The Mass Timber Perspective

TALL WOOD, CODE CHANGES AND FOREST RESOURCE IMPACTS

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Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.
Lendlease CLT Projects
Around the World
Forte’ – Melbourne
Library at the Dock – Melbourne
International House – Sydney
25 King – Brisbane
- 10 Stories (9 office, 1 retail)
- November 2018 Completion
Google HQ – UK

- 11 Floors Above Ground
- 2 story Basement

- 870,000 sq. ft. Gross Exterior Area (GEA)
- 651,000 sq. ft. Net Interior Area (NIA)
LL in the Americas
Future Army CLT Hotels

<table>
<thead>
<tr>
<th>Location</th>
<th># of floors</th>
<th>Room Count</th>
<th>Construction Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ft. Drum, NY</td>
<td>4 Story</td>
<td>99 rooms</td>
<td>Fall 2017 (on going)</td>
</tr>
<tr>
<td>Joint Base Lewis-McChord, WA</td>
<td>5 Story</td>
<td>123 rooms</td>
<td>Summer 2018</td>
</tr>
<tr>
<td>Ft. Jackson, SC</td>
<td>2 – 5 Story Buildings</td>
<td>328 rooms</td>
<td>Fall 2018</td>
</tr>
<tr>
<td>Ft. Bragg, NC</td>
<td>2 – 6 Story Buildings</td>
<td>488 rooms</td>
<td>Spring 2019</td>
</tr>
</tbody>
</table>
The Sweet Spot
CLT should be strongly considered when a project experiences 3 of these 5 conditions.
When all development, design and construction costs are aggregated, the schedule savings achieved through CLT with other speed and value added solutions can be cost competitive in 1-5 stories construction.
# The Case for CLT / Modular Construction

<table>
<thead>
<tr>
<th>PAL PORTFOLIO</th>
<th>TYPICAL NEW PAL HOTEL (ACTUAL*)</th>
<th>REDSTONE ARSENAL (ACTUAL)</th>
<th>DIFFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross SF</td>
<td>54,891</td>
<td>62,688</td>
<td>+14%</td>
</tr>
<tr>
<td>Average # of Employees</td>
<td>18 (Peak 26)</td>
<td>10 (Peak 11)</td>
<td>-43%</td>
</tr>
<tr>
<td>Structural Duration (Days)</td>
<td>123</td>
<td>78</td>
<td>-37%</td>
</tr>
<tr>
<td>Structural Man Hours</td>
<td>14,735</td>
<td>8,203</td>
<td>-44%</td>
</tr>
<tr>
<td>Structural Production Rate/Day (SF)</td>
<td>460 SF/day</td>
<td>803 SF/day</td>
<td>+75%</td>
</tr>
<tr>
<td>Overall Schedule</td>
<td>15 months</td>
<td>12 months</td>
<td>-20%</td>
</tr>
</tbody>
</table>

* PAL New Build Hotel Historical Average
TRIPLE BOTTOM LINE SUSTAINABILITY HIGHLIGHTS

Economic
- 37% Faster than Traditional Metal Stud Construction
- Cost Neutral to Metal Stud Framing (On Military Installations)

Environmental
- 31% more energy efficient than previous PAL New Hotels of similar size per current energy model
- 1,276 tons carbon sequestered (1,656 m3 of timber used)

Social
- Unemployed Veterans were upskilled in the construction trades.
- Eliminated exposure to falls for workers from elevated heights.
MASS TIMBER – BEGINNING OF A NEW INDUSTRY
Cross Laminated Timber in the US

Positively disrupting traditional construction of mid rise structures
What’s Next
Performance Based Path:

» Applies to new materials, structural systems, building sizes

» Current Code Path for tall wood buildings

» Requires documentation, data, testing information, etc. to validate that proposed design meets or exceeds code intent for fire and life safety, structural safety, durability, quality, etc.
Mass Timber Fire Testing

ATF Fire Tests

A team of fire experts from the U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) working alongside scientists from the U.S. Forest Products Laboratory put identically furnished, multistory, one-bedroom apartments constructed of exposed, partially exposed, and unexposed (protected) five-ply cross-laminated timber (CLT) through a series of rigorously monitored tests. The purpose of the tests is to provide data that will help inform any recommendations the ICC Ad Hoc Committee on Tall Wood Buildings (TWB) will propose for the 2021 International Building Code. A series of five tests were conducted. Each test was designed to replicate real world conditions across five scenarios. Identical, furnished, one bedroom apartments were constructed in a multistory building. The door between the living and sleeping areas was left open, and both apartments. A three minute video capturing the highlights of each test is in this playlist.

Full-Scale Fire Tests of a Two-Story Cross-Laminated Timber Structure

http://www.awc.org/tallwood
<table>
<thead>
<tr>
<th>Test Types</th>
<th>Testing Agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Resistive Component Testing – E119 Fire</td>
<td>FP Innovations / NRC / Southwest Research Institute/ Independent Labs</td>
</tr>
<tr>
<td>Full Tested Assemblies – E119 Fire</td>
<td>Underwriters Laboratory</td>
</tr>
<tr>
<td>Full Scale Encased Compartment Comparison Testing</td>
<td>NRC – CNRC</td>
</tr>
<tr>
<td>System Fire Resistance Testing – US Demonstration Project</td>
<td>ATF &amp; FPL</td>
</tr>
<tr>
<td>Penetration Testing</td>
<td>FP Innovations</td>
</tr>
<tr>
<td>Full-scale Mass Timber Shaft Demonstration Fire</td>
<td>NRC- CNRC / FP Innovations</td>
</tr>
<tr>
<td>Flame Spread Testing – ASTME84</td>
<td>FP Innovations / Independent Labs</td>
</tr>
</tbody>
</table>

[https://www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/](https://www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/)
<table>
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<tr>
<th>Type of Construction</th>
<th>Height</th>
<th># of Stories</th>
<th>Exposed Mass Timber</th>
<th>Sprinklers</th>
<th>Primary Frame FRR</th>
<th>Floor FRR</th>
<th>Stair Tower</th>
<th>Concealed Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV-HT (Existing)</td>
<td>85’</td>
<td>4-6</td>
<td>Fully Exposed</td>
<td>Yes</td>
<td>NR</td>
<td>HT</td>
<td>Mass Timber</td>
<td>Not Permitted</td>
</tr>
<tr>
<td>IV– C Proposed</td>
<td>85’</td>
<td>4-9</td>
<td>Fully Exposed</td>
<td>Yes</td>
<td>2 hours</td>
<td>2 hours</td>
<td>Mass Timber</td>
<td>Permitted</td>
</tr>
<tr>
<td>IV-B Proposed</td>
<td>180’</td>
<td>6-12</td>
<td>Partially Exposed</td>
<td>Yes</td>
<td>2 hours</td>
<td>2 hours</td>
<td>Mass Timber</td>
<td>Permitted</td>
</tr>
<tr>
<td>IV-A Proposed</td>
<td>270’</td>
<td>9-18</td>
<td>Fully Protected</td>
<td>Yes</td>
<td>3 hours</td>
<td>2 hours</td>
<td>Noncombustible</td>
<td>Permitted</td>
</tr>
</tbody>
</table>

*Courtesy of American Wood Council*
The 8-Step I-Code Development Cycle

Step 1: January 8 – Final Proposed Language submitted to ICC – **COMPLETED**

Step 2: February 28 – Changes are posted for Public Viewing – **COMPLETED**

Step 3: April 15-25 – Committee Action Public Hearing – Columbus, OH

- Floor Discussion – The code change proposals are considered and discussed at the floor discussion – **COMPLETED**

- Committee Action – The code development committee makes a recommendation on the code change proposal disposition – **PASSED**

- Assembly Action – ICC members in attendance can challenge committee actions
  - Online assembly floor motion voting period is 2 weeks and begins approximately 2 weeks after the hearings close. – **NOT CHALLENGED**

The 8-Step I-Code Development Cycle

Step 4: May 30 – Committee Action Hearing results posted – COMPLETED
Step 5: June 1 - July 16 – Public Comments Sought on Committee Action Hearing Results – COMPLETED
Step 6: August 31 – Public Comments Posted
Step 7: October 24-31 – Public Comment Hearing and Vote*
Step 8: Fall 2020 – New Edition is Published

For Detailed Information

www.iccsafe.org/codes-tech-support/cs/icc-ad-hoc-committee-on-tall-wood-buildings/

www.builddtallbuildsafe.com
Changing the Codes

Engage
Educate
Enroll
Empower
Moving Forward
MASS TIMBER – BEGINNING OF A NEW INDUSTRY
Questions?

This concludes The American Institute of Architects Continuing Education Systems Course

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