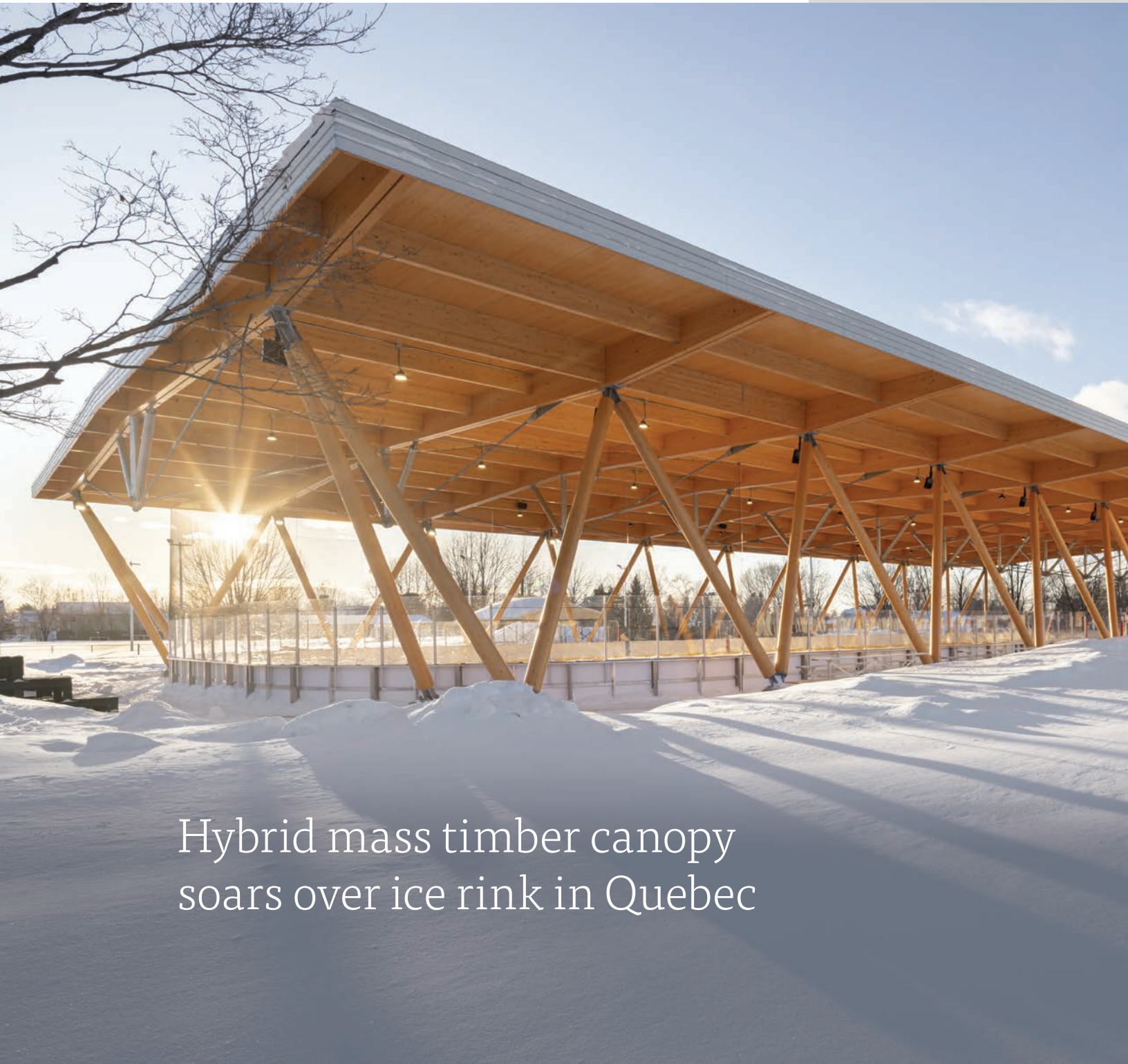


CASE STUDY

L'Espace Philippe Boucher



Hybrid mass timber canopy
soars over ice rink in Quebec

Winters in Quebec can feel exceptionally long, but, as the engineer for this project noted, “When you pour water on the soil, it creates magic.” Municipalities know that the cheapest way to get the most from the ice hockey and figure skating season is to cover their outdoor ice rinks with steel roofs. But the community of Saint-Apollinaire, located just south of Quebec City, challenged their design team to create something more distinctive.

The result is a beautiful wood-steel hybrid canopy that seemingly floats over the ice sheet below. The structure met the community’s aesthetic goals and budget by combining hybrid wood-steel trusses with glue-laminated timber beams (glulam) and decking (GLT), and round glulam columns.

Located near the city’s center in Parc Terry Fox, L’Espace Philippe Boucher was named after a hometown professional hockey player who grew up across the street from the new facility and went on to play with the National Hockey League for 17 seasons. With a specialized refrigerated cooling system, the covered structure protects the ice from November through March. As a bonus, the space can then be used for pickleball and basketball during the rest of the year.

In addition to the ice sheet, built to meet NHL dimensions, L’Espace Philippe Boucher contains players’ benches, bleachers, and a service enclosure for the ice refrigeration system. The sloped geometry of the structure overhangs all sides of the rink, minimizing maintenance requirements and ensuring longevity of the timber components below.

Protecting the Ice at a Popular Park

In March 2021, the Municipalité de Saint Apollinaire issued a request for design-build proposals. They wanted to build a new covered ice rink in Parc Terry Fox, a popular area that already included a multipurpose center; tennis, basketball, and volleyball courts; soccer fields; a water park; and a skate park. ABCP Architecture already had experience designing a covered rink at Parc des Saphirs in Boischatel, Quebec, and assembled a multidisciplinary team to respond to Saint Apollinaire’s request.

“Municipalities are finding that there’s an appetite for these types of structures, especially with the freezing and thawing we have during winters, which makes it hard to keep outdoor ice in place,” said Michel Veilleux, Associate Architect at ABCP Architecture. “These covers are less expensive than building an entire arena. They’re also versatile; the facility helps limit the cancellation of activities due to bad weather and gives citizens a place to gather and play year-round.”

Hybrid Design Makes Strategic Use of Wood

L’Espace Philippe Boucher’s graceful distinction is expressed in the large, hybrid wood- and steel-framed roof supported by turned wood columns. The structure is composed of 11 hybrid trusses, each made with glulam top chords and a steel sub-tensioning system. The depth (or cross section) of the



wood truss chords varies along the length of the girders, based on loading requirements. The hybrid trusses span 98-feet-5-inches despite a relatively low depth, leaving a clear height under the structure of 19 feet.

Glulam beams, ranging in depth from 19 to 31-1/2 inches, make up the secondary structure and function as a support for the GLT decking, which is manufactured using dimension lumber, just like the glulam beams and columns. Half-inch-thick plywood fastened on top of the GLT acts as a diaphragm.

A unique colonnade of V and inverted V glulam columns lines both sides of the rink, each column tilted slightly toward its center. “We wanted the structure to be read as one simple and coherent gesture,” noted Veilleux. “It’s always a challenge

PROJECT DETAILS

L’Espace Philippe Boucher

LOCATION: Saint-Apollinaire, Quebec

STORIES: One story

SIZE: 23,412 square feet

COMPLETED: 2022

PROJECT TEAM

OWNER/DEVELOPER: Municipalité de Saint-Apollinaire

ARCHITECT: ABCP Architecture

ENGINEER OF RECORD: L2C Experts –
Conseils en Structure

MASS TIMBER ENGINEER: Construction les Charpentistes

GENERAL CONTRACTOR: Ronam Constructions Inc.

MASS TIMBER PRODUCER: HASSLACHER Group

MASS TIMBER INSTALLER: Construction les Charpentistes

Connect with the L’Espace Philippe Boucher project team at <https://www.woodworksinnovationnetwork.org/projects/espace-philippe-boucher>



to elegantly integrate structural bracing, especially in an exterior structure where the skeleton is completely exposed. So, from the very beginning of design, our intention was to merge the load support of the roof with its bracing to create a single element.”

While they could have achieved the 98-foot spans with just wood, they chose a hybrid approach—both for aesthetics and budget. “We wanted to make efficient use of wood volumes, and we wanted the roof line to be simple, clean, and thin, so we thought the wood and steel combination was a good choice,” Veilleux added. “We considered other types of structures, but we felt that the V-shape for the columns made this one distinctive and unique. Combined with steel tension members for the wood trusses, it’s an efficient design.”

A small structure housing the ice refrigeration system sits between the rink and adjacent multipurpose center, which houses the Zamboni garage and locker rooms. Wood cladding comprised of vertical cedar planks stained in natural color covers the small structure and bridges the two volumes.

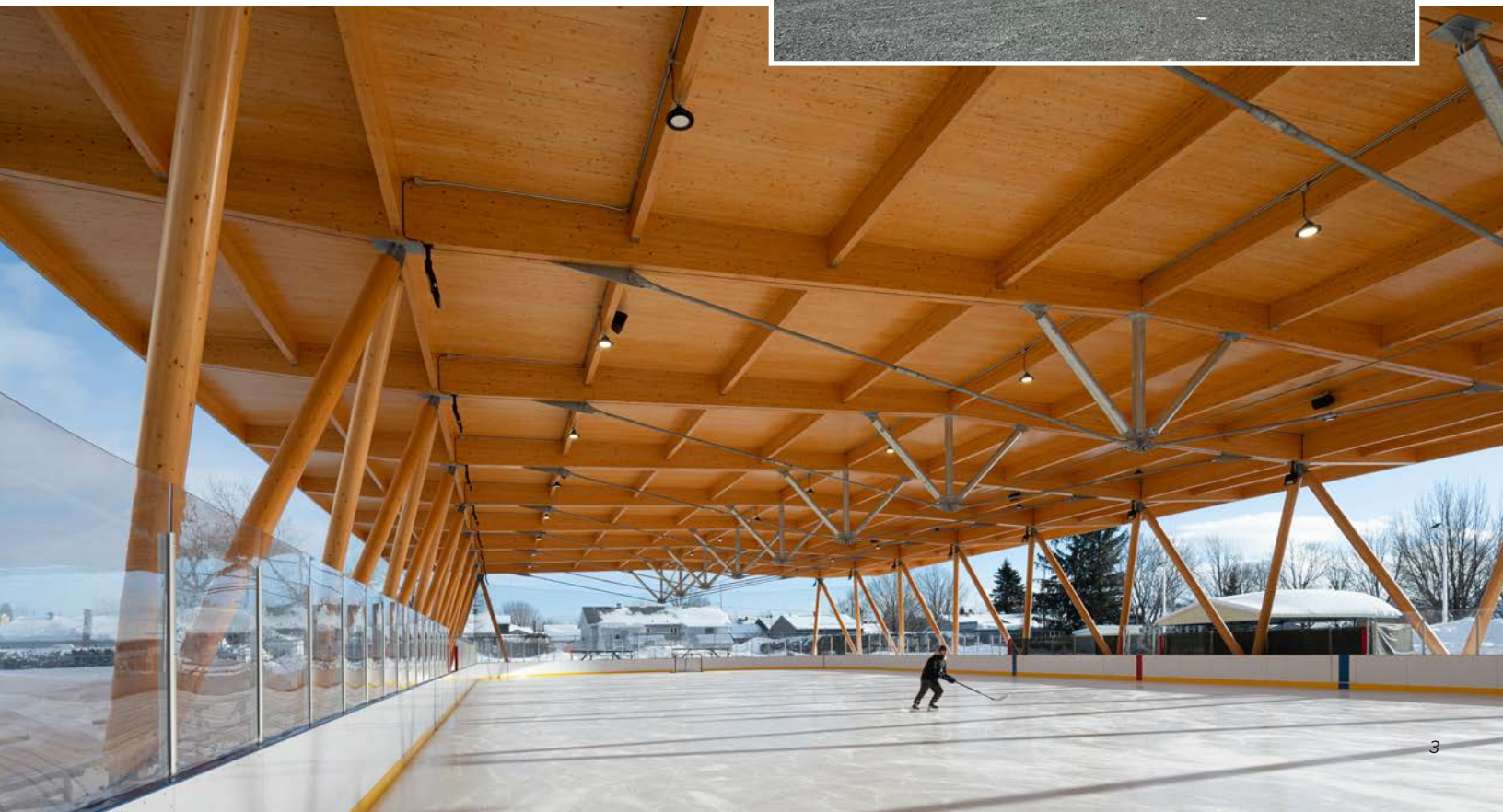
Graceful Columns Round Out the Design

The round wood columns set this project apart, but to create the appearance of a suspended canopy, ABCP originally thought they’d have to use steel columns with a thin profile.

“We wanted the columns to be really thin, to create the illusion of a canopy floating in air,” said Veilleux. “But when we tried to convince the client to use steel, they wanted wood. Strangely, we usually try to promote wood, but didn’t think it was possible to find a wood column that was almost as thin as steel.”

They succeeded, however, and were even more delighted to discover that round wood columns would work. “You don’t see the edges; they’re cleaner and the round shape makes them look even thinner,” said Veilleux. “The connections at both the top and bottom of the columns are simple, and we’ve even hidden the electrical conduits inside the columns themselves. The quality of the wood is also impressive; the finish gives a nice effect that we didn’t expect. We now think the timber columns are one of the most beautiful things about the project.”

Engineers at L2C Experts worked to optimize the lateral and diaphragm design by angling the columns to serve as a bidirectional wind and seismic bracing system extending along both sides of the ice rink. “We used inverted V as well as V bracing, which allowed us to quickly transfer loads from the diaphragm to the foundation,” said Jean-Philippe Carrier, Associate Principal at L2C. “We designed the diaphragm for strength as well as deflection; plywood panels have a different nailing pattern at the ends and at the center to ensure strength.”





L'Espece Philippe Boucher



Volume of wood products used:
12,042 cubic feet



U.S. and Canadian forests grow this much wood in:
1 minute



Carbon stored in the wood:
299 metric tons of CO₂



Avoided greenhouse gas emissions:
116 metric tons of CO₂



TOTAL POTENTIAL CARBON BENEFIT:
415 metric tons of CO₂

EQUIVALENT TO:



88 cars off the road for a year



Energy to operate 44 homes for a year

Source: US EPA

Estimated by the Wood Carbon Calculator for Buildings, based on research by Sarthre, R. and J. O'Connor, 2010, A Synthesis of Research on Wood Products and Greenhouse Gas Impacts, FPLInnovations. Note: CO₂ on this chart refers to CO₂ equivalent.

Reducing Carbon Impact

The use of wood lowers a building's carbon impact in two ways. Wood continues to sequester carbon absorbed by the trees while they were growing, keeping it out of the atmosphere for the lifetime of the building—longer if the wood is reclaimed at the end of the building's service life and re-used. Meanwhile, the regenerating forest continues the cycle of carbon absorption. Wood products also require less energy to produce than other building materials, and most of that comes from renewable biomass (e.g., bark and sawdust) instead of fossil fuels. Substituting wood for fossil fuel-intensive materials is a way to avoid greenhouse gas emissions and reduce embodied carbon.

The sleek roof line was made possible by the hybrid truss configuration. "It helped to put the top truss members in positive and negative bending as well as compression, which kept them shallow," said Carrier. "We modeled many designs and found this hybrid configuration to be the most cost effective."

Designed for Durability

Municipalities are always challenged to maintain their facilities on minimal budgets, and Veilleux said they kept this in mind during design. Concrete pilasters and galvanized steel connectors at the bottom of the columns protect against contact with surface water and prevent impact damage from maintenance equipment, while the large roof overhangs shed water away from the glulam columns.

HASSLACHER Group supplied the glulam beams, circular columns, and glulam truss components. All wood elements were treated at their factory with three layers of coating that protects the wood from moisture and UV degradation. The mass timber elements were then shipped to Canada from Europe, and the hybrid wood-steel trusses were fabricated in Quebec.

"The finish of the wood is really clean, almost like millwork," Veilleux said. "Visitors consider a wood roof to be a unique feature for an outdoor facility like this. It's warm; it looks like a wood canopy that they would have at their home, so they feel comfortable underneath it."

Welcome to the Great Outdoors

Wood was a good choice for this unusual outdoor application, says Veilleux. "The community has been impressed by the warmth of the wood, by the design, and by the space this gives them for hockey, skating, basketball, pickleball, and more. It's a very popular place, and we would never have been able to provide the same quality experience with steel. I would have loved to have had something like this when I was young."

Carrier agreed, adding, "I've skated there with my son. It's impressive because when we go to play hockey, I see people who come not just to skate, but also to see the structure. No one does that with a steel roof."

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Image: Stéphane Groleau (finished photos) / Construction les Charpentistes (construction photo)
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