

SEATTLE
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Enclosure Design for Mass Timber

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Course Description

Larger and taller mass timber buildings are becoming common in North America. These buildings typically utilize CLT or NLT panels, glulam beams and columns, and new engineered timber components to meet the structural and fire requirements associated with greater heights. With these larger wood structures and heavier timber components comes the need for efficient building enclosure assemblies that can be installed quickly on tight sites and are in many cases new and unique to the industry. Prefabricated building enclosure elements are now also commonly used. This presentation shares guidance on building enclosure design and detailing best practices for mass timber buildings. It includes case studies and lessons learned from the design, construction, and monitoring of enclosures for recently completed projects.



Learning Objectives

At the end of this course, participants will be able to:

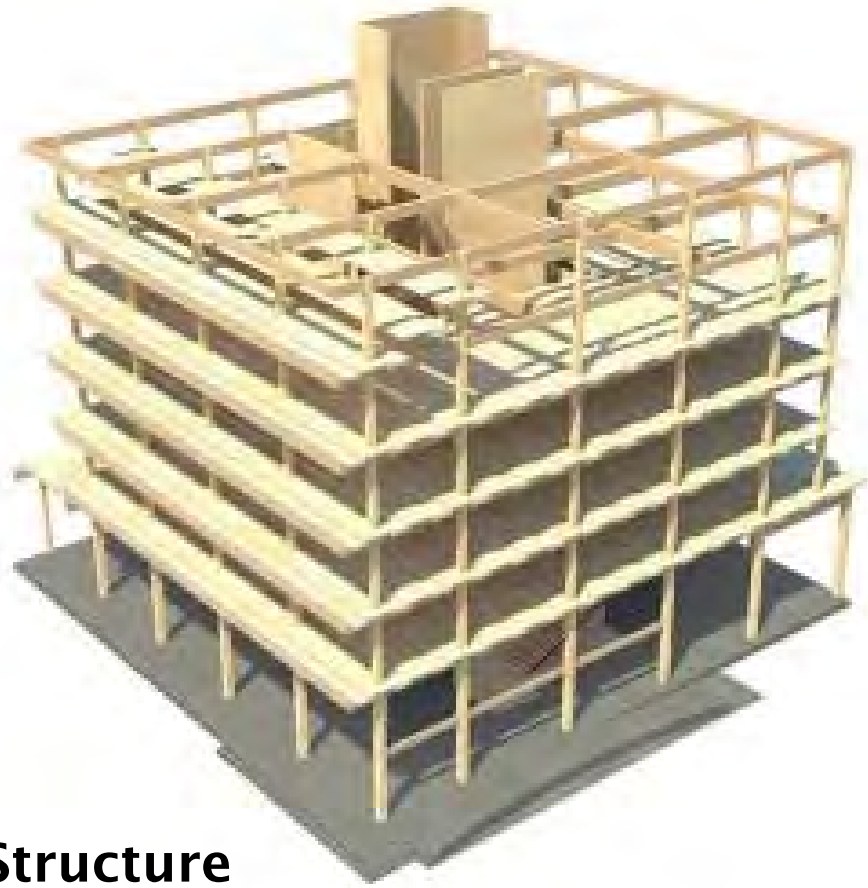
- Review building science fundamentals and building enclosure design considerations for mass timber buildings.
- Discuss common details used for mass timber wall and roof enclosure assemblies.
- Highlight the potential for increased construction efficiency through the use of prefabricated enclosure assemblies.
- Referencing case studies and details from recently completed mass timber projects, demonstrate lessons learned and best practices associated with enclosure assemblies.

OUTLINE

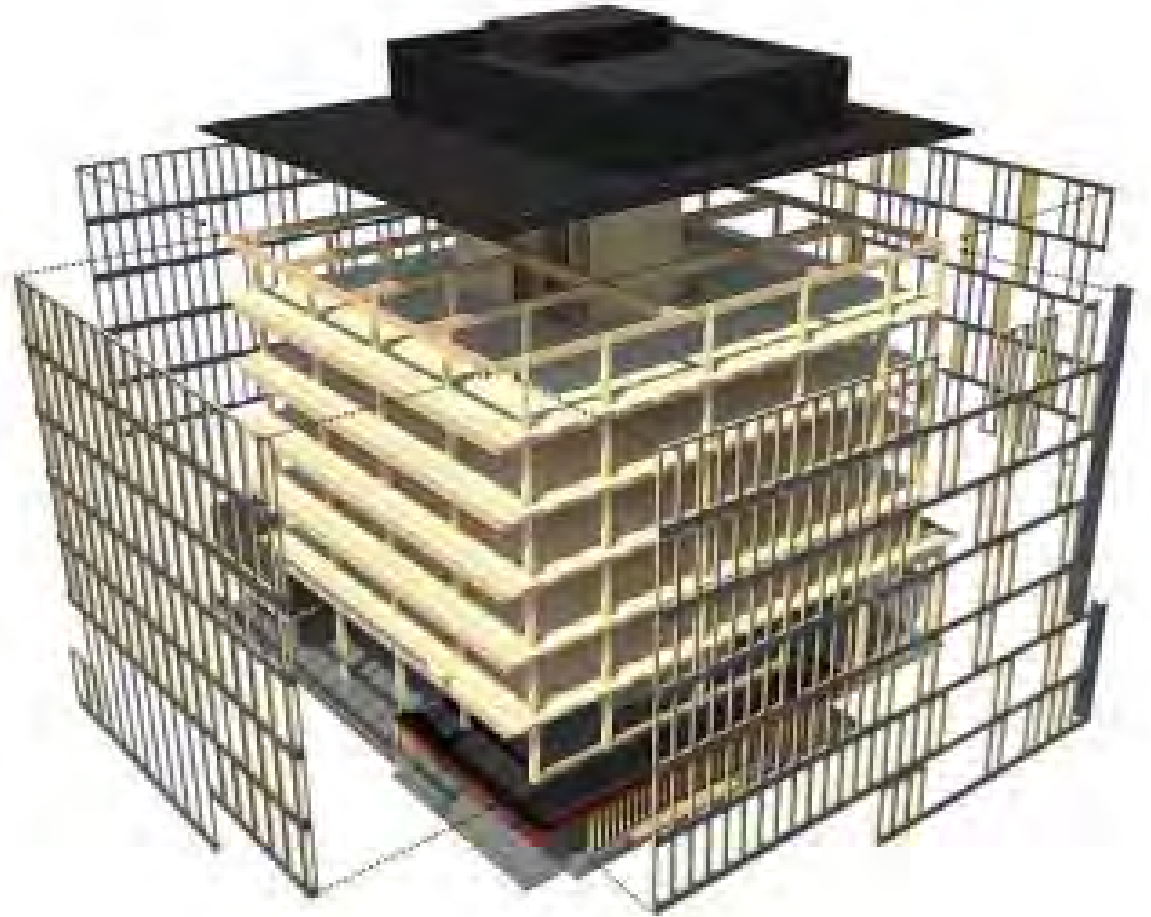
1. Building enclosure design + mass timber
2. Lessons learned
3. Case Study – Wood Innovation Center
4. Case Study – Brock Commons

An aerial photograph of a large building under construction. The building features a prominent green roof on one side and light-colored wooden cladding on the other. The structure is surrounded by construction materials and equipment. In the background, there are trees and a parking lot with several cars. The text "Building Enclosure Design" is overlaid in the center of the image.

Building Enclosure Design



Structure



The Building Enclosure — ↗

Tall Wood Structures

- Fast
- Sensitive to moisture
- Greater movement – shrinkage
- Code Challenges?
- Mixed steel, concrete, and wood
- Not the same as stick-built
- Not the same as high-rise



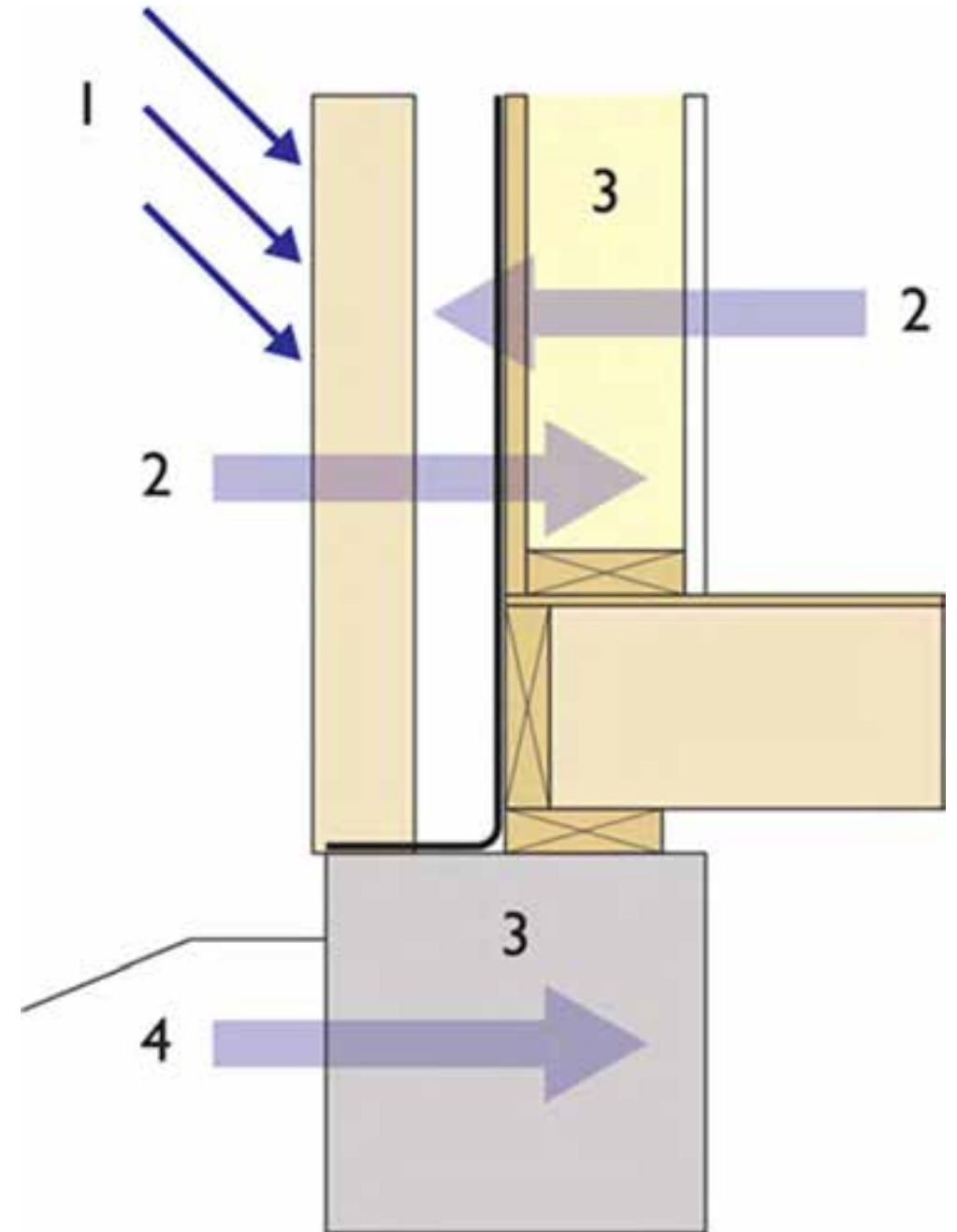
Tall Wood Building Enclosures

- Need for speed
- Protect wood structure from inclement weather
- Robust materials and systems, high-rise appropriate
- Tolerant of movement
- Thermally efficient



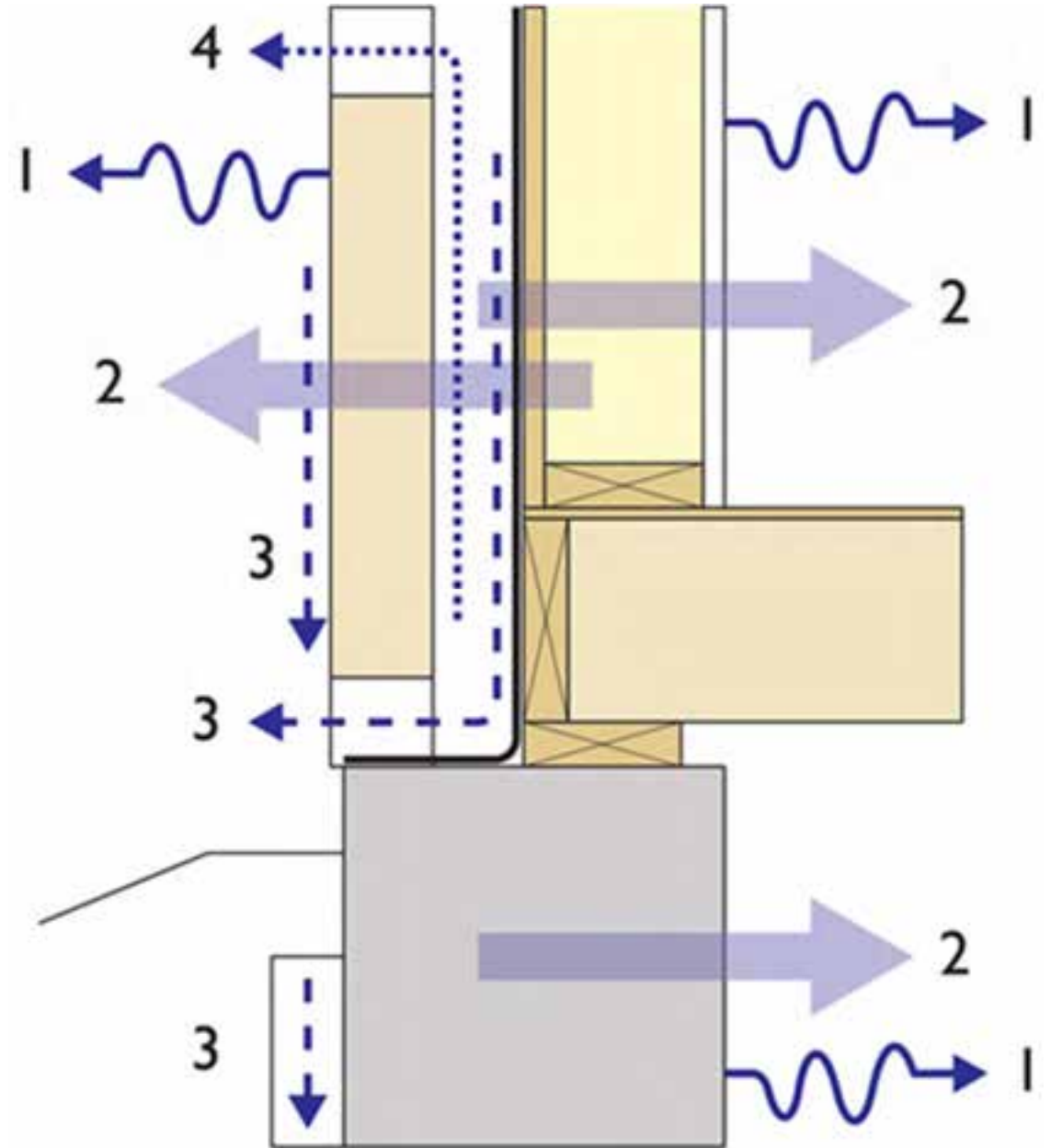
Water Management - Wetting

1. Precipitation
2. Vapor / air movement
3. Construction moisture
4. Groundwater



Water Management - Drying

1. Evaporation
2. Vapor / air movement
3. Drainage
4. Ventilation drying

















Lessons Learned

The image shows an interior view of a building under construction. The structure consists of a grid of thick concrete columns and horizontal beams. The floor is covered with wooden panels, likely formwork, and has white lines drawn on it, possibly for layout or safety. The perspective is looking down a central corridor formed by the columns. In the background, through the open structure, other buildings and a cityscape are visible. The lighting is somewhat dim, with a warm, slightly orange tint, possibly from the time of day or the lighting used in the photo.





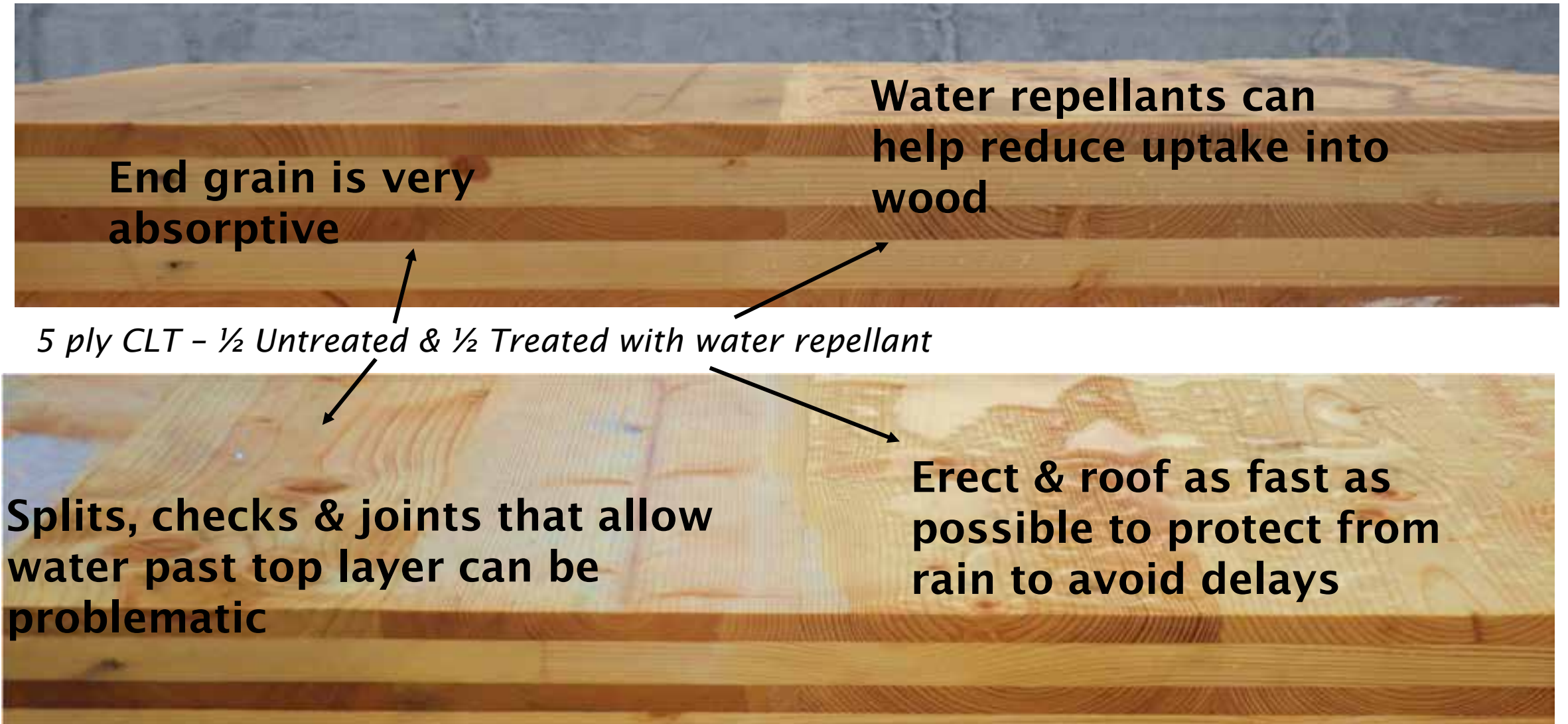
Lessons Learned - Roofs

- Protect large wood roofs from rain
 - but not too late
- Mechanical drying of wetted roofs is slow & causes costly construction delays



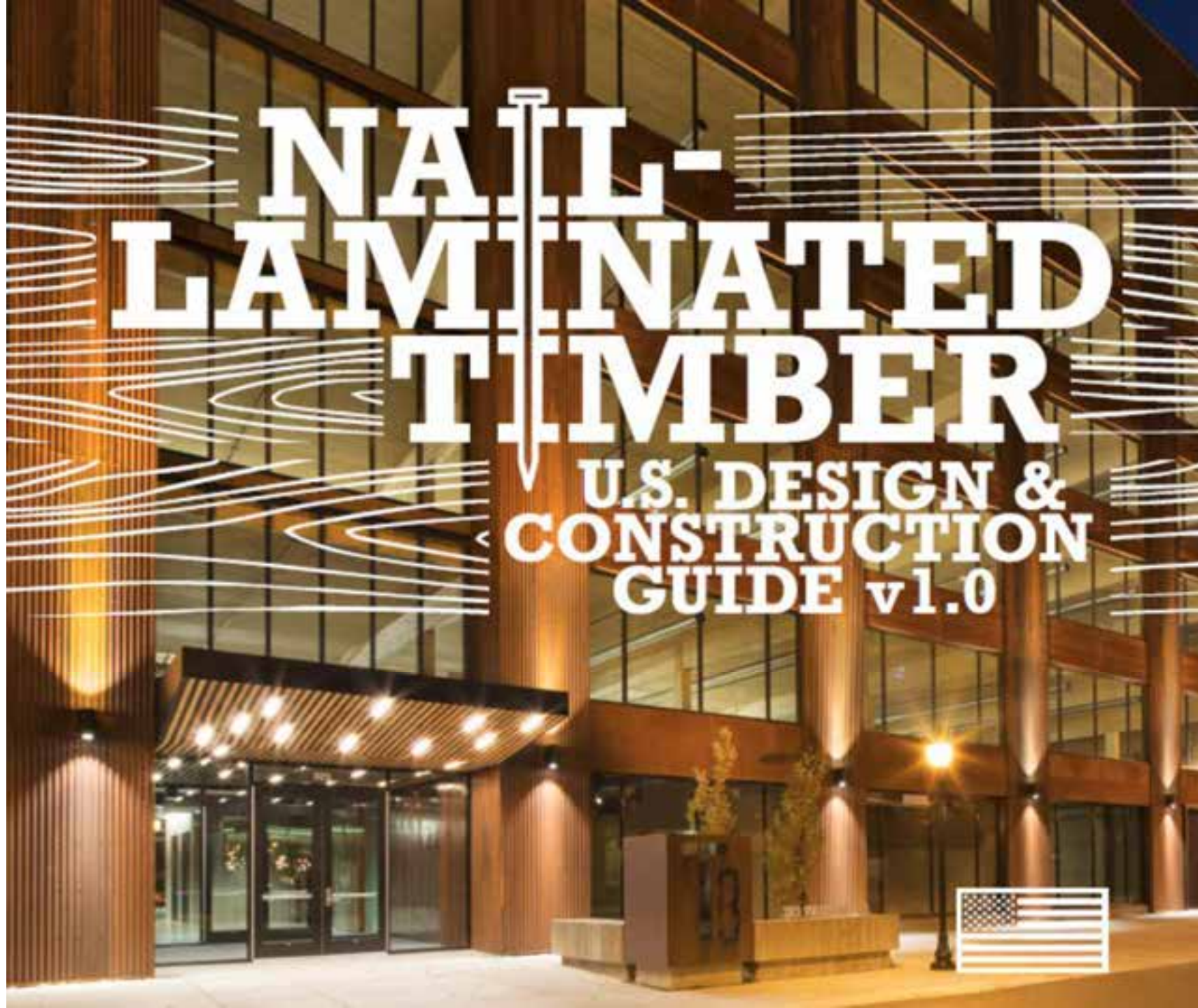


Industry Lessons - Protection



NAIL- LAMINATED TIMBER

**U.S. DESIGN &
CONSTRUCTION
GUIDE v1.0**



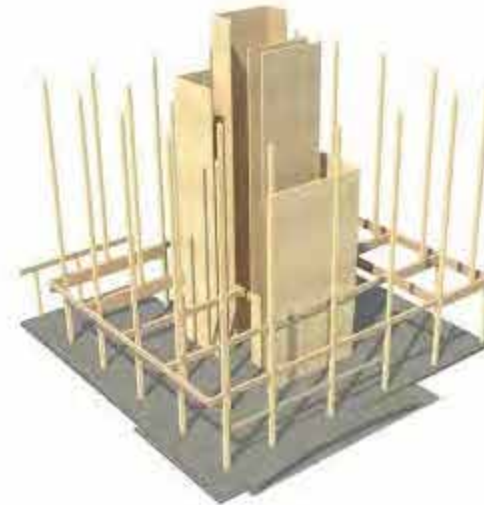
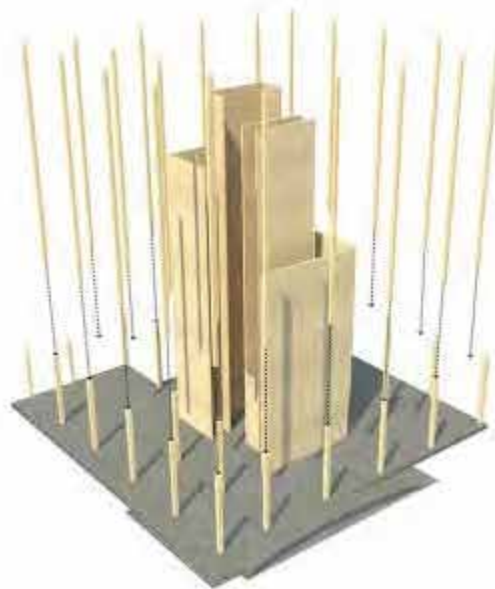
Wood Innovation Center

The image shows the interior of a modern building with a prominent wood structure. The ceiling is composed of large, horizontal wooden beams and planks. The walls are also made of wood, with some sections featuring large windows that look out onto a cityscape. A person is standing in the center of the room, providing a sense of scale. The floor is made of light-colored wood planks. The overall atmosphere is warm and natural.

Taller Wood Building Precedents



WIDC – Structure & Enclosure Systems



Wood Innovation Design Center

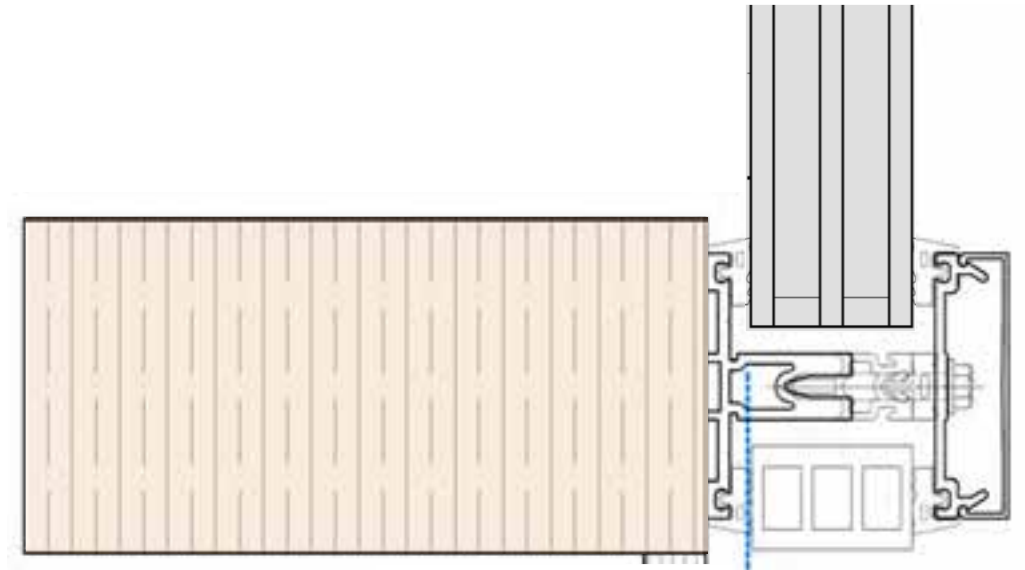
- 6 'tall' levels (equivalent to 8 levels, 98' tall)
- CLT shear walls, glulam columns with glulam beams and staggered CLT floor & roof structure
- Thermal performance design targets
 - R-40 roof
 - R-25 walls
 - R-5 wood curtainwall glazing
- Pre-fabricated design for infill walls and wood curtain wall



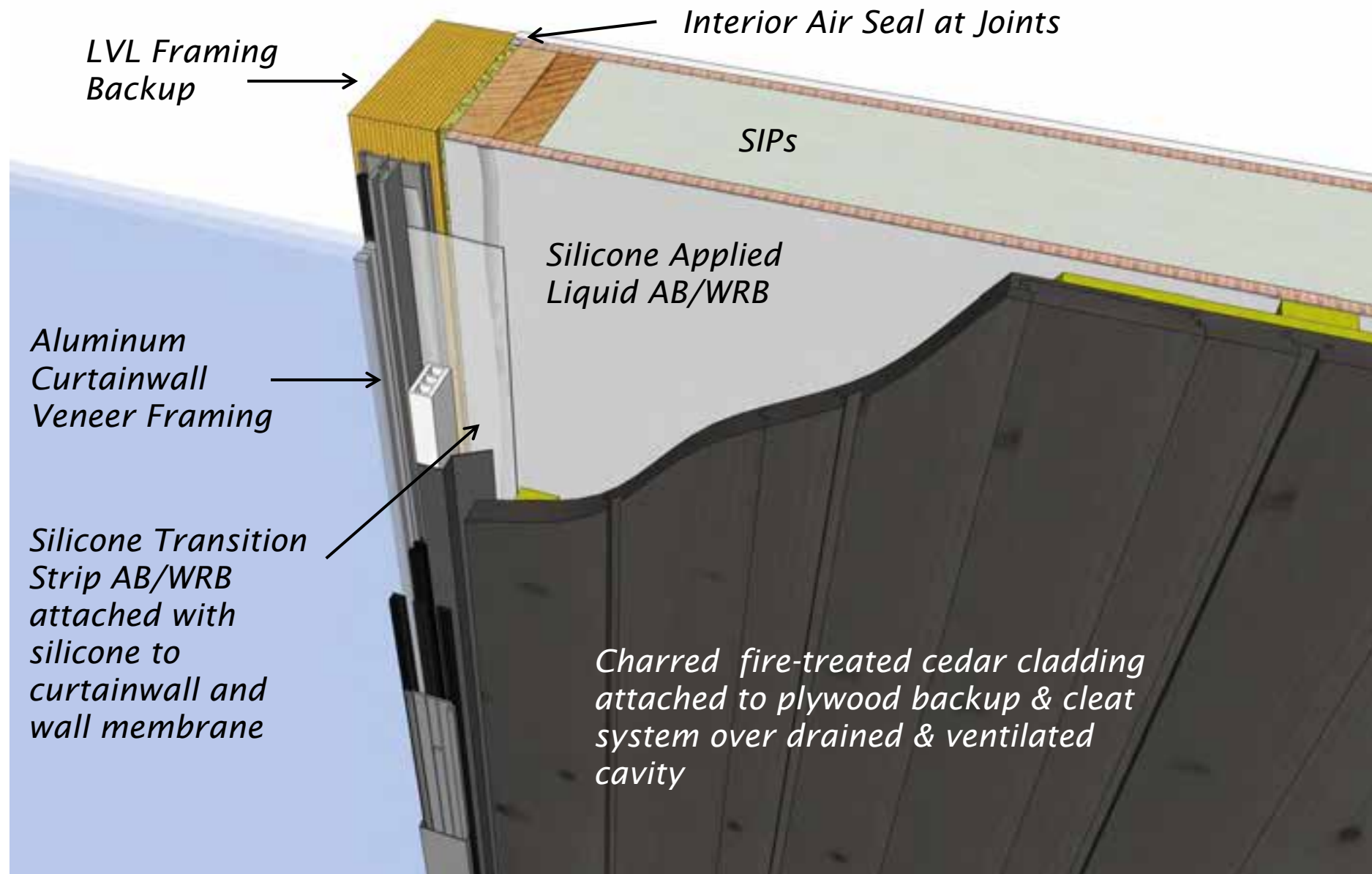
*Michael Green Architecture (MGA) –
Contractor: PCL Construction*

Stick-Built Wood Veneer Curtainwall

- Aluminum veneer curtainwall framing over LVL mullions - installed as individual window units, ground bearing
- Stick built/site glazed with triple glazed IGUs, argon filled, dual low-e coatings (U-0.15)
- R-5 (U-0.20) overall thermal performance



Curtainwall to SIPs Interface





Charred Fire-Treated Cedar Cladding Panels

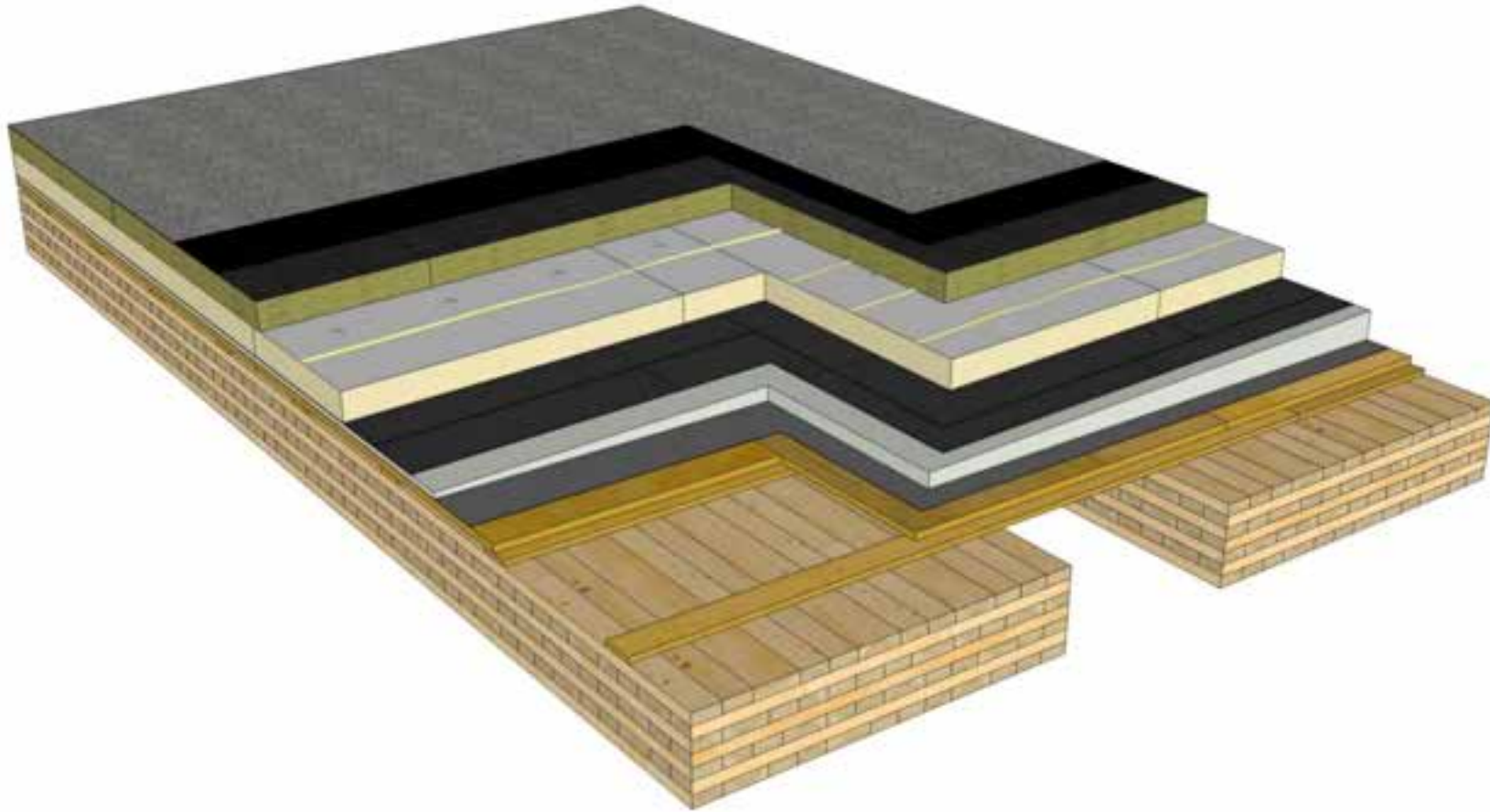


John Boys, Nicola Log-works

Charred Fire-Treated Cedar Cladding Panels



Conventional Roof Assembly



Conventional Roof Assembly



Wood Innovation Design Center



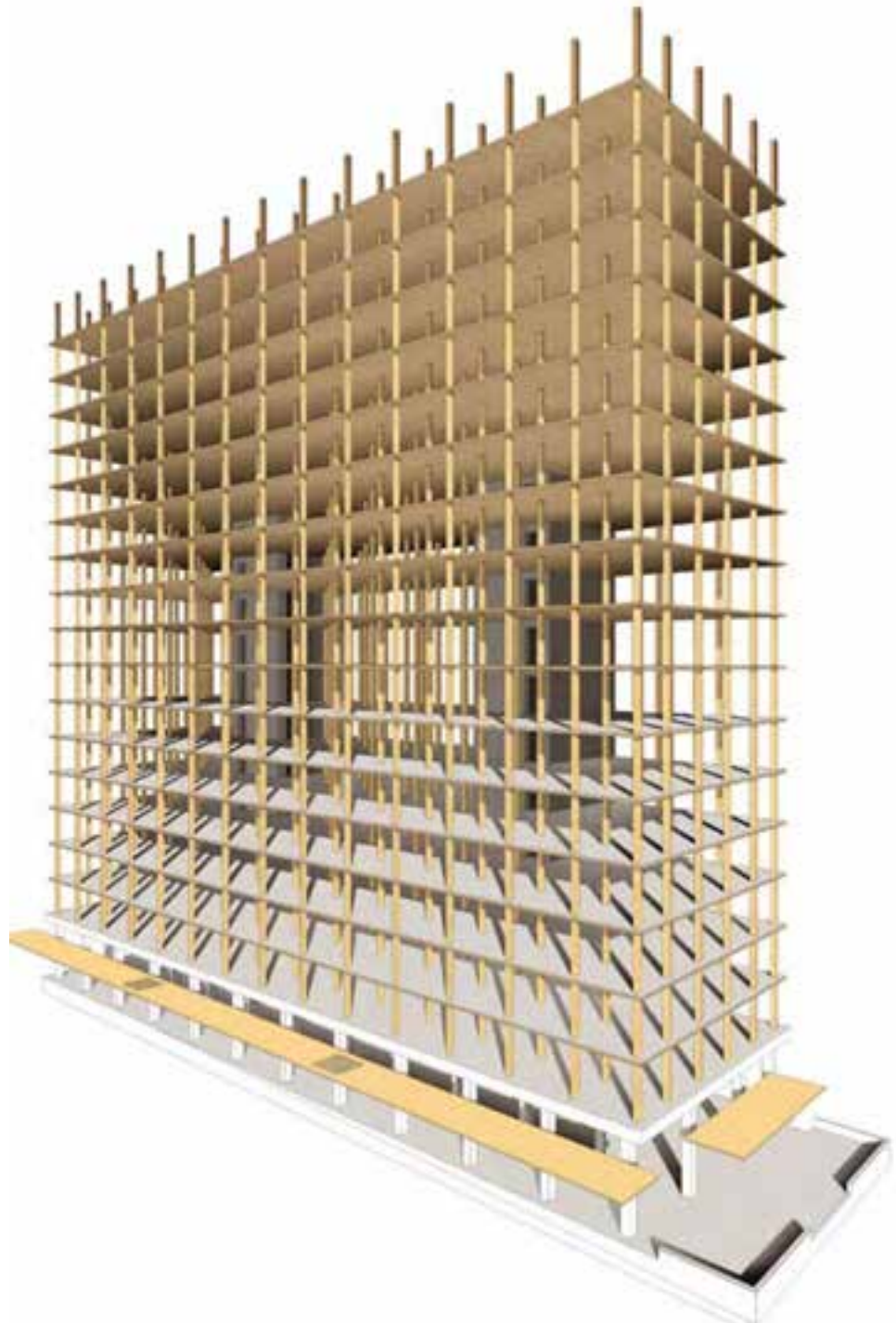
WIDC – Summary

- Durable and energy efficient
- High performance materials and systems
- Small panel pre-fabrication
- Required full exterior access during construction
- Scaffolding, exterior sealants, transition details



A low-angle photograph of a modern building's facade, showing a series of dark, rectangular windows or panels arranged in a grid. The building is angled upwards towards the right. In the background, a large construction crane with a yellow lattice boom is visible against a clear blue sky. The crane's boom extends across the upper portion of the frame. The overall image has a slightly desaturated, blue-tinted appearance.

Brock Commons



Initial Challenges

- Vancouver = Temperate rainforest
- How to protect mass timber from rain during construction in any season?
- Enclosure must keep up with pace of structure
- How to enclose & seal the walls quickly and not be slowed by inclement weather?



UBC Brock Commons- What Wasn't Feasible



Unitized Curtain Wall Option

Problem: Cost, Schedule, Energy

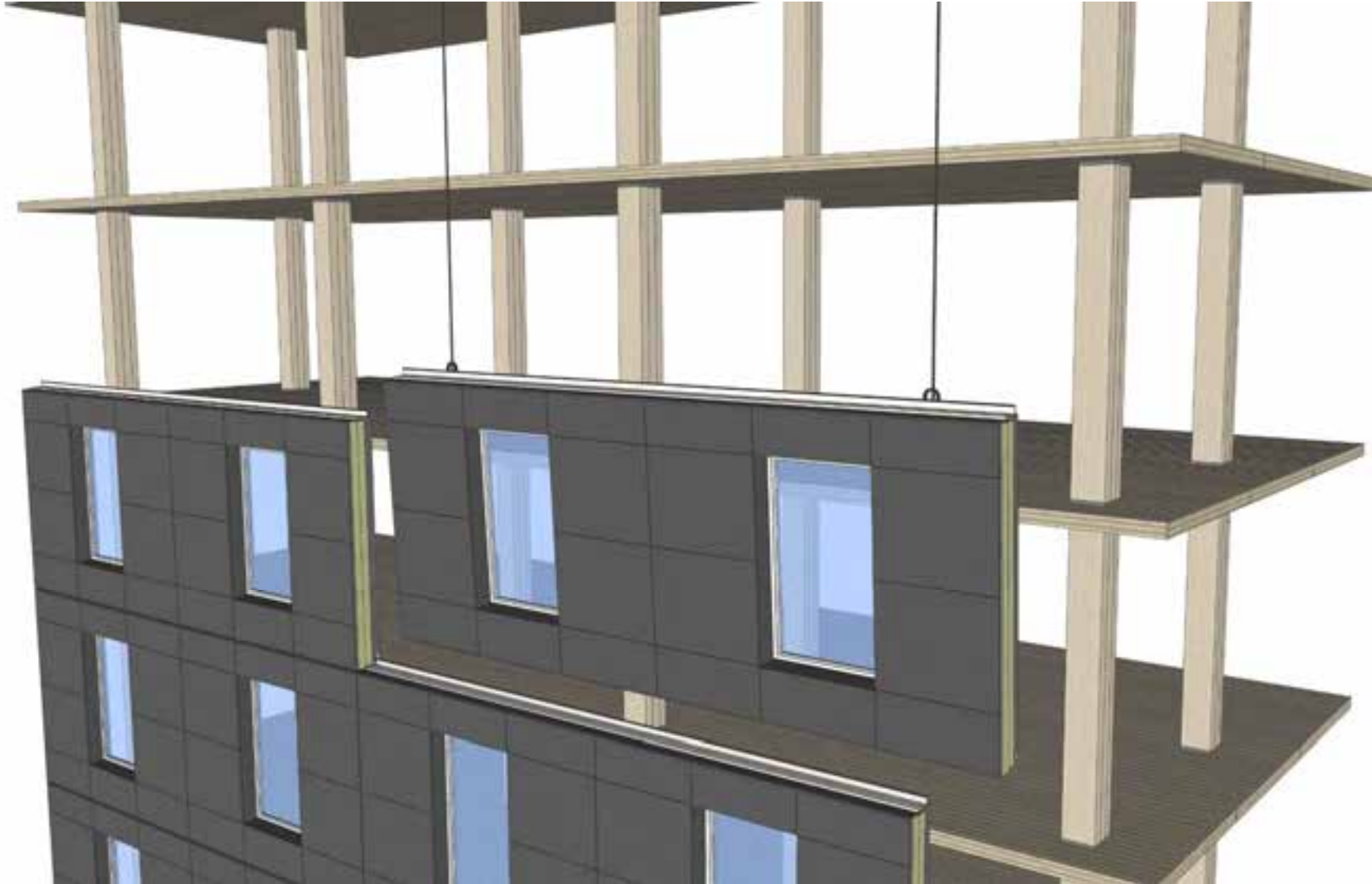


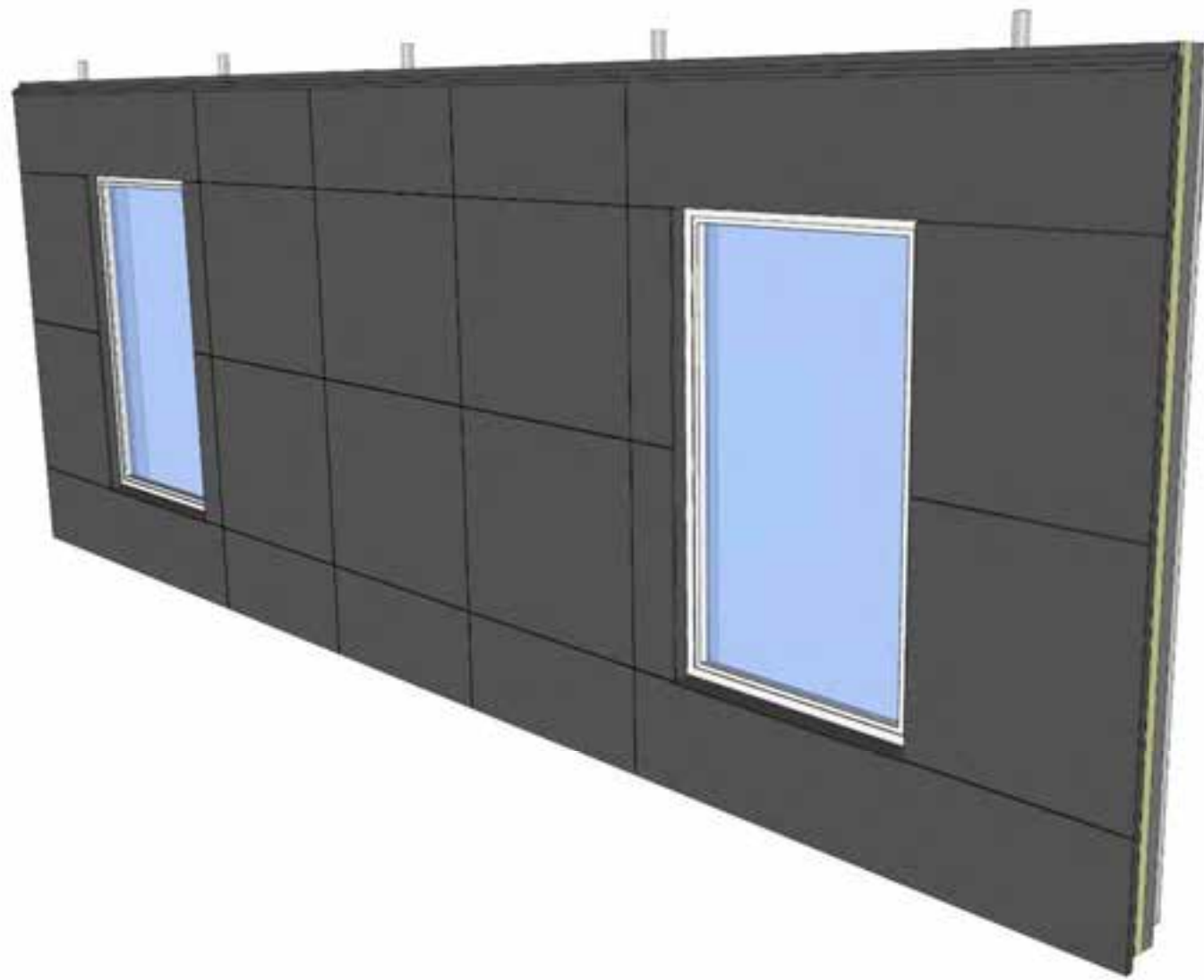
Small Panel Prefabrication Wall – Precedents

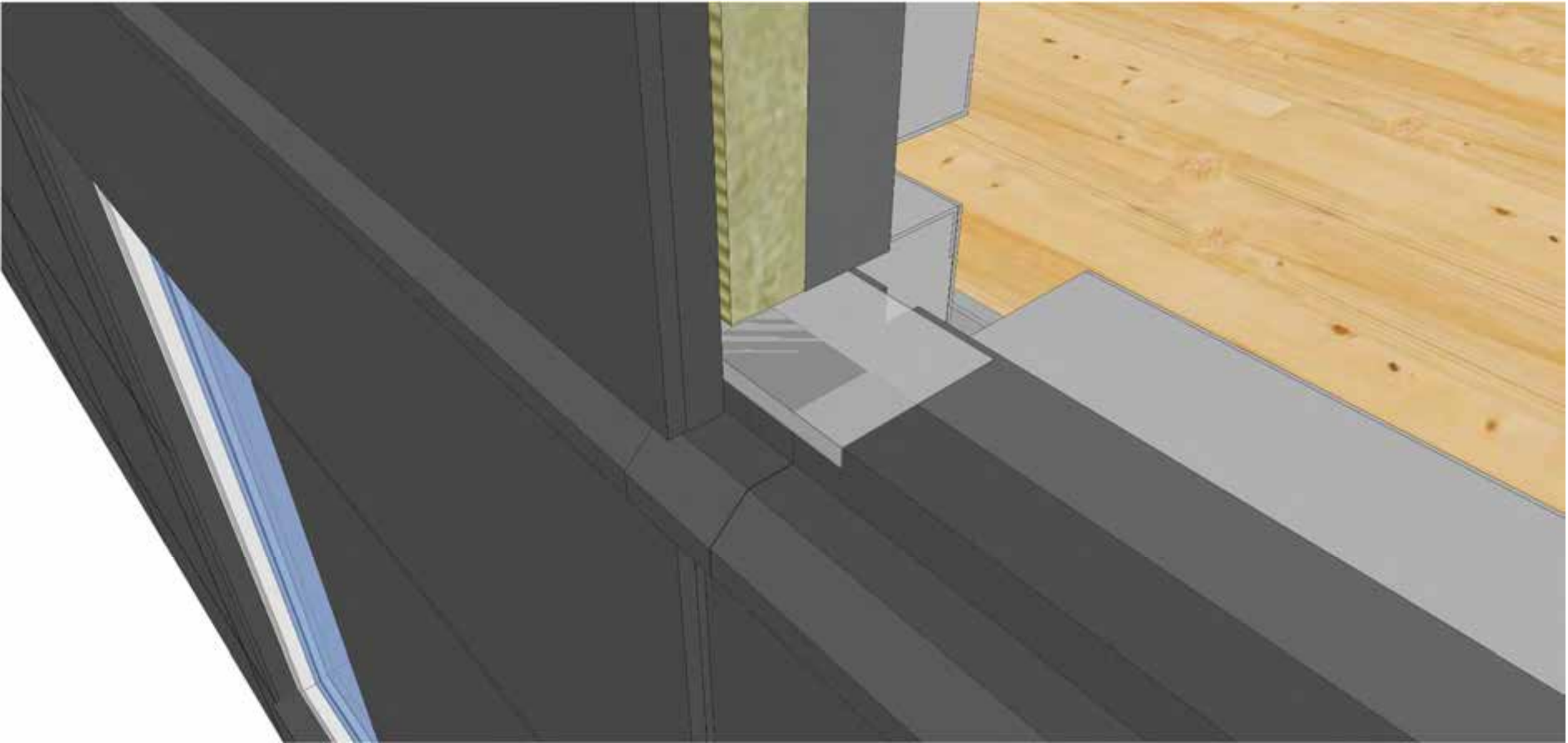
Problem: Schedule

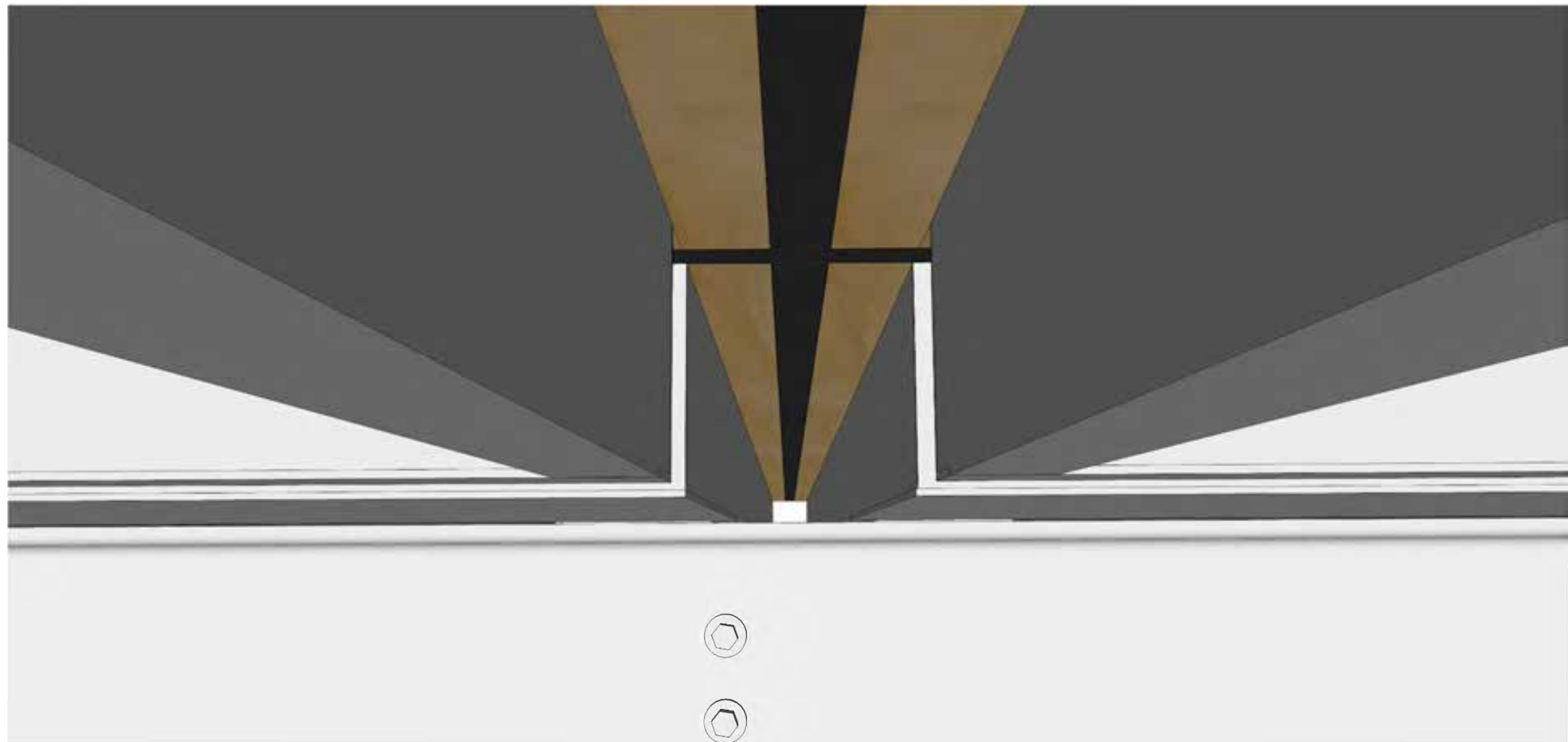


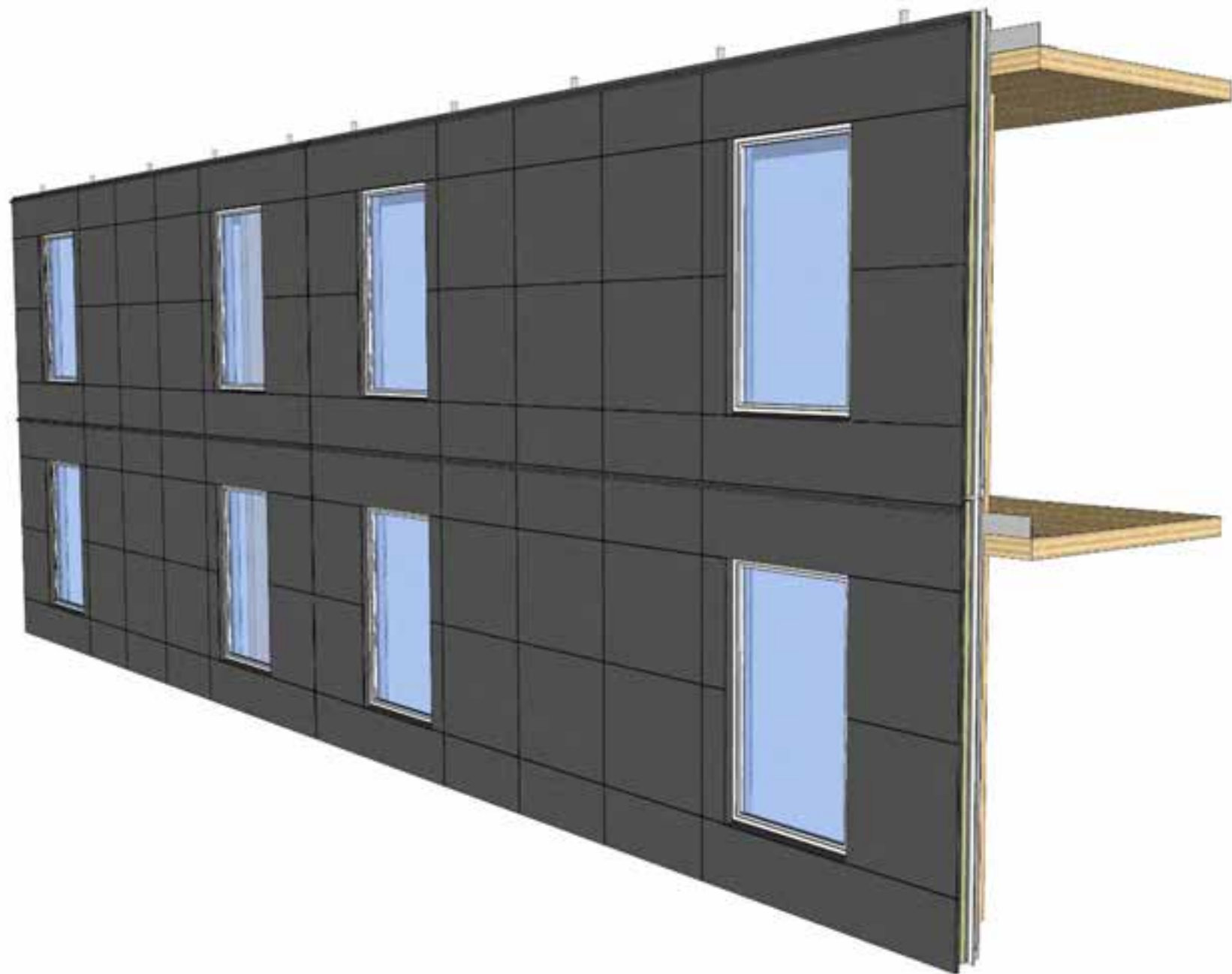
Tall Wood Prefabrication Option – Large Panel with Pre-installed Windows





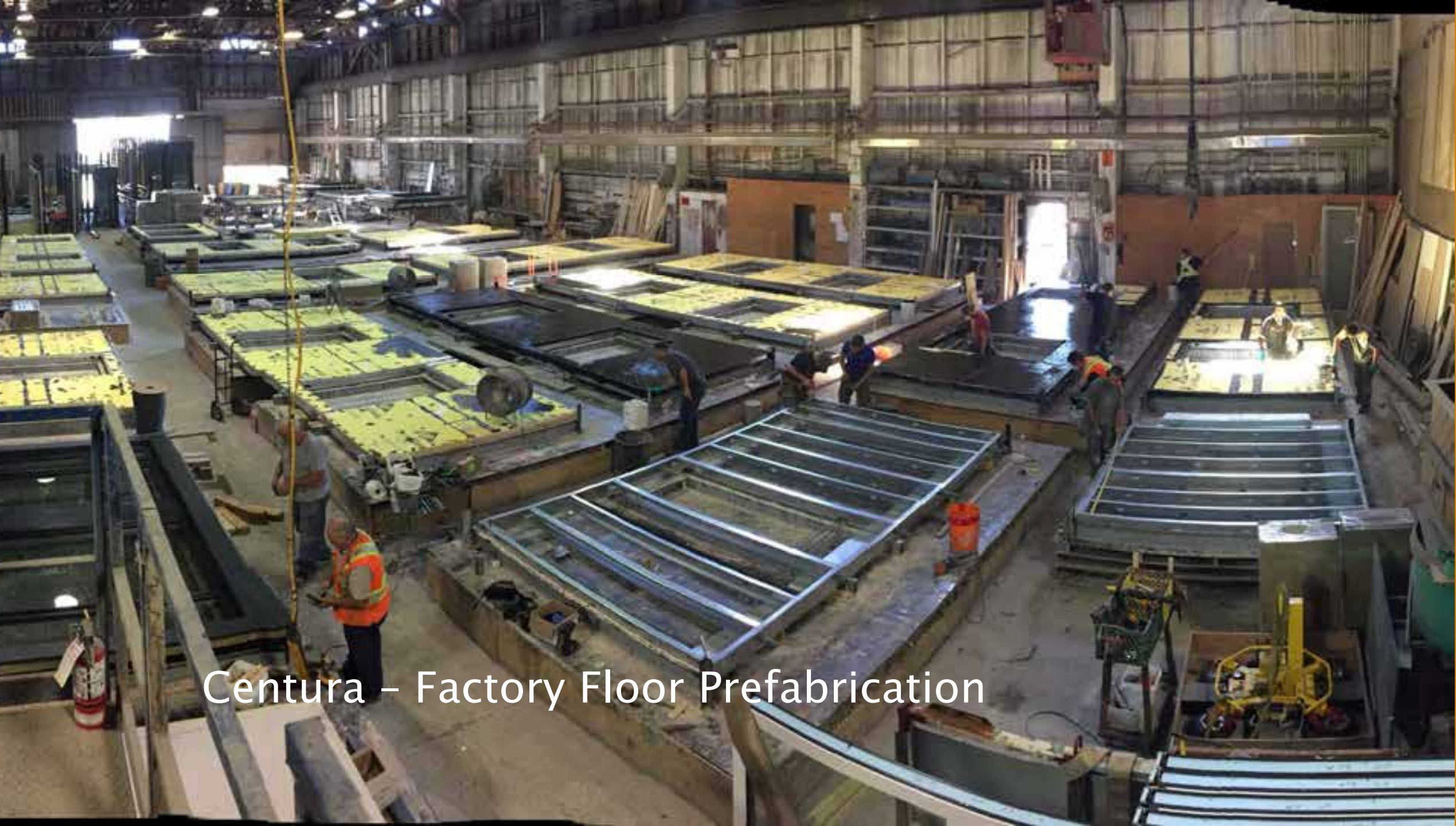








Laboratory Mockup & Physical Testing




Centura – Factory Floor Prefabrication



Site Installation – at Pace with Structure – 1 floors/day



WEEK: 1 

TIMELAPSE 

UBC
BROCK COMMONS

WOOD 
CONSTRUCTION

STARTS 

JUNE/6

WOOD 





Discussion + Questions

cshane@rdh.com

Learn more at
rdh.com



UBC Brock Commons - Façade Design Criteria

Fast installation
– 1 floor/day &
water tight to
protect
structure

Durable &
High-
performance

Thermally
Efficient,
>R-16
effective walls

Resistant to
water & able
to install in
rain

Installed
without access
to exterior –
no sealing or
finishing

Inexpensive,
<\$50/sqft
installed &
finished

Pre-installed
cladding &
windows

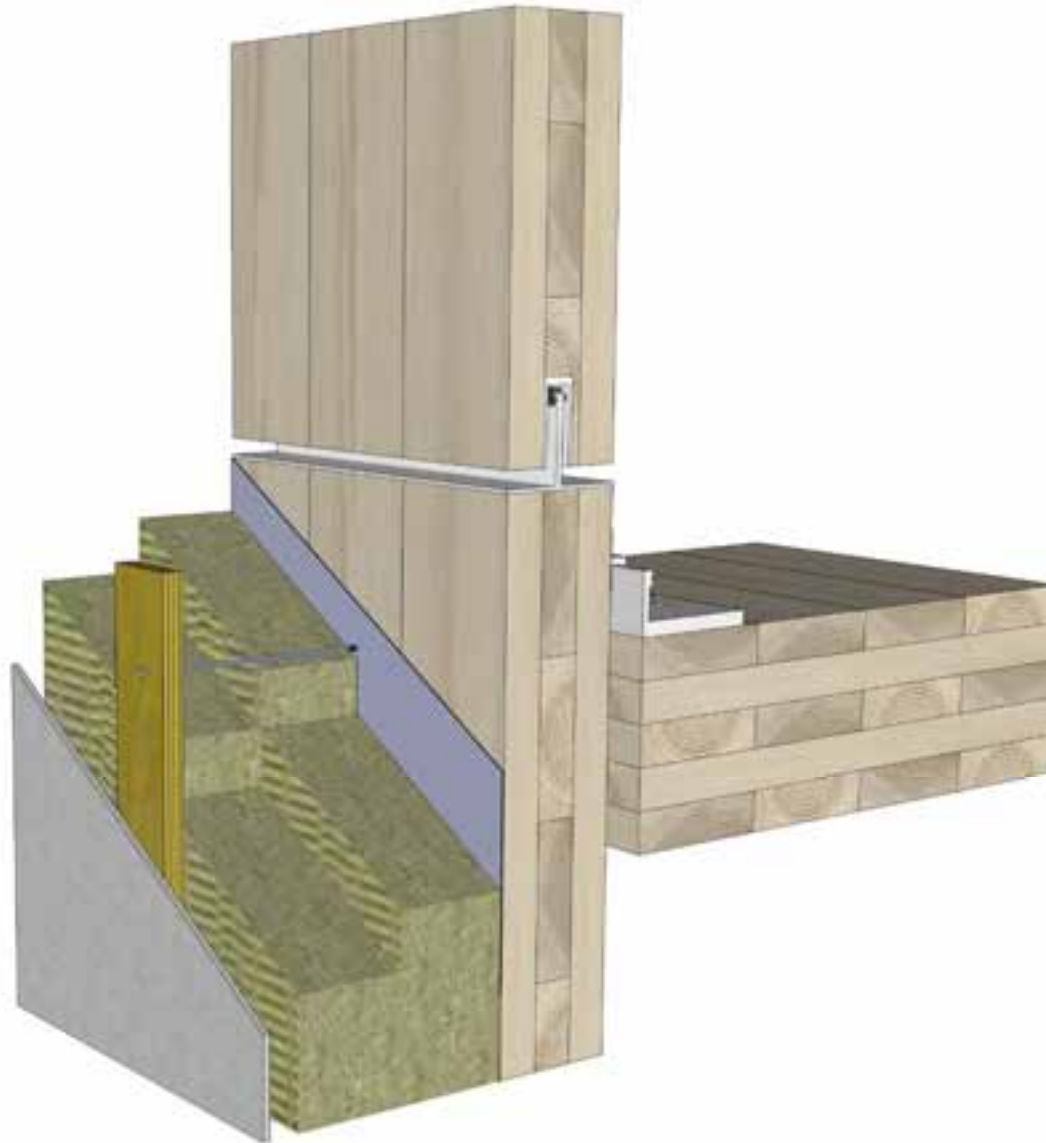
Precedents for Prefabrication of Tall Wood



Precedents for Prefabrication of Tall Wood



Future Facades?



UBC Brock Commons - The 4 Panel Contenders!

Pre-Cast Concrete Sandwich Panels



Steel Stud Framed Panels



Wood Stud framed or CLT Panels



Aluminum Window-wall



Not thermally efficient enough for project nor met the design intent, but kept as contingency and costed