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SPRING/SUMMER 2020 — NUMBER 85

# REACHING NEW HEIGHTS

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**Above** and **on the cover:** Sensations Housing complex by KOZ Architectes
PHOTOS: Courtesy of the architect

## On the Cover



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### REACHING NEW HEIGHTS



# Transforming the world

In the Winter 2019–20 issue, we featured "Innovators & Gamechangers" and "Projects to Watch," topics that we'll continue to spotlight – including in this issue. Among those architects we recognized as gamechangers, Pritzker laureate Shigeru Ban is once again in these pages, as a nominee for the 2020 International Award for Wood Architecture (p.8) and architect of North America's tallest hybrid timber structure, Terrace House (p.14), in Vancouver, B.C.

Over the past several years, many of the industry's most acclaimed architects have proposed or completed large-scale mass timber projects. Without argument, European firms have been among the most groundbreaking, whether in terms of scale or innovation. Recently, the title of world's tallest wood building was claimed by Norway's Mjøstårnet (p.30), and several other European projects included in this issue – and, on the cover – are pushing wood construction to new heights.

High-rise buildings are championed as a solution for housing shortages, but along with their practical appeal, tall structures typically become landmarks, and even a city's claim to fame. Architecture transforms cities, and mass timber is proving to be a gamechanger. Its relatively light weight and considerable strength allow for greater heights, and the biophilic quality of exposed wood creates an appealing effect. The added benefit of carbon sequestration makes this renewable resource an obvious choice for sustainable construction.

The world has changed considerably since our last issue, but *Wood Design & Building* will continue to focus on wood architecture and how it contributes to a better planet. While many wood champions have contributed to the industry's advancement, another should be noted: Michael Sorkin, architect, professor and urbanist – considered as "one of architecture's most outspoken public intellectuals," according to *The New York Times* – died of complications from COVID-19 in late March; one of his firm's recent proposals, a terraced mass timber multi-unit, was a finalist in the Big Ideas for Small Lots NYC competition. Sorkin's advocacy for sustainable urban design made a lasting impact.

Unfortunately, this virus is affecting every industry, but as we prepare to become a stronger, more resilient society, it's also a prime opportunity to rethink architecture. Buildings, and cities, can become better in every way – especially, when they're built with wood.

**Popi Bowman**
*Managing Editor*

*Wood Design & Building* magazine invites you to submit your project for consideration and possible publication. We welcome contributed projects, bylined articles and letters to the editor, as well as comments or suggestions for improving our magazine. Please send your submissions to pbowman@dvtail.com.

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## WHAT I'VE FALLEN FOR LATELY...

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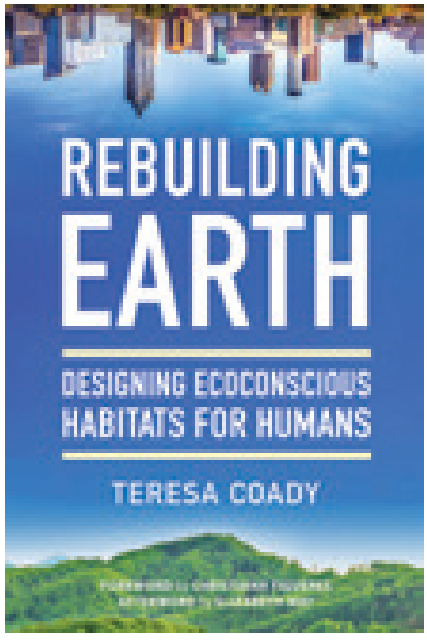


Sometimes a book arrives exactly when it's needed. I recently stumbled across an intriguing title by Canadian architect Teresa Coady, *Rebuilding Earth: Designing Ecoconscious Habitats for Humans* (published this year by North Atlantic Books). Coady was president and founding partner of B+H Bunting Coady Architects, one of Canada's leading sustainable architectural design practices.

As Coady explains in the book's introduction, "Ancient architectural history often reads like a manifesto for the law of unintended consequences. Just as the industrious little beaver has no concept of the massive downstream consequences of its dams, we rarely think about the long-term effects of our construction.... We think we are shaping our buildings. But really, our buildings and development are also shaping us."

She points out that in 1910, the tallest building in the British Empire was 13 storeys (the Dominion Trust Building in Vancouver). Now, looking at the ever-growing list of wood-based high-rises, 13 storeys will soon become an average. We're driven to build bigger, taller, faster – but, Coady argues, this needs to be balanced with the 12 Principles of Conscious Construction:

- Design for life, not machines
- Protect all waters and wetlands; discharge nothing to the oceans
- Restore and protect all forests; keep cities green
- Restore and protect eco-corridors; abandon the paved grid
- Use solar first
- Embrace distributed energy systems first
- Limit man-made $CO_2$ emissions; discharge no toxins or particulates to the atmosphere
- Regulate EMFs; mandate EPDs; build only what is needed; design to human scale
- Design for speech, music and dance; eliminate noise pollution; restore natural sounds
- Restore natural connections
- Measure happiness first
- Balance financial, produced, human, social and natural capital

Coady explains how each of these points can be accomplished, and why they are so important. She even goes so far as to proclaim: "All buildings should be pet- and plant-friendly." This thought-provoking book challenges the modern approach to development, with a call to humanize our cities. As our world continues to transform in unexpected ways, Coady's book asks architects to design a new "normal." There couldn't be a better time.


The Best of 96 Tabbies 2015 Award Winner

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# Elegant Shelter

## Mitchell Brown

Despite the many beautiful examples of urban architecture, when most people think "public transportation shelter," they're more likely to visualize cold steel and glass boxes, rather than an innovative or inspiring structure. Well, no more: Here are just a few of the world's most beautiful bus and bicycle shelters that incorporate wood in elegant, functional ways.

**Umeå, Sweden:** This award-winning design by Rombout Frieling Lab, in collaboration with The Research Institutes of Sweden, uses sound and light to alert passengers that buses are approaching. The structure is designed for Arctic weather conditions; rather than seating, the bus stop contains rotating timber pods to protect passengers from the wind and provide privacy if needed. The researchers went with this approach when they found that people often preferred to stand or lean, rather than sit, while waiting for a bus. Commissioned by the city of Umeå as a prototype and opened during the EU Arctic Forum in 2019, it has a "smart roof" with lighting and speakers that create different atmospheres based on which bus is approaching. (Another innovative, wood-based transit shelter project in the same city inspired this page; read about the International Award for Wood Architecture nominee, Vasaplan, on p. 10.)

**Guelph, ON:** As part of the University of Guelph's push for a greener future, this eco-friendly campus bike shelter was designed by Grinham Architects. Galvanized steel columns support a roof of exposed glulam beams and sloped wood decking, topped by a green roof – featuring drought-resistant plants – manufactured and installed by ZinCo Canada. As the company explains, "The biggest challenge of the roof was the slope. To protect the green roof from sliding off the building, special shear barriers were installed in combination with the ZinCo Floraset sloped green roof assembly, using drainage elements that are specifically designed to secure the growing medium on roofs with slopes up to 25 degrees." The Raithby Bike Shelter is located close to the Department of Landscape Architecture, making it an ideal case study for the students.

**Vancouver, BC:** Located at the main entrance to the University of British Columbia campus, this transit shelter acts as a conceptual extension of the nearby line of Katsura trees. The design by Vancouver's PUBLIC: Architecture + Communication features slender steel columns arranged in a staggered line, supporting an oversized cellular wood structure, which is clad in glass. From a distance, the glass is reflective but as one approaches, the wood is revealed and creates the effect of walking underneath branches. The sidewalk remains largely uninterrupted by the vertical structures, reducing impediments to pedestrian traffic.

**Pittsburgh, PA:** The East Liberty Bike Shelter is a new element that is part of the larger reconstruction of the East Liberty Transit Center, an existing bus and rapid transit station on the Martin Luther King Jr. East Busway. Designed by Pittsburgh's Studio for Spatial Practice, the shelter optimizes the site's limited footprint; it provides free parking for 80 bikes, to serve cyclists using either the Busway Station or East Liberty's business district. The shelter creates a transition between the new station entry plaza and the adjacent mixed-use development, while promoting cycling as a mode of transportation in the city. Its wing-shaped roof form references the floating roofs of the adjacent Transit Center, while the use of cedar relates to the adjacent Eastside Bond apartment buildings. At night, the floating cedar roof and fence are uplit, creating a dramatic effect. Spring-loaded double-decker bike racks allow the bikes to be securely parked within a tight urban footprint. Wood endows a rustic charm to this modern solution.


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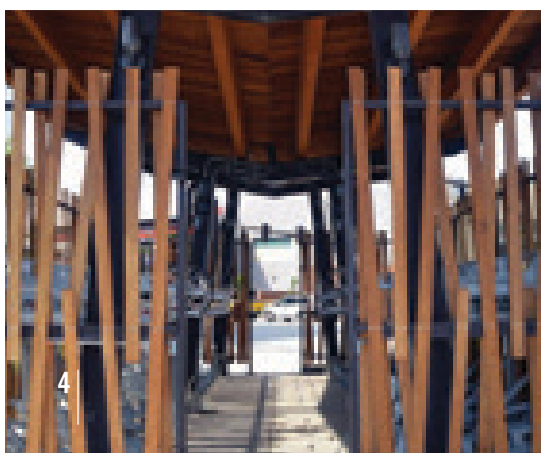
PHOTO: Krista Jahnke


4

1. Umeå, Sweden
Architect:
Rombout Frieling Lab

2. Guelph, ON:
Architect:
Grinham Architects

3. Vancouver, BC
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PHOTOS: Didier Boy de la Tour

# SWATCH OMEGA HEADQUARTERS BY SHIGERU BAN

## Nominated for the 2020 International Award for Wood Architecture

Pritzker laureate and wood champion Shigeru Ban is not a surprising nominee for the third annual International Award for Wood Architecture, which will be announced this summer. Located in Biel/Bienne, Switzerland, the Swatch and Omega Campus – completed by Ban's eponymous firm last year – covers 503,514 sq.ft., which makes it one of the largest hybrid mass timber projects in the world. The Swatch Headquarters building features a curved gridshell roof consisting of 7,700 perfectly fitted timber pieces, while the Omega Factory is a rectilinear structure. Cité du Temps, a museum and conference hall, acts as an interface between Swatch and Omega, both figuratively and physically; the building intersects with the Swatch Headquarters' canopy. The roofs of all three buildings are equipped with photovoltaic panels, and state-of-the-art heating and cooling achieve low energy consumption. Most notable, however, is the intricate freeform lattice shell, which spans more than 787 ft. long. Among the three structures, 162,000 cu.ft. of Swiss spruce were used – equivalent to approximately 10 hours of growth in the country's abundant forests. shigerubanarchitects.com

# MORE INTERNATIONAL AWARD FOR WOOD ARCHITECTURE NOMINEES

Of the five short-listed projects for the 2020 International Award for Wood Architecture, four were European, located in France (Sensations Housing, p.34), Sweden (the Vasaplan bus shelter, below), Switzerland (Shigeru Ban's project) and Finland (Lighthouse Joensuu, p.18).

PHOTOS: Åke E:son Lindman

The inspiration for this issue's "Against the Grain," the **Vasaplan** bus shelter in Umeå, Sweden, uses wood to create a visually engaging public space. Wingårdh Arkitektkontor covered the reinforced concrete pillars with wood, and a grid of overlapping glulam beams supports a glass roof that covers approximately 525 ft. x 33 ft. The benches are made from solid lumber. Integrated heating keeps the ground dry and provides warmth to waiting passengers in winter. The shelter's untreated wood will eventually darken or turn gray. By using wood in both a dramatic and practical way, the designers succeeded in creating a pleasant community meeting place – much more than a common bus shelter. wingardhs.se

PHOTO: Mike Sinclair

The only short-listed project from North America, **111 East Grand** in Des Moines, Iowa, was featured in these pages more than a year ago, while it was under construction (Winter 2018–19 issue); notably, it is the state's first modern mass timber building, and the first DLT office structure in North America. Designed by Neumann Monson Architects, the 65,000-sq.ft., four-storey mixed use building features natural Accoya wood soffits and columns at the street level, while the interiors prominently display the structural spruce glulam beams and columns. DLT panels serve as the floor and exposed roof decks, supported in part by a precast concrete service core at the south end of the building. Timber supplier/engineer StructureCraft worked closely with the design team throughout the project, which stands out as an elegant example of modern mass timber. neumannmonson.com

# PROJECTS TO WATCH

Keeping up with all of the world's wood construction projects is a challenging task, so we're here to help. Some may not see completion, but these are a few of the many projects we'll be watching.

## EUROPE

In Amsterdam, **HAUT** will feature 55 apartments over 21 floors; when it's completed, this will be the tallest hybrid timber residential tower in the Netherlands, reaching almost 240 ft. The building features photovoltaic-clad facade and roof, triple glazing and recyclable materials whenever possible; it also features a large indoor winter garden for tenants' use. Because only the inner walls (CLT panels) are load-bearing, large floor-to-ceiling windows are incorporated. Designed by Team V Architects in cooperation with ARUP, the high-rise is scheduled for completion next year.

- PLP Architecture recently won a competition to design Holland's (and possibly, the world's) tallest timber and concrete tower, dubbed the **Tree House**. At 37 storeys and 459 ft. tall, the building in Rotterdam will include 275 apartments, office space, shops and a restaurant. As part of PLP's "commitment to biodiversity," three glazed greenhouses are situated at the building's pinnacle, and the firm has incorporated rainwater collection into the design. The estimated completion date is 2024.

- Voll Arkitekter, the designer of **Mjøstårnet**, is planning a 20-storey mass timber housing project in the heart of Lillestrøm, Norway, a half-hour drive from Oslo. There have not been recent updates.

- In Paris, Dominique Perrault has created a master plan for the **Olympic Village**, a 126-acre site which will include 2,400 units of housing, shops, restaurants, offices and activity centers. Most buildings will be passive or energy-positive, using wood and other sustainable materials.

## UNITED STATES

- In Los Angeles' Skid Row neighborhood, **The Alvidrez** will be a 77,000-sq.ft., 14-storey tower to provide housing and support services for the local homeless community, with 30 percent of its self-sufficient units for residents with disabilities. Michael Maltzan Architecture is in the design phase for the project – one of the tallest timber buildings planned for California – which will use a mass timber frame and modular CLT "building blocks." The Alvidrez will be funded by the Skid Row Housing Trust, a local nonprofit group that has provided housing for nearly 2,000 people to date; Michael Maltzan Architecture has designed several of their buildings. Completion is expected by early 2023.

- A much different project, also 14 storeys, was announced recently for Hollywood, on Sunset Boulevard. The mass timber commercial high-rise designed by Gensler would include almost 450,000 sq.ft. of offices, with ground-level retail and restaurant space.

- This year's Pritzker recipient Grafton Architects was chosen to design the **Anthony Timberlands Center for the University of Arkansas**, a US$16-million mass timber project funded in large part by a grant from the U.S. Forest Service and the U.S. Endowment for Forestry and Communities. In partnership with local firm modus studio, the design phase is expected to begin this summer.

## CANADA

- Construction started in October for **Design Build Services' Tallwood 1**, the first 12-storey mass timber building on Vancouver Island, near Victoria, B.C. Built using CLT and glulam, its 120 pet-friendly rental units are expected to be available in late 2021.

*We also publish Projects to Watch in our e-newsletter; visit WoodDesignandBuilding.com to sign up.*


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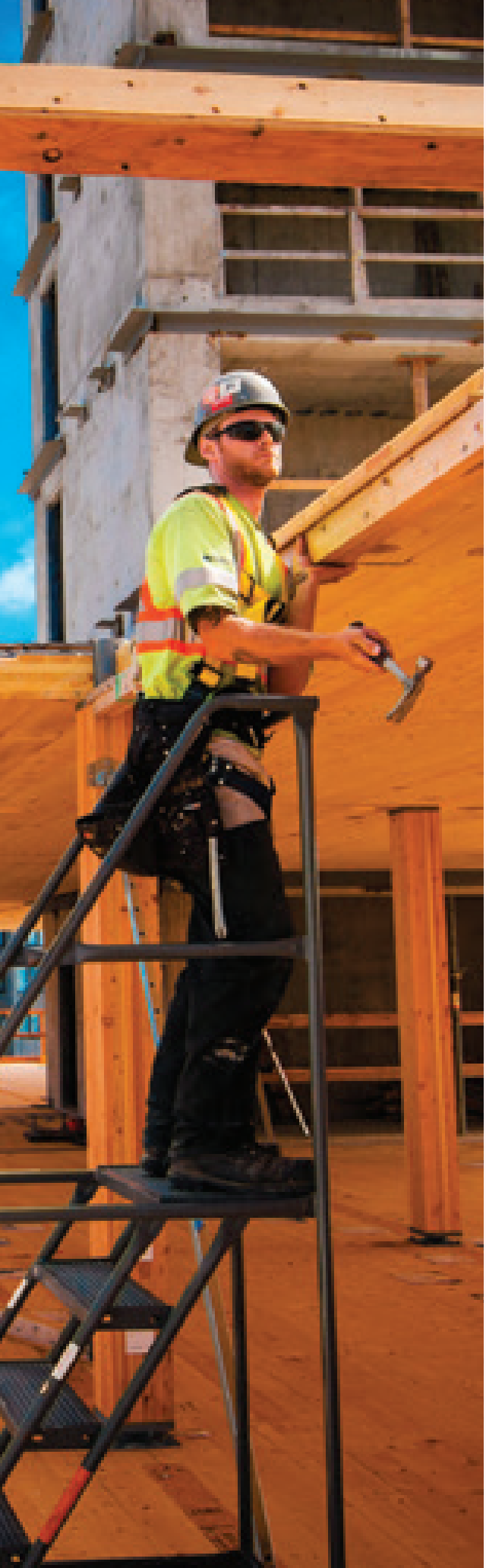

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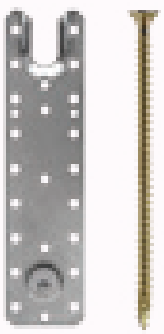

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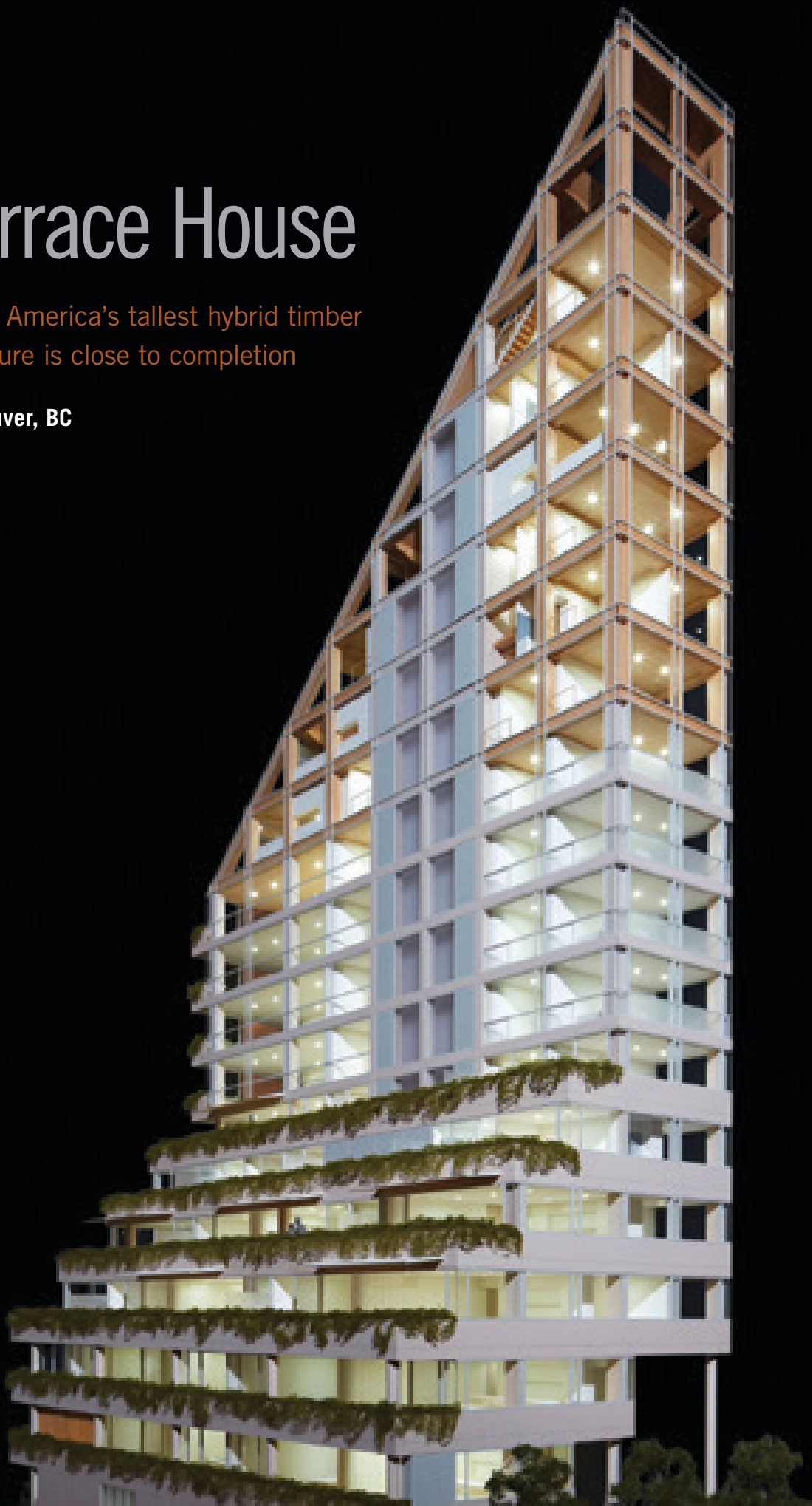
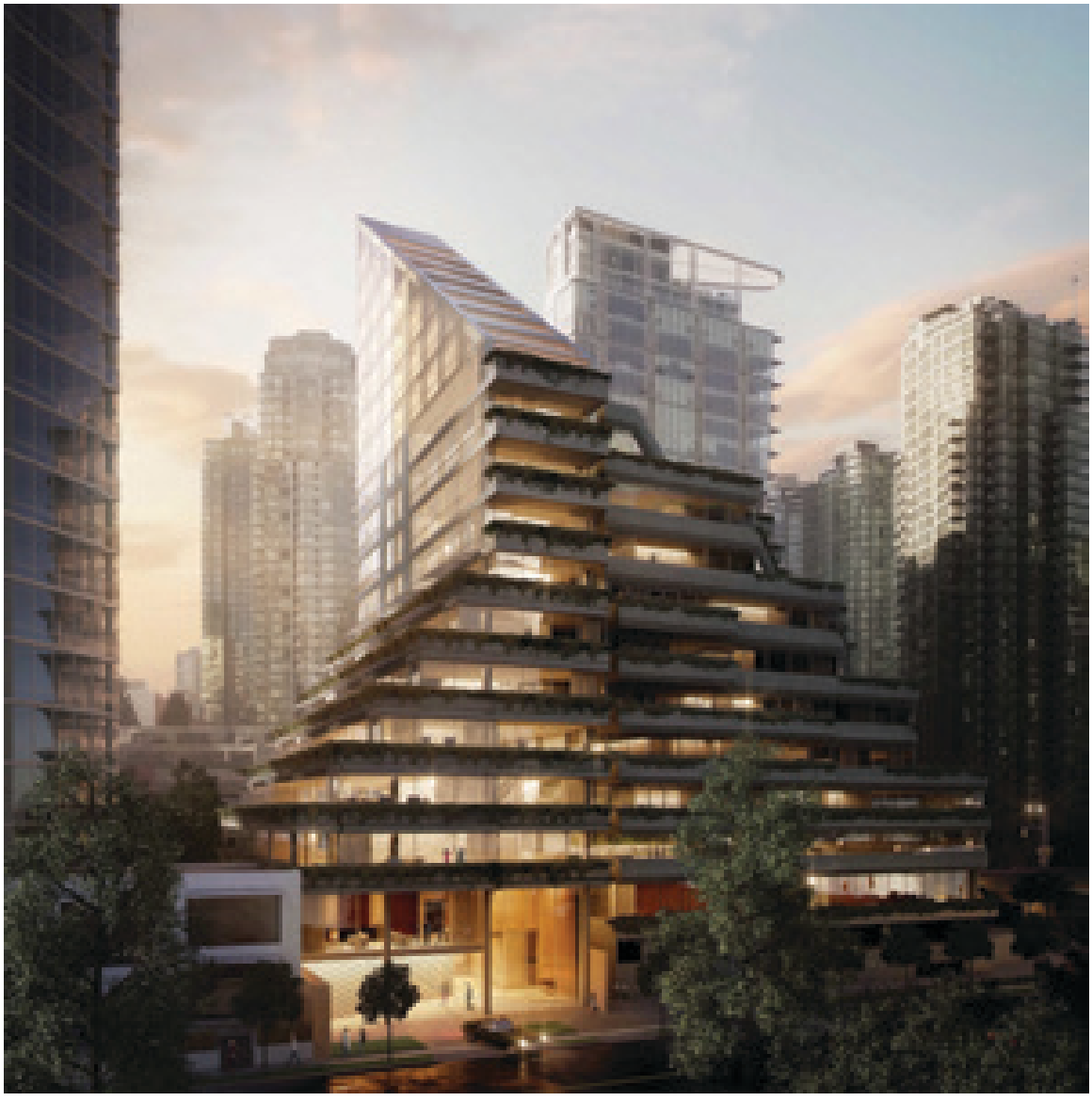
# Terrace House

North America's tallest hybrid timber structure is close to completion

**Vancouver, BC**



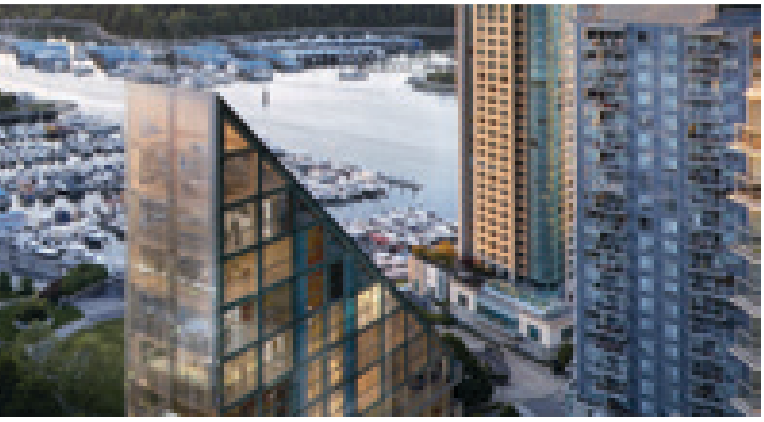


IMAGES: Shigeru Ban Architects

When Shigeru Ban's **Terrace House**, a 19-storey mixed-use project, is completed this year, it not only will be North America's tallest hybrid timber structure – it also will be an extraordinary homage to the legacy of Canadian architect Arthur Erickson and his adjacent Evergreen Building.

Terrace House's form is a direct response to three primary site conditions: the Evergreen Building, the desire not to cast a shadow on the nearby park and preserving existing view corridors toward the waterfront and mountains. Mimicking the Evergreen's geometry and its design DNA, there is a sense that the building is born from Erickson's, a melding of two extraordinary buildings that reflects the connections between the two architects; Erickson spent time in Japan and drew inspiration from the Japanese aesthetic, an admiration that's mutual in Ban's reverence for the late architect.

The building has a concrete structure for the 11-storey podium, tower and core, and a timber structure for the building's triangular apex. Comprising an outer frame of timber and glass top paired with a concrete and steel core, the residential tower will reach 233 ft. at its tip.



Nearly half of the apartments will occupy an entire floor. On the lower levels, these will be wrapped by the terraces that the architect lined up with the Evergreen Building next door. Large sliding glass doors open from the living rooms, bedrooms and bathrooms to the outside, with views across the city, harbour and to the surrounding mountains. Three homes will be spread across the top seven floors as the timber structure tapers upwards.

Ban designed every detail of the 20 luxury residences, down to the custom door handles and cabinet pulls, creating homes that are truly unique. Outdoor spaces adjoining the open-plan living, kitchen and dining rooms feature flooring that matches the white oak inside.

Residences in the gabled structure at the building's top feature the exposed wooden structure, which is made of locally sourced Douglas fir timber from the forests in B.C.'s Kootenay region. Inside, this timber lines the ceilings to add warmth to the space.

With prices starting at $3 million, the luxury residences also will be detailed with in-floor heating and cooling systems, smart technology and glazing chosen to protect interiors from sunlight damage.

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Tokyo, Japan

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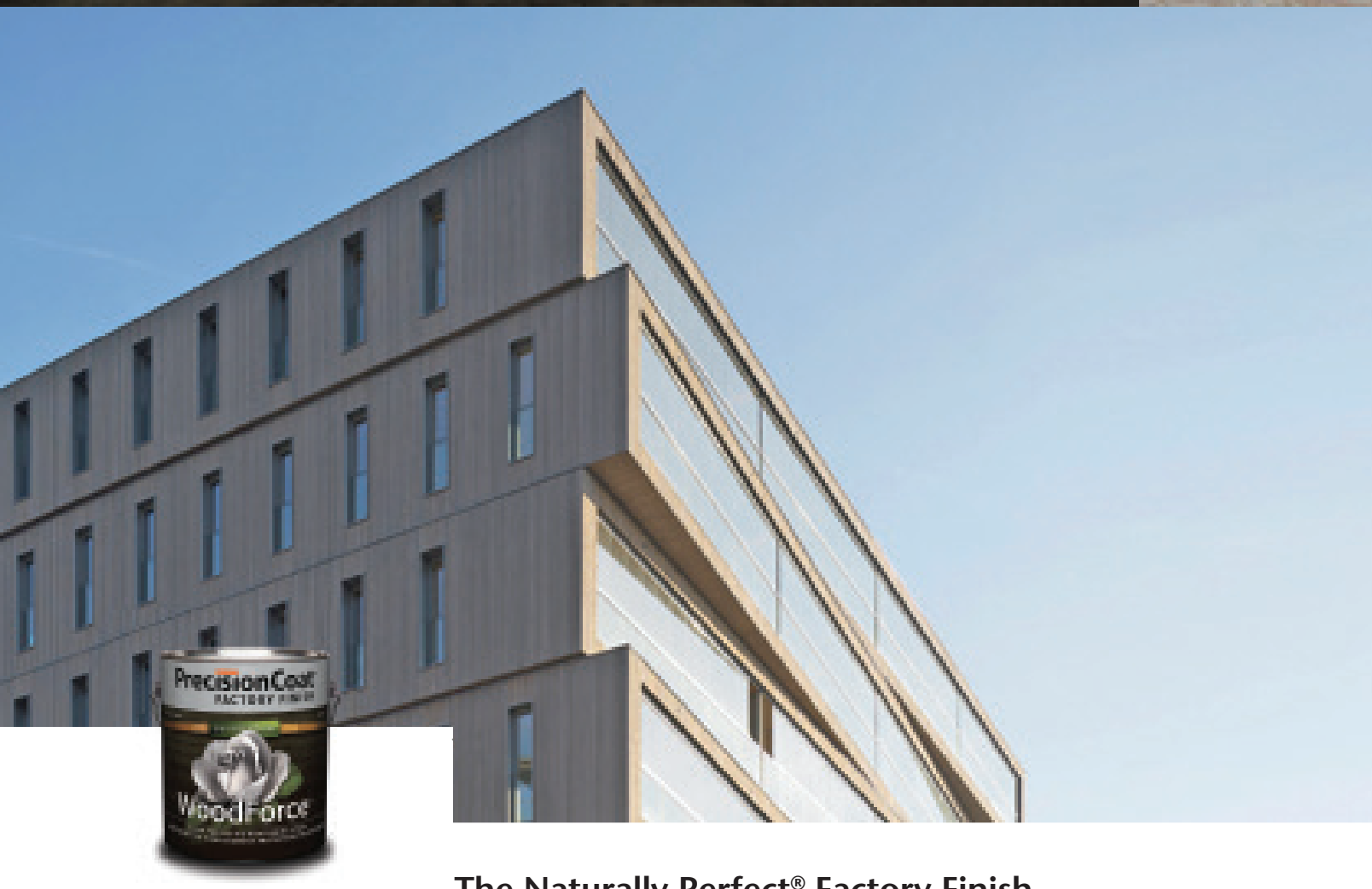


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# Lighthouse Joensuu

## A student housing project inspires new heights

**Joensuu, Finland**

In this small but growing city – where more than 10 percent of the population attends either the University of Eastern Finland or the Karelia University of Applied Sciences – student housing solutions are a priority. Completed last year, the 14-storey Lighthouse Joensuu is Finland's tallest wooden high-rise building, containing 117 student apartments and rising close to 165 ft. The city's zoning plan specified that the site should utilize high-rise construction, favoring wood. As a result, the architects devised an all-wood plan (beyond the concrete ground floor) with innovative design features, including an exterior stone tile facade featuring a lightwork installation by Finnish "light artist" Kari Kola.

The project's goal was to minimize costs by using an efficient floor plan, optimized structures and innovative technology. To that end, the ground floor and civil defense shelter – a standard requirement for occupied buildings over 12,917-sq.ft. (1,200 sq.m.) in Finland – are made of concrete, but the remaining structure uses LVL floors and CLT walls, including for the elevator shaft. The structure is stiffened with numerous steel rods inside the wooden structures, tensioned from top to bottom.

The ground floor includes sauna facilities, a laundry room and adjacent drying room, technical facilities and storage spaces for household and outdoor equipment. Floors one to 13 have nine apartments each, of which two are one-bedroom apartments and the remaining seven are studios, with the apartments varying in size from almost 280 sq.ft. to slightly more than 510 sq.ft.

Although the apartment building is made of wood, very few wooden surfaces are visible in the finished building; most interior surfaces are clad with gypsum board to meet fire safety requirements. The fire safety design for the building is based on functional fire design, as the standard E1 tables only cover wood buildings up to eight storeys high. Sprinklers were installed throughout (OH1 level, two-way water supply), but the building was designed to withstand a fire even if the sprinklers do not work. Building regulations required third-party inspectors for both fire safety and structural design; in addition, the ventilation systems were evaluated according to government standards.

Completed on schedule, each mass timber storey of Lighthouse Joensuu took less than two weeks to build. The panel blanks arrived at the construction site, where the window and door openings and the conduits for building services were then machined under the cover of a tent. The mass timber elements were then installed as the weather permitted. After installation, each completed storey was protected by a temporary roof to maintain the dry chain.

Lighthouse Joensuu's wood components – almost 70,630 cu.ft. in total – store a quantity of carbon equivalent to the annual emissions of approximately 700 passenger cars. The Karelia University of Applied Sciences conducted measurements, acoustics research and evaluated the structure's carbon footprint; studies to date reveal that only about one-fifth of the carbon footprint of Lighthouse Joensuu was generated during the construction period, and the remainder is operational, which is still under analysis.

The project – which won the 2019 Puupalkinto Wood Award and is nominated for this year's International Award for Wood Architecture – was also supported by Finland's Ministry of the Environment. As one of the tallest structures in the town, Lighthouse Joensuu illuminates the skyline by night and acts as a beacon, both for the town and for the future of wood construction.

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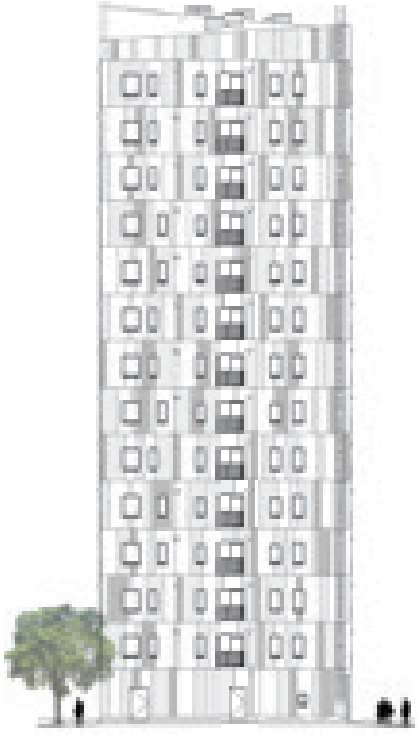

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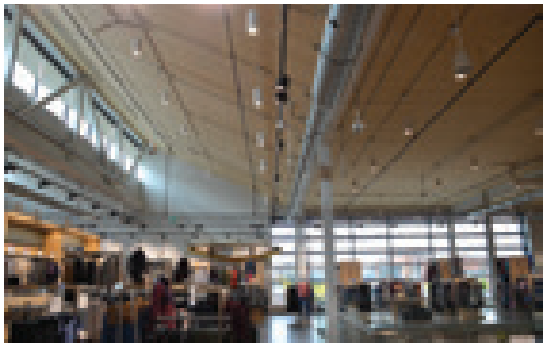
**Structural Engineer:** Entuitive Engineering
**General Contractor:** Meadow Sage Builders
**Photographer:** Yellow Camera Photography

## EXCELLENCE IN INTERIOR

WOOD DESIGN

**AWARD WINNER**
**LAKE LOUISE VISITOR CENTRE INTERIOR RENOVATION (LAKE LOUISE, ALBERTA)**

**Architect:** Patkau Architects
**Structural Engineer:** AECOM
**General Contractor:** Russpet Construction
**Photographer:** Patkau Architects



## EXCELLENCE IN COMMERCIAL

WOOD DESIGN

**AWARD WINNER**
**MOUNTAIN EQUIPMENT CO-OP, BREWERY DISTRICT (EDMONTON, ALBERTA)**

**Architect:** Proscenium Architecture + Interiors with Aedifica
**Structural Engineer:** Fast + Epp
**General Contractor:** Ventana Construction Ltd.
**Photographer:** Stephan Pasche

## EXCELLENCE IN BRIDGE

WOOD DESIGN

**AWARD WINNER**
**ROCKY RIDGE BOARDWALK (CALGARY, ALBERTA)**

**Architect:** GEC Architecture
**Structural Engineer:** ISL Engineering and Land Services
**Photographer:** Robin Zirnhelt, ISL Engineering and Land Services

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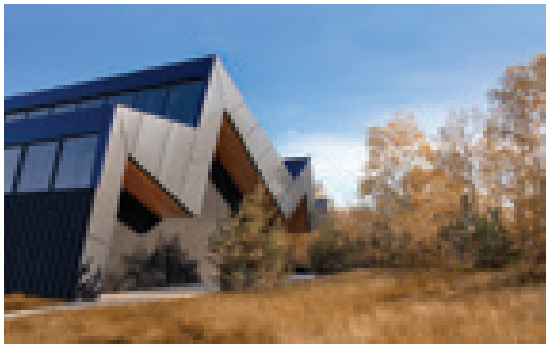
- **Shafraaz Kaba**, Architect, Principal, ASK*
- **Stephan Pasche**, Eng., Associate Principal, Fast + Epp



## EXCELLENCE IN INSTITUTIONAL

WOOD DESIGN

**AWARD WINNER**
**CAPILANO LIBRARY (EDMONTON, ALBERTA)**

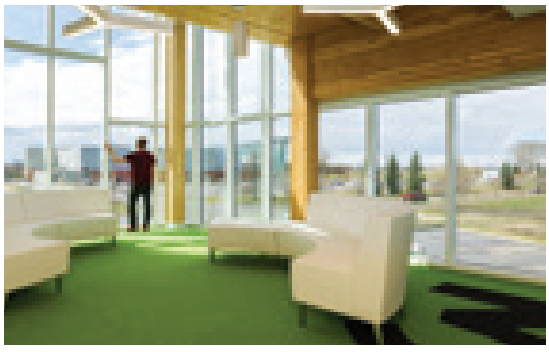
**Architect:** Patkau Architects and Group2
**Structural Engineer:** Fast + Epp
**General Contractor:** PCL Construction
**Photographer:** James Dow / Patkau Architects

## EXCELLENCE IN URBAN

WOOD DESIGN

**AWARD WINNER**
**C-SQUARE (CALGARY, ALBERTA)**

**Architect:** the marc boutin architectural collaborative inc.
**Structural Engineer:** Entuitive Engineering
**General Contractor:** CANA Construction
**Photographer:** Yellow Camera Photography



## INDUSTRY AWARD OF EXCELLENCE

**RED DEER COLLEGE STUDENT RESIDENCE**
**(RED DEER, ALBERTA)**

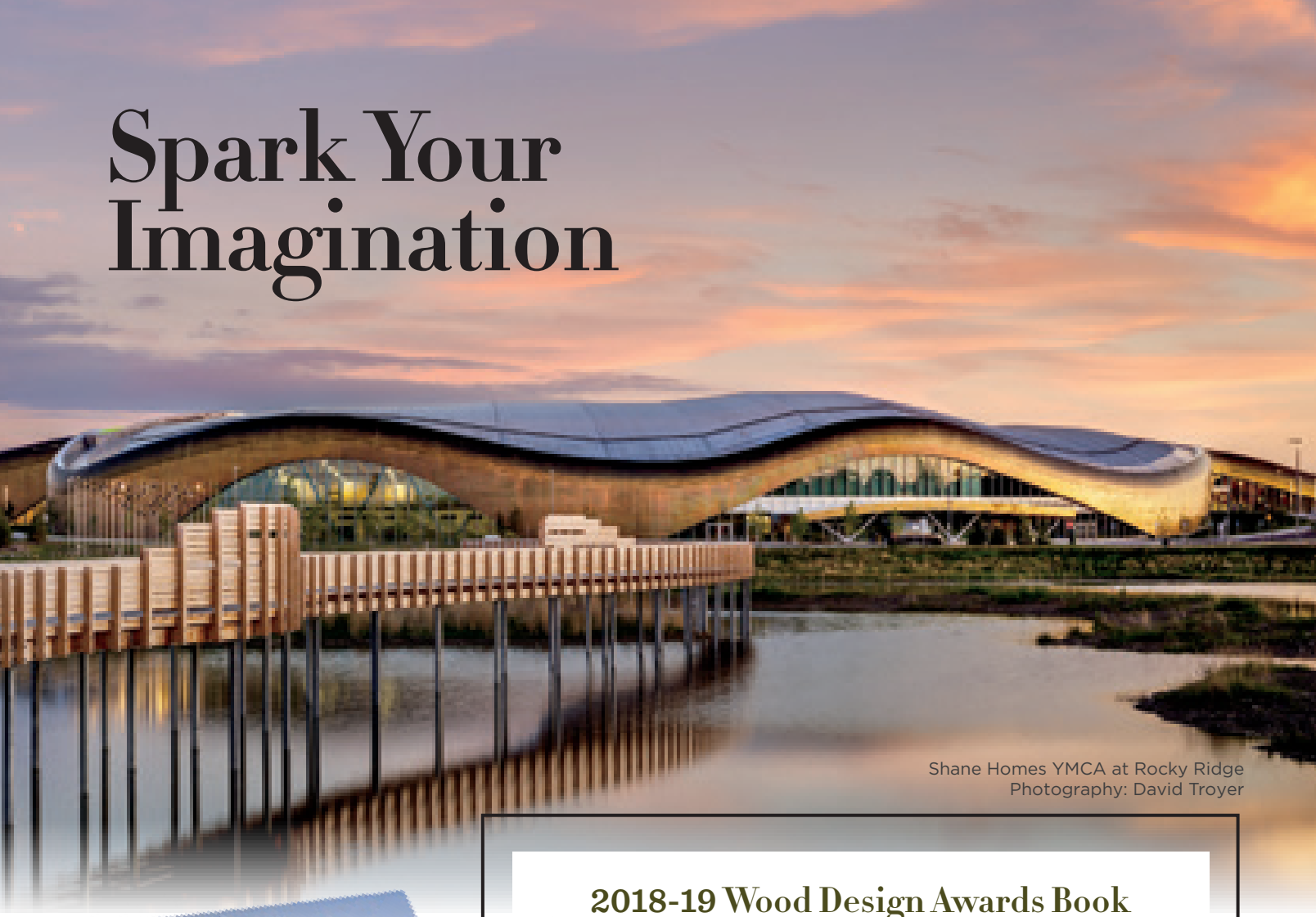
**Architect:** Manasc Isaac Architects
**Structural Engineer:** RJC Engineers
**General Contractor:** Clark Builders
**Photographer:** Manasc Isaac

## EXCELLENCE IN WOOD INNOVATION IN ENGINEERING

**DAN PRENTICE – RJC ENGINEERS**
**SIDEWALK CITIZEN (CALGARY, ALBERTA)**

**Designers:** Studio North
**Structural Engineer:** RJC Engineers
**General Contractor:** Studio North
**Photographer:** Studio North - Hayden Pattullo

# Spark Your Imagination



Shane Homes YMCA at Rocky Ridge
Photography: David Troyer

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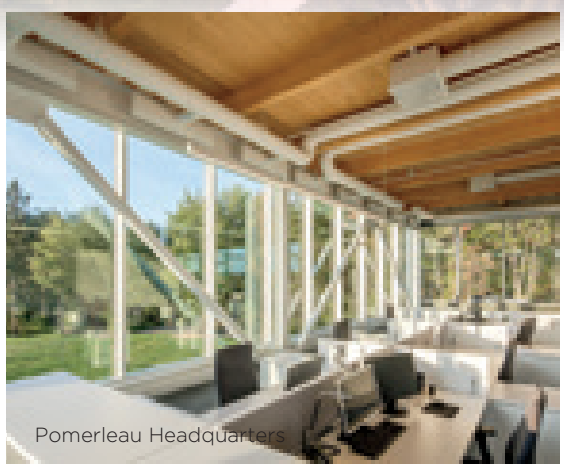
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# Arbora & Origine

## Two large-scale projects prove Quebec's leading role in wood construction

Among the tallest and largest of the world's mass timber buildings, Arbora (in Montreal) and Origine (in Quebec City) are examples of Quebec's commitment to advancing the use of wood. In 2013, the province became the second in Canada to allow six-storey wood buildings; since then, Quebec has continued to lead in the development of large-scale timber projects.

Designed by Lemay+CHA in collaboration with Provencher Roy, the all-wood Arbora complex is the largest of its kind in the world, with three eight-storey buildings comprising nearly 600,000 sq.ft., including 273 condominiums, 30 townhomes, 130 rental units and retail space on the ground floor of one building. The bearing partition walls and floor panels are CLT, while the post-and-beam structure is glulam; the mass timber panels are held together by wooden tongues or nailed metal, and self-tapping screws are used to assemble the beams and columns. Most of the LEED Platinum project was completed last year, with some finishing still underway for the third building.

Origine is an award-winning, 13-storey residential project by Yvan Blouin Architecte, completed in 2017 – the same year as TallWood House at Brock Commons, making both of these projects North America's tallest wood structures (Origine is 56 ft. shorter, at 134 ft. tall). Sitting on a one-storey concrete podium, Origine's wooden structure was erected in only four months, during winter; in total, the 9,580-sq.ft. building was completed in 16 months.

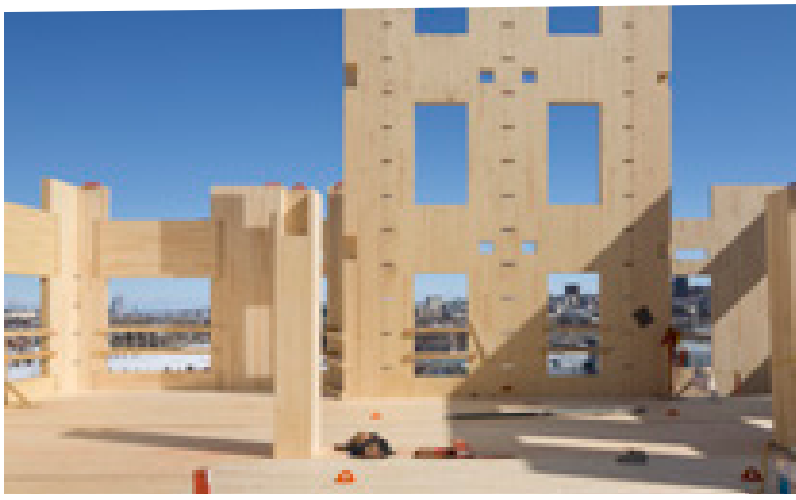
Arbora

The project team conducted two years of research, including seismic and full-scale fire testing, to ensure optimal structural resilience and safety. The primary structure is made of glulam timber posts and beams, with CLT floor slabs, shear walls, shafts and exterior walls. According to the architect, using concrete would have added four to six months to the timeline. The tall, 93-unit structure also wouldn't have been possible to build with heavier materials due to the soil conditions; because the site is near a river, it has a very poor load-bearing capacity. Origine's ingenious design incorporates environmental measures such as a white roof to reduce the heat island effect, and efficient, radiant floor heating. (This project was featured in the most recent Wood Design Awards book.)

Key to both of these buildings – and many more award-winning projects – is the involvement of Nordic Structures, which develops and markets wood products and construction systems manufactured by its sister company, Chantiers Chibougamau. For over 50 years, Chantiers Chibougamau has manufactured forest products in northern Quebec, harvesting black spruce from the boreal forest. The Nordic Structures plant in Chibougamau produces FSC-certified, prefabricated

wood components cut to the required dimensions, using CNC machinery to create door and window openings.

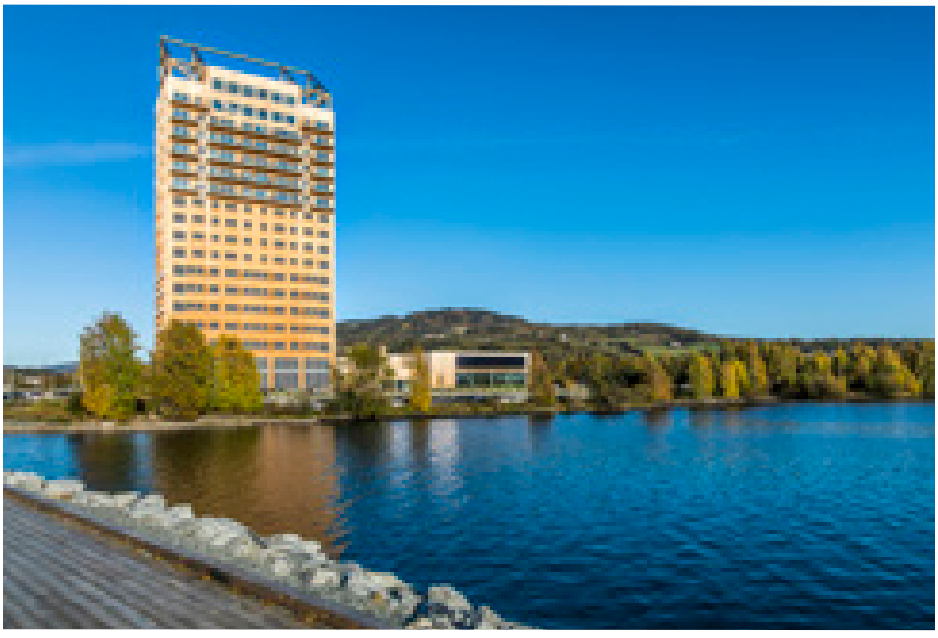
Each of these buildings has become a centerpiece for its neighborhood, showcasing sustainable development and local ingenuity. Together, they have paved the way for taller wood structures in Canada, contributing to the technical development of Quebec's guide for mass timber buildings up to 12 storeys tall – while strengthening Canada's reputation as a leader in sustainable architecture.



PHOTOGRAPHY
Nordic Structures and Stéphane Groleau for Origine and Adrien Williams for Arbora.

# Europeans in the Lead

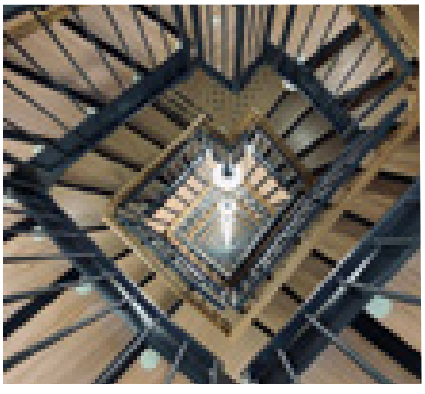
## The race to be tallest, biggest and greenest

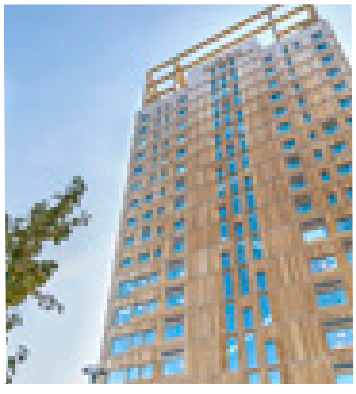


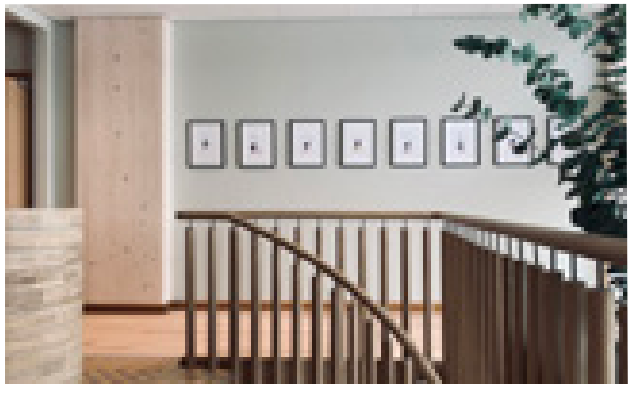
Mjøstårnet PHOTOS: Ricardo Foto, Woodify, Øystein Elgsaas

As wood's resilience, versatility, cost-effectiveness and environmental benefits are becoming better understood, high-rise wood construction – whether hybrid or completely mass timber – is growing increasingly popular throughout the world. While innovative building design is fueling wood's resurgence, Europe rightfully claims a leadership role in promoting the use of mass timber. This February, French President Emmanuel Macron announced that by 2022, the country would aim for building all new public buildings with at least 50 percent wood and/or other bio-sourced materials; the decision was inspired by the low-carbon mandate introduced by Paris, which requires all structures eight storeys or taller to be constructed of timber for the 2024 Summer Olympics.

A 2017 report by the Council on Tall Buildings and Urban Habitat revealed that the majority of timber-based projects seven storeys and taller were being constructed in France, Austria and

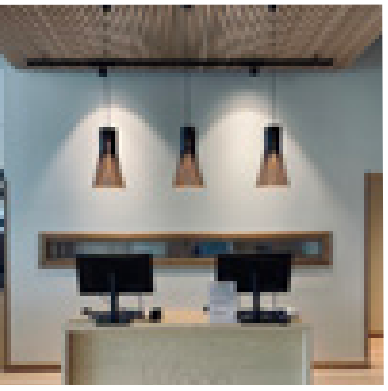






Norway. While some of those projects, such as Michael Green Architecture's 35-storey Baobab tower in France, are presently unconfirmed or postponed, others were completed recently – including what is now the world's tallest timber tower, Norway's Mjøstårnet in Brumunddal, a small town near the country's largest lake; the building's name translates to "the tower of Lake Mjøsa." This area is famous for its forestry and wood processing industry, located about a two-hour drive north of Oslo.

The 18-storey, 113,021-sq.ft. building designed by Voll Arkitekter opened last spring, featuring 35 apartments, five floors of offices, a hotel (appropriately named the Wood Hotel) occupying four storeys, a restaurant, a rooftop terrace and common areas, including a separate pool building also constructed of mass timber. The country's leading glulam manufacturer, Moelven Limtre, worked with the building engineers to develop the 280-ft.-tall building.



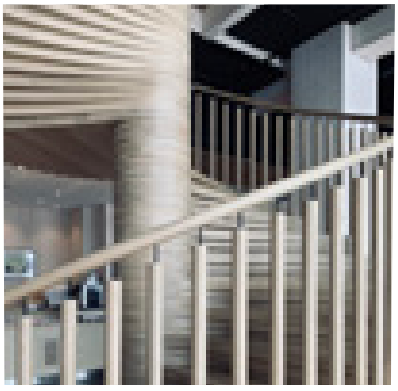


PHOTO: Michael Baumgartner | KiTO

Initially the plan specified a height about 15 ft. shorter, but when the client challenged the design team to consider a solution to maximize the height, the designers used curved edges for the glulam pergola topping the structure; this reduced the wind load while allowing for a more robust structure. As a result of the increased height, Mjøstårnet became the country's third tallest building and its tallest mixed-use structure.

More than 123,600 cu.ft. of timber, equivalent to about 14,000 trees, were used to construct Mjøstårnet. The majority of wood components originated from nearby sustainable forests; the glulam structures were produced at Moelven's factory less than 10 miles from the building site. The CLT used in staircases and balconies was supplied by Stora Enso, while the LVL for wooden floor elements was supplied by Mëtsa Wood. Nordic Steel produced the metal timber connections. The Norwegian University of Science and Technology monitored the building during and after construction, and will publish its findings at a later date.

Meanwhile, in Vienna, Austria, another of the world's tallest wood buildings recently opened to its first commercial tenants, while the hotel plans to open later this year. Designed by RLP Rüdiger Lainer + Partner, the **HoHo Wien** (left) comprises five structures that contain a hotel, apartments, a restaurant, wellness center and offices, culminating in a tower that is 24 storeys and almost 276 ft. tall; this makes it the world's second-tallest wood structure.

IMAGE: Jean Paul Viguler et Associes

The hybrid structure is built with a concrete foundation and stair/elevator towers, along with glulam beams, CLT walls and prefabricated floor systems made of CLT and concrete. The interiors predominantly feature exposed structural wood; the architect estimates that close to 75 percent of the structure is made from timber. Four prefabricated building components – columns, joists, deck slabs and facade elements – simplified assembly, while the connections between ceilings and walls joined together in a modular system. The wood composite floors are secured to the building's core structures and extend out to the facade. A small concrete ring beam at the exterior wall and floor interface ties all of the elements together.

Roughly 153,620 cu.ft. of wood are used throughout the HoHo Wien project, which has a gross floor area of 269,098 sq.ft. Considerable energy savings (estimated at 300,000 mWh) resulted from the use of mass timber instead of other materials, also saving approximately 2,800 tonnes of $CO_2$ production, compared to an equal-size concrete structure. Other efficiencies such as photovoltaic systems are helping the building work towards LEED Gold certification.

The developer's managing director, Caroline Palfy, credits Austria's forest industry for supporting this sustainable method of construction. "The timber used for the entire project will have grown back in our country's forests in only one hour and 17 minutes," she explains. The nation produces more than one billion cu.ft. of timber each year, of which about 85 percent is logged.

Many recent wood projects are competing to claim the "tallest" title, including in Bordeaux, France. Currently under construction, **Hyperion** (above) by Jean-Paul Viguier will be the country's tallest residential tower made of wood, with a 16-storey tower. Named after the world's tallest tree – a California redwood – the project features three buildings with a total of 176 housing units, an underground parking ramp on two levels, an office building and shops. The first three levels are concrete, along with the main tower's central core, which contains elevators and stairways. Topping this is a wooden structure with CLT floors and partitions, estimated to store approximately 1,000 tonnes of $CO_2$. Completion for the wooden tower is planned for spring 2021, while the surrounding buildings and offices are expected to be finished several months earlier.

PHOTO: KOZ Architectes

Another project in France which was completed last year – also reported to be the tallest wood building in the country – the **Sensations Housing** complex (above) by KOZ Architectes is nominated for the 2020 International Award for Wood Architecture. (The same firm is one of several selected to create a mass timber athletes' village for the 2024 Olympics in Paris.) This is the largest all-timber residential project in the country to date, built on a concrete foundation with three volumes, varying in height from eight to 11 storeys. Situated on what used to be a brownfield site in Strasbourg, the 146-apartment structure is built using glulam posts and beams, with structural CLT and shear walls. Steel cladding lends an industrial aesthetic to the exterior facade.

Not much more than a decade ago, in 2008, a worldwide benchmark was set in Sweden by its tallest all-wood building, **Lagerhuset** by Curt Arnold Salomon-Sörensen – a fourth-generation architect who is now in his 90s. The 10-storey grain warehouse in Eslöv was saved from demolition and converted into apartments: almost 102 ft. tall, it was unsurpassed in height (with the exception of Australia's 10-storey Forte Tower) until **Treet** was completed in 2015, in Bergen, Norway. At 14 storeys and 162 ft. tall, the building designed by ARTEC held the title of world's tallest wood building until the TallWood House at Brock Commons (in Vancouver, B.C.) was completed in 2017.

Lagerhuset PHOTO: Håkan Dahlström

Treet PHOTO: David Valldeby

The Cube PHOTOS: Jack Hobhouse

In London, another notable milestone in the race to be tallest is **The Cube** by Hawkins/Brown. The 10-storey hybrid timber, steel and concrete apartment complex was the tallest European building to use structural CLT when it was completed in 2015 – also surpassing the height of any modern wood/hybrid buildings in North America. A unique, twisted cruciform plan ensures each apartment has three external walls, for optimal daylight and views, while the exterior features Western red cedar cladding.

Tall wood buildings may have a relatively short history, but in that time, each new project illustrates the many ways that we can rethink architecture. With North American building codes now evolving to allow more flexibility in wood construction, it likely won't be long before even more mass timber structures will reach taller heights on this side of the ocean, too. However, Japan plans to surpass even the most ambitious projects announced to date, with a 70-storey, 1,148-ft.-tall hybrid mass timber skyscraper designed by Nikken Sekkei, to be completed for the 350th anniversary of Sumitomo Forestry. With that date being in 2041, it remains to be seen whether this will, indeed, become the world's tallest timber tower.

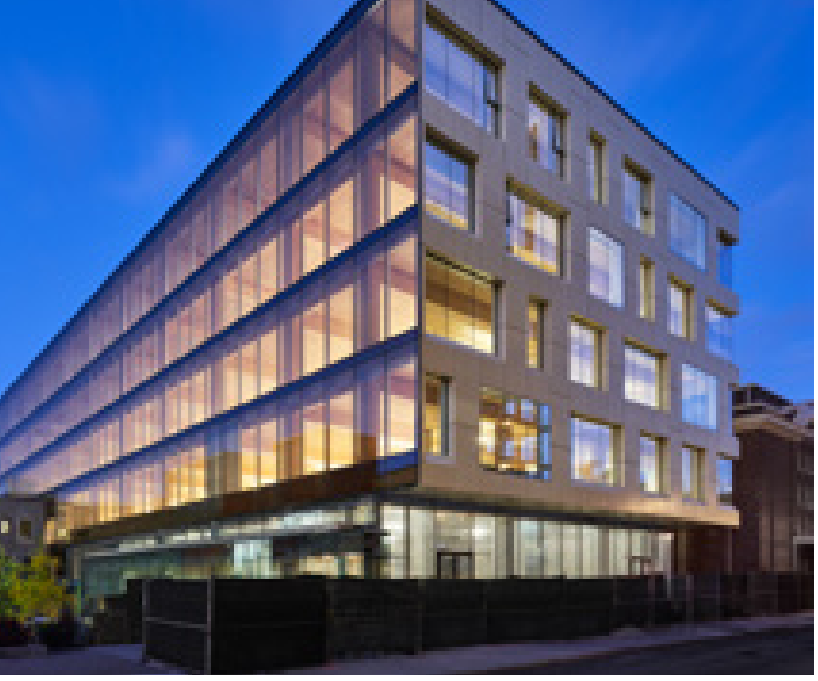


PHOTO: Doublespace Photography

# 80 Atlantic

**Jan Schotte, associate at Quadrangle, & Wayne McMillan, intermediate intern architect at Quadrangle**

This is the fourth and final installment for our serial profile of 80 Atlantic Avenue in Toronto. With base building construction winding down and the enclosure wrapping up at the end of 2019, the team's focus shifted to preparing the interior spaces for fit-out by the future tenants. Special consideration was given, in particular, to the treatment of the wood detailing for this high-profile project, which stands as an exemplar for new mass timber construction.

The Victorian architects who designed the neighboring buildings were indifferent to their timber skeletons, while this project was oriented to show off its structural elements. There were several site planning reasons to maximize the glazing on the south side of the building: It faces the internal courtyard, offering unobstructed views over the neighborhood, and provides the best opportunity for exposing the wood to public view. Along with that visibility, however, came fewer opportunities to hide services.

The wood elements of the building would be a main draw for the tenants, but the details couldn't hinder the future flexibility of the space. High-tech and creative companies are the main types of tenants seeking the kind of office space that 80 Atlantic provides, so the details needed to accommodate a range of changes that these innovative end users could require throughout the building's expected lifespan. The future-proofing details had to be clearly communicated through a tenant construction manual that includes graphic illustrations of the building's features, such as those that integrate and conceal services.

Different approaches were taken for hiding each service. With the ductwork removed from the ceiling and hidden in a raised access floor, the remaining challenges were electrical distribution and fire protection. Accepting that the lights couldn't be removed from the ceiling, the design team set out to find ways to minimize the visible presence of electrical conduits; thanks to the clear north-south structural bays, the lighting distribution could run along the center of each bay, so that conduits would not have to duck under the beams.

For additional electrical distribution, a special recess was created within a number of columns throughout the office plate to allow electrical conduit to run from below the raised access floor to the ceiling. These conduit chases were fitted with removable wood covers to tuck the conduits within the columns, out of sight; that way, tenants can avoid visual clutter on the wood when adding their additional electrical distribution.

Sprinklers also needed to be located overhead, so again the continuous north-south beam orientation was advantageous to organize the sprinkler distribution pipes within each structural bay. The first few floors face 60 Atlantic across the shared courtyard, requiring window sprinklers to maintain complete glazing along this side. These sprinklers are located behind the perimeter beam to ensure they are not visible from the rest of the office. Solar shades were installed afterwards, helping to hide the sprinklers from outside view.

## The benefits of mass timber

80 Atlantic is the first of a new generation of mass timber projects in Toronto. In fact, the city now has several other mass timber projects underway at various stages of development. The combination of a booming real estate market, a maturing forestry sector, labour and material supply shortages for other construction methods, and surging professional interest have made the city a focal point for this resurgence of timber construction.

Globally, buildings account for about 40 percent of greenhouse gas emissions; in Toronto, they account for about 52 percent, including both operational and embodied carbon. This, combined with the looming climate crisis, has led sector leaders to seek new ways to build. As the only renewable structural material, and one which stores carbon for the product's lifetime, timber from sustainably managed forests is key to reducing the embodied carbon of new buildings.

A lifecycle analysis commissioned from RWDI revealed that building 80 Atlantic in wood rather than concrete cut its embodied carbon in half. This single decision saved nearly 2,300 tonnes of emissions – the equivalent of 22 additional years of operational energy. Given the amount of energy expended relative to the operational life of the building, this makes a

compelling case to promote the use of timber for future construction projects.

80 Atlantic is a five-storey office building, and the first to be designed and built under the updated 2015 Ontario Building Code, which permits residential and commercial wood construction up to six storeys. As the first project to seek permitting in the City of Toronto, the goal was to keep within the parameters of the new code to ensure a straightforward approvals process. Since this application, both professionals and the City have grown more comfortable with applying alternative solutions to build outside of these parameters, and as a result, many other mass timber projects are underway that range in both height and use. Demand for taller and taller mass timber buildings continues to grow.

Because timber is much lighter than concrete, when the entire superstructure is designed with wood, this can lead to reductions in foundation design requirements, potentially offering significant savings to the overall construction budget. Timber's lightness compared to concrete also makes it a viable option for sites shown to have poor soil bearing capacity. Interestingly, one of the issues that can arise with timber construction is the need to actually hold the building down.

Construction schedules can take advantage of the benefits of prefabrication when mass timber elements are manufactured off-site, allowing schedule acceleration and just-in-time delivery when managed effectively. Off-site fabrication also typically allows greater precision and higher quality control, resulting in faster and more efficient construction when materials are delivered to site; important to note is that this schedule acceleration is only possible if planned for during the design stage of the project. Because timber is a manufactured product, elements must be designed and coordinated to a higher level of detail with the manufacturers earlier in the process than is the norm in the Toronto development community.

One of the most obvious advantages of building with timber is the potential increase in the speed of construction. Because mass timber products are modular components that are ready for installation the moment they arrive to site, the erection of framing and floor assemblies occurs quite quickly, and with surprisingly few workers required on hand. When compared to concrete again, a wood structure eliminates the time and expenses related to formwork installation and removal, steel reinforcing, reshoring and the time required for concrete to cure before the next floor can be erected. Eliminating these elements also reduces the amount of construction traffic required to and from the site, resulting in a very streamlined construction process with considerable efficiencies available to both the construction budget and schedule. Where a standard construction project may require a crew of 40, a timber building can be erected with six to eight people.

When building in timber, exposing the wood is key to allowing the occupants to enjoy its aesthetic benefits. Wood's natural warmth and visual appeal allows the option to eliminate the need for interior finish assemblies, which also avoids the need for additional labour and materials costs, eliminates the embodied carbon of these additional materials and limits the length of time that additional trades are required on site.

Perhaps the most convincing argument for building in wood is that people inherently seem to love it. Over the course of construction, it seemed as though every new visitor to 80 Atlantic wanted to have their picture taken hugging a column. Because wood retains its natural character, texture and even smell, people feel attracted to it in a way that they don't with steel or concrete. An increasing number of studies are finding links between the health and well-being of occupants and the use of wood in the built environment. From an economic perspective, particularly for the commercial program at 80 Atlantic, the attractive environment that wood creates has translated into higher rents and long-term, high-profile tenancies.

As we reach the point where we step back and reflect on the work that we have put in over the past few years, it's gratifying to know that we have been part of building something new for the city, something that has turned out beautifully, and to contribute to what we see as being an important moment in architecture. We are excited about the number of other mass timber projects that have been announced since the time construction started at 80 Atlantic, and we take that as an indication that our local industry is ready for this new material. As the momentum of mass timber construction grows, we hope that the lessons we have learned, and those of the projects that will follow, will help accelerate the transition to a new method of building that is more environmentally responsible, but also more enjoyable to occupy.

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DEVELOPER
Hullmark Developments Ltd.

ENGINEER
RJC Engineers

CONSTRUCTION MANAGER
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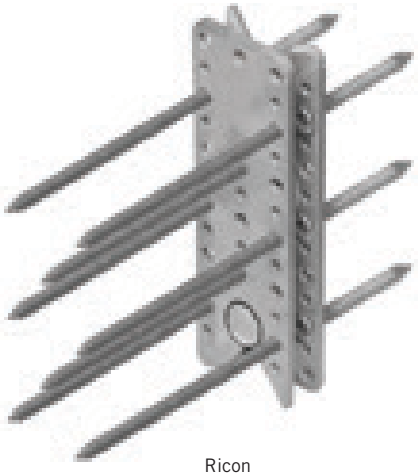
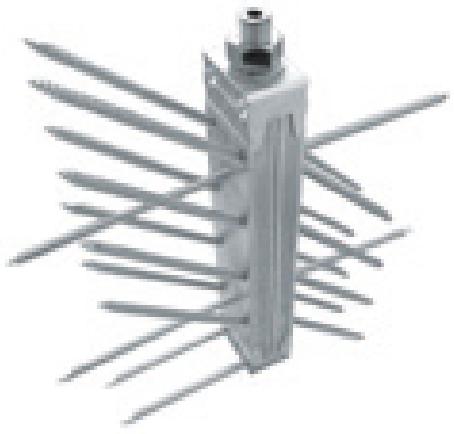
# Tried-and-True Connectors

**Beam hanger systems by MTC Solutions**



Ricon

The MTC beam hanger systems are a revolution in post and beam connecting systems. This system is a complete pre-engineered solution available in different capacities. The connectors consist of male or female components that drop in together for the fastest possible on-site installation. The higher capacity MEGANT connectors feature symmetrical clamping jaws and steel rods.



MEGANT

## An accelerator in the mass timber revolution

Beam hanger systems have many advantages for mass timber construction. One of their main advantages is that they can be preinstalled in a controlled shop environment; this allows for a safe environment for workers by reducing on-site installation risks. Human error also can be reduced when doing the installation away from any extreme environmental site conditions. The preinstallation also allows for reduced crane time on-site and overall power tool requirements. All this permits the beam hangers to be dropped simply into place once the elements reach the site. This drop-in assembly of the beam hanger assists in a more efficient element sequencing in mass timber buildings.

From a designer's perspective, the MTC beam hanger systems can be a more cost-saving alternative to custom connections. The pre-engineered aspects of the system allow for all relevant design and geometry requirements to be available in easy-to-read design tables. These values are verified by extensive research, with the components fine-tuned even before supplying to the market; hence, the research and development phase that may be required for custom connections is eliminated.

## The RICON S VS beam hangers

One of the most popular beam hanger systems on the market is the RICON S VS system connector. This beam hanger features a welded collar bolt with a short throat. The shorter throat allows beams that are not cut perfectly plumb to have a less significant impact on wedging the connecting element tight when dropping in beams.

Most importantly, the RICON S VS connector has been installed in various tall mass timber structures in both Canada and the U.S. Three of the most notable projects to use the RICON S VS connectors include the Rocky Ridge YMCA in Calgary, Alberta, Carbon 12 in Portland, Oregon, and the First Tech Credit Union in Hillsboro, Oregon.

## TECHNICAL ADVANTAGES OF THE MTC BEAM HANGER SYSTEMS

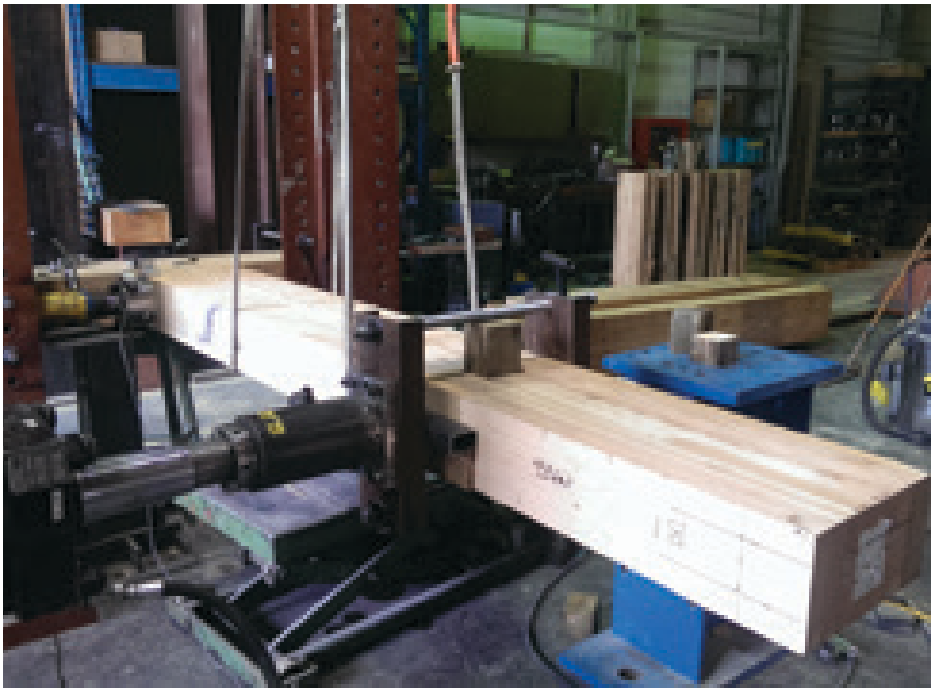
The beam hanger plates are connected to the timber elements using Canadian Construction Materials Centre (CCMC) approved ASSY self-tapping screws. The modern self-tapping screw allows for a fast and simple installation, in addition to offering high shear and withdrawal strength even when placed in the end grain. Extensive testing on these systems has proven their reliable structural performance.

## Interstory drift testing

Carbon 12 is the tallest mass timber building in the U.S. as of press time. This building features a mixed commercial and residential occupancy in Portland, Oregon. The RICON S VS connectors have undergone specific interstory drift tests to investigate their response to the seismic activity in the area. The tests include placing the connector under CUREE protocol, which includes starting the cyclic loading from smaller amplitudes, then increasing the cycle amplitude before reaching the ultimate failure of the system.

The testing results include the RICON S VS connectors sustaining an approximate drift of 4 percent at ultimate failure.

Figure 2 REFERENCE: OREGON FOREST RESOURCES INSTITUTE



This shows that the connectors are suitable to sustain the maximum interstory drift of 2.5 percent allowed in the National Building Code. Other types of MTC beam hanger connectors such as the MEGANT also have proven high interstory drift performances. This further verifies the suitability of using the beam hanger systems in tall mass timber buildings.

## Full-scale fully loaded fire testing

The First Tech Credit Union building was one of the most high-profile projects of 2017 that utilized the MTC RICON S VS connectors. Connections in this building were fully concealed to effectively fire rate all the post-to-beam and girder-to-beam connections.

The RICON S VS connectors have undergone full-scale fully loaded fire testing in San Antonio, Texas, in collaboration with the SoftWood Lumber Board and other partners. During testing, the connectors were installed on full-scale members and placed in a furnace for 1.5 hours; the load applied on the members was designed to mimic a typical office loading. The connectors fully sustained the applied loading, with no failure during the time spent in the furnace.

Being the first of its kind, the full-scale fire test confirmed that the MTC beam hanger connectors can use wood cover and proper wood routing as an effective fire resistance method for connections in post-and-beam framing systems. This uses the concept of a sacrificial char layer from the combustible material to protect the non-combustible material, such as the steel connectors and screws. Additionally, as the steel plate of the beam hangers are narrow, smaller beam sections can be used with one- or two-hour fire ratings.

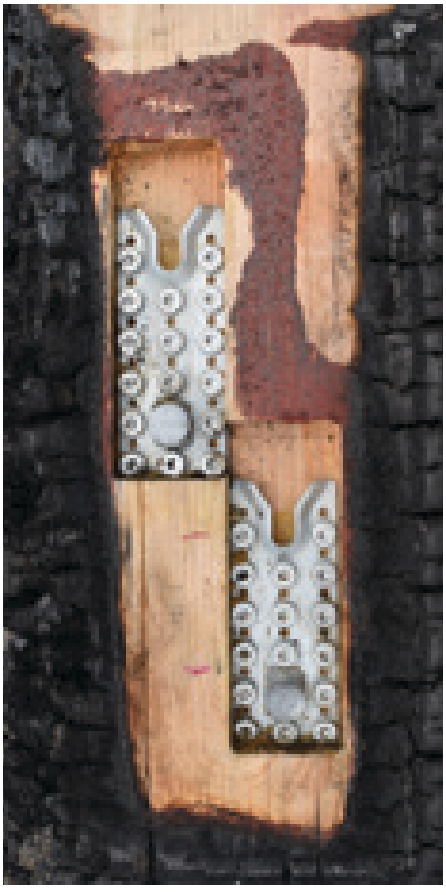
The First Tech Credit Union building is a great example of modern mass timber buildings at its best. Based on a case study done by the APA–The Engineered Wood Association, the First Tech Credit Union building was able to save 4 percent in overall costs compared to a traditional steel structure. Part of this was achieved by taking advantage of the drop-in assembly of these connectors and their simple fire rating requirements.

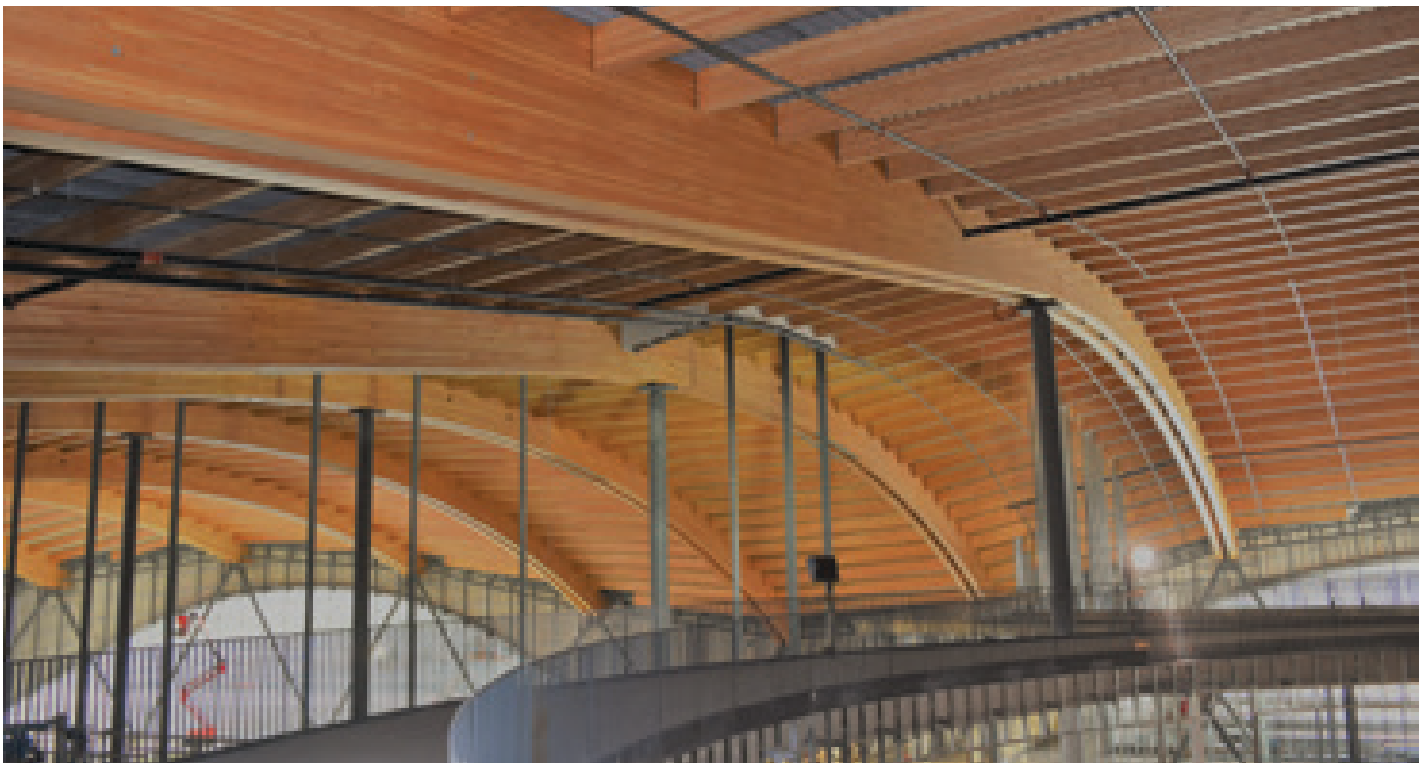
## DESIGN SPECIFICATIONS FOR THE MTC BEAM HANGER SYSTEM

Designing with the MTC beam hanger is simple. These systems have standardized design tables for both the connector capacities and geometry requirements. Designers can simply identify what capacity they require for their projects and choose the appropriate beam hanger. The connectors have capacities up to 318kN and can achieve two-hour fire rating requirements. As taller mass timber buildings with higher fire rating requirements are becoming more common in North American, designers will require more versatile and reliable connecting systems.

The RICON S VS connectors are one of the most versatile beam hanger systems as they can be placed in wood-to-wood, steel-to-wood and concrete-to-wood connections. These special connections are possible since the RICON S VS connectors can be welded onto steel plates. To account for the different installation tolerance levels between concrete and timber elements, it is recommended to use adjustable embed plates in concrete-to-wood connections.

Staggered connector configurations are used to accommodate narrower beam sizes. As seen in the previous pictures, the staggered connection was utilized in the First Tech Credit Union building for narrower posts. Some special geometry considerations must be implemented, such as always having a clear path to the collar bolt; therefore, in staggered configurations, it is not possible to place the connectors on top of each other.





Shane Homes YMCA at Rocky Ridge



The routing for the fire rating can be placed in both the girder (main member) or joist (side member). This allows for greater flexibility while working around project constraints. Routing into the joist will require a wood plug at the bottom for proper fire rating, which can change the clean aesthetic of the connection. Therefore, if possible connection constraints allow, it is recommended to route the girder instead.

The RICON S VS connectors can be used easily in sloped and skewed connections because the beam hanger connectors only require two parallel faces, which is why they were the perfect fit for the Rocky Ridge YMCA's double curvature roof structure.

For this project, approximately 1,800 RICON S VS connectors were used. The pre-engineered aspect of the connector aided in the design of the double curvature connections. In sloped and skewed connections, the most important design consideration is using the right length screw to not poke out from the other side of the wood member.

MTC beam hanger systems are one of the simplest and most cost-effective connectors on the market, tested and proven to work in many large projects throughout North America. MTC Solutions is committed to the continuous improvement of its mass timber connecting systems, and with that the company also supports the future of the mass timber industry.

### Who is MTC Solutions?

MTC Solutions, formerly known as MyTiCon Timber Connectors, is a specialized mass timber connections supplier. With its recent rebranding, MTC is aiming to solidify itself as the face of mass timber connections, by supplying tested and reliable connecting systems to the market. All connections offered by MTC are tested in North America, in collaboration with North American universities.

From rendering to reality.

Photo credit: Kyle Slavin, St. Michaels University School

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## A family tradition

Alto Collective was founded by the Alto brothers, Owen and Kevin, in 2011… but to hear Kevin tell the story, the company actually started long before that. "We witnessed our father firsthand – a woodworker, a handyman, a jack of all trades – create many useful items for the house we grew up in," Kevin told the venture capitalists of CBC's *Dragon's Den* during his successful sales pitch last year. "Shortly after graduating university, my brother and I were back in Calgary, and we both discovered this shared passion, this shared lineage for woodworking."

This discovery happened while the two were on the hunt for the perfect longboard, and when they couldn't find one, they decided to build their own. Working out of their father's basement and garage, they built and rebuilt their board decks until they mastered the skill. That first board rolled off the line (so to speak) in 2011, and since then, the brothers have branched out into smartphone cases, wallets, desktop organizers, cufflinks and smart watch charging stands – all handcrafted from wood, all customizable to achieve the look their customers want.

Kevin's advice for people thinking to start a business is as simple and elegant as the brothers' designs. "Don't wait. If you have an idea, find ways to start testing it. Starting a business might seem daunting, so break down your idea and find small, less intimidating ways to test it. Learn as much as possible."

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