MAINSTREAMING
MASS TIMBER

The built environment faces numerous challenges, from climate change and energy consumption to costs and quality of labor. Buildings are required to be healthy and offer flexibility of use through their lifecycle to maintain relavance. designing and constructing with **Mass Timber** offers pathways to meeting these challenges.

MASS TIMBER

Mass Timber Journey

Kingman Island

MAY 2017

Our mass timber journey begins with focused design and structural research studies to make a case for feasibility in the DC, VA and MD markets.

OCT 2017

Complete planning and feasibility study for DC's Kingman and Heritage Islands—proposing a series of outdoor classrooms and a ranger station built using mass timber.

Suburban Prototype

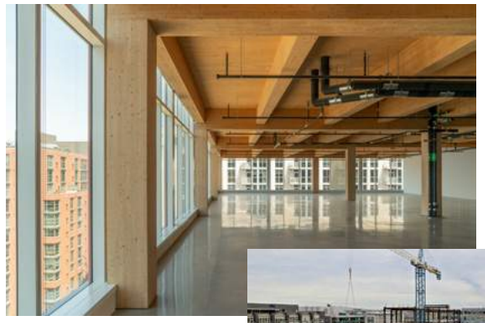
MAR 2018

Concept study begins for 80 M Street SE, exploring the potential for a vertical mass timber addition to an existing commercial office building in DC.

AUG 2018

Complete commissioned schematic study for a mass timber office prototype for the suburban MD market.

80 M Street SE



APR 2019

Design development begins for 80 M, a decision that positions the project to become the first mass timber construction on a commercial office high-rise building in DC.

JUNE 2020

Construction begins on our mass timber addition at 80 M, which will feature two full floors of trophy class office space with 17' ceilings and an occupied penthouse level with a rooftop terrace.

OCT 2021

We explore full-block mass timber repositioning for a commercial office building in downtown DC.

SEPT 2017

Our office prototype is complete, and we begin presentations to local developers to educate them on the potential of mass timber in DC.

JAN 2018

Timber Towers—a conceptual exploration seeking to demonstrate the viability of a mass timber high-rise—wins Honorable Mention in SKYHIVE Skyscraper Challenge.

JULY 2018

Awarded a 2018 USDA Forest Service Wood Innovations grant to fund SD and DD efforts for a modular cross-laminated timber ranger station prototype for Kingman Island Park to be reused throughout the country.

SEPT 2018

Submitted for the Maine Mass Timber Wilderness Lodge competition to explore structural schemes and programming.

MAR 2020

Work begins on our mass timber multifamily prototype, applying our experience and lessons learned to an additional market expertise.

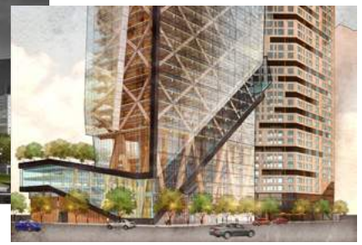
MAR 2021

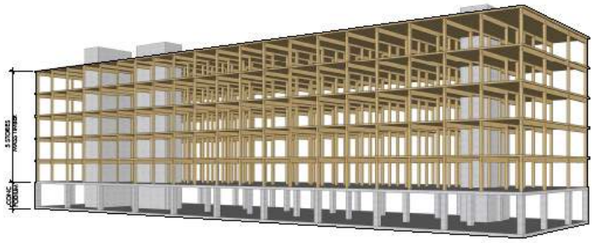
Mass timber arrives on-site at 80 M Street SE. Hickok Cole wins first client-sponsored study for a mass timber multifamily project.

NOV 2021

We explore and win the design of the first ground-up mass timber office building in DC.

Timber Towers





WHAT'S IN THE WORKS

Mass Timber Projects

80 M STREET

HARP'S LANDING

WHITEHAVEN

725 12TH ST

TYSONS TOWER

ROCKVILLE OFFICE

WHAT IS MASS TIMBER

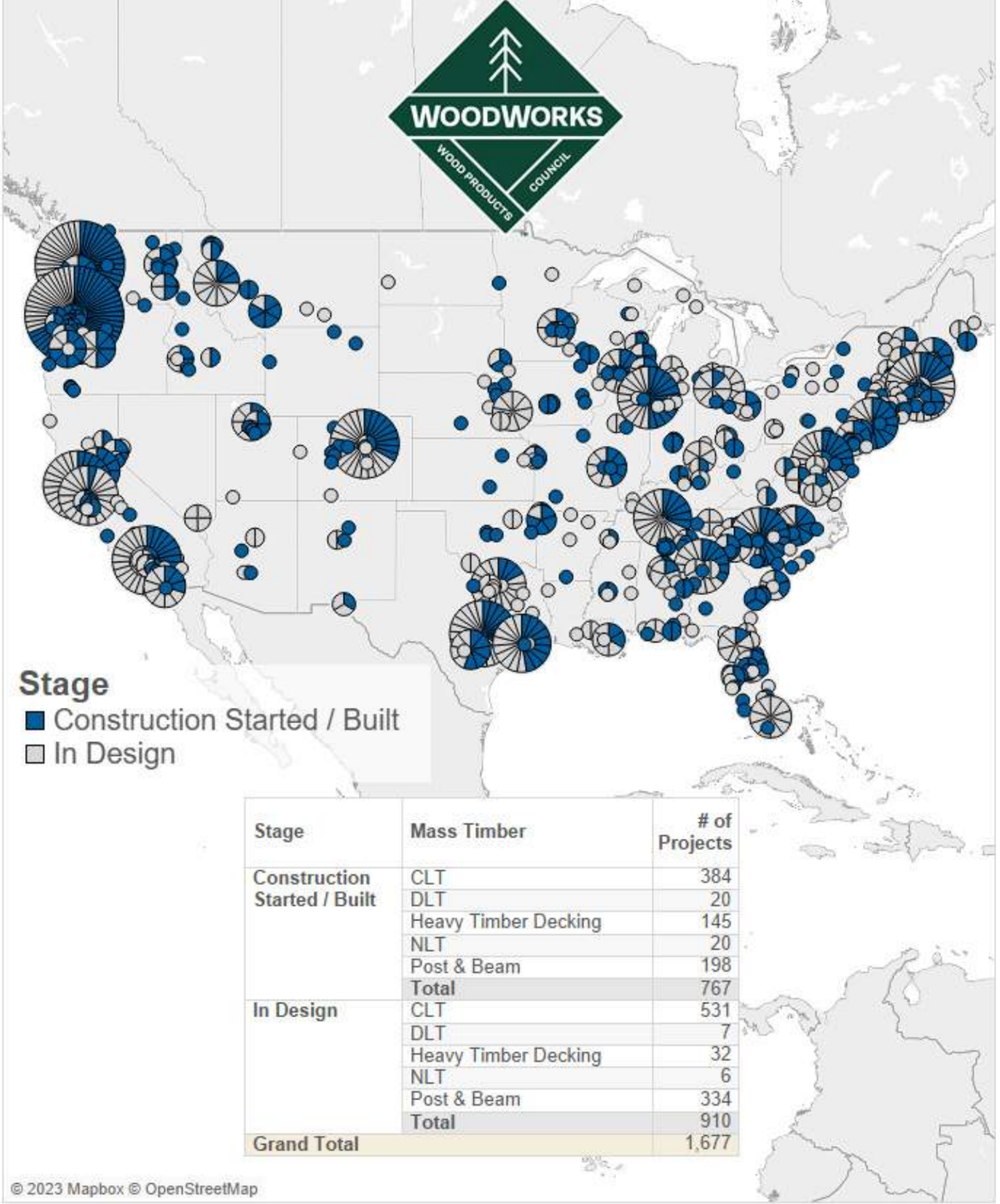
Timber City exhibit | National Building Museum

WHAT IS MASS TIMBER?

The term *mass timber construction* is different from light-wood frame, stick-frame or even heavy timber post-and-beam structures. Mass timber usually refers to **timber products engineered for loads similar in strength to structural materials like concrete and steel.**

— USGBC

- **Cross-Laminated Timber** (CLT):
  Panels consisting of three, five, or seven layers of lumber oriented at right angles to one another and glued together.
- **Dowel-laminated Timber** (DLT):
  Panels created by fastening individual layers of lumber, stacked on edge, into one structural element with dowels.
- **Glue-Laminated Timber** (Glulam):
  Usually beams or columns composed of individual lumber laminations and then glued together.
- **Parallel Strand Lumber** (PSL):
  Usually beams or columns manufactured by gluing strands of wood together under pressure.



Stage	Mass Timber	# of Projects
Construction Started / Built	CLT	384
	DLT	20
	Heavy Timber Decking	145
	NLT	20
	Post & Beam	198
	Total	767
In Design	CLT	531
	DLT	7
	Heavy Timber Decking	32
	NLT	6
	Post & Beam	334
	Total	910
Grand Total		1,677

MASS TIMBER PROJECTS IN THE UNITED STATES

According to WoodWorks, as of December 2022 there were a total of 1,677 mass timber projects underway across the United States

- **California**
  - » CA/Built: 100
  - » In Design: 147
- **DC**
  - » CA/Built: 7
  - » In Design: 15
- **Florida**
  - » CA/Built: 28
  - » In Design: 46
- **Maine**
  - » CA/Built: 8
  - » In Design: 15
- **Massachusetts**
  - » CA/Built: 27
  - » In Design: 70
- **North Carolina**
  - » CA/Built: 42
  - » In Design: 29
- **New York**
  - » CA/Built: 23
  - » In Design: 39
- **Oregon**
  - » CA/Built: 88
  - » In Design: 34
- **Texas**
  - » CA/Built: 50
  - » In Design: 84
- **Virginia**
  - » CA/Built: 10
  - » In Design: 14
- **Washington**
  - » CA/Built: 94
  - » In Design: 55
- **Wisconsin**
  - » CA/Built: 24
  - » In Design: 19

MANUFACTURERS

- Binderholz (Austria)
- FinnForest Merk (Germany, UK)
- Hasslacher Norica (Austria, Germany)
- International Beam (Quebec + Ontario, Canada; currently building factory in Alabama)
- KLH (Austria, Sweden, UK)
- Martinsons (Sweden)
- Moelven (Norway)
- Nordic Structures (Quebec, Canada)
- Smartlam (Montana, US)
- Stora Enso (Austria)

MANUFACTURER + INSTALLERS

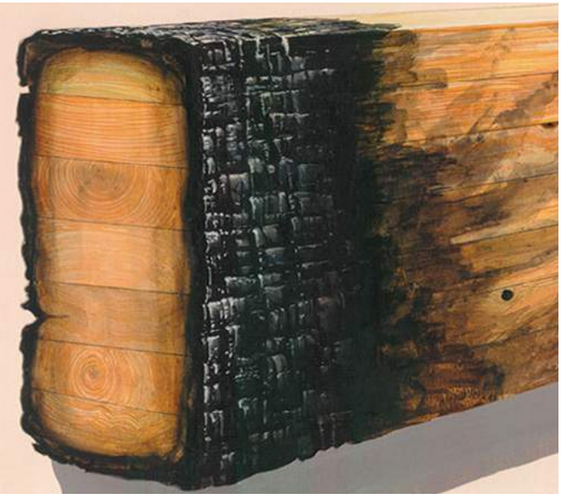
- Katerra (Spokane, WA; Phoenix, AZ)
- Seagate Structures — **Installer only** (BC, Canada; Washington state, US)
- Structurlam (BC, Canada)
- Structure Craft (BC, Canada)
- Structure Fusion (Montreal, Canada)

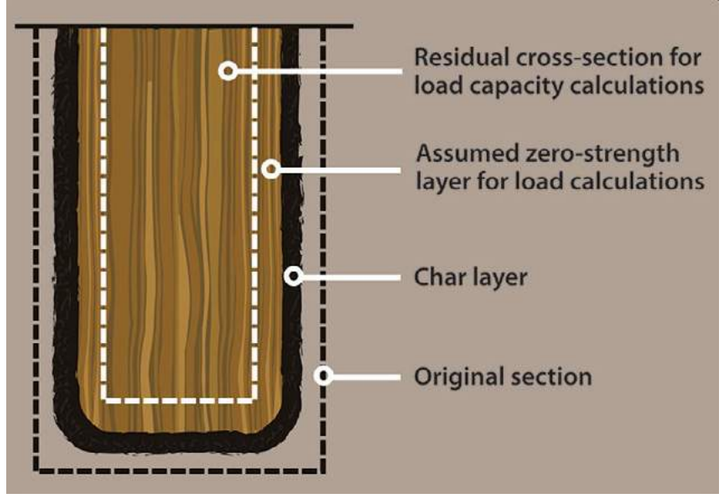
WHERE CAN IT BE USED?

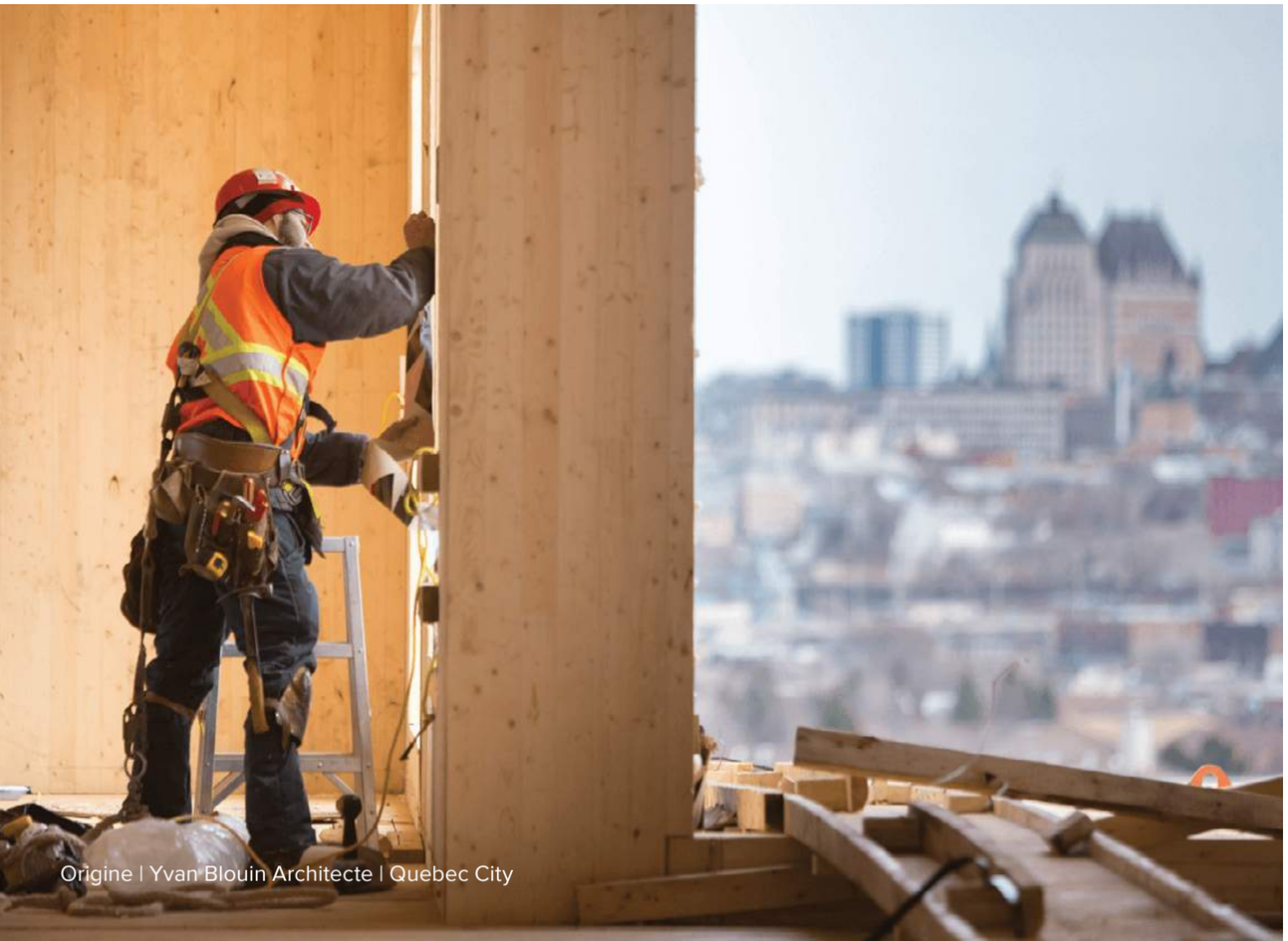
- Office
- Mixed-Use
- Residential
- Institutional
- Schools
- Hotels
- Retail
- Tall Timber

COMPARED TO OTHER METHODS

Mass Timber is a structural system that rivals both concrete and steel in strength and fire safety. Mass Timber is currently allowed per IBC 2021 as part of three construction types that allow various permutations of heights and densities. Some jurisdictions have already adopted these sections to allow for taller timber structures. Mass Timber can be utilized in a Post + Beam with CLT Slab scenario or as Bearing Walls + Slabs.






Origine | Yvan Blouin Architecte | Quebec City

Benefits of Mass Timber

STRUCTURAL STRENGTH AND FIRE SAFETY

- CLT layers are rotated 90 degrees, composite material shows a structural strength that rivals steel
- Lighter wooden buildings can withstand earthquakes better and dissipate the energy of shaking more readily than steel structures
- CLT lamination negates imperfections that any one layer has
- Increasing the density of the wood causes it to char rather than burn outright which slows destruction and helps to maintain structural integrity
- Wood performance in fire is predictable, design for fire resistance through increasing wood depth:
  - 1hr exposure = 1.8in/hr
  - 2hrs exposure = 1.58in/hr[1]

1 American Wood Council, 2015 National Design Specification® for Wood Construction

WHY MASS TIMBER

WHY MASS TIMBER?

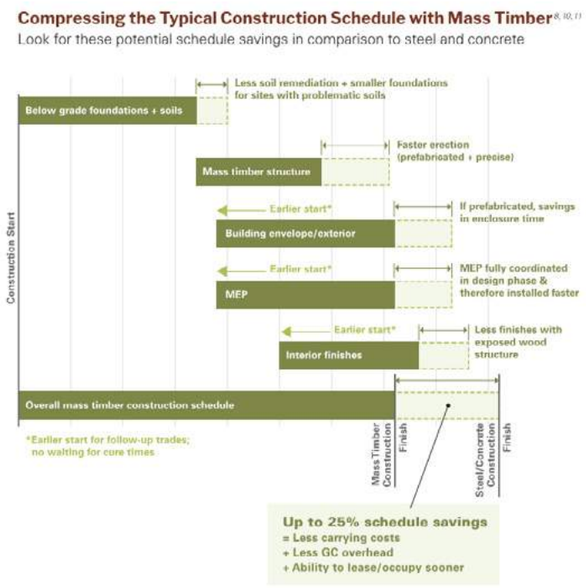
Long Term Vision + Value

- ESG goals are becoming increasingly paramount to the missions of Fortune 500 companies and are a prerequisite to access to capital.
- Mass Timber construction aligns with various jurisdictional ESG initiatives and provides compliancy paths
- Mass Timber buildings have shown potential to drive increased rents when compared to similar buildings within like markets
- Growing confidence amongst the development community that mass timber buildings will increase in value during their lifetime and offer additional value at sale over concrete and steel structures.

WHY MASS TIMBER?

Speed to Market

- Shorter construction = less carrying costs and ability to lease and occupy sooner
- Because CLT panels offer a high level of prefabrication, CLT systems can reduce construction time by approximately 20% when compared to cast-in-place concrete system
- Mass Timber design and coordination needs committed to early to make sure construction schedule reductions can be achieved.



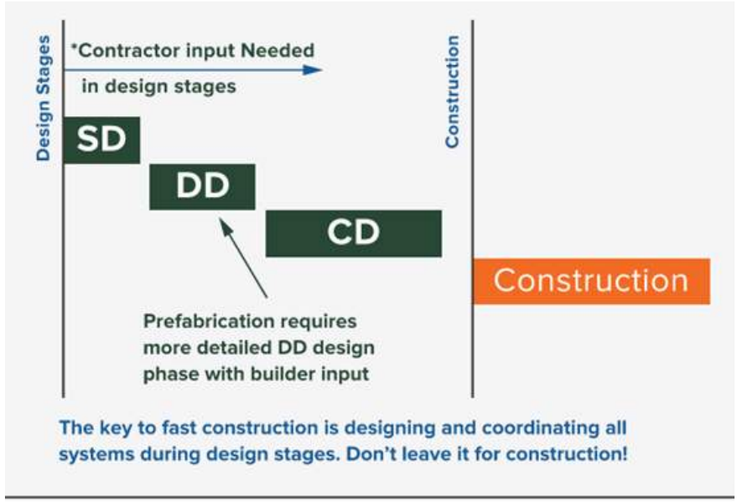


FIGURE 3-1: Builder input and engagement is essential during the design development phase.
Source: WoodWorks

WHY MASS TIMBER?

Long Term Vision + Value

- Smaller amounts of labor are needed to erect solid timber:
  - » **Bridgeport House**: 47,000 SF, 8 story, residential, 14 weeks to erect, 4 skilled laborers + 1 supervisor
  - » **Forté Apartments**: 29,000 SF, 10 story, residential, 10 weeks to erect, 5 skilled laborers + 1 supervisor + 1 trainer
    30% savings over concrete
  - » **80 M Street**: 100,000 SF, 3 story, Commercial
    8 weeks to erect, 7 skilled laborers 25% savings over concrete
- Due to erection sequencing, Mass Timber construction allows for various trades to access floors earlier than concrete construction.

WHY MASS TIMBER?

Structural Benefits

- **Lighter System** (30-40% less than concrete or steel)
  - » Comparable strength to steel
  - » Reduction in foundation system
  - » Minimize soil improvements
- **Prefabrication**
  - » Factory precision + tolerances
  - » Increased levels of quality control
  - » Reduced waste

WHY MASS TIMBER?

Sustainability

- **Renewable Resource**
  - » Primary reliance on young growth forests (15-20 Year cycle)
  - » Support healthy forest
  - » Abundant renewable resource in North America
- **Carbon Sequestration**
  - » Wood naturally stores carbon
  - » Marshall Effect: by 2034 North America can store more carbon that it emits
- **Carbon Emissions**
  - » Reduced carbon emissions in harvest and production process
  - » Can be dependant on source, fabrication, and installation locations

WHY MASS TIMBER?

Aesthetic + Wellness

- **Biophilia: human's innate affinity for nature**
  - » Use of natural materials
  - » Access to natural light and airflow
  - » Closeness to water and plants
- **Health + Wellness**
  - » Imporved cognitive performance and stress relief
  - » Lower heart rate and blood pressure
  - » Enhanced mood of occupants
  - » Increased preference for spaces with natural materials

1 CHALLENGES + CONSIDERATIONS

KEYS TO SUCCESS

Commit Early

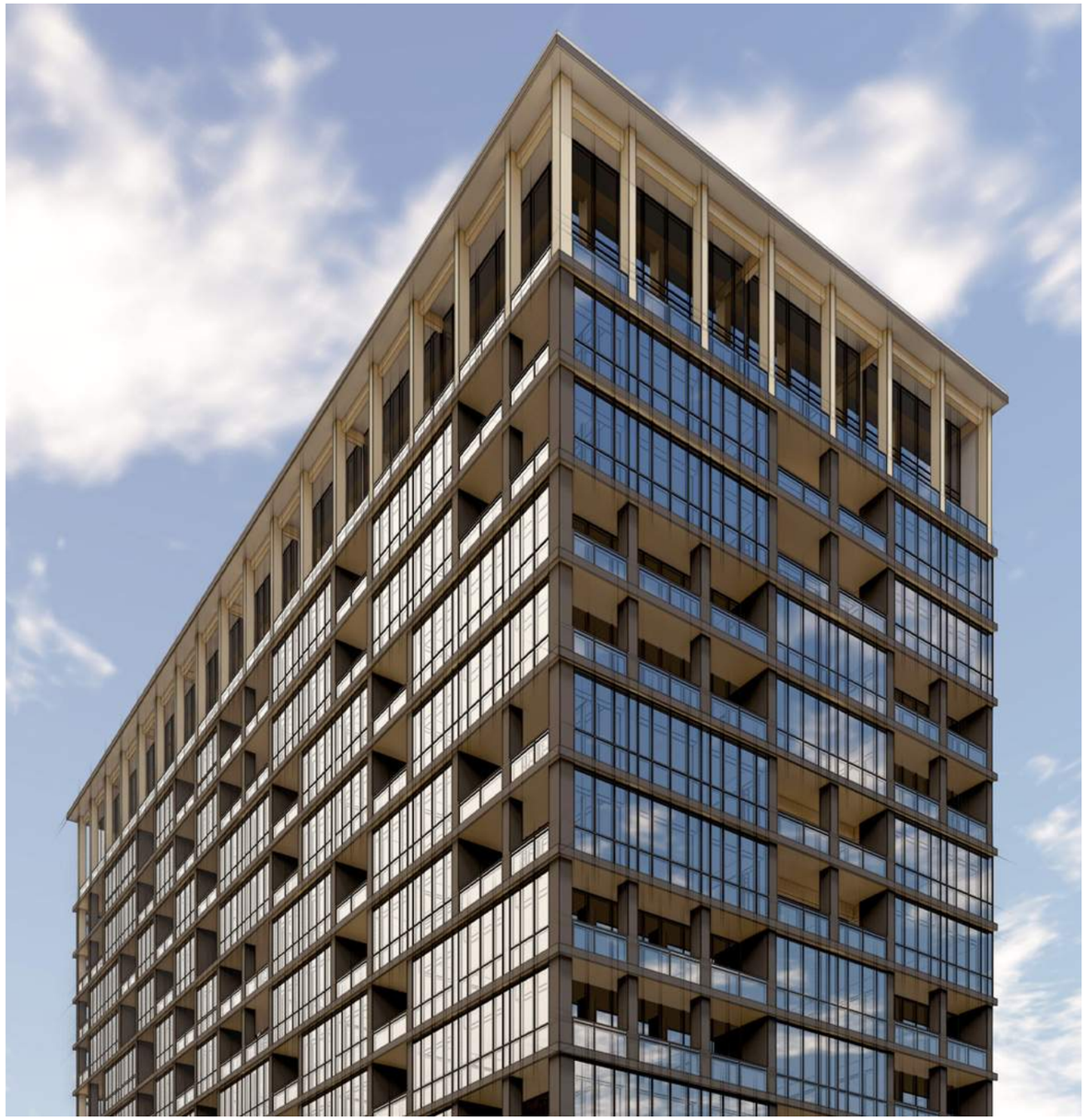
Defining and committing to a structural system early is key to efficiency in any project type. Design the building with the structural system verses design the building then apply the structural system.

Engage Early

Identifying and engaging a GC and mass timber supplier early brings a higher level of efficiency and optimization of the mass timber system and installation. Working with a mass timber supplier early in the design process is critical to controlling cost, maximizing efficiency, minimizing waste, and optimizing coordination with building systems.

Set Project Goals

Setting goals for utilizing a mass timber structural system is vital to defining a path and guiding the decision making process throughout the design and construction phases.



DEFINE GOALS FOR MASS TIMBER

	PROJECT GOAL	VALUE ADD
SCHEDULE Faster construction and reduced schedule; precision and prefabrication.		
EXPOSED NATURAL WOOD Aesthetic value: faster lease-up and leasing premium. portfolio differentiation.		
LIGHTWEIGHT CONSTRUCTION Beneficial in poor soil conditions. Potential reduction in foundation design		
LABOR AVAILABILITY Small crews for timber erection. Precision of prefabricated system and fully design MEP systems minimizes on site design + coordination.		
JUST IN TIME DELIVERY Reduce staging and storage on site. ideal for compact urban site.		
RENEWABLE RESOURCE Nature, environmentally friendly, reduced carbon impact. Support healthy forests and rural economics		

BARRIERS TO ENTRY

BARRIERS

STRUCTURAL DEPTH
Many mass timber buildings constructed with post and beam systems have structural depths exceeding what developers have come to expect.

COLUMN SPACING + SPANS
In order to limit structural depth and maximize efficiency of CLT spans, column grid can be much more densely spaced than typical concrete or steel systems.

GC EXPERIENCE + COMFORT LEVEL
With very few projects built entirely out of mass timber in the DMV area, few contractors understand and many are apprehensive about exploring mass timber as a competitive structural system to traditional concrete or steel.

PRICING/COST ISSUES
Because of the above mentioned issue, as well as limited Timber fabricators + suppliers in our region, pricing for Mass Timber components is higher than in other regions.

REGULATORY FRAMEWORK
Due to the relatively new nature of this type of structure to the DMV area, there is no clear or obvious compliance path under adopted codes.

SOLUTIONS

ADJUSTING THE GRID + POINT SUPPORT
Exploring shallower beams in MEP distribution zone accommodating MEP systems below beams. Utilizing Point Support system can allow for reduced floor to floor height with no beams.

EDUCATIONAL OPPORTUNITIES
HC and our partners are actively engaged in educating each other, clients, and the marketplace about the benefits of Mass Timber Construction. The establishment of Academic partnerships and development of a Mass Timber mock-up in conjunction with the Softwood Lumber Board are tools we hope will help bridge the knowledge gap in our region.

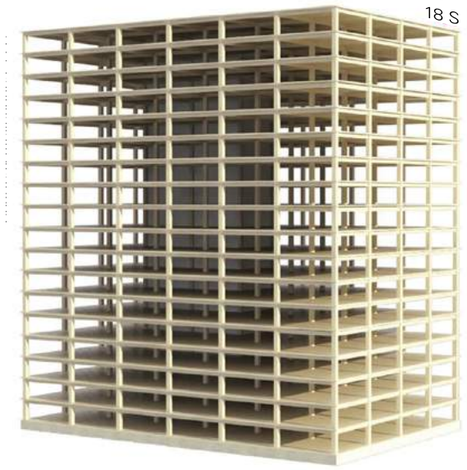
ENGAGE EARLY
Engaging GC and Manufacturers early to provide pricing, optimization, and design assistance Mass Timber models, giving us insight into the challenges and opportunities that Mass Timber construction will bring to our clients.

DIALOGUE WITH AHJ'S
Conversations with AHJ'S have taken place where an alternate compliance path has been established. Officials are eager to see more Mass Timber projects and have offered priority paths towards permitting.

2 RULES + REGULATIONS

IBC 2021 NEW CONSTRUCTION TYPES

(B) Business Use



18 STORIES
BUILDING HEIGHT 270 FT
ALLOWABLE BUILDING AREA 972,000 SF
AVERAGE AREA PER STORY 54,000 SF

TYPE IV-A

Primary Structural Frame: 3HR Fire Rated

Required Noncombustible Protection:
Ceilings: 100% Protection
0% Exposed Timber

Floors: 1" Minimum Coverage

Interior Surfaces: Always Required
2/3 of FRR, 80 mins min

Redundant water main feed at Fire Pump

Fire Safety Procedures During Construction

Other High Rise Requirements

12 STORIES
BUILDING HEIGHT 180 FT
ALLOWABLE BUILDING AREA 648,000 SF
AVERAGE AREA PER STORY 54,000 SF

TYPE IV-B

Primary Structural Frame: 2HR Fire Rated

Required Noncombustible Protection:
Ceilings: 80% Protection
20% Exposed Timber

Floors: 1" Minimum Coverage

Interior Surfaces: Always Required
2/3 of FRR, 80 mins min

Redundant water main feed at Fire Pump

Fire Safety Procedures During Construction

Other High Rise Requirements

9 STORIES
BUILDING HEIGHT 85 FT
ALLOWABLE BUILDING AREA 405,000 SF
AVERAGE AREA PER STORY 45,000 SF

TYPE IV-C

Primary Structural Frame: 2HR Fire Rated

Required Noncombustible Protection:
Ceilings: Not Required

Floors: Not Required

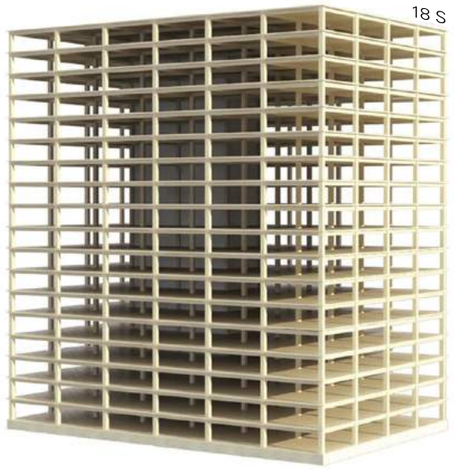
Interior Surfaces: Not Required

Fire Safety Procedures (Over 4 Stories)

Other High Rise Requirements (Over 75 FT)

IBC 2021 NEW CONSTRUCTION TYPES

(R2) Residential Use



18 STORIES
BUILDING HEIGHT 270 FT
ALLOWABLE BUILDING AREA 3,312,000 SF
AVERAGE AREA PER STORY 184,000 SF

TYPE IV-A

Primary Structural Frame: 3HR Fire Rated

Required Noncombustible Protection:
Ceilings: 100% Protection
0% Exposed Timber

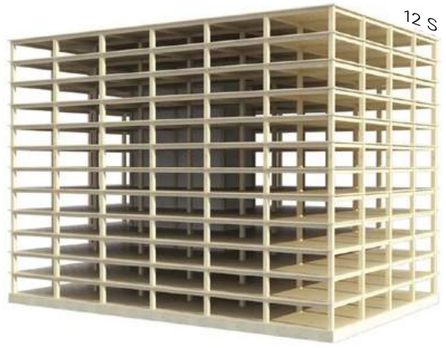
Floors: 1" Minimum Coverage

Interior Surfaces: Always Required
2/3 of FRR, 80 mins min

Redundant water main feed at Fire Pump

Fire Safety Procedures During Construction

Other High Rise Requirements



12 STORIES
BUILDING HEIGHT 180 FT
ALLOWABLE BUILDING AREA 1,476,000 SF
AVERAGE AREA PER STORY 123,000 SF

TYPE IV-B

Primary Structural Frame: 2HR Fire Rated

Required Noncombustible Protection:
Ceilings: 80% Protection
20% Exposed Timber

Floors: 1" Minimum Coverage

Interior Surfaces: Always Required
2/3 of FRR, 80 mins min

Redundant water main feed at Fire Pump

Fire Safety Procedures During Construction

Other High Rise Requirements

8 STORIES
9 BUILDING HEIGHT 85 FT
A ALLOWABLE BUILDING AREA 615,000 SF
A AVERAGE AREA PER STORY 76,875 SF

TYPE IV-C

Primary Structural Frame: 2HR Fire Rated

Required Noncombustible Protection:
Ceilings: Not Required

Floors: Not Required

Interior Surfaces: Not Required

Fire Safety Procedures (Over 4 Stories)

Other High Rise Requirements (Over 75 FT)

IBC 2021 NEW CONSTRUCTION TYPES

		TYPE I		TYPE II		TYPE III		TYPE IV			TYPE V		
OCCUPANCY	SPRINKLER	ALLOWABLE BUILDING HEIGHT IN FEET (TABLE 504.3)											
		A	B	A	B	A	B	A	B	C	HT	A	B
A ,B, R	NO	UNLIMITED	160	65	55	65	55	65	65	65	65	50	40
A, B, R	YES	UNLIMITED	180	85	75	85	75	270	180	85	85	70	60
		ALLOWABLE NUMBER OF STORIES (TABLE 504.3)											
A-2, A-3, A-4	YES	UNLIMITED	12	4	3	4	3	18	12	6	4	3	2
B	YES	UNLIMITED	12	6	4	6	4	18	12	9	6	4	3
R-1, R-2	YES	UNLIMITED	12	5	5	5	5	18	12	8	5	4	3
		ALLOWABLE AREA FACTOR (SF)(TABLE 506.2)											
A-2, A-3, A-4	SM	UNLIMITED	UNLIMITED	46,500	28,500	42,000	28,500	135,000	90,000	56,250	45,000	34,500	18,000
B	SM	UNLIMITED	UNLIMITED	112,500	69,000	85,500	57,000	324,000	216,000	135,000	108,000	54,000	27,000
R-1, R-2	SM	UNLIMITED	UNLIMITED	72,000	48,000	72,000	48,000	184,500	123,000	76,875	81,500	36,000	21,000

NEW CONSTRUCTION TYPES

TYPE IV-A: Fully Protected, exterior and interior

Exterior Walls	Sturctural Frame	Floor Protection	Roof Protection
3 hrs	**3 hrs**	**2 hrs**	**1.5 hrs**

Note: Dual water supply for fire suppression systems required at 120 feet elevation and above. No reductions in protection permitted

TYPE IV-B: Mass timber protected exterior, limited exposed timber interior

Exterior Walls	Sturctural Frame	Floor Protection	Roof Protection
2 hours	**2 hours**	**2 hours**	**1 hour**

Note: Dual water supply for fire suppression systems required at 120 feet elevation and above. No reductions in protection permitted

TYPE IV-C: Mass timber protected exterior, exposed timber interior

Exterior Walls	Sturctural Frame	Floor Protection	Roof Protection
2 hours	**2 hours**	**2 hours**	**1 hour**

Note: No reductions in protection permitted