SEATTLE
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Enclosure Design for Mass Timber

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RDH

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Making Buildings Better

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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

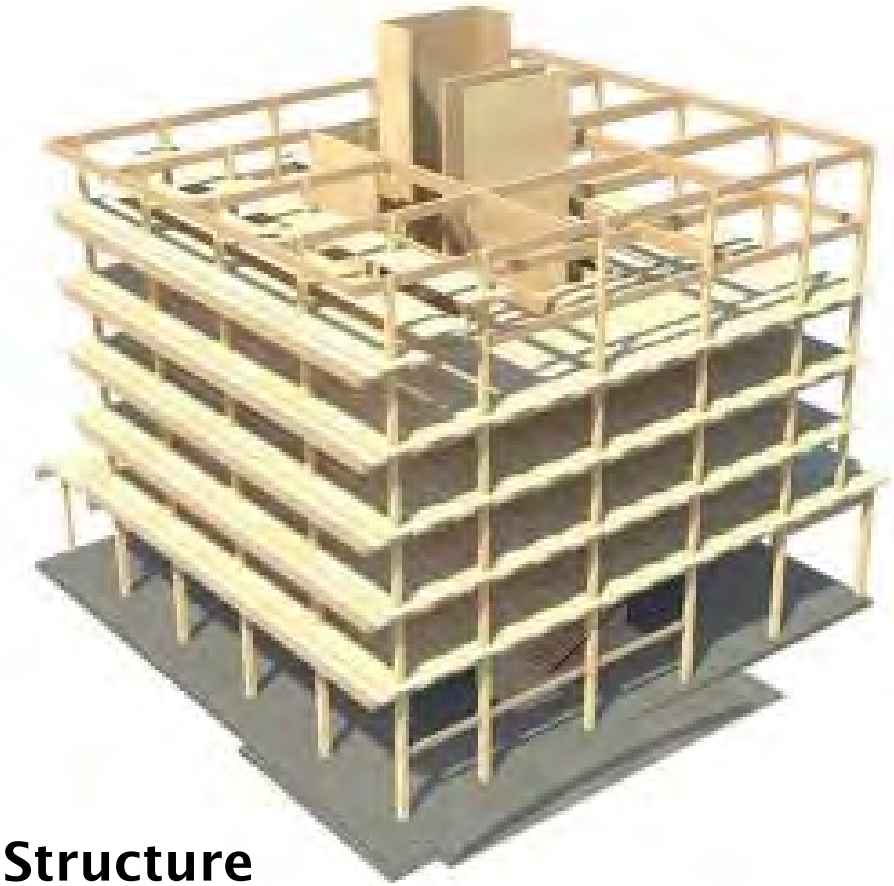
At the end of this course, participants will be able to:

- → 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.

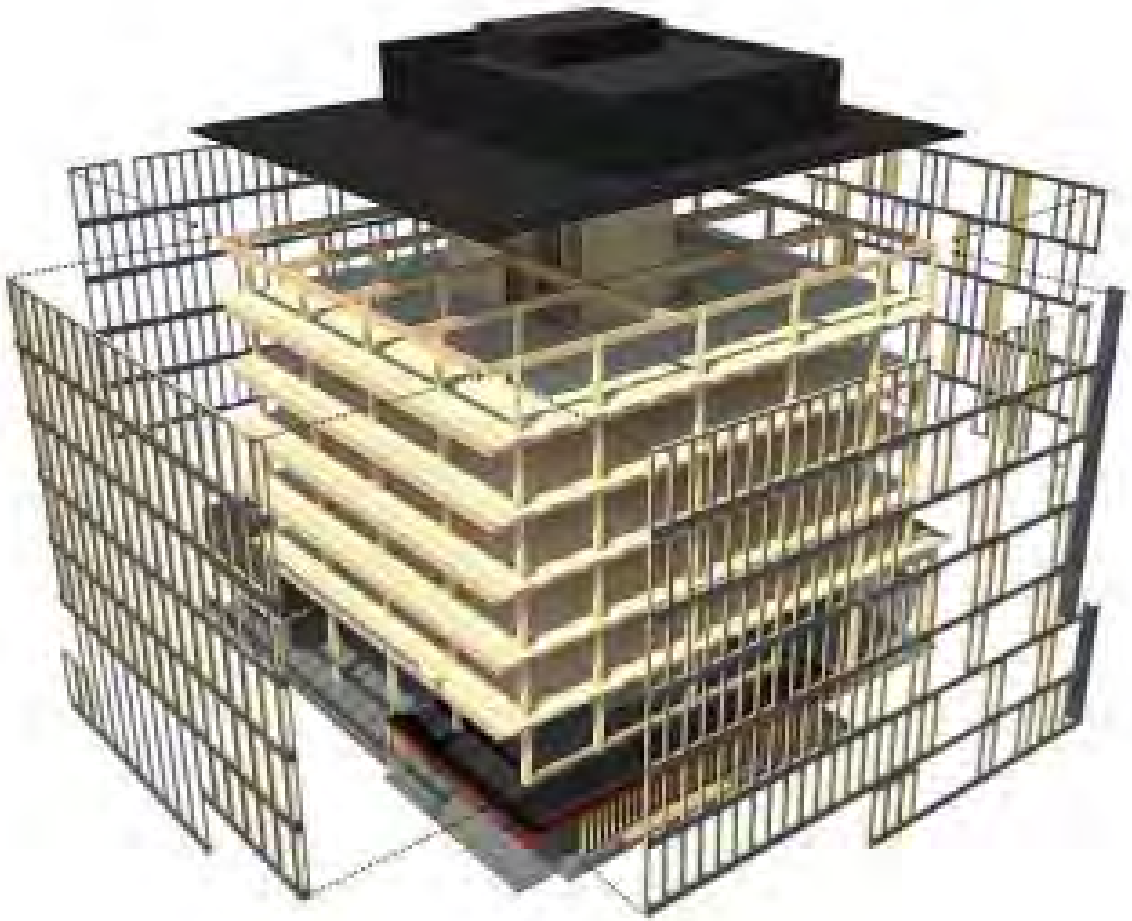
OUTLINE

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

Building Enclosure Design



Structure



The Building Enclosure

Tall Wood Structures

- Fast
- Sensitive to moisture
- Greater movement – shrinkage
- Code Challenges?
- Mixed steel, concrete, and wood

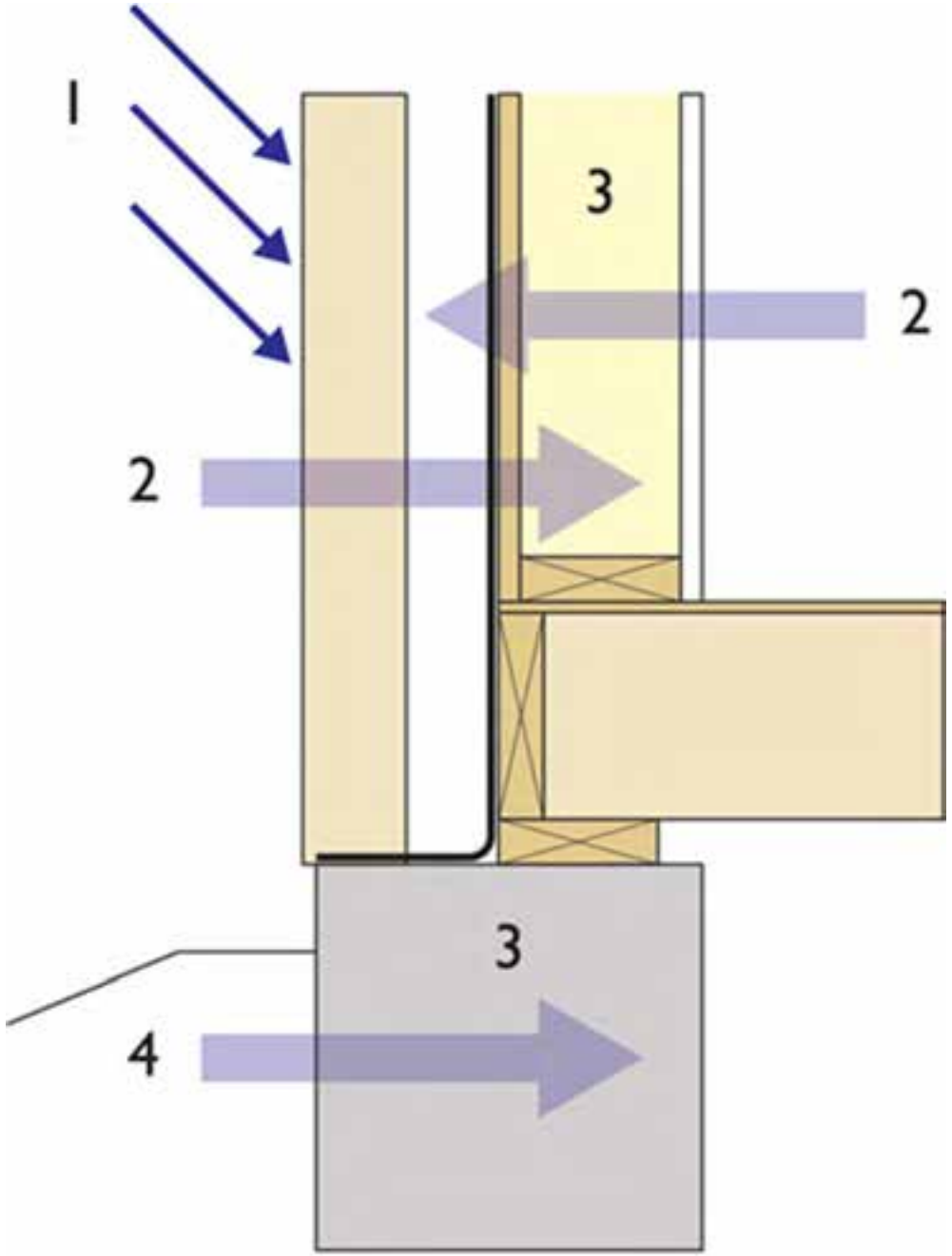
- Not the same as stick-built
- Not the same as high-rise

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

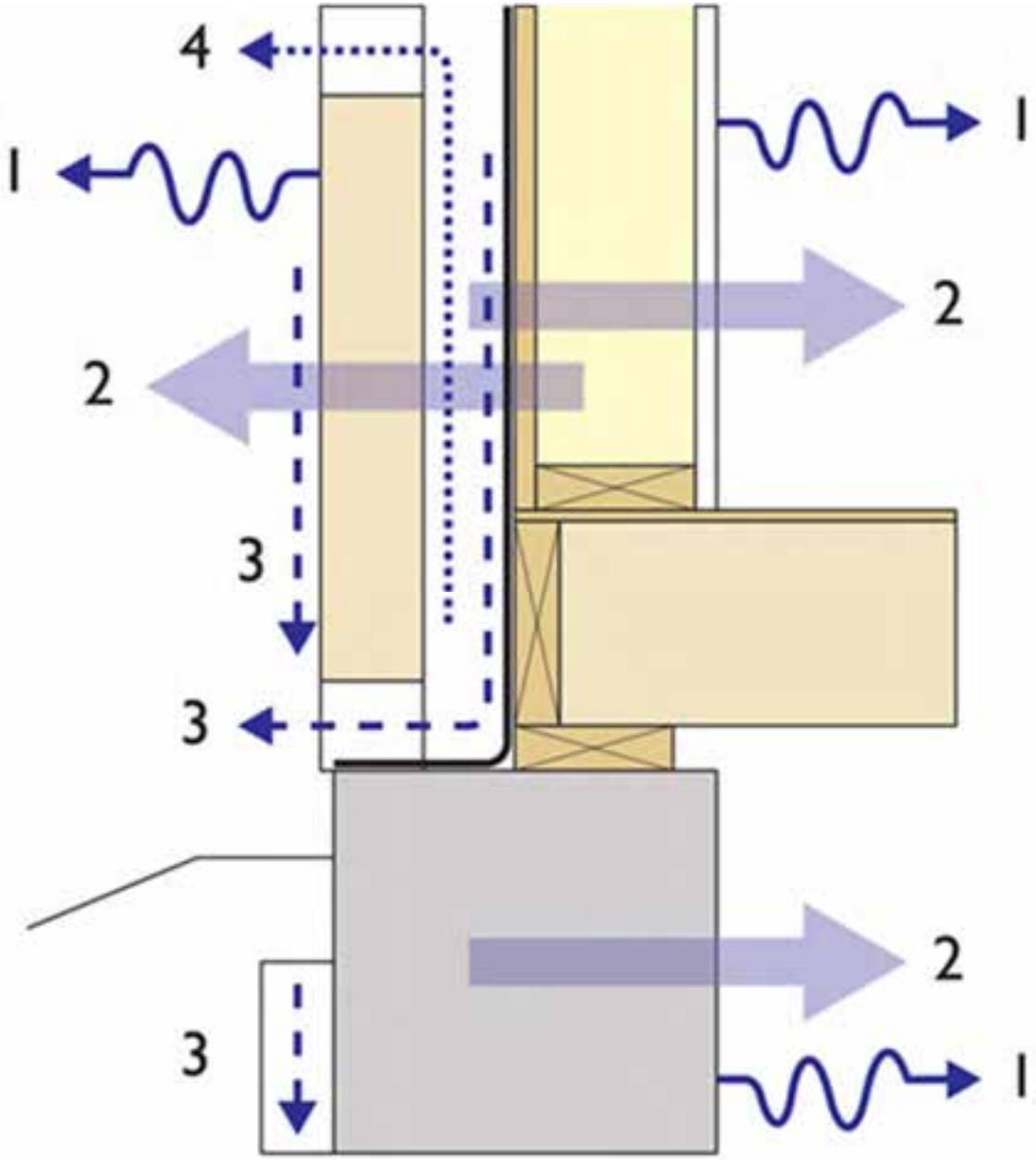
Water Management - Wetting

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




Tyvek


Tyvek


Tyvek


Tyvek

Lessons Learned

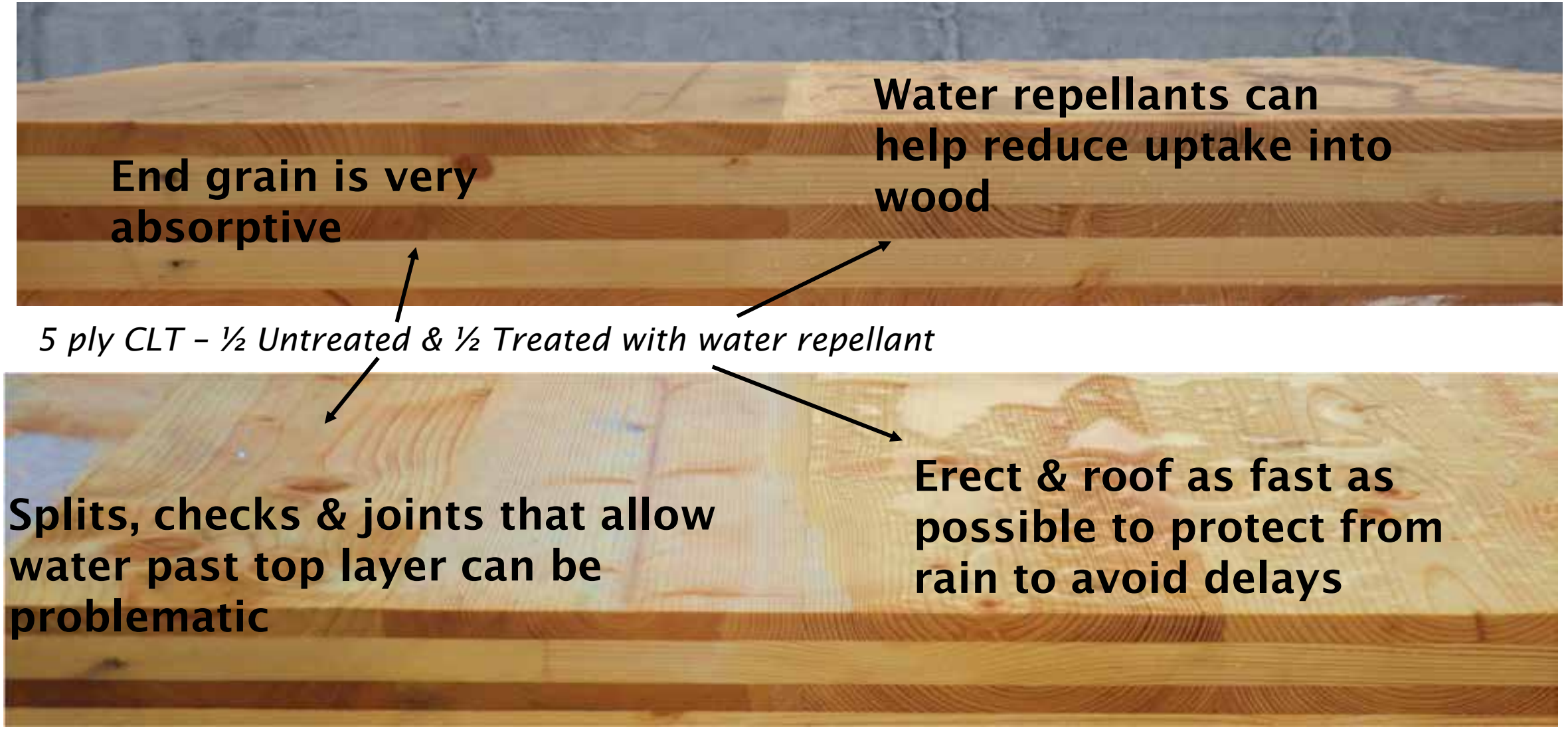

REMA
sopraSEAL

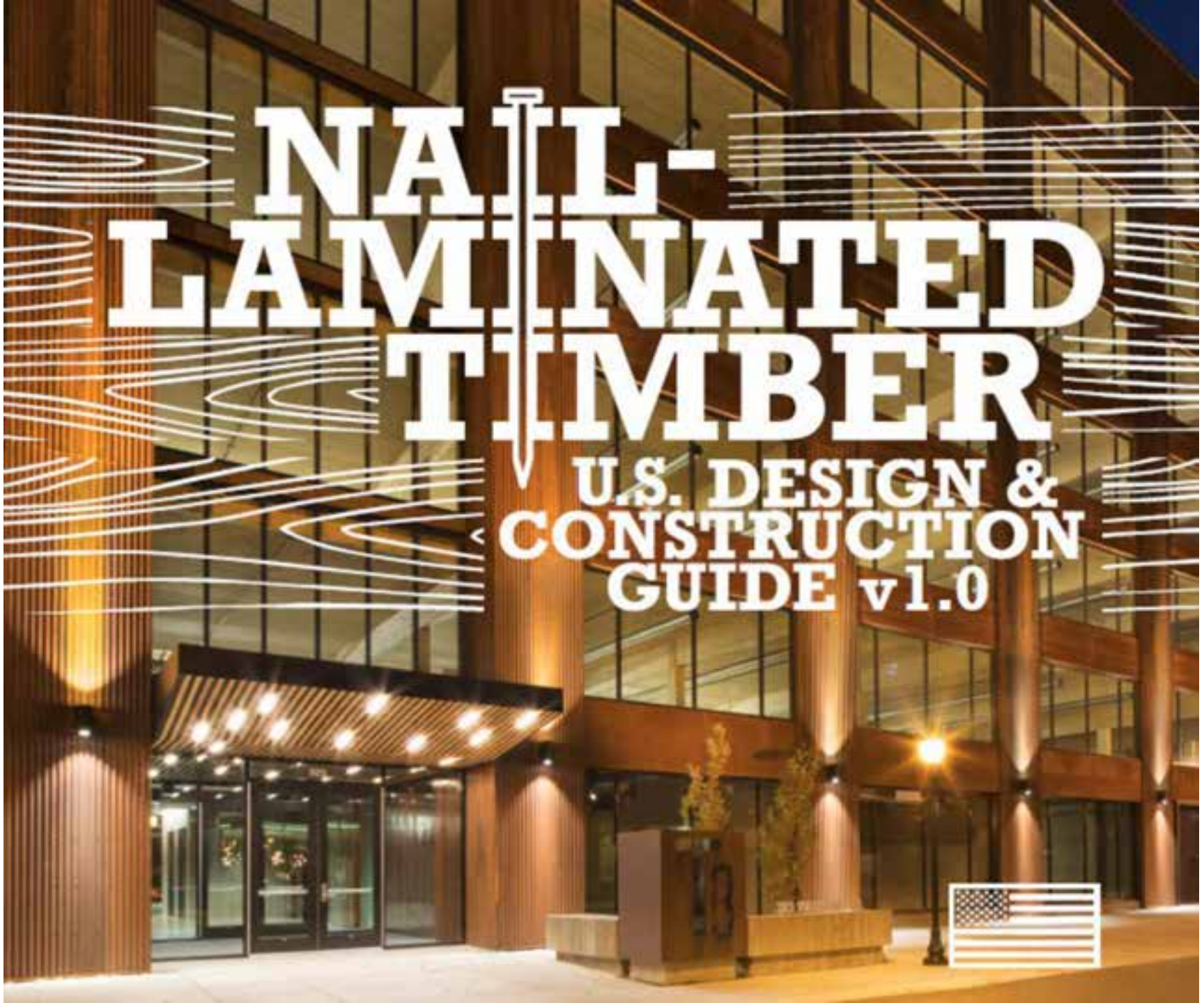
Lessons Learned - Roofs

- 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-
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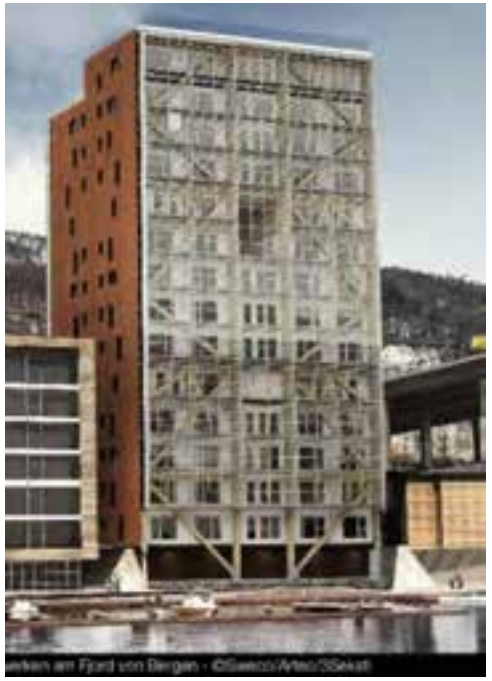
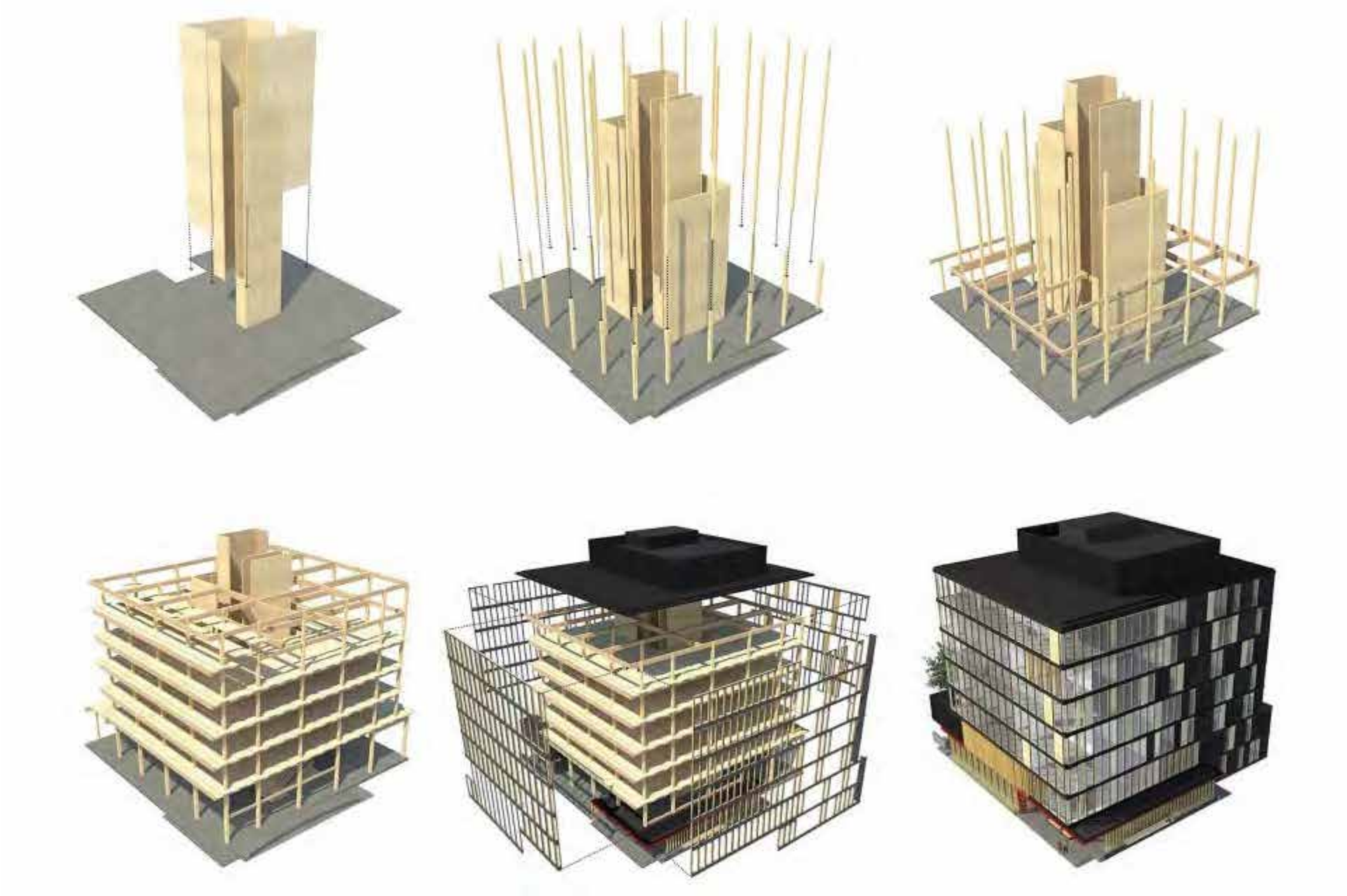
Wood Innovation Center

Taller Wood Building Precedents



WIDC – Structure & Enclosure Systems



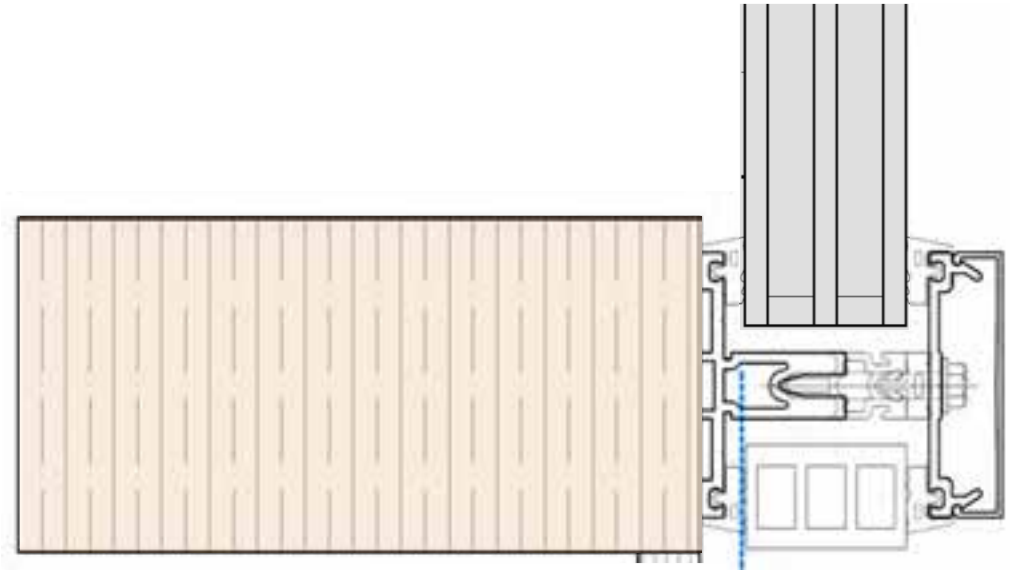
Wood Innovation Design Center

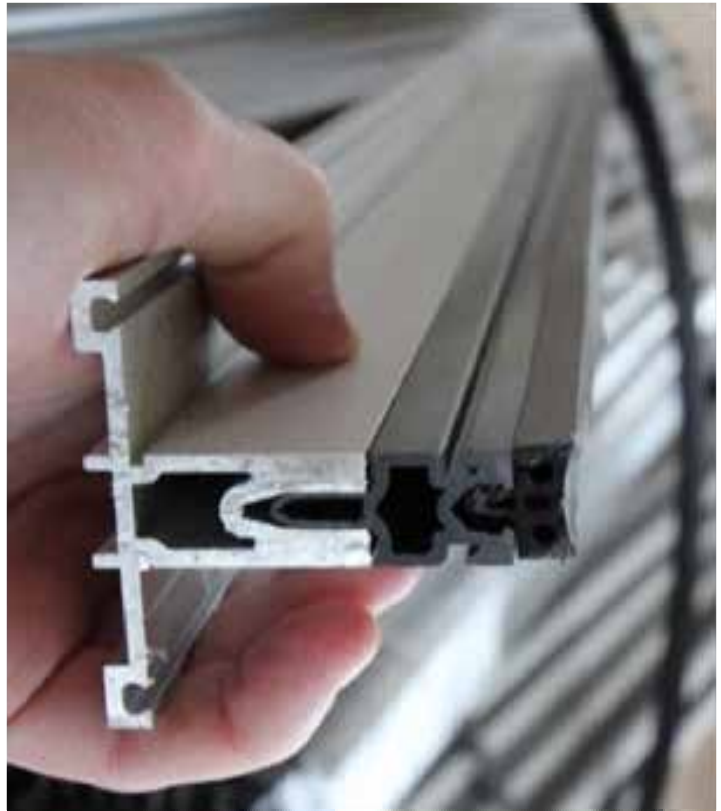
- 6 ‘tall’ levels (equivalent to 8 levels, 98’ tall)
- CLT shear walls, glulam columns with glulam beams and staggered CLT floor & roof structure
- Thermal performance design targets
  - R-40 roof
  - R-25 walls
  - R-5 wood curtainwall glazing
- Pre-fabricated design for infill walls and wood curtain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

Michael Green Architecture (MGA) – Contractor: PCL Construction

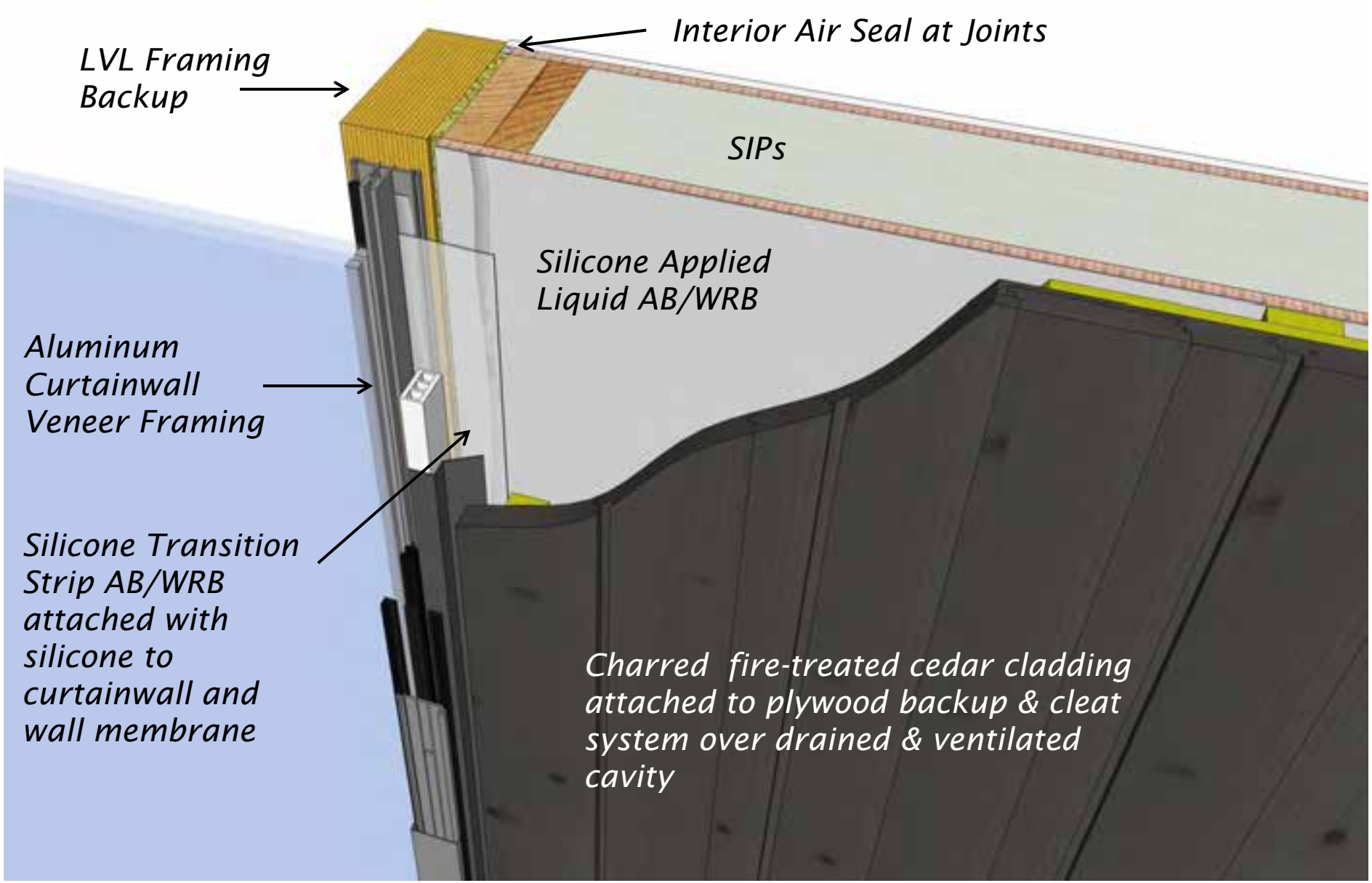
Stick-Built Wood Veneer Curtainwall

- 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

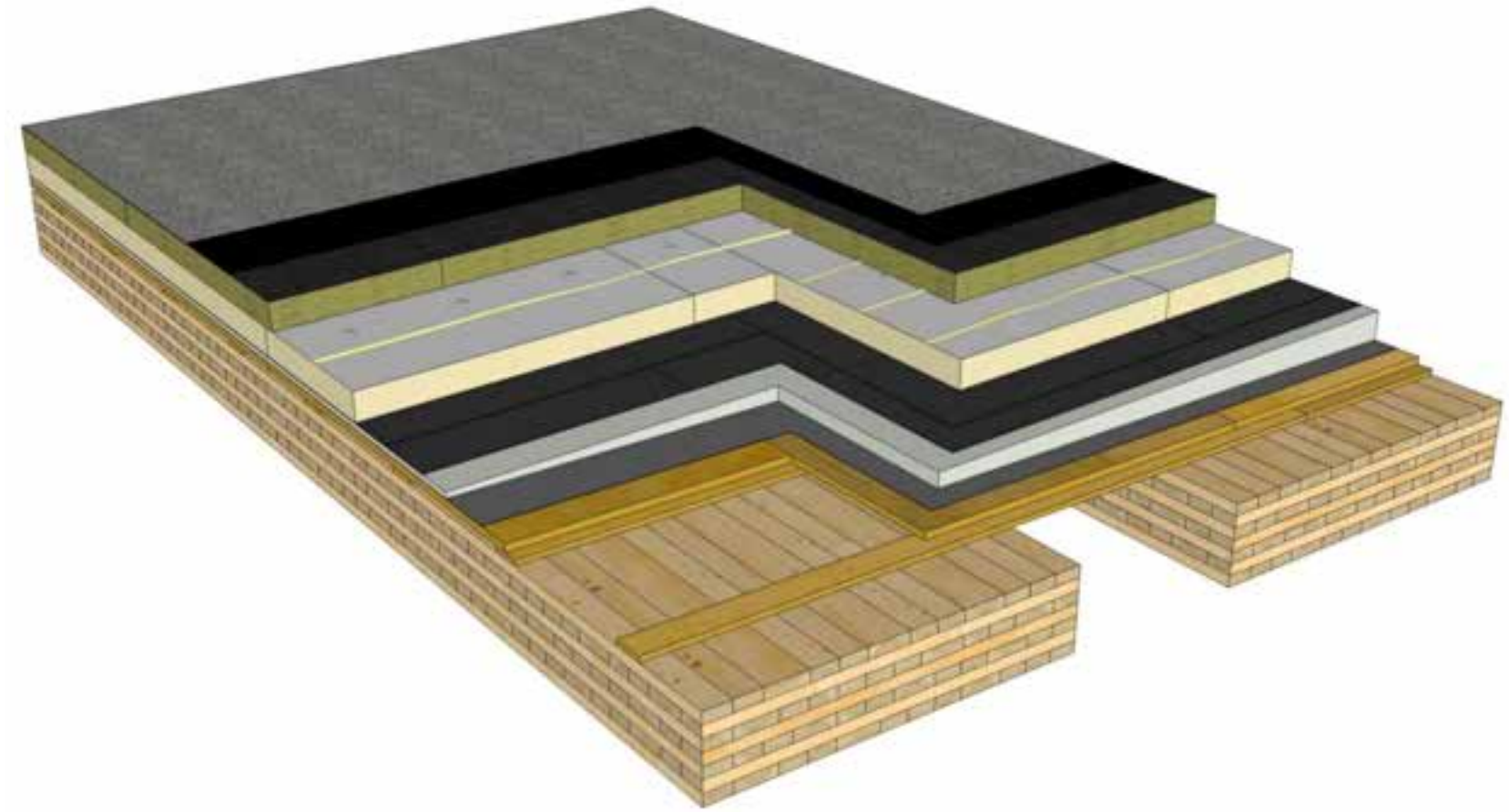


Charred Fire-Treated Cedar Cladding Panels

John Boys, Nicola Log-works

Charred Fire-Treated Cedar Cladding Panels

Conventional Roof Assembly



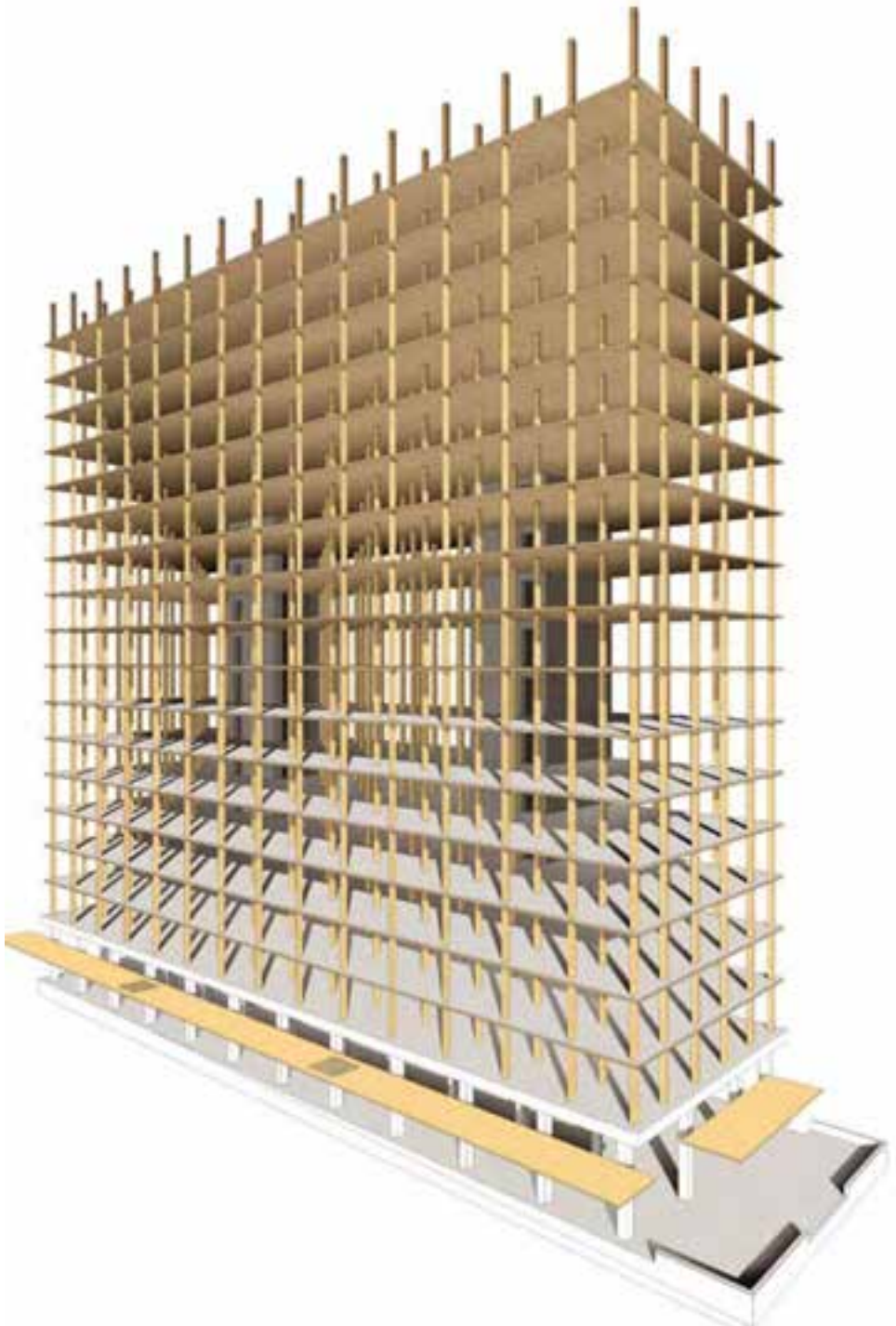
Conventional Roof Assembly

Wood Innovation Design Center

WIDC – Summary

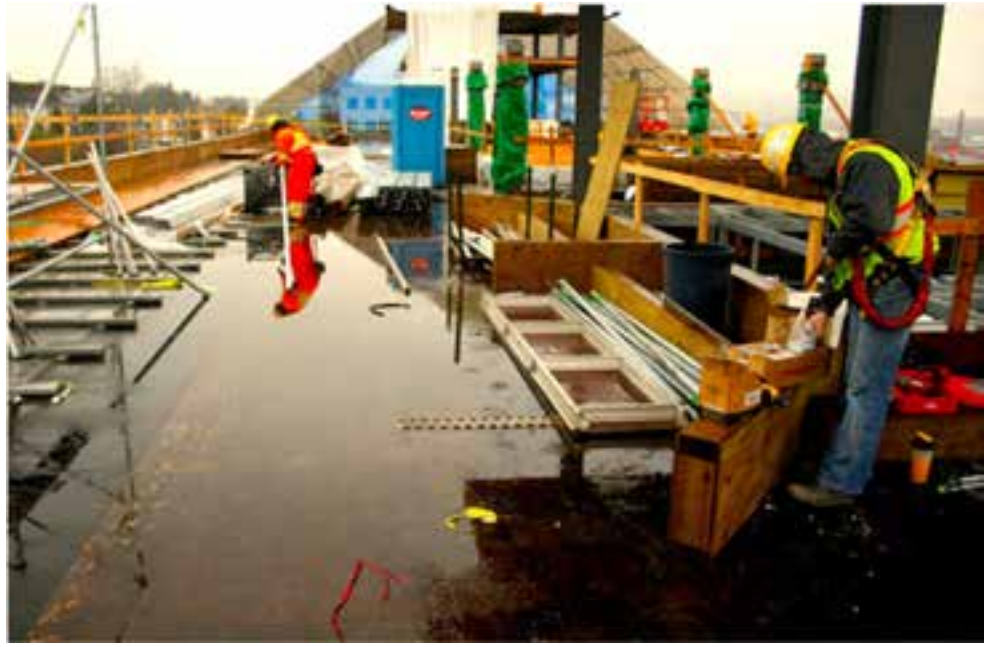
- Durable and energy efficient
- High performance materials and systems
- Small panel pre-fabrication
- Required full exterior access during construction
- Scaffolding, exterior sealants, transition details


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?

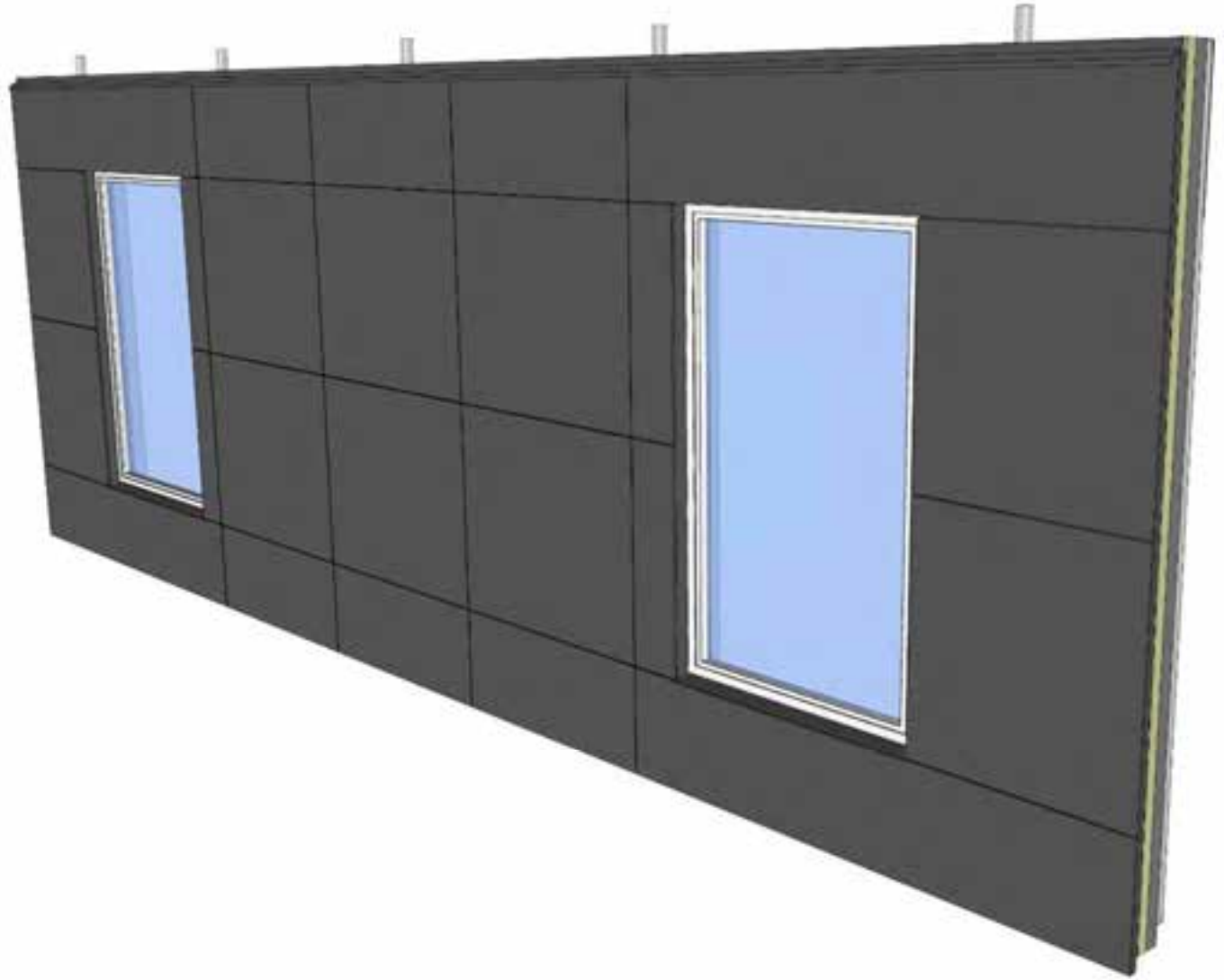


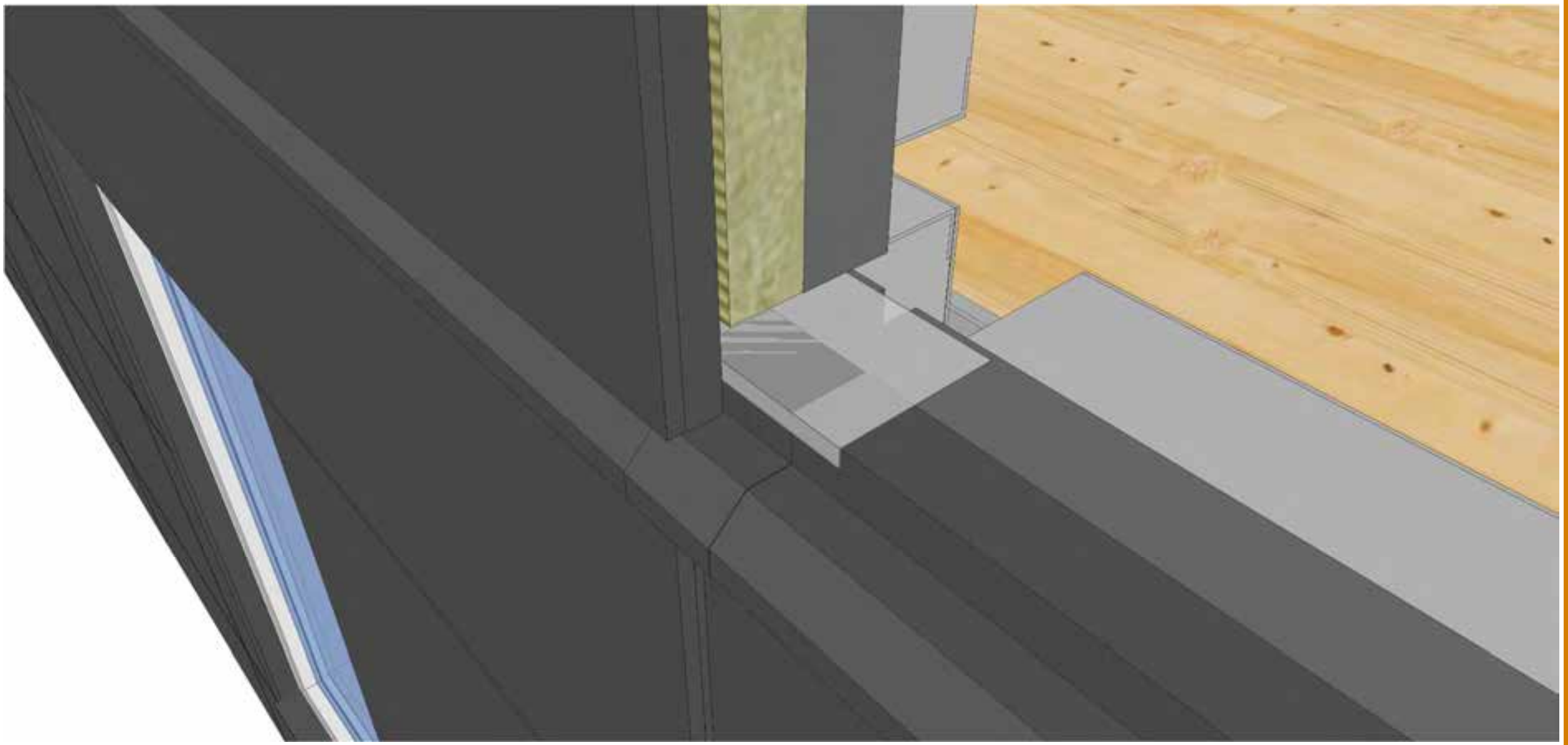
UBC Brock Commons- What Wasn't Feasible

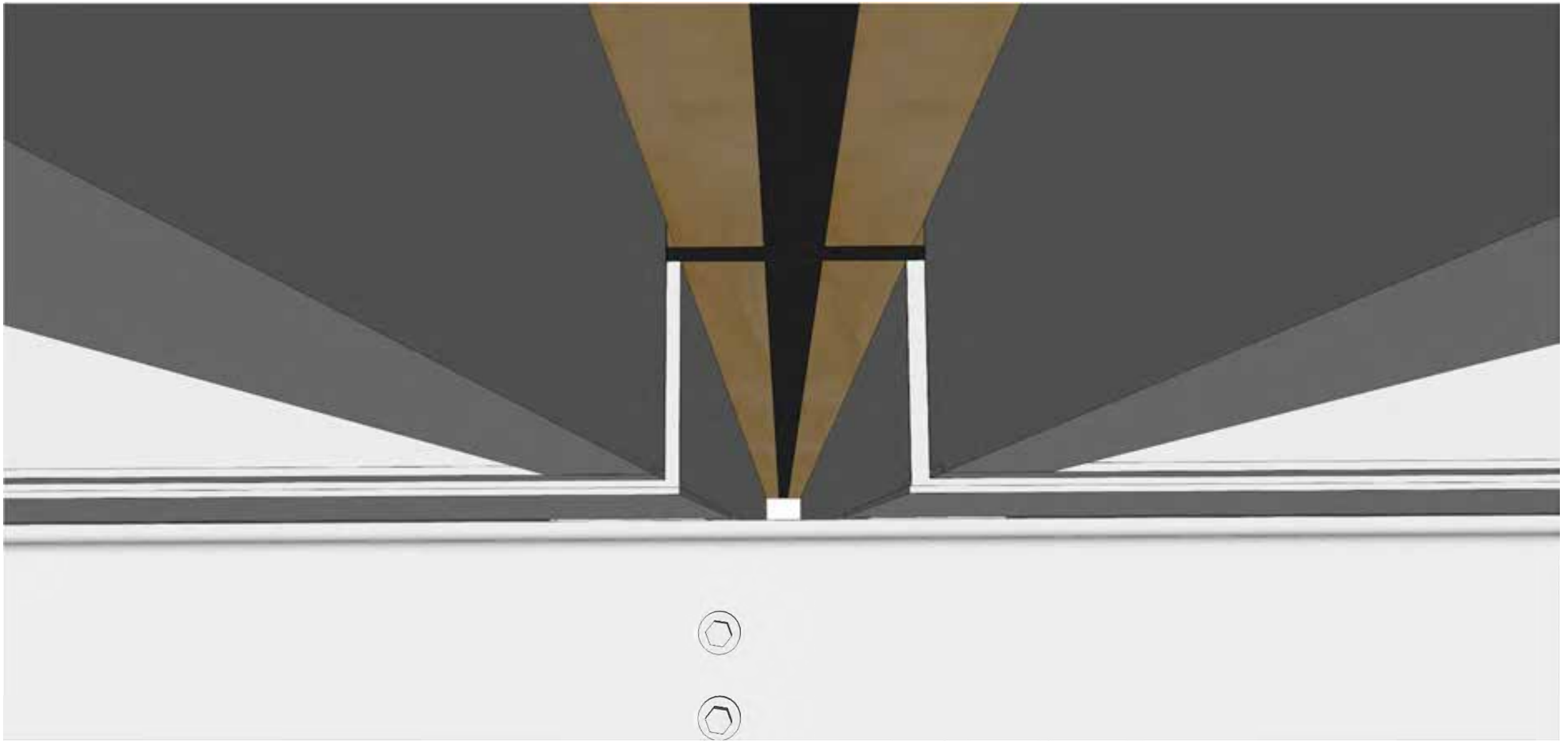
Unitized Curtain Wall Option
Problem: Cost, Schedule, Energy

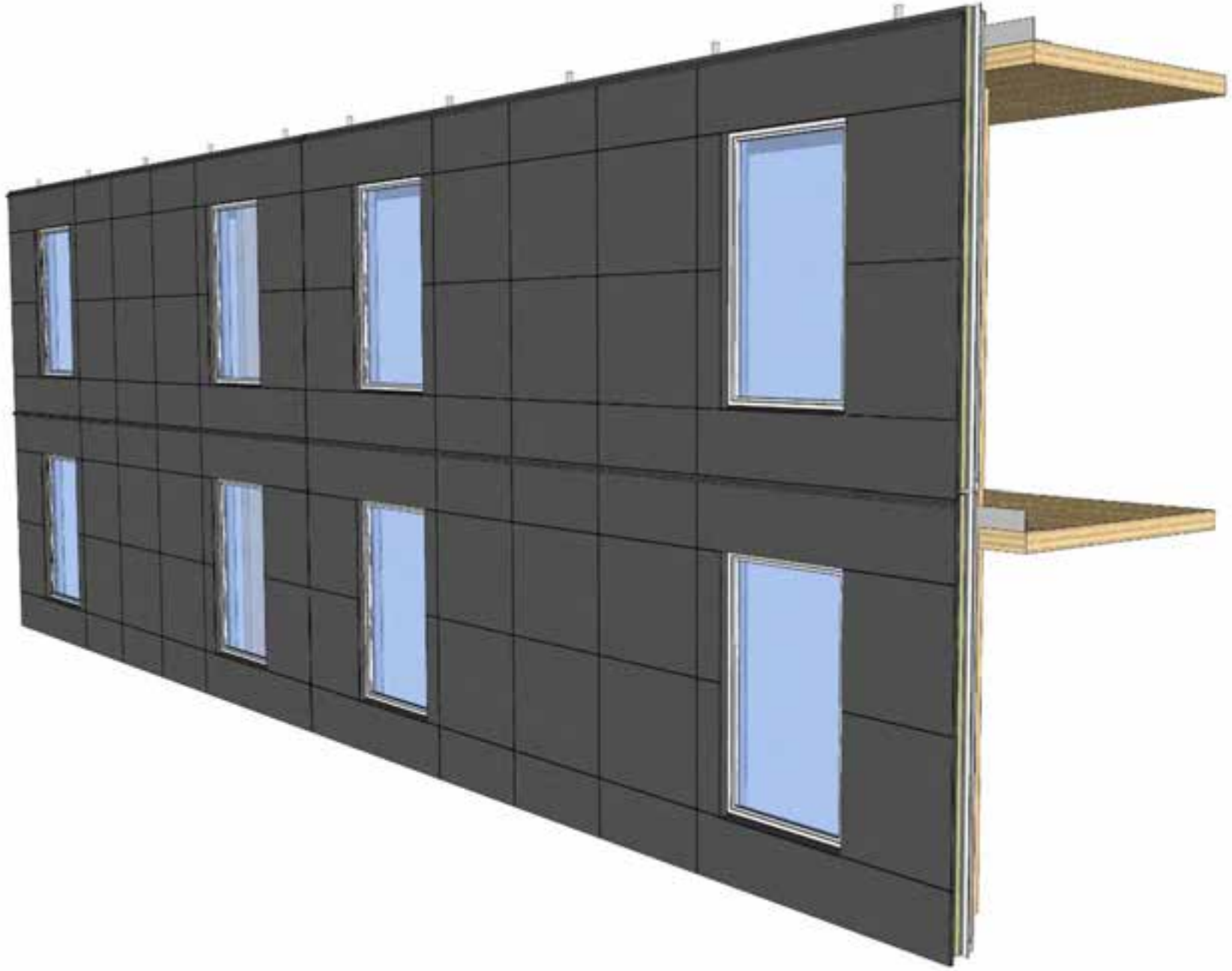
Small Panel Prefabrication Wall – Precedents
Problem: Schedule

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

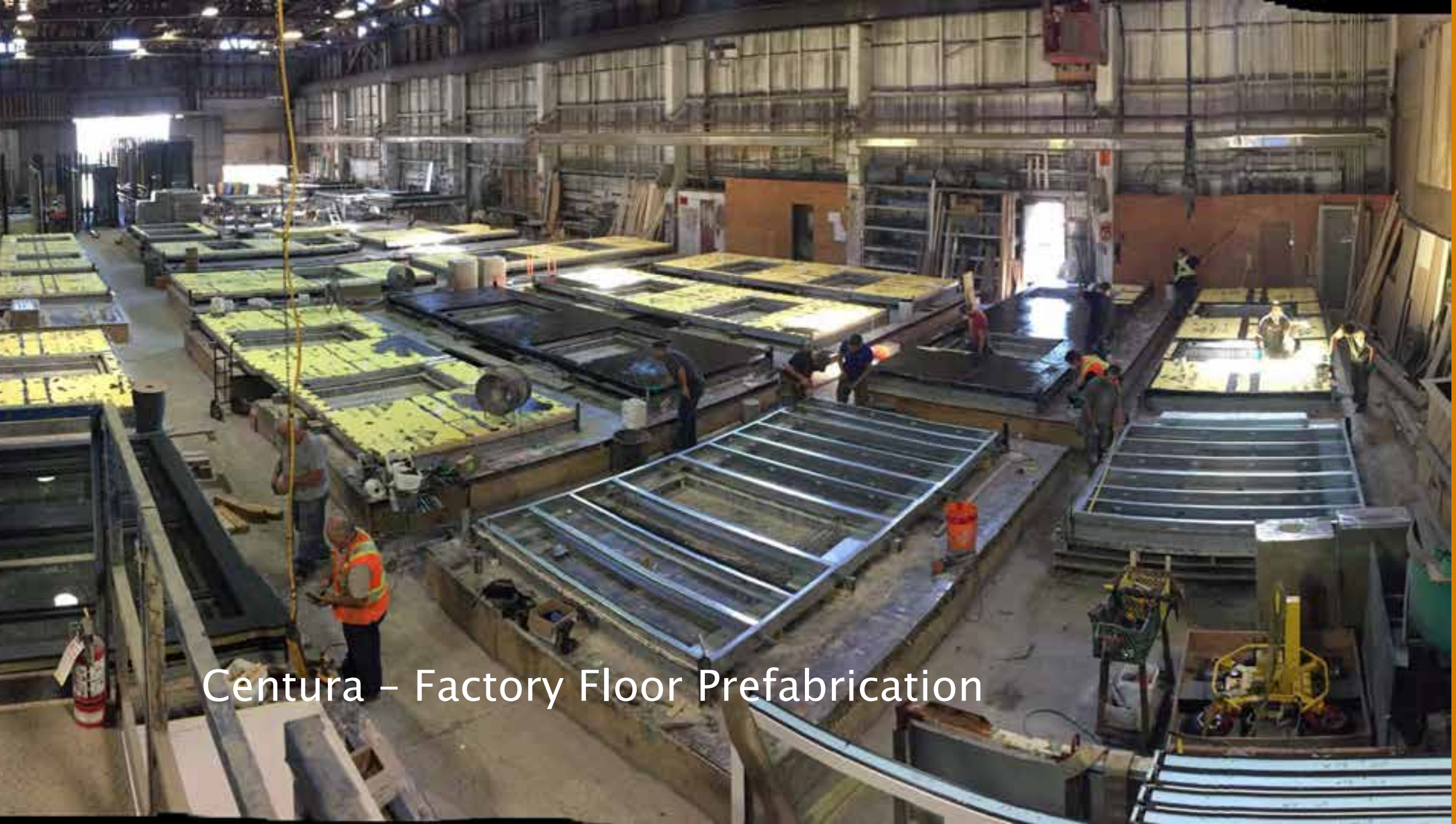








Laboratory Mockup & Physical Testing



Centura – Factory Floor Prefabrication


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

WEEK: 1

TIMELAPSE

UBC
BROCK COMMONS

WOOD
CONSTRUCTION

STARTS

JUNE/6

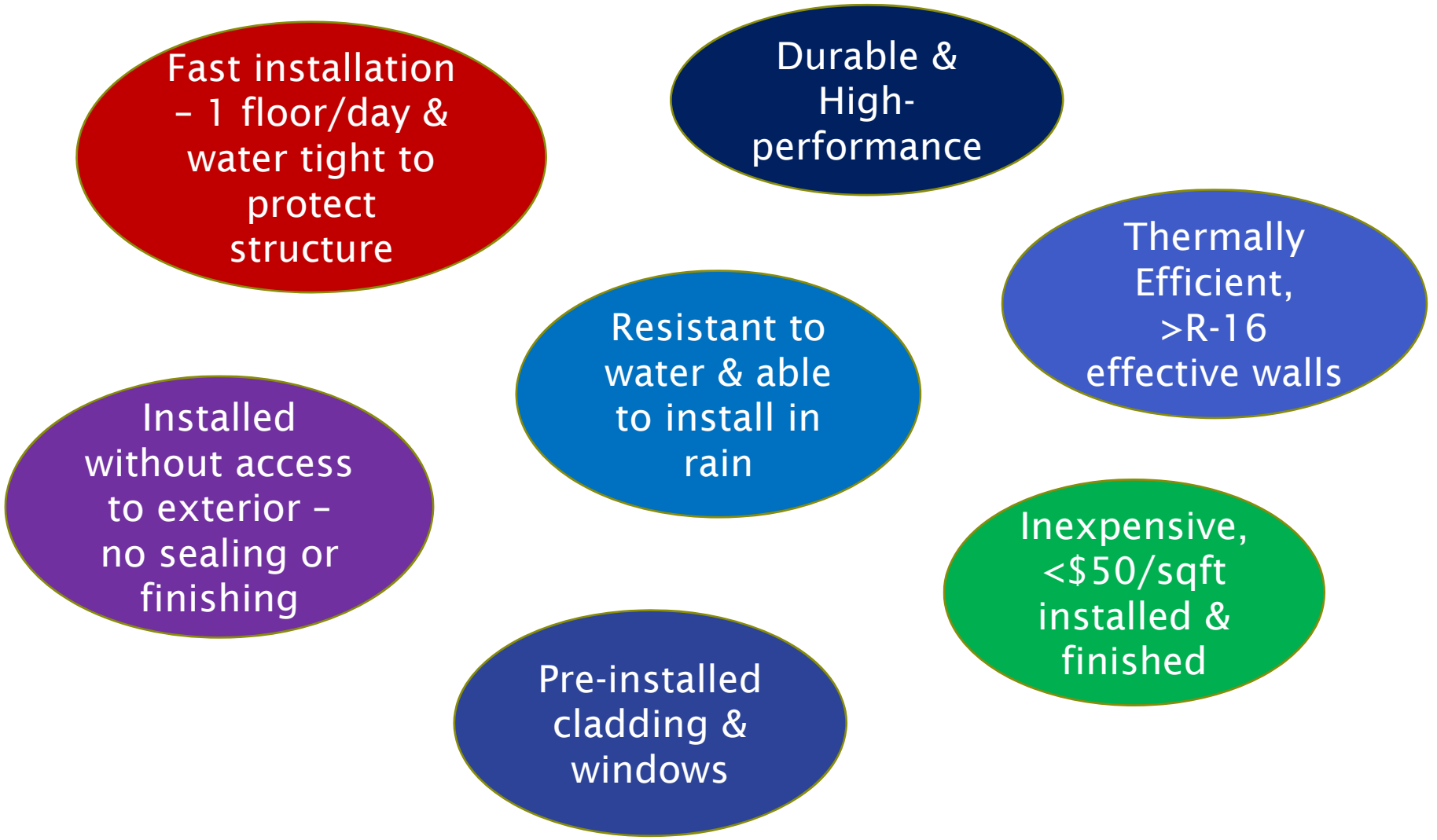
WOOD

Discussion + Questions

cshane@rdh.com

Learn more at
rdh.com

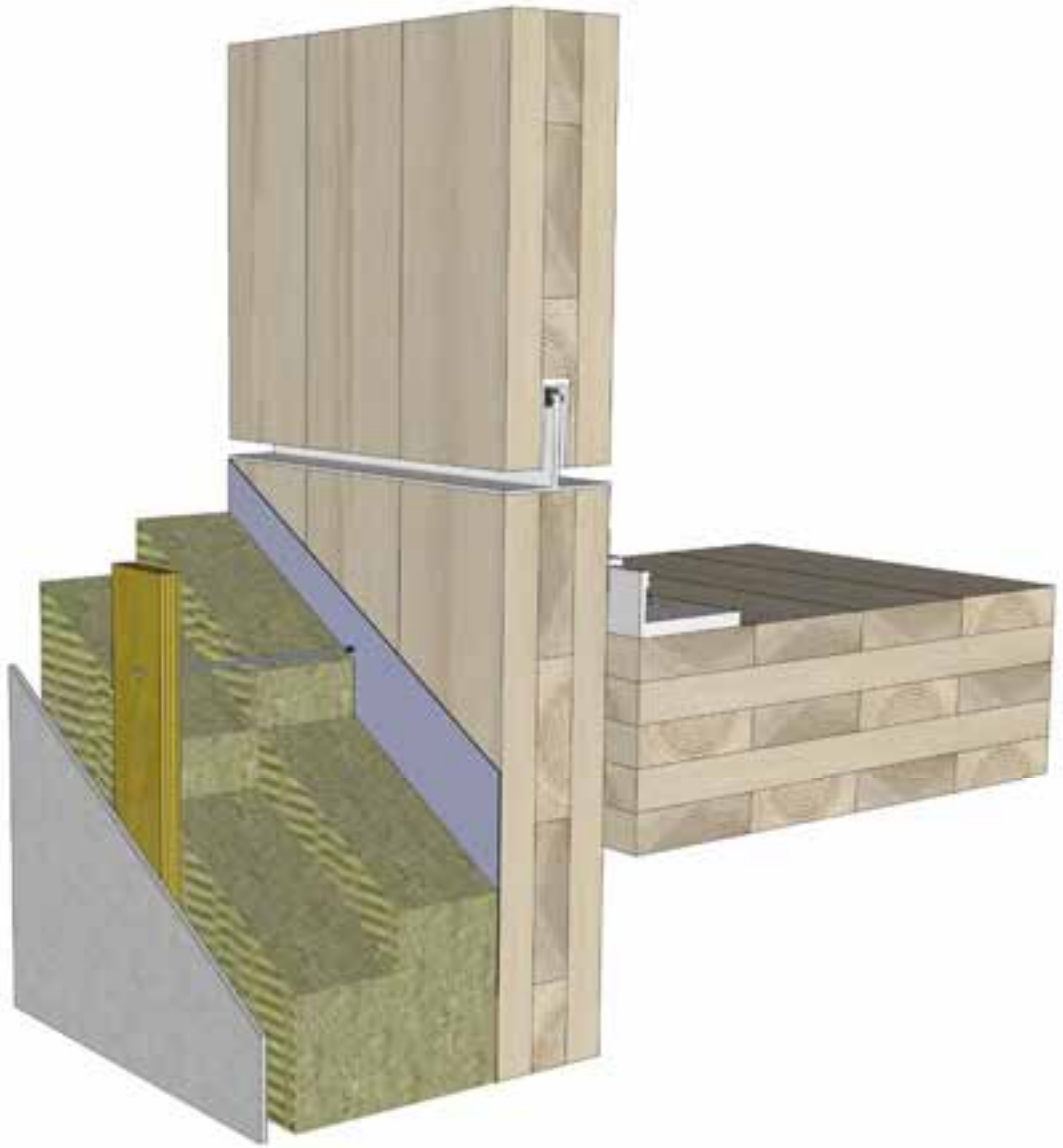
UBC Brock Commons - Façade Design Criteria



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