

Sustainable building materials: Collaborative learning using Cross Laminated Timber in building design at Box Hill Institute

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The Australian Cross Laminated Timber (CLT) market has developed considerably since the 2012 completion of Australia's first timber mid-rise, the 10-storey 'Forté' apartment building in Melbourne. There are now numerous CLT developments under construction and Sydney's first timber office block, 'International House' at Barangaroo, has just been completed. "Even the construction was sustainable, as being timber it did not require drilling or concrete pouring, which made it a very quiet building site with minimal wastage," the managing director of Barangaroo, Mr Deck said.

The tallest wooden building in the world is now 'Treet', a 14-storey apartment block in Bergen, Norway that surpassed 'Forté' last year. Meanwhile, British architects and engineers are planning an 80 storey, 300m high CLT tower for London called 'the Toothpick'. The nickname for these high-rises is 'plyscrapers'.

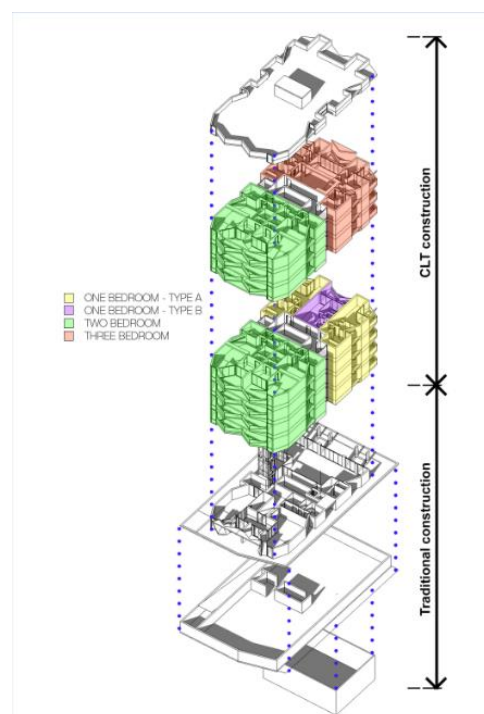
This year for the first time, sustainably grown and harvested Australian timber will be used to manufacture CLT panels when XLam opens Australia's first CLT manufacturing plant in Wodonga, Victoria. The establishment of Australian CLT plants will reduce delivery time and distance, resulting in financial and environmental benefits including the reduced embodied energy associated with transportation. Increased use of CLT due to these benefits and the recent changes to the National Construction Code can help reduce energy demand and associated greenhouse emissions by the building sector.

Learning to design, detail and document CLT buildings will be important in ensuring architects and building designers successfully facilitate this method of construction. Structural loads, waterproofing, fire ratings and acoustic separation need to be carefully considered from a project's outset to enable this cost-effective, low embodied energy solution to be implemented.

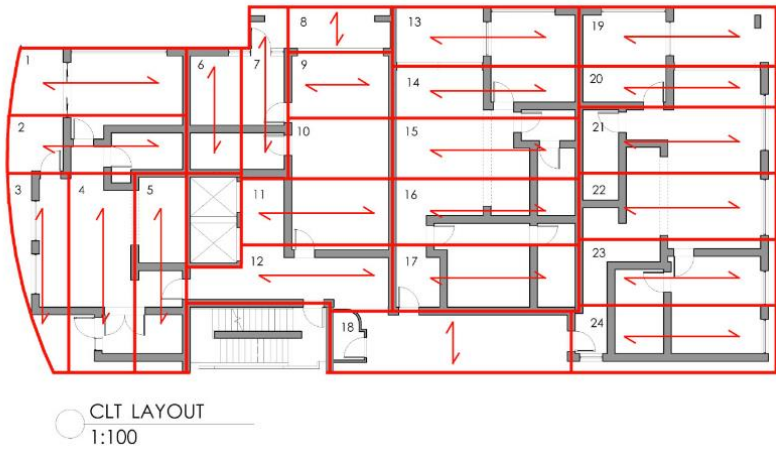
In 2016 Box Hill Institute initiated training in CLT for our final year building design students. This ongoing project provides an exciting opportunity for students to explore the emerging construction technology of CLT. Students are set the task to design and document a sustainable mixed-use, predominantly residential building using CLT construction in the rapidly growing area of Box Hill. To ensure students had all the relevant information and feedback to correctly design and create working drawings for a CLT mid-rise building, the teachers enlisted industry support.

Rob de Brincat (Market Development Manager and engineer for XLam Australia Pty Ltd), Alastair Woodard (WoodSolutions) and Dirk Zimmermann (Architect and Director of Zimmermann Design Studio), provided guest lectures and tutorials throughout the project to ensure that students and teachers understand the construction and regulatory requirements. Whilst basement and ground floor levels are required to be concrete, all levels above the podium are entirely CLT without any steel or concrete structural elements.

CLT is like giant plywood with the panels used as load-bearing walls and floor slabs. Multiple layers of wood with their grains at right angles are glued together under extreme pressure to form giant wall, ceiling and floor panels. Panels are cut to size with openings and joint details created at the manufacturing plant. Assembly on site is fast, reducing CLT building construction times and offering major cost saving opportunities.



1. Cross laminated timber building design concept by student, David Amar



CROSS LAMINATED TIMBER
CONSTRUCTION ANALYSIS

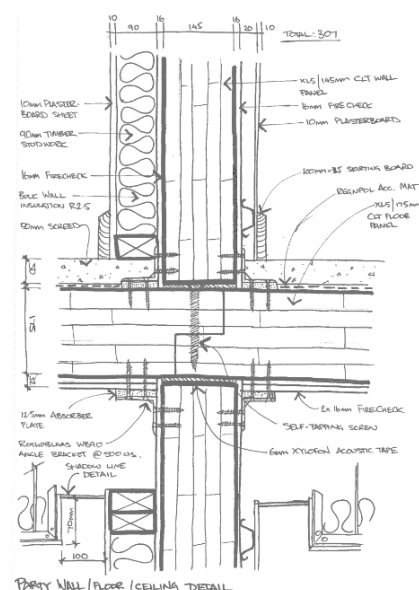
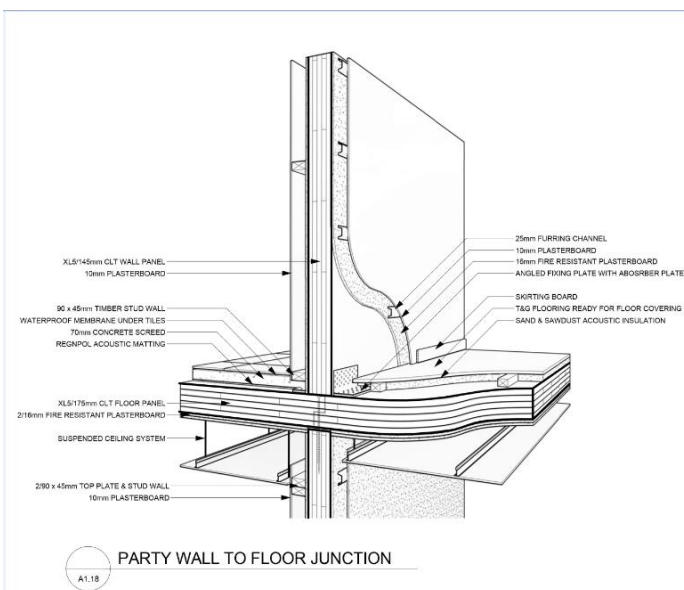
- LOAD BEARING CLT WALLS
 - CLT USED AS A BEAM
 - ↔ DOMINANT GRAIN DIRECTION
- USE OF XL5 175 XLAM RADIATA PINE
MAX PANEL 15000 X 3000

2. Cross laminated timber - wall and floor design concept by student, Cameron Shelton

Another important aspect of this project was use of Building Information Modelling (BIM). BIM is the process of virtual design and construction of buildings throughout their lifecycle, and it is rapidly becoming an effective way of collaborating due to its ability to communicate with various project participants. Due to this holistic approach and effective collaboration, an improvement in the design and construction process quality can help in making critical decisions about a building’s environmental impact. Educational institutes can play an important role in the transition to the next generation of building design professionals with expertise in BIM process to achieve sustainable building design outcomes. For this project, after completing the design phase using traditional 2D and 3D digital tools, students in groups are required to complete documentation (working drawings) by collaboratively working on a central BIM model.

Rick Castricum is a building designer, BDAV Member, and long-term supporter and graduate of Box Hill Institute. Rick led the 2016 and 2017 Industry Design Review Sessions and his ongoing involvement inspires the students to be passionate about collaboration on building design, learning from industry experts and their peers.

Rob de Brincat’s involvement through all stages of the project with CLT engineering advice creates a collaborative learning environment that enables students to experience an integrated design approach and document high performance buildings.



3 & 4. Cross laminated timber construction details by student, Paul Morgan

After the final presentation of completed working drawings in 2016 Rob said: “XLam were extremely happy to assist Box Hill Institute of TAFE in developing this excellent initiative into the design and detailing of CLT. The success of this project is a clear indication of how important it is for our educational institutions to support new building technologies through the training of our young design professionals. I was personally blown away by the quality of both the students and their submissions, which only gives me even more confidence about the future of CLT in this country.”

Acknowledgments: Dr Abdul Rauf and Susan Morris would like to thank the volunteer team of experts and the students for their amazing contribution to the Cross Laminated Timber Project. Our students are extremely engaged in the learning process and have had fantastic outcomes in terms of their portfolio development and employment outcomes. We believe that industry involvement is the key to success in this project.



5. Box Hill Institute building design students with industry supporters. Dirk Zimmermann, front row, second from left, Rob De Brincat, third from right and Alastair Woodard, far right.



Box Hill Institute are developing more learning projects around CLT construction including programs for upskilling building design professionals in the design and detailing of mass timber construction buildings. To register interest in these programs please contact:

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Box Hill student’s CLT multi-residential apartment design wins inaugural Dangerous Designs competition.

Paul Morgan, building design student at Melbourne’s Box Hill Institute has taken out the first WoodSolutions- Dangerous Design prize of \$500 cash – and is in for a chance to win the \$10,000 Grand Prize or the social media voted People’s Sur(Prize)!



To see Paul Morgan’s winning project visit

<http://dangerousdesigns.com.au/entries/submission/article/42/laevo-cross-laminated-timber-apartments.html>

If you like Paul’s project you can vote with a ‘like’ on [Instagram](#) or [Facebook](#)