MID-RISE
Wood Construction

RED STAG TIMBER: MOBILE PLANT WORKSHOP

Case Study

PROJECT INFORMATION

Client	Red Stag Timber
Project Name	Red Stag Mobile Plant Workshop
Region	Rotorua, Bay of Plenty
Build Type	Industrial Workshop
Brief Building Description	Full CLT engineered structure
Number of Storys	One

PROJECT TEAM

Developer	Red Stag Timber
Client	Red Stag Timber
Architect	DCA Architects of Transformation
Project Team	Red Stag Timber
Builder/Contractor	Max Edkins Builders
Structural Engineer	Enovate
Fire	Smart Fire

PROJECT BACKGROUND

This project was initiated to create a purpose-built facility for servicing mobile plant and equipment on the Red Stag Timber site.

Early sketches for a steel-framed building were developed in 2019, with detailed design completed by mid-2021. By then, Red Stag Wood Solutions' new CLT plant was operational and producing high-quality panels.

A review of the proposed design and its location—adjacent to the site boundary and opposite the Toi Ohomai Forestry Campus—prompted consideration of an engineered timber solution. A combination of CLT portal frames and CLT wall and ceiling panels offered better noise containment and insulation, while also providing bracing for the structure.

DCA Architects were appointed for architectural design and Enovate for structural design. Construction, led by Max Edkins Builders—long-time partners of Red Stag Timber—began in March 2024 and was completed in July 2025, with the building in service from September 2025.

INNOVATIONS

Red Stags' Mobile Plant Workshop is the first industrial building of its kind in New Zealand, where all of the superstructure components (aside from the gantry beam) are composed of CLT. Special care was taken in the details to minimise the extent of any exposed steel connections to show off the beauty of the timber.

For LVL / Glulam portal frame design, the size of the member is often governed by the connection strength. The timber section size often needs to increase to accommodate a stronger / stiffer connection. One of the key benefits of a CLT portal frame is the transverse lamella, while not contributing to the 'bending' strength of the member, they provide more timber to help with connection strength. Because of this, the connection strength can begin to approach the member strength if needed. The transverse lamella timber also has the benefit of widening the columns to strengthen against buckling. As part of this project Enovate, along with Red Stag and Holmes Solutions, undertook a prototype test to assess the effectiveness and strength of the CLT portal knee connection under simulated seismic loading. The testing showed very promising results with a good degree of ductility observed.

CLT can be used as a potentially lower cost and aesthetically pleasing alternative to Glulam / LVL structural members. A CLT roof provides a large degree of exposed mass timber and can provide gravity support to the roof cladding while also acting as the structural roof diaphragm. This removes any requirement for roof cross bracing and the potentially complex associated connections. Similar to the roof, the CLT walls can very effectively brace the building (again no wall cross bracing) while also allowing for the large doors and openings which are often required in industrial buildings. Being able to obtain the vast majority of all of the superstructure components from one source brings its own construction advantages, including shop drawing review and QA simplicity, transport and delivery simplicity and reducing cost / timeframe risk.

BUILDING SPECIFICATIONS

- Length: 34m
- Width: 20m
- Apex height: 10m

MATERIALS

- The building uses a combination of CLT clearspan portal frames (1000x294 CL7/294) with CLT tie beams (500x126 CL 3/126), CLT Lintels over doors (630x126 CL 3/126) and the building envelope is enclosed with CLT panels (CL 3/84) providing building bracing and a roof diaphragm.
- The building is clad in coloursteel profiled sheeting over 2 layers of 90x45 battens with Pro Clima Extasana Adhero to the outside of the CLT panels for moisture protection followed by 90 mm insulation and a second layer of Pro Clima Extasana between the outer batten and the cladding.

CONSIDERATIONS

- To have built a building from other materials to achieve similar noise control and insulation would likely have directed the use of a full concrete tilt-up system for walls and roof, and this system would have required substantially larger footings for the tilt-up construction. The timber building provided good sound containment and made insulation relatively cheap and easy as well as providing an aesthetically pleasing work environment.
- Moisture management is essential for any mass timber building. CLT portal frames / beams have a significant amount of end grain along the top of the member due to the transverse lamella. This end grain can easily be exposed during construction and therefore needs to be protected. The contractor did a fantastic job of maintaining water proof breathable coverings over the CLT until the roof panels were ready to be installed.

EASY GAINS

- Cradle to site is a small impact. Small transport cost from forest to mill, manufacture and zero transport to site.
- CLT panels for roof and walls are a significant improvement thermally over uninsulated typical industrial building typology.
- Structure installation and external enclosure with CLT was efficient.

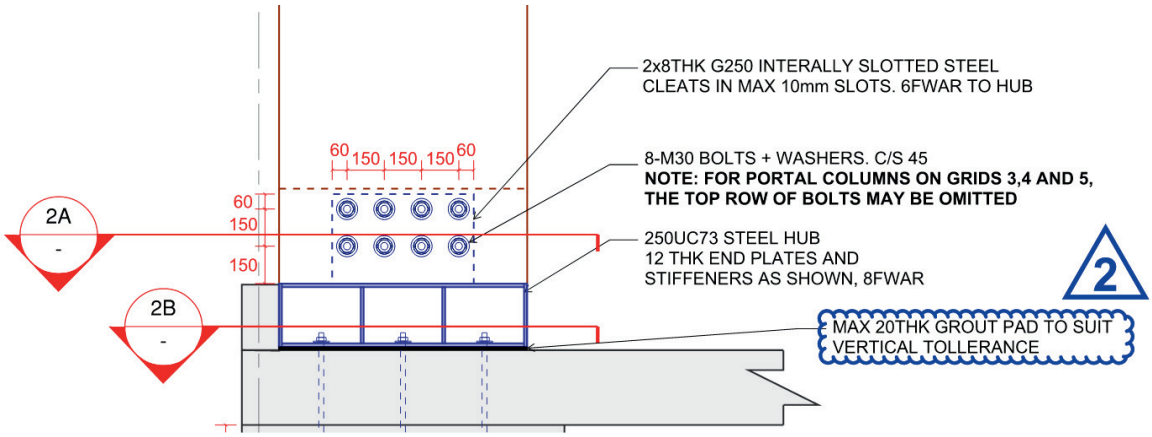
RESULTS SUMMARY

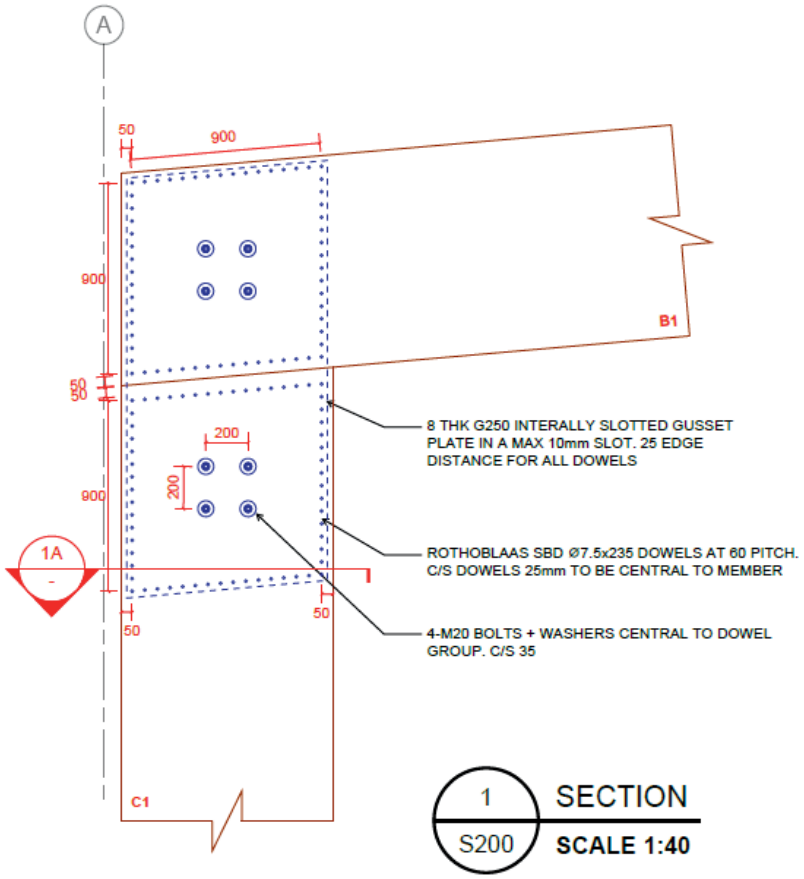
CREDIT: DCA ARCHITECTS

- The Mobile Workshop stores 173 tonnes of carbon within its timber and CLT structure — equivalent to 224kg CO_2e/m^2.
  - For comparison, the Scion Building stores 418 tonnes or 209kg CO_2e/m^2 — meaning the Mobile Workshop has a greater store of CO_2 on a per square metre basis.
- Embodied carbon (A1–A5) is 338kg CO_2e/m^2, around one-third of a typical industrial building (usually ~1,000kg CO_2e/m^2 for a steel portal design).
- The project exceeds key international benchmarks, including:
  - RIBA 2030 Climate Challenge: 750kg CO_2e/m^2
  - Living Building Challenge: 500kg CO_2e/m^2
  - The Mobile Workshop is well below both targets.
- Life-cycle embodied carbon (including biogenic carbon): 49kg CO_2e/m^2.

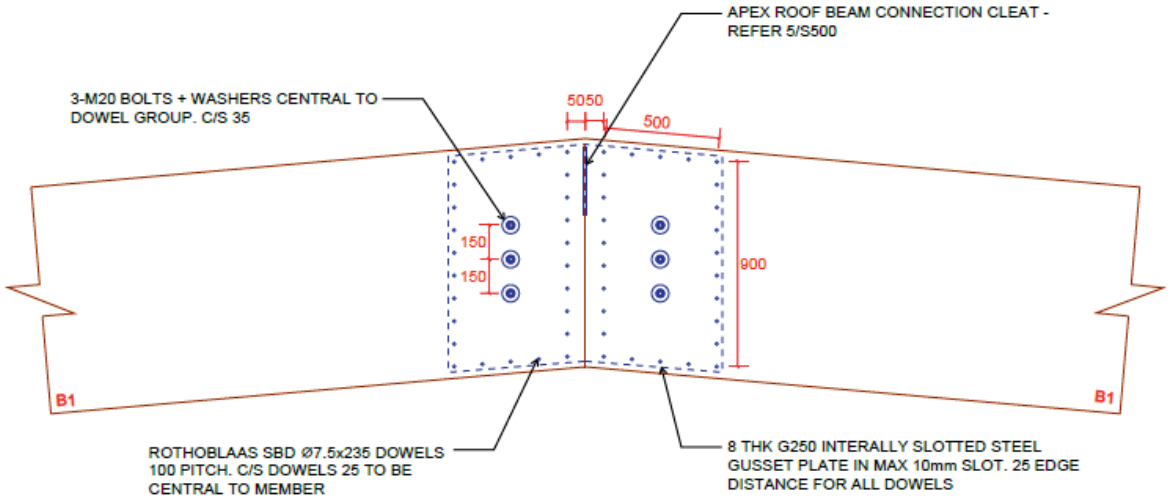
CONNECTIONS

- The knee and apex joints use an 8 mm thick grade 250 internal gusset plate attached using Rothoblaas SBD self-drilling dowels and shear bolts.
- A similar detail is used to support the steel corbels which in turn support a steel runner beam for the gantry crane. Using this style of connection for CLT portal frames works well as the alternating grain direction helps to prevent any potential brittle failures in the timber from occurring.
- The base connection features a structural steel hub with bolts which lift the base of the columns off the slab level. This protects from any water, dust and/or debris, improving the long term durability while providing a robust connection with good strength. This also allows for easy on site installation.



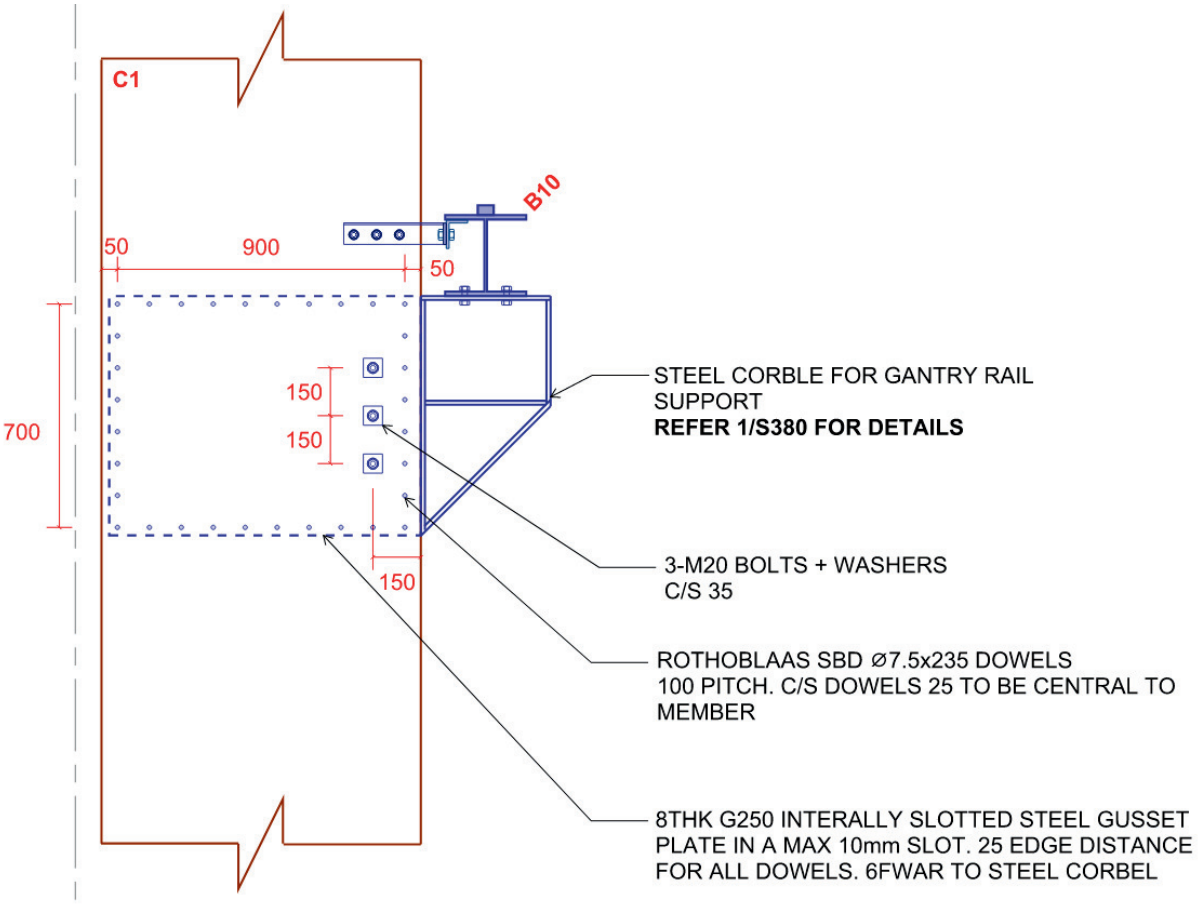


CONNECTIONS



3 / S200 SECTION

SCALE 1:40



ABOUT THE MID-RISE WOOD CONSTRUCTION PROGRAMME

Mid-Rise Wood Construction is a partnership between the Ministry for Primary Industries (MPI) and Red Stag Investments Ltd. The aim of this 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.