

Cross Laminated Timber (CLT) Talking Points

Forest Analytics Department, Texas A&M Forest Service

Cross Laminated Timber (CLT)

- ❖ Developed in Germany and Austria around 1996; 25-fold increase in production as of 2015
- ❖ One of several types of “Mass Timber” or “Engineered Wood”
- ❖ Engineered wood panel typically consisting of three, five, seven, etc. layers of dimension lumber oriented at right angles to one another and then glued together
- ❖ “CLT system” is a set of CLT panels, joinery, ancillaries, logistics, transportation, and assembly instructions
- ❖ European companies currently manufacture 80 percent of world’s CLT production





What are the benefits?

- ❖ Exceptional strength, dimensional stability, rigidity, and design flexibility
- ❖ Can be used as an alternative to concrete, masonry, and steel
- ❖ Panels are manufactured and CNC'd off-site which reduces time of on-site construction
- ❖ CLC buildings, having limited footprint, work well in tight urban construction sites
- ❖ Cost-competitive
- ❖ Well-suited to floors, walls, and roofs
- ❖ Aesthetic and biophilic benefits when wall and floor panels are left exposed
- ❖ Energy performance/savings
- ❖ Acoustics
- ❖ Seismic performance

What are the benefits? (continued)

- ❖ Good fire resistance
- ❖ Carbon reduction, sequestration, and storage (C produced with concrete and steel)
- ❖ Abundant and sustainable timber supplies; wood is a renewable resource
- ❖ Rural economy benefits

U.S. Manufacturers of Structural CLT Panels

- ❖ D.R. Johnson Wood Innovations, Riddle, Oregon (Douglas-fir, Alaskan yellow cedar)
- ❖ SmartLam, Columbia Falls, Montana (Douglas-fir, western larch)
 - Announced in February 2018 they would build a facility in Maine

Facilities Proposing to use Southern Yellow Pine for Structural CLT

- ❖ International Beams / IB X-Lam, Dothan, Alabama
 - APA PRG 320 certification currently in-progress
 - Building in Fredericksburg, Texas will use first panels produced (anticipated Dec 2018)
- ❖ Kattera, Spokane, Washington (announced they will begin manufacturing CLT)
- ❖ LignaCLT Maine LLC (announced in February 2018)
- ❖ Texas CLT LLC, Magnolia, Arkansas (announced in October 2018)
- ❖ Vaagen Timbers (Colville, WA)



Source: Stora Enso

Timeline: Building with CLT in Europe and Canada



What are the Challenges, Limitations, and Barriers?

- ❖ Developing a market for CLT; turning interest into orders
- ❖ Lack of experience with mass timbers and engineered wood among architects, engineers, and builders
- ❖ Advantages of CLT systems are not very well known
- ❖ Not currently a southern CLT manufacturer that has APA PRG-320 certification
- ❖ Current prescriptive code limit is 6 stories (or 85 feet) or Alternative Means and Methods request (time-consuming and expensive)
- ❖ Acceptance of CLT systems in the construction industry
- ❖ Steel and concrete industry lobbies

CLT in the News

- ❖ Sterling Lumber to build \$30 million cross-laminated timber plant in Lufkin, Texas (announced October 2018)
 - TerraLam Timber mats for ground stabilization (e.g., construction sites, oil rigs, forestry applications)
 - <http://www.ktre.com/2018/09/27/gov-abbott-announces-new-lumber-facility-lufkin/>
- ❖ 19,000 square foot McDonald's constructed of CLT and steel opens in Chicago, Illinois (August 2018)
 - https://www.architectmagazine.com/design/buildings/a-steel-and-clt-mcdonalds-flagship-opens-today-in-chicago_o
- ❖ International Code Council (ICC) created Ad Hoc Committee on Tall Wood Buildings to assess science of tall wood buildings and develop code proposals
 - 14 of 14 code-change proposals approved by ICC Code Development Committees (Spring 2018)
 - <https://awc.org/tallmasstimber>

CLT in the News, continued

- ❖ A 5-layer CLT panel being used for sub-floor failed during the construction of 80,000 square-foot Peavy Hall at Oregon State University (Corvallis, Oregon; March 2018)
 - <https://www.constructiondive.com/news/CLT-panel-fails-during-construction-of-80m-osu-building/519905/>
- ❖ Mass Timber Legislation: Timber Innovation Act (H.R. 1380, S. 538) (proposed March 2017)
 - Bill seeks to establish a market for mass timber buildings more than 85 feet tall
 - Establish research and development program for advancing tall wood building construction in the U.S.
 - Authorize the Tall Wood Building Prize Competition through USDA
- ❖ Global CLT production projected to value \$2.07 billion by 2025 (August 2017)
 - <https://www.grandviewresearch.com/press-release/global-cross-laminated-timber-market>
- ❖ Largest CLT structure in U.S. to be built on University of Arkansas campus (expected completion prior to Fall 2019 semester)
 - “Stadium Drive Residence Halls”
 - 5-stories, 368 rooms, 200,000 square feet
 - <https://www.nabholz.com/cross-laminated-timber-project-america-nabholz/>
- ❖ Mullins Library High Density Storage Facility the first CLT project at University of Arkansas
 - Partnership with Fay Jones School of Architecture
 - <https://news.uark.edu/articles/41249/fay-jones-school-brought-focus-to-mass-timber-with-professional-education-seminar>
- ❖ John W. Olver Building on University of Massachusetts, Amherst completed in January 2017
 - Shared home of Building and Construction Technology, and Environmental Conservation, Architecture, and Landscape Architecture and Regional Planning Departments
 - 3 stories, 87,500 square feet, 18 month construction time
 - <https://bct.eco.umass.edu/about-us/the-design-building-at-umass-amherst/>

CLT in the News, continued

- ❖ CLT used to construct 92 room, 62,688 square foot Candlewood Suites hotel at Redstone Arsenal (a U.S. Army post) near Huntsville, Alabama (completed December 2015)
 - Blast testing confirmed that materials used would meet Anti-Terrorism and Force Protection (ATFP) standards
 - <http://www.woodworks.org/wp-content/uploads/4-Story-CLT-Hotel-WoodWorks-Case-Study-Redstone-Arsenal-01-05-16.pdf>



CROSS-LAMINATED TIMBER AND GREEN BUILDING



Stadthaus, Murray Grove, in London, England
Used by permission of Will Pryce

CASE STUDY-UNITED KINGDOM: THE STADTHAUS, 24 MURRAY GROVE

Constructed entirely from cross-laminated timber (CLT) panels, except the foundation, this nine-story residential high-rise in the London Borough of Hackney is the pioneer of wood buildings in the world. Known to many as “Stadthaus” and also “Murray Grove,” this building was the tallest modern wood structure in the world in 2009. The building, commissioned by Metropolitan Housing Trust and developed by Telford Homes, houses 29 apartments with offices on the ground floor.

Using CLT from KLH United Kingdom, a specialty supplier of CLT panels, Waugh Thistleton Architects designed a unique structure that reduces the environmental impact of the entire building process.

The entire building was prefabricated off-site and completed in 49 weeks. The building sequesters a large amount of carbon due to its high wood content, and significant emissions were avoided by not using traditional building materials that generate emissions from the burning of fossil fuels during their production.



East Coast Winner: 475 West 18th, New York, NY
Used by permission of SHoP Architects PC

CASE STUDY-UNITED STATES: U.S. TALL WOOD BUILDING PRIZE COMPETITION

The U.S. Department of Agriculture, in partnership with the Softwood Lumber Board and the Binational Softwood Lumber Council, sponsored the U.S. Tall Wood Building Prize Competition in September 2015. The two winning projects met the Competition’s criteria to showcase the safe application, practicality and sustainability of a minimum 80-foot-tall structure that uses mass timber, composite wood technologies and innovative building techniques. The goals of the Competition were to support employment opportunities in rural communities, maintain the health and resiliency of the nation’s forests and advance sustainability in the built environment.

Framework (Portland, OR) and 475 West 18th (New York City, NY) will each will receive \$1.5 million to begin project work, including the research and development necessary to utilize engineered wood products in high-rise construction in the U.S.



West Coast Winner: Framework, Portland, OR
Used by permission of LEVER Architecture

BACKGROUND

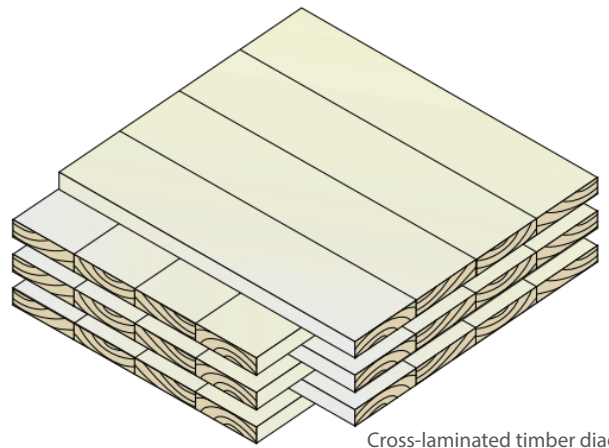
Cross-laminated timber (CLT) is a wood panel made of several layers of dried lumber boards stacked in alternating directions, glued and pressed to form rectangular panels. CLT structural panels have exceptional strength and stability and can be used as floors, walls and roofs in building construction.

Because of its high strength, dimensional stability and design flexibility, CLT is proving to be a highly advantageous alternative to traditional building materials, such as concrete, masonry and steel, in many building types. CLT offers low environmental impacts compared to traditional building materials. Additionally, wood as a building material generally has lower economic and environmental costs but still delivers exceptional beauty, versatility and performance.

CLT panels consist of an odd number of layers of wood (usually, three, five, or seven). Panels are customized for each project and each cut to a precise design. Then, the panels are shipped to the construction site for assembly, where panels are fastened together. Because CLT panels are prefabricated and assembled on-site, the length of construction time can be reduced and use of CLT panels generates almost no waste onsite.



Stadthaus interior during assembly (CLT panels), Murray Grove, London, England
Used by permission of Will Pryce



Cross-laminated timber diagram
Used by permission of reThink Wood

QUICK FACTS

- ✓ Wood is renewable and often outperforms other materials in terms of energy usage and air pollution.
- ✓ Wood provides design flexibility at lower costs than other major building materials.
- ✓ Wood structures can be safely built to comply with building codes.
- ✓ Wood is a resilient building material. It is slow to burn, performs well during seismic events, and can be easily adapted with basic construction tools in the aftermath of disasters.

WOOD INNOVATION

The USDA Forest Service is working to weave wood into the fabric of diverse sectors, including energy production and green building. When managed in a way that protects forested ecosystems, a diversified wood products industry enhances resiliency of our ecosystems, sequesters carbon, and creates jobs in rural communities.

REFERENCES & MORE INFORMATION:

- [USDA Forest Service Wood Innovation Website](#)
- [USDA Forest Products Laboratory Website](#)
- [U.S. Tall Wood Building Prize Competition Website](#)
- [Waugh Thistleton Architects Ltd. Website](#)
- [reThink Wood Website](#)
- [WoodWorks Website](#)
- [APA-The Engineered Wood Association Website](#)
- [KLH UK Website](#)

Mass Timber Projects In Design and Constructed in the US (June 2018)



State	Stage		State	Stage	
AL	In Design	5	NC	In Design	13
	Construction Started / Built	1		Construction Started / Built	5
AR	In Design	2	ND	In Design	1
	Construction Started / Built	2	NE	In Design	1
AZ	In Design	2		Construction Started / Built	1
CA	In Design	40	NH	In Design	1
	Construction Started / Built	15	NJ	In Design	3
CO	In Design	7	NM	In Design	1
	Construction Started / Built	7	NY	In Design	12
CT	In Design	4		Construction Started / Built	4
	Construction Started / Built	2	OH	Construction Started / Built	1
DC	Construction Started / Built	2	OR	In Design	25
DE	In Design	1		Construction Started / Built	12
FL	In Design	19	PA	In Design	2
	Construction Started / Built	9		Construction Started / Built	2
GA	In Design	10	RI	In Design	1
HI	In Design	1		Construction Started / Built	1
IA	In Design	1	SC	In Design	4
ID	In Design	2		Construction Started / Built	4
	Construction Started / Built	1	TN	In Design	2
IL	In Design	9		Construction Started / Built	2
	Construction Started / Built	3	TX	In Design	32
IN	Construction Started / Built	1		Construction Started / Built	8
KS	In Design	1	UT	In Design	3
KY	Construction Started / Built	1	VA	In Design	8
LA	In Design	2	VT	In Design	2
MA	In Design	17		Construction Started / Built	1
	Construction Started / Built	9	WA	In Design	25
MD	In Design	7		Construction Started / Built	14
	Construction Started / Built	1	WI	In Design	8
ME	In Design	5		Construction Started / Built	1
	Construction Started / Built	1	WV	In Design	1
MI	In Design	2		Construction Started / Built	1
	Construction Started / Built	1	WY	In Design	1
MN	In Design	1			
	Construction Started / Built	1			
MO	In Design	2			
	Construction Started / Built	2			
MT	In Design	3			
	Construction Started / Built	3			

EXPANDING THE U.S. CONSTRUCTION MARKET FOR WOOD

WoodWorks is a non-profit organization working to increase the use of wood in buildings other than single-family homes—including multi-family/midrise and all non-residential building types. The opportunity for market share growth is significant.

help@woodworks.org
www.woodworks.org/project-assistance/

A UNIQUE AND NECESSARY ROLE

WoodWorks connects the broader wood industry with individuals who design wood buildings and specify wood products.

- » Works directly with building designers and owners
- » Removes real-world barriers to wood use
- » Creates wood design experts