The timber renaissance – materials, technologies and techniques

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Timber buildings in the spotlight

There is no doubt that timber buildings are currently in the spotlight. We have seen several high-profile projects completed, such as the 53 m tall, 18-storey Tallwood House at Brock Commons in Vancouver Canada, or the world's first all-timber stadium for the appropriately named Forest Green Rovers.

New Zealand is not immune from this new timber age. Sir Bob Jones' plans to complete a multi-storey 'ply-scraper' in central Wellington, and even a timber stadium for Christchurch, have been proposed (well, mentioned at least).

We cannot, however, be tricked into thinking that big timber buildings are by any means a new-fangled idea. Nestled in the heart of downtown Wellington sits what was (until 1998) the second largest timber building in the world, the Old Government Buildings. Interestingly, the building was originally planned in concrete and timber, but the cost of concrete at the time led to a decision to build in timber alone. This cost saving is something that over 100 years later we are still struggling to convey to timber-wary quantity surveyors. Although a value engineering choice, the decision to build the Old Government Buildings in timber has likely assisted it in surviving the subsequent seismic events which continue to test it.

Reasons for change to timber

So why the modern change? What is creating this worldwide buzz and encouraging people onto the mass timber bandwagon?

Clean, green and innovative

In part, the answer is certainly the view of timber as a clean and green material capable of storing copious amounts of carbon, a sure step in reducing global warming. Added to this thought, new (and some not so new) materials are being re-marketed and re-imagined, construction practices are embracing the tech age, and connection methods are moving well beyond gun nailing.

Glue laminated timber (glulam)

Glulam is not new, but remains one of the best ways to create the curves and flowing lines characteristic of so many iconic buildings. It is created by gluing together single bits of sawn timber into a built-up section. These sections are only limited by manufacturing equipment, but can be up to 2 m^2 and capable of massive load-carrying ability.

Cross laminated timber (CLT)

CLT has been at the forefront of this mass timber material movement. Originating in Austria around 30 years ago, CLT is often described as 'plywood on steroids'. Another way to describe it would be a messed piece of glulam, where someone has accidently layered boards orthogonal to each other instead of parallel. The result of this is a mass timber panel, perfect for creating walls and floors with a high level of prefabrication, thus reducing on-site work and construction time.

Laminated veneer lumber (LVL)

LVL is another winner in New Zealand timber construction. Essentially, the glulam version of plywood with fibre veneers running parallel, LVL is stronger in compression than most concretes. Long, strong and straight.

Computer numerically controlled (CNC) machines

CNC machines have also modified the landscape of timber design. Gone are the days of skillsaws on-site (well, mostly). Walls, beams and columns can be cut with pinpoint accuracy off-site during manufacture.

The rise of CNC also brings us to our final stop on this timber renaissance tour – connections. The accuracy of CNC has seen a revival of carpentry joints, such as the dovetail, being used on a much larger scale, which means it is possible to significantly reduce the amount



Left to right: Glue laminated timber (glulam), cross laminated timber (CLT) and laminated veneer lumber (LVL)

A nine-storey CLT building under construction

of steel fixings on-site. Steel does still have a place, of course, one example being fully threaded screws, with diameters ranging from 6 mm to 13 mm and lengths up to 1.3 m. Even 3 m is possible when pre-drilling.

Pres-Lam technology

Another method of connection is PTL's Pres-Lam system. This is a method of mass engineered timber construction that uses high-strength unbonded steel cables or bars to create connections between timber beams and columns, or columns and walls, and their foundations. As a pre-stressed structure, the steel cables clamp members together, creating connections that are stronger and more compact than traditional timber fastening systems. In earthquake zones, the steel cables can be coupled with internal or external steel reinforcing that provides additional strength and energy dissipation, creating a damage avoiding structural system.

Kiwi invented Pres-Lam structures are now popping up all over the world, with two under construction in the US and built examples already complete in Switzerland and Japan. New Zealand has not forgotten about Pres-Lam, however, with the University of Canterbury's von Haast building using four-storey Pres-Lam frames, making it one of the world's tallest frame timber structures.

Challenges to overcome

The timber world is not without its challenges. Inconsistent material supply is often a hurdle, with around 20% extra worldwide CLT demand not being catered for at present. This can create widely varying prices during the design process, creating risk. False perceptions are also an issue, such as the idea that timber will go up in flames with one wrong look or untreated internal timber will start rotting in the first spring shower.

Peavy Hall at Oregon State University, architecturally designed by MGA and one of two buildings under construction in the US using PTL's Pres-Lam technology

We still have work to do, but there is no doubt that the emergence of new construction materials, technologies and techniques is leading the structural timber world to new heights. New Zealand has an important role to play in this renaissance, and with the right team and the right attitude we may even see an all timber replacement to the Beehive in the not too distant future.

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