Mass Timber (MT)/Cross Laminated Timber (CLT) for Modular, Multi-Family Buildings in Hawai‘i

Kate Carrigg

Regional Director for Hawai‘i, WoodWorks

Based out of Portland, Oregon, Kate serves as WoodWorks Regional Director for Hawaii, providing education and technical support within the AEC and Development communities toward the use of wood in multifamily and non-residential construction. She holds a dual master's degree from Oregon State University in wood science and civil engineering and has over a decade of industry experience in the Pacific Northwest on projects ranging from commercial mass timber to light-frame multifamily podium buildings. With backgrounds in structural engineering and construction management, she brings a unique perspective to every challenge and project she assists with.

Introduction to

Mass Timber

Ascent / Korb + Associates Architects / Thornton Tomasetti / Photo Korb + Associates Architects

Presented April 19, 2024, by:

Kate Carrigg, PE
Regional Director

Funding Partners

WOODWORKS WPC WOOD PRODUCTS COUNCIL

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Forestry Innovation Investment

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RedBUILT

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SEAGATE MASS TIMBER INC. QUALITY + INTEGRITY

Solutions Team

Scott Breneman, PhD, PE, SE

Ashley Cagle, PE, SE

Matt Cloninger, PE, SE

Karen Gesa, PE

Erin Kinder, PE, SE, LEED AP

Melissa Kroskey, AIA, SE

Taylor Landry, PE, MLSE

Bruce Lindsey

Ricky McLain, PE, SE

Regional Directors: **One-on-One Project Support**

Mass Timber Construction Management Program

Partner Training Centers

- TRAINING CENTER PARTNER
- COLLEGE PARTNER
- IRONWORKER TRAINING
- HARDWARE MANUFACTURER

What is Mass Timber?


Photo: WoodWorks

Light-Frame Wood


Photo: Benjamin Benschneider

Heavy Timber

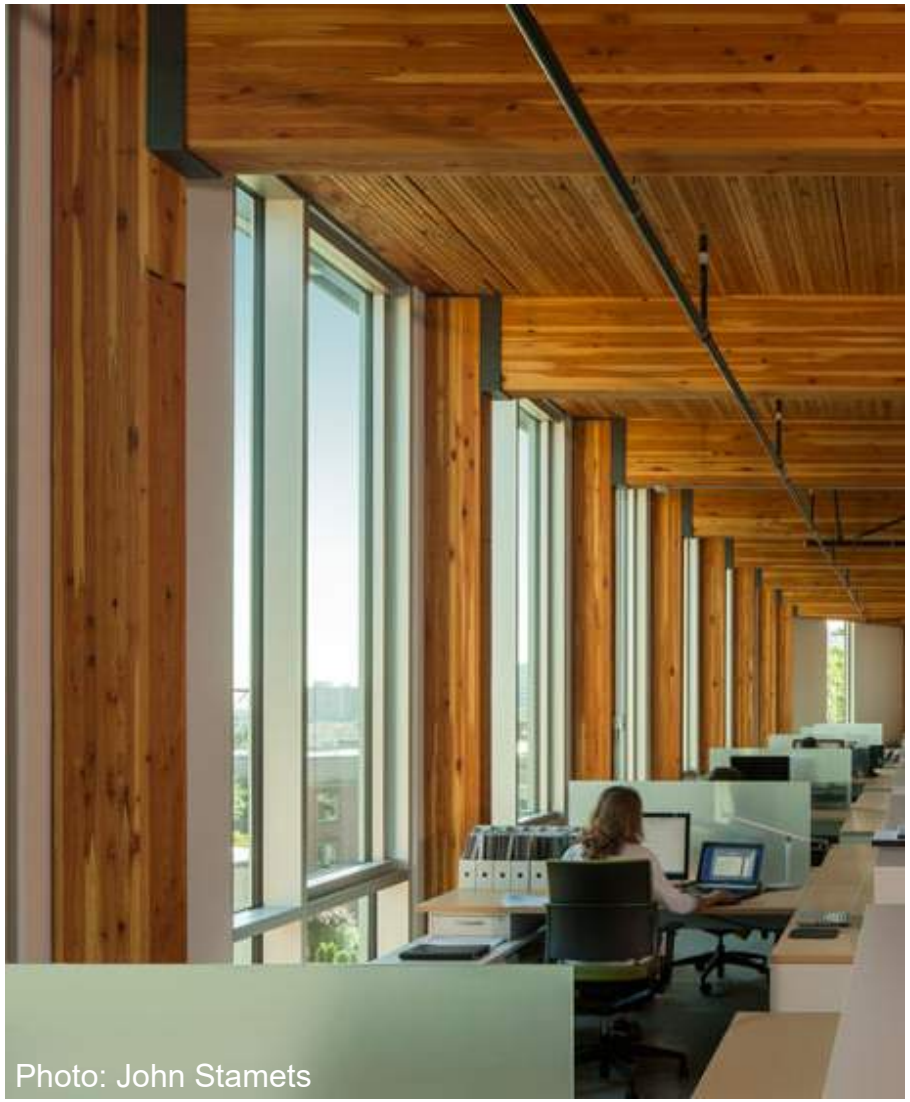
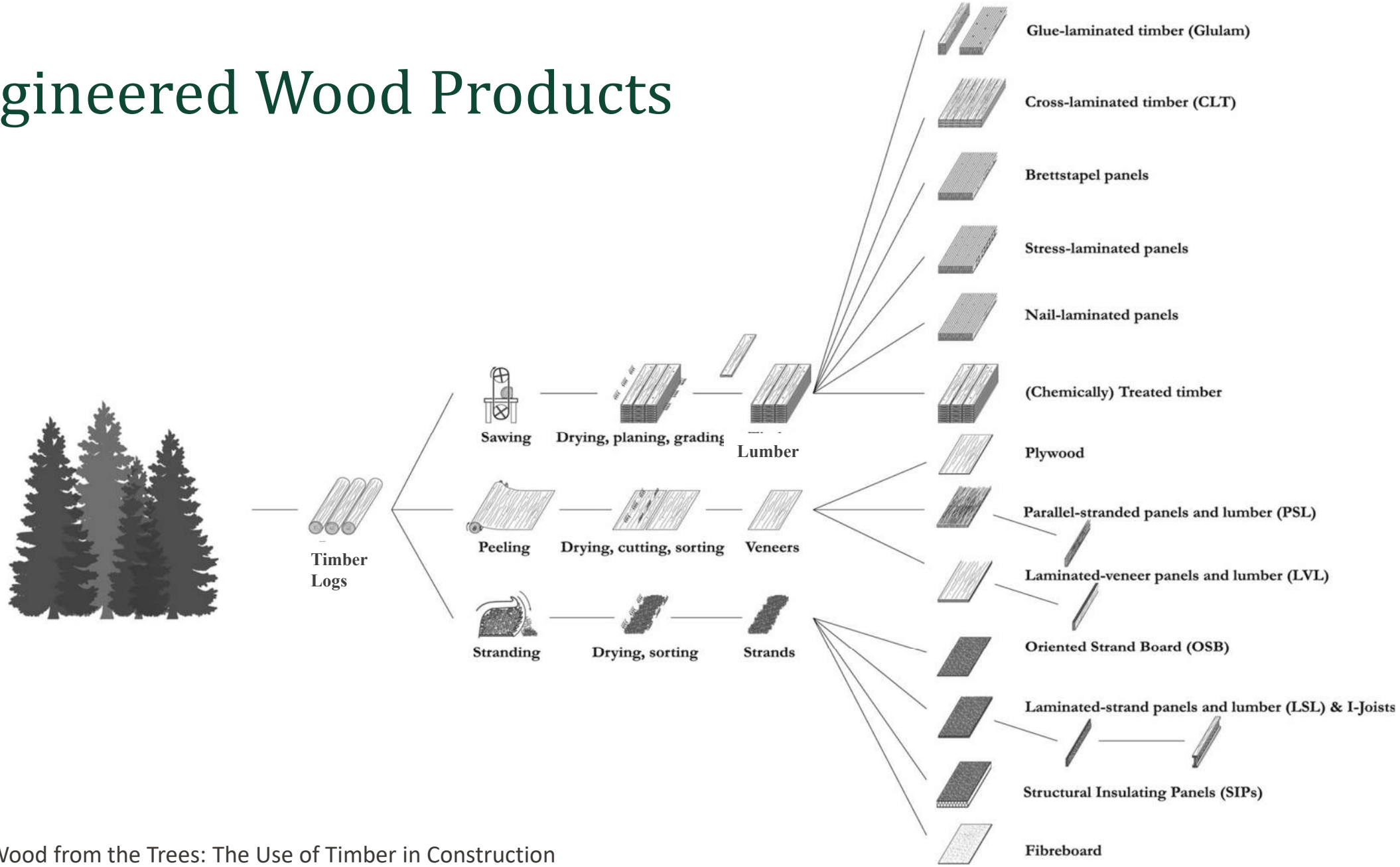


Photo: John Stamets

Mass Timber

Engineered Wood Products



Source: The Wood from the Trees: The Use of Timber in Construction
https://www.sciencedirect.com/science/article/pii/S1364032116306050

Panelized Construction

Mass Timber Products

Glulam

Beams & columns

Cross-Laminated Timber (CLT)

Solid sawn laminations

Veneer laminations (MPP, VLT)

Photo: Freres Lumber

Glue-Laminated Timber (GLT)

Plank orientation

Nail-Laminated Timber (NLT)

Photo: Think Wood

Dowel-Laminated Timber (DLT)

Photo: StructureCraft

Prefabricated and Precise

- Mass timber elements/connections fabricated to tight tolerances
- Computer Numerically Controlled (CNC)

Photo: Alex Schreyer

Photo: Structurlam

Labor Benefits

- Small crews for timber frame installation
- Utilize more entry-level laborers when systems fully designed, coordinated & pre-planned
- Safer construction sites

T3 Atlanta
Hartshorne Plunkard Architecture / DLR Group / StructureCraft / New South Construction /
Photo StructureCraft

Photo: C.D. Smith Construction

Ascent

Milwaukee, WI

Building Facts	493,000 sf, 25 stories
	Type IV-HT
	Multi-Family
	Completed 2022

Developer	New Land Enterprises
Architect	Korb + Associates Architects
Engineer	Thorton Tomasetti
General Contractor	C.D. Smith Construction

Ascent

Milwaukee, WI

- Tallest Mass Timber Building – 19 stories of CLT and GLT over 6-story concrete podium
- 50% of wood remains exposed

Photos: Kate Doughty

Korb + Associates Architects
Thronton Tomasetti

Healthy Buildings & Biophilia

George Fox University – Canyon Commons | Hacker | Photo: Jeremy Bittermann

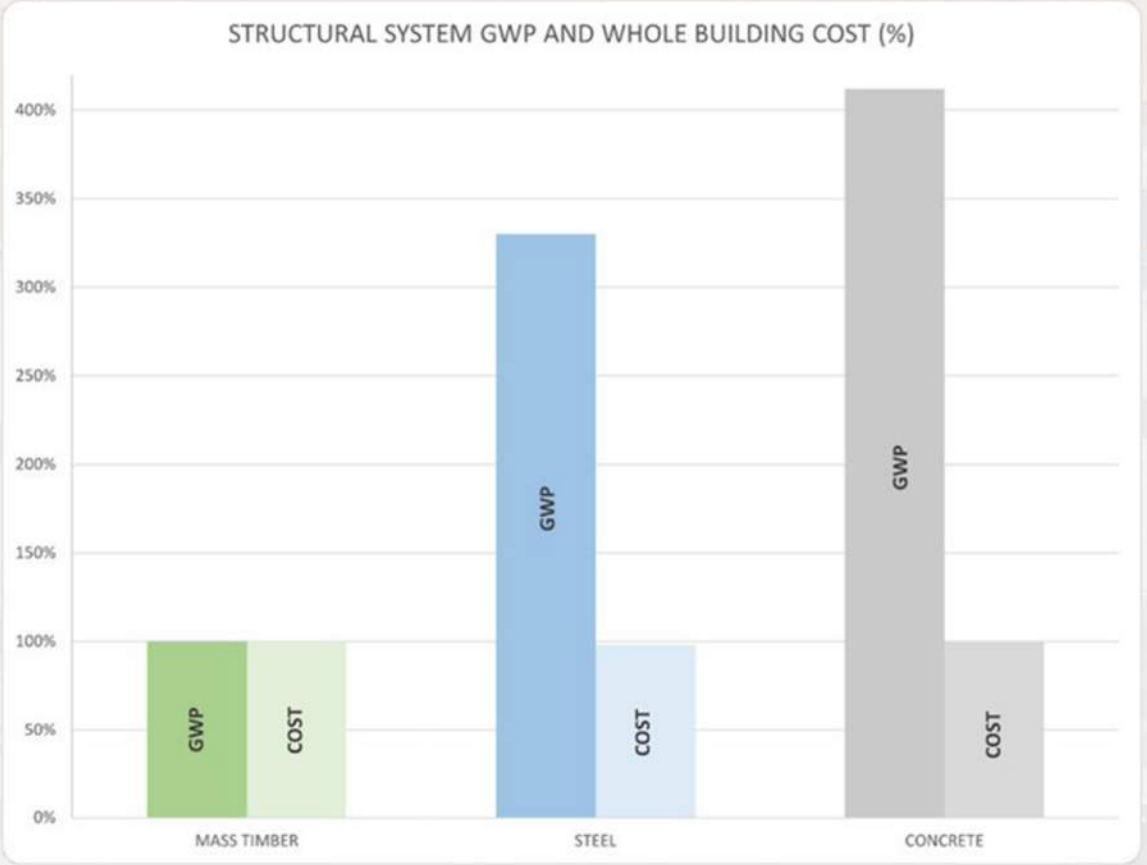
Platte Fifteen

Denver's First CLT Commercial Office Building Puts Sustainability to Work

PROJECT DETAILS

LOCATION:
Denver, Colorado

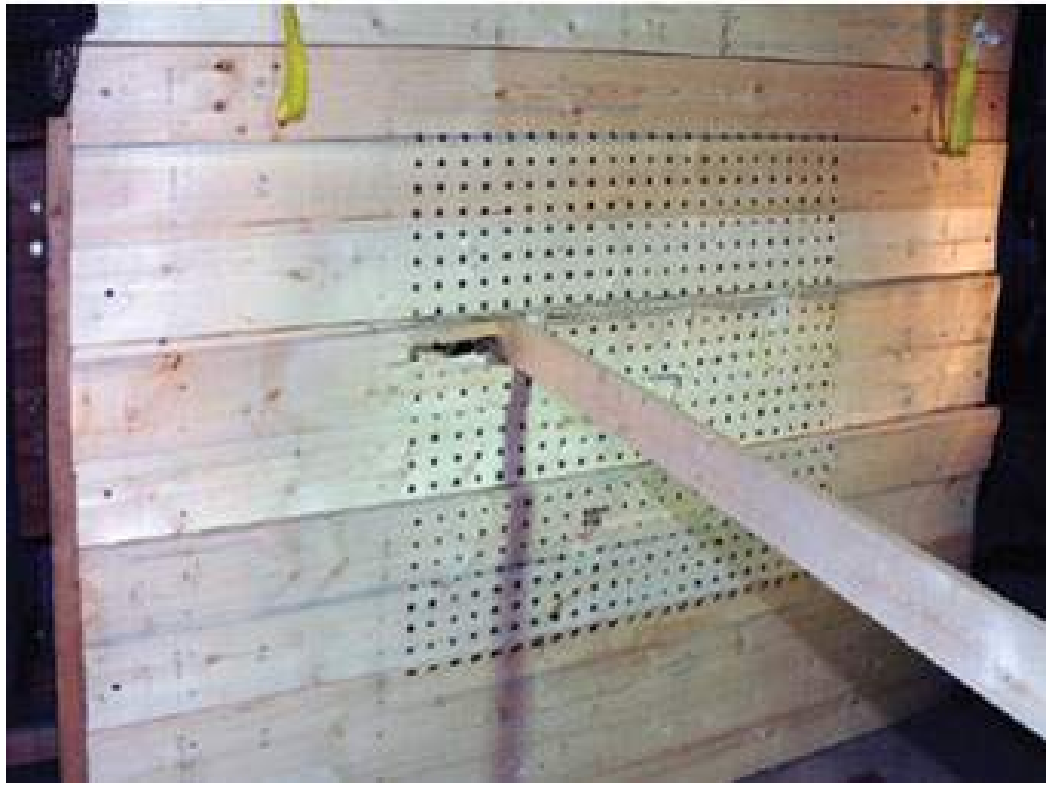
SIZE:
Five stories; 150,418 square feet



Source: Platte Fifteen Life Cycle Assessment
https://www.woodworks.org/resources/platte-fifteen-life-cycle-assessment/

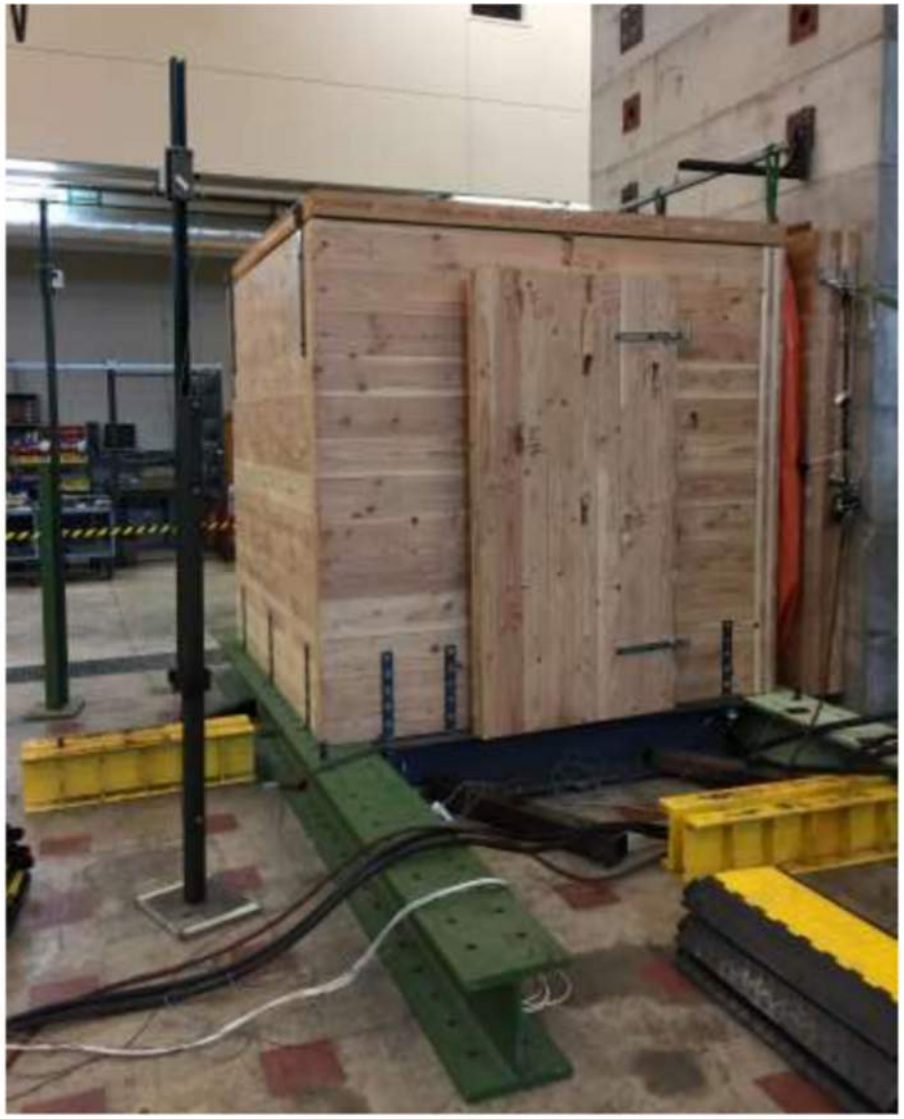
Rendering: Hickok Cole Architect

Disaster Resilience - Storm Shelters



Development of a Ready-to-Assemble Tornado Safe Room

from Cross Laminated Timber



Source: USDA FS FPL CLT tornado shelter

Disaster Resilience – Shake Table Tests

Source: S. PEI et al. http://nheritallwood.mines.edu/

Image Credit: USDA FS FPL/SLB/WoodWorks Live Blast Testing at Tyndall Air Force Base
http://www.woodworks.org/publications-media/blast-testing-research/

Disaster Resilience – Blast Testing

Mass Timber Fire Performance

Photos: Lendlease

Mass Timber Fire Performance

Photos: Lendlease

Mass Timber Fire Performance

Photo David Barber / Arup

- Mass timber has inherent fire protection.
- Elements char at a slow and predictable rate during a fire.

Mass Timber Fire Performance

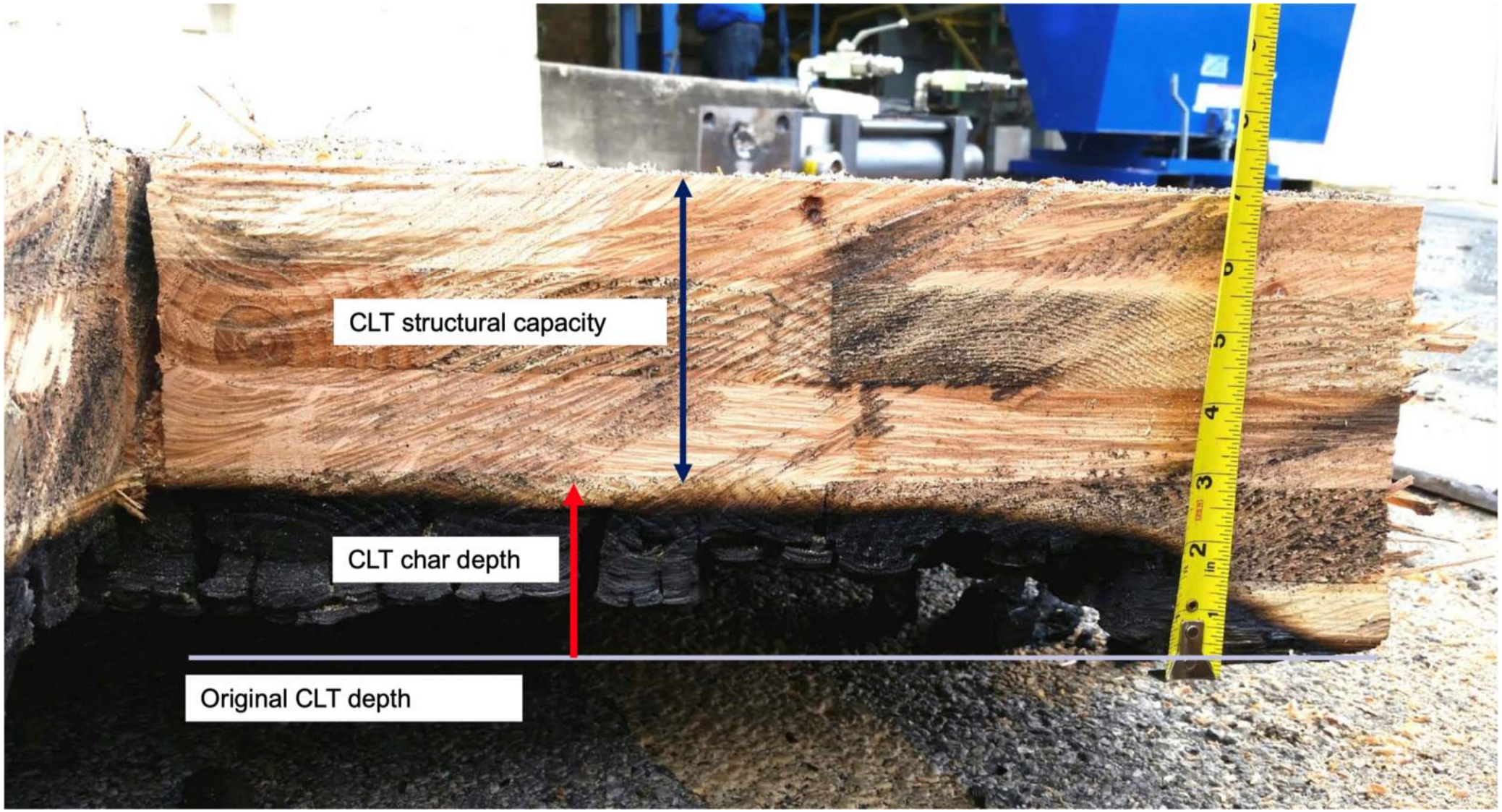


Photo David Barber / Arup

2021 IBC NEW Construction Types

Type IV-A

Image: Andrew Nelson

18 STORIES
BUILDING HEIGHT 270 ft

Type IV-B

Image: Michael Green Architecture

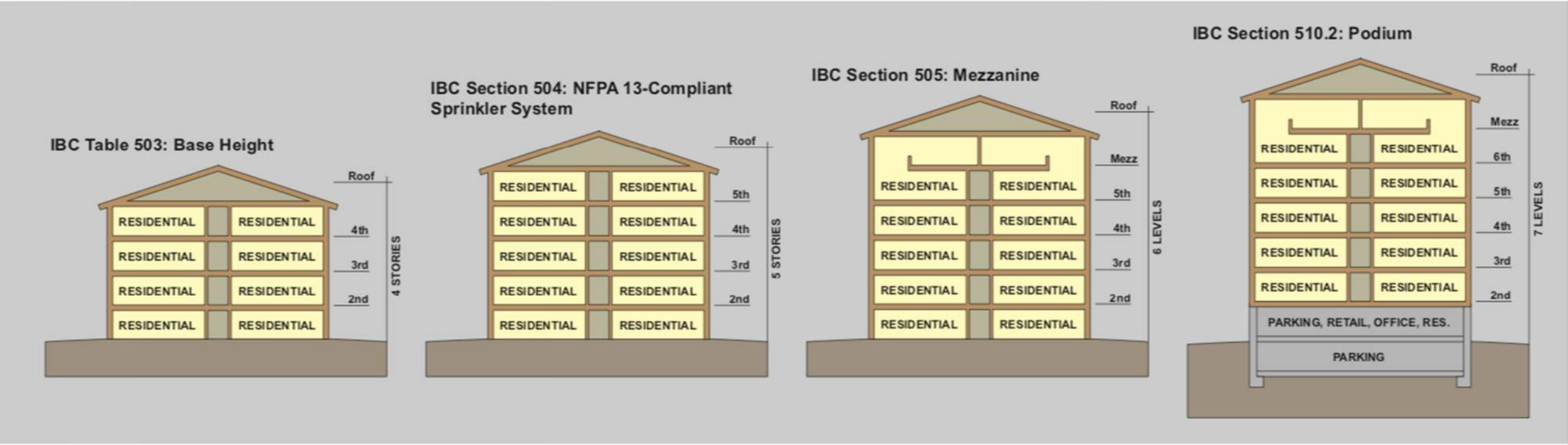
12 STORIES
BUILDING HEIGHT 180 ft

Type IV-C

Images: Susan Jones, atelierjones

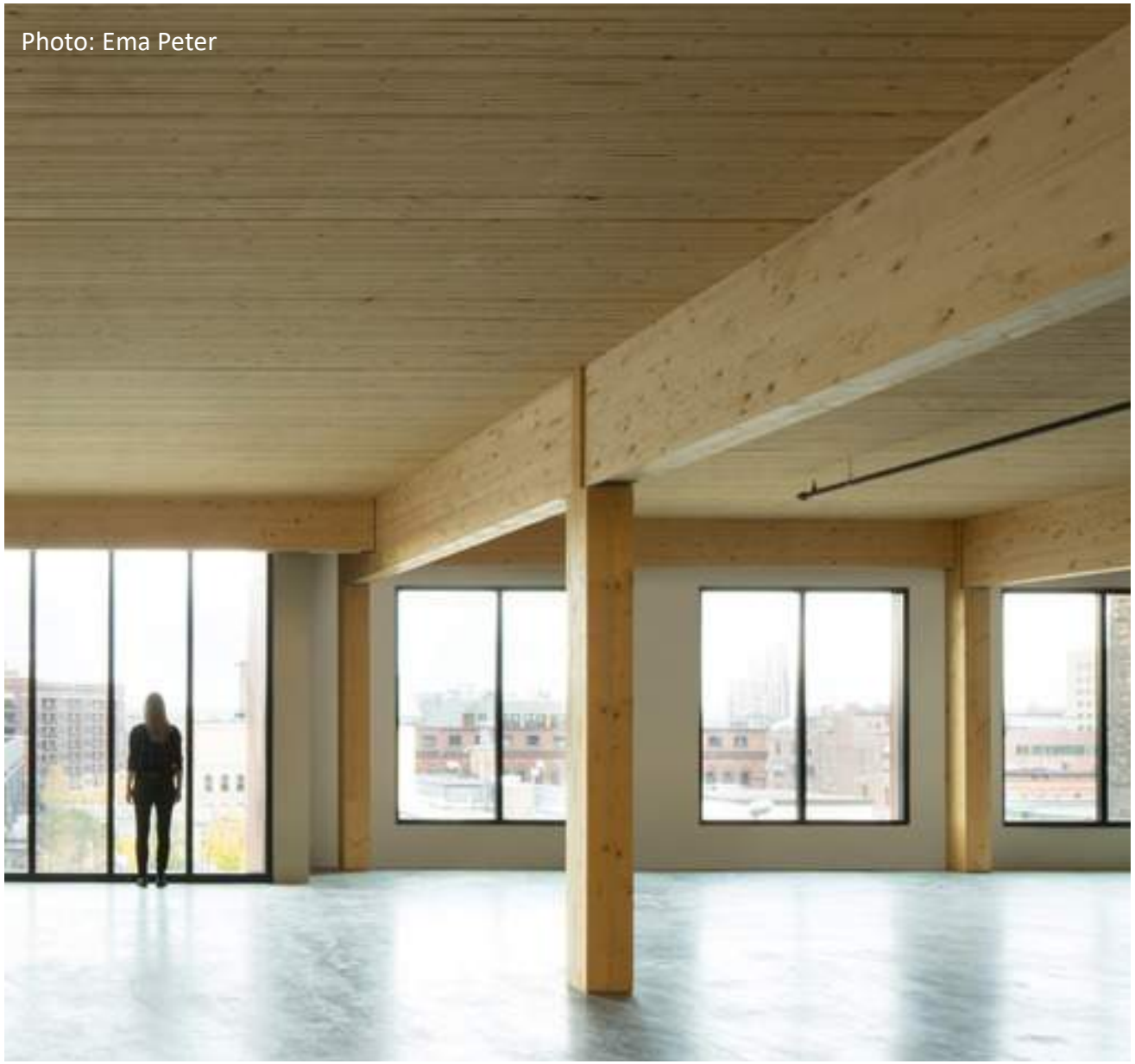
8 STORIES
BUILDING HEIGHT 85 ft

2018 IBC Height & Story Limits

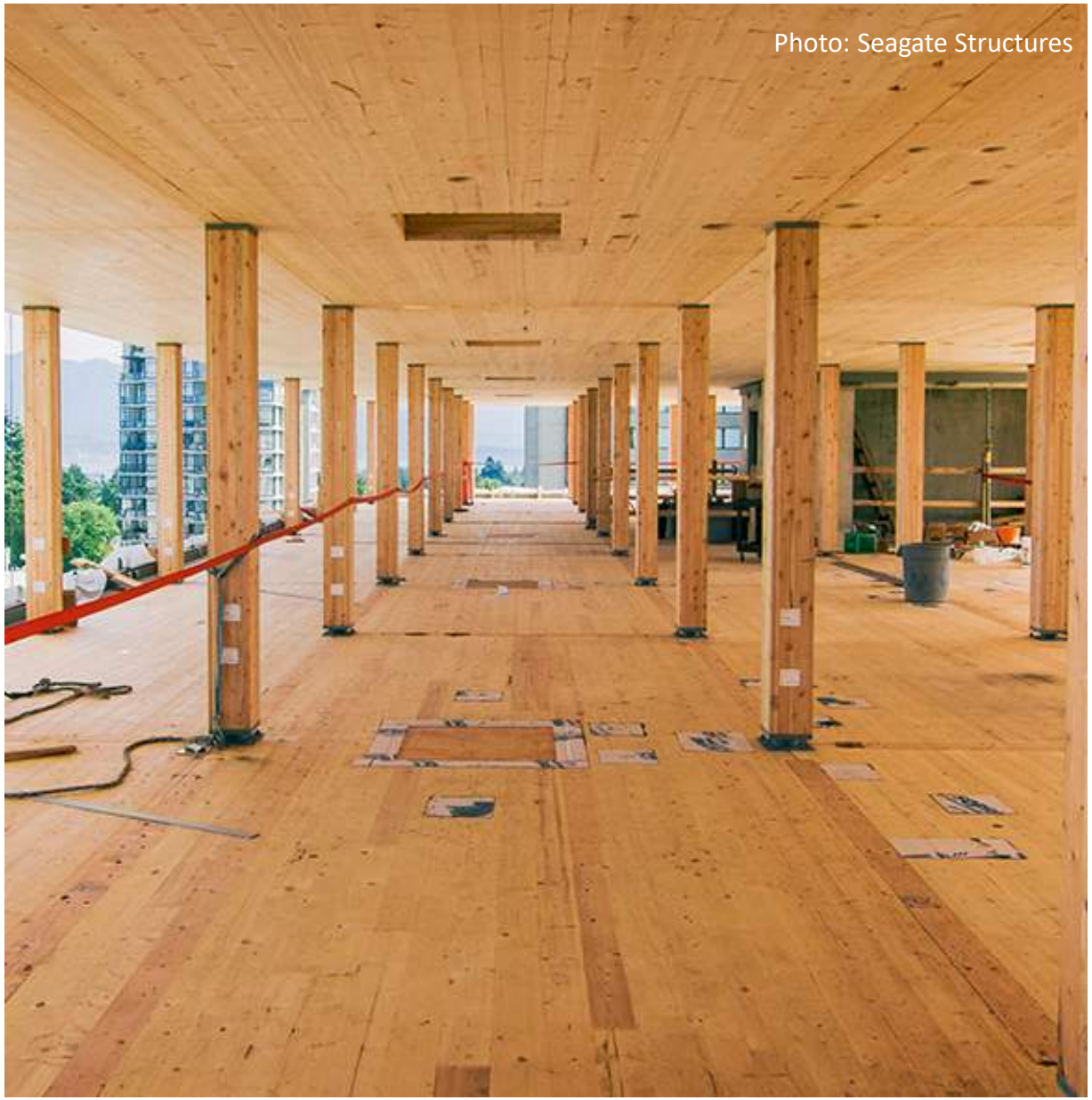


Source: WoodWorks

Type V → Type III
Type IV-HT → + Mezzanines → + Podiums



POST, BEAM + PLATE



POST + PLATE

HONEYCOMB

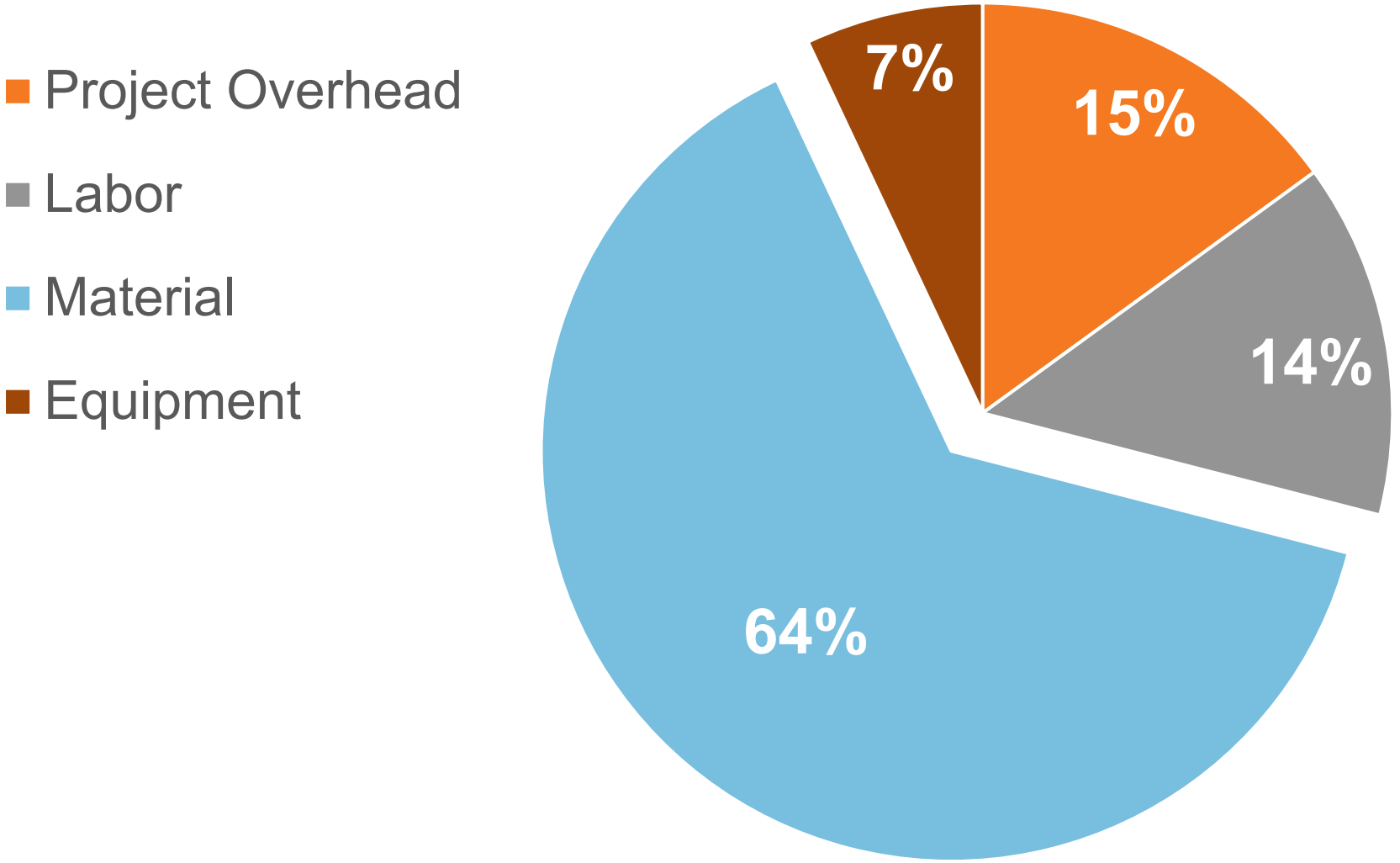
HYBRID LIGHT-FRAME + MASS TIMBER

LEVER Architecture, photo Jeremy Bittermann

HYBRID CONCRETE + MASS TIMBER

HYBRID CONCRETE + STEEL

Mass Timber Package Cost Sources



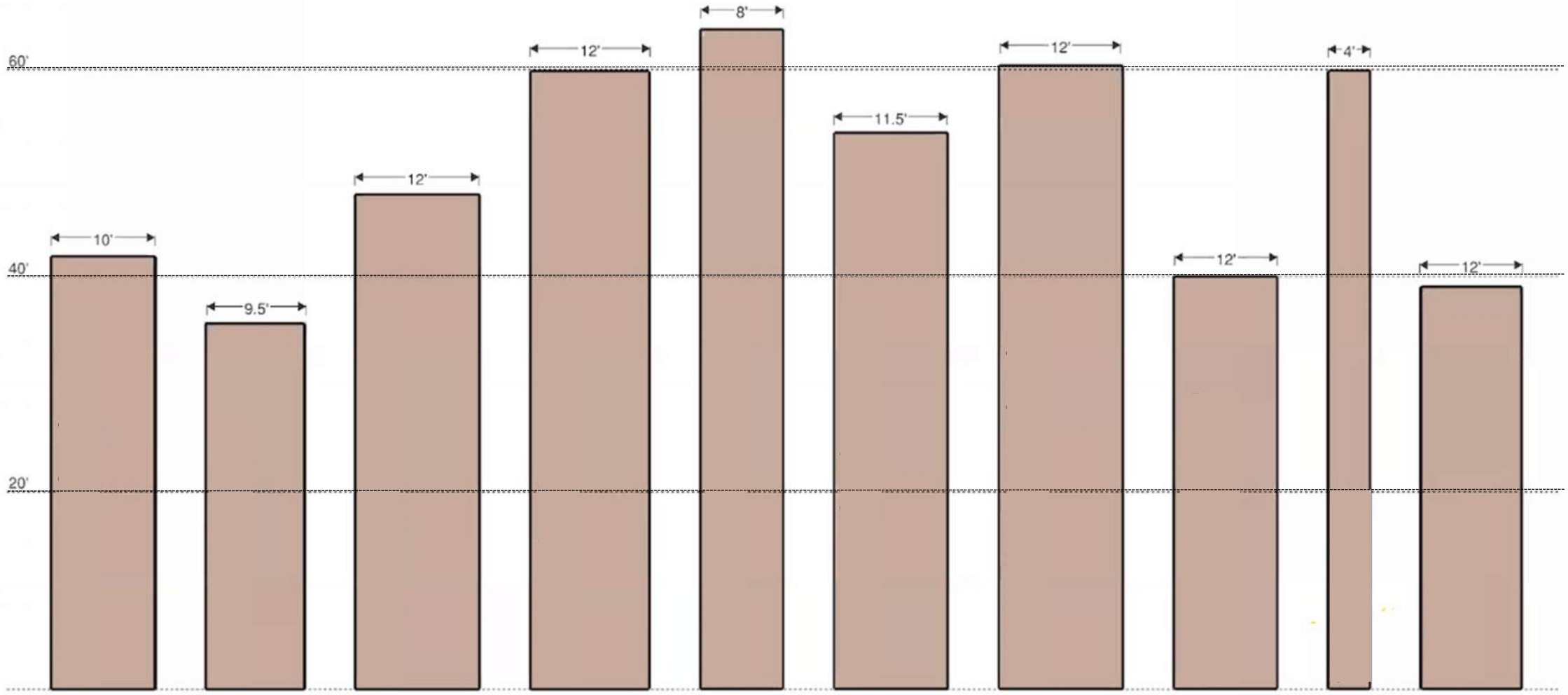
Source: Swinerton

Understand Manufacturer's Capabilities

Photo: DR Johnson

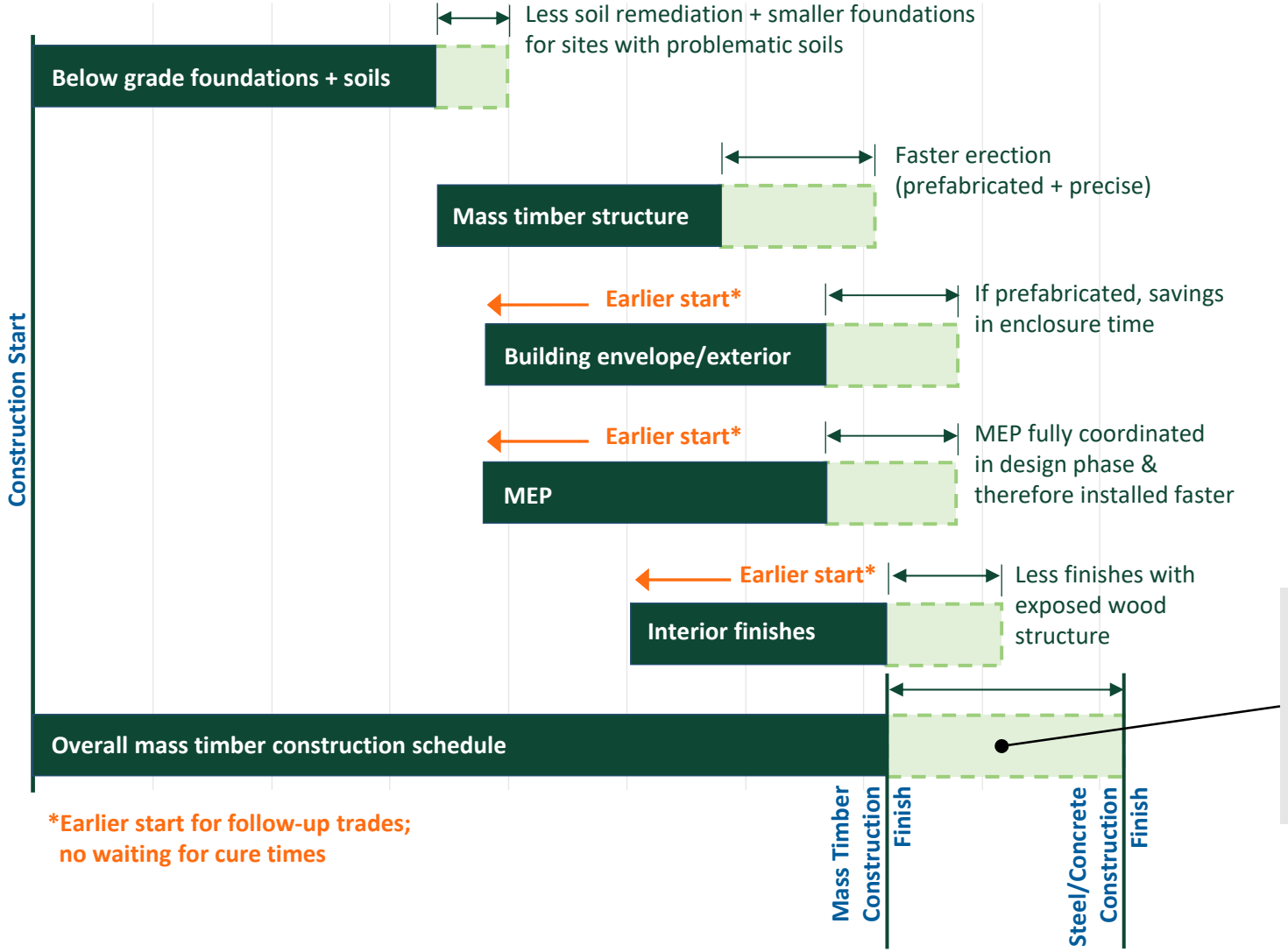
- Different manufacturers use different species, grades
- Manufacturers have specific CNC capabilities
- 3rd Party Fabricators can have additional CNC capabilities
- Trucking/Shipping Logistics and Cost

Understand Manufacturer's Capabilities



Credit: TimberLab

Compressing the Typical Construction Schedule



*Earlier start for follow-up trades; no waiting for cure times

Schedule Savings

= Less carrying costs
+ Less GC overhead
+ Ability to lease/occupy sooner

Off-Site Construction's Goal is one of *Optimization*

Ties together ideas of:

- ***Pre-planning***
- Shorter Construction Schedule
- Lower Material Cost
- Less Waste

Brock Commons, Vancouver, BC | Architect: Acton Ostry| Image Courtesy naturallywood

Modular Construction

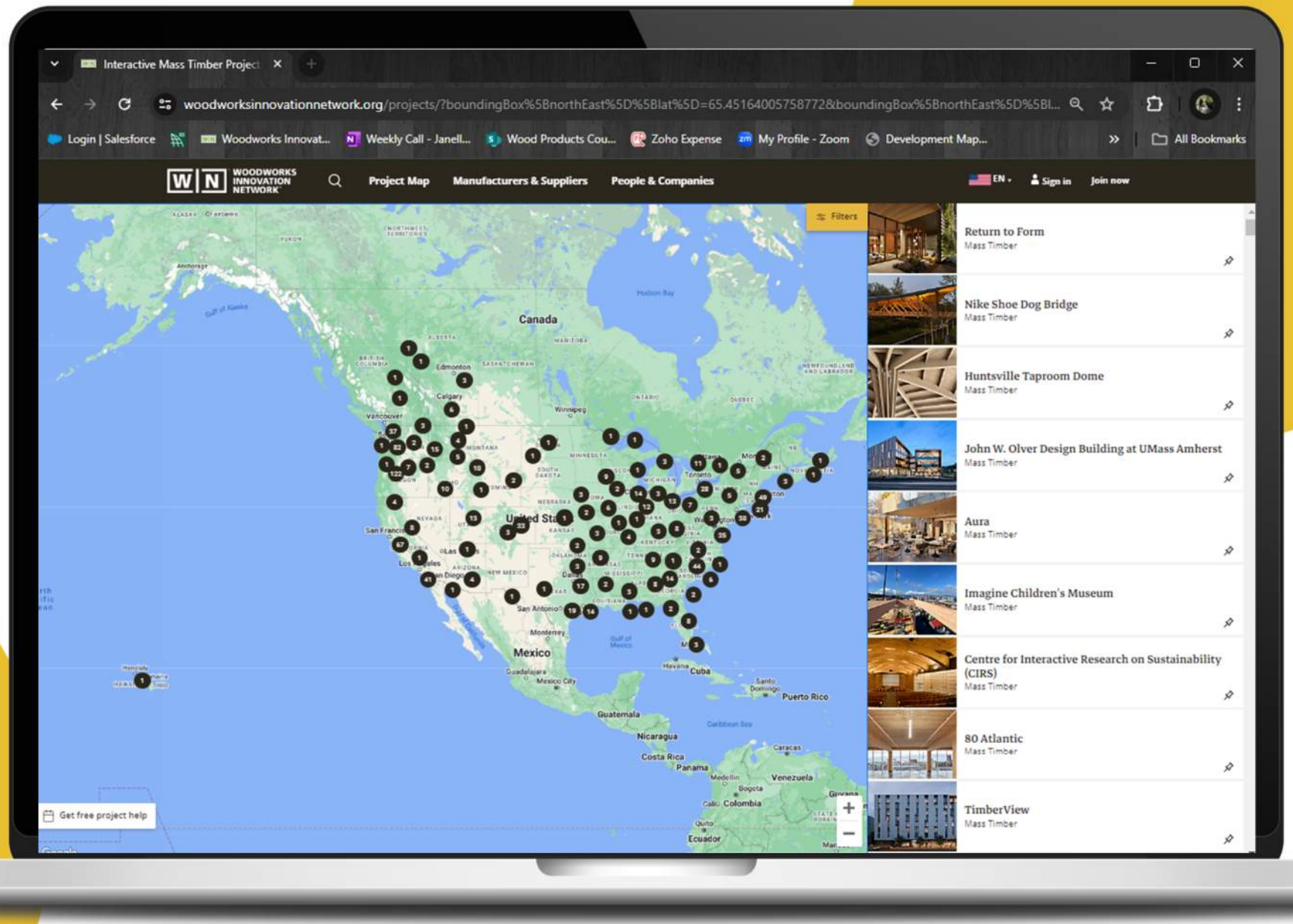
Volumetric Units:

- Bathroom Pods
- Multi-family units
- Classrooms
- Offices
- Can include finishes and furnishings

Image: Zeta Design+Build

Image: Guerdon Modular

WOODWORKS INNOVATION NETWORK.ORG



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