

BUILDER INSIGHT



FACTS AND FIGURES

Construction timeline:

November 2023 – late 2025

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: Morrison Hershfield

Acoustical: BKL Consultants Ltd.

Passive House Certification: Steven Winter Associates, Inc.

Elevator: GUNN Consultants

Project Management: CPA Development

Research Management: Scius Advisory

KEY STAKEHOLDERS

City of Vancouver

BC Housing

City of Vienna

Rüdiger Lainer + Partner

Bulletin No 2 | Vienna House

Process Innovation

Vienna House is a National Housing Strategy project that demonstrates sustainability and innovation in construction. The project will be Passive House certified. It is the first non-market multi-family housing project in B.C. to use Building Information Management (BIM). BIM was used throughout concept design, project delivery and facility management.

The seven-storey mass timber and lightwood frame hybrid building will provide 123 units ranging from studio to four bedrooms. It is an efficient mid-rise building type, with the potential for it to be recreated in B.C. and across Canada. The project has a counterpart housing project in the City of Vienna, Austria. This provides a unique opportunity to share knowledge and best practices in housing design. It will be subjected to acoustical and vibration testing prior to occupancy and will be monitored for ongoing environmental and structural performance.



Figure 1. Rendering of Vienna House from Stainsbury Ave. (source: PUBLIC Architecture).

This bulletin series describes innovative technologies and processes of the Vienna House project. Find them all in the BC Housing Research Centre Library.



These bulletins discuss the Vienna House project as construction is getting underway. Completion is expected in November 2025.

Working with Vienna

Vienna House realizes the vision of a Memorandum of Understanding signed between the Cities of Vancouver and Vienna in 2018 to share best practices in innovative low-carbon affordable housing. The two building projects represent the commitment of each City to demonstrate leadership in pressing global issues. Vienna House in Vancouver will be supported by a sister project in Vienna called Vancouver House. Both will showcase world-leading standards of living for residents while also

addressing challenges of climate change while creating economic opportunities.

In Vienna, subsidized housing is created with a four-pillar model of Economy, Social Sustainability, Architecture and Ecology. For Vancouver House, this model was used to realize a progressive project of timber construction with high energy efficiency and use of energy sources that did not include fossil fuels.

Staff from both cities and the two project teams have been exchanging ideas informally and through a series of workshops and meetings. The Vienna House project demonstrates how innovation in design and construction can be combined with broader advancements in social housing. The objective for both cities is to create attractive, sustainable homes capable of withstanding the stresses of climate change while also providing comfortable, affordable and meaningful places to live for a diverse community.

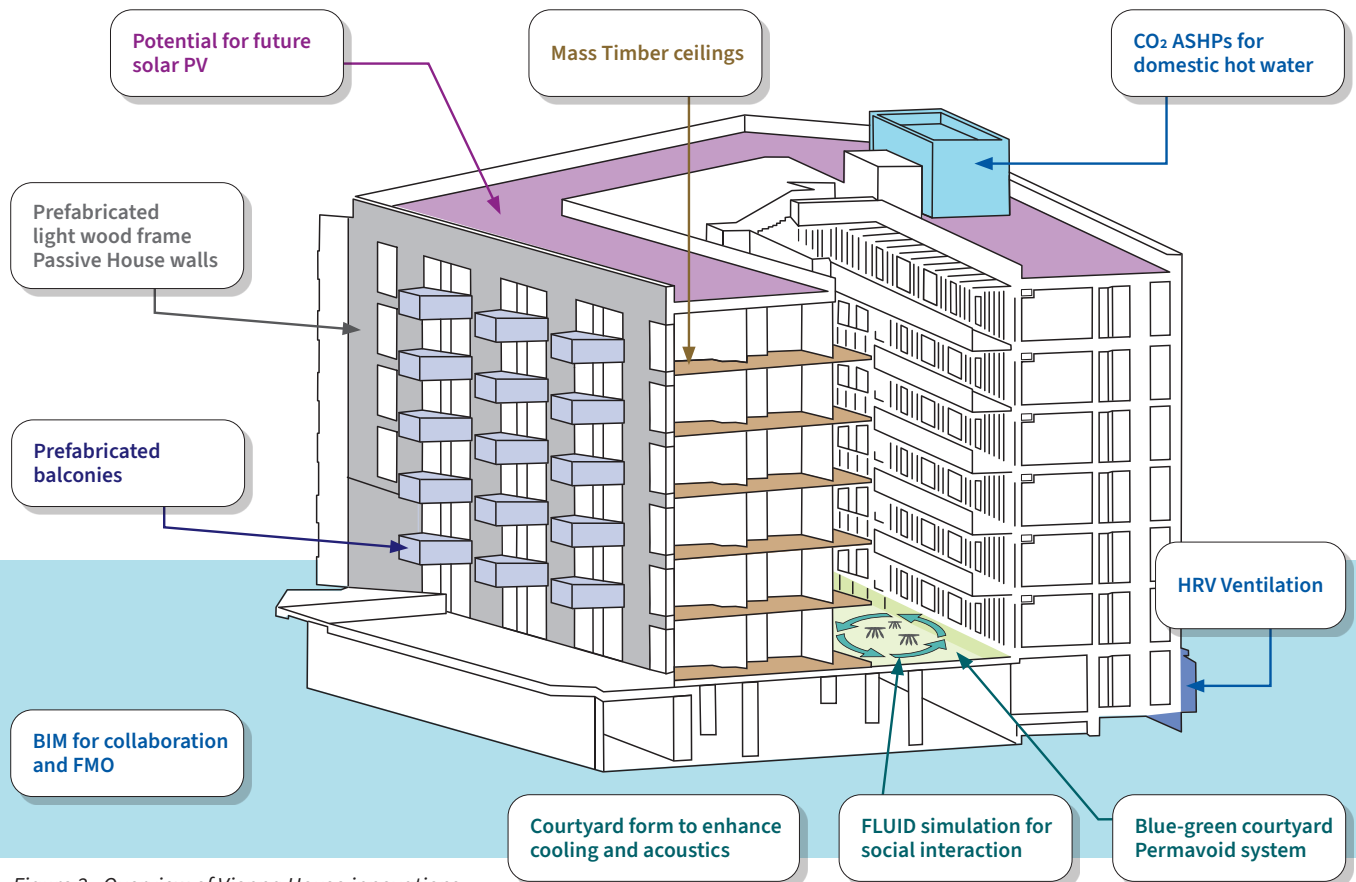


Figure 2. Overview of Vienna House innovations.

Project Charter

A project steering committee (PSC) (comprised of members of the City of Vancouver, Vancouver Affordable Housing Agency [VAHA], BC Housing, and More Than a Roof Housing Society) was formed during Vienna House's initial stages. The PSC developed a project charter to outline the project concept. The concept included a description, objectives, goals, scope, schedule, budget, project governance, staffing, and significant risks. The goals defined by the charter included:

- Increase the supply of safe, accessible, sustainable, and affordable housing to support the well-being of the residents of Vancouver,
- Reduce greenhouse emissions by building efficient and high-performance buildings in the City,
- Explore opportunities to accelerate the development and construction process,
- Maximise quality performance design,
- Increase knowledge and awareness of the capabilities of the prefabricated construction industry.

The project's objective is to provide social housing that contributes to market transformation. This is achieved by improving the availability, acceptability, and affordability of energy efficient and low-carbon building solutions in B.C. Key goals for the project are as follows:

- **Near Zero Emission Building** – These buildings significantly cut carbon emissions while increasing comfort for occupants. Maximizing the use of wood products will reduce embodied carbon emissions. The Passive House standard is equivalent to Step 4 of the BC Energy Step Code and is an effective means of meeting Near Zero Emission building targets to address operational carbon emissions.
- **Climate Resilient Design** – Considering the climate model for 2050 to develop a resilient design addresses the ability for buildings to adapt to a rapidly changing climate.
- **Off-Site Pre-fabrication** – Increasing industry capacity for off-site fabrication will be critical to affordable low-carbon construction. The goal is to identify

strategies to increase use of off-site fabrication. This will improve quality through accuracy and efficiency of construction through reduced construction waste, disturbance, and on-site noise pollution.

- **Knowledge Transfer** – The City of Vancouver and BC Housing recognize that Vienna House provides a unique opportunity, and therefore commit to capture and share learnings. Learnings will also be shared from experts in Vienna through the design and construction of Vancouver House, identifying the process and outcomes of their work in building low-carbon affordable housing.
- **Improve affordable housing supply and availability.**
- **Use renewable construction materials** – Use wood where possible.
- **Achieve a more efficient development schedule** – Utilize the City's Social Housing or Rental Tenure (SHORT) review program and harness faster construction methodology.
- **Develop the project on schedule and on budget.**



Figure 3. Rendering of Vienna House from Victoria Drive
(source: PUBLIC Architecture).



Figure 4. Rendering of Vancouver House in Vienna, Austria (source: Rüdiger Lainer + Partner).

Integrated Design Process (IDP) Workshops

The PSC joined industry experts, policy makers and researchers from Vancouver and Vienna for four IDP Workshops at the start of the project and prior to selecting the project design and construction team. These workshops provided input for designers to collaborate on high-level features and approaches to this project. This collaboration helped to transform the goals and objectives of the project charter into a design for homes for hundreds of Vancouverites.

These workshops, supported through BC Housing Research Centre, provide a pathway to discuss innovations in affordable housing construction. Workshops looked at other communities, including Vienna, to see what is possible to achieve in Vancouver to provide comfortable, sustainable and resilient housing.

Workshop 1 introduced the Vancouver and Vienna teams and provided a platform for sharing of policies, priorities, experiences and innovations. Breakout rooms allowed for focused discussion of timber technology, prefabrication and project delivery models, and digital strategies and data. Feedback from the breakout rooms provided recommendations for the Request for Proposals (RFP) and project delivery processes. Project objectives were discussed, along with methods to achieve them, reasons for the decisions, and action items to ensure implementation.

Workshop 2 focused on discussion of the project delivery approach, goals and criteria for the RFP process and to dig deeper into how to embed a culture of innovation into the project team. It was an ideas exchange designed to equip the PSC with the information necessary to hire the project team. Presentations discussed innovations and the status of the projects in Vienna and Vancouver. These were followed by a facilitated discussion to focus on the procurement path.

BC Housing is using pilot projects such as Vienna House to shift involvement by team members to earlier phases with the intent of breaking down silos, utilizing a shared data set, reducing requests for information (RFIs) and streamlining the construction phase. It was stressed that it is critical to use appropriate language in the RFP for the architecture firm (and supporting consultants) to specify the use of BIM and how it will be incorporated into the Vienna House project. Consultants advising the PSC identified the benefits of using BIM during design and construction as well as for facilities operations and management. BIM should be used to help plan the site sequencing and logistics, and to identify potential problem/conflict areas in the design and fix them before it is tendered to trades. It was stressed that BC Housing should make it clear in the architect's RFP that the expectation is that they will work in a shared model with the other consultants, with everyone taking collective responsibility for the data.

Workshop 3 focused on social housing projects in Vienna, Austria and plans for Vancouver House in Vienna (Figure 4). Approximately 21% of total housing stock is owned by the City of Vienna, with a further 18% owned by the Limited Profit Housing Association (LPHA). Public housing is allocated by standards of income, residency and need as well as hardship. To produce new housing, the plots owned by the City of Vienna conduct a “developers competition” where the architects and builders submit a fully developed project for judging. These projects are evaluated for social sustainability, architecture, economy and ecology.

Vancouver House will be built with a core of reinforced concrete and an attached cross laminated timber (CLT) structure. It has a goal of 100-110 rental units and a kindergarten, including 12 units for assisted living and 11 units for single parents. It is designed to have flexible spaces, with the core and outer walls being load-bearing and inner walls changeable to allow for different layouts. BIM data is used for creation of prefabricated elements and to develop a cost comparison matrix for various options. It will use geothermal and solar energy for heating and cooling and energy generation and use exterior solar screens to aid with cooling.

The City of Vienna also shared details of the DoTank Circular City project, which seeks to reduce material consumption for construction. The project requires 80% of materials from demolished buildings to be reused or recycled by 2050.

Workshop 4 provided another opportunity for collaboration between the Vienna and Vancouver projects and highlighted benefits of digital project delivery for Passive House and prefabrication. At the time of this workshop, the Vienna House project team had been hired. The team, led by PUBLIC Architecture, discussed previous experiences on similar buildings, and the beginning of the discovery phase of the Vienna House project. Representatives from BC Housing and the design team continued their collaboration to present ambitions and ideas for the next phase of the project.

A presentation on the Passive House standard, prefabrication and affordability was also led by an expert from the University of Northern British Columbia. Dr. Guido Wimmers explained the different types of prefabrication and the efficiency that comes with optimization of processes in an offsite, ergonomic environment. Construction of walls built for energy efficiency are also more cost efficient with prefabrication. Affordability is provided both by automation of prefabrication and by consideration of whole building life cycle costs.

Mobilizing Building Adaptation and Resilience (MBAR) and the Integrated Building Adaptation & Mitigation Assessment (IBAMA)

Mobilizing Building Adaptation and Resilience (MBAR) is a multi-year, multi-stakeholder knowledge and capacity building project led by BC Housing, with participation and contribution from over 30 organizations, including national, provincial, and local agencies; and industry partners.

The MBAR initiative at BC Housing aids building owners to address and minimize the impacts of climate change and natural disasters on buildings and the people who reside in them.

Expertise and resources are provided to assist with design considerations of:

- air quality,
- chronic stressors,*
- fire,
- flood,
- heat waves,
- power outages,
- seismic events,
- severe storms,
- wildfires.

* Chronic stressors include freeze-thaw cycles, wind-driven rain, wetting and drying, frost penetration, wind-driven abrasive materials, atmospheric chemical deposition on materials, broad-spectrum solar radiation, and ultraviolet (UV) radiation.

Pilot projects support professional development for those who design, build and renovate buildings to create more resilient homes that can withstand impacts of climate change.

As an early participant in this initiative, Vienna House tested the implementation of the IBAMA framework as a tool to identify natural hazards based on 2050

climate data, opportunities for resilience, occupant essential needs and potential adaptation strategies. Three workshops with participants from Vienna House and BC Housing identified resources available in the neighborhood and design ideas to improve resiliency within Vienna House. Strategies were evaluated for strength of resiliency to emergencies as well as their impact on climate mitigation and sustainability.

The workshops brought together expertise from different aspects of urban planning, building and community design to develop a holistic view of the project and how it would behave in the face of climate events. The workshops raised awareness about adaptation and resilience issues, expanded thinking about how the surrounding neighborhood interacts with the project, and helped establish initial adaptation objectives for the most critical hazards. Importantly, the workshops facilitated early integrated design discussions and systems-thinking methods to developing design approaches for resiliency.

Feedback suggested even more value would be gained from these workshops if:

- they were held earlier in the design process,
- they evaluated both short and long term impacts,
- cost information was available for the different strategies.



Figure 5. Rendering of Vienna House, entrance (source: PUBLIC Architecture)

Value Toolkit

The Value Toolkit is a collaborative engagement process developed by UK-based Ryder Architecture. The toolkit assists organizations in identifying value in their projects by breaking down silos and better communicating shared understanding of goals and objectives. It creates a framework to enable value-based decision making and procurement and includes key value metrics to facilitate evaluation of progress relative to predefined benchmarks.

To better communicate shared understanding of goals and objectives, the Vienna House team used the Value Toolkit framework to support value-based decision making. By identifying benchmarks for success and prioritizing objectives, allocation of resources can be better focused on the items that are important to the project strategy.

FOUR VALUE CAPITALS are defined along with Categories for each which help to define and create the Value Outcome Statements:

- **Human Capital** is defined as the knowledge, skills, competencies and attributes embodied in individuals that contribute to improved performance and wellbeing.
- **Produced Capital** is defined as the man-made goods as well as all financial assets that are used to produce goods and services consumed by society.
- **Social Capital** is defined as the networks together with the shared norms, values and understanding that facilitate cooperation within and among groups.
- **Natural Capital** is defined as the stock of renewable and non-renewable resources (plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people.

The framework begins by defining what is valued for project stakeholders through workshop discussions. Value outcome statements are defined, metrics and measures are assigned for each, with an attempt to expand metrics beyond cost. Finally, those Statements were prioritized through combined ranking by workshop attendees.

The purpose of this exercise is to reflect on the finite resources all organizations are restricted by when setting goals and targets. The final ranking of the outcomes did not reflect importance, but instead priority for resource allocation. The findings highlight top priorities as Reconciliation, Equity and Diversity, Health, Air and Resilience. The value outcome statements within these value categories can be used as a cornerstone for progress and represent BC Housing Research Centre's core areas to target added value.

By engaging in these types of activities, participants can better define where resources are best allocated to achieve the goals of the organizations involved in the project. Defining valued outcomes early in the project should ease decision making as it progresses and reduce uncertainty and conflict.

Social Housing or Rental Tenure (SHORT) Program

The City of Vancouver developed the Social Housing or Rental Tenure (SHORT) program in 2017 to reduce development approval times for high impact multi-family housing projects. It was well received, with 2,000 homes being processed in the pilot phase through 2019. By allowing permit processes to begin earlier, and providing a facilitator to ensure information is processed in a timely manner, SHORT aims to reduce permitting times by weeks or months, thereby expediting development of social housing. The goal is to grant permit approvals in half the usual time.

To qualify for this program, projects are evaluated for these criteria:

- Level of affordability for renters,
- Size of building and number of units,

- Land type – the building needs to be located on government or non-profit owned land with secured funding,
- Adherence to regulations to qualify as a Zero Emissions Building,
- Inclusion of Indigenous partners or residents,
- Renewal or redevelopment of existing social housing to provide more housing units.

Vienna House used the City of Vancouver SHORT program to facilitate quicker approvals for rezoning and development permits. It is difficult to say how much time was saved by participating in the program. The complexity of a project like Vienna House adds to the details that must be designed, verified and reviewed as the project weaves its way through the permitting process. However, representatives from the project stated that participation in SHORT provided goals and timelines where none existed otherwise. The SHORT program dramatically helped to ensure that both the city and the applicant were being pushed towards meeting goals for expedited schedules.

Process Takeaways

Ultimately, the process strategies for Vienna House are expected to encourage collaboration and facilitate a well thought out design and a more resilient, comfortable building that the occupants enjoy. The goals in the project charter have been met, other than schedule and budget, but the team still feels that it is a scheduling success at this stage. Changes to the budget are partially the result of market escalation rather than from innovative building systems. Setting those goals at the outset and getting everyone on board with a resilient, Passive House, prefabricated building eliminated the possibility of reconsidering those strategies during the design phase and eased decision making. The team prioritized values and investigated how best to incorporate those values into the design, which streamlined the process moving forward.



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BC Housing's Research Centre works in collaboration with housing sector partners to foster excellence in residential construction and find innovative solutions for affordable housing in British Columbia. Sharing leading-edge research, advances in building science, and new technologies encourages best practice. The Research Centre identifies and bridges research gaps to address homelessness, housing affordability, social housing challenges and the needs of distinct populations. Mobilizing knowledge and research expertise helps improve the quality of housing and leads to innovation and adoption of new construction techniques, Building Code changes, and enhanced education and training programs. Sign up to receive the latest news and updates from BC Housing's Research Centre at www.bchousing.org/subscribe.