Mass Timber

Building Bigger with Wood
Light Frame and Heavy Timber

- Residential & light commercial
- Thousand-year history
- Significant market coverage
- Height limited
U.S. Light Frame Limits

Per International Building Code (IBC 2015)

- Five floors or 85 ft with proper sprinkler
- Four floors or 65 ft without sprinkling
- Can gain floors but not height by building on top of “non-combustible” construction
Mass Timber

- Multi-family and tall commercial
- 25-year history
- Just entering N. American markets
- The sky’s the limit

Mass timber competes with tilt-up and steel.
Mass Timber Height Limits

- Currently being pushed on a case-by-case basis
- Fire testing and rating underway
- 8-10 stories seen as market niche
Mass Timber

Cross-laminated timber (CLT)

Nail-laminated timber (NLT)

Glulam

Photos by Lend Lease, Roberto Lopez-Anido
Glue-laminated Beams

Photo courtesy Roberto Lopez-Anido
Glue-laminated Beams

Good wood

Wood

Best wood

Photo courtesy Roberto Lopez-Anido
Nail Laminated Timber

- Parallel boards
- Plywood sheathing
- Used for horizontal components

© Structurecraft/ Perkins + Will
Cross-Laminated Timber

perpendicular

parallel
Cross-Laminated Timber

- Manufactured in 10 ft x 60 ft (±) sheets
- 3-, 5-, 7-ply common, up to 20” thick possible
- Kiln-dried lumber (MC ≤ 12%)
- Panels custom cut
Cross-Laminated Timber

- Used for buildings
- Often in combination with glulam columns and beams
- Composite floor construction provides greater spans
“Any softwood lumber species or species combination recognized by American Lumber Standards Committee (ALSC) under PS 20 or Canadian Lumber Standards Accreditation Board (CLSAB) under CSA CSA4141 with a minimum published specific gravity of 0.35, as published in the National Design Specification for Wood Construction (NDS) in the U.S. and CSA O86 in Canada, shall be permitted for use in CLT manufacturing provided that other requirements specified in this section are satisfied. The same lumber species or species combination shall be used in a single layer of CLT. Adjacent layers of CLT shall be permitted to be made of different species or species combinations.”
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Minimum grade in the parallel layers shall be No. 2 or better. Minimum grade in the perpendicular layer shall be No. 3 (or better).
## Grading (also PRG-320)

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<th>Grade</th>
<th>Parallel Layers</th>
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<td>V1</td>
<td>No. 2 Df-L</td>
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### New grade for New England?

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N. American Manufacturers

- SmartLam (Columbia Falls, MT)
- D.R. Johnson (Riddle, OR)
- Nordic (Chibougamau, QC)
- Structurlam (Penticton, BC)
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2500 miles
Advantages

- Rapid construction, fewer workers, less traffic
- CO₂ sequestration
- Use of small diameter lumber
- Cost-competitive
- Lightweight → Smaller foundations
- All the good of wood: acoustics, insulation, aesthetics
- Competing with steel and concrete
Code Acceptance

- IBC 2015
- NDS 2015
- Fire ratings underway
- Seismic rating underway
- Preservative treatment
UMass Design Building

Photos by Umass Amherst
UMass Design Building

Concrete goes here
© Ema Peter 26

Candlewood Suites
Candlewood Suites

- 37% savings in construction time for the structure—using first time crew
- 20% overall reduction in construction schedule
- 44% savings in labor-hours
- 1557 CLT panels, 11 GL columns, 44 GL beams
Designed for Blast
Candlewood Suites

- 935,696 bd ft equiv.
- 5 minutes of US and Canada growth
Questions
References

- CLT Handbook (free from reThinkWood.com)
- Case studies
  - WoodWorks.com
  - Smith, et al. Solid Timber Construction: Process, Practice, Performance