The Timber High Rise Advantage: Design & Cost Considerations for Tall Wood

June 25, 2026

Presented by
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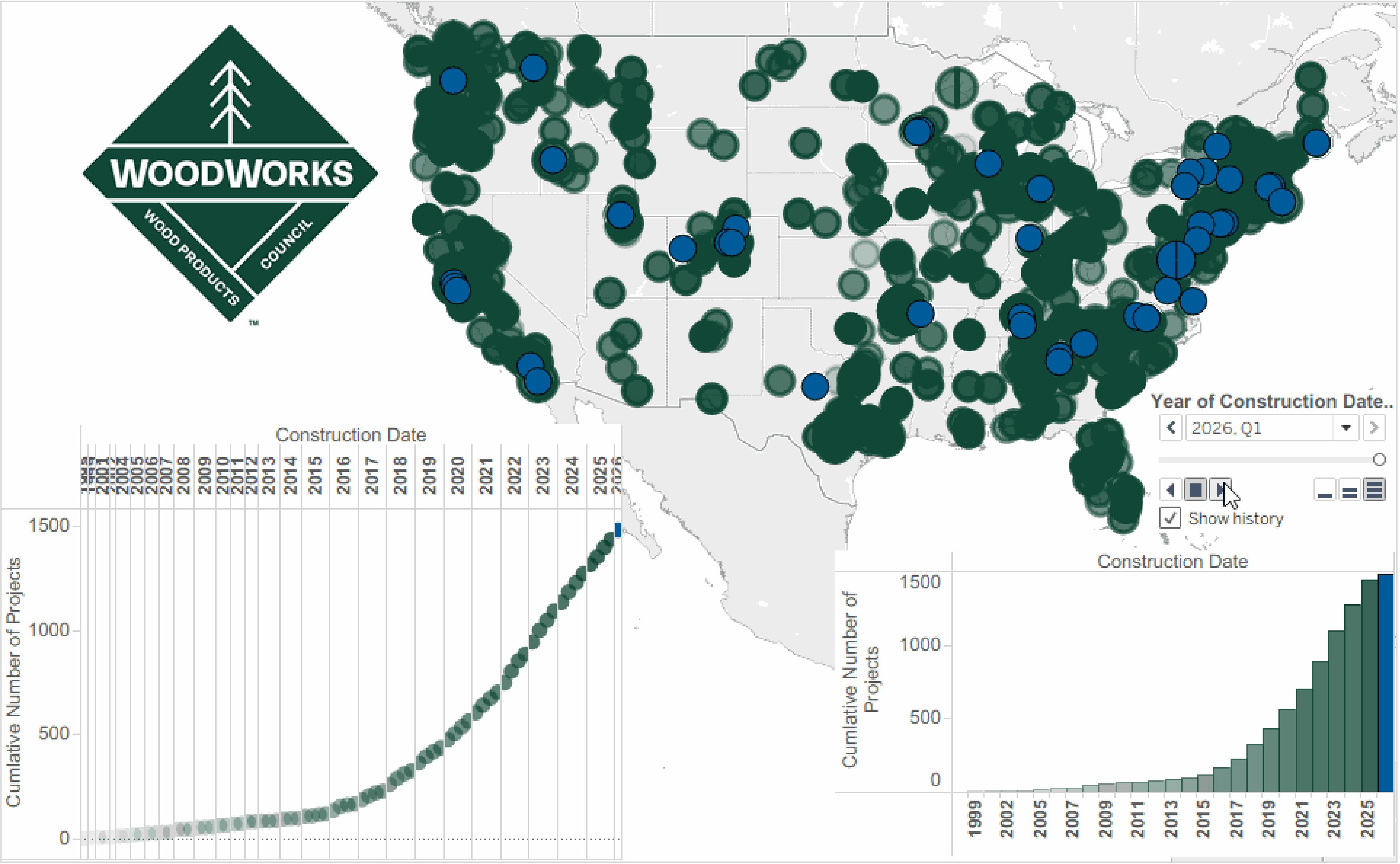
WoodWorks

Image: 1510 Webster / oWOW / DCI Engineers / Photo Andrew Nelson

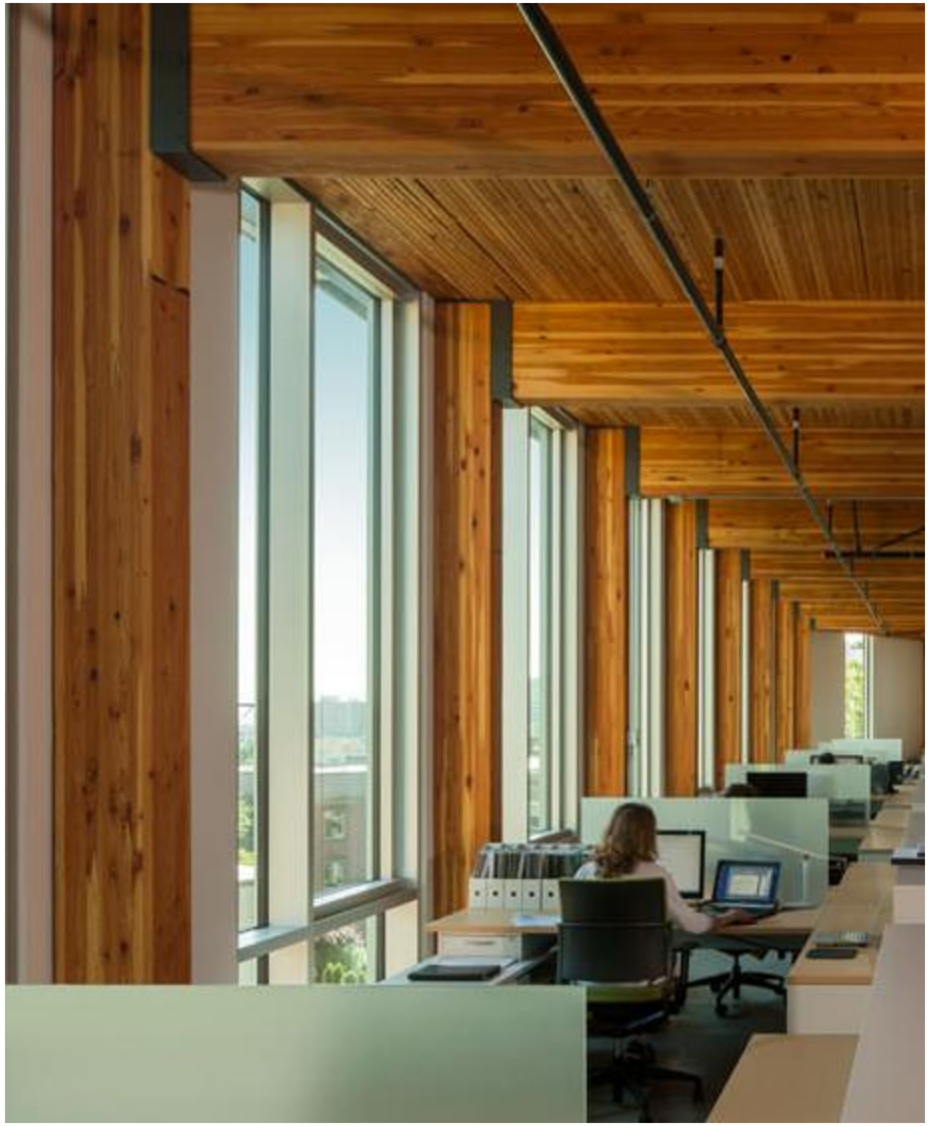
Current State of Mass Timber Projects Over Time

US Market Q1 2026



Light-Frame Wood
Photo: WoodWorks

Heavy Timber
Photo: Benjamin Benschneider



Mass Timber
Photo: John Stamets

Modern Types of Wood Construction

Prefabricated Offsite

Site Built (Light-Frame)

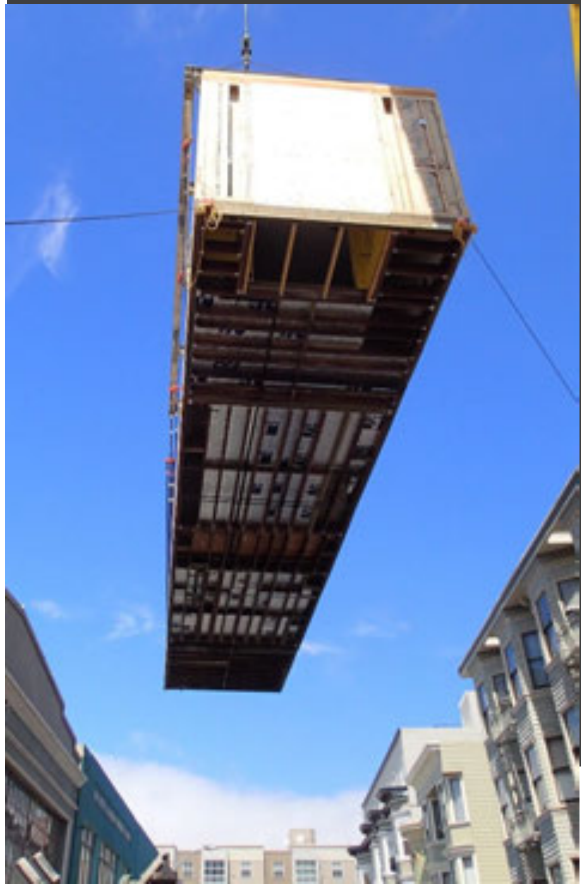
River Edge, Kitchen & Associates
photo courtesy of McAlvain Construction

Panelized (Light-frame)

Photo: Davis Frame

Image: Entekra

Volumetric Modular (Light-frame)



Mass Timber

Photo: LendLease

Mass Timber Construction Terminology

Glue Laminated Timber (Glulam)
Beams & columns

Photo: StructureCraft

Cross-Laminated Timber (CLT)
Solid sawn laminations

Photo: LendLease

Cross-Laminated Timber (CLT)
SCL laminations

Photo:
Freres Lumber

Photo: LEVER Architecture

Dowel-Laminated Timber (DLT)

Photo: StructureCraft

Photo: StructureCraft

Nail-Laminated Timber (NLT)

Photo: Think Wood

Photo: Ema Peter

Glue-Laminated Timber (GLT)

Plank orientation

Photo: StructureCraft

Photo: Manasc Isaac Architects/Fast + Epp

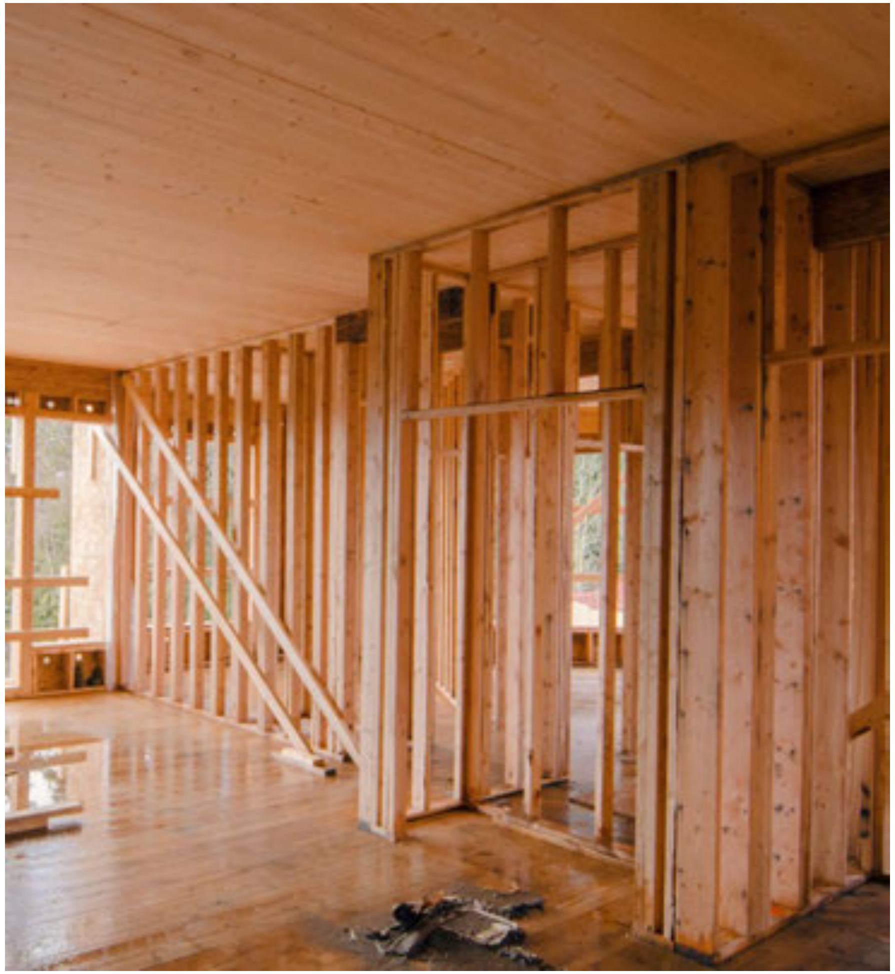
Mass Timber Building Options

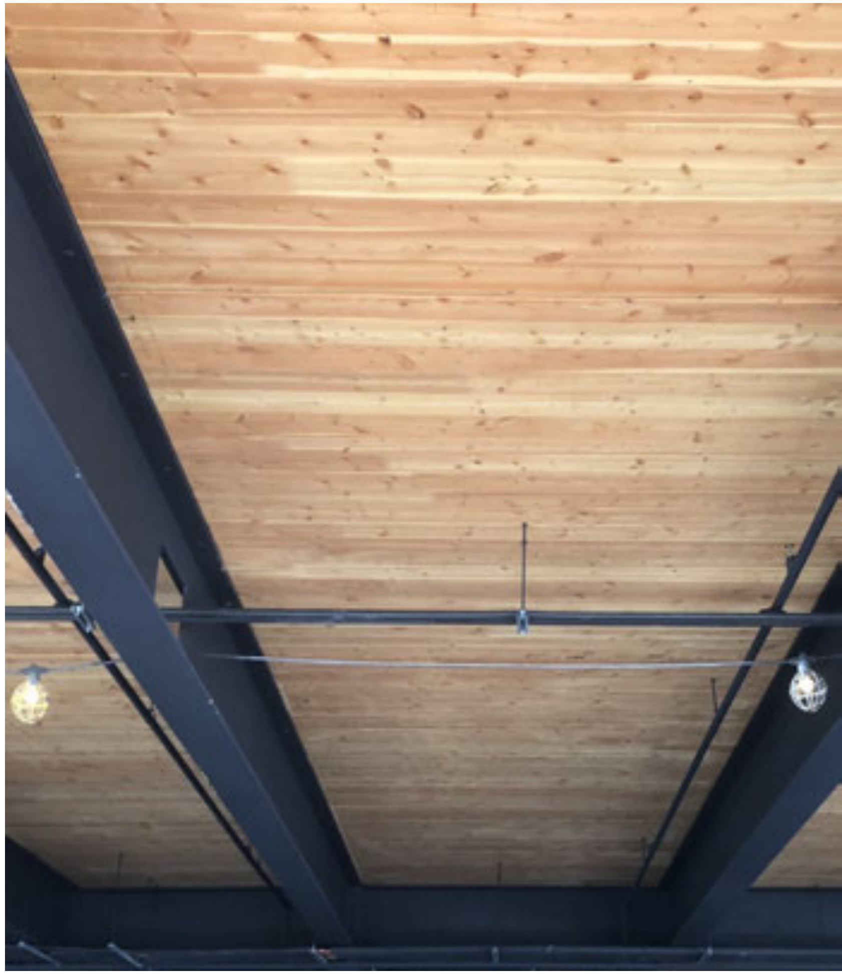
Post and Beam

Flat Plate

Honeycomb

Mass Timber Building Options





Hybrid: Light-Frame

Hybrid: Steel Framing

Framing Options for Tall Timber (>7 stories)

Mass Timber Floors & Roofs on Post & Beam Framing

Credit: ADX Creative and Engberg Anderson

Mass Timber Floors & Roofs on Posts (Flat Plate)

Credit: acton ostry architects

MASS TIMBER IN THE CODE

Photo: Freres Lumber

Construction Types

When does the code allow mass timber to be used?

IBC defines mass timber systems in IBC Chapter 2 and notes their acceptance and manufacturing standards in IBC Chapter 23

Permitted anywhere that combustible materials and heavy timber are allowed, plus more

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?

<u>Type IB & II</u>: Roof Decking

Image: DeStafano & Chamberlain, Inc, Robert Benson Photography

Image: StructureCraft Builders

Construction Types

All wood-framed building options:

<u>Type III</u>

Exterior walls non-combustible (may be FRTW)

Interior elements any allowed by code, including mass timber

<u>Type V</u>

All building elements are any allowed by code, including mass timber

Types III and V are subdivided to A (protected) and B (unprotected)

<u>Type IV (Heavy Timber)</u>

Exterior walls non-combustible (may be FRTW OR CLT)

Interior elements qualify as Heavy Timber (min. sizes, no concealed spaces except in 2021 IBC)

Construction Types

Where does the code allow MT to be used?

Type III: Interior elements (floors, roofs, partitions/shafts) and exterior walls if FRT

ICE Block I, RMW Architecture & Interiors, Buehler Engineering, Bernard André Photography

Construction Types

Where does the code allow MT to be used?

<u>Type IV: </u>Any exposed interior elements & roofs, must meet min. sizes; exterior walls if CLT or FRT. Concealed space limitations (varies by code version)

Image: Perkins + Will

Construction Types

Type IV construction permits exposed heavy/mass timber elements of min. sizes.

Minimum Width by Depth in Inches

Framing		Solid Sawn (nominal)	Glulam (actual)	SCL (actual)
Floor	Columns	8 x 8	6¾ x 8¼	7 x 7½
	Beams	6 x 10	5 x 10½	5¼ x 9½
Roof	Columns	6 x 8	5 x 8¼	5¼ x 7½
	Beams*	4 x 6	3 X 6⅞	3½ X 5½

*3” nominal width allowed where sprinklered

See IBC 2018 2304.11 or IBC 2015 602.4 for Details

Photo: WoodWorks

Construction Types

Type IV min. sizes:

<u>Floor Panels/Decking:</u>

- 4” thick CLT (actual thickness)
- 4” NLT/DLT/GLT (nominal thickness)
- 3” thick (nominal) decking covered with: 1” decking <u>or</u> 15/32” WSP <u>or</u> ½” particleboard

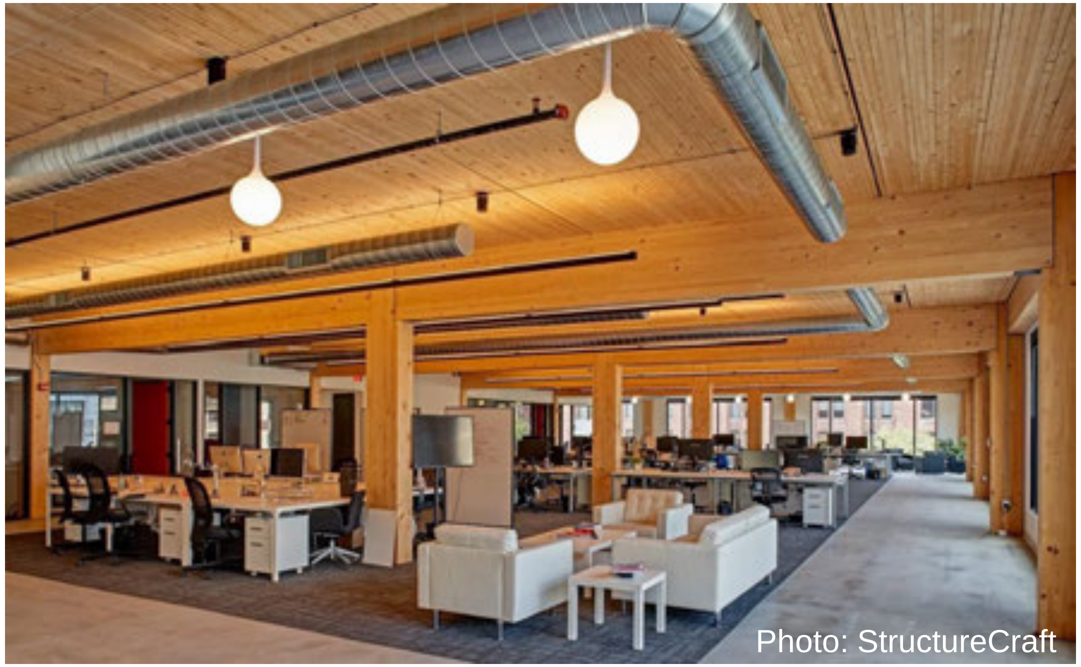


Photo: StructureCraft

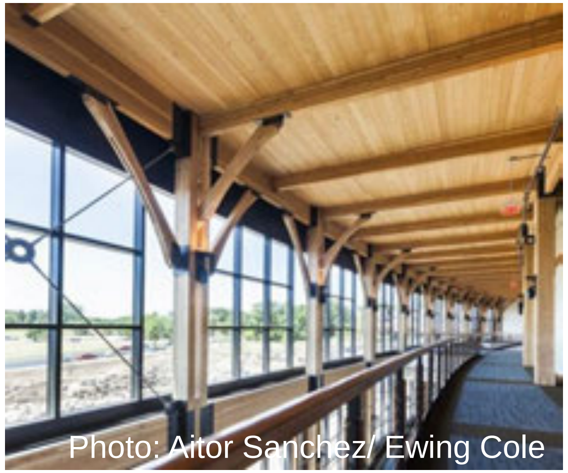


Photo: Aitor Sanchez/ Ewing Cole

Photo: WoodWorks

Tall Wood Code Provisions: Construction Types IV-A, B, and C

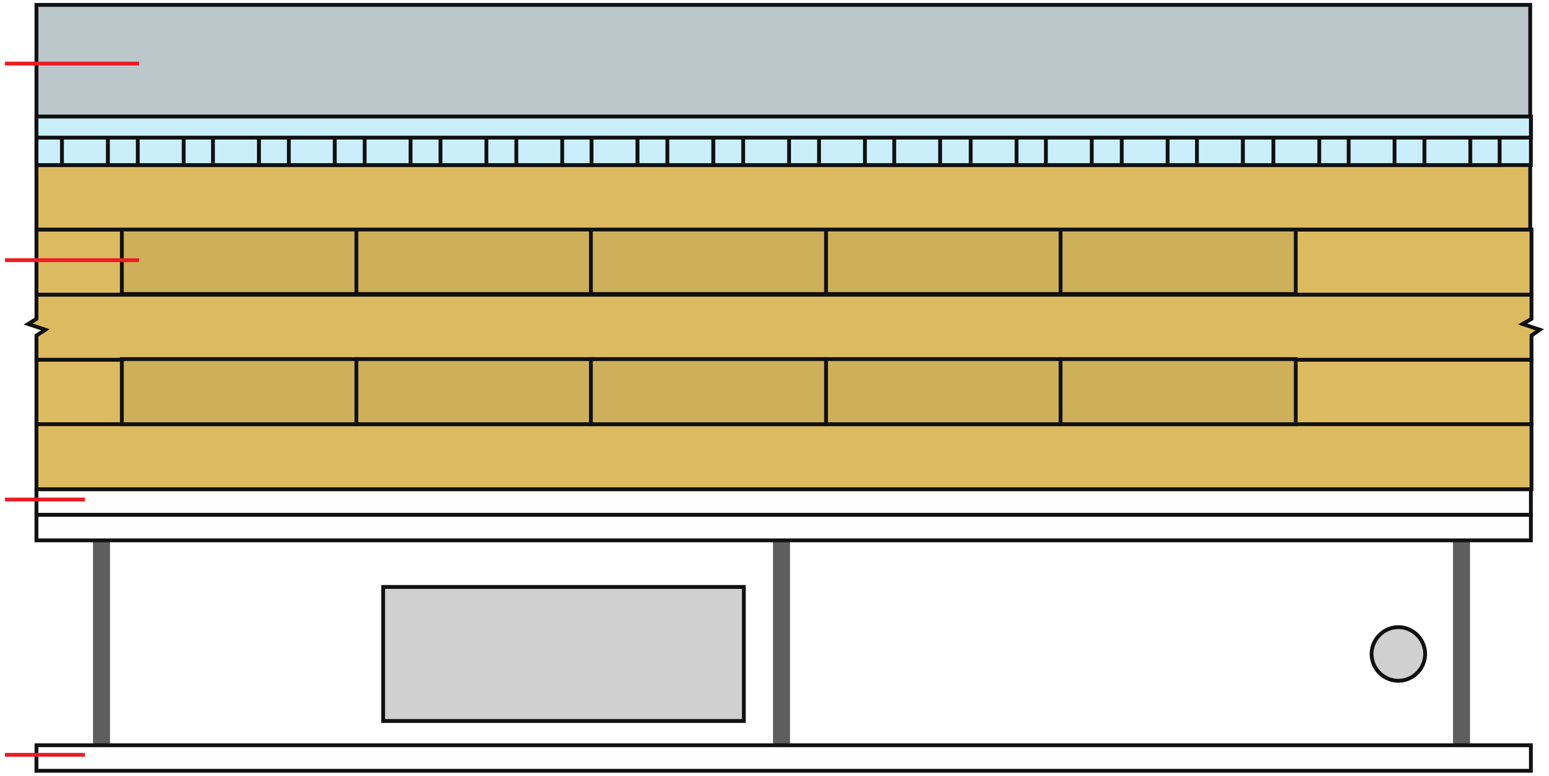
602.4 Type IV. Type IV construction is that type of construction in which the building elements are mass timber or noncombustible materials and have fire resistance ratings in accordance with Table 601. Mass timber elements shall meet the fire resistance rating requirements of this section based on either the fire resistance rating of the noncombustible protection, the mass timber, or a combination of both and shall be determined in accordance with Section 703.2 or 703.3. The minimum dimensions and permitted materials for building elements shall comply with the provisions of this section and Section 2304.11. Mass timber

Exception: Type IV-HT Construction in accordance with Section 602.4.4.

Construction Types

Type IV concealed spaces

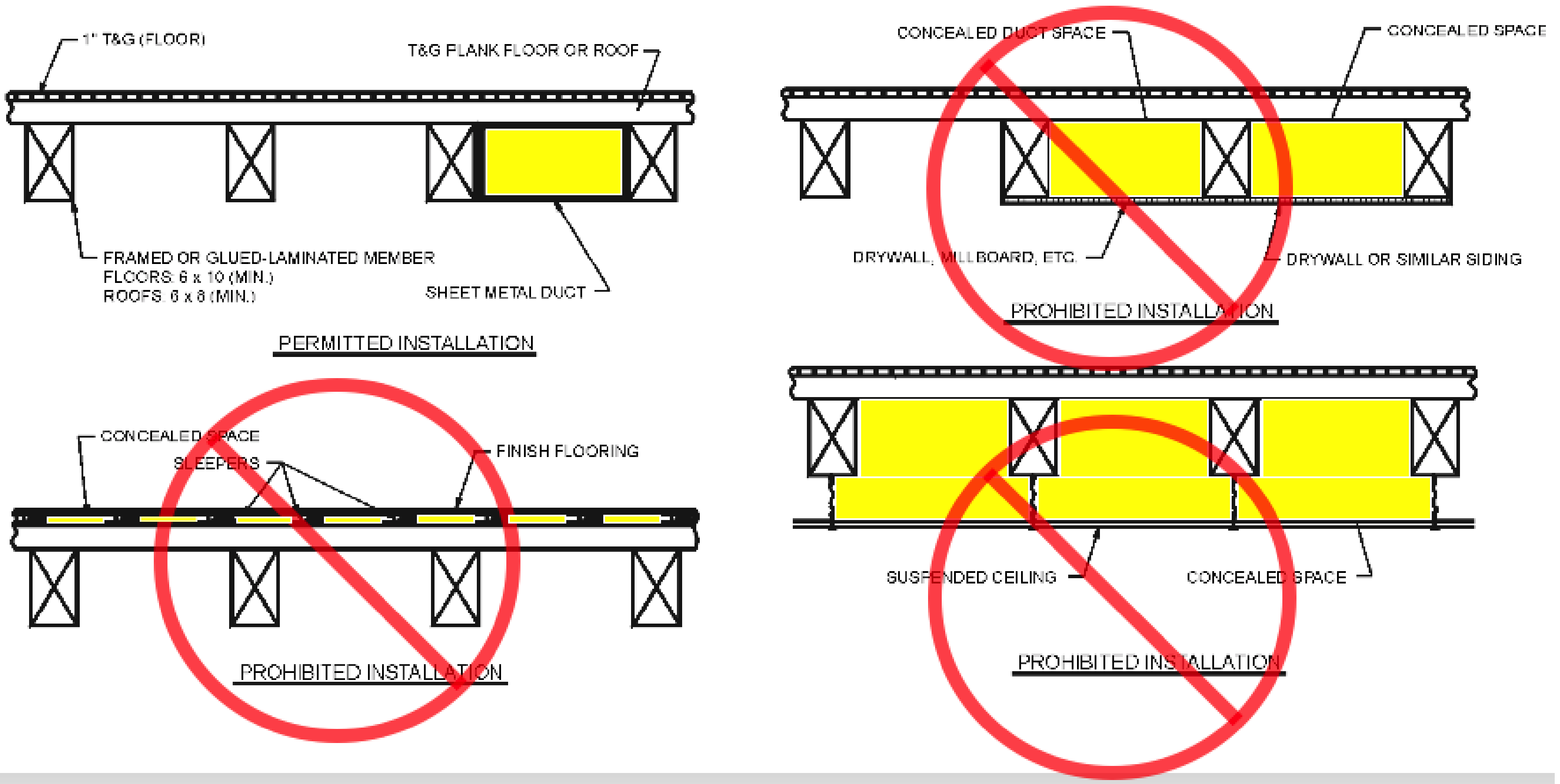
Can I have a dropped ceiling? Raised access floor?



Construction Types

Type IV concealed spaces

Until 2021 IBC, Type IV-HT provisions prohibited concealed spaces



Credit: IBC

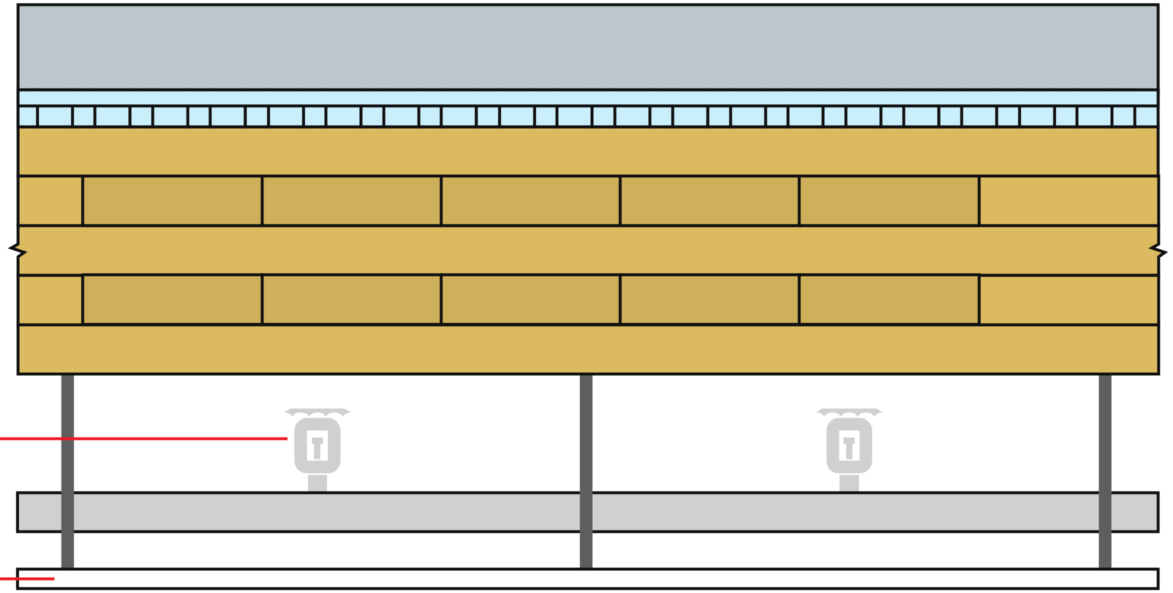
Construction Types

Type IV concealed space options within 2021 IBC

Option 1:

Sprinklers in concealed spaces

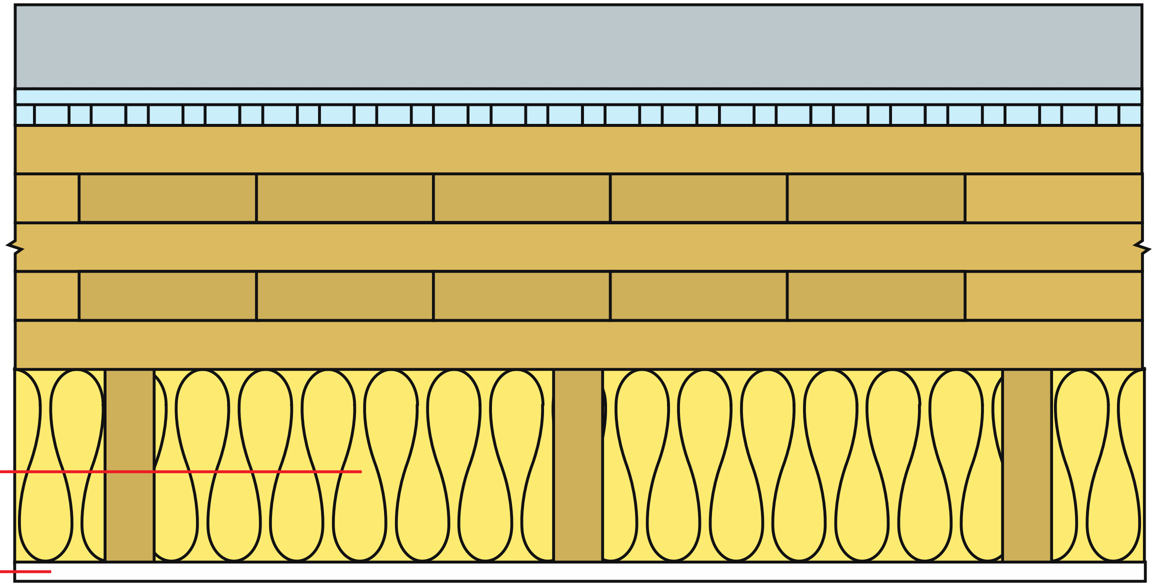
Dropped ceiling



Construction Types

Type IV concealed space options within 2021 IBC

Option 2:



Noncombustible insulation

Dropped ceiling

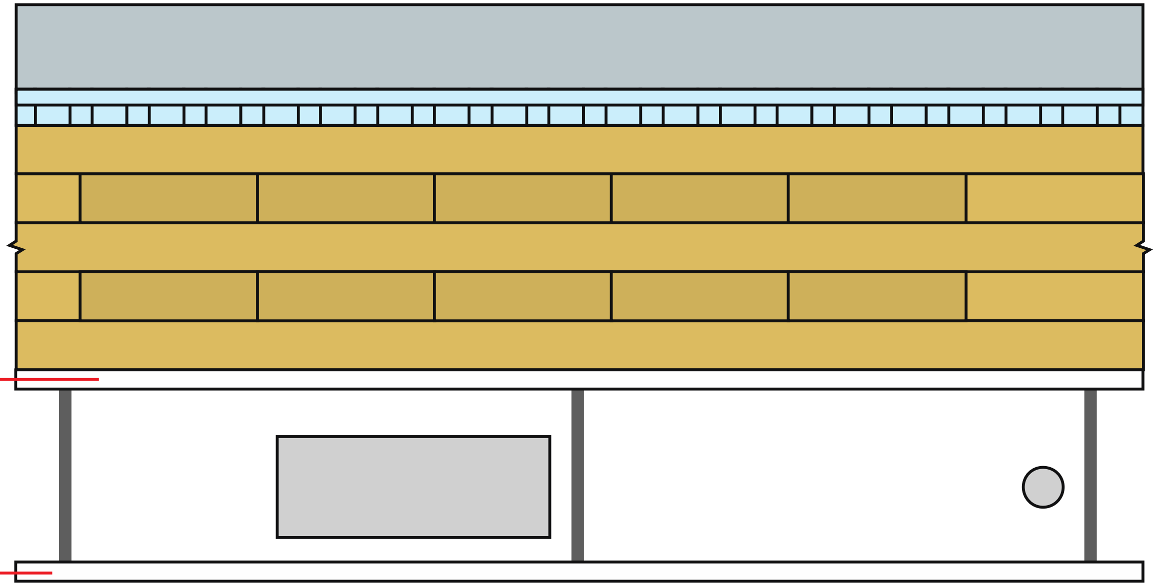
Construction Types

Type IV concealed space options within 2021 IBC

Option 3:

5/8" Type X gypsum on all mass timber surfaces within concealed space

Dropped ceiling



Construction Types

Concealed spaces solutions paper

Richard McLain, PE, SE
Senior Technical Director – Tall Wood
WoodWorks – Wood Products Council

WOODWORKS
WOOD PRODUCTS COUNCIL

Concealed Spaces in Mass Timber and Heavy Timber Structures

Concealed spaces, such as those created by a dropped ceiling in a floor/ceiling assembly or by a stud wall assembly, have unique requirements in the International Building Code (IBC) to address the potential of fire spread in non-visible areas of a building. Section 718 of the 2018 IBC includes prescriptive requirements for protection and/or compartmentalization of concealed spaces through the use of draft stopping, fire blocking, sprinklers and other means. For information on these requirements, see the WoodWorks Q&A, *Are sprinklers required in concealed spaces such as floor and roof cavities in multi-family wood-frame buildings?*[1]

For mass timber building elements, the choice of construction type can have a significant impact on concealed space requirements. Because mass timber products such as cross-laminated timber (CLT) are prescriptively recognized for Type IV construction, there is a common misperception that exposed mass timber building elements cannot be used or exposed in other construction types. This is not the case.

In addition to Type IV buildings, structural mass timber elements—including CLT, glue-laminated timber (glulam), nail-laminated timber (NLT), structural composite lumber (SCL), and tongue-and-groove (T&G) decking—can be utilized and exposed in the following construction types, whether or not a fire-resistance rating is required:

- **Type III** – Floors, roofs and interior walls may be any material permitted by code, including mass timber; exterior walls are required to be noncombustible or fire retardant-treated wood.
- **Type V** – Floors, roofs, interior walls and exterior walls (i.e., the entire structure) may be constructed of mass timber.
- **Types I and II** – Mass timber may be used in select circumstances such as roof construction—including the primary frame in the 2021 IBC—in Types I-B, II-A or II-B; exterior columns and arches when 20 feet or more of horizontal separation is provided; and balconies, canopies and similar projections.

INTRO, Cleveland | Cleveland, Ohio
Harbor Bay Real Estate Advisors
HPA Architecture

The John W. Olver Design Building at UMass Amherst includes exposed wood structure in some areas and dropped ceilings in others. Architect: Leers Weinzapfel Associates

https://www.woodworks.org/wp-content/uploads/wood_solution_paper-Concealed_Spaces_Timber_Structures.pdf

WHAT IS TALL MASS TIMBER?

INTRO, Cleveland, OH | Architect: Hartshorne Plunkard Architecture | Image Courtesy Harbor Bay Real Estate Advisors, Image Fiction

Mid-Rise vs. High-Rise

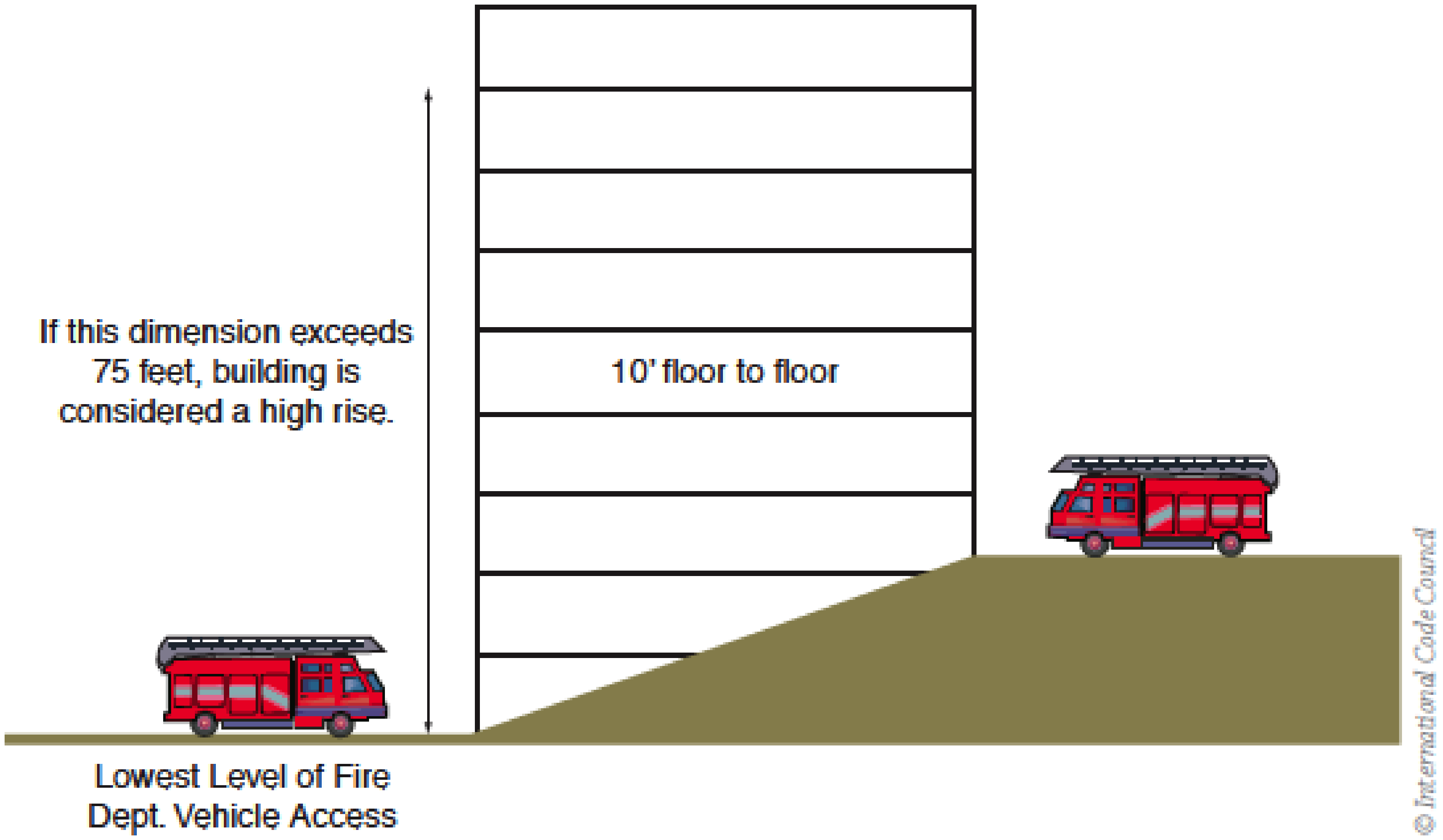


FIGURE 6-6 Determination of high-rise building

Tall Mass Timber in the U.S.

How Did We Arrive Here?

INTRO, Cleveland, OH | Architect: Hartshorne Plunkard Architecture | Image Courtesy Harbor Bay Real Estate Advisors, Image Fiction

2008 – 2015: International Inspiration

8-18-Story Projects in Europe, Canada, Australia

Photos: Waugh Thisleton Architects | Bygg Mesteren | Voll Arkitekter | Michael Elkan | Naturally Wood | UBC

2015-2018: Domestic Innovation

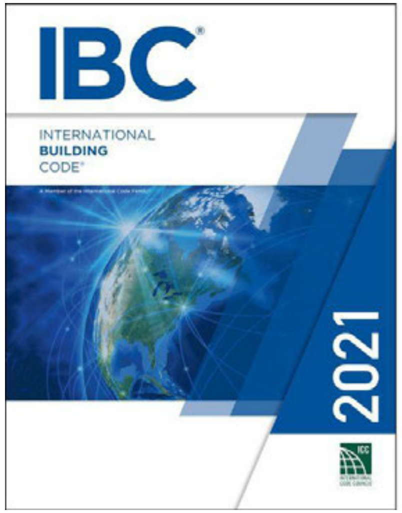
Tall Wood Building Competition, 8-Story Carbon 12 in Portland, OR

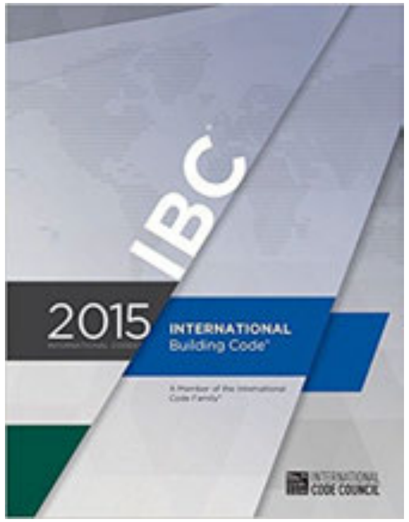
Photos: SHoP Architects | LEVER Architecture | Baumberger Studio/PATH Architecture

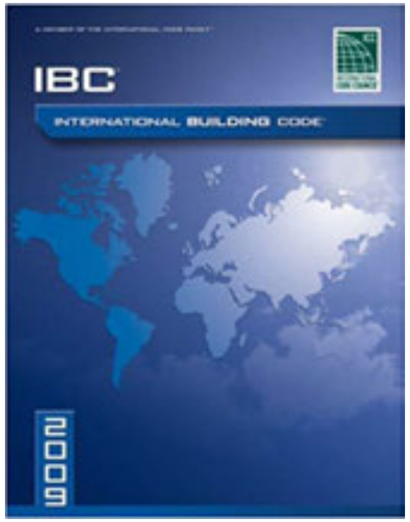
2015-2018: Building a Code Roadmap

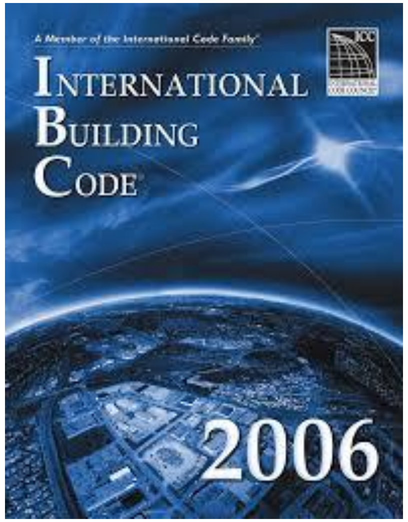
Photos: ICC

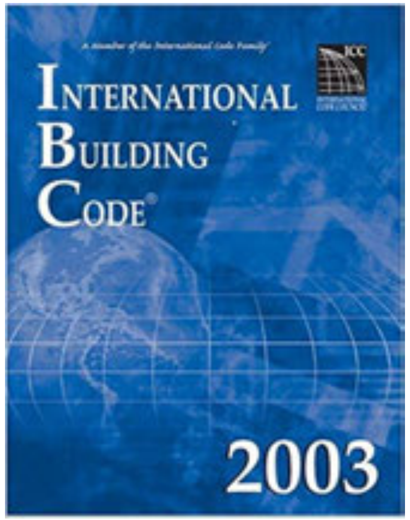
2015-2018: Building a Code Roadmap

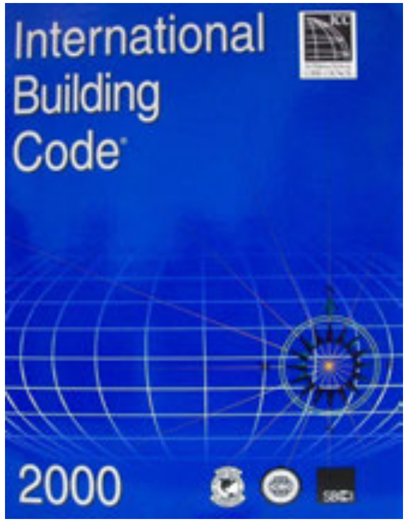












Images: ICC

2015-2018: Building a Code Roadmap

Photo: Lendlease

2015-2018: Building a Code Roadmap

Photo: Lendlease

2015-2018: Building a Code Roadmap

Photo: Lendlease

2015-2018: Building a Code Roadmap

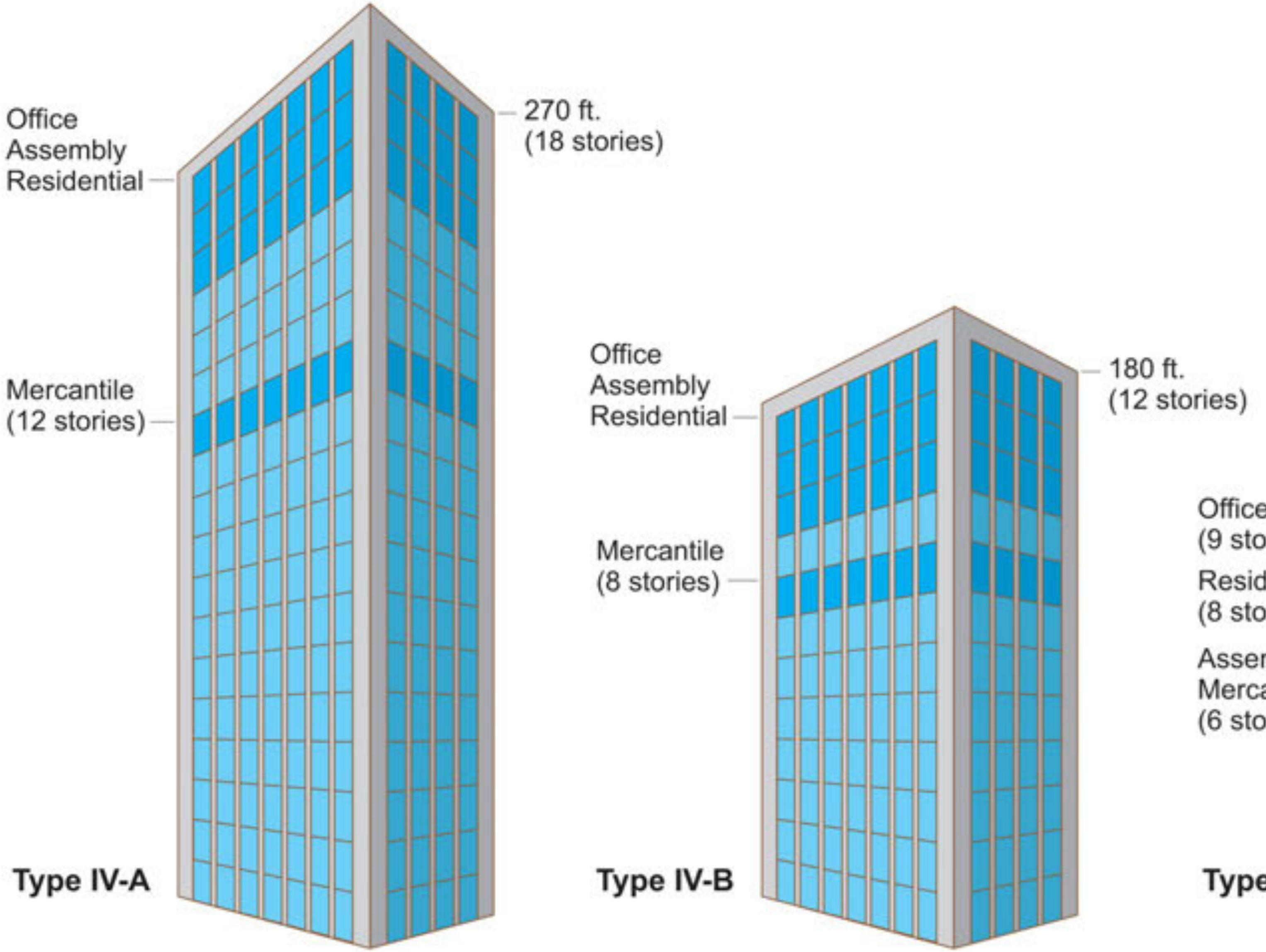
Photo: Lendlease

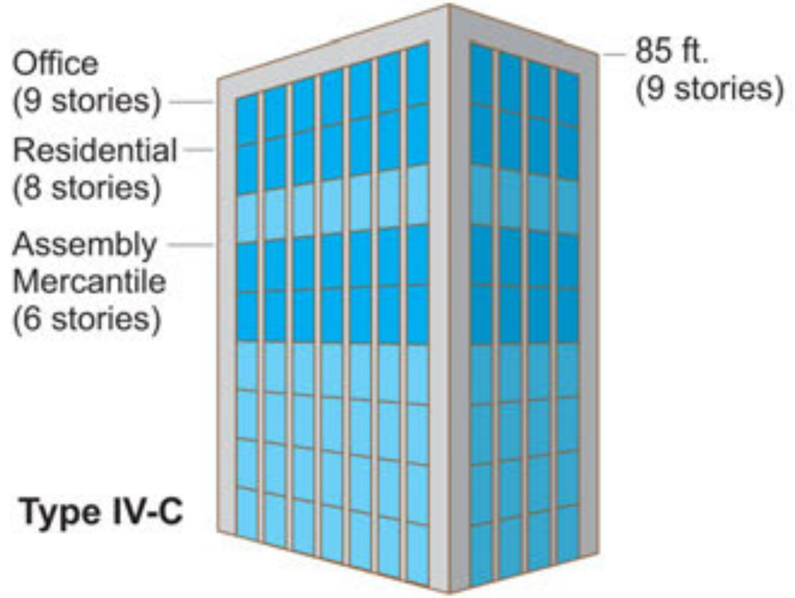
2015-2018: Building a Code Roadmap

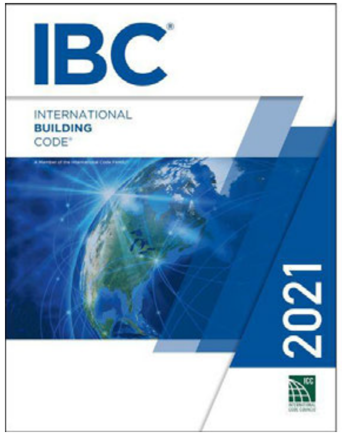
Photo: Lendlease

2018-2021: Rollout of a New Code Path

2021 IBC

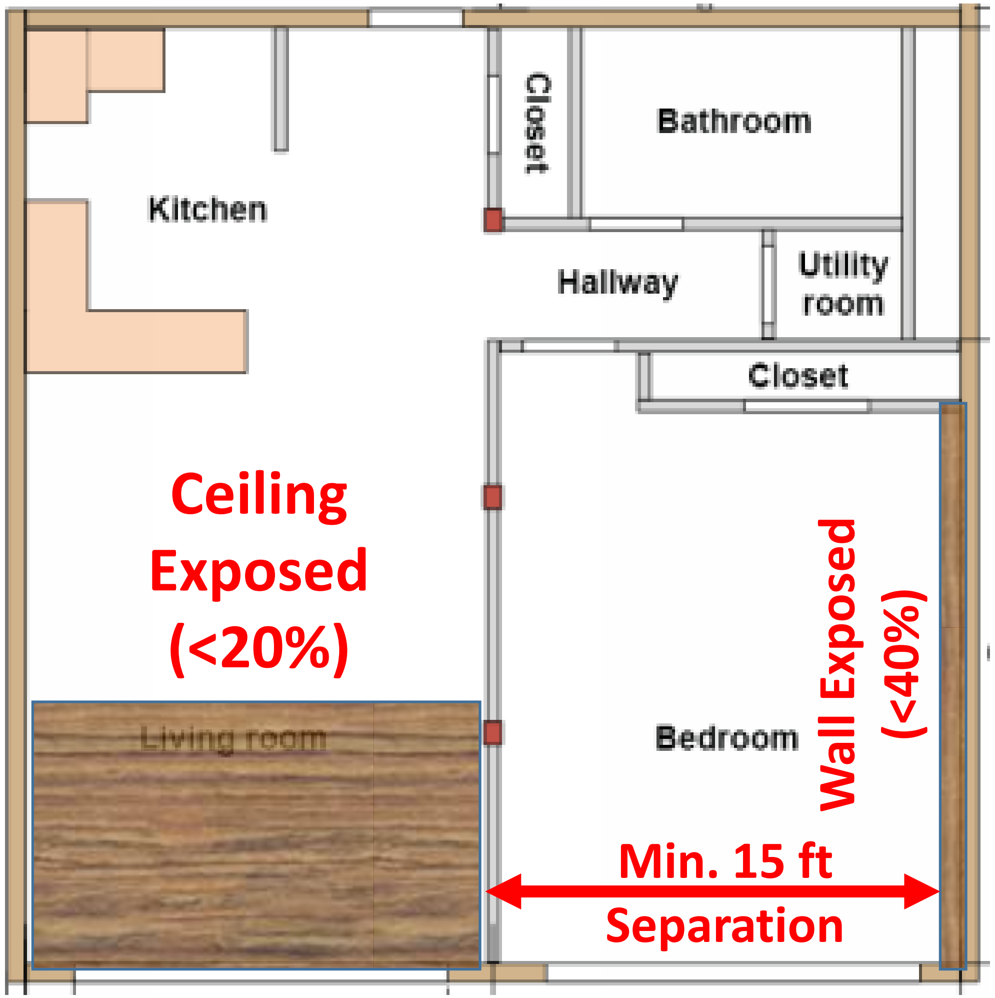


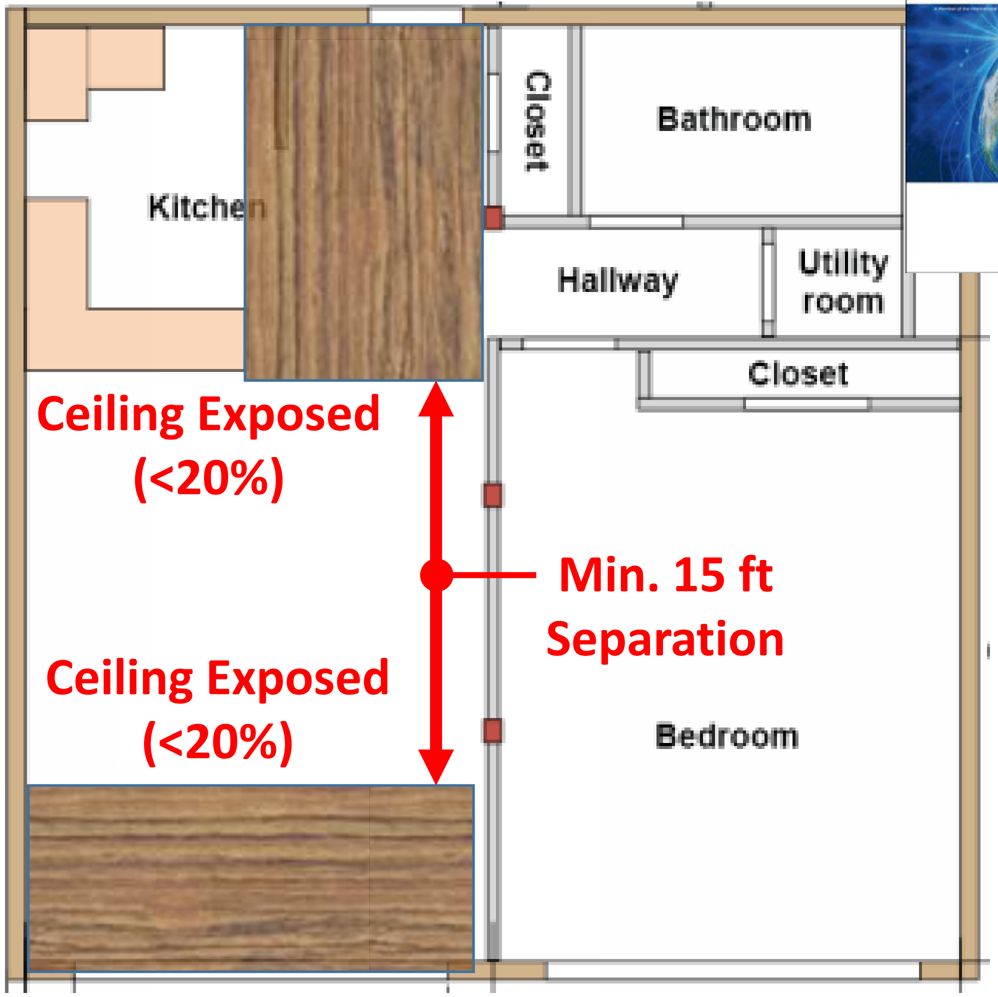


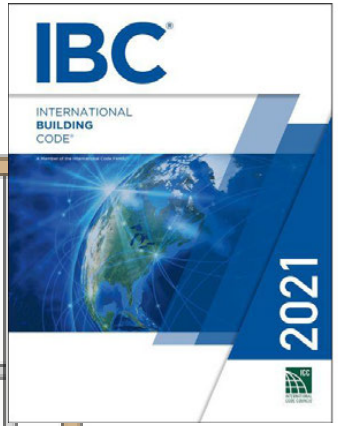


2019-2022: REFINING THE CODE ROADMAP

2021 IBC Allowances



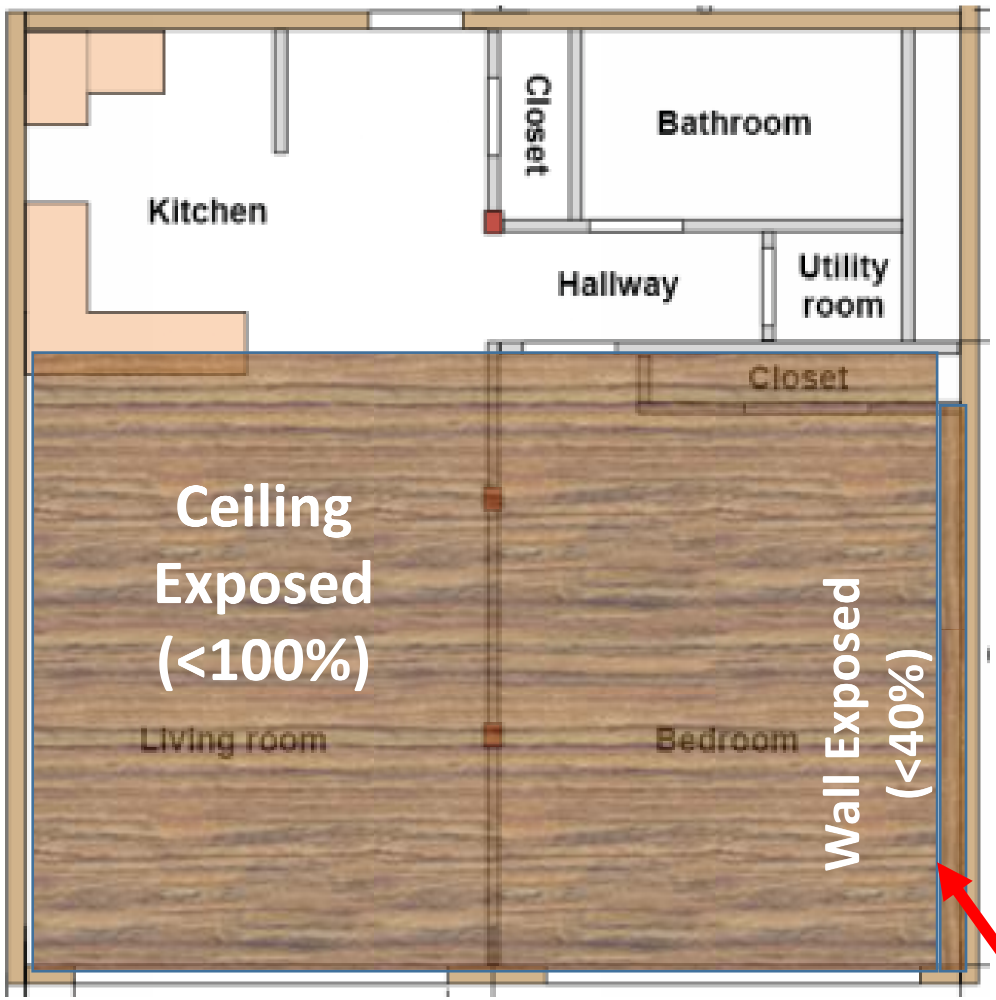


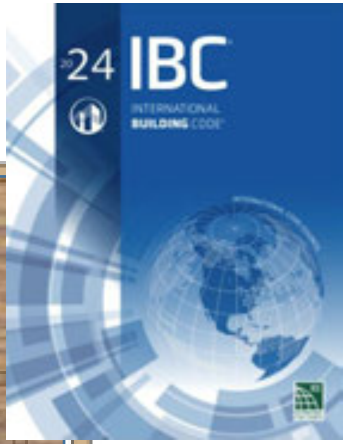


Credit: AWC

2019-2022: REFINING THE CODE ROADMAP

2024 IBC Allowances

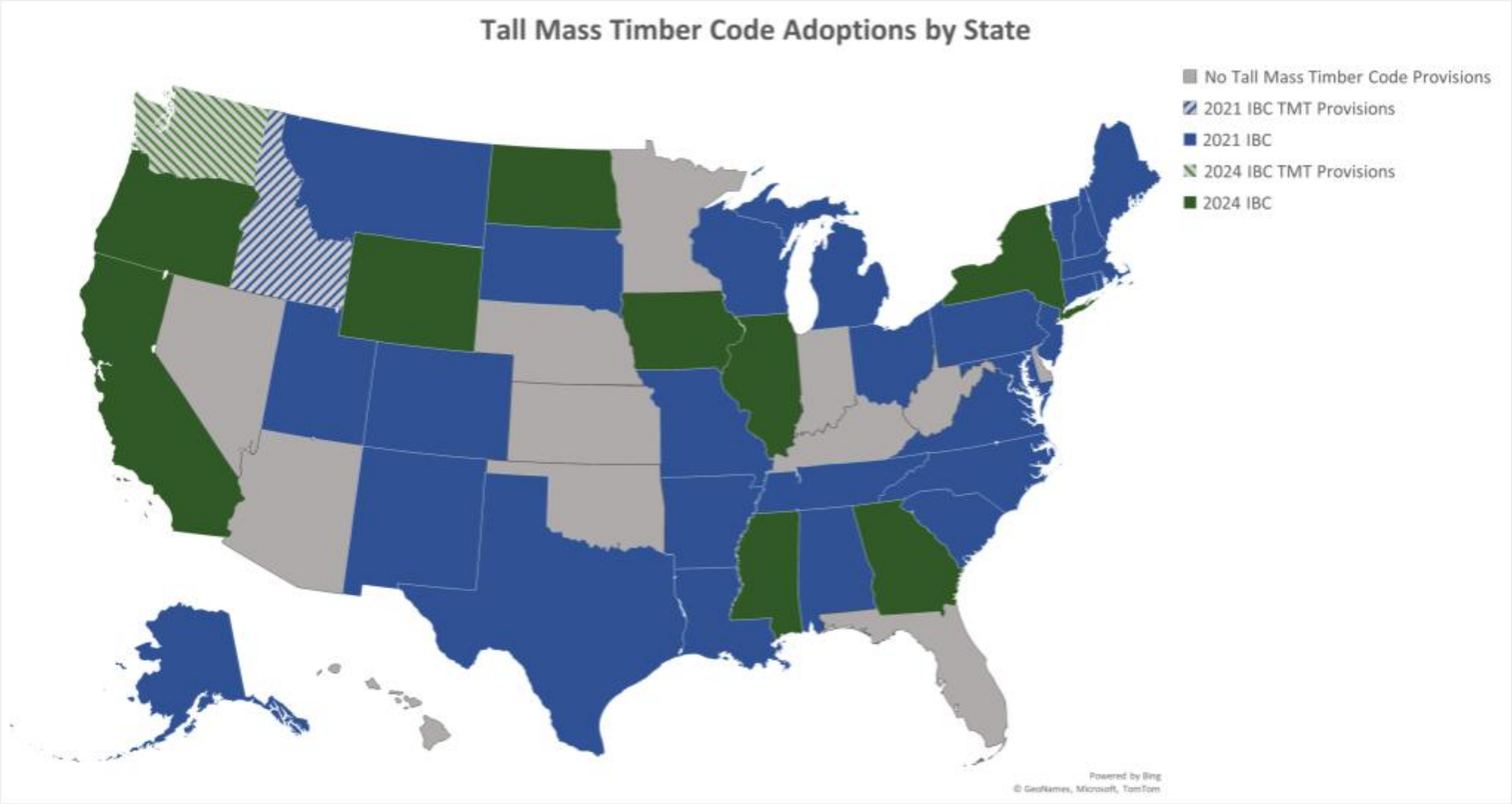




No separation req'd between wall & ceiling

Credit: AWC

TALL MASS TIMBER CODE ADOPTIONS



https://www.woodworks.org/resources/status-of-building-code-allowances-for-tall-mass-timber-in-the-ibc/

IBC 602 – Construction Types

	TYPE I		TYPE II		TYPE III		TYPE IV				TYPE V	
	A	B	A	B	A	B	A	B	C	HT	A	B
Interior Elements												
Exterior Wall Material												

The IBC defines 5 construction types. A building must be classified as one of these.

Tall Mass Timber

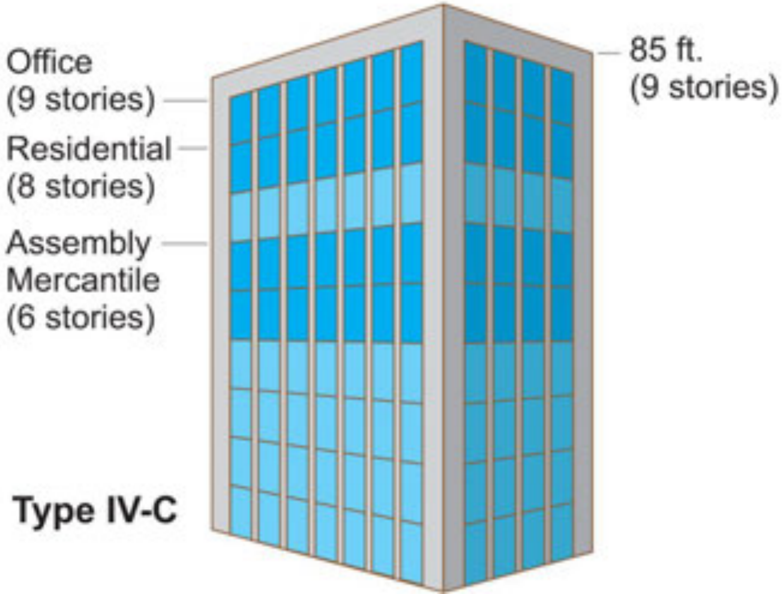
2021 IBC Introduces 3 new tall wood construction types:

- » IV-A
- » IV-B
- » IV-C
- » Previous type IV renamed type IV-HT

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV				TYPE V	
	A	B	A	B	A	B	A	B	C	HT	A	B

Type IV-C

Monte French Design Studio
Photos: Jane Messinger

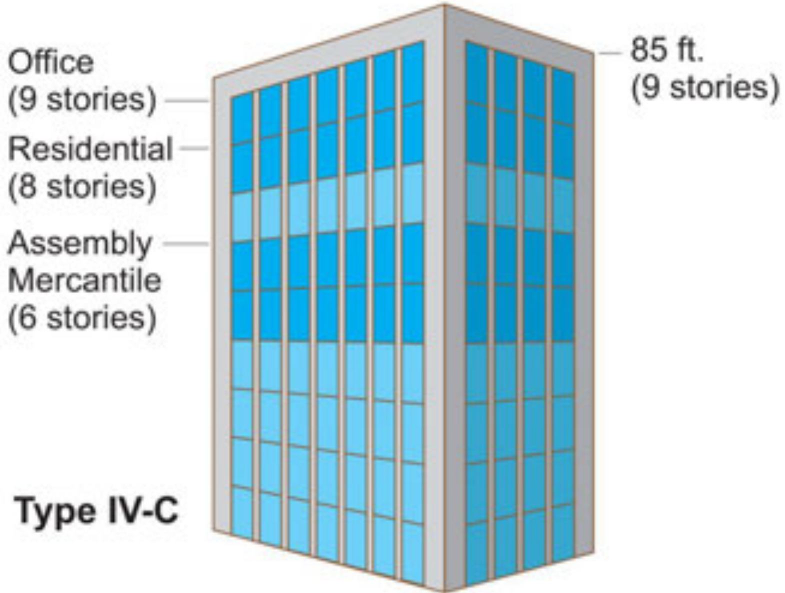


Type IV-C Exposure Limits

All Mass Timber surfaces may be exposed

Exceptions: Shafts, concealed spaces, outside face of exterior walls

Monte French Design Studio
Photo: Jane Messinger



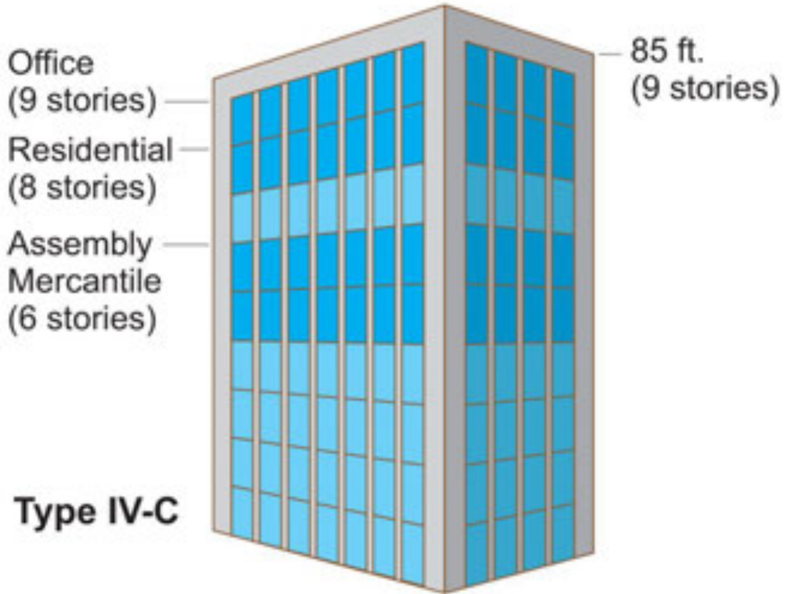
Type IV-C Building Size Limits

In most cases, Type IV-C height allowances = Type IV-HT height allowances, but additional stories permitted due to enhanced FRR

Type IV-C area = 1.25 * Type IV-HT area

Occupancy	# of Stories	Height	Area per Story	Building Area
A-2	6	85 ft	56,250 SF	168,750 SF
B	9	85 ft	135,000 SF	405,000 SF
M	6	85 ft	76,875 SF	230,625 SF
R-2	8	85 ft	76,875 SF	230,625 SF

Areas exclude potential frontage increase



Type IV-B

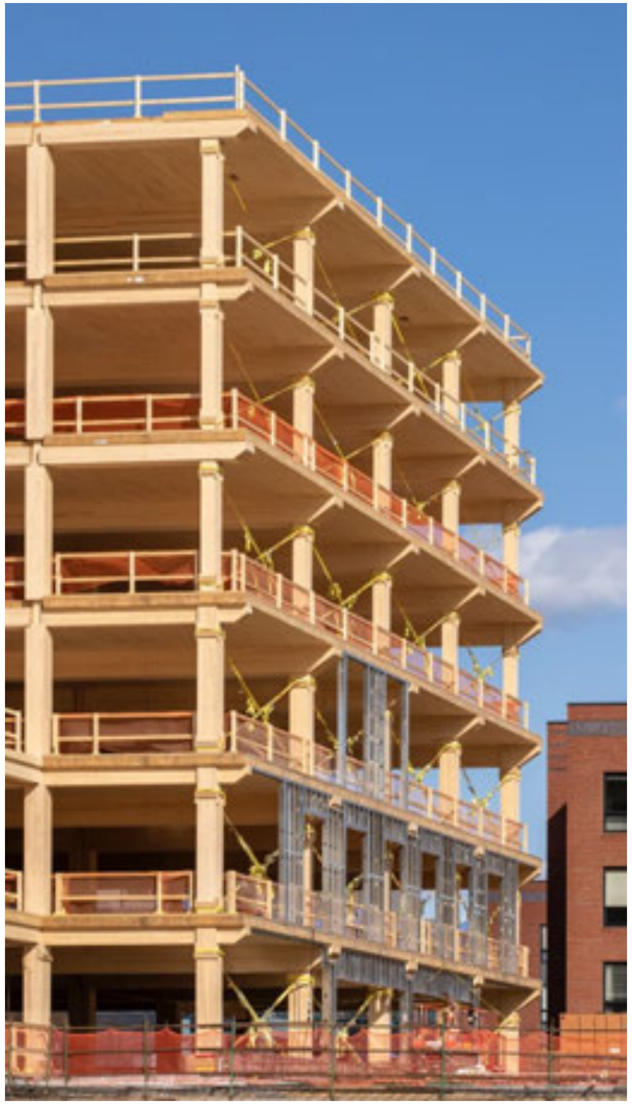
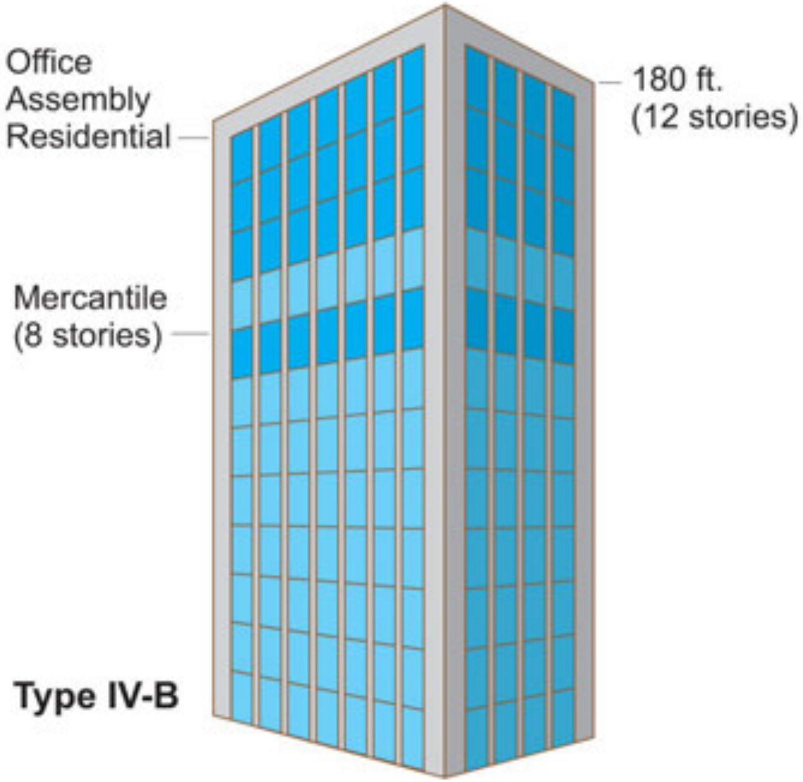


Photo: ©Prakash Patel

Photos: Nick Johnson, Tour D Space



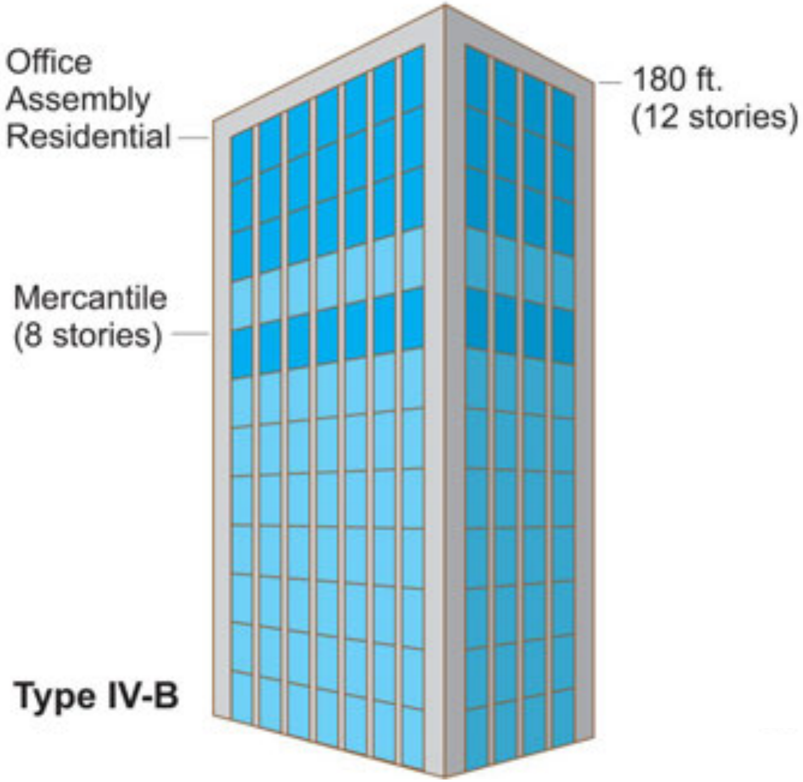
Type IV-B Exposure Limits

NC protection on some surfaces of Mass Timber

2021 IBC: 20% of ceilings or 40% of walls can be exposed

2024 IBC: 100% of ceilings or 40% of walls can be exposed

Photo: Nick Johnson, Tour D Space



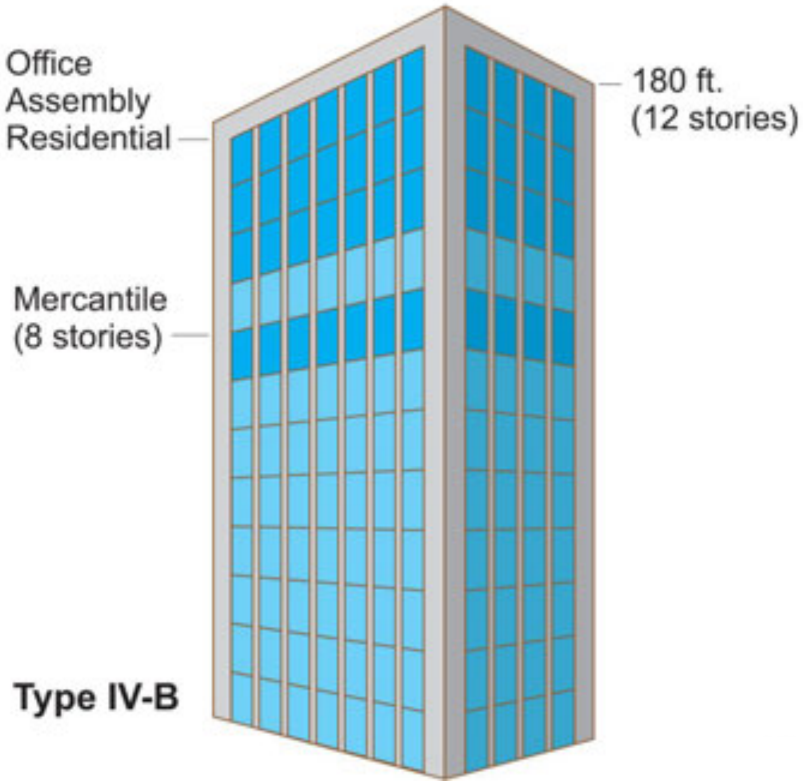
Type IV-B Building Size Limits

In most cases, Type IV-B height & story allowances = Type I-B height & story allowances

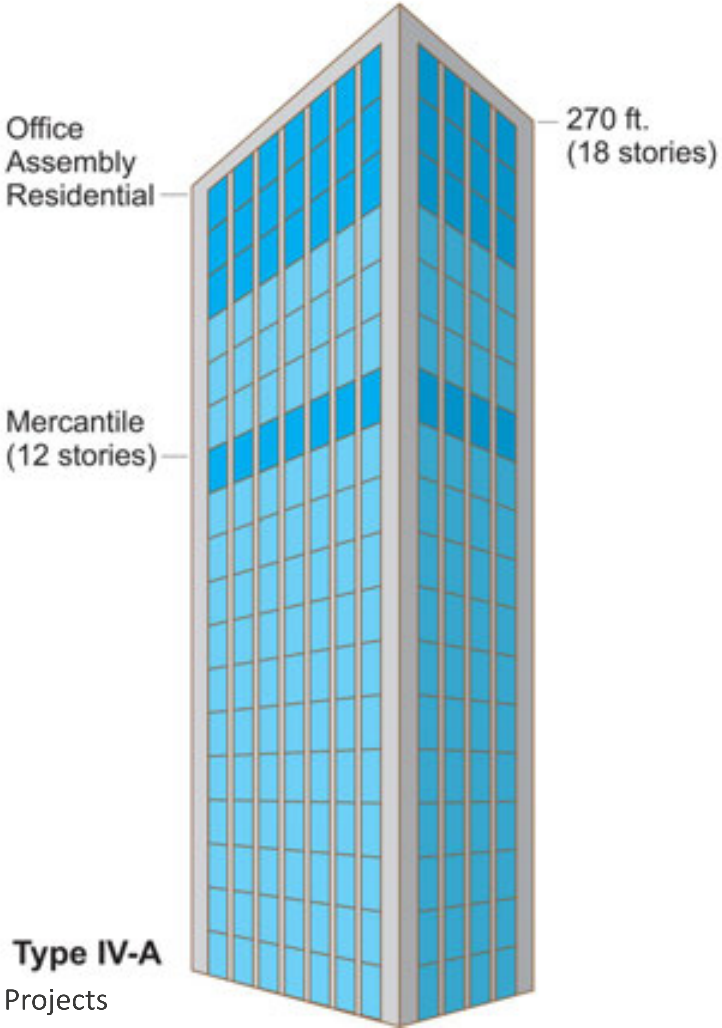
Type IV-B area = 2 * Type IV-HT area

Occupancy	# of Stories	Height	Area per Story	Building Area
A-2	12	180 ft	90,000 SF	270,000 SF
B	12	180 ft	216,000 SF	648,000 SF
M	8	180 ft	123,000 SF	369,000 SF
R-2	12	180 ft	123,000 SF	369,000 SF

Areas exclude potential frontage increase



Type IV-A

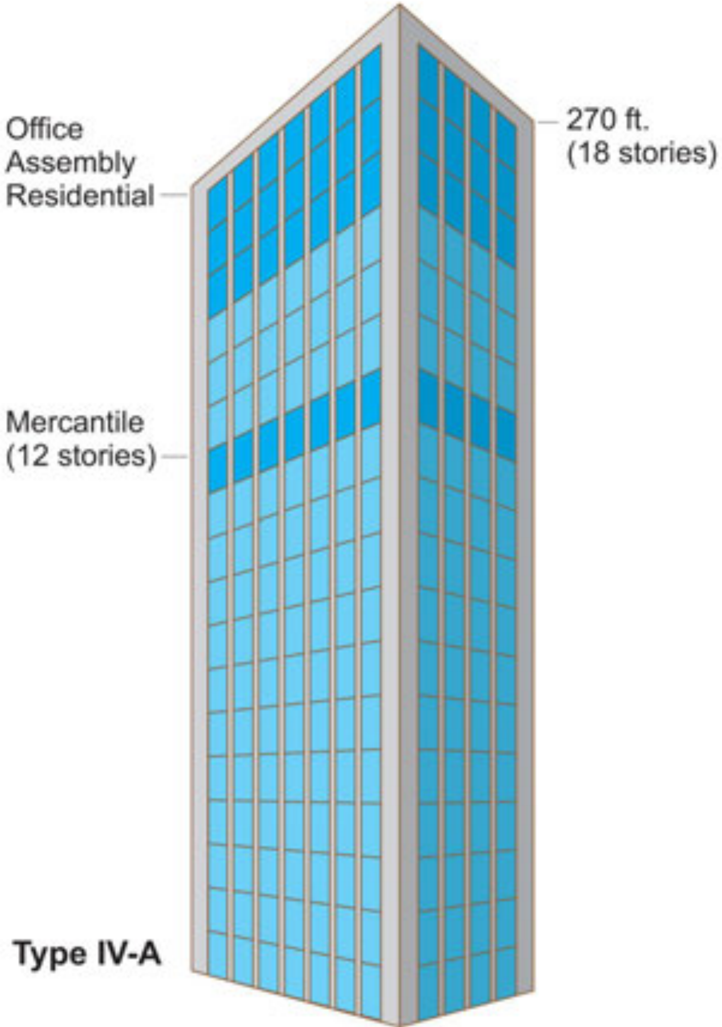


Photos: Flor Projects

Type IV-A Exposure Limits

100% NC protection on all surfaces of Mass Timber

Photo: Flor Projects



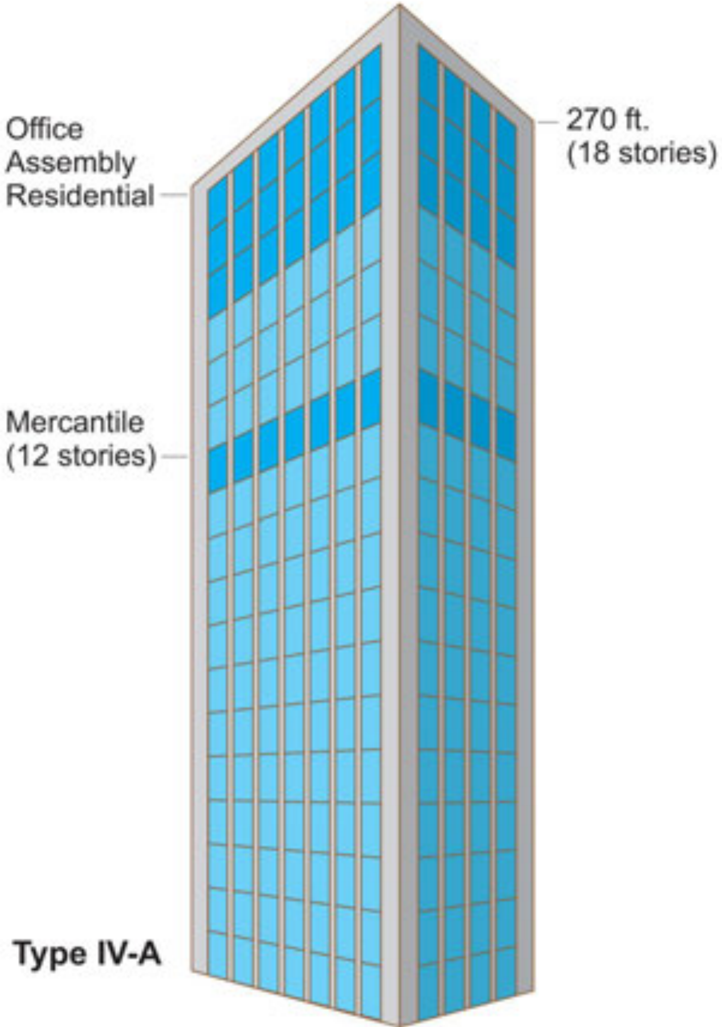
Type IV-A Building Size Limits

In most cases, Type IV-A height & story allowances = 1.5 * Type I-B height & story allowances

Type IV-A area = 3 * Type IV-HT area

Occupancy	# of Stories	Height	Area per Story	Building Area
A-2	18	270 ft	135,000 SF	405,000 SF
B	18	270 ft	324,000 SF	972,000 SF
M	12	270 ft	184,500 SF	553,500 SF
R-2	18	270 ft	184,500 SF	553,500 SF

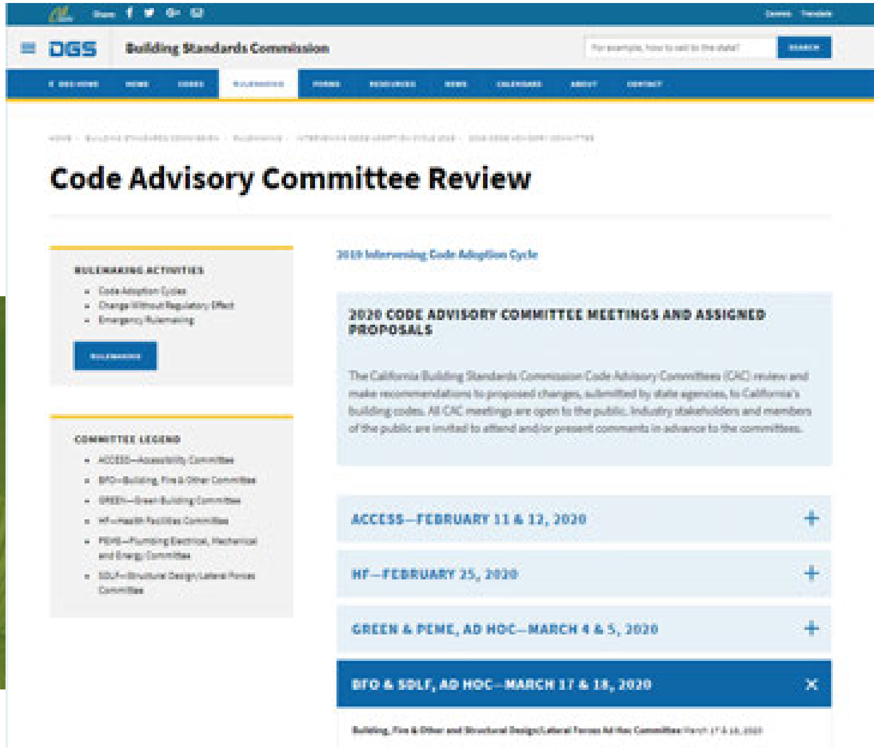
Areas exclude potential frontage increase



Tall Timber in the California Building Code (CBC)

On August 13, 2020 the California Building Standards Commission grouped the tall wood code change proposals into one agenda item and passed them unanimously.

The changes were published as an amendment to the 2019 CBC on January 1, 2021 and became effective on July 1, 2021



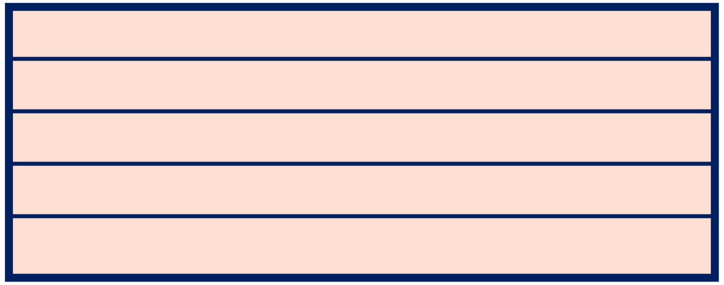
Source: Softwood Lumber Board

CBC Tall Wood Building Size Limits

The CBC has historically not allowed "double-dipping" for sprinkler increases of building height and area for A, E, H, I, L or R occupancies. The IBC has no such restriction.

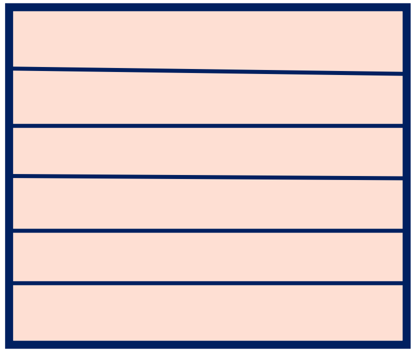
Also specific to the CBC, for multi-story buildings that are A, E, H, I, L or R occupancies, the total allowable building area is equal to the allowable floor area multiplied by the number of stories, not to exceed 2. In the IBC, this value is 3 for all occupancies.

This is also the case for Tall Wood.



Larger Area

VS.



Taller

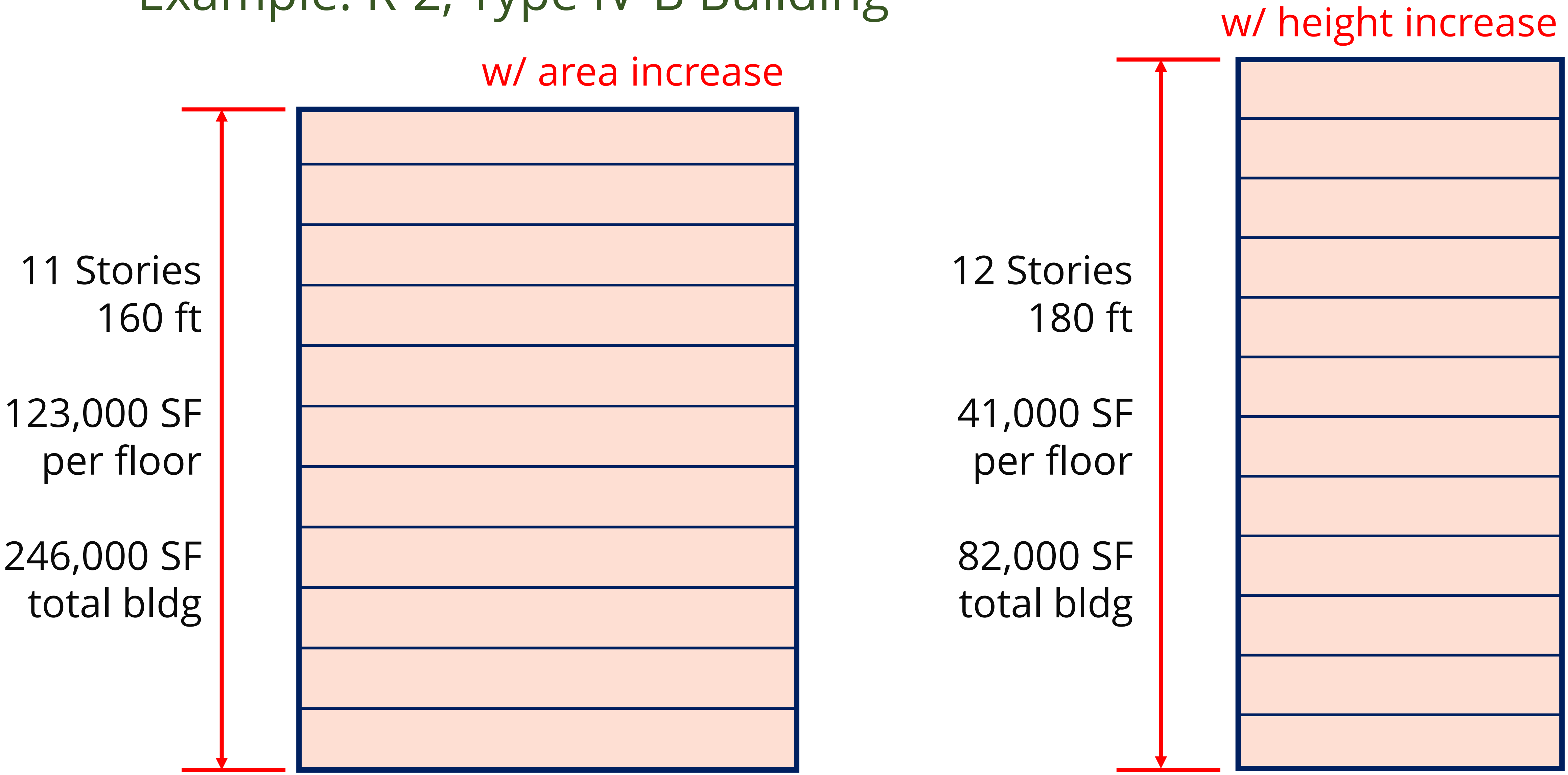
CBC Tall Wood Building Size Limits

For example, if using the sprinkler area increases, the allowable height in the CBC is 20 ft and 1 story less than the IBC limits for Type IV-A, IV-B and IV-C construction for A, E, H-4, I-4, R-1 and R-2 occupancies.

OCCUPANCY CLASSIFICATION	TYPE OF CONSTRUCTION				
	SEE FOOTNOTES	TYPE IV			
		A	B	C	HT
B, F, M, S, U	NS[b]	65	65	65	65
	S	270	180	85	85
A, E	NS[b]	65	65	65	65
	S (without area increase)	270	180	85	85
	S (with area increase)	250	160	65	65

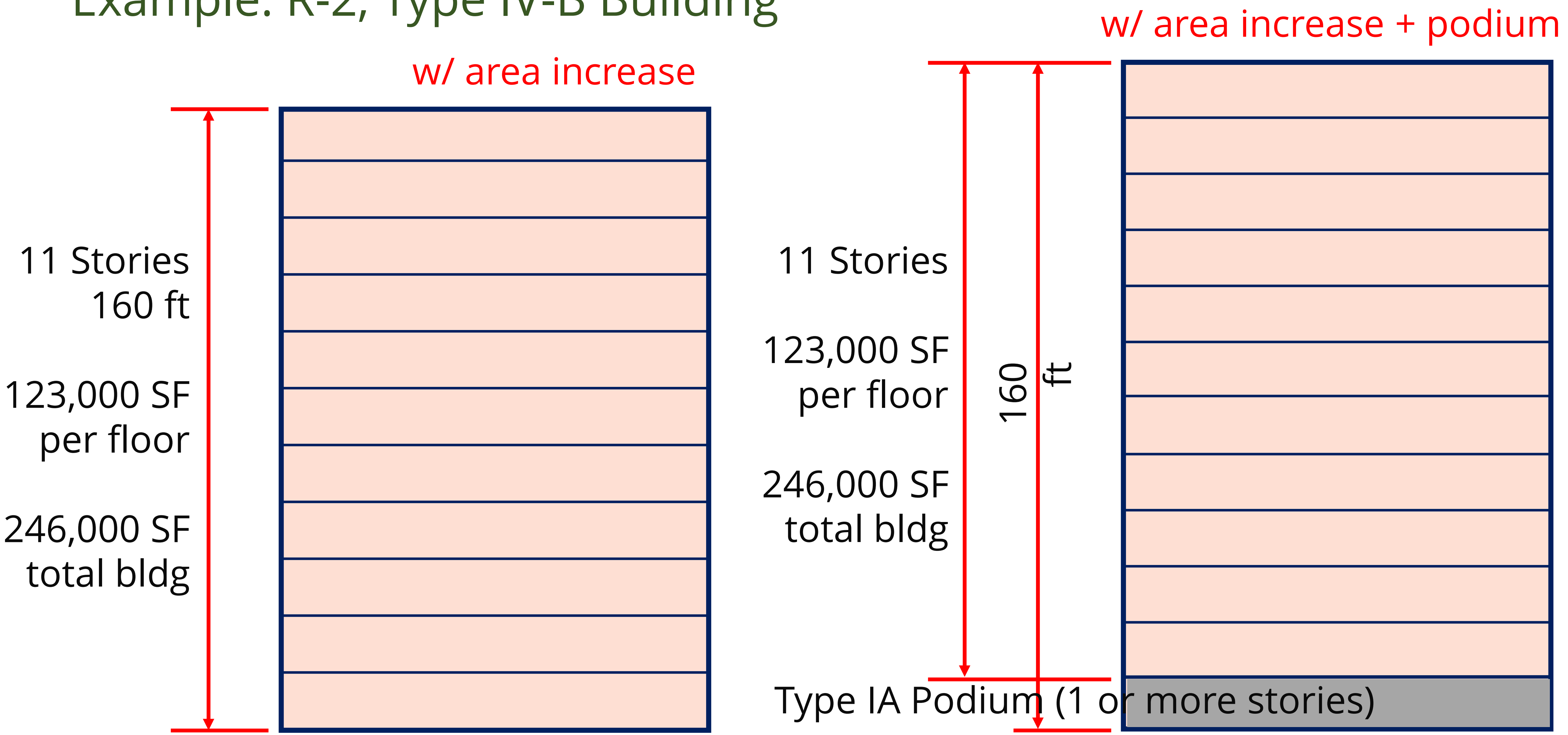
CBC Tall Wood – Sprinkler Increase Options

Example: R-2, Type IV-B Building



CBC Tall Wood – Podium Option (w/ Sprinkler Increase)

Example: R-2, Type IV-B Building

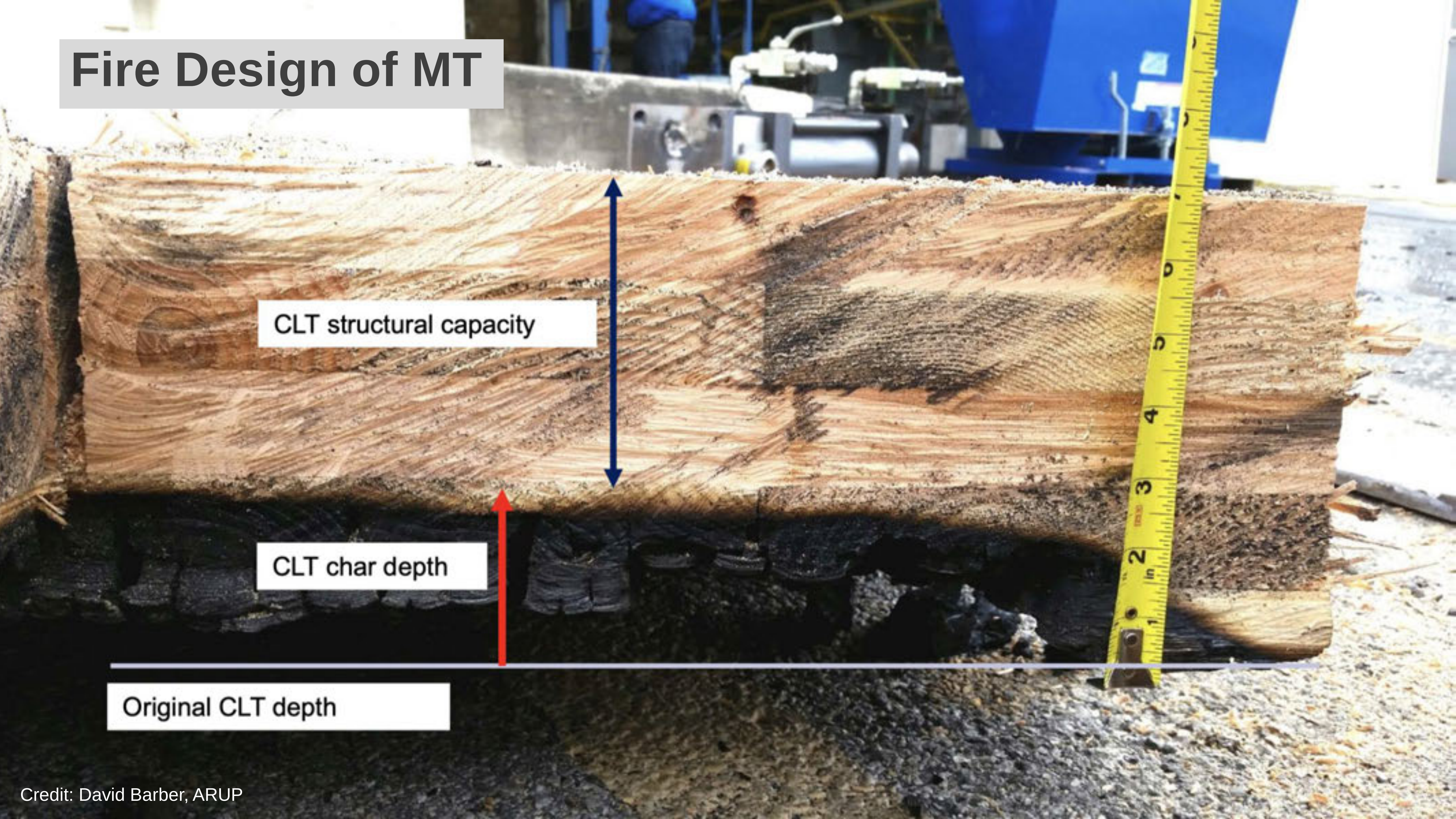


Construction Type – Primarily based on building size & occupancy

	Construction Type (All Sprinklered Values)							
	IV-A	IV-B	IV-C	IV-HT	III-A	III-B	V-A	V-B
Occupancies	Allowable Building Height above Grade Plane, Feet (IBC Table 504.3)							
A, B, R	270	180	85	85	85	75	70	60
	Allowable Number of Stories above Grade Plane (IBC Table 505.4)							
A-2, A-3, A-4	18	12	6	4	4	3	3	2
B	18	12	9	6	6	4	4	3
R-2	18	12	8	5	5	5	4	3
	Allowable Area Factor (At) for SM, Feet^2 (IBC Table 506.2)							
A-2, A-3, A-4	135,000	90,000	56,250	45,000	42,000	28,500	34,500	18,000
B	324,000	216,000	135,000	108,000	85,500	57,000	54,000	27,000
R-2	184,500	123,000	76,875	61,500	72,000	48,000	36,000	21,000

For low- to mid-rise mass timber buildings, there may be multiple options for construction type. There are pros and cons of each, don't assume that one type is always best.

Fire Design of MT



Credit: David Barber, ARUP

MT Fire Resistance Ratings (FRR)

Nominal char rate of 1.5”/HR is recognized in NDS. Effective char depth calculated to account for duration, structural reduction in heat-affected zone

Table 16.2.1A Char Depth and Effective Char Depth (for β_n = 1.5 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

Credit: ARUP

Table 16.2.1B Effective Char Depths (for CLT with β_n=1.5in./hr.)

Required Fire Endurance (hr.)	Effective Char Depths, a_{char} (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

Fire-Resistance Ratings

Driven primarily by construction type

Which Method of Demonstrating FRR of Mass Timber is Being Used?

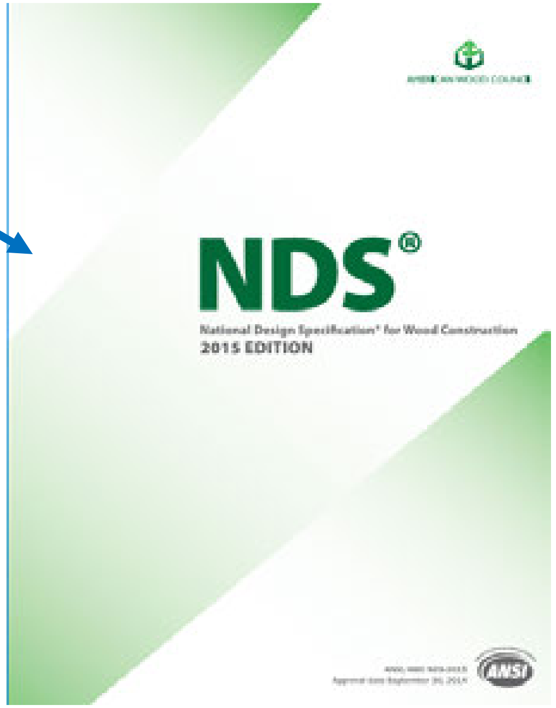
1. Calculations in Accordance with IBC 722 -> NDS Chapter 16
2. Tests in Accordance with ASTM E119

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV				TYPE V	
	A	B	A	B	A	B	A	B	C	HT	A	B
Primary structural frame[f] (see Section 202)	3[a, b]	2[a, b, c]	1[b, c]	0[c]	1[b, c]	0	3[a]	2[a]	2[a]	HT	1[b, c]	0
Bearing walls												
Exterior[a, f]	3	2	1	0	2	2	3	2	2	2	1	0
Interior	3[a]	2[a]	1	0	1	0	3	2	2	1/HT[g]	1	0
Nonbearing walls and partitions Exterior	See Table 705.5											
Nonbearing walls and partitions Interior[d]	0	0	0	0	0	0	0	0	0	See Section 2304.11.2	0	0
Floor construction and associated secondary structural members (see Section 202)	2	2	1	0	1	0	2	2	2	HT	1	0
Roof construction and associated secondary structural members (see Section 202)	$1^1/_2$[b]	1[b,c]	1[b,c]	0[c]	1[b,c]	0	$1^1/_2$	1	1	HT	1[b,c]	0

FRR Design of MT

Calculated FRR of Exposed MT:
IBC to NDS code compliance path



Code Path for Exposed Wood Fire-Resistance Calculations

IBC 703.3
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.

Mass Timber Fire & Acoustic Database

< Back to Mass Timber Fire & Acoustic Database

Application Type

- ☐ Fire-Resistance Rated Mass Timber Floor/Roof Assemblies 30
- ☐ Fire-Resistance Rated Mass Timber Wall Assemblies 26
- ☐ Firestop Systems For Penetrations in Mass Timber Assemblies 57
- ☐ Fire-Resistance Rated Mass Timber Connections 19
- ☐ Perimeter Fire Containment Systems in Mass Timber Structures 5
- ☐ Noncombustible Protection of Mass Timber Building Elements 4

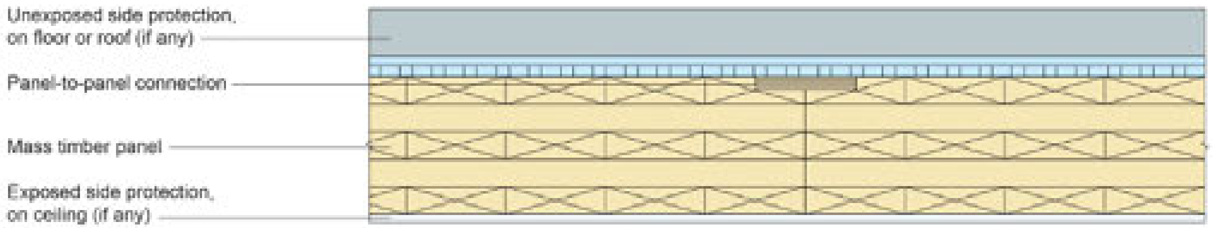
Mass Timber Panel

- ☐ CLT 108
- ☐ CLT (SCL) 1
- ☐ NLT 3
- ☐ DLT 3
- ☐ GLT 2
- ☐ SCL 1
- ☐ T&G

Number of Layers

- ☐ 1 to 3 39
- ☐ 4 to 5 77

Fire-Resistance Rated Mass Timber Floor/Roof Assemblies



Fire-resistance ratings of assemblies are demonstrated through fire-resistance tests, recognized calculations, or approved alternatives. The IBC recognizes US testing standards ASTM E119 and UL 236 while the Canadian standard ULC S101 has the same fire exposure and performance criteria. Fire-resistance ratings developed using these standards may be acceptable to building officials in either country.

Mass Timber Panel	Structural Grade	Exposed Side Protection	Unexposed Side Protection	Panel Connection	Load Rating	Fire-Resistance Rating (Hours)	Test Protocol	Method of Compliance
5-layer 6.89" (175mm) CLT	E1M5 by Structurlam (Mercer)	None	1-1/2" Maxxon Cyp-Grete 2000 over Maxxon reinforcing mesh	Surface Spline	Loaded, See Report	2.5	ASTM E119 & ULC S101	Fire test by Intertek on Feb 22, 2017 Contact Mercer for more Information
5-layer 6.89" (175mm) CLT	V grade by Structurlam (Mercer)	None	None	Surface Spline	Loaded, See Report	2	ASTM E119	Fire test by SwRI on Jan 27, 2022 Contact Mercer for more Information
5-layer 6.89" (175mm) CLT	E grade by Structurlam (Mercer)	None	None	Surface Spline	Loaded, See Report	2	ASTM E119	Fire test by SwRI on Jan 31, 2022 Contact Mercer for more Information

Noncombustible Protection (NC)

The definition of "Noncombustible Protection (For Mass Timber)" is created to address the passive fire protection of mass timber.

Mass timber is permitted to have its own fire-resistance rating (e.g., Mass Timber only) or have a fire resistance rating based on the fire resistance through a combination of the mass timber fire-resistance plus protection by non-combustible materials as defined in Section 703.6 (e.g., additional materials that delay the combustion of mass timber, such as gypsum board).

Credit: Urban One

MT Fire Resistance Ratings (FRR)

IBC 722.7

The fire resistance rating of the mass timber elements shall consist of the fire resistance of the unprotected element (MT) added to the protection time of the noncombustible (NC) protection.

AND
OR

= FRR

Credit: Urban One

Noncombustible Protection (NC)

Prescriptive Noncombustible Contributions to FRR

Type of Protection	Contribution per Layer (minutes)
1/2" Type X gypsum board	25
5/8" Type X gypsum board	40

Source: 2021 IBC Section 722.7.1

Required Noncombustible Contribution to FRR

FRR of Building Element (hours)	Minimum from Noncombustible Protection (minutes)
1	40
2	80
3 or more	120

1 layer 5/8 Type X

2 layers 5/8 Type X

3 layers 5/8 Type X

Source: 2021 IBC Section 722.7

Floor Surface Protection

Min. 1” thick NC protection required on mass timber floors in IV-A and IV-B. Not required in IV-C

Credit: Maxxon

Type IV-A Fire Resistance Ratings (FRR)

Primary Frame (3-hr) + Floor Panel Example (2-hr):

Minimum 1" noncombustible material

Mass timber floor panel

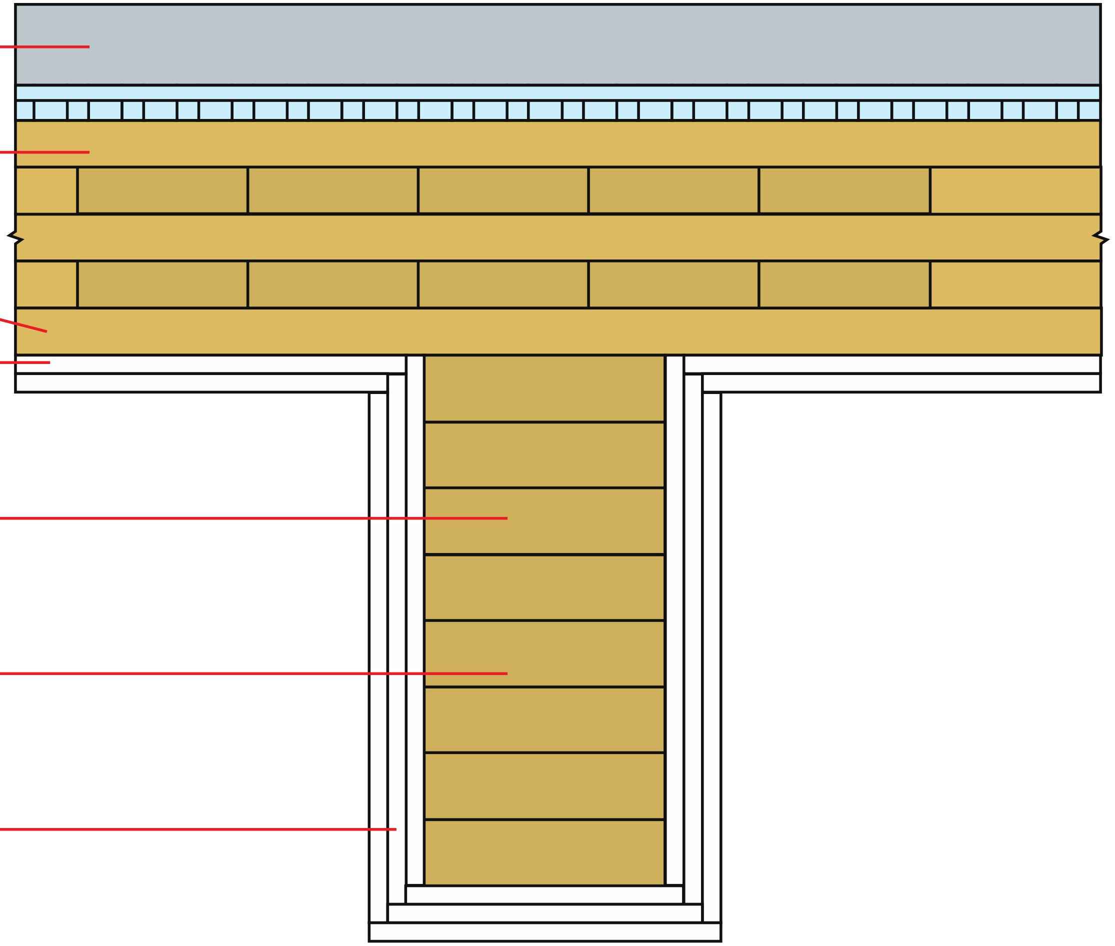
40 minutes of MT FRR

Two layers 5/8" Type X gypsum

Glulam beam (primary structural frame)

60 minutes of MT FRR

Three layers 5/8" Type X gypsum



Type IV-B Fire Resistance Ratings (FRR)

Primary Frame (2-hr) + Floor Panel Example (2-hr)

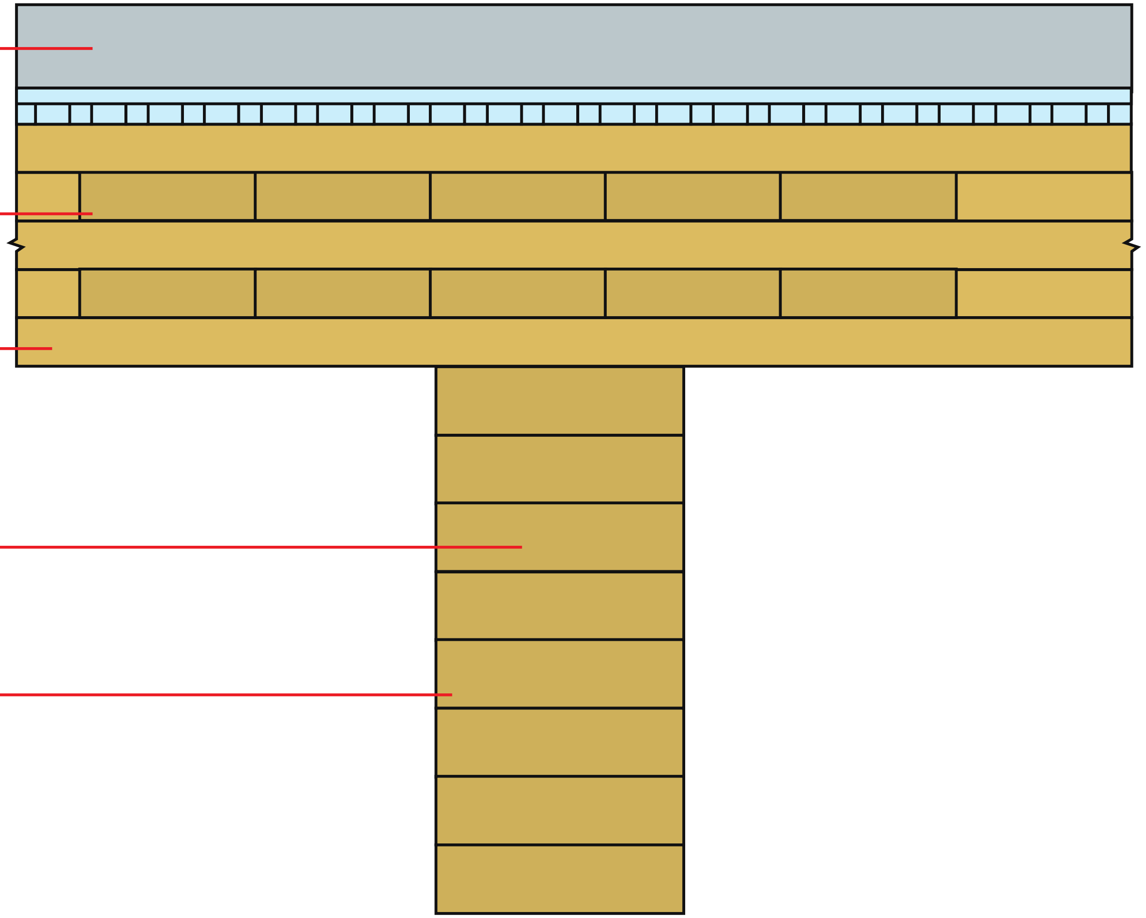
Minimum 1" noncombustible material

Mass timber floor panel

2-hr of MT FRR;
noncombustible material not required

Glulam beam (primary structural frame)

2-hr of MT FRR;
Noncombustible material not required



Type IV-C Fire Resistance Ratings (FRR)

Primary Frame (2-hr) + Floor Panel Example (2-hr)

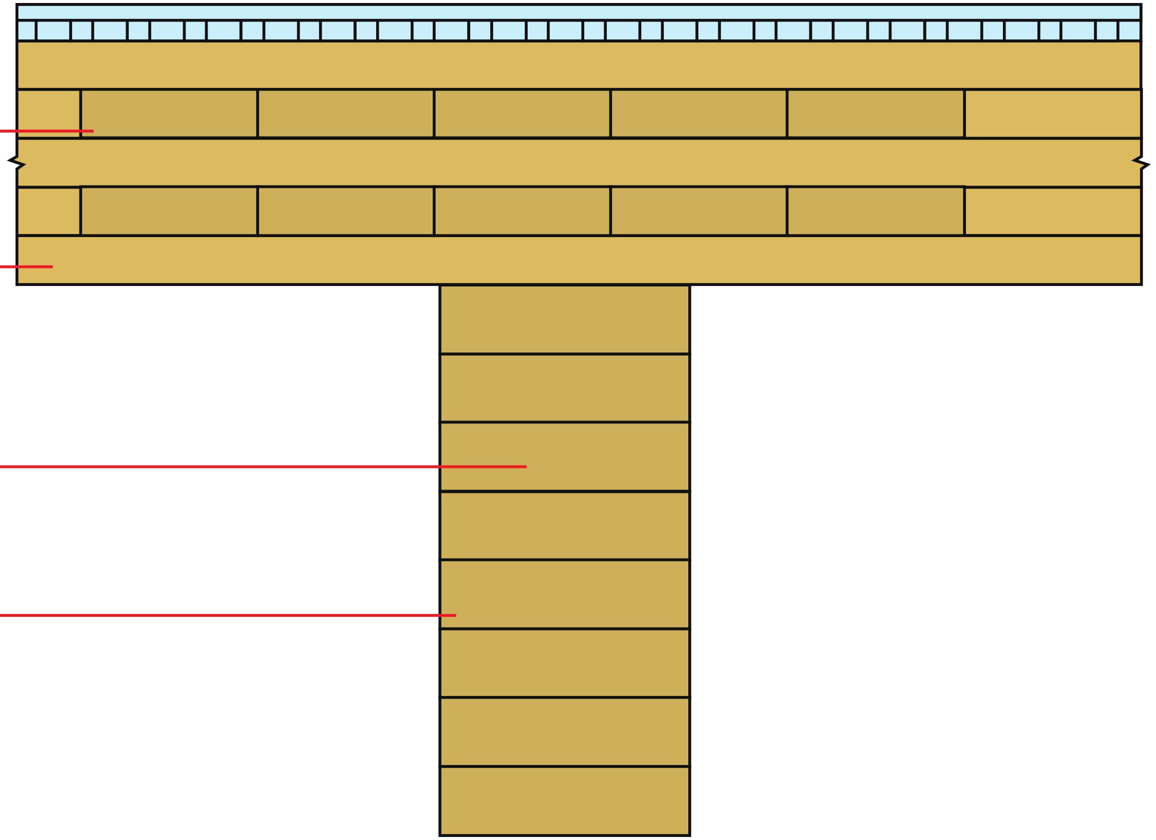
Noncombustible material not required

Mass timber floor panel

2-hr of MT FRR;
noncombustible material not required

Glulam beam (primary structural frame)

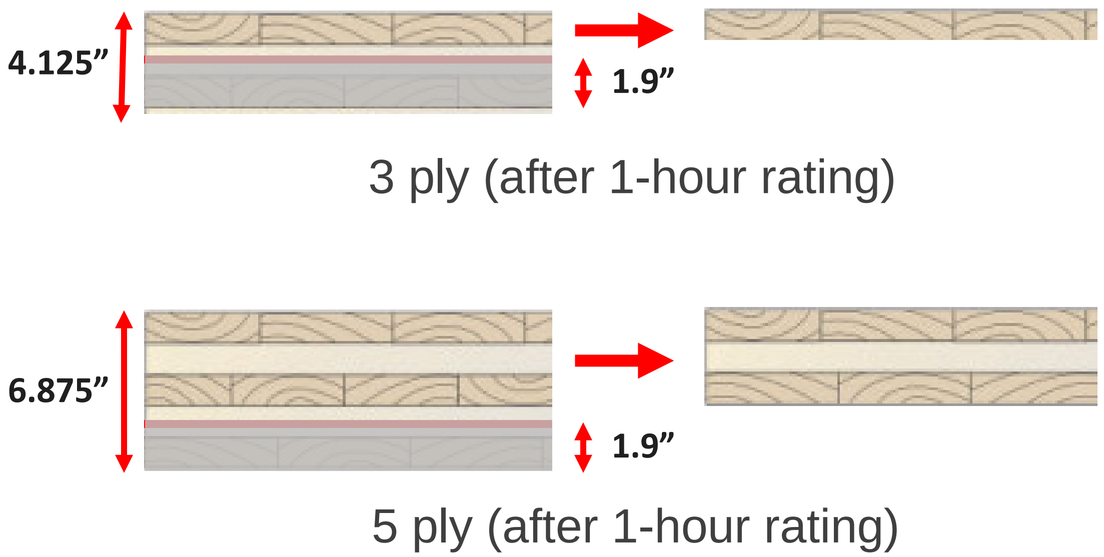
2-hr of MT FRR;
Noncombustible material not required



Fire Design of Mass Timber

- Fire Resistance Ratings (FRR)
  - Thinner panels (i.e. 3-ply) can be difficult to achieve 1+ hour FRR
  - 5-ply CLT panels can usually achieve 1- or 2-hour FRR

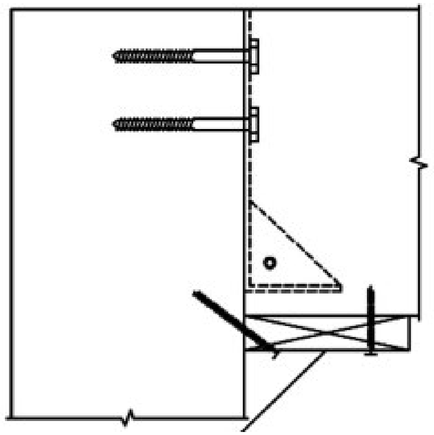
Panel	Example Floor Span Ranges
3-ply CLT (4-1/8" thick)	Up to 12 ft
5-ply CLT (6-7/8" thick)	14 to 17 ft
7-ply CLT (9-5/8")	17 to 21 ft
2x4 NLT	Up to 12 ft
2x6 NLT	10 to 17 ft
2x8 NLT	14 to 21 ft
5" MPP	10 to 15 ft

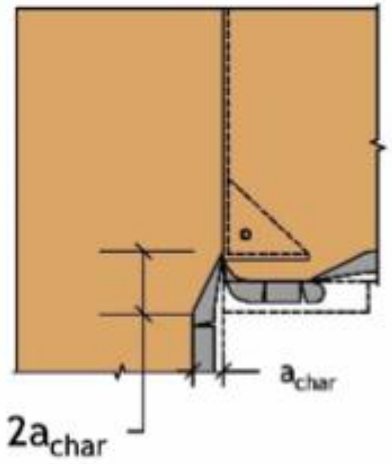


Fire Resistance of Connections

2304.10.1 Connection fire resistance rating. Fire resistance ratings in Type IV-A, IV-B, or IV-C construction shall be determined by one of the following:

1. Testing in accordance with Section 703.2 where the connection is part of the fire resistance test.
2. Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250o F (139o C), and a maximum temperature rise of 325o F (181o C), for a time corresponding to the required fire resistance rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners, and portions of wood members included in the structural design of the connection.



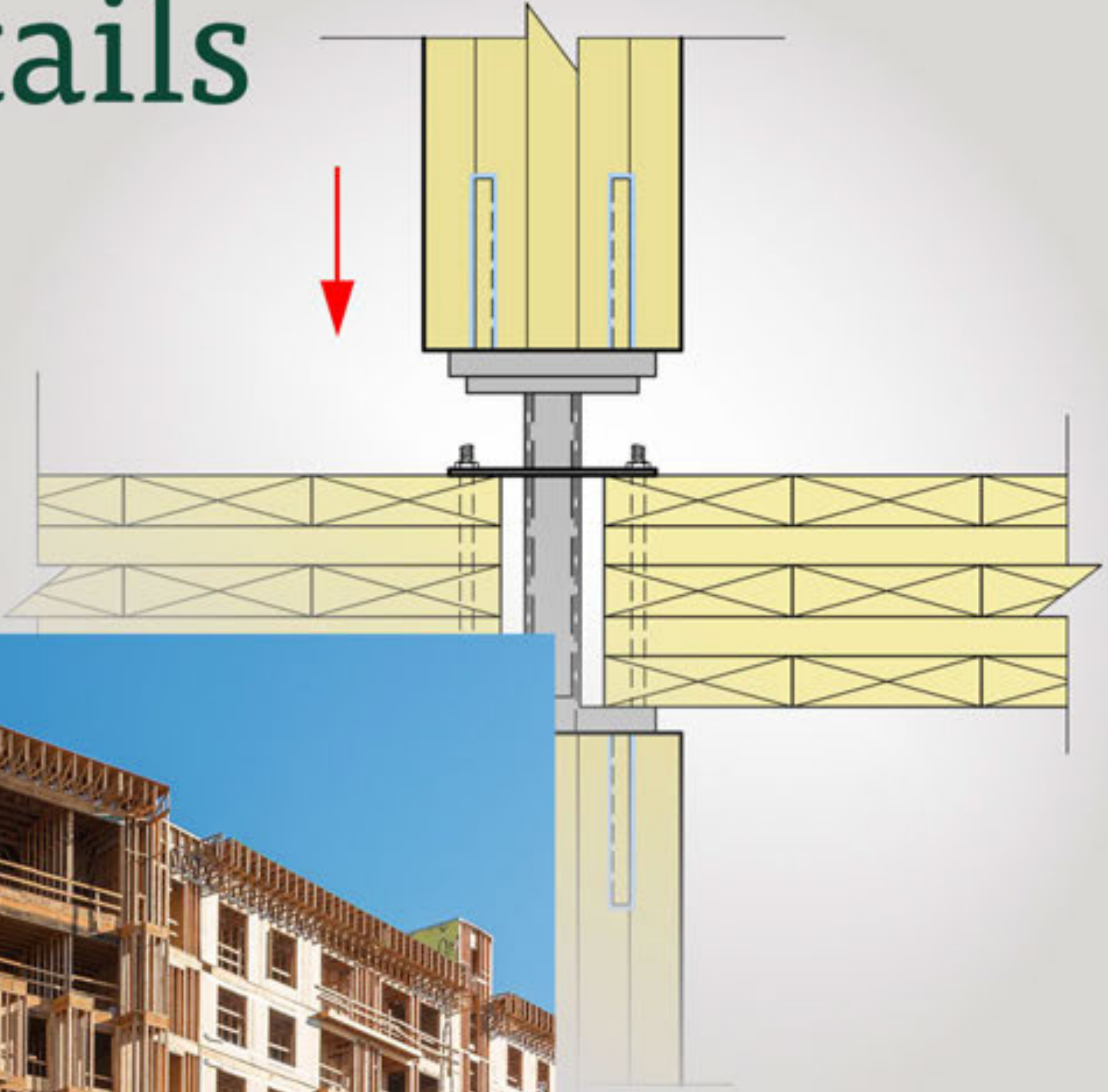


Source: AWC's TR 10

TOOLS

CAD & Revit Details

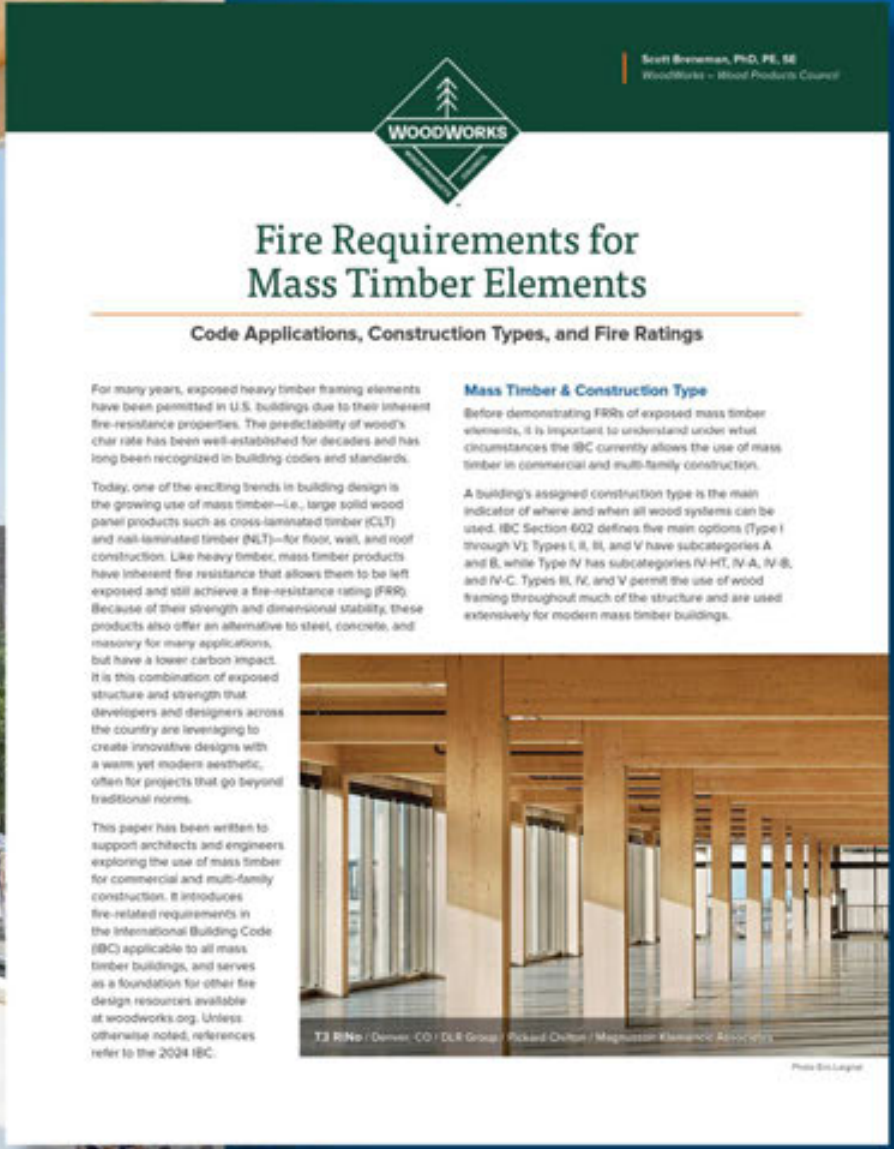
Design your mass timber, light-frame, or hybrid project more easily with these free downloadable details



https://www.woodworks.org/cad-revit/

https://www.woodworks.org/resources/fire-requirements-for-mass-timber-elements/

Timber Lofts / Engberg Anderson Architects / Pierce Engineers, INC
Photo ADX Creative



Scott Breneman, PhD, PE, SE
WoodWorks – Wood Products Council

Fire Requirements for Mass Timber Elements

Code Applications, Construction Types, and Fire Ratings

For many years, exposed heavy timber framing elements have been permitted in U.S. buildings due to their inherent fire-resistance properties. The predictability of wood's char rate has been well-established for decades and has long been recognized in building codes and standards.

Today, one of the exciting trends in building design is the growing use of mass timber—i.e., large solid wood panel products such as cross-laminated timber (CLT) and nail-laminated timber (NLT)—for floor, wall, and roof construction. Like heavy timber, mass timber products have inherent fire resistance that allows them to be left exposed and still achieve a fire-resistance rating (FRR). Because of their strength and dimensional stability, these products also offer an alternative to steel, concrete, and masonry for many applications, but have a lower carbon impact. It is this combination of exposed structure and strength that developers and designers across the country are leveraging to create innovative designs with a warm yet modern aesthetic, often for projects that go beyond traditional norms.

This paper has been written to support architects and engineers exploring the use of mass timber for commercial and multi-family construction. It introduces fire-related requirements in the International Building Code (IBC) applicable to all mass timber buildings, and serves as a foundation for other fire design resources available at woodworks.org. Unless otherwise noted, references refer to the 2024 IBC.

Mass Timber & Construction Type

Before demonstrating FRRs of exposed mass timber elements, it is important to understand under what circumstances the IBC currently allows the use of mass timber in commercial and multi-family construction.

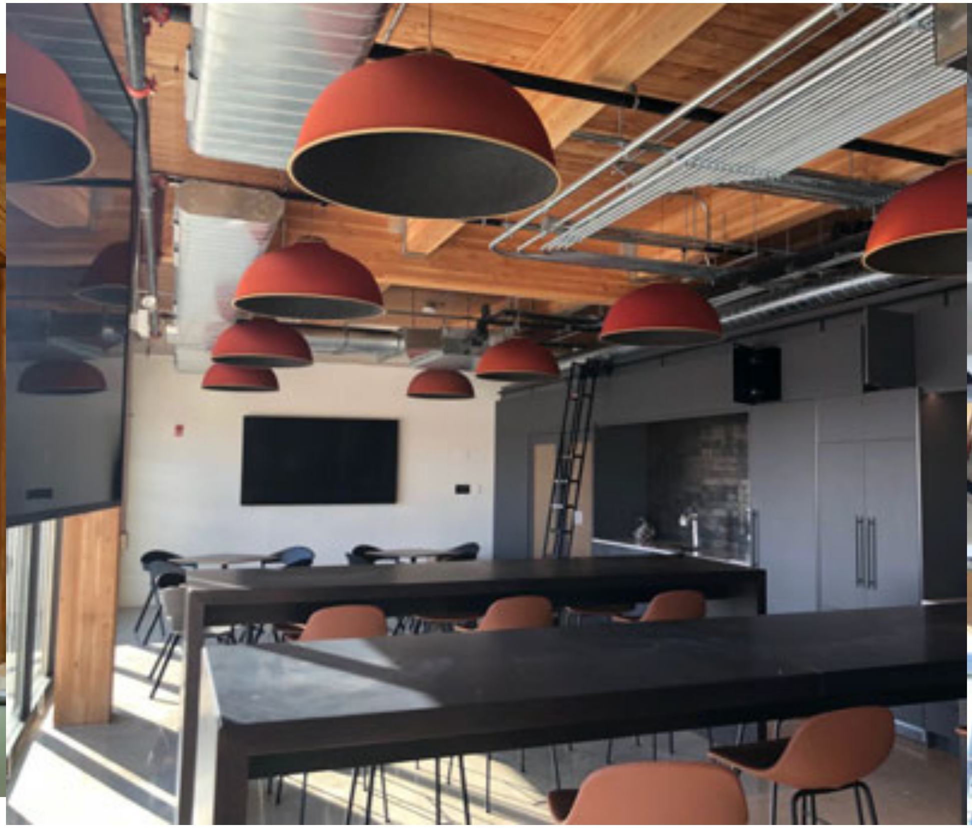
A building's assigned construction type is the main indicator of where and when all wood systems can be used. IBC Section 602 defines five main options (Type I through V); Types I, II, III, and V have subcategories A and B, while Type IV has subcategories IV-HT, IV-A, IV-B, and IV-C. Types III, IV, and V permit the use of wood framing throughout much of the structure and are used extensively for modern mass timber buildings.

T3 RiNo / Denver, CO / DLR Group / Pickard Chilton / Magnusson Klemencic Associates

MEP Layout & Integration

Set Realistic Owner Expectations About Aesthetics

- MEP fully exposed with MT structure, or limited exposure?

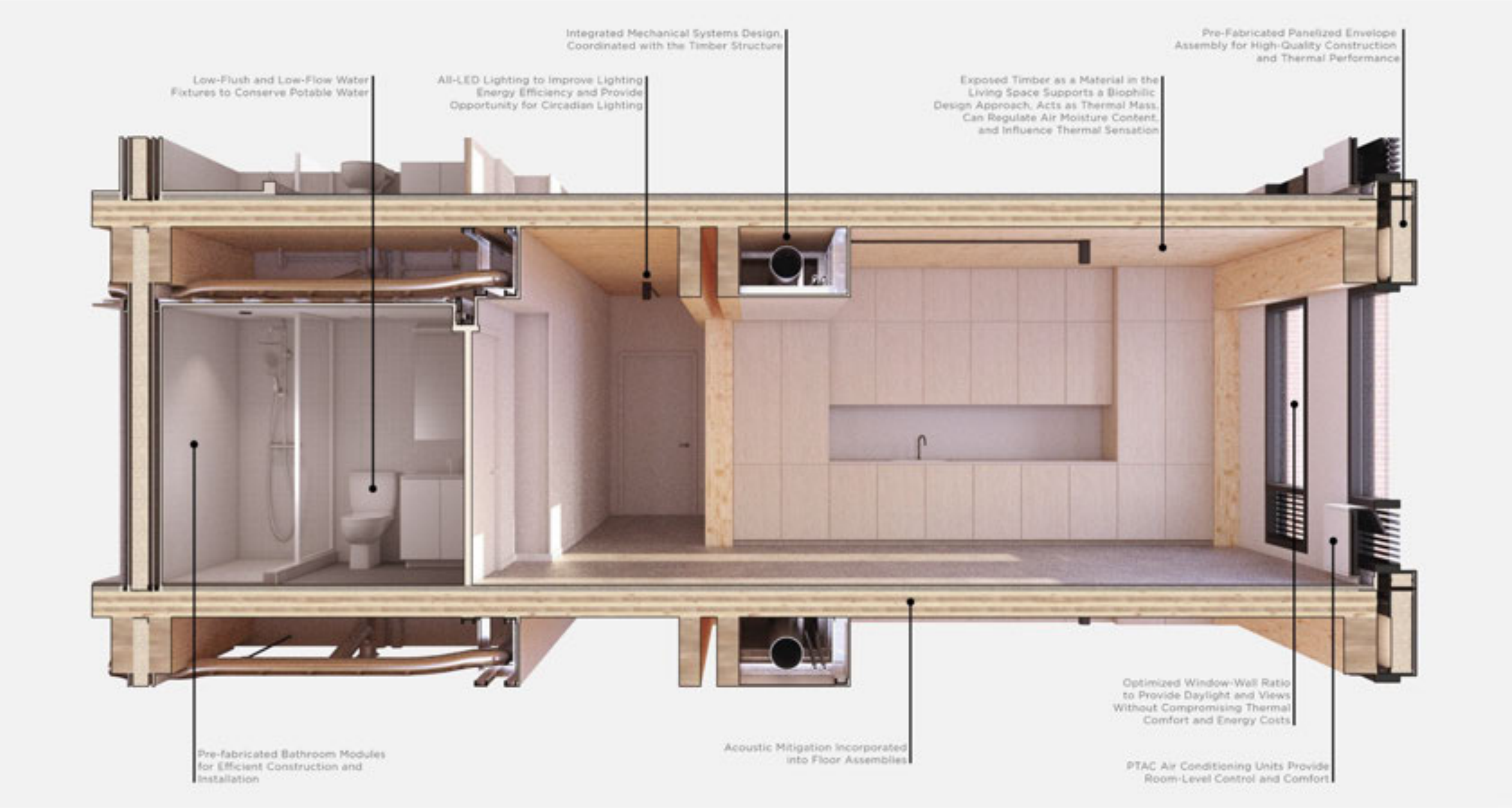

11 E LENOX, BOSTON, MA

Credit: H+O Structural Engineering

11 E LENOX, BOSTON, MA

Credit: H + O Structural Engineering

MEP Systems, Routing and Integration

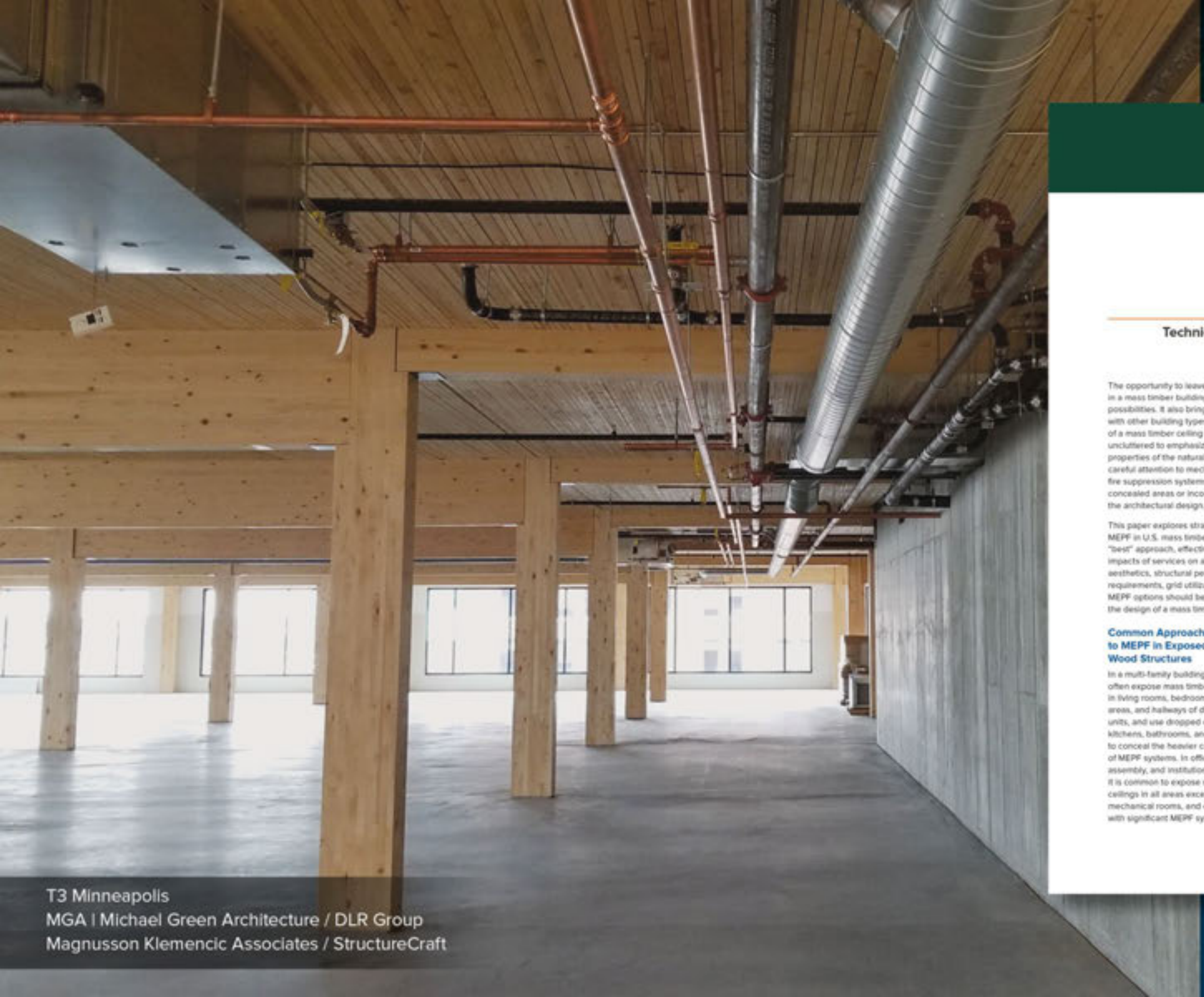


INTEGRATED SYSTEMS

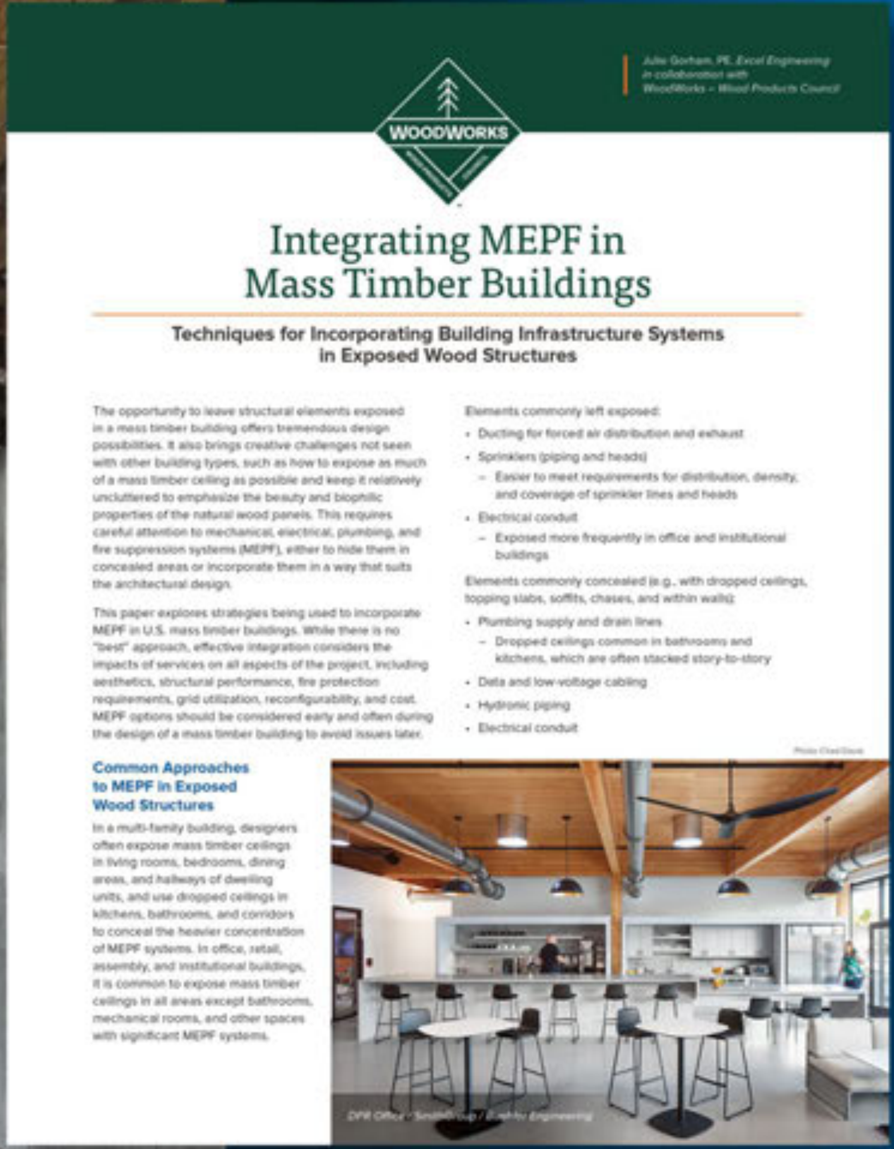
Credit: John Klein, Generate Architecture

The Tallhouse building system prioritizes the integration of design, engineering, and construction. This results in a high performance building finely tuned to meet energy, comfort, acoustic, and design criteria that has been vetted by constructability experts to ensure fast, efficient production.

Utilizing Pre-Fabricated Facade Panels and Bathroom Modules that are manufactured off-site in factories allows for reducing construction time on-site, higher quality control practices, and safer labor conditions for construction workers. Efficient routing of duct-work conserves material, and associated embodied carbon, allowing more exposed timber all while providing the air quality needed for healthy living. Water conserving fixtures reduce potable water use as a precious resource, while maintaining reliable performance.



T3 Minneapolis
MGA | Michael Green Architecture / DLR Group
Magnusson Klemencic Associates / StructureCraft



Julie Gorham, PE, *Excel Engineering*
in collaboration with
WoodWorks – Wood Products Council

Integrating MEPF in Mass Timber Buildings

Techniques for Incorporating Building Infrastructure Systems in Exposed Wood Structures

The opportunity to leave structural elements exposed in a mass timber building offers tremendous design possibilities. It also brings creative challenges not seen with other building types, such as how to expose as much of a mass timber ceiling as possible and keep it relatively uncluttered to emphasize the beauty and biophilic properties of the natural wood panels. This requires careful attention to mechanical, electrical, plumbing, and fire suppression systems (MEPF), either to hide them in concealed areas or incorporate them in a way that suits the architectural design.

This paper explores strategies being used to incorporate MEPF in U.S. mass timber buildings. While there is no "best" approach, effective integration considers the impacts of services on all aspects of the project, including aesthetics, structural performance, fire protection requirements, grid utilization, reconfigurability, and cost. MEPF options should be considered early and often during the design of a mass timber building to avoid issues later.

Elements commonly left exposed:

- Ducting for forced air distribution and exhaust
- Sprinklers (piping and heads)
  - Easier to meet requirements for distribution, density, and coverage of sprinkler lines and heads
- Electrical conduit
  - Exposed more frequently in office and institutional buildings

Elements commonly concealed (e.g., with dropped ceilings, topping slabs, soffits, chases, and within walls):

- Plumbing supply and drain lines
  - Dropped ceilings common in bathrooms and kitchens, which are often stacked story-to-story
- Data and low-voltage cabling
- Hydronic piping
- Electrical conduit

Common Approaches to MEPF in Exposed Wood Structures

In a multi-family building, designers often expose mass timber ceilings in living rooms, bedrooms, dining areas, and hallways of dwelling units, and use dropped ceilings in kitchens, bathrooms, and corridors to conceal the heavier concentration of MEPF systems. In office, retail, assembly, and institutional buildings, it is common to expose mass timber ceilings in all areas except bathrooms, mechanical rooms, and other spaces with significant MEPF systems.

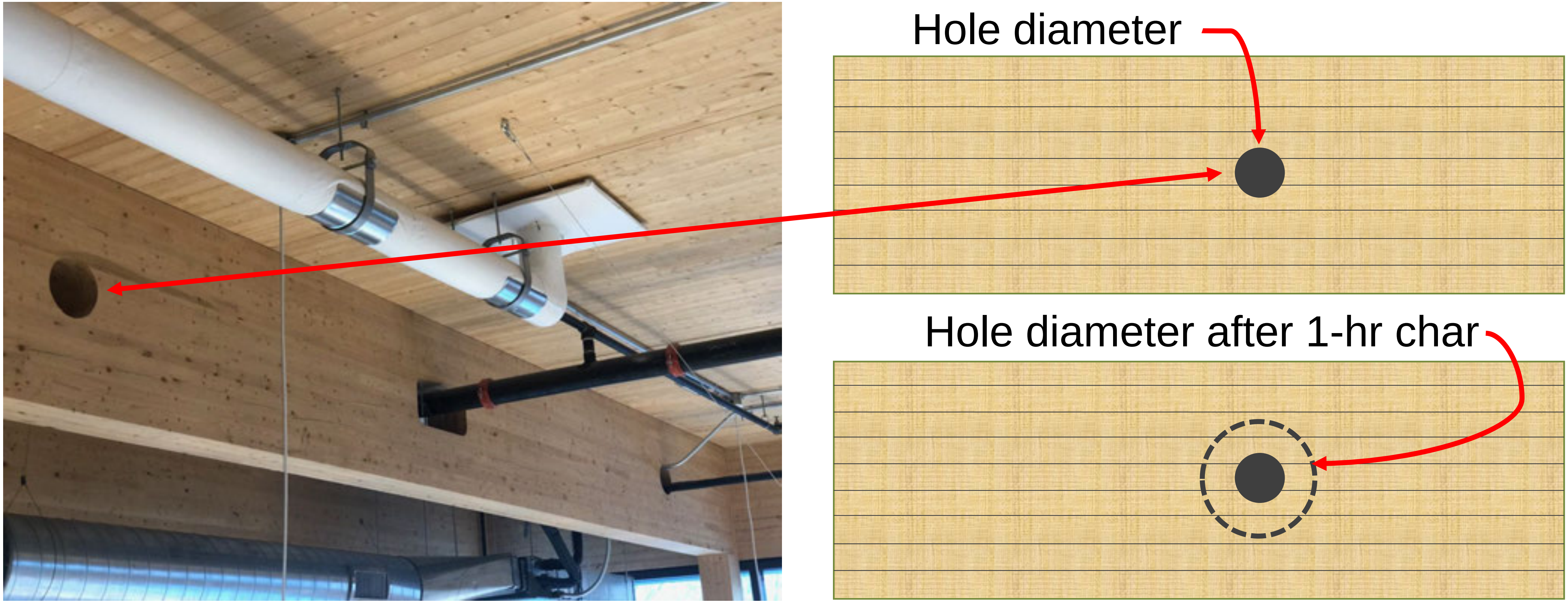
Penetration Fire Protection

Although not a new code requirement or specific to tall wood, more testing & information is becoming available on firestopping of penetrations through MT assemblies

Penetrations & Firestopping

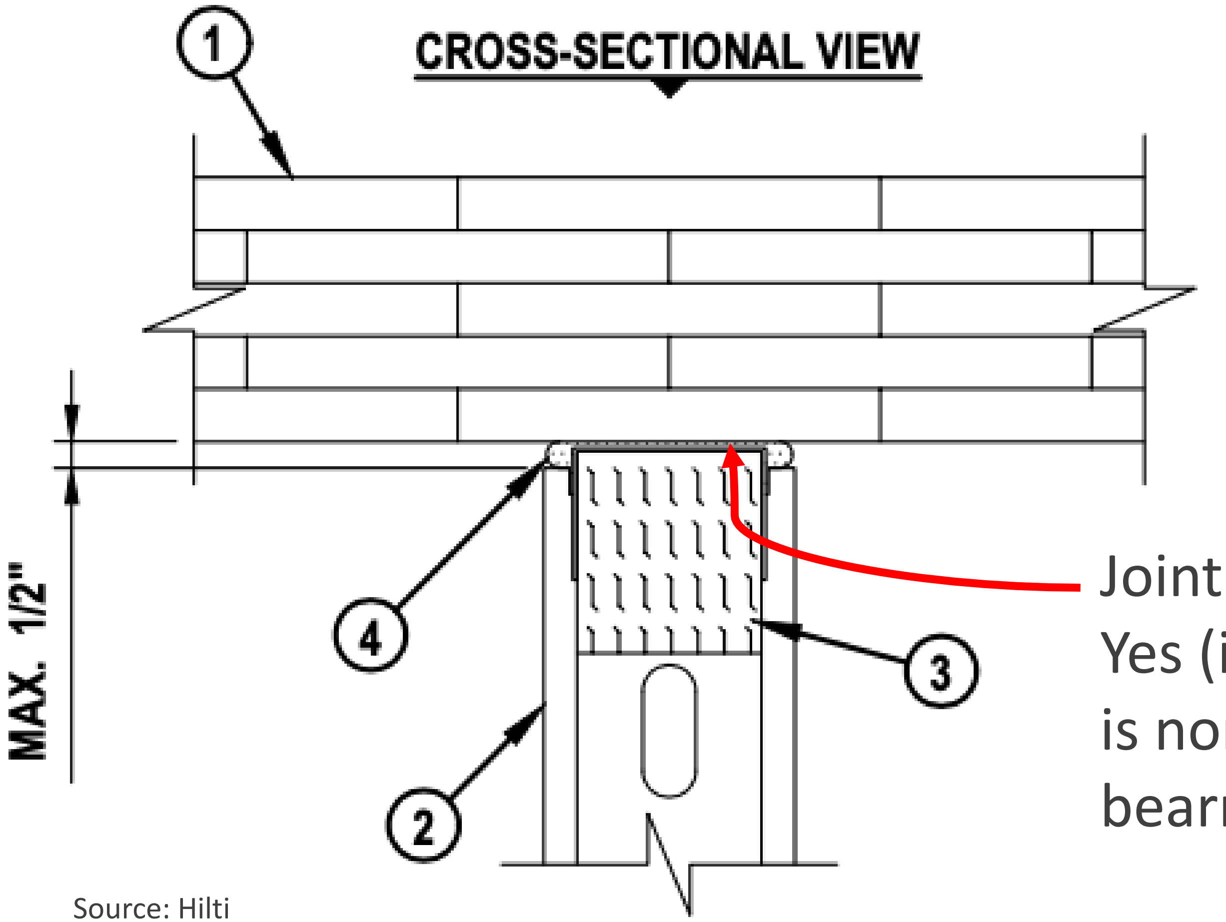
Beam penetrations:

- If FRR = 0-hr, analyze structural impact of hole diameter only
- If FRR > 0-hr, account for charred hole diameter or firestop penetration



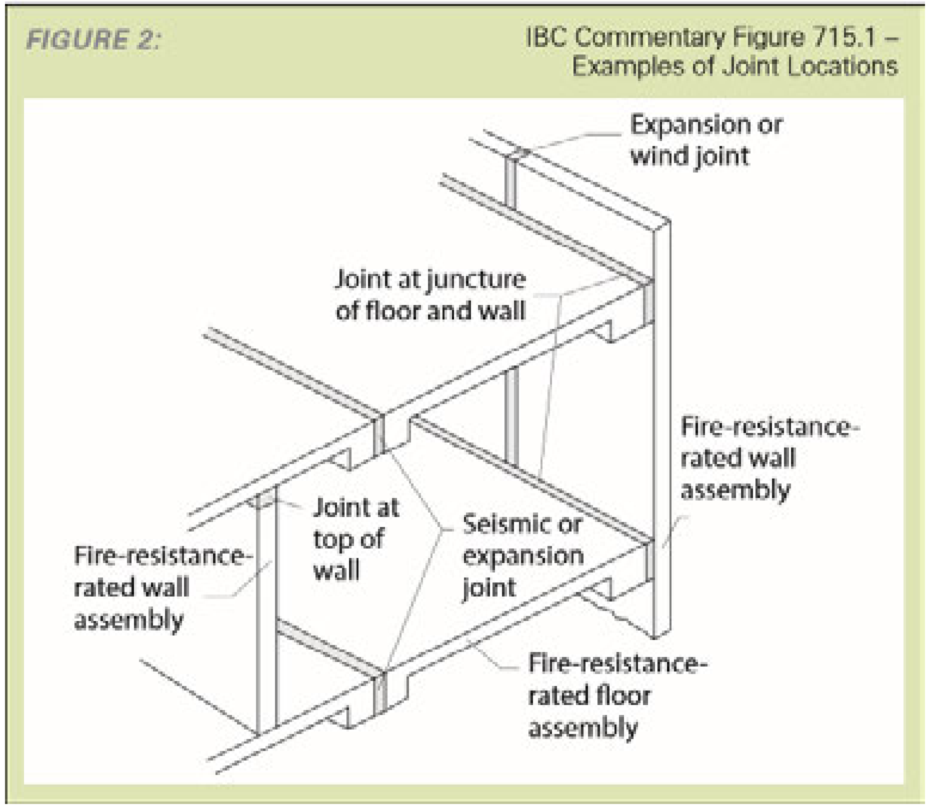
Joints & Intersecting Elements

Not a tall timber specific item, applicable to all mass timber construction



Joint?
Yes (if wall is non-bearng)

Source: Hilti



Source: International Building Code

Sealants at Mass Timber Panel Edges

703.7 Sealing of adjacent mass timber elements. In buildings of Type IVA, IVB, and IVC construction, sealant or adhesive shall be provided to resist the passage of air in the following locations:

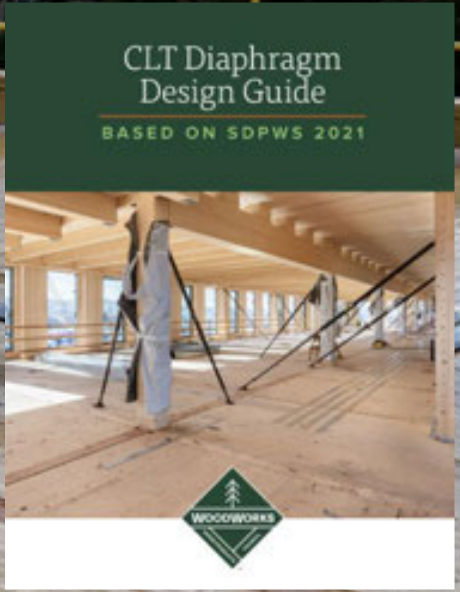
1. At abutting edges and intersections of mass timber building elements required to be fire resistance-rated
2. At abutting intersections of mass timber building elements and building elements of other materials where both are required to be fire resistance-rated.

Exception: Sealants or adhesives need not be provided where they are not a required component of a tested fire-resistance-rated assembly.

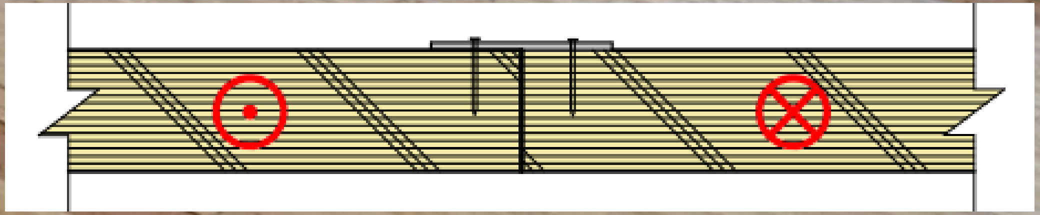
MASS TIMBER DESIGN

DIAPHRAGM CONNECTIONS


PHOTO CREDIT: CHARLES JUDD



PANEL TO PANEL CONNECTIONS – SURFACE SPLINE



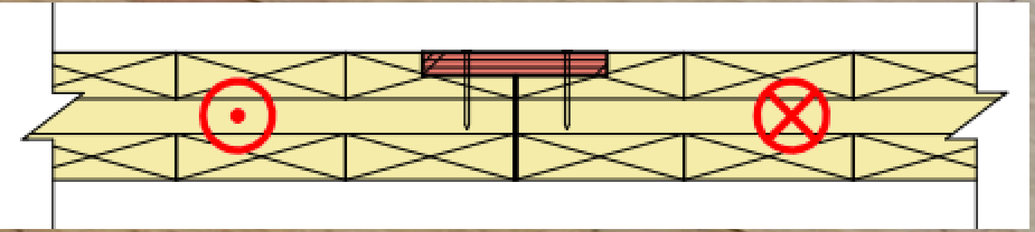


PHOTO CREDIT: ALEX SCHREYER

Considerations for Lateral Systems

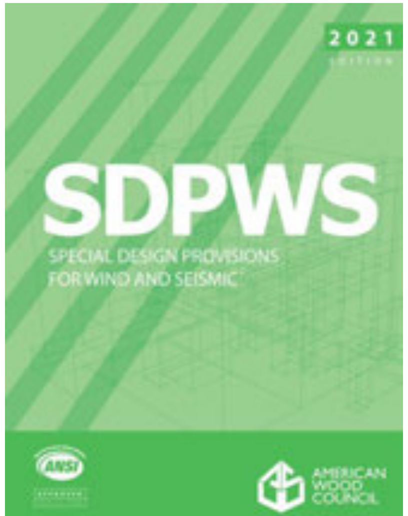
Prescriptive Code Compliance:

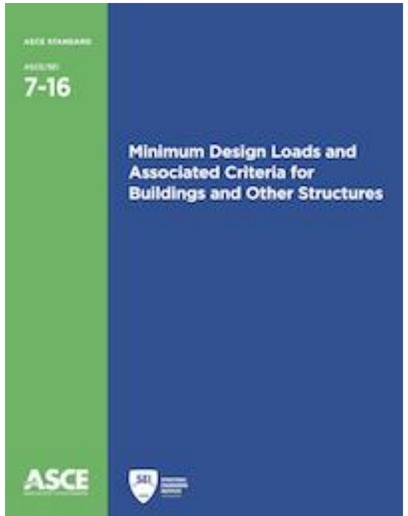
- ☑ Concrete Shear Walls
- ☑ Steel Braced Frames
- ☑ ~~Light Frame Wood Shear Walls (65 ft max)~~
- ☑ Cold Formed Steel Shear Walls (65 ft max)
- ☑ CLT Shear Walls (65 ft max)
- ☒ CLT Rocking Walls

2021 SDPWS, ASCE 7-22

Currently in development!

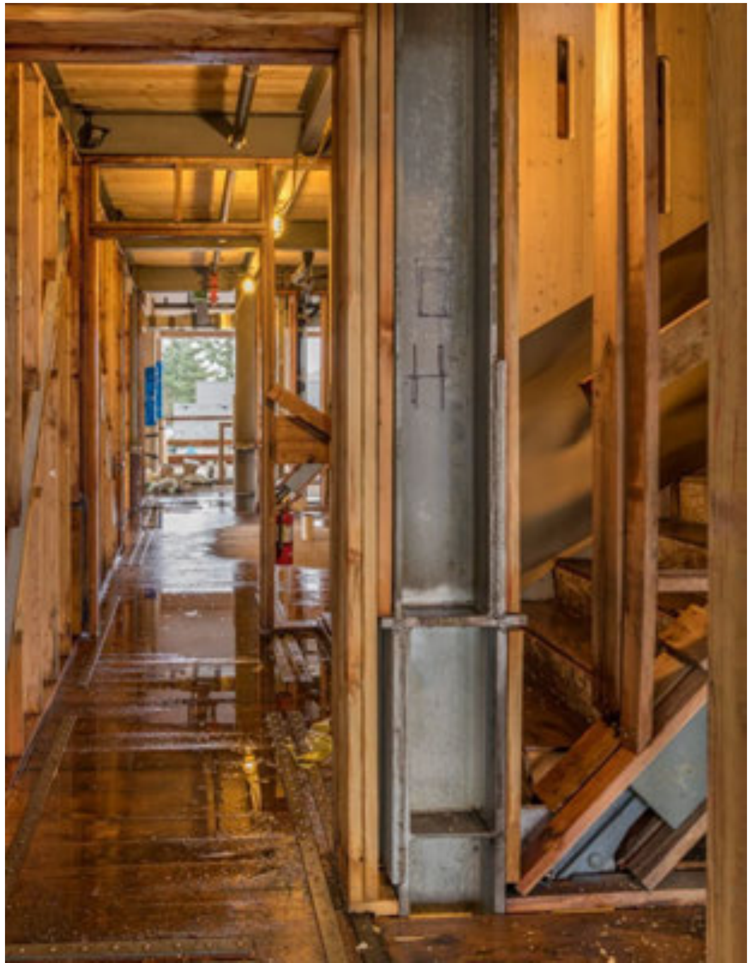

Photo: WoodWorks





Carbon12 – Portland, OR

Buckling-Restrained Braced Frame



Photos: Marcus Kauffmann, ODF

INTRO – Cleveland, OH

Concrete Core Shear Walls

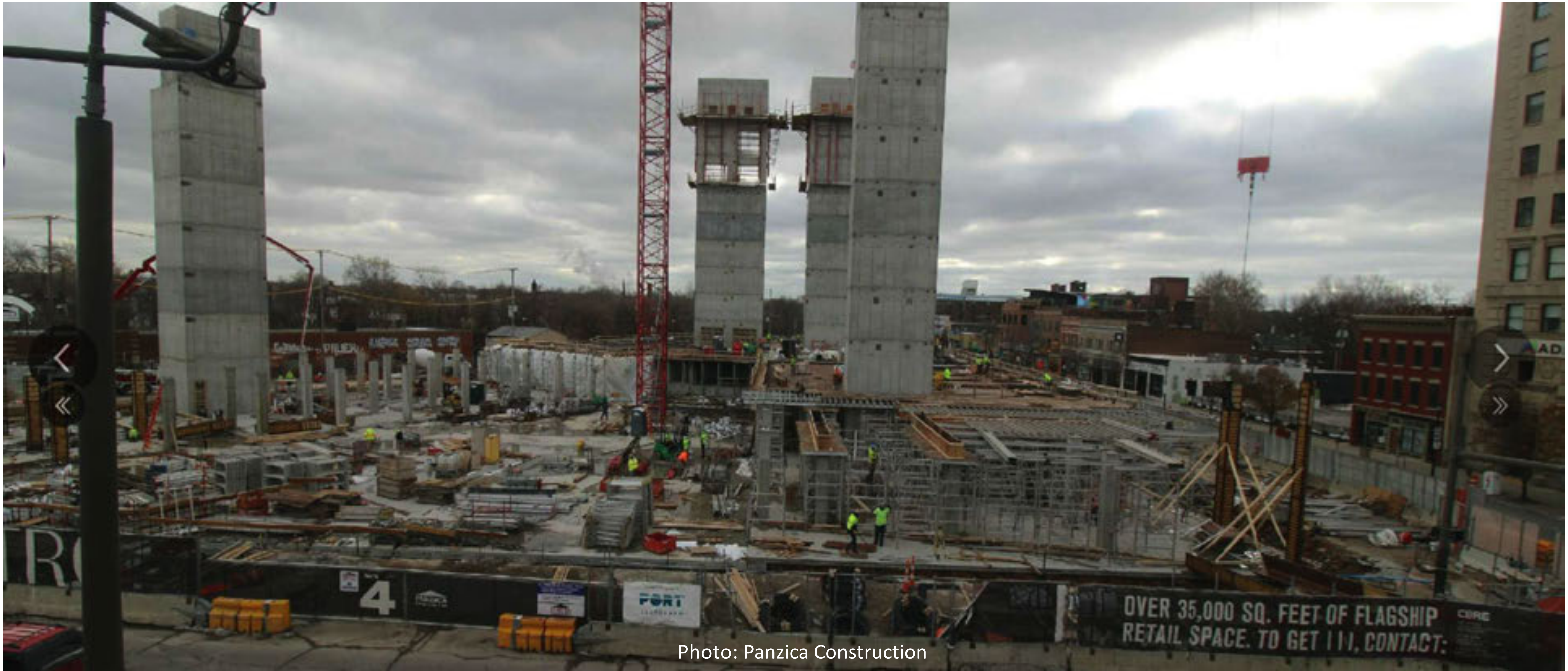
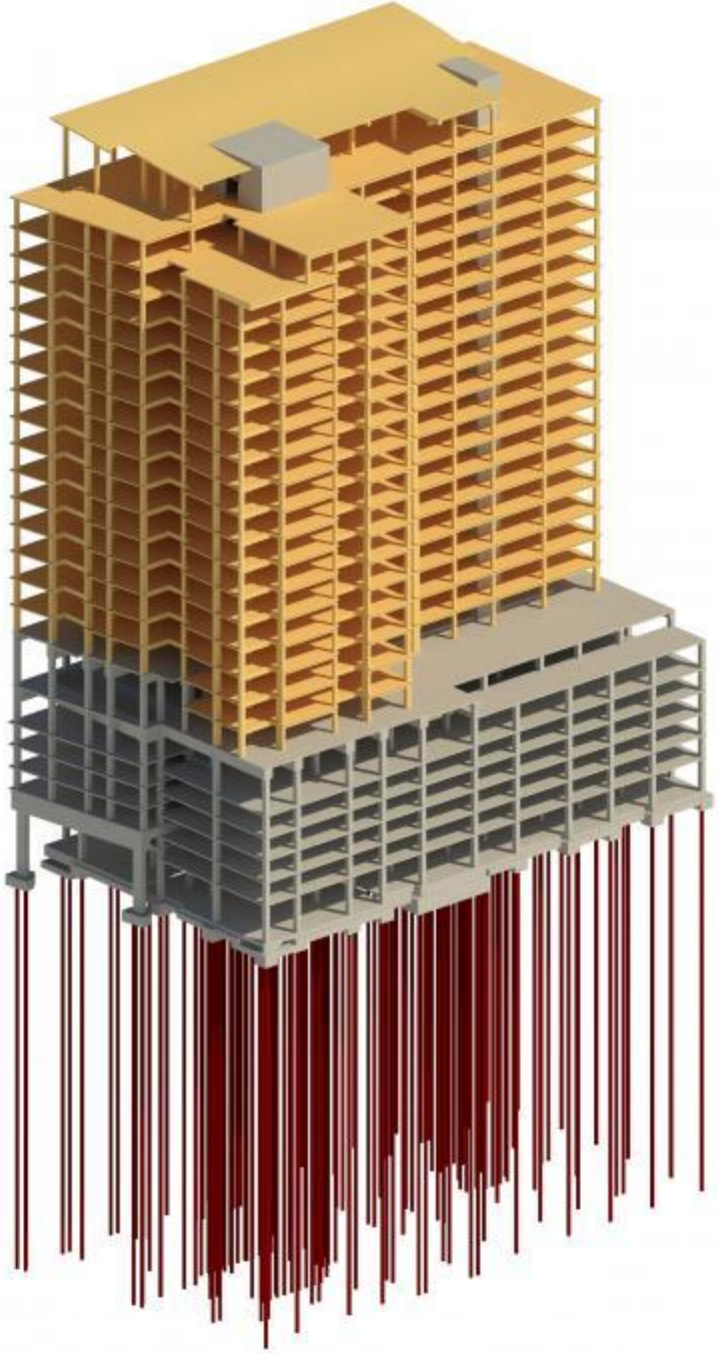


Photo: Panzica Construction

Ascent – Milwaukee, WI

Concrete Core Shear Walls



Photos: Korb + Associates, Thornton Tomasetti

Brock Commons – Vancouver, BC

Concrete Core Shear Walls

Future Potential Lateral System for Tall Wood

Mass Timber Rocking Shear Walls

Photo: WoodWorks

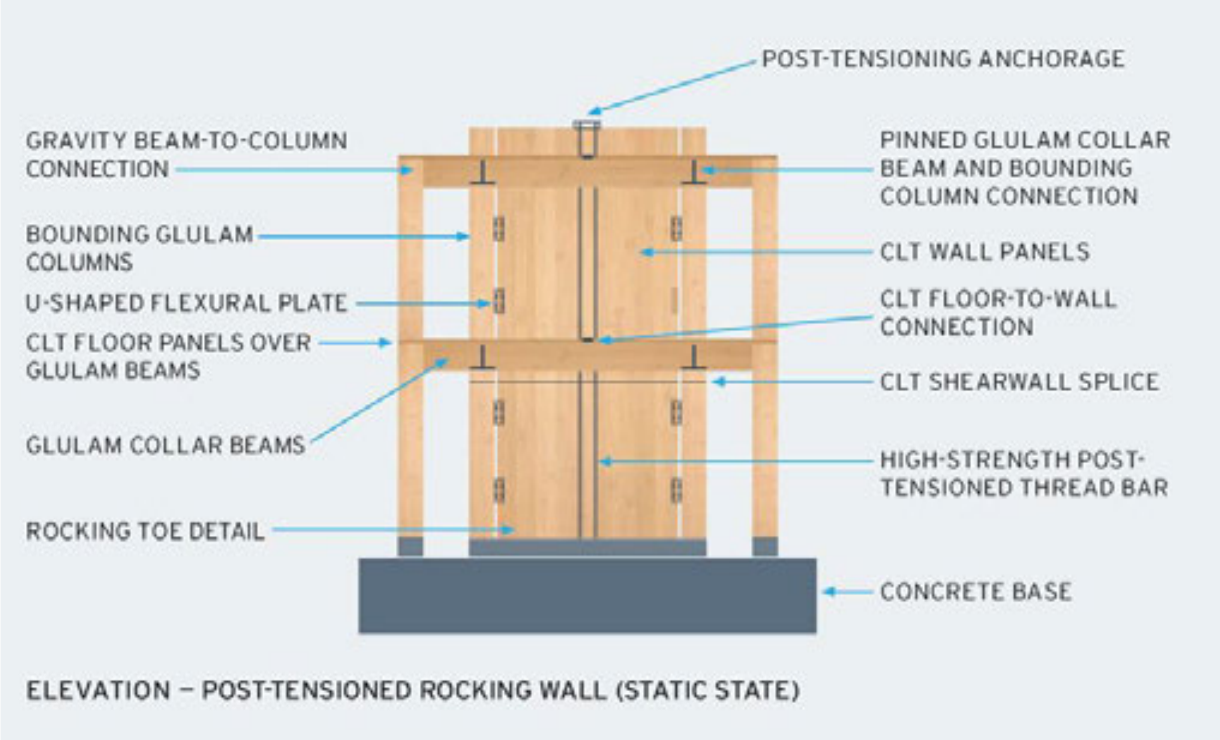


Image: KPFF

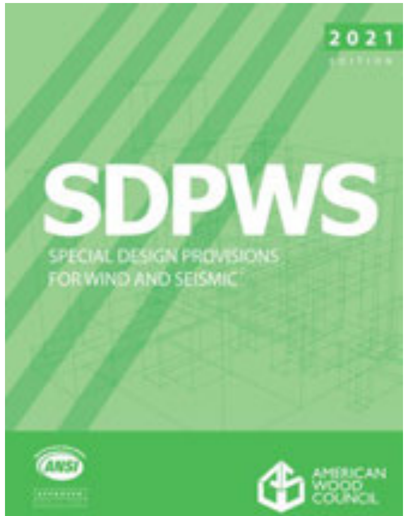
Considerations for Lateral Systems

<u>Prescriptive Code Compliance</u>

- Concrete Shear Walls ✓
- Steel Braced Frames ✓
- Cold Formed Steel Walls ✓
- CLT Shear Walls (65 ft max) ✓
- CLT Rocking Walls ✗

2021 SDPWS
ASCE 7-22

Currently in development!



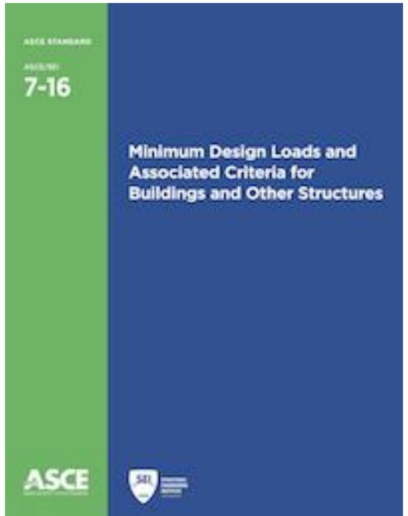



Photo: WoodWorks

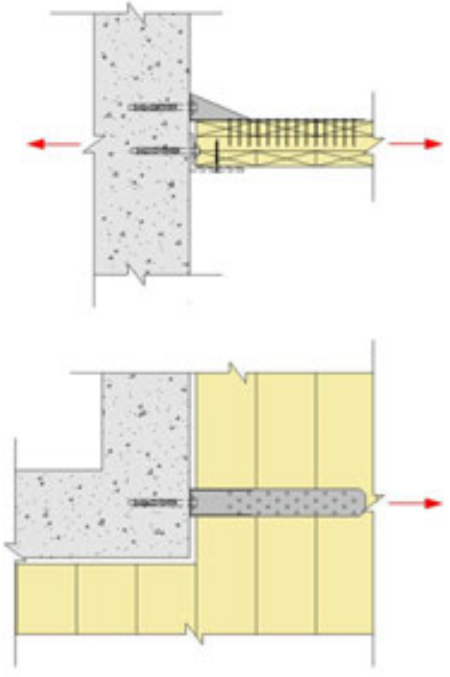

Photo: Acton Ostry Architects

Considerations for Lateral Systems

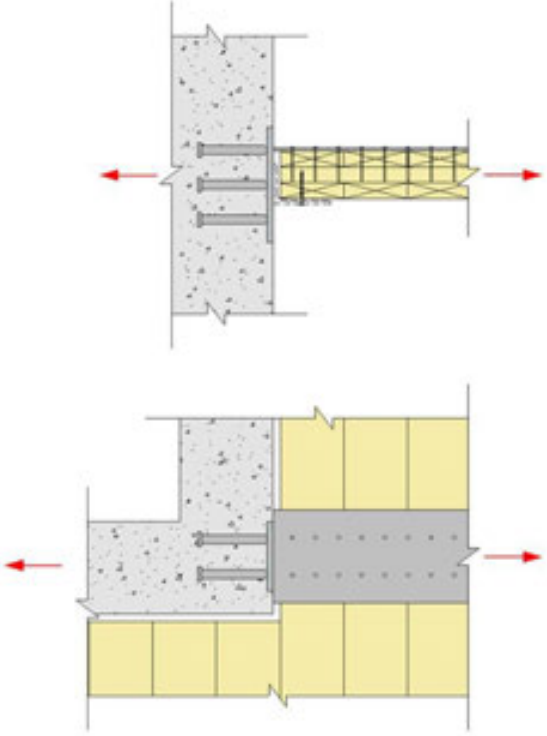
Connections to concrete core

- » Tolerances & adjustability
- » Drag/collector forces

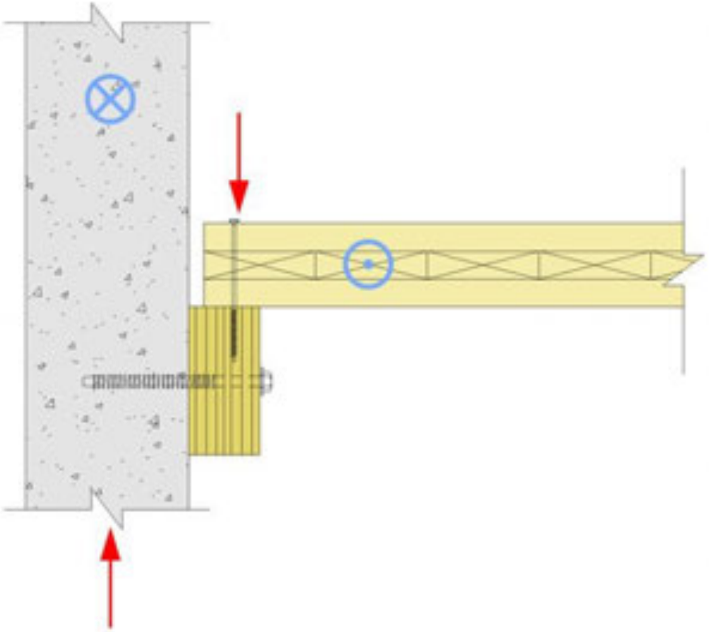
Photo: Acton Ostry Architects



PLAN VIEW



PLAN VIEW



Considerations for Lateral Systems

Connections to steel frame

- Tolerances & adjustability
- Ease of installation

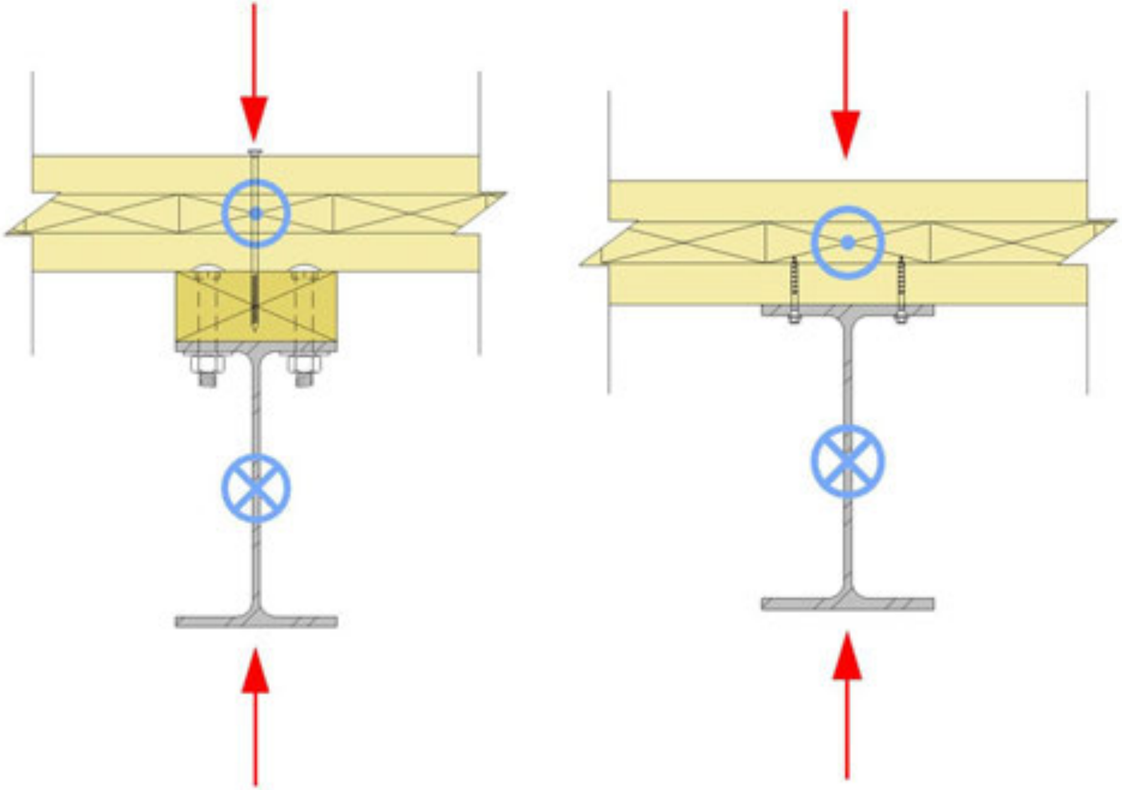
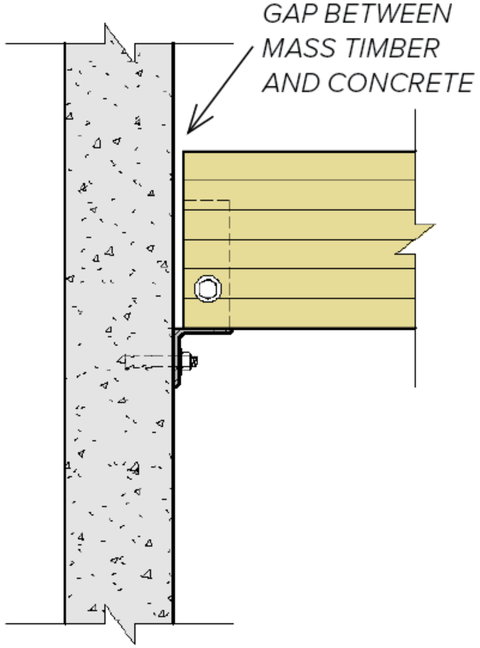
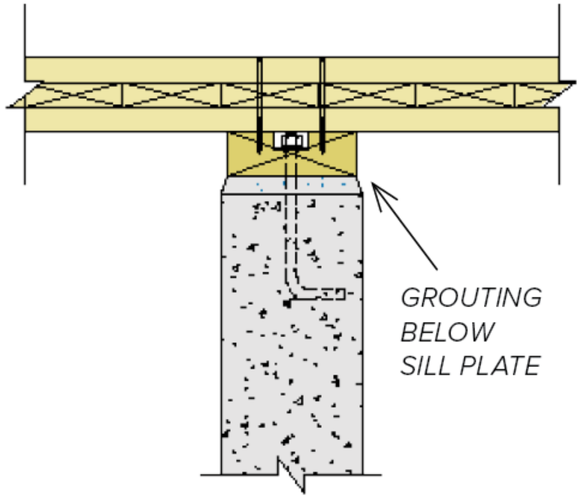
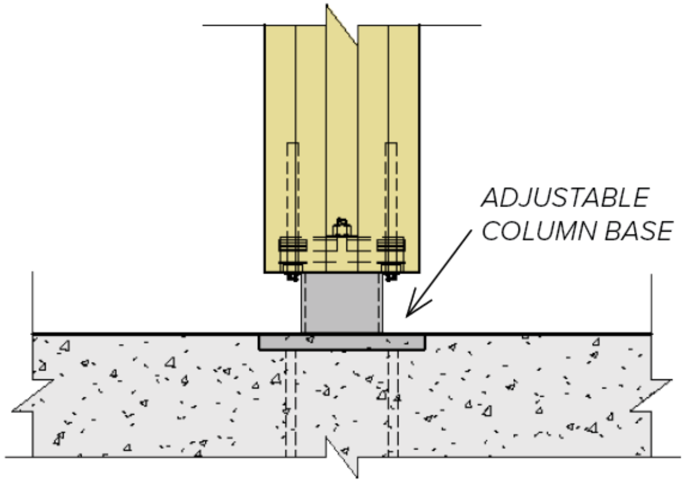


Photo: Marcus Kauffmann, ODF

Connection to other materials - Tolerance Solutions

Solution	Gap Between Mass Timber Beam and Concrete Wall	Grouting Below Sill Plate at Mass Timber Panel to Concrete Wall	Adjustable Column Base at Mass Timber Column to Concrete
Connection example			
	Beam Perpendicular to Wall Connected to Face of Wall	Panel Bears at Top of Wall	Column Bears on Concrete with Adjustable Standoff Base

Planning for Environmental Exposures

- Plan Early
- Risk Evaluation
- Develop Construction
- Phase Plan
- Execute the Design and Moisture Management Plan
- Monitor

RDH Moisture
Management Guide 1st Ed

Photo: Swinerton

Material Environmental Exposure and Moisture Management

Enroute

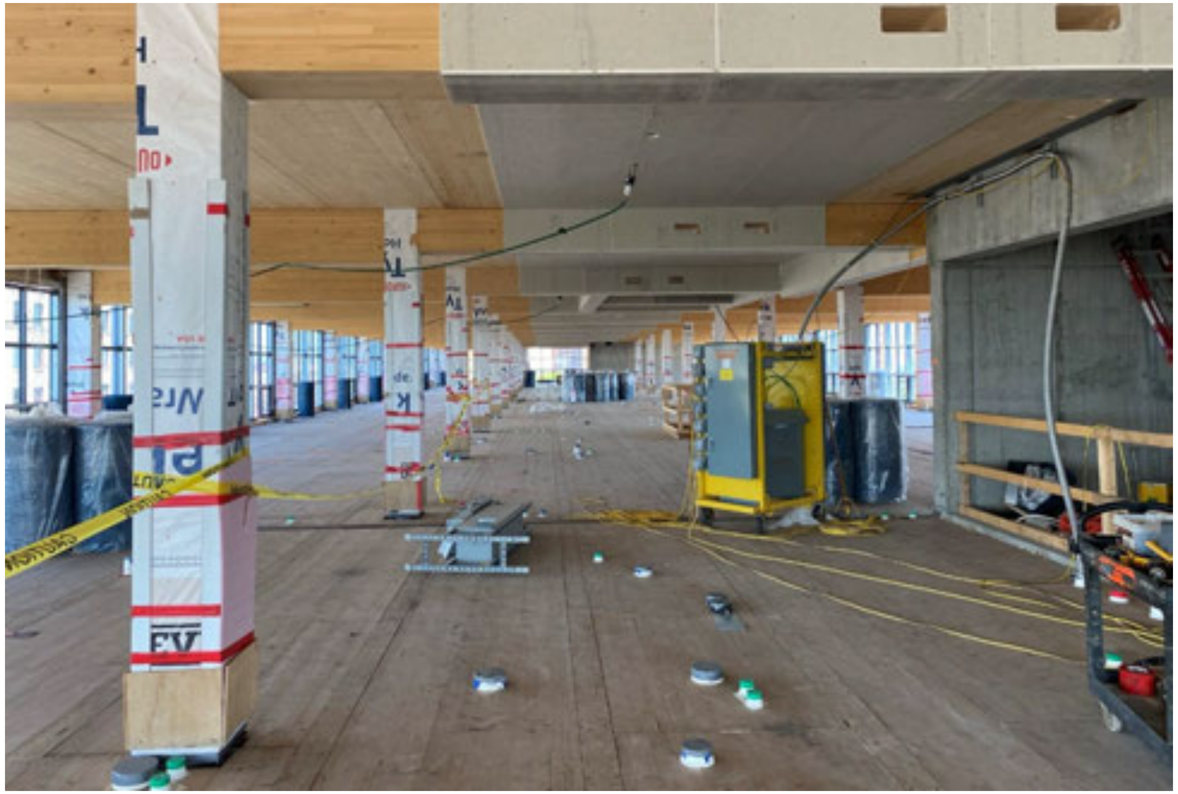
Onsite

Post-Install

Other Material

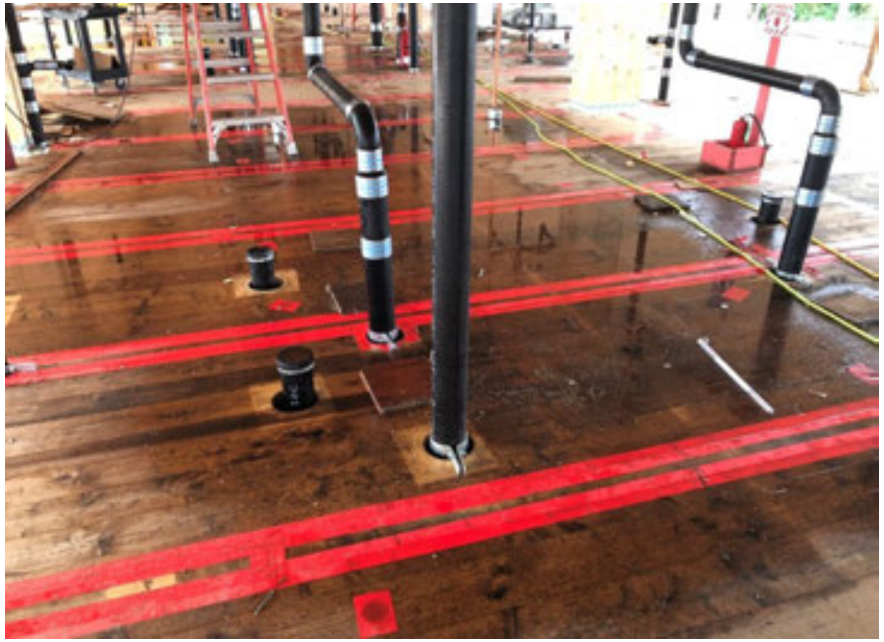
Photo: Alex Schreyer

Enroute Exposure

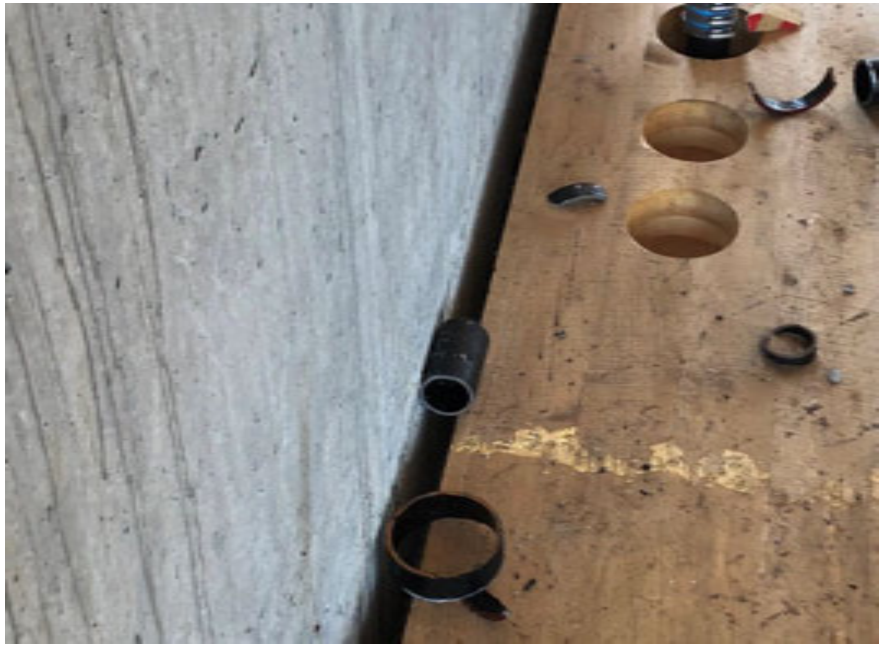


On Site Considerations

On Site Considerations



Onsite Considerations



Other Materials

Acoustics & Sound Control

Acoustics & Sound Control

Consider Impacts of:

- Timber & Topping Thickness
- Panel Layout
- Gapped Panels
- Connections & Penetrations
- MEP Layout & Type

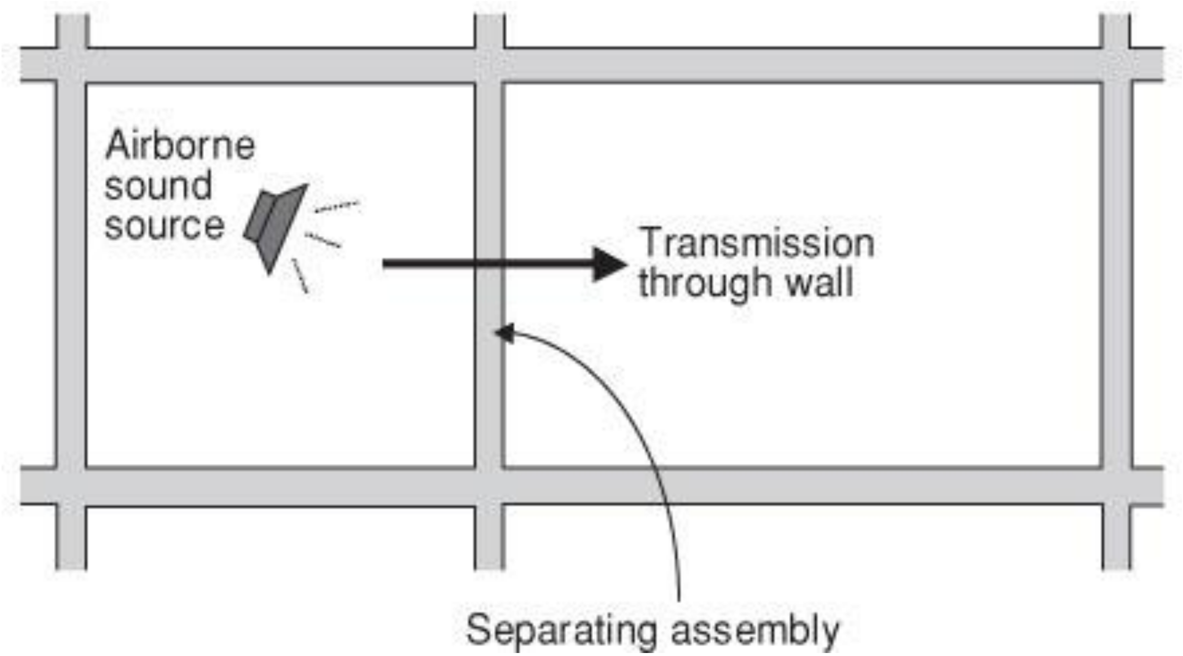
Credit: Rothoblaas

Acoustics & Sound Control

<u>Air-Borne Sound:</u>

Sound Transmission Class (STC)

- Measures how effectively an assembly isolates air-borne sound and reduces the level that passes from one side to the other
- Applies to walls and floor/ceiling assemblies

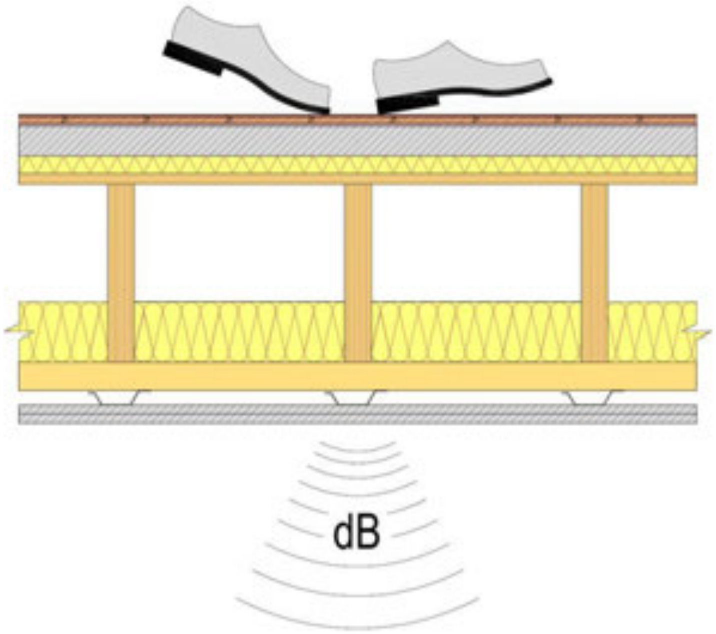


Acoustics & Sound Control

<u>Structure-borne sound:</u>

Impact Insulation Class (IIC)

- Evaluates how effectively an assembly blocks impact sound from passing through it
- Only applies to floor/ceiling assemblies



Acoustics & Sound Control

Code requirements only address residential occupancies:

For unit to unit or unit to public or service areas:

Min. STC of 50 (45 if field tested):

- Walls, Partitions, and Floor/Ceiling Assemblies

Min. IIC of 50 (45 if field tested) for:

- Floor/Ceiling Assemblies

Acoustics & Sound Control

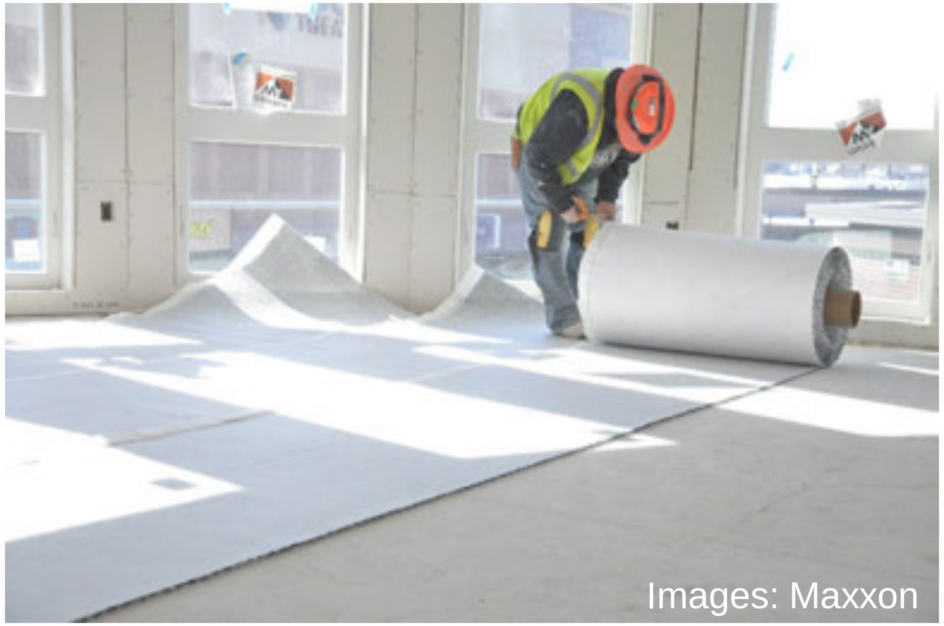
TABLE 1:

Examples of Acoustically-Tested Mass Timber Panels

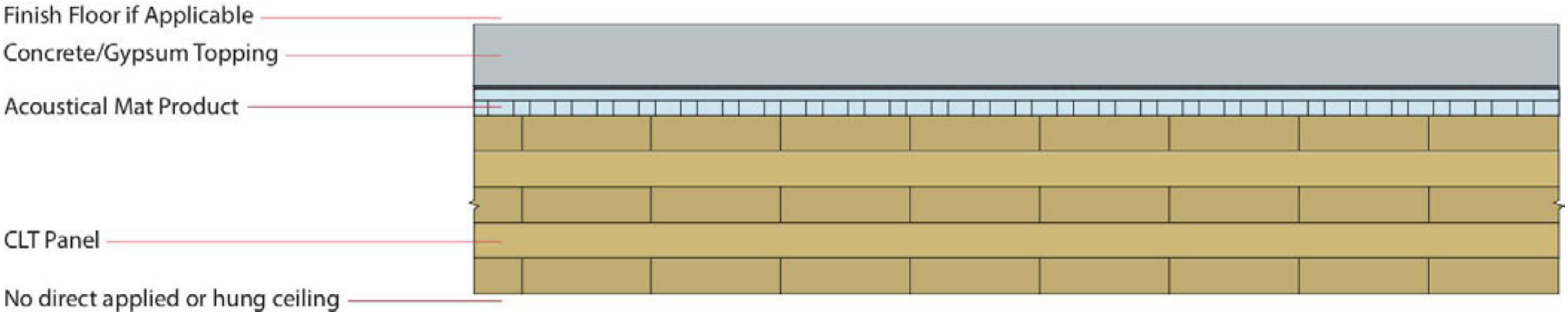
Mass Timber Panel	Thickness	STC Rating	IIC Rating
3-ply CLT wall[4]	3.07"	33	N/A
5-ply CLT wall[4]	6.875"	38	N/A
5-ply CLT floor[5]	5.1875"	39	22
5-ply CLT floor[4]	6.875"	41	25
7-ply CLT floor[4]	9.65"	44	30
2x4 NLT wall[6]	3-1/2" bare NLT 4-1/4" with 3/4" plywood	24 bare NLT 29 with 3/4" plywood	N/A
2x6 NLT wall[6]	5-1/2" bare NLT 6-1/4" with 3/4" plywood	22 bare NLT 31 with 3/4" plywood	N/A
2x6 NLT floor + 1/2" plywood[2]	6" with 1/2" plywood	34	33

Source: Inventory of Acoustically-Tested Mass Timber Assemblies, WoodWorks[7]

Acoustics & Sound Control



Images: Maxxon



Acoustics & Sound Control

Common mass timber floor assembly:

- Finish floor (if applicable)
- Underlayment (if finish floor)
- 1.5” to 4” thick concrete/gypcrete topping
- Acoustical mat
- WSP (if applicable)
- Mass timber floor panels

Credit: AcoustiTECH

Acoustics & Sound Control

Solutions Paper

WoodWorks™
WOOD PRODUCTS COUNCIL

Acoustics and Mass Timber: Room-to-Room Noise Control

Richard McLain, PE, SE • Senior Technical Director • WoodWorks

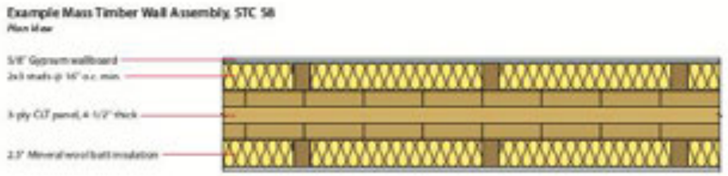
T3 Minneapolis
Architect: MGA | Michael Green Architecture, DLR Group
Structural Engineer: Magnusson Klemencic Associates
Design Assist + Build: StructureCraft

The growing availability and code acceptance of mass timber—i.e., large solid wood panel products such as cross-laminated timber (CLT) and nail-laminated timber (NLT)—for floor, wall and roof construction has given designers a low-carbon alternative to steel, concrete, and masonry for many applications. However, the use of mass timber in multi-family and commercial buildings presents unique acoustic challenges.

While laboratory measurements of the impact and airborne sound isolation of traditional building assemblies such as light wood-frame, steel and concrete are widely available, fewer resources exist that quantify the acoustic performance of mass timber assemblies. Additionally, one of the most desired aspects of mass timber construction is the ability to leave a building's structure exposed as finish, which creates the need for asymmetric assemblies. With careful design and detailing, mass timber buildings can meet the acoustic performance expectations of most building types.

http://www.woodworks.org/wp-content/uploads/wood_solution_paper-MASS-TIMBER-ACOUSTICS.pdf

FIGURE 3:
Interior CLT partition wall with chase walls on both sides



Source: US CLT Handbook

Mass Timber Assembly Options: Walls

Mass timber panels can also be used for interior and exterior walls—both bearing and non-bearing. For interior walls, the need to conceal services such as electrical and plumbing is an added consideration. Common approaches include building a chase wall in front of the mass timber wall or installing gypsum wallboard on resilient channels that are attached to the mass timber wall. As with bare mass timber floor panels, bare mass timber walls don't typically provide adequate noise control, and chase walls also function as acoustical improvements. For example, a 3-ply CLT wall panel with a thickness of 3.07" has an STC rating of 33.[4] In contrast, Figure 3 shows an interior CLT partition wall with chase walls on both sides. This assembly achieves an STC rating of 58, exceeding the IBC's acoustical requirements for multi-family construction. Other examples are included in the inventory of tested assemblies noted above.

Acoustical Differences between Mass Timber Panel Options

The majority of acoustically-tested mass timber assemblies include CLT. However, tests have also been done on other mass timber panel options such as NLT and dowel-laminated timber (DLT), as well as traditional heavy timber options such as tongue and groove decking. Most tests have concluded that CLT acoustical performance is slightly better than that of other mass timber options, largely because the cross-orientation of laminations in a CLT panel limits sound flanking.

For those interested in comparing similar assemblies and mass timber panel types and thicknesses, the inventory noted above contains tested assemblies using CLT, NLT, glued-laminated timber panels (GLT), and tongue and groove decking.

Improving Performance by Minimizing Flanking

Even when the assemblies in a building are carefully designed and installed for high acoustical performance, consideration of flanking paths—in areas such as assembly intersections, beam-to-column/wall connections, and MEP penetrations—is necessary for a building to meet overall acoustical performance objectives.

One way to minimize flanking paths at these connections and interfaces is to use resilient connection isolation and sealant strips. These products are capable of resisting structural loads in compression between structural members and connections while providing isolation and breaking hard, direct connections between members. In the context of the three methods for improving acoustical performance noted above, these strips act as decouplers. With airtight connections, interfaces and penetrations, there is a much greater chance that the acoustic performance of a mass timber building will meet expectations.

Acoustical isolation strips

Photos: Rothoblaas

NEW ONLINE TOOL

Mass Timber Fire & Acoustic Database

Search tested and approved assemblies

https://www.woodworks.org/mass-timber-fire-acoustic-database/

< Back to Mass Timber Fire & Acoustic Database

Assembly Type

- ☐ Floor/Roof 532
- ☐ Wall 147

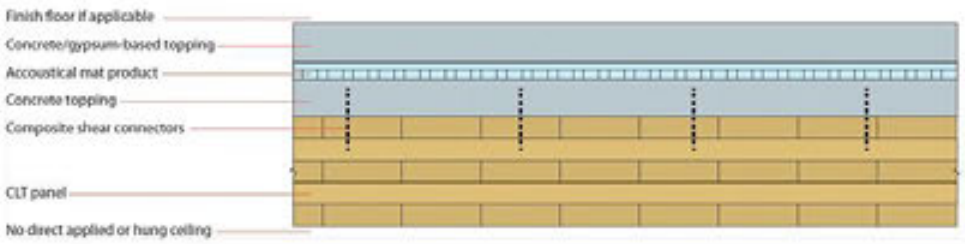
Application Type

- ☐ CLT/Concrete Composite 7
- ☐ Concealed Ceiling 201
- ☐ Concrete/Gypsum Topping 138
- ☐ Other 108
- ☐ Raised Access Floor or Wood Sleepers 78

Mass Timber Panel

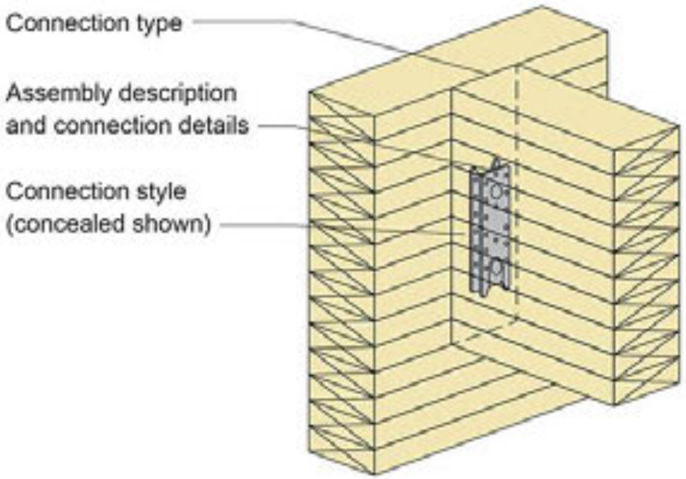
- ☐ CLT 507
- ☐ CLT (SCL) 56
- ☐ NLT 72
- ☐ DLT 22

CLT-Concrete Composite Floor Assemblies, Ceiling Side Exposed



This illustration s
for specific const

Mass Timber Panel	Topping	Acoustical Mat Products Between Concrete Composite and Upper Topping	Upper Topping	Finish Floor	Sound Rating	Impact Rating	Method of Compliance
5-layer 5.40" CLT	2.25" Concrete	Maxxon Acousti-Mat® 3/8	1" Gyp-Crete®	52	STC	50 IIC	Maxxon / Intertek Report # K3094.97-113-11-R0 Contact Product Manufacturer for More Information
5-layer 5.40" CLT	2.25" Concrete	Maxxon Acousti-Mat® 3/8	1" Gyp-Crete®	53	STC	52 IIC	Maxxon / Intertek Report # K3094.69-113-11-R0 Contact Product Manufacturer for More Information
5-layer 5.40" CLT	2.25" Concrete	Maxxon Acousti-Mat® SBR over Maxxon Acousti-Mat® 3/4 Premium	1.5" Gyp-Crete®	56	STC	57 IIC	Maxxon / Intertek Report # K3094.98-113-11-R0 Contact Product Manufacturer for More Information
5-layer 5.40" CLT	2.25" Concrete	Maxxon Acousti-Mat® SBR over Maxxon Acousti-Mat® 3/4 Premium	1.5" Gyp-Crete®	57	STC	61 IIC	Maxxon / Intertek Report # K4507.06-113-11-R0 Contact Product Manufacturer for More Information
5-layer 5.40" CLT	2.25" Concrete	Maxxon Acousti-Mat® SBR over Maxxon Acousti-Mat® 3/4 Premium	2" Gyp-Crete®	60	STC	61 IIC	Maxxon / Intertek Report # K3094.86-113-11-R0 Contact Product Manufacturer for More Information
5-layer 5.40" CLT	2.25" Concrete	Maxxon Acousti-Mat® SBR over Maxxon Acousti-Mat® 3/4 Premium	2" Gyp-Crete®	58	STC	63 IIC	Maxxon / Intertek Report # K3094.86-113-11-R0 Contact Product Manufacturer for More Information
5-layer 5.40" CLT	2.25" Concrete	5/8" OSB on 5/8" Georgia Pacific Dens Deck® on Kinetics® Ultra Quiet SR	None	60	STC	62 IIC	Veneklasen Associates / Intertek Report # K3094.19-113-11-R0 Contact Product Manufacturer for More Information

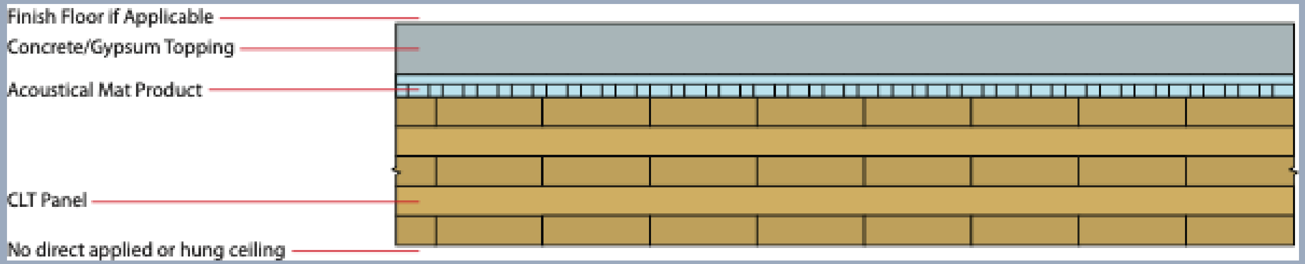


Acoustics & Sound Control

Inventory of Tested Assemblies

Table 1: CLT Floor Assemblies with Concrete/Gypsum Topping, Ceiling Side Exposed

WoodWorks
WOOD PRODUCTS COUNCIL



CLT Panel	Concrete/Gypsum Topping	Acoustical Mat Product Between CLT and Topping	Finish Floor	STC[1]	IIC[1]	Source
CLT 5-ply (6.875")	1-1/2" Gyp-Crete®	Maxxon Acousti-Mat® 3/4	None	47[2] ASTC	47[2] AIIC	1
			LVT	-	49[2] AIIC	
			Carpet + Pad	-	75[2] AIIC	
			LVT on Acousti-Top®	-	52[2] AIIC	
			Eng Wood on Acousti-Top®	-	51[2] AIIC	
		Maxxon Acousti-Mat® ¾ Premium	None	49[2] ASTC	45[2] AIIC	
			LVT	-	47[2] AIIC	
			LVT on Acousti-Top®	-	49[2] AIIC	
	1-1/2" Levelrock®	USG SAM N25 Ultra	None	45[6]	39[6]	15
			LVT	48[6]	47[6]	16
			LVT Plus	48[6]	49[6]	58
			Eng Wood	47[6]	47[6]	59
			Carpet + Pad	45[6]	67[6]	60
			Ceramic Tile	50[6]	46[6]	61
			None	45[6]	42[6]	15
			LVT	48[6]	44[6]	16

Insurance Resources

WoodWorks resources for mass timber insurance:

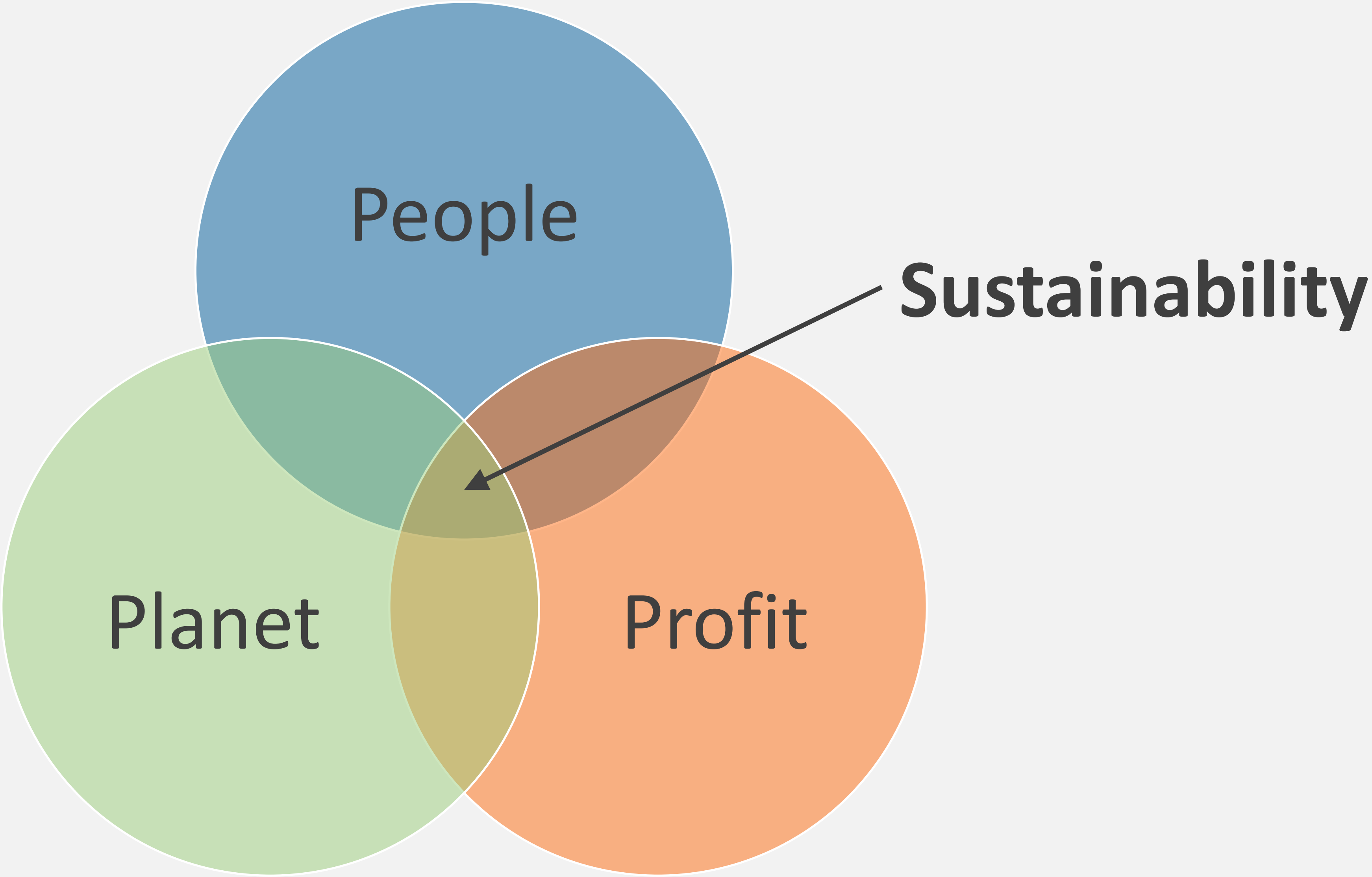
- Video series on MT Builder’s Risk insurance challenges
- Mass Timber Project Questionnaire for Builder’s Risk Insurance – download & fill it out!
- Insurance for Mass Timber Construction: Assessing Risk and Providing Answers (white paper)
- Discuss with WoodWorks Regional Director:
  - Lists of experienced insurance brokers
  - Help answering questions from brokers & insurers

www.woodworks.org/learn/mass-timber-clt/mass-timber-building-insurance/

Understanding the Why

Photo: WoodWorks
Architect/Developer: oWOW

The Triple Bottom Line



New Buildings & Greenhouse Gases

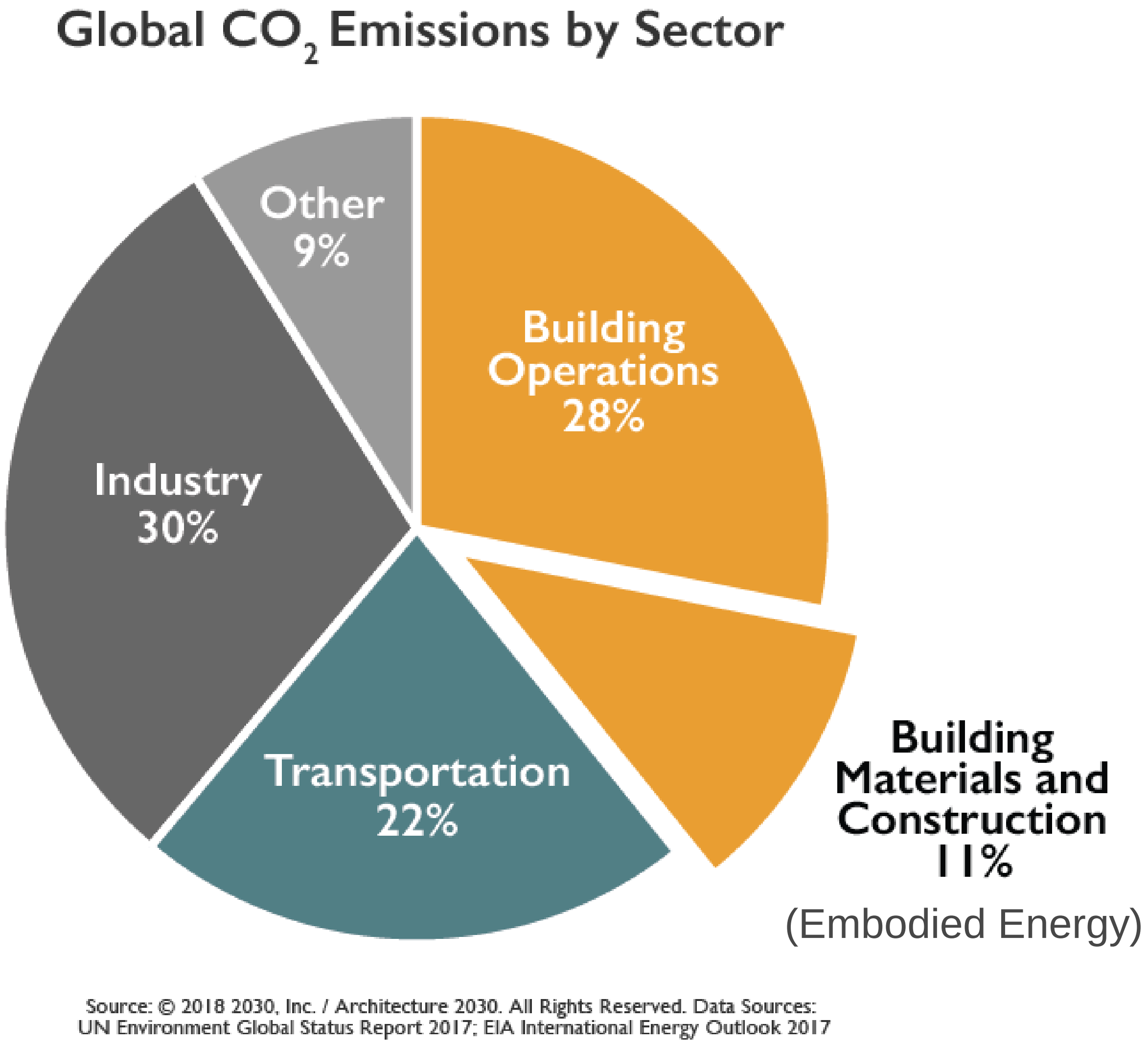


Image: Architecture 2030

Buildings generate nearly 40% of annual global greenhouse gas emissions (*building operations + embodied energy*)

Embodied Energy (11%): Concrete, iron + steel produce approximately 9% of this (Architecture 2030)

Carbon Storage

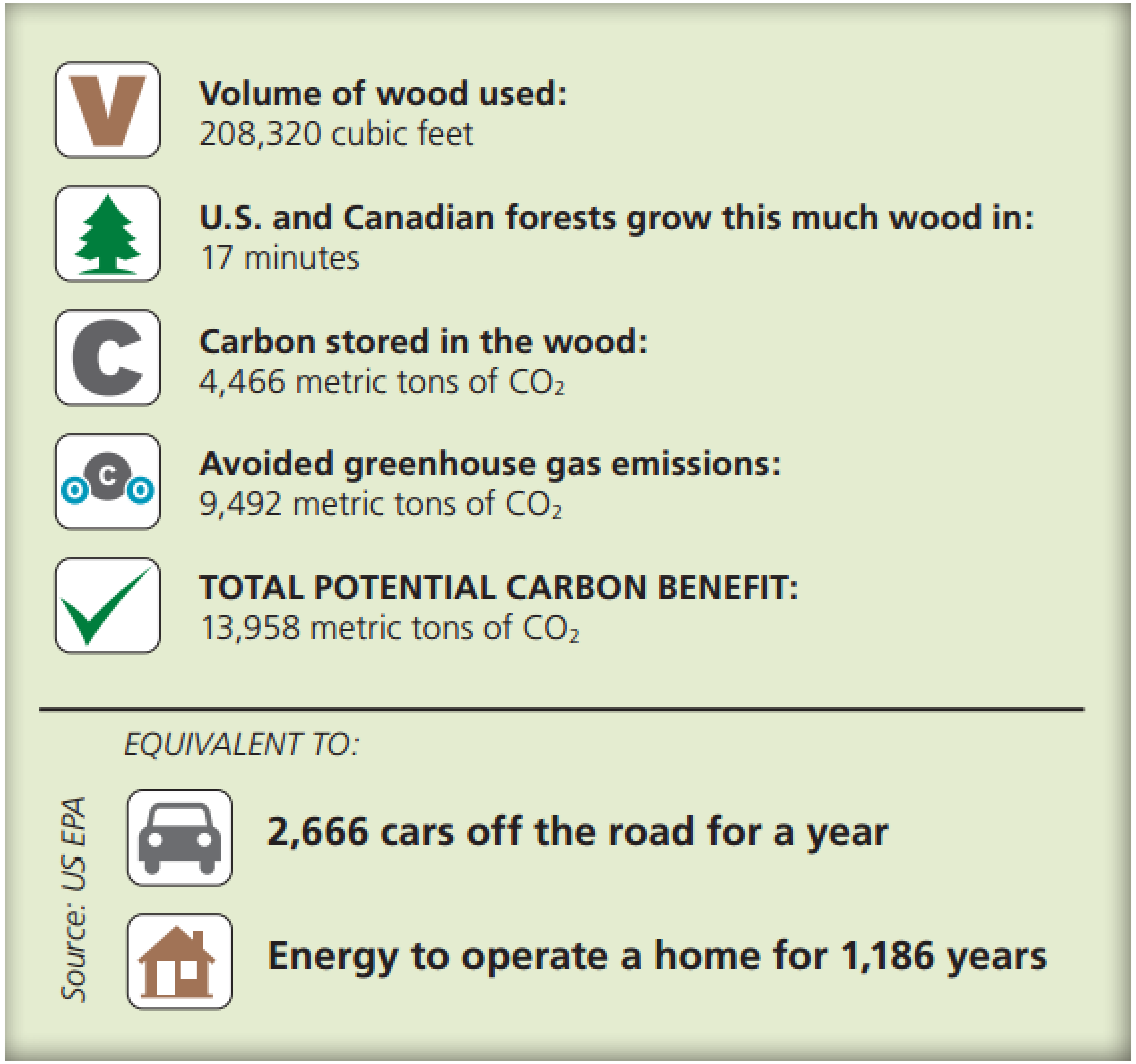
Wood ≈ 50% Carbon (dry weight)


Image: Kaiser + Path


Image: Lever Architecture

WoodWorks Carbon Calculator

- Available at **woodworks.org**
- Estimates total wood mass in a building
- Relays **estimated** carbon impacts:
  - Amount of **carbon stored** in wood
  - Amount of **greenhouse gas emissions avoided** by choosing wood over a non-wood material



http://www.woodworks.org/carbon-calculator-download-form/

Apex Plaza

Charlottesville, VA

Architect: William McDonough + Partners
Engineer: Simpson Gumpertz & Heger
Photo: Patel Photography

Apex Plaza

Charlottesville, VA

300,000 sf, 8 stories (6 mass timber)

Type IV-HT

CLT panels / glulam frame & braced frames

Business (Office)

Completed 2022

W|N PROFILE

William McDonough + Partners
Simpson Gumpertz & Heger
Photo Prakash Patel

Healthy Buildings & Biophilia

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

Residents respond to "look & feel"

- Aesthetics seem to be broadly appealing; wider target markets = better market demand
- Robust pre-leasing = lower costs & risks
  - More income sooner = lowers operating & interest budgets
  - Faster to stabilization = faster to refinance
- Tangible distinction = mitigates future supply risk
- Tangible realization of desired brand identities

Ascent

Milwaukee, WI

Korb + Associates Architects
Thronton Tomasetti
Photo: C.D. Smith Construction

Ascent

Milwaukee, WI

493,000 sf, 25 stories total (19 mass timber)

Type IV-HT with code modifications

Multi-Family

Completed 2022

W|N PROFILE

BUSINESS CASE STUDY

WOOD DESIGN AWARD WINNER

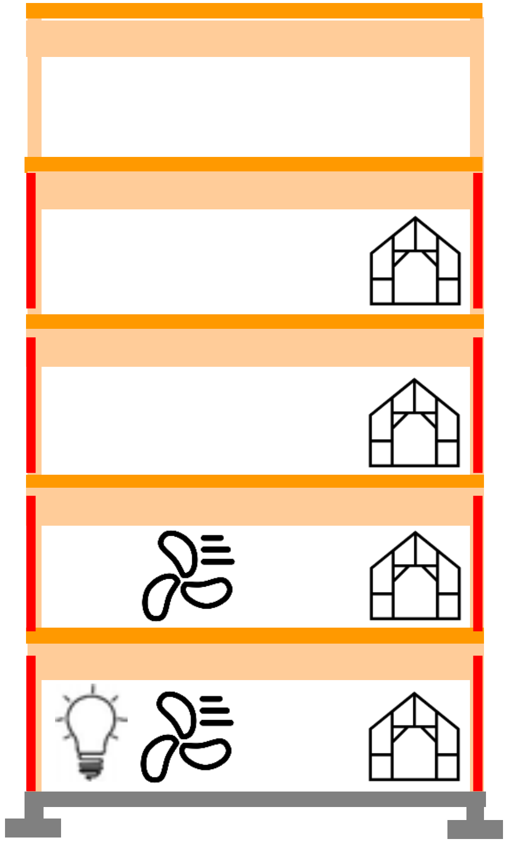
Korb + Associates Architects
Thronton Tomasetti
Photo: VRX Media Group

Labor Benefits

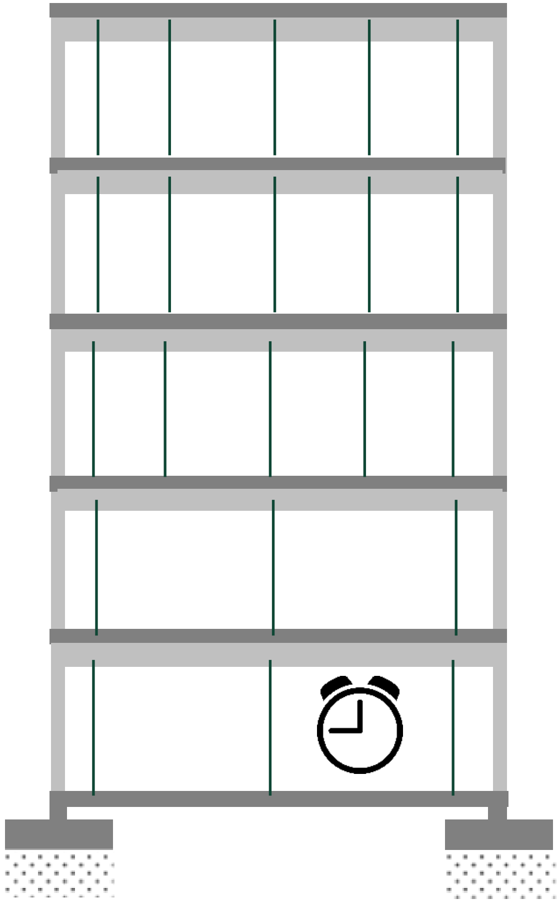
- Labor Shortage Solution
- Small crews for timber frame installation
- Utilize more entry-level laborers when MEPF systems fully designed, coordinated & pre-planned
- Safer construction sites

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

Schedule Savings for Rough-In Trades
Fast Construction



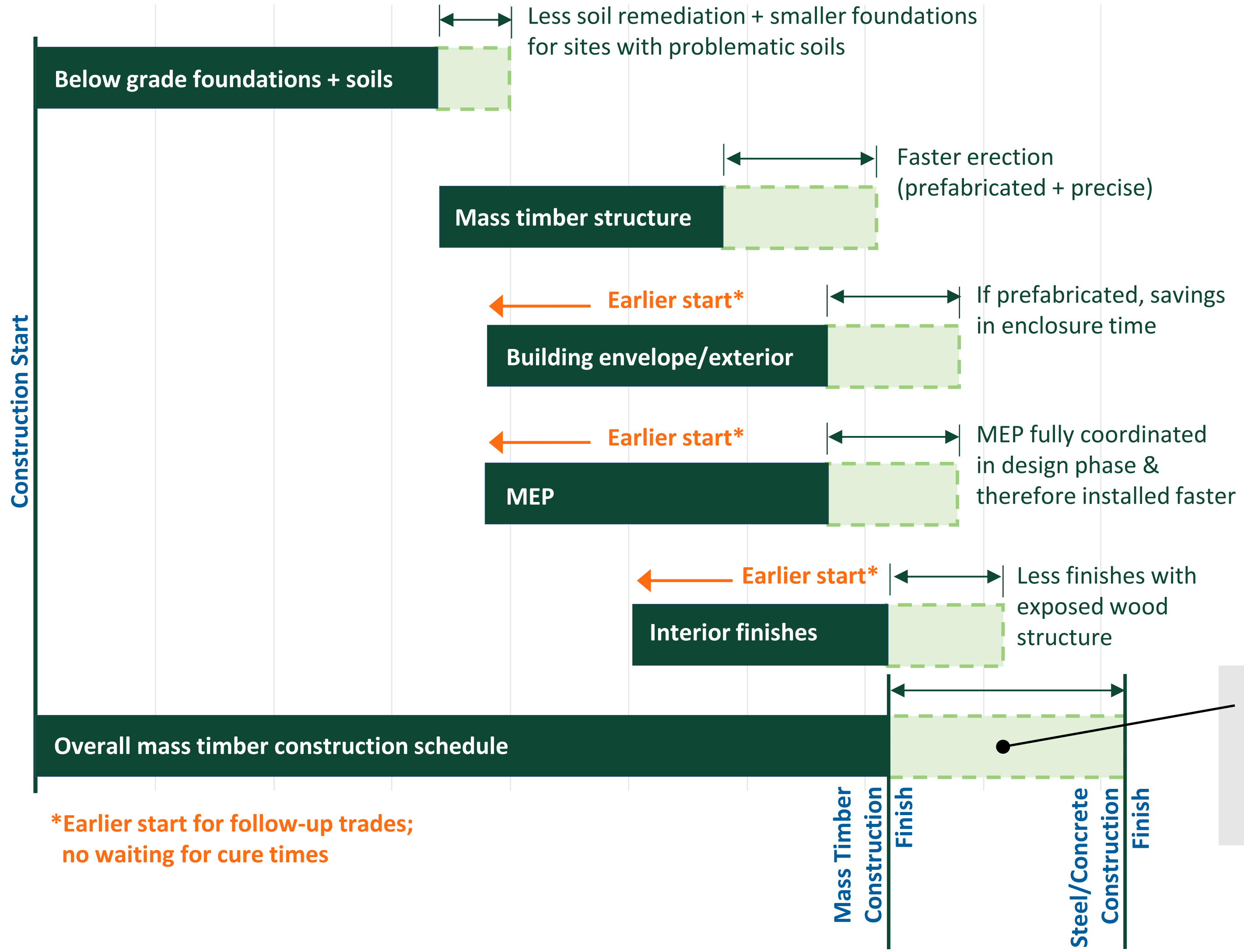
NO curing
(mass timber)



Curing & maze of
shores (concrete)

Photo: WoodWorks

Compressing the Typical Construction Schedule



Look for these potential $$ schedule savings with mass timber in comparison to steel and concrete.

Up to 25% schedule savings

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

Prefabrication: Other systems
Keep up with Fast Pace of Mass Timber

Developer, Asset Manager, Design Builder: Lendlease
Locations: Redstone Arsenal, Huntsville, Alabama

Photos: Lendlease

Prefab Assemblies:

» Bathroom Pods
» MEP Racks

Other systems:

» Enclose building asap
» Lateral system needs to be compatible with fast pace of mass timber

1510 Webster

Oakland, CA

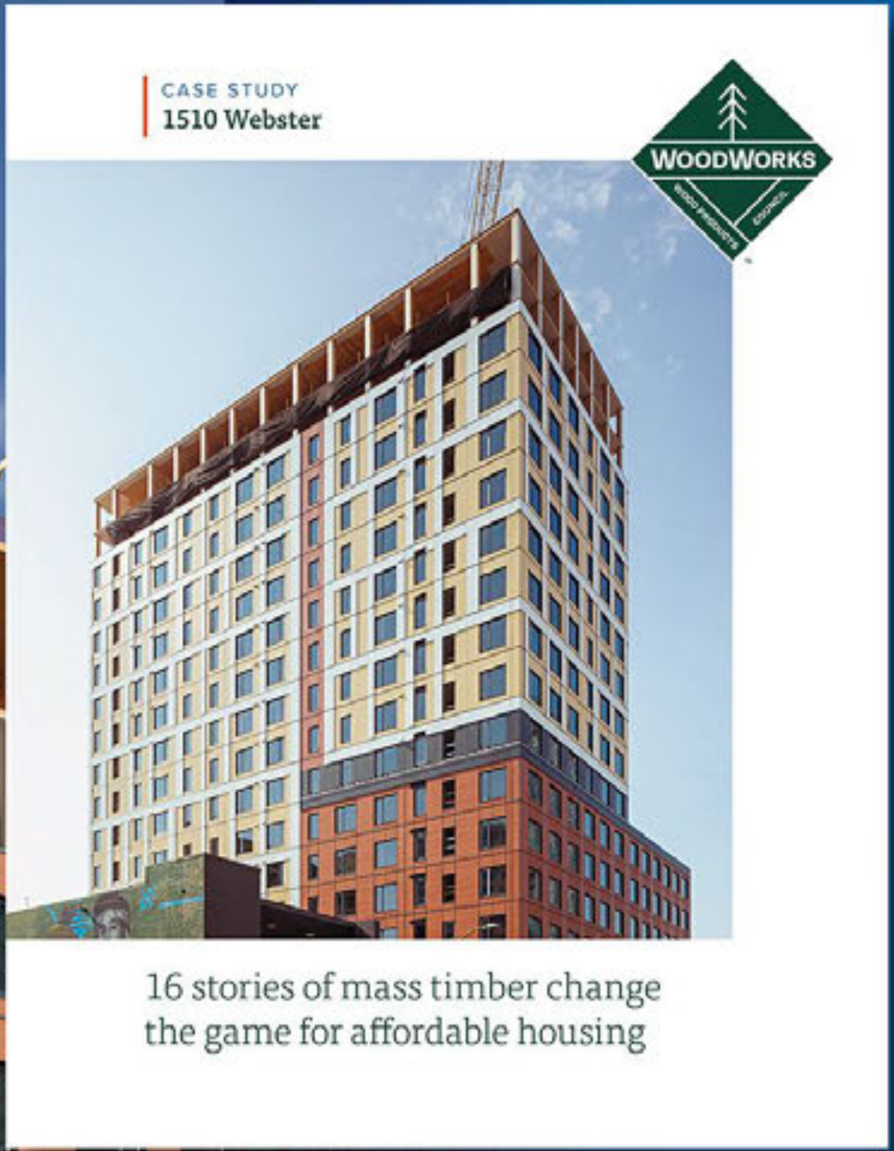
- 16 stories mass timber over two-level concrete
- Designed with Tall Wood code provisions in the 2021 CBC
- Mass timber with concrete cores
- Type IV-A fully protected

Photos: Flor Projects

oWow
DCI Engineers

https://www.woodworks.org/resources/1510-webster/

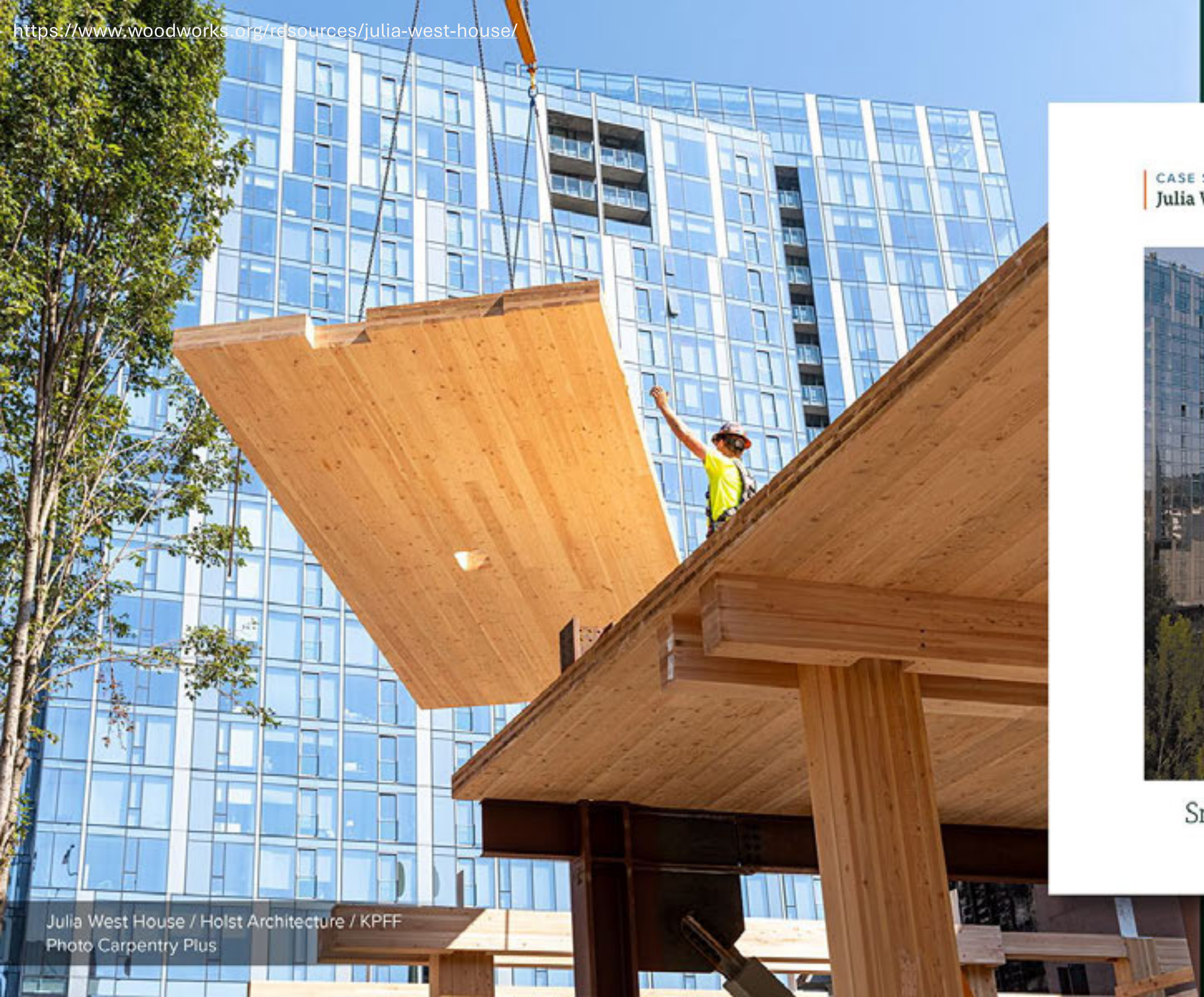
1510 Webster / oWow / DCI Engineers / Photo: Andrew Nelson



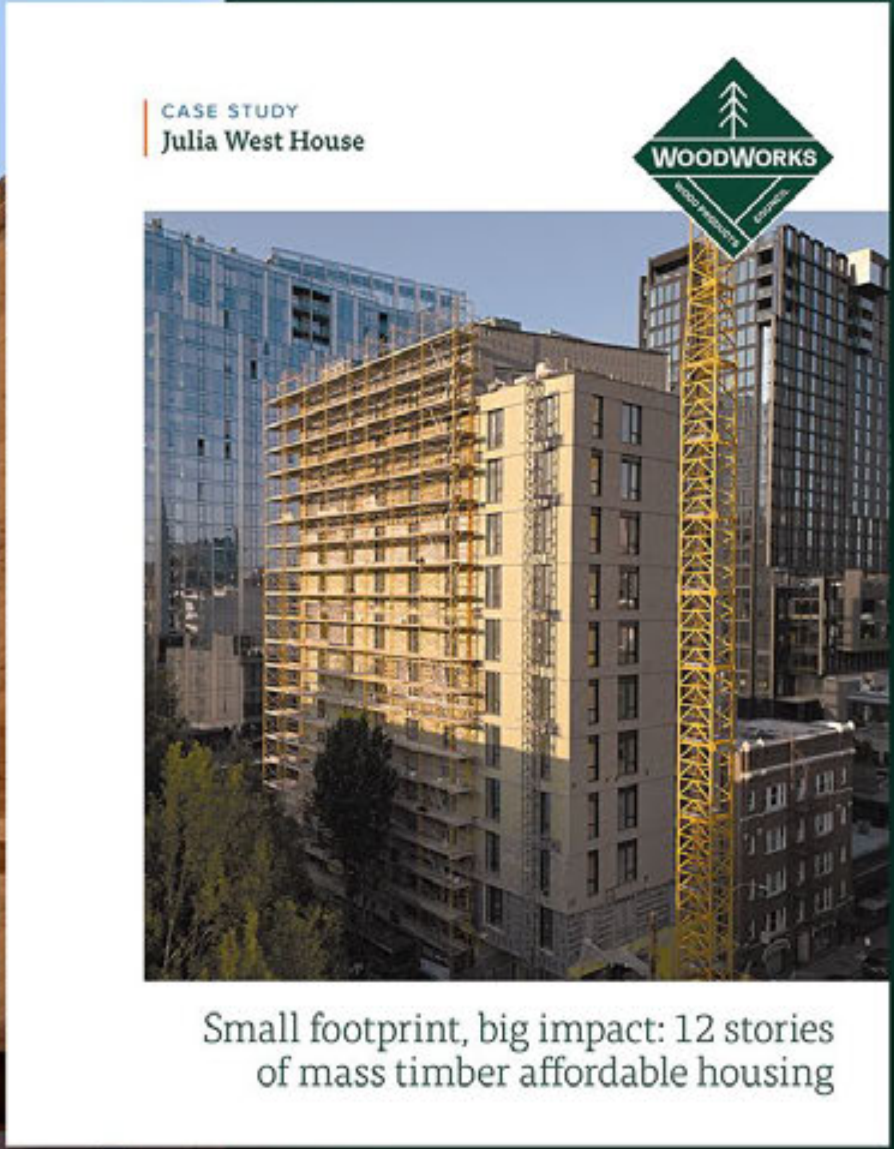
CASE STUDY
1510 Webster

16 stories of mass timber change the game for affordable housing

https://www.woodworks.org/resources/julia-west-house/



Julia West House / Holst Architecture / KPFF
Photo Carpentry Plus

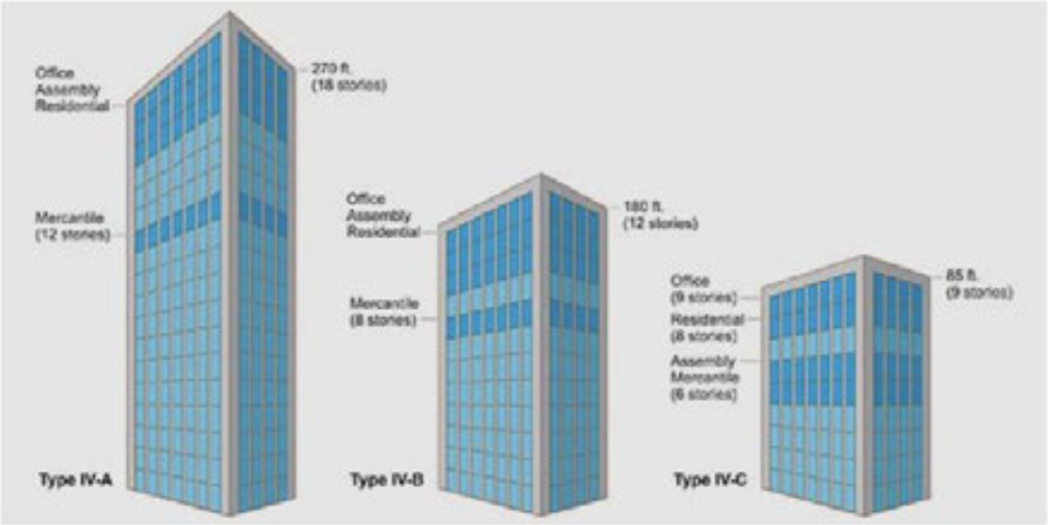


CASE STUDY
Julia West House

Small footprint, big impact: 12 stories of mass timber affordable housing

WOODWORKS IS SUPPORTING 240 TALL WOOD PROJECTS IN DESIGN, AND 21 PROJECTS UNDER CONSTRUCTION OR BUILT

Tall Mass Timber Resources



Tall Mass Timber

Code opportunities and requirements, FAQs, project examples and resources for teams interested in tall timber projects.

Learn More

www.woodworks.org/learn/mass-timber-clt/tall-mass-timber/

What's the 'Sweet Spot' for Tall Mass Timber?

Depends on many factors:

- Project Use
- Site Constraints
- Local Zoning & FAR Limitations
- Budget
- Client Objectives for Sustainability, Exposed Timber
- And More…

But Some General Trends Could Be:

Type IV-C Tall Mass Timber

Example R-2, Type IV-C Building

Not Likely to Utilize Podium Due to Overall Building Height Limit (85 ft) Relative to # of Timber Stories (8)

Same Overall Building Height Limit as IV-HT (85 ft) but higher Fire-Resistance Ratings Req'd

3 Additional Stories Permitted Compared to IV-HT

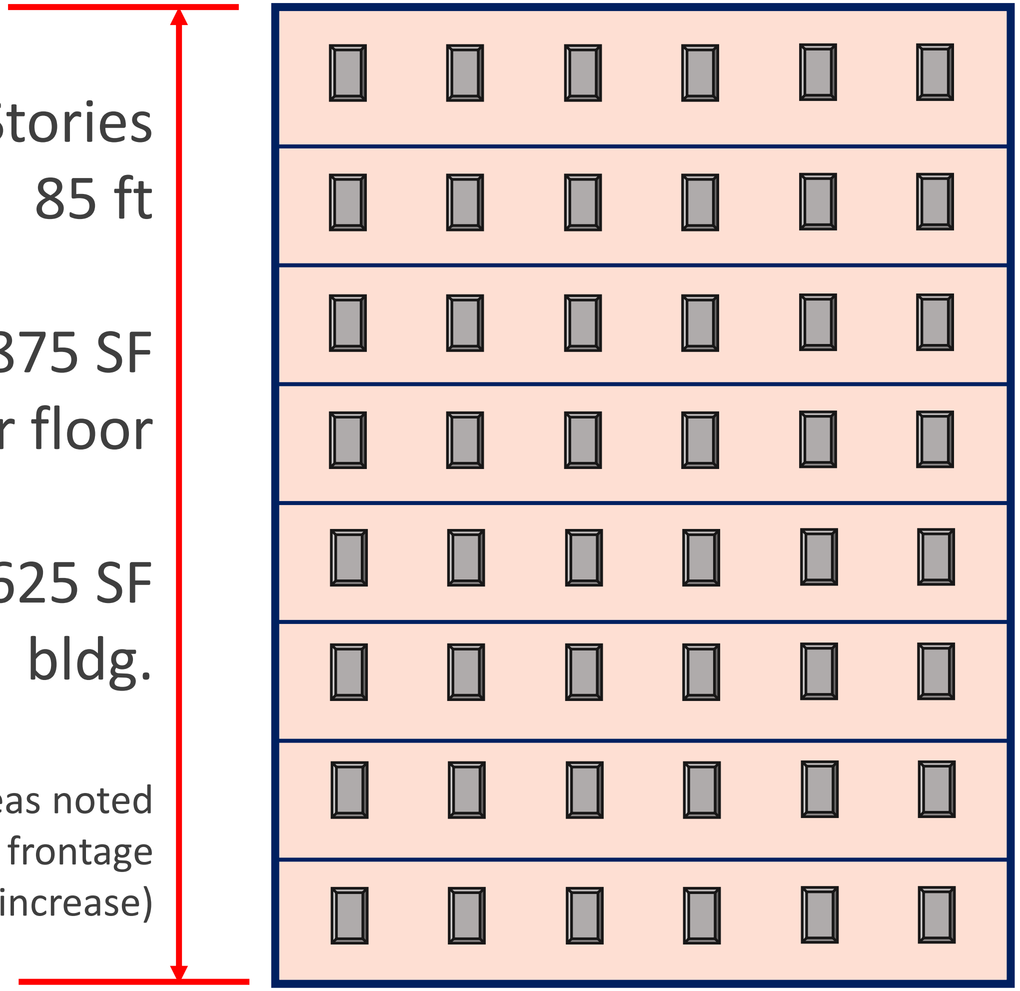
All Timber Exposed

8 Stories
85 ft

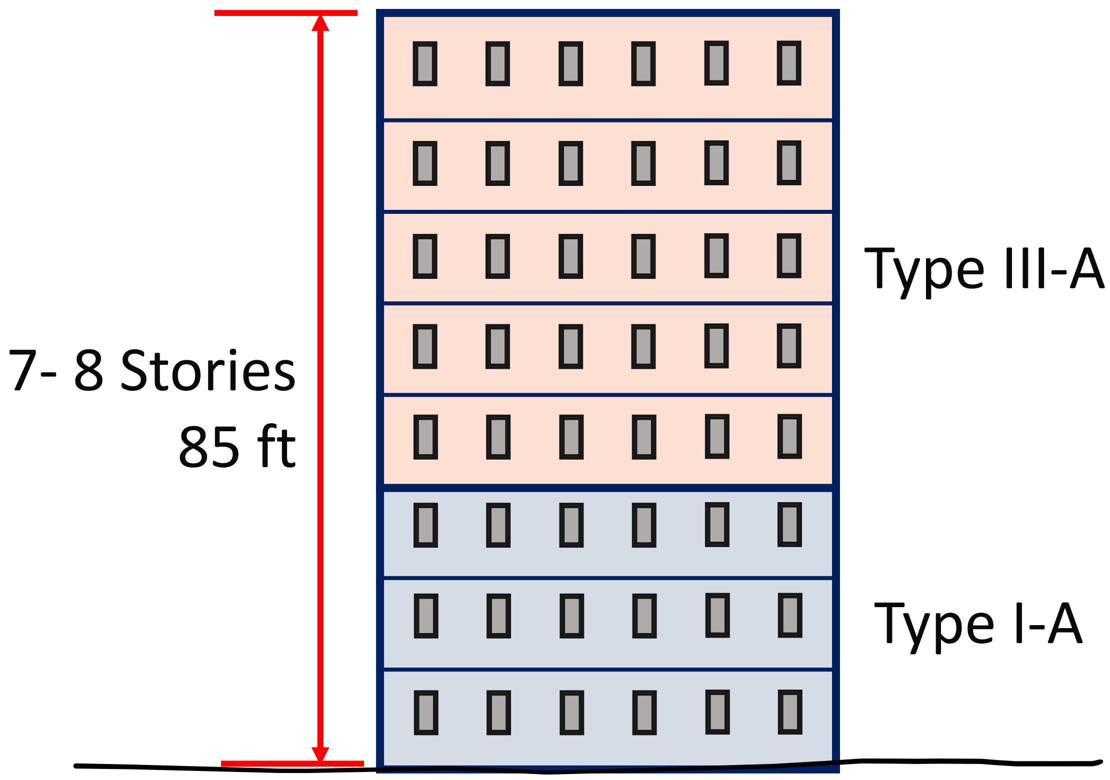
76,875 SF
max per floor

230,625 SF
bldg.

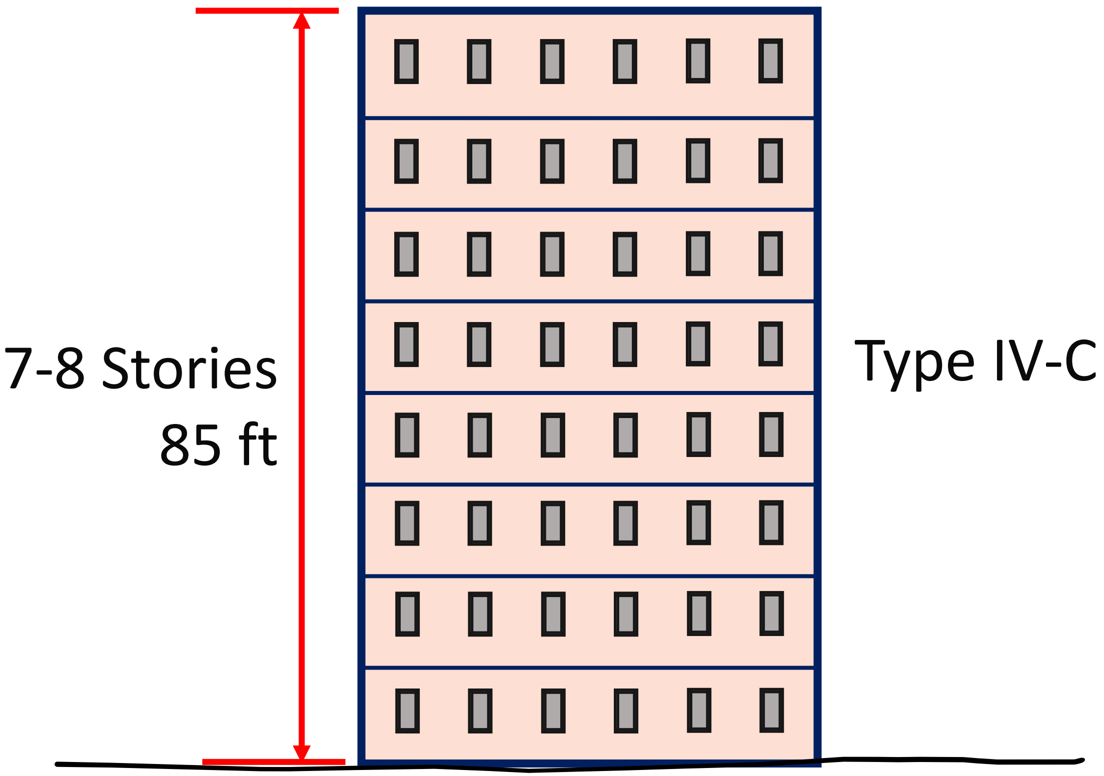
(areas noted assume no frontage increase)



R-2 Occupancy, Type III-A vs Type IV-C



Type III-A



Type IV-C

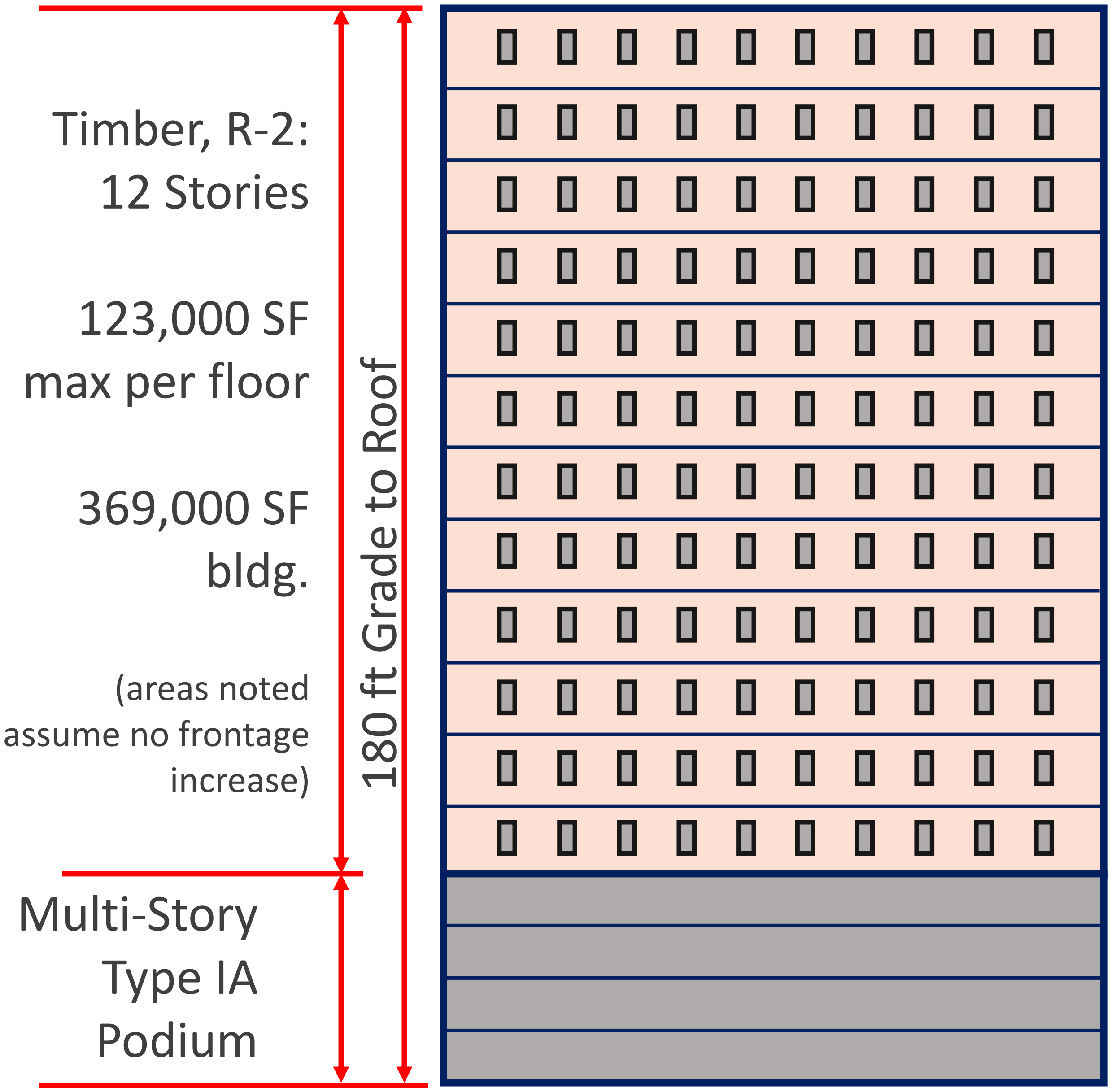
Type IV-B Tall Mass Timber

Example Mixed-Use, Type IV-B Building

Likely to Utilize Podium Due to Overall Building Height Limit (180 ft) Relative to # of Timber Stories (12)

Same Fire-Resistance Ratings Req'd as IV-C But Limitations on Timber Exposed (adjusted in 2024 IBC)

4 Additional Stories Permitted Compared to IV-C



Type IV-A Tall Mass Timber

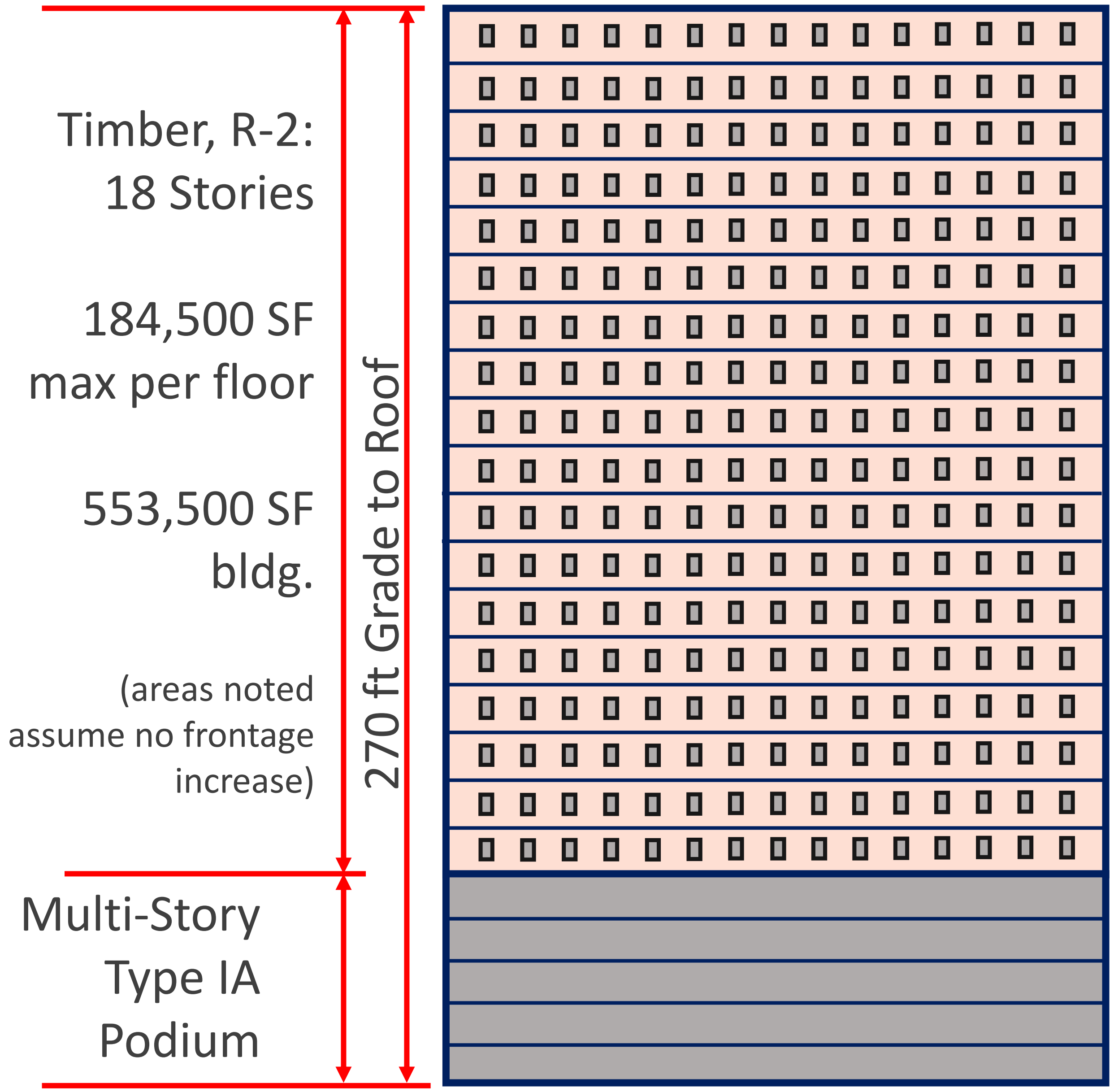
Example Mixed Use, Type IV-A Building

Likely to Utilize Podium Due to Overall Building Height Limit (270 ft) Relative to # of Timber Stories (18)

Higher Fire-Resistance Ratings Required than IV-B For Primary Frame

6 Additional Stories Permitted Compared to IV-B

No Exposed Timber Permitted




IV-C
IV-B
IV-A

Questions? Ask us anything.

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