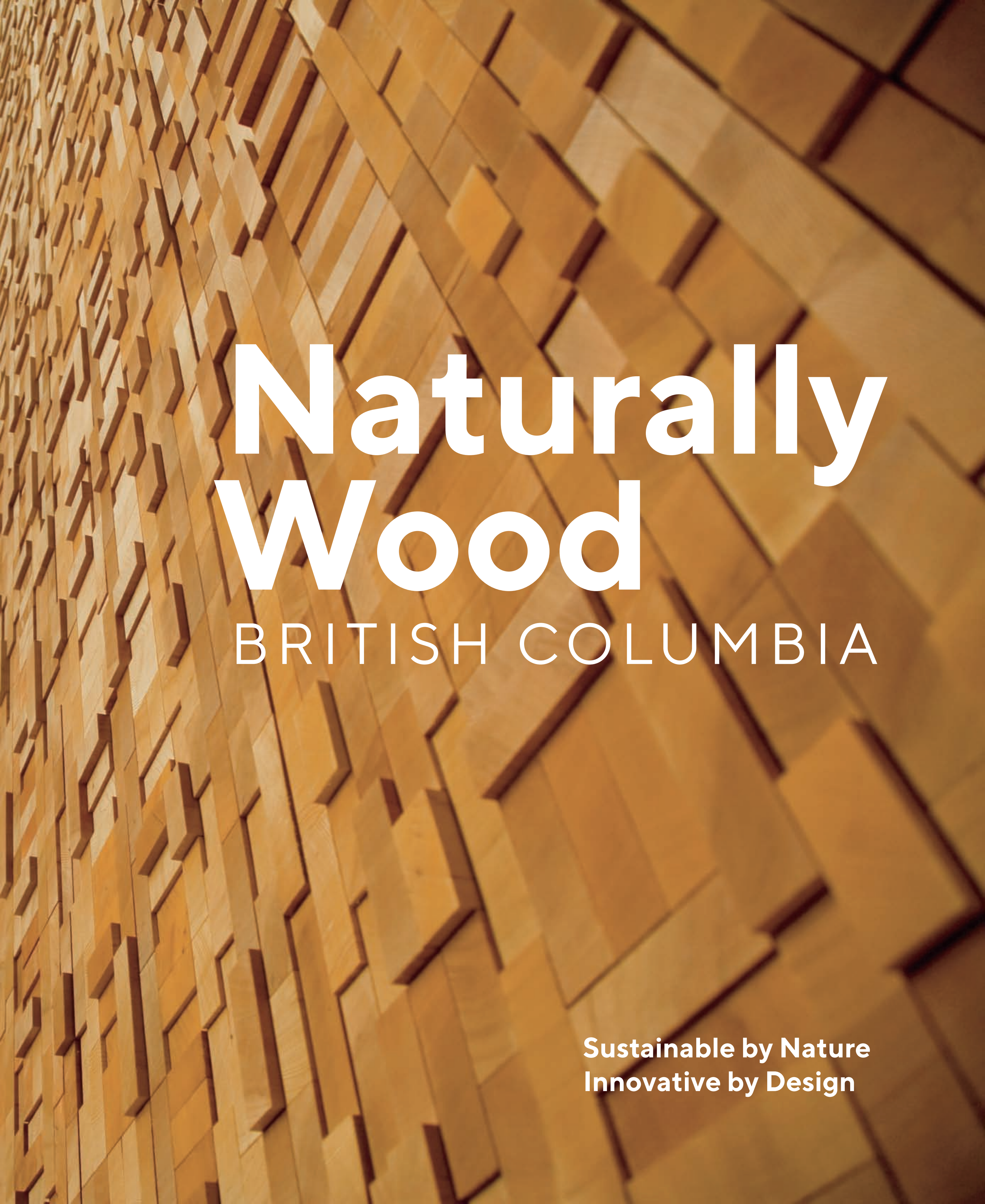


Naturally Wood

BRITISH COLUMBIA

Sustainable by Nature
Innovative by Design

Mass Timber's Mass Appeal

What Is Mass Timber?

The term mass timber can refer to a category of wood products, or a form of construction, that uses large, engineered wood products and systems to form the primary structure of a building. Mass-timber products complement light- and heavy-timber framing options and are commonly fabricated as panels, columns, and beams.

What Are the Benefits of Mass Timber?

Because it comes from forests that are sustainable and renewable, mass timber is an environmentally friendly building material. With its high strength and dimensional stability, it has a growing appeal to building professionals as an alternative to concrete, masonry, or steel in many building types. Hybrid construction pairs the high strength-to-weight ratio of mass timber with concrete and/or steel to create a cost-effective and sustainable building system.

What Are the Different Types of Mass-Timber Products?

Cross-laminated timber (CLT)

CLT is an engineered product consisting of layers of dimension lumber (usually three, five, or seven) oriented at right angles to one another and then glued to form structural panels.

Dowel-laminated timber (DLT)

DLT is a mass-timber panel product created by stacking dimension lumber together on its edge, friction-fit together with hardwood dowels. DLT is the only all-wood mass-timber product with no metal fasteners, nails, or adhesives.

Glue-laminated timber (glulam)

Glulam is composed of dimension lumber pieces bonded together with durable, moisture-resistant adhesives. The grain of all laminations runs parallel with the length of the member.

Laminated strand lumber (LSL)

To make LSL, thin strands of wood are aligned parallel to the length of the member, glued under pressure, and then machined to consistent finished sizes.

Laminated veneer lumber (LVL)

LVL is made of dried softwood veneers, glued together so that the grain of each veneer is parallel to the length.

Mass plywood panel (MPP)

MPP, sometimes dubbed "super plywood," consists of several layers of wood veneer glued and pressed together in alternating directions of grain.

Nail-laminated timber (NLT)

NLT is created by stacking dimension lumber together on its edge and fastening it together with nails or screws. It can be site built or fabricated in panels off-site.

Parallel strand lumber (PSL)

PSL is manufactured from veneers that are clipped into long strands, laid in a parallel formation, and then bonded together with an adhesive to form the finished structural member.

Adapted from Perkins+Will's *Wood 101 and Mass Timber Pocket Guide*

DIMENSIONS MAY VARY BY MANUFACTURER

CROSS-LAMINATED TIMBER

LAMINATED VENEER LUMBER

DOWEL-LAMINATED TIMBER

MASS PLYWOOD PANEL

GLUE-LAMINATED TIMBER

NAIL-LAMINATED TIMBER

LAMINATED STRAND LUMBER

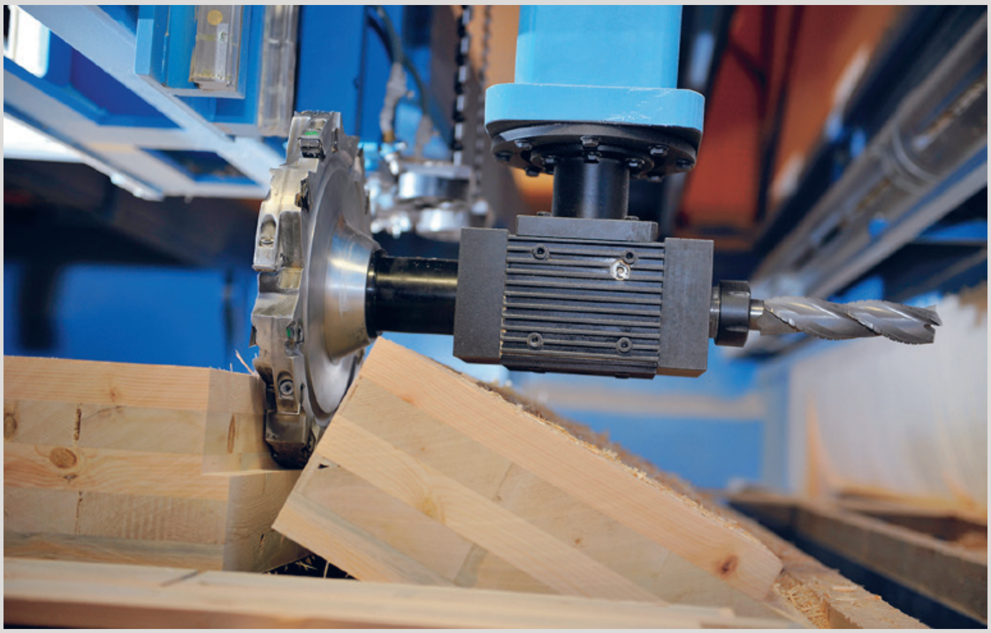
PARALLEL STRAND LUMBER

ESSAY

Timber Tech

Chronicling the technological advances in British Columbia's wood industry

BY JIM TAGGART



CLT fabricated using CNC technology.

The Wood Innovation Research Lab at the University of Northern British Columbia gives much-needed space to test and research state-of-the-art building systems.

In many countries, wood was the first building material, chosen for its strength, versatility, and workability. In B.C., archaeologists have dated the remains of an Indigenous pit dwelling at X̱á:ytem (Hatzic Rock) to at least 5000 BC. The site, eighty kilometres east of Vancouver, was designated in 1992 as a national historic site of Canada for its spiritual value to the Stó:lō Peoples. Pit dwellings employed simple log construction, but over the centuries, more sophisticated forms of wood building were developed and refined. Impressive handcrafted post, beam, and plank longhouses were much in evidence when the first Europeans arrived in the late eighteenth century.

European settlers introduced other hand-building techniques, including the squared-log construction popularized by the Hudson's Bay Company. Then, in the late 1800s, things began to change with the mechanization of sawmills and the introduction of mass-produced nails. Light-wood-frame construction became the norm for smaller buildings, while post-and-beam construction, using nail-laminated decking and simple iron- or steel-plate connections, became the standard for larger ones. Historic examples of the latter—precursors to the recent mass-timber movement—can still be found in Vancouver's Gastown.

The industry grew over the next century, driven by an increasing population and rail and road connections to new markets, but little changed technologically. Notable exceptions were the introduction of plywood, first manufactured in B.C. in 1913; and glue-laminated timber (glulam) beams, first manufactured in North America in 1934 but not widely used in B.C. until after World War II. These were the first engineered wood products (EWPs). EWPs offer certain advantages over solid-sawn lumber, eliminating considerations such as shrinkage due to changes in moisture content, size limitations, and variable strength due to knots and splits.

In the 1970s and '80s, new EWPs were developed, beginning a new era in timber engineering and generating an expanded understanding of the potential of wood structures. EWPs are created using veneers, strands or smaller sections of wood glued together and formed into panels or beams—with dimensions limited only by the size of the press and the constraints of road transportation.

The manufacturing process eliminates defects, improves dimensional stability, and enables larger spans.

Most notable of these EWPs is parallel strand lumber, a beam product developed in B.C. that has been used in many large buildings including the University of British Columbia's (UBC) Forest Sciences Centre and Surrey's Central City. Another new EWP was laminated strand lumber, a large-scale panel product used in projects such as Gilmore SkyTrain Station and North Vancouver City Hall.

B.C.'s architects, engineers, and fabricators are keeping pace with international innovations, importing new, highly efficient connectors from Europe. These connectors provide engineers with alternatives to the simple steel plates that were the default solution for decades. European connectors offer a variety of solutions applicable to different load conditions. The advantage is superior performance, which is achieved through more careful attention to the unique properties of wood, including its different strengths parallel and perpendicular to grain and the greater strength achieved by spreading the load across the fibrous structure, rather than concentrating it at a single point. Some of these connectors are variations on bolts, pins, and screws, while others require complex yet highly precise machining of joints.

These latter types are best accommodated using a computer numerical control (CNC) machining process. The introduction of sophisticated CNC machinery, and the 3-D digital models used to instruct them, constitutes a significant technological advancement in contemporary wood building technology. CNC machines can also be used to cut, rout, and drill wood members of all shapes and sizes with unprecedented speed and accuracy.

In 2001, B.C.'s first CNC machine fabricated structural wood products for the Saulteau Community Centre and then the Prince George Airport, both of which feature glulams machined to an elliptical cross-section. Digital fabrication is now used by at least four timber fabricators in British Columbia. All four companies have worked extensively in international markets, designing and prefabricating structures of all types, from custom houses to large commercial projects.

The speed and precision of CNC fabrication can save a great deal of time and expense on site by bringing multiple operations into the factory. This can include pre-drilling all holes for mechanical and electrical systems, and pre-installing connections. More and more buildings are being created as an entire "kit of parts" so that site assembly becomes similar to children's building blocks—but on a grand scale.

This analogy has become more appropriate since the arrival of cross-laminated timber (CLT) in British Columbia. Constructed much like plywood, with alternating layers of small dimension lumber laid up in panels up to eight feet wide, forty feet long, and twelve inches thick, CLT has the capacity to displace other materials for large-scale commercial projects, given its smaller carbon footprint and environmental advantages. B.C. companies began manufacturing CLT in 2011, initiating a new phase of the revolution in wood building technology.

To maximize the time and cost advantages of building large structures in engineered wood, design and construction professionals engage in an integrated process in which entire buildings are constructed as virtual 3-D models, providing the opportunity to optimize building systems, identify and eliminate conflicts that might otherwise arise in the field, and even follow the construction process in the virtual world before breaking ground on site. This process was employed to great effect in the eighteen-storey Brock Commons Tallwood House at the University of British Columbia.

Prefabrication can be applied to structural members such as posts and beams; to building elements such as roofs and walls; or even to volumetric modules. Some of them, like the roof for the visitor centre of the VanDusen Botanical Garden, are extraordinarily complex. Increasingly, roof and wall panels are being designed to meet the rigorous Passive House energy conservation standard, such as at the Audain Art Museum in Whistler, or the Bella Bella Staff Housing project, which takes advantage of volumetric prefabrication, including fully finished modules. Prefabrication by B.C. companies is increasingly being used to construct highly repeatable buildings, such as residential dormitories and hotels.

Over the past twenty-five years, British Columbia's industry has embraced the emerging technologies of mass-wood design and construction and created a remarkable series of demonstration projects, including high-rise buildings and long-span structures. The Richmond Olympic Oval has a wood roof that covers a vast area with no interior support, while the Wood Innovation and Design Centre in Prince George is a thirty-metre-high academic and office tower that contains no concrete between the ground-floor slab and the mechanical penthouse.

Over this same time, old technologies like nail-laminated timber have been updated and revived in projects such as public transit stations and modern office buildings, and new products have been introduced, such as dowel-laminated timber, a panel product that uses dowels to join laminations, making it easier and safer to cut and shape. We are seeing a growing list of precedent-setting innovations in the province, such as the world's longest-spanning timber catenary roof crowning Grandview Heights Aquatic Centre, or the first-of-its-kind CLT cantilevered staircase in UBC's Earth Sciences Building.

Not far from UBC's gravity-defying CLT staircase is the Centre for Advanced Wood Processing at UBC, a national centre for education, training, and technical assistance for the wood-products manufacturing industry. Home to cutting-edge training and robotic technology, the centre is helping fuel the next generation of professionals and entrepreneurs who will come up with further innovations and breakthroughs. This includes training in product development and wood finishing, as well as company-specific in-plant training. Similarly, the non-profit firm FPInnovations supports innovators through practical research in a variety of areas ranging from forest operations and wood products manufacturing to the performance of advanced wood building systems. This includes real-life seismic testing and validation of products and systems for projects such as the Earth Sciences Building, the Wood Innovation Design Centre, and Brock Commons Tallwood House.

With a combination of enterprise and technology, the B.C. wood industry has developed a depth and breadth of expertise in modern mass-wood construction that firmly positions it as a world leader.

Timber Gets Top Marks

People spend as much as 90 percent of their time inside buildings, and for children, adolescents, and young adults, much of this time is spent in school and educational environments. It is clear that the design of our schools is of critical importance to the health of future generations—an intuitive conclusion now increasingly supported by scientific evidence. In fact, the presence of visible wood is correlated with lower sympathetic nervous system activation—the body's response to stress—and improvements in concentration and test performance.

Along with health and wellness, there is a growing list of compelling reasons to use wood in the construction of our schools. In the past, concrete or other types of materials were favoured for fast construction, but today, prefabricated wood construction is often faster, a boon for school districts looking to reduce construction time and accommodate busy school schedules. B.C. schools place a high value on natural materials, environmental performance, sunlit spaces, and more flexible, open layouts—all the features that wood is best at. Wood also has acoustical properties that can be used to control sound, and thermal properties that help ensure comfort while remaining energy efficient. And with wood's prefabrication advantage, schools can be built with better quality in less time. All these benefits are making timber a top choice for B.C. schools, whether early-childhood, elementary, secondary, or post-secondary.

Begbie View Elementary School
OWNER B.C. Ministry of Education
ARCHITECT DIALOG
STRUCTURAL ENGINEER Read Jones Christoffersen
LOCATION Revelstoke

Lalme' Iwesawtexw (Seabird Island Community School)

Agassiz

While often described as resembling a bird preparing for flight, the enigmatic-yet-elegant, all-wood form of this school suggests different creatures to different observers. The design draws inspiration from traditional First Nations longhouses, with a parallel-frame post-and-beam structure wrapped almost entirely in cedar-shingle cladding, its silvery, sloping trapezoidal shapes echoing the mountainous landscape of its Fraser Valley setting. Working side by side with the owners, the local Seabird Island Band, the architects designed a building with the potential to take on a life of its own.

Completed in 1988, before computer modelling was common, the design was conceived entirely through hand drawings and physical modelling. The school was built by members of the Seabird Island Band, which is a member of the Stó:lō Tribal Council. With no digital tools available at the time, the physical model became a critical tool for the construction team, illustrating how the framing was to be put together and helping to confirm the wood's dimensions and measurements on-site. The project is celebrated for its collaborative, community-based approach, which provided training for members who worked on the project and drew on principles of co-design—a model that calls for architects working with Indigenous communities to listen extensively to community members and meaningfully incorporate their design ideas.

OWNER Seabird Island Band
ARCHITECT Patkau Architects
STRUCTURAL ENGINEER C.Y. Loh Associates Ltd.
COMPLETION 1988 **SIZE** 2,190m^2

Southern Okanagan Secondary School

Oliver

In 2011, a fire destroyed the much-beloved art deco–style Frank Venables Theatre and the attached Southern Okanagan Secondary School, which was originally constructed in 1949 and was undergoing a major renovation at the time. School District No. 53—which serves the southern Okanagan and Similkameen regions of the province—joined forces with the broader school community to rebuild the facility, which was unveiled three years later.

The classroom block and library were reconstructed, a new theatre built, and a neighbourhood learning centre added. The plan is centred on an open-ended, south-facing courtyard, and is anchored at one end by the theatre and at the other by the neighbourhood learning centre. A multi-purpose room, located in the middle of the central wing, is the physical and social heart of the school. The building's circular rotunda sits ceremoniously on a gentle grassy hill, conveying a proud vernacular in the face of the disaster overcome by the community.

Wood is used throughout the building, most impressively in the double-height multi-purpose room. Here, an elegant glue-laminated timber structure—comprising turned posts, diagonal branches, and a hexagonal arrangement of roof beams—is the commanding focal point of the space. Along the corridors, and in some high-impact spaces such as the science labs and gymnasium, birch plywood panelling is used on the walls as a hard-wearing yet aesthetically pleasing finish.

OWNER B.C. Ministry of Education
ARCHITECTS KMBR Architects Planners Inc. and HDR | CEI Architecture Associates, Inc.
STRUCTURAL ENGINEER CWMM Consulting Engineers Ltd.
COMPLETION 2014 **SIZE** 11,100 m^2

École au-cœur-de-l’île

Comox

This flexible and versatile structure on the east coast of central Vancouver Island is a thoroughly modern school by day and a hub for the local francophone community by night. The facility is organized around four distinct pods, each containing a mix of learning spaces, meeting and multi-purpose rooms, student tech areas, teacher workstations, and learning commons. A multi-purpose gymnasium can accommodate a variety of sport, recreation, and cultural events.

Wood is used extensively throughout the building, including a large-scale 2,960-square-metre timber roof structure. Interior spaces make innovative use of exposed glue-laminated timber beams and mass-timber panels to form unique reading alcoves and multi-purpose spaces. Flooded with sunlight, these smaller spaces within the superstructure look out to a grove of nearby coniferous trees, providing an inviting sense of comfort and scale while connecting occupants to nearby nature. These solid wood elements create a durable and warm interior surface that matches the finish of the roof’s expansive wood structure.

Reclaimed Douglas-fir was recovered from the site’s previous building to enhance the new structure. A dramatic 7.5-metre glazing wall features the reclaimed timber as mullions, supporting wind loads. The remaining salvaged wood is used as benches and display cabinets. Additional millwork is constructed of veneer-core birch plywood with exposed edges. Custom perforated plywood panels serve as balustrades and acoustic wall panelling. Natural ventilation, geoexchange energy, and rainwater harvesting complement this building’s extensive use of sustainably harvested wood, both old and new.

OWNER B.C. Ministry of Education
ARCHITECT McFarland Marceau Architects Ltd.
STRUCTURAL ENGINEER Equilibrium Consulting Inc.
COMPLETION 2011 SIZE 4,500 m^2

Cordova Bay Elementary School

Saanich

Located on south Vancouver Island, just north of the provincial capital, Cordova Bay Elementary School demonstrates the abundant benefits of building schools with wood.

The speed, versatility, adaptability, and reduced noise of mass-timber and prefabricated, panelized wood building systems was a boon for this multi-phase demolition and reconstruction that took place during the school year.

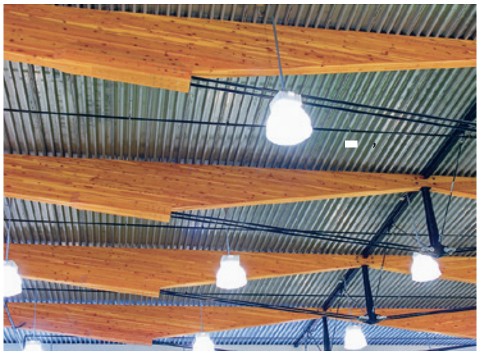
A strategic mix of cross-laminated timber (CLT) and nail-laminated timber (NLT) helped cut costs and maximize value while delivering exceptional stability, structural efficiency, and seismic performance, which is critical in this region. The robust structure is composed of NLT roof panels atop a glue-laminated timber post-and-beam structure framed with CLT walls. It accommodates a four-classroom wing, library commons and computer lab, seminar rooms, and multi-purpose spaces. Sliding partitions provide flexible classroom sizes, and a new corridor extends to an outdoor courtyard that doubles as a practical teaching space.

Expansive airtight glazing provides students and teachers with ample natural daylight, and is complemented by the warmth of exposed wood throughout. Beyond aesthetics, the generous use of visible wood delivers added thermal and acoustic benefits. Overall, the project showcases how schools can take full advantage of wood to construct beautiful, affordable, and safe learning environments that can serve their communities for decades to come.

OWNER B.C. Ministry of Education
ARCHITECT Iredale Architecture
STRUCTURAL ENGINEER Herold Engineering Ltd.
COMPLETION 2016 **SIZE** 1,533 m²

Sk'elep School of Excellence

Kamloops



As one of the largest First Nations elementary schools in the province, the Sk'elep School of Excellence plays a vital role in teaching and preserving the culture and language of the Tk'emlúps te Secwépemc.

The school's geometric design rises boldly from the benchlands above the North Thompson River. Its exterior palette of corrugated metal cladding, stucco, cedar, and cultured stone blends fittingly with the dry, desert-like terrain. The structure features an innovative timber two-way lattice made of sawn hem–fir timber elements. The grids effectively form the wood version of a concrete waffle slab. The gymnasium's roof trusses consist of an elegant hybrid between glue-laminated timber (glulam) beams and a king-post truss. To achieve this, a pair of glulam beams, symmetrical to the centre line, connect together into a king-post truss with double steel-rod bottom chords. This unique timber structure is one of the first of its kind in Canada.

OWNER Tk'emlúps te Secwépemc Indian Band
ARCHITECT Iredale Architecture
TRUCTURAL ENGINEER Equilibrium Consulting Inc.
COMPLETION 2009 **SIZE** 1,719 m²

Samuel Brighouse Elementary School

Richmond

Built primarily of locally sourced wood and mass timber, this school provides educators, support staff, and more than five hundred students from kindergarten to grade 7 with modern classrooms, offices, special education facilities, a computer lab, a library, and a gymnasium. It also contains an adult literacy centre that serves the wider community in Richmond, the city immediately south of Vancouver.

The school's sustainable design and community garden reinforce a curriculum focused on environmental stewardship. The two-storey atrium offers students a dramatic and inviting entry to the school, its double-height glazing flooding the common space in warm, natural light. The facility's abundant use of wood includes a post-and-beam structure, wall framing, roof decking, millwork as interior doors, and protective wall panels. The school's signature undulating nail-laminated timber roof, made with two-by-fours and steel V-shaped king-posts, demonstrates the beauty and structural capacity of dimension lumber. Its prefabricated panels—much of the wood coming from forests affected by the mountain pine beetle—were built off-site, expediting construction and cutting the installation time by half. The roof offers the added benefit of passive ventilation, through windows at the peaks of each wave.

OWNER B.C. Ministry of Education
ARCHITECT Perkins+Will
STRUCTURAL ENGINEER Fast + Epp
COMPLETION 2011 **SIZE** 4,777 m²

Timber Is Top of the Class

School principal Rob Comeau talks about why wood is good for schools

INTERVIEW BY DAVID WYLIE

Abbotsford Senior Secondary School, rotunda.

Located seventy kilometres east of Vancouver in the Fraser Valley, Abbotsford Senior Secondary School features wood as part of a major rehabilitation and replacement project. Central to its design, and crowning the school's three-storey structure, is an intricate and impressive timber rotunda roof built of exposed glue-laminated timber and wood decking. School principal and educator Rob Comeau shares how wood is making the school a place where students feel at home, whether they're enjoying a piano concert in the rotunda or getting hands-on experience building a tiny wood house as part of their green technology program.

Q: Why did you pursue a career in education?
A: I was born and raised in Alberta on a farm. I did my undergrad in agriculture and came out at the wrong time to be a farmer and rancher in the early 1980s. I went to my second love, which was teaching.

Q: Describe your connection to wood as a building material.
A: When working on the farm, wood was a tool. It was a fence post, it was a crossbeam, it was the outside of a grain bin. It was simply functional. On the farm, it wasn't meant to create an emotion, but here in B.C. you see the craftsmanship that people can put into the design of a building and how beautiful wood can look.

Q: What makes a school well designed?
A: Open spaces and light are some of the best design qualities in a school. If you're in a dark, dingy cubicle, you're not feeling very good about where you are. When you can see light and the natural craftsmanship of wood that exists here, those are good design features. That's B.C. architecture—light, wood, and space.

Q: Abbotsford Senior Secondary School underwent a major rehabilitation and replacement project. Can you elaborate on how wood was used in the structural and finishing components?
A: It's a blend of old meets new and it's done in a classy way. When you walk in, you're immediately drawn to the grandeur of the rotunda. There are some very interesting design pieces that catch your eye when you come in. Aesthetically, wood is beautiful, and it speaks to who we are as British Columbians.

Q: How did the new design of the school reuse some of the existing wood from the original structure?
A: When they took the ceiling out, they found beautiful rafters. They looked at them and they said, "We can't destroy this." We've exposed those rafters, stained them, and it is the most gorgeous, inviting gym that you'd ever want to walk into. And some of the older parents still recognize the wood from beams we've repurposed as seats in our rotunda. It's a conversation starter of their memories and time in the school. Now our international baccalaureate business class is going to open up a coffee shop and we're going to take those remaining reclaimed beams and make them into the countertops and high-top tables—refashioning that wood one more time to create another wonderful part of the building. Wood has a way of speaking to you, years, even decades later.

Q: Research is demonstrating that the visual presence of wood indoors can significantly reduce stress levels. Do you experience this in your school?
A: I think you definitely feel better once you've been in a space that incorporates wood. It clears your head. We often have students that just come to the rotunda to be there, enjoy the space, and hang out. It's open and the wood beams are beautiful and inviting. I think it helps with anxiety.

Q: What other benefits do you think the wood and architecture provide?
A: The acoustics in the rotunda are pretty amazing. We recently had an assembly with a baby grand piano in the middle of the rotunda and it was a rich, concert-hall kind of sound in there. I don't think it was necessarily designed to be an acoustic hall but it's certainly a richer sound than you would ever get in a gymnasium. Also, any time you can get quality product right in your backyard, why not use it? It creates jobs in B.C. all throughout the forest industry.

Q: How is wood contributing to sustainability and environmental stewardship at your school?
A: Each of us needs to adjust our carbon footprint and as a naturally renewable material, wood has a role to play. We also have a green technology program for students, along with our own wood program, and this year we're going to be building a tiny house, constructed of local wood.

Q: How is wood part of our cultural identity as British Columbians?
A: There's nothing more majestic than a cedar tree and witnessing what an artist can make out of that. We have First Nations carvers come in every couple of years and do a piece for us. The carvers speak about the cultural aspects of the piece they're working on and what it means. The students get an opportunity to watch them carve and also be able to learn how to carve. We have a totem pole right at the front of the heritage room and a few other commissioned pieces. They all tell a story, and I believe there is great value in sharing that with students, passing it on from generation to generation.


Abbotsford Senior Secondary School

UniverCity Childcare Centre

Burnaby

Nestled in the dense heart of the Simon Fraser University campus, surrounded by trees and a park-like setting, this daycare centre provides early childhood education for fifty preschoolers, using a unique educational programming model that embraces environmental sustainability. It is one of the first childcare facilities in the world to register for the Living Building Challenge—architecture's most rigorous performance standard, which requires sustainable design strategies including exemplary indoor air quality, locally and responsibly sourced wood and other materials, and net-zero energy and water usage.

The L-shaped building includes activity areas for two classes of twenty-five children, connected by a shared lobby, kitchen, washrooms, and reading loft. An exposed steel frame supports a solid-wood roof and exterior wall structures constructed of nail-laminated timber (NLT) panels, which serve as both secondary structure and interior finish. NLT panels, made from salvaged wood affected by the mountain pine beetle infestation, create a corrugated surface that adds visual interest and improves the acoustics of the busy activity spaces. The exterior is clad with western red cedar and the door and window surrounds are milled from reclaimed wood. This exceptionally high-performing building provides children and staff with a warm, welcoming, and healthy environment that is conducive to both learning and play.

OWNER SFU Community Trust
ARCHITECT HCMA Architecture + Design
STRUCTURAL ENGINEER Fast + Epp
COMPLETION 2012 SIZE 530 m²

Nicola Valley Institute of Technology

Merritt

Modern and traditional, high- and low-tech: contrasting design features are united in one of Canada's first facilities dedicated to providing a uniquely Indigenous perspective to post-secondary students. The building's design reflects the cultural characteristics of the Indigenous Peoples of the region while providing up-to-date learning spaces, classrooms, faculty offices, social spaces, labs, a bookstore, a cafeteria, and a library.

While state of the art in its function, the facility's design is faithful to Indigenous building traditions and includes the substantial use of wood and natural materials. To reflect the pit houses that are the most common traditional Indigenous structures in the Southern Interior region of B.C., the building is a combination of wood and concrete with a structural glue-laminated timber column system. The facility's primary structure is Douglas-fir columns, designed and cut using computer numerical control technology.

The exterior is clad in a yellow cedar rainscreen wall. Windows are shaded with sliding cedar louvres to mitigate solar gain.

A glazed ventilation atrium with operable windows, inspired by the extended tipi used in the historic past by the Lower Nicola People, adds to this design motif, while serving as a functional element of its sustainable design.

OWNER Nicola Valley Institute of Technology
ARCHITECT Busby + Associates
DESIGN ARCHITECT Alfred Waugh
STRUCTURAL ENGINEER Equilibrium Consulting Inc.
COMPLETION 2001 **SIZE** 4,518 m^2

Forest Sciences Centre

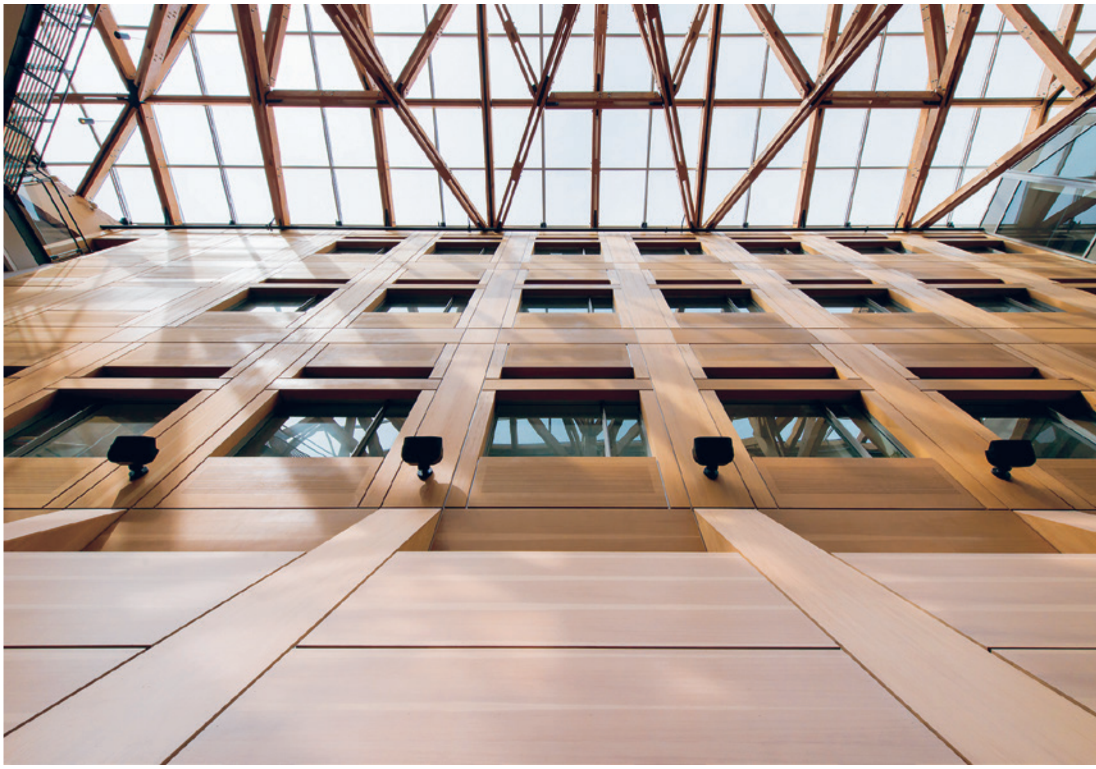
Vancouver

The University of British Columbia's Vancouver-based Forest Sciences Centre is, as its name suggests, an academic and research hub for the science and study of forestry, forest ecology, wood products technology, and innovative wood construction. Designed to showcase what is possible using B.C. forest products, the facility pushed the limits of wood construction at a time when building codes were still catching up to advances in wood technology and construction. Keen to use as much wood as possible, the design team found a solution that was at once practical and innovative—dividing the program into different uses to meet existing building codes.

The plan is bisected by a glazed atrium, with an L-shaped administration building of light-frame wood construction to the south and west and a rectangular laboratory building of concrete construction to the northeast. The laboratory, dubbed the Centre for Advanced Wood Processing, is home to North America's first robotic CNC timber processor. The atrium takes the form of a five-storey galleria, its glass roof supported on thirteen-metre parallel strand lumber "tree" columns, which re-create the feel of a forest canopy. The combination of sprinklers and automated smoke vents, together with tempered glass in the windows and skylights, provides a level of fire separation between the buildings equivalent to that of an unenclosed street.

Two decades after its completion, the facility continues to impress visitors with its innovations in wood construction, and its atrium that is coveted campus-wide by students looking for an inspiring place to study.

OWNER University of British Columbia
ARCHITECT DGBK Architects
STRUCTURAL ENGINEER CWMM Consulting Engineers Ltd.
COMPLETION 1998 **SIZE** 21,500 m^2



Centre for Interactive Research on Sustainability

Vancouver

This interdisciplinary academic centre is home to multiple research groups, and the building itself is the subject of ongoing studies on the long-term effects of sustainable design, construction, and operation.

The Centre for Interactive Research on Sustainability (CIRS) demonstrates a different approach to building design: one that is not simply sustainable, but strives to be regenerative, delivering net-positive results for both environmental performance and human well-being. To that end, CIRS integrates passive design strategies, renewable resources, and occupant engagement in the operation of the building.

The structure of CIRS is a hybrid system, with a basement and ground-level auditorium of cast-in-place concrete, and a roof of curved glue-laminated timber (glulam) beams supporting a solid-wood roof over the auditorium. The upper floors are framed of glulam beams and columns that support a solid-wood floor composed of lumber and plywood decking.

The decision to use wood was in keeping with the regenerative concept of CIRS, given it's a naturally renewable building material that locks in carbon. The spruce–pine–fir lumber in the building comes from B.C. forests that have been impacted by the mountain pine beetle infestation; use of the wood offers the same structural quality as other lumber, and helps to eliminate greenhouse gas emissions from decaying trees and foster new growth.

OWNER University of British Columbia
ARCHITECT Perkins+Will
STRUCTURAL ENGINEER Fast + Epp
COMPLETION 2011 **SIZE** 5,759 m^2

Thompson Rivers University | Old Main Revitalization

Kamloops

Located amid rolling grasslands above the confluence of the North and South Thompson Rivers in the south-central region of the province, this two-storey addition was built on top of the university's "Old Main" building to house Thompson Rivers University's law school. The eye-catching undulating timber roof echoes the surrounding landscape, and provides ample open-air space for the functional elements inside. To meet a tight summer schedule, the panelized roof structure was prefabricated off-site from glue-laminated timber beams, wood joists and plywood sheathing, and installed in only seven weeks, with the panels locking into place like puzzle pieces. Exterior soffits are finished in a smooth cedar cladding, making the sweeping serpentine roof appear like a floating ribbon of wood above the south-facing glass curtain wall.

Its lighter wood hybrid design has the added benefit of minimizing the additional load on the original 1960s structure, transforming an otherwise forgettable low-rise building into a campus focal point. A south wing comprises teaching spaces and lecture halls, while the north wing houses the law library and faculty offices. Expansive interior glazing of the double-height atrium creates transparency and sightlines between the lobby and the library reading room.

A sculptural spiral staircase complements the design—its top-floor landing accommodates a wraparound study counter with mountain views, and doubles as a panoramic venue for informal gatherings. As an altogether modern, flexible design that can shift with programming and student population changes, this is a law school ready for the future.

OWNER Thompson Rivers University
ARCHITECTS Diamond Schmitt Architects Inc. and Stantec
STRUCTURAL ENGINEER Fast + Epp
COMPLETION 2013 **SIZE** 4,180 m²

INNOVATOR

Mass Timber Is Going Mainstream

For architect and timber expert Jana Foit, you can't stop an idea whose time has come

BY KERRY GOLD

Ironically, Jana Foit, an innovator in her field, wants to retire the word "innovation" when it comes to engineered wood. The architect recalls working with a forward-thinking engineer who said it was high time that mass timber entered the mainstream. In other words, we need to remove the mystery around it because it's as practical in application as concrete or steel.

Foit, lead architect on the University of British Columbia's Earth Sciences Building—a project that led the way in building with engineered wood panels—couldn't agree more. "We have to stop talking about it as an innovation and start using it as just another material," she says, seated in the boardroom at Perkins+Will, where for fourteen years she's specialized in the construction of higher-education buildings.

Foit came to wood as a building material by accident, having landed her first job out of university at a small firm that built luxury recreational properties entirely out of custom wood. When she got to Perkins+Will, wood was already very much in the firm's tool box. There was tremendous enthusiasm to do the Earth Sciences Building out of wood-panel construction, even though cross-laminated timber (CLT) wasn't really a part of the conversation at the time. She recalls concerns around cost, and difficulty finding a contractor who could work with engineered wood construction. Eventually everybody bought in, and over time the project proved itself. "I know, because I was on-site for two years," she says. "When I talked to the contractor at the end of it, he said the cost of panelized timber turned out the same as traditional cast-in-place concrete."

At the time, the Earth Sciences Building was the largest panelized wood building in North America. It was made mostly from laminated strand lumber, with only a small amount of CLT, says Foit. Without a North American CLT manufacturer available at the time, they had to get inventive. But that was then and this is now. Wood technology has moved at warp speed.

"It's not really innovation anymore," says Foit. "B.C. has a culture of wood, and it's our province's vernacular, because we are heavily forested and there is a huge wood industry here. So it was natural that we were the first province to do something different."

As mass timber becomes mainstream, new opportunities emerge for Foit's firm. Two of the most exciting are a proposed eighty-storey-tall timber tower to be built along the Chicago River, and recent experiments to create carbon-negative composite fibres from carbon, aramid, and wood. Innovation never sleeps.

Opposite: The Earth Sciences Building's daring cantilevered stair design makes a bold statement of what is possible with engineered wood.

Earth Sciences Building
OWNER University of British Columbia
ARCHITECT Perkins + Will
STRUCTURAL ENGINEER Equilibrium Consulting Inc.
LOCATION Vancouver