SUMMERSET RETIREMENT VILLAGE, MILLDALE

Case Study

MID-RISE Wood Construction

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PROJECT INFORMATION

Client	Summerset
Project Name	Sumerset Milldale
Region	Hibiscus Coast, Auckland
Build Type	Mixed-use Apartment, Care Centre and Memory Care
Brief Building Description	Regional Main Building, Hybrid type including piled concrete substructure, structural steel, timber framing and CLT mid floors and roof
Number of Storys	Three

KEY MILESTONES

Concept Design	1 December 2020
Developed Design	1 September 2022
Detailed Design	1 November 2023
Building Consent	1 February 2024
Foundations	8 January 2024
First Structure	1 May 2024
Structure Complete	30 May 2025
Estimated Completion Date	Q3 2026

PROJECT TEAM

Developer	Summerset
Client	Summerset
Architect	Summerset
Project Team	Summerset
Builder/Contractor	Summerset Construction
Structural Engineer	HFC Structural Engineers
Quantity Surveyor	Summerset Construction
Acoustics	Powell Fenwick
Fire	Powell Fenwick
Sustainability Consultant	Summerset

INTRODUCTION

Summerset is a leading retirement village operator, representing a fast-growing portfolio of 43 villages completed or in development across New Zealand and Australia, with 16 active construction projects in New Zealand alone. Among these is the 6-hectare Milldale Village, featuring a Regional Main Building (RMB) surrounded by independent villas and townhouses.

Milldale is a new subdivision located north of Auckland, and is part of the wider Orewa community and enjoys all the amenities of the Hibiscus Coast. Milldale is situated directly opposite Millwater to the west of State Highway 1 and is just 25 minutes north of Auckland City

In an innovative move, the Summerset team decided to depart from their traditional RMB design, which typically utilises concrete and steel structures, and instead implement Cross-Laminated Timber (CLT) for internal floors and roof structures. This strategic decision was driven by a commitment to reducing the carbon footprint, contributing to broader sustainability goals, and exploring potential program benefits.

The Milldale project has yielded significant advantages. Notably, there was a six-week program benefit on the roof installation, a substantial reduction in carbon emissions, and lower foundation costs due to the building's reduced mass, which resulted in lower seismic loads and overall weight. Additionally, achieving watertightness more quickly facilitated the progress of subsequent trades, and rectification of works on-site proved easier compared to traditional concrete and steel methods.

From a design perspective, critical elements included the coordination of services within walls, leveraging in-wall BIM clash detection, and the coordination of service penetrations in the floor to allow for off-site drilling. The site team focused on a moisture management plan, temporary works management, and the timing of shop drawing processes to create program opportunities.

Fire design was a key consideration, as fire rating solutions for CLT in New Zealand are still under development. Some delays were encountered in obtaining compliant tested solutions for fire dampers in CLT, and the limited availability of intumescent products posed additional constraints. However, the team anticipates that with increased experience across councils and the sector, as well as more providers entering the market, the barriers and challenges related to compliance and cost will improve.

Overall, the Milldale project exemplifies Summerset's commitment to innovation, sustainability, and continuous improvement in construction practices.

PROJECT BACKGROUND & OVERVIEW

Summerset's Regional Main Building (RMB) provides common amenity spaces, care, serviced apartments and memory care services for the entire retirement village. At completion, the broader 6 hectare village will cater for approximately 300 residents, living in a mix of independent living units (villas), serviced apartments, care suites and memory care units. The RMB is at the heart of the village and the communal hub, whilst also providing the core care and staff facilities. It includes a cafe, swimming pool, library, salon, theatre, care and memory care facilities.

On other Summerset projects, the RMB has historically been constructed largely from concrete walls and floors. Milldale's RMB not only shifted to mass timber but also benefited from a revised facade and roof structure design to improve aesthetics.

With this change, the RMB was able to optimise a CLT panel as a roof structure, a first for Summerset and a step away from a traditional truss roof.

KEY REASON FOR USING ENGINEERED TIMBER

Reduce carbon footprint and increase efficiency / reduce building time on site. This would allow Summerset to achieve a contribution to key sustainability targets, whilst also potentially completing the building sooner, making this communal space available to our operations team and residents earlier than expected.

GENERAL CONSIDERATIONS

ARCHITECTURE DESIGN OVERVIEW

The RMB floor plan needed to match previous RMBs to achieve consistency in design across projects and to ensure the same internal offering was provided to Residents. This meant the external walls remained as 90mm studs and incorporated large stud packs along the facade and elsewhere.

With this, more coordination time was needed for services in walls that were not strapped and lined.

Penetrations in the floor were modelled down to a much smaller diameter than normal to promote as many off-site penetrations to be formed in the factory rather than on-site.

ENGINEERING FEATURES

The project comprises 3 seismically separated structures (referred to as Zones 1, 2 and 3) that make up the RMB building.

The three structures are supported on concrete pile foundations with ground beams and a suspended ground floor slab.

Zone 1 has CLT first floor with an acoustic cradle floor, supported by timber-framed walls using a combination of ply and conventional gib bracing.

Zone 2 has CLT first and second floor with an acoustic cradle floor, supported by timber-framed walls using a combination of EBF frames to the lower level and conventional ply and gib bracing to upper levels.

Zone 3 has CLT first and second floor with an acoustic cradle floor, supported by timber-framed walls using conventional ply and gib bracing to upper levels.

All zones use CLT laid to falls to form the balconies and a flat CLT roof structure and parapets are used, with a warm roof over, creating the falls for the roof

The CLT floors are joined using a combination of screws and nail plates resulting in a stiff diaphragm floor and roof enabling the distribution of seismic and wind loads to the bracing structure

Building weight

Structures with a lower overall mass result in lower seismic loads, generally reducing foundation costs and bracing requirements.

GUIDES & REFERENCES

In addition to the NZBC other guides and references include:

BRANZ: Multi-storey Light Timber-Framed Buildings in New Zealand Engineering Design

DZ NZS AS 1720.1/V6.0 – (Draft) Timber Structures

Canadian CLT Handbook – FP Innovations

CLT Handbook – US Edition

KEY DESIGN CONSIDERATIONS

ACOUSTIC PERFORMANCE & BENEFITS

CLT floors are coupled with a timber floating floor system to provide physical isolation between habitable spaces. Combined with a suspended plasterboard ceiling, sound and impact insulation performance that exceeds the design requirements of the building code is achieved.

Compared to conventional timber mid-floor construction, CLT offers additional mass and stiffness, helping to reduce airborne noise and impact noise transmission. The added mass in particular helps limit the level of airborne noise transfer, in particular low frequency, which is usually the limiting factor of conventional timber floor constructions.

Having solid timber floors helps address flanking noise around full-height intertenancy walls, providing enhanced sound separation between horizontally adjacent apartments as well as simpler construction detailing.

BUILDING ENVELOPE

Careful consideration of external timber framing depth and structural design is required to maintain the thermal efficiency of the building. The Summerset Regional Main Building was restricted to 90mm timber framing due to restrictions from the previous heavyweight building solution, which provide reduced structural strength of the external walls. As a result, there ended up being increased timber framing and stud packs required on external walls, notably derating the building's thermal efficiency (more timber bridging and less insulation). Recommend 140mm timber framing minimum on future lightweight timber projects for external walls.

COST CONSIDERATIONS & MANAGEMENT

Sustainability was the main driver (rather than cost) to select a CLT option.
Being a lightweight structure, there is a slight saving in the substructure and programme betterment with a CLT roof.

Additional elements or scope required related to CLT:

- Extra intumescent paint requirement to underside of CLT
- Extra intumescent paint requirement to steel structure
- Weather protection, which includes wrapping all the CLT panels with weather protection membrane
- Moisture management considerations
- Temporary works for bracing the structure during construction
- Extra construction monitoring fees by consultants
- Labour-intensive process with the amount of specialised timber fixings required on site
- Raised acoustic floor requirements
- Warm roof selection

Milldale started with the knowledge from ongoing CLT builds, and some learnings were captured during the planning phase.

ACOUSTIC PERFORMANCE BENEFITS

With mass timber floors, the acoustic treatment requires a Soundown acoustic floating floor above, this reduces space-to-space noise and, whilst an extra floor compared to only a concrete/screed floor, is quick to install and ensures the rooms perform to the designed STC ratings.

Walls with mass timber in part needed to be strapped and lined; however, this gives the acoustic properties as needed but also allows for service routes, etc, so the cost of strapping was not only for acoustic purposes.

BUILDING ENVELOPE (CONNECTIONS & SEISMIC)

Weather Protection of CLT Elements

The design incorporated an external RAB board with vertically installed protection membrane, which was prioritised and applied immediately after the CLT floors above were landed and fixed. This approach aimed to provide timely protection for the floors below. The external envelope features a combination of brick, long run iron, and Rockcote cladding, with seismic separation between the three cladding zones.

FIRE DESIGN

CLT is used for the floors within the building as well as a part of the roof construction. The inherent fire rating of the CLT is used to provide the fire separation between firecells.

Due to the managed evacuation within the building, parts of the CLT floor and roof are protected on the underside with intumescent paint encapsulation to limit the impact of CLT involvement in a fire, such that the CLT fire rating itself is inadequate without additional fire rating needing to be provided

Structural steelwork providing support to the floors that is connected to the CLT is protected with intumescent paint to limit the steel temperature to a lower temperature than required for protection of the steelwork itself, to minimise any local charring of timber in the event of a fire.

Fire rating solutions in New Zealand are still being developed with CLT, and some delay was present to receive compliant, tested solutions for fire dampers in CLT. Special fire dampers with double-blade packs are required by Holyoake (fire damper manufacturer) to meet the tested solution.

BUILDING SERVICES DESIGN

CLT provides simple installation options with a flat underside finish suitable for fixings to be fastened directly into. The CLT can have penetrations for services prefabricated in the factory, speeding up installation time on site. However, many of these penetrations tend to be covered by timber bottom plates, voiding the benefit.

Careful coordination is required during design to coordinate services penetrations with the stringent requirements of the lightweight timber walls and GIB/plywood bracing structure. The switch from the concrete wall structure to plywood shear walls created the requirement for significant stud packs for load transfer. The stud packs ranged up to 8 studs wide, which had impacts on any in-wall services or the placement of recessed services flush boxes. Typically, a flush box could be installed on either side of a stud, and tolerance would be within ~45mm of the designed location if there was a clash. In the instance where there are 8 studs, the tolerance is significant as the stud packs can not be altered to fit a flush box.

Coordinated architectural elevation drawings required an in-wall BIM clash detection process to be undertaken to identify clashes between stud packs and services, which was a first for Summerset.

Ply shear walls and GIB brace walls required programming and sequencing changes to services installation as the plywood & GIB could not be split and fixed around a service as it would affect the structural integrity of the ply sheet. In most instances, walls had to be completed before services could penetrate through, so from that aspect, the installation was industry standard. Changes came to the installation of in-wall services. Plumbing and cabling trades had to complete in-wall works and had to install a short stub-out when penetrating through a wall. Most services had to complete a 2-stage install for in-wall services as they had to come back to connect into the in-wall services post-ply/GIB completion.

CONSTRUCTION

ADVANTAGES OF USING ENGINEERED TIMBER

- Overall programme gains from Superstructure becoming watertight.
- Reduced H&S risk due to easier handling
- Reduced Environmental impact

SITE CONSTRUCTION

Moisture Management Plan (MMP)

Several key considerations were addressed to ensure effective moisture management of the CLT elements.

- Delivery and storage - this was managed by covering the panels with tarpaulins, elevated off the ground, and separated with dunnage to prevent moisture ingress and facilitate safe crane handling.
- For installation, we relied on protection membrane being installed as quickly as possible, this required an engineer sign off of all structural fixings that would be covered by the membrane.
- On the roof, our waterproofing contractor applied a vapour barrier primer daily to newly landed panels, providing interim protection until splice strapping and final vapour barrier installation were completed.
- To manage water ingress during RAB and window installation, temporary floor drains were installed to remove water as needed.

Prompt protection of the CLT floor and roof was critical, achieved through proactive planning and close coordination among trades and engineers.

Temporary Works

The lightweight design required temporary works beyond typical standards, impacting both schedule and cost. These requirements must be integrated into early-stage programming and cost planning. This entailed engaging a temp works design engineer to produce a solution for every floor/zone. Implementation of this design then also required sign off before CLT was landed.

Intumescent Paint Requirements

A significant portion of the CLT floor soffits requires intumescent coating to meet fire protection standards—a requirement not applicable to conventional concrete structures. This adds both cost and time, which must be carefully accounted for in project budgets and schedules.

PROJECT INSIGHTS

PROJECT LEARNINGS

Shop Drawings

Early in the process, it was recognised that shop drawings needed to be reviewed and approved in the correct sequence. Significant efficiencies were gained by producing CLT shop drawings after the supporting structure drawings were approved. Given the rapid installation of the supporting structure, it was essential to have CLT approvals queued to maintain continuous manufacturing and meet on-site programme demands.
To streamline approvals and address complex design elements, workshop-style reviews with all relevant engineers were conducted. This collaborative approach minimised delays and safeguarded the project's critical path.

Programme Betterment Opportunities

By stacking shop drawing approvals and securing manufacturing slots early, we unlocked opportunities for programme gains, provided structural steel and timber framing could also be accelerated. Achieving this required detailed planning from procurement through to shop drawing schedules, demanding more coordination than a conventional concrete build.

Notably, the CLT flat roof system delivered a programme gain of approximately six weeks compared to a conventional truss roof, enabling earlier weatherproofing and an accelerated fit-out phase. Realising such gains hinges on pre-construction planning, with sufficient trade shop drawing approvals in place before site commencement.

Programme Metrics:

- Superstructure Start: September 2024
- Superstructure Completion: May 2025
- We believe current learnings could reduce this 9-month superstructure timeline on future projects.

Cost Betterment

Cost savings were limited as redesigning our standard finishes was not feasible, given the specifics around retirement village aesthetics and “look and feel”. For other project types, these opportunities would be applicable. For example, exposing CLT soffits could reduce costs.

Intumescent Paint Options

At the time of consent, only one intumescent paint supplier was approved.
A second, more cost-effective supplier has since been approved, presenting future savings potential.

BARRIERS & CHALLENGES TO OVERCOME

Contractual Master Agreements

A master agreement was established with Red Stag, differing in several respects from our standard supplier contracts. It was critical to fully understand the terms from the outset to prevent potential breaches by either party. Regular meetings and clear action tracking ensured effective collaboration and a smooth contractual process.

Compliance and construction

There is no NZ Standard for this material. CLT is viewed either as an alternative solution under the NZ Building Code or an engineered timber solution, attracting additional design costs to demonstrate performance.

As the CLT floor units arrive on site precut to specific sizes, the construction accuracy and sequencing can be challenging, however, any issues are relatively easy to resolve on site using standard CLT/timber fixings.

Protecting the structure from moisture during construction is essential as well as ensuring the 3 mm tolerance to joints in CLT is met to comply with structural and fire rating requirement is essential.

Brick veneer and interstorey drift

Timber structures generally adopt higher ductilities, which result in larger drifts in the structure. For this project, a lower ductility was adopted due to the use of conventional brick ties and brick veneer to avoid damage and failure of the brick veneer.

TEAM MEMBER COMMENTARY

Our experience with the CLT has been pretty good so far, other than the fact that it is really a product that should be installed in the dryer seasons.

We found that using CLT achieves watertightness faster than conventional concrete and steel, and is easier to rectify when needed.

The biggest issue that we have faced so far has been the structural walls, with the stud pack coordination and all the temporary bracing to all the walls.

Things to consider would be the service penetration locations, fire rating, acoustics and the linings prior to acoustic floor install and the moisture content of the floor before the acoustic floor installation.

As an overall it's a pretty good system to work with and can be reasonably straightforward with some minor changes.

Douw Groenewald - Salute Construct

In general,

- CLT is a cleaner install (no silica dust from drilling above head)
- Work surfaces are level
- Stop and go takes a lot of resources.
- Braced walls and bracing seem to hold up completing of works.

Gerrie Van Eeden - Hanlon Plumbing

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.