

Mass timber adoption in New Zealand

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Figure 1: Cathedral Grammar School, Christchurch

Abstract

Mass timber adoption has recently witnessed significant growth. It is increasingly being used as the structural material of choice for a wide range of construction and infrastructure projects across New Zealand. This paper explores some of the industry changes that have contributed to this growth and looks at some of the external influences that have been playing a role in promoting the uptake of mass timber. It provides an overview of how manufacturing is moving to meet the growing demand and gives

viewpoints on various topics related to manufacturing, supply chain and wider industry factors. Mass timber has an important future, where plenty of opportunity exists, and will have an essential part to play in our low carbon future.

Overview of recent growth

There has been a major increase in the use of mass timber products such as glulam (GLT), cross-laminated timber (CLT) and laminated veneer lumber (LVL), as structural materials for construction and

infrastructure projects in New Zealand since 2019 (see Figures 1, 3 and 4). This is a trend which looks to continue for several years yet.

What had been (up to 2019) a steady (and, in comparison, slowly growing) mass timber industry has seen a notable increase in the demand for these products across all construction sectors. This is a trend which is also mirrored globally, particularly in North America, Europe and closer to home in Australia. Where mass timber had previously been used for highly bespoke projects, or in projects only as feature elements, it is now being widely adopted as a material of choice for full structural solutions on an increasing range of building types.

Of course, buildings do not happen overnight, and as a precursor to this demand on the building site a notable increase was seen in 2016–2017 of the number of design consultants wanting to incorporate mass timber into their designs. Until that point, the mass timber design community in New Zealand was quite small and the design work required for mass timber, particularly from a structural design viewpoint, was considered highly specialised.

Sustainability credentials

During this same period, conversations around climate change and global warming were becoming very much mainstream topics, which through a form of social responsibility led to many organisations incorporating carbon reduction policies across their building activities.

With this increase in consultants and public awareness of climate change, mass timbers benefits – such as its sustainability credentials (decarbonising construction, carbon sequestration), speed of construction, biophilic design, architectural expression of structure and the ability to perform well seismically – came into the spotlight.

Growing interest

Industry bodies, technical groups, Primary Growth Partnership (PGP) programmes and content providers dedicated to mass timber have been evolving and growing in numbers, which has helped in the dissemination of information to a wider and growing audience. The Wood Products and Manufacturers Association (WPMA), the Timber Design Society (TDS) – a technical group of engineering New Zealand, the Timber Design Centre (TDC), Scion, Mid Rise Wood Construction and the annual WoodWorks conference are all successful platforms for propelling the adoption of mass timber in New Zealand.

An example of the notable increase in interest in learning about mass timber can be seen in Figure 2, showing attendance numbers at the annual WoodWorks conference for the last seven years. This illustrates a consistent level of interest from 2016–2019, with a growth period starting from the 2020

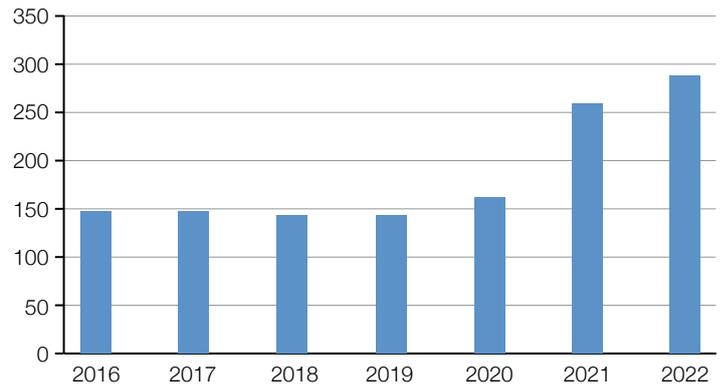


Figure 2: WoodWorks conference attendance 2016–2022

period. This would align with the timing of these first major buildings being constructed and people starting to notice more mass timber buildings entering the built environment around them.

ITP and EPD

The recent Industry Transformation Plan (ITP) published by the Ministry for Primary Industries (MPI) combines much of this knowledge and thinking around the benefits of using mass timber. The ITP puts out a clear message to the industry about how the Government sees the construction sector moving towards a more sustainable future.

An industry-wide Environmental Product Declaration (EPD) has also been compiled and published, allowing designs to better access the environmental aspects of the structures they are designing. Carbon accounting is becoming a standard measure on buildings and other environmental schemes are gaining popularity. More and more manufacturers have invested in environmental product information like V.O.C. testing and Declare labels to support Green Star and Living Building Challenge projects.

Supply to meet the demand – manufacturing capacity

RedStag TimberLab is a mass timber supplier in New Zealand, producing GLT, CLT, LVL and Frame and Truss across multiple plants in Auckland, Rotorua and Hamilton. Our goal is to lead the industry in the modern manufacturing of mass timber.

Manufacturing capacity in New Zealand, which for the past few decades has been growing at a rate in line with the market demand (as it was prior to 2019), has had to rapidly change its pace of growth to meet this increased demand. Manufacturing growth took several years to come to fruition because new building materials and equipment from overseas (typically Europe) were required to meaningfully increase capacity.

Having witnessed this demand increase on the horizon, RedStag TimberLab has put plans in place

to grow capacity and capability across our mass timber-focused operations. Operations have grown substantially over this period, with the first stages of these plans (a purpose-built CLT plant in Rotorua and an extension to the Auckland GLT plant) being completed and already creating additional capacity for the market. We remain committed to supporting the uptake of mass timber by growing local capacity and capability. Additional manufacturing equipment across multiple sites has already been purchased and is in transit to enable extra capacity through 2023.

Manufacturing growth is needed in two primary areas to ensure that the supply for this growing market keeps pace with demand, the first being commodity production for 'off the shelf' solutions and secondly bespoke production for custom-made and prefabricated solutions.

Increasing capacity for commodity production is a simpler equation, and with capital investment, time and raw materials this can (and has) been achieved with great results. Once operational, a facility designed for commodity production can often turn capacity up or down to meet the market due to the repetitive nature of the processes involved.

Manufacturing facilities for bespoke production are much more complex and take more time and investment to deliver supply to market. These facilities require everything that the commodity product does, plus a large amount of human resource (both upfront and ongoing), and specialist plant planning to provide capability and allow for flexibility in production.

Developing manufacturing facilities that cater for both forms of production is not the most efficient way to produce, but is often what is required with



Figure 3: Coastlands Aquatic Centre, Kapiti Coast



Figure 4: St Patrick's Church, Christchurch

a market size like New Zealand has to offer. The capital input to mirror what some of the European plants have in the way of automation for bespoke manufacturing is challenged by the market size here.

Increased workload on factory floor

Modern manufacturing (CAD, CAM and CNC), and a wider adoption of prefabricated and offsite solutions being incorporated into construction methodologies, has seen a notable increase in another part of the bespoke production model. Whereas in the past the process would be finished at the completion of the timber part(s), there are now a growing number of projects where post-manufacturing operations (such as multi-part assembly and module building) are

being incorporated. These tasks are being completed as part of the manufacturing process to enable the construction to be quicker and less disruptive to its surroundings.

This increased workload on the factory floor has required a rethink in the way we approach designing components and how we programme construction site works. Typically, with prefabricated products, the design needs to happen much earlier and to a more finite stage to allow for this work to be completed well ahead of when the construction starts. With a completely prefabricated structure, the build time can easily outpace the manufacturing time, so we need to move to a strategy where the building components are made and stored ready for construction before the building site needs them.

Completing this production ahead of the construction timeline, and taking into account the increased upfront design work both by the design consultants and the manufacturers, has meant a shift in the commercial arrangements required to make this work for all parties. There has been a move away from traditional tender models, which were very linear in time, to increasingly using early involvement forms of engagement where designers have direct contact with manufacturers throughout the design phases and the manufacturing companies can start the process of producing manufacturing information much earlier.

Software platforms like BIM 360, which enable the real-time sharing and combining of design work in 3D models from various sources, have aided a wider team of designers and manufacturers/suppliers to work together in this early engagement process.

Wider industry factors

Raw material supply has become a large focus for industry, with a general awareness that we need to be sending less logs offshore as unprocessed fibre and create more finished goods for both export and local use. There is a big opportunity to increase jobs, especially in the regions, and to increase our forestry export values when considering the export of finished goods.

With overseas governments providing subsidies to their industry to enable log purchases at higher rates, local manufacturing is paying the price. The price paid for logs by local mills must match what the export market will pay, meaning the raw material costs for local manufacturers are controlled by what these overseas buyers are doing. The result once the subsidies have been applied is that overseas producers can often produce products from New Zealand grown timber and ship them back to here at a cheaper rate than we can produce locally.

We need to encourage growth in our forests to meet future demand, and it is essential that our current forests do not decline in size and that the harvesting and replanting of these areas continues.

A large amount of research and product development is being undertaken in New Zealand by manufacturers/suppliers, higher education (the Auckland of University and the University of

Canterbury), as well as designers and developers looking to introduce and test proprietary solutions. This research, coupled with an increasing amount of case studies and post-construction testing for factors like acoustics, are increasing the knowledge around material properties and performance.

Constructors have risen to the occasion as well, with more and more building and construction companies increasing their knowledge of mass timber and understanding how to successfully incorporate these materials on-site. With a greater knowledge of moisture control, construction methodologies that incorporate prefab/CNC components and material handling for exposed structural elements, constructors are more able to help in achieving quality outcomes.

A greater utilisation of digital tools like 3D models, virtual reality (VR) and augmented reality (AR) are allowing site teams to harness the digital information provided by the design teams and relay it as built information back to designers and customers in real time.

Standards and regulations

A new design standard (NZS AS 1720.1) to replace our old NZS 3603 has just been released, which will bring us more in line with recent learnings and international standards. A greater awareness of international standards and verification methods is also allowing local designers to design mass timber in a more efficient and robust way.

Fire design and associated building compliance and insurance regulations are a heavy focus for industry. A large amount of resource has and continues to go into performance testing and specialist design knowledge to give confidence to building owners, regulators and emergency services.

A low carbon future

The mass timber industry in New Zealand has an exciting future where plenty of opportunity exists, and an essential part to play in our low carbon future.

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