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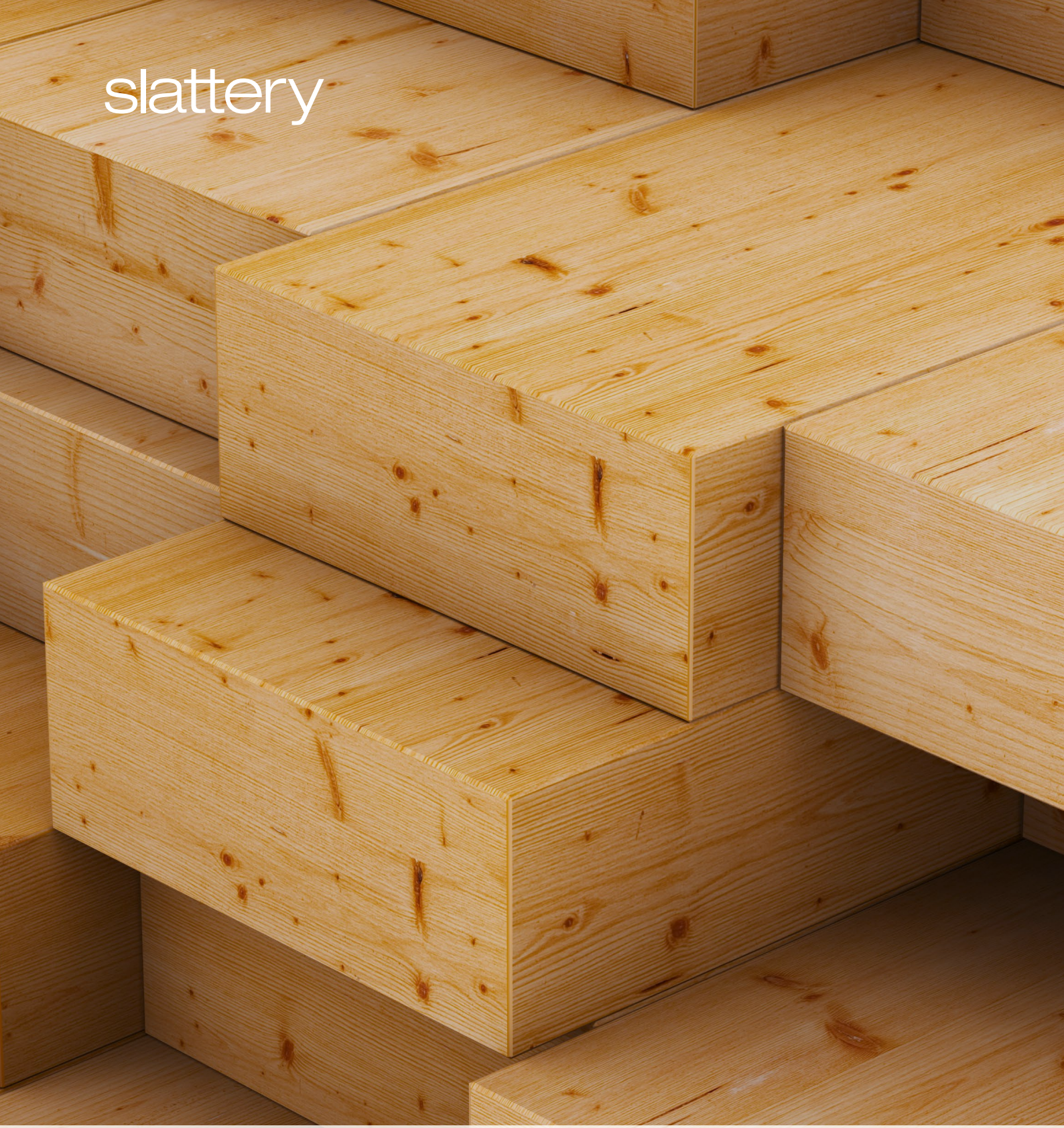

Kaizen: Education 03

What's the knock on wood?

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Timber – a consideration for tertiary institutions

One of the world's oldest building materials is making a comeback as mass engineered timber grows in popularity around Australia. The environmental, architectural and program benefits of engineered wood construction are compelling and it is now seen internationally as a viable alternative to the more traditional formula of steel, concrete and masonry.

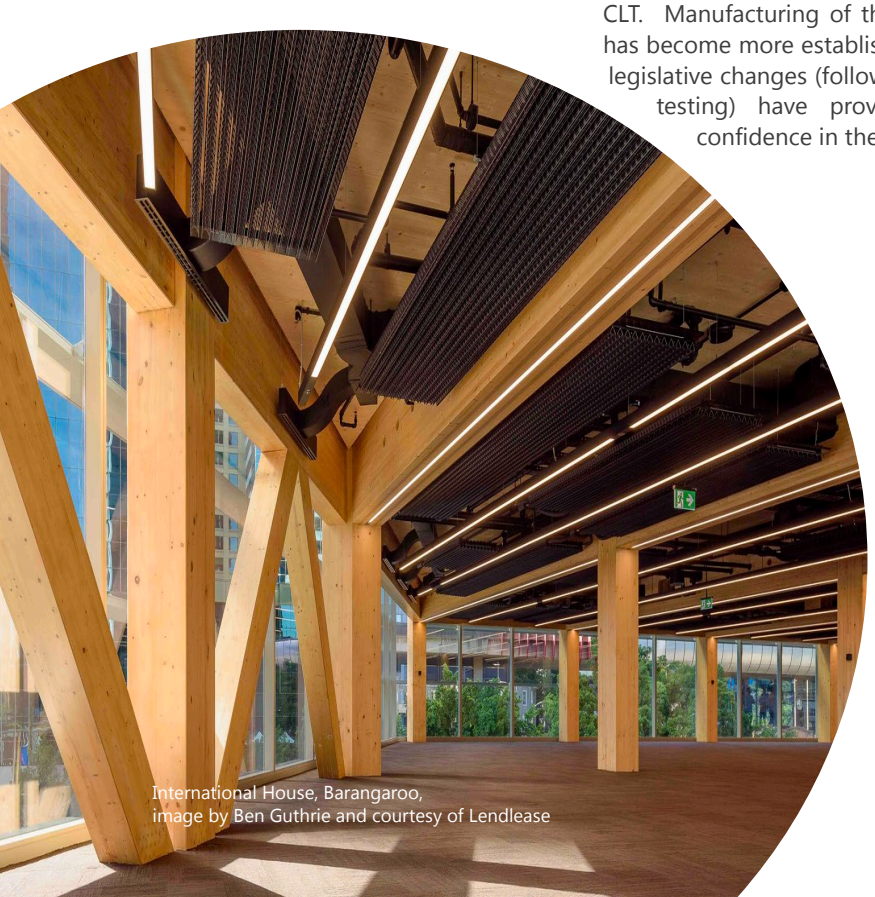
Engineered timber is predominantly pre-fabricated in a factory, saving considerable time on site. It is a renewable resource, offering multiple environmental benefits including use as a biomass fuel at the end of its life. With clear benefits, why are our major Australian universities mostly opting for more traditional construction techniques?

In this paper, Slattery explores some of the reasons why mass engineered timber construction is struggling to gain traction in the education sector and how this can be overcome.

What is new about timber construction?

Today, there is an emergence of engineered wood products including cross-laminated timber (CLT) and glue-laminated timber (Glulam) that are strong enough to be used as structural materials in multi-level construction. This is innovative technology that is renewable, recyclable and carbon friendly.

What's driving change in the use of engineered wood is the greater awareness and availability of Australian made products such as Glulam and CLT. Manufacturing of these products has become more established here and legislative changes (following stringent testing) have provided greater confidence in their use.



International House, Barangaroo,
image by Ben Guthrie and courtesy of Lendlease

Engineered Wood Products

The production of CLT involves multiple timber veneer layers being glued together, with the grain alternated to form a structural timber panel. Much like precast concrete, these panels can be used to construct walls and floors. Glulam, on the other hand, layers the grain in the same direction to form structural beams and columns. It is made from thicker sections of timber (15-45mm) compared to LVL (laminated veneer lumber) made from 3mm veneers, which has been in use for beams and rafters for several decades.

Glulam and CLT have been used in Europe for many years, however in Australia, the Engineered Wood industry is in its relative infancy. Despite this, demand for timber products in the commercial and residential sectors is currently very strong as this technology finds favour with architects and builders alike. There are approximately 50 or so completed or under-construction engineered timber projects around Australia.

Forte Living, Melbourne, image courtesy of Lendlease

Recent examples- the highly recognised 'firsts'

Lendlease has led the way in Australia with several 'firsts':

1. Forte Living in Melbourne was the first CLT building in Australia, a ten-storey apartment building developed and built in 2013 using wholly imported timber products.
2. International House, Sydney at Barangaroo was Australia's first engineered office building, a seven-storey structure designed by Tzannes Architects.
3. 25 King Street, Brisbane, a ten-storey 45m commercial building designed by Bates Smart and built entirely from mass engineered timber (other than its concrete base) was completed in 2018.

Why not timber construction in the tertiary sector?

While many universities have used engineered wood for certain elements of the building, the use of it as the predominant structural material is rare and the tertiary sector has not yet fully embraced mass engineered timber construction as an alternative construction methodology.

There are, of course, key examples that are changing the game by demonstrating the benefits of engineered wood. Macquarie University's Incubator project completed in 2017 has a predominantly timber structure comprising glulam columns, CLT ceilings and LVL roof beams. Two of its design parameters were speed of program and its potential to be relocated.

Monash University completed its 150-bed student housing project on its Mornington Peninsula campus which utilises glulam beams and CLT walls/floors in February 2019. A Passive House designed and built facility, the ground floor is constructed in concrete, with the five residential levels above constructed in CLT. The CLT halves the embodied carbon in the building, relative to a concrete structure.

Combined with its roof top solar, it reduces operating carbon use and with the all-electric design is net zero ready.

Universities are traditionally conservative in nature, preferring to work with what they know and the methodologies that can deliver the facilities they require. This is often to coincide with the start of semesters and new student intakes, also managed within the complexity of timetabling. Tried and tested techniques are therefore preferred by universities to minimise risk.

Rather than embracing such innovation on their campuses, university infrastructure teams have been relatively apprehensive to adopt new construction techniques and technologies despite some obvious benefits as there is no room for error.

Monash University, Mornington Peninsula Campus, image courtesy of Jackson Clements Burrows Architects

Considerations for universities

1. Program

Due to the prefabricated nature of engineered wood and the absence of curing times, use of mass engineered timber will result in less time on site and an earlier handover.

Whilst hard to properly test, anecdotal evidence from contractors suggests that handover can be achieved 20-30% quicker with timber. Macquarie University's Innovator project only took five months to construct, with minimal disruption to delivery of semester programs. For universities, the flow on revenue from possessing a teaching facility / accommodation building quicker becomes important. However, consideration needs to be given to the highly detailed design required as the majority of components are prefabricated, and the potential long lead times which may necessitate the engagement of timber suppliers prior to the appointment of a head contractor.

Early Contractor Involvement (ECI) is noted as a critical success factor in projects such as Macquarie University's Incubator and also in key international examples such as Brock Commons Tallwood House in Canada, a $53M/18-storey student residential building. This helped minimise risk and enabled a collective and collaborative process to resolve problems quickly.

2. Cost

CLT and glulam suppliers proudly boast that the use of their products will provide an overall cost benefit. We understand savings are accrued through:

- Less time on site saving builders' preliminaries costs including supervision, site accommodation and cranage;
- It's a quick/dry build solution, largely prefabricated with a high degree of accuracy because of the detailed design required from the outset;
- Reduced foundation costs due to timber being more than 50% lighter than more conventional materials such as steel and concrete;
- Earlier access to fitout contractors with mechanical, engineering and plumbing services already planned and accommodated within the prefabricated engineered timber products, further decreasing the overall time on site.

It is across the details of these variables that cost savings can be achieved. However many developers are erring on the side of caution and opting for more traditional techniques due to the unknowns associated with timber. For universities, consideration needs to be given to:

- Undertaking appropriate due diligence early in the design phase including engaging with suppliers to understand current cost data and procurement;
- Maximising the use of standard sizes;
- Selecting a tender list which has experience with mass engineered wood products and construction.

As the production and engineering of timber in Australia develops, the financial viability of engineered wood products as a construction system will become far greater and more widely known.

3. Sustainability

Timber is a natural renewable source unlike traditional construction materials like steel and concrete which are not produced from sustainable resources. This combined with a lower embodied energy (the energy consumed in providing materials), carbon storage (growing trees absorb CO2, store carbon and emit oxygen) and the fact that timber is a recyclable product makes it a truly sustainable construction material.

Australian universities are at the forefront of sustainable development with many, including Monash University, The University of Melbourne and the University of Technology Sydney, targeting a net zero carbon footprint.

Due to this, we anticipate the tertiary sector's interest in timber construction to grow. Already, University of Tasmania, Sandy Bay campus is looking to support the local timber industry and stimulate new CLT production through their current and future projects.

Macquarie University's Incubator project, image courtesy of Architectus

25 King Street, Brisbane,
image courtesy of Lendlease

4. Availability and lead times

Glulam has been locally produced in Australia for decades and is therefore readily available. CLT on the other hand is traditionally sourced from Europe and New Zealand and whilst readily available, lead times can range from three to six months depending on manufacturing peaks and troughs.

In March 2018, Australia's first CLT manufacturing plant opened in Victoria which aims to significantly reduce lead times in comparison to European supply and make CLT more readily available to contractors. Considering the local production is still gaining momentum, reduced lead times have not been immediately realised and a 16+ week lead time for CLT is still more realistic. With interest in the Australian market from other European suppliers growing, it will not be long before other local manufacturing plants are developed. The resultant competition will no doubt improve the program and financial viability of timber as a structural solution.

5. Fire resistance

There remains a misconception that engineered wood provides an inferior fire resistance to traditional construction materials. In fact, products like CLT and Glulam are engineered to reduce fire risk with the ability to char at a predictable rate whilst maintaining its strength and avoiding deformity. Therefore, engineered timber provides a comparable level of fire resistance to traditional materials.

In addition, due to its inherent fire resistance, timber avoids the requirement of a second trade on site to provide fire resistance. By comparison, structural steel needs to an added layer of protection, for example, fire spray.

6. Aesthetic Benefits

There is no doubt that timber has beautiful aesthetic appeal, which is why many architects are choosing to leave structural beams, columns and floors exposed. With any cost benefit analysis, consideration needs to be given to the extra cost of providing feature finishes to cover traditional construction materials.

7. Wellbeing

Considerable research has been undertaken demonstrating the relationship of biophilic design elements in the built environment as having a positive impact on our well-being. In education spaces, use of natural light, plants and greenery, nature views and water features have been shown to increase rates of learning, improve concentration, attendance and test results, and reduce the impact of Attention deficit hyperactivity disorder (ADHD).

A recent Australian study has found that exposed wood similarly fosters feelings of connection to nature and is correlated with increased levels of concentration, improved mood and individual productivity, leading to greater satisfaction and less stress.

Final recommendations for universities

The volatile construction market in Victoria and New South Wales has led to contractors becoming far more discerning with regard to projects they tender on. Timber projects offer enormous benefit as noted above however there remains perceived risk which stems from an unfamiliarity with the product.

Steps which universities can put in place to mitigate perceived risk from contractors includes:

- Engagement of a consultant team with strong timber experience;
- Use of comprehensive visual design modelling to inform the understanding of buildability, construction and cost implications;
- Early engagement of contractors and/or timber suppliers to better inform the design;
- Collaborative, transparent and continuous communication with the entire project team;
- Selection of a contractor tender list with relevant experience through an early EOI process.

With a significant amount of research being undertaken from within many university engineering and sustainable design departments, university infrastructure teams are uniquely positioned to take advantage of the latest innovations to apply to their own requirements.

About Slattery & Kaizen

Slattery is a property and construction advisory firm specialising in quantity surveying, cost management and early phase project advisory, with an outstanding history spanning more than 40 years.

We work hand-in-hand with governments, institutions and organisations as well as planners, developers, architects and design teams on a broad range of property and construction projects.

A commitment to excellence and innovation, and an ability to become an integral part of the project team has earned Slattery the trust and respect of clients and project teams alike. Slattery adds value by taking control and ownership of the cost management process from the outset. We understand the importance to drive innovation and productivity.

Slattery's Kaizen Papers focus on sharing knowledge, ideas and pertinent cost information related to our industry. Kaizen is the Japanese word for improvement, and a business philosophy that strives for continuous improvement in process. We produce papers across the sectors we work with, which are shared with our clients and made available on our website for all to view.

We invite you to explore these further at www.slattery.com.au/thought-leadership

Education

At Slattery, we believe in creating education precincts that facilitate positive learning outcomes for students and staff. While aesthetic and functional design is vitally important, it is also essential that projects deliver value for money through quality construction and cost management.

Slattery is passionate about education projects, with a total portfolio now comprising over 400 education projects delivered since 2000. In fact it has been a core focus of our business for more than 40 years. We have worked with 24 of the 43 registered universities in Australia, including 6 of the Group of 8 and fully understand the challenges facing tertiary institutions. Our expertise is unrivalled and ensures our tertiary clients receive accurate, reliable and tested data.

For more information about Slattery and our Education team, please contact National Education Sector Lead, Tom Dean at tom.dean@slattery.com.au

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