Building Better with Timber

A guide to mass timber construction for clients and architects

Bligh Tanner is committed to adopting and exploring the latest timber technologies.

Over recent years we have built up knowledge and expertise in the emergent use of cross laminated timber, adopting it as the primary structural material in several projects to date.

This guide has been prepared to share what we have learned and explain a number of common issues that arise on such projects. We hope this information will be helpful to our clients and collaborators in considering the suitability of the material for their project.

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Building Better

Growing interest

Encouraged by recent changes to the NCC, activity by State Government and timber industry groups, the Brisbane construction market is seeing a significant and growing interest in cross laminated timber promising cost savings and construction benefits. Examples are:

+ Lend Lease report ***zero*** 'lost time injuries'
+ Hutchinson Builders estimate ***2-3% cost savings*** possible on suburban housing projects
+ Strongbuild ***reduced program from 24 to 14 weeks*** for three towers of 6,7 and 8 stories

Real projects

Construction is already underway for the tallest engineered timber office building in Australia. Located at the Showgrounds, Lendlease continues to demonstrate the potential of the material.

Bligh Tanner is involved in the design of four CLT buildings here in Queensland including a fire station, seven-storey residential building and a mixed-use development.

The 18-storey Brock Commons in Canada (see cover image) was erected in 9.5 weeks by nine men

Using technology

Building Information Modelling (BIM) is becoming standard for building designers. There is opportunity for us to use this technology to bring efficiencies to design, documentation, planning, fabrication and construction of our buildings.

Pioneer, market leader or early adopter?

CLT is a technology with a proven record in Europe, UK and USA, and is being used by builders in Australia and New Zealand. XLam, a manufacturer of CLT with a new factory on the VIC/NSW border, have delivered over 500 projects since starting manufacture in 2012.

Emerging technologies can represent both commercial opportunities and risks. There are considerations for design professionals, main contractors, trade contractors and clients, we believe that forming collaborative relationships can best identify, navigate and mitigate technical issues and the potential risks involved.

Bligh Tanner offers specialist technical expertise and is well connected to a network of industry professionals, researchers and experts to support us in delivering engineered timber projects.

Measure twice, cut once

Cross Laminated Timber (CLT) is a structural material that can yield significant improvements in speed of construction, safety and quality by enabling prefabrication, modularisation and design for manufacture.

Cross Laminated Timber is the name given to large structural building panels made from solid wood boards glued together in layers. Like plywood, CLT panels are very strong and stable because the layers of boards run in opposing directions.

CLT is commonly manufactured in three or five layers to create rectangular panels that can reach 3.5m in width and 16m in length.

How is it used?

CLT is used for floors and walls of buildings, commonly found economic for multi-storey buildings.

Typically, the structural design of floors is based on one-way spanning configuration making the material well suited to a cellular type of construction with parallel walls and beams. Such configurations may be found in residential, hotel and aged care buildings.

When is a project particularly well suited to CLT?

+ When there are benefits to a short program and disruption is to be minimised.
+ When there is repetition in the design of multiple stories.
+ On a difficult, remote or constrained site that lends itself to off-site manufacture.
+ When its lightweight nature will be beneficial, e.g. poor soils, vertical extensions or transfer structures.
+ When non-traditional forms of contract are possible (e.g. ECI or design and construct)

CLT panels are commonly erected in platform construction and screwed together using proprietary fixings

Pros	Cons
Potential to save time and money, by reducing construction time and prelim costs	The builder must adapt, requiring planning of logistics and involvement in design for manufacture and erection
Small workforce, fewer trades, reduced wet-trades and reduced temporary works	Requires experienced installer (typically one specialist and several apprentice carpenters)
Shop drawings are complete and approved before construction	Lead-time must allow for finalising the design, coordination with services subcontractor and fabrication drawings
Reduced foundations and transfer structures	One-way spanning nature of CLT means cantilever balconies and long-span open-plan spaces are more challenging
Excellent dimensional tolerances, with positive impacts on quality of workmanship for following trades	Late design changes can be difficult to make (though carpentry techniques can be readily applied)
Easier to install services and form holes (best done in factory but easy to do on site)	Multi-storey CLT buildings require sprinklers, even when conventional construction does not
Improved airtightness and thermal performance	Fire and acoustic requirements necessitate application of additional finishes
Exposed timber finish is possible	Fire engineering advice may be required
Adopting new methods on projects may lead to other innovations and advancements for the business	The novel form of construction requires close management during design and construction to ensure risks are identified and mitigation strategies applied

This assessment is intended to give balanced view on issues that may be faced by our clients in the use of CLT. Fortunately, several of the disadvantages are related to the initial adoption of the technology and will not remain with time.

In the meantime, we believe careful planning and collaborative approach between client, builder, architect and timber suppliers can successfully navigate these issues.

Australian Examples

1

International House, Barangaroo

Award-winning International House, designed by Tzannes Architects and developed by Lendlease, is constructed from CLT and glulam.

Tzannes turned the structural limitations imposed by the use of timber to an advantage and celebrated them, forming a unique colonnade form evocative of a forest which gives the building a distinctive character.

A significant feature of the design is the close integration of services and structure, left exposed to "dematerialise" the building and bring savings.

Image credit Tzannes Architects

2

Aveo Norwest

The short program for this new residential retirement complex, currently under construction by Strongbuild, made CLT a winning choice.

All wall and floor panels were manufactured in Europe, shipped to Australia for processing in Strongbuild's factory, then craned into place on site.

Using CLT enabled the project to be completed 13 weeks earlier than with concrete. The new residential building comprises 10 storeys and is due to become one of the country's largest uses of CLT technology.

The building was designed by Jackson Teece, TTW (Sydney) and PTL (Christchurch).

Image credit Strongbuild

3

Macquarie Uni Innovation Hub

Constructed entirely from timber, this single storey building is designed to be disassembled and relocated at the end of five years.

Designed by Architectus and TTW, the prefabricated roof features CLT and tapering Glulam roof beams spanning 20m and cantilevering over the veranda each side. Beams are supported by 'V' columns of Victorian Ash.

This striking building is seen by the university as the first step in the establishment of the Macquarie Park Innovation District, designed to target entrepreneurs and start-ups and establish

Image credit TTW


1


2


3

Bligh Tanner Projects

4

32 Bellevue Parade

Bligh Tanner has been engaged on this project and examined several options for this combined office and residential development. The geometry features stepped levels between apartments and mezzanines, making framing challenging.

The anticipated benefits of CLT are the speed of construction, the simplicity of the structure and erection process compared to other materials, and its contribution to sustainability of the development.

The client is keen to adopt 3D BIM and prefabrication techniques to achieve savings in construction and improve quality.

Architect Nitid Architecture

5

Mascar Street

Our developer client wishes to be an 'early adopter' of timber construction, and has appointed us for this seven-storey residential development.

The developer wishes to cautiously test the technology and potential benefits to manage the risks of elevated construction costs. To this end, a phased approach including the parallel design of the building in both CLT and conventional construction materials is planned so that an informed decision can be made prior to committing to a chosen method.

Developer Mosaic Property Group

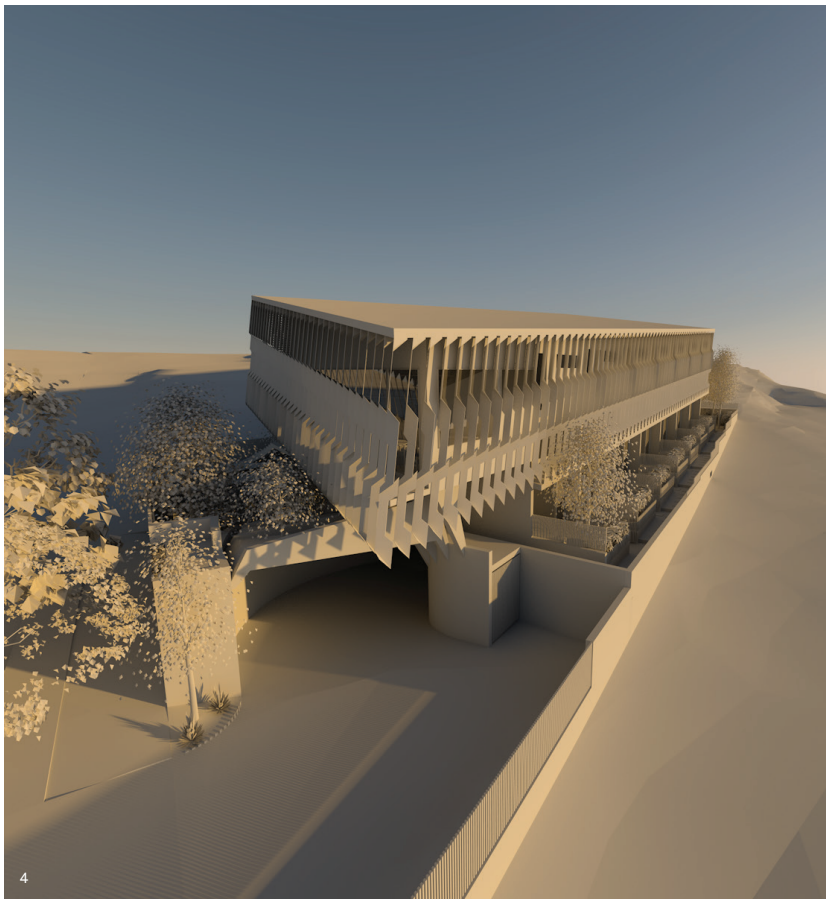
6

Maryborough Fire Station

We are working with Hutchinson Builders, Hyne Timber, XLam, Baber Studios and University of Queensland to design a landmark project showcasing the potential of timber.
The project is a Queensland Government Market Led Proposal and comprises fire station, regional command centre, offices and community spaces.

If successful, this project will help change industry perceptions and challenge initial concerns over fire safety. It will be a defining moment in the industry, illustrating the potential fire safety andsustainable outcomes of timber when used in significant infrastructure.

Builder Hutchinson Builders
Architect Baber Studio



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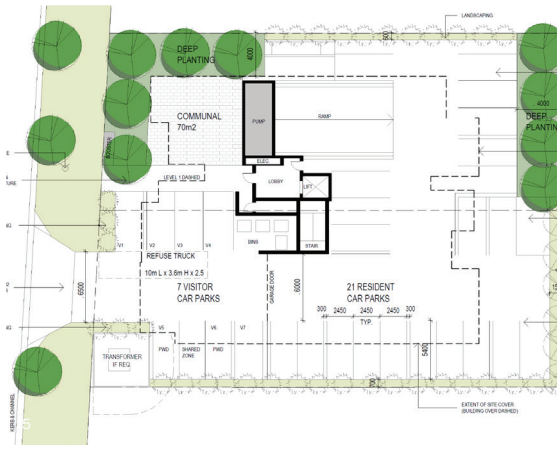

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Curtis Island Resort

Bligh Tanner was engaged to develop the timber design of a tourist resort on Curtis Island using Cross Laminated Timber (CLT).

Located off the Queensland coast, the remoteness of the site lends itself to the product that can be prefabricated and transported to the island by boat.

A significant feature of the architectural design is the exposure of the timber panels that make up the roof. By removing rafters, finishes and concealing services, the roof design is simple, cost-effective and directly contributes to the warm and inviting ambience of the interior design.

Client Client QRE Pty Ltd Aquatic
Architect Aquatonic

5

UQ Modular Project

Working as an industrial partner to the University of Queensland, Happy Haus and Marquette Properties for this research project, we examined alternative systems of construction in search of improvements in speed, cost and quality applicable to a three-storey development.

The use of CLT as structural wall and floor elements was evaluated as having the greatest potential to reach the aims and could be readily applied to the Australian residential market.

Architect Aquatonic

6

Randall Road Kindergarten

We have been appointed to design a single-storey kindergarten to introduce our client into using CLT.

As a small sized project in a wider portfolio of work, this childcare centre offers an opportunity to mitigate risks of introducing this novel technology, allowing client, designers and builder to iron out potential problems before applying to larger, more significant projects.

Developer Raw Property Studio
Architect Elevation Architecture

Contact us

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Further Information

Technical Guidance

+ XLam Design Guide
+ Wood Solutions Guide 16 – Massive Timber Construction Systems – CLT
+ Wood Solutions Guide 37 – Mid-rise Timber Buildings
+ Wood Solution Guide 38 – Fire Safety Design of Mid-rise Timber Buildings