Mass timber in Hospitality & Beyond

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DLRGROUP

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

AIA Approved Continuing Education

Course Description

This course will explore applications of mass timber in Hospitality projects, allowed under changes to the 2021 IBC. Sustainability benefits in addition to the aesthetic advantages of mass timber are qualities shared between hospitality and office construction, where DLR Group has an extensive mass timber portfolio. Working together with the University of Minnesota, Marriott International, Coffman Engineers, Friedman Properties, and Smartlam North America, DLR Group has completed work on a USDA Wood Innovation Grant to develop a prototype building design. Research findings serve as inspiration for future projects and help answer the typical doubts of mass timber as a viable structure option for hotels. Key considerations include fire protection, acoustics, durability, longevity, and cost.

Learning Objectives

1. Understand the fire protection design requirements for mass timber hotels
2. Learn about the acoustical design goals for hospitality projects and how they are impacted by mass timber assemblies
3. Discuss durability and longevity considerations for mass timber hotels
4. Understand how hotel developers understand mass timber costs and value

AGENDA

Introductions

Mass Timber Case Studies

- T3 Program
- T3 Austin Residential Units
- Canopy Minneapolis

Mass Timber Hotel Prototype Research

On the Boards – What we thought we knew, what we know now

- 9th & High Student Housing
- Truckee Mass Timber Hotel
- DC Timber Hotel
- Frisco Timber Development

MASS TIMBER CASE STUDIES

T3 PROJECTS

7 Built: 1.2m SF

Minneapolis
Atlanta
Nashville
Austin
Denver
Toronto 1
Toronto 2

Under Construction:

Fort Lauderdale

CDs Complete:

Durham 1
Durham 2

In Entitlements:

Redwood City
Vancouver
Toronto 3

Awaiting Launch:

Omaha
Oak Brook
Chicago







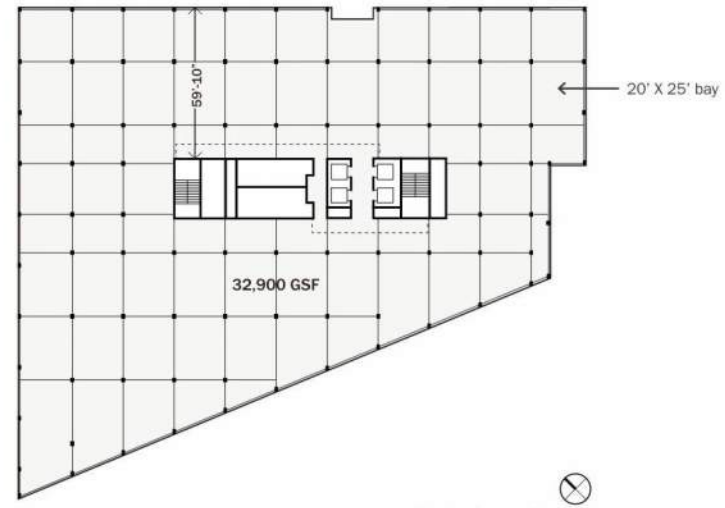


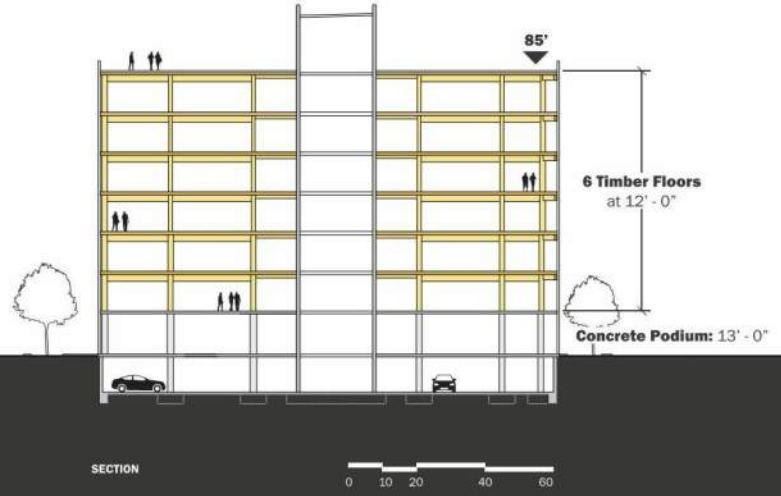


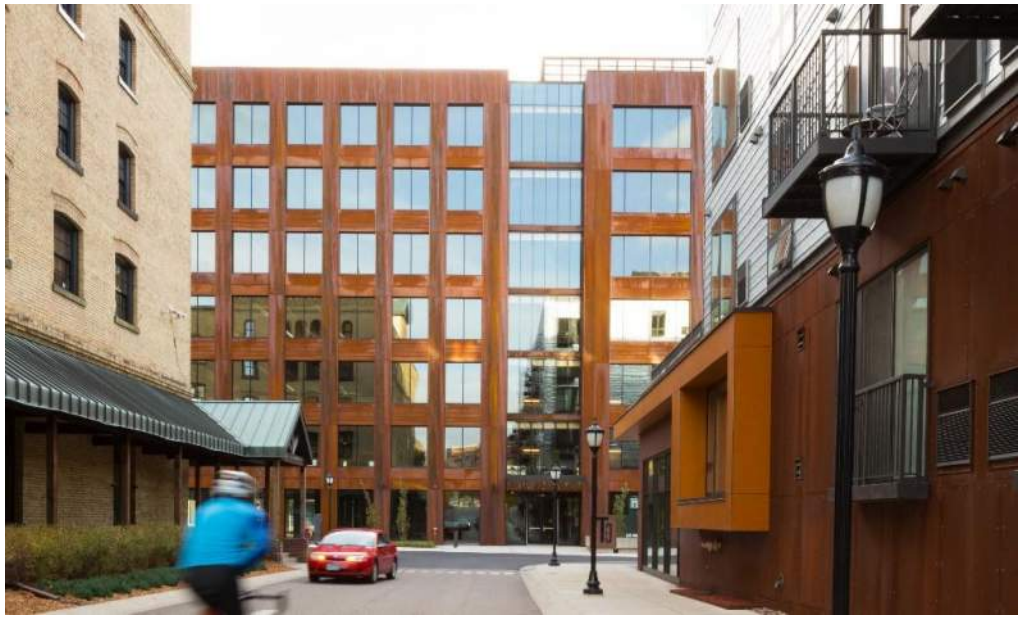


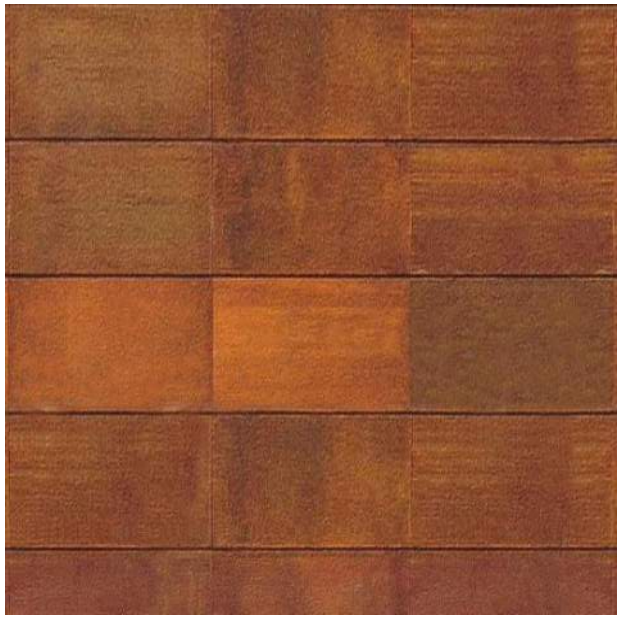
CASE STUDY – T3 PROGRAM

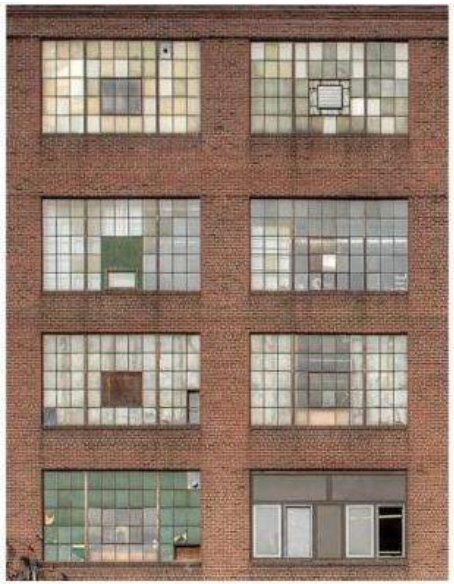
WHY TIMBER

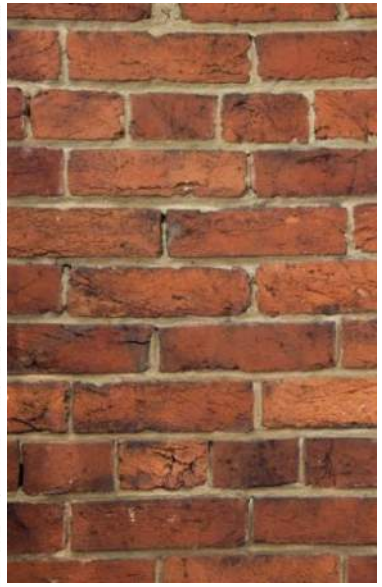

59'-10"
20' X 25' bay
32,900 GSF
TYPICAL PLAN
0 10 20 40 60


85'
6 Timber Floors
at 12' - 0"
Concrete Podium: 13' - 0"
SECTION
0 10 20 40 60



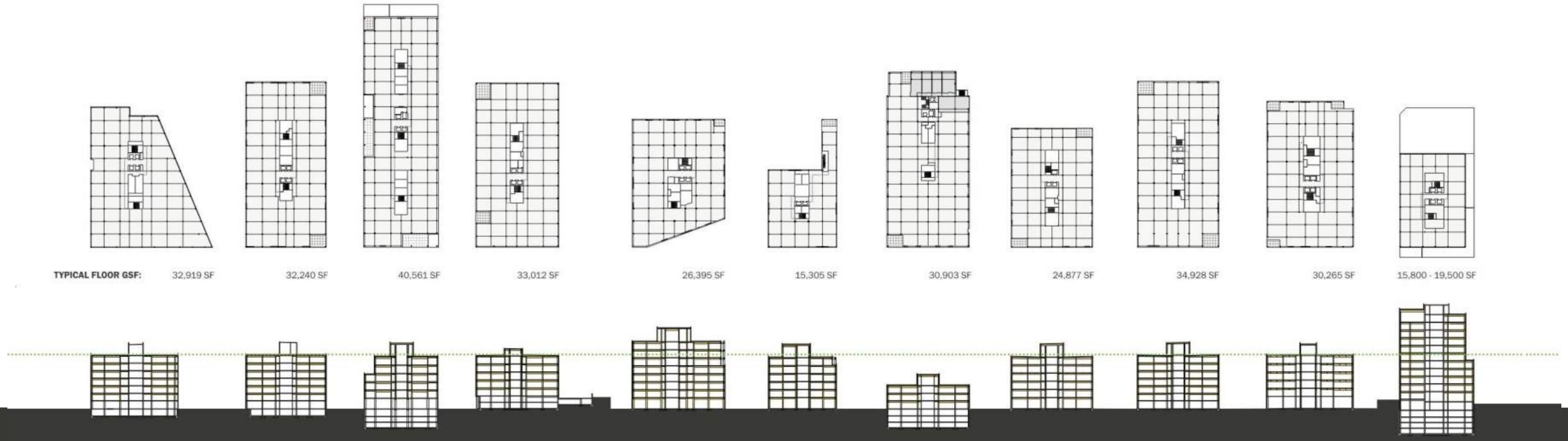




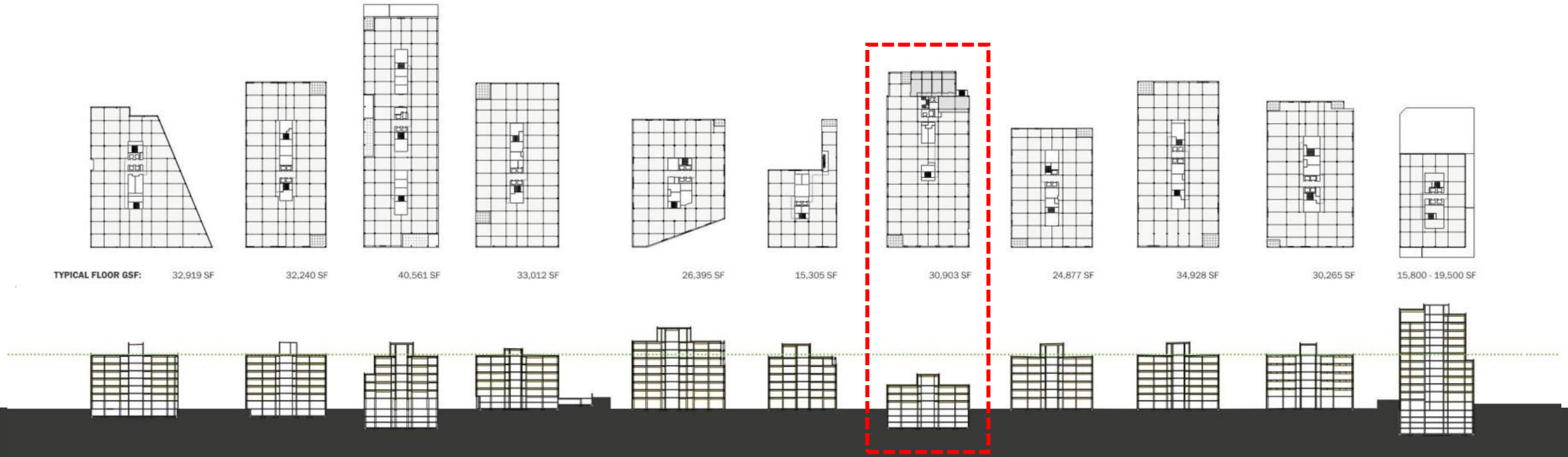


MASS TIMBER CONTEXT

CASE STUDY – T3 MINNEAPOLIS



TYPICAL FLOOR GSF:	32,919 SF	32,240 SF	40,561 SF	33,012 SF	26,395 SF	15,305 SF	30,903 SF	24,877 SF	34,928 SF	30,265 SF	15,800 - 19,500 SF
MSP	**ATL**	**DEN**	**NSH**	**TOR**	**TOR**	**ATX**	**DHM**	**DHM**	**FTL**	**VBC**	
T3 Minneapolis Minneapolis, MN	T3 West Midtown Atlanta, GA	T3 RiNo Denver, CO	T3 Wedgewood-Houston Nashville, TN	T3 Sterling Road 5A Toronto, Ontario	T3 Sterling Road 3A Toronto, Ontario	T3 Eastside Austin, TX	T3 ATC Block 3 Durham, NC	T3 ATC Block 4 Durham, NC	T3 FAT Village Fort Lauderdale, FL	T3 Mount Pleasant Vancouver, British Columbia	it bia



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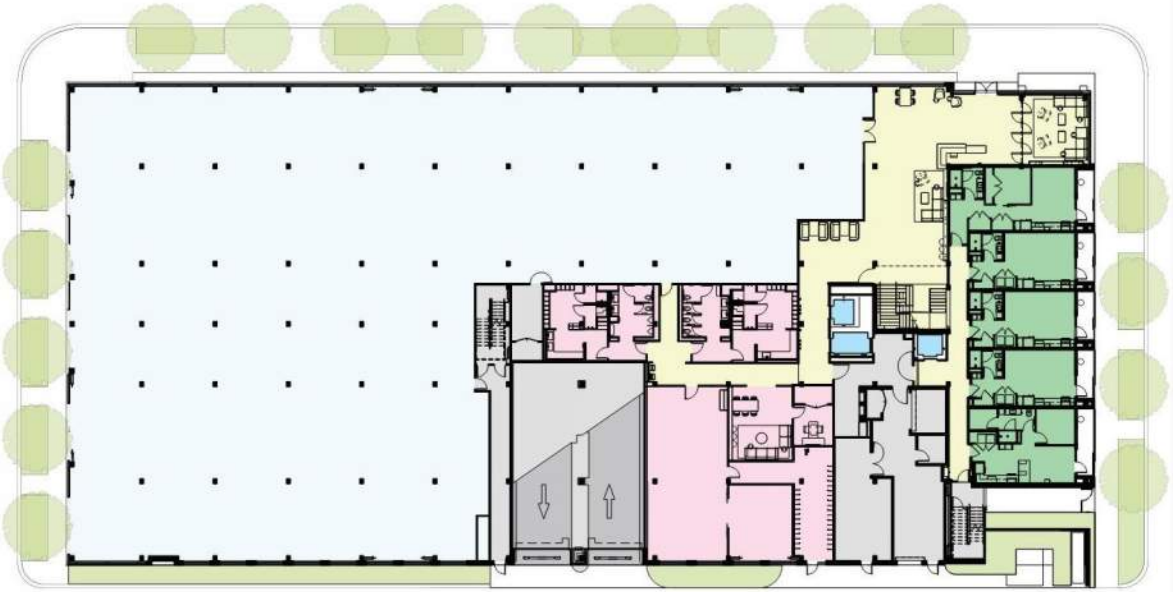
311
ATWAC
1211
E FOURTH
FOR LEASE
T3



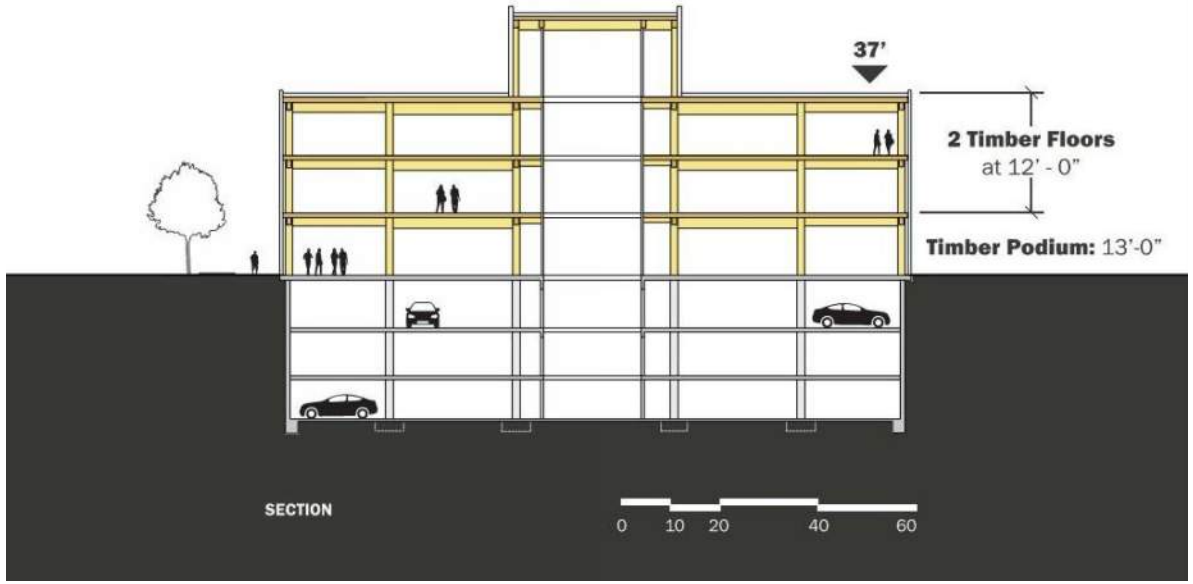
GROUND FLOOR PLAN | ATX Eastside

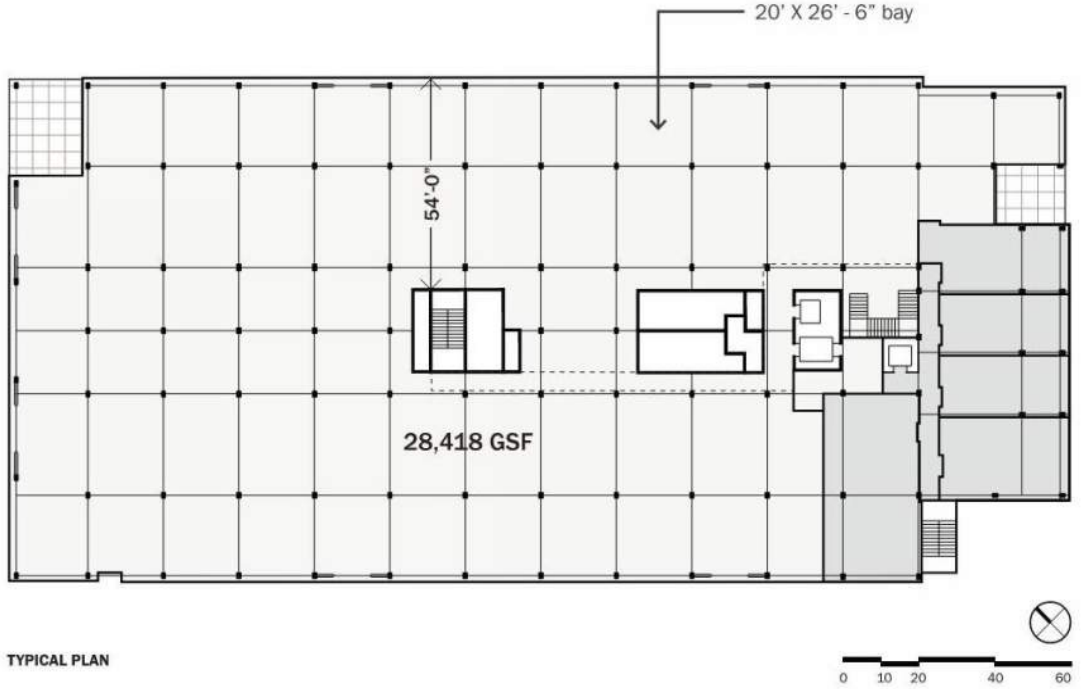
not to scale

- *Transit*
- *Major Street Traffic*
- *Major Bike Path*
- *Bus Stop*
- 1 *Plaza Saltillo Station*
- 2 *5th Street downtown*
- 3 *Downtown Austin*
- 4 *Red River Cultural District*
- 5 *East Cesar Chavez Neighborhood*
- 6 *Cosmic Coffee at Texaco Depot*
- *Amenity*
- *Social Work Space*
- *Building Services*
- *Office*
- *Residential*
- *Vertical Circulation*
- *Circulation*

59

CASE STUDY – T3 ATX EASTSIDE





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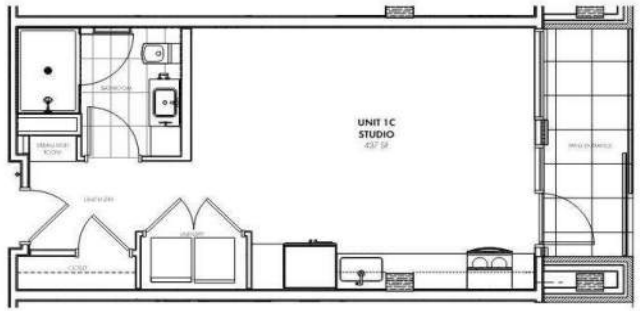
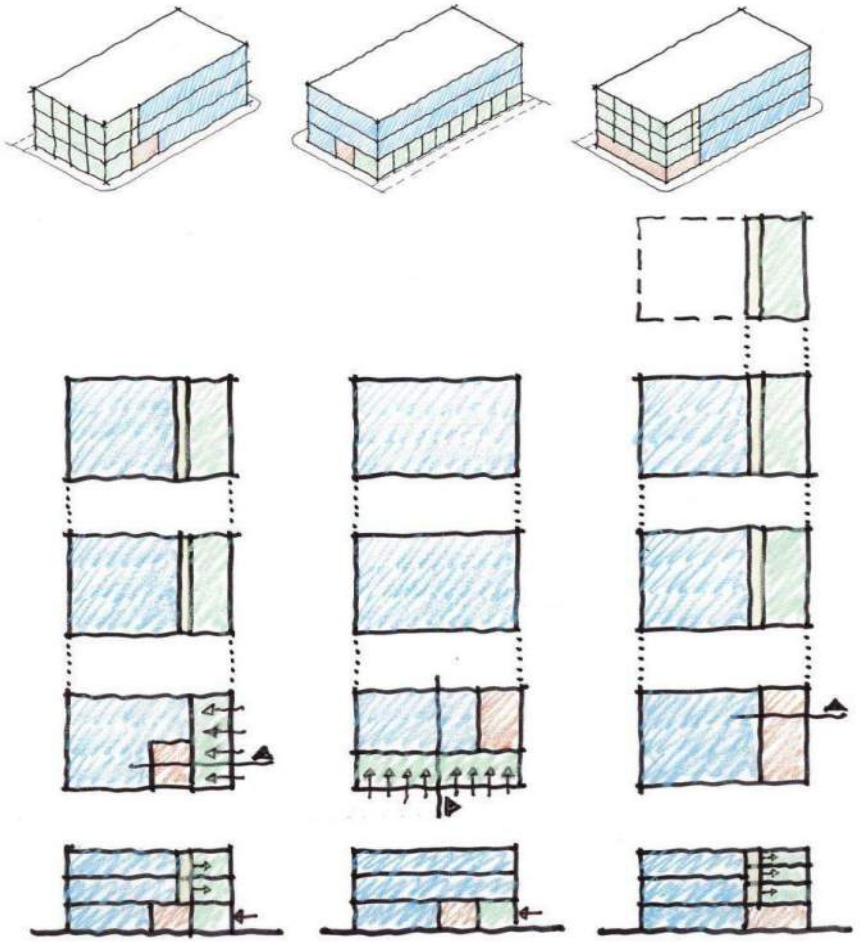


ENLARGED STUDIO UNIT LAYOUT



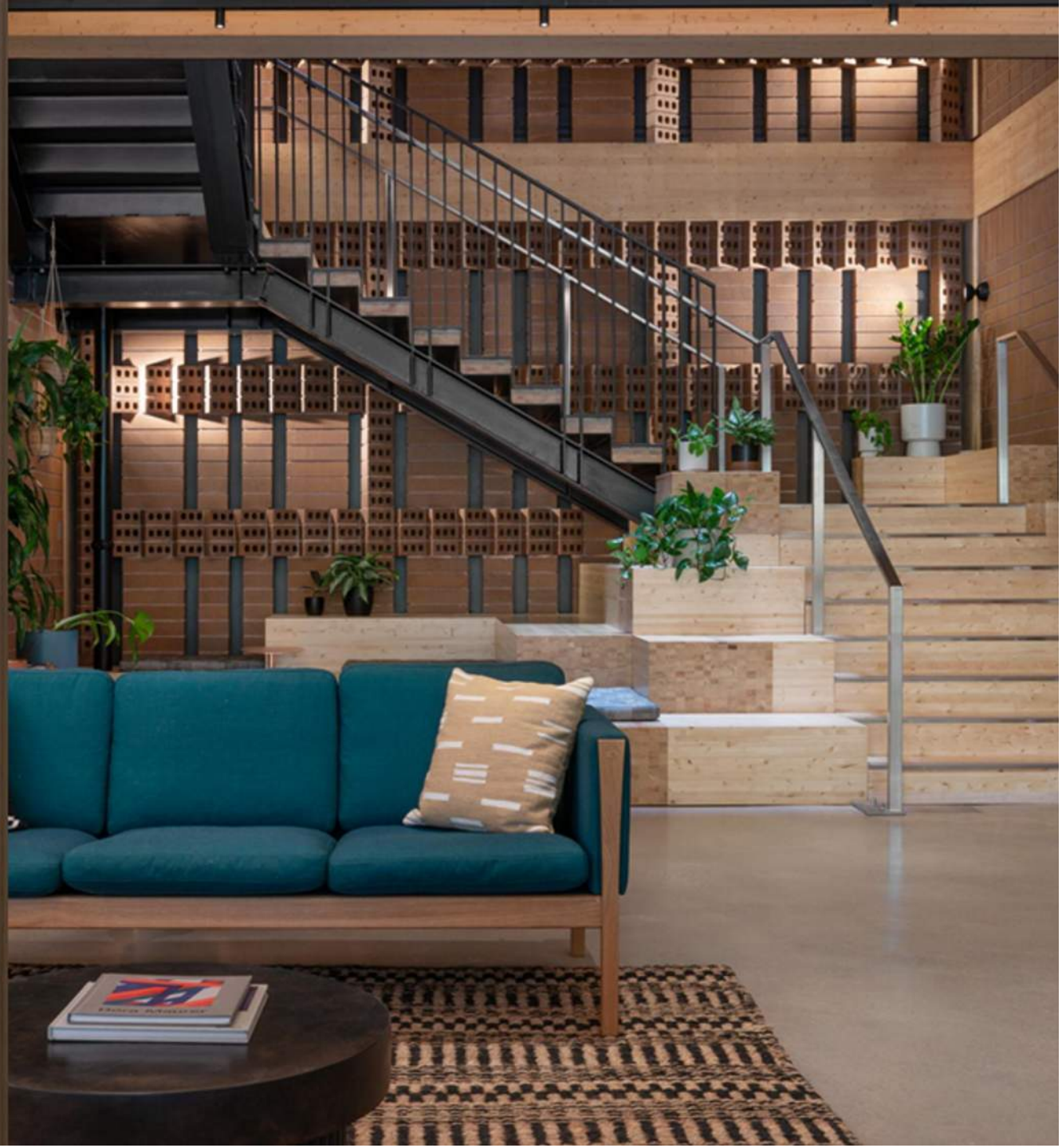
T3 Lofts
Floors aligned
Patio units
High ceilings

Alley Lofts
100% Efficiency for Resi
No vertical circulation for Resi
Progressive Alley Artist Loft

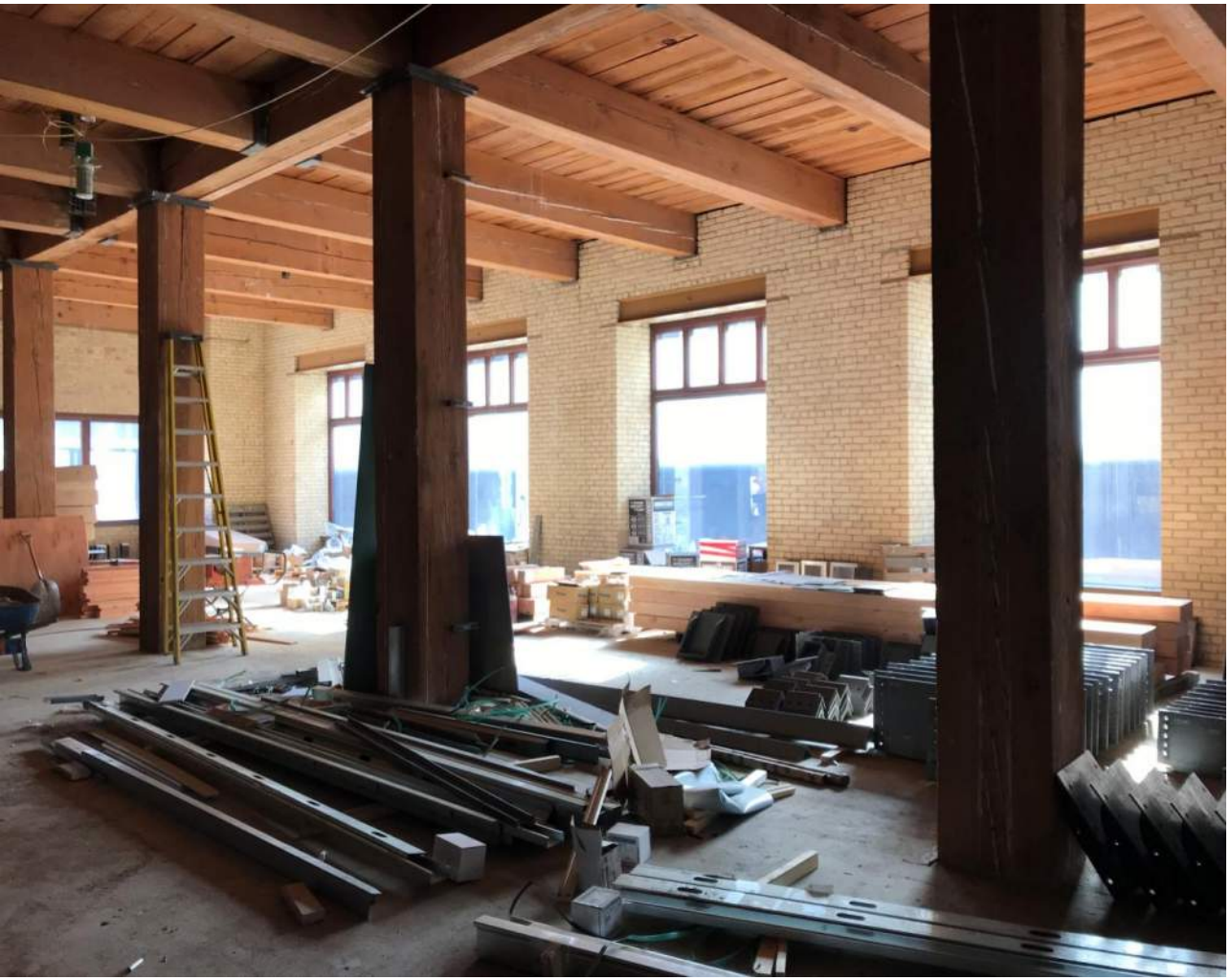
Attayac Flats
Resi atop Office amenity
Consistency of Office plates
Floors not aligned

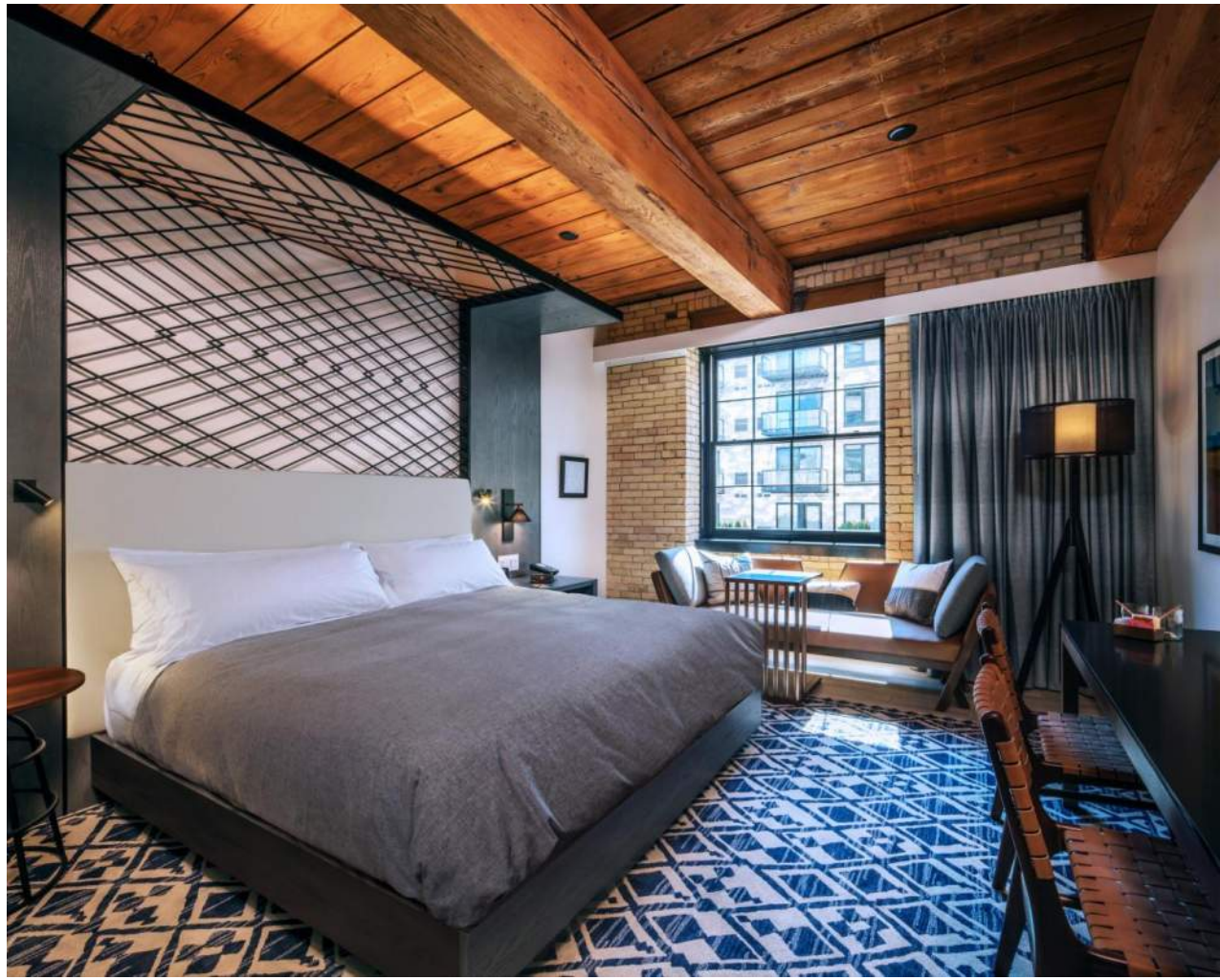
Mixed-Use Stacking Schemes

RESIDENTIAL UNITS

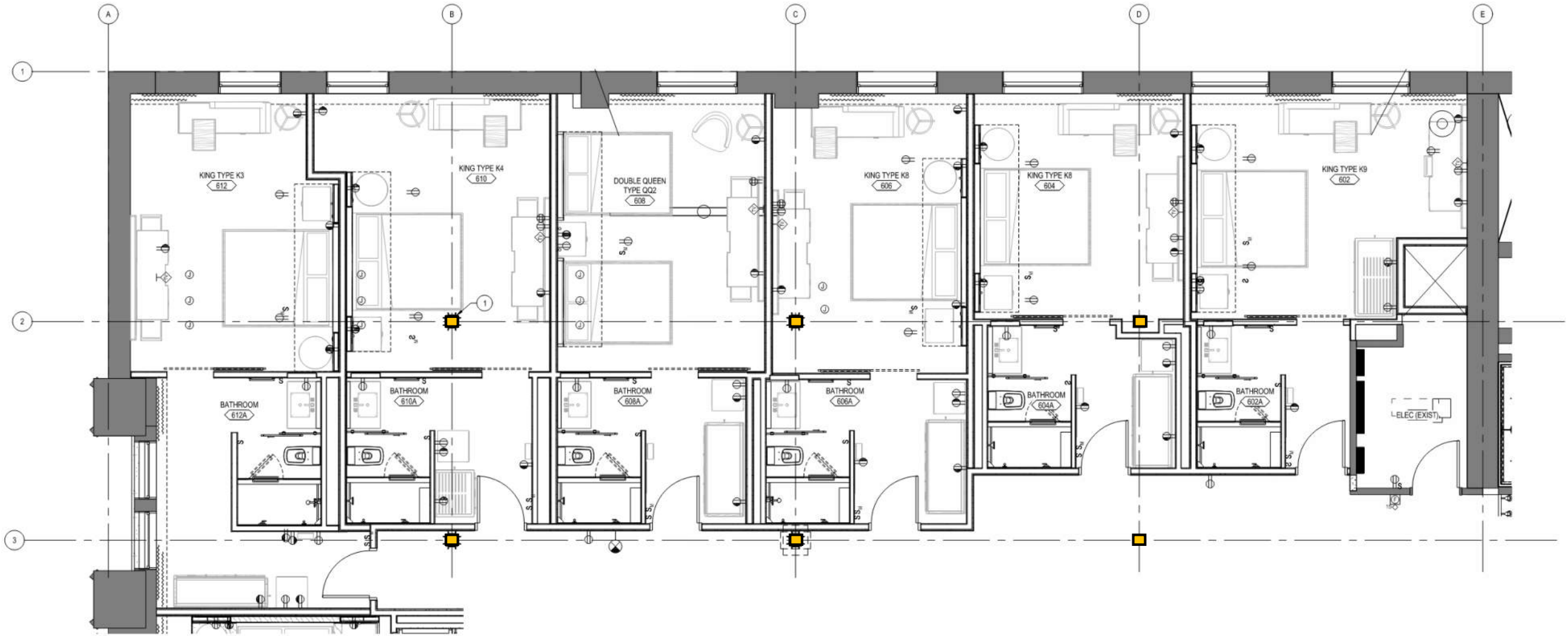


CASE STUDY – CANOPY MINNEAPOLIS

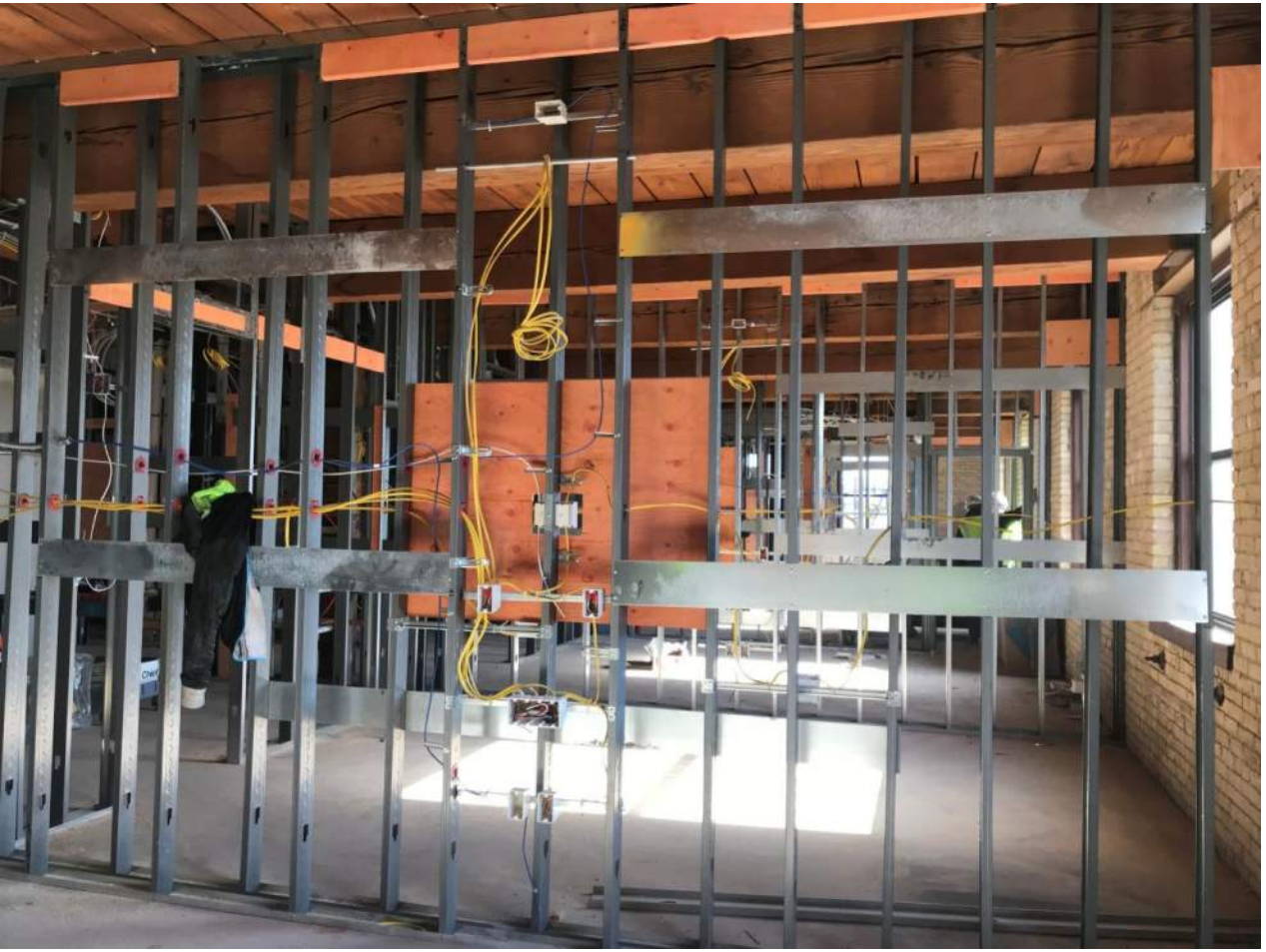




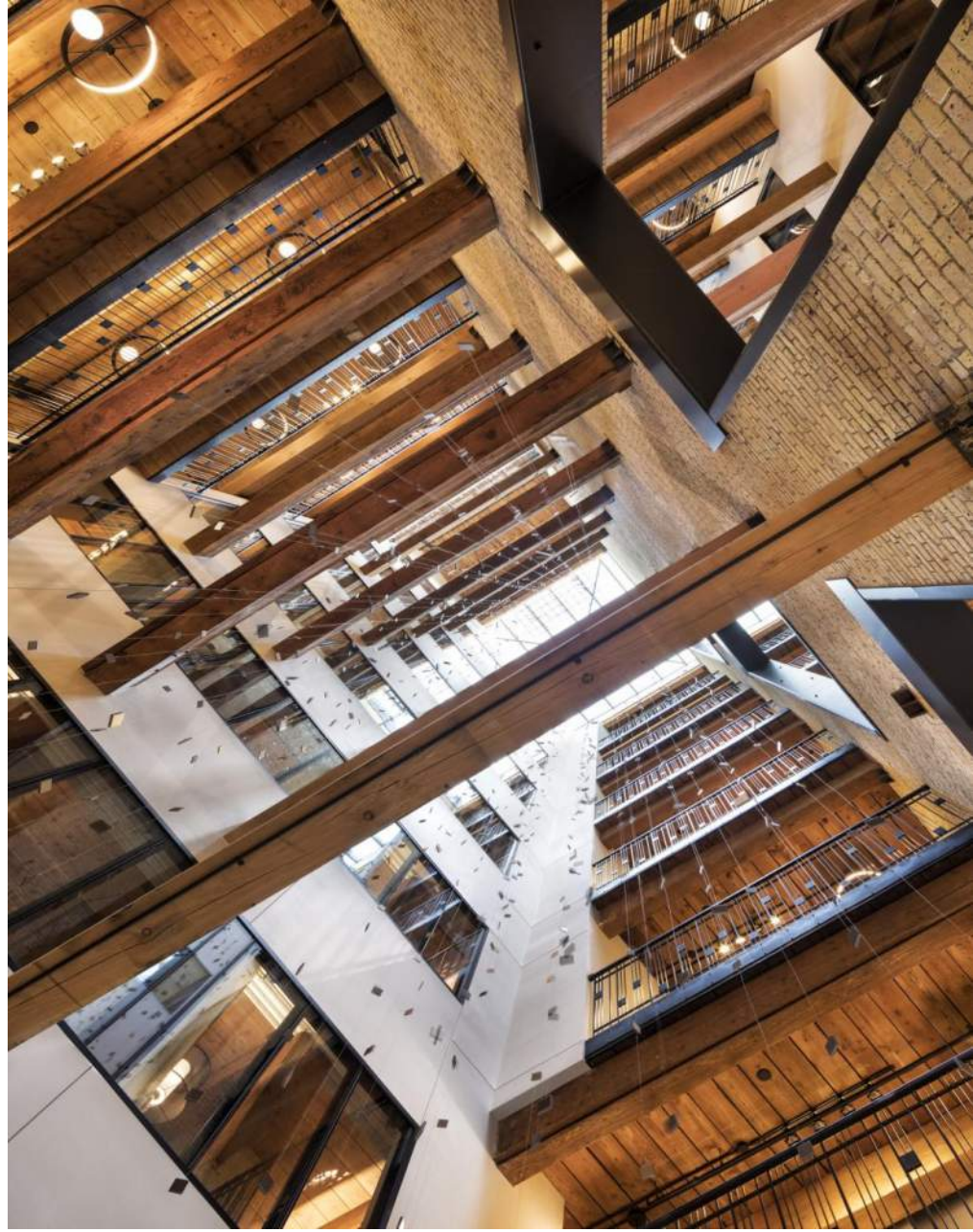
GOOD BONES TO GUESTROOMS



GUESTROOM LAYOUTS



MEP INTEGRATION AND PARTITIONS



ATRIUM BEFORE AND AFTER

MASS TIMBER HOTEL

WOOD INNOVATION GRANT

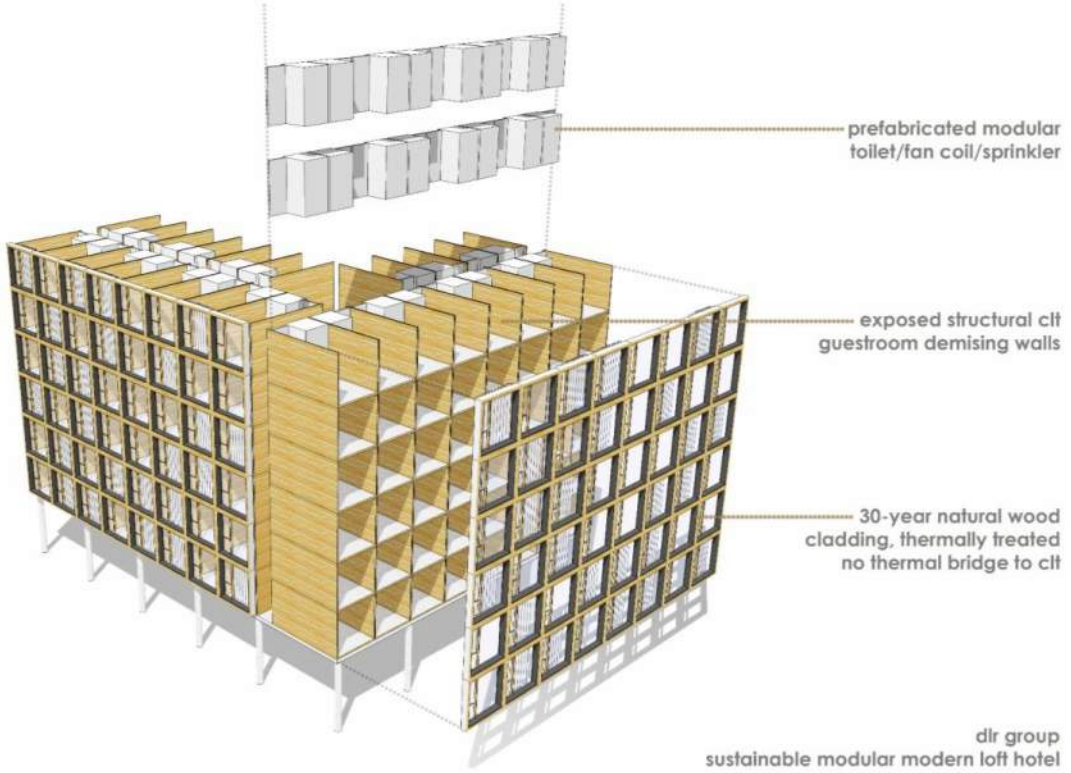
DLR GROUP + UNIVERSITY OF MINNESOTA

Grant-Based Research

Develop a prototype design for mass timber hotels that takes advantage of the changes to the 2021 International Building Code (IBC) and addresses:

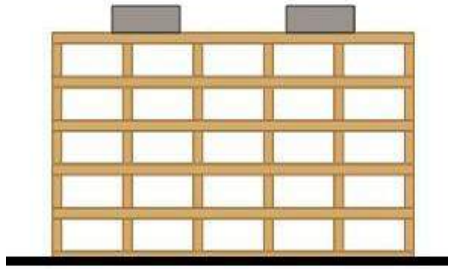
- Structure
- Acoustics
- Code Compliance
- Durability
- Beauty
- Biophilia
- Modularity
- Prefabrication

1) FLEXIBILE MODULE FOR MULTIPLE HOTEL BRANDS
2) EFFICIENT STRUCTURE
3) 2-HR FIRE RATING FOR PRIMARY STRUCTURAL FRAME
4) APPROPRIATE ACOUSTIC SEPARATIONS WITH MASS TIMBER
5) PROMOTE PREFABRICATION
6) FACILITATE MEP INTEGRATION
7) FIT WITH NEIGHBORHOOD CONTEXT
8) UTILIZE HEALTHY MATERIALS
9) PROMOTE BIOPHILIA AND WELLNESS
10) CONSIDER MAINTENANCE AND DURABILITY CONCERNS
11) CELEBRATE BEAUTY OF EXPOSED WOOD STRUCTURE



PROTOTYPE GOALS

2018

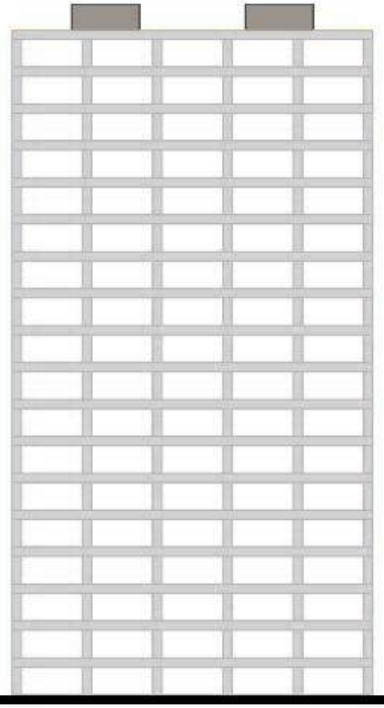


TYPE IV-HT

MAX 5 STORIES, 85’
BLDG. AREA 246,000 SF
AVG. PER STORY 49,200 SF
17’ FLR-TO-FLR

2021

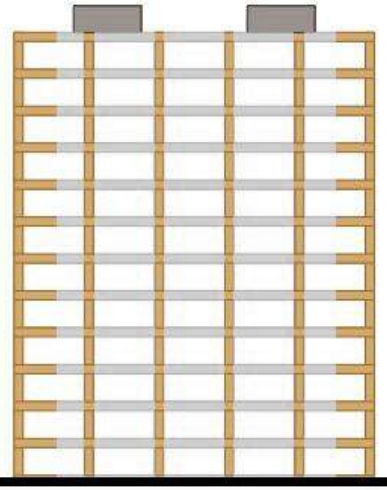
100% ENCAPSULATED



TYPE IV-A

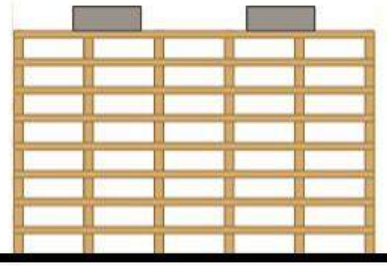
MAX 18 STORIES, 270’
BLDG. AREA 738,000 SF
AVG. PER STORY 41,000 SF
15’ FLR-TO-FLR

80% BEAMS+CEILINGS
ENCAPSULATED



TYPE IV-B

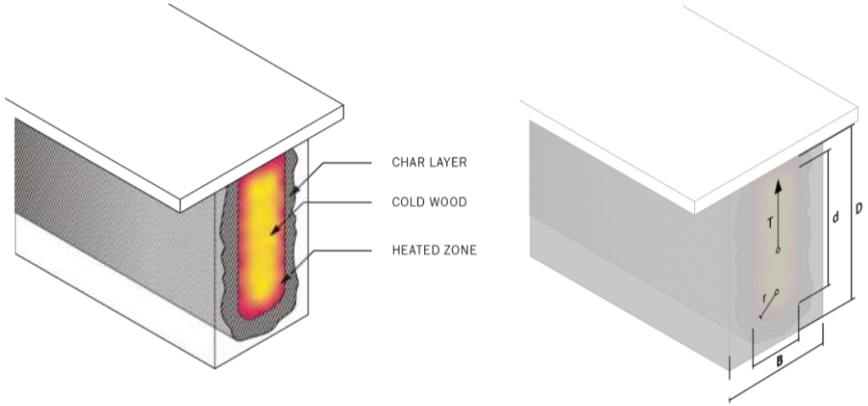
MAX 12 STORIES, 180’
BLDG. AREA 492,000 SF
AVG. PER STORY 41,000 SF
15’ FLR-TO-FLR



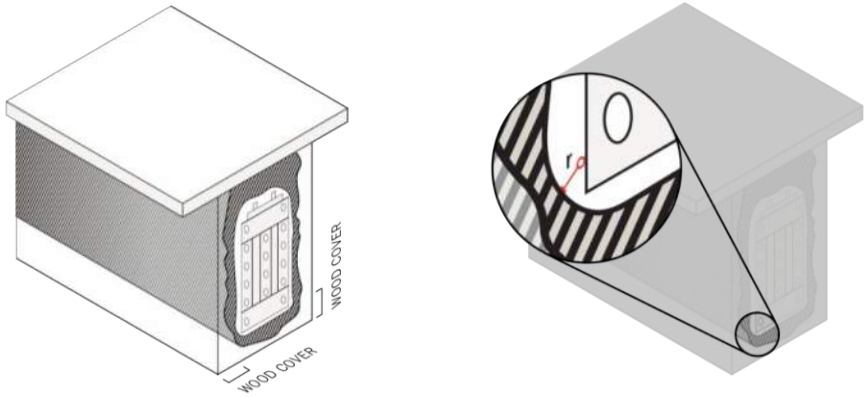
TYPE IV-C

MAX 8 STORIES, 85’
BLDG. AREA 307,500 SF
AVG. PER STORY 38,437 SF
10’-7” FLR-TO-FLR

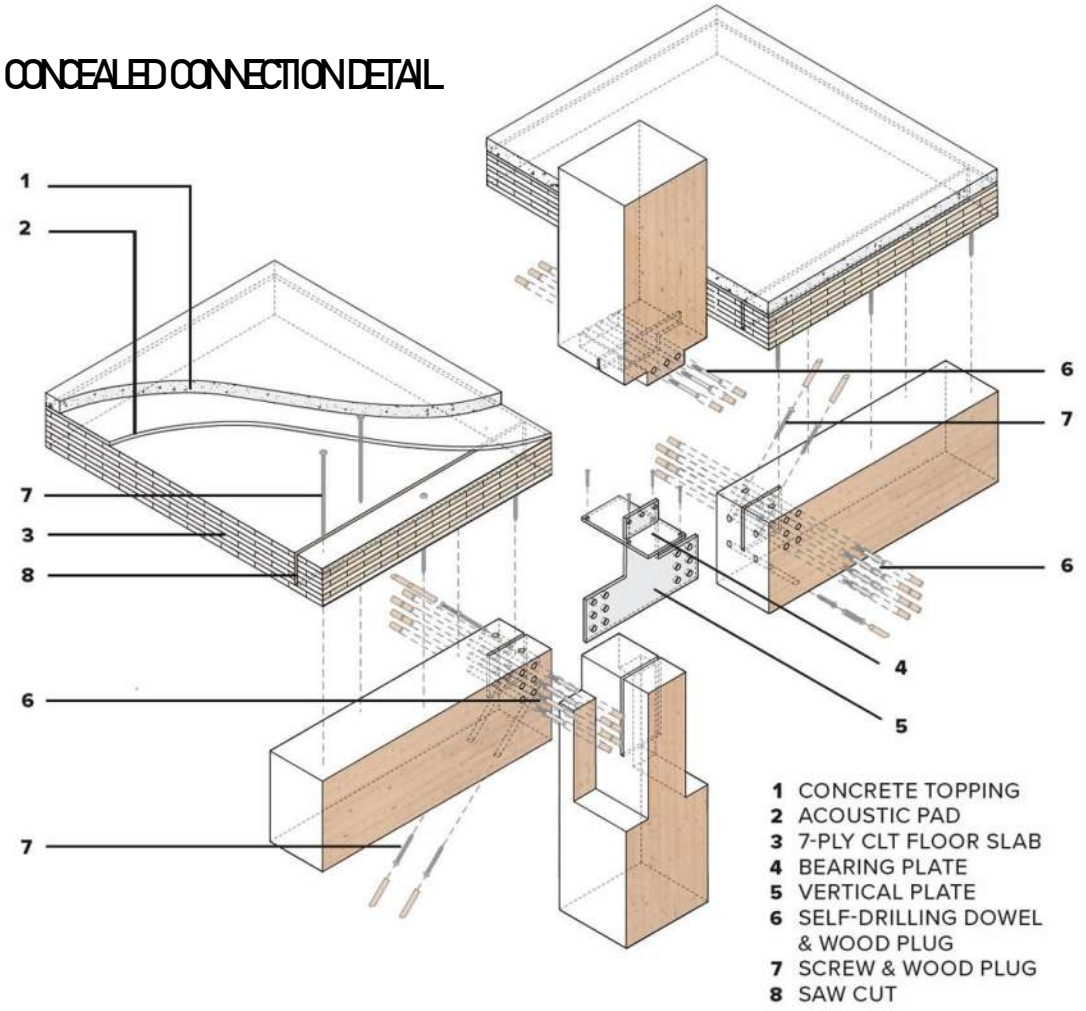
American Wood Council - Calculating the Fire Resistance of Exposed Wood Members - Technical Report No 10



Concealed Beam Hanger System MTC Solutions



CONCEALED CONNECTION DETAIL

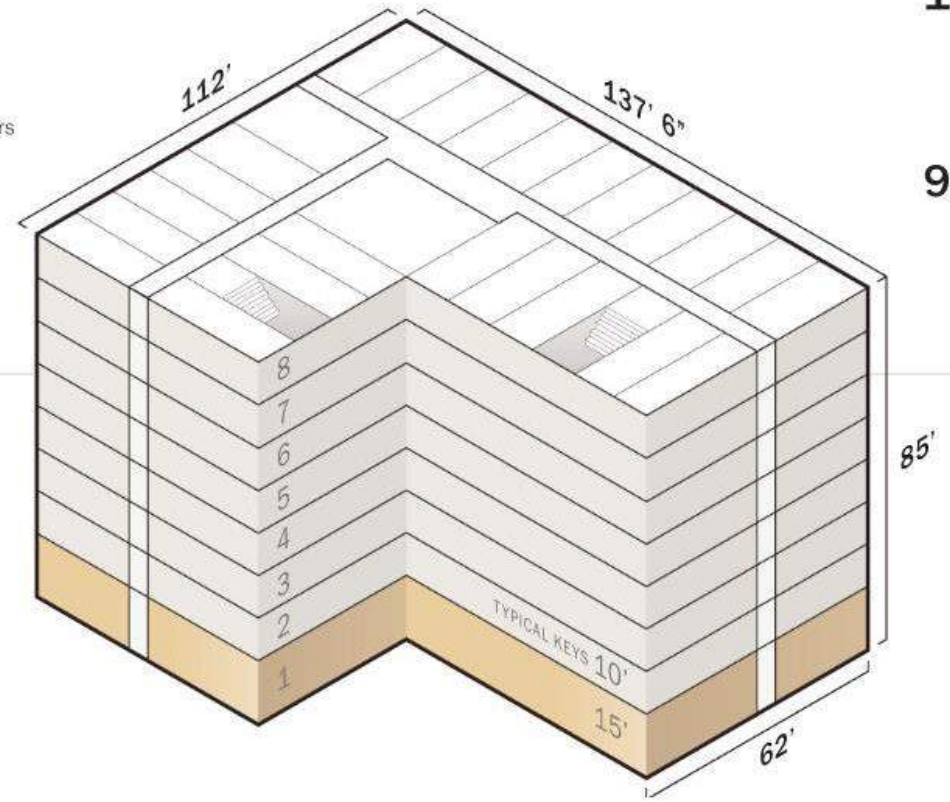


FIRE RATED WOOD STRUCTURE

25
Keys Per Floor

7
Guestroom Floors

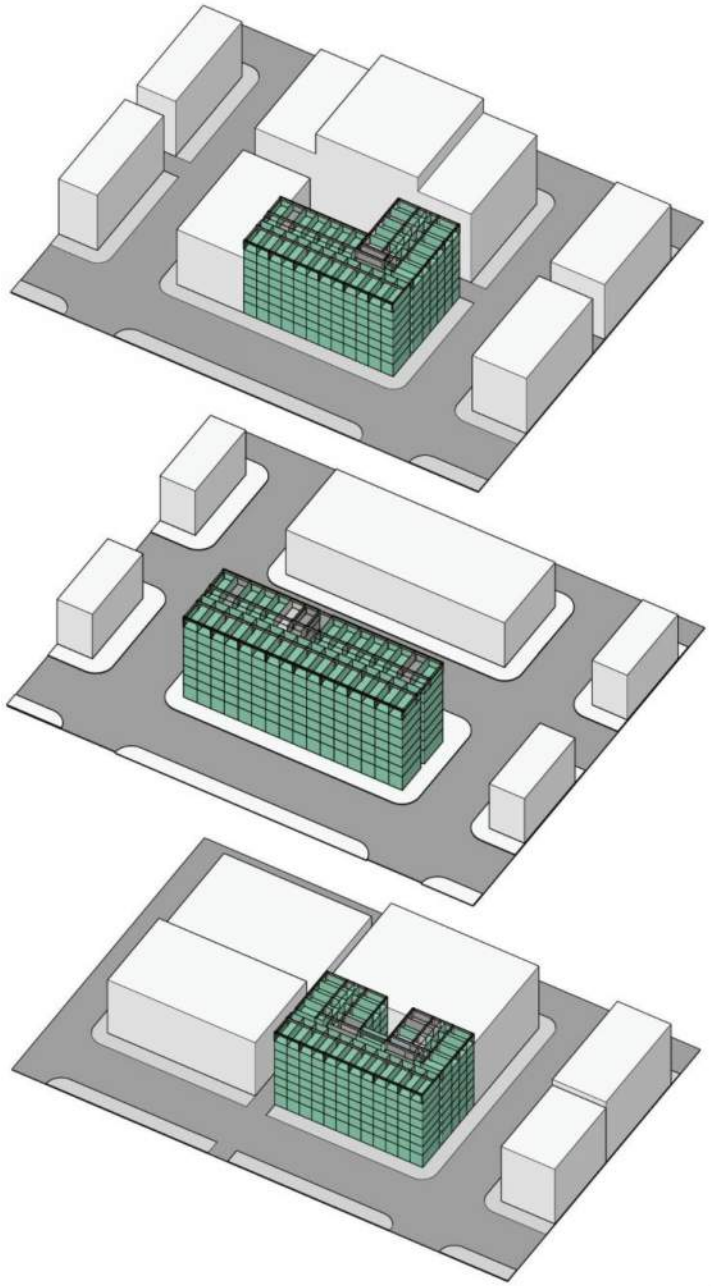
175
Keys Total



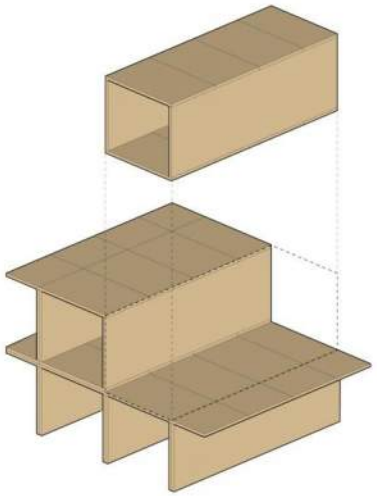
11,650
SF Per Floor

8
Total Floors

93,200
SF Total



MODULAR + ADAPTABLE DESIGN



- HIGH QUANTITY
- DYNAMIC LOAD
- SHIPPING AIR

- HIGH QUANTITY
- TRANSFERS REQUIRED
- CLT ACOUSTICS

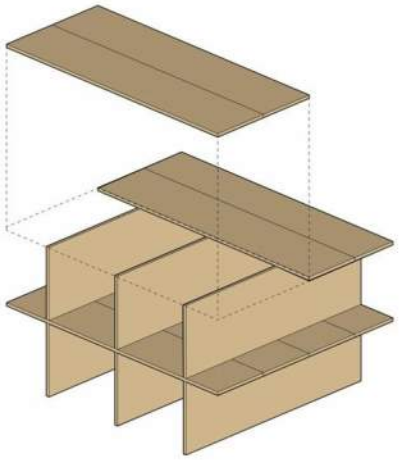
+ LOW QUANTITY
+ NO TRANSFER
- BEAM DEPTH

+ LOWER QUANTITY
+ NO TRANSFER
- BEAMS 2 WAYS

+ LOW QUANTITY
- TRANSFERS REQUIRED
- PUNCHING SHEAR

STRUCTURAL OPTIONS

- HIGH QUANTITY
- DYNAMIC LOAD
- SHIPPING AIR



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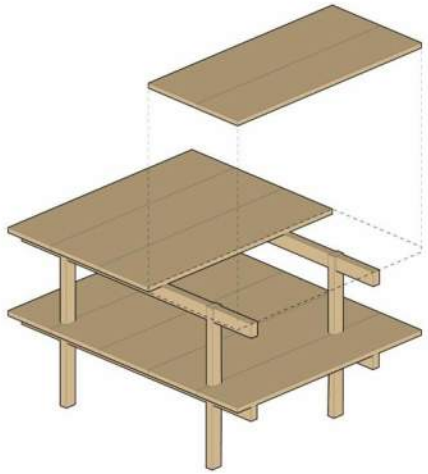

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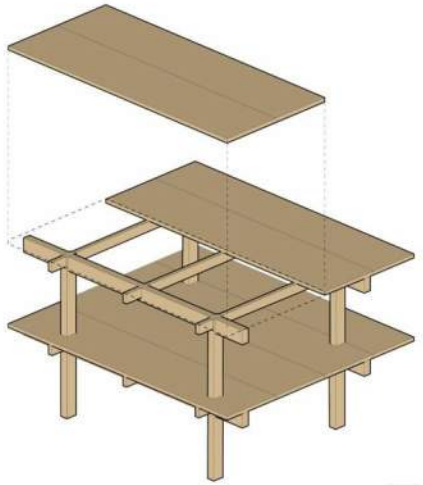

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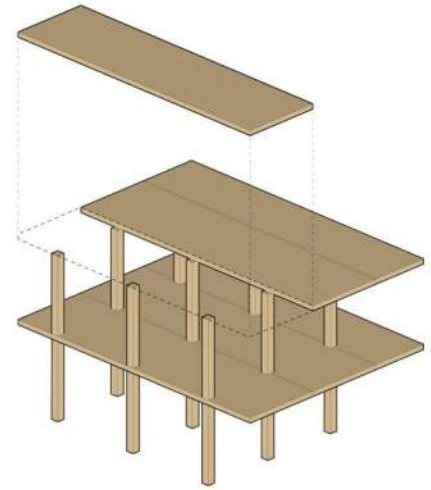

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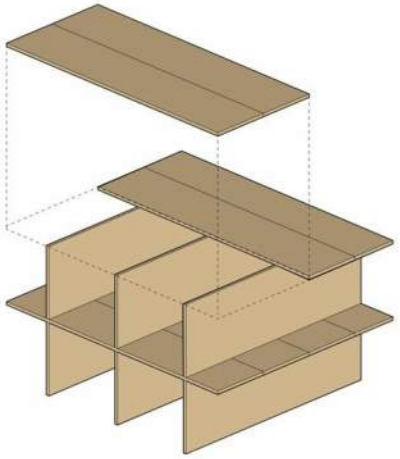

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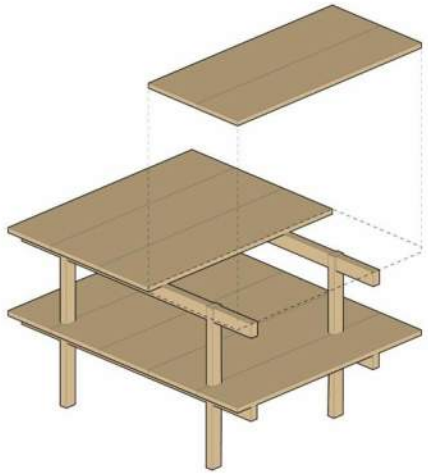

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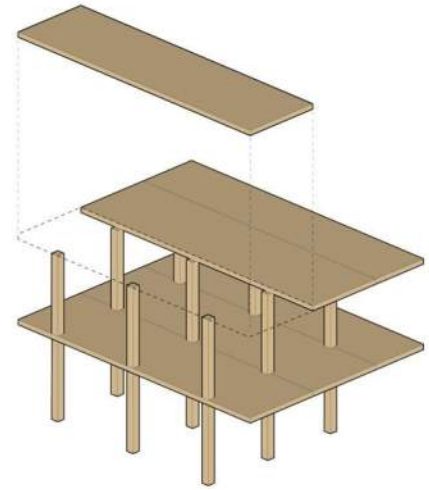


+ LOW QUANTITY
- TRANSFERS REQUIRED
- PUNCHING SHEAR

STRUCTURAL OPTIONS

PURLINS

STACKED BEAMS

ONE WAY SYSTEM

VOLUMETRIC

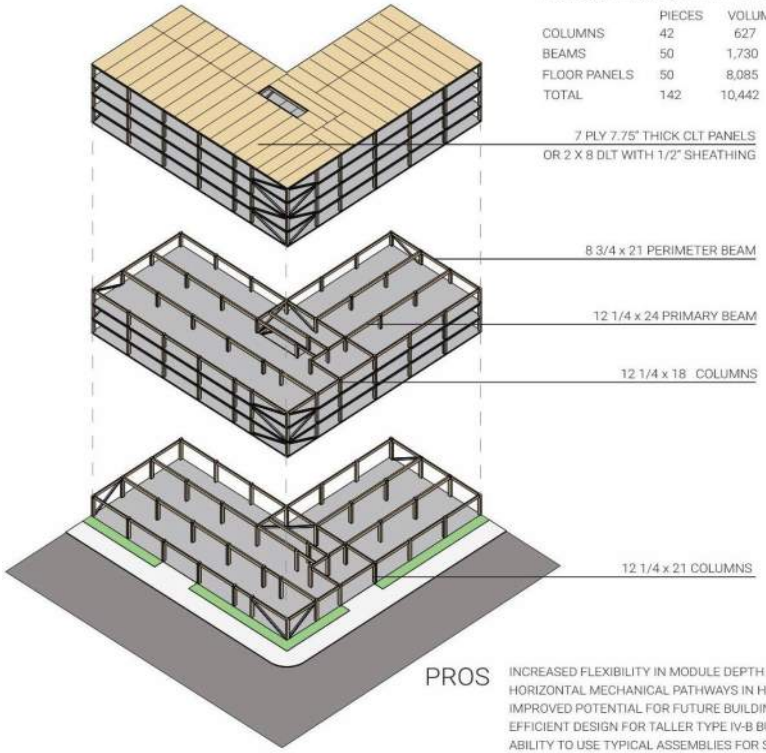
BEARING WALL

CLT SLAB

POST & BEAM DOUBLE SPAN

PER FLOOR TIMBER QUANTITY TAKE-OFF

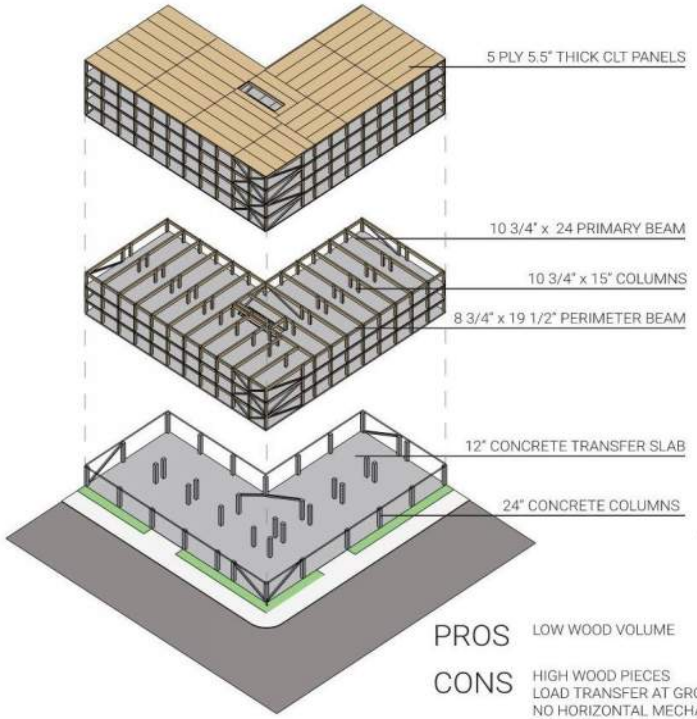
	PIECES	VOLUME
COLUMNS	42	627
BEAMS	50	1,730
FLOOR PANELS	50	8,085
TOTAL	142	10,442



PROS
INCREASED FLEXIBILITY IN MODULE DEPTH AND WI
HORIZONTAL MECHANICAL PATHWAYS IN HALLWAY
IMPROVED POTENTIAL FOR FUTURE BUILDING REUS
EFFICIENT DESIGN FOR TALLER TYPE IV-B BUILDING
ABILITY TO USE TYPICAL ASSEMBLIES FOR SOUND F

CONS
DEEPER FLOOR PANELS

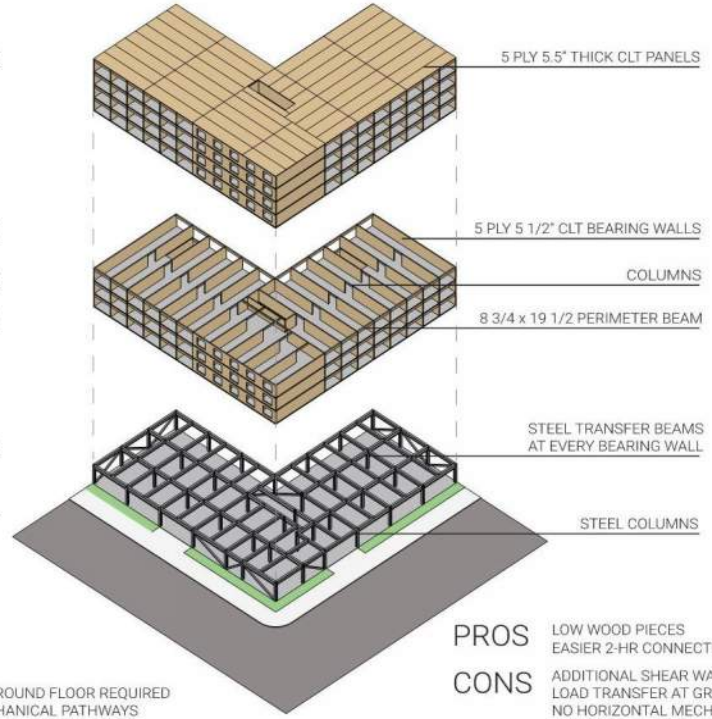
FLOOR PANELS	49	5706
BEARING WALLS		
TOTAL	212	8859



PROS
LOW WOOD VOLUME

CONS
HIGH WOOD PIECES
LOAD TRANSFER AT GROUND FLOOR REQUIRED
NO HORIZONTAL MECHANICAL PATHWAYS
ODD COLUMN SPACING AT GROUND FLOOR
INCREASED NUMBER OF CONNECTIONS

FLOOR PANELS	49	5706
BEARING WALLS	39	4281
TOTAL	143	10,537



PROS
LOW WOOD PIECES
EASIER 2-HR CONNECTIONS

CONS
ADDITIONAL SHEAR WALLS REQUIRED
LOAD TRANSFER AT GROUND FLOOR REQ
NO HORIZONTAL MECHANICAL PATHWAYS
REDUCED FUTURE FLEXIBILITY FOR BUILD
CLT WALLS PERFORM POORLY ACOUSTIC

RESEARCH + FRAME OPTIMIZATION

PURLINS

STACKED BEAMS

ONE WAY SYSTEM

VOLUMETRIC

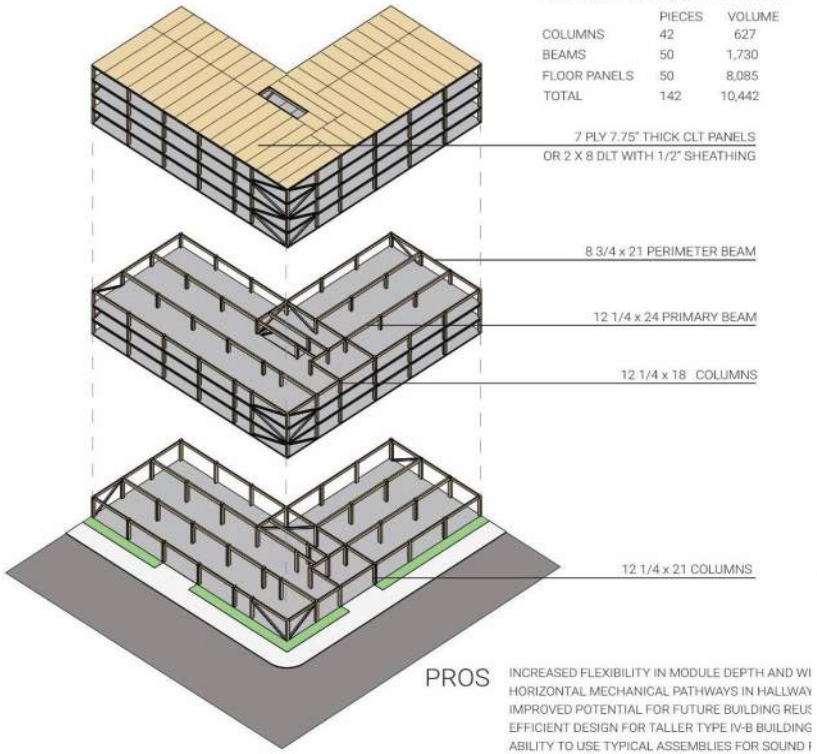
BEARING WALL

CLT SLAB

POST & BEAM DOUBLE SPAN

PER FLOOR TIMBER QUANTITY TAKE-OFF

	PIECES	VOLUME
COLUMNS	42	627
BEAMS	50	1,730
FLOOR PANELS	50	8,085
TOTAL	142	10,442



PROS
INCREASED FLEXIBILITY IN MODULE DEPTH AND WI
HORIZONTAL MECHANICAL PATHWAYS IN HALLWAY
IMPROVED POTENTIAL FOR FUTURE BUILDING REUS
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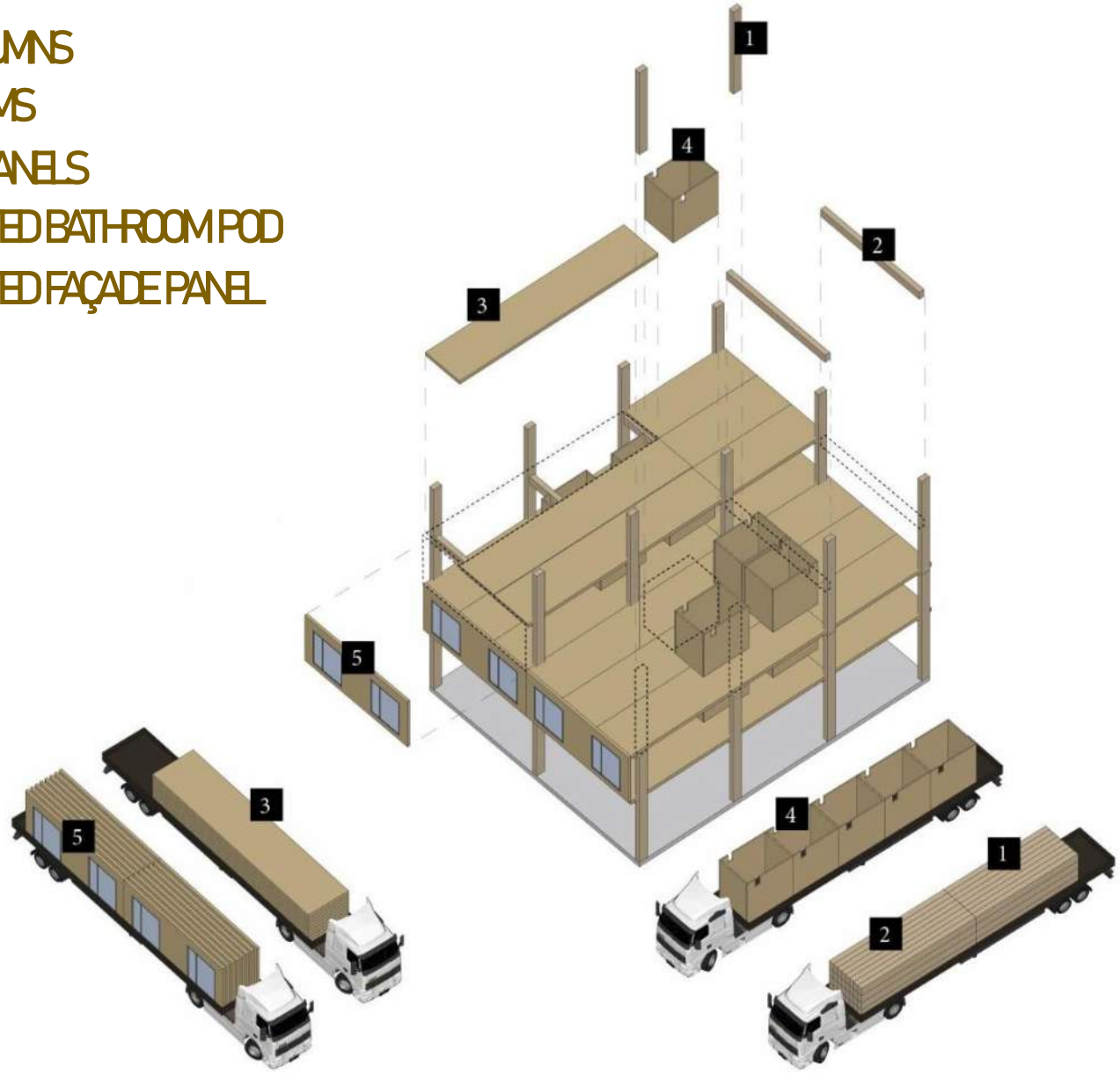
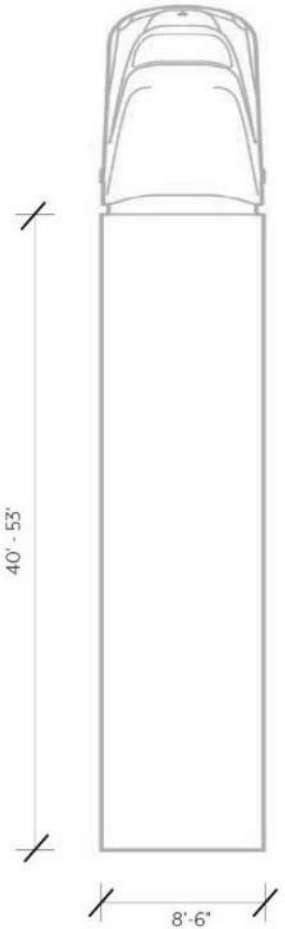
NO HORIZONTAL MECHANICAL PATHWAY
REDUCED FUTURE FLEXIBILITY FOR BUILD
CLT WALLS PERFORM POORLY ACOUSTIC

RESEARCH + FRAME OPTIMIZATION

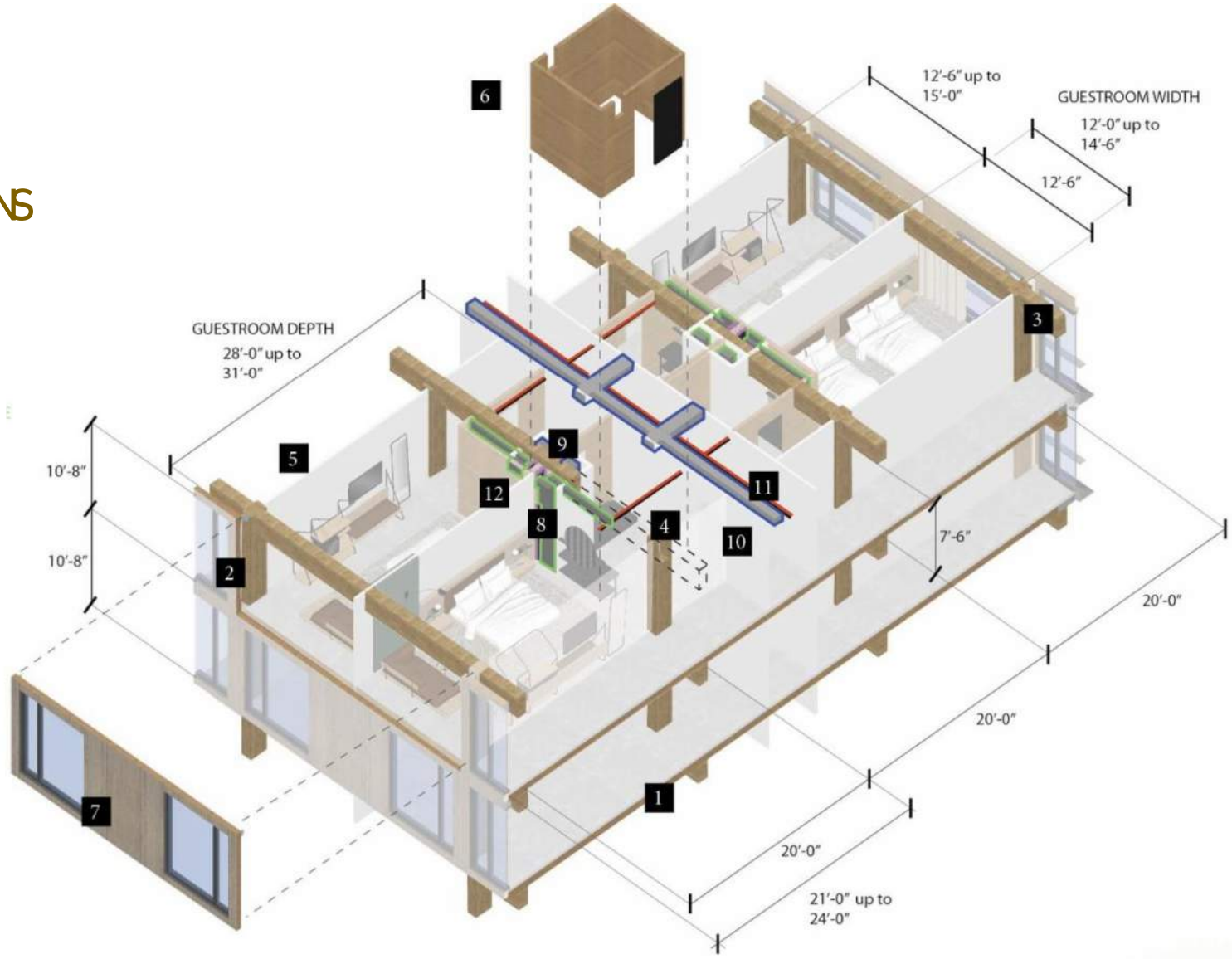
1. GLULAM COLUMNS
2. GLULAM BEAMS
3. CLT OR DLT PANELS
4. PREFABRICATED BATHROOM POD
5. PREFABRICATED FAÇADE PANEL





PREFABRICATION & RAPID CONSTRUCTION

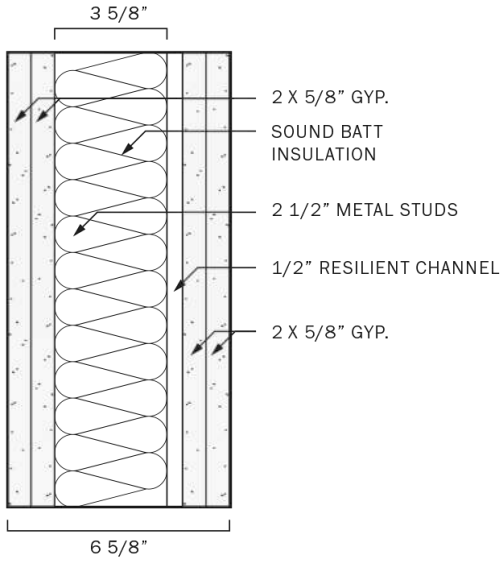
1. CLT OR DLT FLOOR PANEL
2. GLULAM COLUMS
3. GLULAM BEAMS
4. 2-HR STRUCTURAL CONNECTIONS
5. STANDARD GYP PARTIONS
6. PREFABRICATED BATH
7. PRABRICATED FAÇADE
8. MECH UNIT
9. SUPPLY AIR
10. EXHAUST
11. SPRINKLERS
12. HEATING AND COOLING LINES



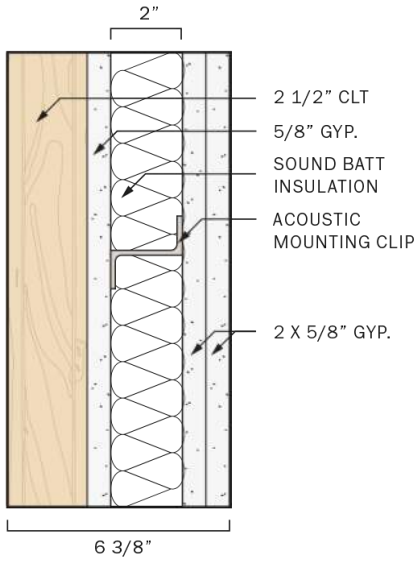
PROTOTYPICAL INTEGRATED MODULE

TYPICAL DEMISING WALL STUDY

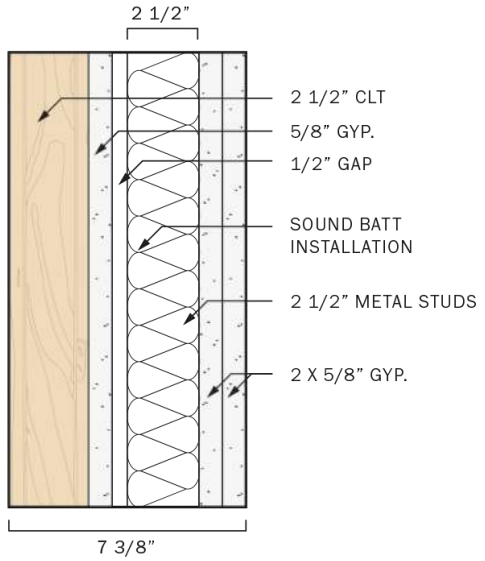
STANDARD GYP STC 57



STC 52 PREDICTED

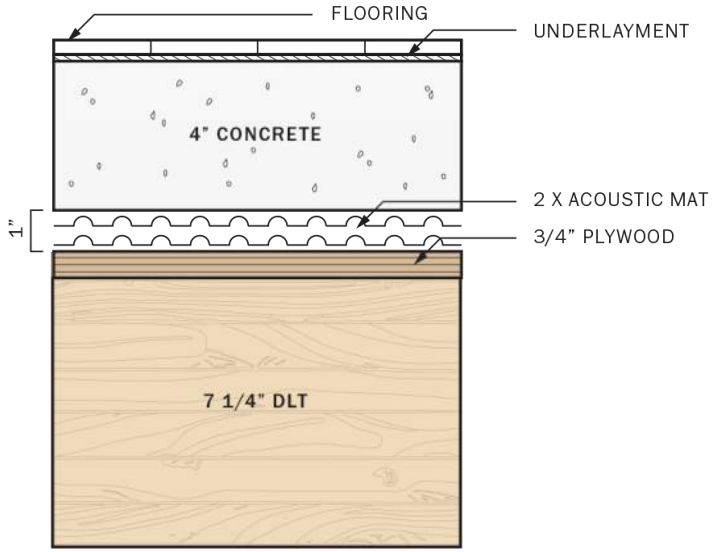


STC 56 PREDICTED



TYPICAL FLOOR ASSEMBLY

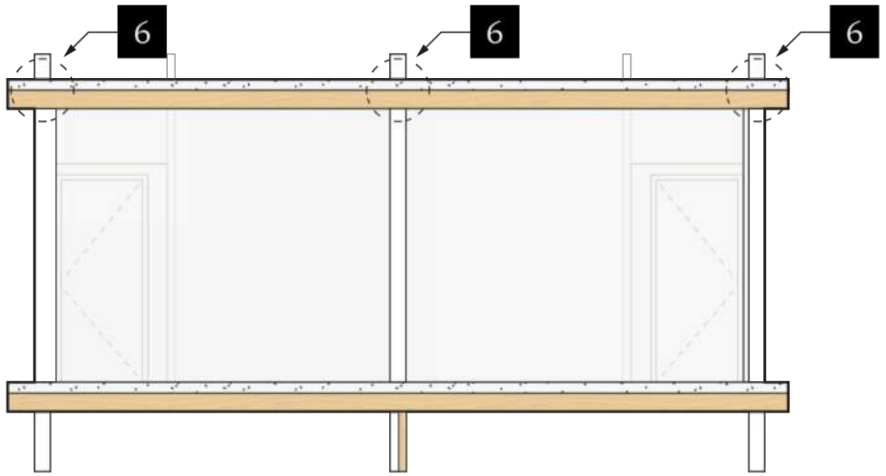
PLITEQ TESTED ASSEMBLY STC 59 IIC 58



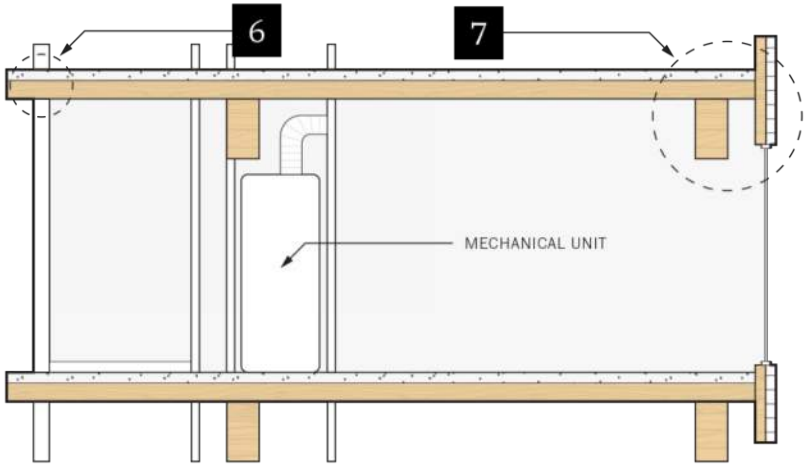
TARGETS	STC	IIC	FIRE
Demising Wall	55		1-hour
Corridor Wall	50		1-hour
Floors	55	57+	2-hour

ACOUSTIC DESIGN

SECTION 1



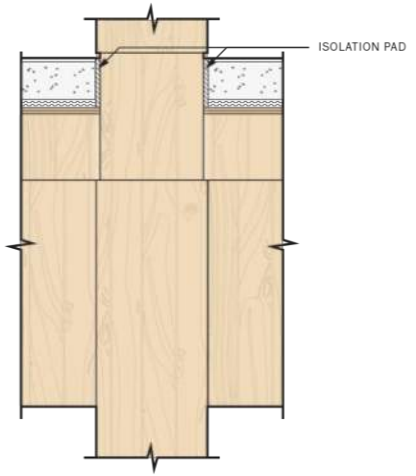
SECTION 2



ACOUSTIC DESIGN

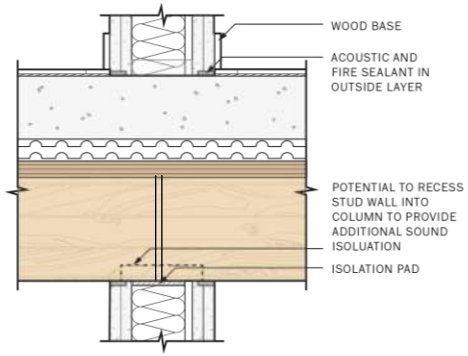
5

COLUMN INTERSECTION



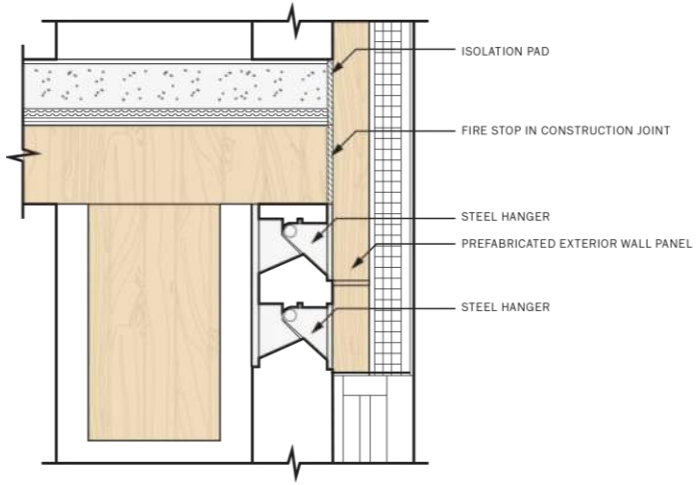
6

DEMISING WALL HEAD AND SILL

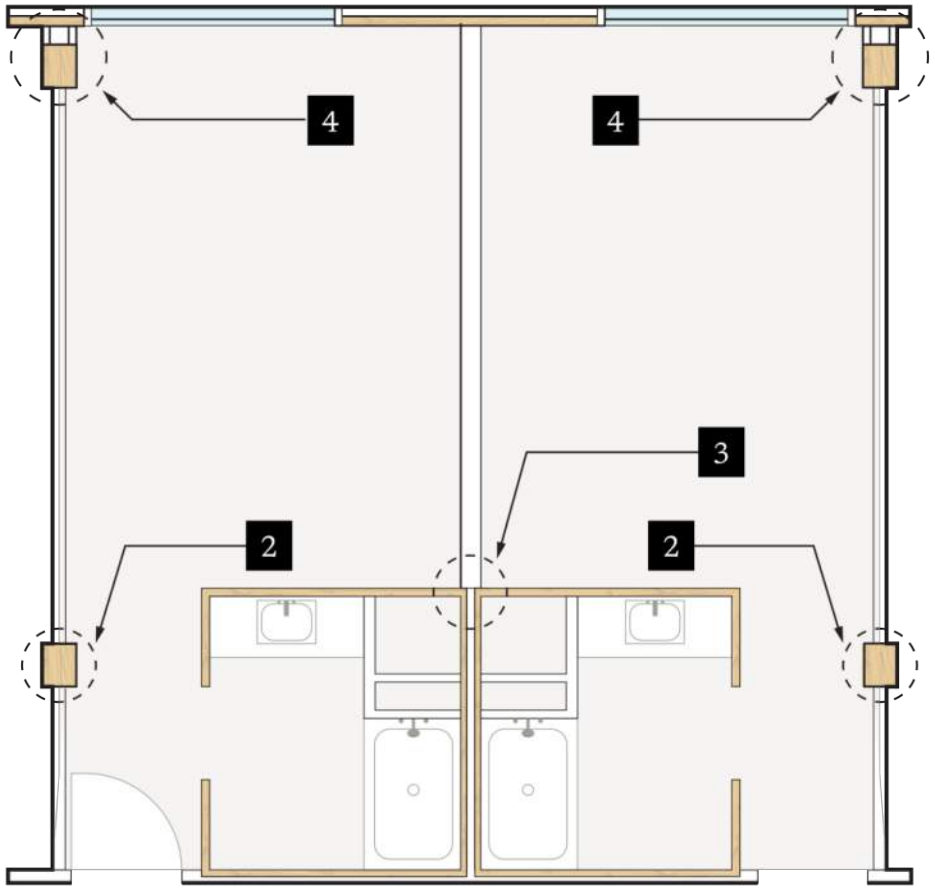


7

PREFABRICATED FAÇADE ATTACHMENT



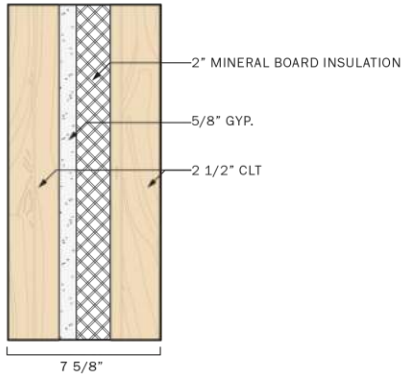
DEMISING WALL INTERSECTIONS



1

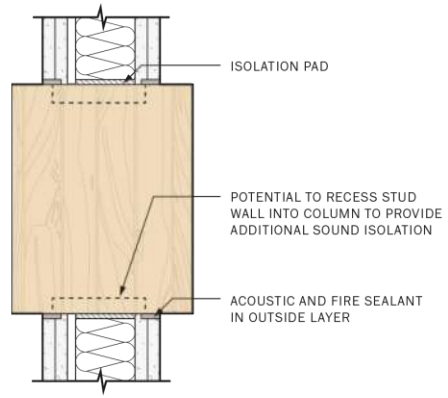
DEMISING WALL @ BATHROOM

STC 57 PREDICTED | 1-HOUR CALCULATED FIRE RESISTANCE



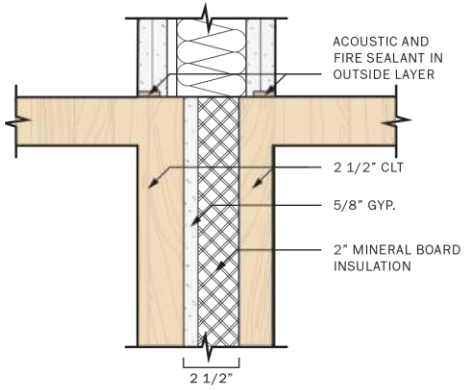
2

DEMISING WALL @ COLUMN



3

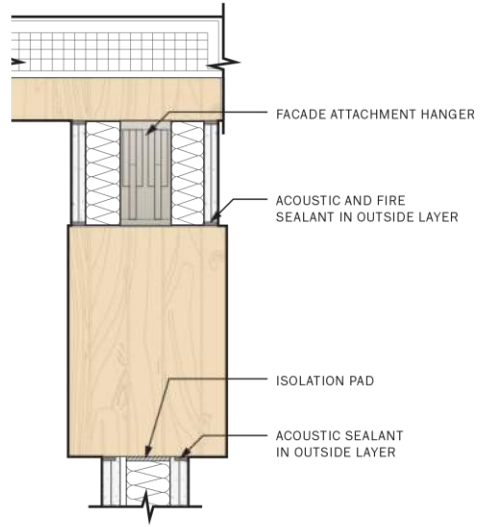
DEMISING WALL TO BATH PODS



4

FAÇADE ATTACHMENT

PLAN DETAIL



ACOUSTIC DESIGN

1 ROOF SHAPED FOR RAIN COLLECTION

2 DEEP EAVES PROVIDE PROTECTION AND SHADING

3 OPEN SPACES AND OPERABLE WINDOWS FOR NATURAL VENTILATION

4 OPERABLE GUESTROOM WINDOWS

5 MECHANICAL CIRCULATION PLENUM

6 PUBLIC SPACE MECHANICAL RUNS

7 GUESTROOM EXHAUST AIR

8 GUESTROOM SUPPLY AIR

9 GUESTROOM HEATING & COOLING LINES

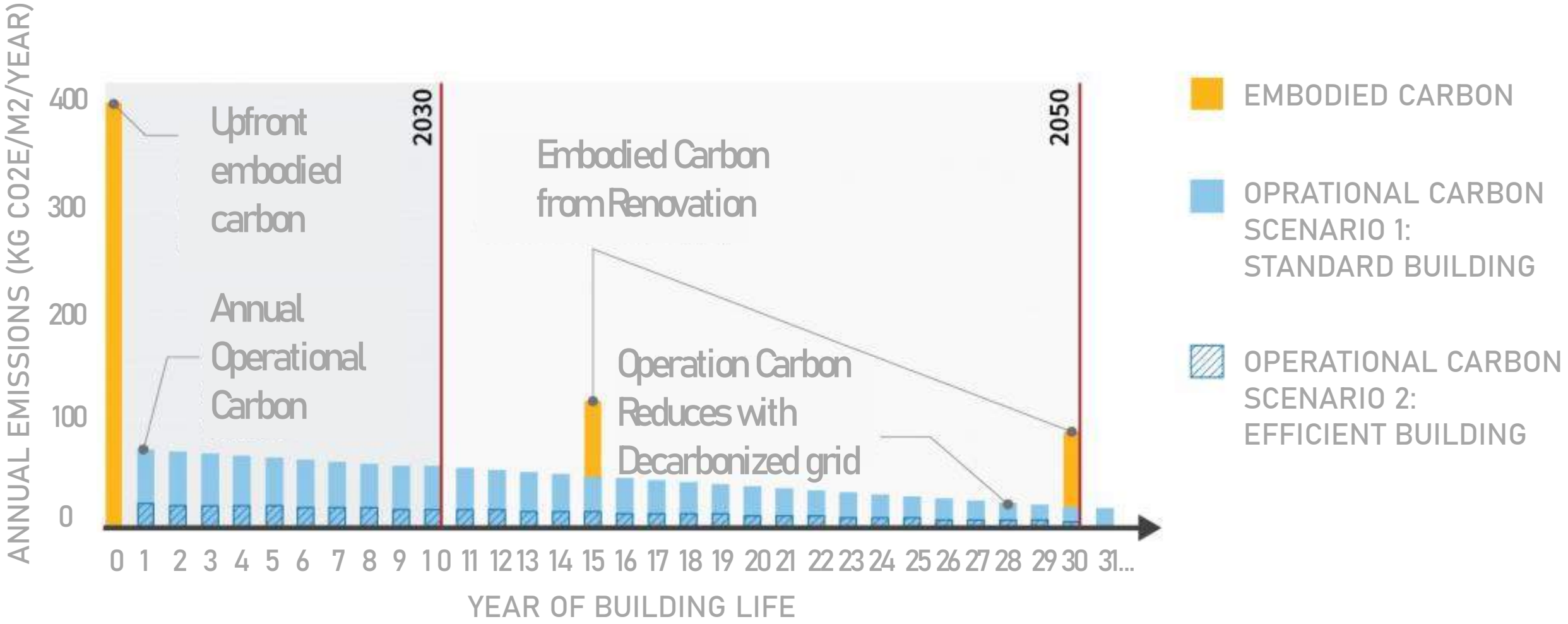
10 FIRE SPRINKLERS

11 GUESTROOM MECHANICAL UNIT

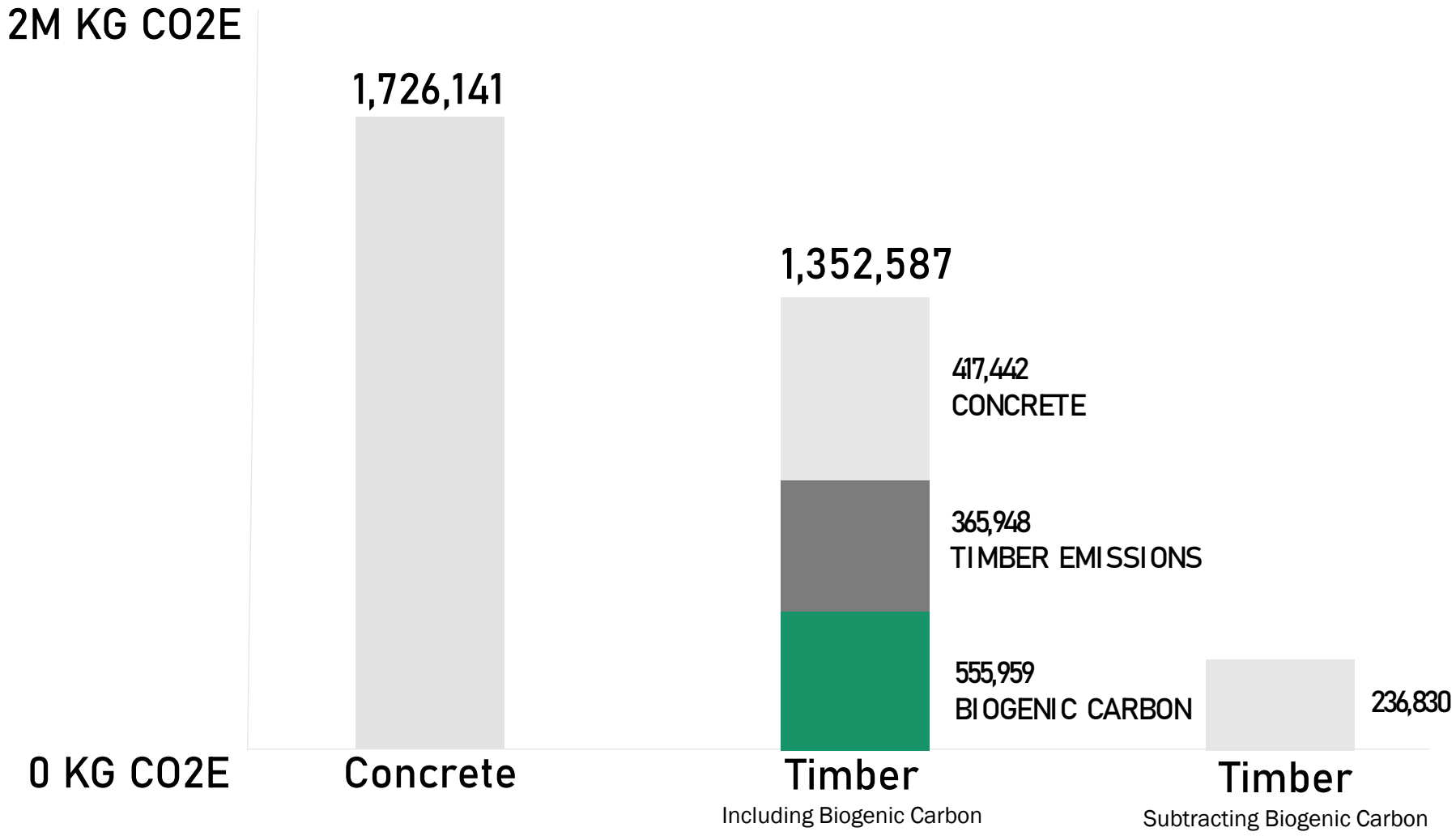
12 RAINWATER CISTERNS

13 CONSOLIDATED PLUMBING DROPS ALONG BEAM IN CEILING / FAUX BEAM EXTENSIONS

EMBODIED CARBON LIFE CYCLE



BUILDING CARBON LIFECYCLE



LIFECYCLE ANALYSIS

HOTEL

INTERIOR

THE GUEST WHO WANTS TO...

INFLUENCE

DISCOVER

BOND

RELATE

GUEST ESSENTIALS

ADVENTURE TOOLS

PERSONAL WELLNESS

SMART CHOICES

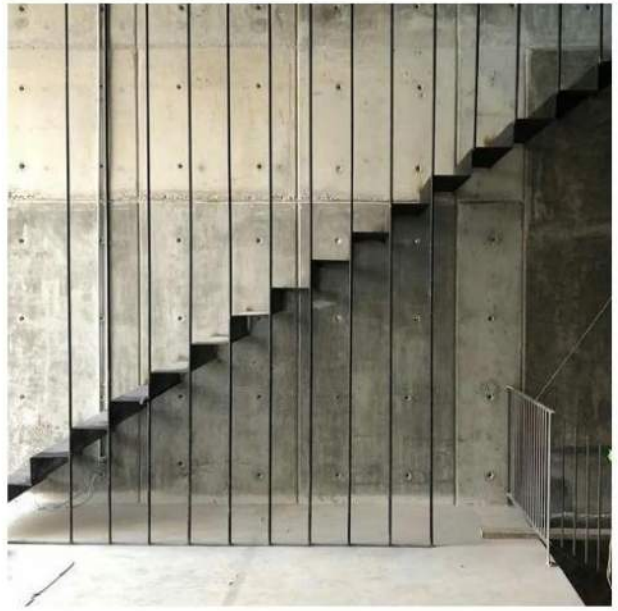
FRESH + LOCAL

AUTHENTIC MATERIALS





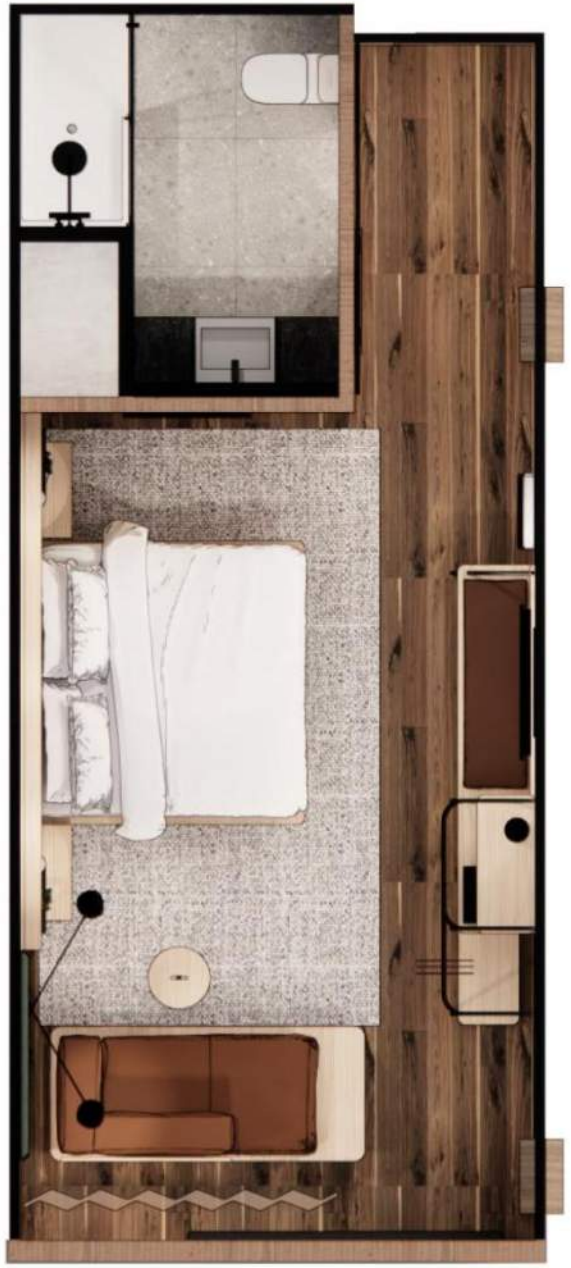




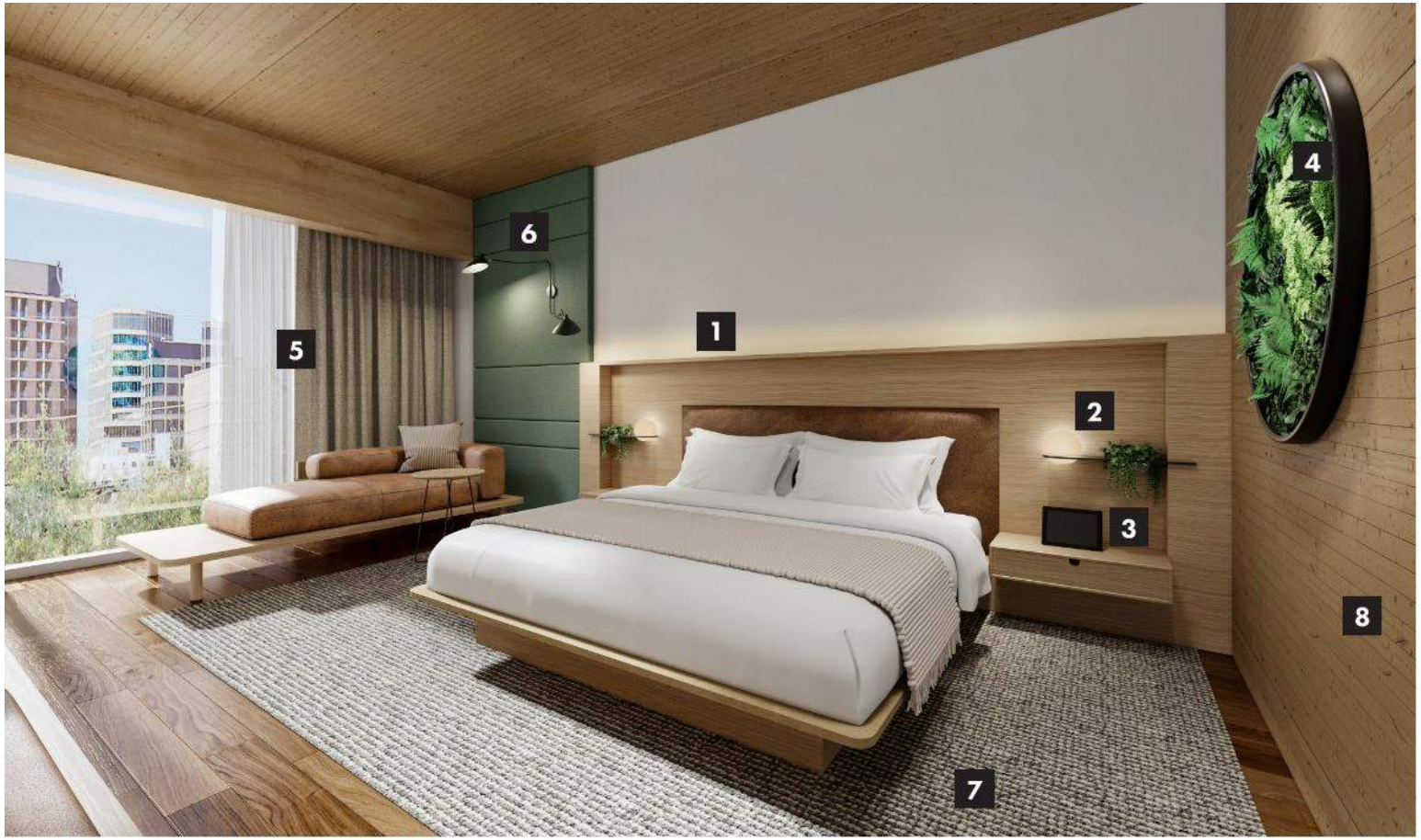

1 HOTEL ENTRANCE
2 HOTEL LOBBY
3 RETAIL MARKET
4 RESTAURANT & MARKET ENTRANCE
5 BIKE RENTAL
6 FITNESS
7 CHECK-IN
8 COFFEE SHOP
9 LUGGAGE
10 ADMIN
11 RESTROOM
12 FOOD PREP
13 LAUNDRY
14 STAIR
15 DOCK
16 OUTDOOR EVENT
17 MECH/ ELEC
18 POCKET DOG PARK

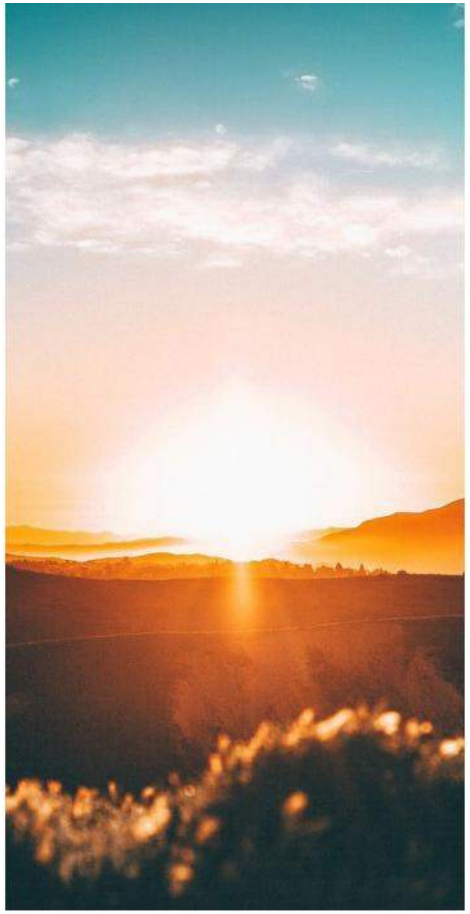
GROUND FLOOR PLAN

GUESTROOM



GUESTROOM DESIGN





1 HORIZON LINE OF LIGHT

2 COLOR TEMP ADJUSTABLE LIGHTS

3 TOUCH-PAD FOR MOOD SETTING/ CUSTOM EXPERIENCE

4 PRESERVED GREENERY ART FEATURE

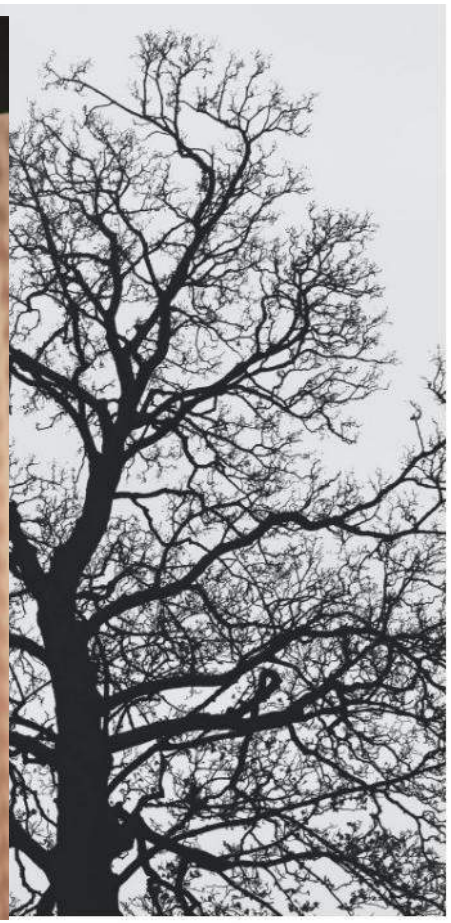
5 MOTORIZED DRAPERY

6 ACOUSTIC WALL PANELS

7 NATURAL FIBER RUG

8 MODULAR WOOD STRUCTURE BATHROOM

RESTED + WELL



1 UPLIGHTING WITH SHADOW CASTING

2 OPEN HANGING WARDROBE

3 CLUTTER FREE GUEST STORAGE

4 MULTI-FUNCTION WORK/ LOUNGE

5 ADJUSTABLE LIGHTING

6 MAXIMIZED DAYLIGHTING

7 BRIGHT, CLEAN ORGANIC BEDDING

8 RICH WOOD FLOORING

RESTED + WELL

ROOFTOP BAR + RESTAURANT

1 FEATURE STAIR

2 OUTDOOR DECK

3 ELEVATOR LOBBY

4 RECEPTION

5 COATS

6 RESTROOM

7 BAR

8 EVENT

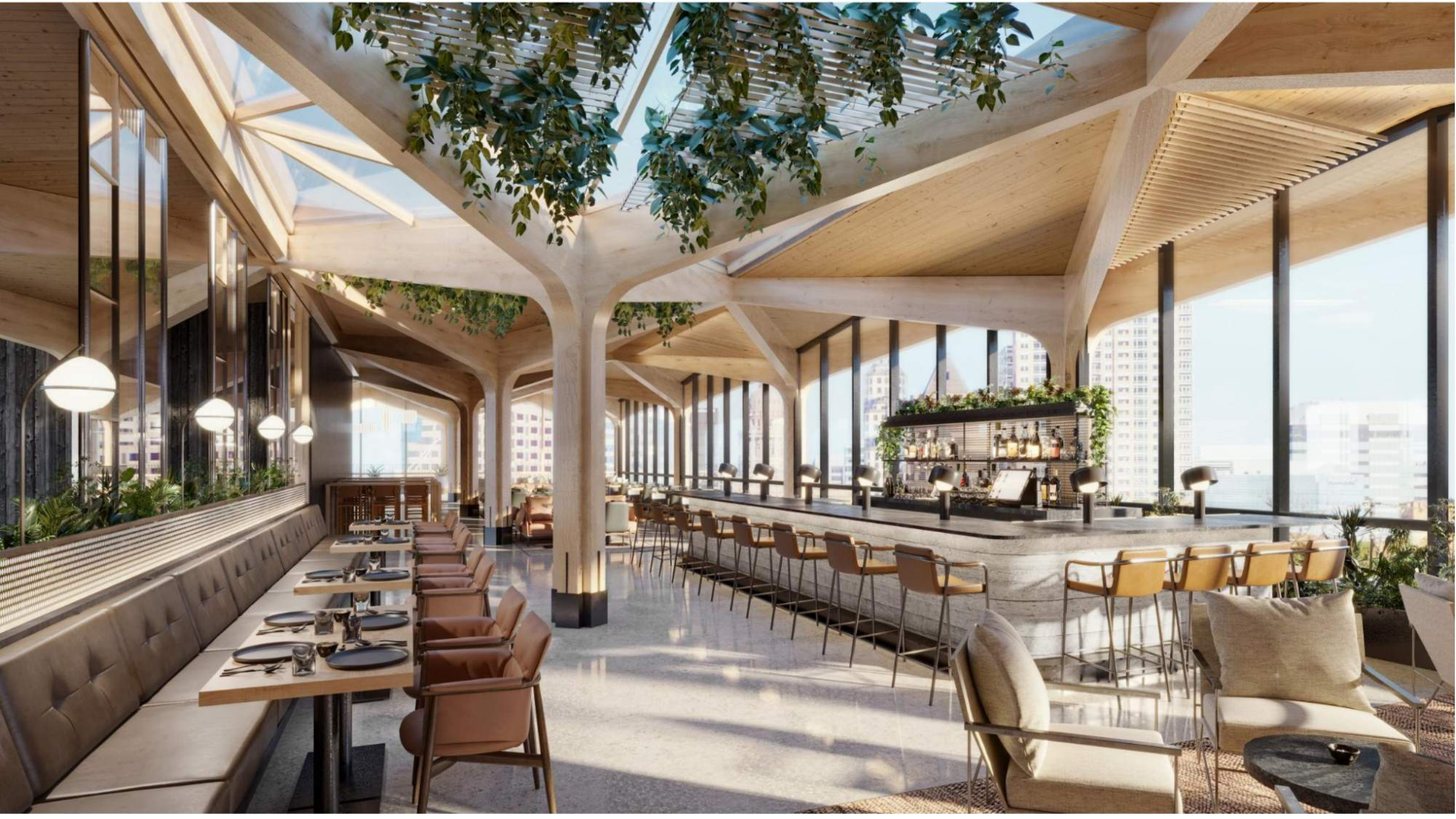
9 KITCHEN

10 STAIR

11 SERVICE ELEVATOR

12 ROOFTOP GARDEN

ROOFTOP FLOOR PLAN



ON THE BOARDS

What we thought we knew

- Post and beam framing
- Floor assembly
- Units that follow structure

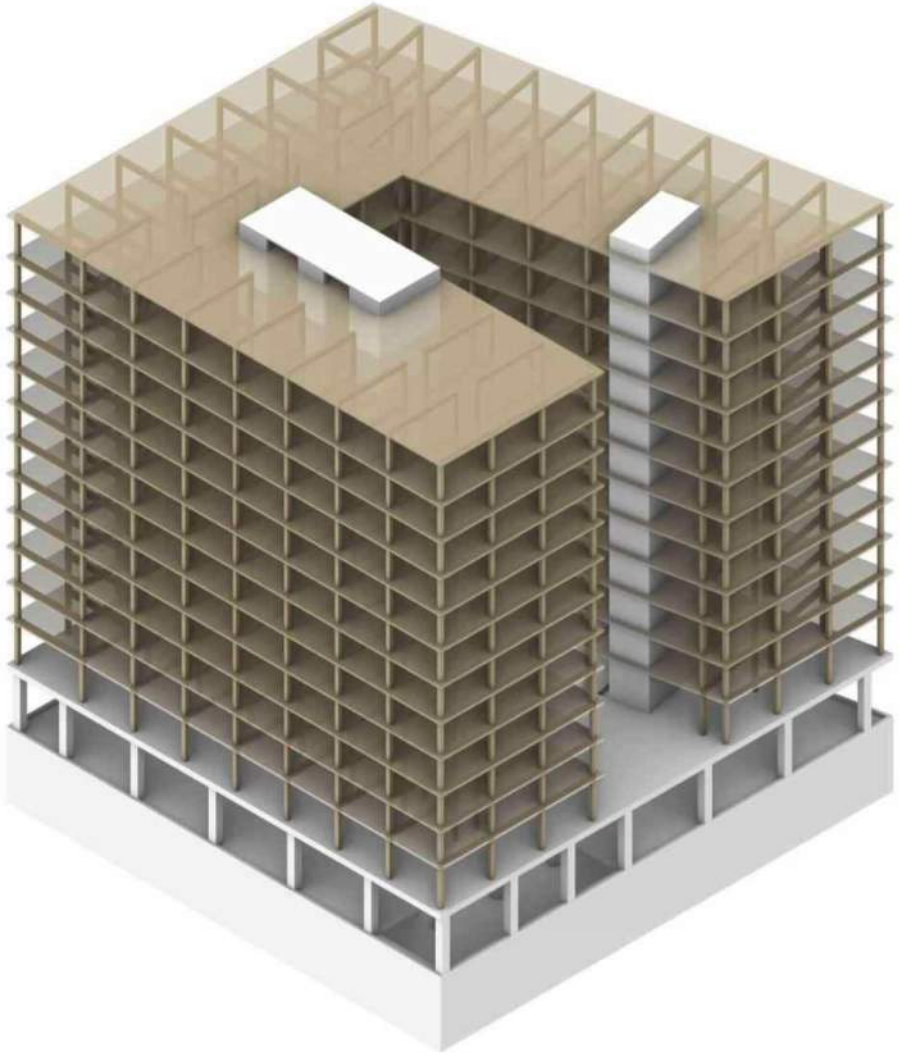
What we know now

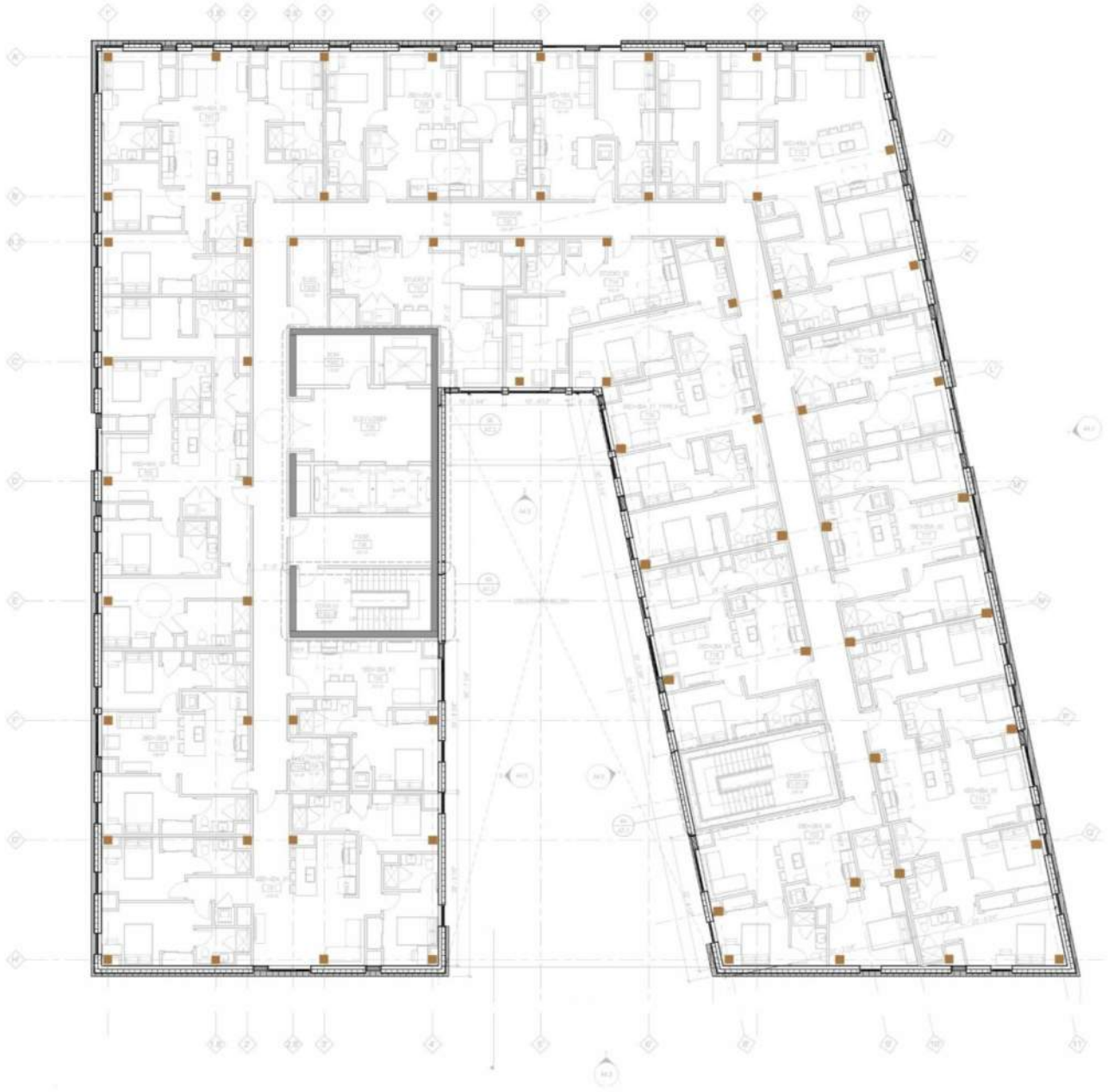
- Post and Beam Framing was right
- Floor assembly was similar
- Unit layouts break the grid where needed to optimize the overall configuration of the rooms

Timber Driver

- Appealing to a younger consumer
- City approvals

9TH & HIGH STUDENT HOUSING





9TH & HIGH STUDENT HOUSING

What we thought we knew

- Shorter building might be beneficial to frame more economically with light frame bearing walls
- Telling story with building materials

What we know

- Client preference for real timber frame
- Strong desire for sustainable branding
- Desire for modular construction
- Desire for timeless value of asset

Timber Driver

- Sustainability story and appealing to discerning guests
- City approval

CONFIDENTIAL MOUNTAIN HOTEL

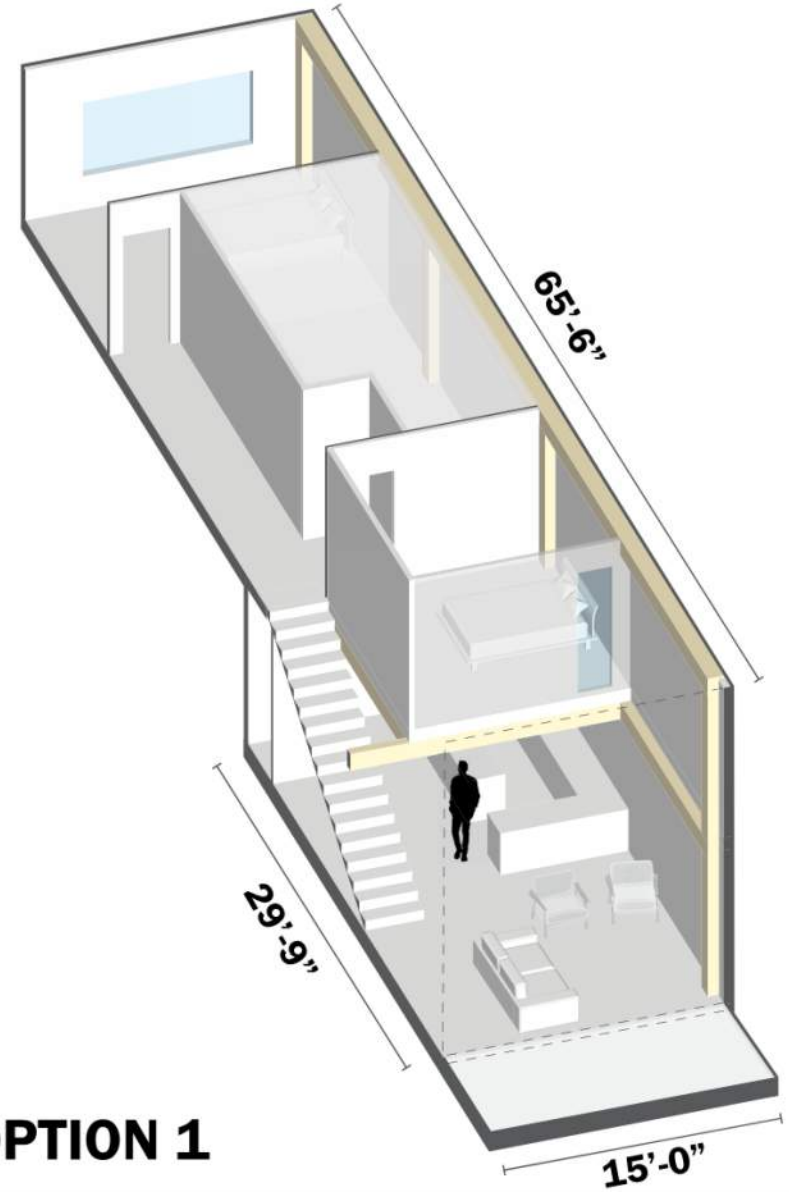
Timber Scheme 1:
steel stud and deck on glu-lam post and beam podium

notes:
need drywall finish below steel guestroom deck
dropped finished ceiling at ground floor center bay only
majority of public space is exposed timber
structural grid at podium is 25' x 20/20/20 = 60'

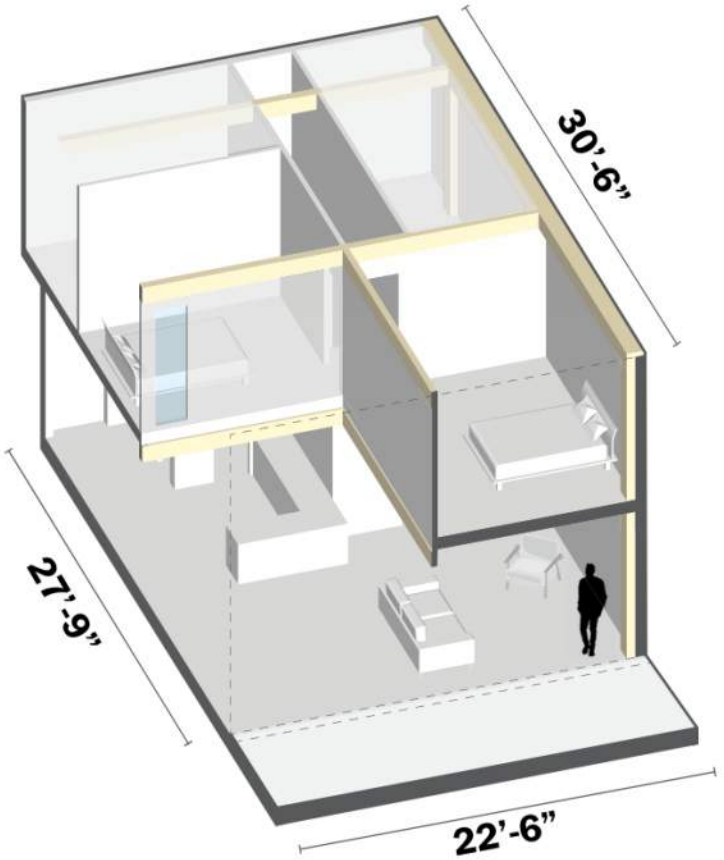
Timber Scheme 2:
steel stud with timber deck on glu-lam post and beam podium

notes:
no finish ceiling required in guestroom proper (dropped at toilet)
dropped finished ceiling at ground floor center bay only
majority of public space is exposed timber
structural grid at podium is 25' x 20/20/20 = 60

LIGHT FRAMING OPTIONS



OPTION 1



OPTION 2

CONFIDENTIAL MOUNTAIN HOTEL

What we thought we knew

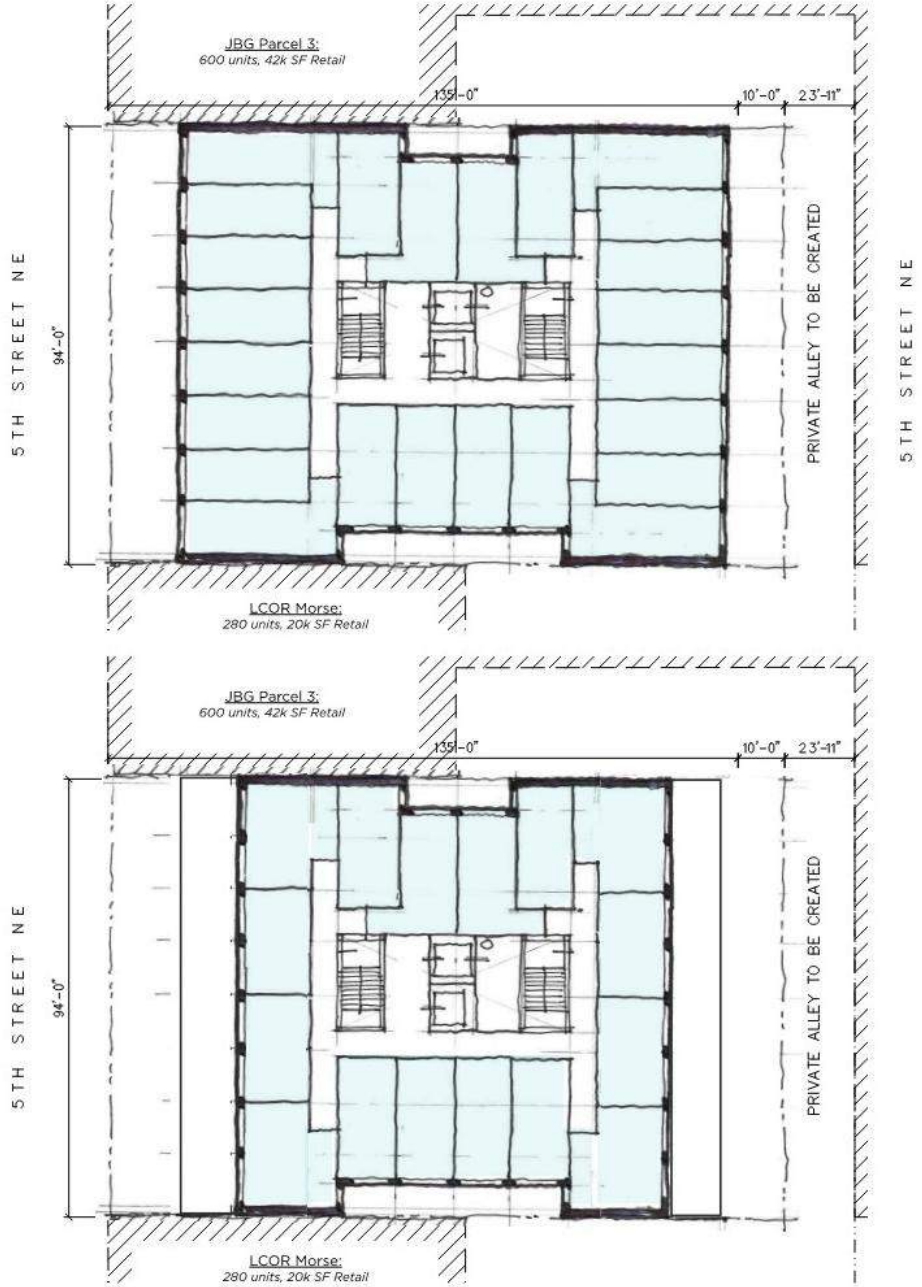
- Post and beam construction
- Market differentiation of timber
- Brand adoption would not be an issue

What we know

- Post and beam construction confirmed
- Guests have yet to pay a cost premium for sustainability
- Concern about brand acceptance

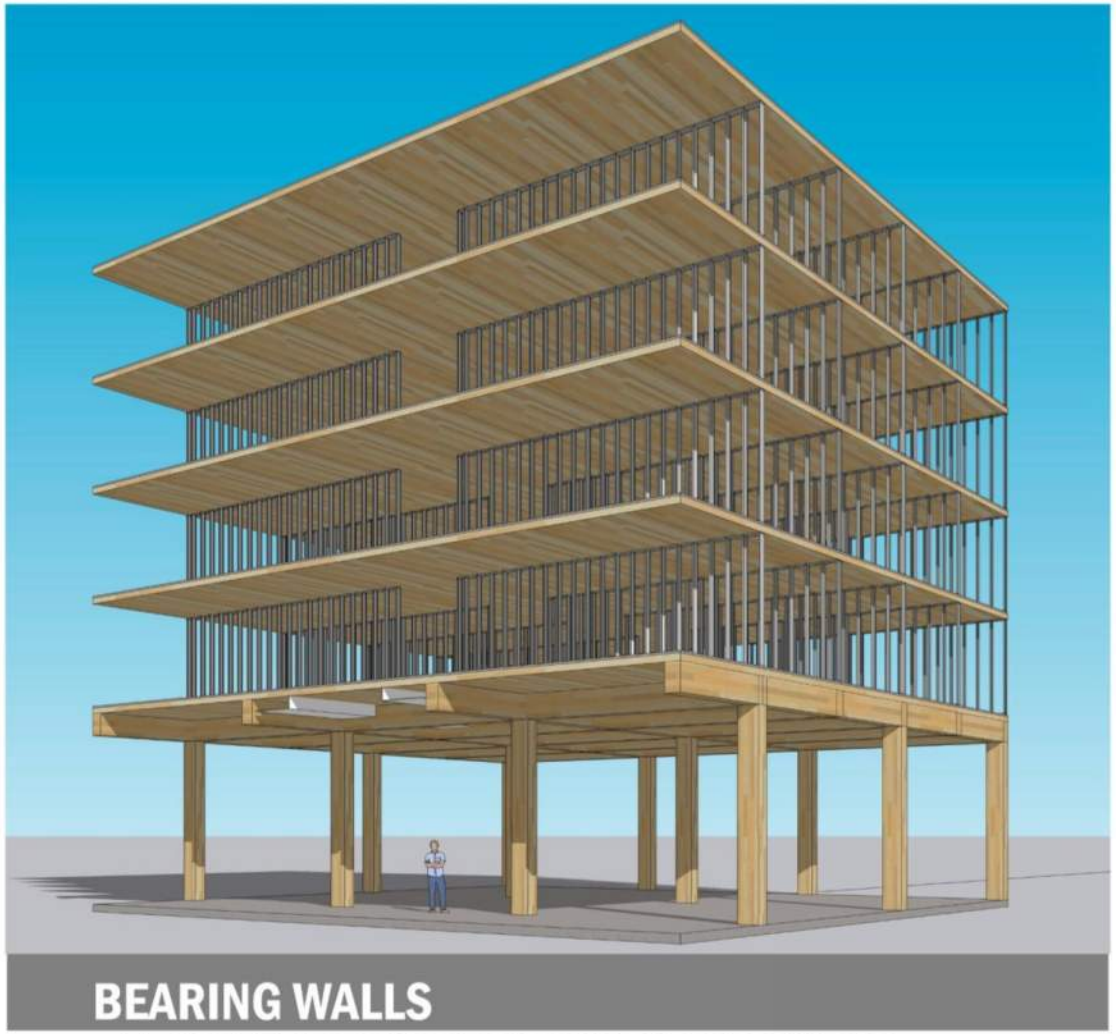
Timber Driver

- Neighborhood context and story
- Aesthetic
- Hotel branding



POST + BEAM

NO TRANSFERS
CLEANER GROUND FLOOR CEILING
GUESTROOM DEMISING WALLS ARE ACOUSTIC ONLY
TIMELESSNESS OF ASSET / FLEXIBILITY
MORE FIBER



BEARING WALLS

TRANSFER BEAMS AT GROUND FLOOR CEILING
THINNER NLT / DLT / CLT DECK
HEAVIER BEARING GUESTROOM DEMISING WALLS
LESS FIBER
LIKELY THE LOWEST FIRST-COST TIMBER SOLUTION

What we thought we knew

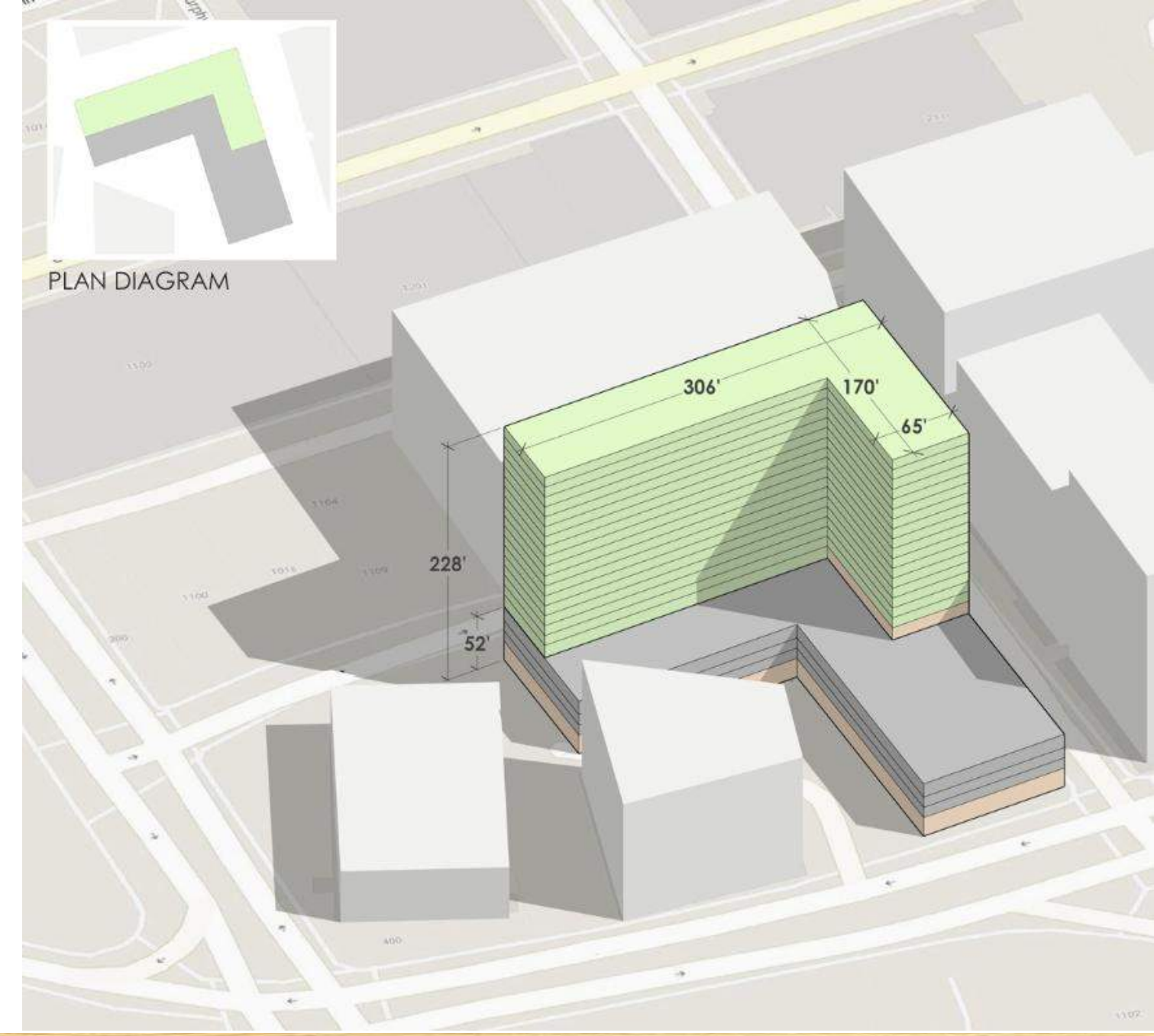
- Municipalities would be reluctant to adopt timber code updates
- Developer motivation for timber would be based on rent premiums

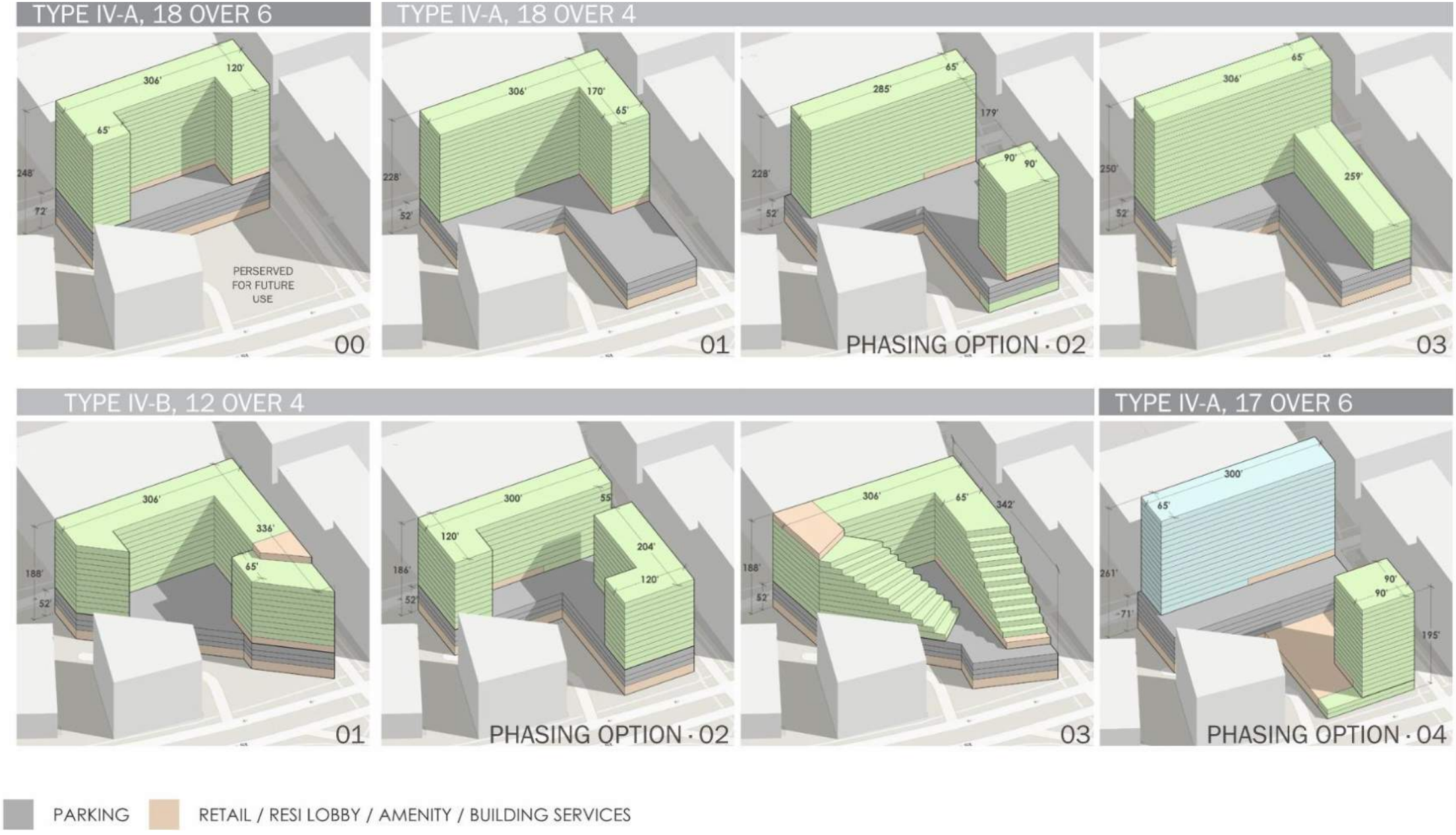
What we know

- City is open to expanded interpretations for exposed timber
- Strong desire for sustainability

Timber Driver

- Market differentiation
- Sustainability ethos





UNITS PARKING RETAIL / RESI LOBBY / AMENITY / BUILDING SERVICES

TEXAS MASS TIMBER DEVELOPMENT

WE ARE HOTEL DESIGNERS

1,100 HOTELS WILL BE BUILT IN THE U.S. NEXT YEAR

1.5 MILLION METRIC TONS OF CARBON EMISSION COULD BE AVOIDED

IF THEY WERE MASS TIMBER HOTELS

Questions?

- Steve Cavanaugh FAIA, LEED AP scavanaugh@dlrgroup.com
- Bobby Larson AIA, LEED AP BD+C blarson@dlrgroup.com

This concludes The American Institute of Architects Continuing Education Systems Course