

# oN5 BUILDING

## DEMONSTRATING THE BENEFITS OF MASS TIMBER

oN5 will be constructed using high-performance cross-laminated timber panels to demonstrate the potential for commercial mass timber. Named for its location near the intersection of Ontario Street and East Fifth Avenue in Vancouver, this innovative four-storey project will meet the rigorous energy efficient standards of Passive House along with several other advanced building technologies.



## PROJECT OVERVIEW

Located in the Mt. Pleasant neighbourhood of Vancouver—a community filled with architecture and design firms—oN5 will serve as a demonstration project showcasing high performance mass timber construction and design. The choice to use wood for oN5 was made by the building’s owner/ developer, who also serves as principal of EQUILIBRIUM, the engineering firm for the project. A long-time proponent of mass timber, the structural engineering firm recognizes the benefits of wood as a sustainable building material.

### A climate friendly building material

Mass timber can help deliver energy efficient buildings with a smaller carbon footprint over the lifetime of the facility; so much so that the energy needed to fabricate a laminated wooden beam is about one-sixth of that required for a steel one of comparable strength. And because trees take carbon out of the atmosphere when growing, timber buildings can help reduce emissions by storing the carbon. With this benefit in mind, the City of Vancouver is encouraging the use of mass timber as part of their Climate Emergency Action Plan.

### Biophilic benefits of timber

The project also provides the opportunity to demonstrate the advantages of mass timber when it comes to assembly and installation. The challenging zero-lot-line site, just 7.6-metres wide, calls for creative construction techniques to minimize disruption to the neighbourhood, something that would have been difficult to achieve with conventional steel and concrete construction. Its lightweight mass timber building elements can be prefabricated, then lifted into place quickly and efficiently. Installation is expected to be 40 to 50 percent faster than typical construction methods.

Cross-laminated timber (CLT) panels will be left exposed to the interior, highlighting the natural beauty of wood and eliminating the need for additional finishes. Visible wood in the workplace can also offer biophilic benefits, as a growing body of research suggests that the use of such organic materials can have a positive impact on employees’ stress levels, productivity and overall well-being.

### LOCATION

Vancouver, British Columbia

### SIZE

840 m<sup>2</sup>

### COMPLETION

2022

### ARCHITECT

Hemsworth Architecture

### STRUCTURAL ENGINEER

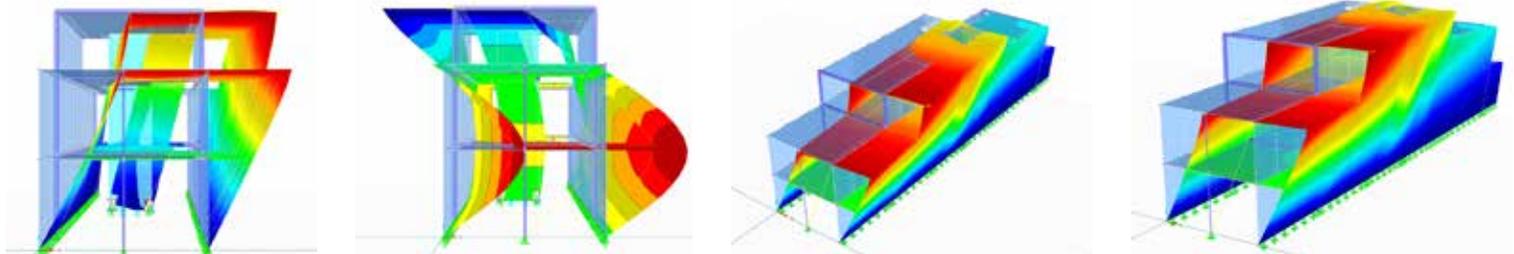
EQUILIBRIUM Consulting, Inc.,  
a KATERRA Company

### GENERAL CONTRACTOR + CONSTRUCTION MANAGEMENT

Naikoon Contracting Ltd.

*“We feel that as engineers, we have a responsibility to put our money where our mouth is. We want to provide an example to society while doing something good for the environment by using mass timber. The City of Vancouver and British Columbia are leaders in wood excellence, and we’re proud to be part of it.”*

**Robert Malczyk**, principal at EQUILIBRIUM Consulting Inc.,  
a KATERRA Company



## STRUCTURE+DESIGN

The oN5 project will incorporate five advanced building technologies designed to improve the structure's efficiency and long-term performance.

- 1. High-performance and design:** The structure will be one of a growing number of high-performance commercial buildings in British Columbia, designed to achieve high levels of occupant comfort and energy efficiency by exceeding code minimums. Wood is a natural insulator, which makes it well-suited for Passive House requirements. In addition, prefabrication of the wood panels results in precise tolerances, which reduces gaps in the envelope and improves long-term energy performance.
- 2. Fire-resistant CLT panels:** While building codes require that the exterior wall of a zero-lot line urban infill structure be made of non-combustible material, the team is working on an alternative solution that will allow prefabricated CLT panels to be used for the building's exterior walls. Wood's ability to char—forming an insulating layer protecting interior wood from damage—means the CLT panels provide natural, predictable fire resistance.
- 3. New approaches to CLT assemblies:** The load-bearing CLT shear wall panels will arrive at the jobsite prefabricated for quick, easy installation. Insulation will be pre-applied to the outside of the CLT wall panels. This approach follows Passive House design principles that wall assemblies be breathable to the outside. Designers are considering two options—one using more traditional insulation and the other an innovative gypsum fibreboard product from Europe. The CLT panels will then be faced with a rain screen and cladding. The design team is also considering a prefabricated assembly for the floor panels, with materials added to the CLT to improve both acoustic and vibration performance. Designers are also researching ways to pre-attach mechanical and electrical systems to the CLT.
- 4. Innovative CLT adhesive system:** CLT floor panels will be connected without need for beams or steel connectors. The project will use an innovative adhesive system that connects the ends of the CLT floor panels forming a rigid diaphragm. The pioneering adhesive system uses a resin, which will be injected into the small gap between the CLT floor panels. The glue feeds itself into the cells of the wood, creating a solid, seamless connection. The technology allows mass timber to be used for flat slab construction, making it comparable to concrete in terms of interior clear heights, flexible layout and efficient construction.

- 5. Unique seismic damage avoidance design:** The building will use an innovative, resilient slip friction joint system, developed in New Zealand, that will dissipate seismic energy and restore the structure to center after an earthquake. While the unique system works the same in terms of energy dissipation regardless of structure type, it works particularly well with mass timber since wood is one-sixth the weight of concrete, reducing forces during a seismic event.

Given the goal is to showcase innovation, the design team is also investigating the use of several new building systems, including wood-based, 3-D prefabricated kitchen and bathroom kits designed to reduce costs and construction time.

## PRODUCTS+SYSTEMS

CLT wall, floor and roof panels will serve as the building's primary structure, complemented by a concrete and masonry base. Making use of an innovative European bonding system, the building will not require beams.

### Cross-laminated timber

CLT panels are made by layering dimension lumber (usually three, five or seven layers) at right angles to one another; the layers are then glued to form structural panels. Cross-lamination provides strength and dimensional stability, making the panels suitable for long-span applications.



## WOOD: A HIGH-PERFORMANCE AND SUSTAINABLE CHOICE

oN5 will incorporate several sustainable building technologies—most notably, the use of mass timber and strategies based on Passive House principles.

### Energy-efficient optimized building envelope

Passive House, a high-performance building standard, uses efficient design to provide a comfortable work environment, avoiding the need for active heating and cooling systems by optimizing the building envelope. And by adding extra insulation and taking other design measures, the building will require very little in the way of energy for mechanical systems. Most of the heat will be provided by a heat recovery ventilator.

### A smaller carbon footprint

Wood is a natural, sustainable building material, and is unique in its ability to store carbon. As a mass timber structure, oN5 provides advantages over steel and concrete in terms of carbon sequestration and lower greenhouse gas emissions from production of the timber components.

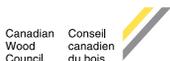
### Health and wellness benefits

The design team's goal for oN5 is to use the wood in its most natural condition, to show how we can better connect people with the material and structure that comprises building. The design will maximize natural light and ventilation in the narrow site, complemented by a warm wood interior. As research suggests, this abundance of wood in the workplace can promote employee health, wellness and increased productivity.



Model photo courtesy Hemsworth Architecture

## INNOVATION PARTNERS



## FOR MORE INFORMATION

This profile is published by Forestry Innovation Investment, the Government of British Columbia's market development agency for forest products.

For more information on building with wood in Canada and the National Building Code visit [cwc.ca](http://cwc.ca).

For more examples of innovative wood building projects throughout British Columbia, visit:

[naturallywood.com](http://naturallywood.com)