Mass Timber in Maine
An Update on Activities

Maine Forest Products Council Annual Meeting
Rockland, ME
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Visit us online at composites.umaine.edu.
Presentation Summary

• The Advanced Structures & Composites Center

• Mass Timber Overview/Opportunity

• Maine Mass Timber Working Group

• Ongoing Mass Timber Research at UMaine

• Conclusions
ASCC - Introduction

• 100,000 ft² R&D facility
• Established in 1996 – Current lab opened 2000
• ~$160 million in contracts since 2001
• More than 500 industrial clients including 150 Maine companies
• 60 full-time staff/faculty
• 25 graduate/75 undergraduate students
Structural Testing

- 90’ long testing floor
- 3 test frames (300, 110 and 55 kip)
- Horizontal load reaction wall

- 230’ long testing floor
Norway Spruce / SPF-S Monitoring

Objective: To have Norway spruce included in the SPF-S lumber category
• ALSC approved on 10/21/2016
• Now doing required 5-year monitoring of SPF-S in the Northeast with NELMA

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MASS TIMBER IS A CATEGORY OF FRAMING STYLES OFTEN USING SMALL WOOD MEMBERS FORMED INTO LARGE PANELIZED SOLID WOOD CONSTRUCTION INCLUDING CLT, NLT OR GLULAM PANELS FOR FLOOR, ROOF AND WALL FRAMING

Source: Woodworks
Mass Timber Products

Nail-Laminated Timber (NLT)

Cross-Laminated Timber (CLT)

Glue-Laminated Timber (GLT)

Horizontal Framing

Tongue & Groove Decking (T&G)

Timber Concrete Composite

Structural Composite Lumber

Source: Woodworks
UMASS DESIGN BUILDING
AMHERST, MA


Source: Woodworks
BROCK COMMONS
VANCOUVER, BC

17 STORIES OF TIMBER INSTALLATION
STARTED JUNE 6, 2016
FINISHED AUGUST 10, 2016

Source: Woodworks
TALL MASS TIMBER
BUILDING COMPETITION

Framework: An Urban + Rural Ecology

- Tall Wood Competition Winner
- Location: Pearl District, Portland, OR
- Height: 130’ / 12 stories
- Total Building Area: 90,000 square feet
- Building Uses: Ground floor retail; 5 office floors; 5 apartment floors; Rooftop amenity
- Materials: Cross laminated timber floors and lateral force resisting system; Glue laminated beams and columns

OWNER: BENEFICIAL STATE BANCORP
ARCHITECT: LEVER ARCHITECTURE
ENGINEER: KPFF

Source: Woodworks
Maine Mass Timber Working Group

Adhoc group made up of researchers, contractors, sawmills, architects, engineers and others to promote the opportunity in Maine.

EDAT recommendation:
Priority “E” of the EDAT report states: “Invest in the research, development and commercialization of emerging wood technologies….Cross Laminated Timber (CLT) research at the University of Maine is linked to several potential manufacturing facilities seeking east coast locations. Immediately form a collaboration of appropriate parties to promote the siting of a CLT facility in Maine and identify recommendations to incentivize wider use of CLT and possible demonstration projects.”

EDA RIS I6 Grant: If awarded, the Maine Mass Timber Commercialization Center would be formed at UMaine, expanding efforts (as well as staffing & funding) to pursue this unique opportunity for the Forest Products Industry in Maine.

Mass Timber Design Competition
Mass Timber – UMaine’s Objectives

- To become the leader in the Northeast U.S. for Mass Timber information, R&D, and commercialization facilitation.

- Coordinate efforts answering the important questions that a developer/investor needs answered when considering siting a Mass Timber plant in Maine.

- Put our world-class, ISO 17025 accredited wood composites laboratory to work supporting the Mass Timber industry.

- Educate students (e.g. engineers and wood scientists) that can support another Mass Timber manufacturer in Maine
Recent CLT Research at UMaine

- Hybrid SPF-s / LSL
  - SPF-s in Maine: 390 million BF in 2015
  - New Mass Timber plant likely to consume ~50 MMBF/YR
  - Laminated Strand Lumber
    Most massive timber product made in the U.S.?
  - Use two of Maine’s strengths: Solid sawn lumber & wood composites
PRG-320

Table A1.
ALLOWABLE DESIGN PROPERTIES for PRG 320 CLT (for use in the U.S.)

<table>
<thead>
<tr>
<th>CLT Grades</th>
<th>$F_{L0}$ (psi)</th>
<th>$F_{L0}$ (10^8 psi)</th>
<th>$F_{E0}$ (psi)</th>
<th>$F_{E0}$ (psi)</th>
<th>$F_{E0}$ (psi)</th>
<th>$F_{E0}$ (psi)</th>
<th>$F_{E0}$ (psi)</th>
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<tr>
<td>E1</td>
<td>1,550</td>
<td>1.7</td>
<td>1,375</td>
<td>1,800</td>
<td>135</td>
<td>45</td>
<td>500</td>
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<tr>
<td>E2</td>
<td>1,650</td>
<td>1.5</td>
<td>1,020</td>
<td>1,700</td>
<td>180</td>
<td>60</td>
<td>525</td>
<td>1.4</td>
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<tr>
<td>E3</td>
<td>1,200</td>
<td>1.2</td>
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<td>E4</td>
<td>1,550</td>
<td>1.7</td>
<td>1,375</td>
<td>1,800</td>
<td>175</td>
<td>55</td>
<td>575</td>
<td>1.4</td>
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<tr>
<td>V1</td>
<td>900</td>
<td>1.6</td>
<td>575</td>
<td>1,350</td>
<td>180</td>
<td>60</td>
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<td>1.4</td>
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<tr>
<td>V2</td>
<td>875</td>
<td>1.4</td>
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<td>1,150</td>
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<tr>
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<td>55</td>
<td>575</td>
<td>1.4</td>
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</tbody>
</table>

- E1: 1950F-1.7E Spruce-pine-fir MSR lumber in all parallel layers and No. 3 Spruce-pine-fir lumber in all perpendicular layers
- E2: 1450F-1.5E Douglas fir-Larch MSR lumber in all parallel layers and No. 3 Douglas fir-Larch lumber in all perpendicular layers
- E3: 1200F-1.2E Eastern Softwoods, Northern Species, or Western Woods MSR lumber in all parallel layers and No. 3 Eastern Softwoods, Northern Species, or Western Woods lumber in all perpendicular layers
- E4: 1950F-1.7E Southern pine MSR lumber in all parallel layers and No. 3 Southern pine lumber in all perpendicular layers
- V1: No. 2 Douglas fir-Larch lumber in all parallel layers and No. 3 Douglas fir-Larch lumber in all perpendicular layers
- V2: No. 1/No. 2 Spruce-pine-fir lumber in all parallel layers and No. 3 Spruce-pine-fir lumber in all perpendicular layers
- V3: No. 2 Southern pine lumber in all parallel layers and No. 3 Southern pine lumber in all perpendicular layers

Table 1. Allowable Design Properties for Laminates Used in SmartLam CLT (for Use in the U.S.)

<table>
<thead>
<tr>
<th>CLT Grade</th>
<th>$F_{L0}$ (psi)</th>
<th>$F_{E0}$ (10^8 psi)</th>
<th>$F_{L0}$ (psi)</th>
<th>$F_{L0}$ (psi)</th>
<th>$F_{E0}$ (psi)</th>
<th>$F_{E0}$ (psi)</th>
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<td>1,000</td>
<td>135</td>
<td>46</td>
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</table>

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Conclusion

• Mass Timber is projected to continue growth in the U.S. Will the first facility in the Northeast be Maine?

• UMaine and the MMTWG are committed to moving Mass Timber technologies forward

• Coordination, energy & seizing opportunities