Cross-Laminated Timber (CLT)

Introduction
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Overview
Cross-laminated timber (CLT) is fundamentally changing the way we design, manufacture, and build. Katerra’s investments and innovations will help CLT become the backbone for future generations of high-performance, low-carbon buildings.

North America is in the early stages of a CLT construction boom, driven by increasing demand and expanded building code acceptance of mass timber structures. CLT allows developers, designers, and builders to move beyond the traditional construction trade-offs – to create buildings that are sophisticated and efficient, rapidly assembled and structurally sound, affordable and aesthetically stunning.

As access to high-quality CLT continues to expand in North America, we believe it will become the material of choice across a broad range of market sectors, building types, and geographies.
Katerra + CLT

Katerra’s goal is to develop the most advanced mass timber building systems in the world, and to make them more widely available, more efficiently produced, and of higher quality than ever before.

CLT is much more than simply a structural building material. It is an opportunity to evolve building design and construction itself, making it easier to create buildings that are elegantly designed, efficiently built, and environmentally responsible, all while providing phenomenal long-term investment returns.

To achieve these lofty goals, we take an integrated approach and apply technology at every step of the process. Katerra is establishing end-to-end mass timber expertise and making unprecedented investments in CLT R&D, testing, manufacturing, design, engineering, and construction. With this level of control and innovation, we can provide our partners with the most cutting-edge building systems available.
“CLT is perfect for Katerra in that it’s a material that creates beautiful spaces, is designed for manufacturing, and is sustainable all at the same time. We are ready to help bring mass timber to the mainstream of U.S. construction.”

– Michael Marks
Co-Founder, Katerra
Why CLT
I’ve never seen anybody walk into one of my buildings and hug a steel or concrete column. But I’ve actually seen that happen in a wood building.”

– Michael Green
Principal, Michael Green Architecture
CLT: An Upside for Everyone

Cross-laminated timber is a building material that offers a unique combination of efficiency, strength, safety, aesthetics, and environmental benefits to deliver value across the entire construction ecosystem.

The efficiency and accuracy of manufactured materials production and having less craft in the field means faster build times, reduced labor-hours, greater risk control, and increased cost assurance.

The superior aesthetics and operational efficiencies of mass timber buildings present unique opportunities for design differentiation, high occupancy demand, and long-term asset value growth.

CLT’s inherent structural, aesthetic, and biophilic characteristics offer unique design possibilities that blend form, function, user experience, and sustainability.

As a prefabricated material, CLT moves labor upstream and offsite, speeding site build times, improving safety, and mitigating many of the risks associated with traditional construction sites.

Mass timber buildings are at the forefront of healthy and dynamic communities, providing physiological and psychological benefits to the people who live and work in them, and reducing the environmental impact of construction.
The design community has enthusiastically embraced CLT for its potential to create spaces that are both functional and beautiful, and to meet the rising demand for buildings that can be produced and operated more sustainably.

CLT’s inherent properties provide many unique structural and aesthetic advantages over traditional building materials and open up new and exciting design possibilities, including:

• Potential for increased floor-to-ceiling height
• Thinner overall floor assembly comprised of fewer independent materials
• Reduced weight on footings, gravity load, and bracing requirements

A CLT wall weighs ~75% less than concrete for a similar strength level.

Beyond these functionally superior attributes, the aesthetic qualities of building with CLT are widely recognized. Exposed wood offers a natural beauty that cannot be replicated with other fabricated materials and creates a “biophilic” effect that satisfies the innate tendency humans have to seek out and associate with nature. Moreover, recent studies demonstrate that simply being surrounded by wood triggers a positive effect on the brain, leading to greater employee retention, productivity, academic performance, and health in work settings.
Utilizing panelized CLT enables builders to employ a “just-in-time” delivery approach, which drastically minimizes the logistical challenges normally associated with traditional construction.

Seamless coordination between trades has the potential to accelerate construction schedules up to 30 percent – a statistic that is borne out of over two decades of European experience. This efficiency is driven by the unique qualities of CLT and the CLT planning process, which include:

- Prefabrication of CLT panels to meet building design requirements
- Predetermined logistics plans
- Coordination with the factory to load trucks in the sequence required onsite
- Pre-located pick locations to simplify and accelerate rigging in the field

Further efficiencies can be realized through effective coordination between the design team, manufacturing team, and construction team, and the use of multiple cranes on the same site.

Labor Efficiency

Greater onsite efficiency is made possible by CLT’s inherent material and assembly attributes. Fewer workers are required onsite as compared with traditionally built structures – an average crew size is 15 people, as compared with 30 for a concrete build. This efficiency is driven by:

- Simplified designs that facilitate easy installation
- Fewer panel picks due to large panel size
- Fewer trades onsite
Cost Benefits

CLT can deliver efficiencies and cost benefits at each stage in the construction process.

Cost-Competitive Materials
CLT is cost-competitive with other building material options. Cost savings are driven by efficiency in materials production and by a reduction in logistics and labor-hours required during installation, making it particularly cost-competitive in markets with high labor rates.

Faster Construction
The prefabricated, panelized nature of CLT results in construction times that are up to 30 percent faster than conventional concrete and steel buildings. This savings is driven by efficiencies in both materials production and onsite assembly.

Accelerated Return on Investment (ROI)
Faster build times equate to more attractive project ROI for developers, as assets can become revenue-generating on a shorter timeline, and the inherent appeal of wood buildings can support faster speed to occupancy, higher ROI per square foot, and greater lifetime value.
Benefits to Owners & Occupants

Moving beyond near-term project schedules and costs, the benefits of building with wood to long-term asset ownership and occupancy are even greater. Buildings that utilize wood to achieve “biophilia,” the innate tendency humans have to seek out and associate with nature, offer benefits that can improve a building’s long-term ROI. Exposure to wood is linked to many positive benefits for commercial and residential inhabitants.\(^1\) Hundreds of studies corroborate that natural elements like sunlight, views, vegetation, air quality, and use of natural materials have substantial impact on our health, wellbeing, and productivity.

The financial implications of wood-based biophilia are significant. Savvy investors and owners are beginning to harness these benefits to develop spaces that create more value for their businesses, residents, and communities.

Increased Density
People are more relaxed in wood environments, suggesting that similar or increased levels of comfort can be achieved in smaller spaces.

Increased Design Longevity
Visible wear and aging can be seen as a positive factor in wood materials, reducing long-term CapEx and OpEx expenditures stemming from renovations, upgrades, and redesigns.

Increased Market Demand
As general awareness grows about the inherent benefits of biophilic design for wellness and productivity, demand for spaces finished with wood materials continues to grow.

The biophilic benefits of wood-based design make projects financially compelling as long-term strategic asset investments.

\(^1\) APA ([https://www.apawood.org/designerscircle-nature-in-design-the-biophilia-effect](https://www.apawood.org/designerscircle-nature-in-design-the-biophilia-effect))
Environmental & Sustainability Impact

Embodied carbon emissions – the emissions associated with building products extraction, manufacture, transportation, and construction – account for 15 percent of annual global greenhouse gas emissions and 28 percent of global building sector emissions.1

As building energy efficiency improves and the planet rapidly urbanizes, embodied carbon is estimated to be responsible for almost half of new construction emissions between now and 2050.2 Two of the most ubiquitous conventional building materials, concrete and steel, are also among the most carbon-intensive to produce. Switching to lower carbon footprint alternatives can significantly reduce a building’s negative environmental impacts.

By contrast, wood is a renewable material that sequesters carbon during its lifecycle. Mass timber products such as CLT can provide a lighter, stronger, more sustainable alternative to concrete and steel structures. The environmental and sustainability advantages of building with CLT as compared with concrete and steel are derived from the inherent qualities of wood as a carbon-capture material, the CLT production process, and the efficiency of installation.

Material Attributes

- Wood is a renewable resource that can be regenerated through sustainable forestry.
- Trees are 50 percent carbon by dry weight; when a tree is cut down, it sequesters carbon, and when a new tree is planted, the carbon-capture potential for that plot of land is doubled.
- The carbon sequestered in a 1,000 m³ wood building is equivalent to taking more than 1,500 cars off the road for 1 year.

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1 Materials Palette (https://materialspalette.org/)
2 Architecture 2030 (https://architecture2030.org/new-buildings-embodied/)
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Production Process

• The abundance of wood as a raw material in North America means that building materials need not be imported from overseas, reducing the transportation footprint generated by imported steel and concrete.

• Less energy is consumed in the production of CLT than concrete or steel. By some estimates, wood production is roughly five times more efficient than concrete and roughly 20 times more efficient than steel.

• Due to the close connection between design and production, there is very little waste material generated during the production process.

Construction

• Less heavy machinery is required for shorter periods of time, and deliveries and jobsite traffic are greatly reduced.

• Given the relatively light weight of CLT, less concrete and steel are required to support the building structure, and these two materials account for as much as 15 percent of global carbon emissions.

• CLT’s inherent fire-resistant properties mean it can be left exposed, reducing the need for finish materials and processes.

Working with CLT offers an opportunity to develop a virtuous cycle of benefits – supporting healthy forests with responsible harvesting techniques, shrinking the environmental footprint of the building industry, reducing forest fire risk by strategic thinning of our national forests, and creating new jobs in rural communities.
Community & Construction

Site Improvements
The prefabricated, easy-to-install nature of CLT lends itself to numerous improvements on and around the construction site, including:

• Less construction site noise
• Fewer truck deliveries and less lay-down area required
• Smaller and potentially fewer cranes due to lighter weight of materials to hoist
• Reduced foot traffic onsite, due to reduced labor crews
• Decreased dependency on good weather conditions (compared to concrete)

Safety
Fewer people onsite and CLT installation sequencing lead to more effective field oversight and, therefore, fewer safety concerns. CLT crews experience fewer safety incidents for the following reasons:

• Prefabricated structural elements are safe to work above and below once installed
• Concurrent completion of walls and floors reduce incidence of falls
• Fewer power tools are required
North America is currently experiencing a boom in CLT design and construction, driven by its expanded definition in the building code, code compliance testing, and increasing demand for mass timber buildings.

Developers and builders seeking to enter this market will benefit from expanded building code permissions. In December 2018, The International Code Council (ICC) released voting results on Tall Wood Building amendments to the 2021 International Building Code (which are already adopted in Washington State, Oregon, and Utah).

**Type IV-A**
Maximum 18 stories, with gypsum wallboard on all mass timber elements

**Type IV-B**
Maximum 12 stories, limited area of exposed mass timber walls and ceilings allowed

**Type IV-C**
Maximum 9 stories, all exposed mass timber designed for a two-hour fire resistance

**Soaring Demand**
Beyond technical code changes, government support and public excitement for mass timber construction has spiked over the past few years. National press coverage has reported on the nearly 500 projects currently in design or construction in the U.S. As interest in this building material has grown, so has the ecosystem of support and service providers. Developer partners are increasingly responding to consumer and client demand for the aesthetic and environmental properties of CLT.
Why Katerra CLT
“As the only true end-to-end supplier of CLT, no other company in the world will rival Katerra’s ‘trees to keys’ CLT delivery.”

– Craig Curtis, FAIA
Architecture + Interior Design, Katerra
Why Katerra

Katerra has built a world-class mass timber operation, spanning research, architecture, engineering, sourcing, manufacturing, logistics, and construction.

We control and optimize the entire building process, taking a technology-first approach and investing in R&D and continuous innovation at each step of the value chain. Katerra’s team includes globally recognized leaders and best-in-class partners, and our production capacity and service capabilities are unmatched. The result is a portfolio of CLT structural products and full-scale building systems that will continue to expand and add value over time.

Learn more about how Katerra has developed a superior CLT offering, and how we can support your next project as either a fully integrated building partner or CLT material supplier.
Katerra continues to pioneer the vertical integration of mass timber by integrating traditionally fragmented steps in the design-build process.

Katerra’s model offers a unique value proposition: a fully-integrated building partner that can offer clients the cost, quality, and speed benefits of robust technology systems, scaled purchasing power, and high-volume fabrication.

In addition to Katerra’s end-to-end customer model, we also supply mass timber components to other design-build projects, supporting those material clients with value-added services as needed. Katerra can provide reference designs, application notes, or engineering specs, to help our customers and partners easily and effectively realize their designs and builds.
Value-Added Services
Katerra offers services to support clients throughout the CLT development process.

### Design
- Architecture and structural engineering, on a consultation or full-service basis
- Evaluation of building material options

### Engineering
- Engineer of record services for Mass Timber projects
- Structural engineering in support of design completion and material selection

### Component Design
- Creation of detailed building models and shop drawings for fabrication

### Sourcing
- Sourcing of CLT hardware and connections
- Sourcing of glulam and other related mass timber building elements

### Manufacturing
- Supply of completed, detailed CLT panels and assemblies per design specifications

### Logistics
- Delivery planning
- Loading and shipment of all CLT building components to building site

### Construction
- Construction management and oversight of labor and trades
- CLT erection

Clients may purchase materials only, any combination of services listed above, or an end-to-end, turnkey solution.

Katerra’s Mass Timber sales team representatives can support clients throughout this engagement and advise on the optimal package of services.
Katerra CLT Ecosystem: Best-in-Class

Katerra leadership combines world-class technology and operational expertise with established experts in the CLT building community. The result is an organization with an unparalleled track record across mass timber R&D, product integrity testing, design, manufacturing, and construction – a combination that makes us uniquely suited to deliver high-quality CLT product at mass scale.
Katerra CLT Leadership

Nic Brathwaite
Chief Technology Officer

Nic Brathwaite helps to develop technology strategies and implement innovative solutions to improve building quality, reduce construction time, and reduce costs. With more than 25 years of experience building technology-oriented businesses, Nic is focused on the application of technology throughout Katerra’s end-to-end building services. He served as the Chief Technology Officer at Flextronics for over a decade, where he oversaw the launch and growth of several of Flextronics’ largest business units, including an innovative push into product development. A prolific inventor, he currently owns 56 patents spanning from digital to wireless network devices.

Trevor Schick
Head of Katerra Materials

Trevor leads the Katerra materials organization. Most recently a senior vice president at Hewlett-Packard in charge of global supply chain and quality, he leverages over 15 years of experience in the electronics industry so that Katerra delivers on a promise of right materials, right cost, right time, and right quality.

Tom Keilty
Head of Commercial Building Platforms

Tom’s career in the construction industry has spanned over 30 years and two countries. As the owner and operator of an infill-oriented construction and development company in Vancouver, he gathered invaluable experience in delivering projects on difficult sites and high exposure locations. His interest in sustainable construction practices stems from his early exposure to working in Vancouver’s intensely eco-friendly urban landscape. Tom brings the unique ability to build a strong team starting in preconstruction. By understanding the goals and values from the client’s perspective, he keeps the team focused on what is most important to the client. With an easy communication style, Tom brings clarity to complex issues and he rises to the challenge of balancing quality and aesthetics with sustainable and cost-effective solutions.

Craig Curtis, FAIA
President, Katerra Architecture + Interior Design

Craig was a partner with The Miller Hull Partnership for 30 years before joining the Katerra team. Notable projects include the Bullitt Center, the world’s first commercial office building to meet the stringent requirements of the Living Building Challenge, and the $450m replacement of the San Ysidro Land Port of Entry, the busiest border crossing in the world. Craig’s success with the design of many award-winning projects was possible because of his integrated design approach: relying heavily on his team of architects, engineers, and contractors to solve complicated problems simply, creatively and elegantly, together.
Matt has 30 years of experience in the highly competitive and dynamic global electronics manufacturing and distribution industry. Since 2009, he held both Chief Operating Officer and President of Americas Operations roles at CEVA Logistics and was a member of the company’s executive board. Matt served as Executive Vice President of World-Wide Operations and Logistics at Flextronics International for 15 years. At Flextronics, he ran end-to-end contract manufacturing and logistics operations generating revenues in excess of $20 billion.

Sarah Smith leads mass timber material sales at Katerra, working closely with builders, designers, and developers seeking reliable, competitive, high-quality solutions for building with CLT. In this role, Sarah is also responsible for managing Katerra’s accounts with major national general contractors. Before Katerra, Sarah led strategy projects at AECOM, as well as providing strategic guidance to public and private sector clients on emerging markets as a management consultant for Booz Allen Hamilton.

Nick Milestone is the Director for Katerra Mass Timber. Prior to joining, Nick held the position of Director for off-site and Innovation for the Wm Hare Group (UK, UAE and Singapore), developing building systems in Mass Timber, Structural Steel, and Light Gauge Steel. Prior, Nick was the Managing Director of B & K Structures Ltd. Nick is a Director and the Chairman of TRADA (Timber research and development association), the UK’s first Timber research association founded up in 1934.

Michael founded Michael Green Architecture in 2012 with a focus on advanced wood buildings that support community, health and the environment. He is known for his research, leadership and advocacy in promoting the use of wood in the built environment, lecturing internationally on the subject. Michael is a Fellow of the Royal Architectural Institute of Canada and has been honored with North America’s most prestigious awards, including 2 RAIC Innovation Awards and 3 Governor General’s Medals (the highest awards for a Canadian architect), as well as numerous North American Wood Design Awards and International Interior Design Awards.
Marta Maj, PE, M.Eng  
Associate Structural Engineer, Mass Timber Engineering & Technology

Marta has over 15 years of experience in the design of complex structures with a special expertise in timber commercial, institutional, and residential construction. She has worked as a lead engineer on notable mass timber and CLT projects including the UMass Building in Amherst, MA, and the University of Arkansas SDRH, Fayetteville, AR.

Jason Herman  
General Manager, Spokane Valley Mass Timber Factory

Jason has 26 years of experience in high production timber manufacturing processes including, medium density fiberboard, plywood, remanufacturing, sawmilling, planers and CLT. He was the Plant Manager for SmartLam which was the first CLT plant in the U.S. Involved with CLT since 2012, Jason has toured over 60 timber manufacturing process in the U.S, 14 in Canada and 12 in Europe.

Alana Wallace  
CLT Process Engineer, Spokane Valley Mass Timber Factory

With over 10 years of experience, Alana has worked in energy production and high-volume steel manufacturing with roles ranging from process engineering to quality control to front line leadership. Alana leverages her background to improve processes and productivity while maintaining the highest quality CLT panels on the market in Katerra’s CLT factory in Washington State.

Robert Malcyzk  
Director, CLT Platforms

Through his career, Robert has worked on over 600 projects, several of which have received awards including the Art Gallery of Ontario Galleria Italia with architect Frank Gehry, one of the most complex timber structures ever built. Robert is a long-standing member of the National Building Code of Canada (NBC) O86 “Engineering Design in Wood” code committee and a member of the recently formed CLT code committee. He is regularly invited to lecture on the subject of timber engineering both nationally and internationally. Robert is committed to sustainability and energy performance, and was involved in the design of the first “Passivhaus” projects in Canada.
Mathias Oberholzer, PE
Senior Director, Mass Timber Engineering & Technology

Mathias’s love for timber spans a little over 20 years. With a degree in structural engineering, specializing in mass timber from Berne University, Switzerland, Mathias expanded his skillset working with design software company CADWork. Mathias joined Katerra in 2018 and leads the efforts on mass timber component design. In addition to being a professional engineer (Canada), Mathias is a member of Swiss Timber Engineers (Switzerland), a graduate member of the Institution of Structural Engineers (England), serves on the CSA 086 subcommittee for Engineering Design in Wood (Canada), and is a member of the Timber Frame Engineering Council (USA).

Greg Smith
Head of Construction, Pacific Northwest

Greg began his career in the construction industry in 1985 and has worked as a tradesman, concrete specialty subcontractor and design build GC/Developer. He is experienced in the commercial, industrial, retail, institutional and residential market segments. His focus has always been on constructing the most efficient structures for Owners while honoring the Designers’ intent. He is dedicated to a collaborative and integrated project delivery process with a commitment to both sustainable materials and construction processes. With an extensive background in the concrete industry with Ceco Concrete, Greg is a bit of an anomaly as a concrete guy who strongly believes in CLT as an integral part of the future of construction.

Olav Felgendreher
Project Management, Construction, Installation – Vancouver, BC

Olav is a key member of Katerra’s Mass Timber component design team. He brings 40 years of construction to the team, along with more than 20 years of involvement in mass timber projects throughout Europe, Canada, and the US. These projects have ranged in sizes from single family residential to large, very complex, commercial structures. Olav was instrumentally involved in North America’s first CLT projects, including the Pallas Residence in Revelstoke, the Dowling Residence in Vancouver, and the AGF INC. Head Office in Montreal.
Collaborators & Service Providers

Design

Michael Green Architecture (MGA)
MGA is located in Vancouver, BC, and is internationally renowned for its leadership in building with advanced wood products and technologies. MGA became a Katerra Design Partner in 2018.

Lord Aeck Sargent (LAS)
LAS is a respected architectural and design firm with a focus on innovation across the spectrum of architecture, landscape architecture, planning, preservation, and interiors. LAS became a Katerra Company in 2018.

Research & Development

Washington State University (WSU)
Washington State University’s Composite Materials and Engineering Center is a leading interdisciplinary research organization focused on innovative, practical solutions for sustainable infrastructure solutions. Katerra has installed research-scale CLT manufacturing equipment and established our process parameters onsite at WSU to develop and certify our products.

Technical University Graz (TU Graz)
Through subsidiary Katerra Materials Research, Katerra collaborates and funds projects with TU Graz, the leading mass timber institution in Austria, and home of Dr. Gerhard Schickhofer, a leading visionary in the CLT industry.

Holz.bau Forschungs GmbH (HbF)
Katerra has joined HbF, a consortium of CLT and mass timber providers that is the nucleus of the industry in Europe. Through this collaboration, we address common technology and product requirements and work together to continue building the mass timber industry.
Product Quality & Innovation

Technology-First Approach
Katerra is, above all else, a technology company. This informs our approach to design, construction, and manufacturing – and this holds true for our production of CLT. Our Spokane Valley factory leverages manufacturing innovation from across industries to optimize production speed, efficiency, and quality, and we’ve made a dedicated commitment to R&D and continuous innovation at every step of the value chain.

Research and Development
Katerra CLT products have been tested to stringent code compliance standards for strength, seismic, fire, vibration, and acoustic performance, and we will work toward having forest-to-construction-site chain of custody transparency. Through integration and collaboration across design, manufacturing, and construction, we’re developing a portfolio of next-generation CLT products, assemblies, and full-scale building systems that will expand the horizons of what mass timber can do.

Feedstock
Creating a consistent, high-quality product begins with taking a technology-first approach to sourcing and processing our raw materials:

- Strategically sourcing timber species groups from the Inland Northwest forests known for their tight grain structure, integrity, and quality
- Advanced geometric and biometric scanning and mechanical grading of lamstock
- High-capacity sorting and transformation of lamstock to accelerate raw materials intake and achieve specification
- Optimization of utility of adhesives
**Manufacturing**

Our commitment to quality flows throughout our manufacturing processes, and includes:

- Onsite kilning capabilities to ensure each board in our process meets or exceeds industry standards
- Scanning technology to assess the strength and aesthetic attributes of each board including knot sizes, pith, and wane
- Precision mechanical preparation and primer application of lamstock prior to processing
- Advanced panel algorithms for layup placement
- CLT press technology that compresses panels during the curing of the adhesive in three directions to ensure a consistent, quality bond and minimal gaps between boards
- Precision CNC equipment that yields finished panels to tight tolerances
- Panel finishing, including a sanded face finish and applied protective end-grain sealer
- Whole-building temperature and humidity control to ensure consistent quality

**Factory Process Quality**

In-house quality assurance and quality control lab processes and procedures are governed by the requirements approved by Katerra’s third-party approval agency. Quality measures include strict process control, product testing, reporting and document control, traceability, and ongoing third-party factory quality audits to ensure compliance with both our quality control manual and regulatory standards. We have invested the time and resources in the tools, equipment, and processes necessary to consistently deliver a best-in-class CLT product.

**Product Tracking and Transparency**

We are setting the industry standard for tracking and monitoring of lamstock, glueline, and panels as they progress throughout production. Every lamination will have its characteristics measured and tracked from beginning to end, providing transparency and assurance of quality. This collected data will support rigorous testing, materials optimization, and process control to help us achieve product and process improvements into the future.

**Design-to-Fabrication Advantages**

Wood is in many respects the easiest of structural materials to fabricate. Katerra CLT panels are cut to finish specifications at the factory using state-of-the-art 5-axis CNC gantry machines. This allows building design models to be exchanged directly into digital files read by the machines that produce high-precision fabricated building components, ready for shipment and installation on building projects.

Please see the Katerra CLT Technology Profiles for further details on Katerra’s CLT Technology and R&D initiatives.
World-Class Manufacturing: Spokane Valley CLT Factory

Katerra’s state-of-the-art, 270,000 ft² mass timber manufacturing facility in Washington features one of the largest CLT presses currently in operation globally, giving us the ability to dramatically scale the production of CLT in North America and drive growth across the industry. The factory leverages automation and manufacturing innovation from across industries to optimize production speed, efficiency, and quality, while remaining a low-cost provider.

The Spokane Valley location offers easy access to rail lines and major freeways, as well as proximity to timber and communities with timber and building material expertise. This facility will produce cross-laminated timber floor systems, cross-laminated timber wall panels, and glulam structural beams in the future.

Our commitment to quality at every phase of the value chain includes strategic sourcing of lamstock, onsite scanning, sorting, and kilning capabilities, and state-of-the-art pressing, cutting, and finishing technology. This facility optimizes core manufacturing processes in order to develop the highest quality CLT panels at the lowest possible cost by:

- Automating processes
- Integrating industry-leading technological solutions
- Operating at the highest level of standards and quality

At full operation, this will be one of the largest-capacity and most sophisticated CLT plants in the world.
Initial product offerings will include both 5-layer and 3-layer panels, used primarily for floors. We will quickly test and certify 7-layer and 9-layer panels including CLT shear wall panels to be used for lateral stability, enabling even faster and cheaper construction. Master panels will come out of our press with a format size of 12 ft wide x 60 ft long, creating the greatest possible production flexibility.
Sustainability & Stewardship

The building industry is vital to the environment and the social fabric of our communities. We have an opportunity within the next decade to develop new solutions the right way; solutions that not only help to ramp up industry productivity, but also drastically reduce the carbon footprint of construction and help meet the need for more – and more affordable – housing.

Cross-laminated timber has the potential to significantly reduce greenhouse gas emissions associated with the building sector. Katerra is committed to creating CLT products and processes that reduce the environmental impact of buildings from manufacturing, to construction, to operation. To achieve this, we employ strict internal policies and adopt a number of industry-leading approaches.
Chain of Custody Certifications
Katerra’s CLT factory in Spokane Valley, WA has earned chain of custody certification for three major certification programs: Sustainable Forestry Initiative® (SFI-03536), Forest Stewardship Council® (FSC C156195), and the Programme for the Endorsement of Forest Certification (PEFC/29-31-382). Katerra’s chain of custody certifications reflect our flexible approach to meet our clients’ needs by offering customizable packages of mass timber services and products, including the option to provide products under these rigorous sustainability certification programs.

Resource Efficiency
We are pursuing a close connection between design and production, enabling more precise tracking of materials to achieve reduction in waste and overproduction over time. CLT construction also enables the reduction or more efficient use of other building materials. And because the structure can be left visually exposed, CLT also helps eliminate supplemental finish materials. Mass timber buildings are also significantly lighter than comparable concrete buildings, which reduces foundation size and seismic forces, in addition to embodied energy.1

Environmental Transparency
Katerra is committed to third-party environmental certification and is pursuing Type III Environmental Product Declaration to ISO 14025 for our CLT product line (commencing once the factory has been in operation for a minimum of 12 months, in accordance with the standard).

Responsible Supply Chain
Sustainably managed forests support rural economies. Katerra is committed to sourcing environmentally responsible forest products, with 100 percent of our lumber for CLT sourced from well-managed forests.

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1 Think Wood (https://www.thinkwood.com/news/4-things-to-know-about-mass-timber)
Katerra’s CLT product line is cost-competitive with other building material options, particularly when integrated with Katerra CLT design best practices. Cost savings are driven by efficiency in materials production and by a reduction in logistics and labor-hours required during installation, making it particularly cost competitive in markets with high labor rates.

Furthermore, faster build times mean more attractive project ROI for developers, as assets can become revenue-generating on a faster timeline, and the inherent appeal of wood buildings can equate to faster speed to occupancy and higher prices per square foot.

- For most residential, student housing, and hospitality projects of six to twelve stories, Katerra CLT will be cost-neutral with concrete and steel.
- For commercial offices, Katerra CLT will also be competitive with concrete and steel and in some instances should generate project savings.
- Residential, student housing, and hospitality projects up to six stories that use only CLT floor panels may experience a slight cost premium over traditional building materials.

In all cases, developers must also consider the advantages of speed to market, brand differentiation, and superior aesthetics when making the decision to use this material. When acting as a material supplier, Katerra is also able to add additional value to CLT projects through our end-to-end services, including design, engineering, component design, logistics, and installation.
Project Profiles
Catalyst Building

LOCATION
Spokane, WA

TYPE
Mid-Rise | Commercial Office

ARCHITECT
Katerra + Michael Green Architecture

KATERRA SERVICES PROVIDED
Architecture and Engineering, Design Coordination, Materials, Construction Management

PROJECT STATUS
Anticipated Completion – Summer 2020
The 150,000 ft² Catalyst Building will be the first office building in Washington State constructed out of CLT. As part of the new South University District, the development will be connected to an energy and resource sharing eco-district that serves as a bridge between Spokane’s downtown core and the growing University District. The project is core and shell commercial with a final intended use of higher education classrooms and labs, co-working spaces, and private sector offices.

Mass Timber & CLT
The client’s goal was to design and construct a wood building that could match or exceed the performance and ROI of a comparable steel and concrete building and showcase the inherent benefits of CLT with regard to aesthetics, build efficiency, and environmental impact. As a result, the team developed and implemented numerous solutions intended to minimize the use of concrete, steel, and other traditional building materials. Solutions included 30-foot span CLT and glulam composite floor panels, CLT shear walls, and CLT exterior wall panels.

Product Innovation
Leveraging partnerships with Washington State University (WSU) and Technical University Graz (TU Graz), Katerra developed a long span mass timber floor solution – the Katerra Rib Panel – in the summer of 2018. The rib panel is the first timber solution in North America to address vibration in a common commercial 30-foot span without utilizing any concrete or structural composite.
The Postmark

LOCATION
Shoreline, WA

TYPE
Mid-Rise | Multifamily Market Rate

ARCHITECT
Katerra

KATERRA SERVICES PROVIDED
Architecture and Engineering, Design Coordination, Materials, Construction Management

PROJECT STATUS
Under Construction
The Postmark is Katerra’s first cross-laminated timber project, utilizing European CLT in advance of our factory being operational. This project demonstrates the potential for mass timber to create elegant and sustainable buildings and to introduce significant construction efficiencies through prefabrication and deeper integration between design, manufacturing, and construction. The Postmark will include 243 apartment units in two five-story buildings above a two-level below-grade parking structure. It will be part of an up-and-coming suburban community north of Seattle, where an impending extension of Seattle’s light rail system is driving growth and creating demand for sophisticated but affordable housing.

**Mass Timber & CLT**

CLT, along with glulam beams, is utilized as the floor slabs and roof structures, which reduces structural loads and dramatically increases build efficiency when compared to concrete and steel. Katerra’s design process involved high levels of 3D modeling and coordination with manufacturing. The prefabricated panels arrived onsite with all joints precut, to extremely low tolerances, enabling the crew to install an entire floor (30,000 ft²) in just three days.

By designing for manufacturing, Katerra is putting the focus on standardizing the highly repeatable elements of projects, and demonstrating how mass timber building systems can help meet the growing need for sustainable and affordable housing.
Amberglen South

Amberglen South is a ten-building apartment complex that is located within Hillsboro’s Amberglen Business Park, a master-planned community with a diverse mix of suburban office, multifamily, and hospitality. The 7.9-acre parcel will be divided into four development pads, bisected by new public road extensions. The two westernmost pads will contain 352 market-rate apartments within two 6-story podium buildings with two levels of structured parking. The C-shaped buildings will include elevated exterior courtyards at level-2 on both blocks. Katerra collaborated with partner architect JDA to provide three buildings on the site, the first to be built with Katerra CLT.

Mass Timber & CLT

The Amberglen South project highlights CLT’s design and engineering advantages and demonstrates how those advantages translate into more desirable living spaces in the residential market. Exposed CLT and mass timber within the living units is aesthetically pleasing as a finish material, and it also allows for improved floor-to-ceiling height, making more efficient use of the available space. Katerra assisted in the mass timber design and engineering, component design, construction planning, and installation. These are podium projects, with CLT utilized as the floor slabs and roof structures, along with glulam beams. In addition to offering environmental, safety, and thermal performance advantages, CLT construction also reduced structural loads and increased build efficiency when compared to concrete and steel.

Katerra’s design process involved high levels of 3D modeling and coordination with manufacturing. The project CLT panels are currently being manufactured in Katerra’s Spokane Valley factory.
UMass Design Building

This four-story 87,500 ft² academic facility houses the school of integrated design at the University of Massachusetts in Amherst. The program includes offices, design studios, lecture theaters, laboratories, and the required ancillary spaces. This project is one of the largest timber structures in the U.S., and one of the largest wood-concrete composite projects in the world. The Design Building set a new standard of quality and performance for institutional timber construction in the U.S., and it demonstrates how state-of-the-art timber construction can meet the demanding performance requirements of large post-secondary educational facilities.

Mass Timber & CLT

The Design Building was conceived as a learning building, and as such it demonstrates many of the natural benefits of wood construction – to communities, to occupants, and to the environment. In keeping with the school’s main purpose, the structure will be largely exposed. The result is that structure becomes architecture, creating beautiful spaces that highlight the building’s unique design systems and take advantage of the many biophilic effects of natural materials. It also demonstrates how mass timber can support local economies and embody the values of the building’s owners and occupants.

- The floor slabs utilize an innovative 5-ply CLT-concrete composite system that allows for spans up to 29 feet.
- The building’s shear walls are composed of a 7-ply CLT system that uses HSK plates and steel hold downs to eliminate the need for traditional concrete and steel systems.
- Exposed glulam posts and beams provide additional lateral support.
- Other innovative uses of mass timber include a beautiful, exposed wood/steel zipper truss system and the use of 7-ply, non-composite CLT panels for the roof.
Wood Innovation & Design Centre

LOCATION
Prince George, BC

TYPE
Commercial | Educational

ARCHITECT
Michael Green Architecture (Now a Katerra Design Partner)

PROJECT STATUS
Completed in 2014

Awards & Recognitions

- 2016 Governor General's Medal in Architecture
- 2015 RAIC Award of Excellence for Innovation in Architecture
- 2015 Lieutenant-Governor of BC Award in Architecture (Merit)
- 2015 AIBC Innovation Award

Mass Timber & CLT

WIDC is about celebrating wood as one of the most beautiful and sustainable materials for building in BC and around the globe. Its goal is to help more architects, engineers, and private developers recognize the value of mass timber design as an alternative to steel, concrete, and masonry. With the exception of a mechanical penthouse, there is no concrete used in the building above the ground floor slab. The design incorporates a simple, “dry” structure of systems-integrated CLT floor panels, glulam columns and beams, and mass timber walls. This approach translates into repeatability, meaning this building and its systems can be easily replicated, rather than serving only as a one-off showpiece.

The entire building was designed and built in just 16 months, demonstrating mass timber’s potential to accelerate construction schedules.
BC Passive House Plant

**LOCATION**
Pemberton, BC

**TYPE**
Commercial

**ARCHITECT**
Hemsworth Architecture

**ENGINEER**
Equilibrium (Now a Katerra Company)

**PROJECT STATUS**
Completed in 2014

**Awards & Recognitions**
- 2016 Governor General’s Medal in Architecture
- 2015 AIBC Innovation Award
- 2015 BC Wood Design Award
- 2015 Architizer’s Project of the Day (15.03.21)
- 2014 North American Wood Design Award

Set against an inspiring mountainous backdrop in the Pemberton Industrial Park, this 16,200 ft² shop facility was entirely prefabricated and erected by the owner, BC Passive House. The surprisingly simple and economical structure achieves a very high degree of architectural and environmental quality, setting a new standard for sustainable, light-industrial construction in the province.

**Mass Timber & CLT**
The main structure consists of post and beam construction, with CLT wall panels and light frame roof panels. Built with locally sourced, sustainable materials, the building offers a bright, healthy, and comfortable working environment. The office portion, which houses the drafting and administration staff, was designed and built to the stringent Passivhaus standard requirements using the company’s state-of-the-art prefabricated panel product.
Product Details
Katerra CLT Product Overview

Katerra is developing an entire line of CLT-related products for manufacture, organized in the graphic below.

**Base Products**

- **CLT**

  - Floor / Roof Panel*
  - Wall Panel
    - Future State

**Use Products**

- Ribbed Panel
- Shear Wall
  - Future State
- Ribbed Panel

**Finish Products**

- Acoustically Tested Floor Assembly
  - Future State
- Fire-Rated Floor and Roof Assemblies
  - Future State

*Defined in Katerra CLT Product Definition

Please see the *Katerra CLT Product Definition* for further details and technical specifications.
Layups & Configurations

Katerra will offer 11 different CLT flat panel layups, including 3-, 5-, 7-, and 9-ply laminations in architectural and industrial appearance grades.

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Layup Availability: Estimated for release Q2 2020

1 “CLT Layup” is classified as a “CLT-Grade” in the PRG-320 standard
2 See Section 3.3 for associated design values for each CLT layup designation
Activating Your CLT Project

We make it easy to take the next step with Katerra CLT.

As the market for mass timber grows and matures, we recognize our value as a robust supply partner to firms that may need only limited assistance with architecture, engineering, and construction supervision.

CLT and Mass Timber Sales Flow

- **CLIENT INQUIRY**
  - Phone introduction
  - Determine feasibility
  - Determine scope and timeline
  - Receive plans and specifications and 3D model if possible

- **ENGINEERING**
  - Determine involvement of project design team
  - Set up technical conference call if required with project designers and internal team
  - Engineering analysis as required

- **CADWORK**
  - Use plans provided by customer to develop pricing model or use 3D model when possible
  - 3D model is not to be at a high level of precision
  - Export viewer file to send to customer

- **TAKEOFF**
  - Generate takeoff from 3D Cadwork model for the following elements when necessary: CLT, glulam, fasteners

- **PRICING**
  - Send takeoffs for glulam and fasteners to appropriate partners
  - Use takeoffs to generate pricing proposal
  - Review proposal internally

- **PROPOSAL**
  - Email proposal and model to customer
  - Follow up with call
  - Determine timeline for response and additional follow-up
Sales Contacts

Our Mass Timber Materials team has the ability to quickly respond to general contractors, architects, or other parties that are interested in a quick evaluation of their project or are in need of pricing and structural efficiency assessments.

Mass Timber Design-Build Services

Adam Kurtenbach
Business Development, Mass Timber New Build

Mass Timber Third-Party Material Sales

Colin Chornohus
Business Development, CLT West

Pete Kobelt
Business Development, CLT East

Visit katerra.com/clt to request a consult for your mass timber project.
Additional Resources

Supplementary detailed information is available in addition to this Katerra CLT introduction. Please reach out to your sales contacts to request any of the materials below.

- CLT Technology Profiles
- CLT Product Definition
- CLT PFS-TECO Research Report 0126
- CLT Floor and Roof Span Tables
- CLT Sustainability Statement
- CLT Appearance Grades/Visual Surface Quality
- CLT Product Care & Moisture Control Plan
- CLT Project Master Specification
- CLT Product Warranty