
Timber
Unlimited
NZ TDS
NEW ZEALAND
TIMBER DESIGN
SOCIETY
Serving the NZ timber industry – a hybrid approach
Hybrid Building Seminar
November 2023
Robert Finch and Daniel Moroder

We exist to build belief in the possibilities of timber

Timber Unlimited is an industry-neutral, non-commercial non-profit, founded to encourage and facilitate the use of timber in the design and construction of all building and infrastructure projects.

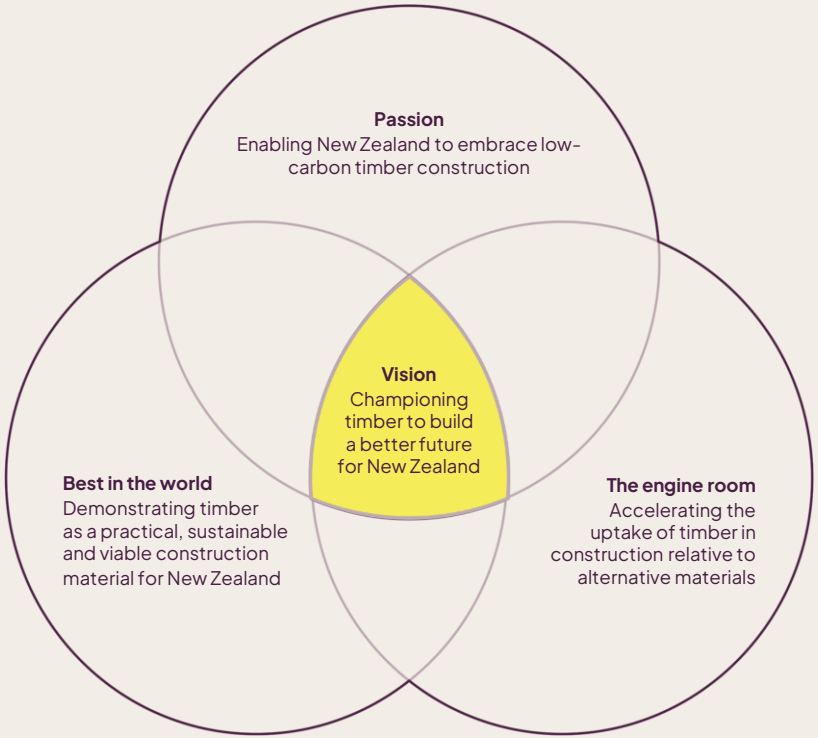
Our purpose is to enable good outcomes for the Sector:

National good
Support transition to a lower carbon economy, lift GDP & value of export receipts

Industry good
Decrease reliance on volatile log exports, encourage higher value domestic demand, lift sector investment in capability & capacity, encourage innovation

Direct beneficiaries
Central Government, Wood Processors & Manufacturers

Indirect beneficiaries
Forest Owners, B&C sector, Commercial Asset Owners



We’re creating an environment where the powerful credentials and benefits of timber are well understood

What we do:

As the country's go-to timber resource, we provide all the timber design information and knowledge in one place, empowering the industry to build better.

Everything we do is to minimise the time and cost of gaining the capability, competence and confidence to find new ways of building with timber by:

- Championing the reasons and benefits of using timber.
- Educating and providing guidance to upskill and build capacity.
- Addressing barriers and helping solve problems.
- Showcasing inspiring innovation and demonstrating it can be done with timber.
- Facilitating collaboration and connections to help share and grow knowledge, skills and techniques across the industry.
- Building a thriving community of timber advocates where we can bring like-minded individuals together for the greater good.

Building a better future for both the construction industry, and New Zealand as a whole.

Founding members

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BRANZ

wpma Wood Processors & Manufacturers Association of New Zealand

SCION FORESTS ▪ PRODUCTS ▪ INNOVATION

Funders

Te Uru Rākau New Zealand Forest Service

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SUPPORTED BY ENGINEERING NEW ZEALAND

The NZ Timber Design Society

Learned society

Collaborating Technical Society (CTS) of Engineering NZ

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The NZ Timber Design Society

Membership organisation

Run by volunteers as an incorporated society

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The NZ Timber Design Society

Our sponsors

rothoblaas

MiTek®

IBUILT™ NEW ZEALAND WOOD PRODUCTS LIMITED

XLAM™

SIMPSON Strong-Tie

futurebuild LVL®

Foster the designed use of timber

Timber is used <u>well</u> in design

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Purpose

Achieve a common understanding of good timber design

Improve the quality of timber design

Encourage excellence

Ensure designers have the knowledge to design well

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Timber Unlimited sponsored the latest technical notes in the TDS journal

Technical notes provide practical guidance and design tools for designers

TECHNICAL NOTE - CAPACITY DESIGN AND NZS AS 1720.1

Dr Tobias Smith
PTL | Structural & Fire, Christchurch

This technical note has been kindly supported by Timber Unlimited

INTRODUCTION

NZS AS 1720.1 introduced a new Chapter ZZ9 which sets out the minimum seismic design requirements for timber structures when using B1/VM1 of the New Zealand Building Code. This was a significant extension of the information previously available in NZS 3603:1993.

As part of this new chapter two terms are introduced:

- Potential Ductile Elements (PDEs) are connections or components that are capable of sustained inelastic and hysteretic response.
- Capacity Protected Elements (CPEs) are elements which are loaded in series with the PDE but are not PDEs. Typically, a CPE is nominated as such because it is not capable of inelastic and/or hysteretic behaviour.

Separating the PDEs and CPEs is the overstrength of the PDE. This technical note discusses overstrength and its use in NZS AS1720.1. It also discusses the limitation placed on overstrength actions by the standard and how this is applied.

Potential Ductile Elements and Capacity Protected Elements

NZS1170.5 references and defines a potential inelastic zone whose performance must be considered when assigning the structural ductility factor, μ. This term does not sit well with timber design, as the timber itself is inherently brittle under common loading cases. As such, timber buildings rely on elements, not zones, for their structural ductility.

Similarly, the term inelastic can also be problematic in a timber context. For example, a bolted connection which has an embedment only failure (for example crushing the timber without bending the small dowel as defined by Eq. ZZ4.32, Eq. ZZ4.33, Eq. ZZ4.38 and Eq. ZZ4.39 of NZS AS 1720.1) will present inelastic response but cannot be considered ductile. Ductile response requires plastic deformations combined with energy dissipation (Appendix A NZS1170.5), under cyclic loading. As such, the term ductile, rather than inelastic is considered more appropriate. As an examples, small dowel connections governed by the equations Eq. ZZ4.34 to Eq. ZZ4.37, Eq. ZZ4.40 and Eq. ZZ4.41 area considered ductile.

For any structure in timber with a selected structural ductility factor of greater than 1, capacity design must be used. Capacity design in accordance with NZS1170.5 is a design method in which elements of the primary horizontal earthquake action resisting system, in this case the PDE, is chosen and suitably designed for energy dissipation. To ensure that the PDE is the weakest link, capacity design guarantees that all other structural elements are provided with sufficient strength so that the chosen means of energy dissipation can be maintained. In NZS AS1720.1, these elements are called Capacity Protected Elements, CPEs. Overstrength, defined as the maximum probable strength of the PDE, provides the demand on the CPE (N^*_{CPE}). Clause ZZ9.3.5.5 describes attributes of the PDE which must be accounted for in the definition of its overstrength. Overstrength does not cover the effects of over-capacity which is the gap between the PDE demand (N^*_{PDE}) and the PDE characteristic capacity (N'_{PDE}):

NZ WOOD
For a better world

REINFORCEMENT OF TIMBER MEMBERS
Chapter 12.6 | September 2020

wpma
Wood Processors & Manufacturers Association of New Zealand

NZ Wood Design Guides

A growing suite of information, technical and training resources, the Design Guides have been created to support the use of wood in the design and construction of the built environment.

Each title has been written by experts in the field and is the accumulated result of years of experience in working with wood and wood products.

Some of the popular topics covered by the Design Guides include:

- Timber, Carbon and the Environment
- Seismic Design
- Working Safely with Prefabricated Timber
- Costing Timber Buildings

To discover more, please visit http://nzwooddesignguides.wpma.org.nz

Front Cover: Daniel Moroder
Back Cover: Top left and bottom right: Andy Van Houtte, Top right: Robert Jockwer, Bottom left: Rothoblaas

NZ Wood Design Guides is a Wood Processors and Manufacturers (WPMA) initiative designed to provide independent, non-proprietary information about timber and wood products to professionals and companies involved in building design and construction.

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Funding for the NZ Wood Design Guides is provided by our partners:

wpma · supported by forestgrowers commodity levy · JACKS · ewpaa · NZ TDS NEW ZEALAND TIMBER DESIGN SOCIETY · AGMARDT · BRANZ

(c/o Mass Timber Building Science Primer)

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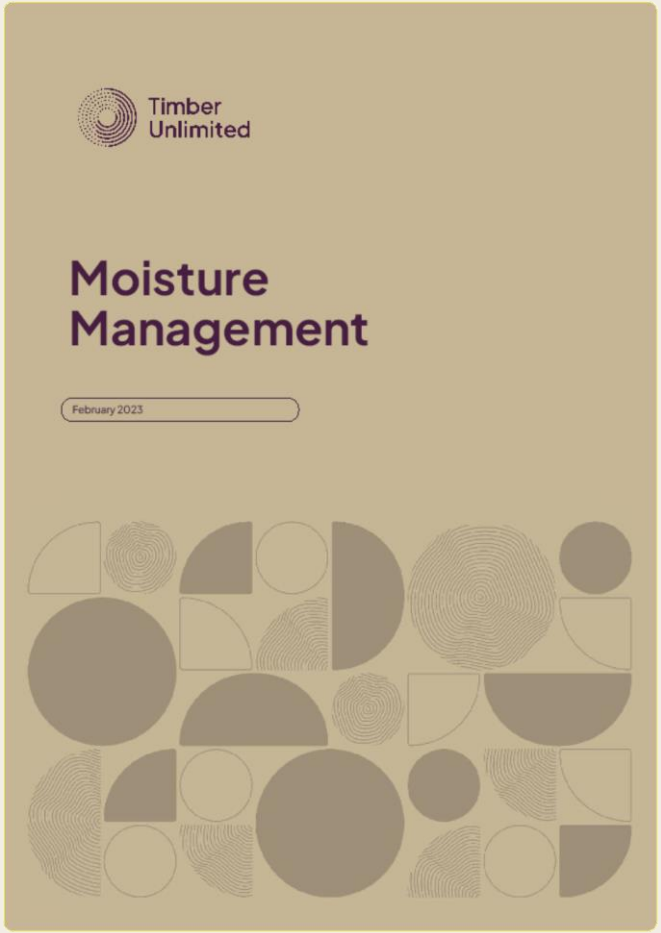
Timber Unlimited now host and manage the NZ Wood Guidelines

New guidelines will be developed and existing guidelines will be updated, corrected and improved

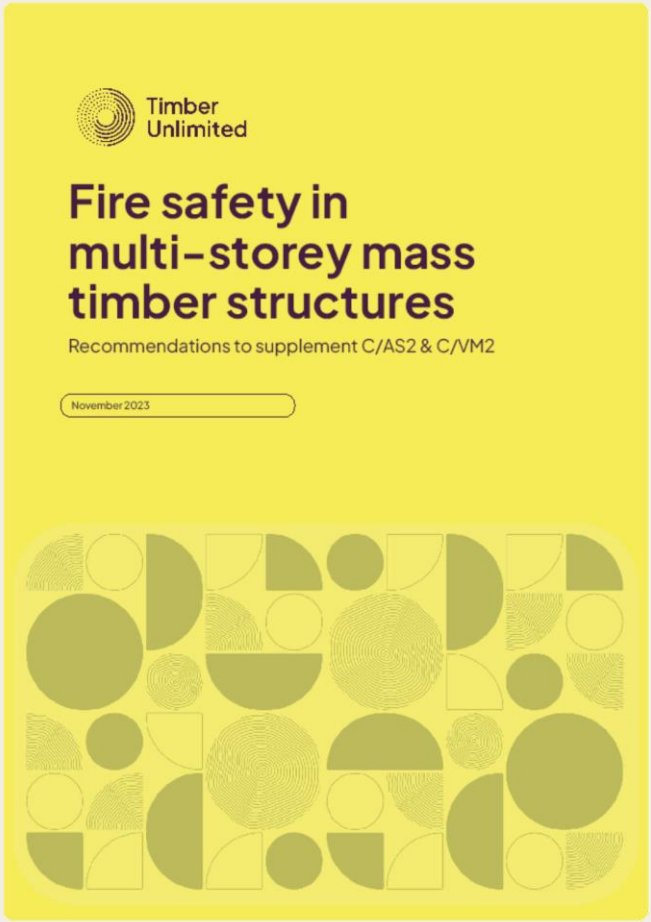
Moisture Management:

- A new best practice guide is under development.
- Provision of guidance to cover the stages of transport, site storage & construction
- Target availability is March 2024



Fire guide

- An NZ commentary on the international Fire Safe Use of Wood Guide published in July 2022 is under preparation
- Will assist with compliance pathways under the NZ Building Code
- Target availability is Dec 2023
- Additionally, Recommendations to Supplement C/AS2 and C/VM2 have been prepared and will be made available in Nov 2023.



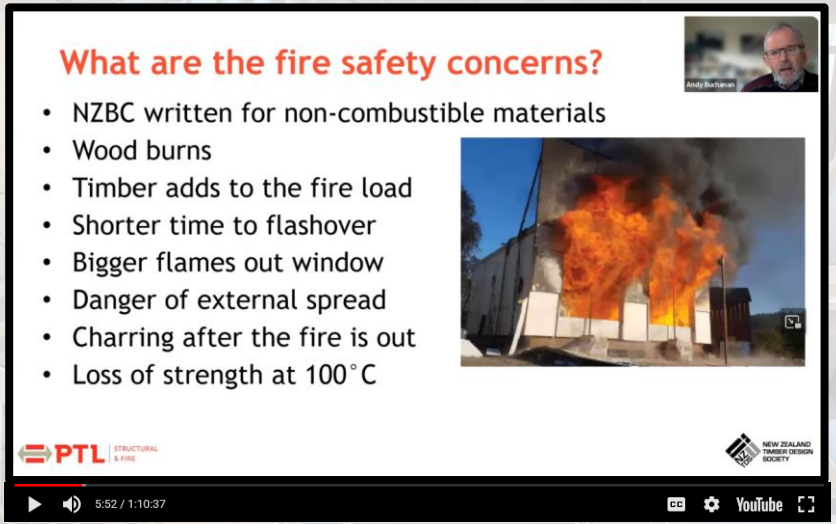
TDS Webinar series

Second Thursday each month at lunchtime

Some topics covered:

- Fire Engineering for Timber Structures
- Reinforcement of timber members
- Light timber framed bracing walls
- Carbon Evaluations for Timber Buildings

Recordings under www.timberdesign.org.nz



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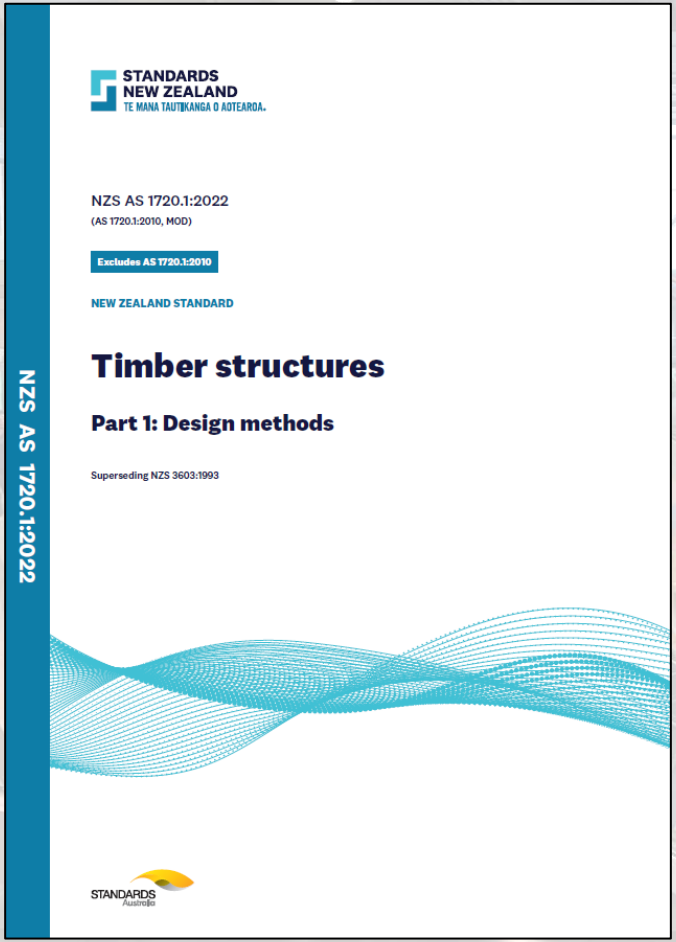

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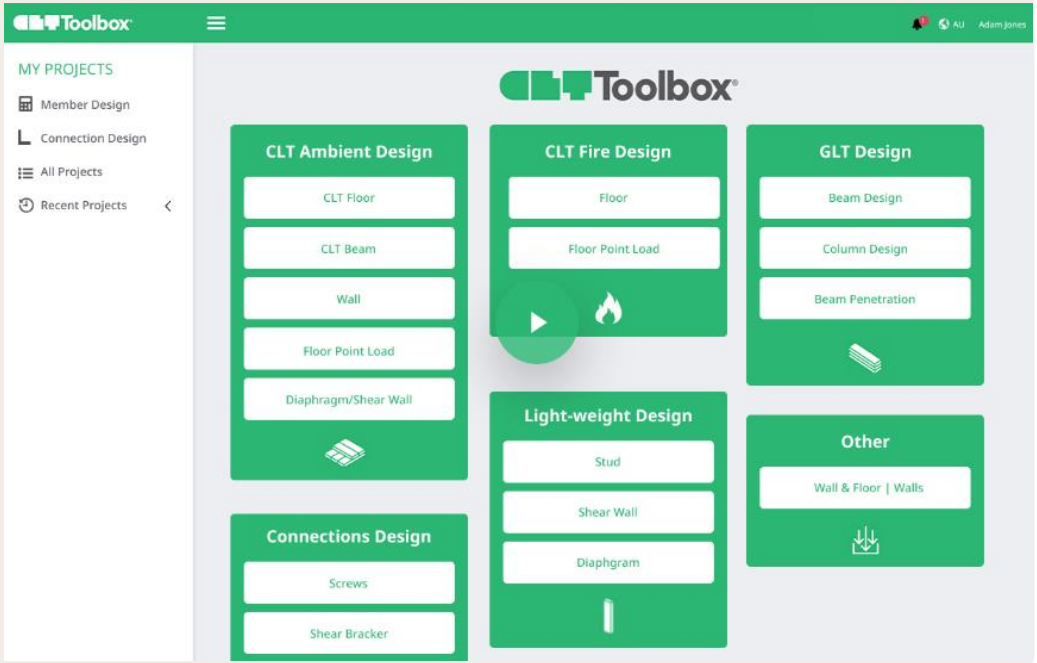
Timber Unlimited are collaborating with MBIE (BSP) and SNZ to update the Standard

Public comment was received and a TU facilitated Technical Coordination Group will work on a set of recommendations to MBIE (BSP) and SNZ to amend the Standard

Timber Unlimited is sponsoring and coordinating a design software package

Several NZ specific modules of the software will be made available for free.

Additional modules will be available at a discounted rate for TDS and SESOC members



Hybrid Buildings Seminar

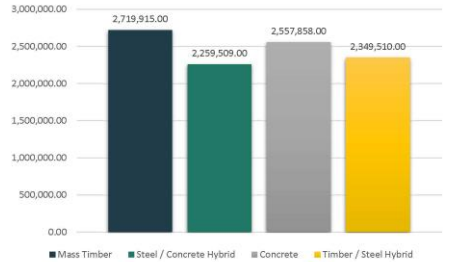
Hybrid Buildings

Hybrid buildings provide a pragmatic and realistic path for NZ to:

- Get more timber into buildings immediately
- Transition to a low emissions economy
- Ramp up future supply base that will match escalating demand
- Achieve competitive and viable total out-turn costs in the short and medium term

Cost Comparison

$ Potential Cost Savings
$895,938.00



	Cost Analysis			
Core Structure	Construction	P&G	Development	Total
Mass Timber	$2,719,915.00	$ 647,120.00	$ -	$ 3,367,035.00
Steel/Concrete	$2,259,509.00	$ 900,000.00	$ 434,710.00	$ 3,594,219.00
Concrete	$2,557,858.00	$ 900,000.00	$ 434,710.00	$ 3,892,568.00
Timber/Steel	$2,349,510.00	$ 647,120.00	$ -	$ 2,996,630.00

Hybrid Buildings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APRIL SEP 2025
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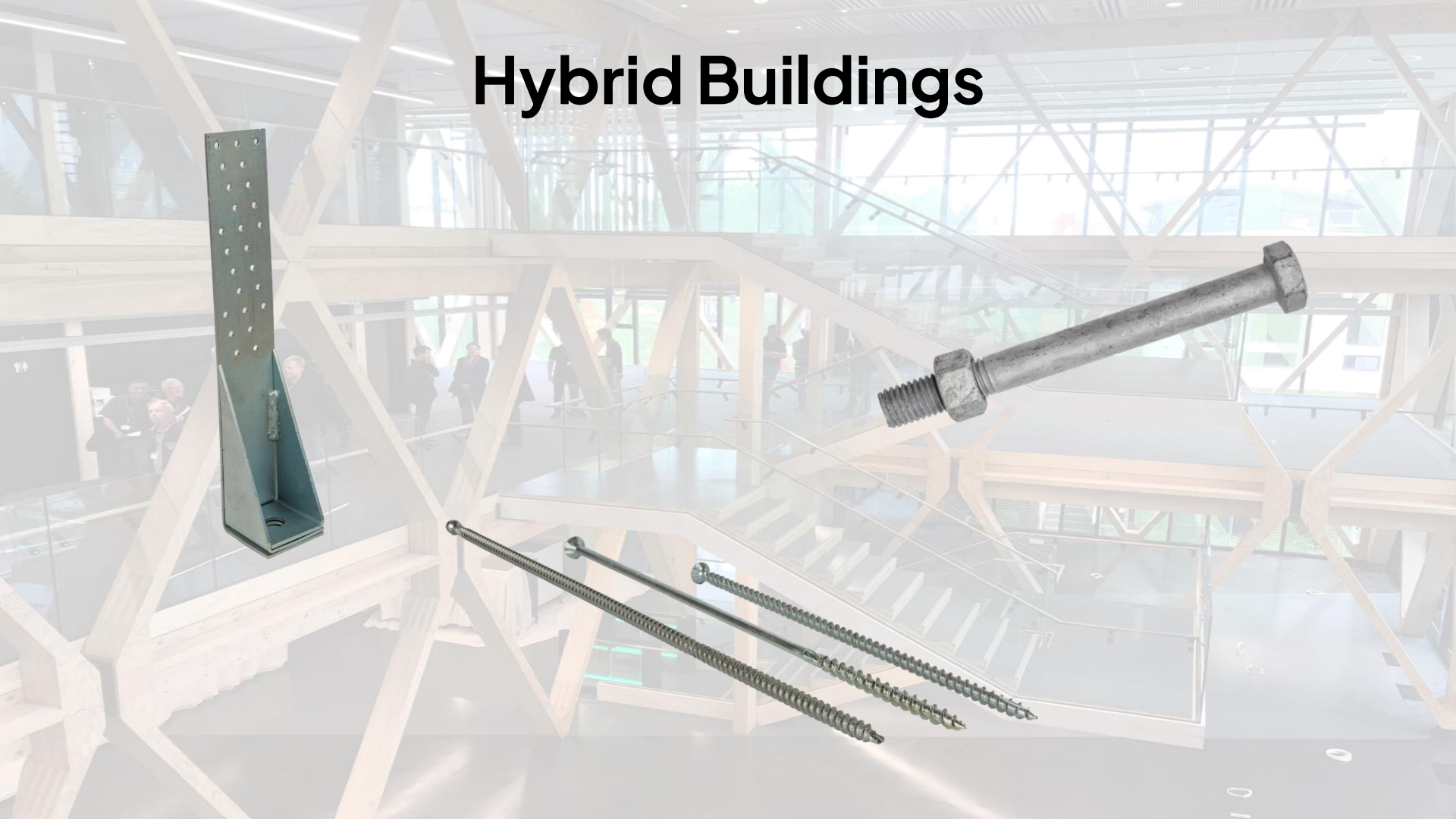
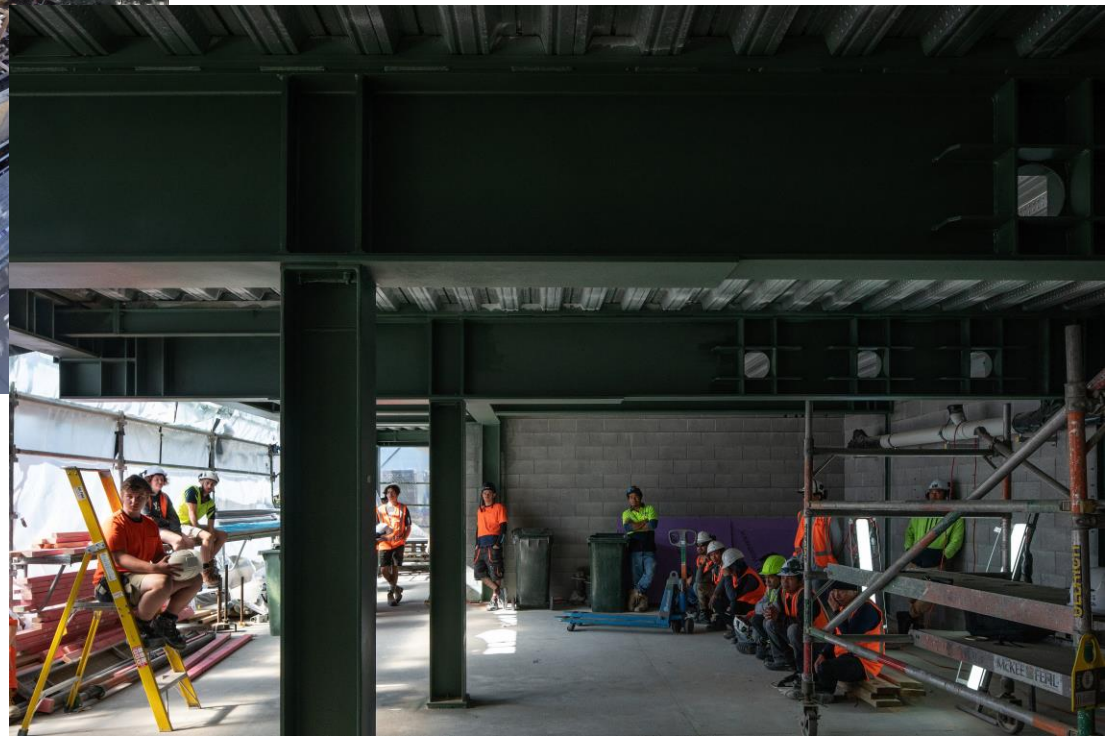
Hybrid Buildings



Use the right material in the right place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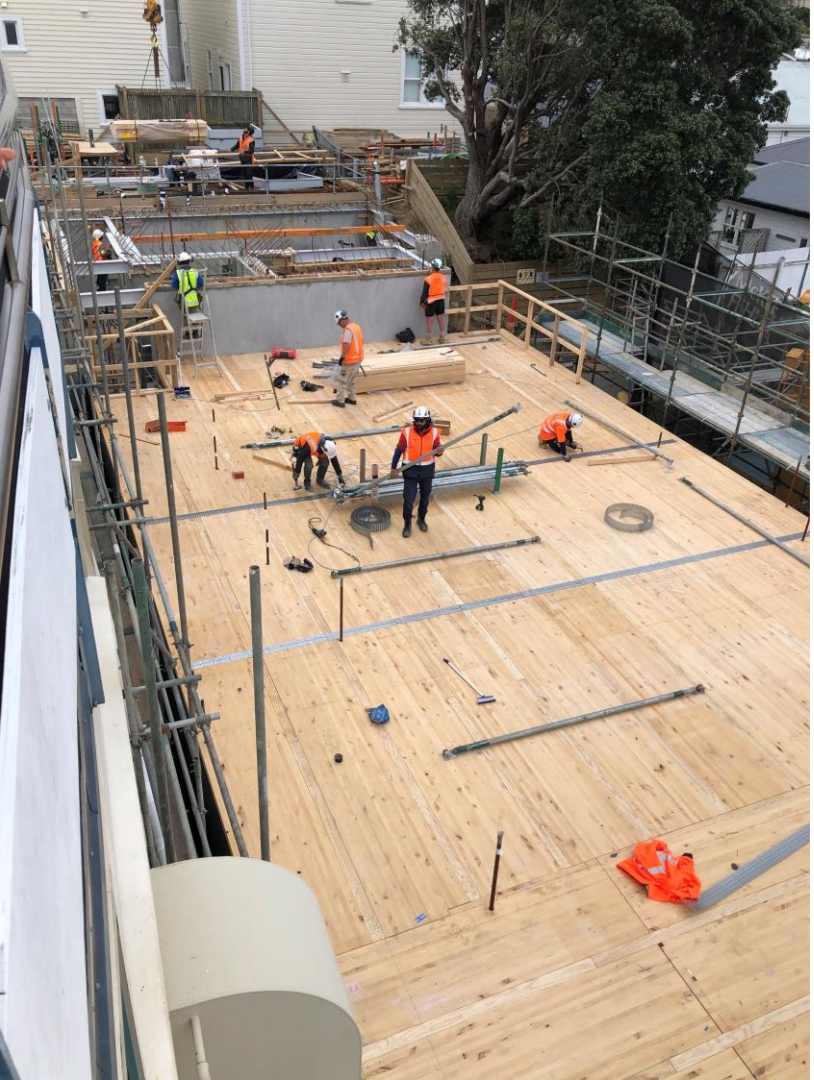

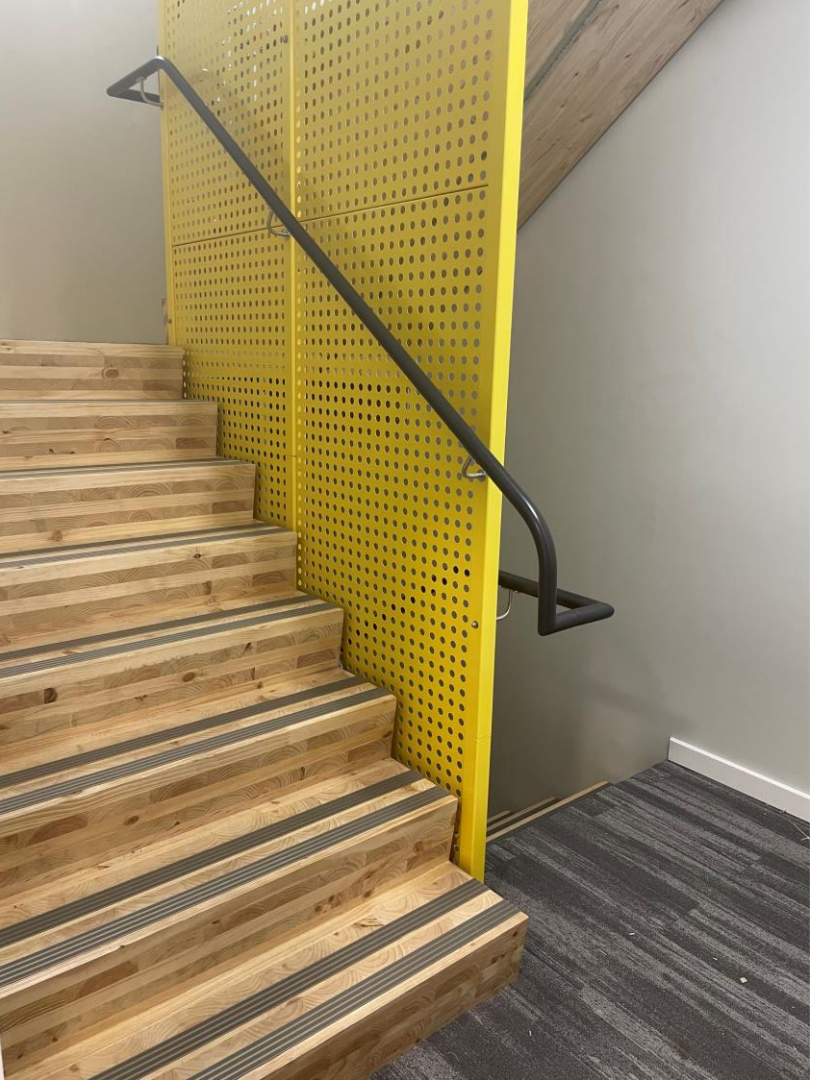


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Enjoy the seminar!