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SENT TO LSU AGCENTER/LOUISIANA FOREST PRODUCTS DEVELOPMENT CENTER - FOREST SECTOR / FORESTY PRODUCTS INTEREST GROUP

Attached is a presentation delivered on August 24th at the monthly meeting of the Central Louisiana Chapter of the Society of American Foresters.

An Overview of Cross-laminated Timber (CLT) & Mass Plywood Panels (MPP): Mass Timber

Regards,

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An Overview of Cross-laminated Timber (CLT) & Mass Plywood Panels (MPP) - Mass Timber -

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CENLA Chapter Meeting

August 24, 2017



Outline

- What is Cross-Laminated Timber (CLT)
- CLT uses and benefits
- Where is it being used internationally?
- North America manufacturing and applications
- Standards and testing
- What is MPP?--Uses, manufacturing, applications
- Opportunities for CLT/MPP
- Limits to adoption of CLT/MPP
- Key questions for potential manufacturers
- New U.S. South CLT/MPP Study
- Final observations

What is Cross-Laminated Timber (CLT)?

- CLT consists of layers of dimension lumber (typically three, five, or seven) oriented at right angles to one another and then glued to form structural panels with exceptional strength, dimensional stability, and rigidity.
- Panels are particularly cost effective for multistory and large building applications.
- Some designers view CLT as both a standalone system and product that can be used together with other wood products; it can also be used in hybrid and composite applications.
- Softwood or hardwood.



CLT Uses and Benefits

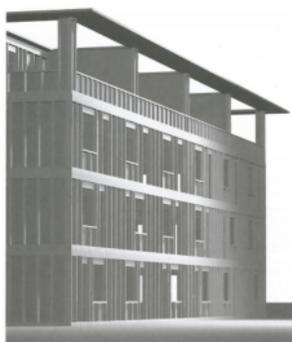
- Strong enough to replace concrete and steel in multistory buildings.
- Lighter and more flexible than standard materials and can withstand stress from earthquakes or storms, say its proponents.
- It is also more fire resistant than many standard materials such as wallboard.
- Nontoxic and a good insulator.
- Reduces structure carbon footprint.
- Sequesters carbon.

CLT Uses and Benefits

- Could create manufacturing jobs in struggling, rural timber towns.
- Revenue stream for forest thinning.
- New markets for forest landowners.
- Could help state/local governments create a revenue stream from the undersize trees that are culled.

CLT Uses and Benefits

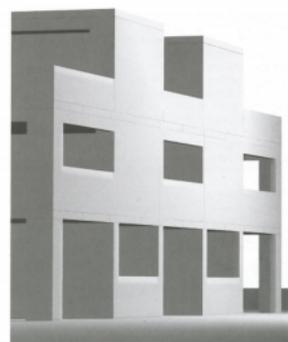
LIGHT WOOD-FRAME



POST + BEAM



MASS TIMBER



- Build a story/3 days
- Build a house in a week

Where is CLT Being Used Internationally?

- During 2008-2015, the global production of cross-laminated timber grew at a CAGR of around 26% with Europe accounting for most of this market.
- About 60 European plants manufacture the product.
- A UN annual review in 2015-16 found that production of CLT is expanding globally from 650,000 to 700,000 cubic meters in 2015 to a projected 1 million cubic meters in 2016.
- Austria is currently the world's biggest producer of CLT.
- Other major producers include Germany, Czech Republic, Italy, Spain and Switzerland.
- In the United Kingdom alone, there are about 600 CLT buildings
- Australia/New Zealand – Many buildings constructed **from PINE**

North American CLT Manufacturing & Applications

- Current epicenter for NA CLT/(MPP) is the Pacific Northwest & British Columbia, Canada.
- Oregon and Washington, have shown great interest in pursuing CLT manufacturing and utilization strategically to enhance local economies.
- Canada-based companies Structurlam and Nordic Structures have been producing locally sourced CLT panels since 2010 and remain the largest Canadian CLT manufacturers to date.

North American CLT Manufacturing & Applications

- The U.S. CLT manufacturing started later with SmartLAM in Montana being the first U.S. based CLT company (2012).
 - As an example of the growth potential, SmartLAM has grown to produce over 1 million board feet of CLT per-month, with plans to expand and build another production facility.
- Another example is the DR Johnson Lumber Co. In Riddle, OR - began manufacturing CLT in 2015.
- Sterling Lumber Company in the Chicago suburbs-TerraLam.
- NO CLT MANUFACTURING FACILITIES IN THE U.S. SOUTH USING SOUTHERN YELLOW PINE!!

Potential CLT Being Markets (in addition to Tall Buildings)

- 90% buildings US less than 12 stories.
- In mid-rise gap of 6-12 stories, wood is more efficient.
- Market for CLT in modular structures, such as military housing or tiny home construction.
- CLT panels can also be used as flooring systems.

Standards and Testing

- CLT manufacturers in Europe adopted a proprietary approach for panel mechanical properties.
- The first performance-based CLT material standard for CLT in North America was developed through the collaboration of APA-The Engineered Wood Association and FPInnovations.
- The PRG320 standard was published in 2012 and recognized by American National Standards Institute (ANSI).
- The standard specifies a total of 7 CLT performance grades and the testing methods to quantify and determine the grades.
- PRG320 is referenced in the 2015 edition of the National Design Specifications (NDS) for Wood Construction in the U.S., and the 2014 edition of the Canadian National Standard for Engineering Design in Wood (CSAO86).
- North American CLT manufactures have been gradually adopting this standard.

Standards and Testing



- Tests at a federal laboratory suggest that cross-laminated timber (CLT) components used in a multi-story apartment building would perform well in the event of a fire.
- With roughly 30% of the CLT ceiling area in the living room and bedroom exposed, the fire essentially put itself out once the furnishings and contents of the room had been consumed by fire.
- The underlying wood was protected by a layer of char during the four-hour test.

Standards and Testing



- On the world's largest earthquake simulator, a 2-storey structure was tested against a 6.7 magnitude earthquake simulation, which is the same magnitude as the Northridge earthquake that rattled Southern California in 1994.
- "Today was a great success," Andre Barbosa, an engineer at Oregon State University said. "We just ran Northridge twice, back to back."
- It was actually 125 percent Northridge and the building performed very well with no indication of damage."

Key Questions for Mass Timber Industries

- What are the key success and risk factors?
- How markets performed so far and how will they perform in the coming years?
- Which countries represent the biggest markets?
- What is the structure of the cross-laminated timber industry and who are the key players?
- What are the environmental/financial benefits?
- What were the historical price trends?
- What are the margins?
- What are the barriers to entry?

Key Questions for Mass Timber Industries

- What are the various unit operations involved?
- What is the total size of land required?
- What are the machinery requirements?
- What are the raw material requirements?
- What are the utility requirements?
- What are the manpower requirements?
- What are the infrastructure costs?
- What are the capital costs?
- What are the operating costs?
- What will be the income and expenditures?
- What is the time required to break-even?

Limitations for CLT/MPP Adoption

- Limited awareness of emerging timber technologies
- Limited legislative support from government
- Lack of experienced designers
- Lack of experienced builders
- Lack of experienced architects
- Lack of building codes

CLT Manufacturing



D.R. Johnson Lumber Co., Riddle, Oregon



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Brock Commons, an 18-story University of British Columbia student housing project that went up at a pace of **a floor every three days**.

CLT flooring was used over glulam beams with a concrete core.

Mass Plywood Panels (MPP)

- A veneer-based engineered wood product, MPP is a massive, large-scale plywood panel with maximum finished panel dimensions up to 12 ft. wide by 48 ft. long and up to 24 inches thick.
- The panels may be customized to fit specific projects; constructed in 1-inch thick increments that provide superior strength and performance.
- A good alternative to cross laminated timbers, MPP is an engineered panel that allows wood products to be used for multi-story buildings, while increasing the speed of construction.
- What sets it apart is the fact that it uses engineered veneer and custom plywood layups as a base material rather than lumber.

Mass Plywood Panels (MPP)

- One manufacturer in the U.S.-Freres Lumber Co.-Lyons, Oregon.
- Studies conducted at Oregon State University show that by using veneer as a raw material for a Mass Timber Panel, they can potentially achieve the same structural attributes of a CLT panel with 20 to 30% less wood.
- Other advantages of MPP include how the panels' relative lightness can help transportation costs and logistics.

Mass Plywood Panels (MPP)



Freres Lumber Co.-Mass Plywood Panel
Photo by Richard Vlosky

New Study Starting Fall 2017

Project Title

Markets, and Investment Potential for Cross-Laminated Timber and Massive Plywood Panels Manufactured from Southern Yellow Pine

- The Louisiana Forest Products Development Center, Louisiana State University Agricultural Center is partnering with study funding entities.
- Contact Rich Vlosky (me) if interested in partnering.

Final Observations

- CLT manufacturers in North America have seen a steady growth since the product was first introduced.
- This trend is driven by a combination of new businesses focusing on CLT manufacturing and existing engineered timber producers adding CLT manufacturing capacity to their product lines.
- CLT (MPP) is currently on a rapid upward trajectory in North America.



Questions/Comments?

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