

BUILDER INSIGHT



FACTS AND FIGURES

Construction timeline:
November 2023 – July 2026

Construction budget: \$54.9 M

Residential Units: 123

Site Area: 2,968 m², 31,945 ft²

Total Gross Floor Area: 13,039 m², 140,334 ft²

Net Floor Area: 10,446 m², 112,433 ft²

Building Height: 22.64 m, 74.29 ft

Volume of Mass Timber: 1,194.67 m³ of CLT

Annualized Whole Life Carbon Emissions:
7.8 kgCO₂e/m²/year

Total Energy Use Intensity: 49 kWh/ m²/year

PROJECT TEAM

Owner: More Than A Roof Housing Society

Land: Non-Market Housing Development & Operations

Architect: PUBLIC Architecture

General Contractor: Kindred Construction Ltd.

Owners BIM Consultant: Summit BIM

Design BIM Consultant: BIMOne

Construction BIM Consultant: Modelo Tech Studio

Structural Engineering: Wicke Herfst Maver Consulting Inc.

Mechanical and Electrical: Introba

Fire Suppression: Introba

Energy Modeling: Introba

Passive House Consultant: Introba

Embodied Carbon Modeling: Introba

Civil: Core Group Civil Consultants Ltd.

Landscape: Matthew Thomson Design Ltd.

Building Code: GHL Consultants Ltd.

Building Envelope: Stantec

Acoustical: BKL Consultants Ltd.

Passive House Certification: Steven Winter Associates, Inc.

Elevator: GUNN Consultants

Project Management: CPA Development

Research Management: Scius

KEY STAKEHOLDERS

City of Vancouver
BC Housing
City of Vienna
Rüdiger Lainer + Partner

Bulletin No 10 | Vienna House Lessons Learned from Prefabrication

Vienna House is a demonstration project under CMHC's National Housing Strategy and the BC Mass Timber Demonstration Program that showcases sustainability and innovation in construction. The building will be Passive House certified. It is the first non-market multi-family housing project in B.C. to use Building Information Management (BIM) through all stages of design, construction, and facility management.

The seven-storey mass timber and lightwood frame hybrid structure will provide 123 units ranging from studio to four bedrooms. It is an efficient mid-rise typology that can be easily replicated in B.C. and across Canada. Vienna House is named for its counterpart housing project in the City of Vienna, Austria. In reciprocation, the Austrian project is called Vancouver House. Together, these projects provide a unique opportunity to share knowledge and best practices in housing design.

This report is part of a series of insights describing the innovations incorporated into Vienna House and the lessons learned from their implementation. Use of prefabrication was part of the project charter because of its potential to improve the way multi-storey housing is built.



Figure 1. Vienna House during construction, December 2025 (source: Kindred Construction)

Specifying Prefabrication in the Project Charter

Established by the City of Vancouver and BC Housing, the Vienna House project charter established a framework for the project. Its overarching objective was to deliver housing that is affordable, environmentally focused, and financially viable, while contributing to market transformation in low-carbon building solutions.

The project targeted Passive House certification to significantly reduce carbon emissions and maximize the use of low carbon, renewable materials like locally sourced wood. It also prioritized climate-resilient design, utilizing innovative mechanical systems to ensure occupant thermal comfort as the climate changes.

A central pillar of the Vienna House charter was its emphasis on prefabrication, which the project team viewed as critical to the future of affordable, low-carbon construction. Prefabrication is a construction approach in which building elements are produced off-site in a controlled environment, transported to site, and assembled, rather than constructed on site. Using prefabrication has offered several advantages such as rapid construction, cost certainty, reduced labour requirements, and reduced embodied carbon and construction waste. However, there are several barriers to its widespread adoption. Some of these barriers include high investment costs, technical difficulties, logistics problems, and a lack of design standards.

Putting this requirement in the charter aligned efforts to implement prefabrication throughout the design process. The charter outlined several specific targets for prefabrication:

- **Improved Quality and Accuracy:** By shifting building processes to a controlled off-site environment, the project aimed to achieve much higher construction accuracy and overall quality.
- **Enhanced Construction Efficiency:** Prefabrication was intended to significantly reduce construction waste, minimize neighborhood disturbance, and limit requirements for on-site storage of materials.
- **Accelerating Project Timelines:** Harnessing off-site construction methodologies was identified as a primary strategy to cost-effectively accelerate the overall development and construction process.

Site Characteristics

The lot for Vienna House is a consolidation of city-owned properties at 2009-2037 Stainsbury Avenue, now referred to as 2001 Stainsbury Avenue, in an emerging mixed-use, medium density residential and commercial neighbourhood. It is bordered by the SkyTrain commuter train line to the north, Victoria Avenue to the west, Stainsbury Avenue to the south, and another multi-unit residential building to the east.

The design makes efficient use of the space but leaves limited area for storage of building supplies during construction. Prefabrication of walls and floors allows these components to be installed quickly after delivery, reducing logistical challenges.



Figure 2. Site surroundings (source: Public Architecture)

A Courtyard Layout

Several massing options were considered during the schematic design phase. Ultimately, a courtyard layout was chosen over a more traditional double-loaded corridor option to increase airflow and sunlight in the units and to reduce exposure to noise. This layout was also identified as potentially improving social connections between residents, which supported the operator's goal to build a strong community.

This layout has outdoor sheltered walkways to access the units in the courtyard. The increased number of windows and exterior walls expanded the material requirements to meet Passive House standards, but reduces requirements for mechanical cooling, and provides better access to fresh air.

The building features 123 units over seven levels, comprised of 29 studio, 37 one-bedroom, 35 two-bedroom, 16 three-bedroom and 6 four-bedroom. All of the units are adaptable, with 10% fully accessible. Seven units are at the parkade level, facing the community garden to the north. These units do not feature prefabricated walls or CLT ceilings. The courtyard gathering space sits above paving stones on a “blue roof” which will gather stormwater to limit runoff and provide irrigation for landscaping.



Figure 3. The courtyard at Vienna House, under construction May 2026 (source: Scius)

Design

Vienna House is designed with prefabricated wall panels and 5-ply Cross Laminated Timber (CLT) floors. Gravity loads are supported by interior prefabricated open frame panels, while the lateral loads are supported by both the interior and the exterior prefabricated walls. CLT is also used for the elevator core. Steel structural elements provide additional load support as necessary. The stairs and walkways in the courtyard are independent of the structural system for the rest of the building. The balconies are prefabricated aluminum that is designed to clip onto brackets attached to structural elements.



Figure 4. Installation of exterior wall panels (source: Scius)

Prefabricated Walls

The exterior panels are stacked and offset below the floor level to maximise panel, floor, and balcony connection efficiency. The building was constructed by installing the exterior walls first, followed by the interior walls and then the CLT floors for each of the six levels above the parkade.

The exterior walls use a double-stud assembly with an exterior plywood sheathing covered by a water-resistant membrane. The outer cavity is filled with insulation, with an air barrier on the interior made of Oriented Strand Board (OSB) sheathing that is taped at joints and transitions. The OSB also serves as a vapour-retarding layer. Another wood frame cavity on the interior holds additional thermal fiberglass insulation and is covered by gypsum board and a vapour retarder primer. The walls were prefabricated off-site at TAG Panels from the weather barrier to the OSB, with the additional interior framing and insulation completed on-site.

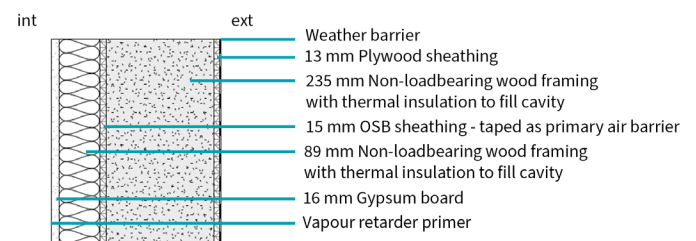


Figure 5. Exterior wall assembly (source: Public Architecture)



Figure 6. Interior of a suite with wall panel for above level attached. (source: Scius)

Figure 6 shows the interior of a courtyard-level (L2) suite with the exterior wall panel for L3 connected above the window opening. A cavity for tie-down rods remains open, to be filled with insulation at a later date. Figure 7 shows another suite with interior framing completed and insulation installed above the windows.



Figure 7. Another suite with interior of double-stud framing completed and second layer of insulation partially installed. (source: Scius)

Use of prefabrication was identified in the project charter, however the extent to which it would be used was not. The wall panel supplier was identified during the project tender, which required the design to remain flexible to accommodate multiple bids. Options were considered for open panels and closed panels. Coordination of the panels, floors, and other building systems was delayed until post-tender when the panels were specified.

Further study was recommended by the general contractor, Kindred Construction, before tender to establish the estimated costs for “complete” panels that included pre-installed windows and cladding. However, this was not pursued.

Mass Timber

CLT floor panels were sourced from Kalesnikoff, based in Castlegar, B.C., and installed by Seagate Mass Timber. The CLT is exposed for the ceilings of the living room and kitchen spaces on levels 2 through 7. During design, the option to use CLT floors was weighed against a more conventional Trus Joist I-beam (TJI) floor.

While the CLT floors came at a higher cost, the benefits over the TJI option included:

- Factory production provides more prefabrication and more precision. Panels are installed to a tolerance of $\pm 1/16$ ". They are also less affected by the elements.
- Better fire resistance characteristics, both during construction and for the finished building.
- Feels like a concrete floor and provides better sound transfer characteristics.

Constructing TJI floors onsite would also introduce logistical challenges due to site constraints. Options were considered for 3-ply CLT floors with light gauge steel and gypsum board covering the ceilings. The 5-ply CLT with exposed ceilings was chosen primarily because of the aesthetic appeal and acceptable cost difference.



Figure 8. Living area of a four-bedroom unit.

The panels were delivered with a weather protection membrane on every other level to minimize exposure to moisture during installation. When the panels were specified, there was some debate about whether the membrane would retain moisture in the panel which might seep in through tears in the membrane, rather than let it dry. Applying the membrane on every other level allowed data to be taken about moisture content that could be used for reference on future projects.

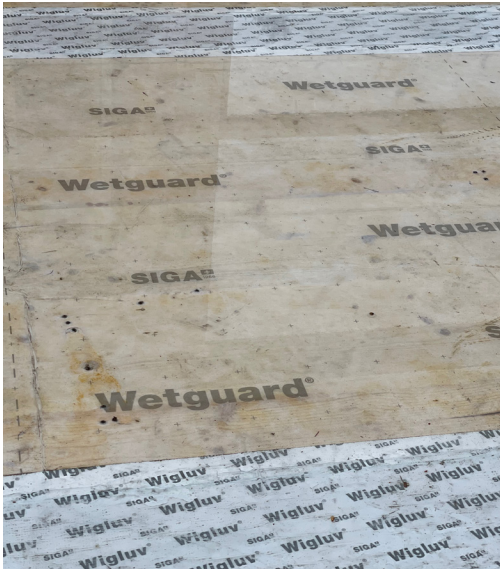


Figure 9. A weather protection membrane and taping on the top of installed CLT panels (source: Scius)

Challenges

Coordination of prefabricated components

Construction coordination was facilitated using BIM to organize and sequence the architectural, structural and mechanical, electrical and plumbing (MEP) elements and for clash detection. However, the panel design was not known until after tender. The time required to complete the site work and underground parkade structure did not provide a sufficient buffer for full coordination once the prefabrication and mass timber suppliers were onboarded. As a result, there was a schedule delay and some extra costs incurred.

An important lesson from the Vienna House procurement process is that the prefabrication and mass timber suppliers need to be involved early. For projects that do not have significant activities scheduled between project tender and when prefabricated components are required, project teams will need to add coordination time into the schedule. Alternatively, these components can be procured before the issue for construction (IFC) documents

are issued. Another option to enhance installation of prefabricated components would be to hire the BIM consultant during design development to give consultants more time for detailed conflict review.

Alternatively, contracting the wall supplier during the design phase (design-assist or early supply contract award) would allow details to be coordinated from the onset instead of after construction drawings are issued. This may require different procurement methodologies.

Moisture

Prefabricated elements are much more sensitive to moisture than traditional wood frame construction because they contain layers of different materials that can take longer to dry out when wet. The exterior closed panel walls at Vienna House included connections to the balconies and the courtyard walkways, increasing the complexity and detailing requirements. The panels were required to be briefly opened to make structural connections, exposing sensitive materials such as insulation to the elements. This introduced an additional risk of moisture ingress.

The final CLT roof panel was installed just six months after the first wall panel. However, the panels were exposed to significant precipitation both during that time and in the following months before the roof, windows, and cladding were completed. Extra time was required to dry the components once the structure and roof were complete.

Wall panels with moisture sensitive components would benefit from increased protection when installed or exposed during prolonged wet weather. Future projects may benefit from designs with prefabricated wall panels acting in non-loadbearing applications to reduce complexity and allow fully water-resistant prefabrication. Where connections to panels are required for structural hold-downs or balcony connections, these connections should be external to the panel to avoid opening the panel and risking water ingress.

Moisture management is discussed in a separate Vienna House Builders Insight Report.

Crane Requirements

Location and lifting capacity of construction cranes must be coordinated with the design of prefabricated wall panels and mass timber floors. For Vienna House, the CLT panel sizes had to be reduced from their original optimized design at the eastern end of the building because of the lift capacity at the farthest extent of the primary crane arm. A second crane was introduced to the project to facilitate lifting schedules and increase coverage for the site. However, due to the site constraints, the placement options for these cranes were limited.

If exterior wall panels had been procured with windows and cladding pre-installed, this would have further impacted the crane requirements. The additional weight of the panels, especially at the furthest extent of the crane arm, would be considerable.



Figure 10. Crane 1 lifting a palette of panels onto Level 7. (source: Scius)

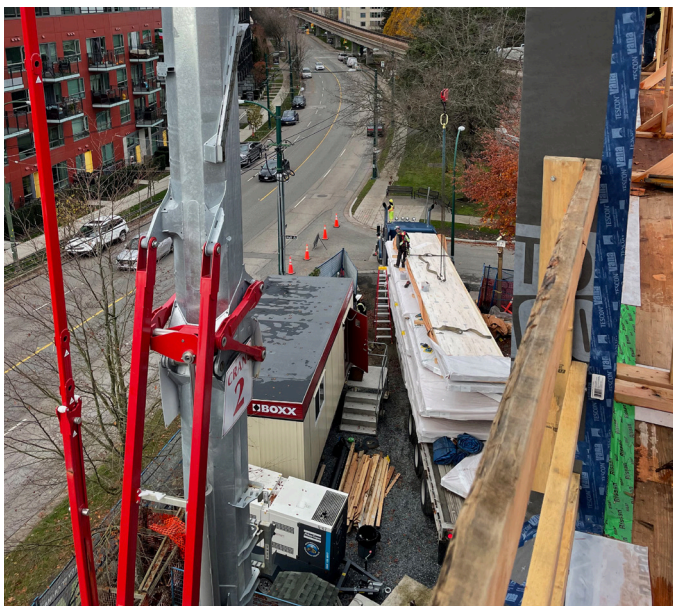


Figure 11. Crane 2 lifting a CLT floor. (source: Scius)

Concrete Interface

The interface between the concrete for the parkade/ foundation and the courtyard-level units provided installation challenges. The interior and exterior prefabricated panels are designed to a high precision, while the concrete can vary in height and uniformity. Additional wood material was used to provide a shim to level out that connection and align the panels.

Staging Area

Synchronizing timing of production and installation of prefabricated elements can be challenging as manufacturer schedules and construction schedules will likely not align perfectly. Storage of materials or delays in delivery will result.

When the construction schedule was delayed, the CLT manufacturing missed its original window. Prefabricated wall panels which had been completed needed to be stored at the manufacturer during the delay. Manufacturers do not always have this space available.

When components are delivered to site, sometimes they cannot be installed immediately. Sites like Vienna House have limited space for storage, even for a short amount of time. Often, extra “laydown space” must be acquired for storage. This was avoided at Vienna House other than for pre-assembly of the balconies. However, coordination of manufacturing schedules, construction schedules, and logistics for transportation and storage of components is an important consideration for any prefabricated building project.

Prefabricated Balconies

Two different types of prefabricated balconies were used at Vienna House. Both were manufactured by Sapphire Balconies and shipped flat-packed to an offsite staging area where they were pre-assembled. The balconies are made of aluminum and are strong and lightweight.

They attach to the exterior of the building with mounting brackets that are bolted to the structure. Support rods extend from the steel balcony support flanges on the level above to a connection about two-thirds down the length of the balcony. The balconies are thermally broken from the building at the bracket connectors (Figure 14), making them more energy efficient than traditional balconies.

Prefabricated aluminum balconies along Victoria Drive to the west and the northwest corner are attached with

steel brackets that extend horizontally from the building, where the balconies slide on and are secured (Figure 15). They are also thermally broken from the structure. These large balconies provide extra space for the three- and four-bedroom units.



Figure 12. Balconies along the south side of Vienna House (source: Scius)



Figure 13. Aerial view of the west side of Vienna House (source: Bright Future Studios)

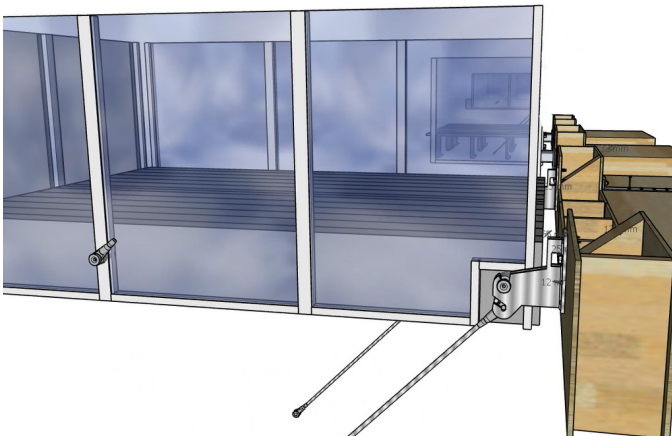


Figure 14. Illustration of the south-facing balconies with a thermal break at the connection (source: Sapphire Balconies Ltd.)

The prefabricated balconies were quick to install. The team was able to connect the south-facing ones more quickly as they proceeded, with the last one taking only seven minutes to install. The larger balconies also connected quickly. Installation was safer for the crew than traditional balcony construction. For further information on the balconies see this article on [BC Housing LinkedIn](#).



Figure 15. Installation of large balconies (source: Kindred Construction)

Benefits

There are clear benefits to maximizing the use of prefabrication for multi-storey residential projects.

- The increased precision of factory construction over similar site-built walls and floors improves building performance.
- The improved efficiency and safety that can be achieved benefits the construction team and requires less labour on site. Installation can be completed more quickly than traditional light wood frame construction.
- Logistics of installation can be pre-planned with sequencing to limit uncertainties.
- Coordination of mechanical, electrical, and plumbing (MEP) is simpler when BIM is used for panel and mass timber design.
- Costs for prefabrication may be recouped by shorter schedules and less rework.
- Factory construction creates less waste.
- Less space is required for material storage on site.
- Installation of prefabricated components is quieter and has less impact on neighbouring properties.
- Exposed mass timber surfaces can be more appealing to tenants and owners than drywall finishes.

Conclusions

Vienna House has demonstrated the benefits and value of using prefabricated components to build multi-storey housing. It was an ambitious project that sought to demonstrate many innovations. The lessons learned from use of prefabricated wall panels, mass timber floors, and clip-on balconies have informed projects that followed. There is growing interest in using prefabrication more frequently.

BC Housing has incorporated these lessons learned into the [Digitally Accelerated Standardized Housing \(DASH\)](#) program, which seeks to speed housing development through the use of standardized components and layouts. Information about panel design and composition, use of BIM, and moisture management is informing these projects to ensure that high quality buildings are produced quickly and cost-effectively. As similar projects are completed in British Columbia, the expertise to implement these buildings will become more widespread.



Since 2020, the Province of British Columbia (B.C.) and Forestry Innovation Investment have invested over \$11.1 million through B.C.'s Mass Timber Demonstration Program (MTDP) to help with the incremental costs associated with the design and construction of 22 building projects and 8 research projects that demonstrate emerging or new mass timber or mass timber hybrid building systems and construction processes.



The Vienna House Multi-Unit Affordable Housing Demonstrations Initiative received funding from Canada Mortgage and Housing Corporation (CMHC) under the National Housing Strategy Demonstrations Initiative. The views expressed are the personal views of the author and CMHC accepts no responsibility for them.

Acknowledgement

BC Housing gratefully acknowledges funding support from the Mass Timber Demonstration Program for this bulletin series. Our sincere appreciation to More Than a Roof Housing Society and the entire project team for their cooperation.

Disclaimer

The greatest care has been taken to confirm the accuracy of this information. The authors, funder and publisher assume no liability for any damage, injury or expense that may be incurred or suffered as a result of the use of this publication including products, building techniques or practices. The views expressed do not necessarily represent those of any individual contributor or BC Housing. It is always advisable to seek specific information on the use of products in any application or detail from manufacturers or suppliers of the products and consultants with appropriate qualifications and experience. It is acknowledged that many product options exist. Materials and products depicted in figures are shown as examples and do not represent an endorsement of any specific brands or products.

About BC Housing Research Centre

BC Housing's Research Centre collaborates with industry, non-profit, and public sector partners to foster excellence, innovation, and affordability in British Columbia's housing sector. We share leading-edge research, advance science and technologies to encourage best practices, and provide data analysis to understand and find solutions to housing issues across the province. The Research Centre identifies and bridges research gaps in the following topic areas: populations & communities, built environment & design, sustainable & resilient housing, housing assistance & policy, housing & wellbeing. Mobilizing knowledge and research expertise accelerates innovation and facilitates the adoption of new housing models, building methods, and standards. Housing studies and program evaluations drive policy changes and support access to affordable housing in British Columbia. Sign up to receive the latest news and updates from BC Housing's Research Centre at www.bchousing.org/subscribe.



1701-4555 Kingsway, Burnaby, BC V5H 4V8 Phone: 604-439-4135
Toll-free: 1-877-919-9070 Email: research@bchousing.org www.bchousing.org