# New timber design standard

A timber design standard available later this year will provide new options for designers and engineers to take advantage of the exciting innovations in engineered wood.

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**THERE IS A NEW** timber design standard in the works for Aotearoa New Zealand. This will provide ways of designing timber structures that are outside the scope of NZS 3604:2011 *Timber-framed buildings*, our prescriptive light timber framing standard.

### *Timber building design has changed*

The current timber design standard, NZS 3603:1993 *Timber structures standard*, was last revised in 1993. Since then, a lot has changed in New Zealand and around the world with timber buildings.

A wide range of engineered wood products and innovative timber building systems have become available and are being utilised for residential and commercial buildings. Timber products are also being used more commonly for multi-storey buildings up to 18 storeys.

While we may not be ready for that just yet in New Zealand, there have been enough significant innovations in timber building to warrant an update to our current timber standard, and that's exactly what is happening.

Nelson Airport - its innovative design makes extensive use of LVL.

PHOTO – DAVID CARRADINE

### *Revision adapts Australian standard*

The revision process for NZS 3603:1993 began as far back as 2011 with a committee assembled and the necessary updates, scope and other changes decided on after in-depth discussions. Working groups were created for different parts of the revision so that national expertise in timber design could be capitalised on.

It was decided to utilise the provisions of AS 1720.1-2010 *Timber structures, Part 1: Design methods* and make use of existing design methods that could be easily adapted to New Zealand.

The new standard will be NZS/AS 1720.1, which mostly replicates AS 1720.1 but has specific portions that are designated for use in New Zealand with details provided in an appendix.

Public consultation on the draft closed in February 2019 with formal balloting by the committee done in December 2019.

With the complexity involved, it has taken some time to address all the concerns and develop a document satisfactory to the full committee. It was also decided to remove the fire behaviour provisions from the standard, and these are now incorporated within AS/NZS 1720.4:2019 *Timber structures - Part 4: Fire resistance of timber elements*.

While the shift in format is a significant change from NZS 3603:1993, there are also several content changes that designers need to be aware of in the new standard.

## Big changes to connections

Connections are one of the biggest changes, and in some cases, these will require a different approach.

### Non-potential ductile elements

Screws, nails, bolts and coach screws that are not being used as potential ductile elements (PDEs) can be included using a simplified approach that is similar to what is already done in NZS 3603:1993. This method is relatively prescriptive, is based on existing timber species groups and tends to be mostly conservative.

### Potential ductile elements

PDEs include fasteners used to resist earthquake loads. In those cases, a detailed method is required that uses the European yield model (EYM) - a model used throughout most of the world to calculate connection capacities in timber.

The EYM considers all possible failure modes and provides capacity calculations for all of them, with the lowest capacity used for the connection design. It can be used for large diameter fasteners (bolts and dowels) and small diameter fasteners (screws, nails and rivets), although different failure modes can apply. The limiting cases consider yielding through timber crushing and fastener bending.

The EYM uses species-specific material properties, which are provided in the standard. It tends to provide a more detailed evaluation of connection performance and allows designers to evaluate how a connection performs under different scenarios.

### Brittle failure mode evaluations

Brittle failure modes caused by catastrophic timber fracture are considered through a separate series of detailed equations. These brittle failure mode evaluations are one of the novelties of the new standard - currently, only Canada requires checking of these failure modes and only for large diameter fasteners.

This will require more calculation time but can be programmed for a range of connection configurations and fasteners. The simplified method is based on the EYM also, but the equations are not presented or required.

## Other changes in NZS/AS 1720.1

Other changes in the new standard include:

- additional mechanical properties provided for relevant New Zealand timber species to facilitate connection and member design
- increased guidance on the design of structural timber diaphragms
- methods for designing timber buildings to resist earthquake loading.

Properties and methods for designing with laminated veneer lumber (LVL) - an increasingly popular choice for a variety of building application - are also included. While LVL has been used in New Zealand for many years, it was not officially included in NZS 3603:1993 and was therefore considered an Alternative Solution.

## What's not included?

While cross-laminated timber (CLT) is increasingly being utilised around the world and in New Zealand, it will not be included in the new standard and remains an Alternative Solution. This is consistent with initiatives in some other countries that have embraced CLT but are still navigating methods for designing and safely incorporating the material in their building codes and standards.

How to design for penetrations and reinforcement of timber members that have been notched or penetrated will not be included in the new standard but has been the subject of technical articles and guidelines available in New Zealand.

## More options for designers to reduce carbon footprint

Considering the global advances and significant increase in the use of timber, especially for multi-storey buildings, it is not surprising that a revision of the New Zealand timber design standard NZS 3603 is happening. It will give designers more options as government initiatives seek to reduce greenhouse gas emissions and develop buildings that have high resilience and reduced carbon footprints.

The new standard NZS/AS 1720.1 will be a big step forward for timber design in New Zealand, and instead of recreating the wheel it is utilising existing relevant knowledge from an Australian standard to accelerate the process.

This change may not include all the innovations in wood construction, but it will be a step in the right direction and will be greatly anticipated by timber engineers. An exact date of publication has not been set, but it is hoped the new standard will be available during the second half of 2022.

**For more** Keep your eyes open for opportunities to learn more about the new standard, which will likely be in webinar form or publications from BRANZ or the Timber Design Society.