

Where Learning Meets Nature: Mass Timber's Impact on Student Experience and Performance

Joe Mayo
Mahlum



**Margaret
Sledge**
Bohlin Cywinski
Jackson



Jeff Jansing
Walter P Moore



WoodWorks | The Wood Products Council

is a registered provider of AIA-approved continuing education under Provider Number G516. All registered **AIA CES** Providers must comply with the AIA Standards for Continuing Education Programs. Any questions or concerns about this provider or this learning program may be sent to AIA CES (cessupport@aia.org or (800) AIA 3837, Option 3).

This learning program is registered with **AIA CES** for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

AIA continuing education credit has been reviewed and approved by **AIA CES**. Learners must complete the entire learning program to receive continuing education credit. AIA continuing education Learning Units earned upon completion of this course will be reported to **AIA CES** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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



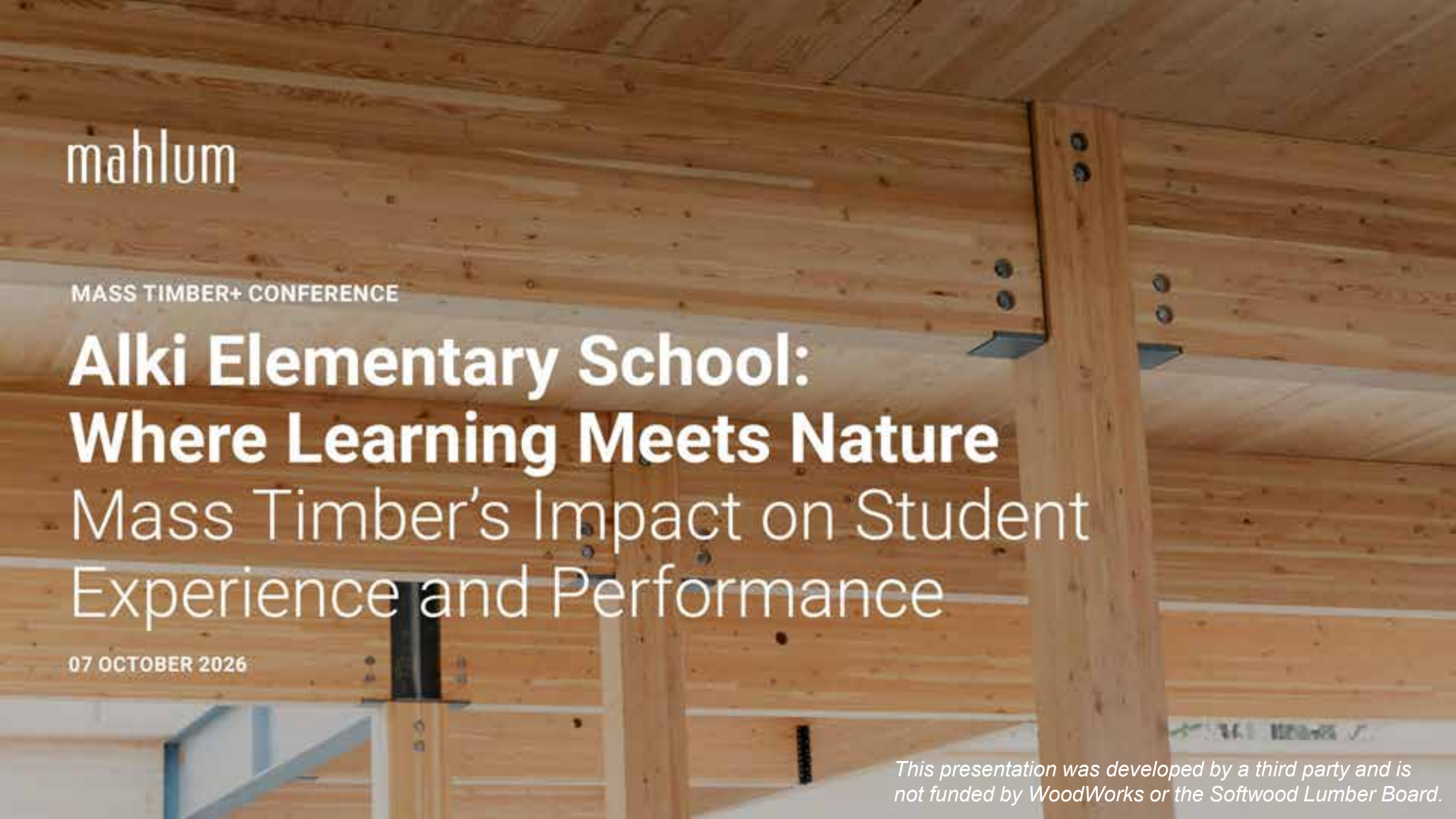
Course Description

This course examines evidence-based design strategies and integrated project delivery for mass timber in contemporary K-12 learning environments. Through research findings and project case studies, participants will explore how exposed mass timber, biophilic design principles, daylighting, acoustical comfort, and resilient structural systems contribute to occupant well-being while supporting safe, durable, and adaptable educational facilities.

The session begins with findings from Seattle's Alki Elementary School, where post-occupancy research is evaluating how exposed wood, natural light, acoustics, and strong connections to nature influence student engagement, comfort, belonging, and learning outcomes. The discussion then examines the Rosa O. Valdes STEM + Innovation Center at Greenhill School, highlighting how early integration of mass timber enabled the project team to achieve goals for sustainability, flexibility, resilience, life-safety, and collaborative STEM education while addressing material procurement and project delivery challenges.

Learning Objectives

1. Describe how biophilic design strategies, exposed mass timber, daylighting, and acoustical design can influence occupant well-being, student engagement, and learning outcomes in educational facilities.
2. Evaluate how mass timber structural systems contribute to safe, resilient, and adaptable K–12 learning environments, including considerations for life safety, long-term flexibility, and building performance.
3. Identify design strategies that integrate mass timber with educational programming to create collaborative learning spaces while addressing acoustical comfort, daylighting, occupant wellness, and sustainable design objectives.
4. Apply lessons learned from post-occupancy research and completed mass timber school projects to inform the planning, design, and specification of code-compliant educational facilities that support the health, safety, and welfare of building occupants.



mahlum

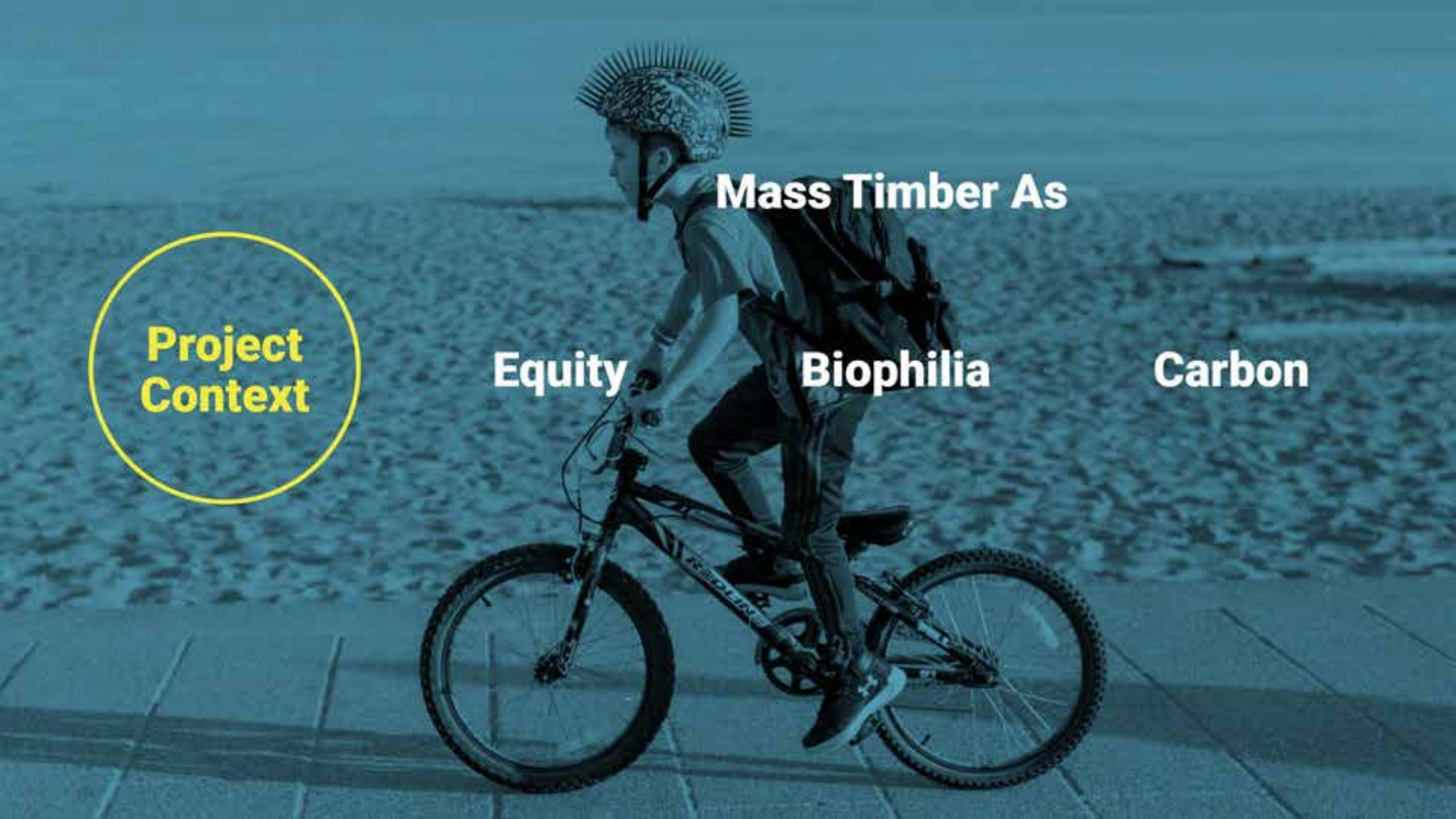
MASS TIMBER+ CONFERENCE

Alki Elementary School: **Where Learning Meets Nature**

Mass Timber's Impact on Student
Experience and Performance

07 OCTOBER 2026

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

A person wearing a helmet with a mohawk, a backpack, and a t-shirt is riding a mountain bike on a sandy beach. The background shows the ocean waves. The image has a blue tint.

**Project
Context**

Mass Timber As

Equity

Biophilia

Carbon

A teal-tinted map of Seattle, Washington, showing the city's layout and surrounding water. The map highlights the locations of Elliott Bay, Downtown Seattle, West Seattle, and Alki Elementary. A yellow location pin marks Downtown Seattle, and another yellow location pin marks West Seattle. A yellow dashed line with a yellow hatched area above it indicates the ferry route between the two locations. The text 'ELLIOTT BAY' is positioned above the ferry route, 'DOWNTOWN SEATTLE' is to the right of the Downtown pin, 'WEST SEATTLE' is below the West Seattle pin, and 'ALKI ELEMENTARY' is in a yellow box to the left of the West Seattle pin.

ELLIOTT BAY

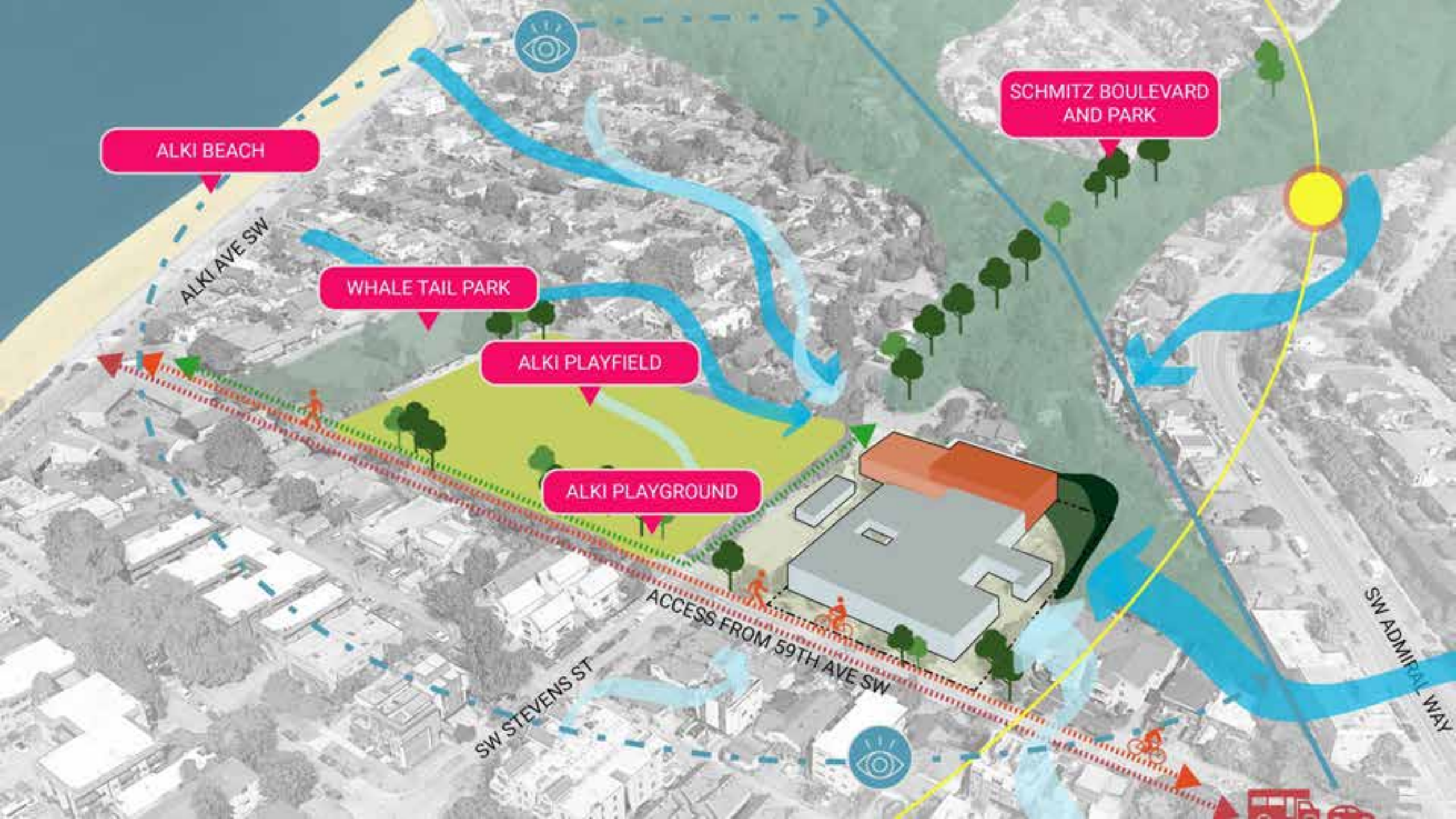
DOWNTOWN
SEATTLE

ALKI ELEMENTARY

FERRY ROUTE

WEST SEATTLE





ALKI BEACH

ALKI AVE SW

WHALE TAIL PARK

ALKI PLAYFIELD

ALKI PLAYGROUND

SCHMITZ BOULEVARD
AND PARK

ACCESS FROM 59TH AVE SW

SW STEVENS ST

SW ADMIRAL WAY

309

Students K-5

45,400

Square Feet

EXISTING COMMUNITY
CENTER

EXISTING GYMNASIUM

EXISTING CLASSROOMS

19

Teaching
Stations

ALKI AVE SW

SW STEVENS ST

ACCESS FROM 59TH AVE SW

SW ADMIRAL WAY



542

Students PS-5

79,000

Square Feet

35

Teaching
Stations

ALKI AVE SW

SW STEVENS ST

ACCESS FROM 59TH AVE SW

SW ADMIRAL WAY



SEATTLE PARKS AND REC
ALKI PLAYGROUND

59th AVE SW

SW STEVENS
STREET

SW STEVENS STREET

SCHMITZ PARK TO
ALKI TRAIL

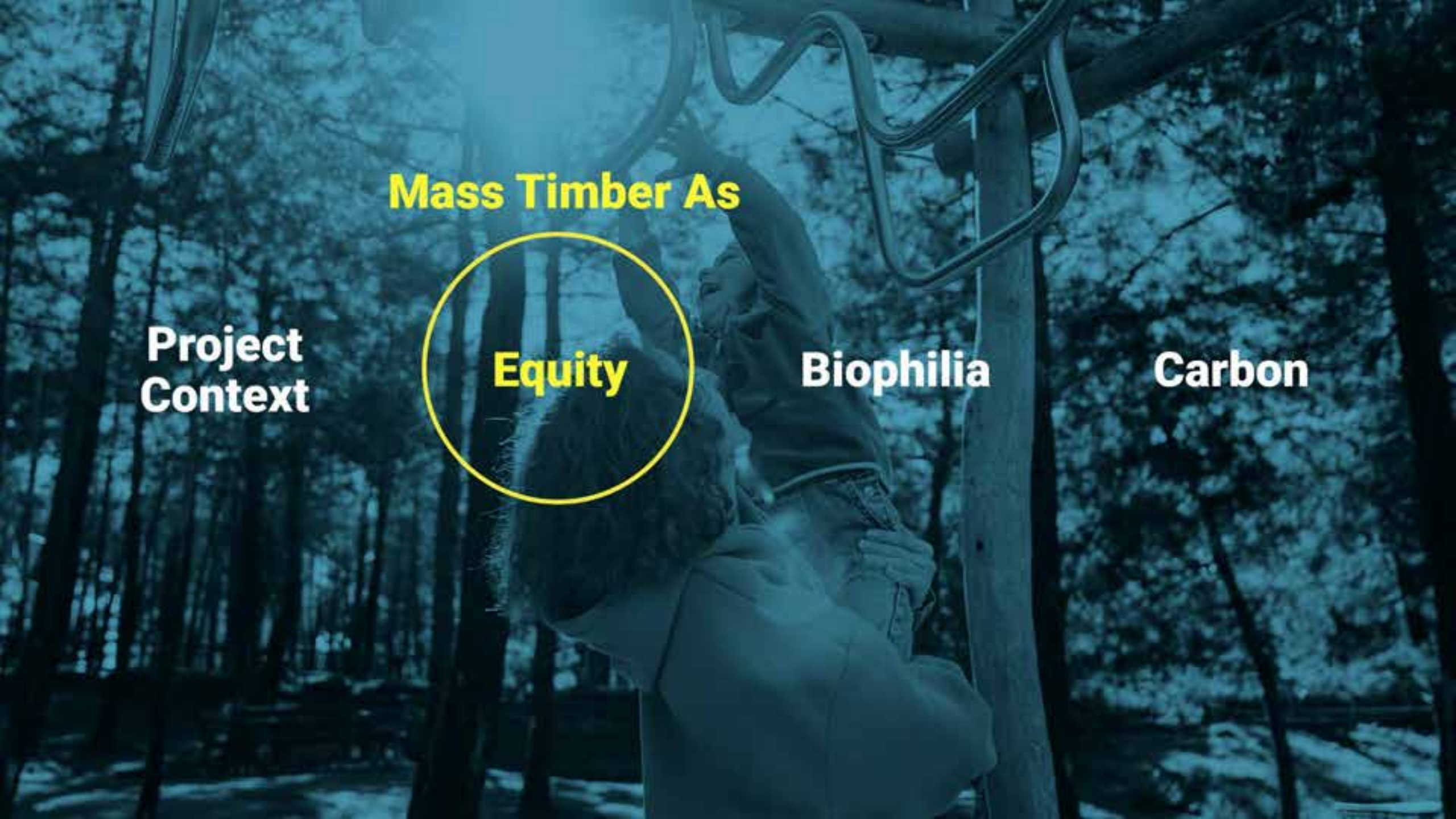
PARKWAY

ALKI
COMMUNITY
CENTER

ALKI ELEMENTARY SCHOOL

59th AVE SW

WAY

A blue-tinted photograph of a person climbing a wooden structure in a forest. The person is wearing a dark jacket and is reaching up towards a horizontal wooden beam. The background is filled with tall, thin trees and dense foliage. Overlaid on the image are several text elements: 'Mass Timber As' in yellow at the top center, 'Equity' in yellow inside a yellow circle in the center, 'Project Context' in white on the left, 'Biophilia' in white in the middle right, and 'Carbon' in white on the far right.

Mass Timber As

**Project
Context**

Equity

Biophilia

Carbon

Seattle Public Schools

Strategic Plan: Seattle Excellence

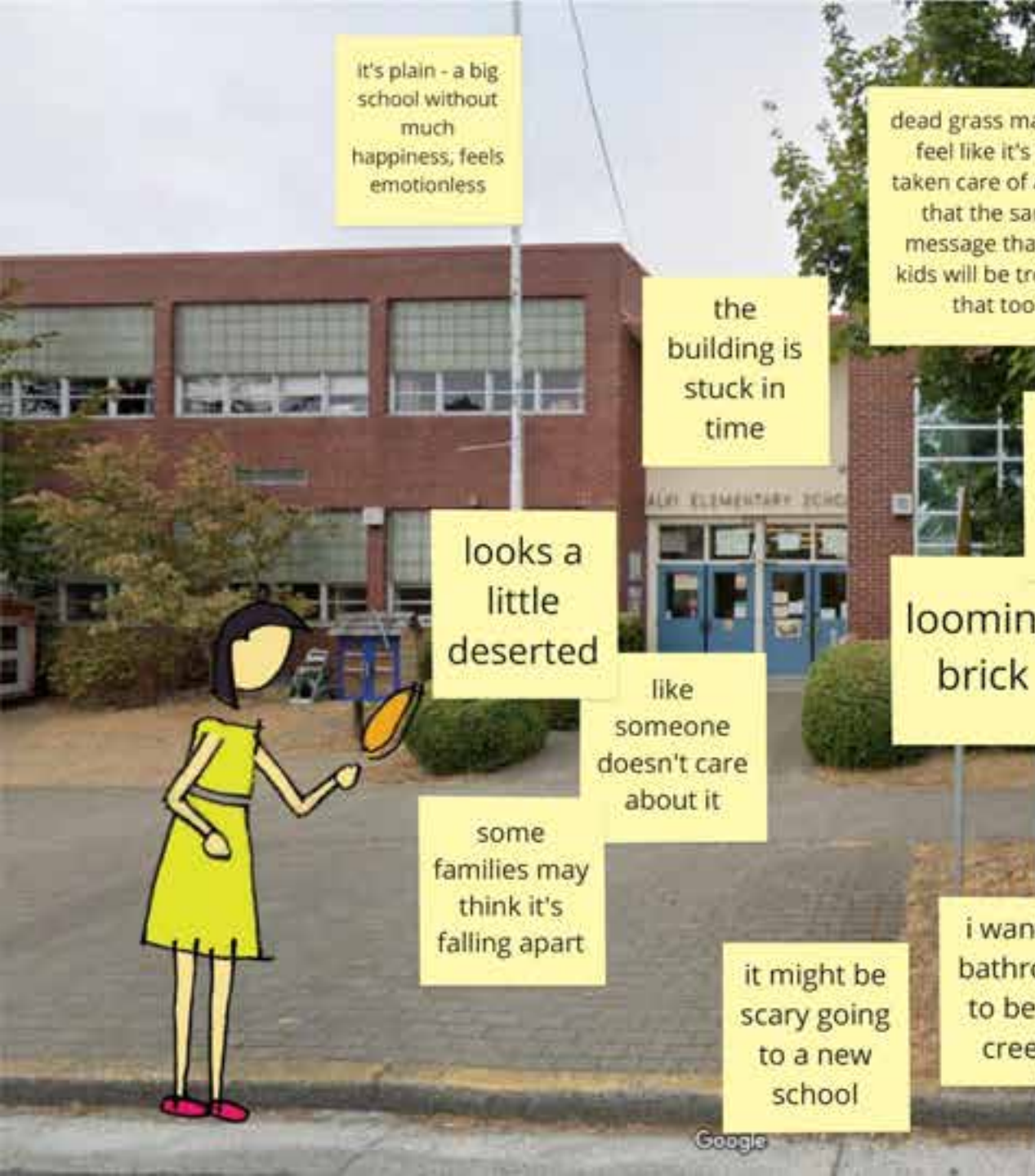
Focus on ensuring racial equity in our educational system.

Unapologetically address the needs of students of color who are furthest from educational justice.

Work to **undo the legacies of racism** in our educational system.

If we imagine the building
as an **equity strategy**,
how can we activate it to
communicate values and
messages of **belonging and inclusion?**





it's plain - a big school without much happiness; feels emotionless

dead grass makes it feel like it's not taken care of and is that the same message that my kids will be treated that too

the building is stuck in time

looks a little deserted

like someone doesn't care about it

some families may think it's falling apart

it might be scary going to a new school

looming brick

i want the bathrooms to be less creepy-

What's the problem?

Uncomfortable

boring

Inaccessible

extremely old building - some things are broken and it communicates unwelcoming message

Unwelcoming

reminds me of being bored in school

Intimidating

it's quite big

Un

broken windows

What else is possible?

a big BLM mural

a welcome to alki mural

big welcome sign with the name of the school

more color

More plants inside and outside

flags to be welcoming

a canopy upfront where you enter

museum of the elementary school when you walk through the front door

make the floor our colors like the alki way

Disrupt Socio-spatial Issues

Spatial Aspirations

"Institutional-like" materiality and aesthetics (feels like a neighborhood school, not a bureaucratic institution)	Site and school space fails to acknowledge and teach local history of conquest, displacement, relocation, internment	Gate-like qualities of the welcoming point of school building	Building Others Students FFEJ Building limits and stigmatizes "safety-net" services	Building prohibits universal experience	Classroom space standardizes learning
is less hierarchical than everyday space in society	Acknowledges that Seattle Public Schools sits on the traditional Native land of the Coast Salish people past and present	Encourages families and community members to share stories, information, and personal experiences	Demarginalizes the often stigmatized programs, services, and resources designed for students and families FFEJ	Provides universal access on shared pathways	Acknowledges and affirms differentiated learning

Gate-like qualities of the welcoming point of school building	Building is silent to racial and gender-based inequities	Bathrooms normalizes a gender-binary	Playground, cafeteria, and hallways discourage small group, individual engagement	Building is Bystander to Confusion Mysterious-Space
Presents an entry point that feels like an open door	Communicates " racial microaffirmations " and other affirmations that explicitly welcome BIPOC communities, LGBTQ+...	Delinks gender and toilets	Encourages small group, individual engagement within playgrounds, cafeteria, and hallways	Communicates how it works

**Front porch
connects school
to neighborhood
community and park.**

A school that reflects
and honors personality,
identity, and lived
experiences.

Inclusive space that
supports diverse
ways of learning and
knowing.

Inviting building
that's easy to
navigate.





ALKI AVE SW

SW STEVENS ST

ACCESS FROM 59TH AVE SW

SW ADMIRAL WAY





ALKI AVE SW

SW STEVENS ST

ACCESS FROM 59TH AVE SW

SW ADMIRAL WAY

Inviting Entry

SOCIO-SPATIAL ISSUE

Gate-like features create tension at the welcoming point of school entry



STRATEGY

Encourages families and community members to share stories, information, and personal experiences

Presents an entry point that feels like an open door

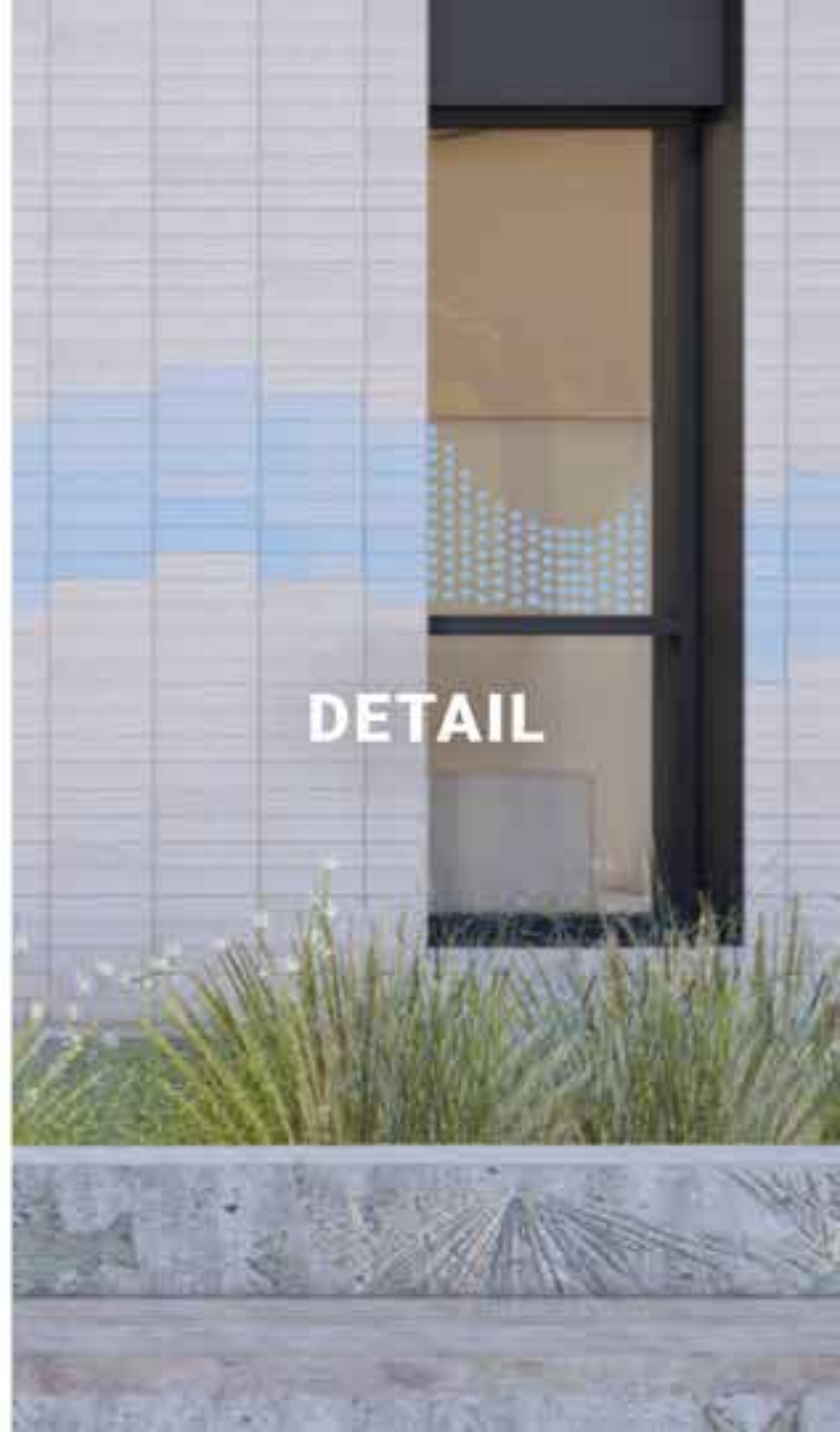
STRATEGY

Acknowledges that Seattle Public Schools sits on the traditional Native land of the Coast Salish people past and present

łál-il

SOCIO-SPATIAL ISSUE

Space fails to acknowledge and teach local history of conquest, displacement, relocation, internment

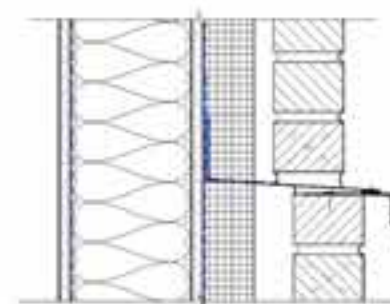
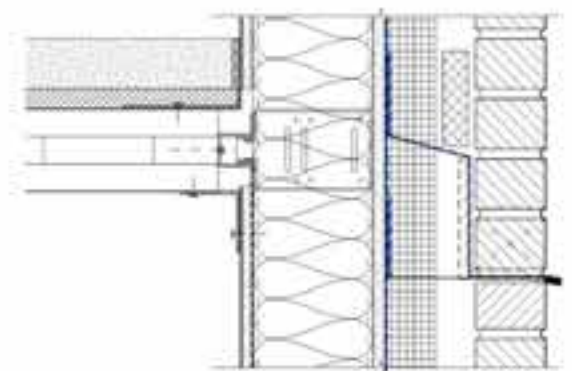
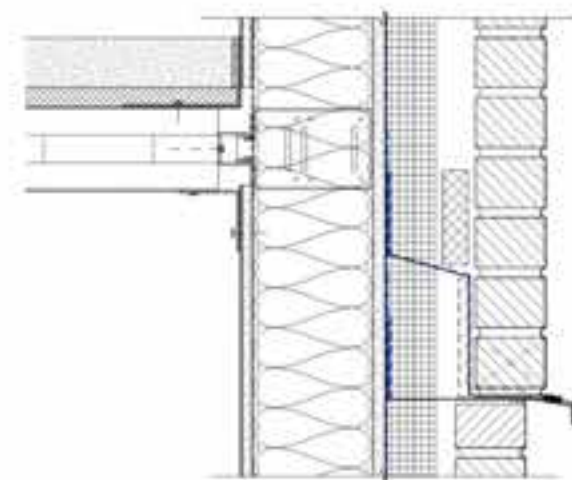


Mass Timber and Masonry

Stack Windows / Support Brick at Foundation

TMS 402 Section 12.2.2.7 Steel Backing:

Support at each story above 30 ft.



Section A

Alki Elementary School

Inviting Entry



Front porch
connects school
to neighborhood
community and park.

**A school that reflects
and honors personality,
identity, and lived
experiences.**

Inclusive space that
supports diverse
ways of learning and
knowing.

Inviting building
that's easy to
navigate.



Recognition of Place & History



Recognition of Place & History

Learning from Coast Salish



Historic Duwamish villages

Non-Native settlers encountered not an empty wilderness but Native people and rich cultures along the Duwamish and beyond. This comparison of current and historic geography shows how water and land were changed for

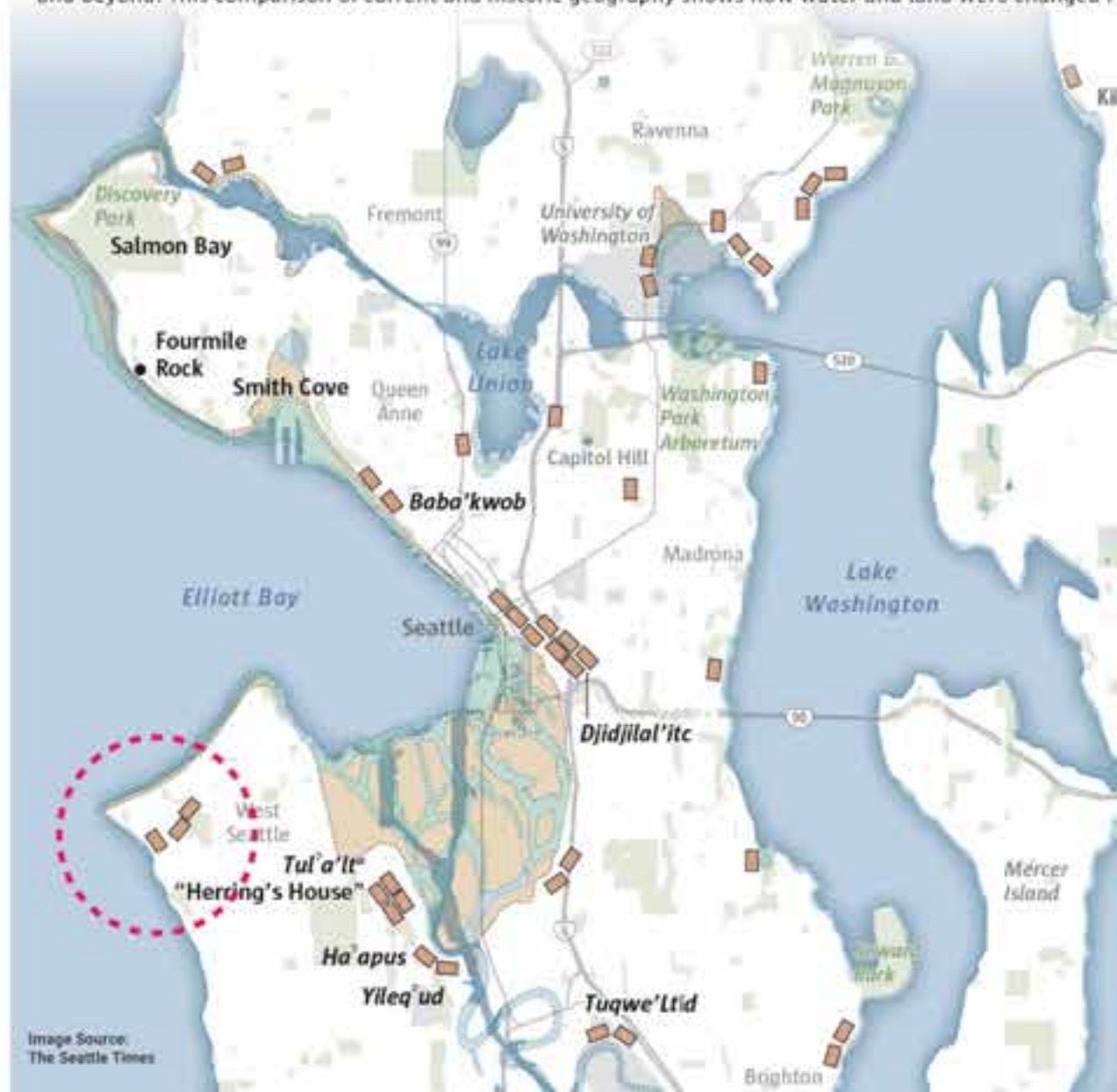


Image Source:
The Seattle Times

Recognition of Place + History

STRATEGY

Acknowledges that Seattle Public Schools sits on the traditional Native land of the Coast Salish people past and present

SOCIO-SPATIAL ISSUE

Space fails to acknowledge and teach local history of conquest, displacement, relocation, internment

Alki Elementary School

Inviting Entry



Recognition of Place & History

The Trees are our Ancestors



Alki Elementary School

Ribbon Cutting



Front porch
connects school
to neighborhood
community and park.

A school that reflects
and honors personality,
identity, and lived
experiences.

**Inclusive space that
supports diverse
ways of learning and
knowing.**

Inviting building
that's easy to
navigate.



Mass Timber Structural Framing

Establish Approach

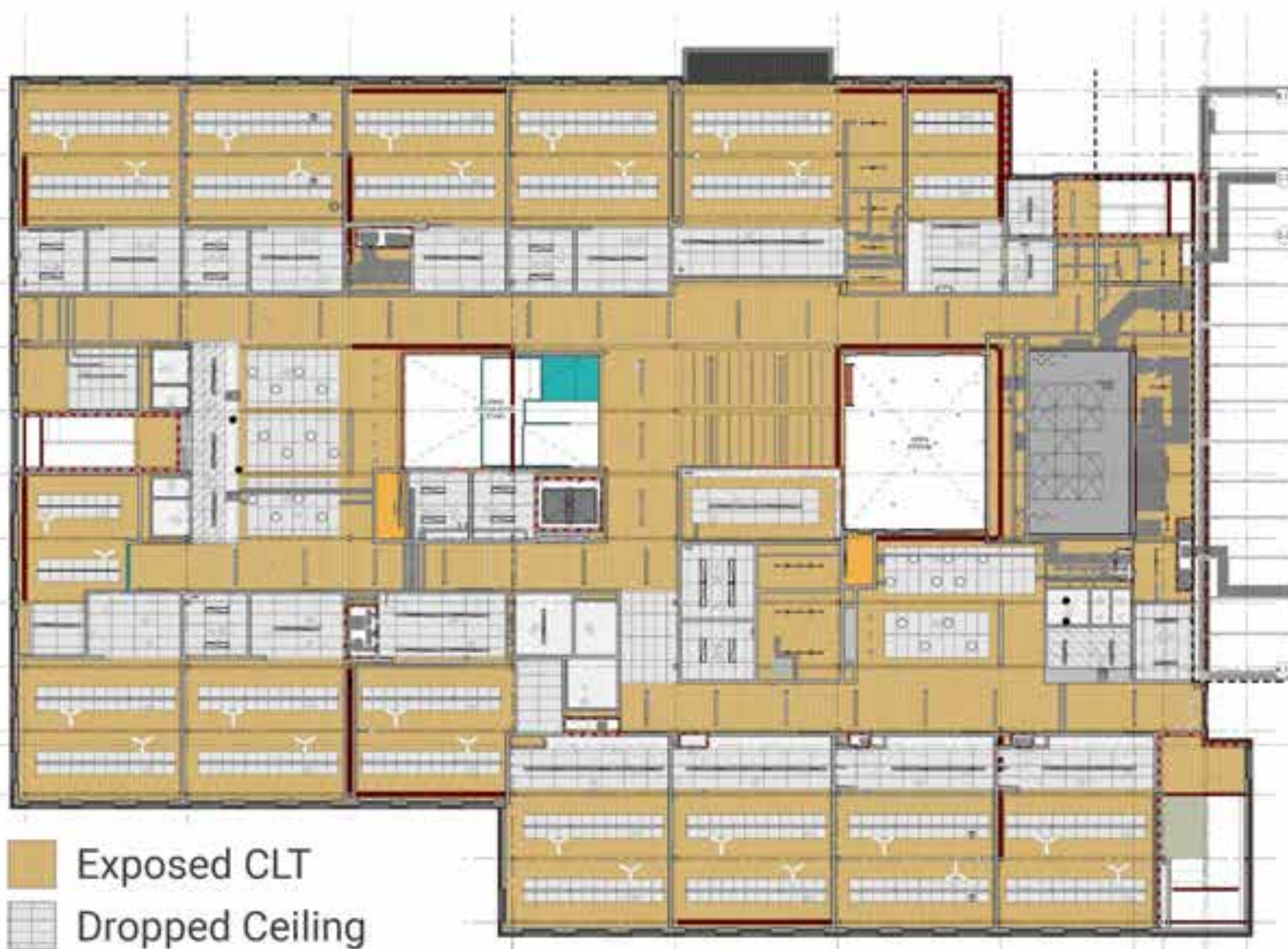


Classroom



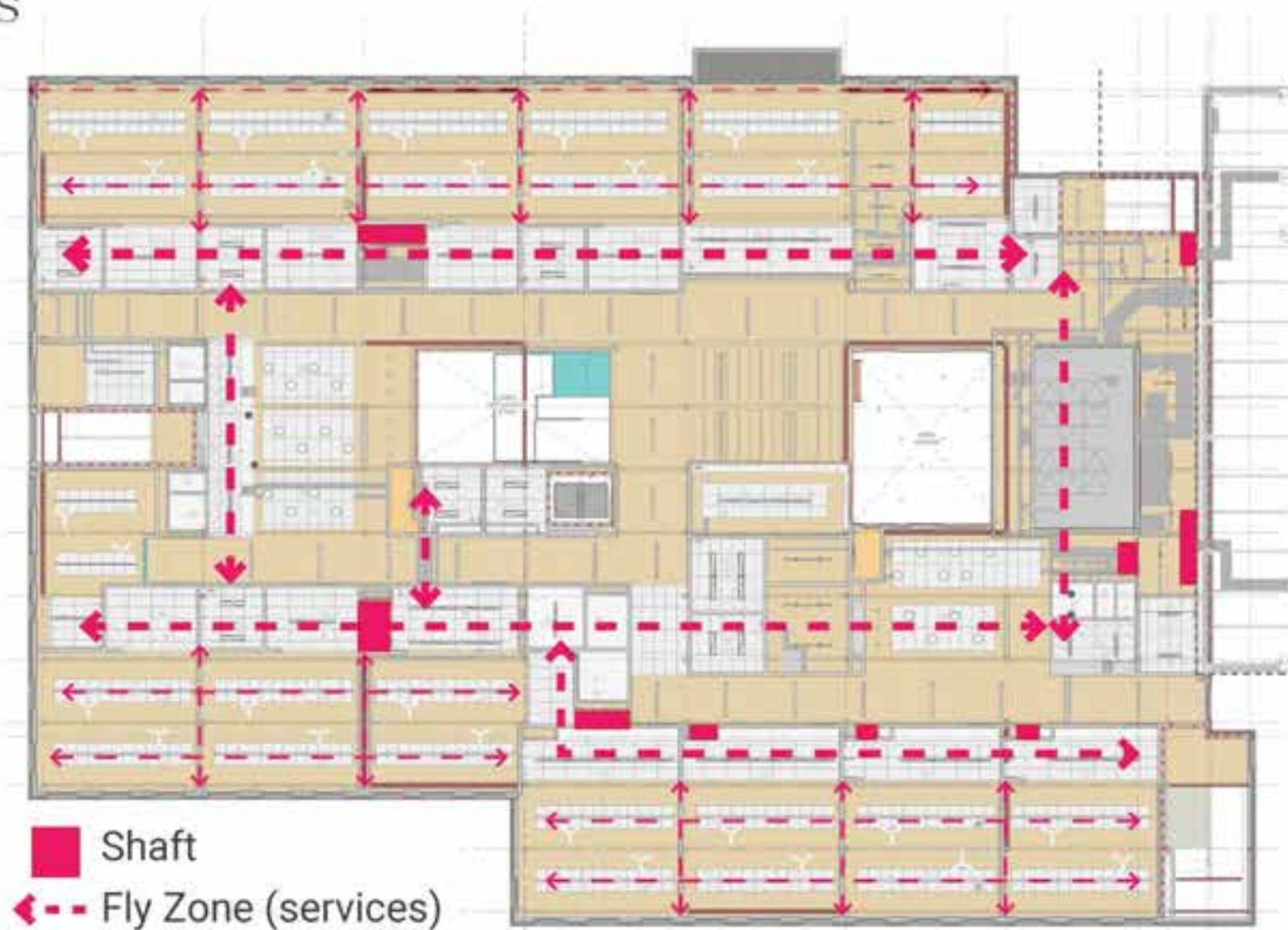
Mass Timber Services: Reflected Ceiling Plan

Establish Approach



Mass Timber Services: Design Approach

Fly Zones / No Fly Zones

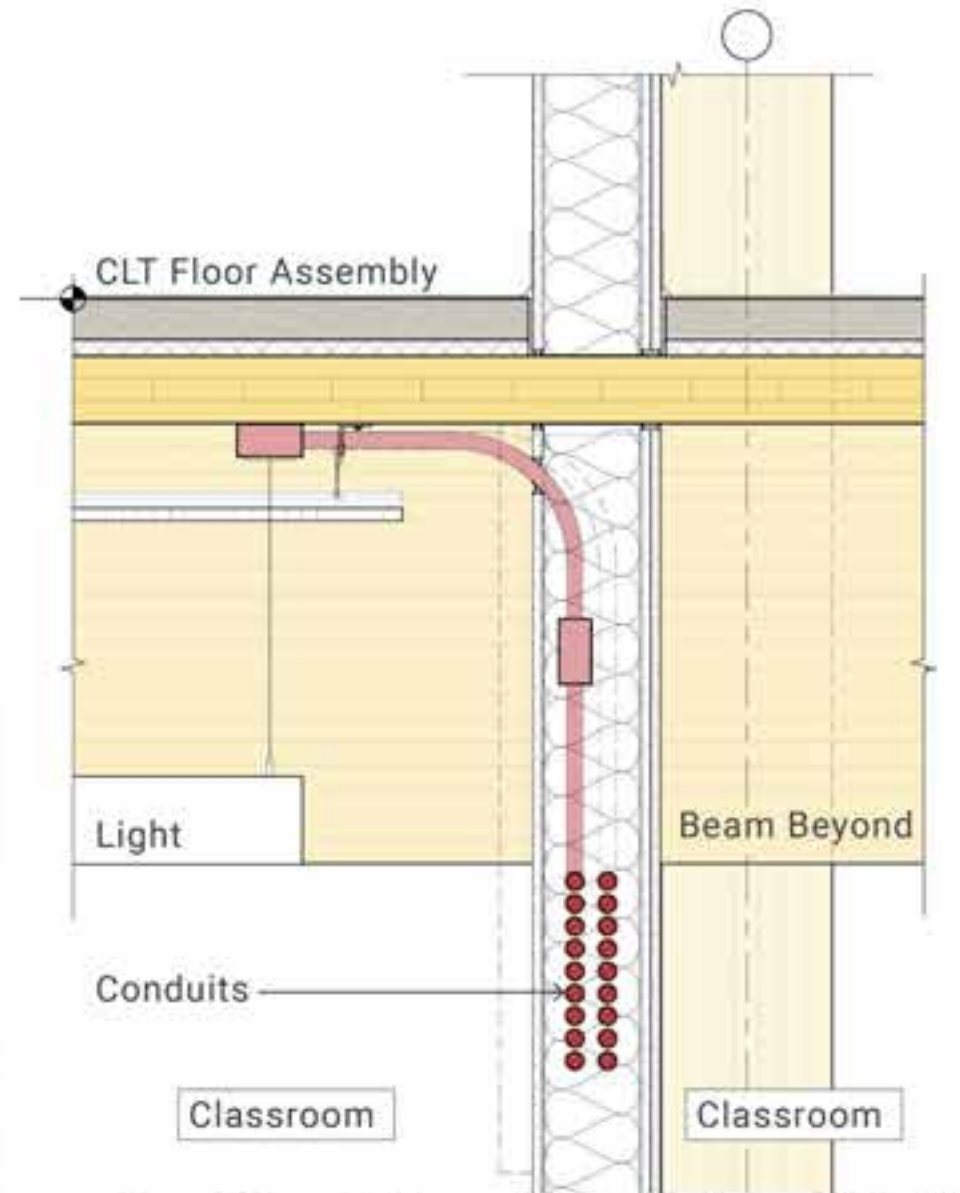


Mass Timber Coordination

Teaching Walls



View of Classroom

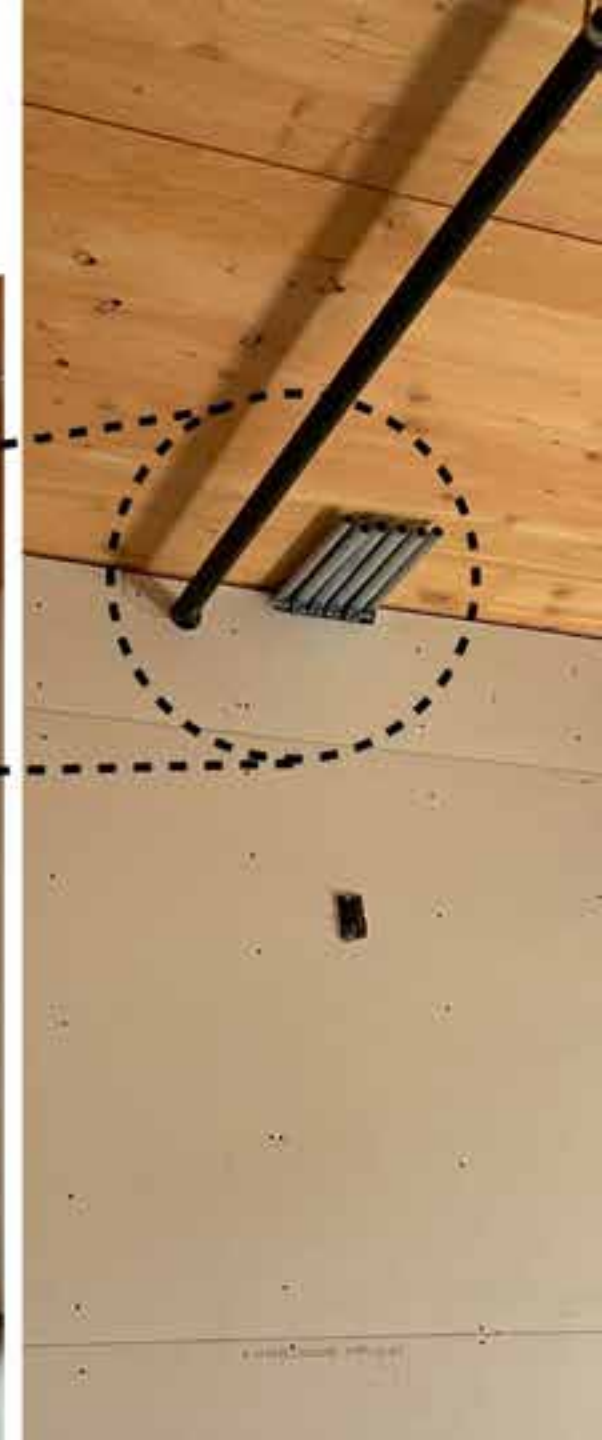
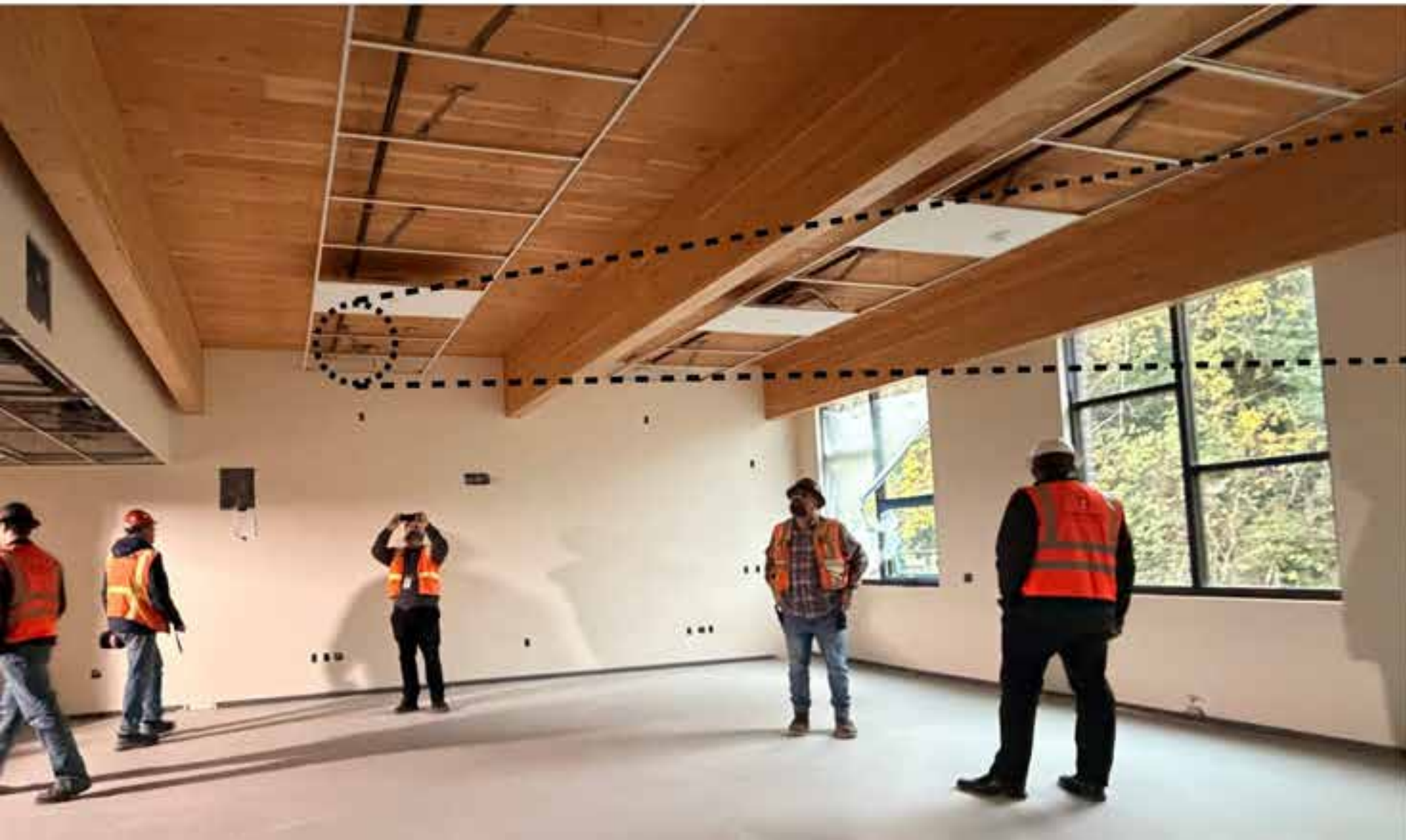


Section Thru Teaching Wall



Alki Elementary School

Future Flexibility: Teaching Walls



Corridor



Floor Plans



LEVEL 01

LEGEND

- Classrooms
- Learning Support
- Library

- Administration
- Physical Education
- Art & Music

- Kitchen
- Student Dining
- Building Support



LEVEL 02



LEVEL 03



Learning Commons

Drop ceilings for acoustics and to conceal MEP services

Exposed CLT ceiling in corridors for biophilia

Sensory Nook for regulation

Restrooms adjacent

"Tide Pool" patterning promotes biophilia



Learning Commons



Front porch
connects school
to neighborhood
community and park.

A school that reflects
and honors personality,
identity, and lived
experiences.

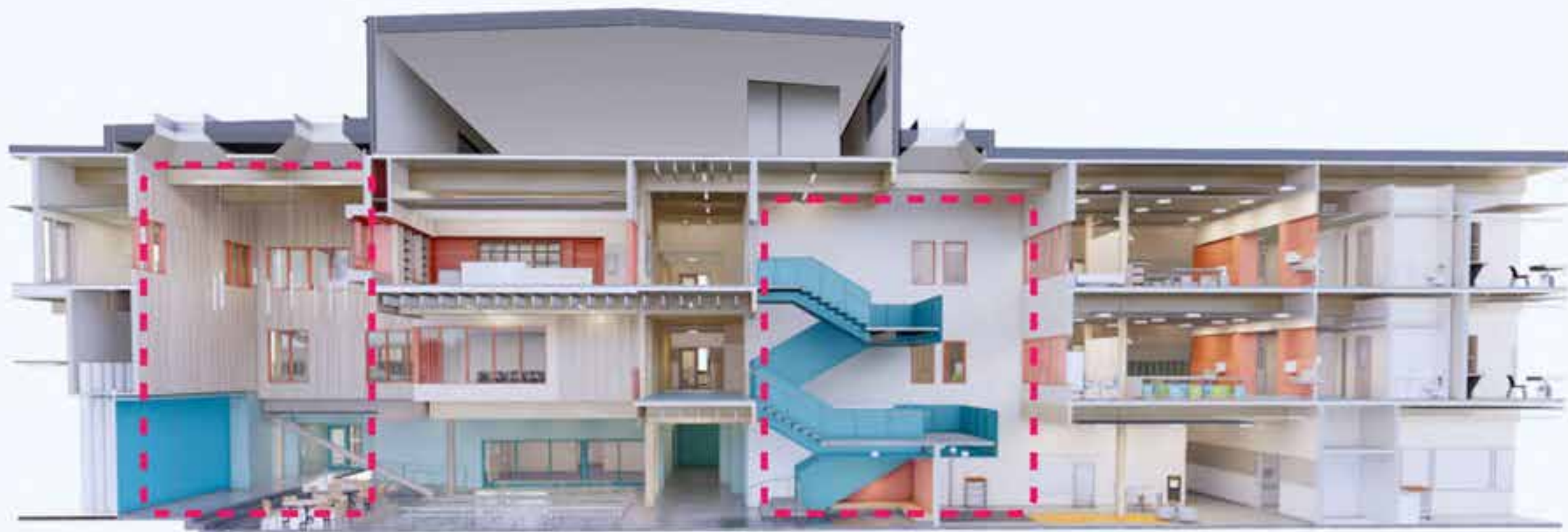
Inclusive space that
supports diverse
ways of learning and
knowing.

**Inviting building
that's easy to
navigate.**



Atrium

Building Section: 3-Story Connections



Atrium

Light, Ventilation, Connection



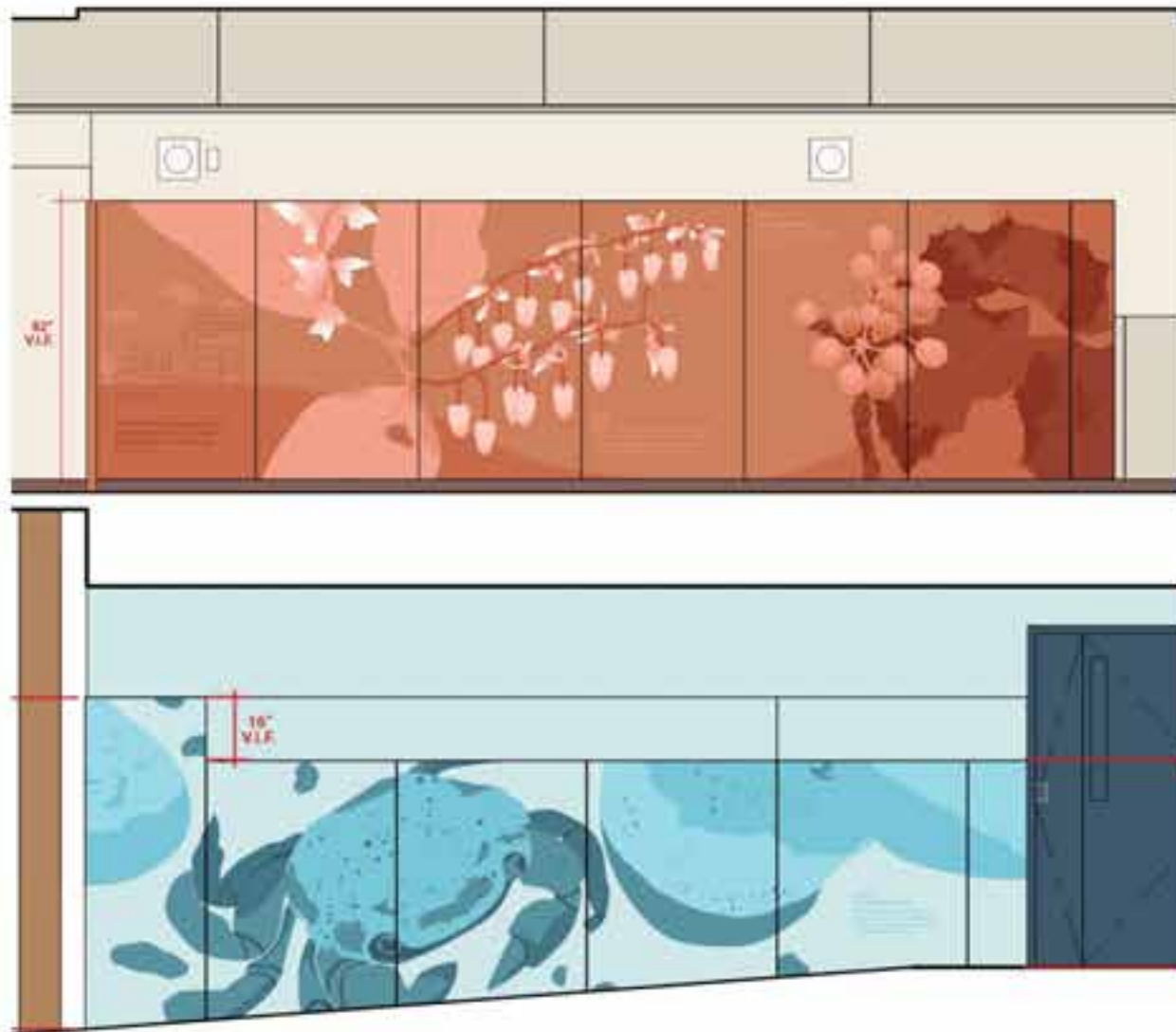
Circulation Stair

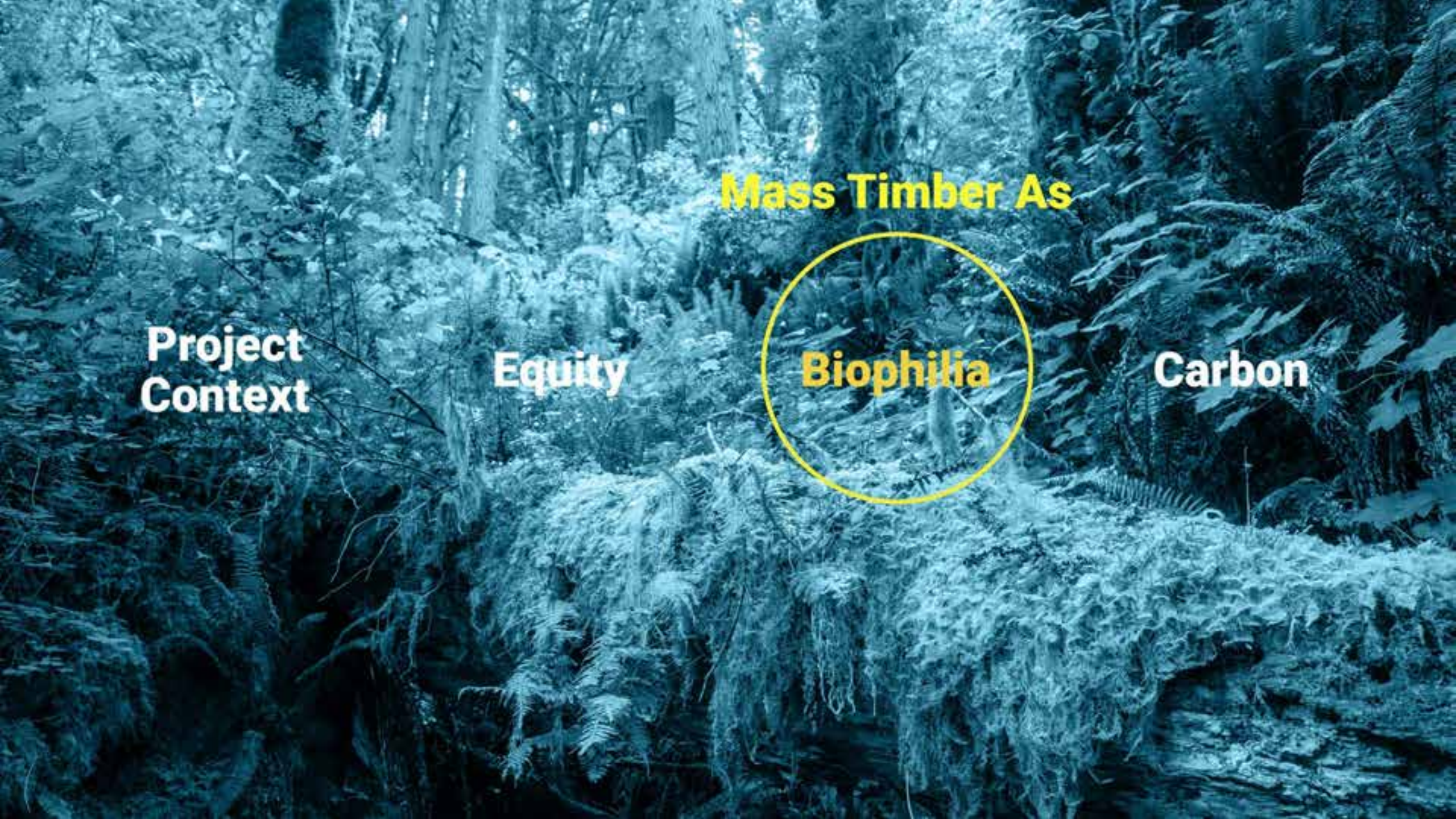
Light & Connection



Environmental Graphics

Place Attachment



A photograph of a dense forest with a yellow circle highlighting a specific area. The text "Mass Timber As" is written in yellow above the circle. The text "Project Context", "Equity", "Biophilia", and "Carbon" are written in white below the circle. The background is a lush green forest with many trees and ferns.

Mass Timber As

**Project
Context**

Equity

Biophilia

Carbon

>3x

improvement in
6th grade
math test scores

>2.5x

stress
reduction

14%

improvement in
short-term
memory

(NOUN)

Biophilia:

A hypothetical human tendency to interact or be closely associated with other forms of life in nature : a desire or tendency to commune with nature.

Construction Logistics

Work Environment

"As the mass timber structure went up, you could feel a difference on the jobsite. The crews seemed happier working around the exposed wood, and there was a real sense of pride and connection to the building they were creating."

Matt Everett, Senior Project Manager,
Cornerstone General Contractors



Wood Innovation Grant



Material decisions are outpacing our understanding of **how exposed wood influences learner engagement.**

Improving the school building may well be the **most overlooked means of improving student health, safety, and academic performance.**

Yet in conversations about factors that lead students to academic success, only rarely does the role of the physical environment come to the fore... There are nearly 51 million K-12 students in the United States, **and they each spend more than 15,600 hours in public schools by the time they graduate.**

**SCHOOL BUILDINGS: THE FOUNDATION
FOR STUDENT HEALTH AND SUCCESS**

Material Experience of Wood

Research Approach > Methodology

Finalizing research methodology with Seattle Public Schools and the University of Oregon

This study involves the collection and analysis of student-level outcome data from two elementary schools — one with exposed mass timber and one without

IEQ assessments of classrooms prior to beginning

Planning to pilot study Spring 2027

Full year data collection, surveys, and analysis 2027-2028 school year





**Project
Context**

Equity

Biophilia

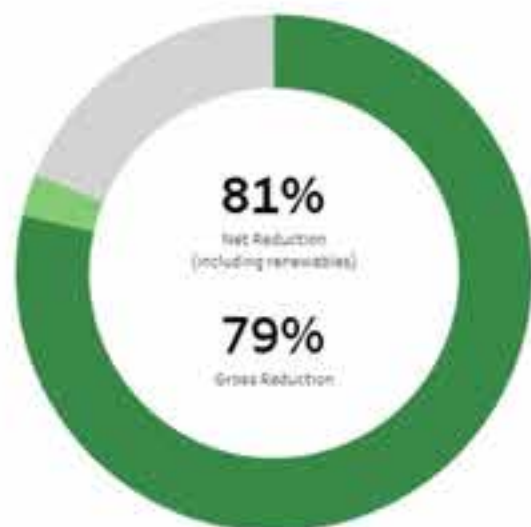
Mass Timber As

Carbon

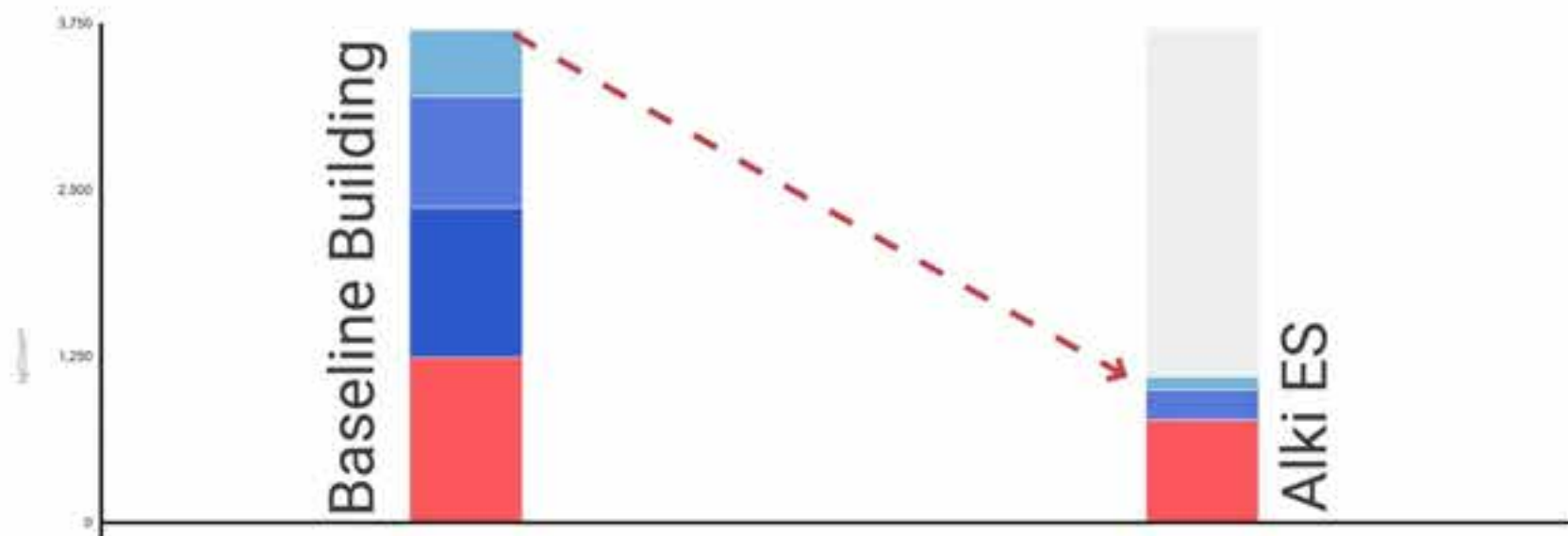
Mass Timber & Sustainability

Total Carbon

Net pEUI: 12



Emissions Over 60 Years



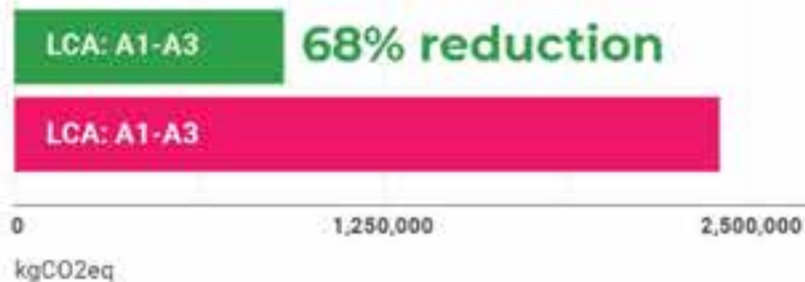
- Embodied Carbon Emissions
- Electricity Emissions
- Refrigerant Emissions
- Reduction from Baseline

c.scale™

Environmental Impact

Embodied Carbon

Embodied Carbon Comparison: Opening Day



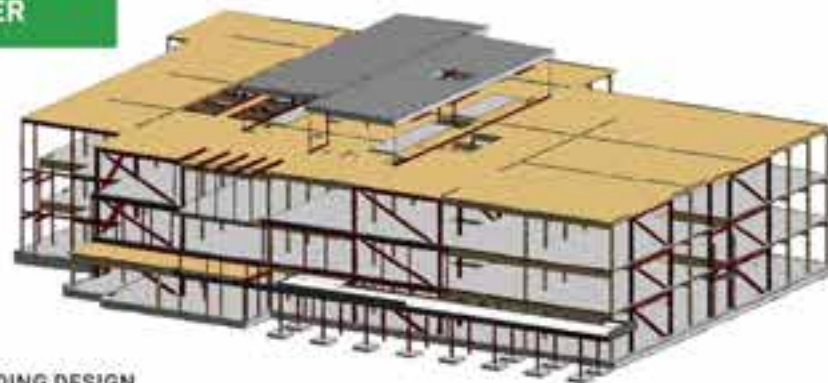
Embodied Carbon Comparison: Thru End of Life



Key: ■ Alki Elementary Mass Timber ■ Alki Elementary Steel & Concrete Option

ACTUAL DESIGN RESULTS

ALKI ELEMENTARY
MASS TIMBER



VS. BASELINE BUILDING DESIGN

ALKI ELEMENTARY
STEEL & CONCRETE OPTION



Our Collaborators

DESIGN TEAM

Architect: Mahlum

General Contractor: Cornerstone

Structural Engineer:
PCS Structural Solutions

Envelope Consultant: BET&R

**Mechanical / Electrical/Telecom
Engineer:** Hargis

Plumbing: Greenbusch

Early Learning: Anjali Grant Design

Civil: AHBL

Stormwater: Mayfly

Landscape: Osborn Consulting

Acoustics: A3

Food Service: Halliday Associates

GENERAL CONTRACTOR & EXTERIOR ENVELOPE SUBCONTRACTOR TEAMS

General Contractor: Cornerstone

Mason: R&D Masonry

Sheet Metal & WRB:
Architectural Sheet Metal (ASM)

Mass Timber & Steel Erector:
Evergreen Erectors

**Exterior Metal Wall Framing &
Sheathing:** GK Knutson

Steel Canopy: Lundahl

Exterior Paint: NW Partitions

Storefront & Glazing: Sound Glass

Roofing: Wayne's Roofing

Below Grade Waterproofing: Inland

OWNER

Seattle Public Schools



THANK YOU

Questions?

CONTACT US!

Joe Mayo jmayo@mahlum.com

Where Learning Meets Nature: Mass Timber's Impact on Student Experience and Performance

Bohlin
Cywinski
Jackson



walter
p moore

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



Project Team

Design Team

Bohlin Cywinski Jackson

Walter P. Moore

DBR, Inc.

OJB Studios

Westwood (Pacheco Koch)

Holmes Keogh Associates

Metropolitan Acoustics

Architect

Structural Engineer

MEP/FP/Tele

Landscape Architect

Civil

Code

Acoustics

Greenhill
S C H O O L

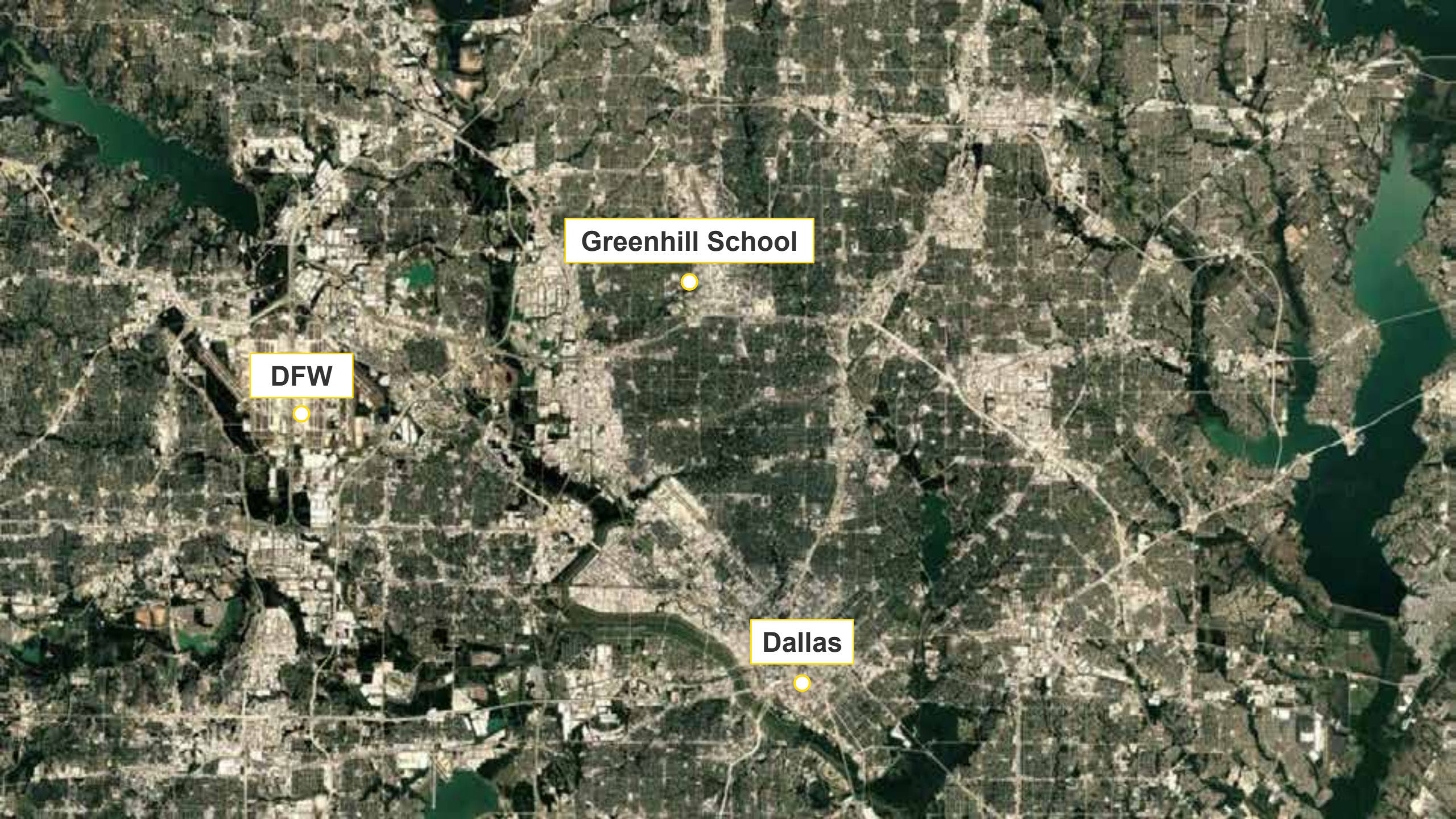
Contractor Team

Scott + Reid

Smartlam, Western Archrib, DCI

Construction Manager

CLT and Glulam, Connection Design



DFW

Greenhill School

Dallas

School Context



Envisioning a New STEM Building

Aspirations:

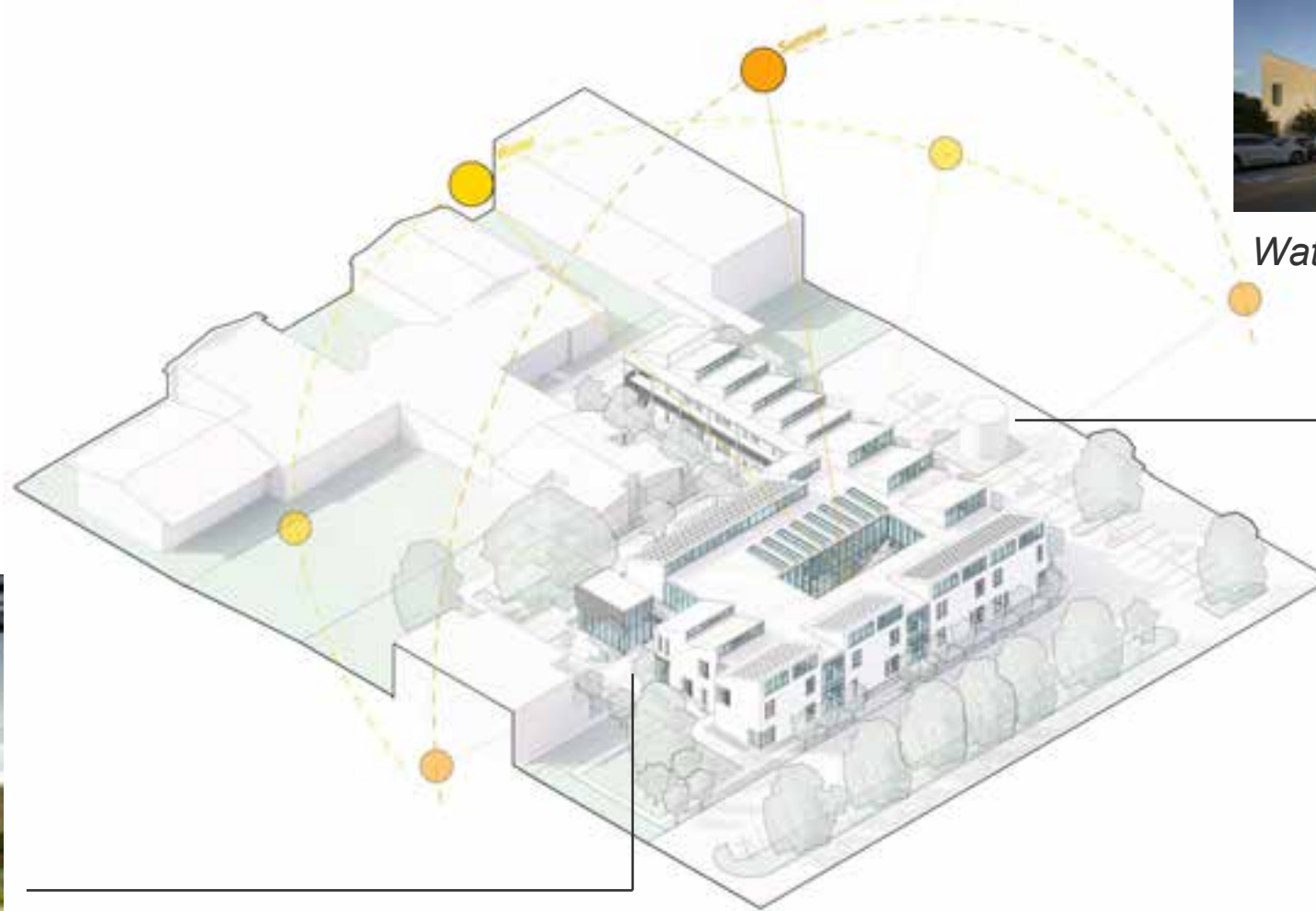
- **Inviting and welcoming building**, fostering social engagement and connections
- Transparent; **Learning on display**
- **Flexibility** in the space
- Model for **sustainability**

Performance Goals:

- Rainwater/Stormwater re-use and management
- Daylight autonomy
- Embodied carbon
- Energy use reduction
- Sustainable strategies on display

capturing the passion of our younger students	shaded space outdoors that is adjacent to building	building as a model for problem solving in sustainability	curriculum connections	Greenhouse (Lee didn't write this)	raised bed gardening, birding, pollinators...
helping our students learn the economics of sustainability	YES!!! MS Curriculum focusing on sustainability	so much hands on work that is accessible for younger students	rainwater capture and reuse	climate study	telemetry and data extraction from sustainable systems for class
the chance to be a leader in Dallas	Sustainability matters! To GH and the community and world	inspiring youth to be problem solvers in world	lots of connections to the world	age is less important for sustainability - all ages can be involved	seems like an ideal topic that would lead to interdisciplinary studies

Campus Context | Massing Approach



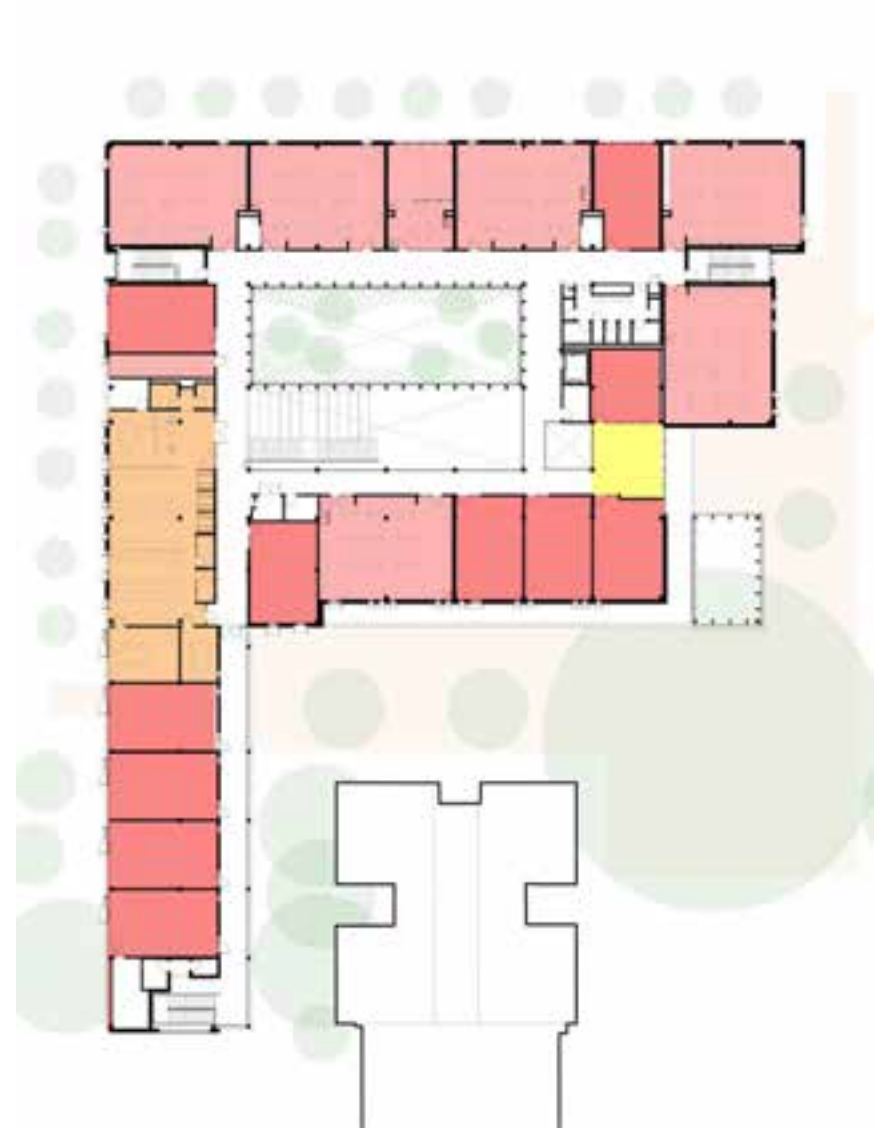
Water Collection Tank

High Bay





Level 1



Level 2



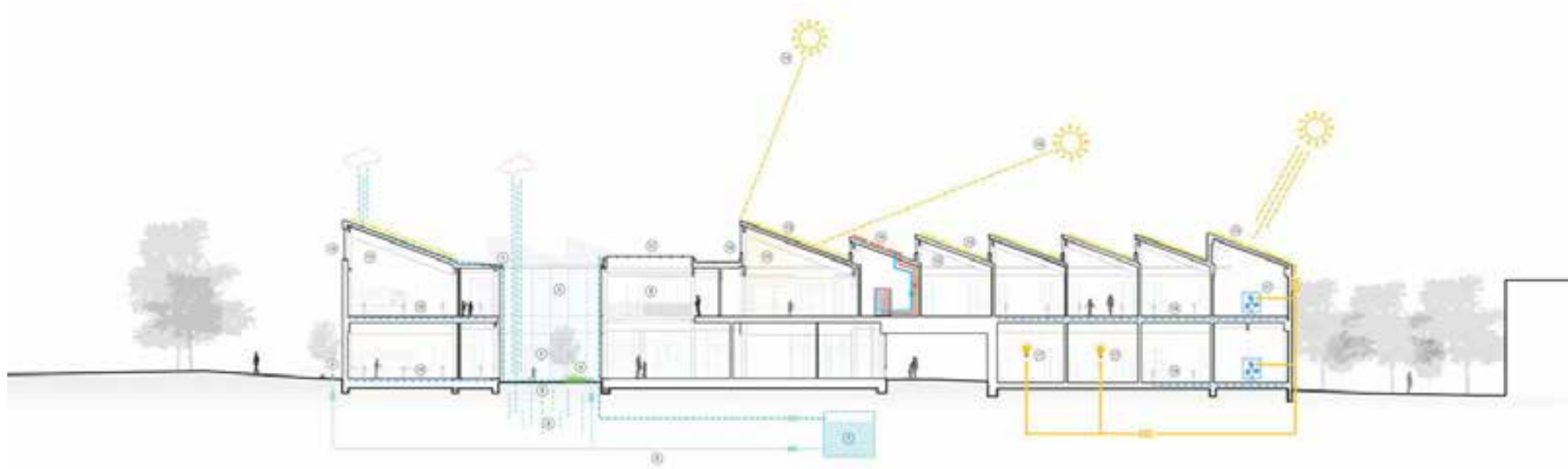




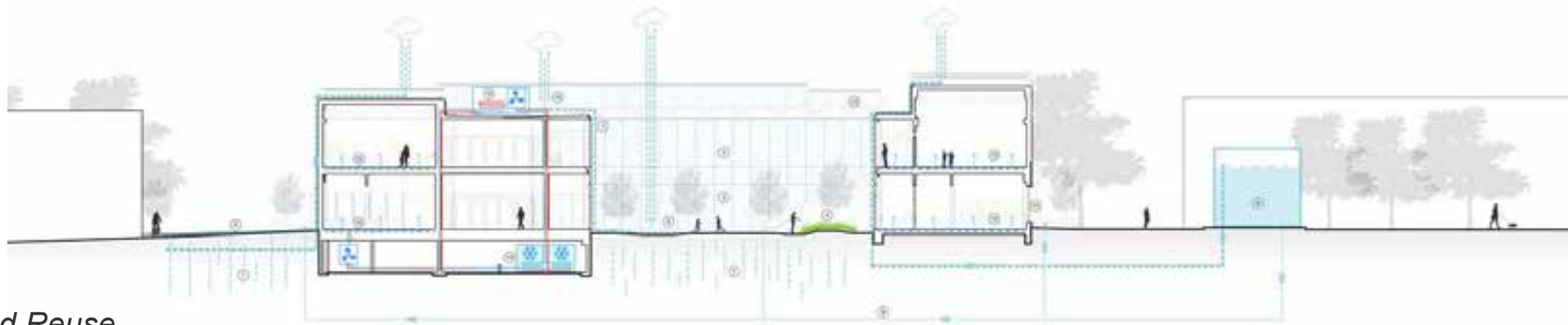




Sustainability on Display

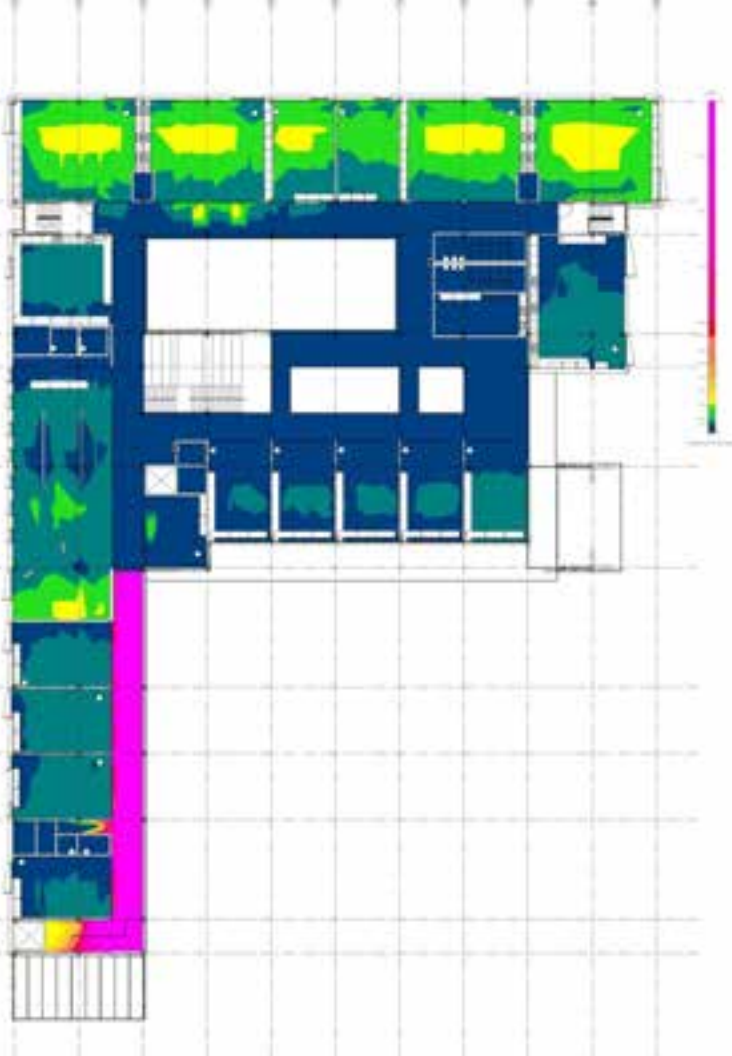


Design for Daylight

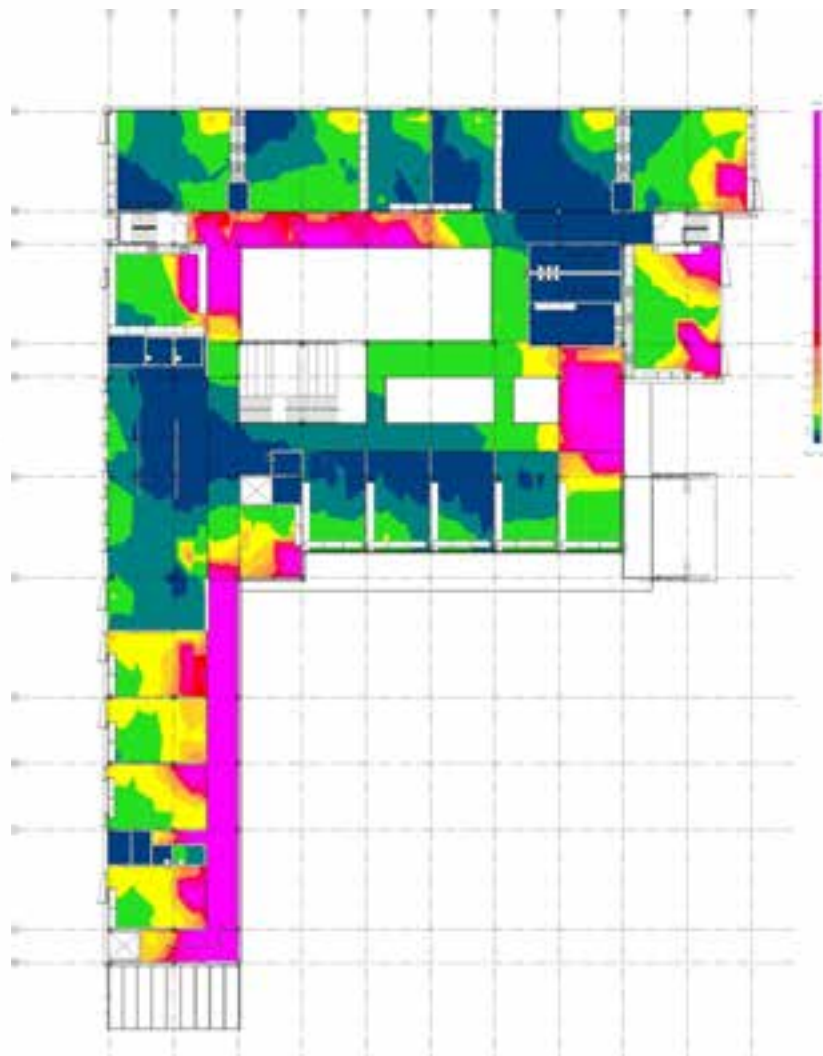


Water Collection and Reuse

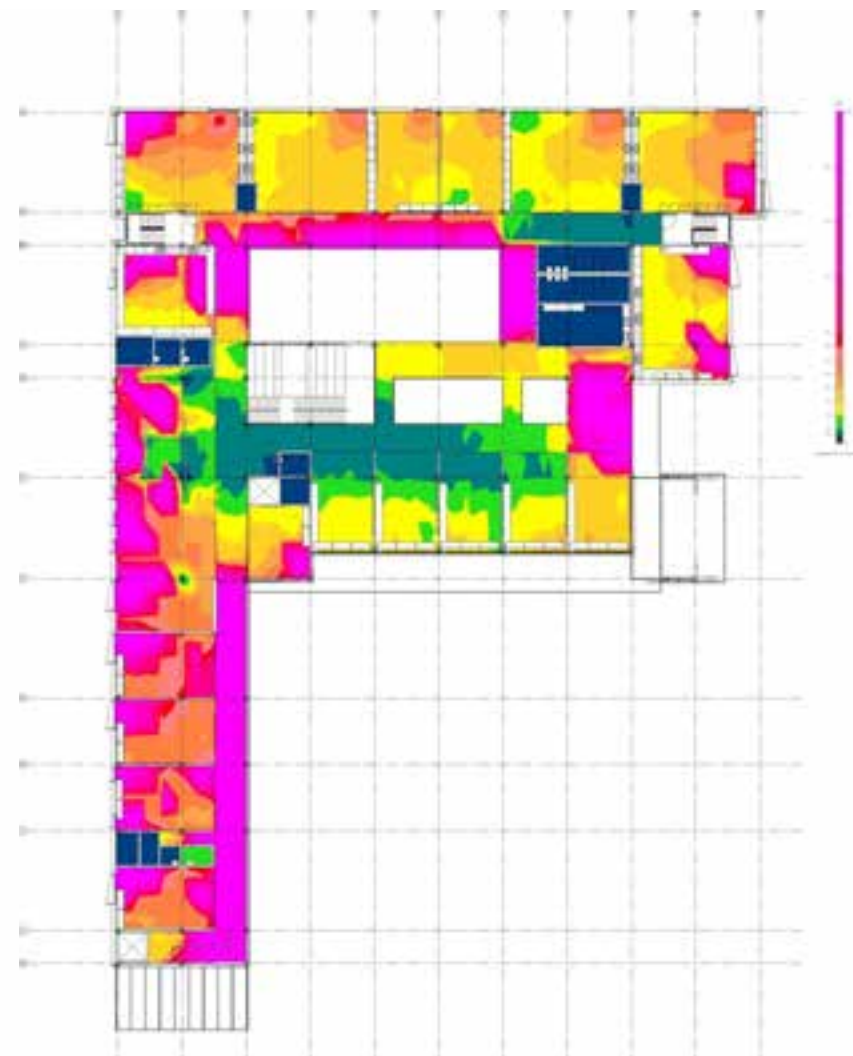
Daylight Analysis



Sawtooth Only



Windows Only



Combined



North Elevation



South Elevation



East Elevation



West Elevation



L1 Classroom



L2 Classroom









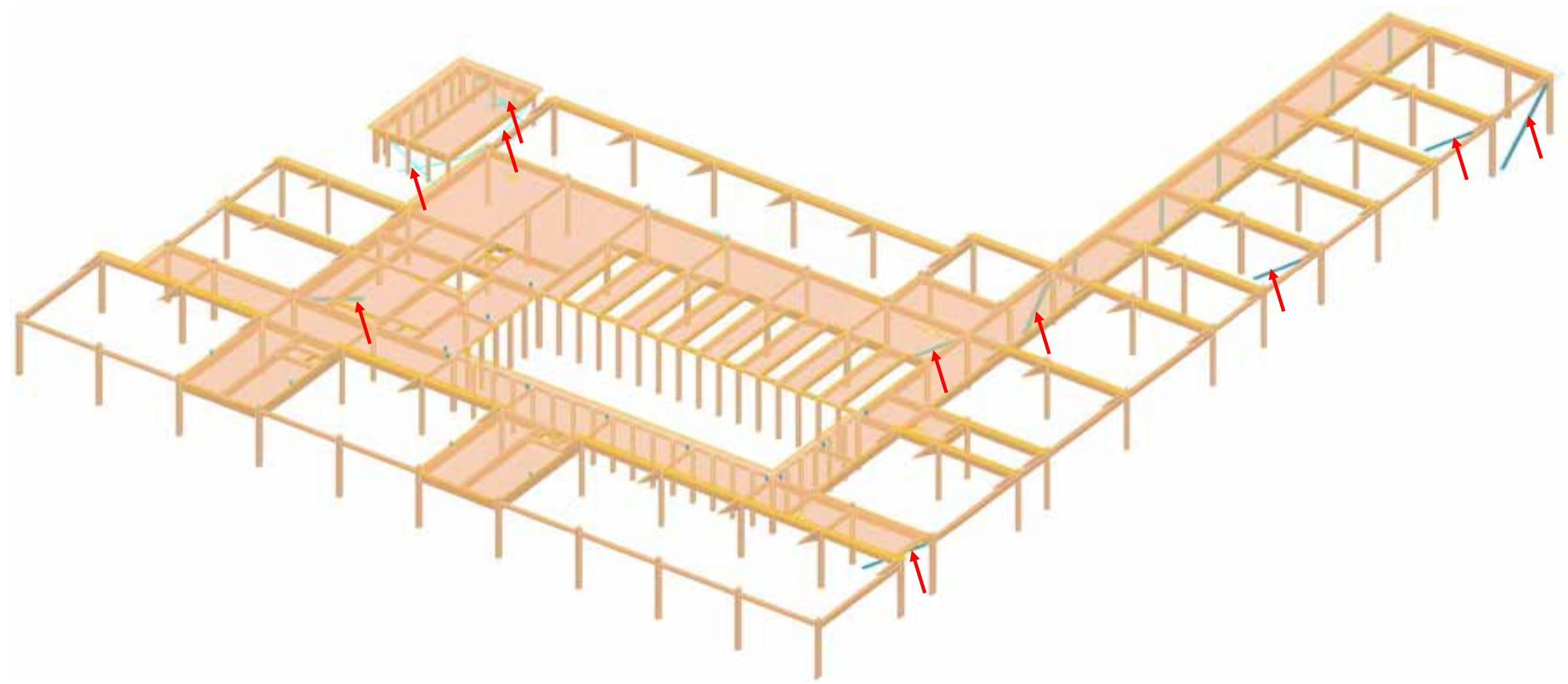


Sawtooth Massing

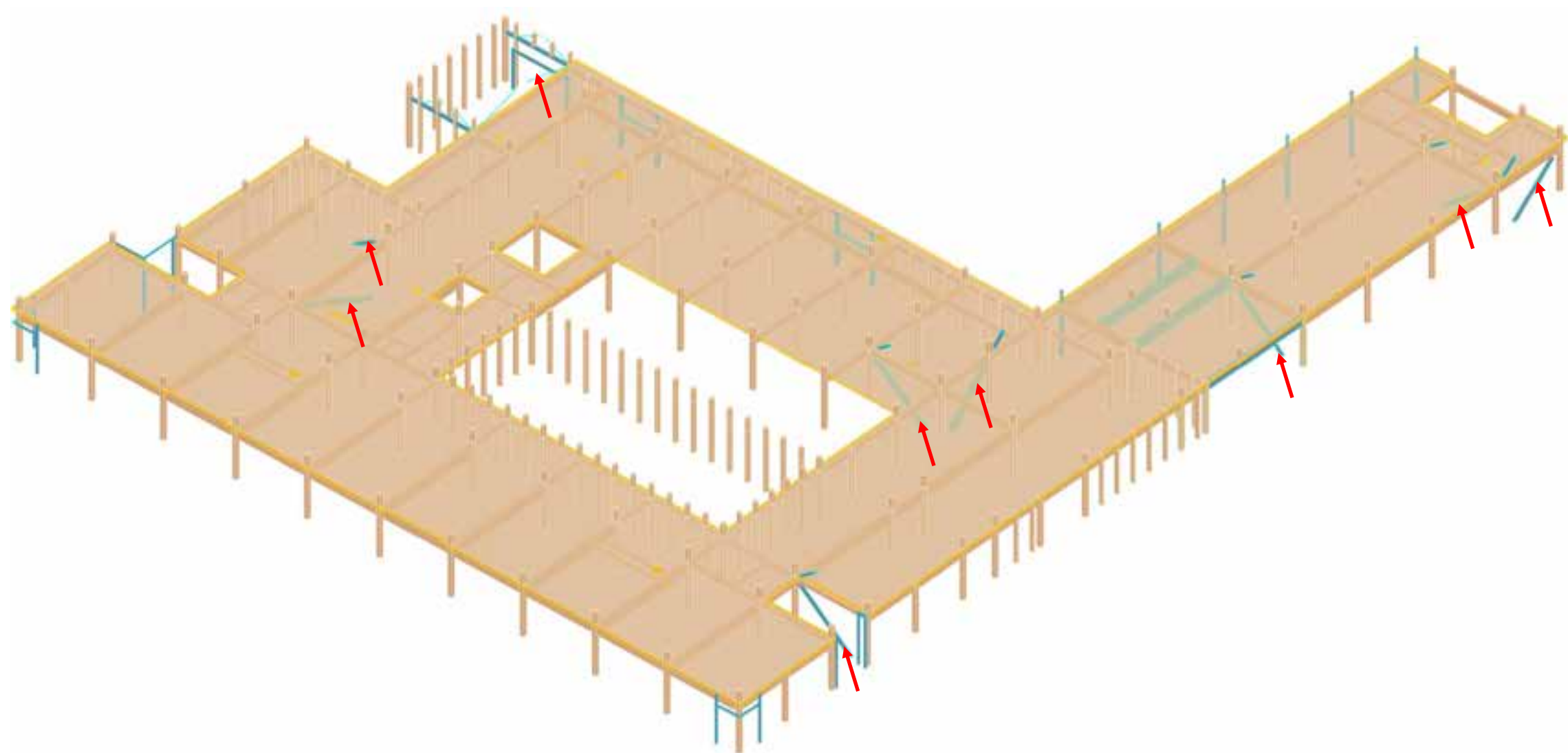




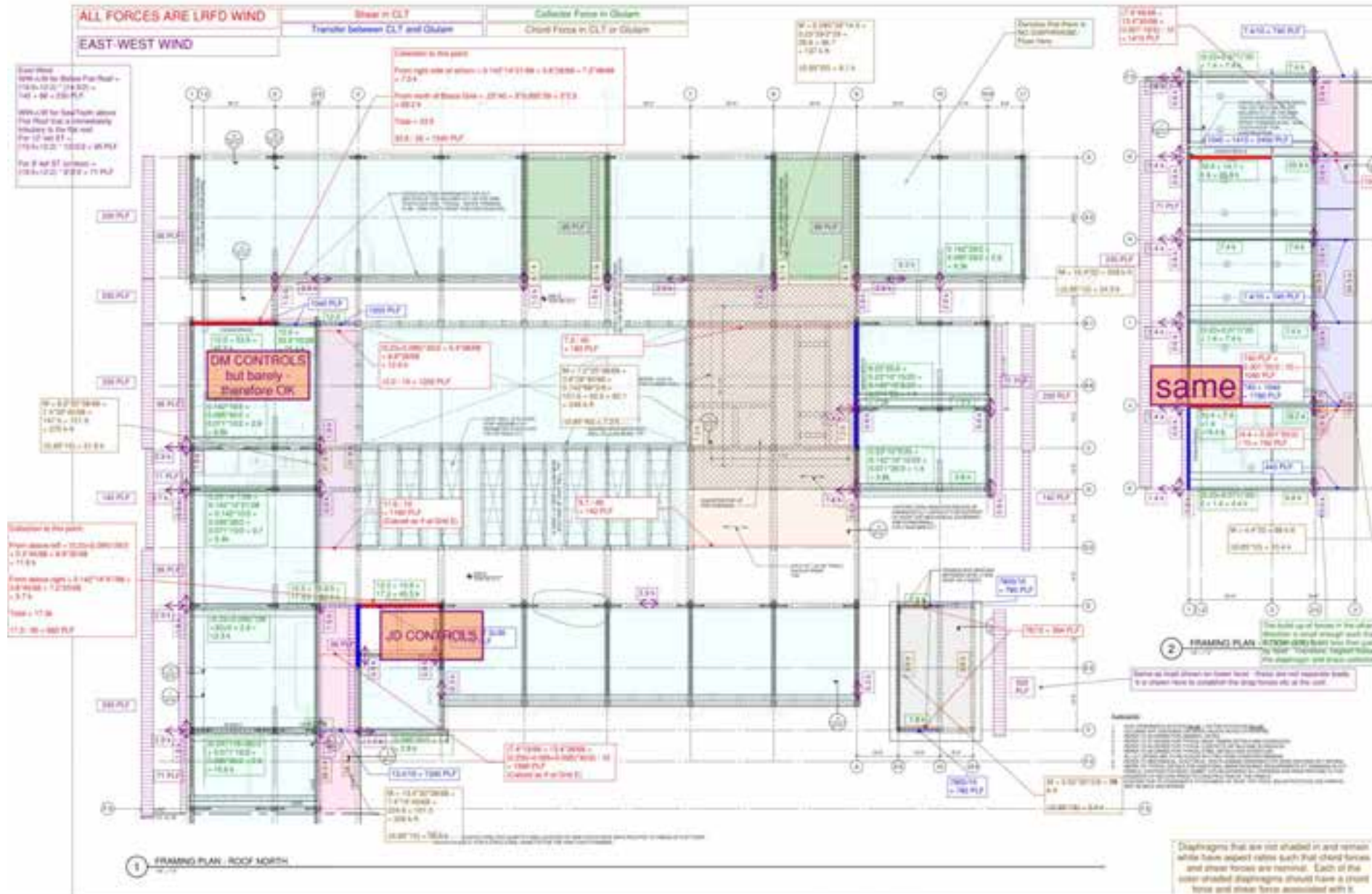
Roof-Level Diaphragm



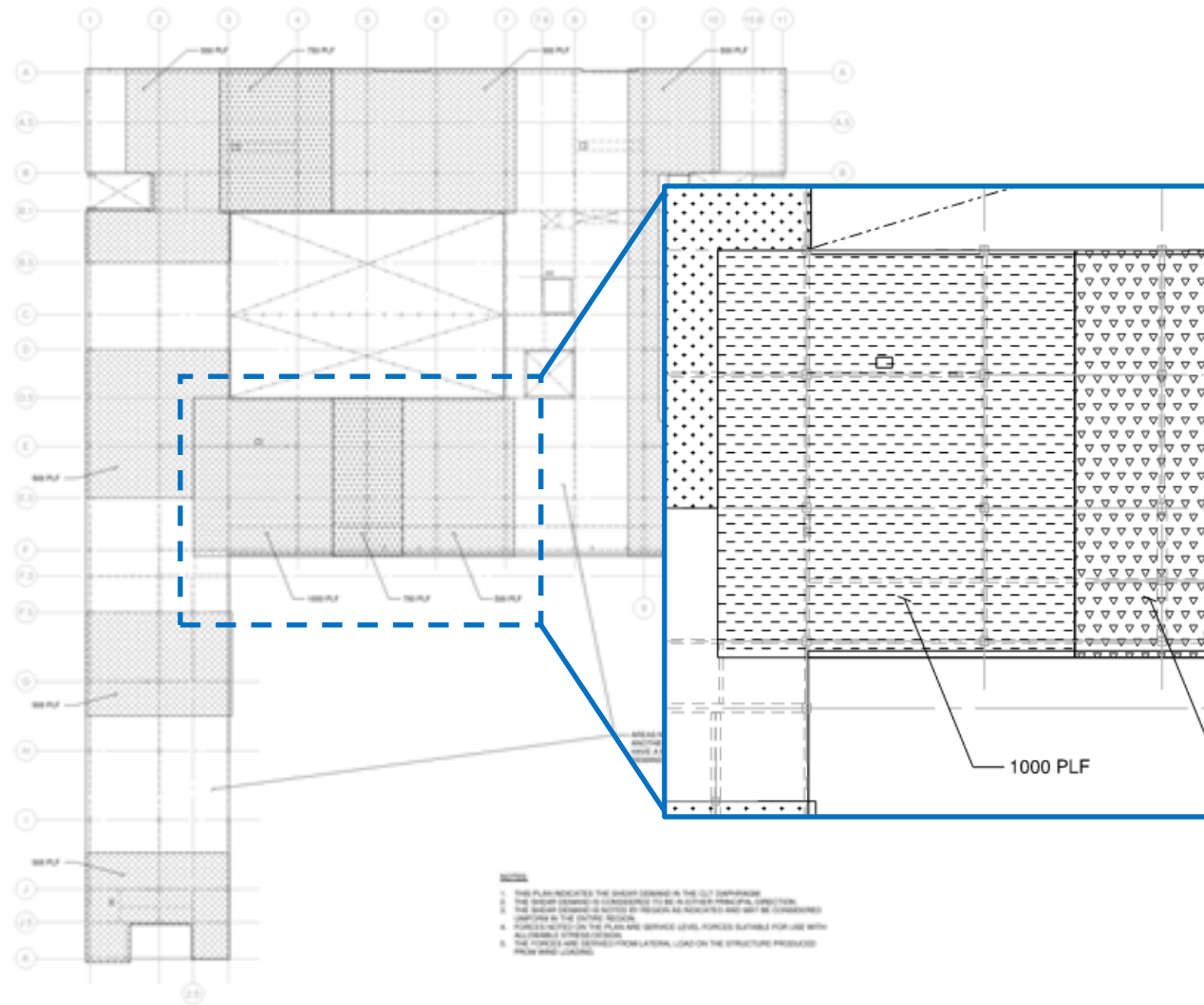
Level 2 Diaphragm



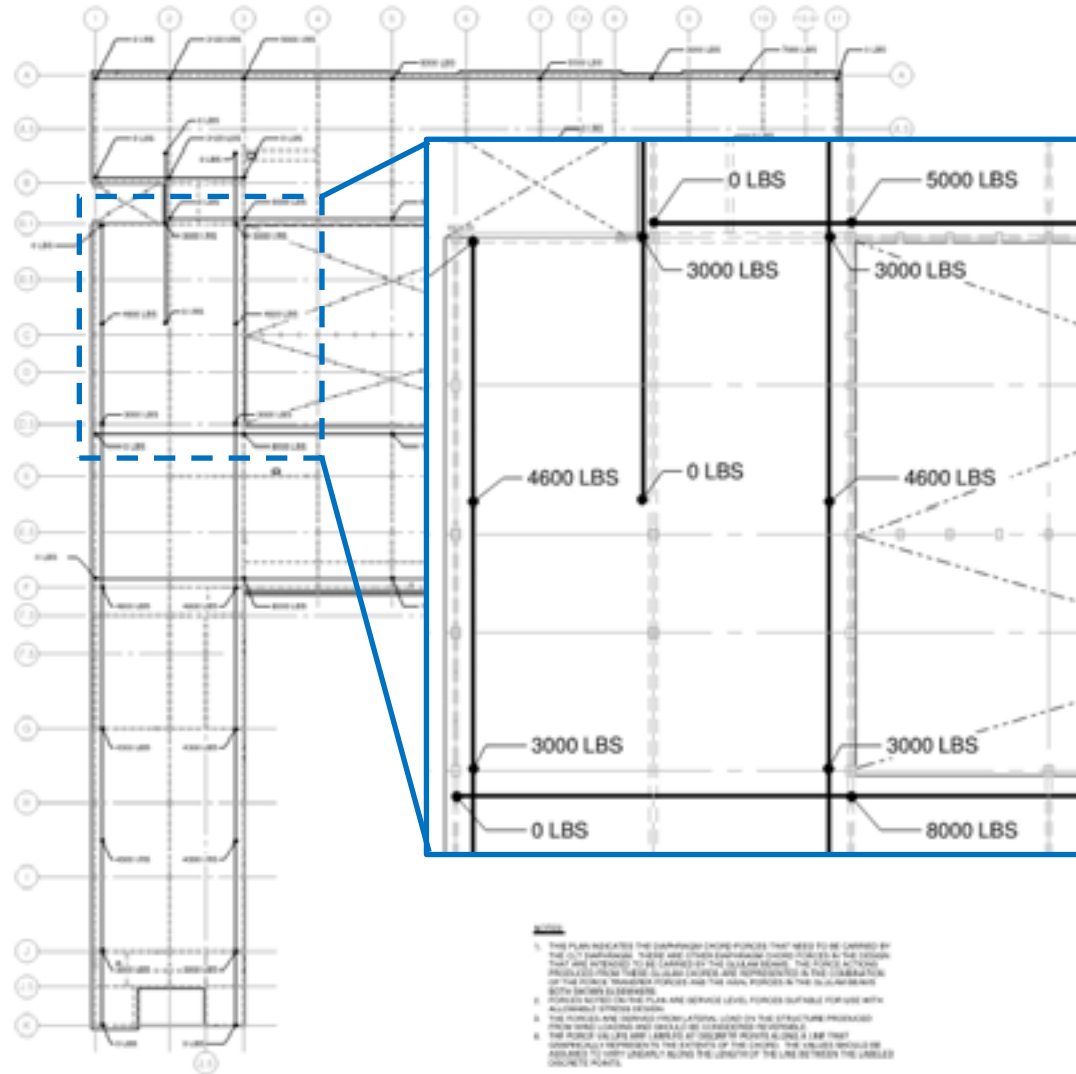
Diaphragm Analysis



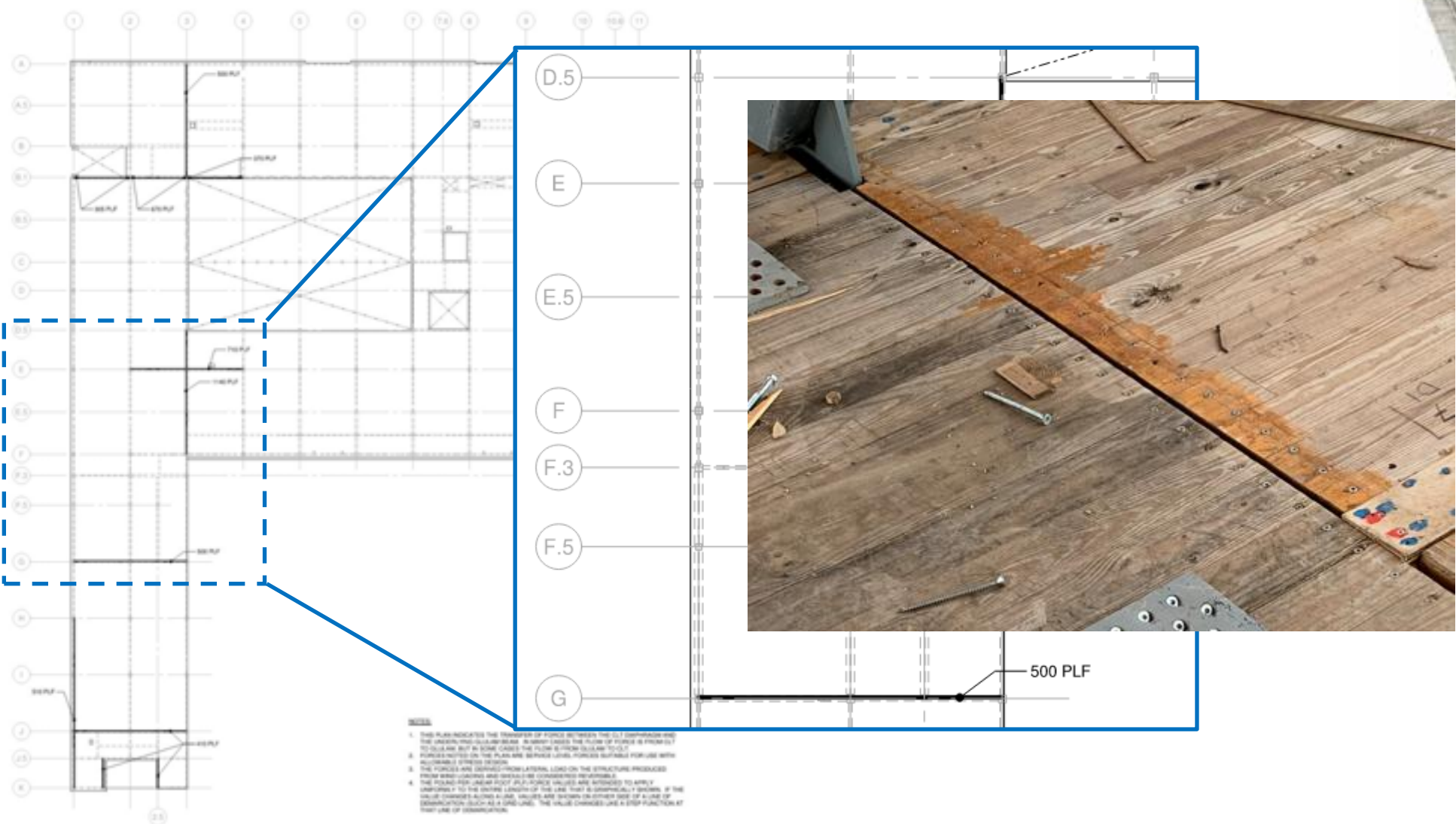
Diaphragm | CLT Shear



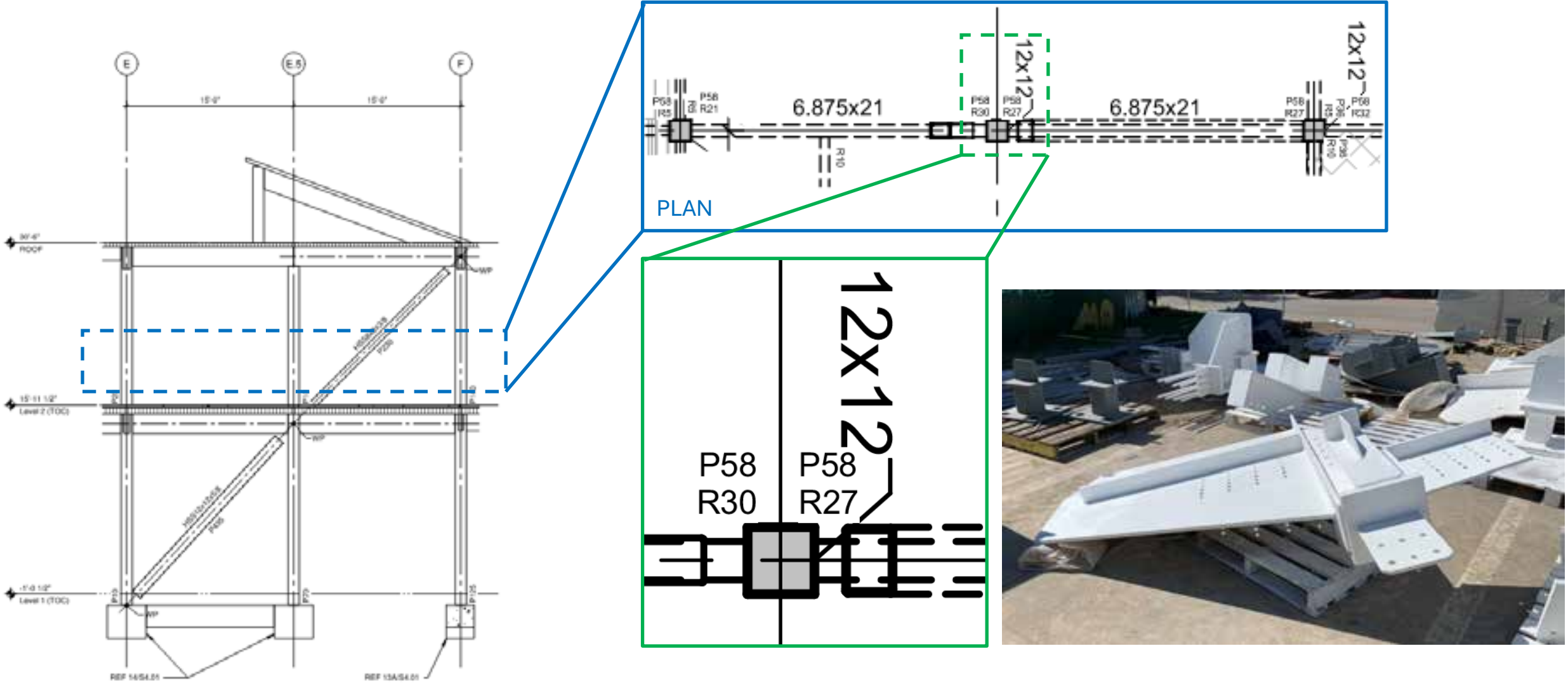
Diaphragm | Chord Forces



Diaphragm | Force Transfer



Diaphragm | Glulam Collector Connection Axial and Through-Forces

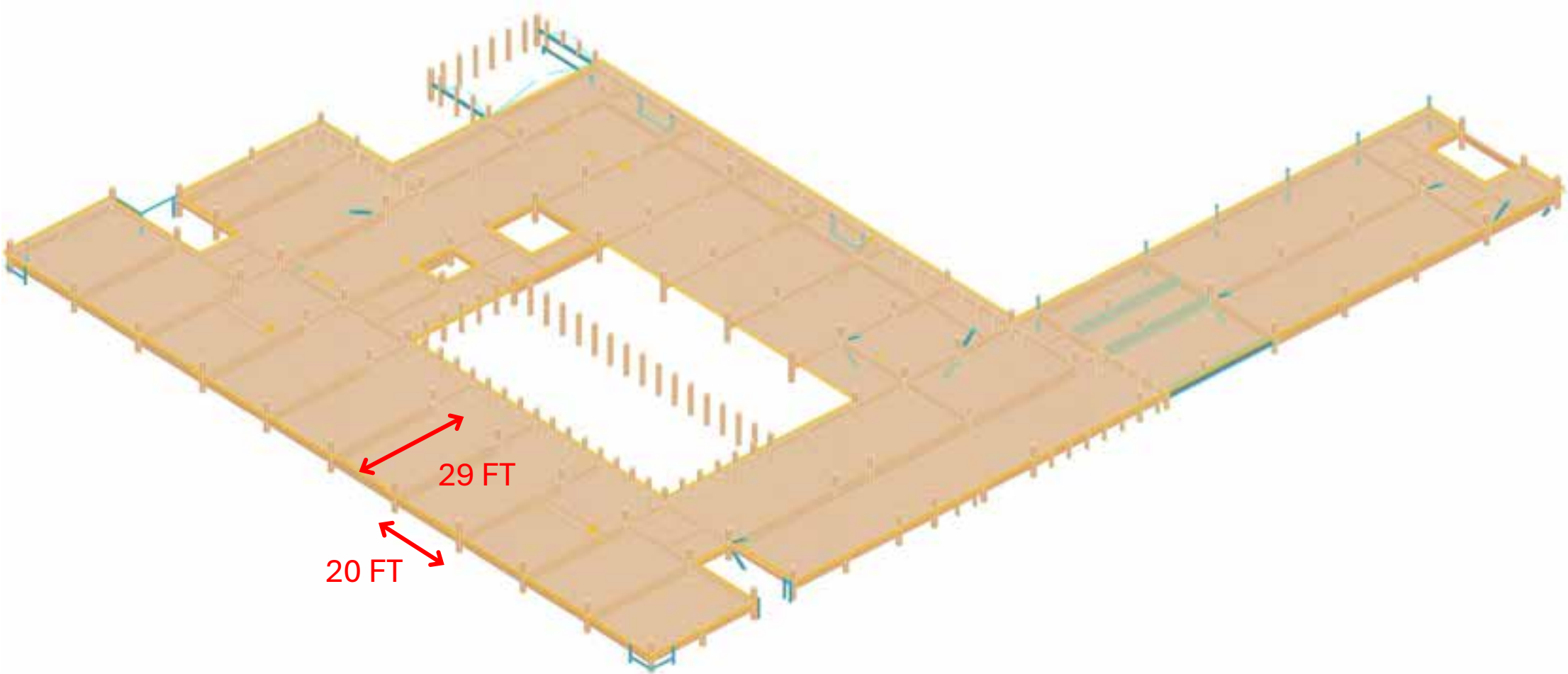








CLT Span | Level 2



Floor System Layup



CLT Layup



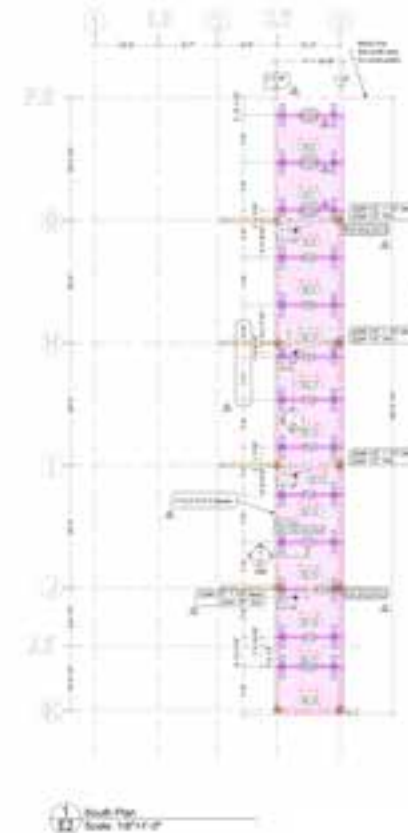
Roof-3 Ply Machine Stress-Rated

Floors-5 Ply Machine Stress-Rated

Typical Laminations – Southern Yellow Pine

Bottom Lamination – Douglas Fir

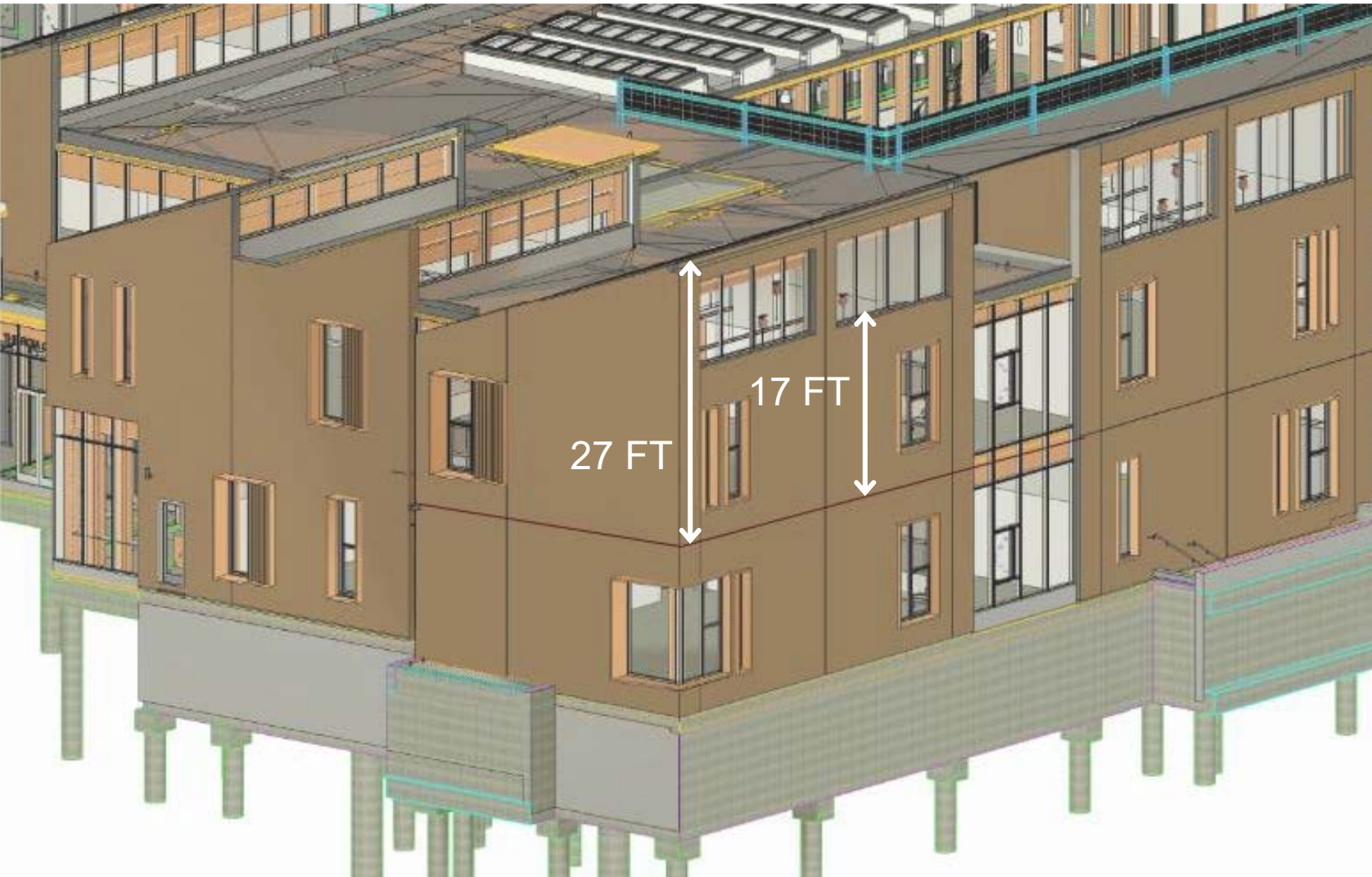
Roof CLT Layout



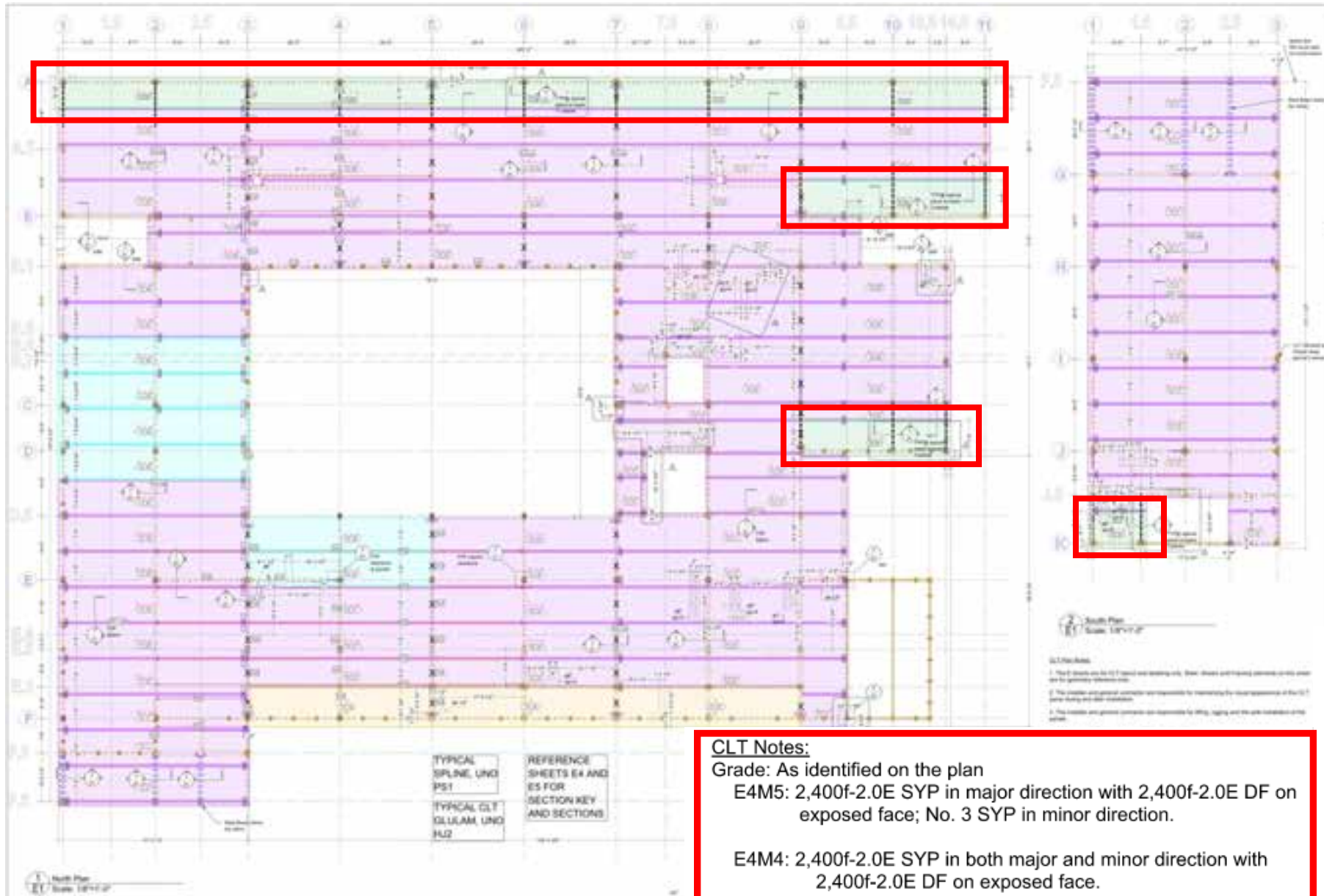
Key:

- Steel
- Glulam
- 3-ply ALT SL-E4M5 CLT Panel
- 3-ply ALT SL-E4M4 CLT Panel
- 5-ply ALT SL-E4M5 CLT Panel
- 5-ply ALT SL-E4M4 CLT Panel
- 5-ply MAXX SL-E4M5 CLT Panel
- 5-ply ALT Transverse SL-E4M5 CLT Panel

Brick Support on CLT



Level 2 CLT Layout



Custom CLT Panel

Table 1. ASD Reference Design Values^(a) for Lumber Laminations Used in IB MAX-CORE CLT (for Use in the U.S.)

CLT Grade	Laminations Used in Major Strength Direction									Laminations Used in Minor Strength Direction								
	Grade & Species	F _b (psi)	E (10 ⁶ psi)	F _t (psi)	F _c (psi)	F _v (psi)	F _s (psi)	F _{c,L} (psi)	G	Grade & Species	F _b (psi)	E (10 ⁶ psi)	F _t (psi)	F _c (psi)	F _v (psi)	F _s (psi)	F _{c,L} (psi)	G
	2400f-2.0E DF ^(b)	2,400	2.0	1,925	1,975	180	60	670	0.51	2400f-2.0E SP ^(b)	2,400	2.0	1,925	1,975	190	60	805	0.57
CLT Grade	Laminations Used in Major Strength Direction									Laminations Used in Minor Strength Direction								
	Grade & Species	F _b (psi)	E (10 ⁶ psi)	F _t (psi)	F _c (psi)	F _v (psi)	F _s (psi)	F _{c,L} (psi)	G	Grade & Species	F _b (psi)	E (10 ⁶ psi)	F _t (psi)	F _c (psi)	F _v (psi)	F _s (psi)	F _{c,L} (psi)	G
E4M4	2400f-2.0E DF ^(b)	2,400	2.0	1,925	1,975	180	60	670	0.51	2400f-2.0E SP	2,400	2.0	1,925	1,975	190	60	805	0.57
	2400f-2.0E SP ^(b)	2,400	2.0	1,925	1,975	190	60	805	0.57		2,400	2.0	1,925	1,975	190	60	805	0.57
E4M5 & E4M5.1	2400f-2.0E DF ^(b)	2,400	2.0	1,925	1,975	180	60	670	0.51	No. 3 SP	450	1.3	250	725	175	55	565	0.55
	2400f-2.0E SP ^(b)	2,400	2.0	1,925	1,975	190	60	805	0.57		450	1.3	250	725	175	55	565	0.55
V22	No. 2 Eastern Hemlock-Tamarack	575	1.1	275	825	170	55	555	0.41	No. 2 Eastern Hemlock-Tamarack	575	1.1	275	825	170	55	555	0.41

For SI: 1 psi = 0.006895 MPa

- (a) Tabulated values are allowable design values and not permitted to be increased for the lumber flat use or size factor in accordance with the NDS. The design values shall be used in conjunction with the section properties provided by the CLT manufacturer based on the actual layup used in manufacturing the CLT panel (see Tables 2 and 3).
- (b) 2400f-2.0E DF MSR lumber laminations are used in the outermost layers and 2400f-2.0E SP MSR lumber laminations are used in the other layers in the major strength direction. The 2400f-2.0E DF MSR lumber laminations in the outermost layers are permitted to be replaced by 2400f-2.0E SP MSR lumber laminations.
- (c) No. 2 DF lumber laminations are used in the outermost layers and No. 2 SP lumber laminations are used in the other layers in the major strength direction.
- (d) No. 1/No. 2 SPF lumber laminations are used in the outermost layers and No. 2 SP lumber laminations are used in the other layers in the major strength direction.



Thank you!

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

Margaret Sledge, *AIA, LEED AP BD+C, NOMA*
Senior Associate, Sustainability Director

msledge@bcj.com

Bohlin Cywinski Jackson | www.bcj.com

Jeff Jansing, *P.E.*
Senior Principal

jjansing@walterpmoore.com

Walter P Moore | www.walterpmoore.com

