Case Studies in Performance: Mass Timber in Sensitive Spaces

MASS TIMBER+ SM

OFFSITE CONSTRUCTION CONFERENCE

PRODUCED BY WOODWORKS WOOD PRODUCTS COUNCIL · FEA Forest Economic Advisors

Credits: 1.0 AIA/CES HSW LUs, 1.0 PHD credit, 0.10 ICC credit

Alex Zink
Miller Hull

Sylvia Richards
Architect

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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 session will demonstrate mass timber's successful integration into environments with high-performance standards by looking at real-world project case studies of laboratory and library projects. Attendees will gain insights into how mass timber can meet rigorous requirements for structural performance, including vibration control, in-room noise control, hygiene, fire safety, and acoustic NRC requirements—all while supporting occupant wellness, indoor air quality, and sustainability goals. The session will also address the collaborative design strategies necessary to balance architectural expression and building system integration, to meet the high demands of these facilities.

Learning Objectives

1. Identify the key performance criteria that must be addressed when using mass timber in sensitive spaces including fire resistance, vibration control, acoustics, and durability.
2. Describe how mass timber construction can contribute to improved indoor environmental quality and occupant well-being.
3. Discuss unique challenges specific to mass timber in sensitive spaces and how various mass timber components can be used effectively to address them.
4. Apply lessons from case studies to future projects where mass timber may be considered for specialized occupancies with high safety, health, and performance expectations in a cost effective approach.

MILLER HULL

MASS TIMBER+ CONFERENCE
OCTOBER 30, 2025

MILLER HULL - DOWEL LAMINATED TIMBER PROJECTS

ALEX ZINK, AIA, azink@millerhull.com

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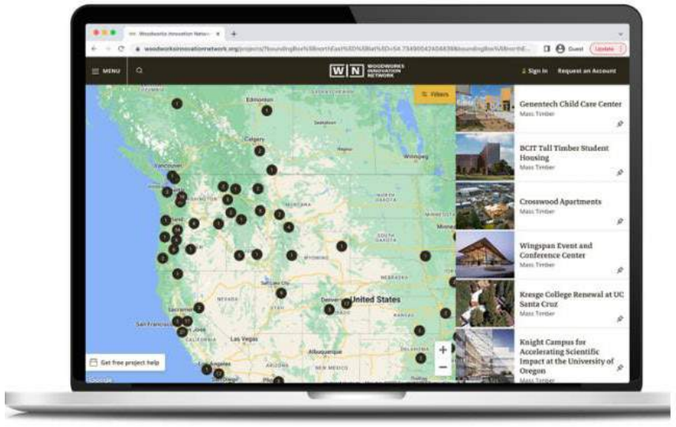
Sustainability expertise distinguishes Miller Hull

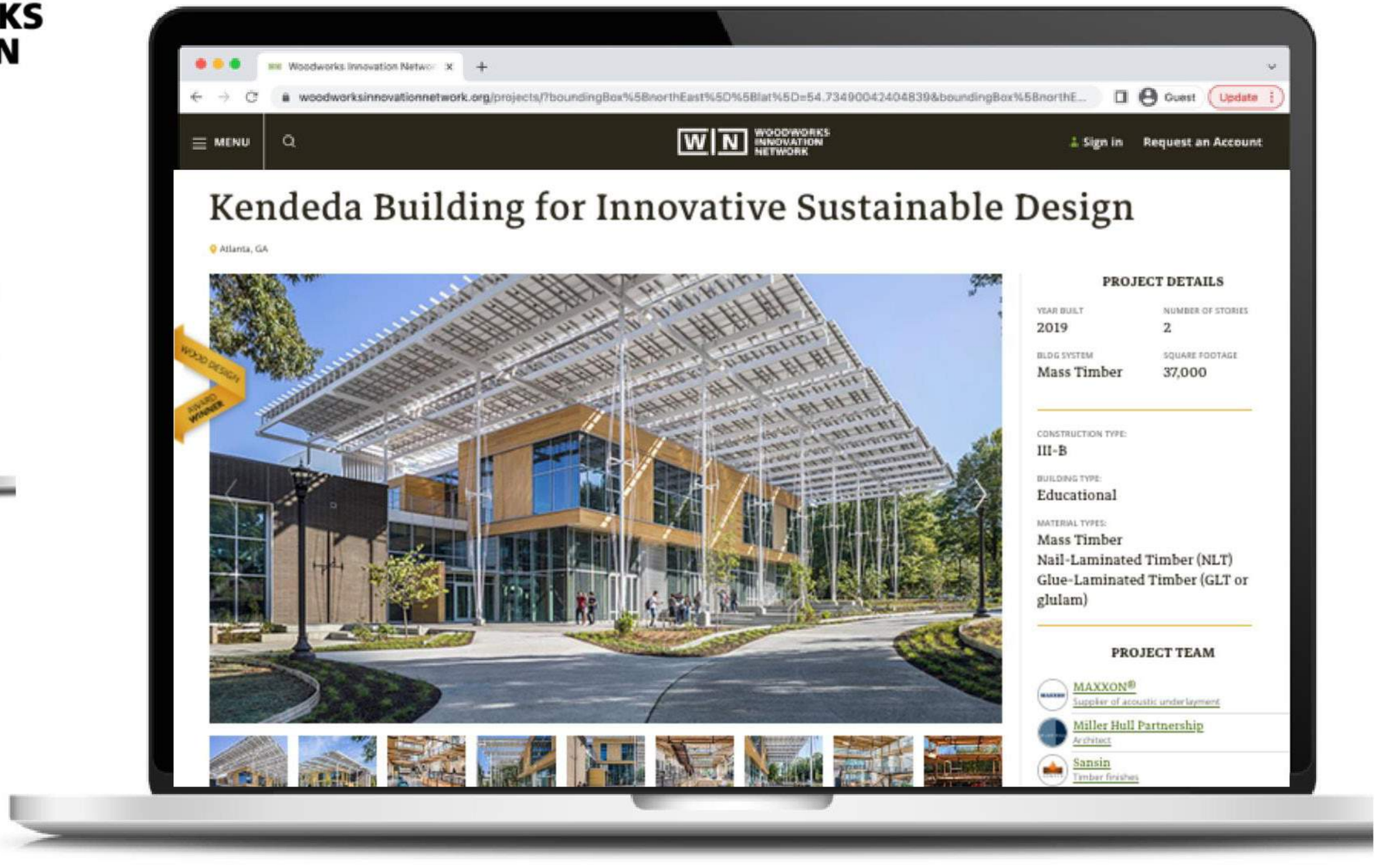
The Miller Hull Partnership

- Founded in 1977 by David Miller & Bob Hull
- 100 people in Seattle & San Diego
- 375+ Design awards
- 120+ National awards
- 8 COTE Top 10 awards
- 5 Living Buildings
- 10 Mass timber buildings
- 8 Net Zero Energy buildings
- EMission Zero initiative—*1/3 carbon offset for every completed project*

WOODWORKS INNOVATION NETWORK



SCAN ME



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Miller Hull Partnership

Seattle, WA

INDUSTRY
Architect

SERVICES OFFERED
Architect, Designer, Mass Timber, Hybrid, planning

HAS EXPERIENCE WITH THESE BUILDINGS:
Assembly (Worship, Restaurant, Theater, etc.), Business (Office), Civic (Recreational), Educational, Factory/Industrial (warehouse, storage, parking, etc.), Government, Hotel/Motel, Mercantile (Retail), Mixed-Use, Multi-Family (Apartments, Condos, etc.), Student Housing, Transportation (Airports, Train or Subway Stations), Custom Innovative Residential

HAS EXPERIENCE WITH THESE MATERIALS:
Mass Timber, Cross-Laminated Timber (CLT), Nail-Laminated Timber (NLT), Dowel-Laminated Timber (DLT), Glue-Laminated Timber (GLT or glulam), Timber-Frame / Post and Beam, Heavy Timber Decking, Hybrid (wood with steel or concrete), Structural Composite Lumber (e.g. LVL and LSL), Wood-Concrete Composite Systems, Light-Frame, I-joists, Lumber, Open-web trusses, Wood structural panels

HAS EXPERIENCE WITH CONSTRUCTION TYPES:
I-A, I-B, II-A, II-B, III-A, III-B, IV-A, IV-B, IV-C, IV-HT, V-A, V-B

INDIVIDUALS WHO WORK HERE:

Alex Zink
Architect

Brian Court
Partner

Nick Clesi
Designer

With the firm's establishment in the Pacific Northwest, Miller Hull has been designing and building in the heart of timber country for over forty years. Environmentalism, resource efficiency and performance driven design shaped the early ethos of the firm and timber has played an important role manifesting that vision.

The Miller Hull Partnership, LLP is an internationally recognized architecture, planning, urban and interior design firm that works to create a regenerative and inclusive future through the built environment. Since its founding in 1977, Miller Hull has been designing dynamic and environmentally responsible buildings that provide enduring value for their communities. The firm has studios in Seattle and San Diego with work extending across multiple project types for a range of public and private clients where people live, work, learn, gather and serve. Widely recognized for innovative, timeless designs and a partnership-driven practice, Miller Hull has received over 350 local, regional, national, and international awards for design excellence, including the American Institute of Architects Firm Award and Architect 50's Top Firm for Sustainability.

INNOVATIVE LIGHT-FRAME AND MASS TIMBER PROJECT PORTFOLIO:

Central Library at Stevens Ranch (A-DLT)
Bend, OR — Save

Redmond Public Library (A-DLT)
Redmond, OR — Save

Mesa Court Community Center (CLT)
Irvine, CA — Save

Matt's Place 2.0 (CLT)
Spokane, WA — Save

Newhouse Replacement Building (A-DLT)
Olympia, WA — Save

Moorhead Community Center & Public Library (A-DLT)
Moorhead, MN — Save

Health Sciences Education Building (CLT)
Seattle, WA — Save

Kendeda Building for Innovative Sustainable Design (NLT)
Atlanta, GA — Save

Bullitt Center (NLT)
Seattle, WA — Save

Pike Place Marketfront (NLT)
Seattle, WA — Save

Benefits (Pros)

1. Climate
2. Aesthetics
3. Health/Wellness
4. Light Weight (MT structure is 50% lighter than concrete structure)
5. Schedule
6. Structural
7. Local Economy
8. Accuracy
9. Quite installation
10. Smaller laydown area

Challenges (Cons)

1. Cost
2. Insurance / Knowledge Gap / Perceived Risk
3. Acoustics
4. Coordination
5. Schedule
6. Structural
7. Moisture Protection

MASS TIMBER FLOORING SYSTEMS

Two-way floor systems

Cross Laminated Timber (CLT)

Mass Plywood Panels (MPP)

One-way floor systems

Glue Laminated Timber flooring (GLT)

Nail Laminated Timber (NLT)

Dowel Laminated Timber (DLT)

Manufacturer 1 = StructureCraft/DowelLam
Manufacturer 2 = Mad River Mass Timber
Manufacturer 3 = SIlva Span (A-NLT)
Manufacturer 4 = International Timber Frames

NLT & heavy timber in 1908 Polson Building
(Miller Hull's Seattle office)

DLT in 2024 Redmond Public Library
(Miller Hull project near Bend, OR)

Diagram images from StructureCraft

FINE TUNE THICKNESS

Minor benefit

- DLT can be manufactured at a greater variety of thicknesses than most CLT factories

DLT thicknesses

- 2x4 = 3.5”
- 2x6 = 5.5”
- 2x8 = 7.25”

CLT thicknesses

- 3ply = 4.125”
- 5ply = 6.875”
- 7ply = 9.625”

EFFICIENT 1-WAY SPAN

Medium benefit

- DLT can span 20% further than CLT because all fiber is oriented in the strong direction

LESS GLUE

Major benefit

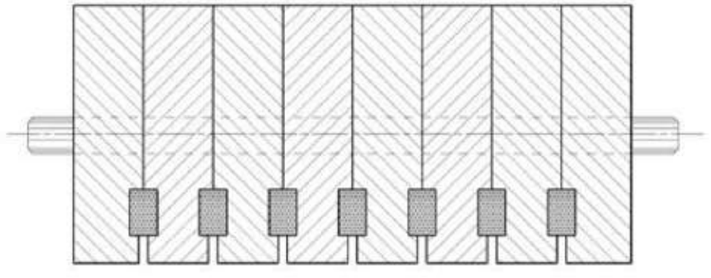
- Less glue -> less embodied carbon
- Less glue -> better indoor air quality
- Minor downside -> DLT requires plywood & nails

ACOUSTICS

Major benefit

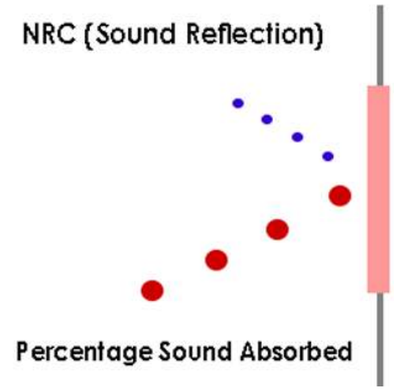
- DLT can have slots on the underside where sound absorbing strips can be added, completely eliminating the need for drop ceilings

Acoustic DLT



Acoustic Square DLT (NRC = 0.70)

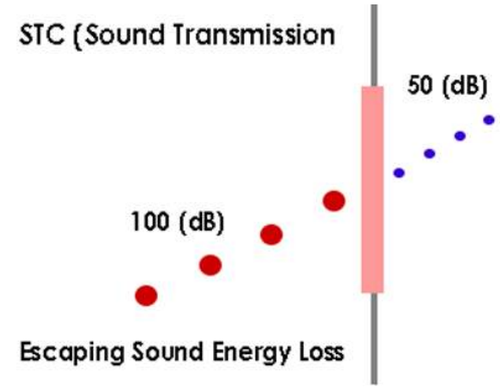
NOISE REDUCTION COEFFICIENT (NRC)

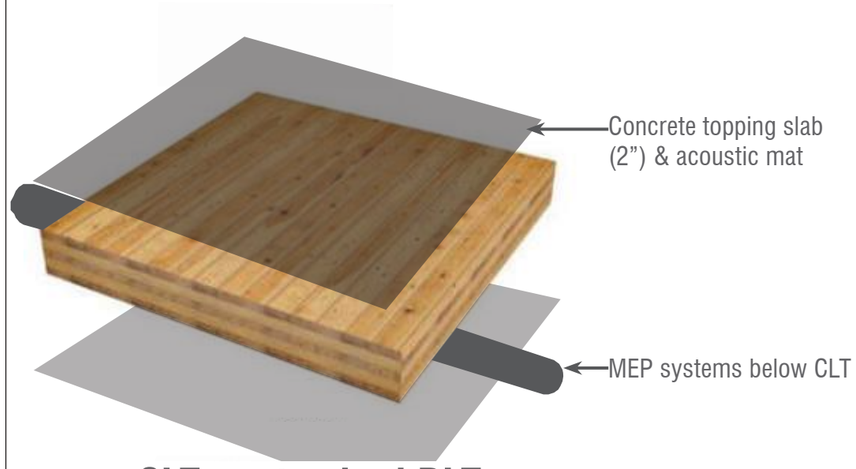


CLT

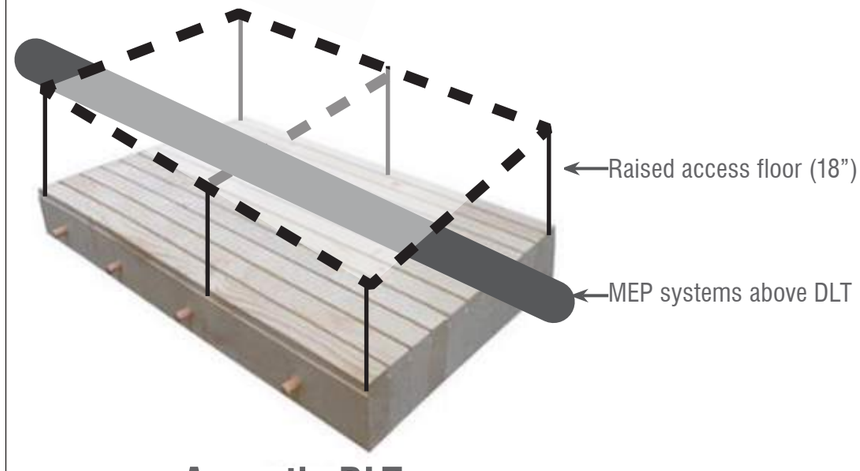
Acoustic DLT

SOUND TRANSMISSION CLASS (STC)





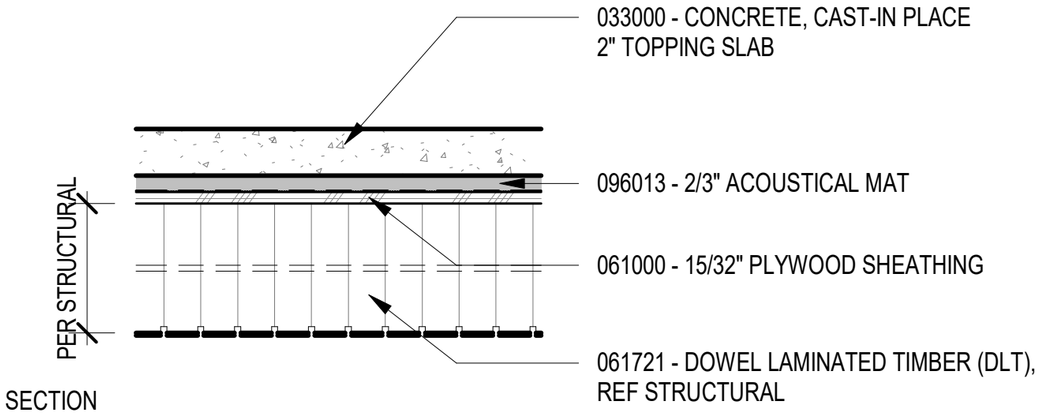
CLT or standard DLT



Acoustic DLT

Sound diagrams from Live Acoustics

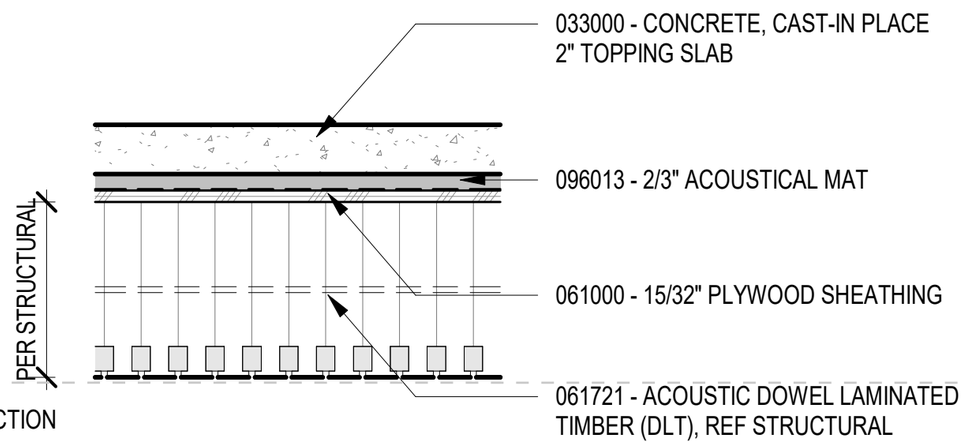
Newhouse Replacement Building



SECTION

F4 CONCRETE O/ DLT

FIRE RATING: UNRATED

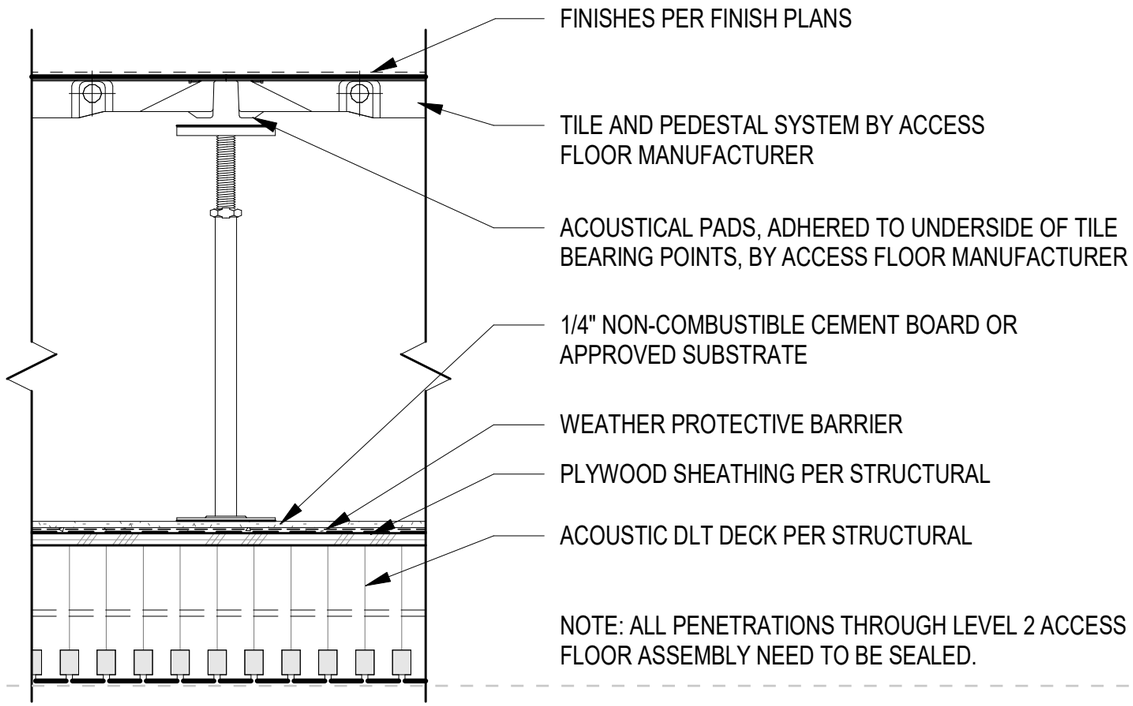


SECTION

F3 CONCRETE O/ ACOUSTIC DLT

FIRE RATING: UNRATED

Redmond Public Library

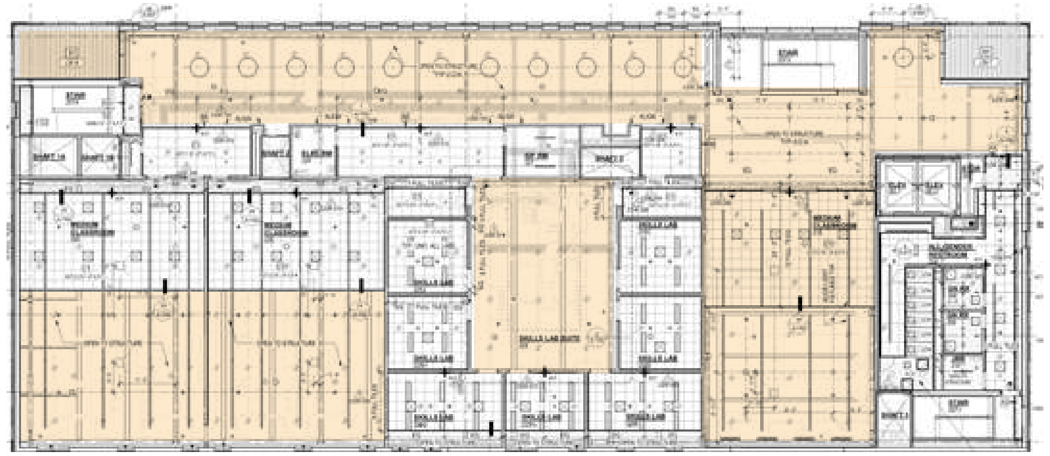


F2 ACCESS FLOOR OVER DLT

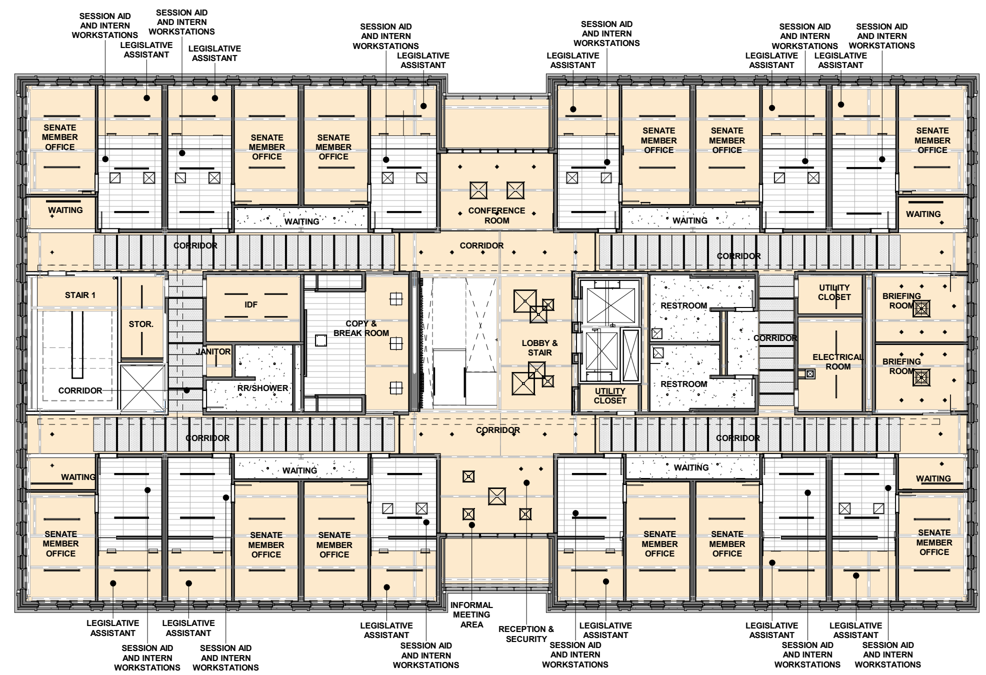
FIRE RATING: UNRATED | Manufacturer: Tate Access Floors, Inc.

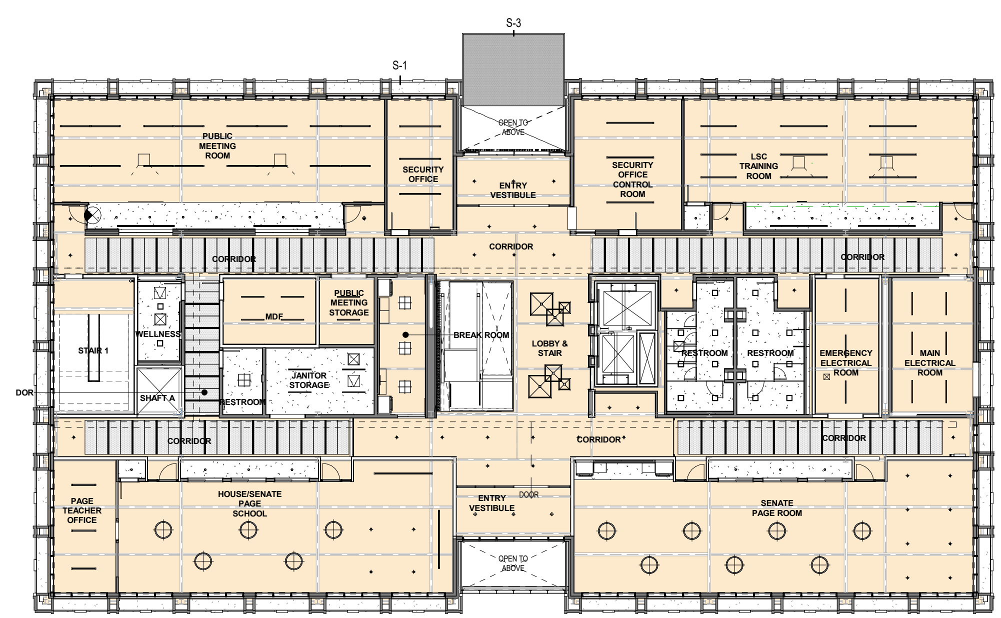
AESTHETICS - EXPOSED MASS TIMBER

UW Health Sciences Education Building | 40% exposed CLT



Newhouse Replacement Building | 65% exposed ADLT / DLT

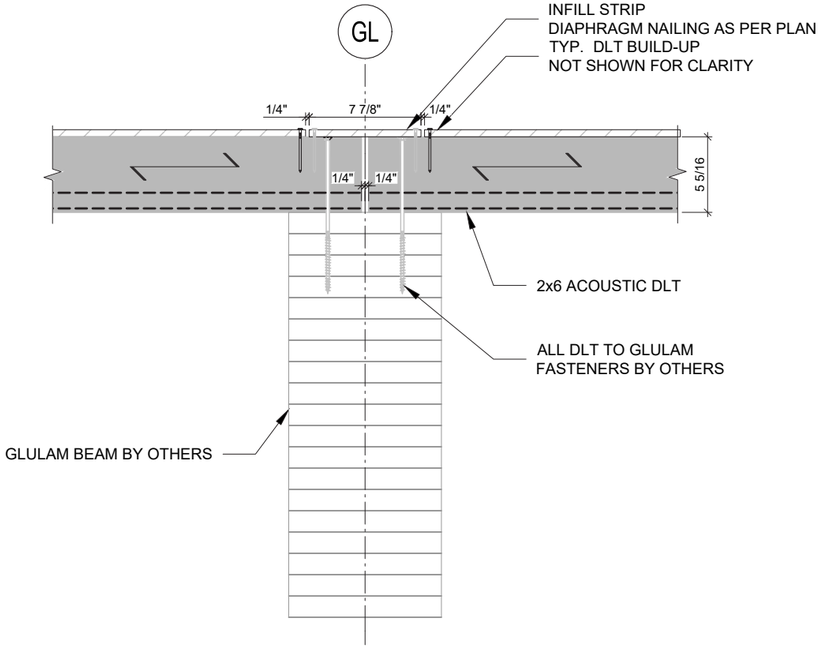




Redmond Public Library | 80% exposed ADLT / DLT

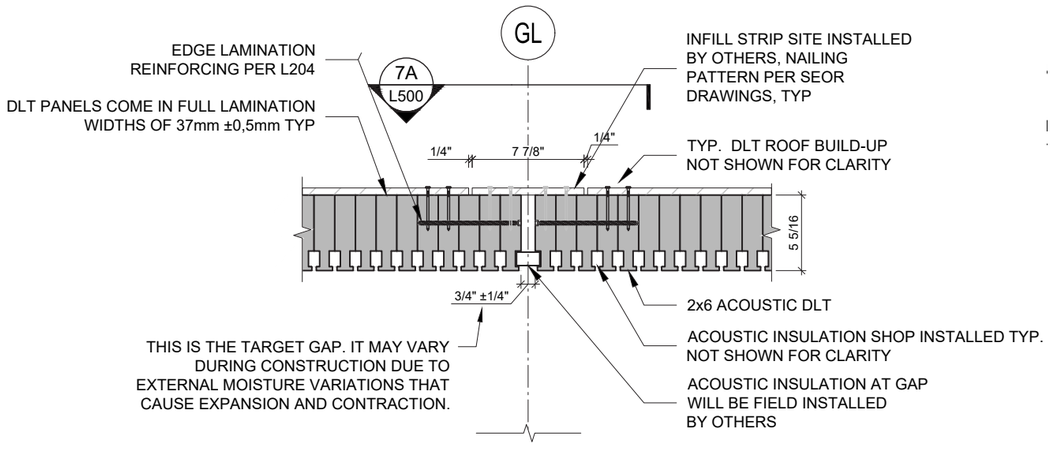
DLT CONSTRUCTION TOLERANCE

Tolerance DLT Panel to DLT Panel



4 TYPICAL ACOUSTIC DLT JOINT

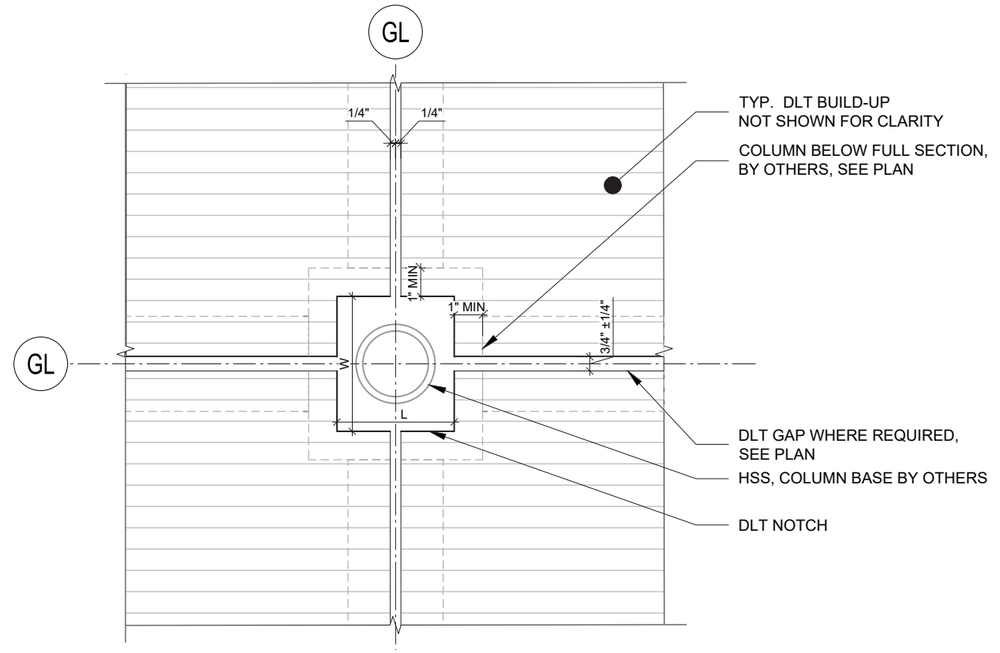
1 1/2" = 1'-0"



7 TYPICAL ACOUSTIC P1 2x6 DLT JOINT

1 1/2" = 1'-0"

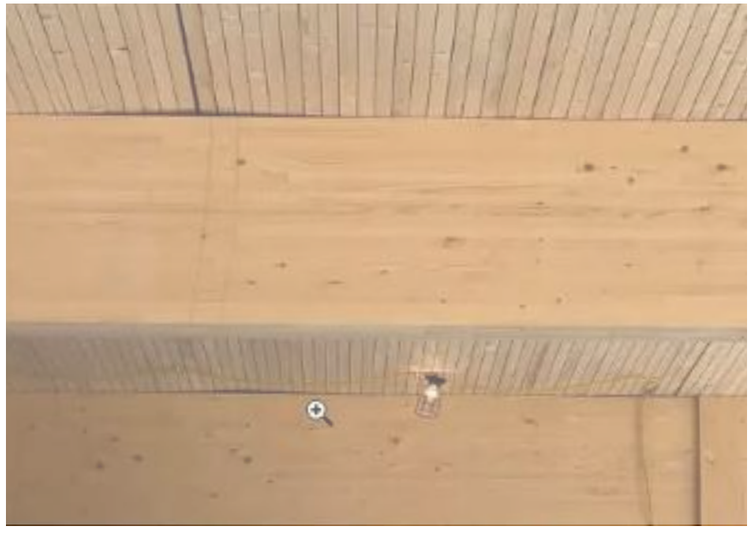
NOTE: 3/4" TOLERANCE COULD VARY DUE TO MOISTURE EXPANSION AND PLACEMENT TOLERANCE BY +1/4", - 3/4"



13 DLT NOTCHING AROUND COLUMN TYP

1 1/2" = 1'-0"

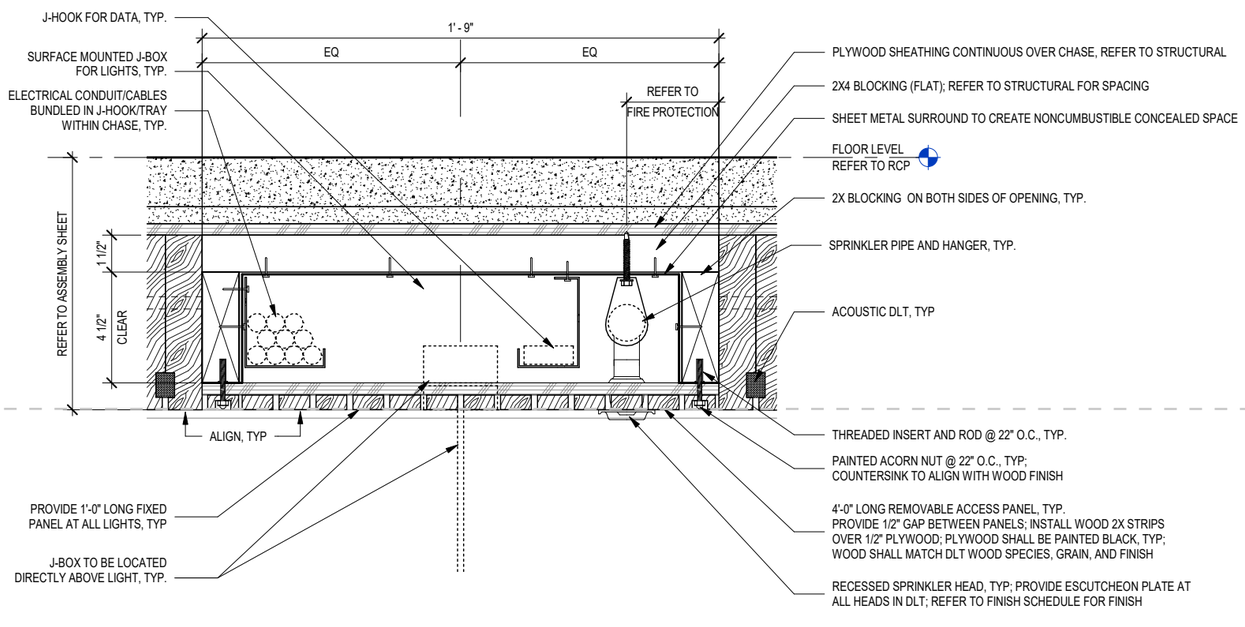
NOTE: 3/4" TOLERANCE COULD VARY DUE TO MOISTURE EXPANSION AND PLACEMENT TOLERANCE BY +1/4", - 3/4"



Moisture issues if not enough gap

DLT CONSTRUCTION TOLERANCE - MEP CHASES

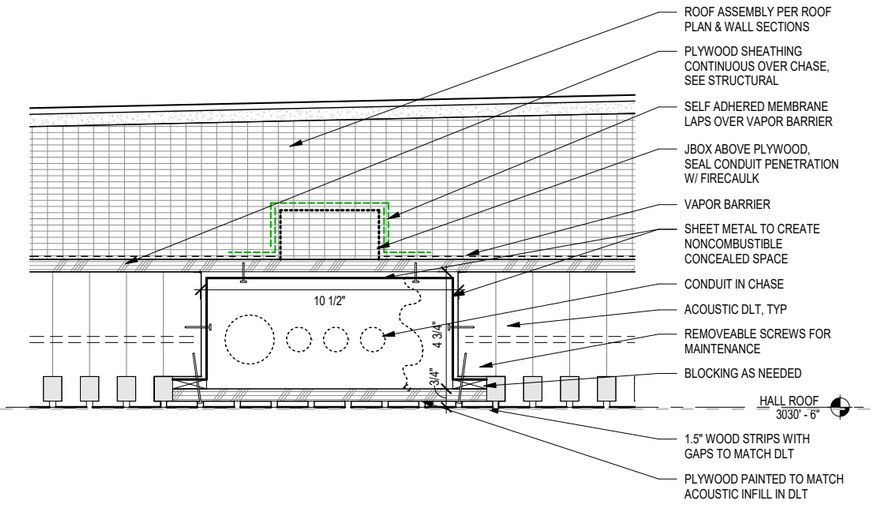
Newhouse Replacement Building



1 / A630 — **DLT (ACOUSTICAL) SERVICE CHANNEL @ EXPOSED AREAS**

3" = 1'-0"

Redmond Public Library

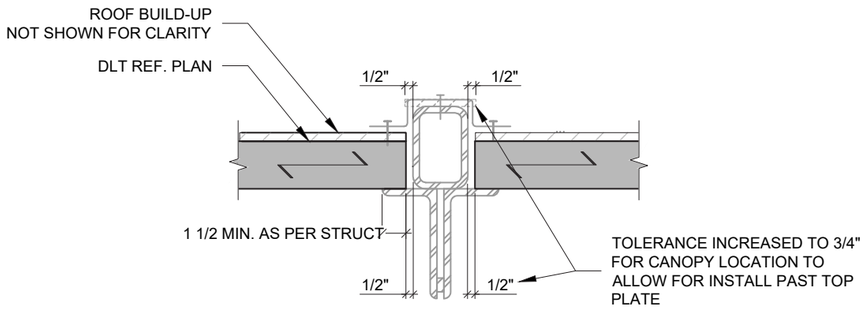


13 / A123 | A508 — **SECTION THROUGH E/W DLT CHASE**

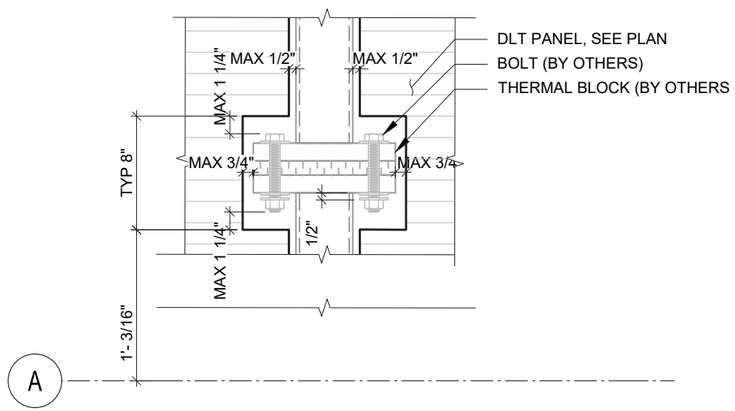
3" = 1'-0"

DLT CONSTRUCTION TOLERANCE

Tolerances DLT To Steel

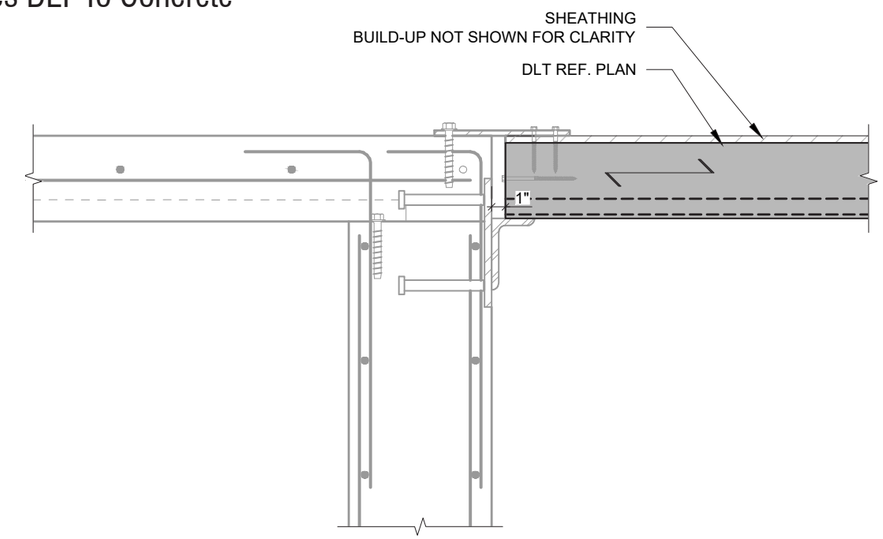


8 BUILT-UP STEEL BEAM DETAIL
1 1/2" = 1'-0"

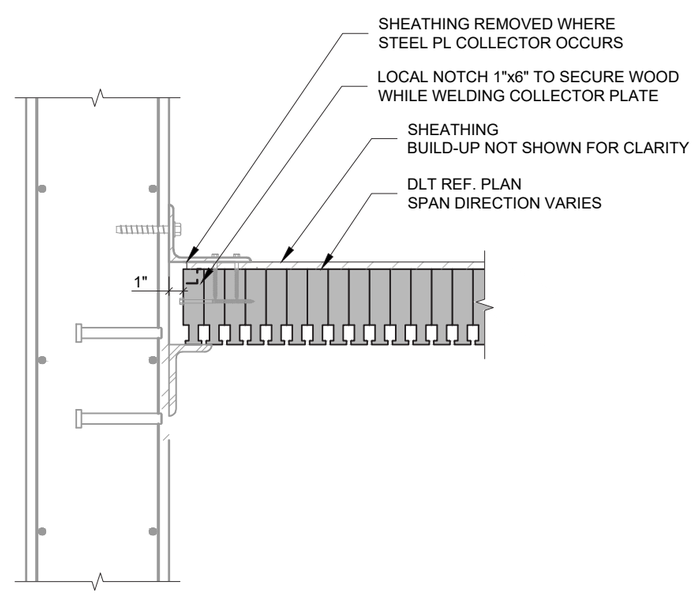


5 TYPICAL NOTCH AROUND THERMAL BLOCK
1 1/2" = 1'-0"
NOTE: 3/4" TOLERANCE COULD VARY DUE TO MOISTURE EXPANSION AND PLACEMENT TOLERANCE BY +1/4", - 3/4"

Tolerances DLT To Concrete



2 TYPICAL TOP OF CONCRETE SHEAR WALL
1 1/2" = 1'-0"



5 TYPICAL CONCRETE SHEAR WALL TO LEVEL 2
1 1/2" = 1'-0"

MOISTURE MITIGATION

Minor challenge

- CLT is more dimensionally stable
- DLT can swell (particularly in width direction)

SHEAR STRENGTH

Medium challenge

- DLT requires structural sheathing on top (1/2” plywood or OSB).
- DLT has less shear capacity than CLT -> (DLT 35’ max cantilever from cores)
- DLT requires more braced frames / shear walls

COST

Medium challenge

- DLT saves money with efficient use of fiber, however, there are few DLT manufactures, so competitive bidding is low (see sourcing challenge)

SOURCING

Major challenge

- Limited DLT manufacturers in North America
- New DLT manufacturers coming online in 2025

Solution

- Open Spec with NLT (by GC) as an alternate
- Price CLT with dropped ceilings

Redmond Public Library (Redmond, OR)

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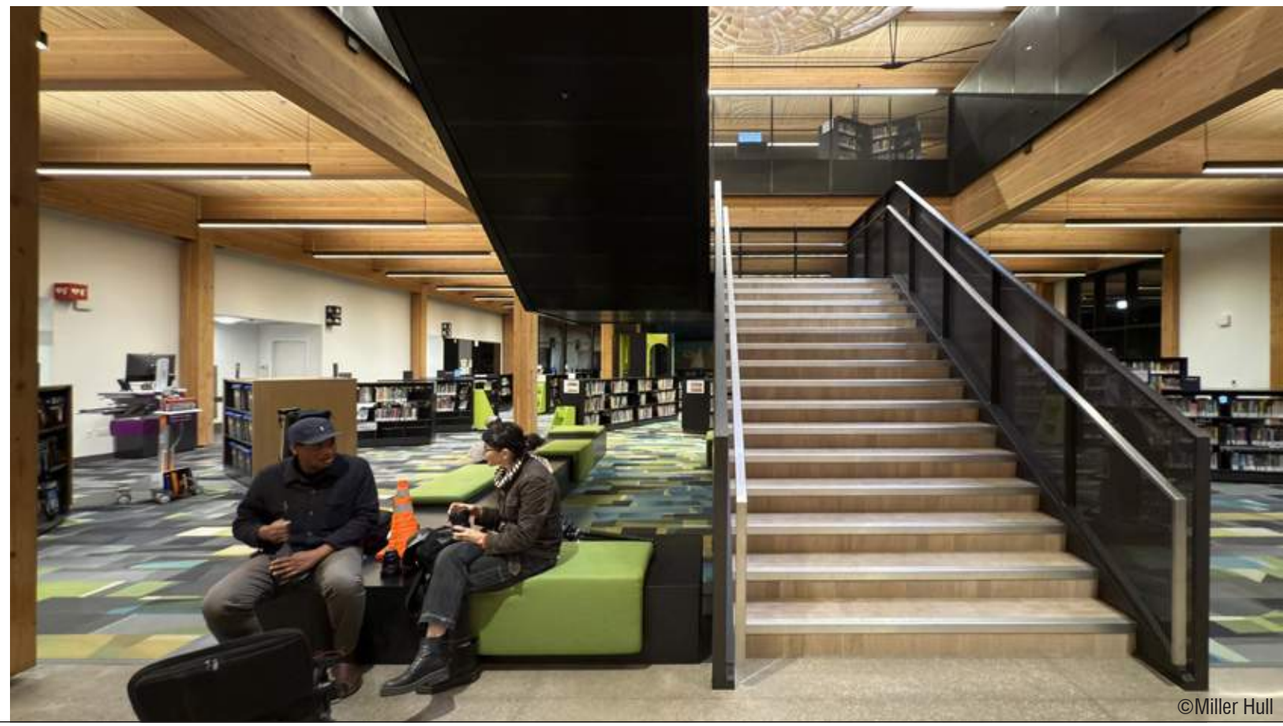
Redmond Public Library (Redmond, OR)



Redmond Public Library (Redmond, OR)

1. Envelope Optimized for Net Zero Energy
2. Occupant Health
3. Mass Timber
4. Embodied Carbon Reduction
5. High Performance Mechanical Systems
6. Renewable Energy
7. Water Use/Reuse
8. Equity and Accessibility

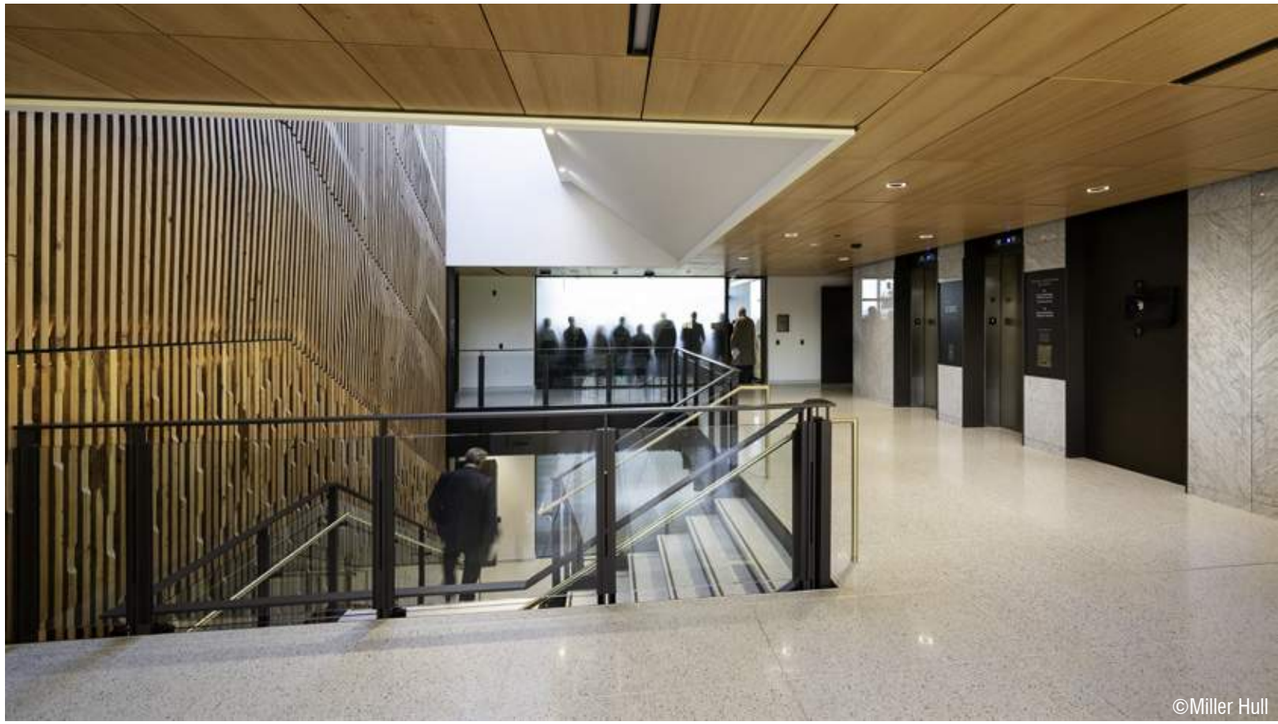
DLT PROJECTS - IN CONSTRUCTION

Central Library at Stevens Ranch (Bend, OR)

DLT PROJECTS - IN CONSTRUCTION

Central Library at Stevens Ranch (Bend, OR)

Newhouse Replacement Building (Olympia, WA)

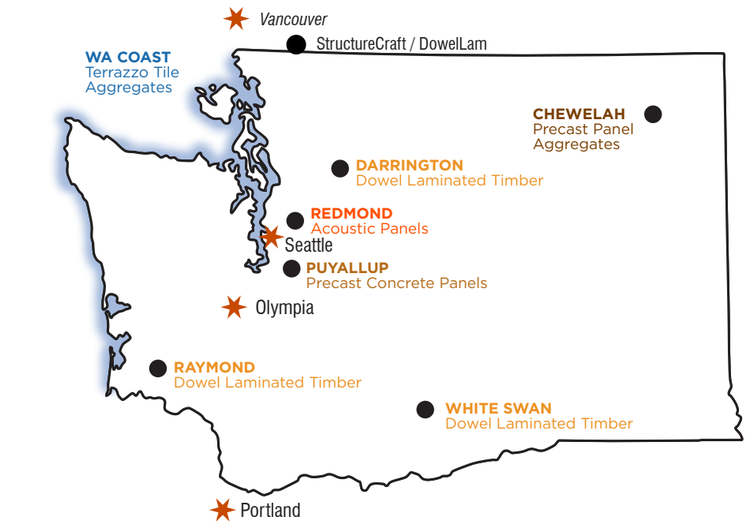


Newhouse Replacement Building (Olympia, WA)

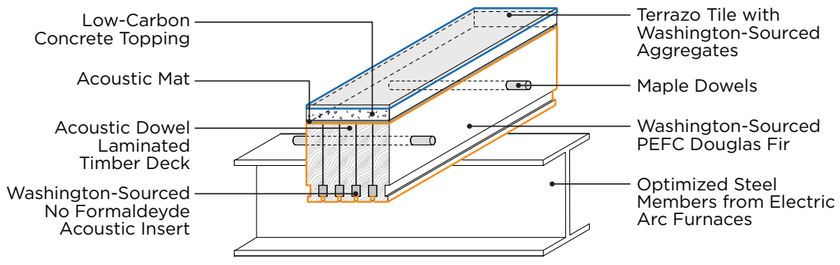
INNOVATE

MATERIAL SOURCING

All interior building finishes reduce chemicals of concern, providing quality, sustainable products that create a healthier indoor working environment and reduce chemical harm to the construction industry and fence line communities. In addition, the project achieved significant reductions in embodied carbon through reduction of Global Warming Potential (GWP) from many standard building materials. This was accomplished through the use of mass timber as part of the primary structural system, optimization of concrete mixes (saving 14%), steel sizing, material salvage and reuse, and diligent vetting of Environmental Product Declarations (EPDs) for many of the project's materials. All of these strategies resulted in a 34% reduction of embodied carbon from primary materials as compared to a LEED baseline.



SELECT REGIONALLY SOURCED MATERIALS



MASS TIMBER STRUCTURAL SYSTEM COMPONENTS

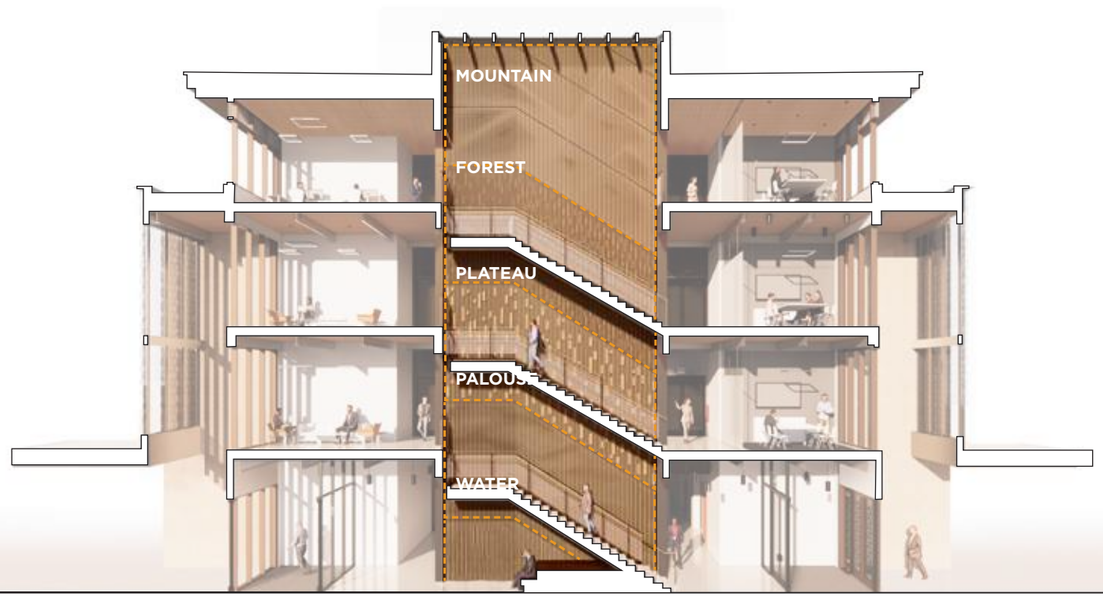
Newhouse Replacement Building (Olympia, WA)

CARLYON PRESS HOUSE, 1939

AYER PRESS HOUSE, 1969

SALVAGED LUMBER, 2023

HISTORIC BUILDING DECONSTRUCTION



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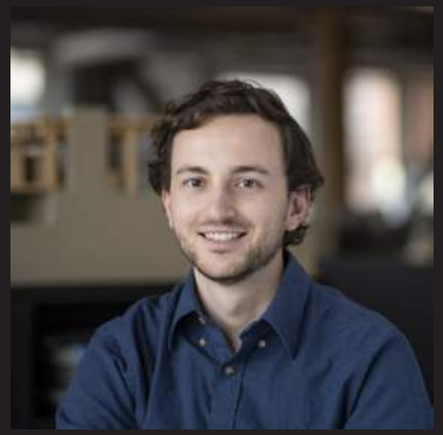
DLT PROJECTS - IN CONSTRUCTION

Moorhead Community Center & Public Library (Moorhead, MN)



Alex Zink
Architect, AIA, LEED AP BD+C
The Miller Hull Partnership
azink@millerhull.com

THANK YOU!

ADIMAB Expansion, Lebanon, New Hampshire

Design Team:

Sylvia Richards, architect
Christopher Smith, architect
Marc Rosenbaum, mechanical engineer, energy consultant
Andy Shapiro, energy consultant
Michael Scancarello, structural engineer
Kelly Price, structural engineer
Florian Back, structural engineer
Aaron Welch, electrical and mechanical engineer
George Martin, electrical and mechanical engineer
Rose Mary Su, acoustics and vibration control
John Haney, civil engineer
Susan Howard, horticulturalist

Building Construction:

ReArch, Burlington, VT - construction management
Bensonwood, Walpole, NH – mass timber structural system
Nordic Structures, Montreal, Quebec –mass timbers
A.R.C. Mechanical, Lebanon, NH –mechanical systems
MEI Electrical, Westfield VT – electrical systems
Milk Metals, Chicago, IL – bridge, stair structures, steel panels
Duratherm, Vassalboro, ME –wood windows and doors
AP Timberline, Rutland, VT – interior/exterior woodworking
Murphy's Cell-Tech, St Johnsbury VT – insulation/air sealing

Adimab Team:

Jason Yehle – coordination and understanding of all things
Jordan Desroches – IT genius
Kirt Johnson – operations and encouragement
Urszula Sharples – laboratory coordination

SYLVIA RICHARDS practice for ARCHITECTURE

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

2009

MASS TIMBER+

2012

MASS TIMBER+

2013

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2015

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2016

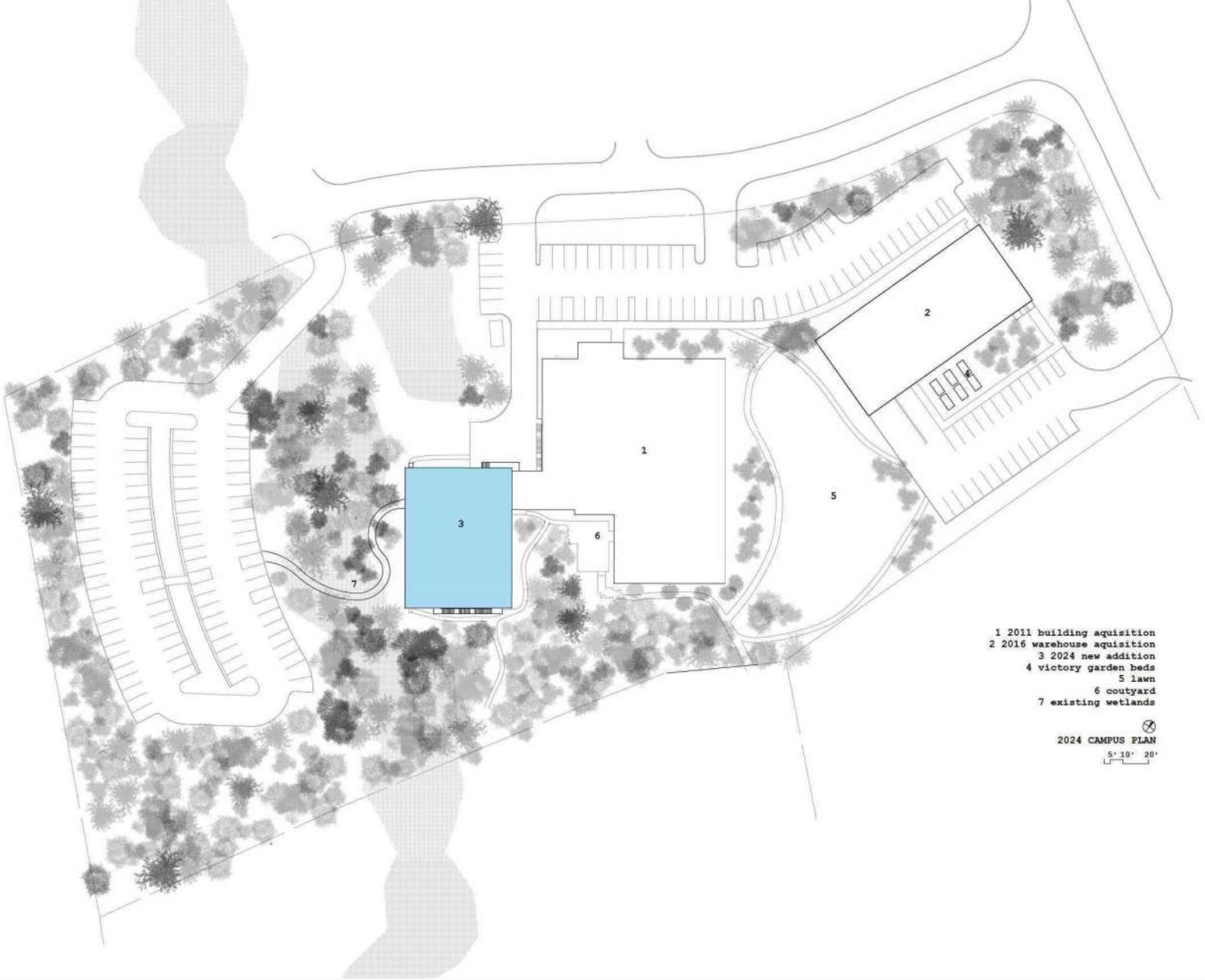
MASS TIMBER+

2017

MASS TIMBER+

2018

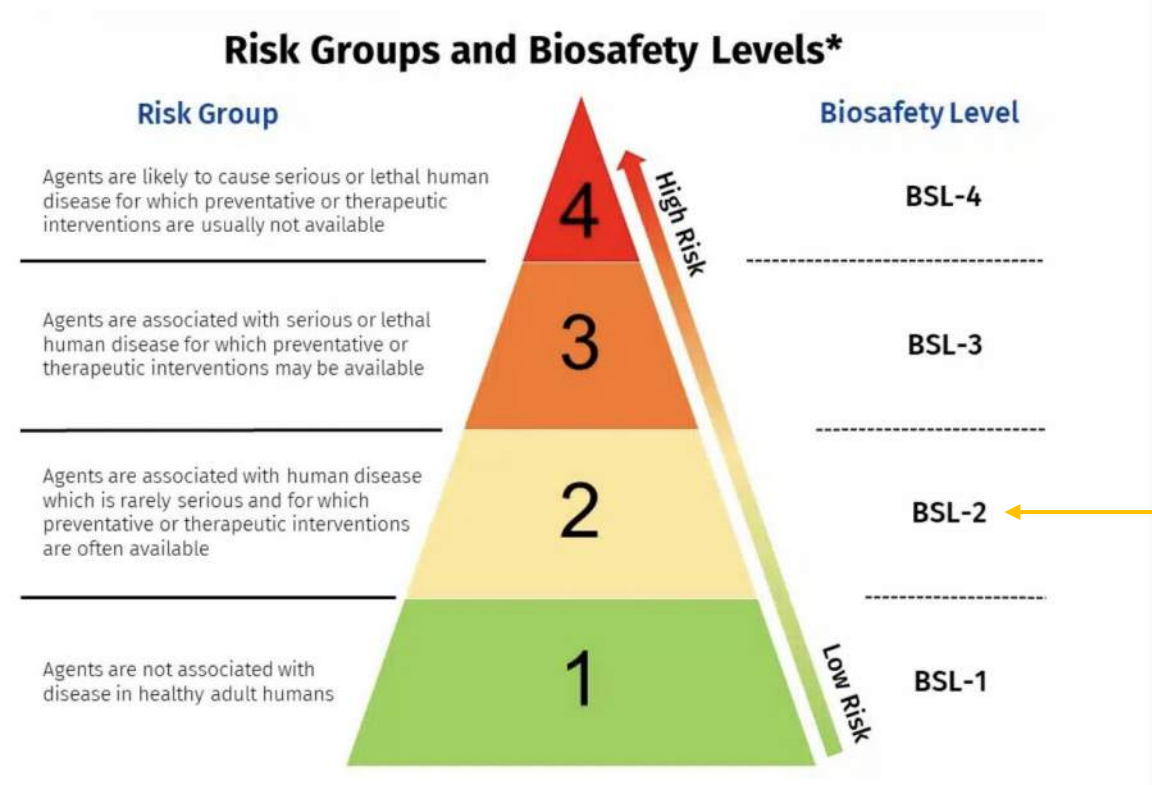
MASS TIMBER+



1 2011 building aquisition
2 2016 warehouse aquisition
3 2024 new addition
4 victory garden beds
5 lawn
6 coutyard
7 existing wetlands

2024 CAMPUS PLAN

5' 10' 20'



ADIMAB

EXISTING:

LABS AND SCIENCE	10,170 SQFT
OFFICES AND SEATING	5,250 SQFT
CONFERENCE	1,390 SQFT
CORE (non-science)	5,000+ SQFT

NEW ADDITION:

LABS AND SCIENCE	9,738 SQFT
OFFICES AND SEATING	3,264 SQFT
CONFERENCE	4,454 SQFT
CORE (non-science)	4,078 SQFT

VISION:

- *care for the natural environment*
- *support a culture of community*
- *integrate buildings with nature*
- *spaces people can thrive in*

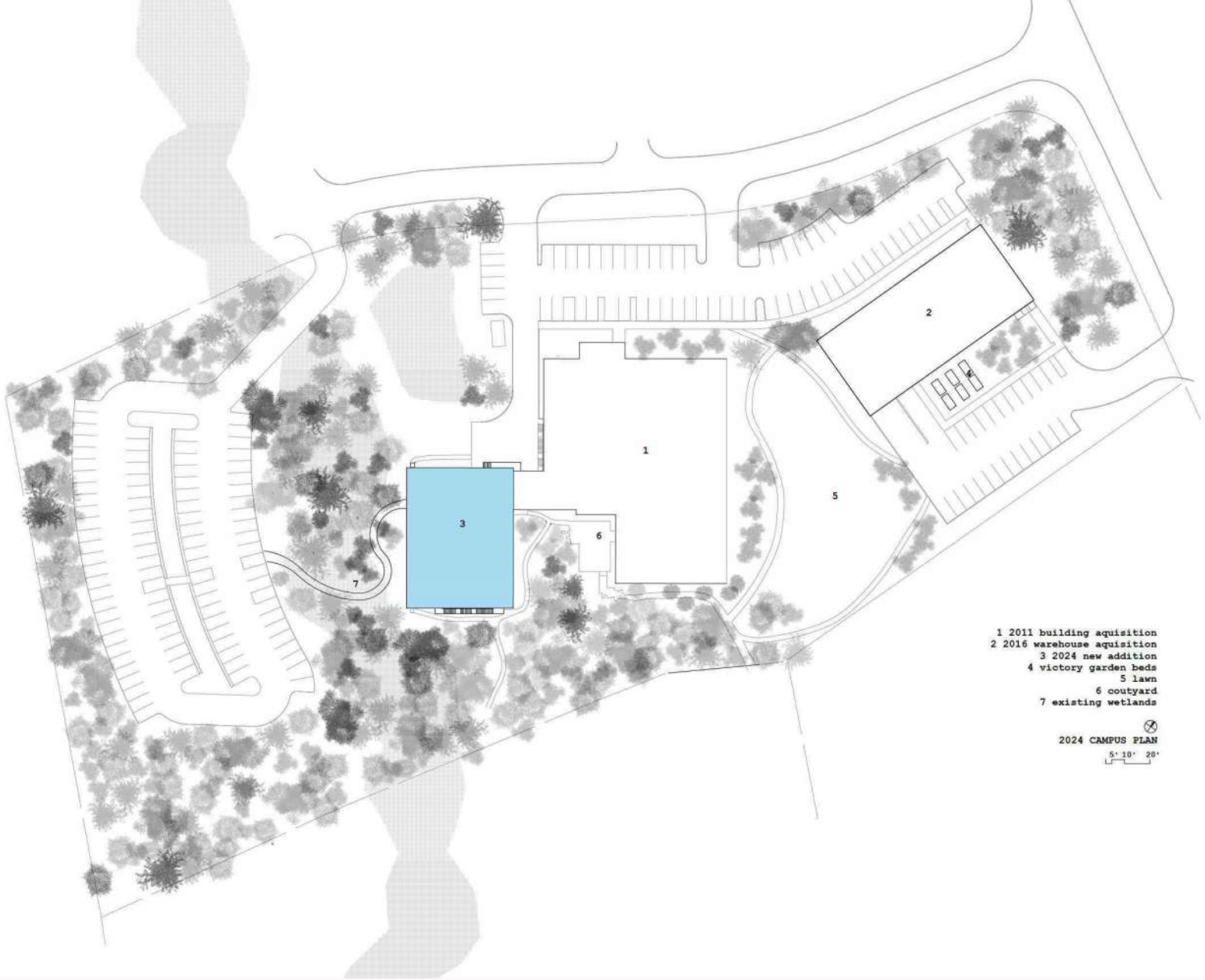
MASS TIMBER+

1 bridge to parking
2 existing wetlands
3 connector to existing labs

EAST-WEST SECTION

5' 10' 15'

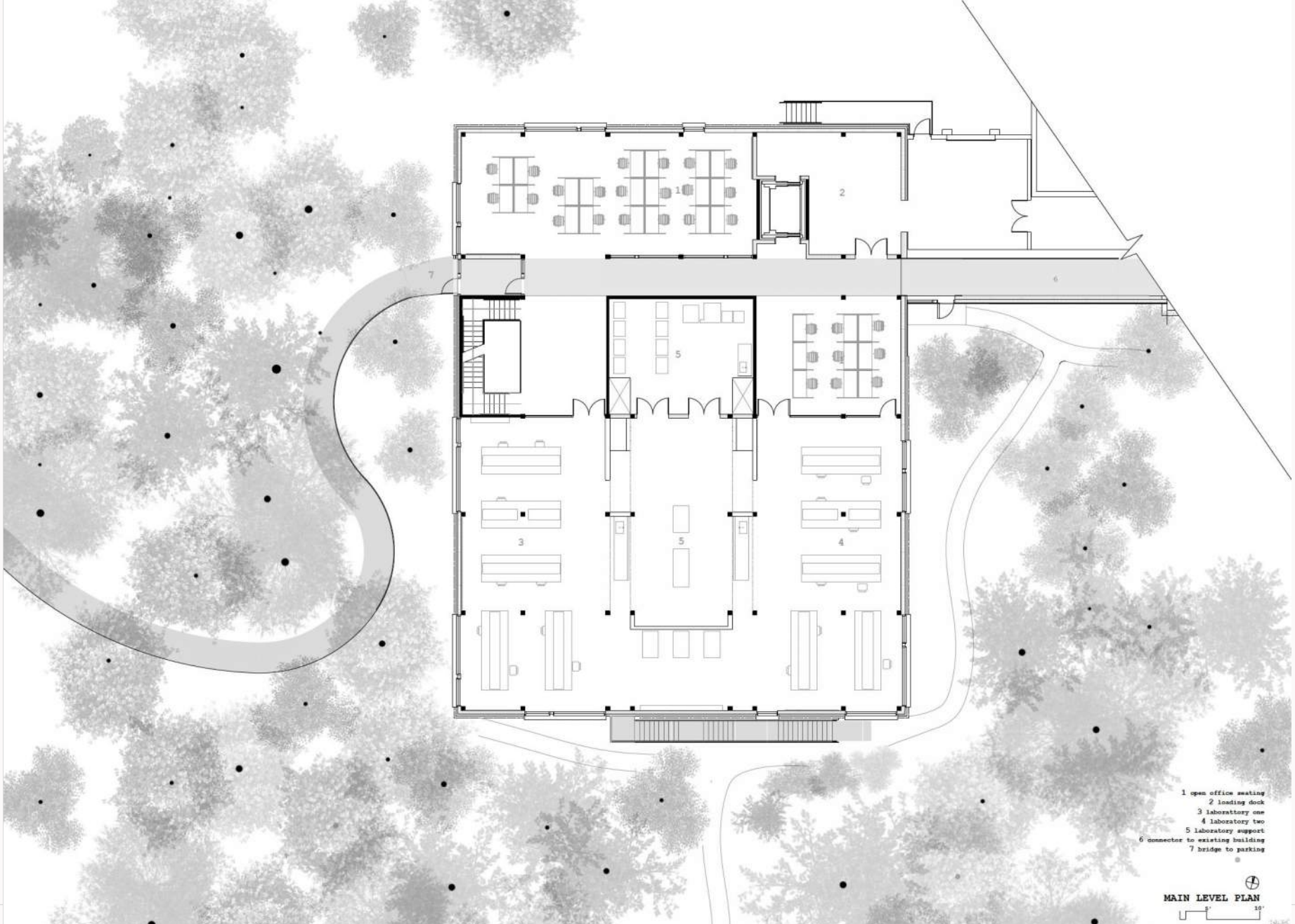
MASS TIMBER+



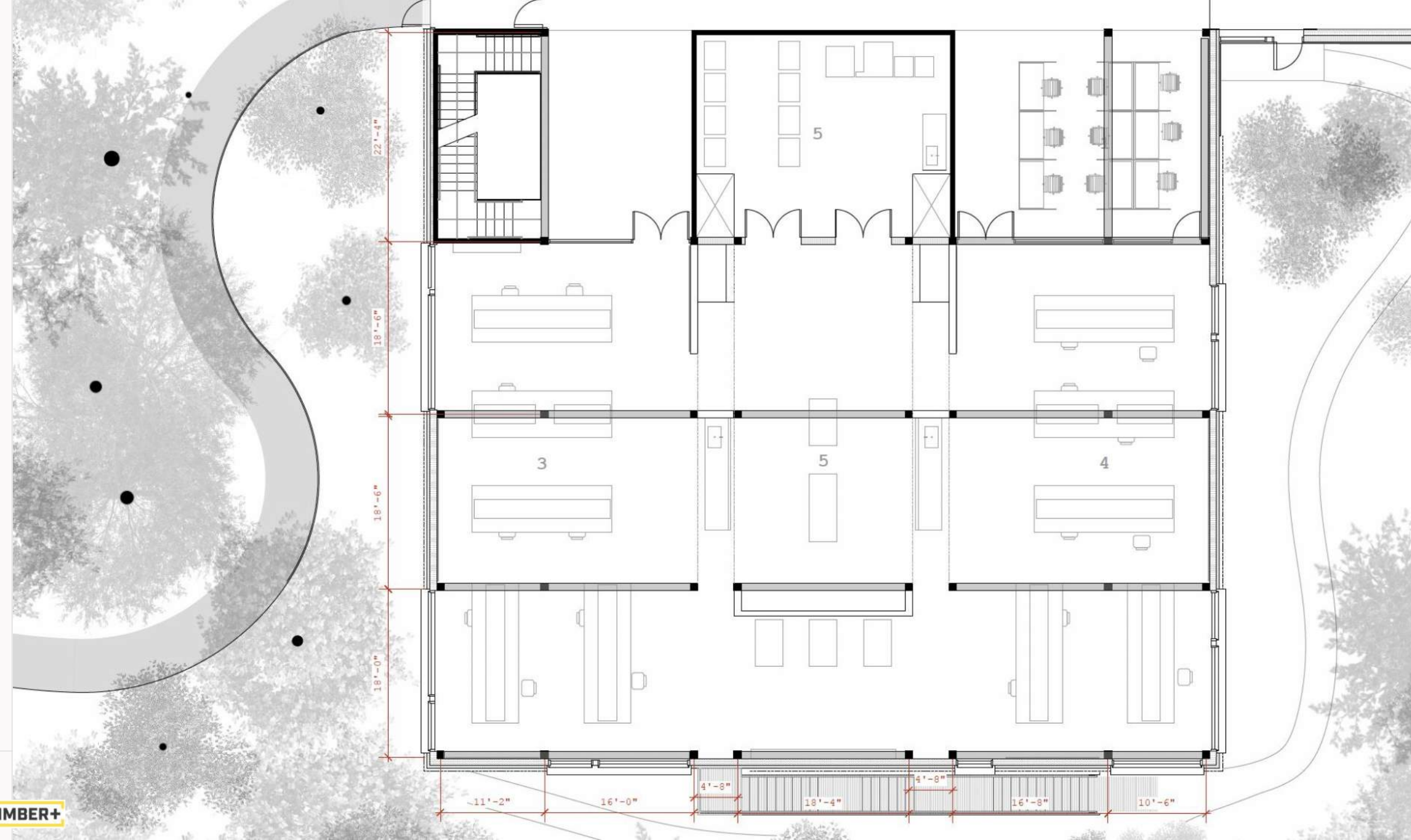
1 2011 building aquisition
2 2016 warehouse aquisition
3 2024 new addition
4 victory garden beds
5 lawn
6 coutyard
7 existing wetlands

2024 CAMPUS PLAN

5' 10' 20'


1 open office seating
2 loading dock
3 laborattory one
4 laboratory two
5 laboratory support
6 connector to existing building
7 bridge to parking
MAIN LEVEL PLAN

MASS TIMBER+



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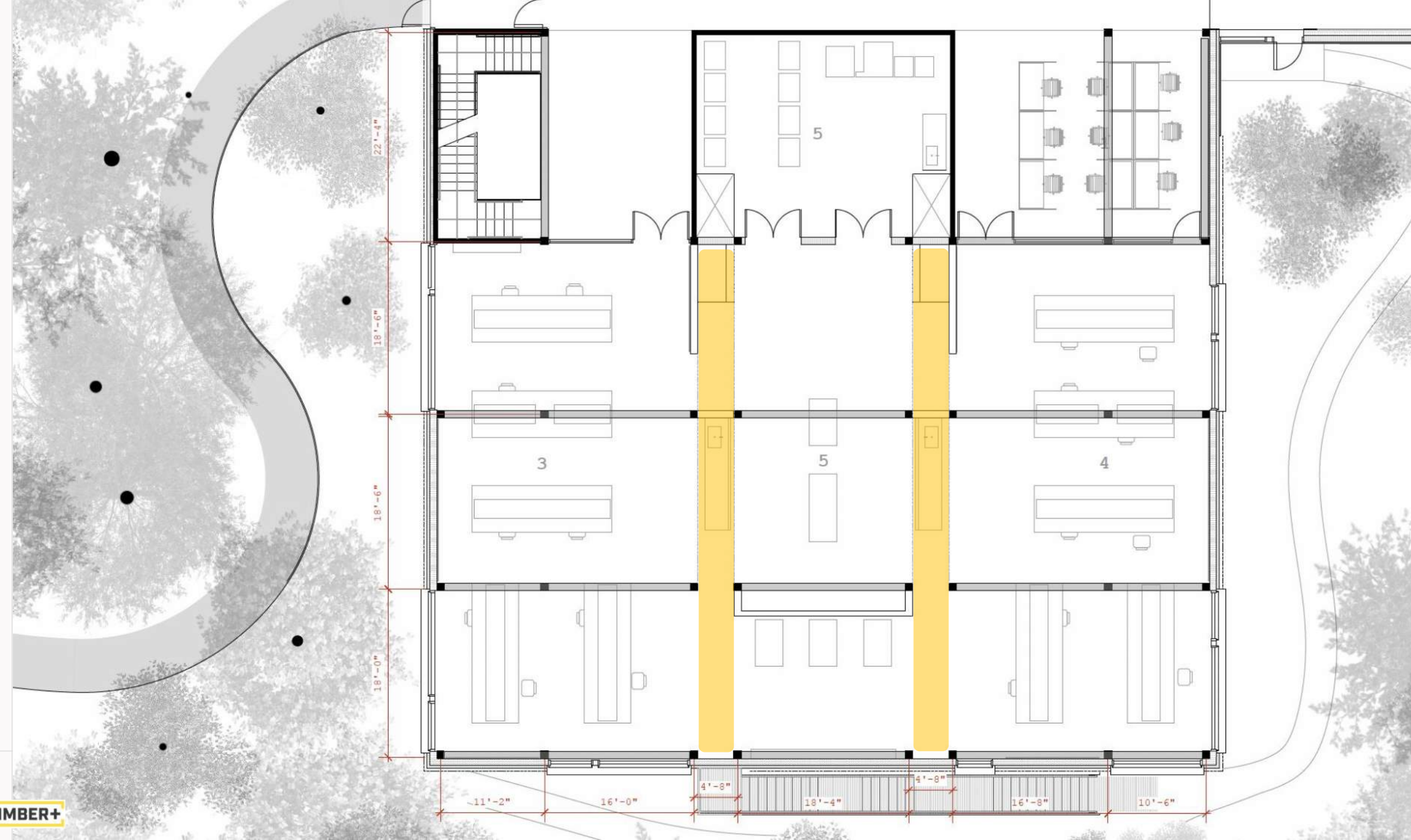

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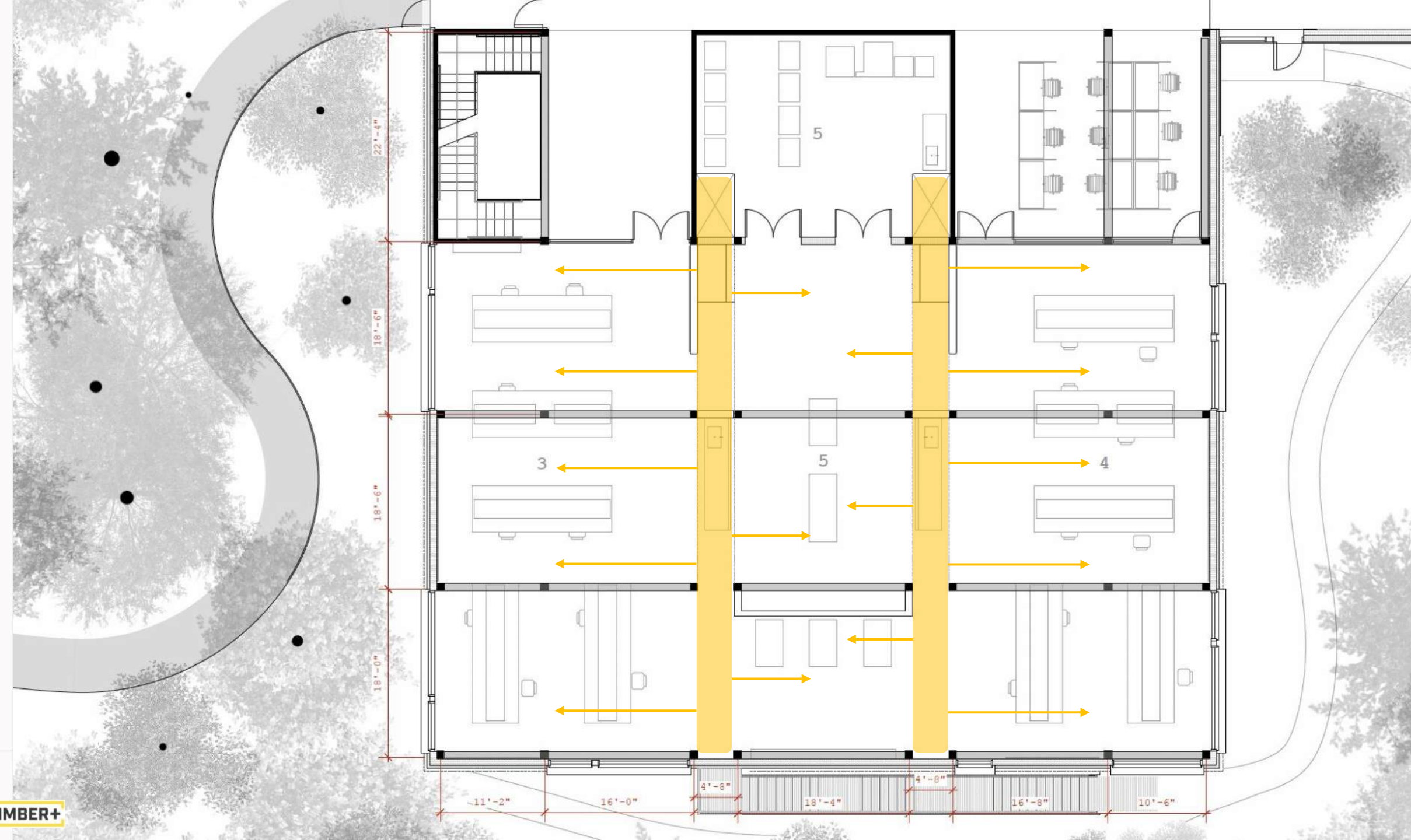

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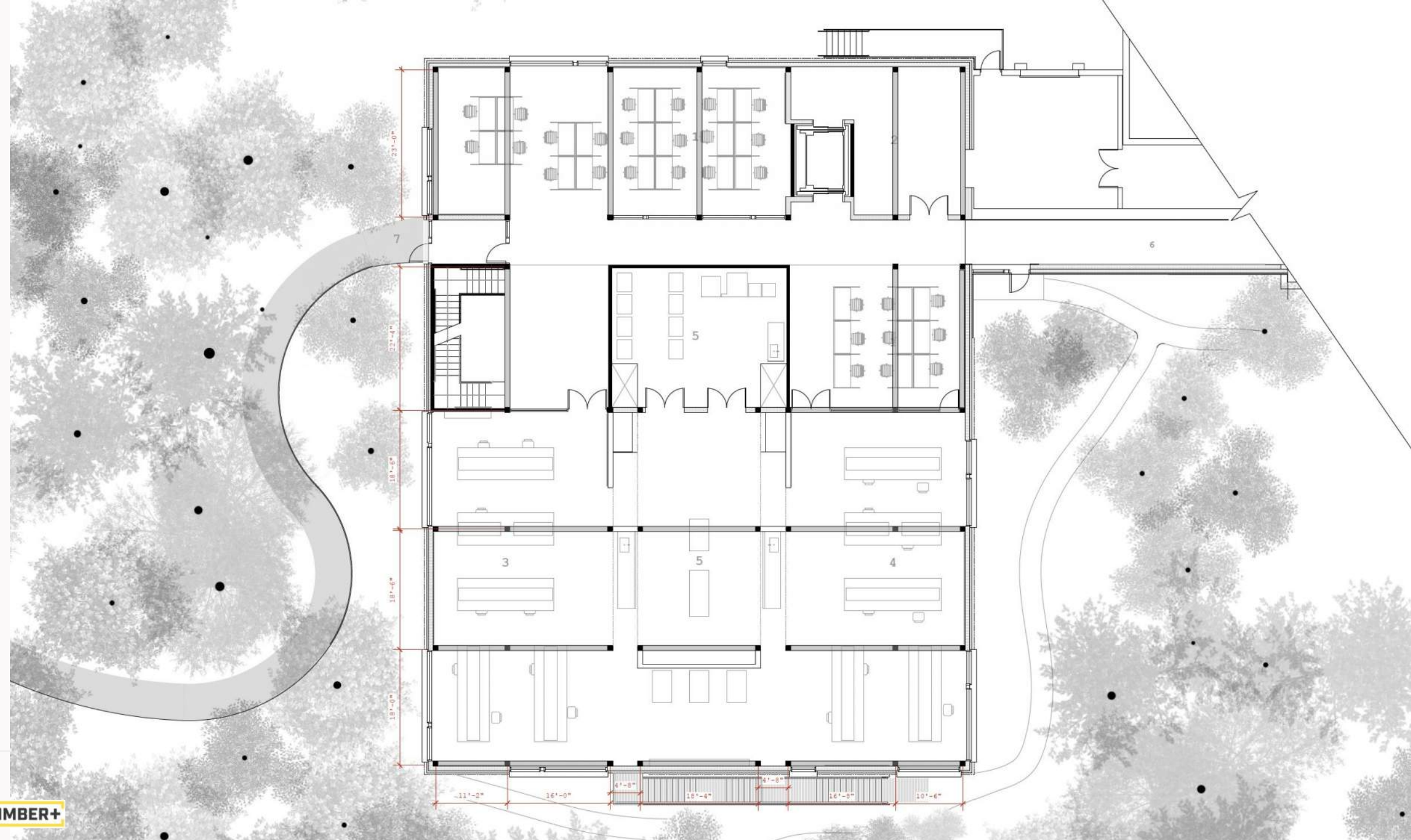

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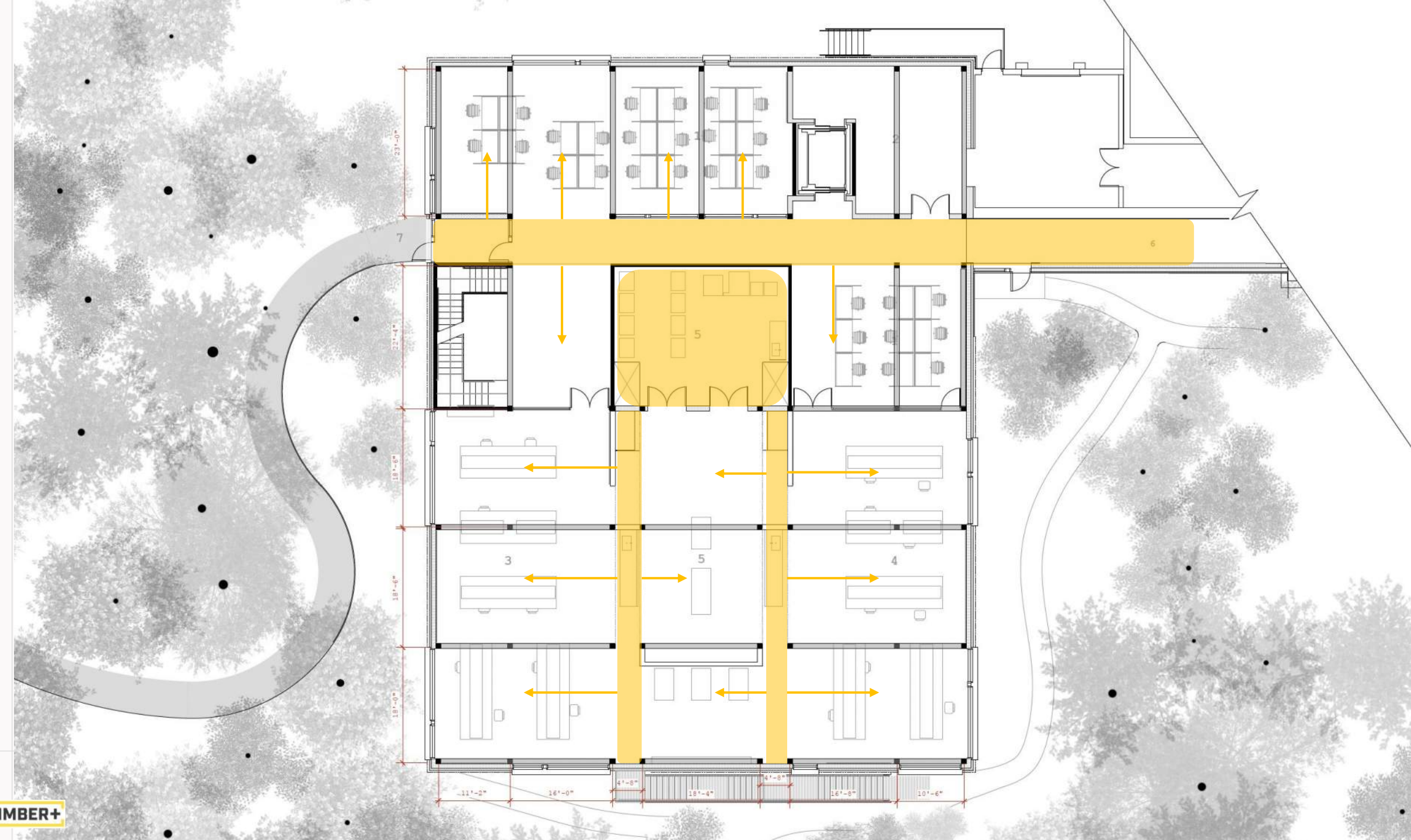


MASS TIMBER+

100% outside air in labs exchanges 6x per hour

Very high level of filtration (MERV 8 protects HEPA)

Energy recovery ventilation keeps relative humidity up

The exchanger is many layers of corrugated aluminum sheets

The last third of the exchanger has a desiccant coating that absorbs and releases moisture

This coating is a 3A molecular sieve

90% heat recovery and
70% moisture recovery ERVs

Demand control ventilation based on need

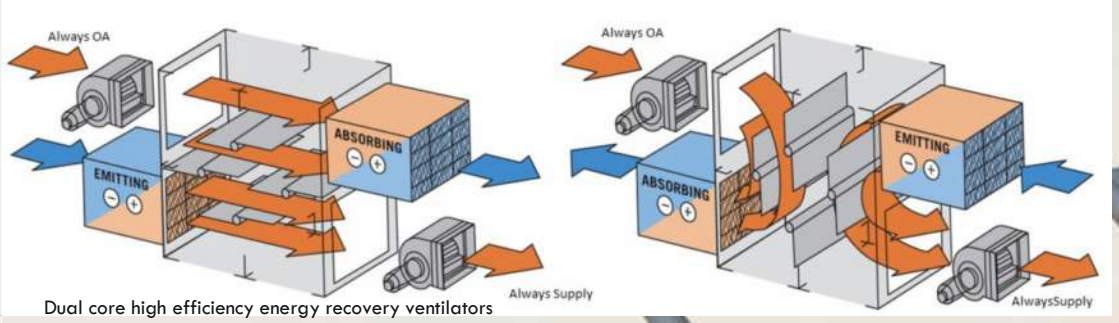
Heat pump chiller can simultaneously provide hot water and chilled water, moving energy from one to the other if some spaces need cooling while others need heat

Fans and pumps are all variable speed based on demand

Heat pump chiller, air-cooled chiller, and gas boiler are all very high efficiency and have high range of modulation

New equipment replaces much less efficient equipment in the existing building

Equipment is right-sized based on existing building loads



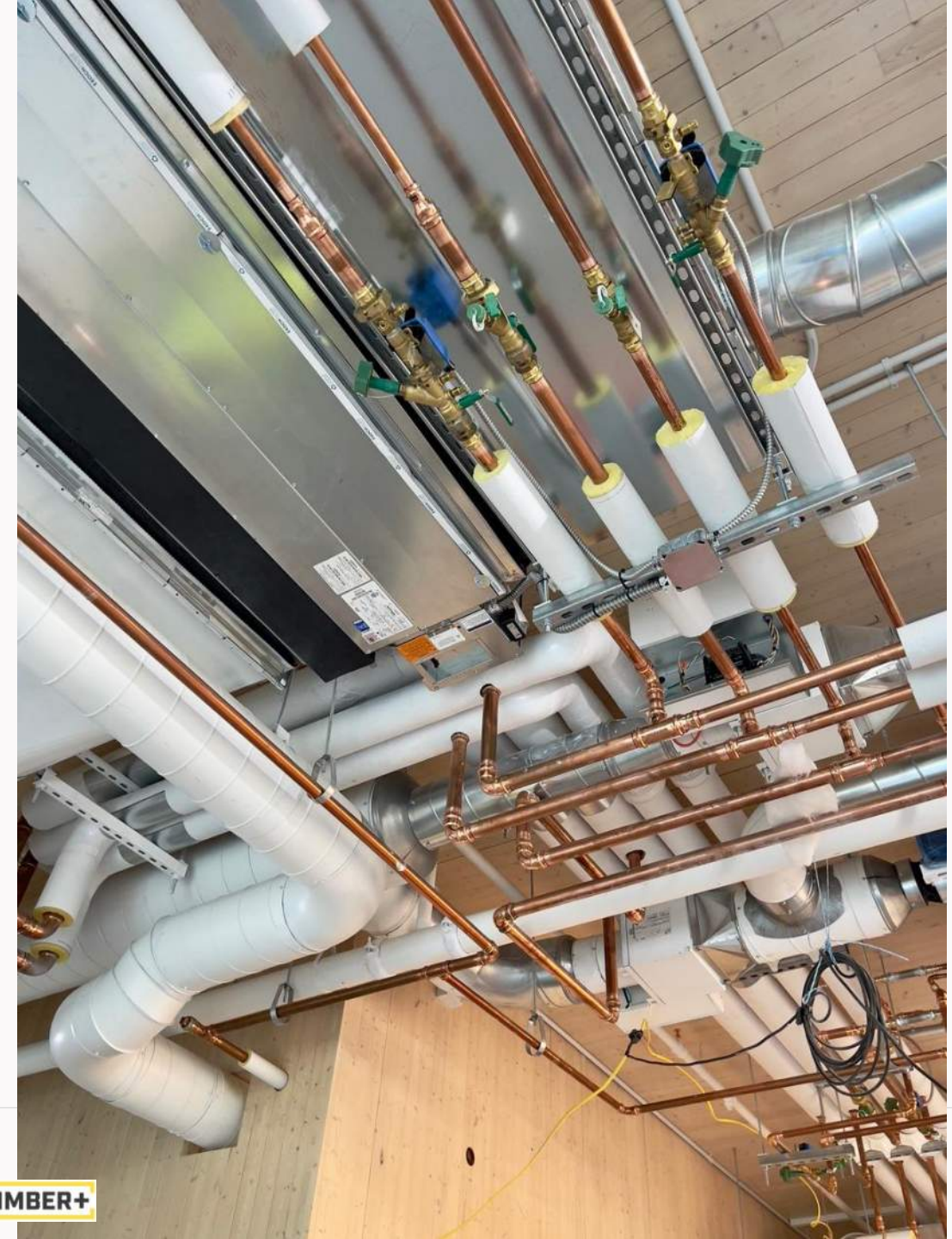
Dual core high efficiency energy recovery ventilators

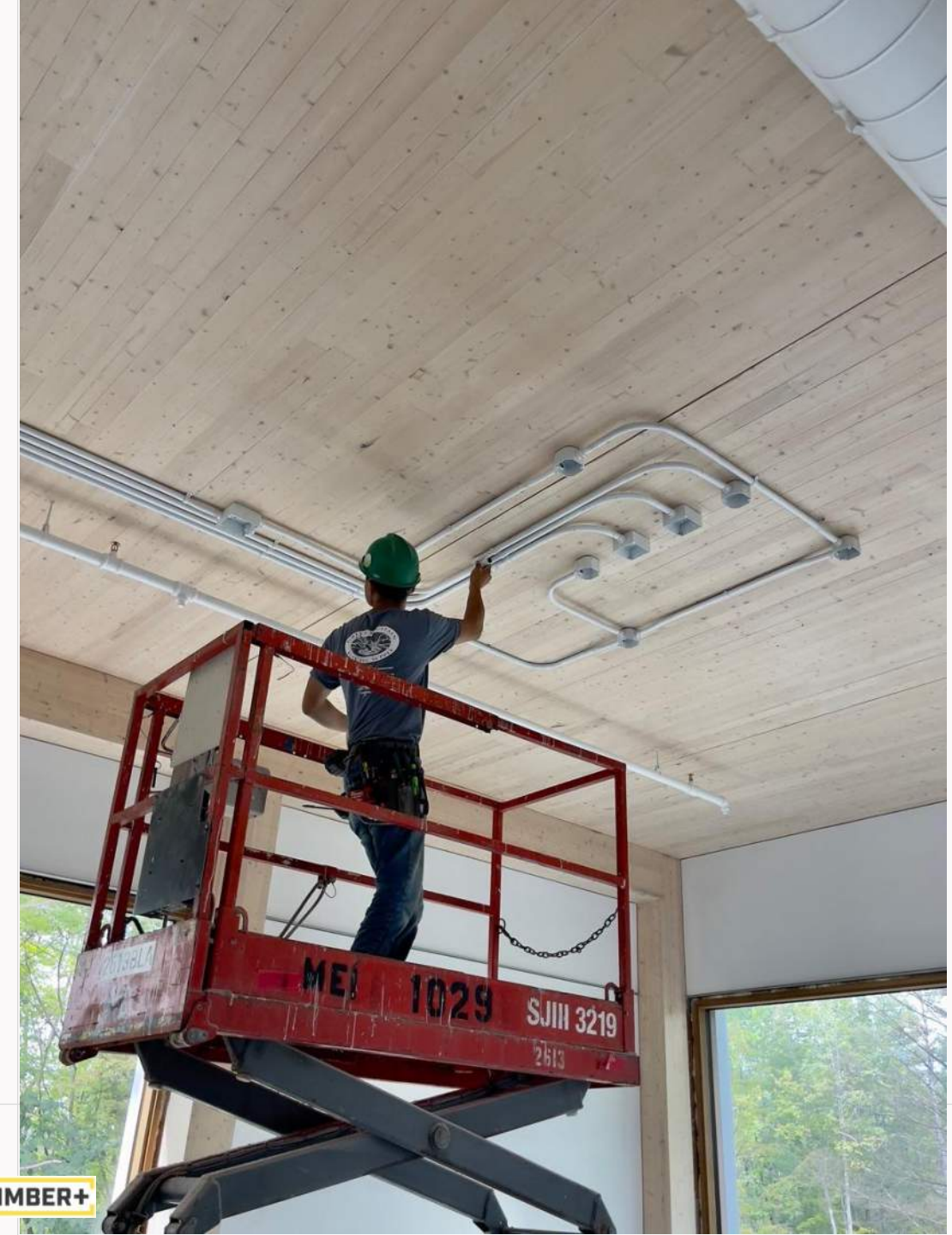
- Simple efficient reversing damper technology for cold climates
- 90% efficiency heat recovery
- 70% efficiency moisture recovery
- HEPA filtration

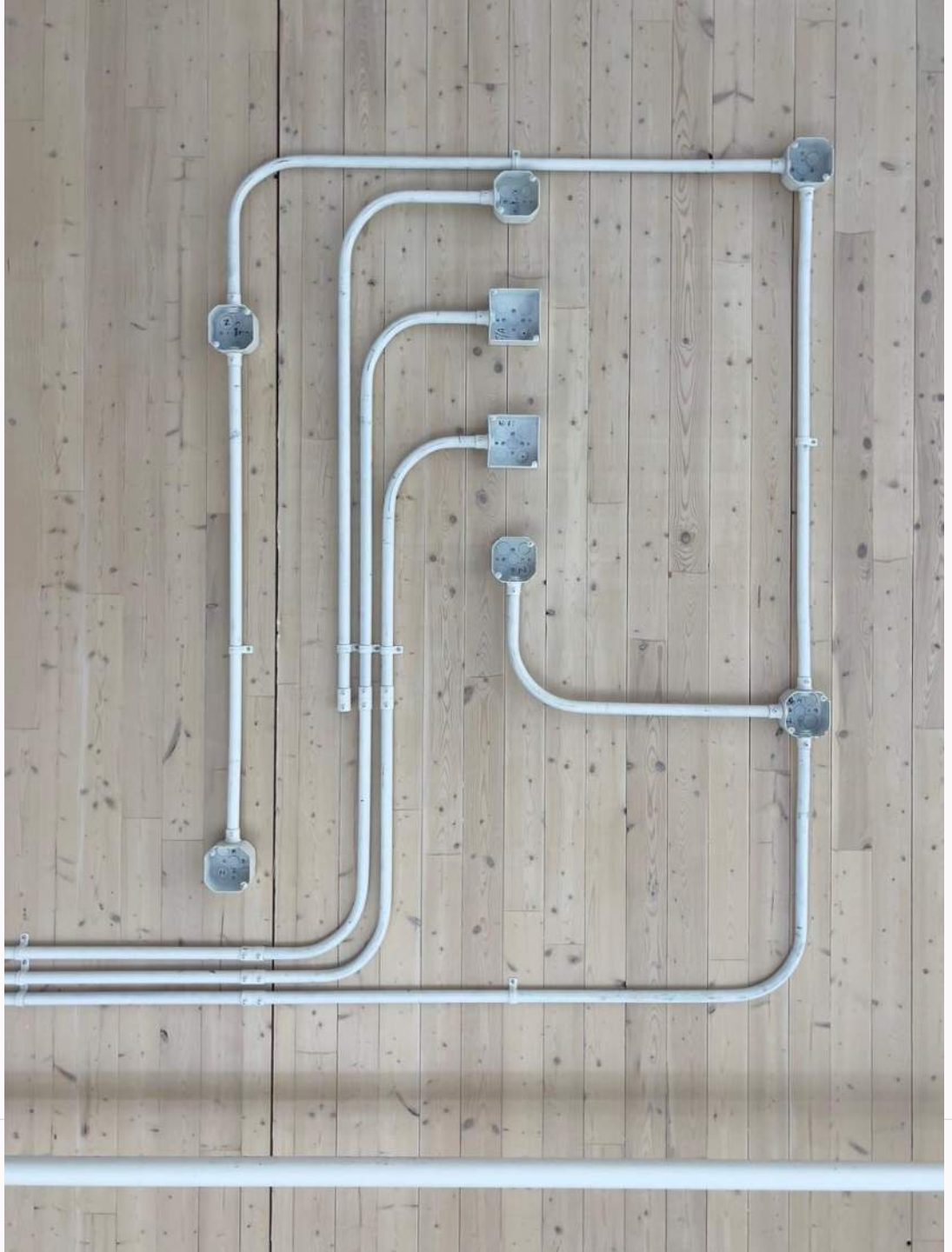
MASS TIMBER+

MASS TIMBER+


Link-Belt
Link-Belt




MEI 1029 SJIII 3219



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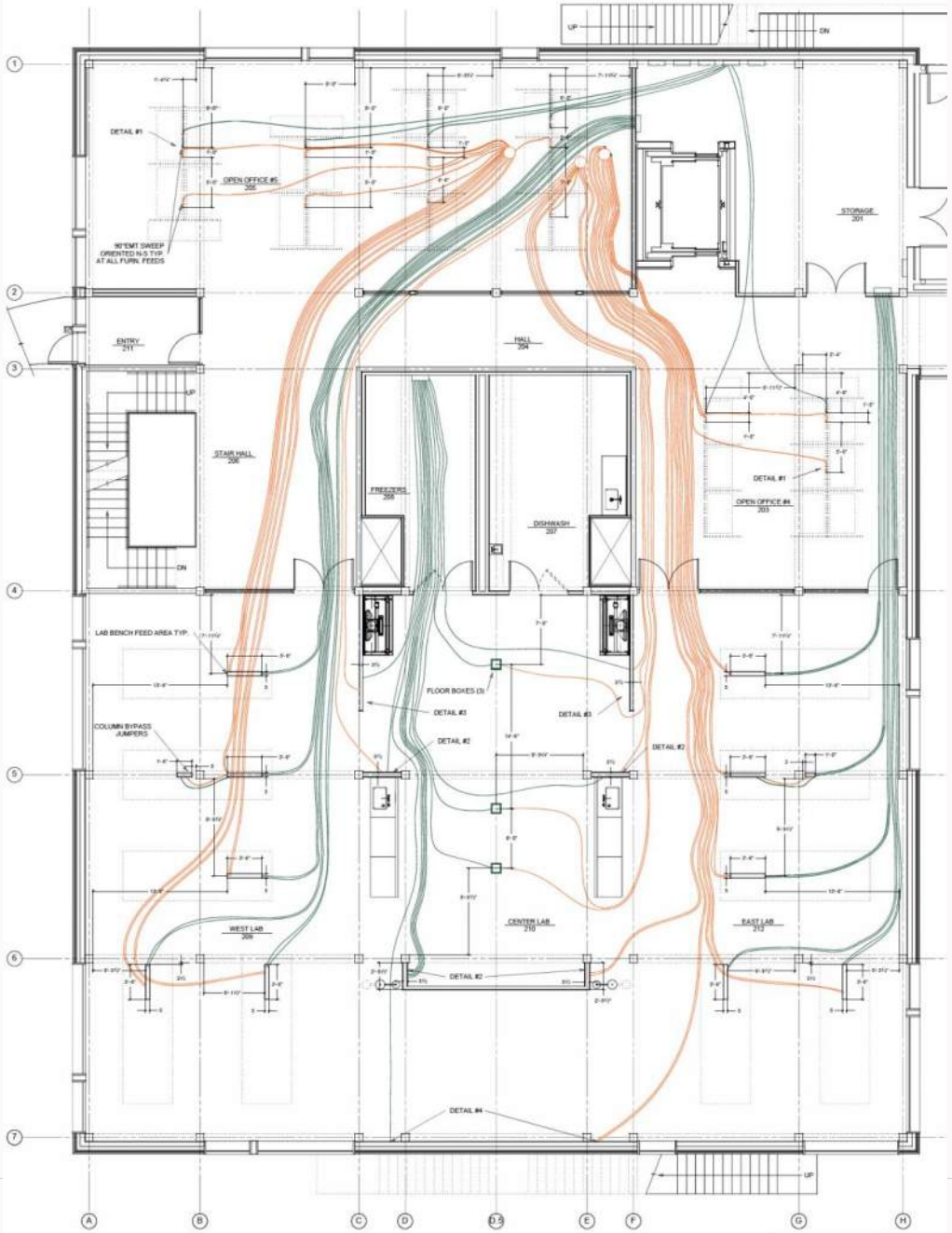


MAIN LEVEL - SUB SLAB CONDUIT

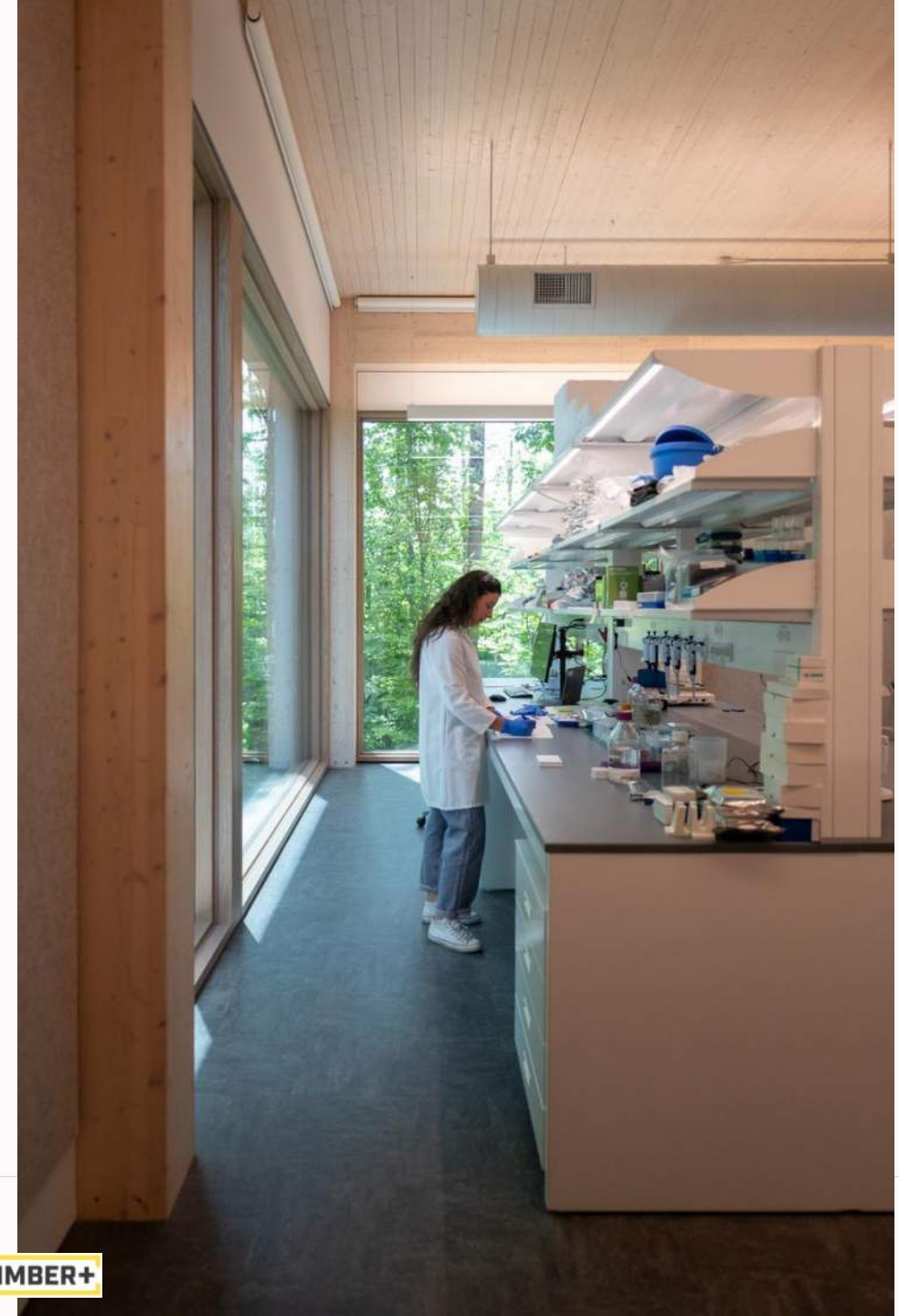
Date: 13 OCT 2022

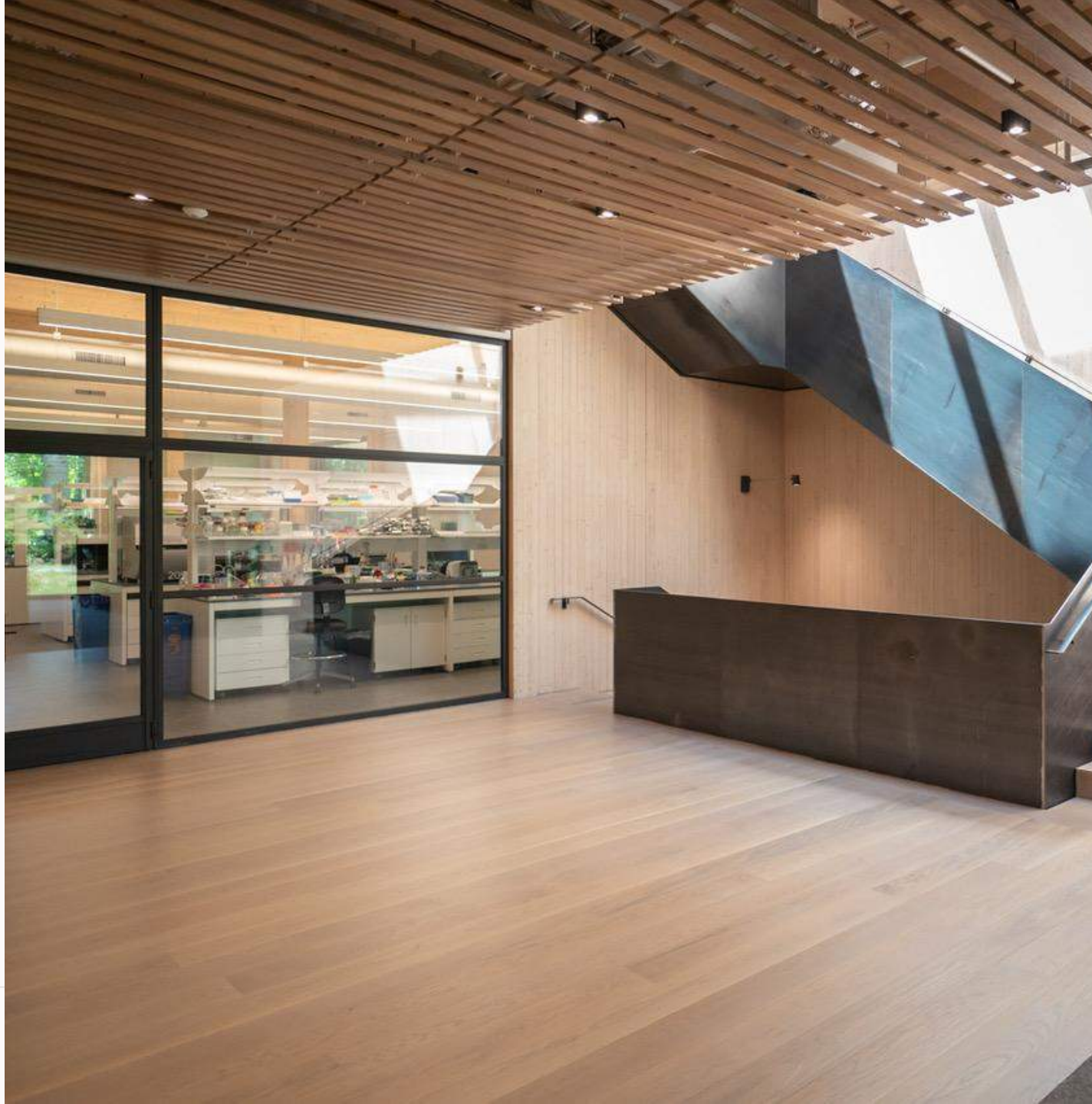
Sheet No.

ASK-21

MASS TIMBER+

MASS TIMBER+





MASS TIMBER+

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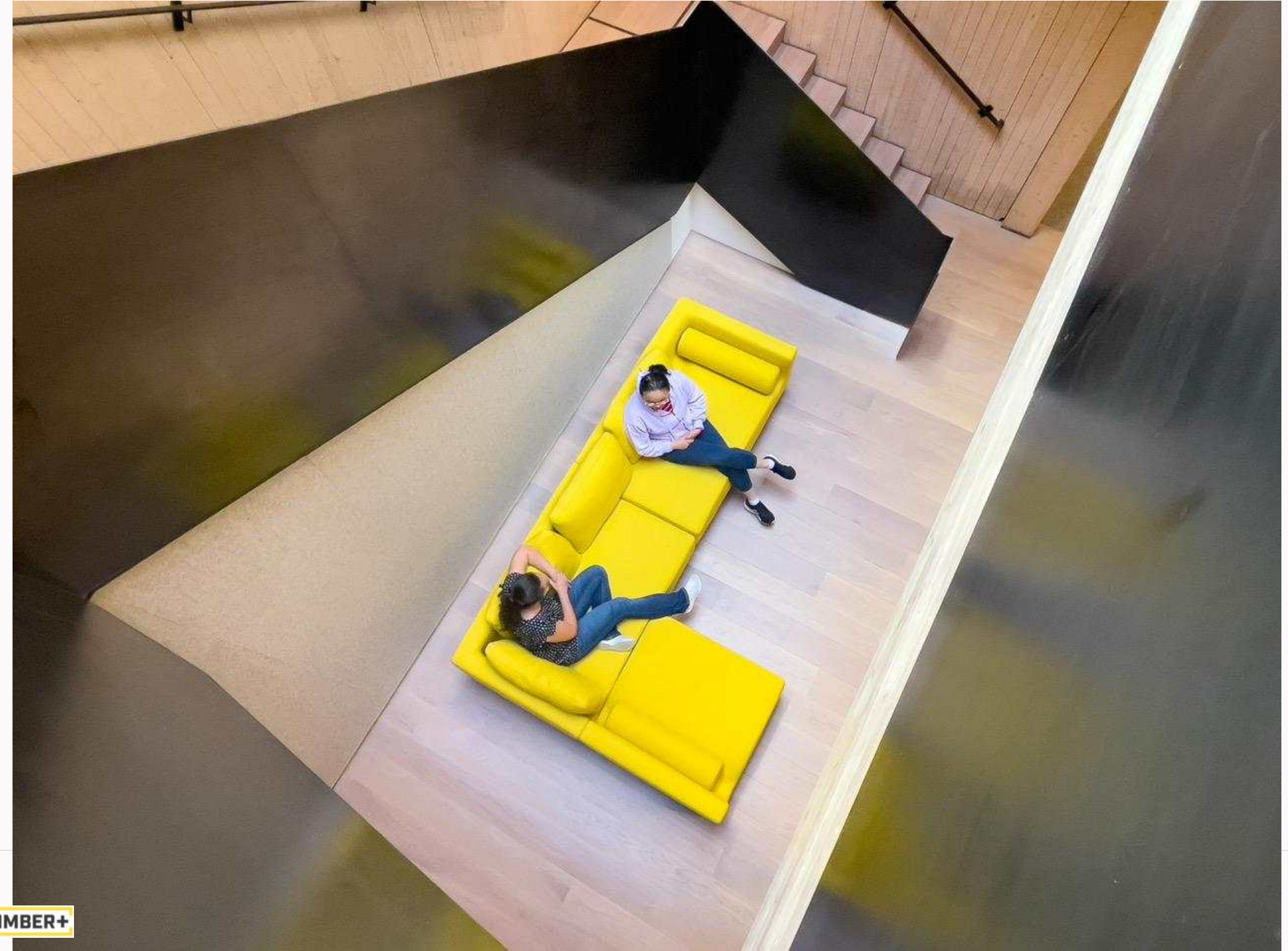

MASS TIMBER+

We chose sustainable materials wherever possible, as well as one's that contribute to a healthier indoor environment.

FLOORING
1. New England white oak with a zero-VOC finish, *Carlisle*
2. renewable wool and recycled fiber carpet, *Tretford*
3. 'Marmoleum" made of 97% natural materials, *Forbo*

ACOUSTIC WALL PANELS
Natural felted wool, *FilzFelt*

ACOUSTIC CEILING CLOUDS
60% recycled content, *Arktura*

WOOD TRIM AND CEILINGS PANELS
New England white oak with a zero-VOC finish

DESK CUBICLES
The cubicle structures are made of sheets of black *RichLite* with an inner core of sustainably harvested Finnish birch plywood.
The black outer surfaces are made of 100% recycled paper set with a bonding resin. It is an extremely durable and sustainable material.

This concludes The American Institute of Architects Continuing Education Systems Course