Tall Wood Building Enclosures
A Race to the Top

CCBST VANCOUVER, NOVEMBER 2017

BRIAN HUBBS, P.ENG – PRINCIPAL, SENIOR FAÇADE SPECIALIST

RDH FAÇADE ENGINEERING

RDH CELEBRATING 20 YEARS EST. 1997

MAKING BUILDINGS BETTER™

Design Considerations for Tall Wood Buildings

Taller Wood Building Precedents – Europe, Australia & North America

LCT One, Austria

Forte, Melbourne

WIDC, Prince George

T3, Minneapolis

Murray Grove, London

TREET, Norway

UBC Tall Wood House, Vancouver

The Future of Tall Wood? – Concepts & Actual Projects

MGA

CEI Architecture

Terrace House – Shigeru Ban / RDH

Structure

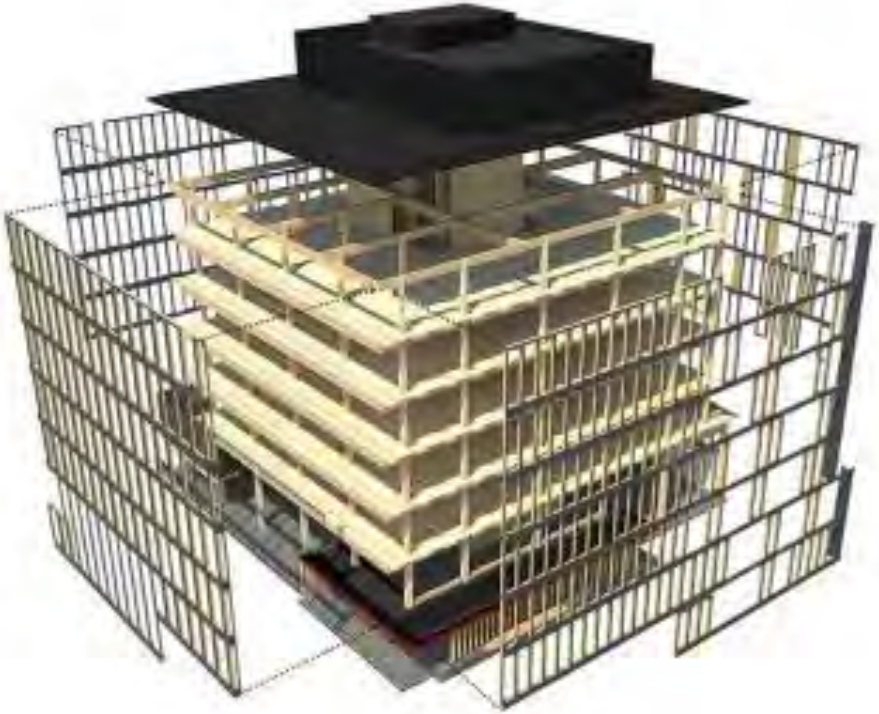


Image Credit: MGA - Wood Innovation Design Centre

The Building Enclosure

Taller Wood Building Structures

→ Fast

→ Sensitive to moisture

→ Greater movement (shrinkage & drift)

→ Fire code challenges

→ Mixed steel, concrete & wood materials

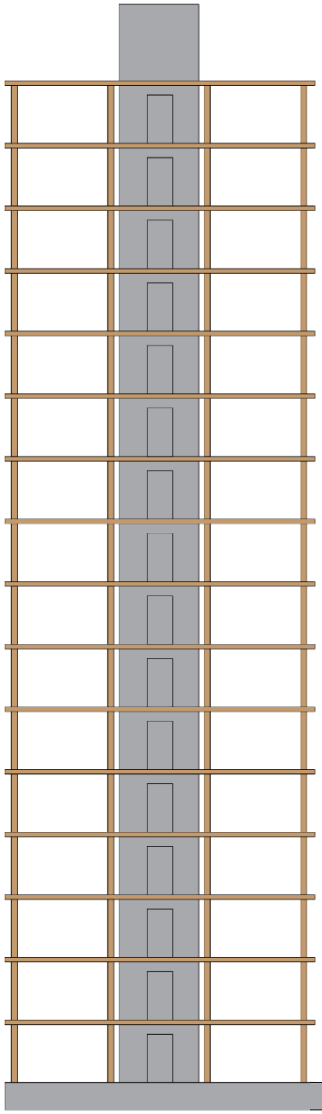
→ Is not the same as stick-built wood-frame and also different from high-rise steel or concrete structures

Potential Challenges with Mass Timber Buildings

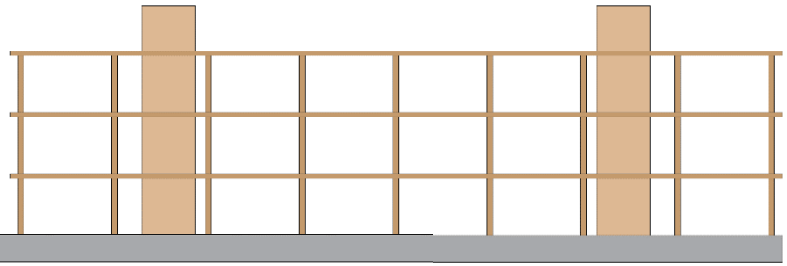
Building Enclosure Design Fundamentals

- → Primary function of the **Building Enclosure/Façade**: Separate the exterior & interior environments
  - → Protect mass timber during construction & in-service
  - → Serves functional and aesthetic & purpose
  - → Controls heat, air, and moisture transfer along with noise and fire
  - → Designed to accommodate building movement, structural loads, initial & seasonal wood movement
- → Key passive design element for an sustainable, energy efficient building

Tall Versus Shorter Mass Timber Buildings



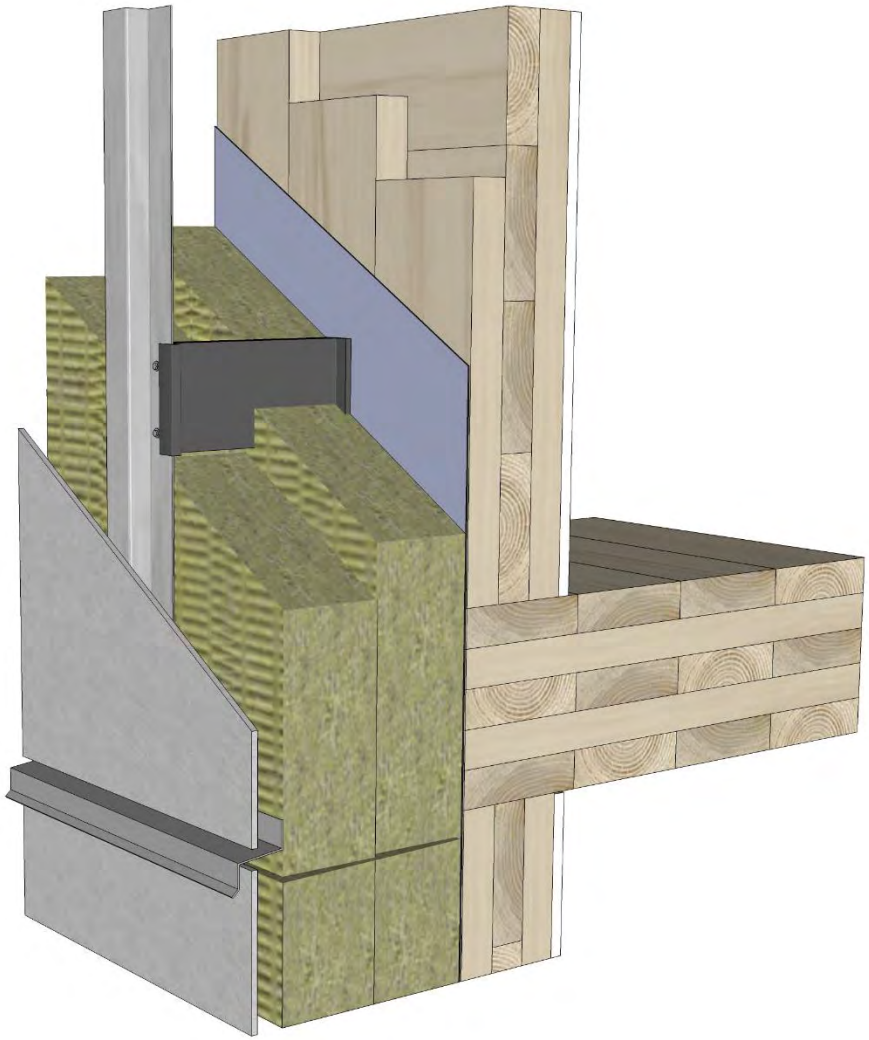
- → **Tall Wood Structures**
  - → More repetitive, more exposed, difficult access, need for more speed – *ideal for prefabricated facades*
  - → Less focus on roof and more on walls for weather protection
- → **Low to Mid-rise Wood Structures**
  - → Easier access to walls from ground
  - → Greater focus on roof for weather protection than walls
  - → Prefabrication of façade also possible though less economies of scale

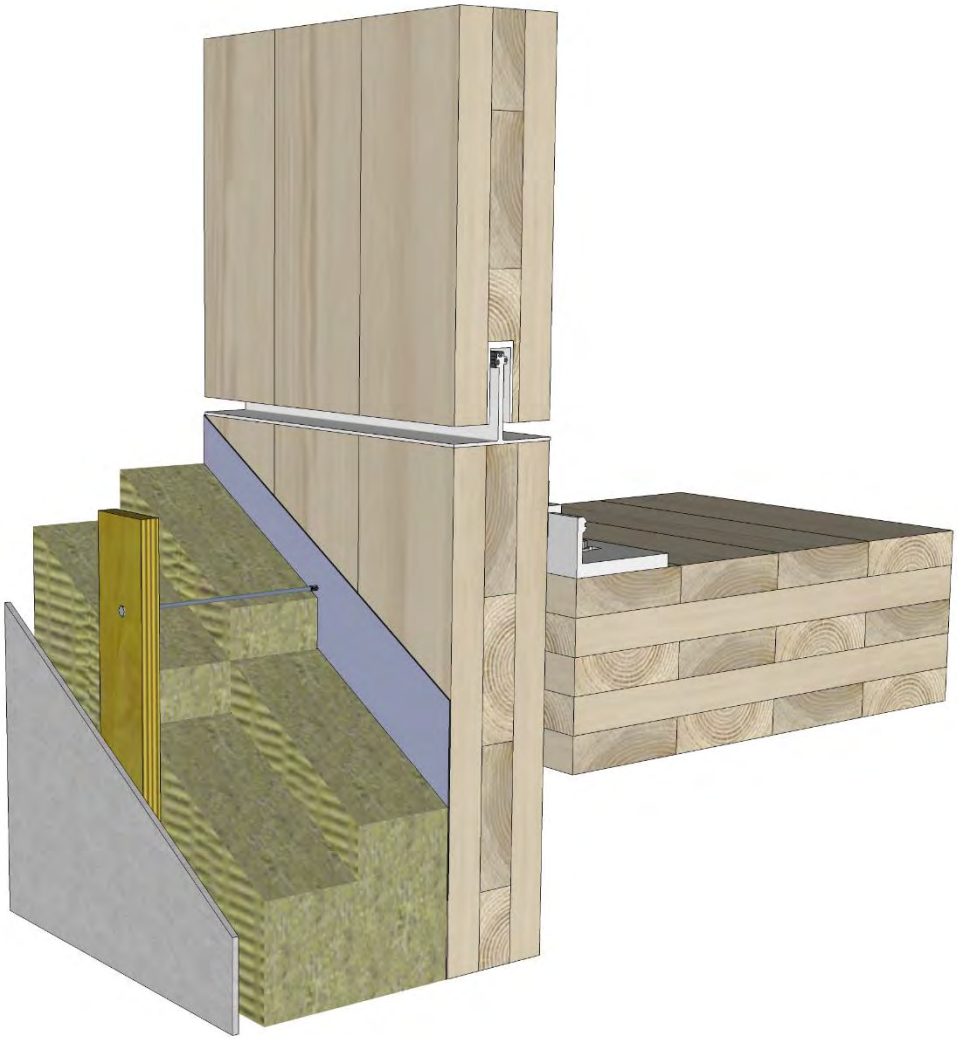


Tall Wood Building Enclosures

- → **Need for Speed**
  - → Erect and seal fast
  - → Protect wood structure
  - → Accommodating of inclement weather
- → **Ensure Durability**
  - → Robust materials – high-rise appropriate
  - → Tolerant of movement
  - → Thermally efficient
  - → Non-combustible

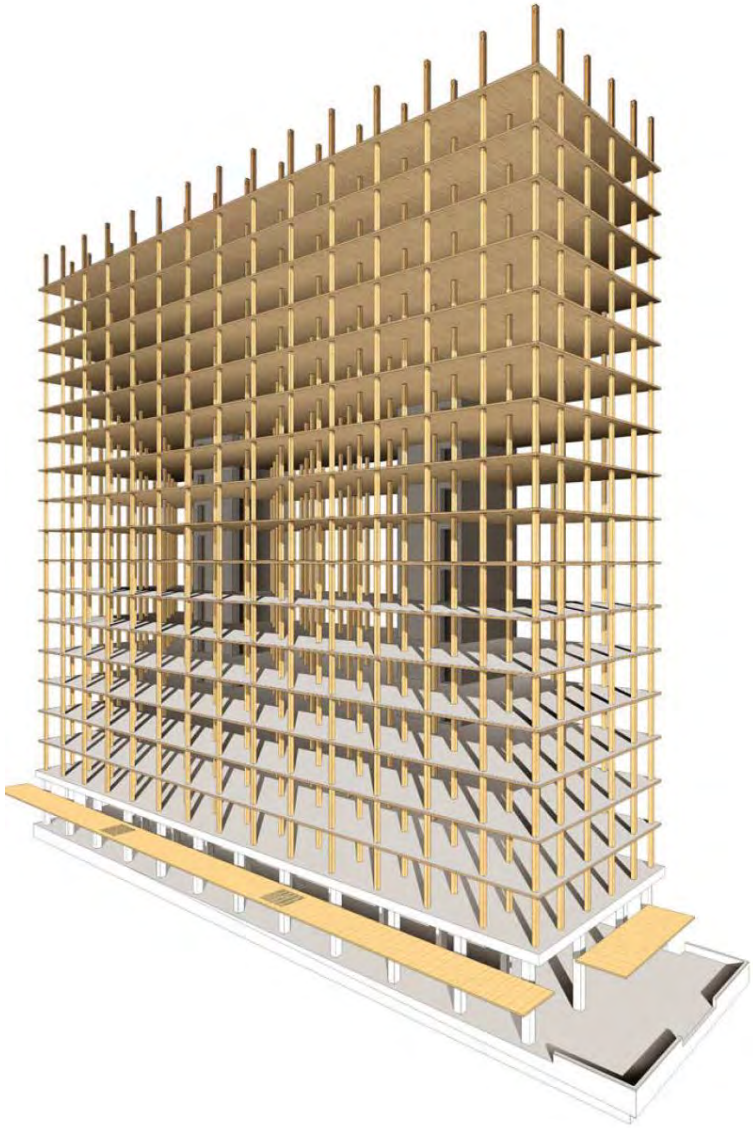
Façade Systems - Load Bearing vs Curtain-wall





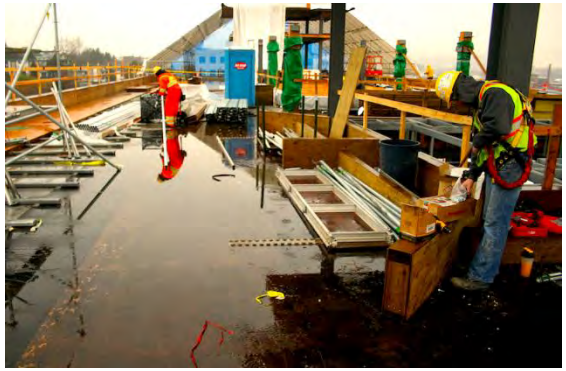
UBC Brock Commons, Tall Wood House Façade Challenge

UBC Brock Commons, Tall Wood House
Façade Challenge



Initial Concerns & Questions from Project Team

- → Vancouver = Temperate rainforest
- → How to protect mass timber from rain during construction in any season
  - → Giant tarps?
  - → Temporary roof lifted by crane?
  - → Waterproof the floors?
  - → Enclose as fast a possible?
- → Enclosure must keep up with pace of structure
- → How long can mass timber floors get wet for? Best way to protect it?
- → How to enclose & seal the walls quickly and not be slowed by inclement weather?



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

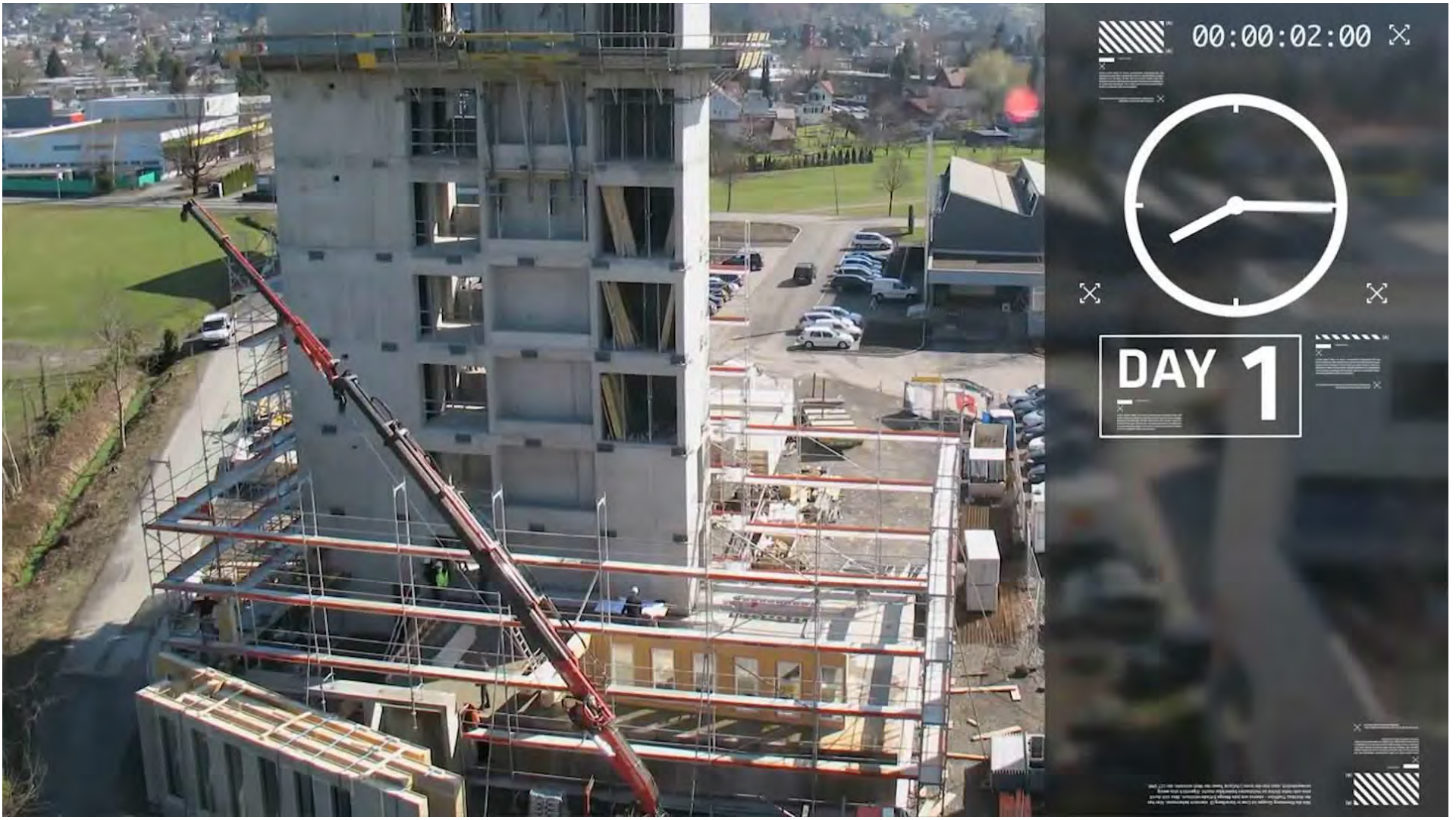
Resistant to water & able to install in rain

Installed without access to exterior – no sealing or finishing

Inexpensive, <$50/sqft installed & finished

Pre-installed cladding & windows

Precedents for Prefabrication of Tall Wood



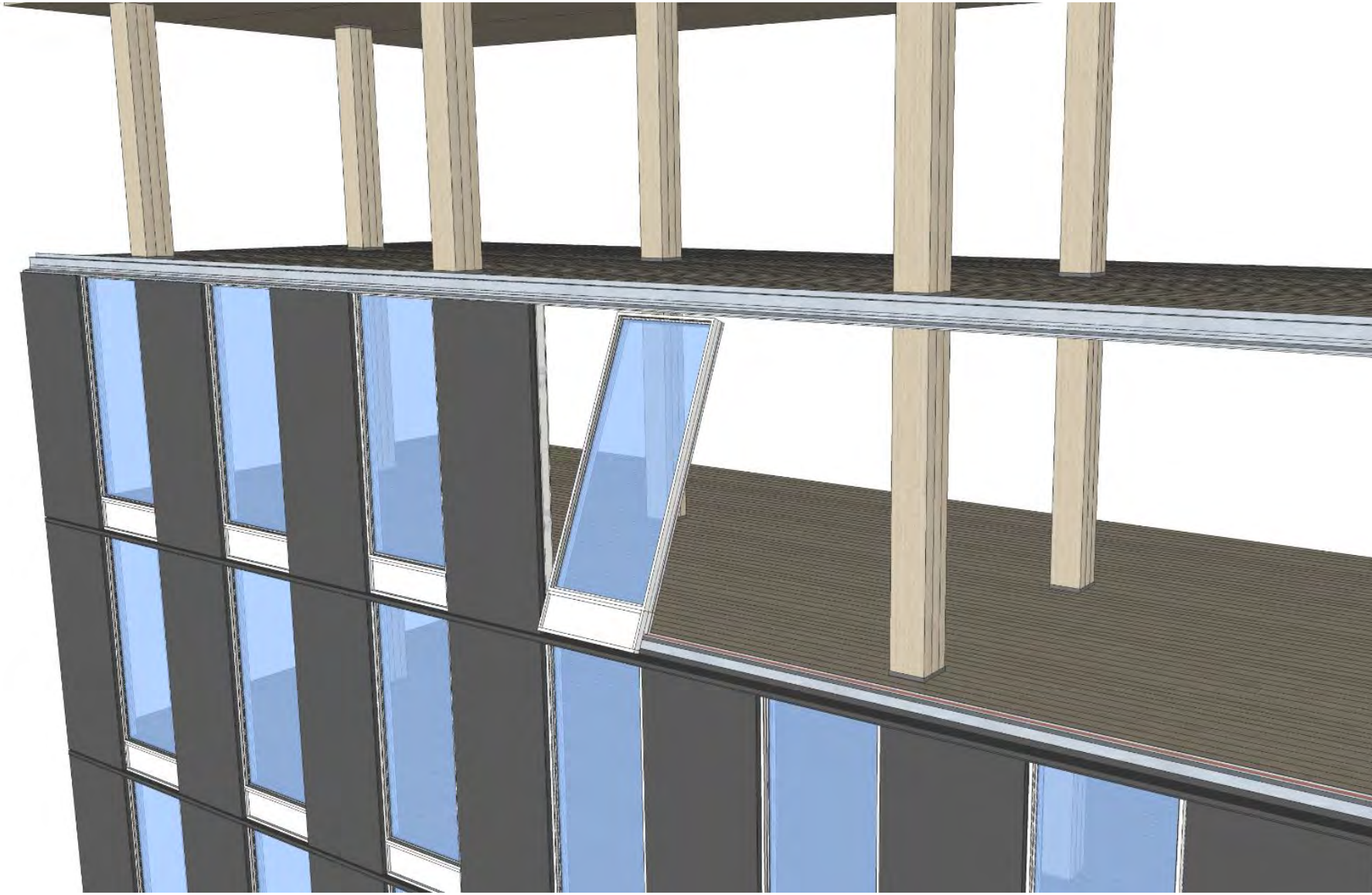
Precedents for Prefabrication of Tall Wood

Precedents for Prefabrication of Tall Wood

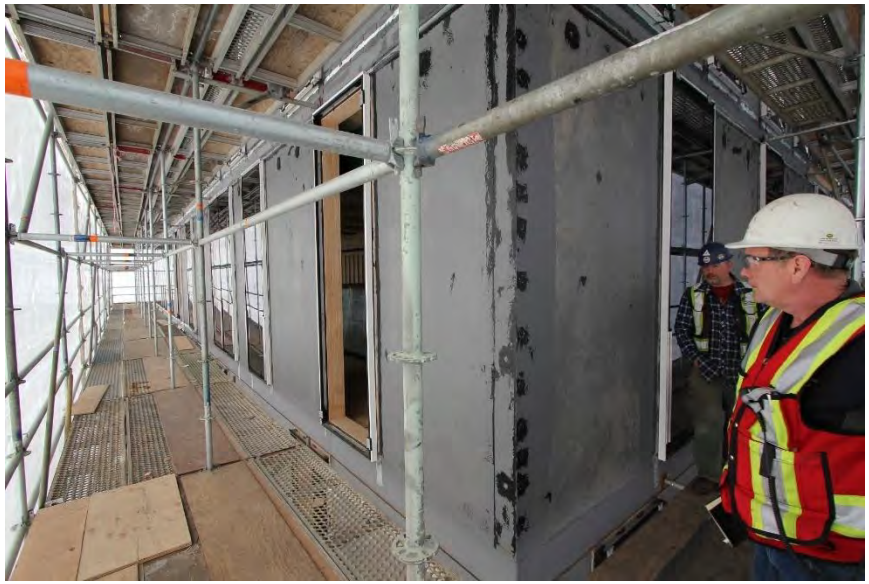
UBC Brock Commons- What Wasn't Feasible

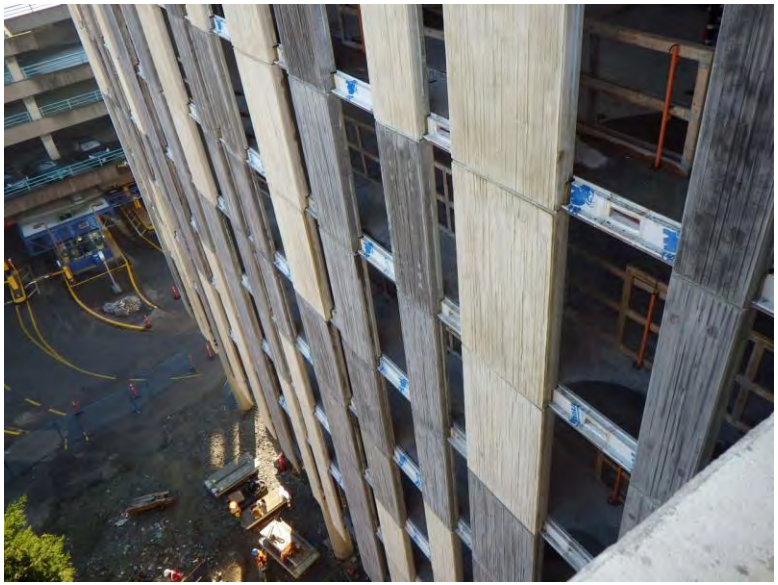
Unitized Curtain Wall Option
Problem: Cost, Schedule, Energy

Window-Wall Option
Problem: Schedule, Energy

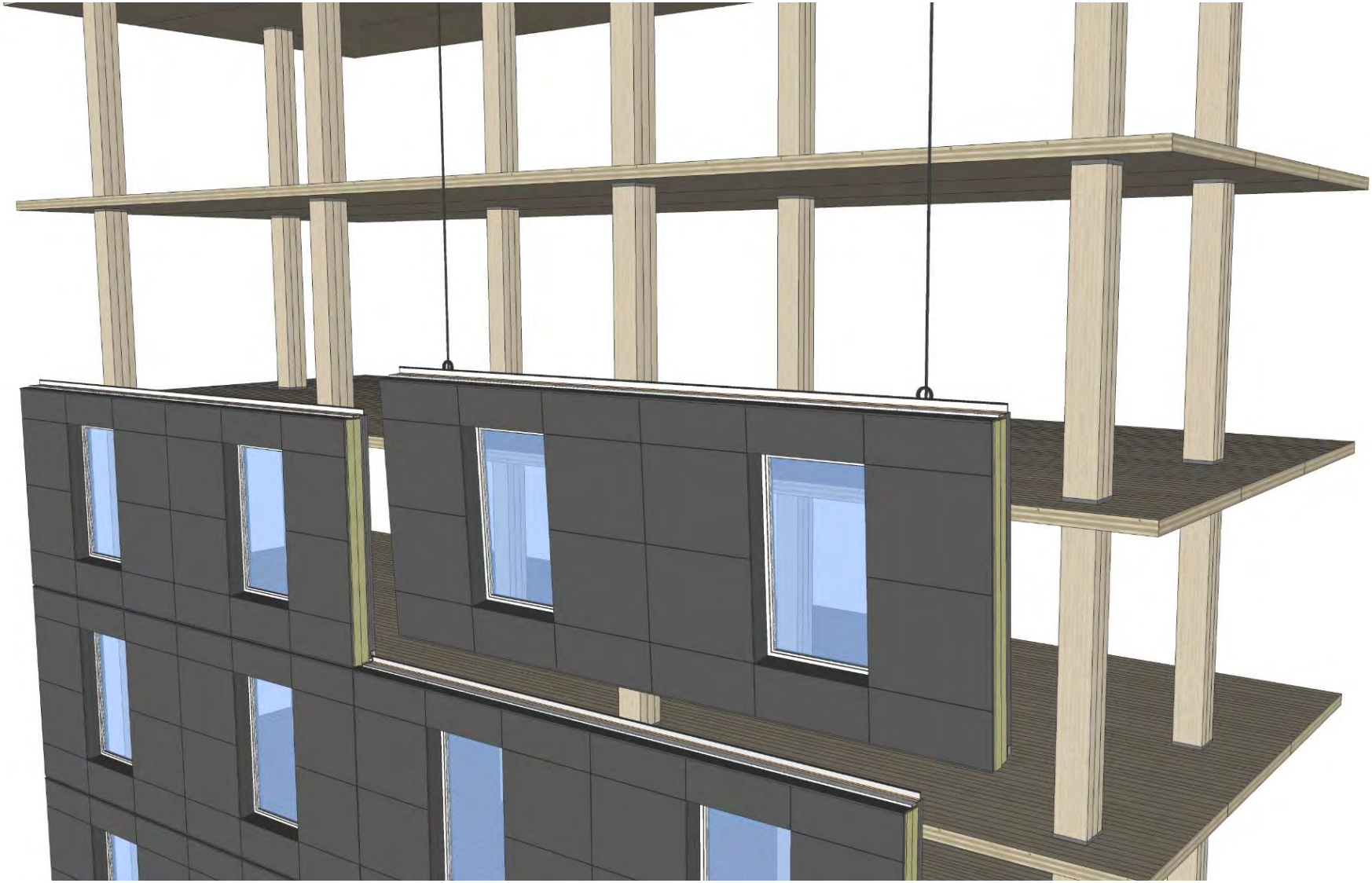


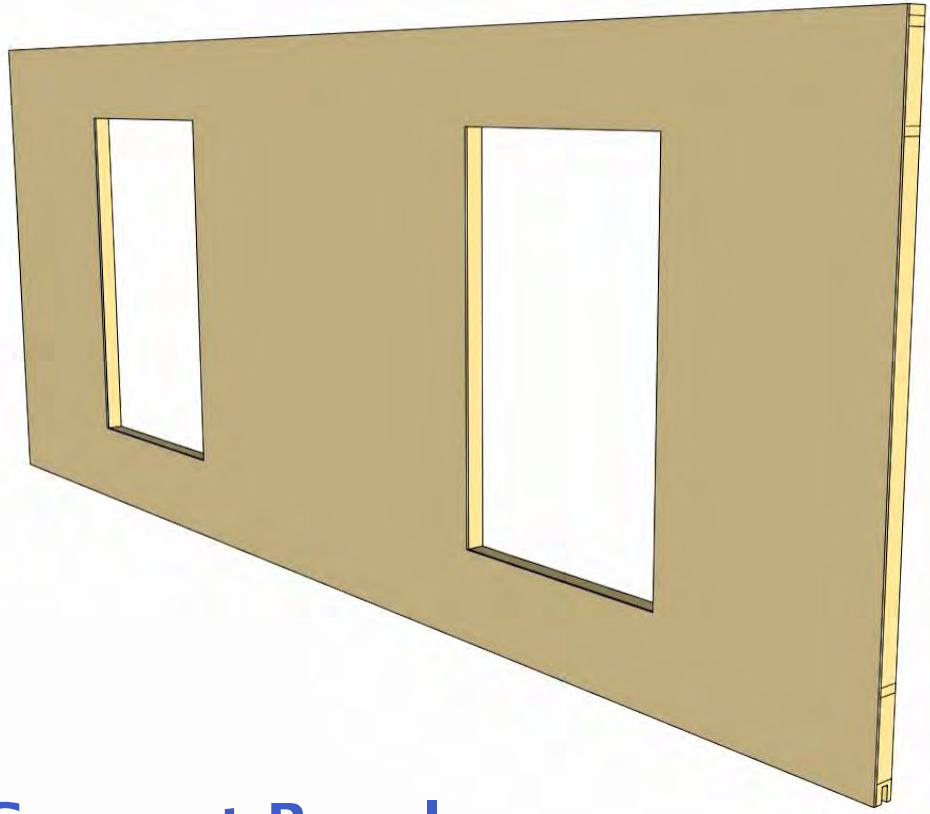
Small Panel Prefabrication Wall – Precedents
Problem: Schedule





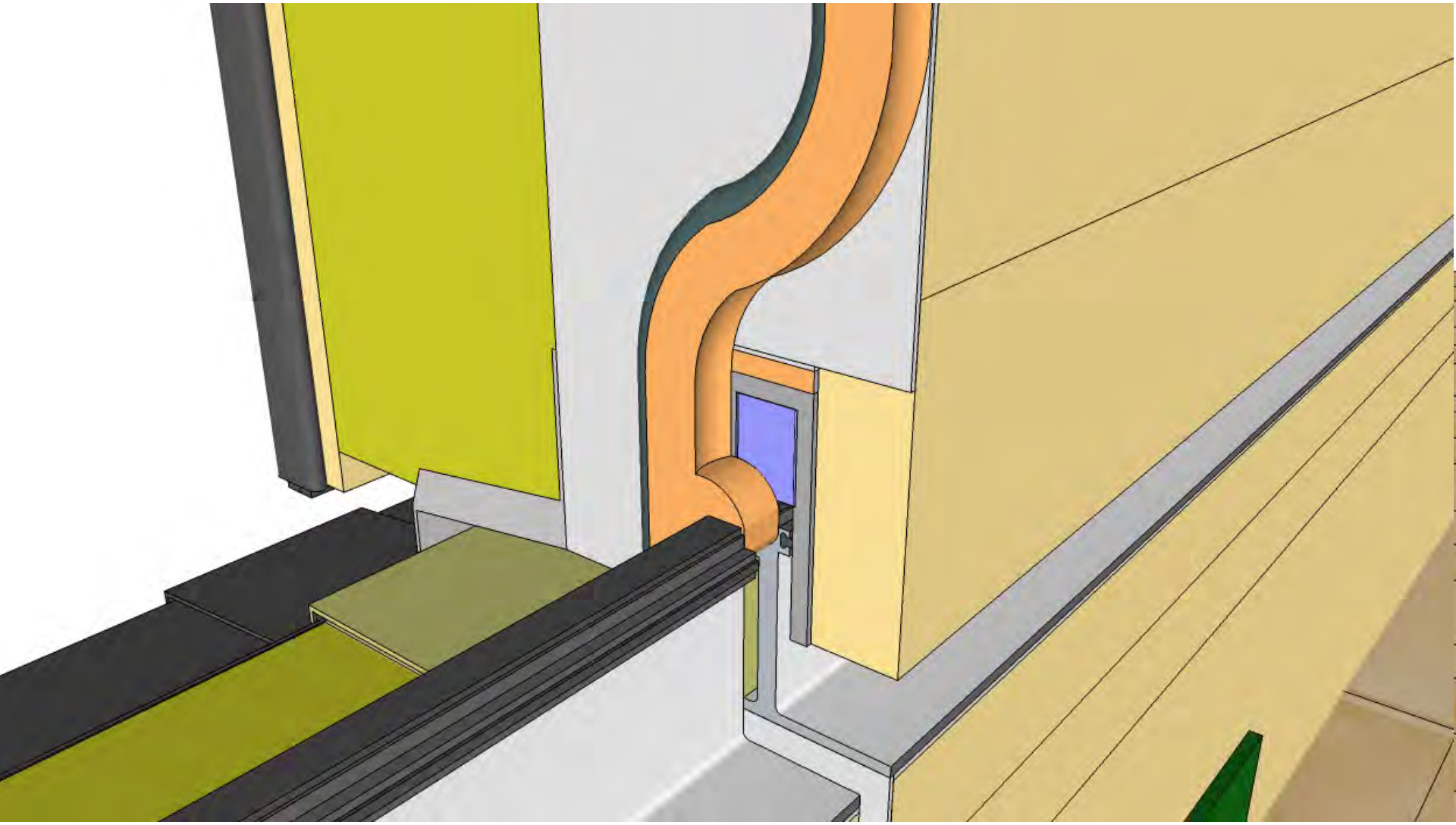
Tall Wood Prefabrication Option – Large Panel with Pre-installed Windows





Tall Wood Concept Panel

Tall Wood Concept Panel



UBC Brock Commons - The 4 Panel Contenders!

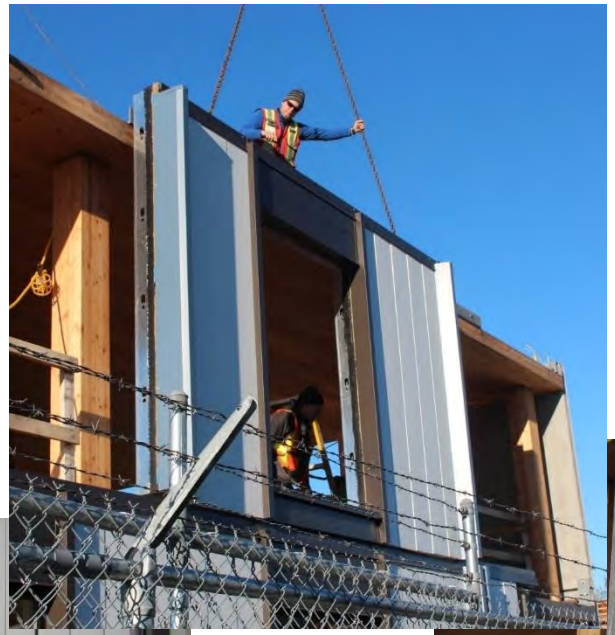
Pre-Cast Concrete Sandwich Panels

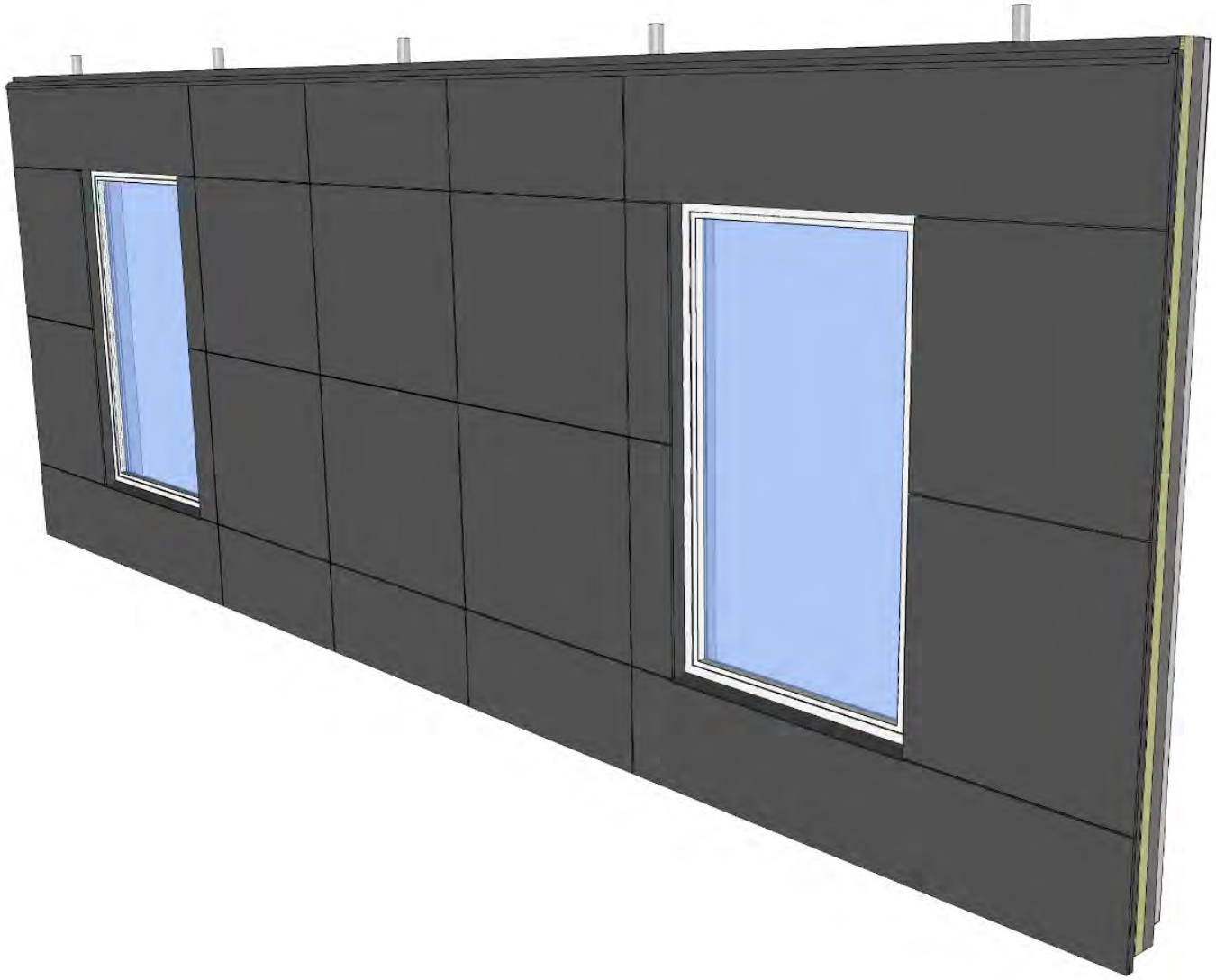
Steel Stud Framed Panels

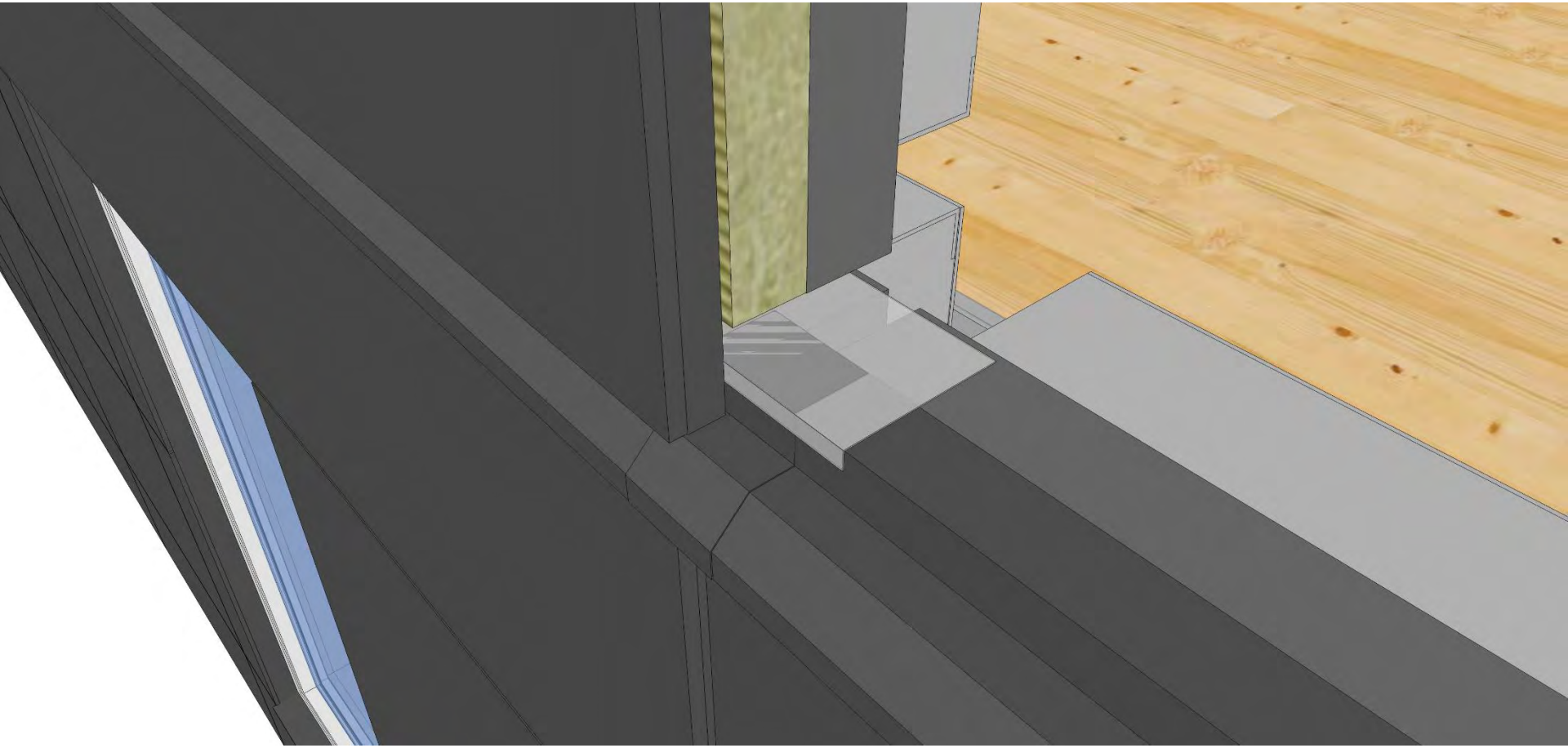
Wood Stud framed or CLT Panels

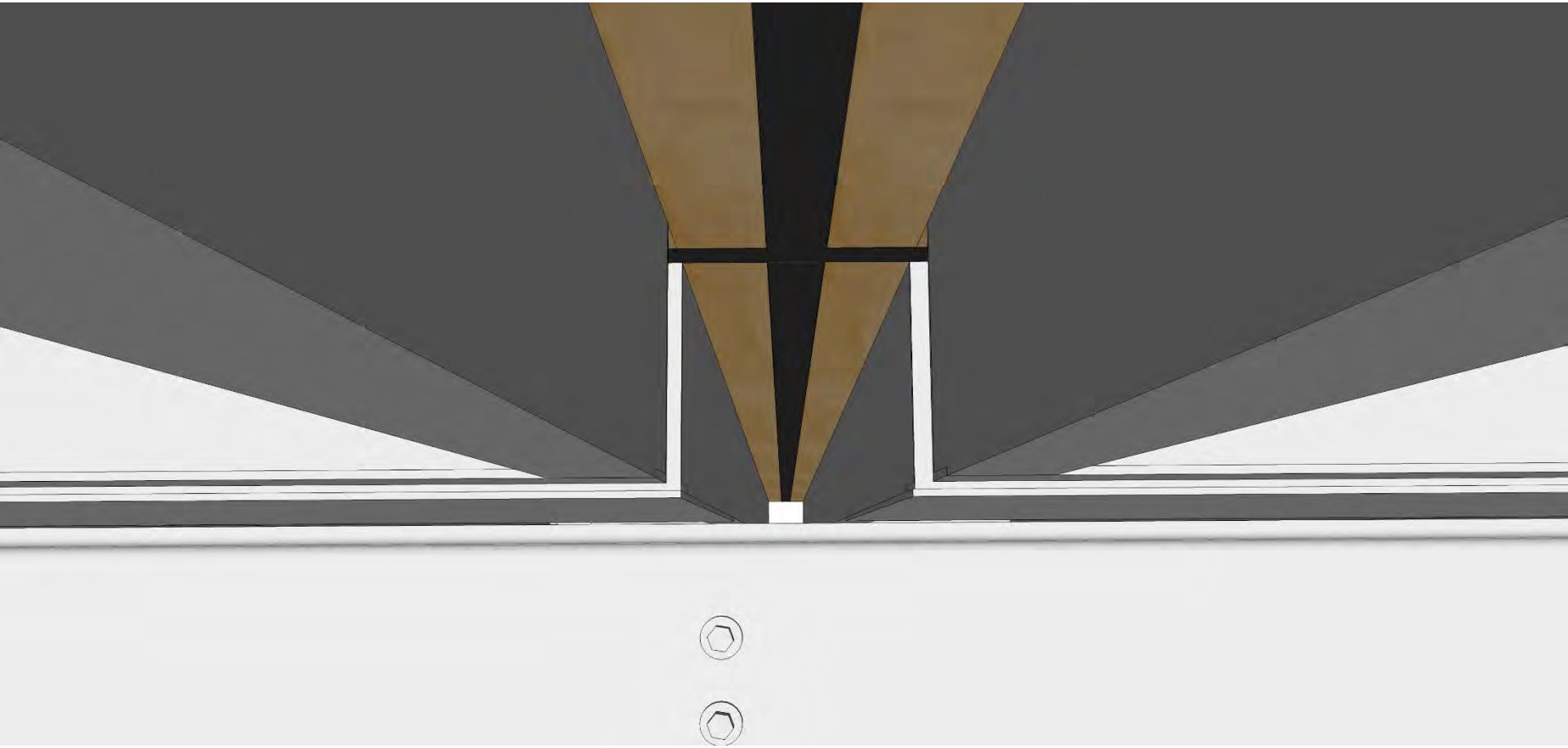
Aluminum Window-wall

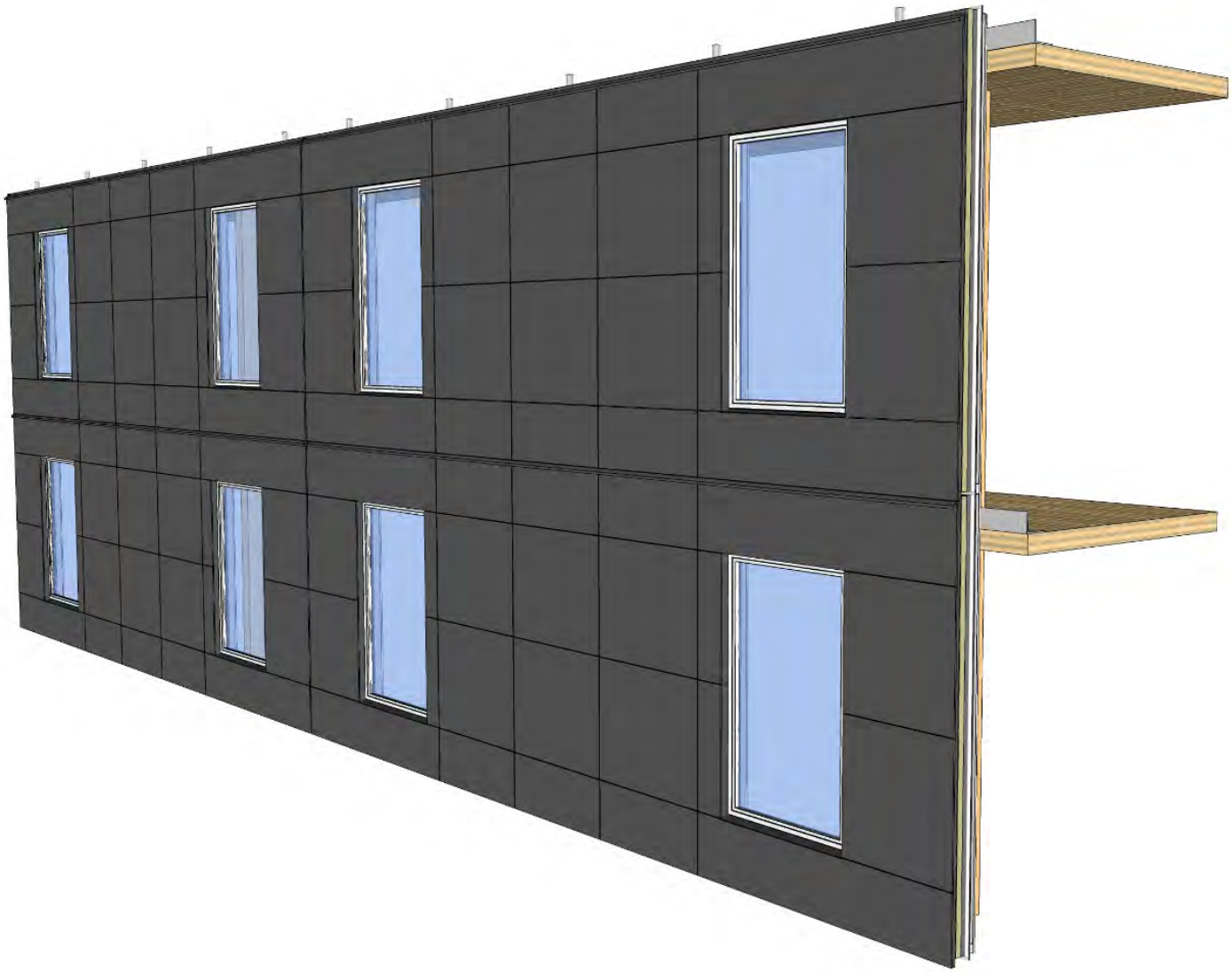
Prefabricated Panel Competition Mock-ups





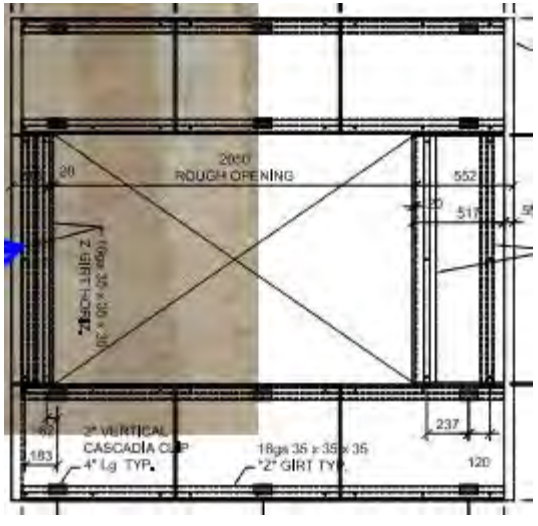




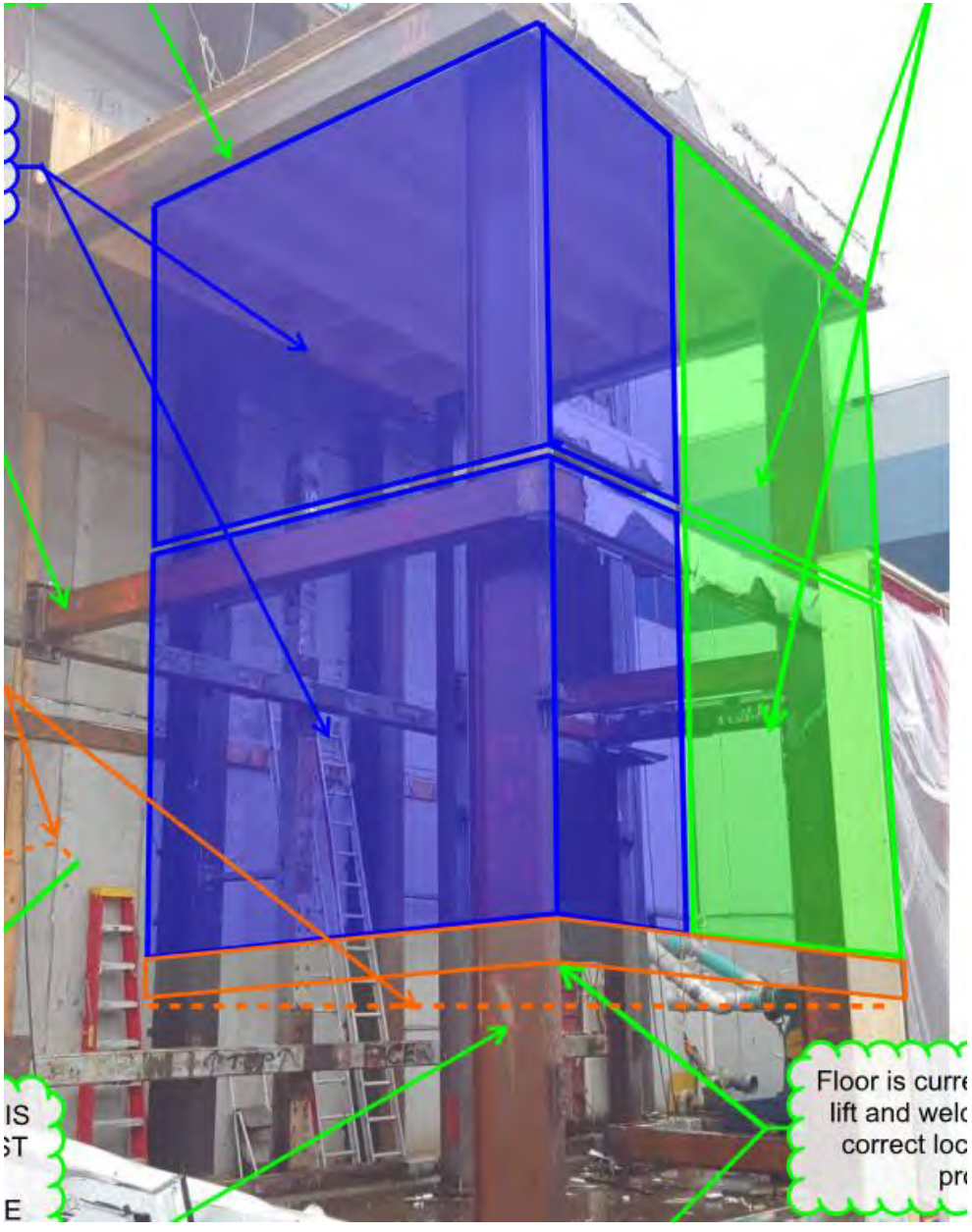


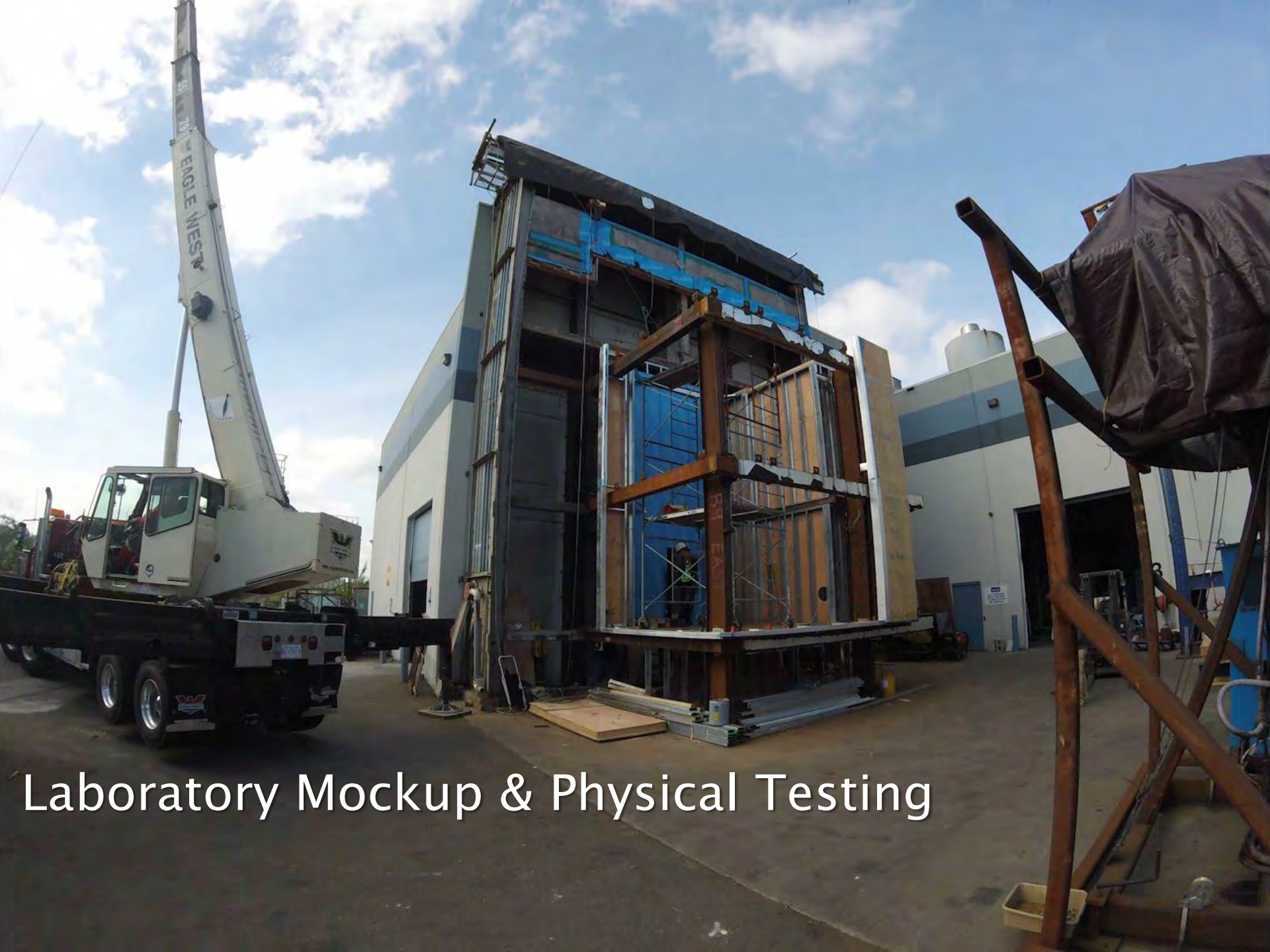
Performance Mockup

Proposed Construction Team



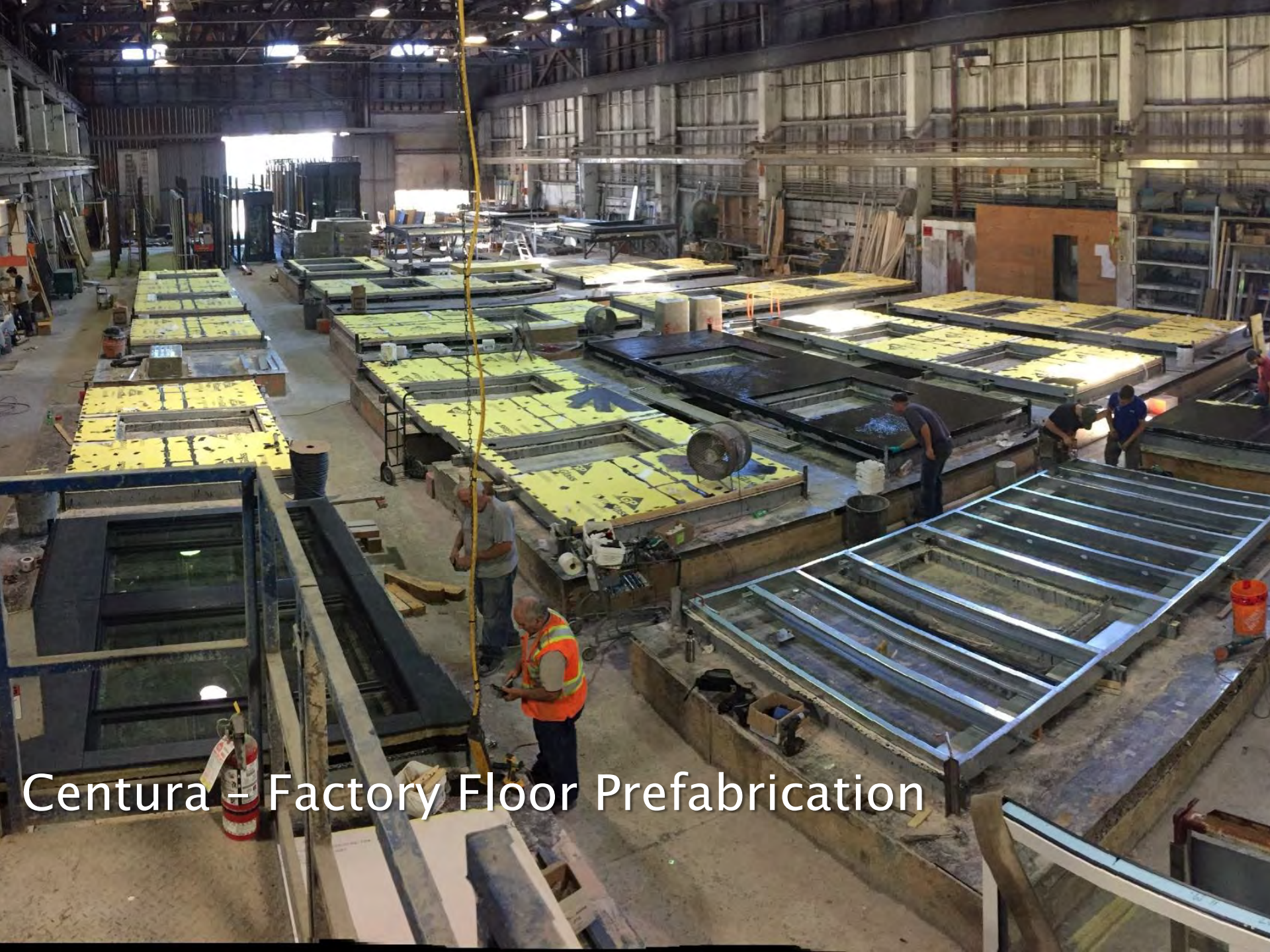
Proposed RDH (Similar Cost)



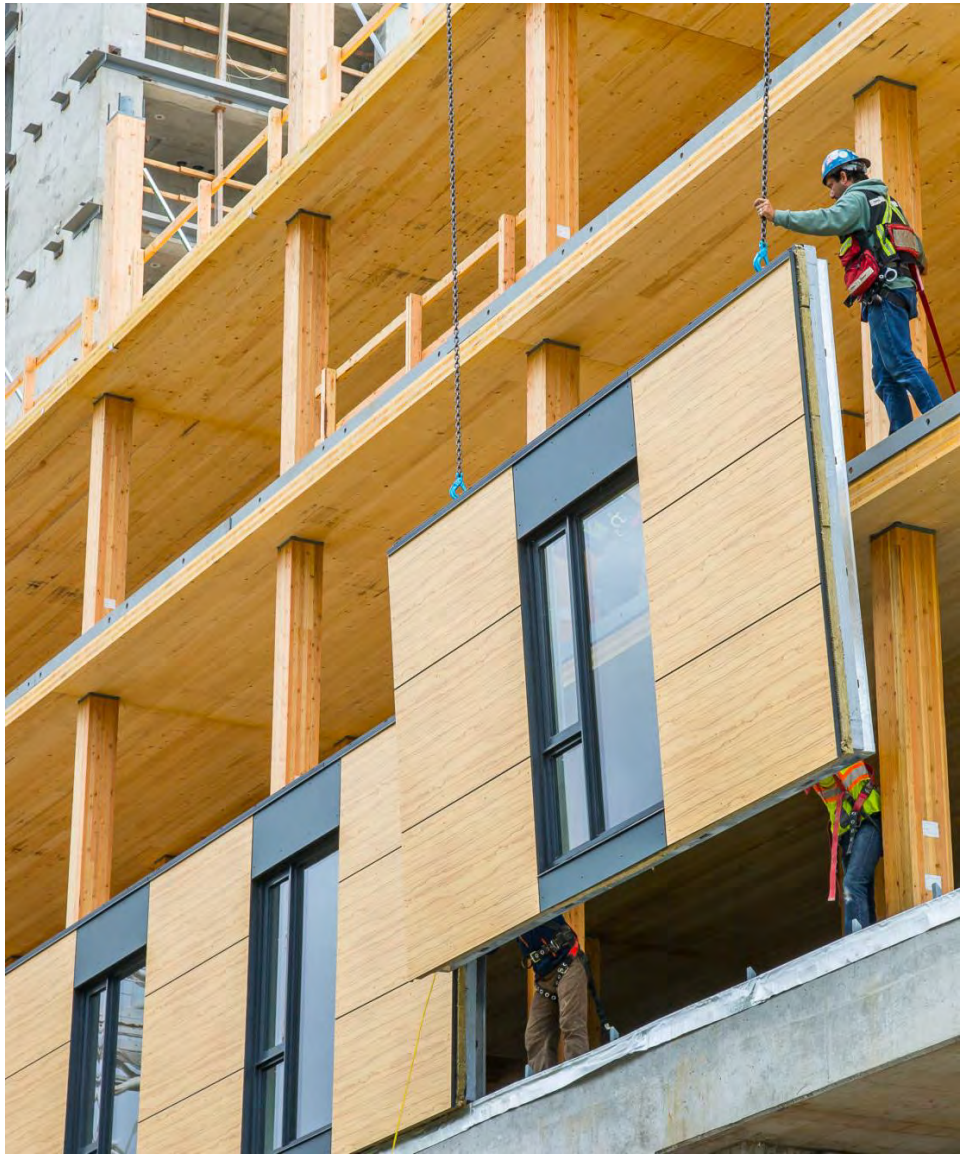


Laboratory Mockup & Physical Testing

EAGLE WEST



Centura – Factory Floor Prefabrication



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

WEEK: 1

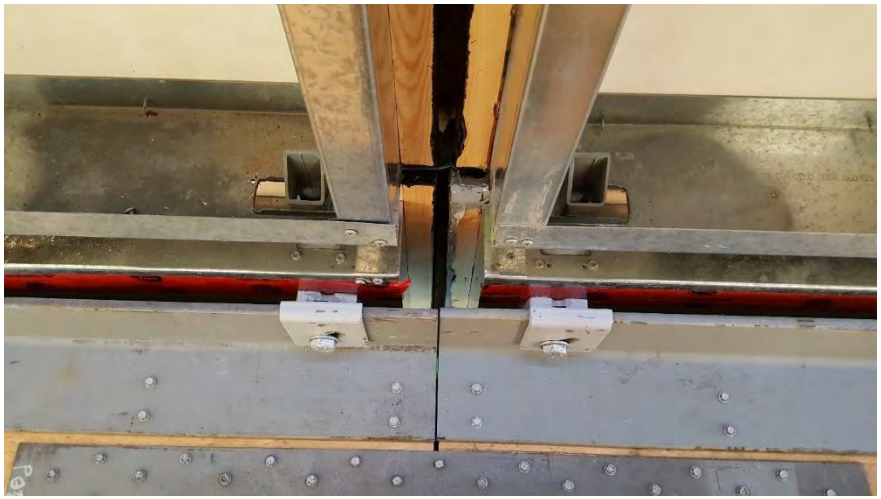
TIMELAPSE

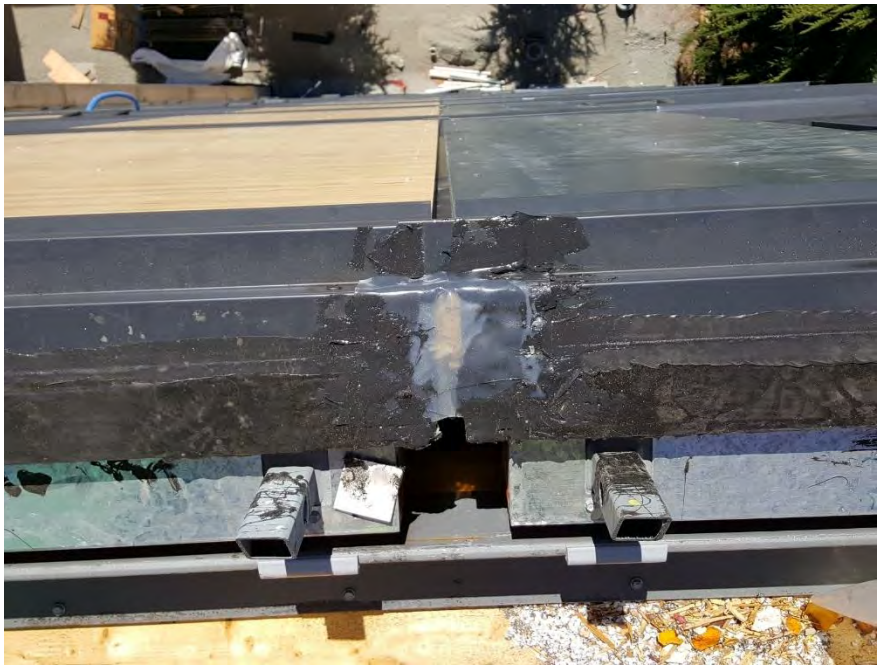
UBC
BROCK COMMONS

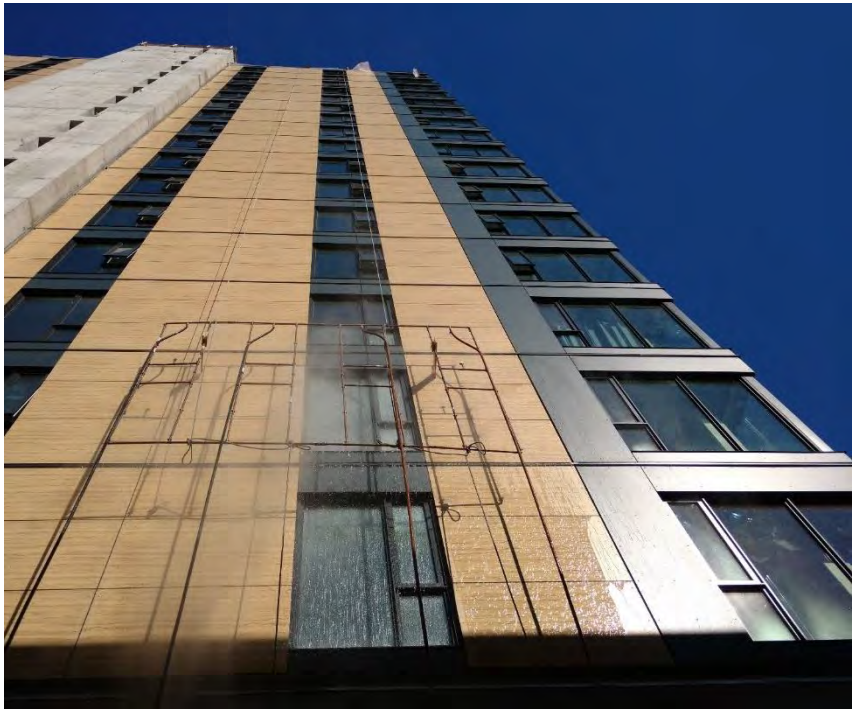
WOOD
CONSTRUCTION
STARTS
JUNE/6

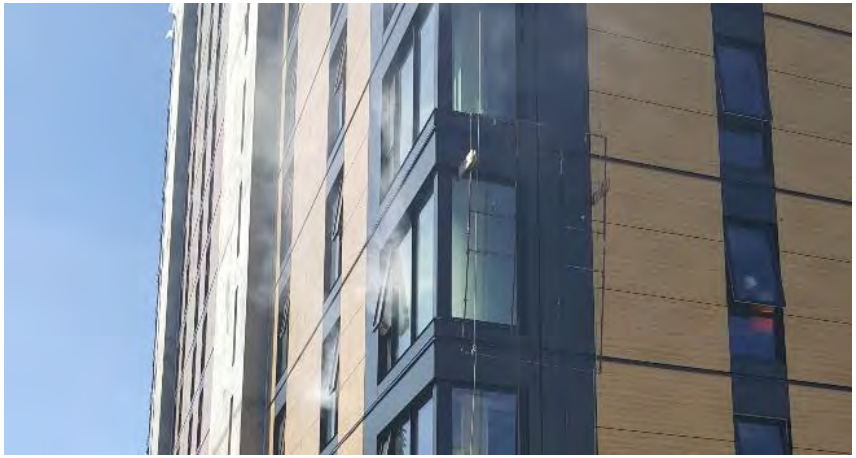
WOOD

Field Testing and Commissioning

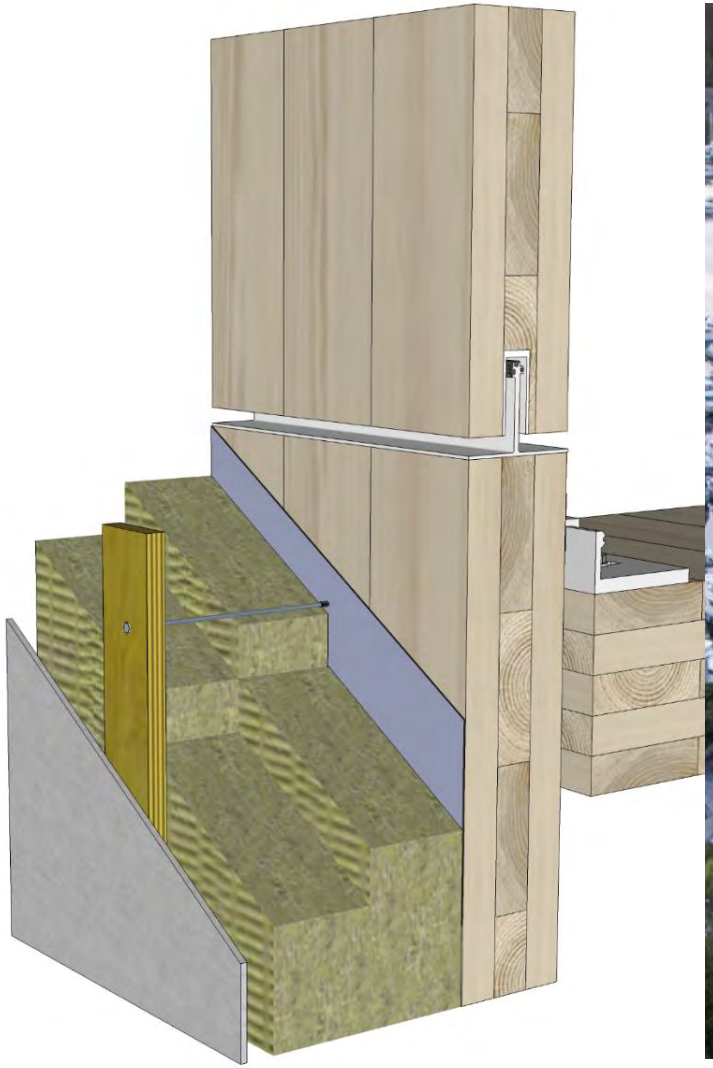








Future of Wood High-Rise
Passive House vs Terrace House



Brian Hubbs, bch@rdh.com

RDH
FAÇADE
ENGINEERING