

Mass Timber Economics: Cost Influences and RealWorld Comparisons

October 14, 2026

Presented by:

Chris Kendall, KL&A Engineers & Builders

Suzanne Robinson, LeMessurier Structural Engineers

Steve Whitcraft, Turner Construction Company



Agenda



Mass Timber Economics: Cost Influences and Real-World Comparisons

AIA Course	1:00 – 1:05 pm EDT	Welcome
	1:05 – 1:50 pm EDT	Presentation
	1:50 – 2:00 pm EDT	Webinar Q&A
NON-Credit	2:00 – 2:15 pm EDT	Manufacturer Spotlight – Discussion with Quality Buildings

MASS TIMBER DESIGN & COST CONSIDERATIONS

October 14, 2026

Chris Kendall, P.E. Principal
ckendall@klaa.com

Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board



140+

Total Staff

70+

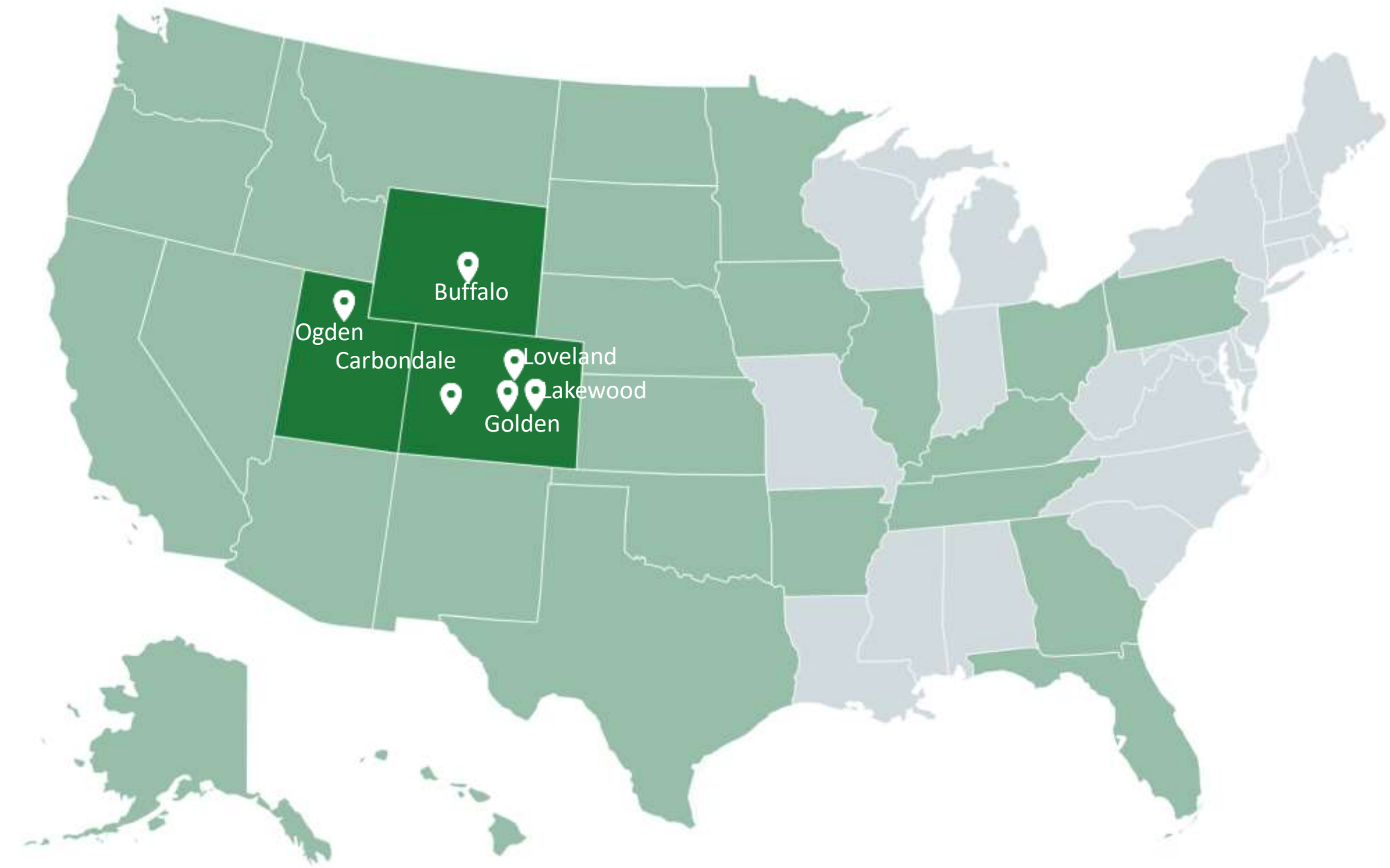
Licensed
Engineers

6

Offices

32

Years in
business



SERVICES

- Structural Engineering
- Civil Engineering
- Embodied Carbon Consulting
- Steel Detailing
- Steel Construction Management
- Mass Timber Construction Management

Outline



WHAT IS MASS TIMBER?



MASS TIMBER PRECEDENT PROJECTS

Programs
Construction Types
Asides



BUILDING CODES AND FIRE RATINGS



LCA CASE STUDY SERIES

Denver Office Feature



TAKE AWAYS

Mass Timber | What is it?



- It's made of trees
- It's solid wood
(big pieces made out of little pieces)
- It's large flat panels
(CLT, NLT, DLT, GLT, MPP etc.)
- It's also glulam beams and columns
- It's prefabricated

Photo Credit: KL&A



MASS TIMBER PRECEDENT PROJECTS

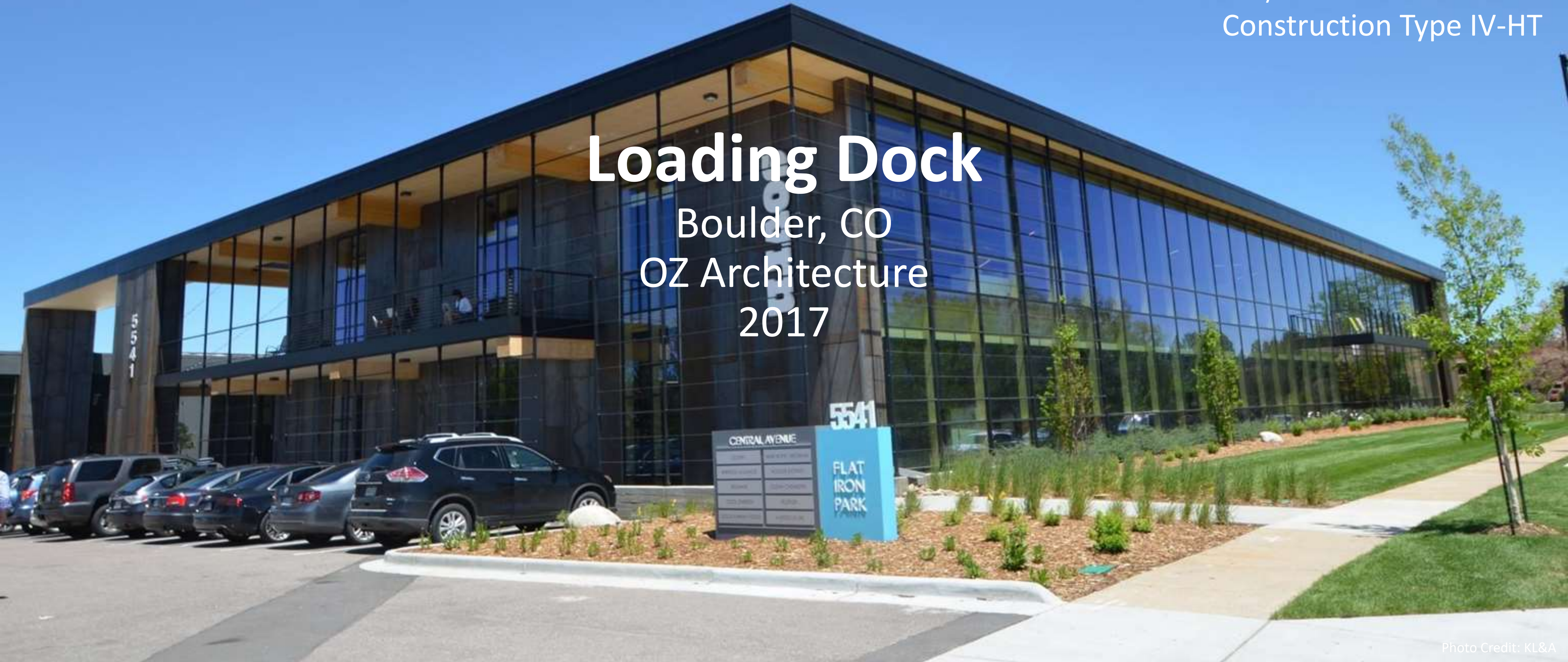
Office
34,000 Square Feet
25'x30' Grid
7-Ply 5-layer CLT Floor Panel
5-Ply CLT Roof Panels
Glulam post and beam
3-Ply CLT Shear Walls
Construction Type IV-HT

Loading Dock

Boulder, CO

OZ Architecture

2017



Loading Dock



Civic Office
31,600 Square Feet
3-Ply CLT Floor and Roof Panels
Glulam Post and Beam
Construction Type V-B

Northglenn City Hall

Northglenn, CO
Anderson Mason Dale
2024



Northglenn City Plan Diagram

Office
23,035 Square Feet
3-Ply CLT Floor and Roof Panels
5-Ply CLT Shear Walls
Glulam Post and Beam
Construction Type III-B

DU Burwell Center for Career Achievement

Project
Construction Types
Asides

Denver, CO
Lake|Flato and SAR+
2021

Office
23,000 Square Feet
23'x23' Grid
3-Ply CLT Floor and Roof Panels
5-Ply CLT Shear Walls
Glulam Post and Beam

Structural Elements

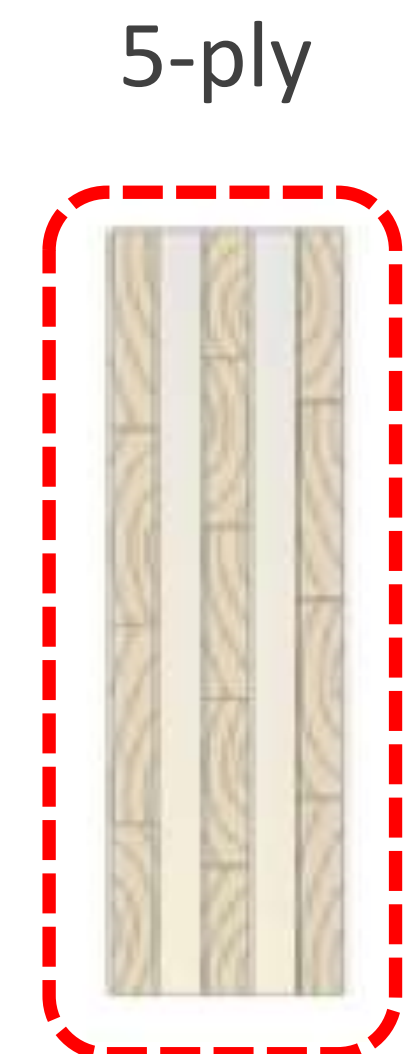
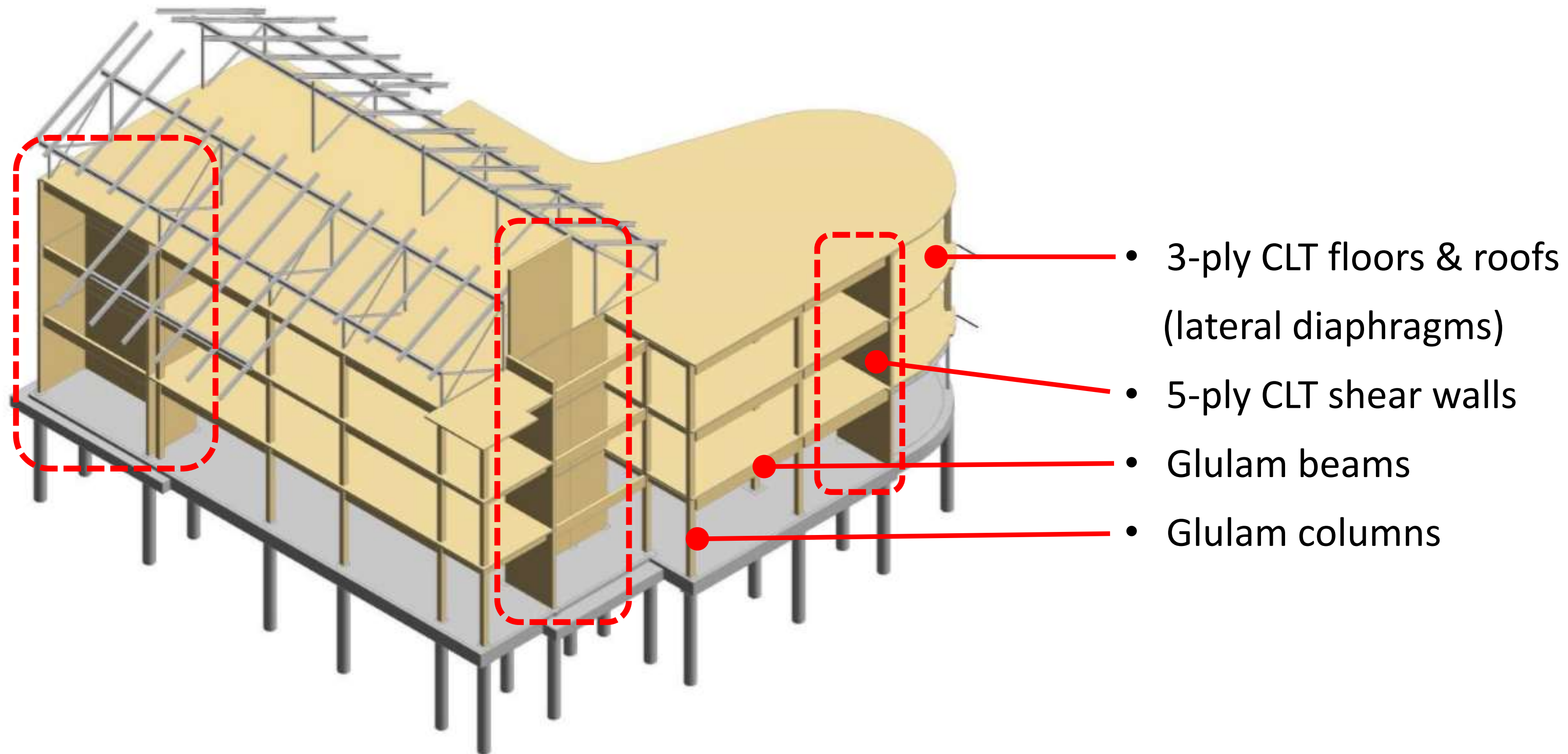
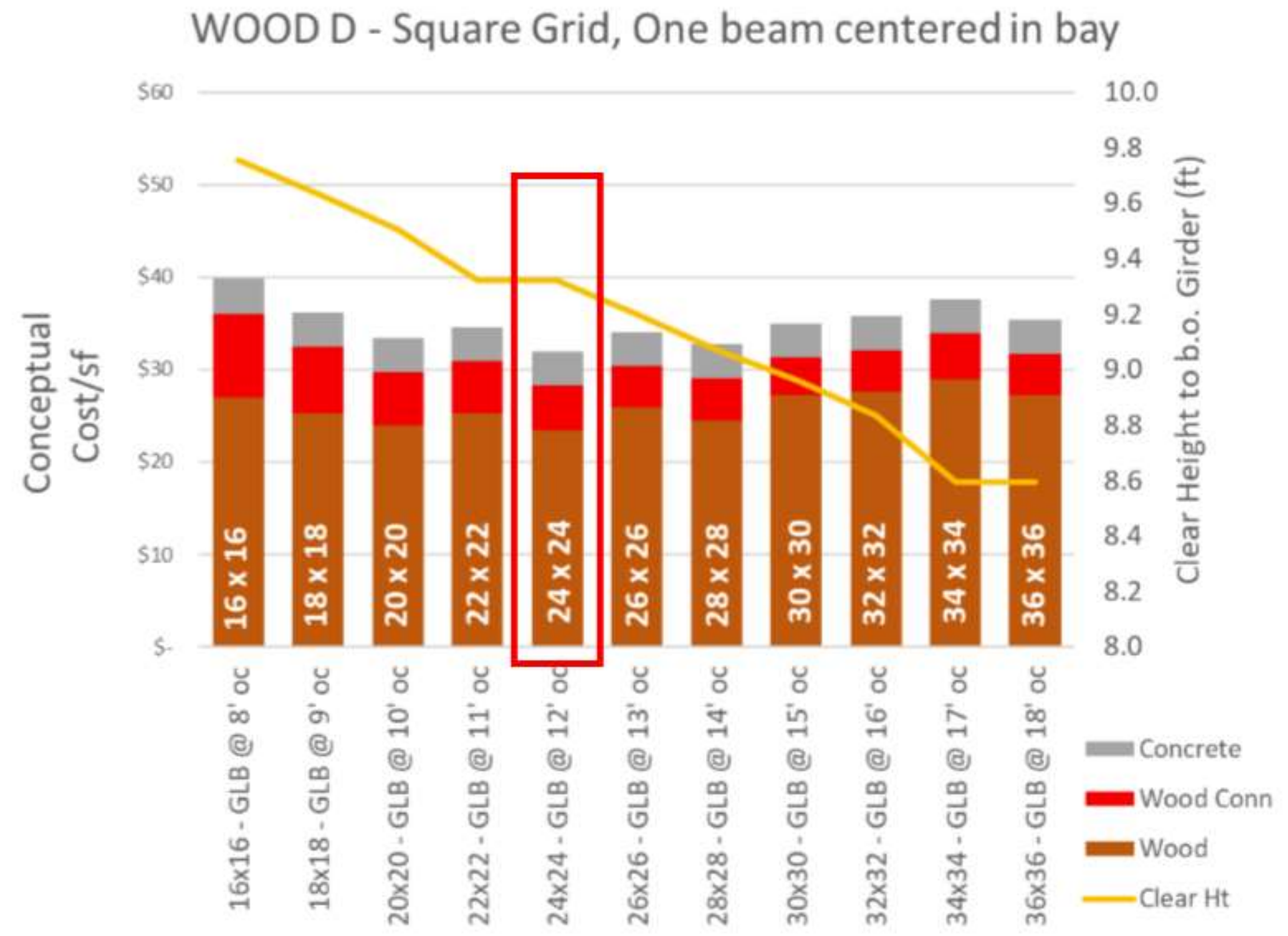
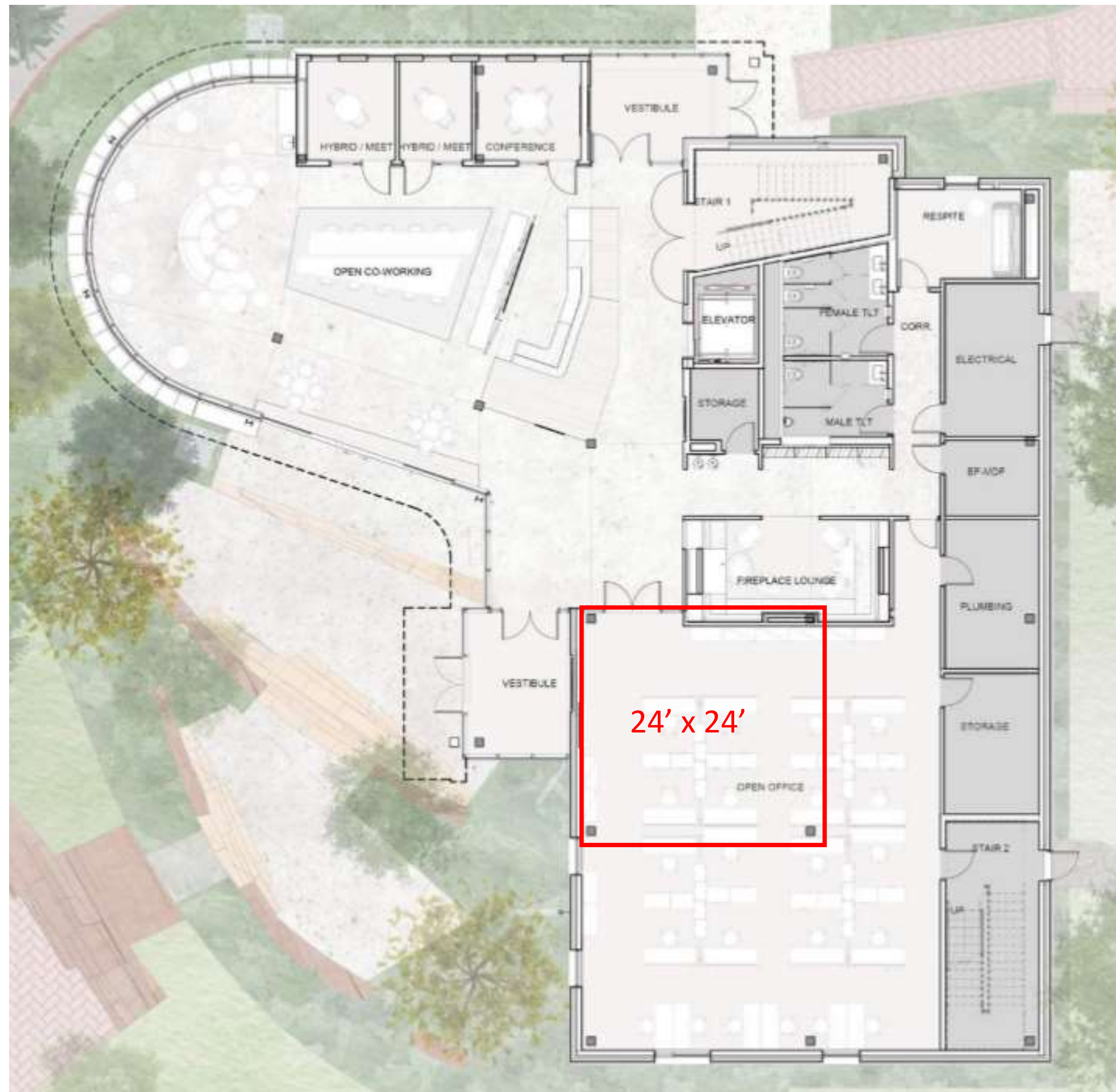


Image courtesy of KL&A

DU Burwell Center Grid Selection



Platte Fifteen

Denver, CO
OZ Architecture
2019

Platte Fifteen Life Cycle Assessment



Authors
KL&A Engineers and Builders
Adolfson & Peterson

THINK
WOOD.



Office
30'x30' Grid
135,000 Square Feet Mass
Timber Construction Over
145,000 Square Feet of Concrete
3-Ply CLT Floor and Roof Panels
Glulam Post and Beam
Construction Type III-B
Over Type I-A

Photo Credit: JC Buck

PLATTE 15 CONNECTIONS





Multi-Unit Residential
232,000 Square Feet
Wood construction over
208,000 Square Feet
concrete
CLT and Light Frame Hybrid
292 Units
Construction Type III-A
Over Type I-A

Cirrus

Denver, CO
Davis Partnership Architects & Katterra
2022

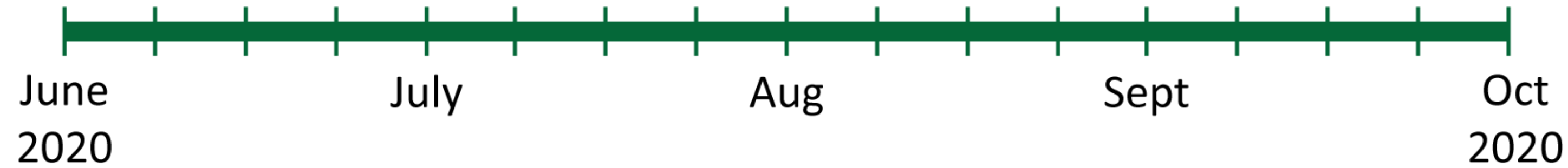




Cirrus Light Frame/Mass Timber Hybrid

Cirrus Hybrid Framing Duration

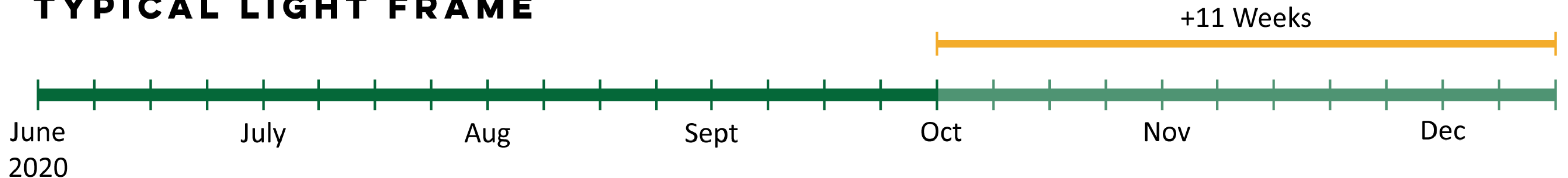
MASS TIMBER HYBRID ACTUAL



MASS TIMBER HYBRID ESTIMATED



TYPICAL LIGHT FRAME



232,000 ft² of wood construction framed in 17 weeks (13,640 ft²/week).

A construction worker wearing a bright yellow-green safety vest and an orange hard hat is positioned on a large, cantilevered concrete slab of a building under construction. The worker is seen from the back, looking down at the edge of the slab. The building's structure consists of thick, grey concrete beams and slabs, with a window opening visible below the worker. The sky is a clear, pale blue.

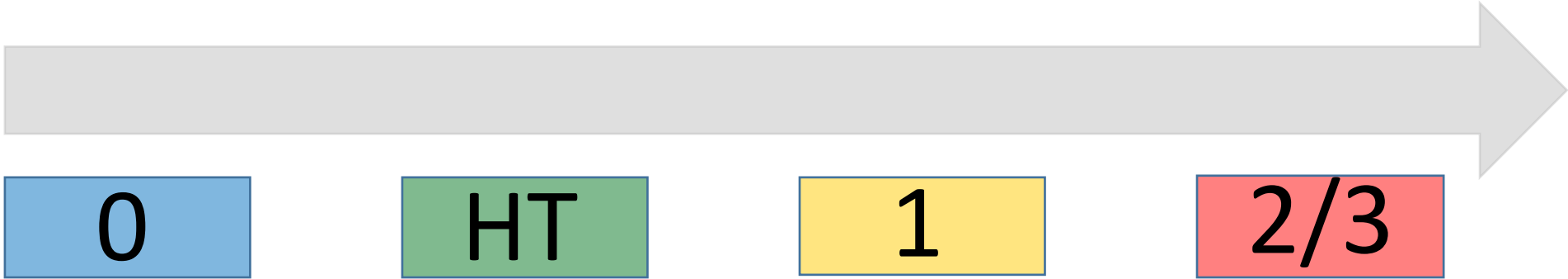
MASS TIMBER IN BUILDING CODES

IBC Table 601

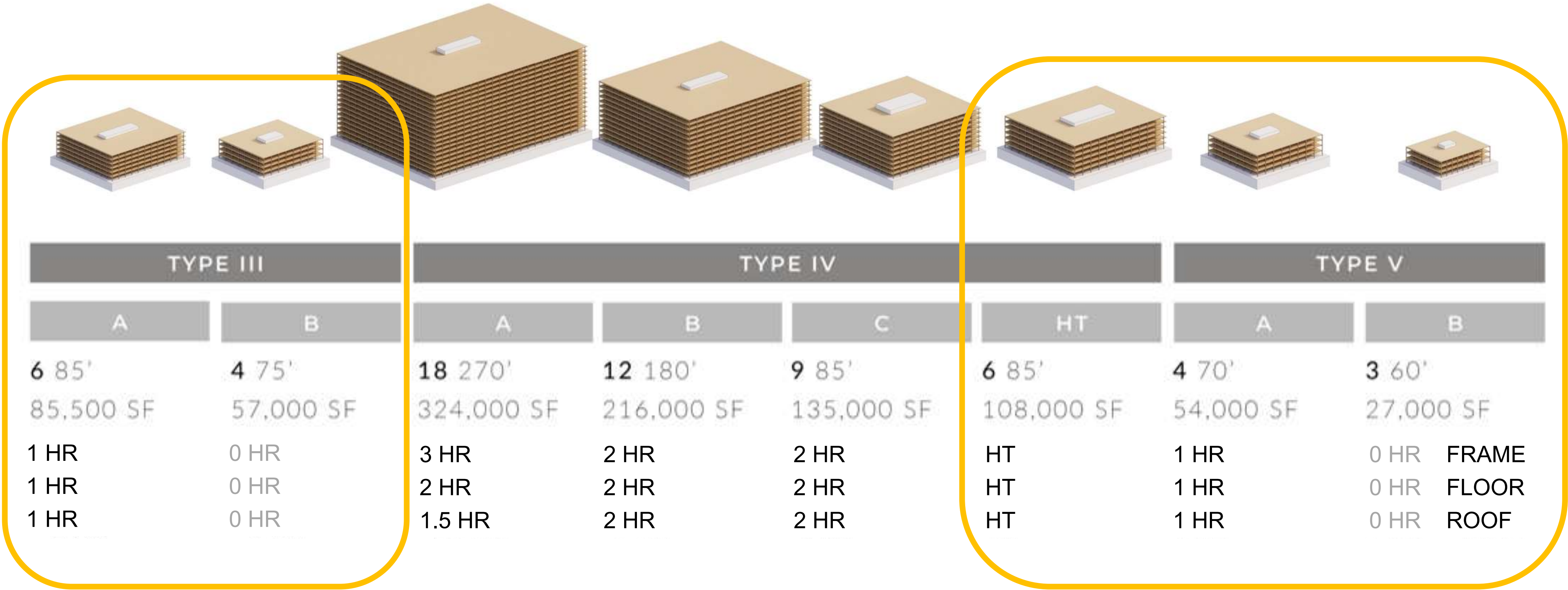
TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

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 ^{e, 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)	1½ ^b	1 ^{b, c}	1 ^{b, c}	0 ^c	1 ^{b, c}	0	1½	1	1	HT	1 ^{b, c}	0	

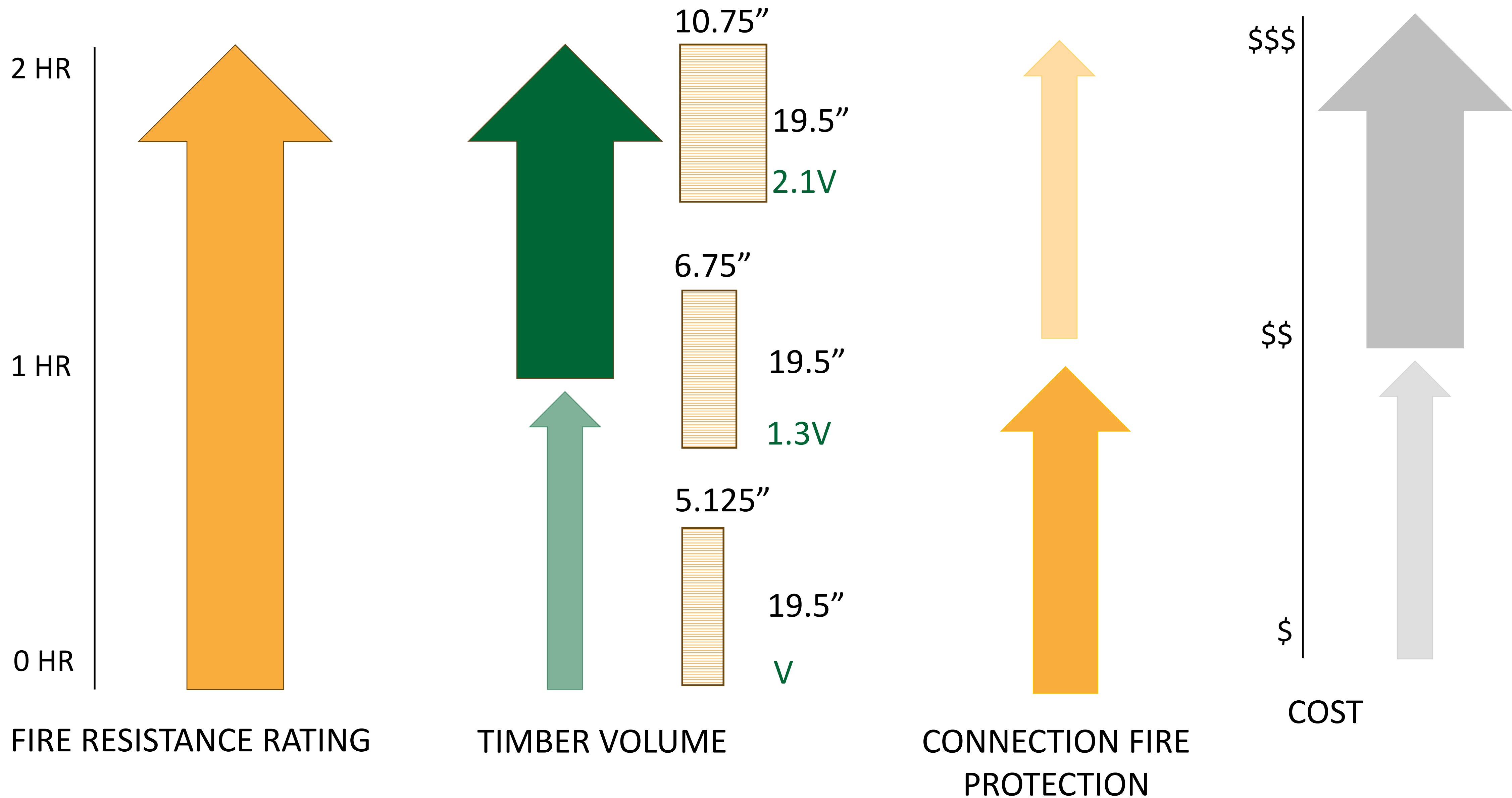
c. In all occupancies, heavy timber complying with Section 2304.11 shall be allowed for roof construction, including primary structural frame members, where a 1-hour or less fire-resistance rating is required.



SELECT A CONSTRUCTION TYPE WITH THE LOWEST FIRE-RESISTANCE RATING POSSIBLE

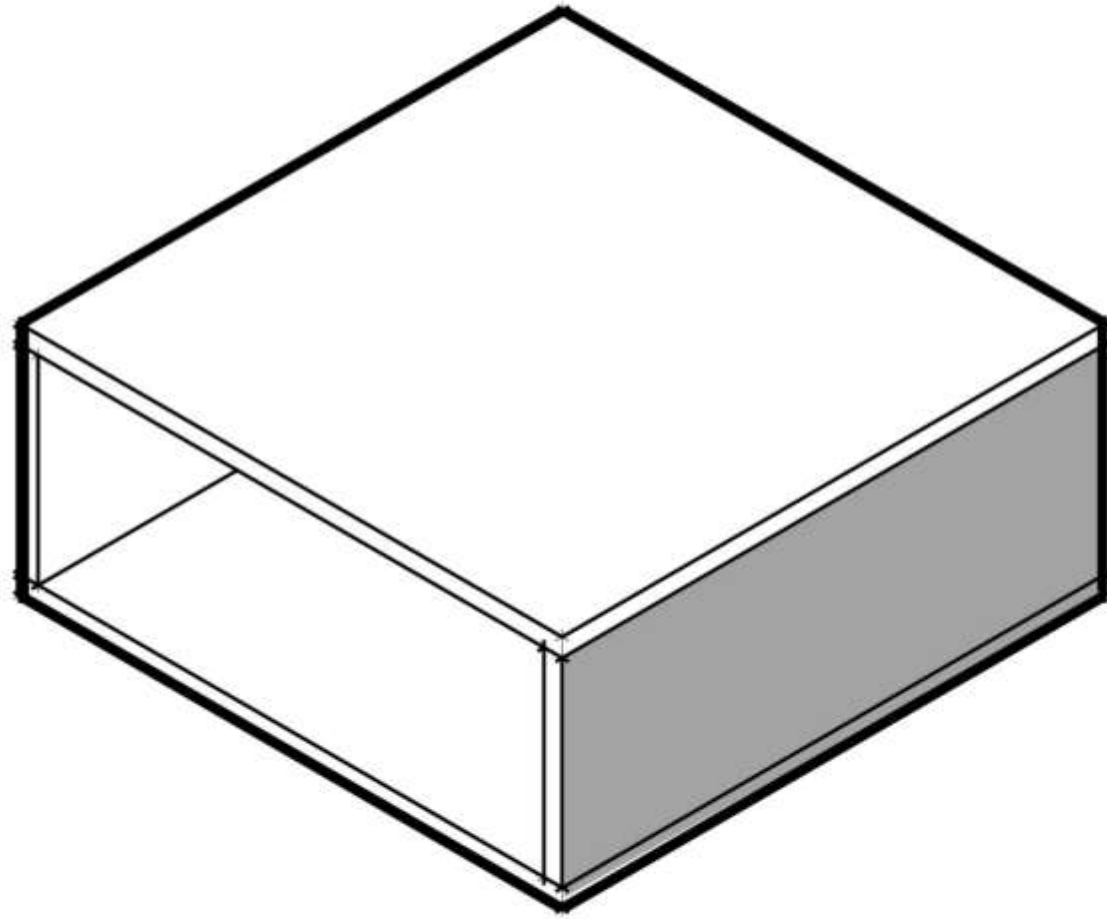


As Fire Resistance Rating Increases...Cost Increases



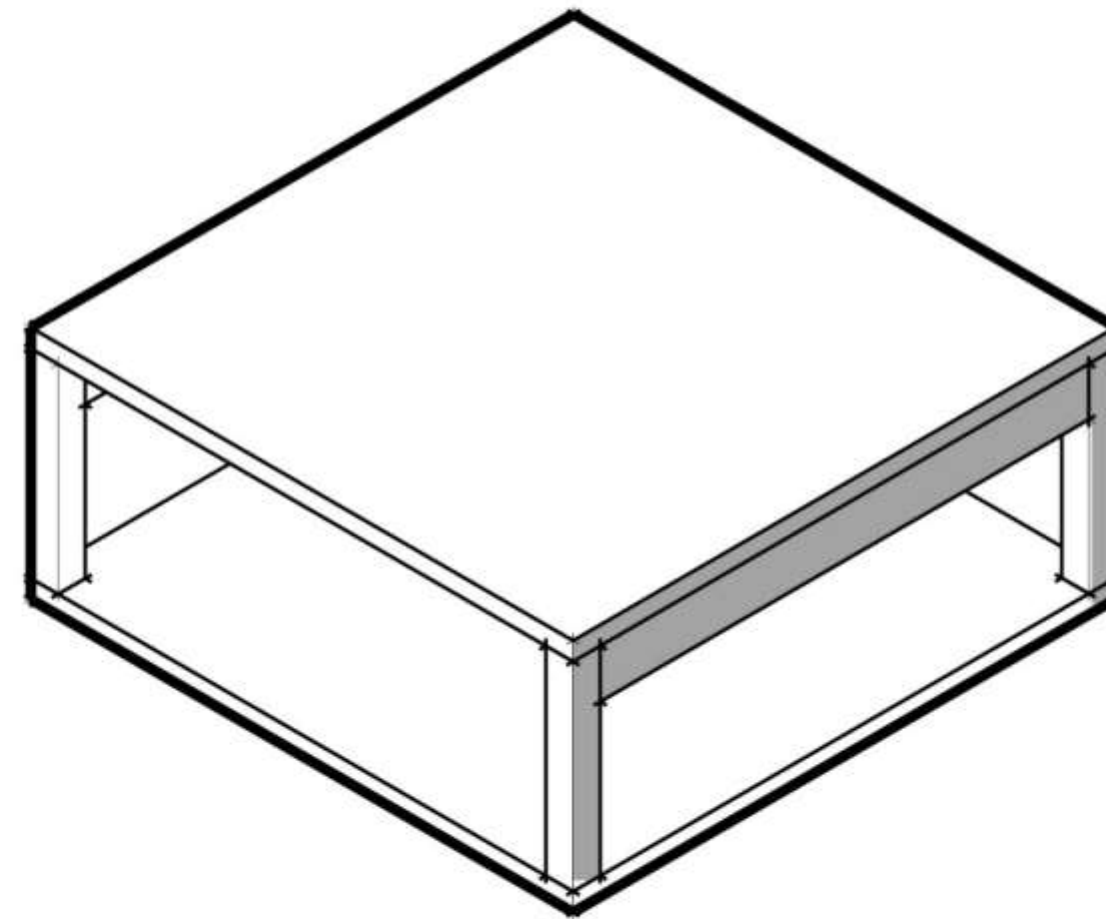


MASS TIMBER SYSTEMS AND COSTS



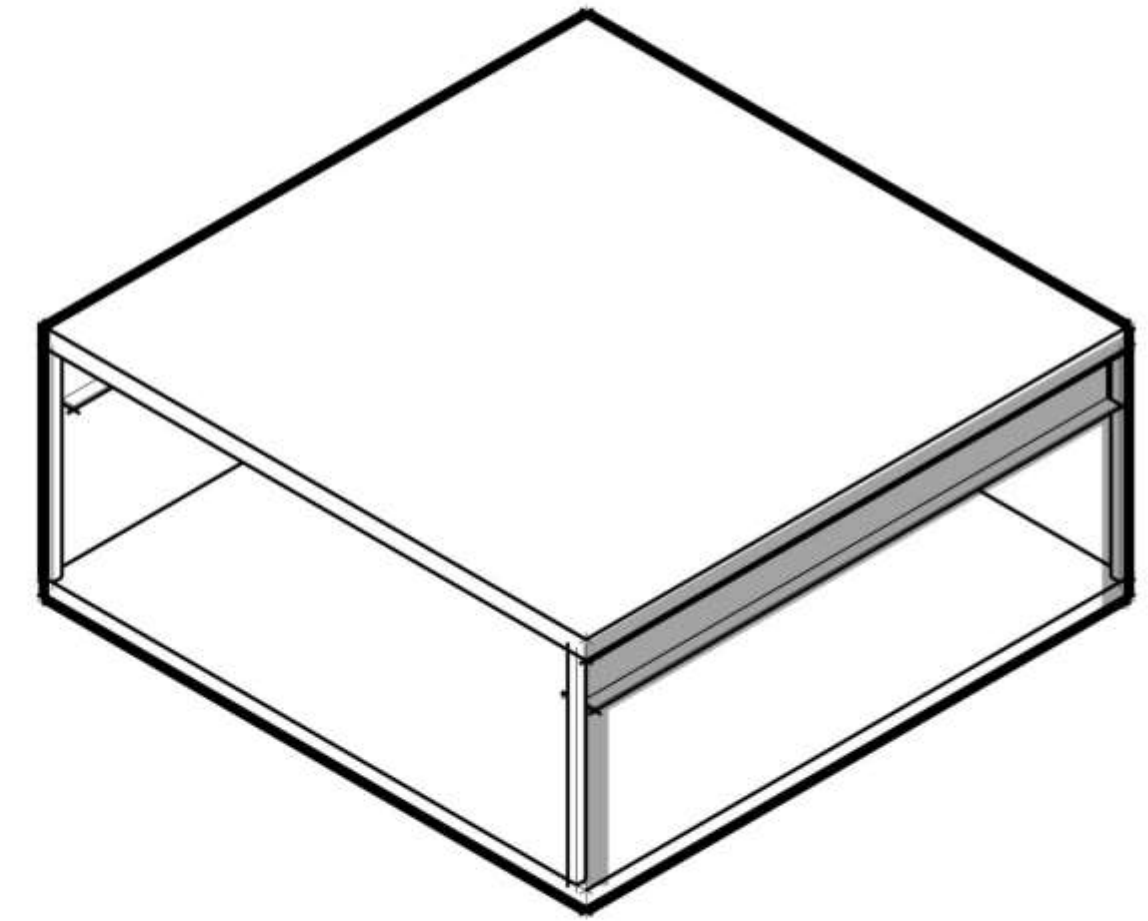
PANELIZED SYSTEM

MASS TIMBER PANELS FOR ALL PRIMARY
STRUCTURAL ELEMENTS



TIMBER FRAME

MASS TIMBER FLOOR PANEL SLABS W/ A PRIMARY
STRUCTURE OF GLULAM COLUMNS AND BEAMS



HYBRID SYSTEM

MASS TIMBER FLOOR SLABS SUPPORTED
BY STEEL OR CONCRETE



PANELIZED SYSTEM

- WOOD VOLUME IS CRITICAL ASPECT
- BUILDING HEIGHT LIMITED BY PANEL COMPRESSION CAPACITY AT FLOOR TO WALL INTERFACE
- LIMITS ARCHITECTURAL PROGRAM



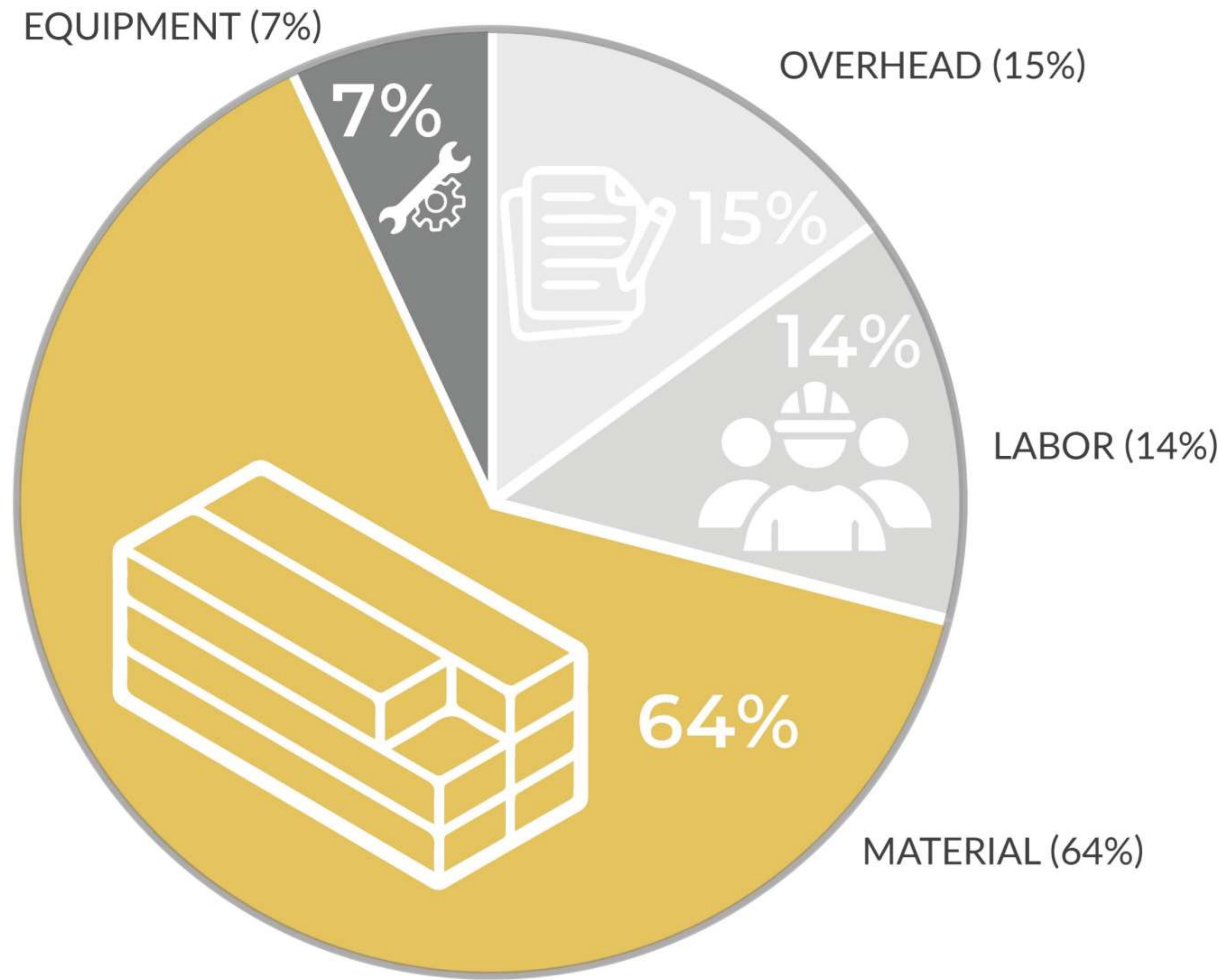
TIMBER FRAME

- WOOD VOLUME IS CRITICAL
- ↑ COST UP W/ SPAN
- ↑ COST UP W/ STEEL CONNECTIONS
- ↑ DEPTH INCREASES RAPIDLY W/ SPAN



HYBRID SYSTEM

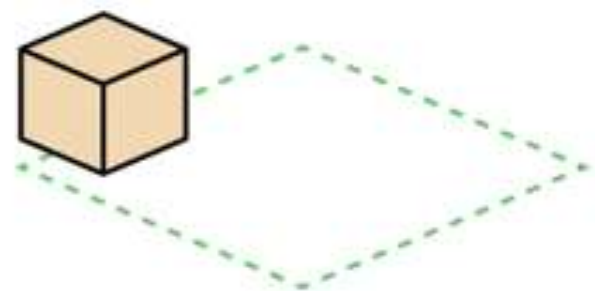
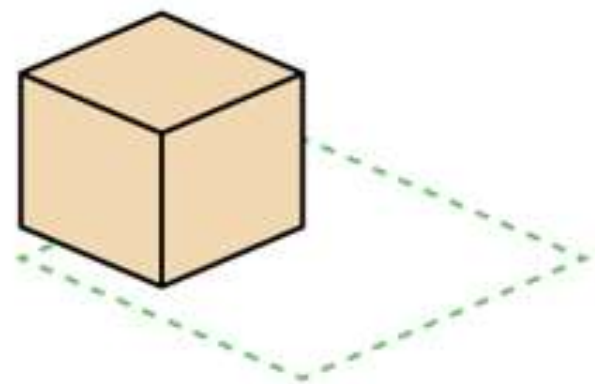
- STEEL PIECE COUNT IS CRITICAL
- ↓ COST DOWN W/ SPAN
- SELECT BUILDING TYPE WITH 'UNRATED' FRAME



Cost related indices

Volume/Area ratio
(VAR)

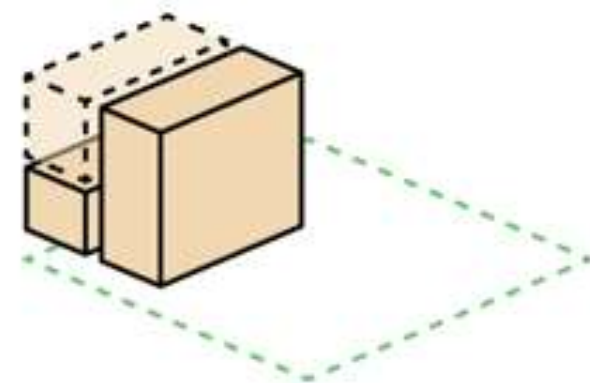
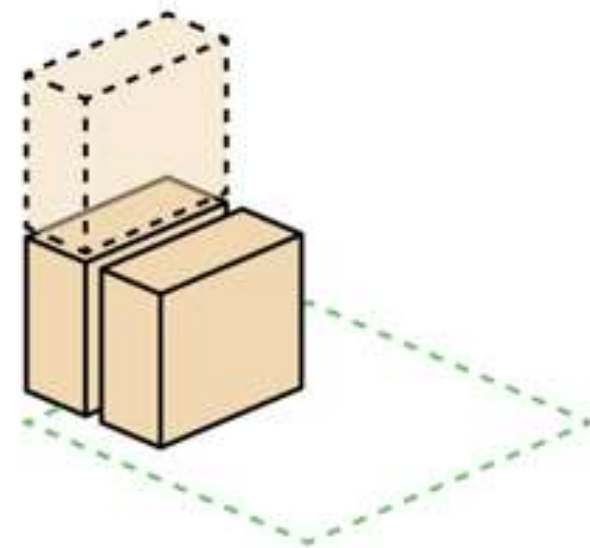
$\frac{\text{Total timber volume}}{\text{Floor area}}$



VOLUME

Cost-Adjusted
Volume/Area ratio
(VAR)

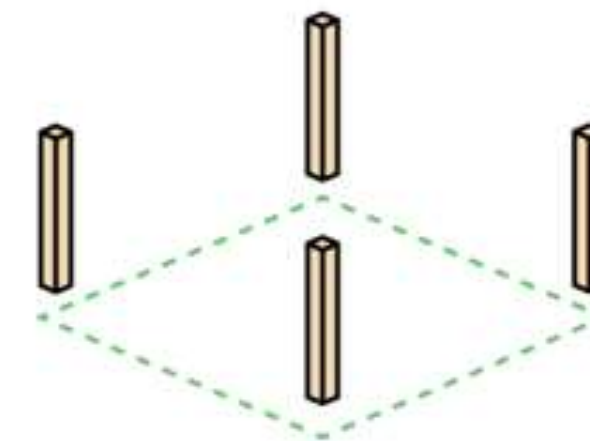
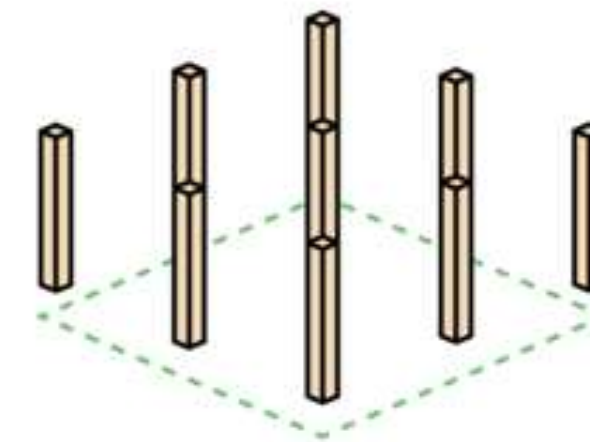
$\frac{\alpha \times \text{GLB volume} + \text{CLT volume}}{\text{Floor area}}$



**GLULAM
vs CLT**

Piece/Area ratio
(PAR)

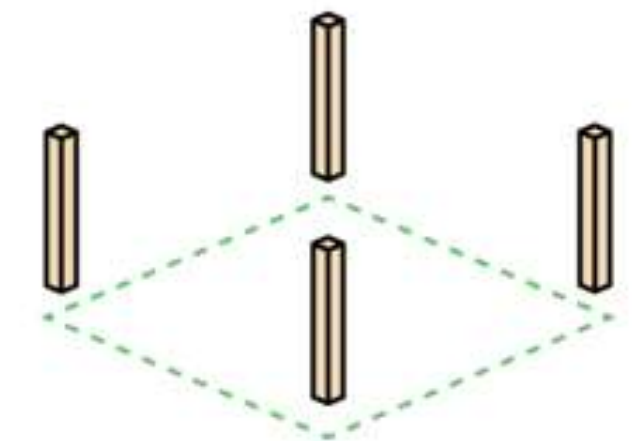
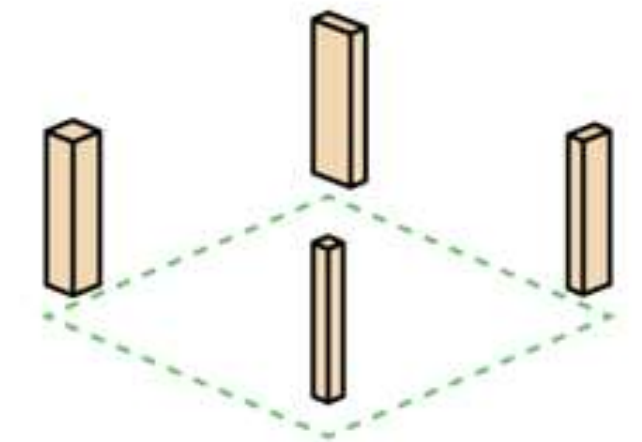
$\frac{\text{Number of pieces}}{\text{Floor area}}$



**NUMBER
of PIECES**

Relative complexity ratio
(RCR)

$\frac{\text{Number of unique pieces}}{\text{Total number of pieces}}$



COMPLEXITY

Worse
↓
Better

Project Cost Data



COST SHOWN AS \$/FT² INSTALLED TIMBER STRUCTURE

A tall, modern multi-story building with a grid-like facade of windows and balconies. The building is situated in an urban environment with other buildings and trees visible in the background and foreground. The sky is overcast.

Student Residential
200,000 Square Feet
5 Ply CLT Floor and Roof Panels
130 Units
586 Beds
Glulam Post and Beam
Type IV-B
Completion March 2027

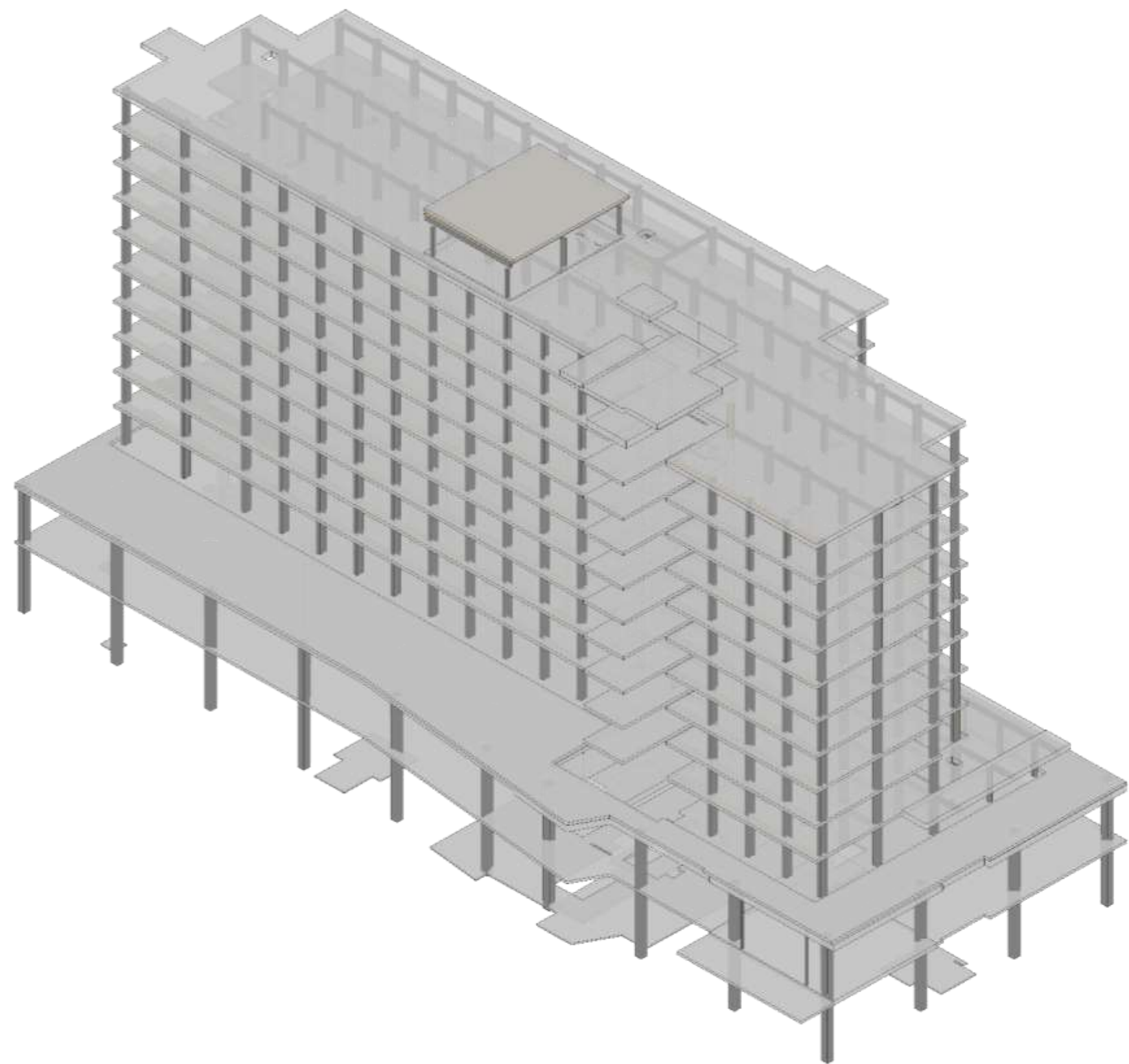
Summit House

Denver, CO
Shears Adkins Rockmore

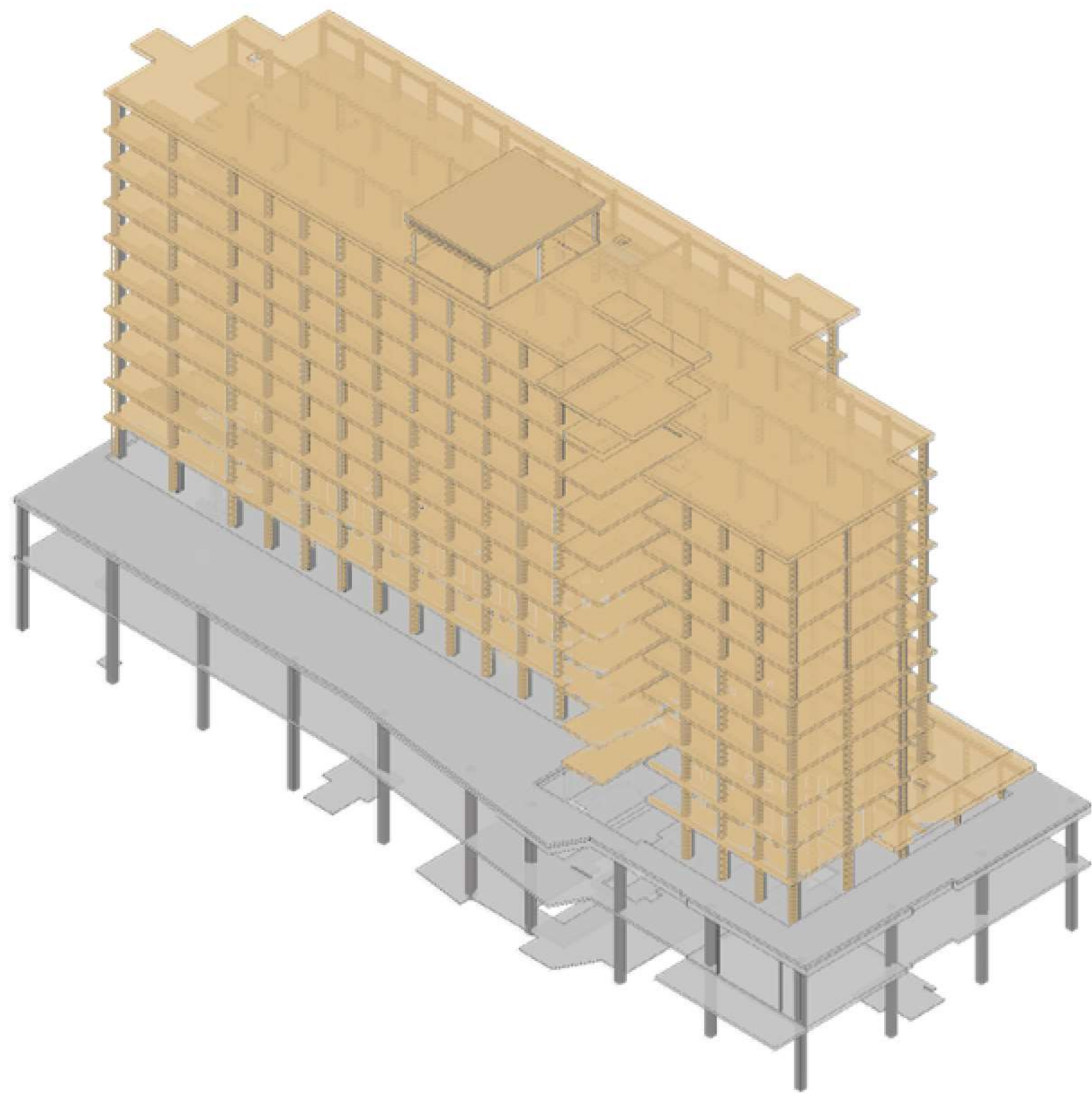
Project Timeline



Summit House Cost Comparison

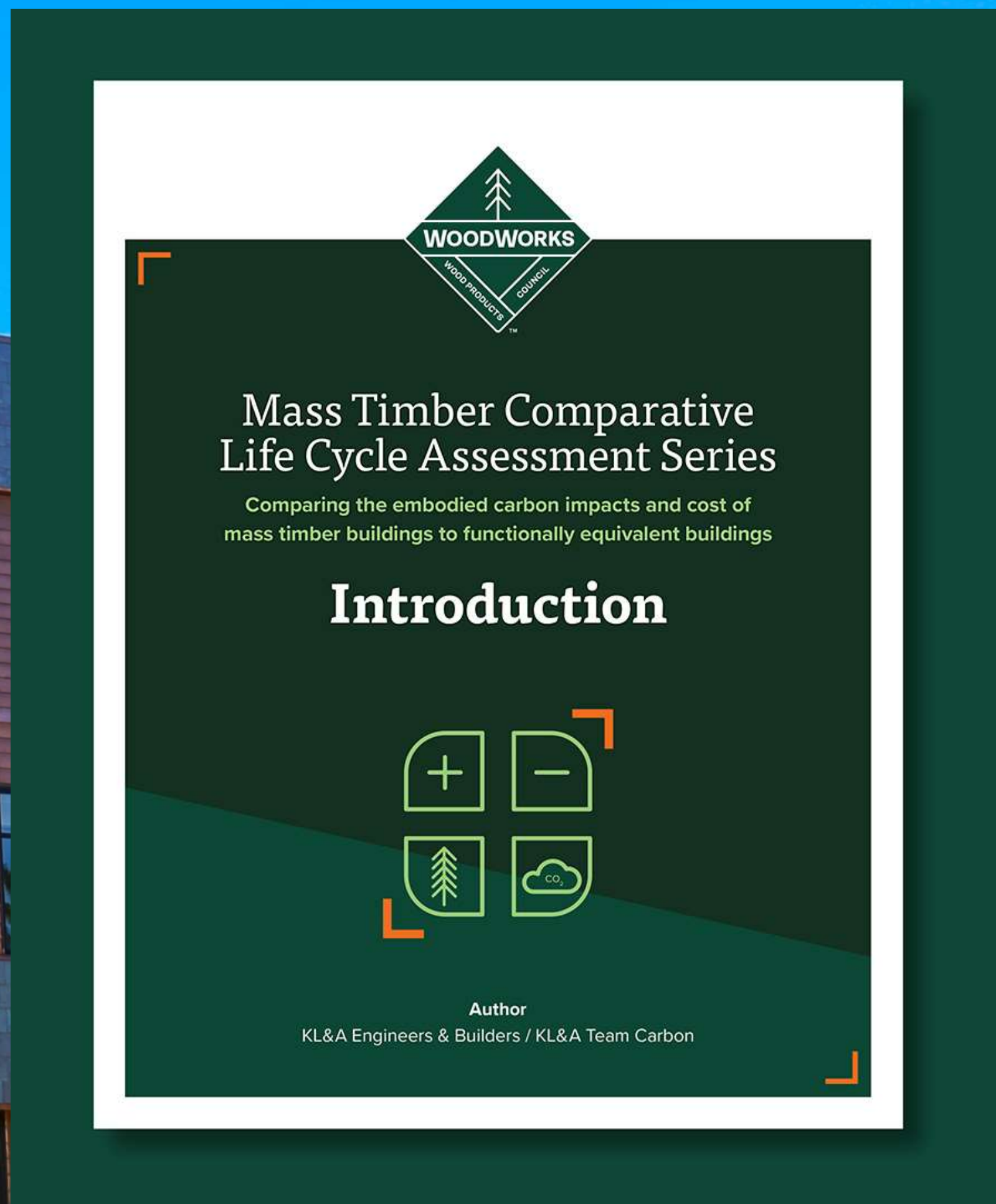


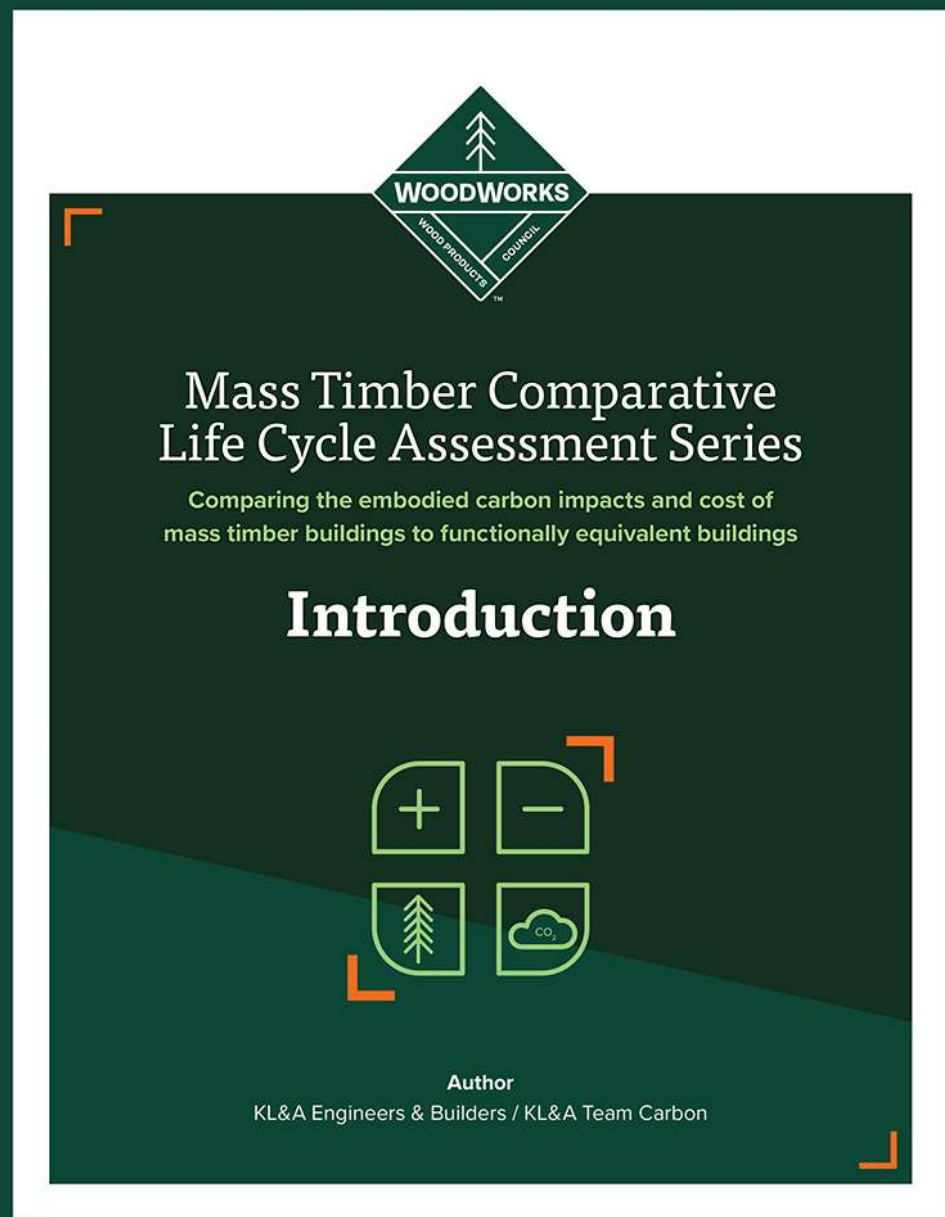
CONCRETE
\$408/SF
22.5 MONTH
CONSTRUCTION
\$285,000 SAVINGS



MASS TIMBER
\$409/SF
19.5 MONTH CONSTRUCTION
0.35% PREMIUM

WoodWorks, KL&A Team Carbon,
USDA U.S. Forest Service, Softwood Lumber Board





Return to Form

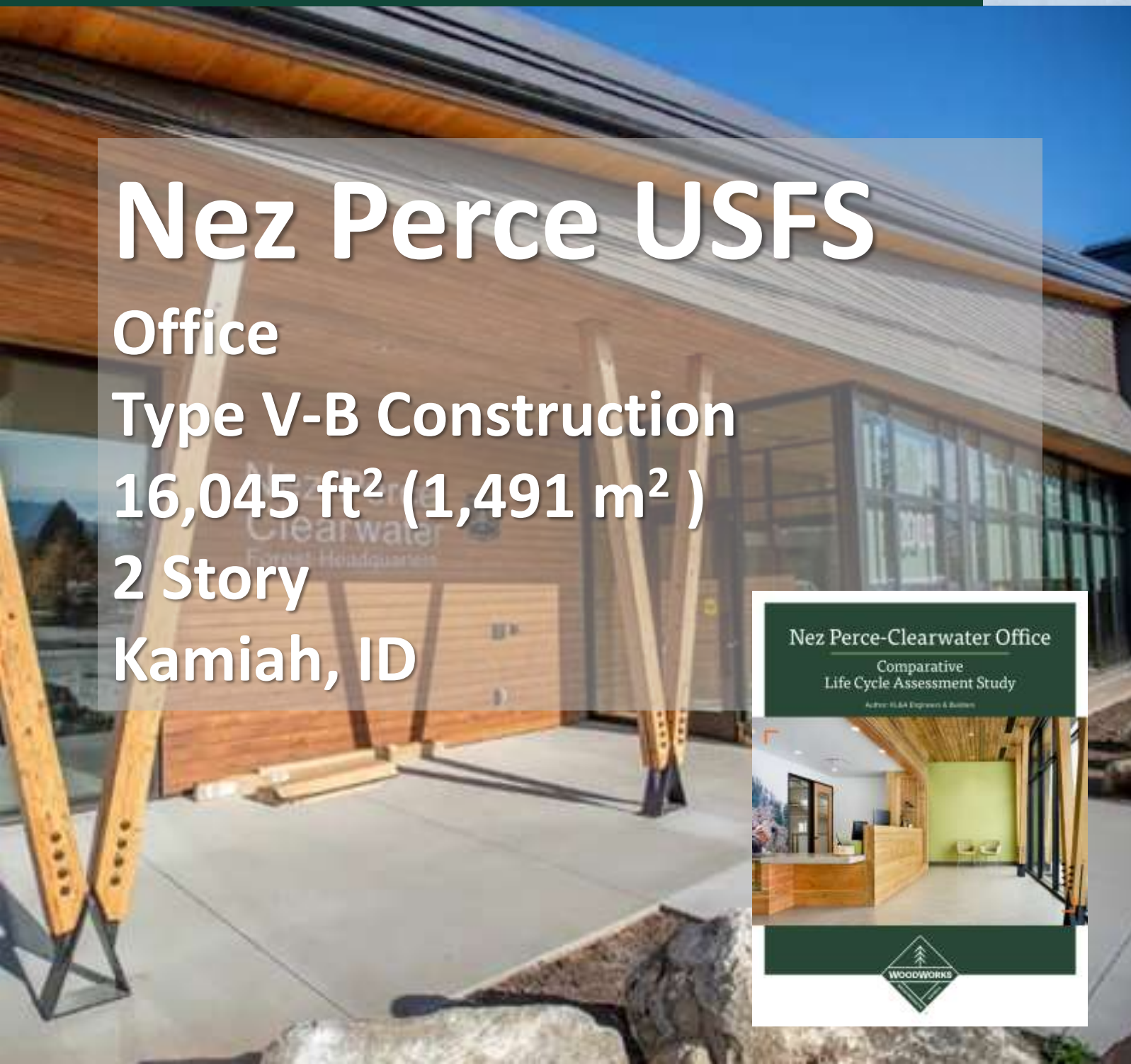
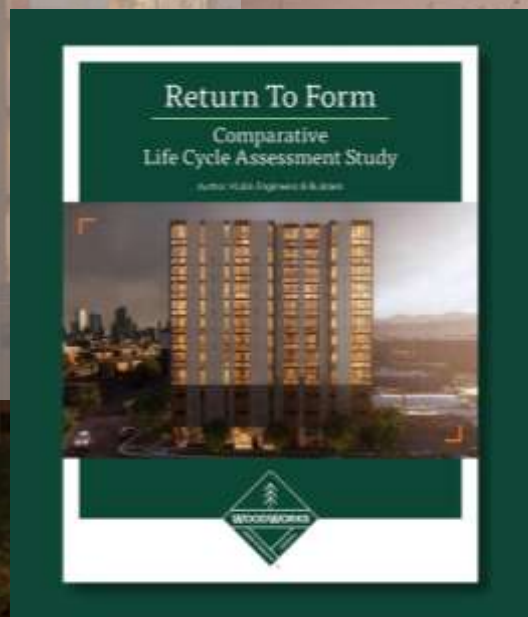
Multifamily / Retail

Type IV-B Construction

139,000 ft² (12,900 m²)

12 Story

Denver, CO



Nez Perce USFS

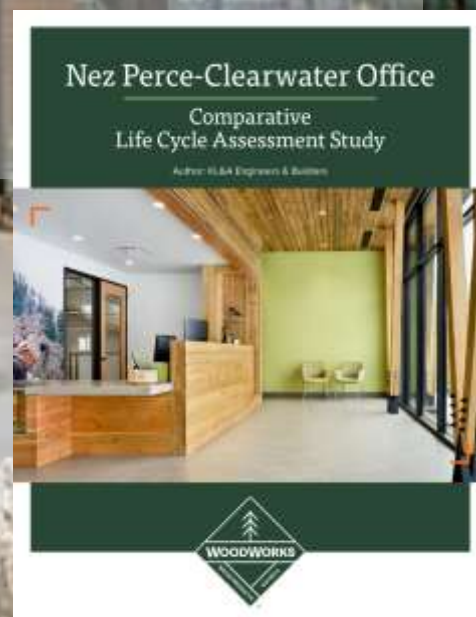
Office

Type V-B Construction

16,045 ft² (1,491 m²)

2 Story

Kamiah, ID



Burwell Center

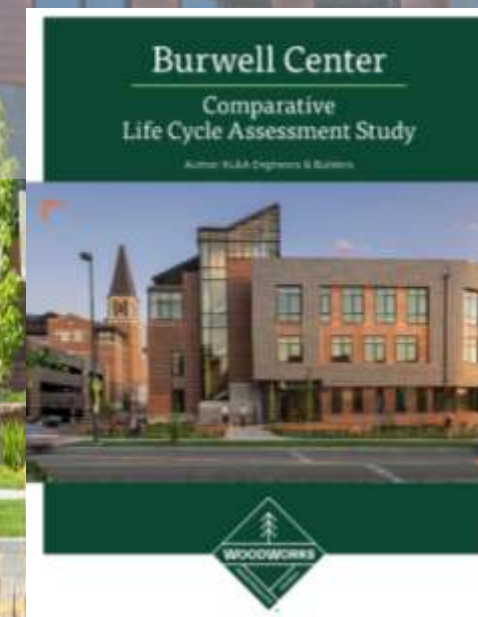
Office / Higher Ed

Type III-B Construction

22,990 ft² (2,136 m²)

3 Story

Denver, CO



Denver Office

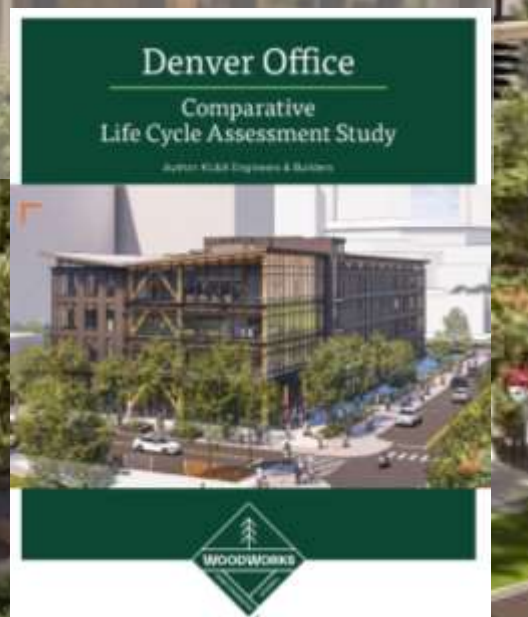
Office / Higher Ed

Type III-A Construction

98,280 ft² (9,130 m²)

4 Story

Denver, CO





Mass Timber Comparative Life Cycle Assessment Series

Comparing the embodied carbon impacts and cost of mass timber buildings to functionally equivalent buildings

Introduction



Author
KL&A Engineers & Builders / KL&A Team Carbon

- **Comparative WBLCA**

- TallyLCA 
- Scope
 - Structure
 - Enclosure – Vertical and Horizontal
 - Fire Resistance
 - Acoustic
 - Ceiling Finishes
- Cradle-to-Grave (A-C, plus Module D)
- Includes Biogenic Carbon (-1/+1, 32% Permanent Storage)

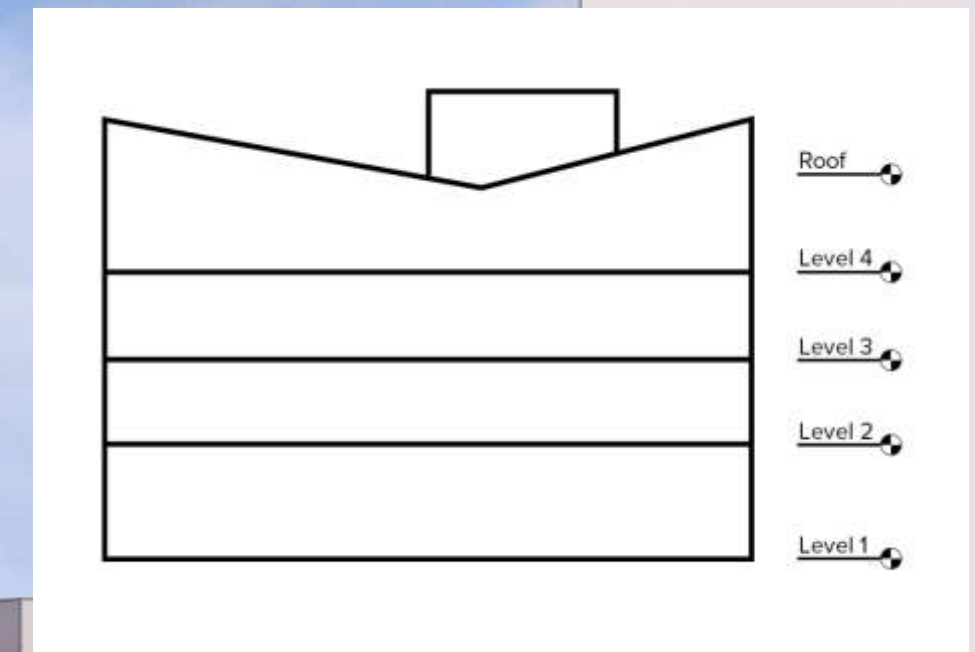
- **Comparative Cost & Speed of Construction**

- Normalized Material & Labor Costs

BUILDING STUDY METHODOLOGY

Office / Higher Education
Type III-A Construction
98,280 ft² (9,130 m²)
4 Story

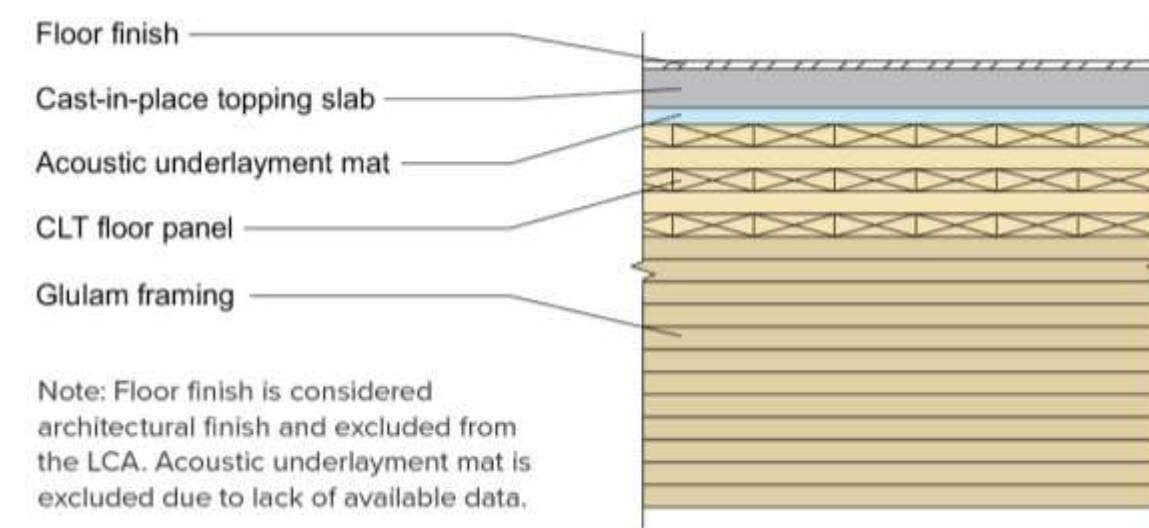
Architect: Shears Adkins Rockmore
Engineer: KL&A
Contractor: PCL



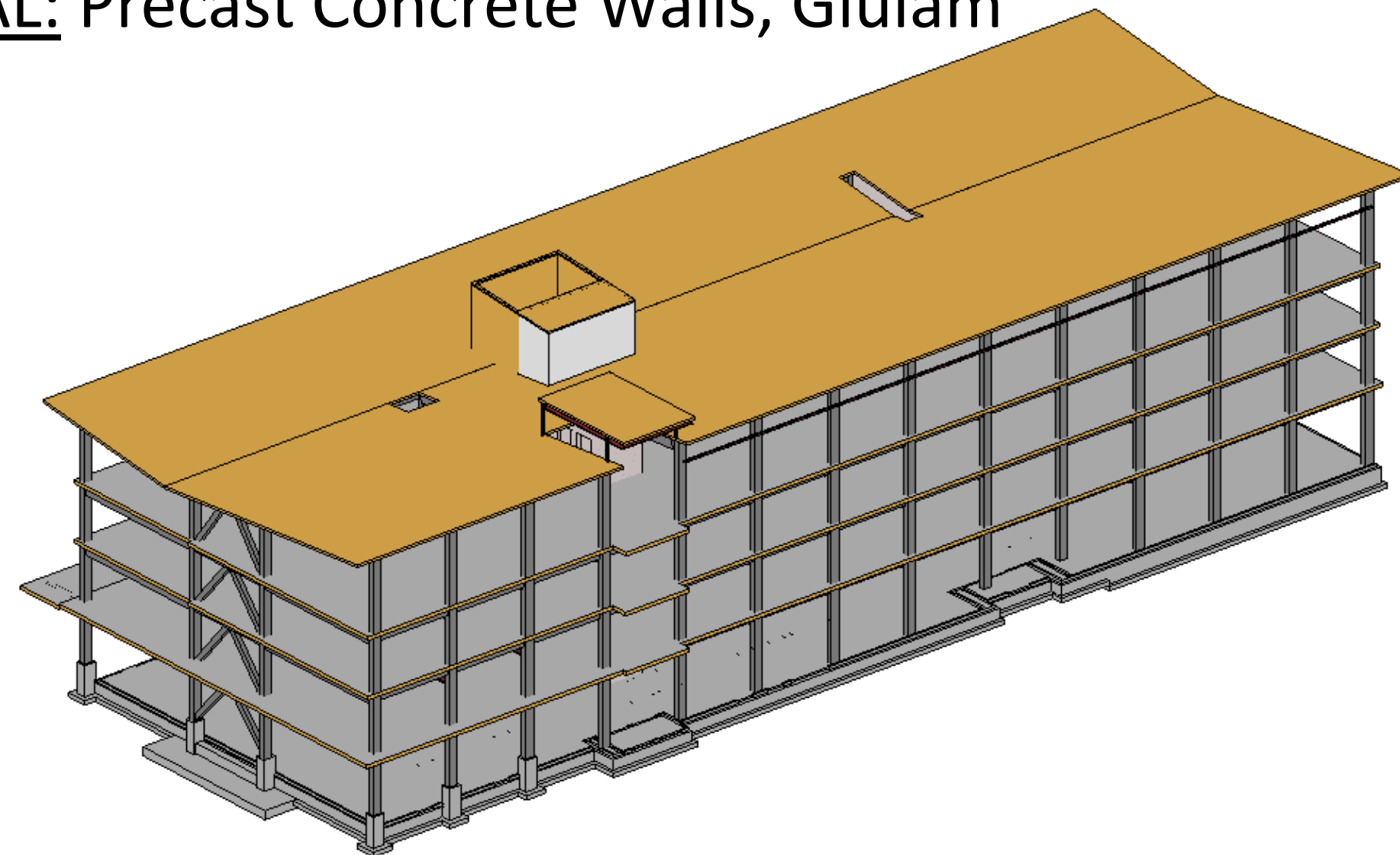
Foundations: Spread Footings
No below grade
L1: Concrete Slab on Grade
L2 – Roof: CLT Panel & Glulam
Lateral: Precast Concrete Core Walls + Glulam Brace
Grid: 20' X 34'

Denver Office Building

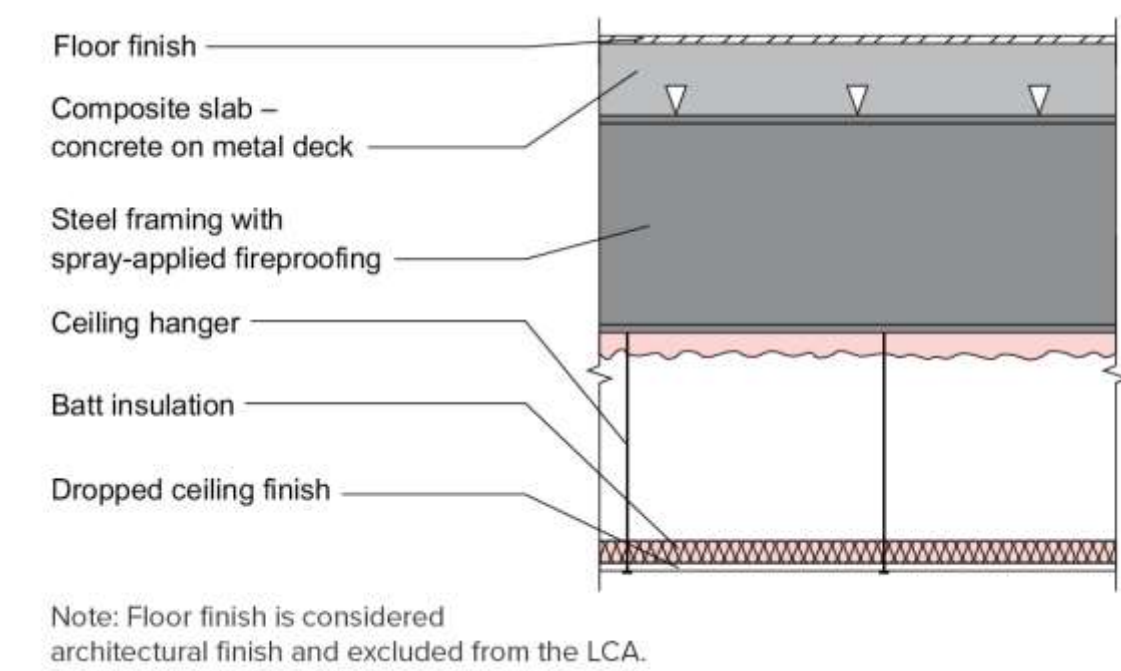
Denver, Colorado



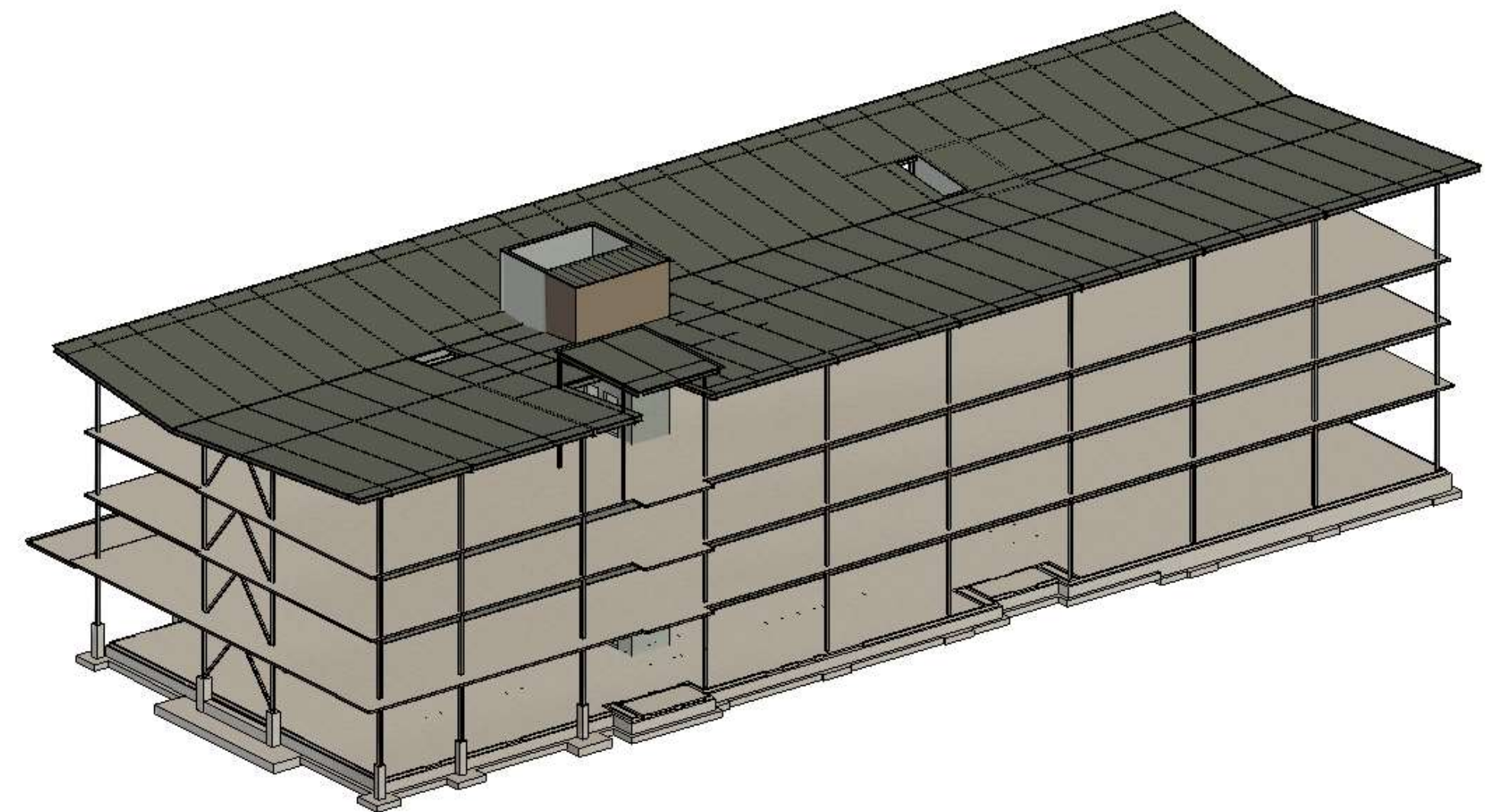
- FLOOR: 5-ply CLT Floor, Concrete Topping Slab, Glulam Framing
- ROOF: 5ply CLT, Glulam Framing
- LATERAL: Precast Concrete Walls, Glulam Brace



MASS TIMBER
(AS DESIGNED)

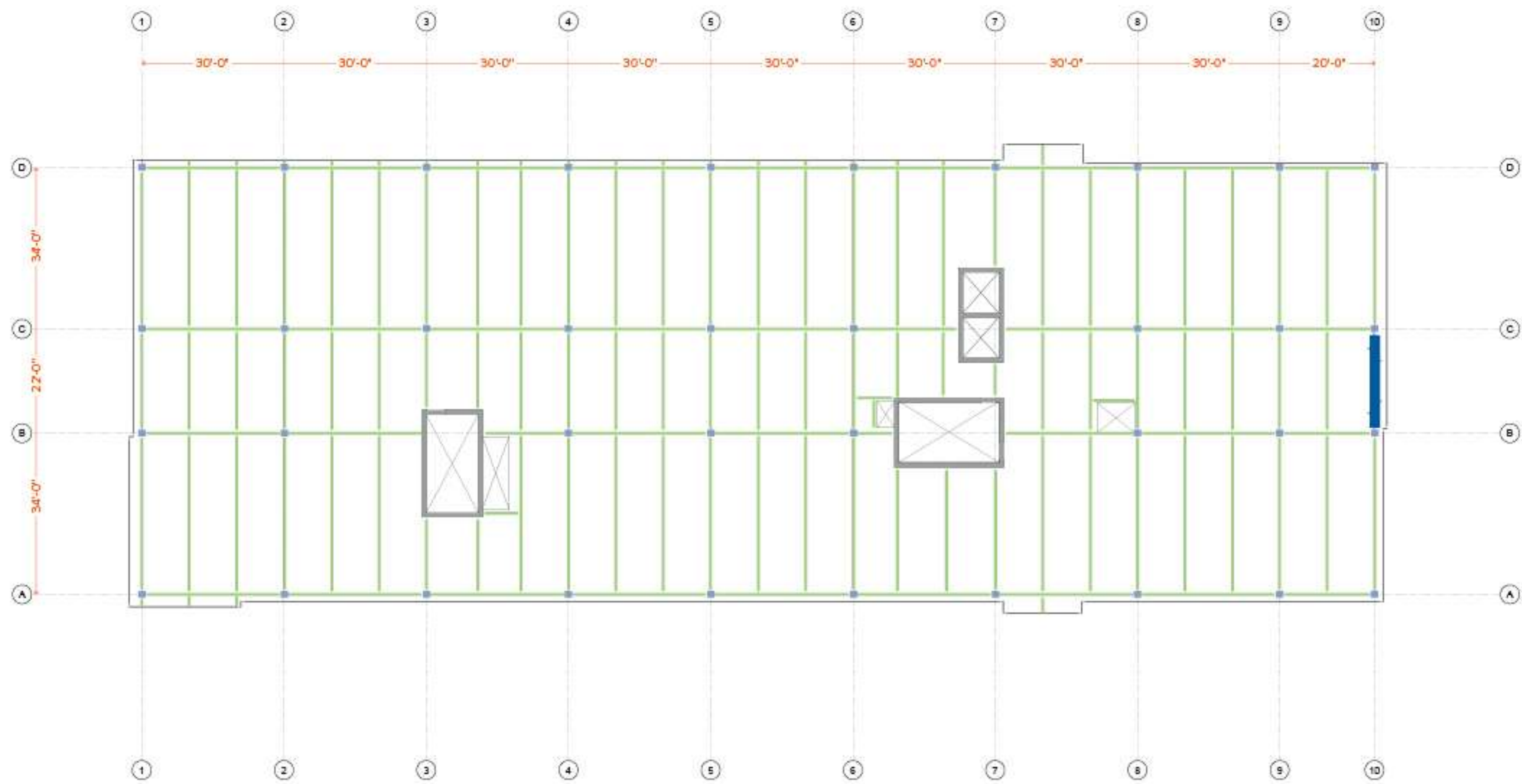


- FLOOR: Concrete on Metal Deck, WF Framing
- ROOF: Metal Deck, WF Framing
- LATERAL: Precast Concrete Walls, Steel Brace



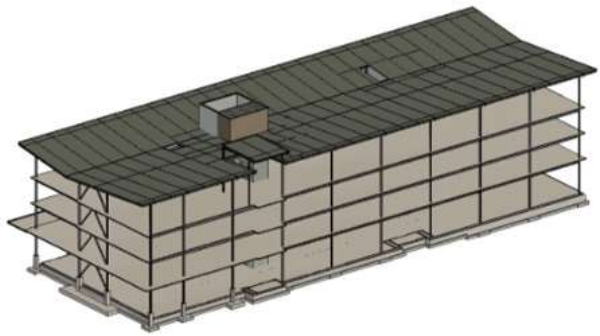
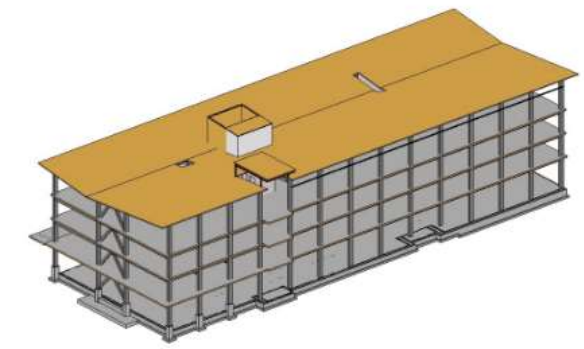
STEEL
(CASE STUDY COMPARISON)

FUNCTIONAL EQUIVALENCY DENVER OFFICE



STEEL FRAMING PLAN (CASE STUDY COMPARISON)

- Structural Column Locations
- Structural Framing Locations
- Precast Concrete Core Wall
- Steel Braced Frame

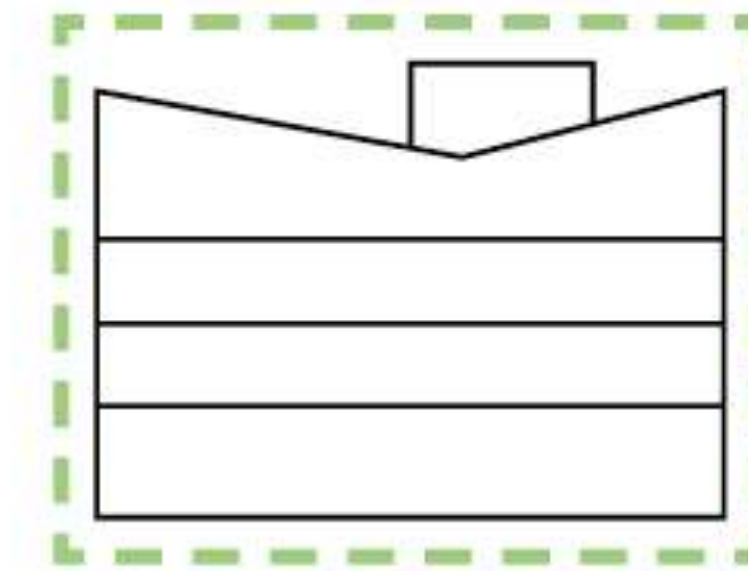
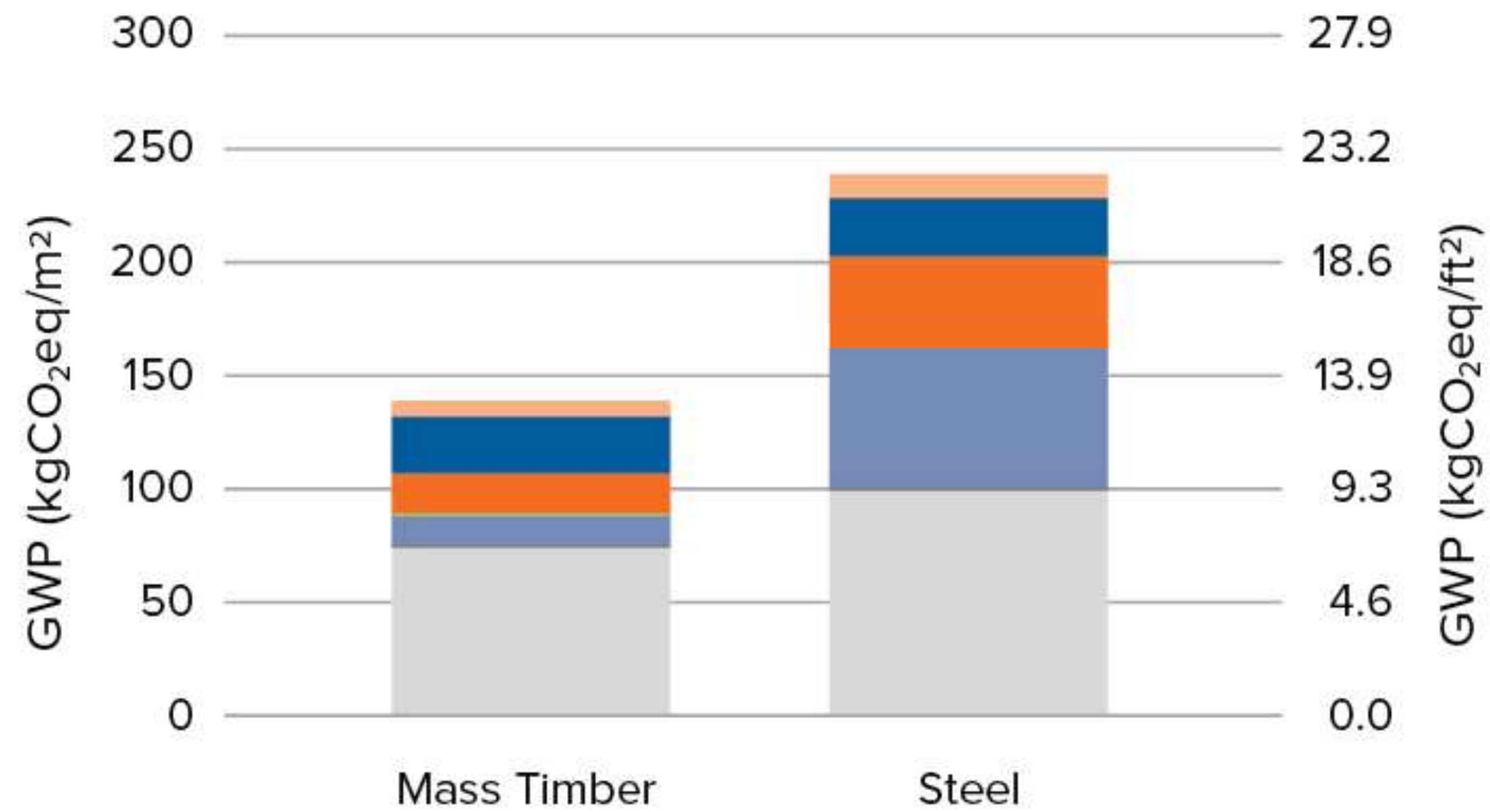


MT < STEEL
42% TOTAL REDUCTION

ARCH
32% REDUCTION

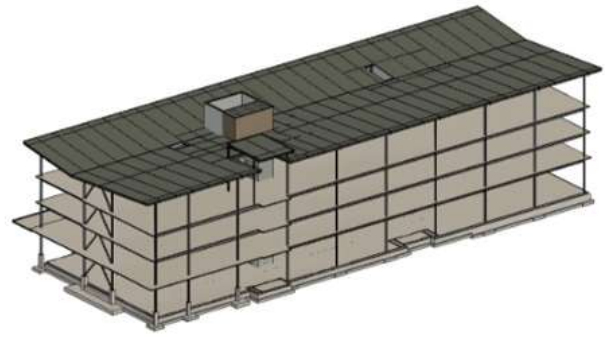
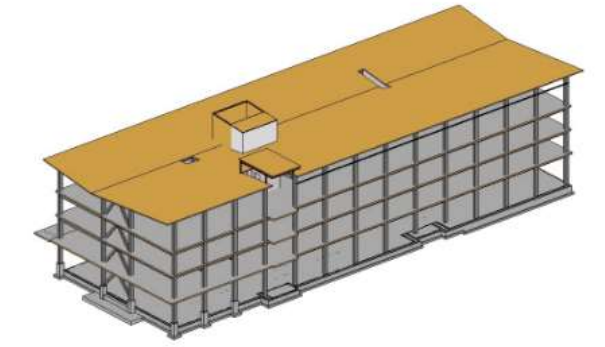
STRUCTURE
46% REDUCTION

Total Building GWP



- Wood
- Metals
- Masonry
- Concrete
- Thermal & Moisture Protection
- Glazing & Curtainwall
- Finishes

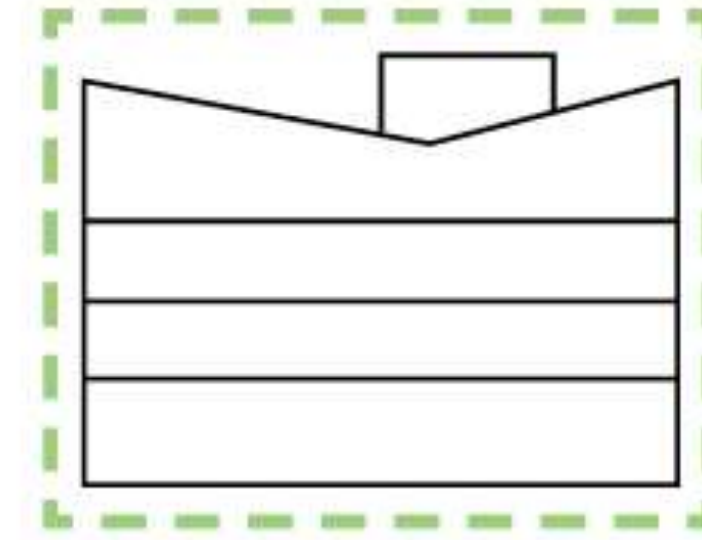
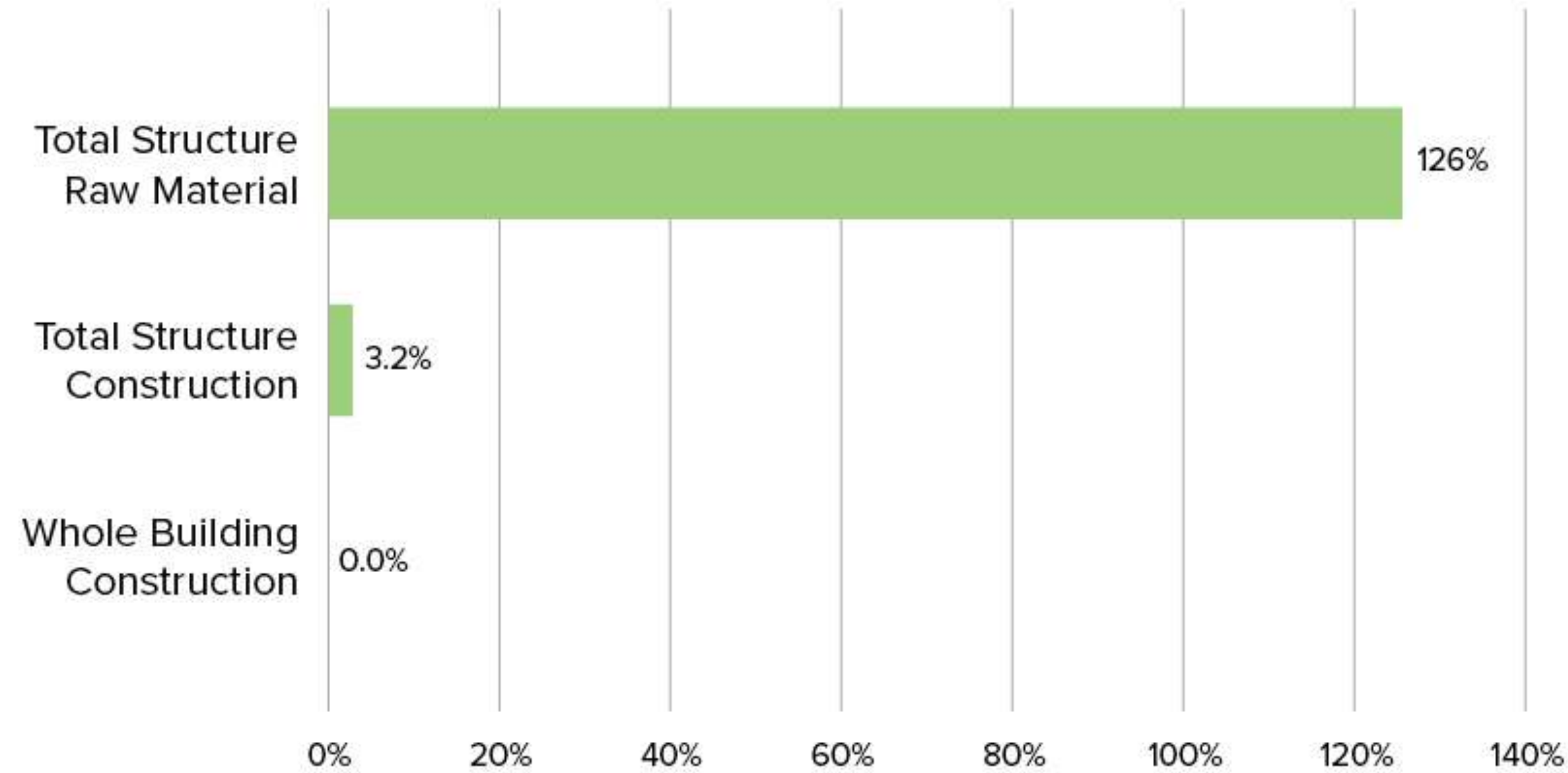
DENVER OFFICE – TOTAL GWP



2.5 Months Faster

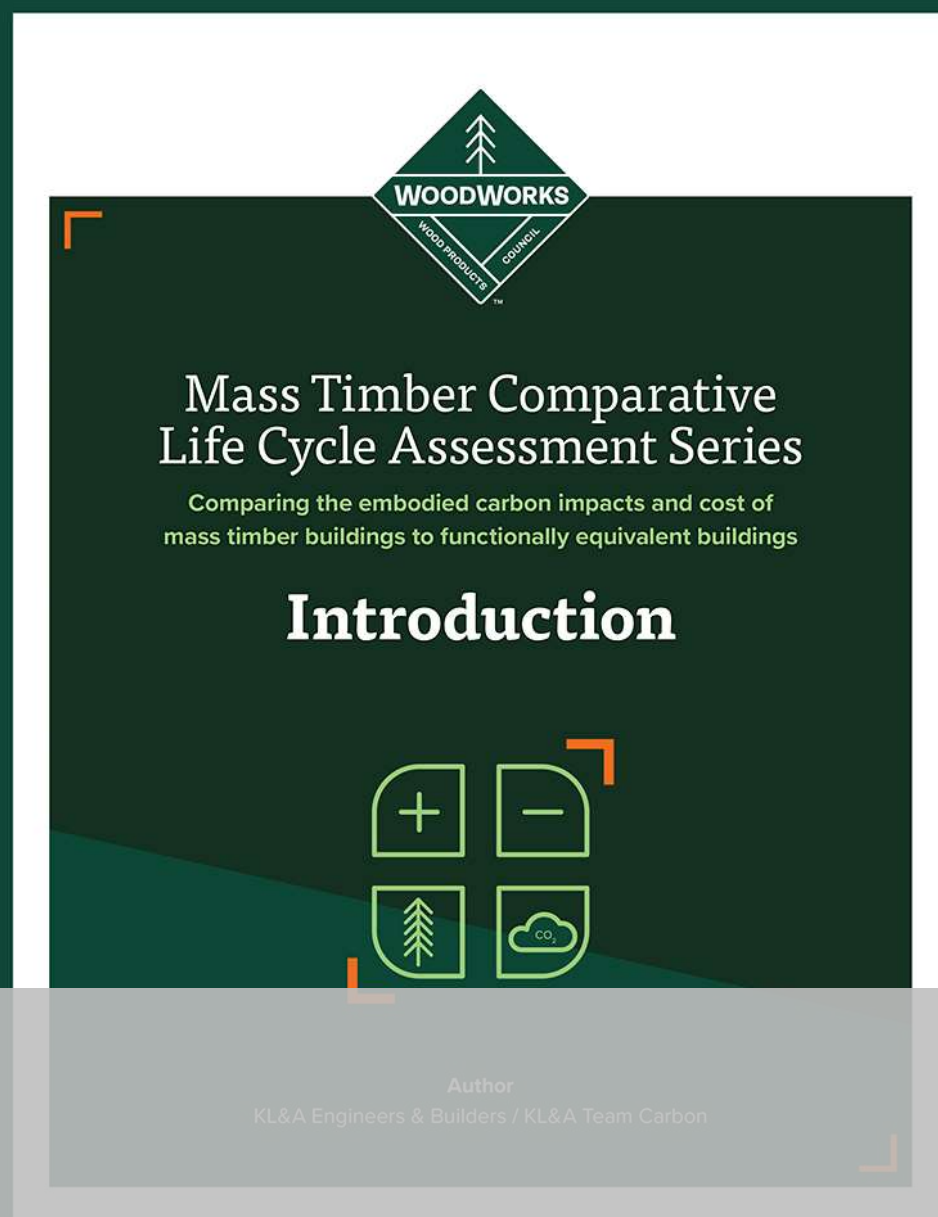
0% \$ Premium

Construction Cost

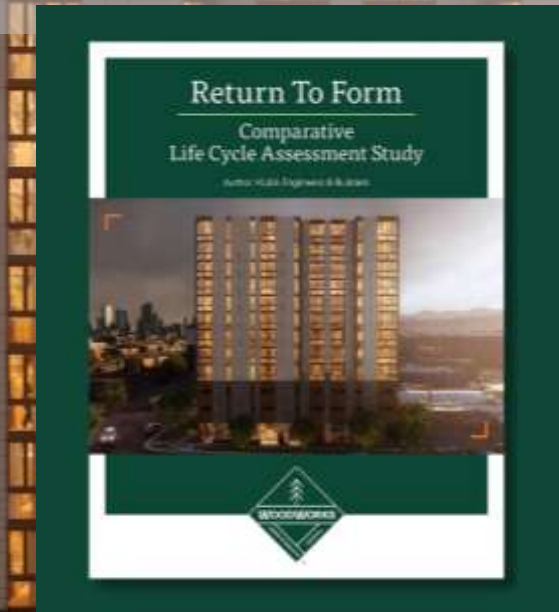


Mass Timber

DENVER OFFICE – COST & SCHEDULE

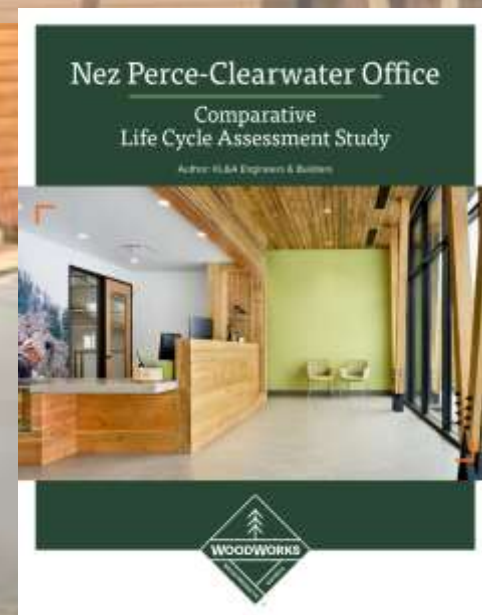


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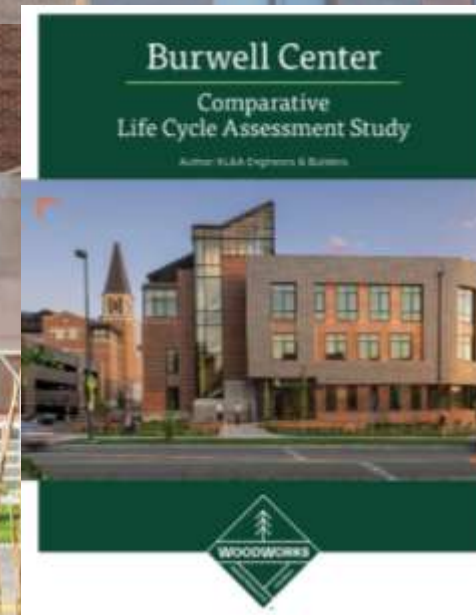


LCA STUDY TRENDS

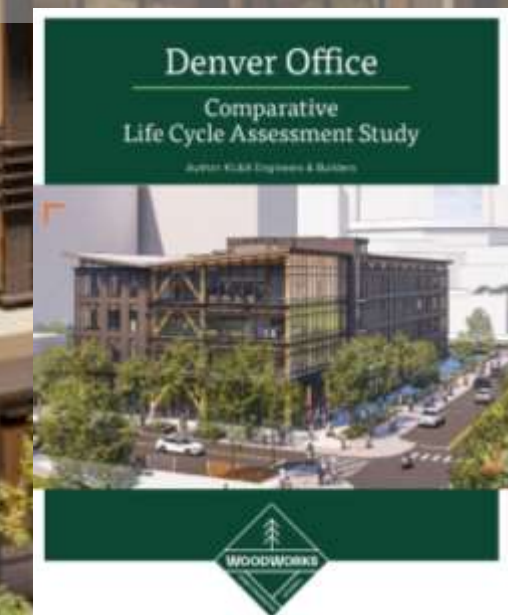
Nez Perce USFS



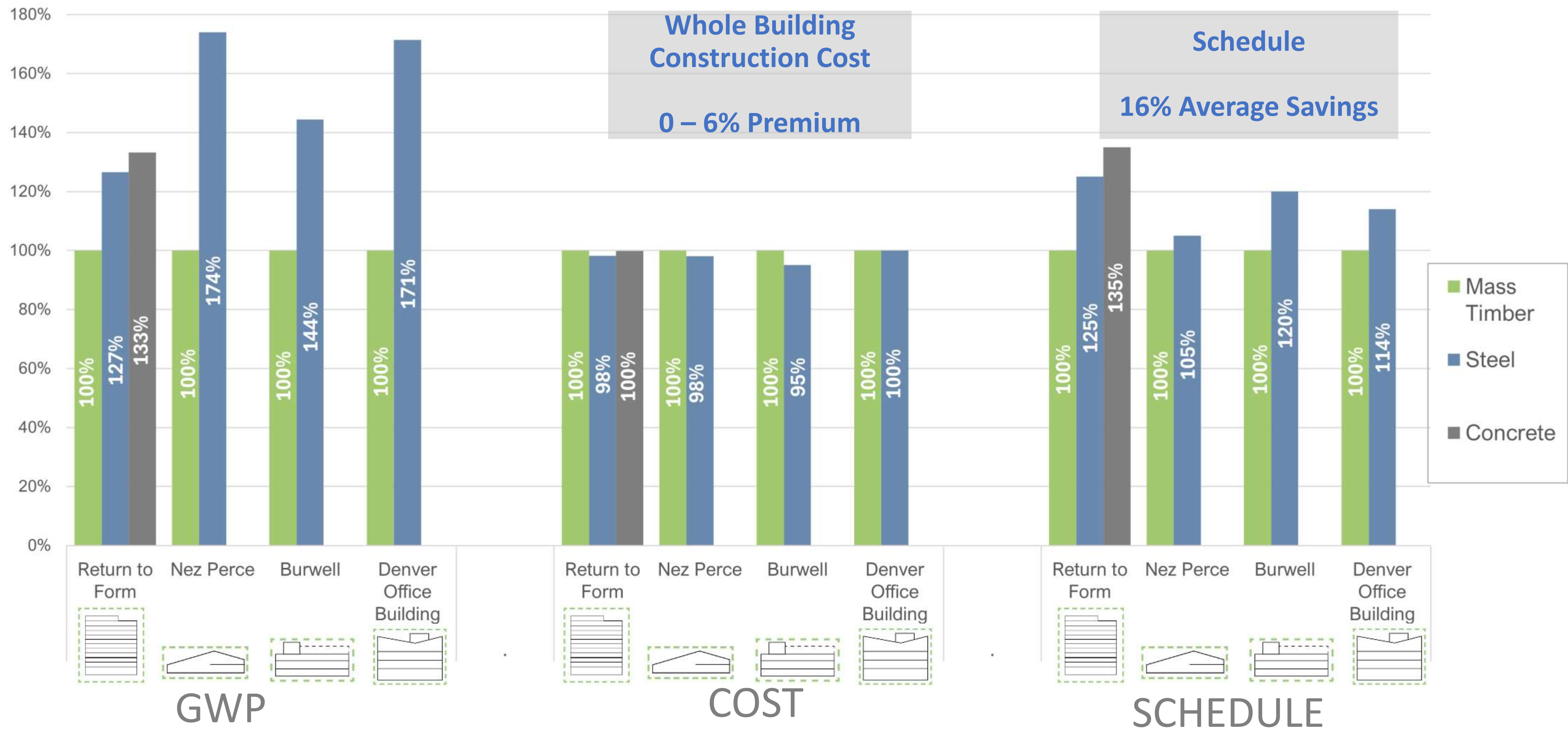
Burwell Center



Denver Office



Comparative GWP, Cost, and Schedule

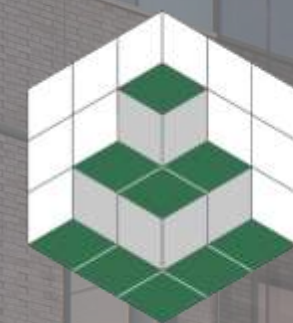


TOTAL BUILDING TRENDS
COMPARATIVE STUDY SERIES

TAKE AWAYS

- **DESIGN CONSIDERATIONS**
 - PROGRAM
 - CONSTRUCTION TYPE IS CRITICAL
 - FIRE RATING (SELECT THE LOWEST RATING POSSIBLE)
 - CONSIDER HYBRIDS
- **COST CONSIDERATIONS**
 - TIMBER VOLUME
 - COMPLEXITY
 - SPEED OF CONSTRUCTION / REDUCED FINISHES (HOLISTIC COST ANALYSIS)
- **MASS TIMBER STRUCTURAL SYSTEMS HAVE CLEAR EMBODIED CARBON BENEFITS**

THANK YOU



KL&A
Engineers & Builders

A close-up photograph of a mass timber joint. Two large, light-colored wooden beams are joined at a right angle. The joint is reinforced with grey metal plates and black bolts. The wood grain is clearly visible, and the lighting highlights the texture of the timber.

Mass Timber Multi-Family

Studies in Carbon, Cost, and Constructability

October 24, 2026

Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.

Meet the Team



**Suzanne
Robinson**

*Director of Sustainability,
LeMessurier*



**Steve
Whitcraft**

*Preconstruction Exec.,
Turner*

Minneapolis



Stick-Built

Denver



Cast-in-place concrete

Atlanta



Cast-in-place concrete

All three buildings were redesigned for mass timber.



Mass Timber in Three Regions

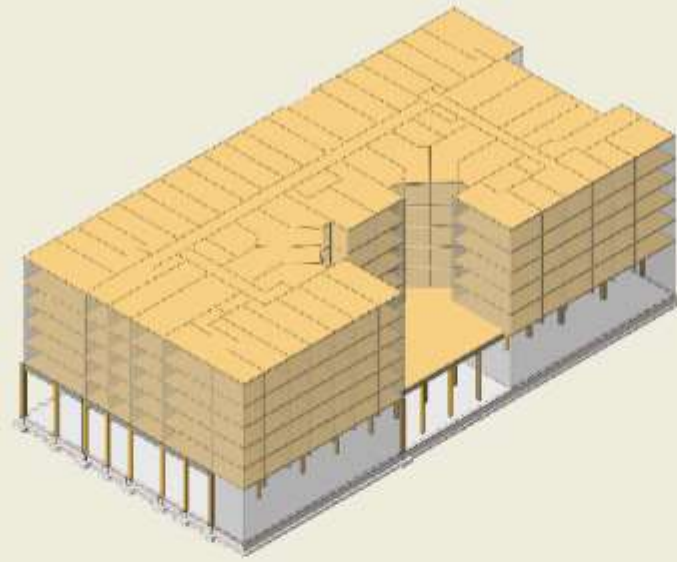
Comparative Life Cycle Assessment Study

Author: LeMessurier



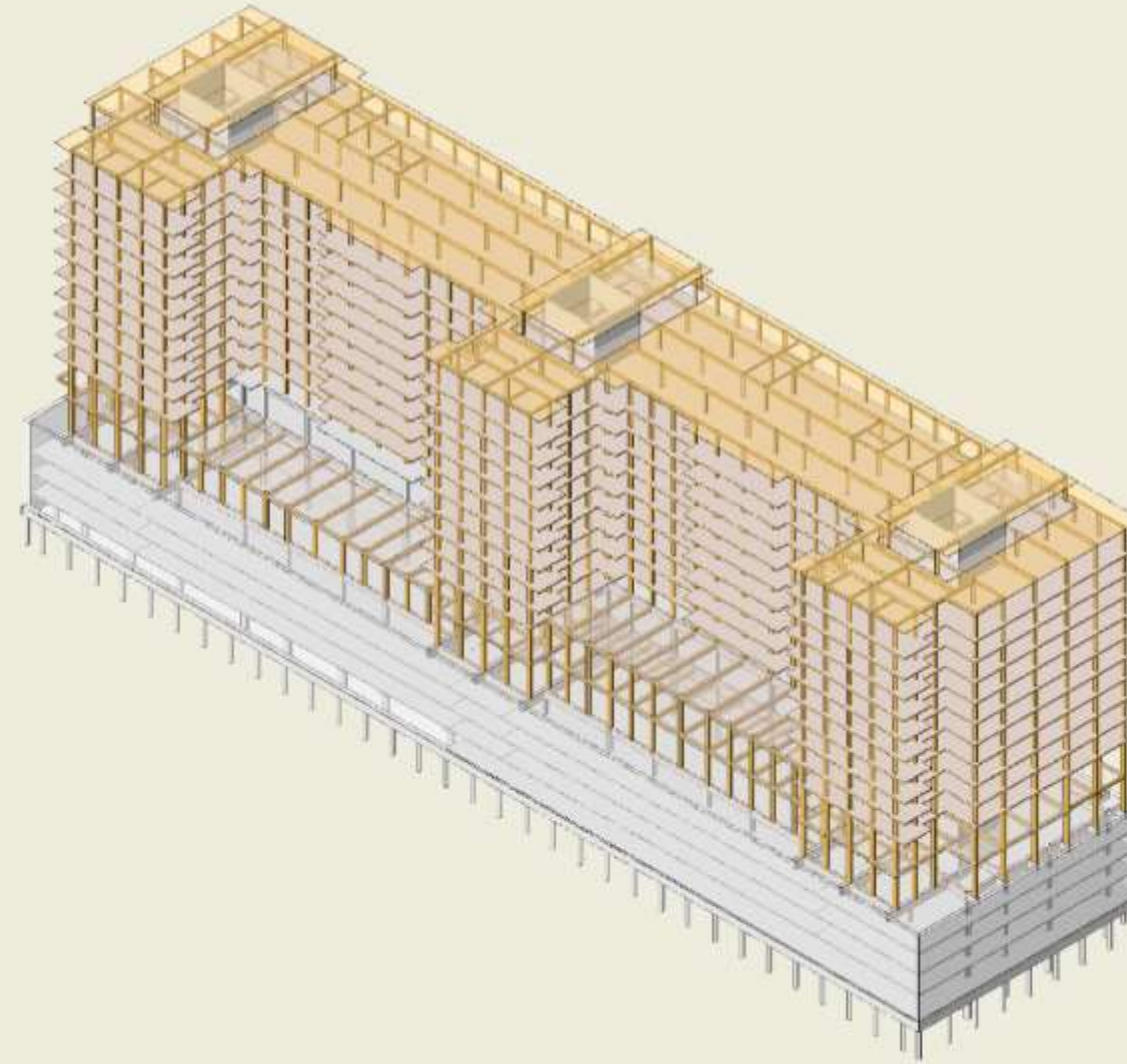
Rendering: SCB

Minneapolis



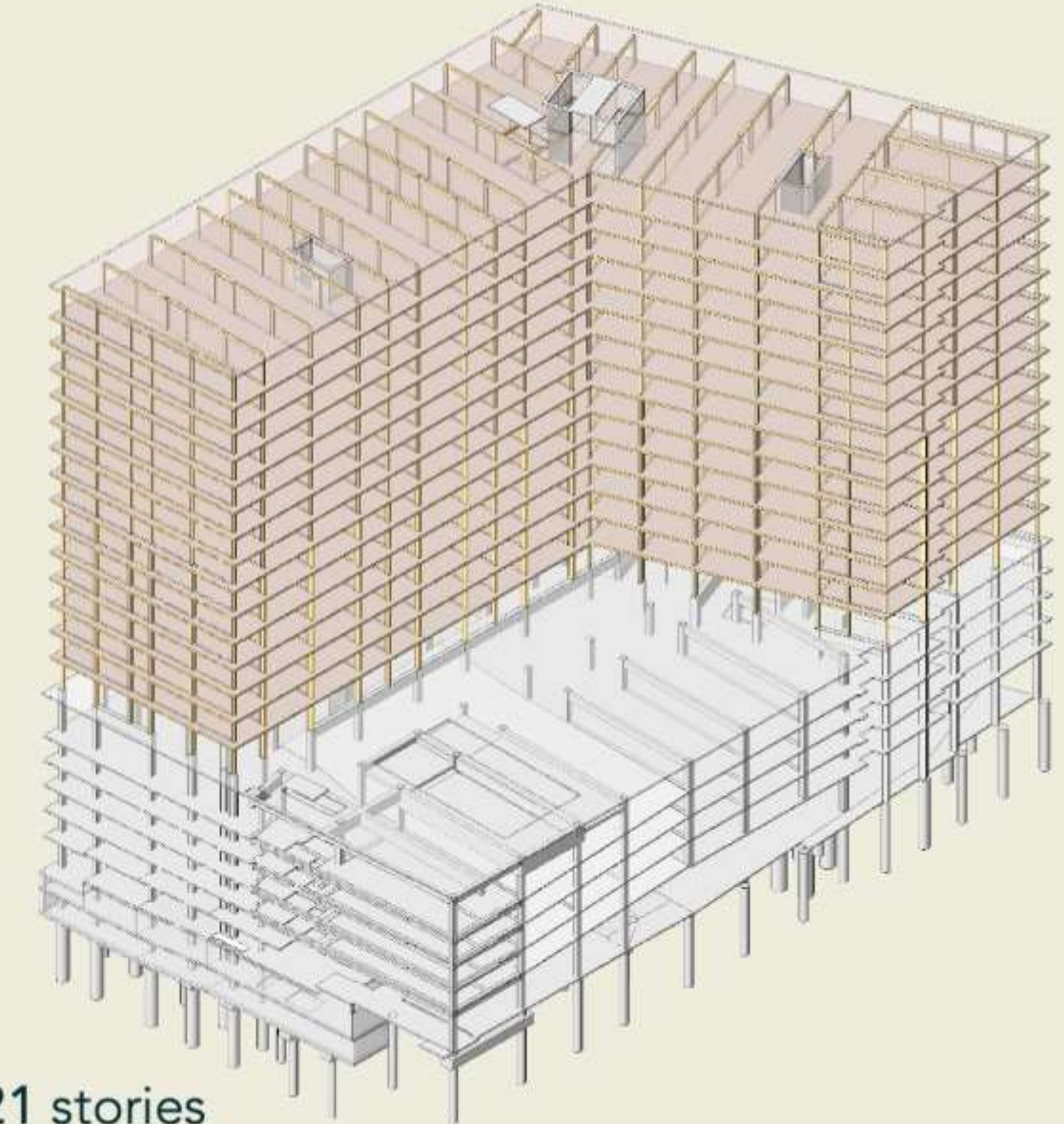
6 stories
165,340 GSF
130 Residential units

Denver



12 stories
755,300 GSF
395 Residential units
241,500 SF of parking

Atlanta

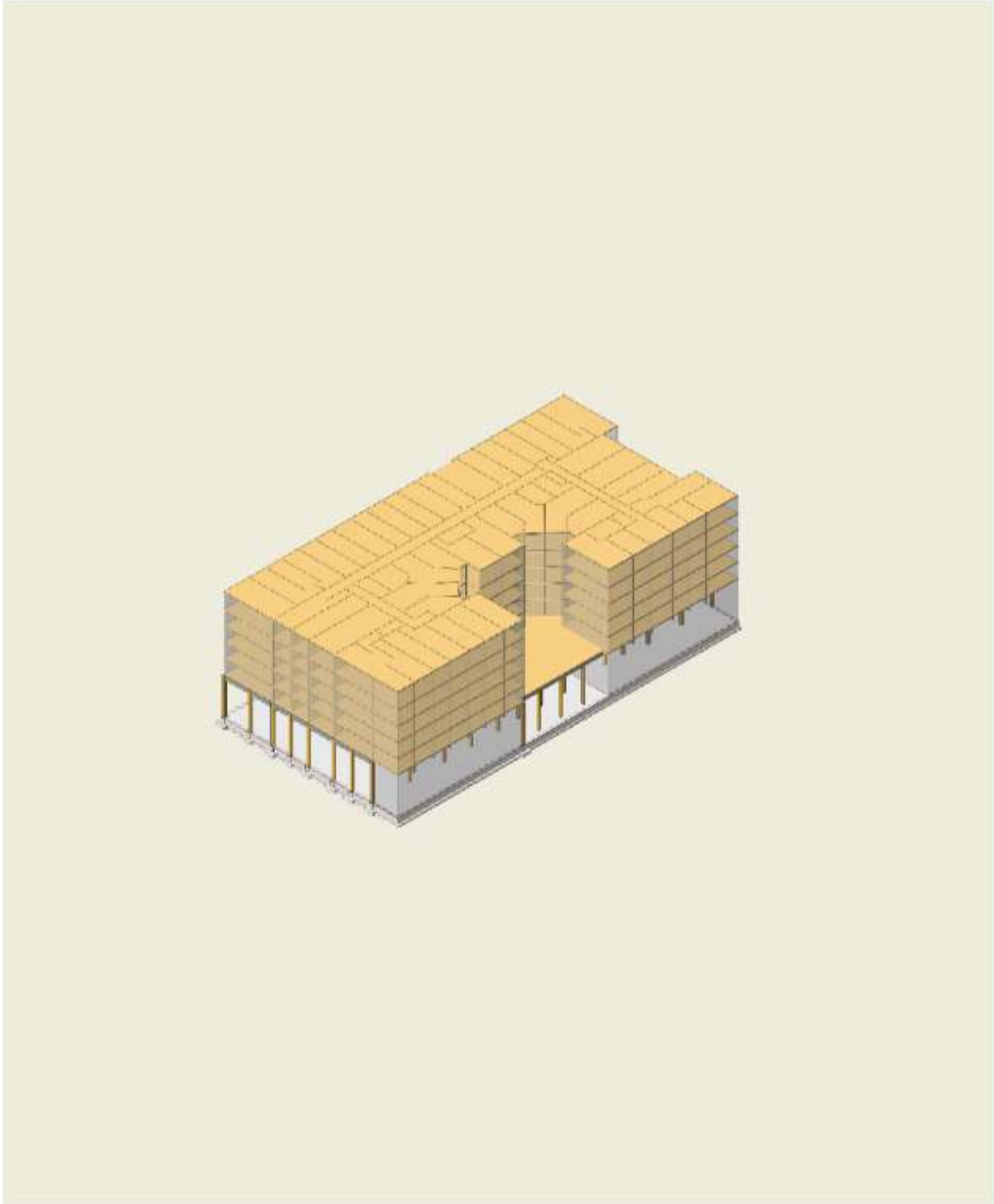


21 stories
758,483 GSF
353 Residential units
268,000 SF of parking

All analysis reflects mass timber equivalent calculations of existing cast-in-place concrete or stick-built structures. Cost, carbon, and constructability data all show significant gains even so; gains that will likely increase when actually designed for mass timber.



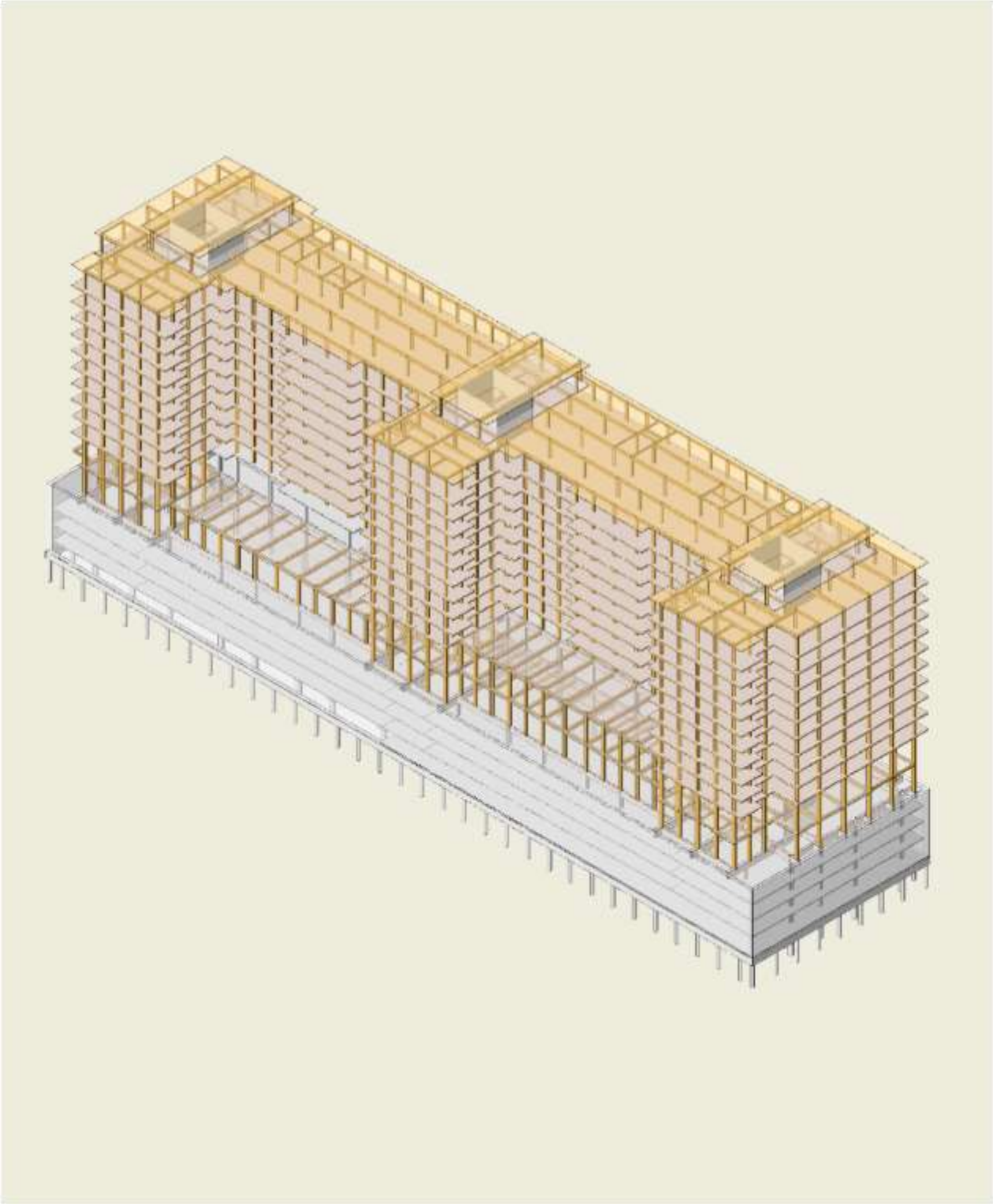
Minneapolis



Type IV-C

Max # of stories	9 stories
Building height	85'
Allowable area	405,000 sf
Average area per story	45,000 sf
Amount of unprotected timber	100%
Primary structure	2 hr rated

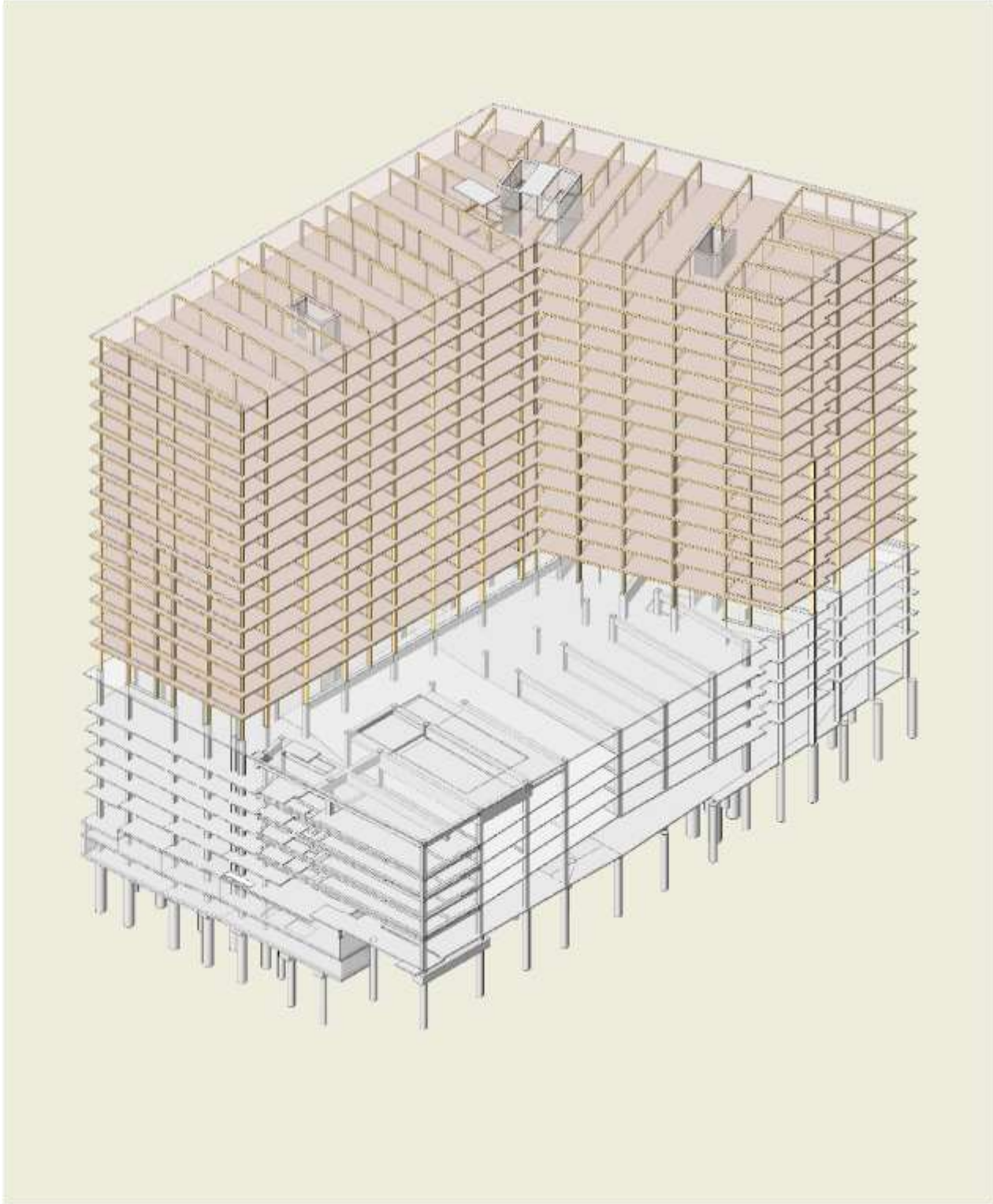
Denver



Type IV-B (IBC 2024)

Max # of stories	12 stories
Building height	180'
Allowable area	648,000 sf
Average area per story	54,000 sf
Amount of unprotected timber	100% ceiling
	40% walls
Primary structure	2 hr rated

Atlanta



Type IV-A

Max # of stories	18 stories
Building height	270'
Allowable area	972,000 sf
Average area per story	54,000 sf
Amount of unprotected timber	0%
Primary structure	3 hr rated





Summary
GWP



Minneapolis case study

42%

Total reduction
kgCO₂eq

IBC 2021 TYPE III-A ON TYPE IA PODIUM

IBC 2021 TYPE IV-C



Denver case study

22%

Total reduction
kgCO₂eq

IBC 2024 TYPE IA

IBC 2024 TYPE IV-B



Atlanta case study

16%

Total reduction
kgCO₂eq

IBC 2021 TYPE IA

IBC 2021 TYPE IVA

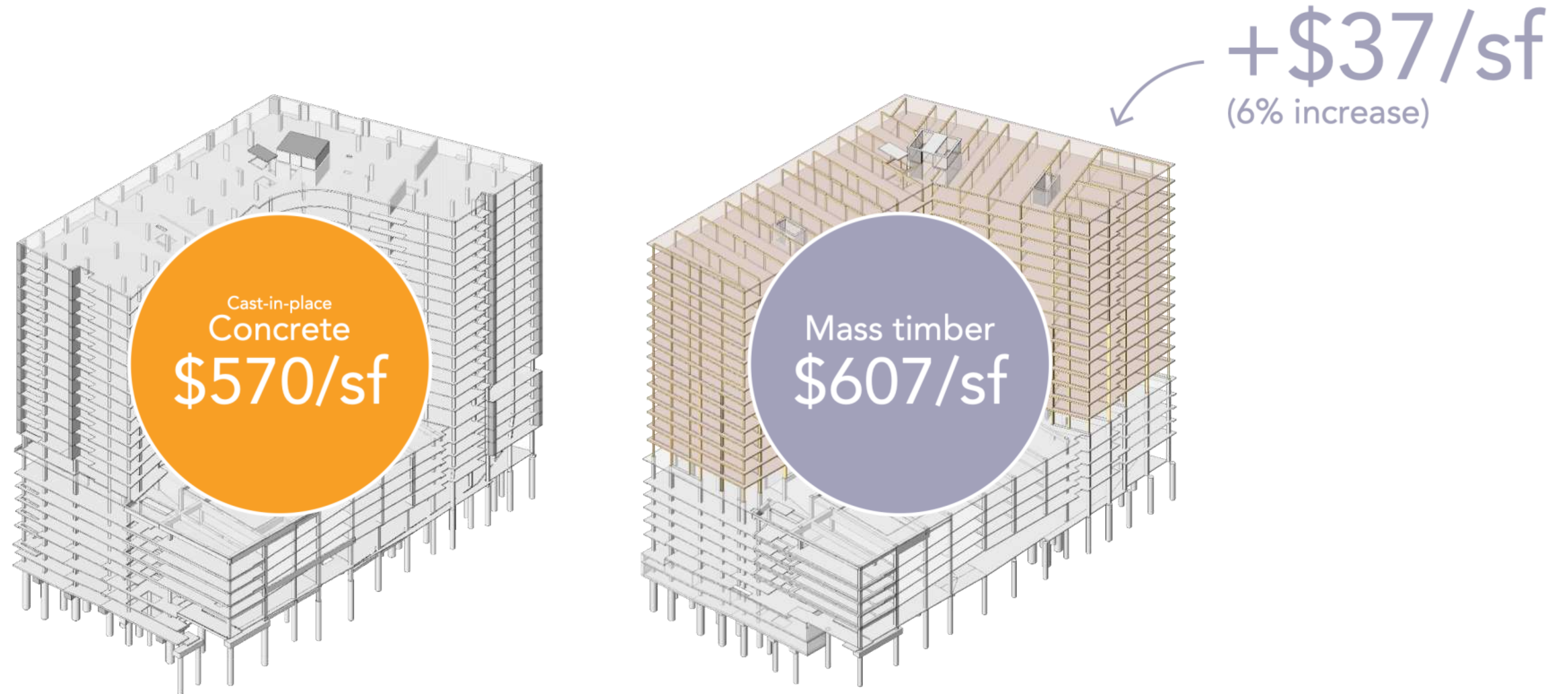


LEARN MORE ABOUT THE DATA AND
METHODOLOGY HERE: [OLIFANT.ORG](https://olifant.org)



Atlanta case study

IBC 2021 Type IV-A



\$ Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc. Costs are based on residential area only. Garage costs were excluded since they remained a constant in each scenario.

16 Stories
417,417 GSF of residential
340 Residential units



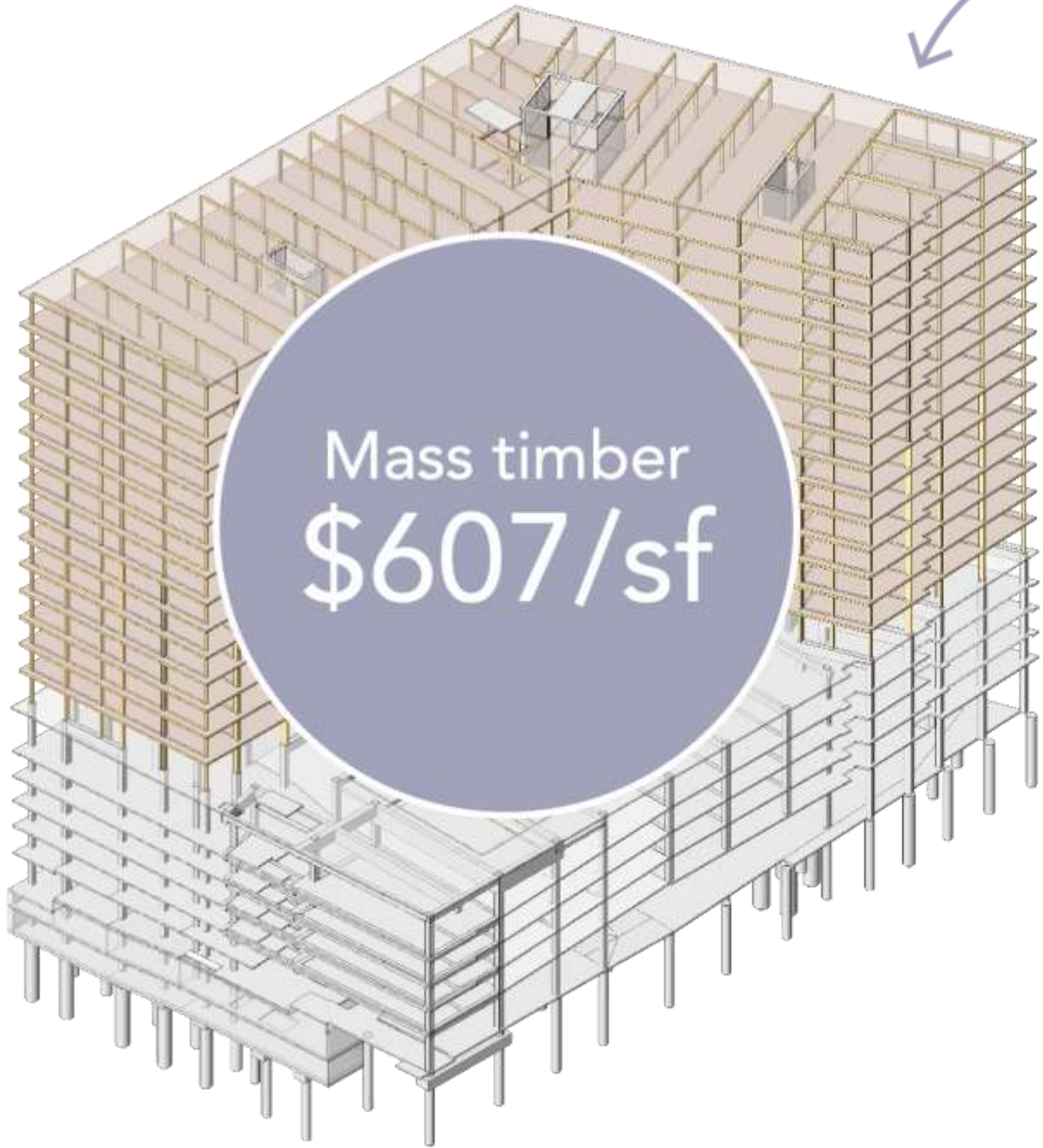
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Atlanta case study

IBC 2021 Type IV-A

Structural
Concrete structure
\$30,139,000
Indirect costs¹
\$3,177,000



Structural
Mass timber structure
\$31,468,000
Fire protection: floor plates
\$5,507,000
Fire protection: beams & columns
\$3,181,000
Floor build up
\$3,671,000
Transfer structure
\$543,000
Exterior envelope
\$509,000
Indirect costs¹
\$4,546,000
Schedule savings
(\$1,750,000)

\$ Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc. Costs are based on residential area only. Garage costs were excluded since they remained a constant in each scenario.

16 Stories
417,417 GSF of residential
340 Residential units

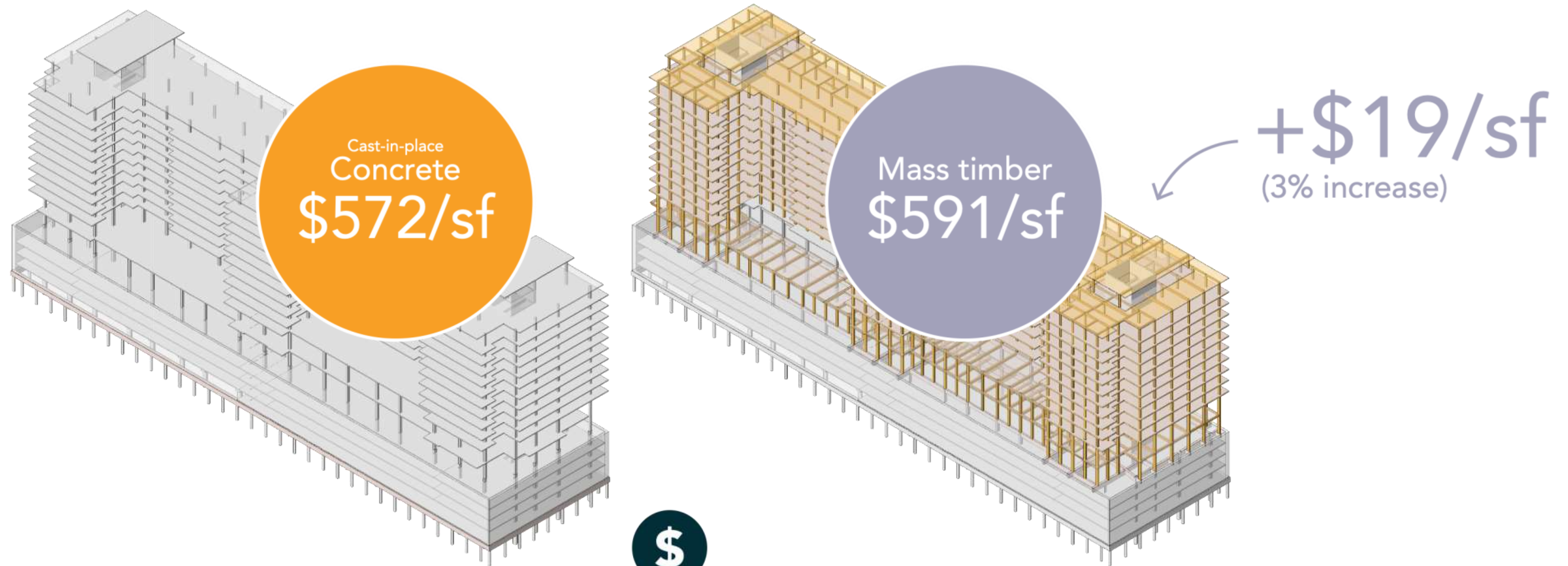
¹ INDIRECT COST: SUM OF SUBCONTRACTOR BONDS, CONSTRUCTION CONTINGENCY, INSURANCE, AND CM FEE; AS A VOLUME PERCENTAGE OF DIRECT PROJECT COST





Denver case study

IBC 2024 TYPE IV-B



Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc. Costs are based on residential area only. Garage costs were excluded since they remained a constant in each scenario.

12 Stories
513,800 GSF of residential
395 Residential units



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METHODOLOGY HERE: [OLIFANT.ORG](https://olifant.org)



Denver case study

IBC 2024 TYPE IV-B

Structural

Concrete structure
\$45,828,000

Indirect costs¹
\$4,830,000



IBC 2024 allows for more wood exposure, less cost, and less added carbon through additional materials.

Structural

Mass timber structure
\$36,009,000

Concrete
\$8,969,000

Floor build up
\$4,801,000

Fire protection: beams & columns
\$3,364,000

Transfer structure
\$2,810,000

Fire protection: floor plates
\$1,201,000

Exterior envelope
\$900,000

Indirect costs¹
\$5,832,000

Schedule savings
(\$1,750,000)

Interior ceiling finishes
(\$975,880)



Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc. Costs are based on residential area only. Garage costs were excluded since they remained a constant in each scenario.

12 Stories

513,800 GSF of residential

395 Residential units

¹ INDIRECT COST: SUM OF SUBCONTRACTOR BONDS, CONSTRUCTION CONTINGENCY, INSURANCE, AND CM FEE; AS A VOLUME PERCENTAGE OF DIRECT PROJECT COST





Minneapolis case study

IBC 2021 TYPE IV-C



\$ Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc.

6 Stories
165,340 GSF of residential
130 Residential units



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Minneapolis case study
IBC 2021 TYPE IV-C

Structural
Structure
\$8,692,000
Indirect costs¹
\$916,000



Structural
Mass timber structure
\$13,620,000
Indirect costs¹
\$1,170,000
Interior ceiling finishes
(\$1,226,000)
Concrete foundation
(\$700,000)
Exterior envelope
(\$590,000)

\$
Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc.
6 Stories
165,340 GSF of residential
130 Residential units

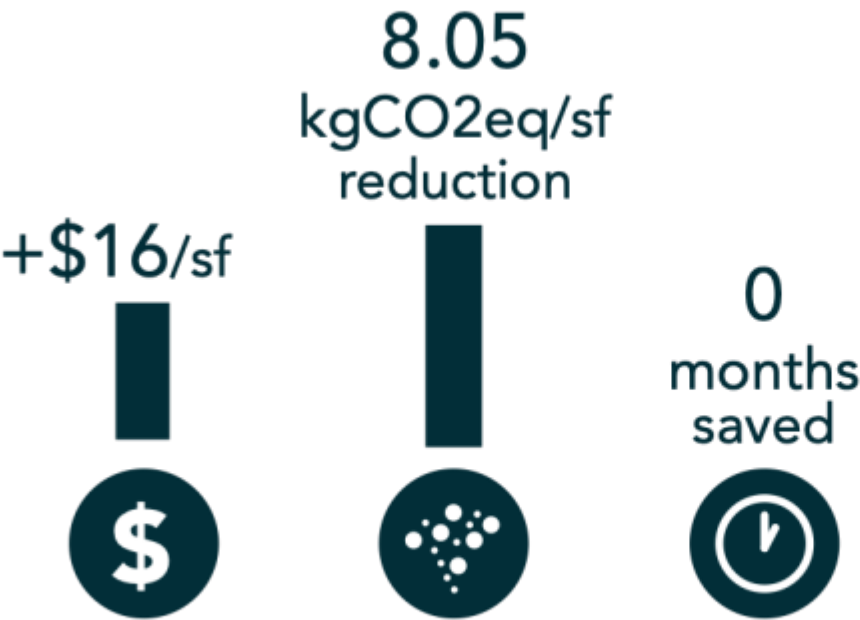
¹ INDIRECT COST: SUM OF SUBCONTRACTOR BONDS, CONSTRUCTION CONTINGENCY, INSURANCE, AND CM FEE; AS A VOLUME PERCENTAGE OF DIRECT PROJECT COST



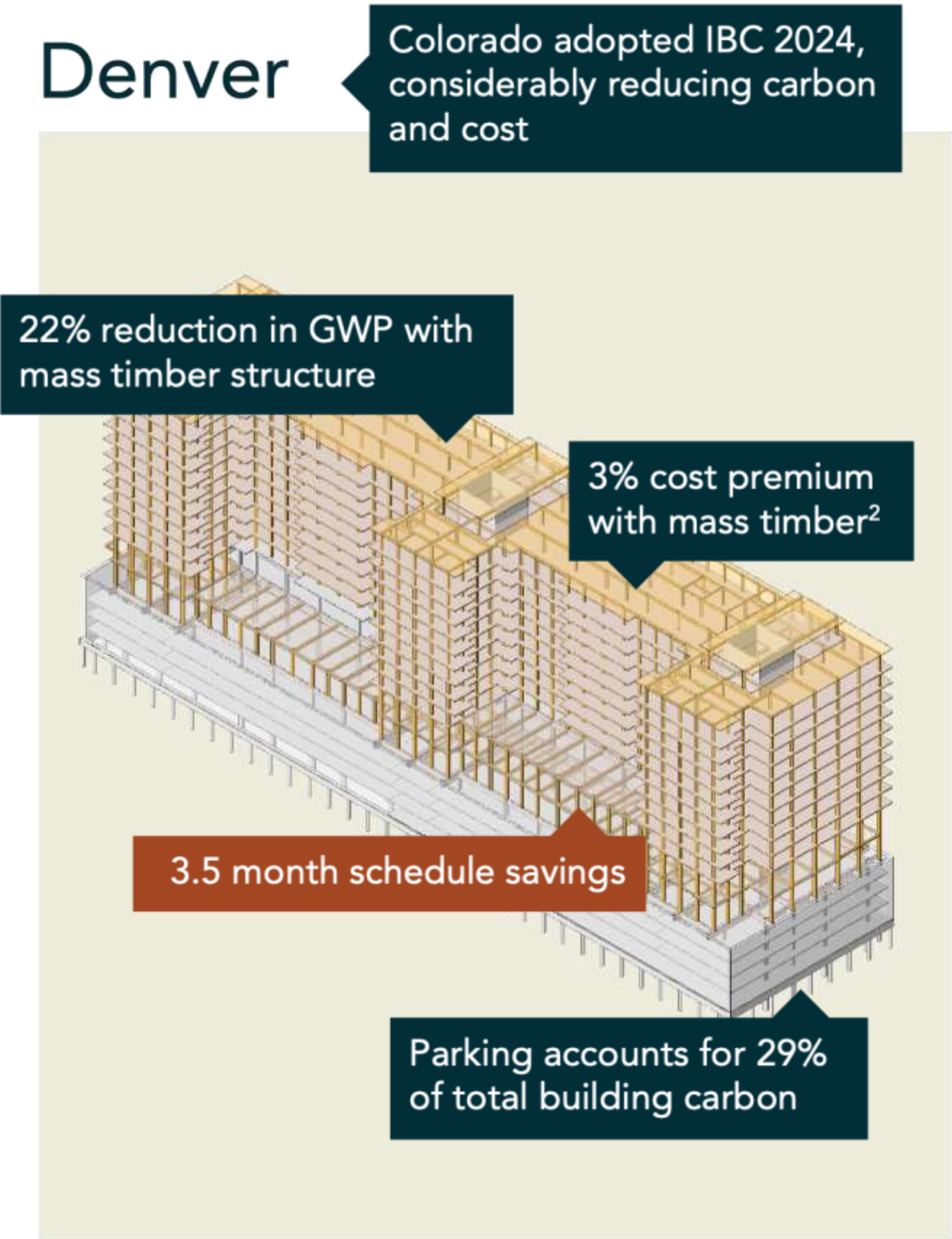
Minneapolis



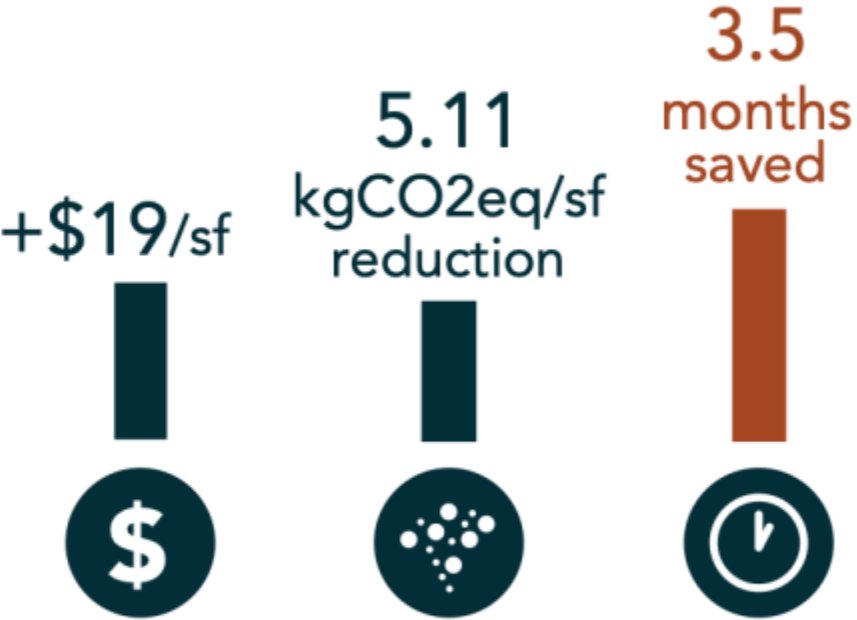
¹ Mass timber stores more carbon than a stick-built structure



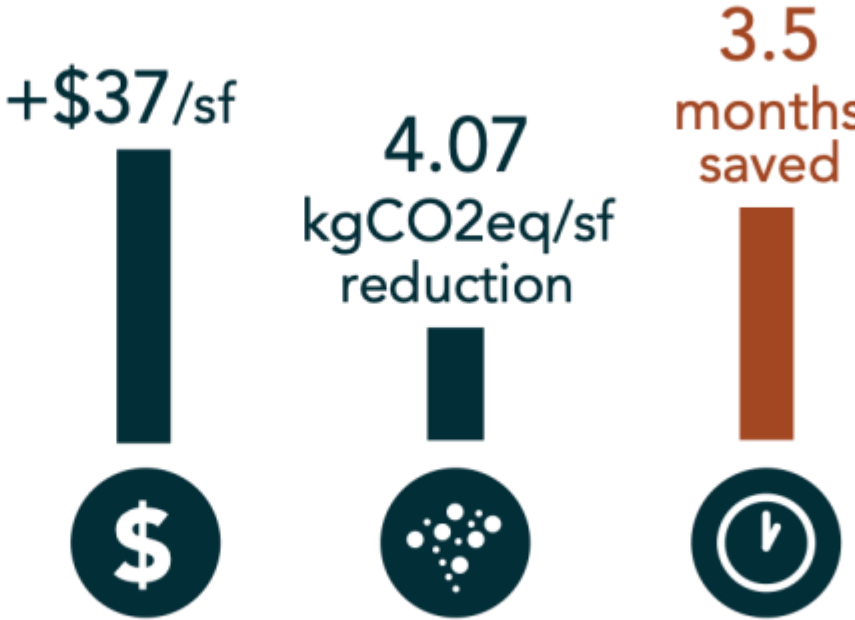
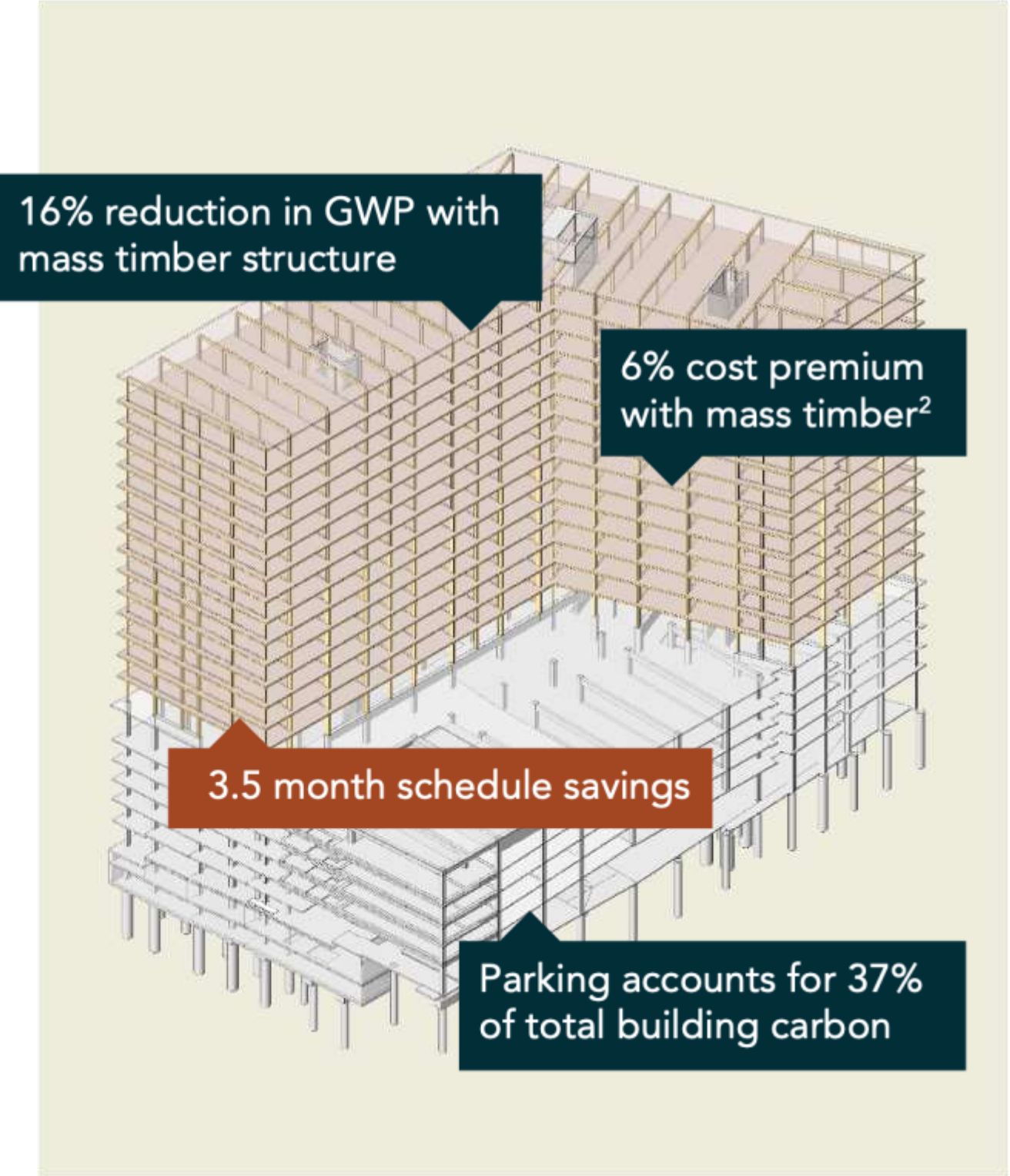
Denver



² Cost likely to improve if building was originally designed for mass timber



Atlanta



Minneapolis



Denver



Atlanta



A close-up photograph of a wooden truss structure. The image shows several wooden beams of varying shades of brown, some with a prominent grain. These beams are connected by grey metal gusset plates, which are secured with black bolts. The text "Thank You!" is overlaid in the center in a large, white, sans-serif font.

Thank You!

This concludes The American Institute of Architects Continuing Education Systems Course.

➤ QUESTIONS?

This concludes The American
Institute of Architects Continuing
Education Systems Course

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