



Mass Timber Construction: Products, Performance, and Design

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Designing a wood building? Ask us anything.

| FREE PROJECT SUPPORT / EDUCATION / RESOURCES

Nationwide support for the code-compliant design, engineering and construction of non-residential and multi-family wood buildings.

- Allowable Heights/Areas
- Construction Types
- Structural Detailing
- Wood-Framed & Hybrid Systems
- Fire/Acoustic Assemblies
- Lateral System Design
- Alternate Means of Compliance
- Energy-Efficient Detailing
- Building Systems & Technologies

| woodworks.org/project-assistance | help@woodworks.org



John W. Olver Design Building at UMass Amherst
Leers Weinzapfel Associates, Equilibrium Consulting
photo © Albert Vecerka / Esto

Funding Partners



Program Partners



OVERVIEW | TIMBER METHODOLOGIES



Light Wood-Frame
Photo: WoodWorks



Heavy Timber
Photo: Benjamin Benschneider



Mass Timber
Photo: John Stamets

Glue Laminated Timber (Glulam)
Beams & columns



Cross-Laminated Timber (CLT)
Solid sawn laminations



Cross-Laminated Timber (CLT)
SCL laminations



Photo: Freres Lumber



Photo: StructureCraft



Photo: LendLease



Photo: LEVER Architecture

Dowel-Laminated Timber (DLT)



Photo: StructureCraft

Nail-Laminated Timber (NLT)



Photo: Think Wood

Glue-Laminated Timber (GLT)

Plank orientation



Photo: StructureCraft



Photo: StructureCraft



Photo: Ema Peter



Photo: Manasc Isaac
Architects/Fast + Epp

NAIL LAMINATED TIMBER



PHOTO CREDIT: STRUCTURECRAFT

Nail Laminated Timber (NLT)



Photo: StructureCraft



Photo: Think Wood



The image shows the Kendeda Building, a modern structure with a prominent white, cantilevered canopy supported by a network of white cables and vertical poles. The building's facade is a mix of light-colored wood slats and large glass windows. In the foreground, a paved plaza with a blue and white geometric pattern is visible, where several people are walking and a person is riding a bicycle. The background is filled with lush green trees under a clear blue sky.

Kendeda Building

for Innovative Sustainable Design
Atlanta, GA

Architect: The Miller Hull Partnership
Engineer: Uzun + Case
Photo: Jonathan Hillyer



Kendeda Building

for Innovative Sustainable Design
Atlanta, GA

37,000 sf, 2 stories

Type III-B

Educational

Completed 2019



Architect: The Miller Hull Partnership
Engineer: Uzun + Case
Photo: Jonathan Hillyer

Dowel Laminated Timber (DLT)



Photo credit: StructureCraft
Builders

Dowel Laminated Timber (DLT) Panels

What is it?

- » Similar to NLT
 - » Dowels instead of Nails connecting lams
- » Lams usually finger jointed
- » Common in Europe
- » Not recognized in IBC

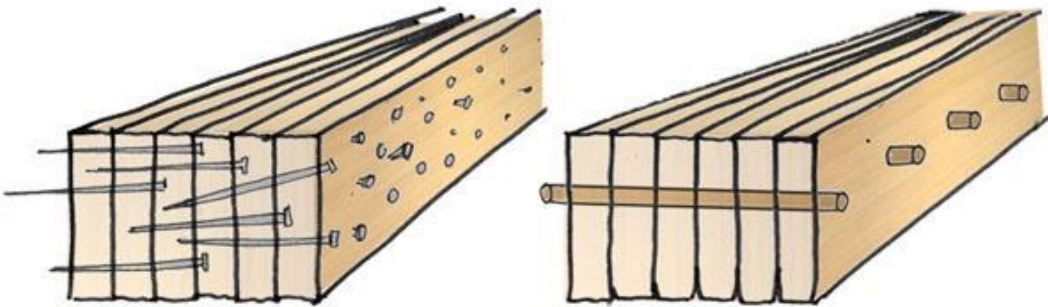


Photo credit: StructureCraft





Campus 244

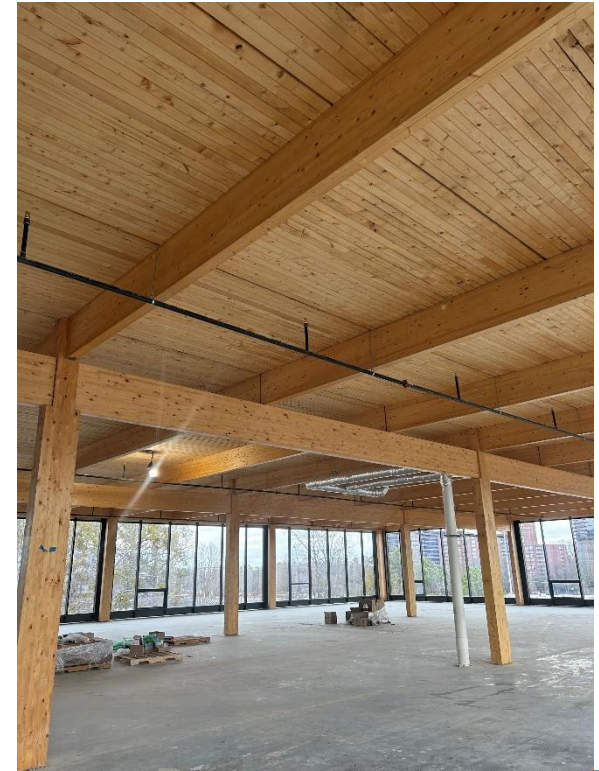
Dunwoody, GA

S9Architects
StructureCraft
Photo: Winter Construction

Campus 244

Dunwoody, GA

- » 2-story mass timber overbuild on 3-story existing structure
- » Existing foundations did not need to be underpinned



Photos: Winter Construction

S9Architects
StructureCraft

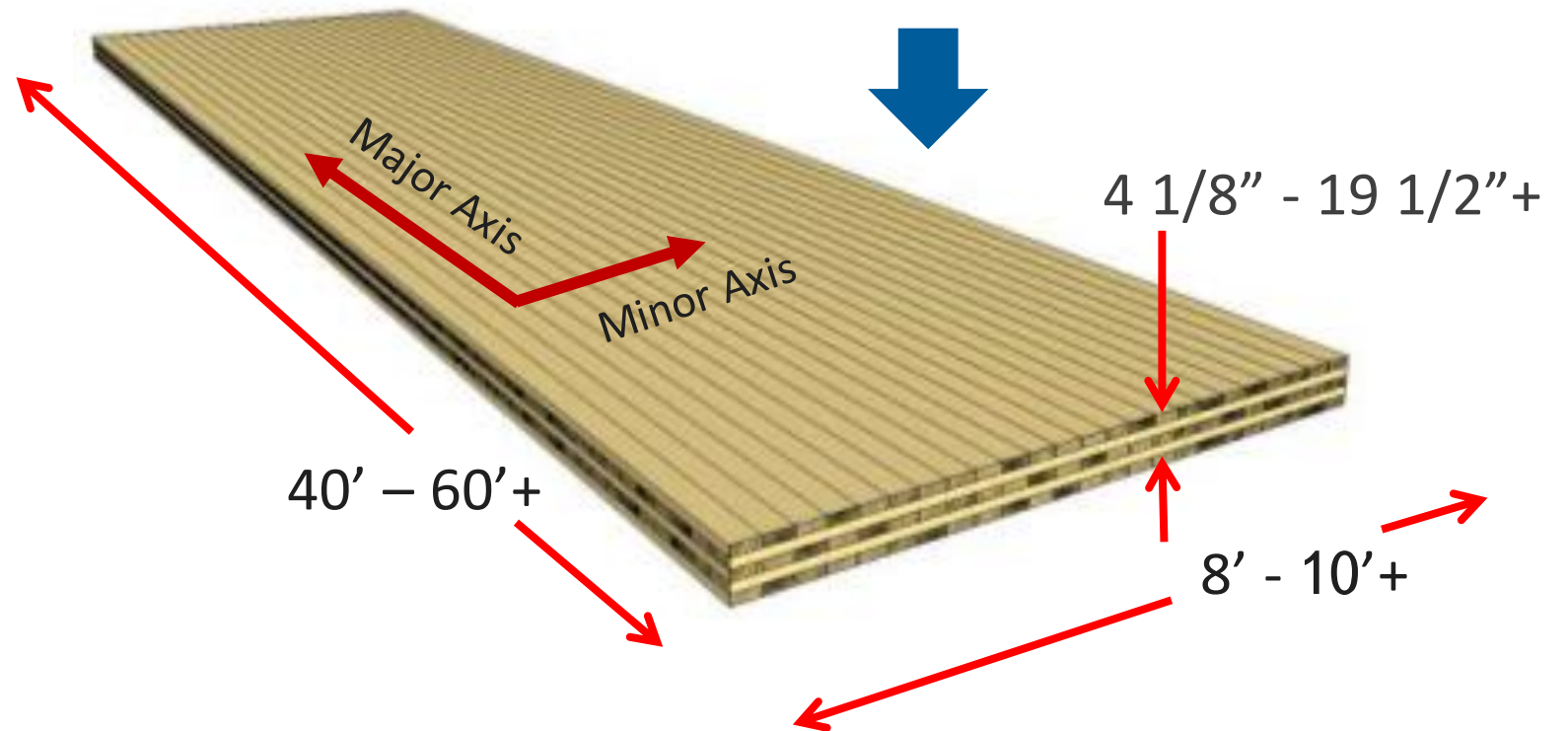
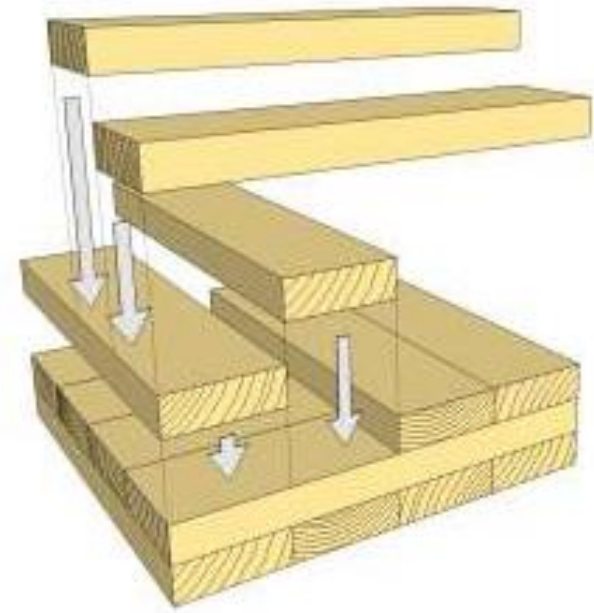
Cross Laminated Timber (CLT)



Cross Laminated Timber (CLT)

What is it?

- » Solid wood panel
- » Solid sawn lams
- » 3+ layers
- » 90° cross-lams





619 Ponce

Atlanta, GA

POTTERY BARN

POTTERY BARN

Handel Architects
StructureCraft
Photo: StructureCraft



619 Ponce

Atlanta, GA

120,000 sf, 4 stories

Type III-B

Office / Retail

WoodWorks
CASE
STUDY

W N
PROFILE

Handel Architects
StructureCraft
Photo: StructureCraft



Photo: Ema Peter

STRUCTURAL SOLUTIONS | POST, BEAM + PLATE



Photo: Seagate Structures



Photo: Lendlease



Photo: John Klein

STRUCTURAL SOLUTIONS | HYBRID LIGHT-FRAME + MASS TIMBER



Photo: TimberLab

STRUCTURAL SOLUTIONS | HYBRID STEEL + MASS TIMBER

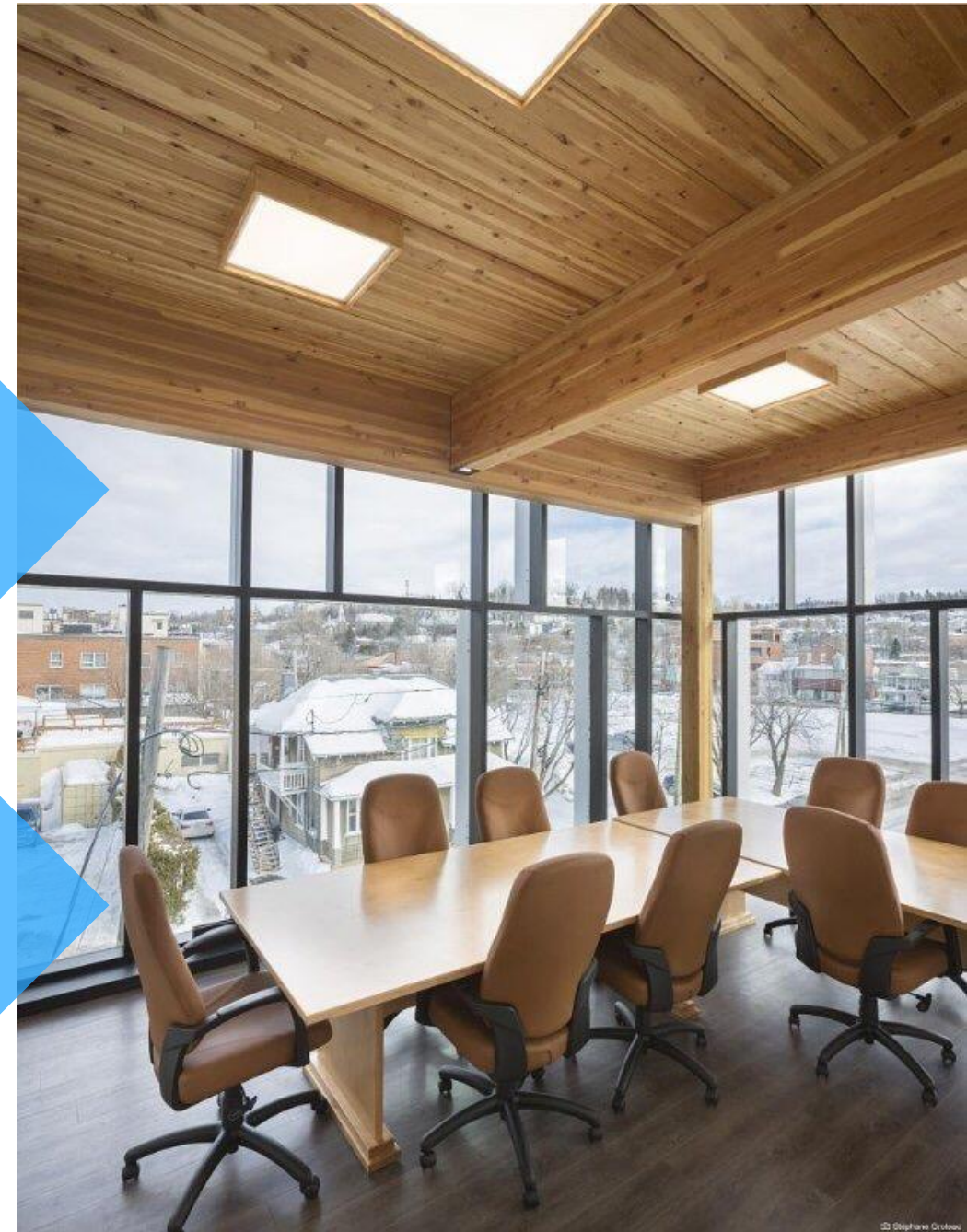
Market Drivers for Mass Timber

PRIMARY DRIVERS

- » Construction Efficiency & Speed
- » Construction Site Constraints – Urban Infill
- » Innovation/Aesthetic

SECONDARY DRIVERS

- » Carbon Reductions
- » Structural Performance – Lightweight



Mass Timber Appeal

What is the ultimate appeal and driver for any building and material type?



Reduced Construction Time

» Less time on site = less \$\$



Franklin Elementary School
Franklin, WV
45,200 sf 2-story Elementary School
2.5 months to erect CLT

Source: City Construction



Murray Grove,
London, UK
8 stories of CLT over 1 story concrete podium
8 stories built in 27 days (~1/2 the time of precast concrete)

Source: Architect Magazine

Material Mass

» 75% lighter than concrete



Reduced Embodied Carbon

The Beam on Farmer



The Beam on Farmer / RSP Architects / PK Associates / Jason Roehner Photographs

The Beam on Farmer



Volume of wood products used:
158,915 cubic feet



U.S. & Canadian forests grow this much wood in:
12 minutes



Carbon stored in the wood:
3,982 metric tons of CO₂



Avoided greenhouse gas emissions:
1,541 metric tons of CO₂



TOTAL POTENTIAL CARBON BENEFIT:
5,523 metric tons of CO₂

EQUIVALENT TO:



1,168 cars off the road for a year

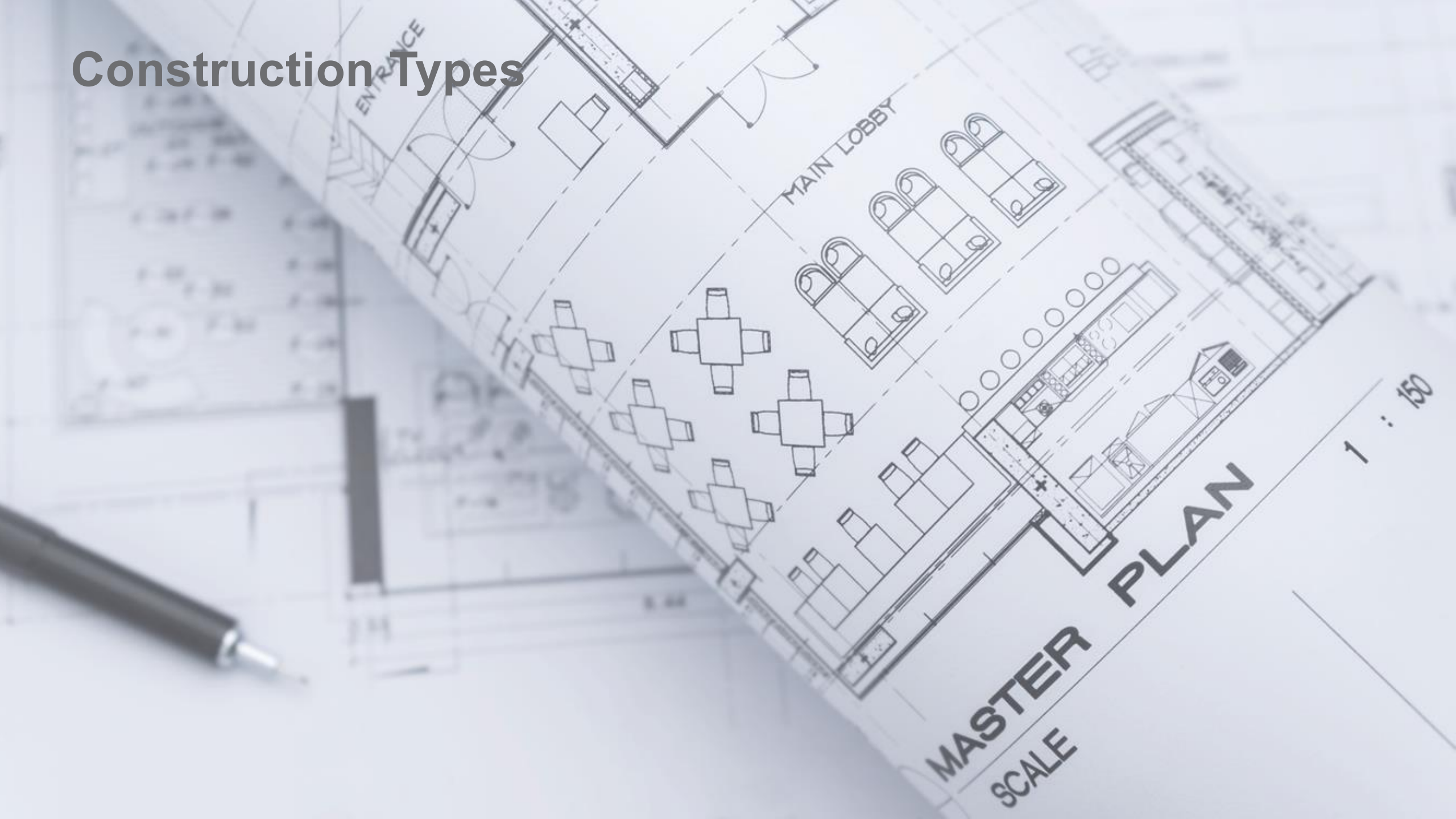


Energy to operate 583 homes for a year

Source: US EPA

Estimated by the Wood Carbon Calculator for Buildings, based on research by Sarthre, R. and J. O'Connor, 2010, A Synthesis of Research on Wood Products and Greenhouse Gas Impacts, FPInnovations. Note: CO₂ on this chart refers to CO₂ equivalent.

Construction Types



Construction Types

IBC defines 5 construction types: I, II, III, IV, V
A building must be classified as one of these

Construction Types I & II:
All elements required to be non-combustible materials

However, there are exceptions including several for mass timber

Construction Types

Where does the code allow MT to be used?

- Type IB & II: Roof Decking



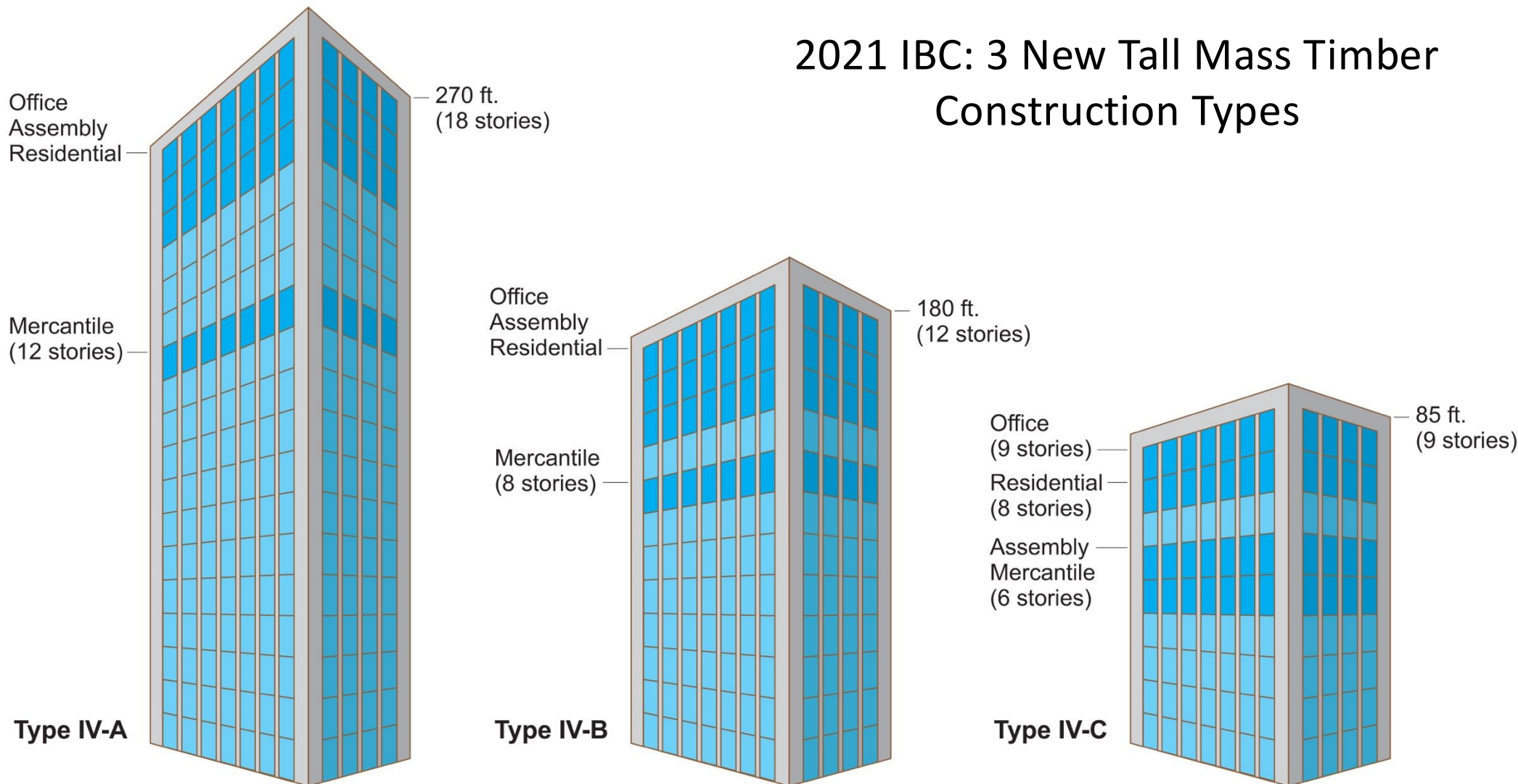
Photo Credit: DeStafano & Chamberlain, Inc, Robert Benson Photography



Image: StructureCraft Builders

Construction Types – Type IV-A, B, &C

2021 IBC: 3 New Tall Mass Timber Construction Types



Fire Resistance

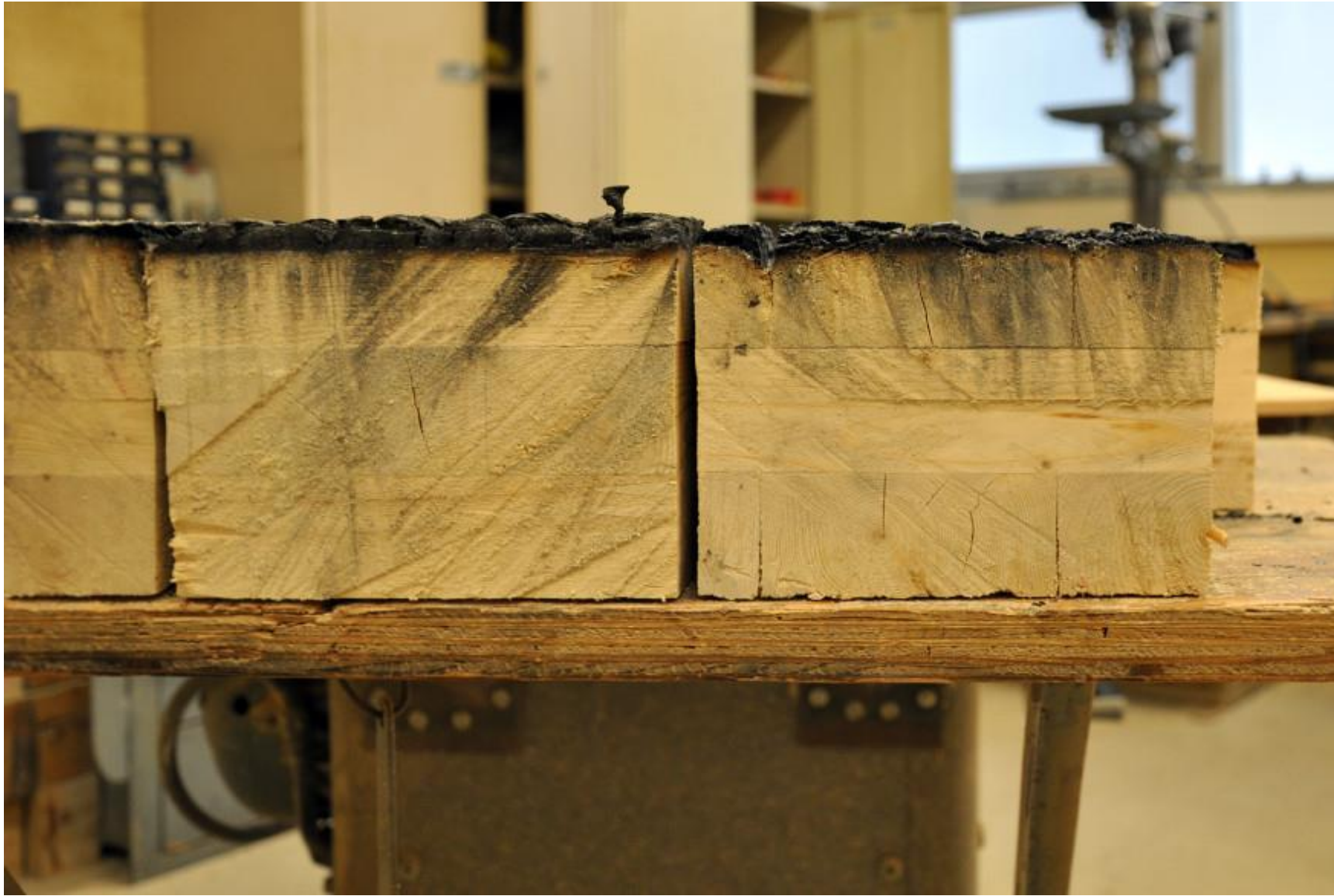
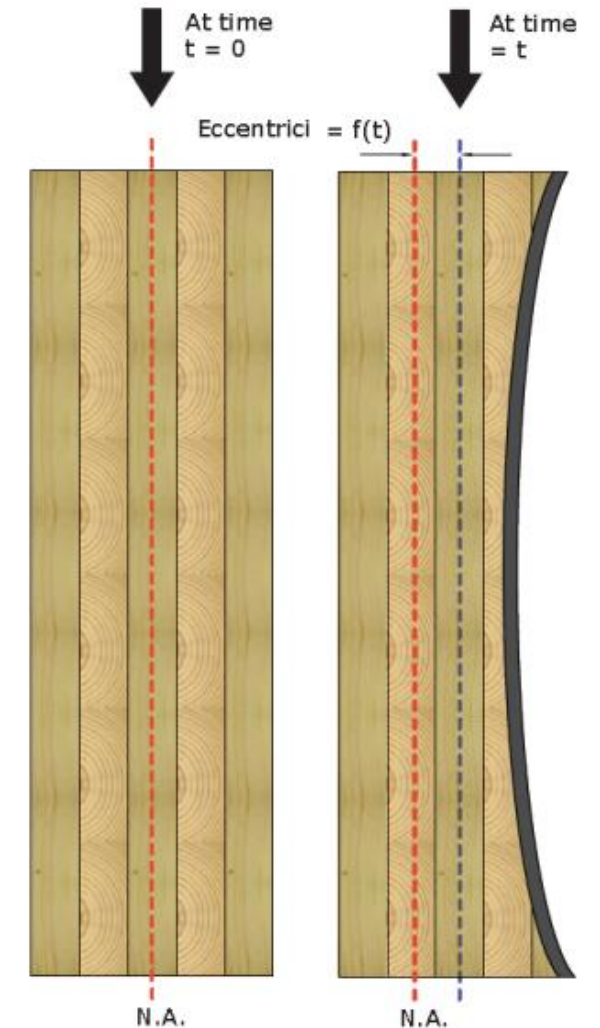
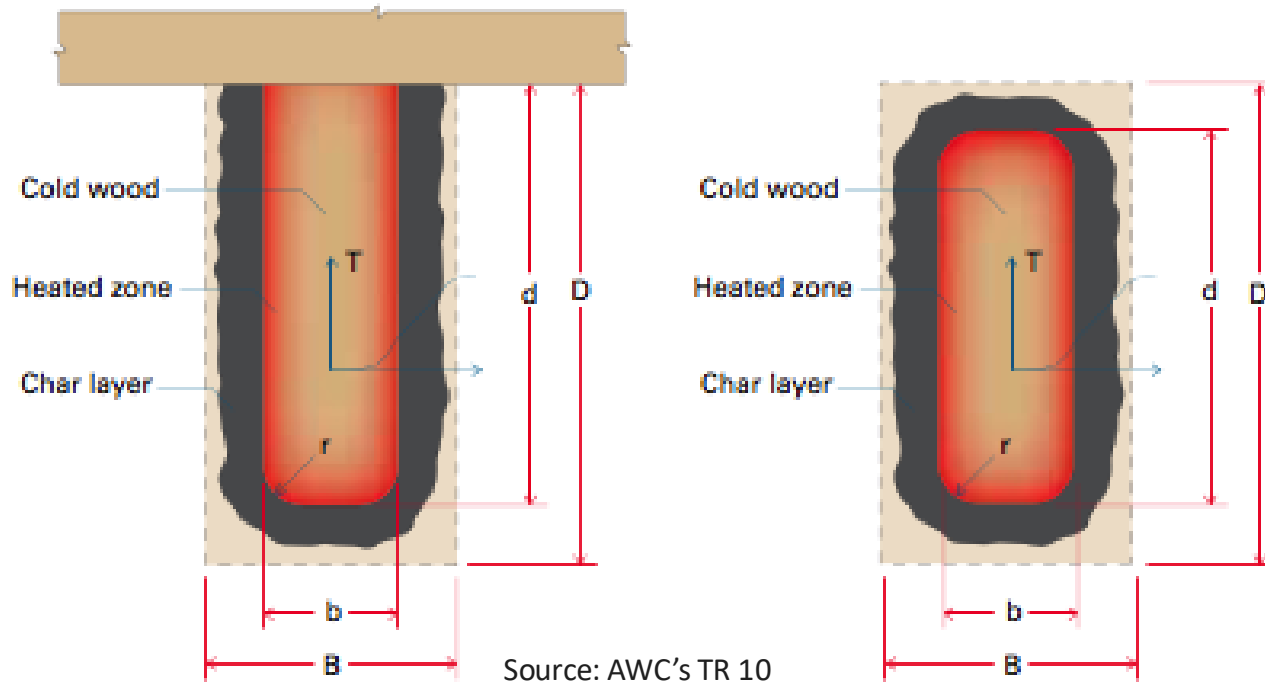


Photo Credit: FPinnovations

Fire Resistance

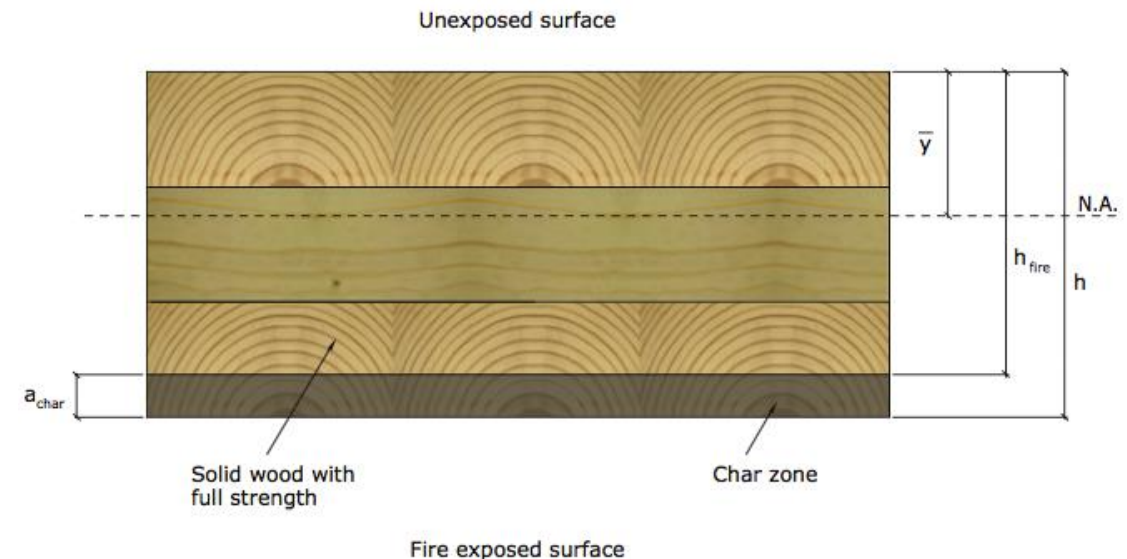
» Mass timber's inherent fire resistance



Fire Resistance

Prescriptive fire resistance requirements:

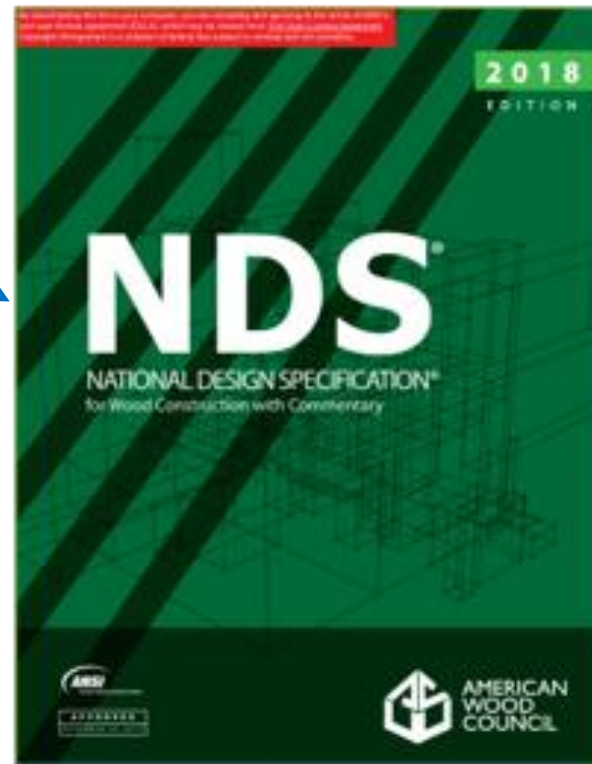
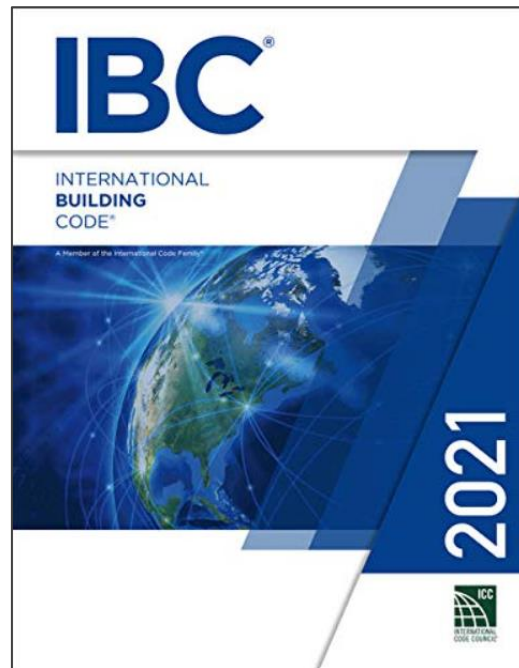
- » Type IV-HT: minimum sizes
- » Other than type IV: Demonstrated fire resistance:
 - » IBC 703.2 allows several options, including:
 - » ASTM E119 tested assembly
 - » Prescriptive FRR per IBC 721
 - » Calculations per IBC 722
 - » NDS Chapter 16
- » Type IV-A, B, and C: minimum sizes AND Demonstrated fire resistance



Fire Resistance

Calculated FRR of Exposed MT:

» IBC to NDS code compliance path



IBC 703.2.2

Methods for determining fire resistance

- Prescriptive designs per IBC 721.1
- **Calculations in accordance with IBC 722**
- Fire-resistance designs documented in sources
- Engineering analysis based on a comparison
- Alternate protection methods as allowed by 104.11



IBC 722

Calculated Fire Resistance

"The calculated *fire resistance* of exposed wood members and wood decking shall be permitted in accordance with **Chapter 16 of ANSI/AWC National Design Specification for Wood Construction (NDS)**



NDS Chapter 16

Fire Design of Wood Members

- Limited to calculating fire resistance up to 2 hours
- Char depth varies based on exposure time (i.e., fire-resistance rating), product type and lamination thickness. Equations and tables are provided.
- TR 10 and NDS commentary are helpful in implementing permitted calculations.

Fire Resistance

Fire resistance using char:

- » NDS Chapter 16
- » NLT, CLT, Glulam, Solid Sawn, SCL



Table 16.2.1A Char Depth and Effective Char Depth (for $\beta_n = 1.5 \text{ in./hr.}$)

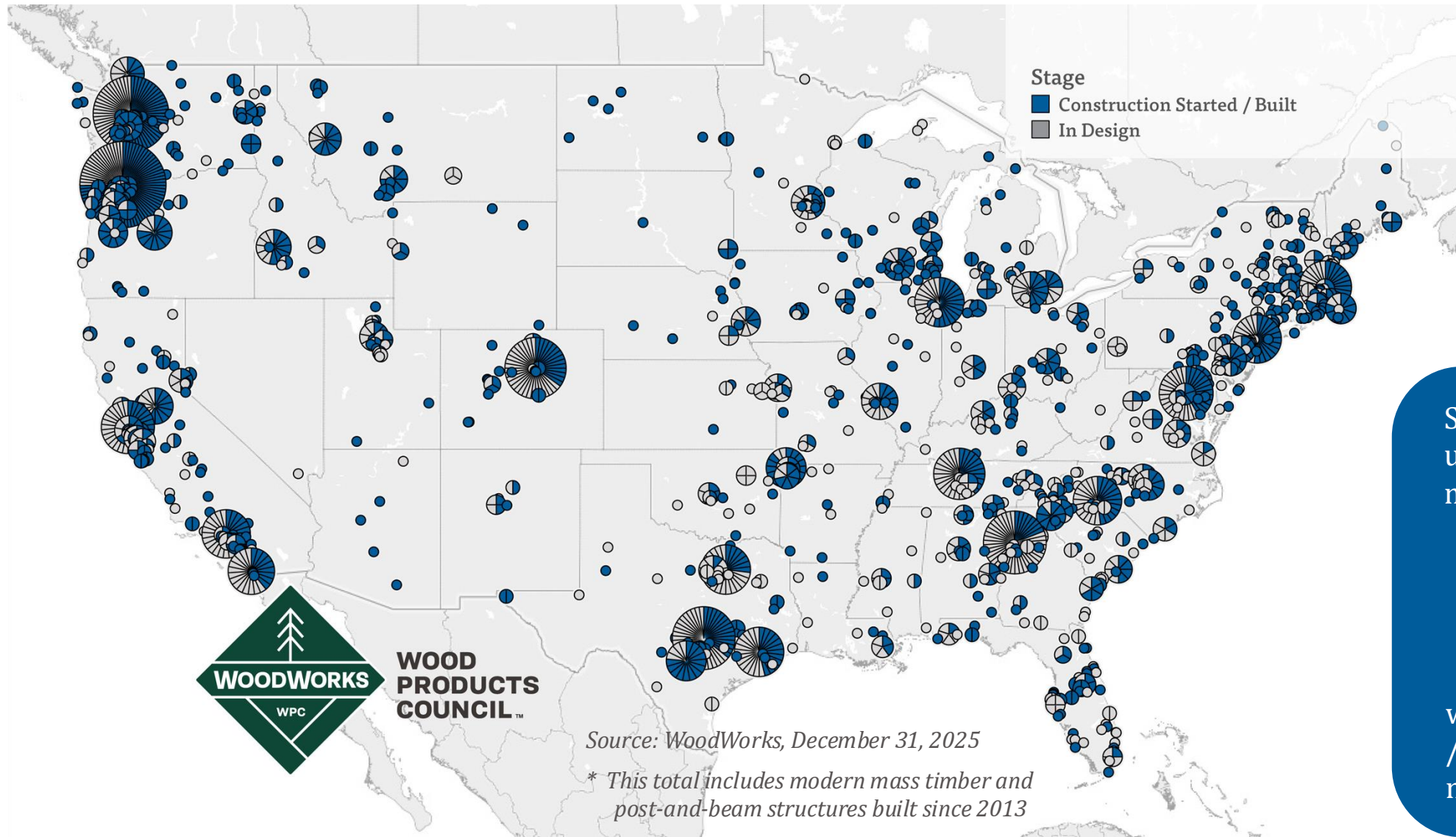
Required Fire Resistance (hr.)	Char Depth, a_{char} (in.)	Effective Char Depth, a_{eff} (in.)
1-Hour	1.5	1.8
1½-Hour	2.1	2.5
2-Hour	2.6	3.2

Table 16.2.1B Effective Char Depths (for CLT with $\beta_n = 1.5 \text{ in./hr.}$)

Required Fire Resistance (hr.)	Effective Char Depths, a_{eff} (in.)								
	lamination thicknesses, h_{lam} (in.)								
	5/8	3/4	7/8	1	1-1/4	1-3/8	1-1/2	1-3/4	2
1-Hour	2.2	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.8
1½-Hour	3.4	3.2	3.1	3.0	2.9	2.8	2.8	2.8	2.6
2-Hour	4.4	4.3	4.1	4.0	3.9	3.8	3.6	3.6	3.6

Current State of Mass Timber Projects

As of Q4 2025, in the US, **2,664** multi-family, commercial, or institutional projects have been constructed with, or are in design with, mass timber.



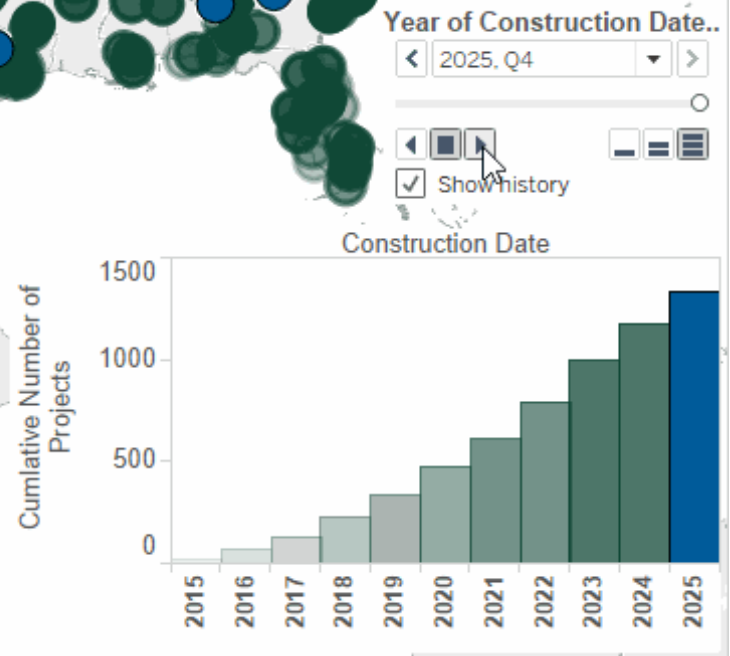
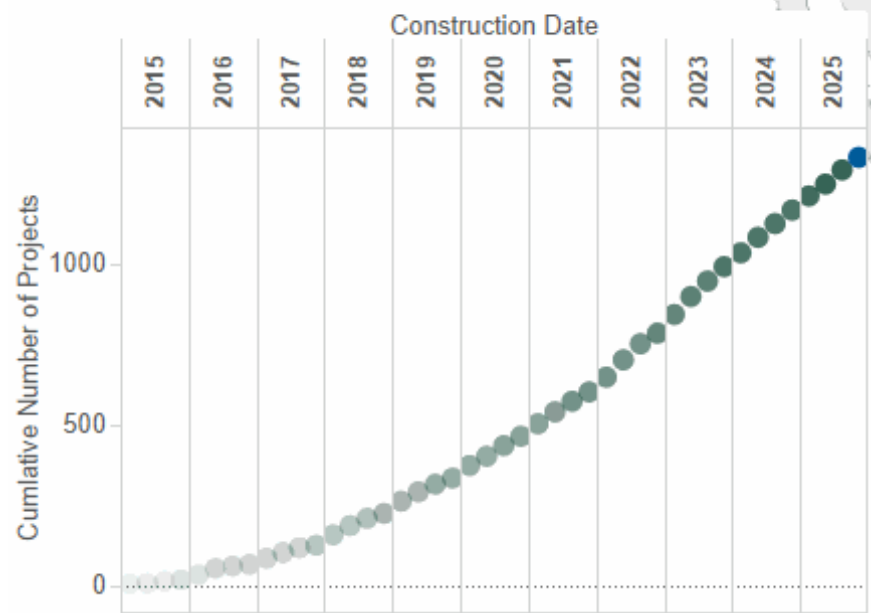
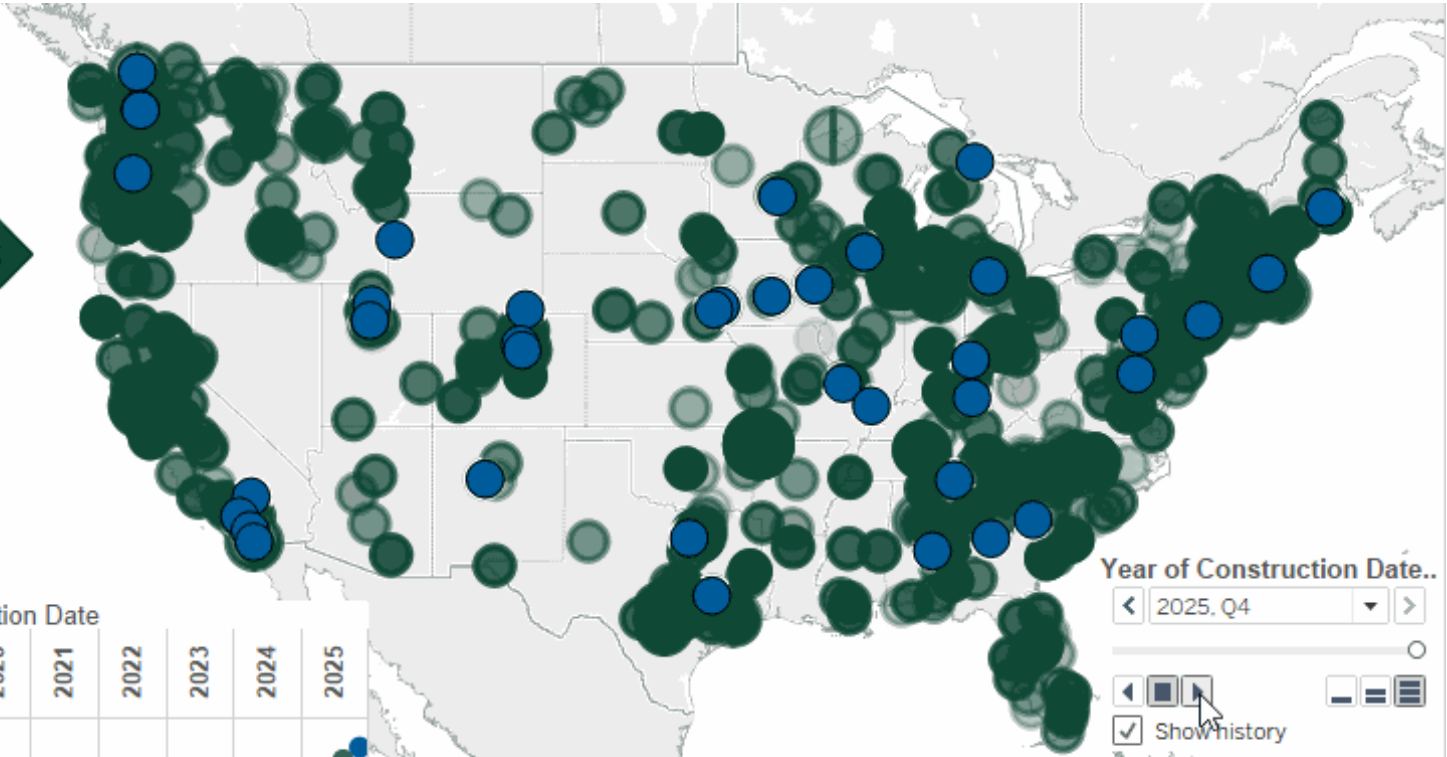
Scan this code or use the url to find the map and more details online.



[www.woodworks.org/
resources/mapping-
mass-timber/](http://www.woodworks.org/resources/mapping-mass-timber/)

Current State of Mass Timber Projects Over Time

US Market Q4 2025



Questions? Ask us anything.



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901 East Sixth, Thoughtbarn-Delineate Studio,
Leap!Structures, photo Casey Dunn

