Case Studies in Innovation: Landmark Mass Timber Projects

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

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

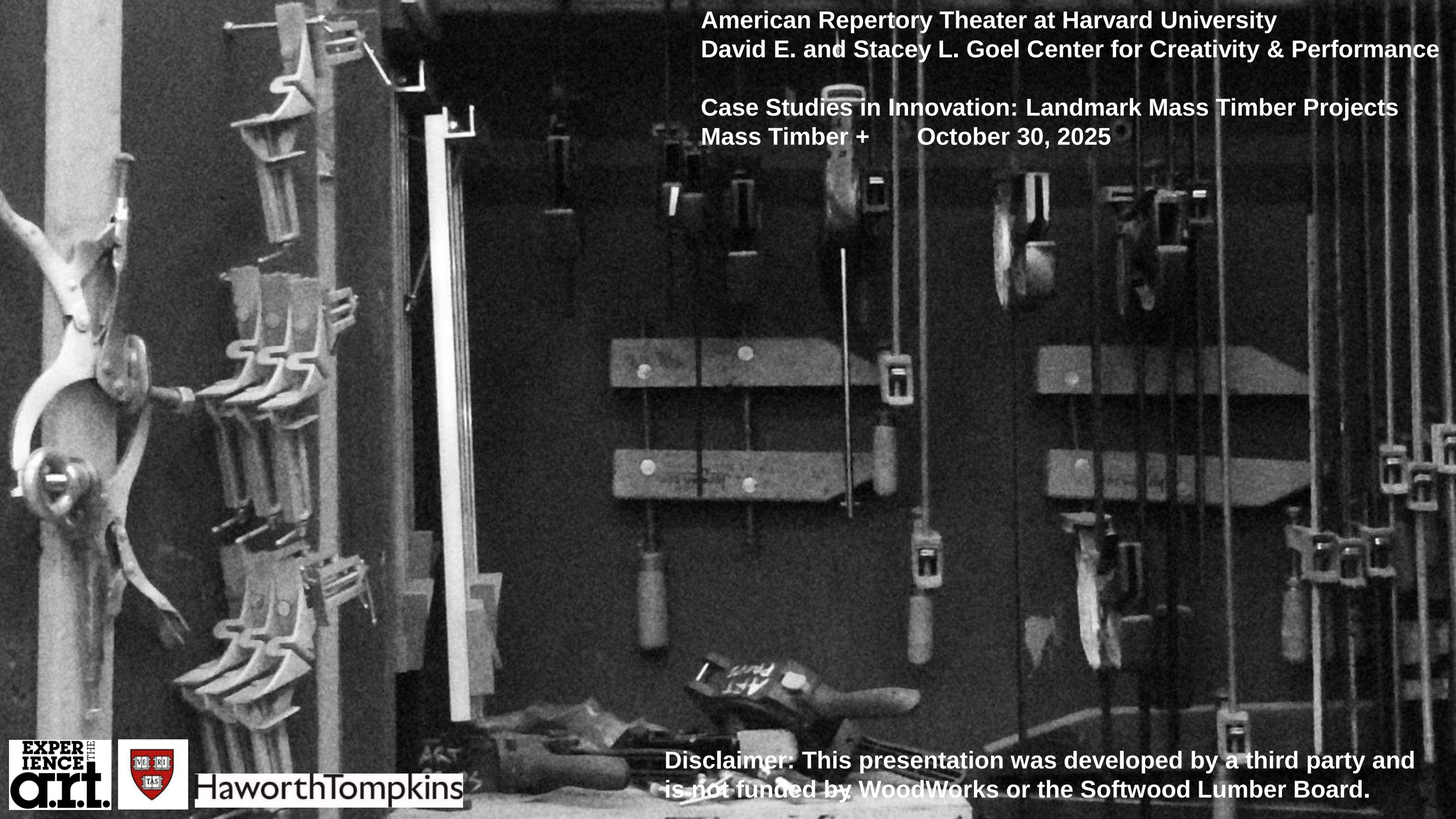
AIA Approved Continuing Education

Course Description

Mass timber is redefining what’s possible for sustainable, high-performance buildings—from cultural facilities to record-setting commercial towers. This session presents case studies that explore the structural, fire safety, acoustic, and environmental strategies enabling mass timber to meet stringent code requirements while prioritizing occupant wellness and environmental impact. Attendees will learn how design and construction teams overcame technical challenges through integrated processes, innovative detailing, and material optimization, yielding lessons applicable to projects of all scales and types.

Learning Objectives

1. Identify the key code compliance, structural, and fire safety factors that influence the design of large-scale mass timber projects.
2. Describe integrated design strategies that support occupant health, safety, and environmental performance in mass timber buildings.
3. Discuss innovative detailing, material strategies, and construction approaches that enable mass timber to achieve project goals.
4. Apply lessons learned from diverse case studies to inform the design and delivery of future mass timber projects.



American Repertory Theater at Harvard University
David E. and Stacey L. Goel Center for Creativity & Performance

Case Studies in Innovation: Landmark Mass Timber Projects

Mass Timber + October 30, 2025

HaworthTompkins

American Repertory Theater at Harvard University
David E. and Stacey L. Goel Center for Creativity & Performance
Mass Timber + October 30, 2025

Peter Reiss, AIA, LEED AP

Principal with ARC

Architect

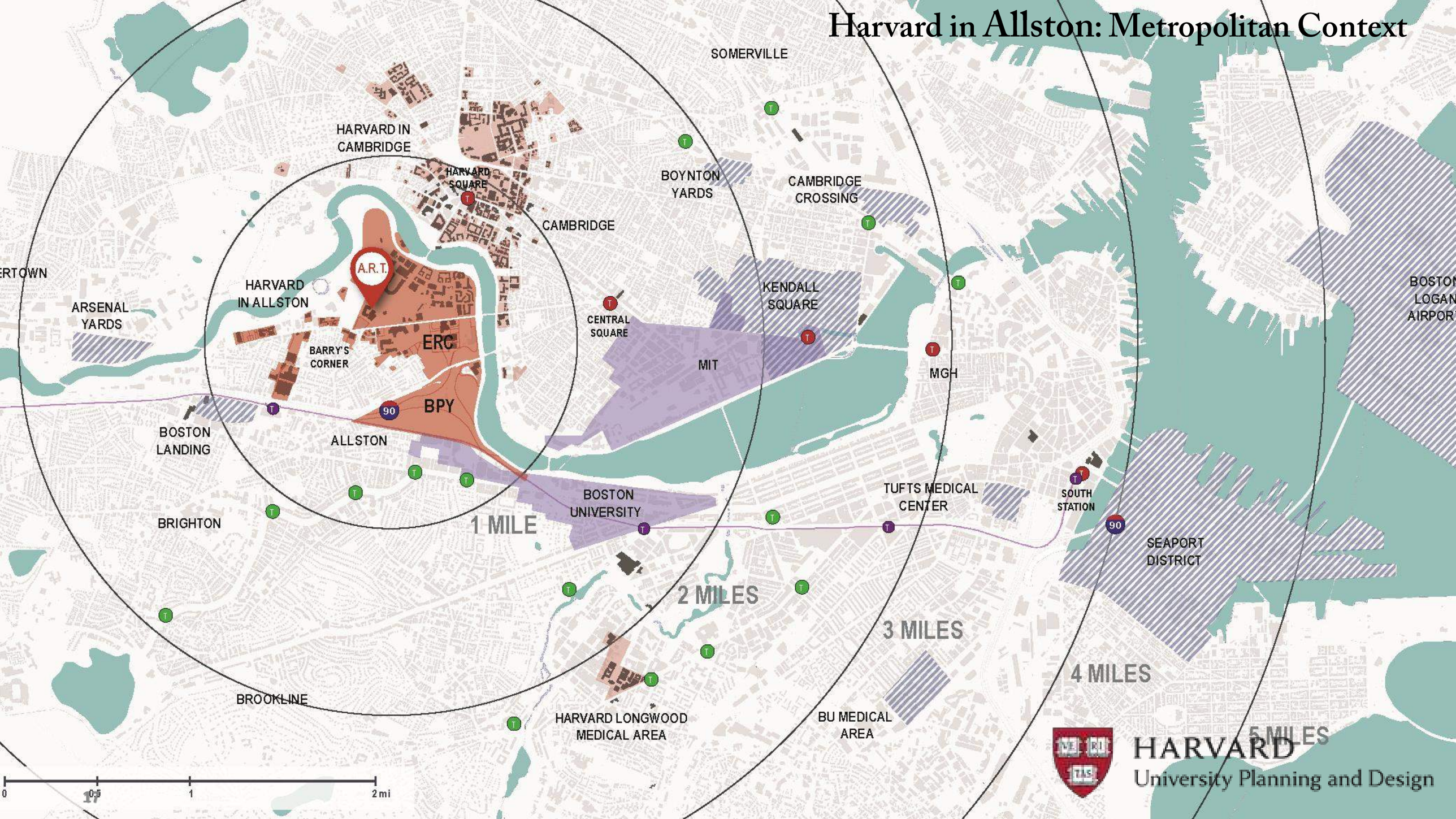
Aaron W. Malone, PE

Principal with LeMessurier

Structural Engineer


AMERICAN
REPERTORY
THEATER
A.R.T.

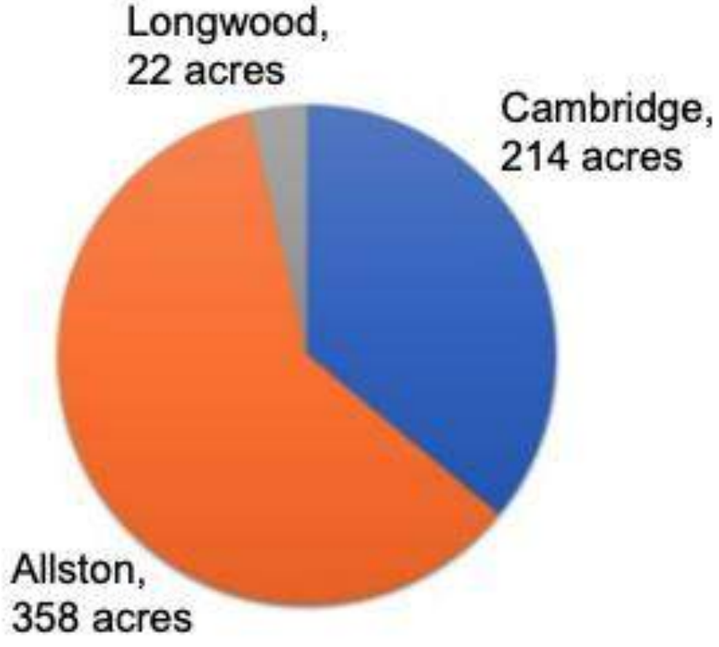
Harvard in Allston: Metropolitan Context



HARVARD
University Planning and Design

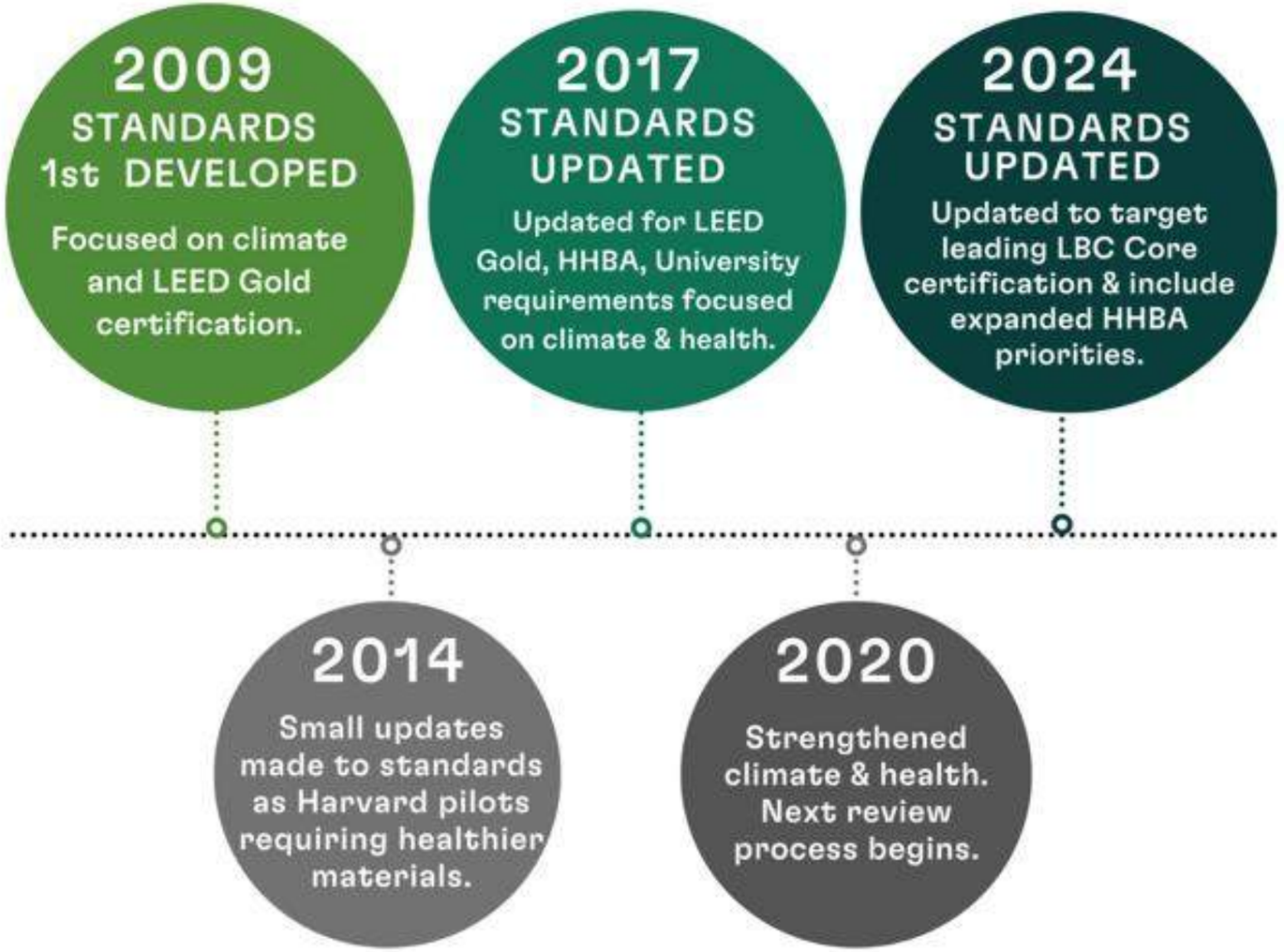
Harvard in Allston Property Ownership

Harvard owns a total of **358 acres in Allston**.



HARVARD
University Planning and Design

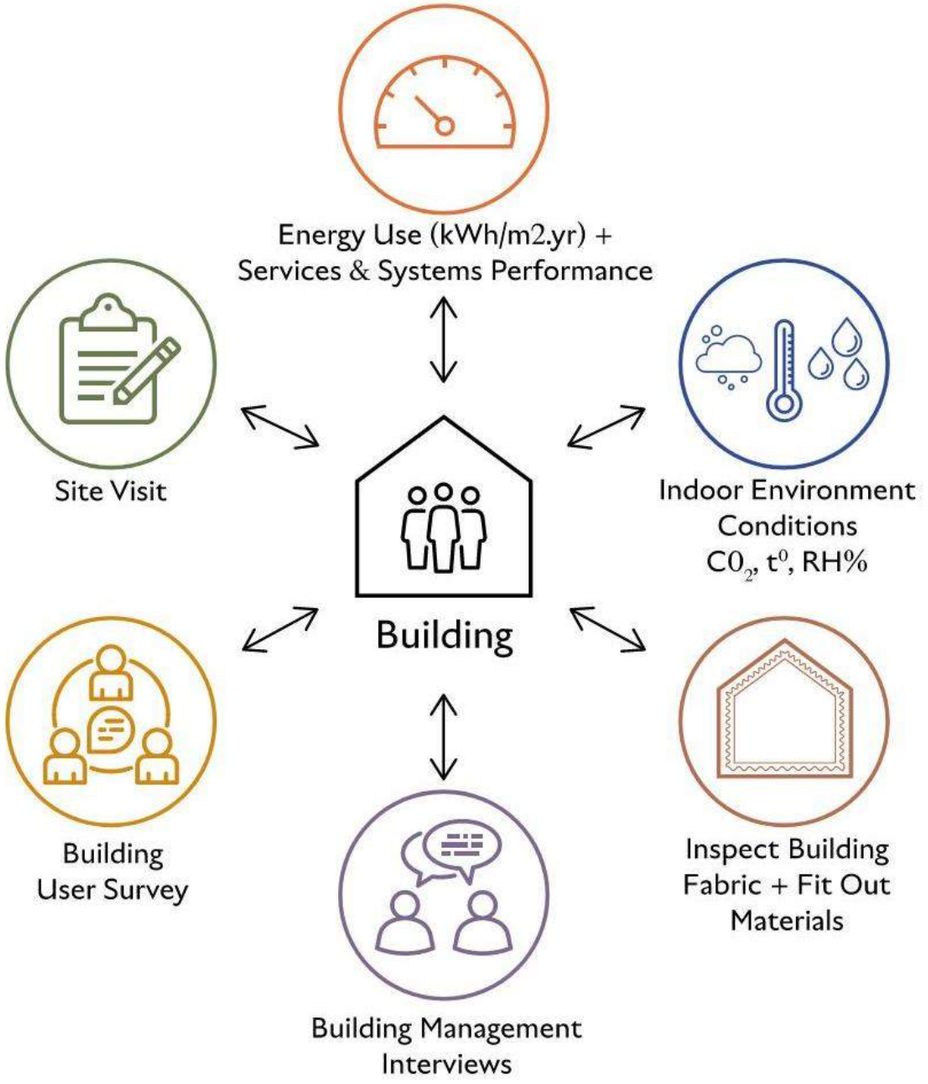
Harvard University - Sustainable Building Standards



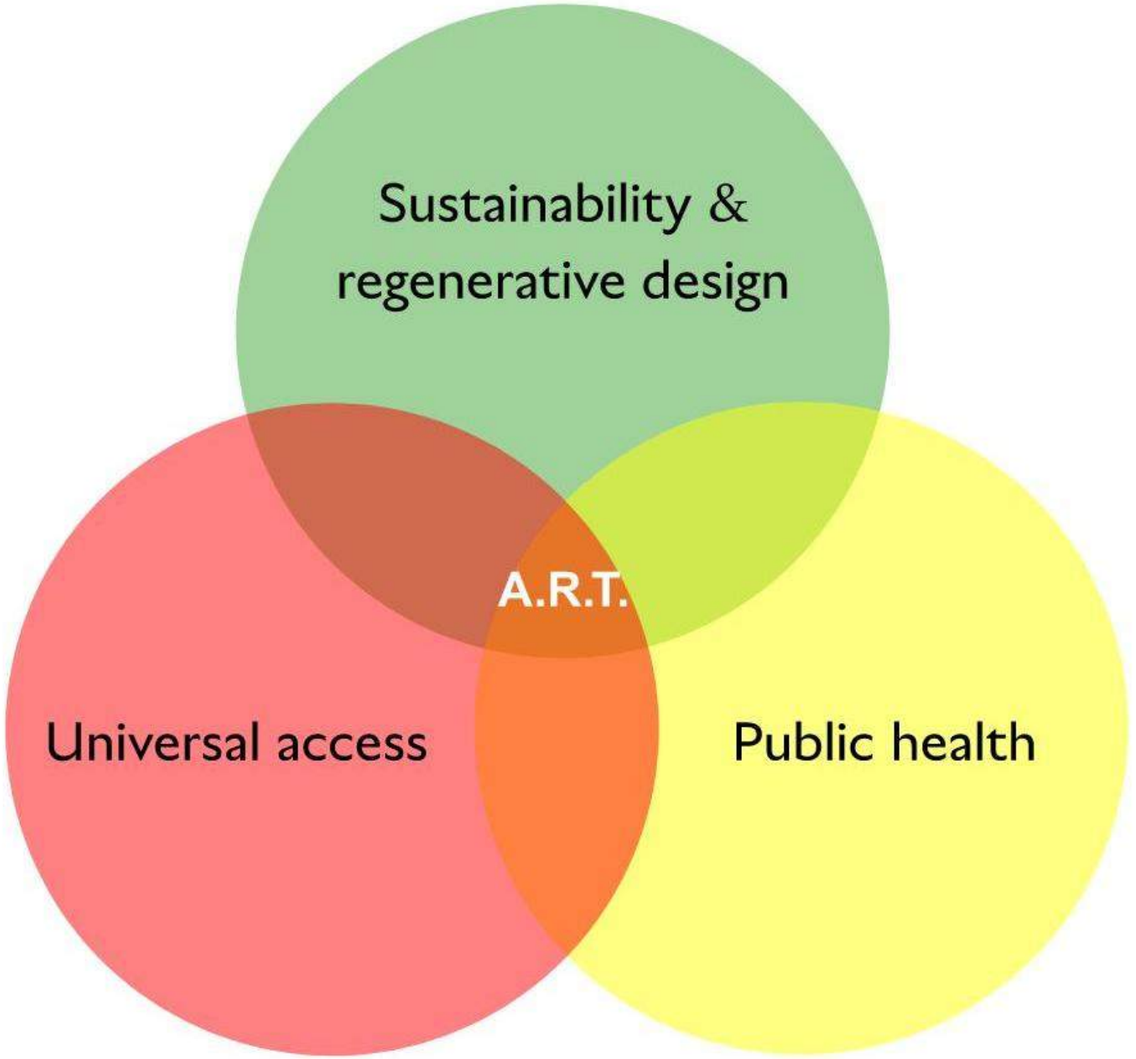
A Holistic Building Approach

Targeting Living Building Challenge Core

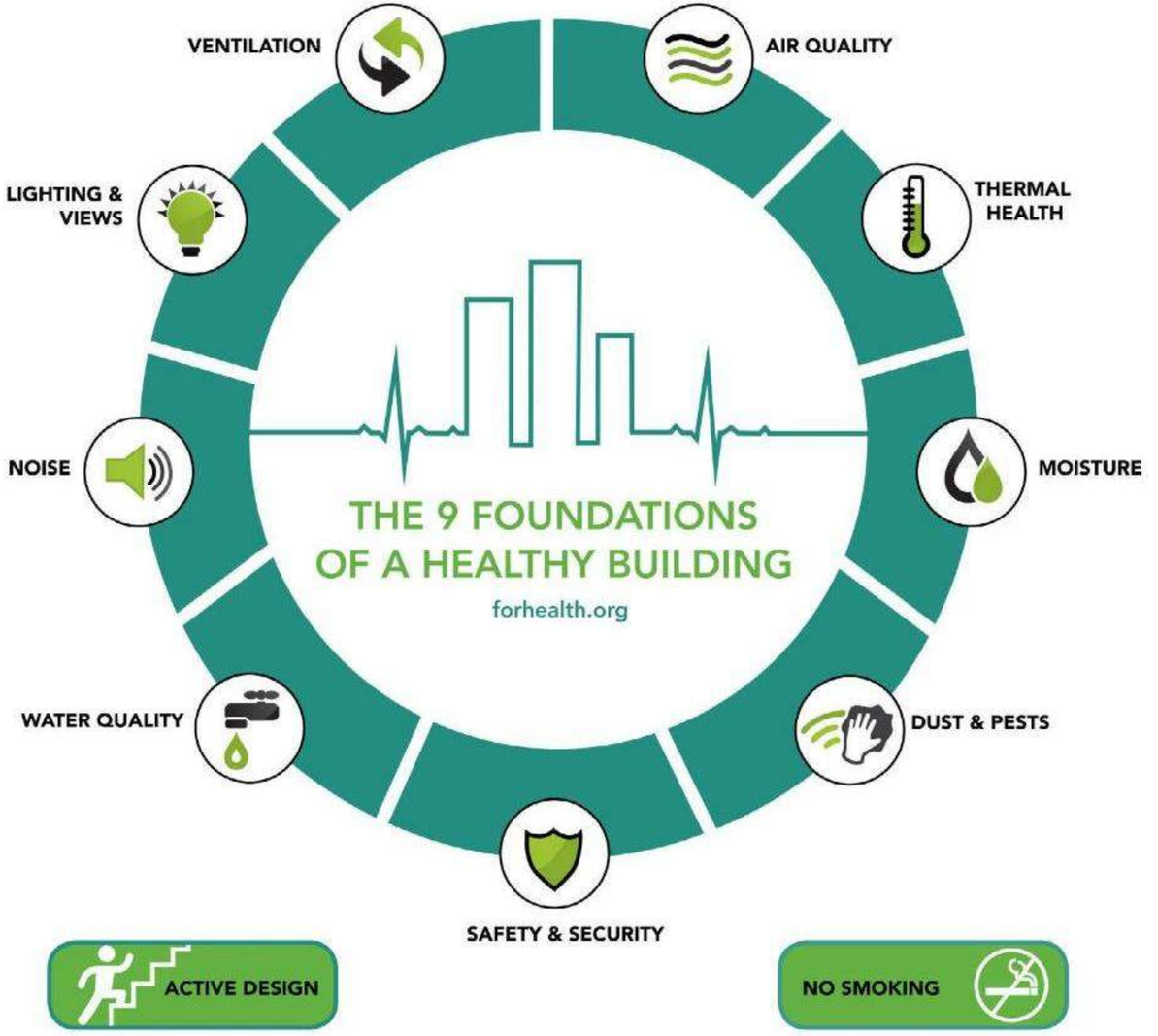
LBC Core ‘petals’



Post occupancy monitoring/ evaluation



A.R.T guiding principles



Peer review process

Sustainability Facts

Low Energy Use Intensity (EUI) Rating = 23

Photovoltaic solar roof panels to generate
50% of the electricity demand

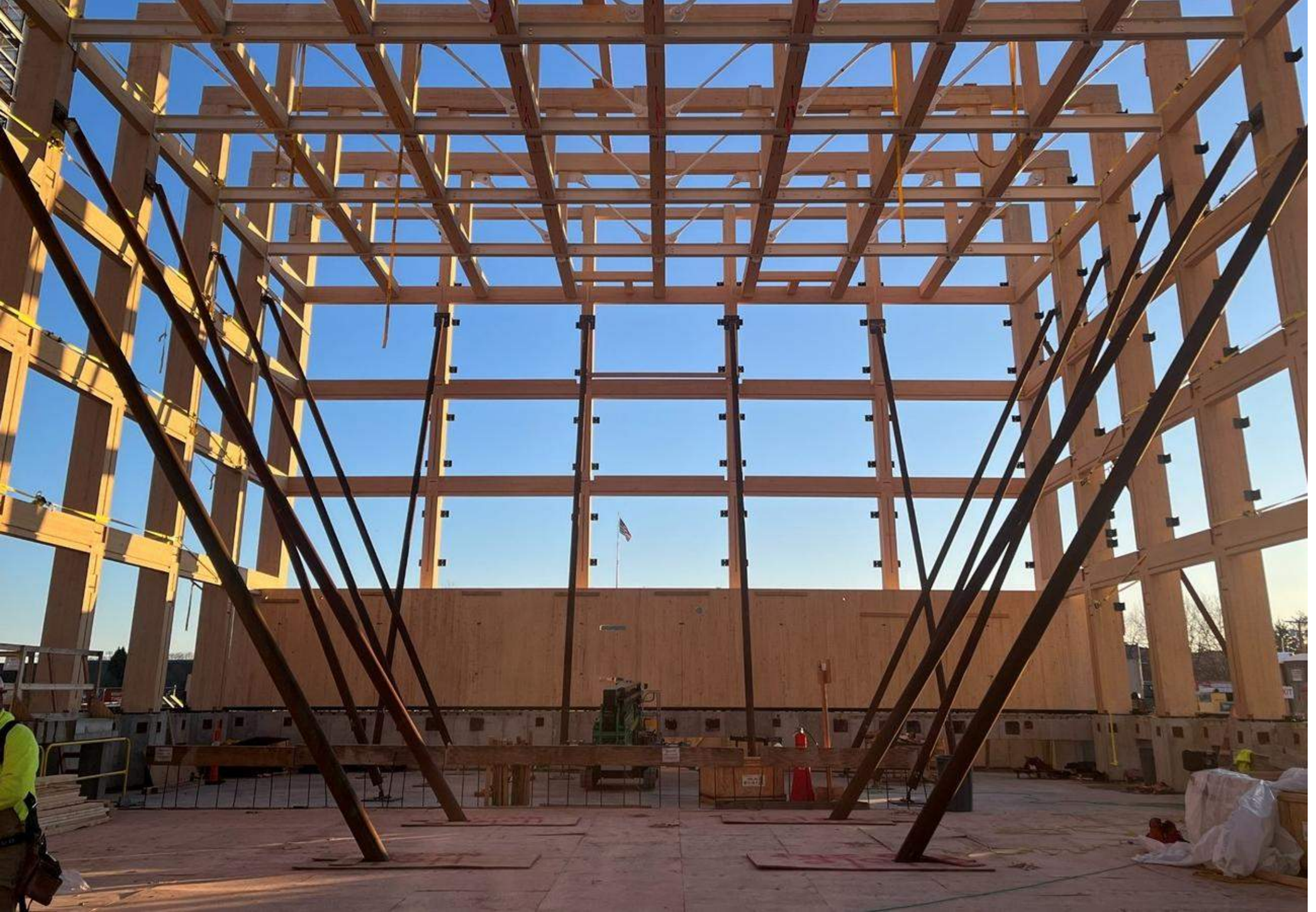
The first Natural Ventilation system in a performance facility on the east coast of America

50% reduction in indoor potable water

Stormwater attenuation systems, including green roofs

Collaboration with Harvard's T.H. Chan School of Public Health

Collaboration with Harvard's Healthier Building Academy to avoid the use of toxic chemicals



Embodied Carbon Reduction

20% reduction in embodied carbon

560 metric tons of carbon saved

equivalent to:

carbon sequestered by 2,060 acres of u.s. forests in one year

co2 emissions from 2,280,873 pounds of coal burned

greenhouse gas emissions from 5,228,936 miles driven by a gasoline powered car

La Cartoucherie
Bois de Vincennes, Paris

La Cartoucherie
Bois de Vincennes, Paris

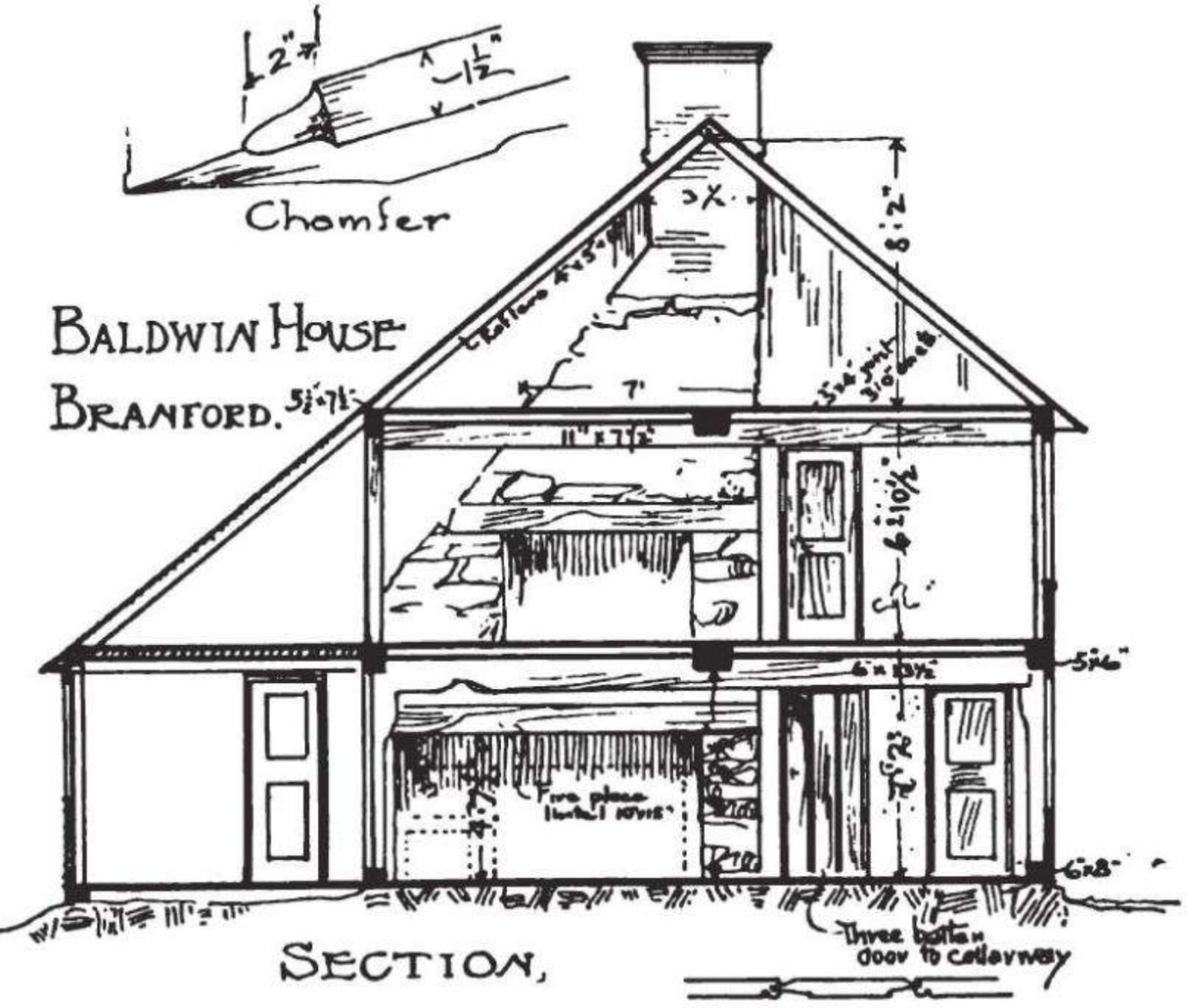
Bristol Old Vic
Bristol, United Kingdom

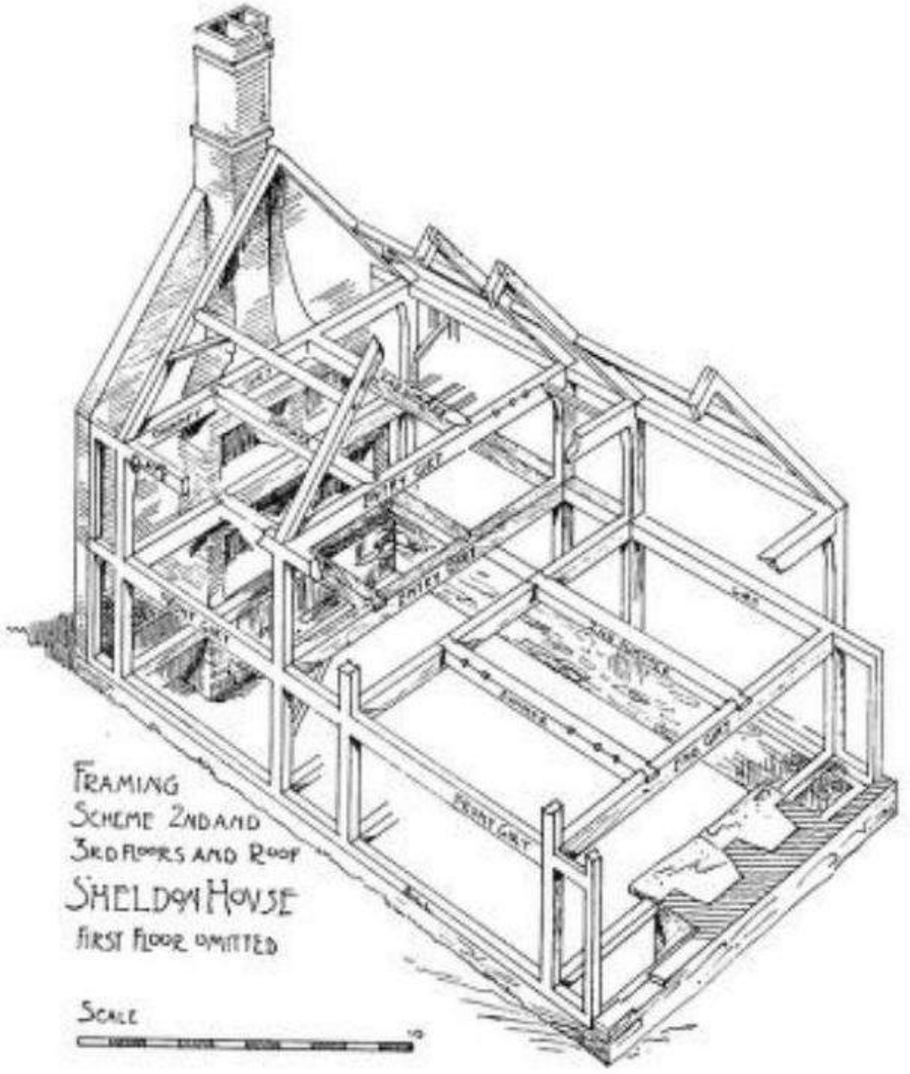
Haworth Tompkins

Bristol Old Vic
Bristol, United Kingdom

Haworth Tompkins

New England Regional Context "Saltbox" Houses
Solid Sawn Timber + Masonry

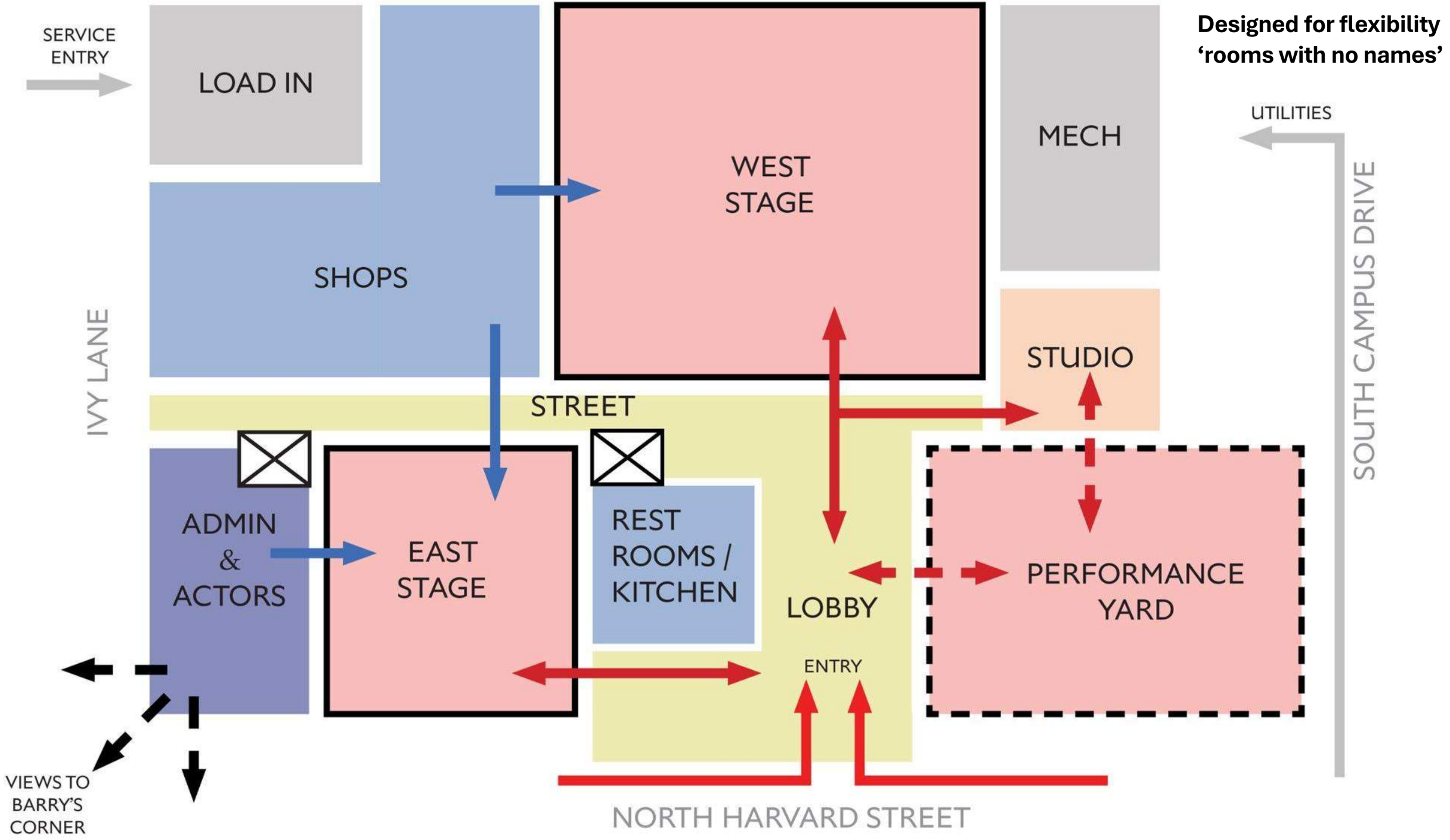


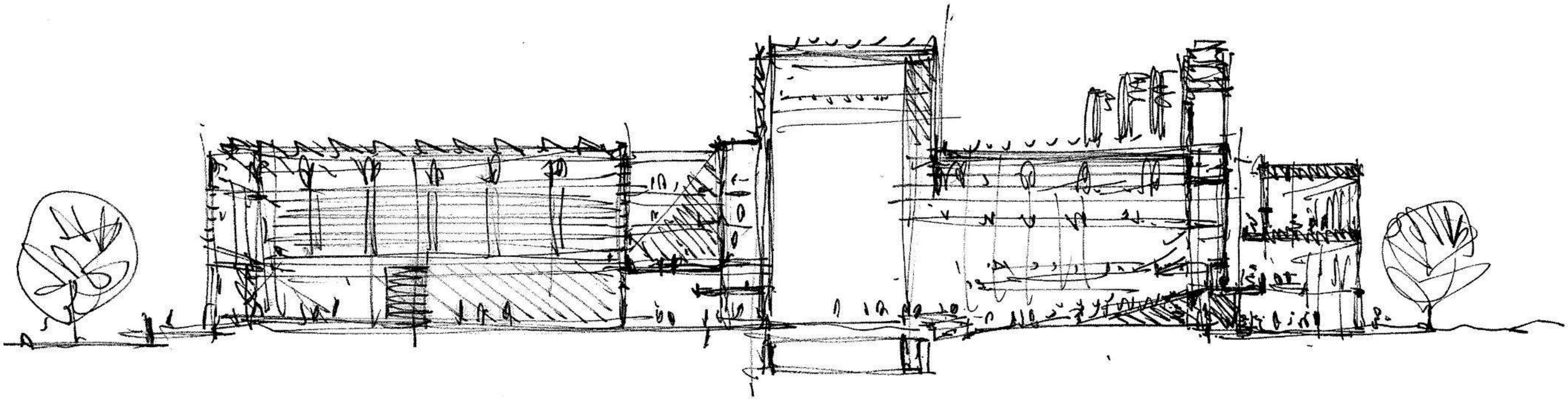



MASS MoCA Building 6
North Adams, MA

John W. Olver Design Building
UMass Amherst
Amherst, MA

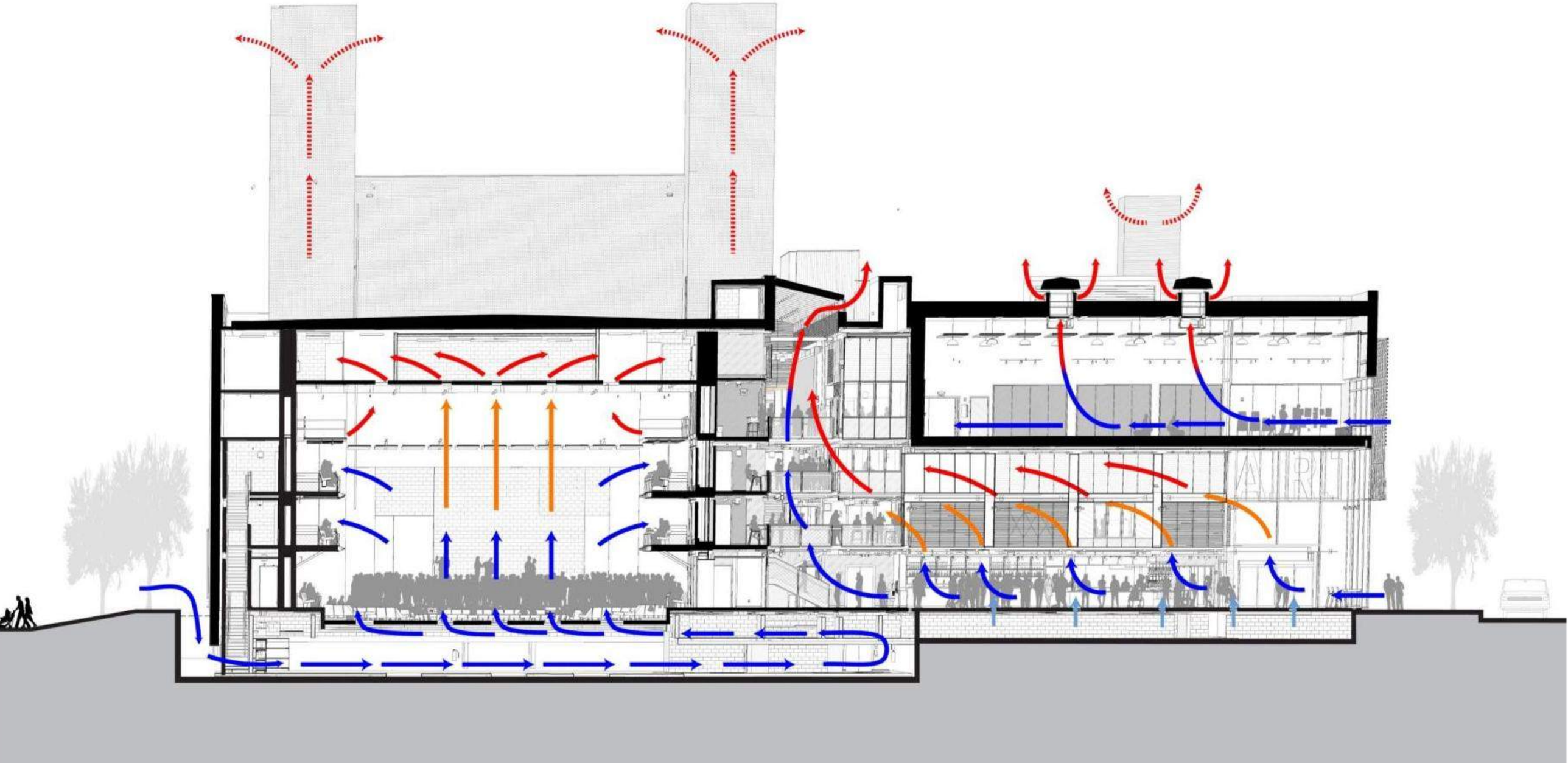
Connecting to both Cambridge & Allston


Designed for flexibility
'rooms with no names'
SERVICE ENTRY
LOAD IN
SHOPS
WEST STAGE
MECH
UTILITIES
SOUTH CAMPUS DRIVE
IVY LANE
STUDIO
STREET
ADMIN & ACTORS
EAST STAGE
REST ROOMS / KITCHEN
LOBBY
PERFORMANCE YARD
ENTRY
VIEWS TO BARRY'S CORNER
NORTH HARVARD STREET

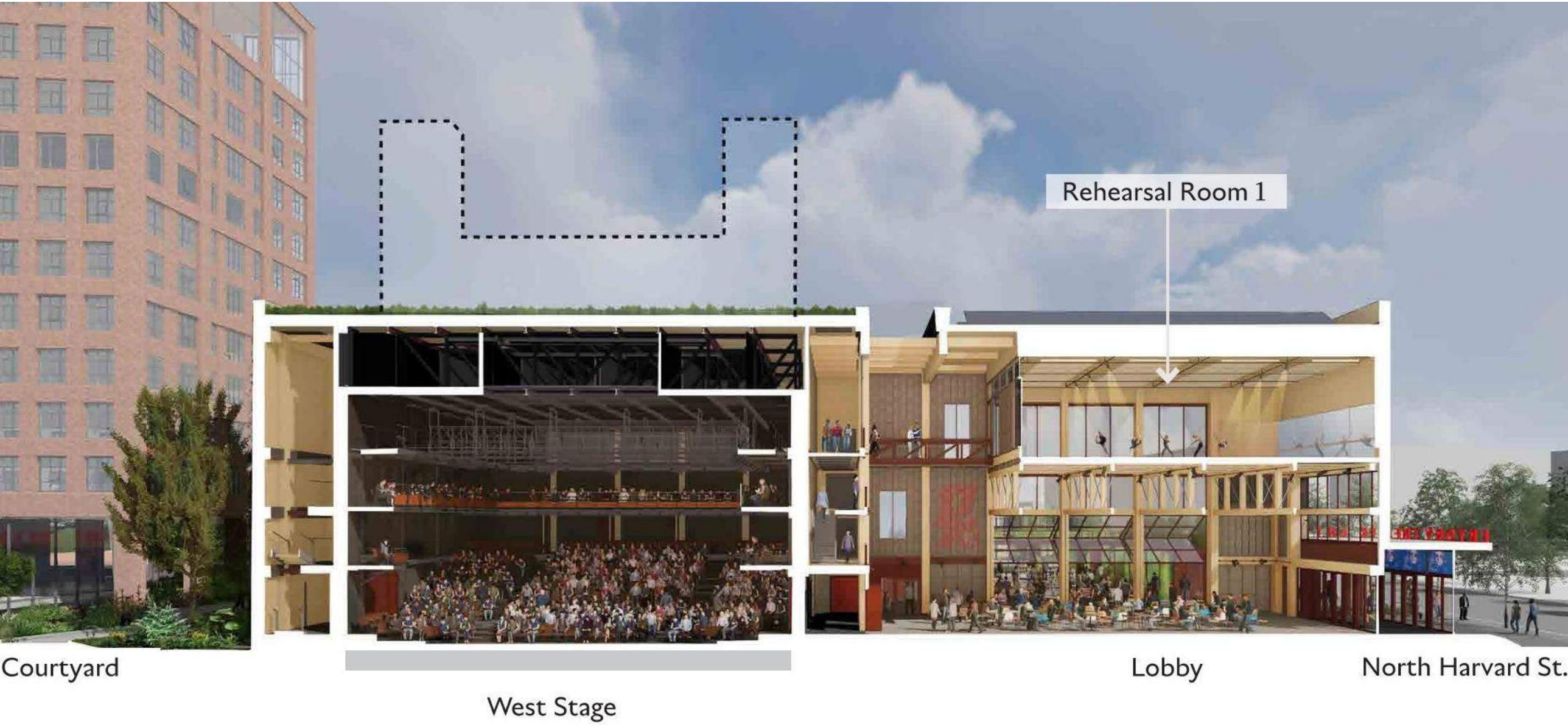


A. R. T. MAY 2. 2014

Passive assist natural ventilation



Section east-west

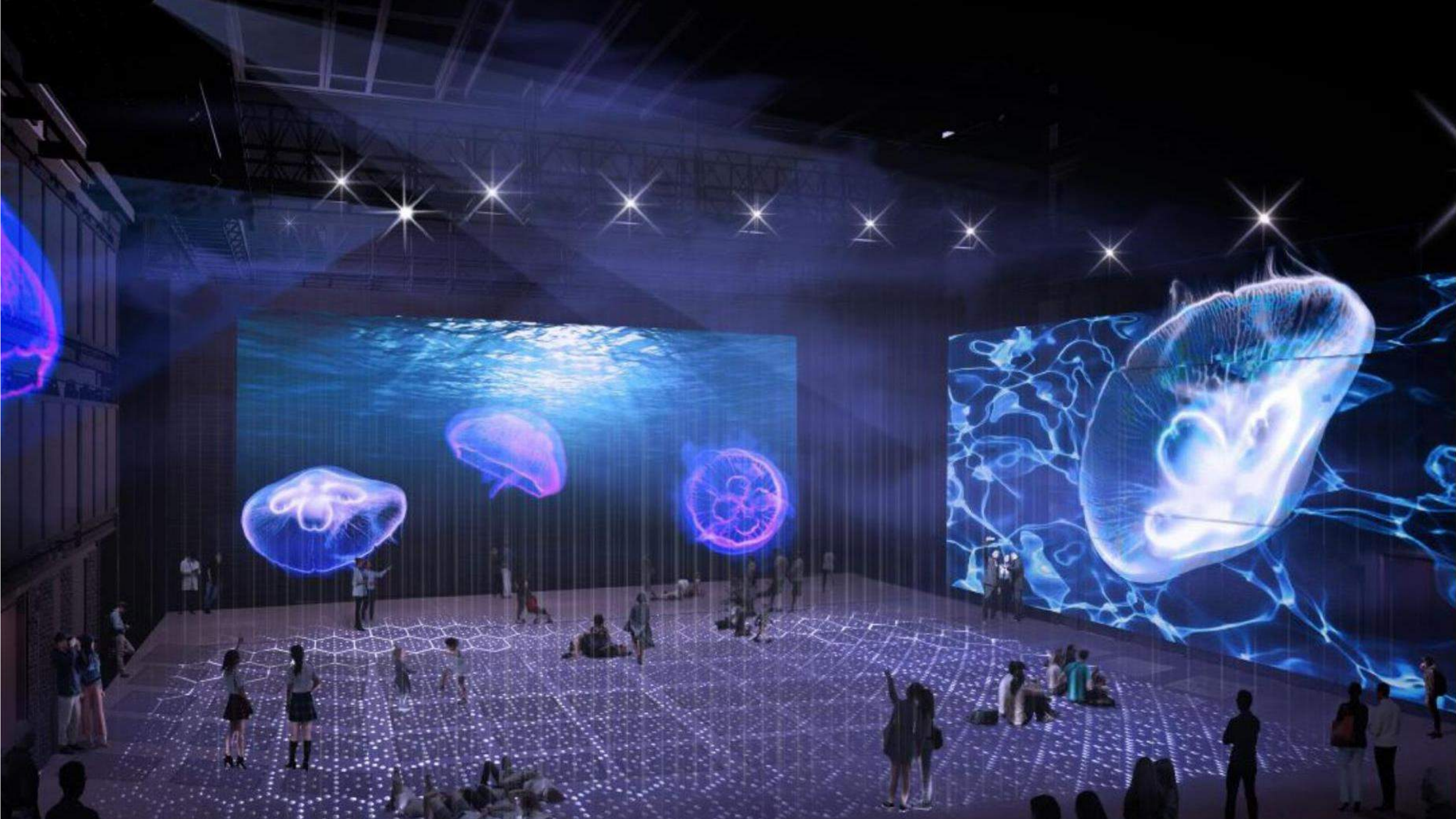


Section north-south

Townhouse East Stage Kitchen Lobby Yard


Elevator
West Stage


BOX OFFICE
BOX OFFICE




JLG

Type V-A Construction

1-Type IV and Type IV-HT were considered, but would have required:

a.NFPA 258 testing – and/or addition of FRT plywood outboard from our exterior CLT wall assemblies

Type VA Construction

a.Height: Limited by Group A (A-1, A-2, A-3) – 3 Stories, 70'.

b.Area: Limited by Group A – 34,500 SF Max (without frontage). (approx 38,000 with 63% open perimeter)

true 1-hour with char calcs or layers of material/technical data required for all members and all connections

Fire Design

1-hr rating for Type VA

Combustible but slow burning

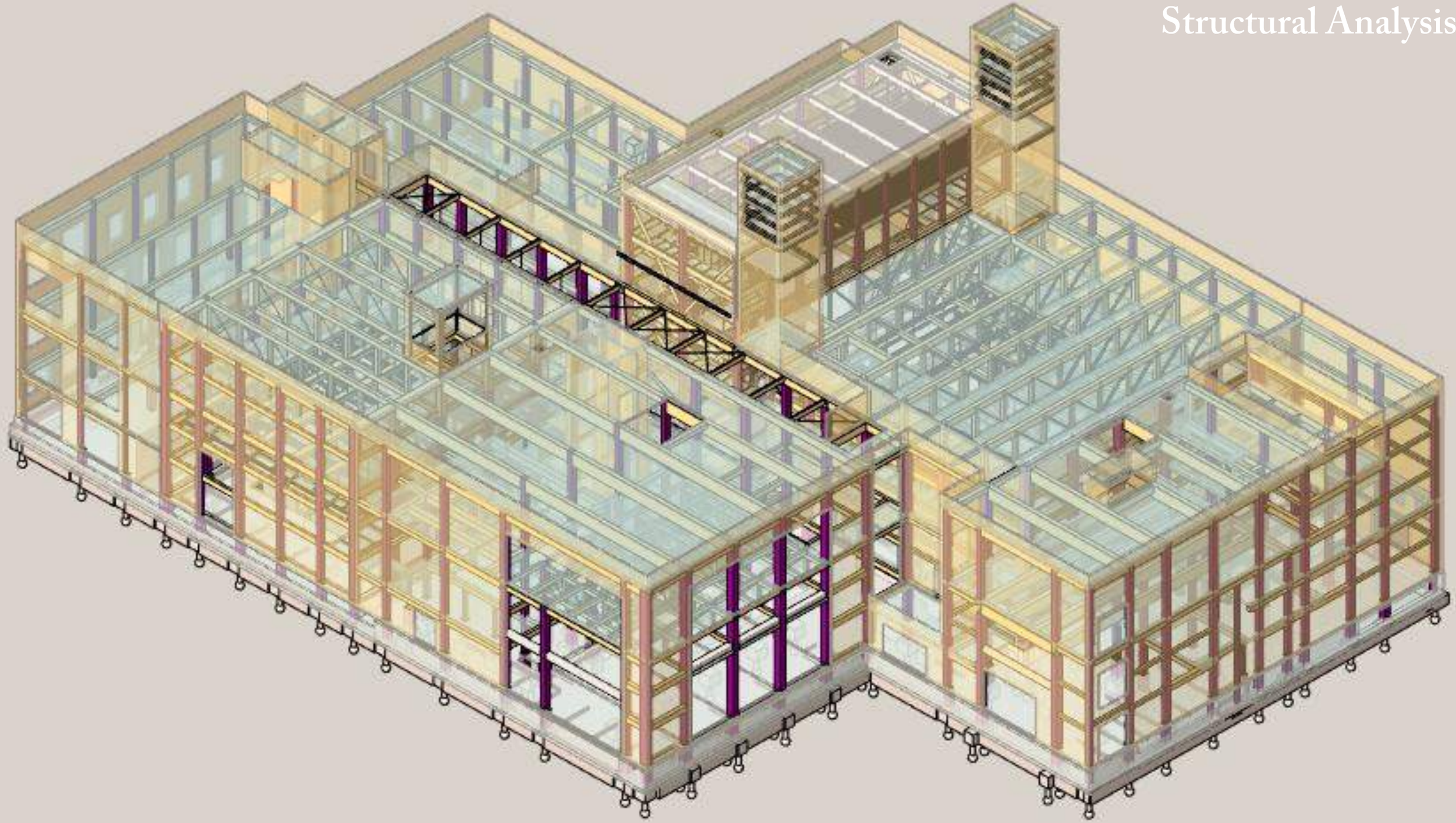
Gypsum at concealed Spaces

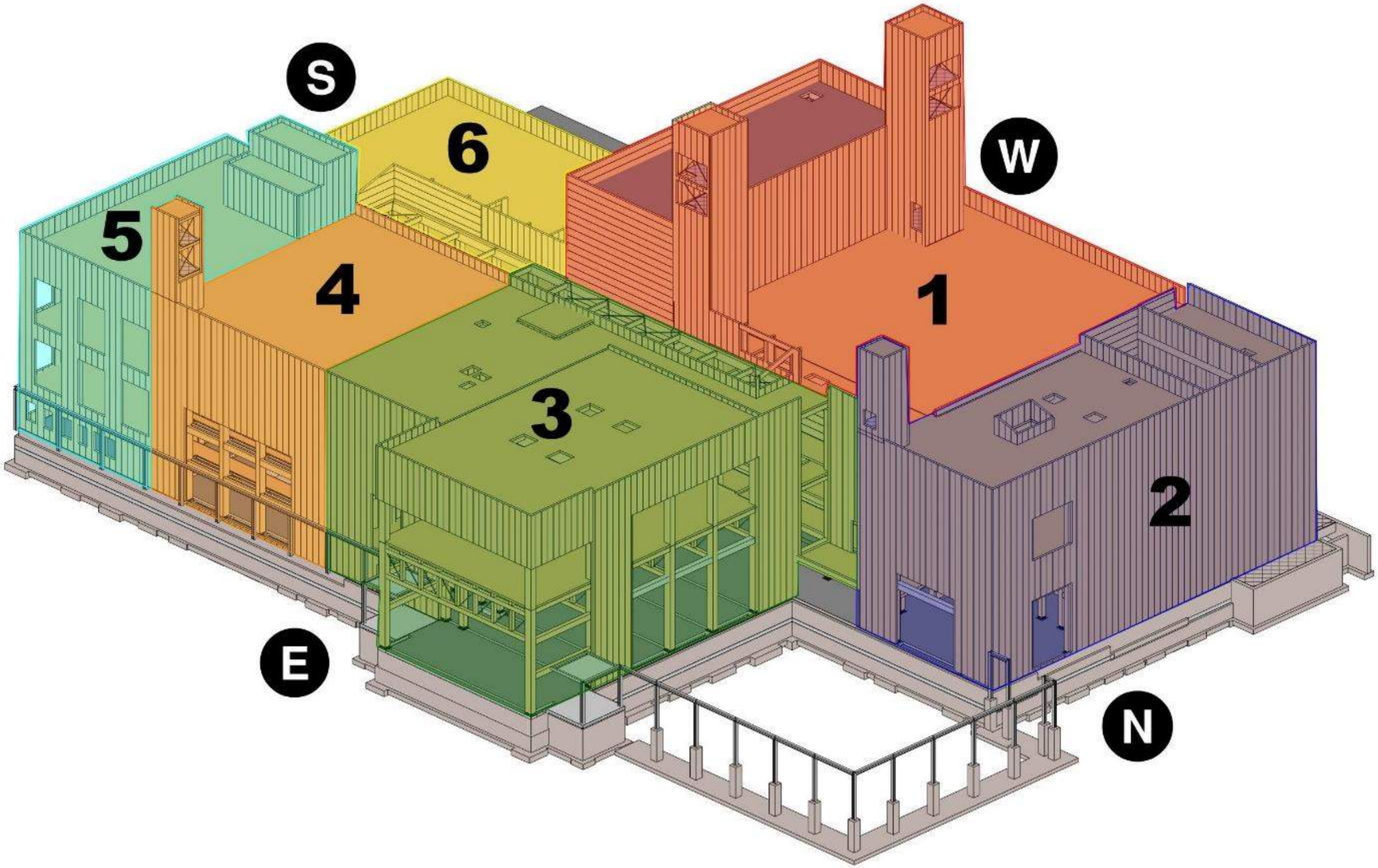
Char method for exposed members

Impact on structura connections

Mass Timber Structural Design

Structural Analysis





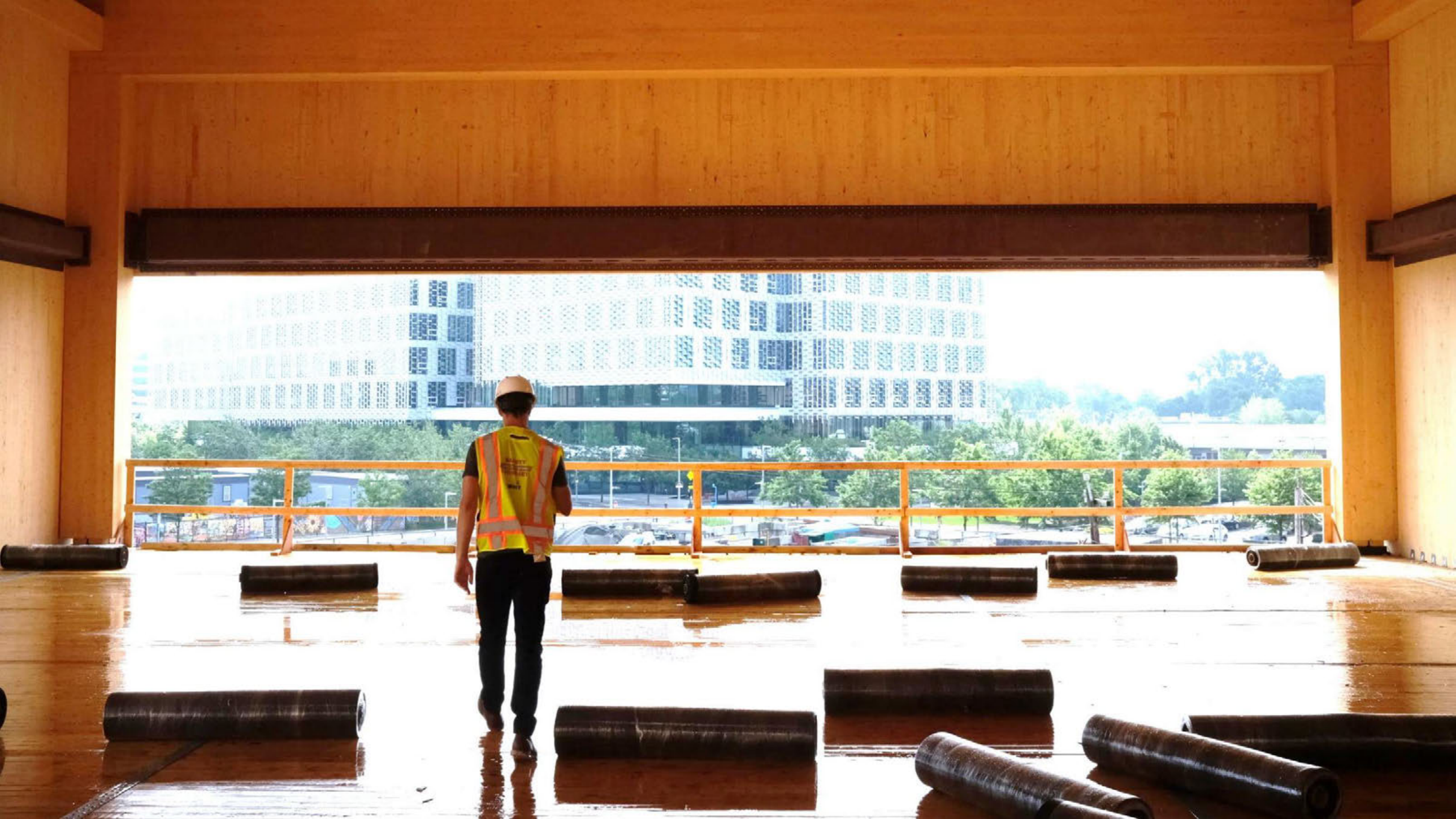
Construction Sequence

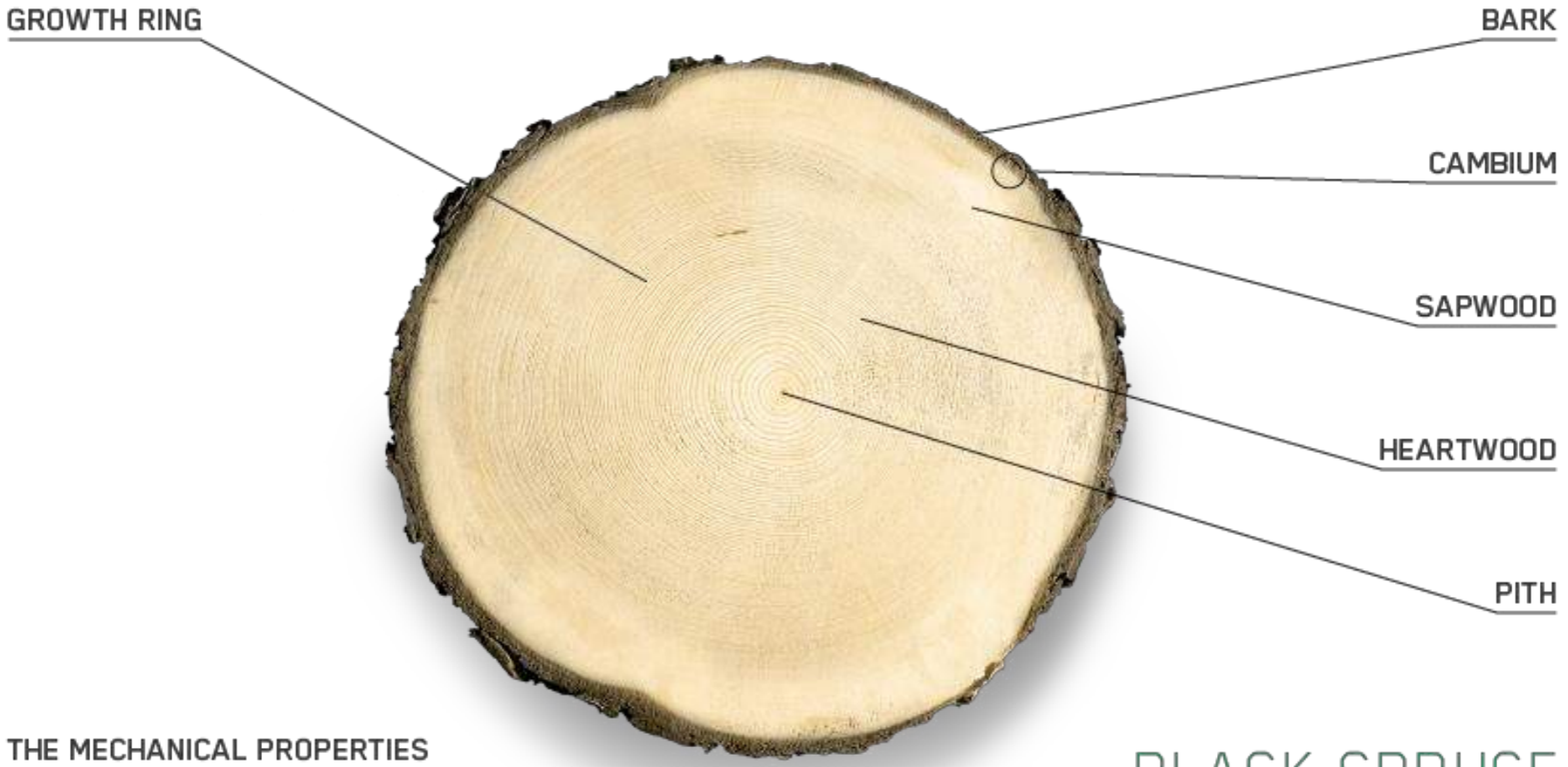
6 in 1

Moisture protection

Shop drawing packages

Phased for sub trade scheduling





THE MECHANICAL PROPERTIES IMPROVE AS THE DENSITY OF THE GROWTH RINGS INCREASE.

BLACK SPRUCE
CROSS SECTION

FSC
www.fsc.org

The mark of responsible forestry
FSC® C016562
FSC® C002803

Cross-Laminated Timber (CLT)
CLT is an engineered product consisting of layers of dimension lumber (usually three, five, or seven) oriented at right angles to one another and then glued to form structural panels.

Glue-Laminated Timber (Glulam)
Glulam is composed of dimension lumber pieces bonded together with durable, moisture-resistant adhesives. The grain of all laminations runs parallel with the length of the member.

Mass Timber Procurement

Design Assist
Start of DD

Species
(design values)

Proprietary products

Optimization

Connections
(impact member size)

Schedule

Cost

Timber Supply

Northern Quebec

Boreal Forest

Black spruce and jack pine

50 frost free days

Mature at 80-120 years

4” to 6” trunk diameter

Milled and conditioned to 1 1/2”x2 1/2” board stock as short as 18” length (max 120”)

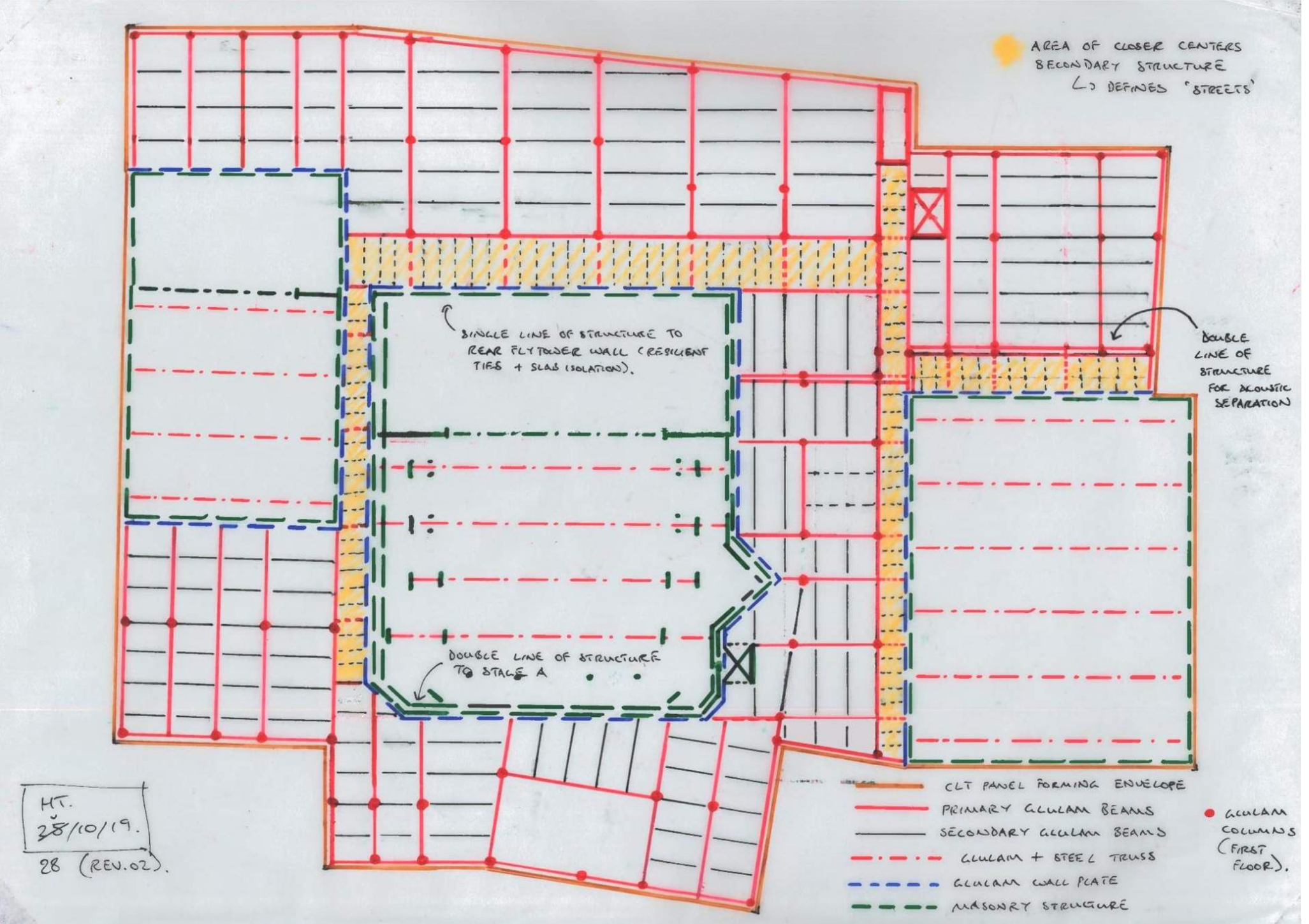
CLT

1-3/8 and 3/4 lam stock pressed into orthogonal layers

Long spans similar to concrete on metal deck

Dimensional stability and 2-way span

Non-toxic adhesives



Structure as Architecture

Place a given material where its properties are best suited and where it can serve multiple functions

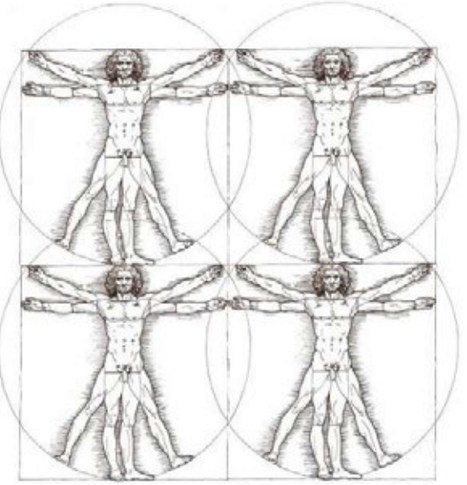
Exposed structure

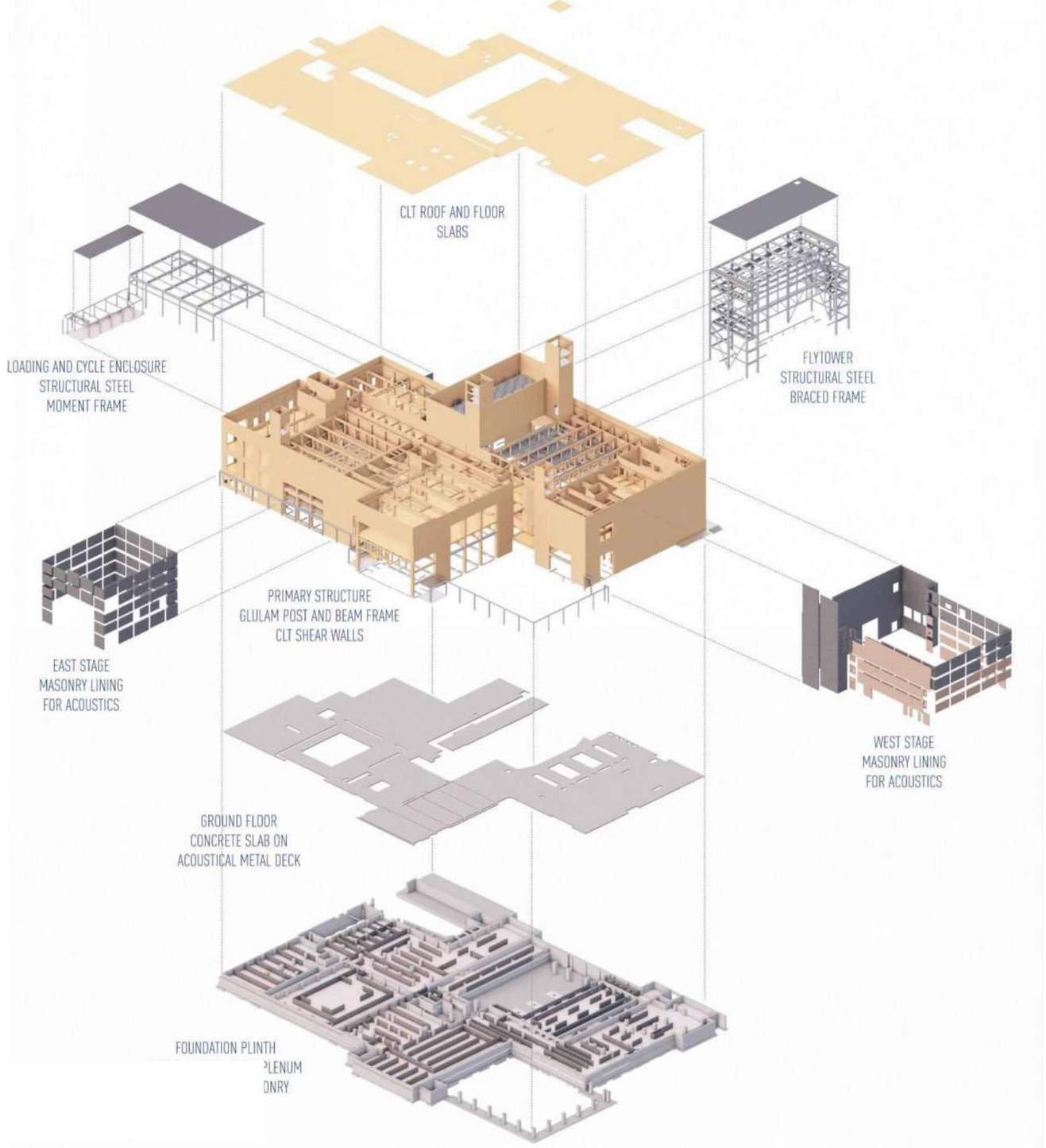
Closer coordination

Timber members are larger

Timber spans want to be shorter

12' x 12' Grid (human scale)





Structural Materials

Glulam post + beam
(1300 cubic yards)
(615 tons)

CLT floors and walls
(3600 cubic yards)
(1550 tons)

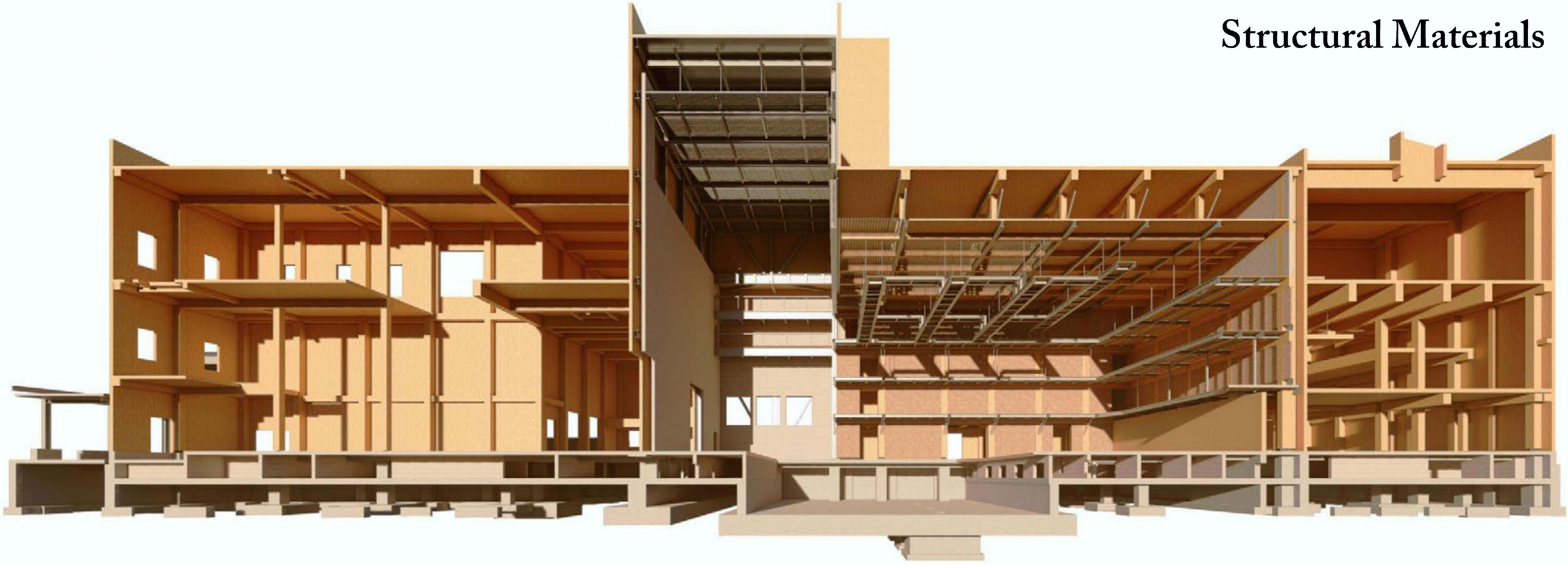
Structural steel
(592 tons)

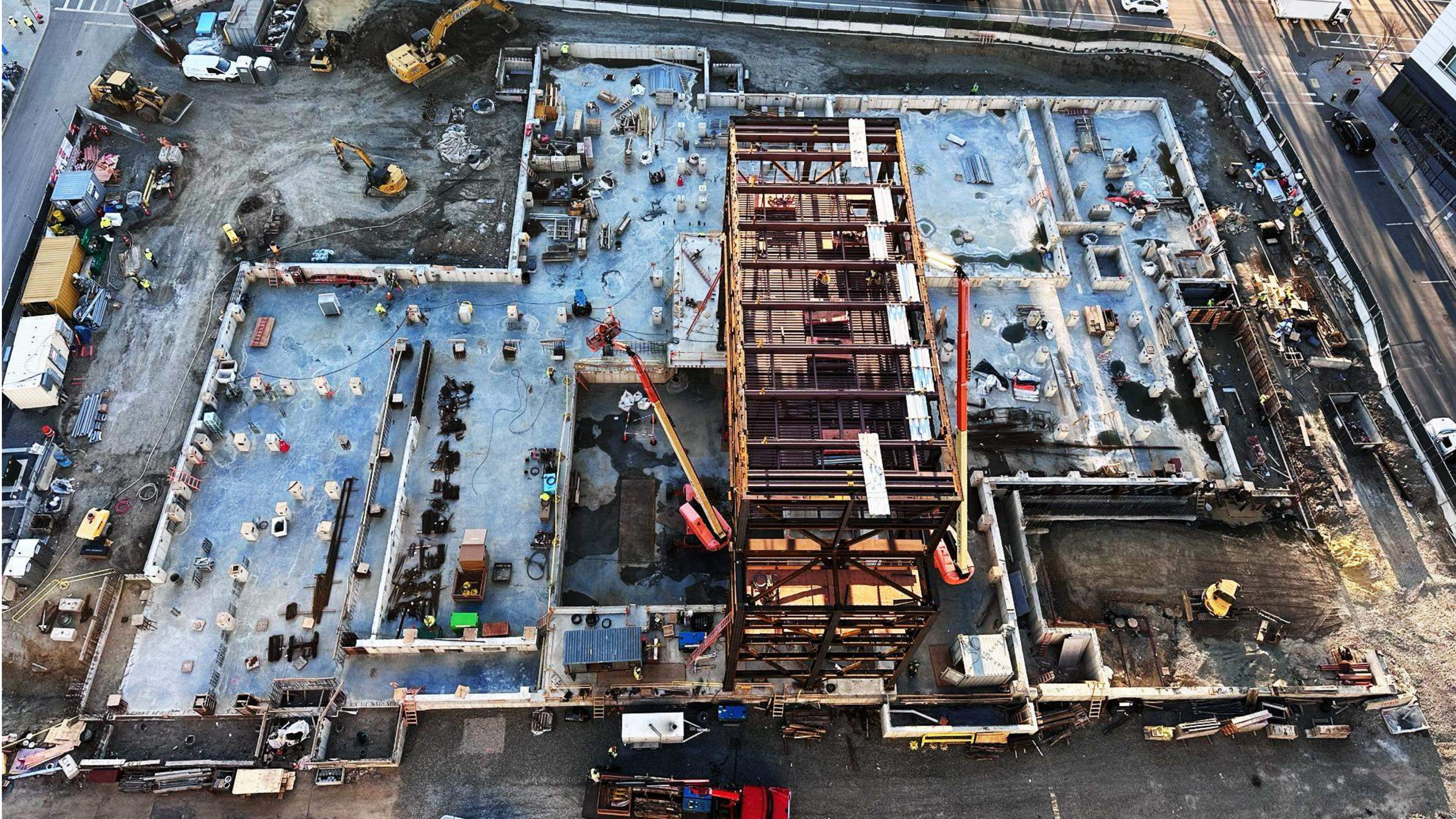
Miscellaneous metals
(265 tons)

Concrete (foundations and toppings)
(6160 cubic yards)

Masonry (bearing walls and linings)
(computing)

Structural Materials





Hybrid Approaches

It's ok
to use steel,
sometimes

Compact
members

Steel
flytower

Exterior
conditions

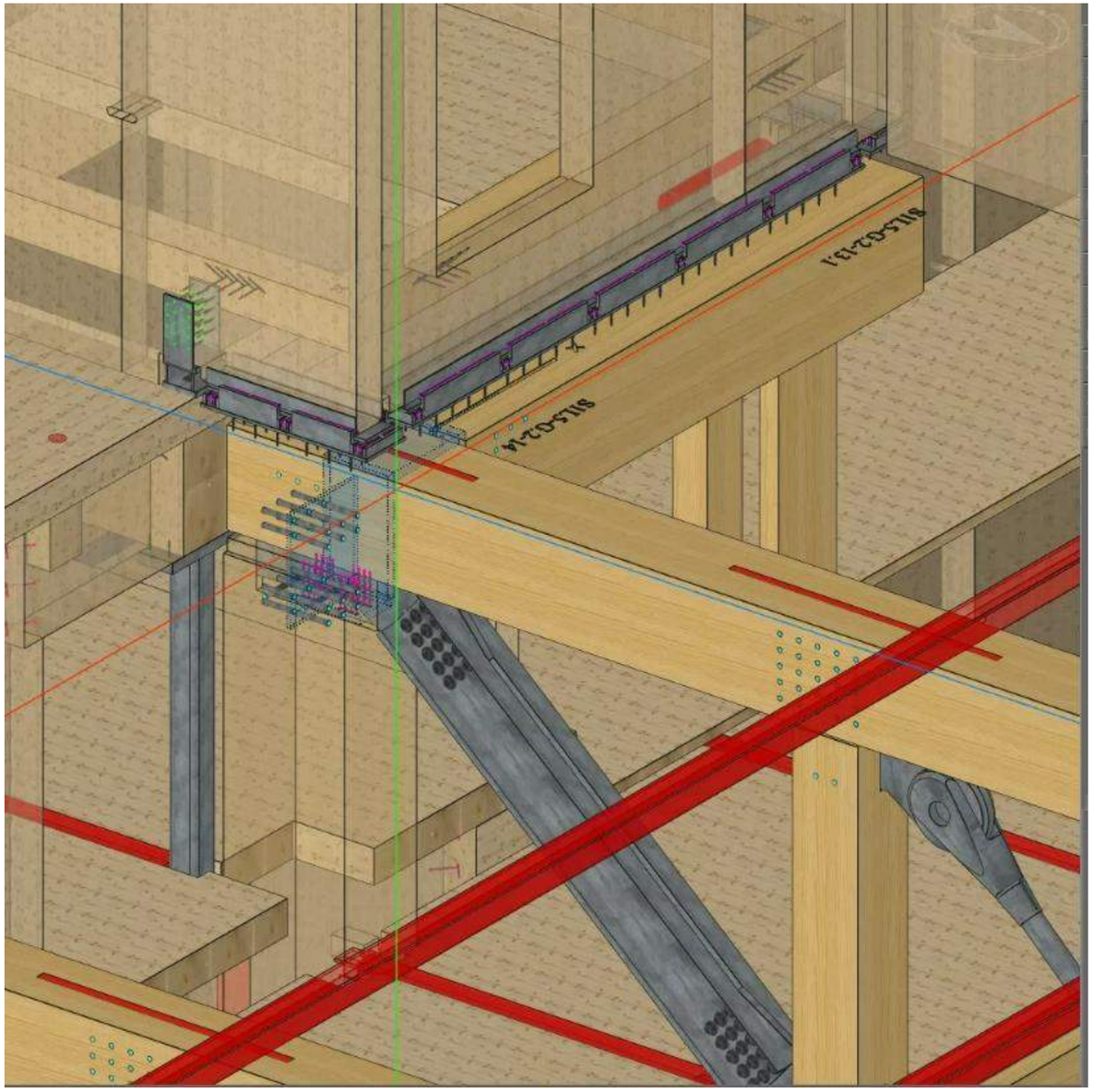
Hybrid Approaches

At the member level

Timber-steel trusses

Steel in timber connections

Structural Connections



CLT Walls

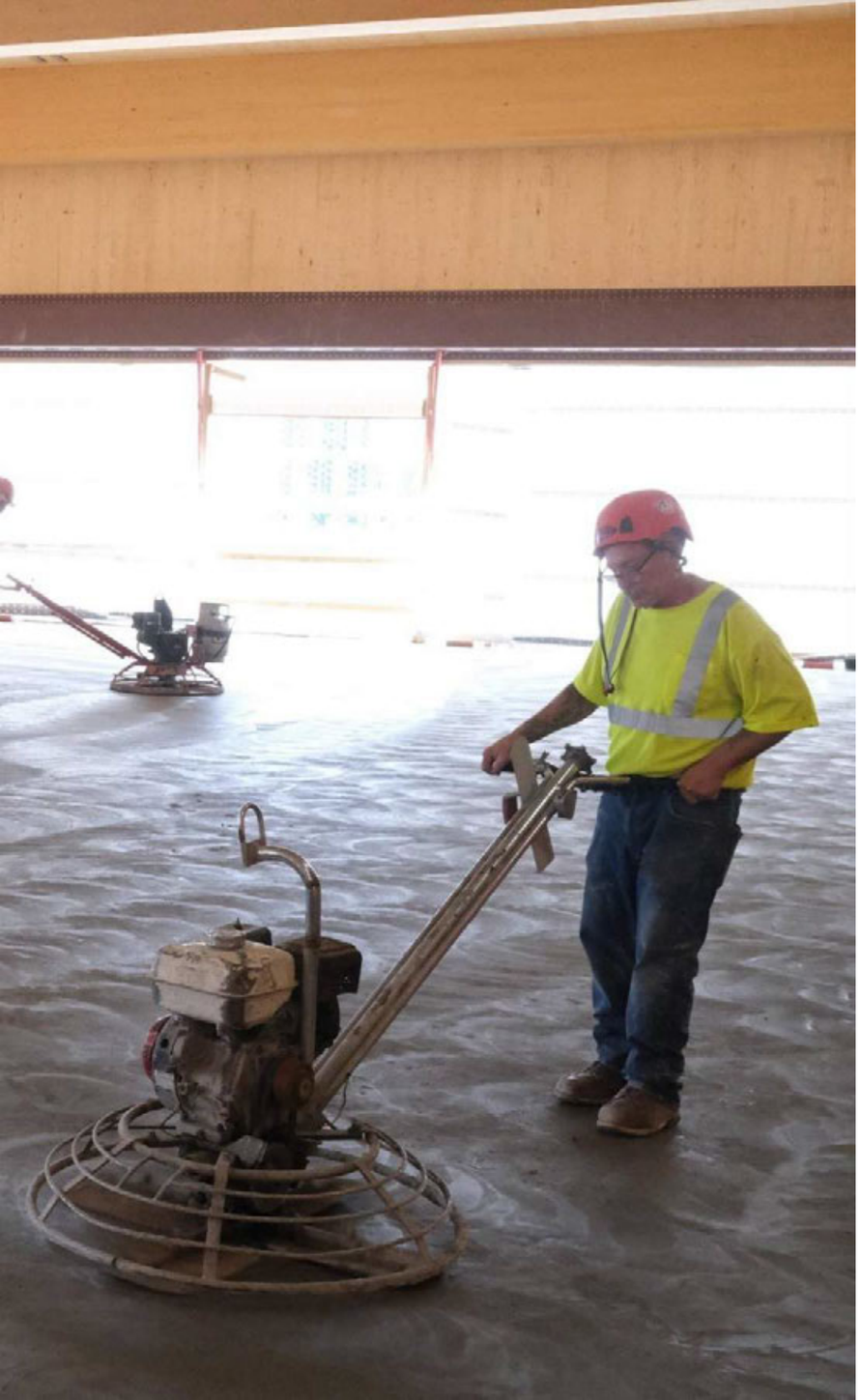
Load Bearing

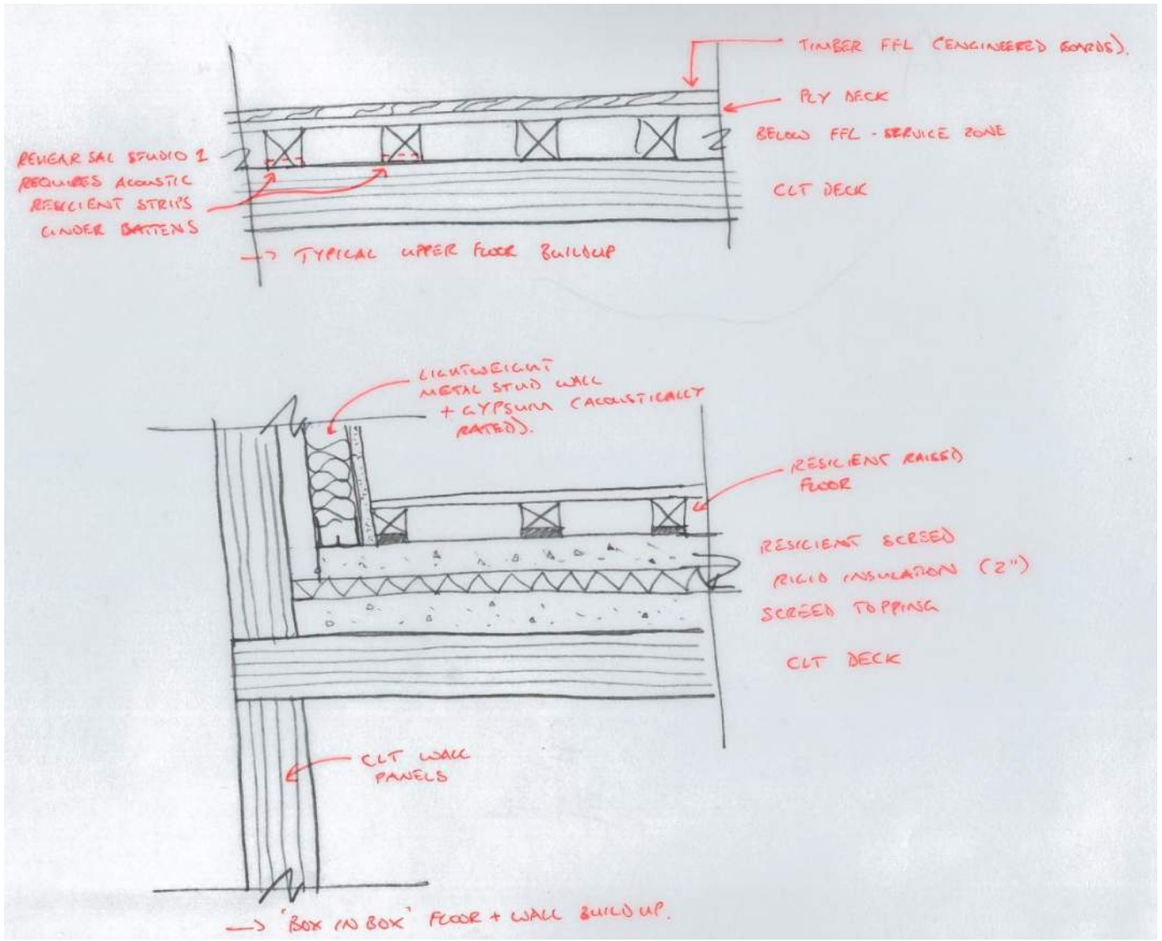
Resist shear for wind and eq

Facade backup

Fire separation

Architectural finish





Floor Assemblies

Concrete toppings

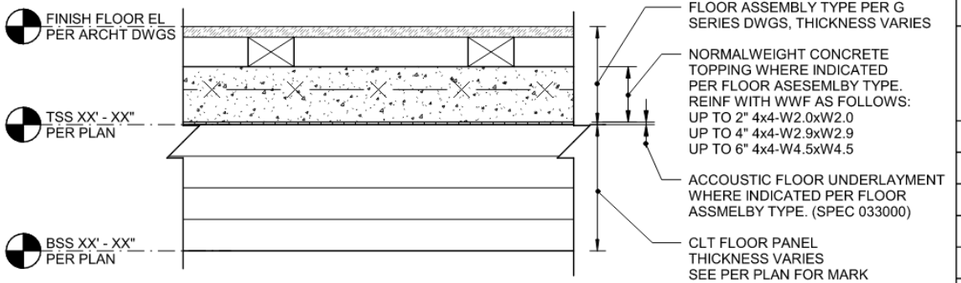
Underlayment

Box in Box

Floating floors

Conduit route

CLT FLOOR/ROOF SLAB ASSEMBLY

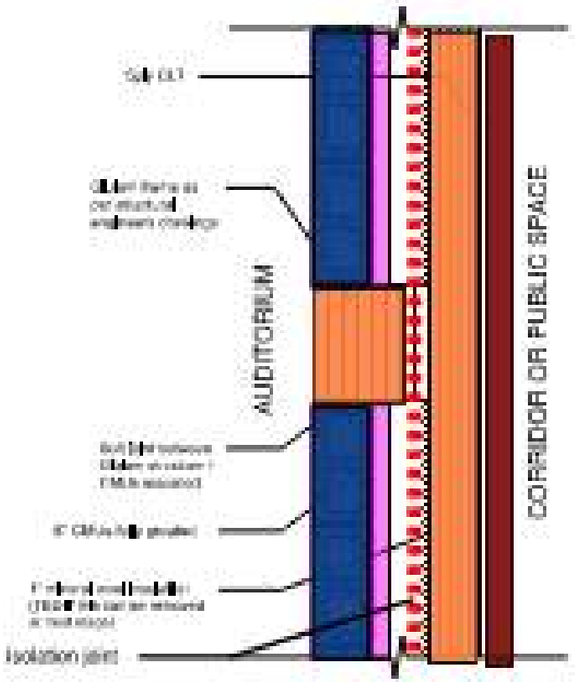


CLT FLOOR PANEL SCHEDULE

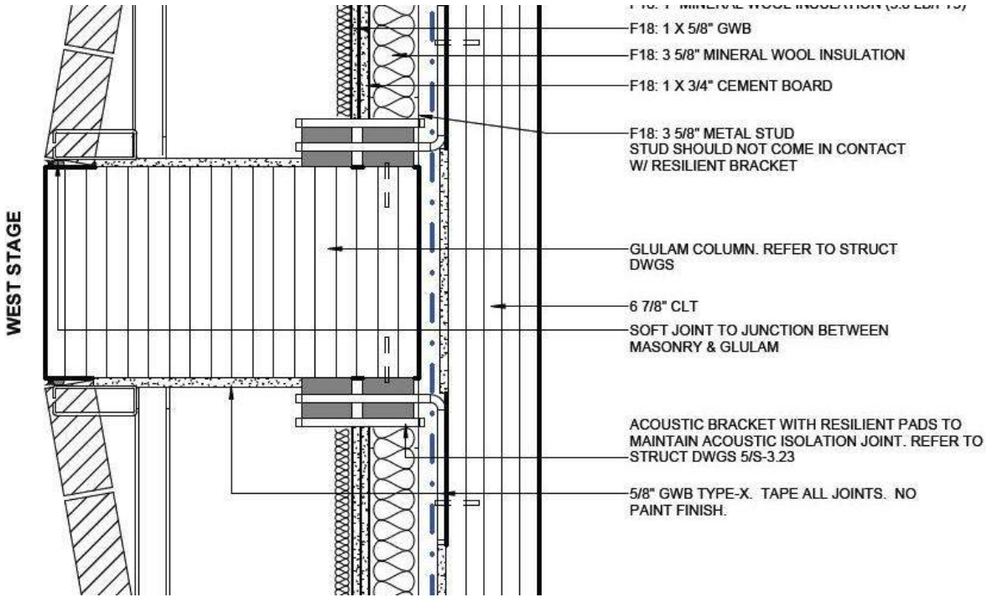
SEE PLAN FOR CLT PANEL MARKS. SEE GENERAL NOTES AND PROJECT SPECIFICATIONS FOR CLT STRESS GRADE AND FURTHER MATERIAL REQUIREMENTS

CLT PANEL MARK	PANEL LAYUP L = LONGITUDINAL T = TRANSVERSE 35 = 1-3/8" = 34.925mm 19 = 3/4" = 19.05mm	PANEL THICKNESS
3-PLY 105S	35L - 35T - 35L	4-1/8" (105mm)
5-PLY 143S	35L- 19T - 35L - 19T - 35L	5-5/8" (143mm)
5-PLY 175S	35L- 35T - 35L - 35T - 35L	6-7/8" (175mm)
7-PLY 213L	35L - 35L - 19T - 35L - 19T - 35L - 35L	8-3/8" (213mm)
7-PLY 244L	35L - 35L - 35T - 35L - 135T - 35L - 35L	9-5/8" (244mm)

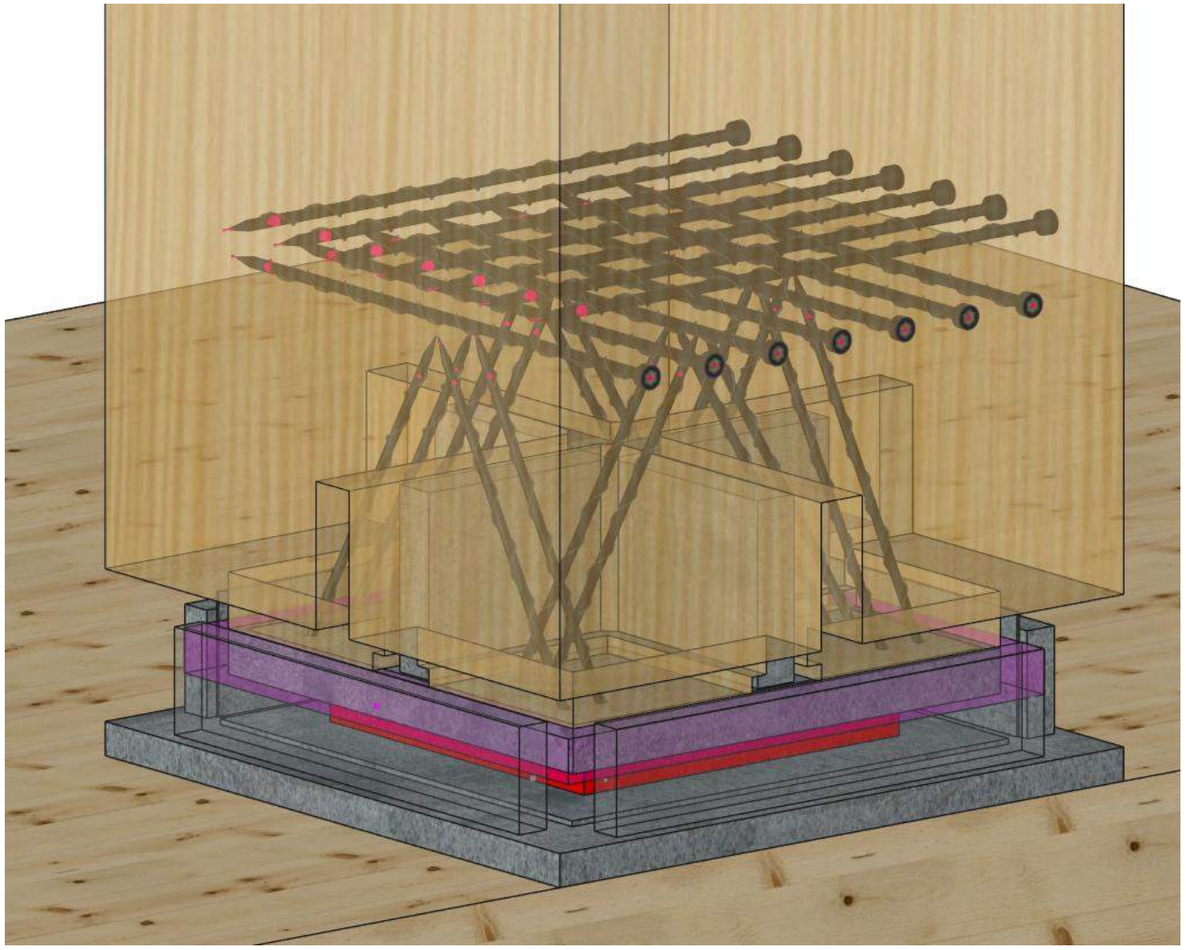
Acoustical Performance



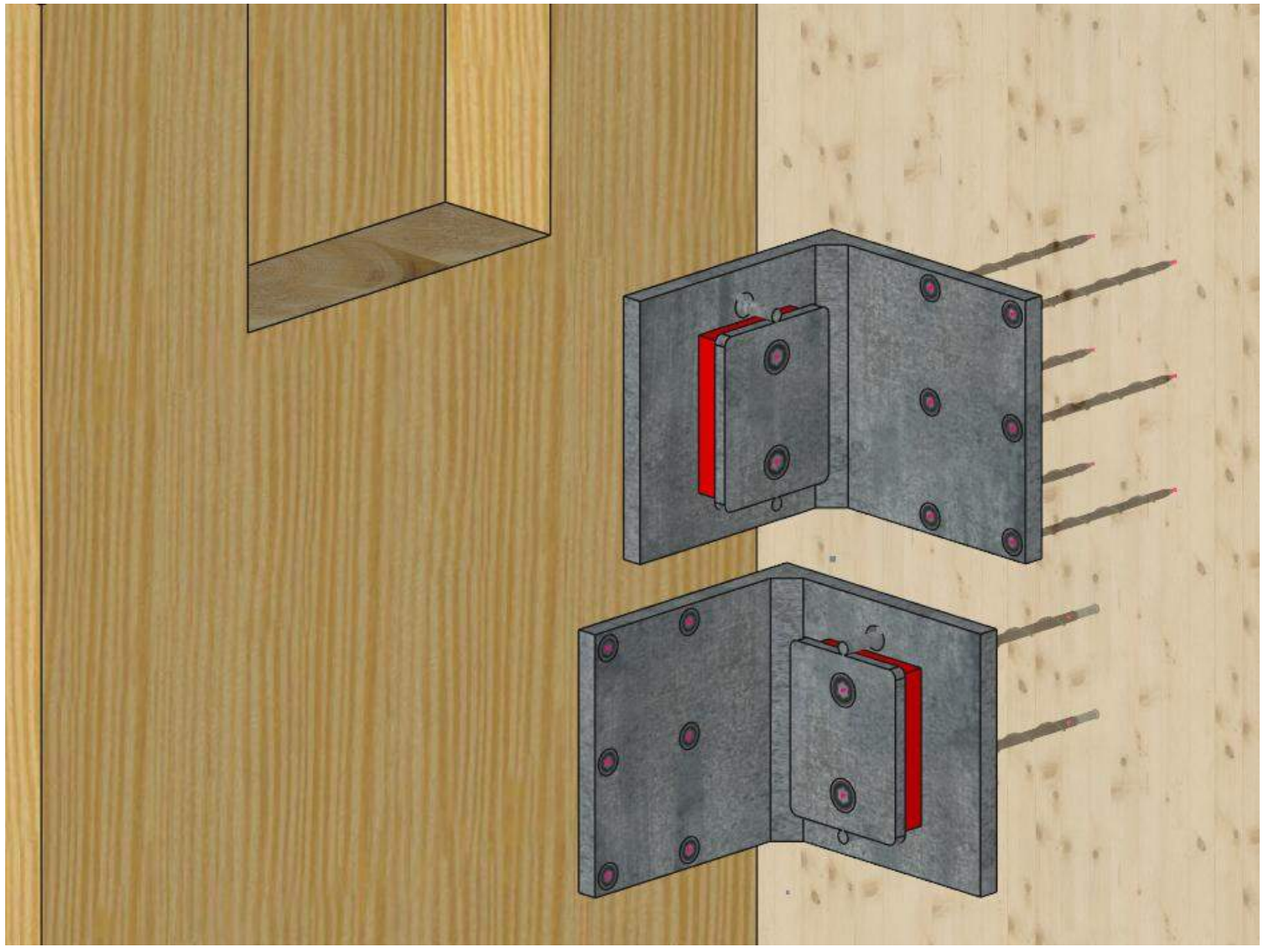
AUDITORIUM AT LOBBY



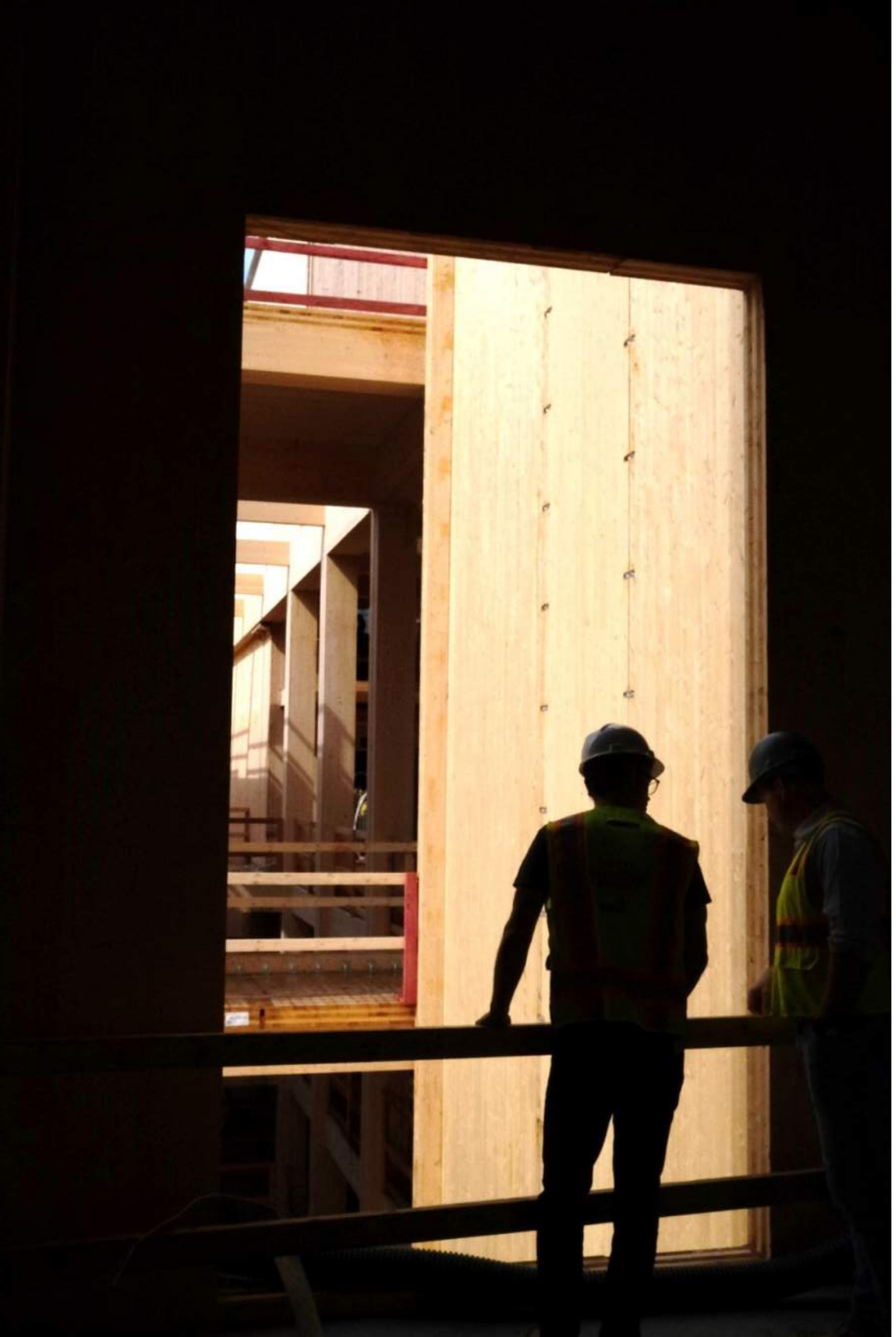
Acoustical isolation connections



Column-to-column isolation



Column-to-wall isolation



This Concludes The American Institute of Architects Continuing Education Systems Course

Build with timber!

Q&A

EXPERIENCE THE a.r.t.

HaworthTompkins

arc.

LeMessurier.