KEVIN HICKMAN RETIREMENT VILLAGE

RYMAN HEALTHCARE

25 STEADMAN ROAD
RICCARTON PARK, CHRISTCHURCH

CASE STUDY

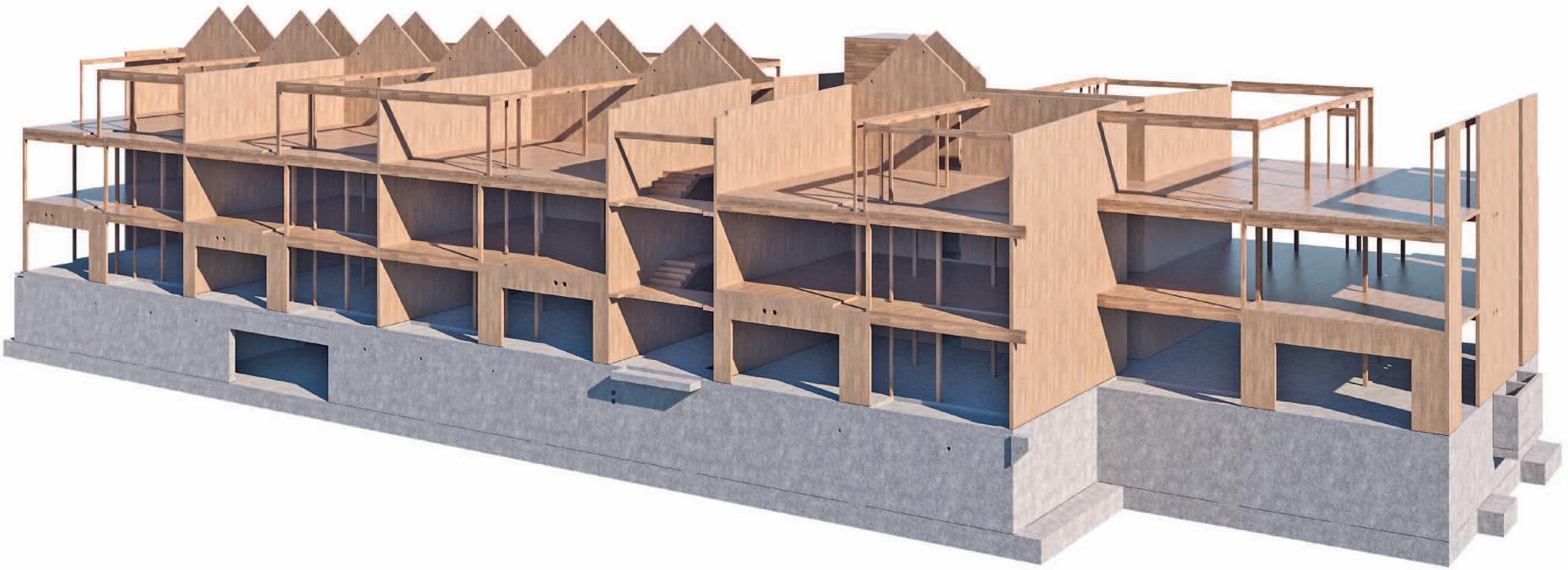
Ministry for Primary Industries
Manatū Ahu Matua

MID-RISE Wood Construction

RED STAG TIMBERLAB

INTRODUCTION

The building is the third of five apartment blocks in the Kevin Hickman Retirement Village in Christchurch. The apartment building has three above-ground levels with basement parking. There are a total of 27 apartments with a mix of two and three bed options. The CLT structure starts at the ground floor walls and includes two suspended CLT floors with LVL supporting structure. The basement structure is concrete. The Gross Floor Area (GFA) is 4,444m^2.



TECHNICAL INFORMATION

Client:	Ryman Healthcare
Project Name:	Kevin Hickman Retirement Village
Building Purpose:	Residential - Independent retirement living
Description:	Concrete basement with two suspended CLT floors with LVL supporting structure and three levels of CLT walls
Number of Levels:	Three (3) above ground and basement
Gross floor area:	4,444 m^2
Acoustic Design:	Floor/ceiling between apartments - STC 55, FSTC 50 Walls between apartments - STC 55, FSTC 50
Architect:	Ryman Healthcare
Structural Engineer:	Mitchel Vranjes / Structure Design
Building Purpose:	Kevin Hickman Retirement Village
Fire Engineer:	Gannon Fire & Risk
Acoustic Engineer:	Norman Disney Young
Main Contractor:	Ryman Healthcare
CLT Subcontractor:	Tricon Construction Services

1. DESIGN

A three level apartment block using two suspended levels of CLT flooring on a concrete basement and concrete suspended ground floor with CLT corridor and party walls.

2. FIRE

The original compliance pathway was to fully encapsulate the timber structure with 16mm fire rated plasterboard, this was submitted to council for approval. Whilst council were assessing the design for consent Ryman discussed reducing the amount of encapsulation to the timber, working with CCC (Christchurch City Council), FENZ and the design team. A revised consent was submitted with a peer review reducing the coverage of the fire rated plasterboard encapsulation to the structure. Fire rated plasterboard encapsulation was removed from the majority of the CLT walls and all the ceilings. Fire rated plasterboard encapsulation remained on the corbels and beams.

3. SAFETY

Safety, compared to the traditional designed precast concrete structures for the first two apartment blocks, the mass timber solution using CLT and LVL posts and beams have had the following improvements to safety on site:

- Up to 60% less truck movements to site for deliveries.
- Reduced heavy lifting requirements from cranes.
- Reduced hours worked on the timber structure by 45-55%.
- Reduced exposure to dust and noise.

In addition to the above we have had comments from workers on site that the building is a nicer place to work, easier to keep clean and tidy, warmer.

4. CONSTRUCTION EFFICIENCIES

50% time saving on the mass timber super structure compared to the concrete structures on site. Now we are in the 1st fix services trade contractors are realizing the benefits with fixing, drilling etc into timber as opposed to concrete, reduced noise and dust as mentioned above.

5. LESSONS LEARNT

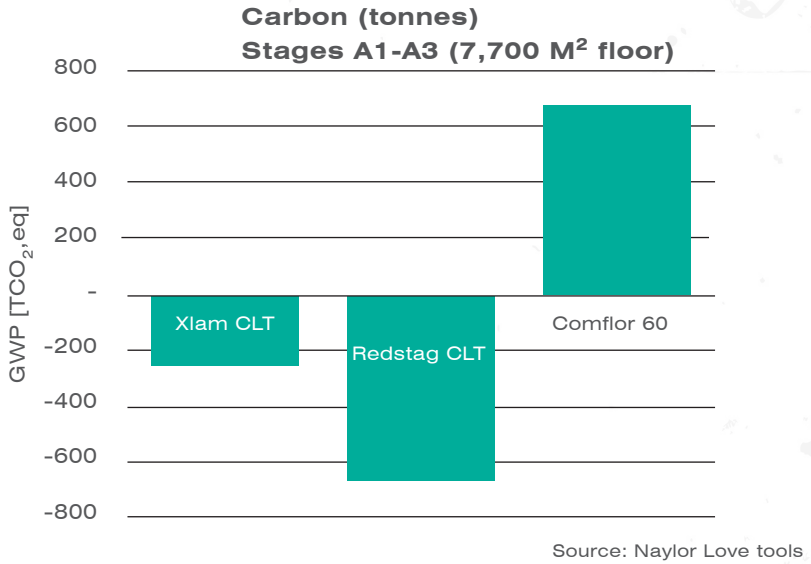
There have been a number of lessons that can be taken from this project into future ones.

- Up front preparation is essential. The better the planning the better the implementation on site.
- As we get into the services fit out we have seen service coordination issues that needed resolving, these were around service routes and penetrations to timber structure.

V-QUEST ANALYSIS

- There is a major weight variation between options. The heaviest superstructure option (excluding foundations) is 52% heavier than the built timber option.
- To support the concrete and steel heavy option the foundation mass increases by an additional 56%.
- Costs reflect core structure including foundations, frame, structural walls and upper floors. P&G is also included.
- Costs have been included for acoustic floors and extra over allowance for fire rates linings to timber where required.
- Time saving applied to options with CLT floors to speed of floor construction.
- Concrete steel option includes Rib & Infill system to upper floors and precast concrete walls.
- CO_2eq of core structure materials quantified only (A1-A3).

	Mass Timber (As-Built)	Hybrid - (Steel Frame)	Concrete/Steel
	Kg	Kg	Kg
CO_2-e	666,589	794,461	2,039,150
Weight	933,900	902,900	2,030,800



Source: Naylor Love tools

Flyover link - https://www.youtube.com/watch?v=A7BDJ7L_Z9U&feature=youtu.be.

DEVELOPERS COMMENTS ON USING CLT

The building is the third of five apartment blocks in the Kevin Hickman Retirement Village in Christchurch. The apartment building has three above-ground levels with basement parking. There are a total of 27 apartments with a mix of two and three bed options. The CLT structure starts at the ground floor walls and includes two suspended CLT floors with LVL supporting structure. The basement structure is concrete. The Gross Floor Area (GFA) is 4,444m^2.

NOTE Response comments from:

DM - Design Manager
AM - *Aaron McCallum*, Site Manager
TB - *Tom Brownrigg*, Construction Manager
JC - *Jason Cordes*, Red Stag Timber Lab

Is it cost-effective, compared to concrete/steel?

DM There is a cost premium for mass timber buildings. The major impact has been scope creep in fixings, corbels, and encapsulation (although there has been some reduction in this). As mass timber design is not as well established as concrete and steel there have been late changes that have resulted from peer review and other last-minute assessment. This has resulted in more structure and resulting cost. Any future cost planning should include a premium for these items.

JC To support in mitigating these challenges, Early Contractor and Supplier Involvement (ECI and ESI) is recommended. Optimised design at the early stages of a project can often incorporate value engineering and optimisation that simplify processing and optimise supply.

Is it faster, and what savings can be made?

TB We anticipate it to be faster and savings to be realised.

AM It's certainly faster, but the work that goes in during design and reviews make the difference to the efficiencies during the build.

DM Design is significantly slower but there is potential for more rapid construction however this does rely on supply chain performance.

JC ECI and ESI at the forefront of projects provides the ability to optimise and expedite design decisions. Incorporating experienced mass timber consultants (structural and fire engineering) is recommended to capture the benefits of timber super structures.

Is there cost competition and options for supply of the wood products?

TB Low competition at present, we feel that global suppliers are needed in New Zealand market to drive true competition.

AM Currently there are only two main players in this market, Red Stag and XLam. More competition will always drive savings.

DM There are not a lot of supply chain options within New Zealand and each supplier has built in barriers (unit thicknesses and test information) that prevents easy change. This requires the early identification of a supplier which is then integrated within the design and does not allow a great deal of control over supply chain performance for the balance of the process. For the industry to be successful against traditional methods there needs to be greater and easier options available, including the ability to easily change suppliers during the design process.

JC The challenge with product alignment (e.g. product thickness and recipes) is that there are feedstock differences between suppliers. Red Stag focuses recipes around 42 and 20 mm layers to prevent the need to utilise more expensive SG graded timber. Treatment is also very important to align with the New Zealand Building Code, providing property owners with the protection and confidence that their timber assets are protected against biological threats and water ingress during the life of the building (plumbing leaks, facade challenges, etc). Not all suppliers are equal. Careful consideration should be given to all product attributes, including each supplier's Environmental Product Declaration (EPD). Domestic suppliers will have a significantly better environmental position compared to imported material. Imported materials do not generally provide treatment options, conformity to the New Zealand standards and building codes and have an inferior EPD.

Who are the mass timber experts and what have they done?

TB Architect – Ryman Healthcare; Engineers - Mitchel Vranjes (MV) & Structure Design; Main contractor - Ryman Healthcare; specialist CLT sub contractor - Red Stag Timberlab.

AM As this is my first mass timber building I've only had exposure to Structure Design, who are contracted to MV for all CLT design consultation.

DM Tricon who are erecting the building, Gannon Fire and Risk who are fire engineers, PTL have acted as Fire Peer Reviewer for the non-encapsulation Value Engineering process.

How do the designs tackle earthquake, fire, acoustic, thermal and cladding/moisture concerns?

TB Designs follow common design principles for mass timber. Tectonus seismic connectors used for CLT to concrete connections https://www.tectonus.com/

AM

- B04 has the Techtonus system to deal with seismic movement that allows the building to move, but come back to the original position. For everything else, it's not really that different to a standard build.
- Earthquake – Tectonus system; deflection detail at ground floor level; vertical seismic joints between fixed structure and panels connected to Tectonus; timber elements are arranged into a honeycomb layout; additional strapping and fixings have been required to enhance the floor diaphragms.
- Fire - the original compliance pathway was to fully encapsulate the timber structure with 16mm fire rated plasterboard, this was submitted to council for approval. Whilst council were assessing the design for consent Ryman discussed reducing the amount of encapsulation to the timber, working with CCC (Christchurch City Council), FENZ and the design team. A revised consent was submitted with a peer review reducing the coverage of the fire rated plasterboard encapsulation to the structure. Fire rated plasterboard encapsulation was removed from the majority of the CLT walls and all the ceilings. Fire rated plasterboard encapsulation remained on the corbels and beams.
- Acoustic - Sound down raised acoustic floor. Typical inter tenancy wall detailing.
- Façade - Wrapshield over CLT panel and brick cladding provides the primary weathertightness.
- Thermal - Consented under old H1 requirements.

What are the environmental benefits, including CO_2, wastage and traffic movements?

TB Estimated 70% reduction in up front $C0_2$ and predicted 65% reduction in truck movements to and from site.

Do Councils understand and permit designs for mass timber buildings?

DM Yes but there has been some learning around encapsulation and non-encapsulation approaches which appears to still be an evolving space.

ACOUSTICS – RESPONSE TO CCC RFI G6-159

NDY has been requested to respond to an RFI from Christchurch City Council dated 4 December 2023 (BCN-/2022/8789/B) relating to acoustics clause G6 of the NZBC. The RFI is as follows:

G6 – 159 Demonstrate compliance with G6.3.1 for the common walls, floors and ceilings of habitable spaces in household units between occupancies. Provide details showing these building elements will achieve a STC rating of no less than 55 assessing the impact of removing the fire rated plasterboard which is currently providing the fire encapsulation of the CLT walls and floor/ceilings in Buildings B04 Riccarton Retirement Village, Steadman Road.

We have reviewed the sound insulation performance of the intertenancy walls and floors for Building 04 and recommend the following constructions to achieve NZBC clause G6 compliance.

FLOOR TYPE	FLOOR FINISHES	CEILING CONSTRUCTION	LABORATORY STC / IIC RATING
Apartment Floor & Ceiling Configurations (between levels G-1 and 1-2)			
Min. 126mm CLT	• Floor finish on • 20mm Maglock Dragonboard on 60mm high SoundDown PAB with Mammoth 580 blanket in cavity	• Min. 400mm air gap between the soffit and ceiling • Min. R1.8 Pink Batts Classic ceiling insulation • Suspended 13mm standard plasterboard ceiling (8.7kg/m^2) • Ceiling lining fixed to Rondo Keylock ceiling system	Min. STC 55 / IIC 55

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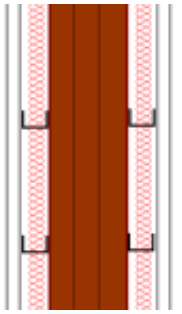
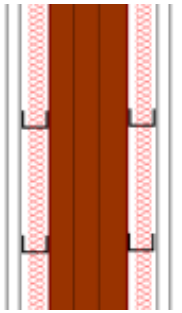
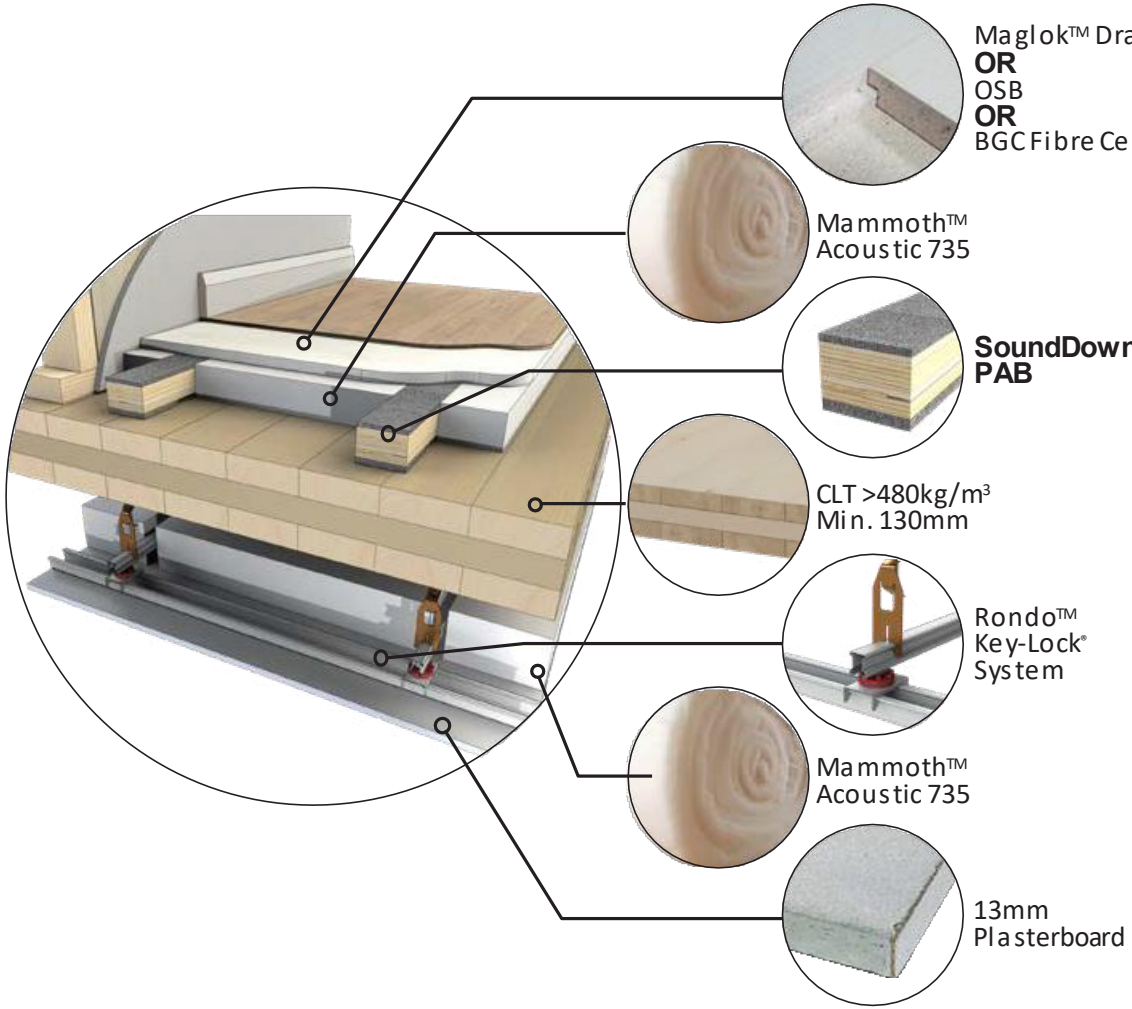
NDY, A Tetra Tech Company COMPANY NO. AK336379

WALL TYPE / LAB PERFORMANCE	CONSTRUCTION DESCRIPTION	DIAGRAM
Level 1 inter-tenancy apartment walls (type CLT21)		
Cross Laminated Timber **Min. STC 55**	▪ 1 x 16mm Fyreline plasterboard (13 kg/m^2) ▪ 64mm steel frame (BMT 0.55) @min 600mm with 64mm thick polyester/glass wool insulation with min. 11kg/m^3 density ▪ 126mm CLT panel ▪ 64mm steel frame (BMT 0.55) @min 600mm with 64mm thick polyester/glass wool insulation with min. 11kg/m^3 density ▪ 1 x 16mm fire-rated plasterboard (13 kg/m^2)	
Ground floor and level 2 inter-tenancy apartment walls (type CLT07)		
Cross Laminated Timber **Min. STC 55**	▪ 1 x 10mm Noiseline or 1 x 13mm standard plasterboard (8.6 kg/m^2) ▪ 64mm steel frame (BMT 0.55) @min 600mm with 64mm thick polyester/glass wool insulation with min. 11kg/m^3 density ▪ 126mm CLT panel ▪ 64mm steel frame (BMT 0.55) @min 600mm with 64mm thick polyester/glass wool insulation with min. 11kg/m^3 density ▪ 1 x 10mm Noiseline or 1 x 13mm standard plasterboard (8.6 kg/m^2)	

SoundDown™ PAB

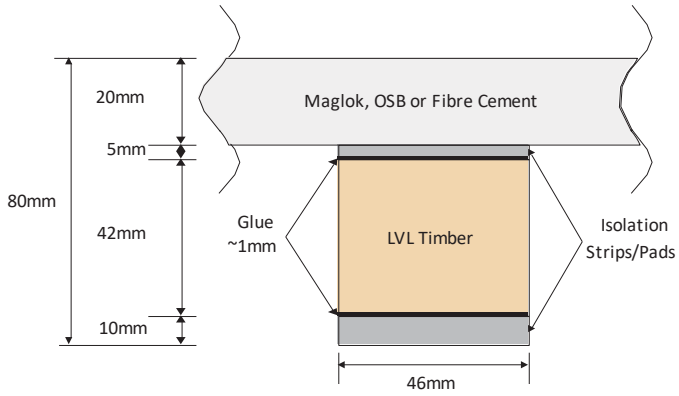
A pre-assembled acoustic batten comprised of LVL & recycled rubber isolation strips, enabling superior acoustics, services integration and flexibility of topping layer.



System Information

Total System Depth:	460mm
SoundDown™ Build Up:	77mm
Services Routing:	✓
Topping Durability:	Maglok ✓
Installation Time:	>3m2/Hour
Weight | OSB	18.4kg/m²
Weight | Maglok	26.2kg/m²
IIC (OSB):	57
IIC (Maglok):	60
STC:	66

**Weights displayed are PAB with topping panel only, shown below.*



ABOUT THE MID-RISE WOOD CONSTRUCTION PROGRAMME

Mid-Rise Wood Construction is a six-year partnership between the Ministry for Primary Industries (MPI) and Red Stag Investments Ltd.

The aim of this $6.75 million programme is to encourage widespread adoption of precision- engineered timber in mid-rise building construction. Since its inception in 2018, the programme has assembled a pool of New Zealand professionals experienced in mid-rise wood building design and construction to help share and grow knowledge and expertise with the broader industry.

Engineered timber is not only naturally beautiful but also provides a very strong, low carbon and comparably low-cost alternative to steel & concrete. It is easy to transport, relatively light, and has outstanding earthquake and fire resilience. The use of prefabrication can decrease construction time by as much as 30 percent, and reduces costs compared with traditional building methods. Combining Cross- Laminated Timber (CLT), laminated veneer lumber (LVL), glulam and panelised framing timber creates a cost-effective, fast, resilient and sustainable system for mid-rise construction.

For more information, go to www.midrisewood.co.nz or to subscribe to the newsletter and receive the latest news and updates on the Mid-Rise Wood Construction in your inbox, go to https://midrisewood.co.nz/newsletter/.

For more information on **Mid-Rise Wood**
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