SUSTAINABLE BUILDING

GOALS ACHIEVED WITH MASS TIMBER

SPECIAL
8-PAGE SUPPLEMENT

WINTER 21/22
VOLUME 6, ISSUE 9

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ABOUT US:

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Wood *WORKS!* is a national program of the Canadian Wood Council that advocates for the adoption of wood in the building and construction sector. With the goal of transforming markets and promoting holistically built environments, this industry-led program enables innovative systems integration, provides strategic market outreach, and supports the sector through training, best practices, research, networking, and direct technical support.

Contact us for support on your next mass timber project:

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Thank you to the following experts for their perspectives and taking the time to be interviewed:

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Reagan Davis, Junior Engineer,
Wood Research and Development
Project: Dillman Bridge

Alberta:
Vedran Škopac,
Principal at Reimagine Architects Ltd.
Project: Northern Lakes College, High Prairie Campus Building

Ontario:
Matt Bolen, BAS, M.Arch, OAA, CPHD
Principal, Architect at Edge Architects Ltd.
Project: YWCA Kitchener-Waterloo Supportive Housing

Québec:
Project: Arbora Case Study content

British Columbia:
Whistler Community Services Society
Building Case Study content

Revolutionizing the Construction Industry

Sustainable Building Goals Achieved With Mass Timber

With mounting pressure to find sustainable solutions, people are taking note of mass timber construction as an innovative alternative to more carbon-intensive building materials. Mass timber construction is gaining honors worldwide, and people are quickly realizing the benefits it provides. When left exposed, mass timber allows occupants to experience the biophilic and aesthetic benefits. Construction professionals, too, are seeing advantages, with decreased construction time and labor requirements. As a durable and versatile product, mass timber provides architects and engineers with peace of mind, knowing that the products they specify will stand the test of time. As a material sourced from the only major renewable commercial construction material in the world—trees—mass timber is a sustainability win all-around.

What is mass timber? While you're probably familiar with the following—cross-laminated timber (CLT), nail-laminated timber (NLT), glue-laminated timber (GLT), laminated strand lumber (LSL), and laminated veneer lumber (LVL)—these, along with other large-dimensioned structural composite lumber products, are part of a bigger classification known as mass timber.

While modern mass timber is an emerging type of construction, traditional post-and-beam or timber frame has been around for centuries. Today, mass timber products can be formed by mechanically fastening and/or adhesive-bonding smaller wood components—such as dimensional lumber, wood veneers, strands, or fibers—to form large prefabricated wood elements used as beams, columns, arches, walls, floors, and roofs. Mass timber products have sufficient volume and significant cross-sectional dimensions that offer benefits for fire prevention, acoustic performance, structural capacity, and construction efficiency.

Not convinced? Don't take our word for it! In this insert, we asked Canadian design and construction professionals about specifying and working with mass timber, and the opportunities for using it in construction.

Andrew Bowerbank
Vice-President, Market Development
Vice-président, Développement des marchés
Canadian Wood Council

Why Choose Wood?

The Whistler Community Services Society Building was the first retail building of its kind in Canada and demonstrates the potential for mass timber construction due to its repeatability, cost-competitiveness, and enhanced environmental performance. The exposed mass timber on the inside of the building creates a warm and welcoming environment for employees and visitors.

The project originally received both development and building permits and was put out to tender as a construction management contract based on a steel and concrete structural system. However, it soon became apparent that the concrete supplier would be unable to meet the required construction schedule.

"The dimensions of the building as originally designed made it perfect for CLT," says Carla Dickof, senior technical specialist with Fast + Epp. The mass timber structure consists of vertical CLT panels, a glulam post-and-beam interior frame, CLT ground and upper floors, and a glulam and CLT roof.

YWCA Kitchener-Waterloo Supportive Housing project

WOULD YOU USE A MASS TIMBER SYSTEM AND/OR PRODUCTS AGAIN BASED ON YOUR EXPERIENCE?

It's a yes for Matt Bolen, principal architect at Edge Architects Ltd. in Kitchener, ON. The YWCA Kitchener-Waterloo Supportive Housing project received funding through the CMHC Rapid Housing Initiative, which meant that there was an aggressive construction timeline and a requirement for innovative, modular construction solutions. The environmental and aesthetic advantages that mass timber provides aligned perfectly with the goals and values of the client, YW Kitchener-Waterloo.

"Seeing how fast the building was able to be erected was very special. Also, the natural beauty of the exposed panels is different from any other structural system," says Bolen. "We focused on how to create repetition, ultimately creating a system that we could build on for other sites and clients."

Mass timber is a truly transformative product. The ability to use panels takes days, weeks, and even months off of a conventional construction schedule. "If we can enhance this capability," Bolen says, "it will allow desperately needed residential units to be provided in our urban, suburban, rural, and even remote communities."

Northern Lakes College
High Prairie Campus Building

Arbora project

WHAT DID YOU LEARN FROM INCORPORATING WOOD INTO THE PROJECT?

Reagan Davis, junior engineer at Wood Research and Development (WRD) in Moncton, NB, noted that, "Dynamic testing on timber piles is not an accurate assessment of the capacity. Static load testing proved a much higher capacity, at a higher cost and time, although much more accurate." Davis's comments come from her work and experience on the new Dillman Bridge in Nova Scotia, which had been previously out of commission since 2019 following a fatal accident. Before that, for nearly 100 years, the bridge crossed the Musquodoboit River, connecting many small communities. Without it, an estimated 1,400 households in the region were forced to take lengthy detours.

WRD won the tender to design the new bridge, which is a 35 m clear-span timber bridge, with 61.5-in.-deep girders. To prevent another tragic accident, WRD included a crash-proof rail system in the new design.

"Had this project been built with concrete and steel, it would have been more challenging for the community," WRD noted on its website. "It would have taken a lot more time to complete, which would ultimately affect the environment surrounding the people of Meaghers Grant."

When asked if there were things Davis would change in the future to improve efficiency, she noted, "A built-in lifeline for maintenance and construction workers along the length of the girders would provide better access and safety for completing work near the tops of the girders, which were taller than 5 ft. Reach and access were limited using a typical BIU unit."

Prefabrication and assembly prior to treatment extends the life of the structure exponentially. The new Dillman Bridge was fully assembled in the WRD plant first, then dismantled and shipped to the site for installation.

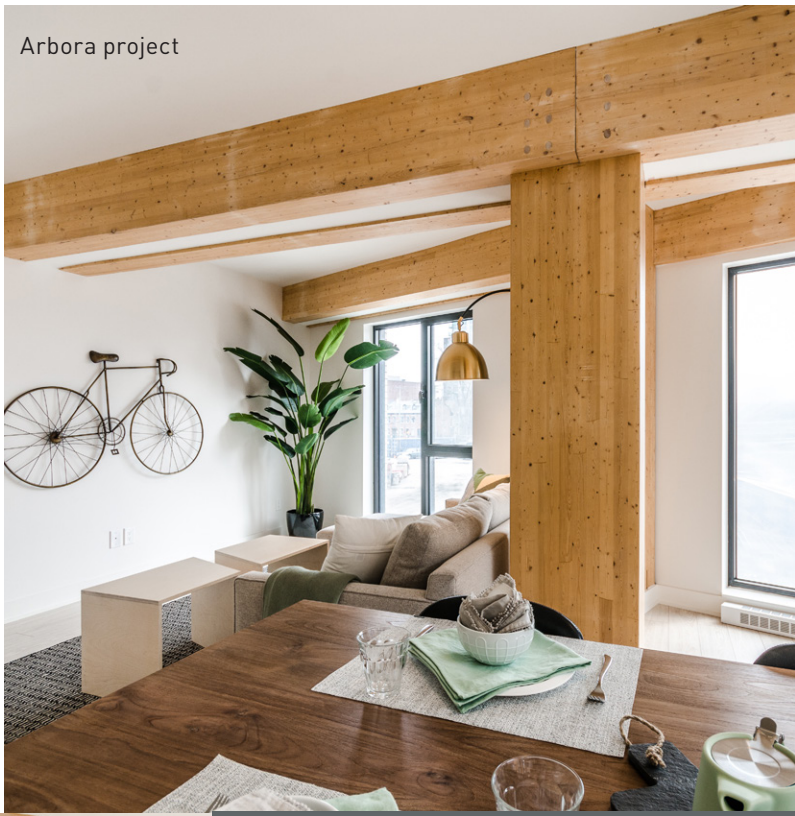
Dillman Bridge

Dillman Bridge

DID YOU INCLUDE WOOD PRODUCTS FOR SUSTAINABILITY, COST, ERECTION SPEED, LABOR, ON-SITE FLEXIBILITY, OR FOR OTHER REASONS?

It's a combination of "all of the above" and then some for the Arbora project. Montréal's Griffintown District is home to a world record-breaking building, Arbora, one of the world's largest residential complexes made entirely of solid engineered wood. The 434-housing-unit project boasts three seven-storey buildings, each 25 m high, for a total of 55,515 m^2. The wooden stories (eight in Building B and seven in Buildings A and C) are residential units.

Arbora showcases mass timber by putting glulam beams and columns on display in each apartment. The wood is encapsulated on one side of the wall and exposed on the other. To leave the wood partially exposed, the designers compared Arbora's fire load with that of a similar building constructed of non-combustible materials. The fire load represents the amount of heat released by a fire and is based on the combustible materials present in the building. The engineers calculated Arbora's fire load, taking into account the beam and column sections that would be exposed to flames, and made sure it was less than the fire load of a similar building constructed with non-combustible materials. On the basis of this calculation, a request for equivalent measures was submitted to the Régie du bâtiment du Québec and was accepted.



Arbora project

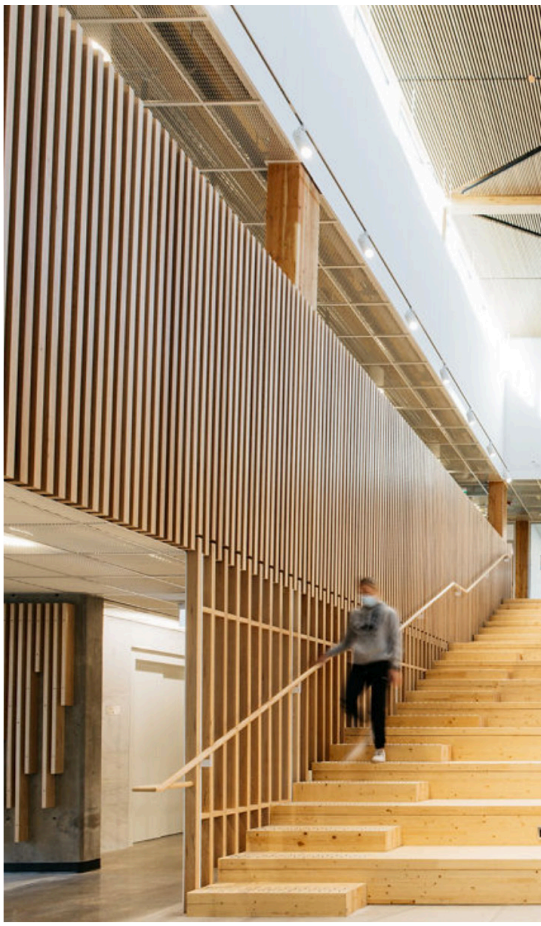
Records can be broken, but the unmatched aesthetic quality of Arbora's exposed wood beams and columns will endure.

Arbora project

In order to gain a better understanding of the potential low carbon footprint when using mass timber, the Québec Ministère des Forêts, de la Faune et des Parcs and the Fonds vert commissioned a life cycle analysis on Arbora's Building C. Under the direction of FPInnovations, the researchers assessed the environmental impacts and the carbon footprint of two scenarios: Arbora as it was built with mass timber and its concrete equivalent. The analysis was carried out on the basis of a 60-year life cycle and included the stages of production, construction, operation, and end of life.

The results concluded that the greenhouse gas (GHG) emissions for the wooden building were 6.9 kt CO_2 equivalent, compared to 8.6 kt CO_2 equivalent for the concrete building. This difference in GHG emissions between the two buildings corresponds to nearly 1.7 kt of CO_2 equivalent of avoided emissions. The study demonstrated that the wooden structure in the Arbora project contributed enormously to the reduction of its environmental imprint compared to its concrete equivalent. The use of wood in partitions as a substitute for steel further reduced the impact on the environment.

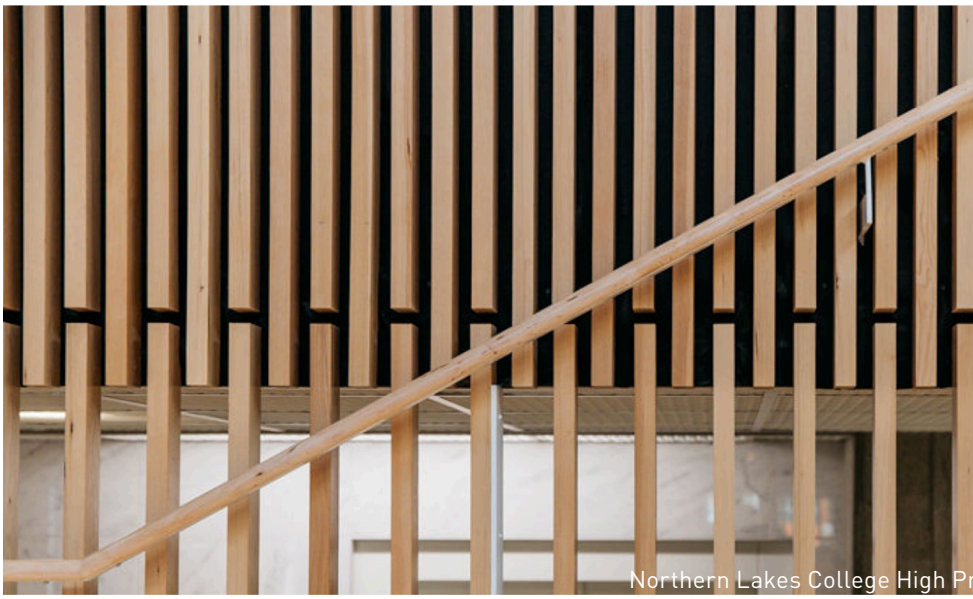
Northern Lakes College High Prairie Campus Building



WHAT ARE THE INNOVATIVE OPPORTUNITIES FOR GREEN/ SUSTAINABLE CONSTRUCTION IN YOUR PROVINCE?

For a lot of design and construction professionals, mass timber translates to taller and larger innovative buildings. Bolen notes that carbon sequestration is a big part of the narrative when selecting building materials with clients. With no specific incentives that he's aware of to specify mass timber products, Bolen goes on to say that it "would be good to see funding and/or subsidies related to mass timber construction, which has clear advantages."

For Vedran Škopac, Principal at Reimagine Architects Ltd., it's the compounding benefits that yield opportunities for mass timber construction: acoustic performance, installation time, *and* supporting local economies. Škopac hopes the benefits of mass timber in relation to mental health of building inhabitants will become part of the discussion in the near future.



Northern Lakes College High Pr

The new Northern Lakes College Campus's design, landscape, and architectural components display the College's vision, mission, and sustainability plans.

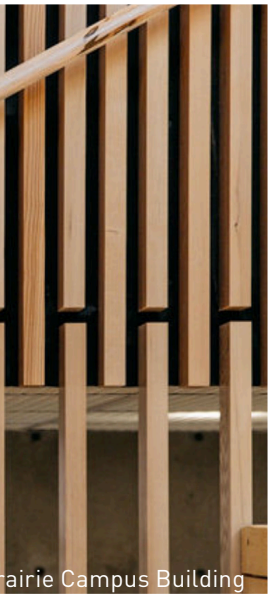
Northern Lakes College High Prairie Campus Building

WHAT IS THE UNTAPPED POTENTIAL OF SUSTAINABLE CONSTRUCTION, AND WHAT INNOVATIONS COULD MAKE A DIFFERENCE IN THIS BUILDING TYPE IN THE NEXT FEW YEARS?

According to Škopac, the untapped future potential for sustainable construction is taking things to higher heights. "To use more wood in buildings that have larger footprints would have a higher impact in the way we look at sustainability in architecture."

Škopac worked on the new Northern Lakes College, High Prairie Campus, which includes 33 individual learning suites, 12 classrooms, a health programs lab with space to accommodate up to eight beds, and three trades labs for carpentry, mechanics, and welding and metal work. The building is LEED Silver and will be net zero energy. Western Archrib provided the glulam beams and columns, using both Douglas fir and spruce-pine GLT throughout the Campus. The High Prairie Campus also features Westdek floor paneling.

Reimagine's innovative detailing of "dropped" glulam beams allowed for easier building systems coordination during the design and augmented construction speed on-site.



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Northern Lakes College High Prairie Campus Building

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