

PROJECT PROFILE

ON5 BUILDING

TYPE OF BUILDING

Commercial + industrial

LOCATION

Vancouver, BC

SIZE

840 m²

COMPLETION

2022

LOCATION

Vancouver,
British Columbia

ARCHITECT

Hemsworth Architecture

STRUCTURAL ENGINEER

Equilibrium Consulting Inc.

TIMBER SPECIALTY ENGINEER

Timber Engineering Inc.

GENERAL CONTRACTOR

Naikoon Contracting Ltd.

MATERIALS

Cross-laminated timber

Top floor panel flown in.
Photo: KK Law



Demonstrating
the benefits of
mass timber
for commercial
office design.

oN5 was constructed using high-performance cross-laminated timber (CLT) 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 was designed to meet the rigorous energy-efficient standards of Passive House along with several other advanced building technologies.

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



Located in the Mt. Pleasant neighbourhood of Vancouver—a community filled with architecture and design firms—oN5 serves 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 structural engineer 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.

Mass timber delivers an open, flexible design

The project also provided 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, called 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 were prefabricated, then lifted into place quickly and efficiently. Installation of the mass timber elements was 15 days.

Cross-laminated timber (CLT) panels were 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.



Prefabricated mass timber construction makes it easier to install and assemble a building in narrow urban zero-lot-line sites.
Photo: KK Law



FEATURED TECHNOLOGIES

High-performance and design

The structure is 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 resulted in precise tolerances, which reduces gaps in the envelope and improves long-term energy performance.

Fire-resistant CLT panels

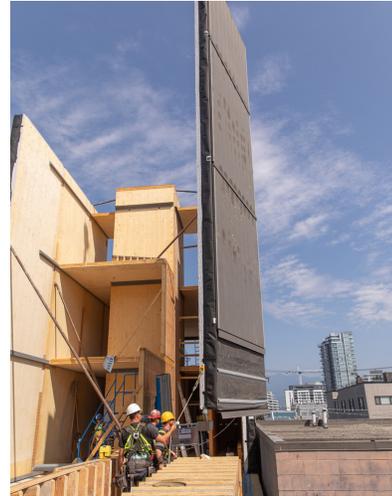
While building codes require that the exterior wall of a zero-lot line urban infill structure be made of non-combustible material, the team developed an alternative solution that allowed prefabricated CLT panels to be used for the building's exterior walls. Wood's ability to char—forming an insulating layer protecting interior wood from damage—means the CLT panels provide natural, predictable fire resistance.

New approaches to CLT assemblies

The load-bearing CLT shear wall panels arrived at the jobsite prefabricated for quick, easy installation. Mineral wood insulation and rainscreen cladding was pre-applied to the outside of the CLT wall panels. This approach followed Passive House design principles that wall assemblies be breathable to the outside.

Innovative CLT adhesive system

CLT floor panels were connected without need for beams or steel connectors. The project used an innovative adhesive system that connects the ends of the CLT floor panels, forming a rigid diaphragm.



The CLT shear wall panels arrived prefabricated with insulation and cladding.
Photo: KK Law

The adhesive system uses a resin, which was 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.

Unique seismic damage avoidance design

The building used an innovative, resilient slip friction joint system, developed in New Zealand, that will dissipate seismic energy and restore the structure to centre 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.



“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, Timber Engineering Inc.



Installation team.
Photo: KK Law

Sustainable, energy-saving features

oN5 incorporates 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 is 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 was 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 maximizes 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.

To learn more:

To read about Canada’s Green Construction through Wood program visit nrcan.gc.ca

For information about building with wood in Canada and the National Building Code visit Canadian Wood Council at cwc.ca

For more examples of innovative wood building projects throughout British Columbia visit naturallywood.com

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