Mass Timber at UMaine

While its combination of structural performance, flexibility in design, and aesthetics are enough for many designers, mass timber has numerous other advantages.

Many architects and engineers believe that we are now in "the beginning of the timber age" where "plyscrapers" will soon be dotting city skylines all over the world. These tall wood buildings are a result of "mass timber" – a category of construction characterized by the use of large wood-based panels for wall, floor, and roof construction. Products in the mass timber family include: Cross-Laminated Timber (CLT), Nail-Laminated Timber (NLT), Glued-Laminated Timber (Glulam), and Structural Composite Lumber (SCL) e.g., Laminated Veneer Lumber (LVL), Laminated Strand Lumber (LSL), and Parallel Strand Lumber (PSL), as well as hybrid products manufactured with a combination of materials.

Advantages of Mass Timber:

- Environmental Attributes: Mass timber products use renewable and sustainable resources instead of fossil-fuel intensive materials. This equates to a lighter carbon footprint.
- Construction Efficiency: Mass timber construction is faster, leading to less construction traffic, and requires fewer workers than similarly-sized concrete construction projects.
- Seismic Performance: The fact that mass timber weighs less than other materials offers some structural advantages such as smaller foundations and lower forces for seismic resistance.
- Fire Performance: Mass timber provides inherent fire resistance due to the nature of thick timber to char slowly, at a predictable rate, allowing these systems to maintain their structural integrity for significant time durations.

CLT Blast Testing at Tyndall Air Force Base

Recent Mass Timber Research at UMaine

Structural Performance of Hybrid CLT

Students and staff at the University of Maine manufactured and performed mechanical property testing to determine the feasibility of using lumber from Northeastern U.S. forests and laminated strand lumber (LSL) in hybrid CLT. One outcome of this study was a better understanding of how CLT panels may be designed using various wood and engineered wood products to maximize the attributes of the specific laminae, and therefore efficiently maximize the mechanical and physical properties of the final CLT panel. For example, test results indicated that the use of LSL as the cross-ply material increased the perpendicular-to-grain shear strength of CLT, which significantly enhanced panel capacity.

Hybrid CLT Manufactured at UMaine

Blast Testing of CLT

In 2016, WoodWorks conducted a series of live blast tests on three two-story CLT structures at Tyndall Air Force Base to demonstrate the effectiveness of CLT over a spectrum of blast loads.

The University of Maine supported the project by conducting static/quasi-static testing and data analyses and aiding in the design and on site execution of dynamic blasting.

Qualification of New CLT E-Grades

The UMaine Advanced Structures and Composite Center is currently working on a project to introduce two new grades of cross laminated timber (CLT) using MSR-graded Spruce-Pine-Fir South (SPF-S) lumber produced in Maine. These grades are designed to be equivalent to existing CLT manufactured with southern yellow pine or Douglas-fir, species known for their high stiffness and strength. Introduction of these grades will make Maine/New England more competitive in the CLT market.

Effect of Gaps

Research at UMaine is currently underway to investigate the effect of gaps between the inner layers on mechanical properties of CLT. Secondary objectives include the development of modeling techniques applicable to a range of gap sizes to predict said effects, and the determination of whether significant reductions in CLT shear and creep performance, due to the existence of edge gaps of CLT manufactured with lumber, can be mitigated with alternate materials such as SCL.

Maine Mass Timber Commercialization Center

Based at the University of Maine, the Commercialization Center has teamed with industrial partners, trade organizations, construction firms, architects, and other stakeholders in the region to promote mass timber construction in the region. Specific objectives include promotion of the siting a mass timber facility in Maine, identifying recommendations to incentivize wider use of mass timber, and promote possible demonstration projects.

Manufacturing and Testing Capabilities

As an ISO 17025 accredited testing laboratory, the UMaine Advanced Structures and Composites Center is capable of conducting most wood composites testing including the CLT qualification tests required under ANSI/APA PRG 320: Standard for Performance-Rated Cross Laminated Timber.

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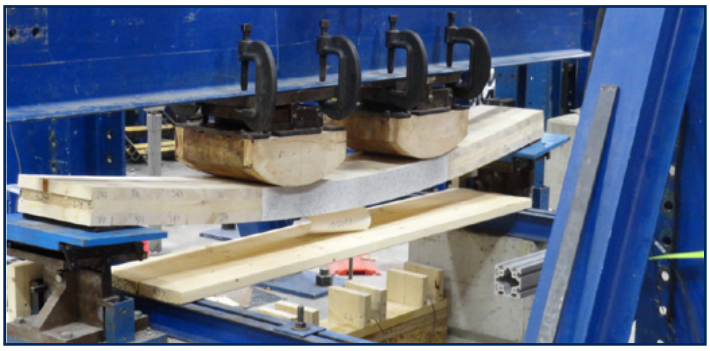
About the UMaine Composites Center

The UMaine Advanced Structures and Composites Center helps clients take a technology from the design state to a commercially viable product. The 100,000 ft^2 (8,100 m^2) laboratory employs over 180 personnel with expertise in multiple disciplines including large-scale and coupon-level testing, composites manufacturing and analysis, FEA and other modeling techniques, and more. The Center may be hired to jointly develop a product, or solely as a contractor to manufacture and/or test wood composite products.

Structural Testing Laboratory at UMaine

Uniform Load Bending Test of CLT at UMaine



4-point Hybrid CLT Bending Test at UMaine