initially at least, lead to the need for more detailing of design documentation.

"I expect the building surveyors will be asking for more detailed documentation than what they traditionally might require, at least until the industry develops standard details that can be relied upon for approval. Experience with other changes has shown this to be the case.

Considering the implementation of the new code requirements, Greg also stressed the importance of site inspections to ensure that design details have been accurately implemented.

"While states and territories do vary in their processes, in some cases there is a statutory requirement to inspect fire rated walls. It is not uncommon to rely on the builder or the contractor to confirm that construction is in accordance with the BCA. However, due to the amount of detailing, corners, junctions, etc., it would be prudent for a builder to engage someone, probably an architect, engineer or a building surveyor, to ensure sure that projects relying on the new timber framing construction initiative in the BCA are constructed to comply with the BCA."



Behind the code change – looking at the process and some expected outcomes

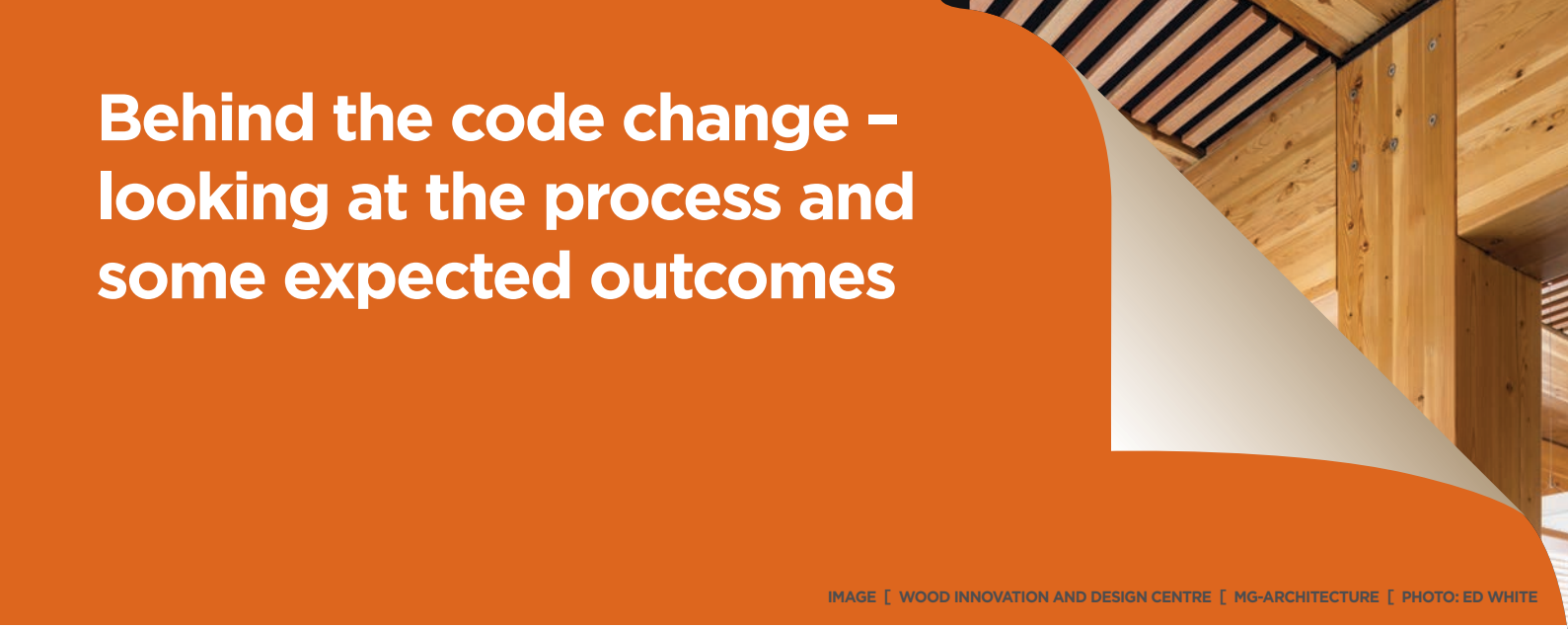


IMAGE [WOOD INNOVATION AND DESIGN CENTRE [MG-ARCHITECTURE [PHOTO: ED WHITE

A two-year, extensive, consultative approach drove the Proposal for Change and it continues with a communications program that is designed to encourage its uptake – with economic benefits for industry.

Momentum for the Code change started more than three years ago, with a discussion about the Building Code and the timber industry, explained Ric Sinclair, Managing Director of FWPA. "We realised the move to three storey timber buildings was significant, but it needed to go further." The team, lead by Boris Iskra, National Manager Codes and Standards for FWPA, Paul England from EFT Consulting, and Andrew Dunn from Timber Development Association of NSW, set about formulating a strategy for their Proposal for Change (PfC). Their aim was to take an evidence-based, consultative and inclusive approach.

The PfC solution was based on extensive research and comprised the use of appropriate layers of fire-resistant plasterboard – fire-protected timber – and the installation of compliant fire sprinkler systems.

"An important factor in our success," explains Ric, "was that we had already built relationships with the key building specifier organisations through our WoodSolutions program." This meant groups like the Australian Institute of Building Surveyors, Engineers Australia, and the Property Council of Australia were consulted and their needs accommodated. This resulted in a better proposal that was not only more likely to achieve the desired code change, but also to be more workable and well received into the future.

"I'd also like to thank the Australian Building Codes Board because they were very receptive to our process," Ric concluded.

"This Code change is one of the biggest things that's happened in the industry for 30 years," says Eileen Newbury, Marketing and Communication Manager at FWPA. We need to provide specifiers with the knowledge to confidently implement the NCC changes."

Eileen and her team's plan for effectively and efficiently communicating the change involves a range of approaches and resources, launched with a national workshop series.

Up to thirty CPD workshops, delivered under the WoodSolutions' program in tandem with many of the same stakeholders involved in the process, explain the change.

"We'll work with the Australian Institute of Building Surveyors (AIBS) because it's so important building surveyors know what they're looking for," says Eileen. "We'll also work with the Australian Institute of Architects (AIA), Building Designers Australia (BDA), the Building Designers Association of Victoria (BDAV), and with fire engineers through Engineers Australia." FWPA is aiming to work closely with all these associations to up-skill their members by the time the Code comes into effect on 1 May 2016.

Boris Iskra, National Manager – Codes and Standards for FWPA, and Paul England from EFT Consulting will be delivering the CPD workshops as they were involved in the development of the NCC proposal and were an integral part to the Code change being accepted, says Eileen. The WoodSolutions technical support team positioned in each state will support some workshops with general WoodSolutions' presentations providing informative and practical timber related information. "These generic presentations were at the request of the associations," says Eileen, "because they saw the need for continued education of their members - not just with what's happening with the Code change, but to help them understand more about wood as a building material in general."

Alongside the workshop series, the team is also working on two Technical Design Guides that will be available through the CPD series and online through the WoodSolutions website.

One Technical Design Guide will look at the Code for fire engineers or those requiring a fire engineering analysis in particular, while the other will outline the details of the Code and how the buildings are to be constructed under it. The guide will address fire provisions, including floor/ceiling systems, wall systems and lift/shaft details, as well as stair construction and emergency stairs, and fire-grade plasterboard requirements and sprinklers.

Kevin Ezard from Frame Australia, commented that the DtS approach is set to significantly reduce current regulatory requirements, lower costs of engineering and architectural and planning documentation, and should encourage improved productivity through prefabricated construction solutions for both lightweight and massive timber building.

Kevin's opinion is reinforced by the results of FWPA's Market Access research project "Increasing deemed to satisfy height limits for timber construction - Cost benefit analysis" that estimated in 2013-14 the market value of multi-residential construction between four and eight storeys was $6.6 billion and office building within the same height $2.8 billion, a total of $9.4 billion.

Over the next decade, the project estimate for market share penetration of timber framed construction was five percent. The estimate for annual growth in multi-residential was also 5%, and that of office construction 3%. Using these annual growth rates the value of multi-residential timber framed construction was modelled to rise to some $510 million per year.

Massive promise from new thinking on wood

MAIN IMAGE COURTESY AGROP

FABRICATED OFF-SITE WITH STATE-OF-THE-ART CNC MACHINERY, THESE [MASSIVE TIMBER] STRUCTURES ARE DELIVERED TO SITE READY TO ASSEMBLE AND ARE EXTREMELY QUICK TO ERECT.
IMAGE COURTESY AGROP

CLT USED FOR RESIDENTIAL CONSTRUCTION

JAPANESE ARCHITECT SHIGERU BAN'S TAMEDIA OFFICE BUILDING IN ZURICH, WITH ITS STUNNING EXPOSED GLULAM STRUCTURE AND LOCKING PIN CONNECTIONS.

There's a paradigm shift happening in Australian construction, as momentum around new engineered timber products and the growing use of prefabricated building techniques create a perfect convergence that can deliver real dividends for architects, designers, engineers, builders and developers.

IMAGE COURTESY OF HOMAG

Through the WoodSolutions program, timber industry services company Forest and Wood Products Australia (FWPA) joins industry trail-blazers to consider the benefits and uses of pre-fabricated timber.

FWPA National Marketing and Communications Manager Eileen Newbury confirms the term "massive timber" is gaining growing currency in the pre-fab construction sphere. One of the most commonly searched areas of the WoodSolutions website, it's used to refer to specific types of engineered timber designed to be the primary structural components of a building, with the most commonly used massive timbers including cross laminated timber (CLT), laminated veneer lumber (LVL) and glue laminated beams (Glulam).

As Rod Pindar, Principal at Fitzpatrick + Partners architects explains, each has its own benefits in terms of applications.

Pindar describes LVL and Glulam as framing components, ideally suited to large span structures, such as warehouses, halls and sports facilities, due to their excellent strength to weight properties.

"Netball Central in Sydney's Olympic Park, designed by Scott Carver for Netball Australia, is an example of this, with what are currently Australia's largest LVL portal beams used as the primary structure."

LVL and Glulam are also being increasingly applied in the commercial and education sectors as an alternative to traditional construction options. CLT, on the other hand, is a large structural panel system designed originally for residential floors and walls. However it is now being adopted in a variety of applications across a wide range of building types.

"Fabricated off-site with state-of-the-art CNC machinery, these [massive timber] structures are delivered to site ready to assemble and are extremely quick to erect," says Pindar.

"Work on site is typically handled by small teams using cordless power tools, resulting in quiet, clean and safe working conditions. Fixing of services or other components can be easily handled with simple tools whilst waste is both minimal and recyclable."

CLT construction can also utilise a host of proprietary connectors, plates and screws for easy on-site assembly.

"I think there is tremendous potential both for increasingly efficient and beautiful methods of massive timber assembly," says Pindar. "The best example to date is certainly Japanese architect Shigeru Ban's Tamedia Office Building in Zurich, with its stunning exposed Glulam structure and locking pin connections."

He believes massive timber, with its aesthetic quality and sustainability, can play a significant role in helping to alter perceptions of prefabricated construction.

"Look at the ten storey Forte Living apartments by Lendlease in Melbourne's Docklands for example, it's recognised as a quality, innovative development and not encumbered in any way by the rapid, prefab construction techniques that delivered it," he says.

Pindar confirms Fitzpatrick+Partners has done extensive research into hybrid systems for commercial projects using CLT floor slabs or timber cassette systems in conjunction with steel framing components.

"With these types of systems there is the potential to eliminate wet trades entirely, allowing the interior fitout and fixing of services to follow immediately after the erection of the superstructure, which itself can be erected incredibly quickly."

The FWPA's Eileen Newbury adds that there are a number of developments in the supply chain in Australia, including new educational and advisory services from WoodSolutions, that will accelerate the uptake of massive timber and timber prefabrication in general.

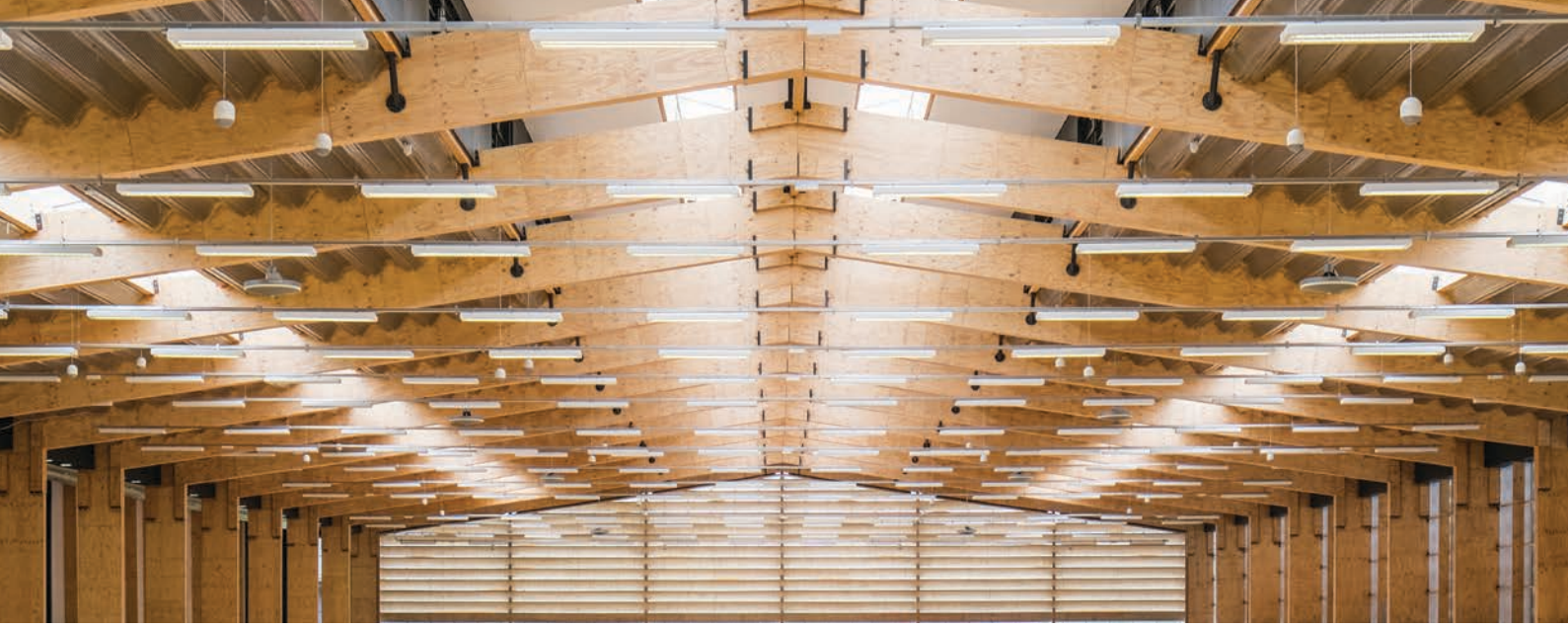
"In addition to massive timber projects, there are also panellised prefabrication plants and projects, such as CSR's Velocity, that build high quality engineered wall and floor elements. Developments like this show that there's market potential to expand more traditional 'stick' timber framing offsite construction too," she says.

One company becoming heavily involved in the prefabrication sector is Lendlease, which after completing Forte, then constructed The Library at the Dock, an award-winning Six Star Green Star public building made of massive timber. The company is currently completing a major six storey commercial office project at Barangaroo, also with massive timber. It is also launching its own prefabrication business, DesignMake, which will produce building components, primarily from CLT.

Construction company Strongbuild, currently completing the three tower multi-residential Macarthur Gardens project using CLT in Sydney's West, is also in the process of constructing its own prefabrication facility.

Further south in Victoria, XLam Australia is building the first Australian CLT production plant in Wodonga, and expects to be in full production by mid-2017.

Australian Business Development Manager for XLam Australia, Rob De Brincat, says the message the company has been getting from industry is it wants a "value-add" beyond just supply of CLT.



He says the construction industry sees the benefit of having locally produced panels, and the company also aims to offer a full package of services, from assistance with design and engineering through to installation. Space has also been set aside in the factory for expanding the CLT production capabilities to include installing components such as door frames and windows, before the CLT panels are transported to the build site.

"The way CLT is designed and modelled in CAD allows [production] to route the service tracks and understand where the plumbing goes," he says.

He adds that recent engineered timber projects, such as Strongbuild's Macarthur Gardens, are encouraging more companies across the industry to realise the advantages of engineered timber and consider it for more projects.

"To grow the market in this space, it is important people realise you don't have to be a large player, CLT can bring benefits to jobs of all types and sizes, it really depends on the specifics of each project."

The XLam operation will also be focusing on hybrid solutions, and is looking to work in partnership with suppliers of Glulam and LVL.

With the primary market need leaning towards complementary products and building systems and integrated designs, prefabrication is the biggest market opportunity for such materials, according to De Brincat. Using engineered timbers means buildings can have components supplied that are put together "like Meccano".

An example of a complementary approach for a large project would be prefabricated Glulam beams and LVL columns that are erected on site, with tilt-up CLT walls that are pre-lined and have windows already in place.

Dr Robert Crawford is Senior Lecturer in Construction and Environmental Assessment at the University of Melbourne, and one of the researchers involved in the ARC Training Centre for Advanced Manufacturing of Prefabricated Housing. He is also leading a research project for the University's Thrive Research Hub on timber pre-fabrication and the potential to create carbon-positive buildings.

Dr Crawford says the advantages of prefabrication include an increase in the quality of construction, improved worker safety, reduced construction waste and potentially reduced costs, while construction speed is also improved.

"You are not held up by weather, and in the factory you can build 24 hours a day. The factory environment also increases the ability to control construction."

"When engineered timbers are used in prefabrication, there are added environmental benefits," he adds. "Timber is a store of carbon and is a renewable resource. It is also potentially a sustainable resource."

The degree of environmental benefit depends on the resources used in the harvesting and manufacture of the timbers, and transport and processing add to the carbon footprint of the product. When the products are imported, the carbon footprint is greater.

"That will change a little with the new Victorian facility XLam is building," he says.

Another benefit of timber, including engineered timbers, is that it's an easy material to work with both for assembly and disassembly. It is also easier to rout in services, even after construction, compared to concrete, and connecting components is also easily achieved using screws.

"Engineered timber systems can also be combined with other systems," Dr Crawford says, "such as prefabricated service risers for large multi-storey buildings or prefabricated bathroom pods."

"Prefabricated floor cassettes are also another approach that is being increasingly used," he adds, "and many companies that have established themselves as frame and truss prefabricators are moving into this as a product line. These include hybrid steel and CLT systems, and also all-timber systems."

In engineering terms, as a structural material, massive timbers are one of the materials best suited to prefabrication, according to XLam technical manager and former AECOM senior structural engineer, Nick Hewson.

He also believes the increasing use of Building Information Modelling [BIM] by architects has benefits for prefabrication approaches.

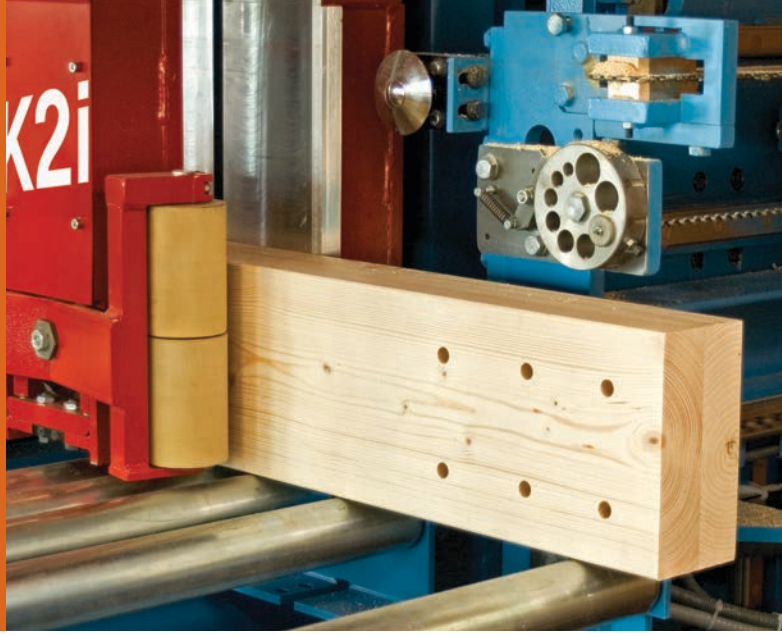
"BIM models can be taken almost straight from the designer to the CNC machine," he says. "There is so much less room for interpretation. Timber and BIM are a perfect match."

Hewson believes that a mind-set change is needed in the industry to understand and utilise the opportunity to design in the virtual space and then utilise CNC machinery.
This includes how services are designed and integrated.

Instead of the current trend for services consultants to performance specify and leave the designing to the subcontractors, they could model services designs in 3D and then the subcontractors could implement it in the offsite setting.

LEFT: NETBALL CENTRAL IN SYDNEY'S OLYMPIC PARK, AUSTRALIA'S LARGEST STRUCTURE USING LVL PORTAL BEAMS AS THE PRIMARY STRUCTURE.
2015 AUSTRALIAN TIMBER DESIGN AWARDS FINALIST IN SUSTAINABILITY & EXCELLENCE IN TIMBER DESIGN PUBLIC OR COMMERCIAL BUILDING.
DESIGNER: SCOTT CARVER AND ARUP,
PHOTOGRAPHER: GEOFF AMBLER; ETHAN ROHLOFF

RIGHT: CLT COMPONENT BEING MACHINED OFF-SITE.
IMAGE COURTESY OF HUNDEGGER



Principal Structural Engineer for Bligh Tanner engineers, Toby Hodsdon, has been actively exploring the use of CLT on a wide range of projects, including aged care, education and multi-level residential.

Innovations using CLT are starting to appear, such as a prototype for lightweight modular bathroom pods using thin CLT walls. Another project sees the firm working on utilising prefabricated CLT elements is an island resort in Queensland, where shipping of materials for conventional construction would be extremely difficult.

"Lightweight modular design particularly lends itself to difficult and remote sites," Hodsdon says.

"It is also ideal for sites with poor ground conditions or limited crane space when its lightweight nature brings very tangible benefits to a project."

He says one of the main differences with these new forms of construction is that considerable technical thinking needs to be done before a project commences. This engineering-oriented thinking includes planning lift sequence and methods, considering how stability will be managed during installation, and even how components are stacked into shipping containers so they can be fed to the onsite crane in the right order.

"Prefab means thinking upfront," he says.

"If thinking upfront is code for thinking forward to the future, it just about sums up the outlook for prefabricated timber in Australia; it's massive," concluded FWPA's Eileen Newbury.

"We see part of our role, through both FWPA and WoodSolutions, as ensuring that the timber supply chain and the design and build industries are up for the challenge!"

BELOW: PRYDA FLOOR CASSETTE

Building higher in timber? New free WoodSolutions Technical Design Guides

Discover a wide range of information, exclusive to the three new WoodSolutions Design Guides:

- 37 - Mid-rise Timber Buildings
- 38 - Fire Safety Design of Mid-rise Timber Buildings
- 39 - Robustness in Timber Structures

Written by experts, these Guides give you the information you need to make the most of the recent National Construction Code (NCC) changes. The NCC now allows Deemed to Satisfy (DTS) provisions for Class 2, 3 and 5 buildings up to an effective height of 25m.

These and other Technical Design Guides, along with more free information and advice about designing and building with wood and wood products, are available from **woodsolutions.com.au.**

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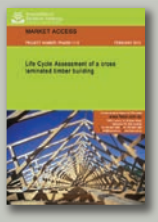

Designing for the code change
Free download from
woodsolutions.com.au

Following the recent changes in the 2016 National Construction Code (NCC) FWPA's WoodSolutions initiative has created an advisory program to increase the use of lightweight and massive timber in the construction of mid-rise multi-story office and residential buildings as well as hotels.

The Program has been launched in Victoria, with a small extension in Queensland. Professional advisors have been recruited in these two states to help developers, designers and builders alike understand timber systems and how to design and build mid-rise buildings in timber efficiently and safely in accordance with the Deemed to Satisfy provisions of the NCC. ***Ric Sinclair, Managing Director of FWPA, said the program is designed to magnify and fast-track the uptake of wood systems by offering free and independent technical seminars and one-on-one support on specific projects.***

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