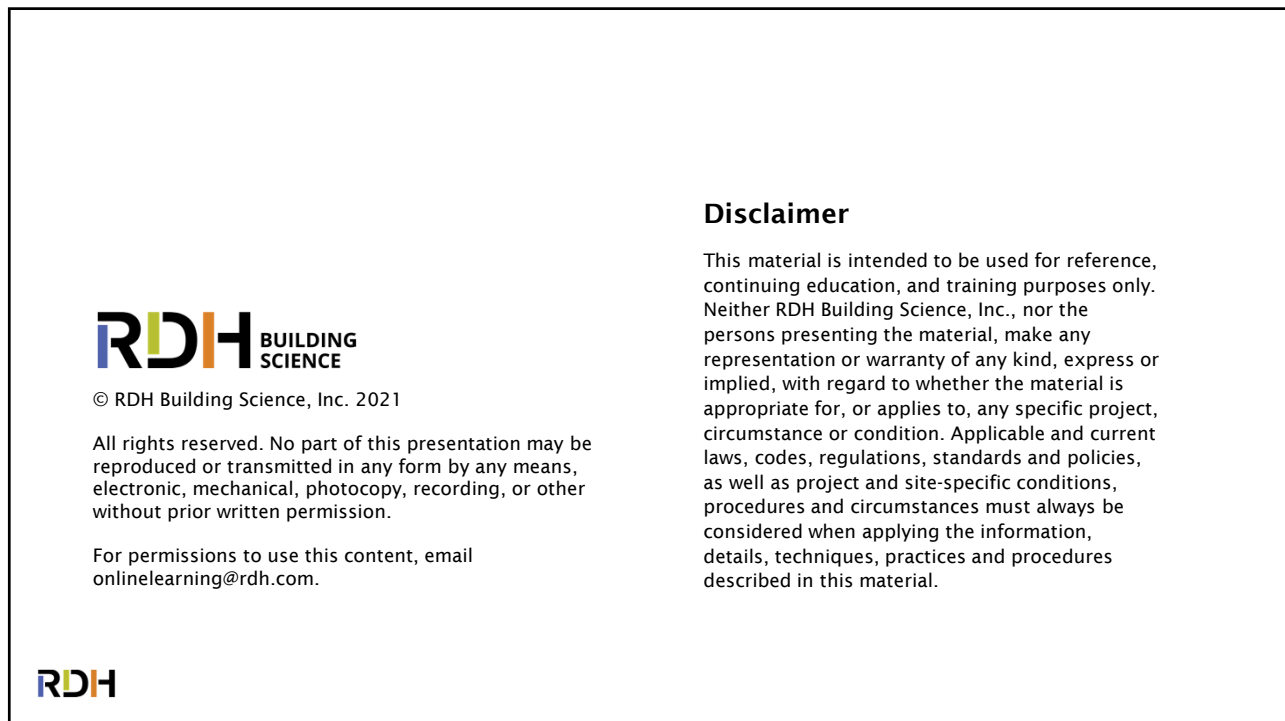




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Curtain-wall & Window-wall

5



Site Built & Prefabricated Facades

6



Prefabrication is not New

7

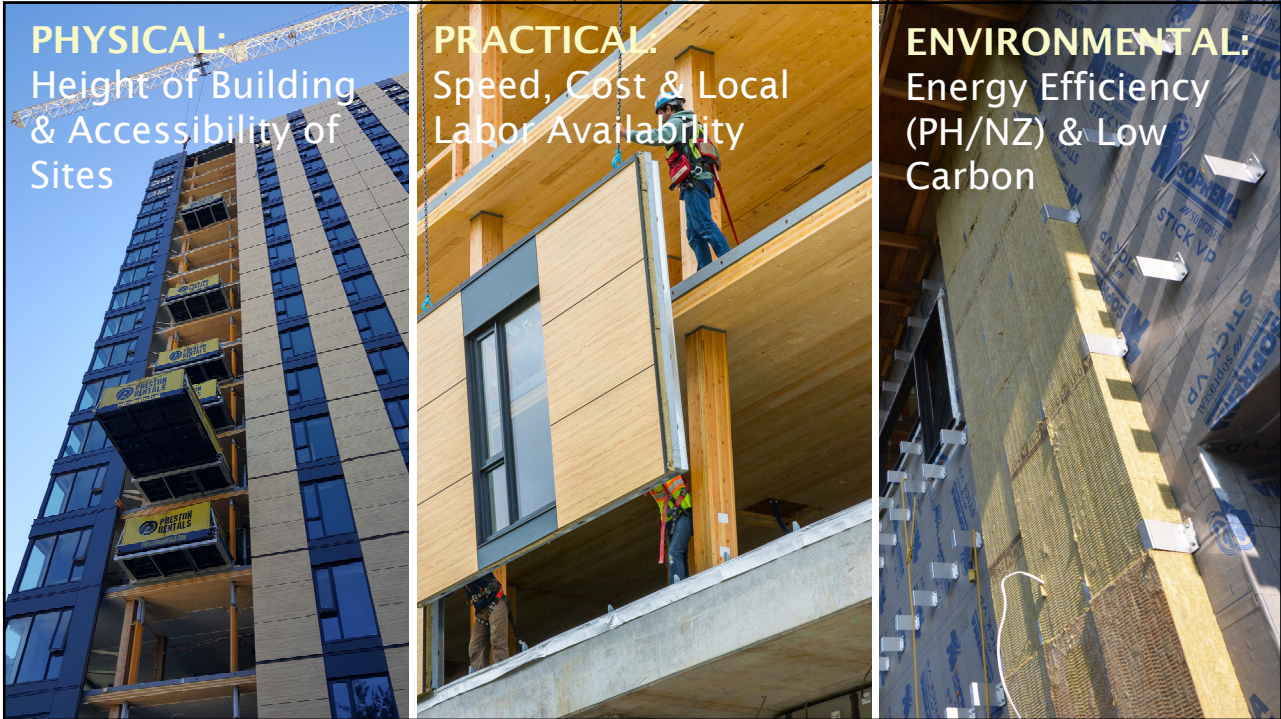


Where Next?

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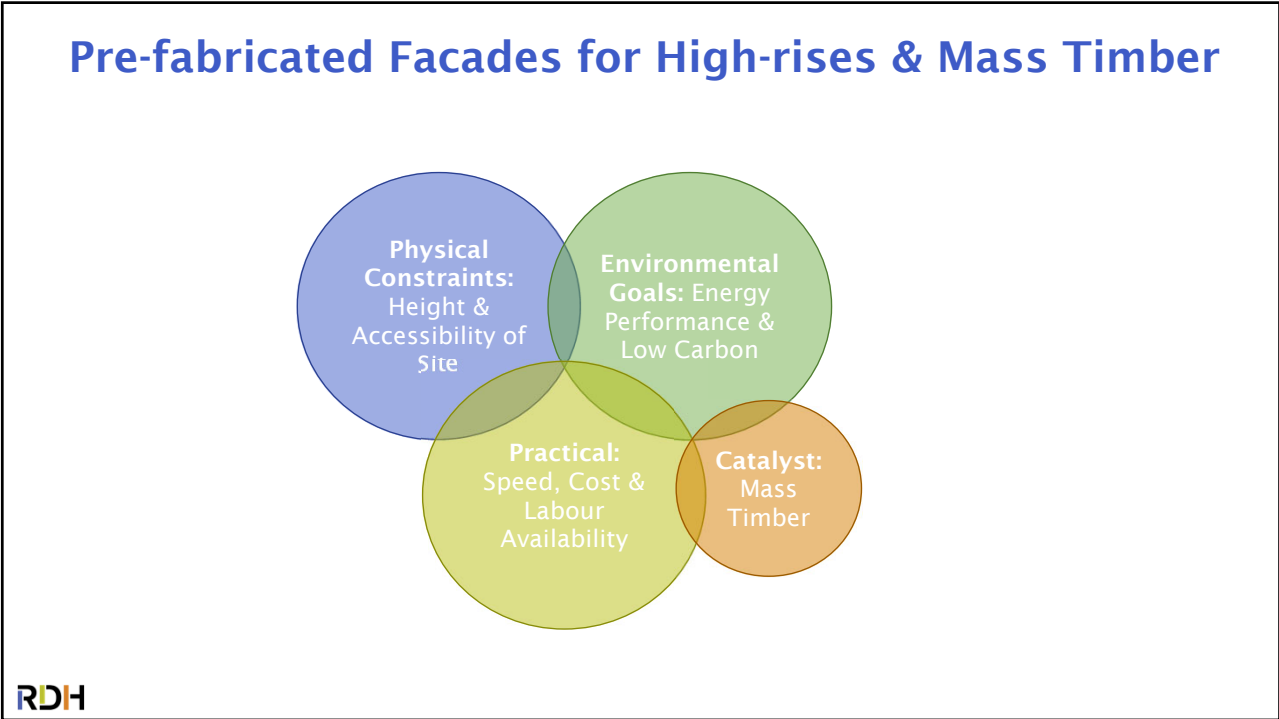
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**High-rise**  
=  
**Site-Built vs. Prefabricated Façades**

(market, design and speed dependent)

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**High-rise**  
+  
**Passive House**  
=  
**Site-Built vs. Prefabricated Façades**

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**High-rise**  
+  
**Passive House**  
+  
**Mass Timber Structure**  
=  
**Prefabricated Façades**

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**High-rise**  
 +  
**Passive House**  
 +  
**Mass Timber Structure**  
 +  
**Low Carbon Goals**  
 =  
**Prefabricated Wood-based Façades**

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### The Carbon Argument for Mass Timber Facades

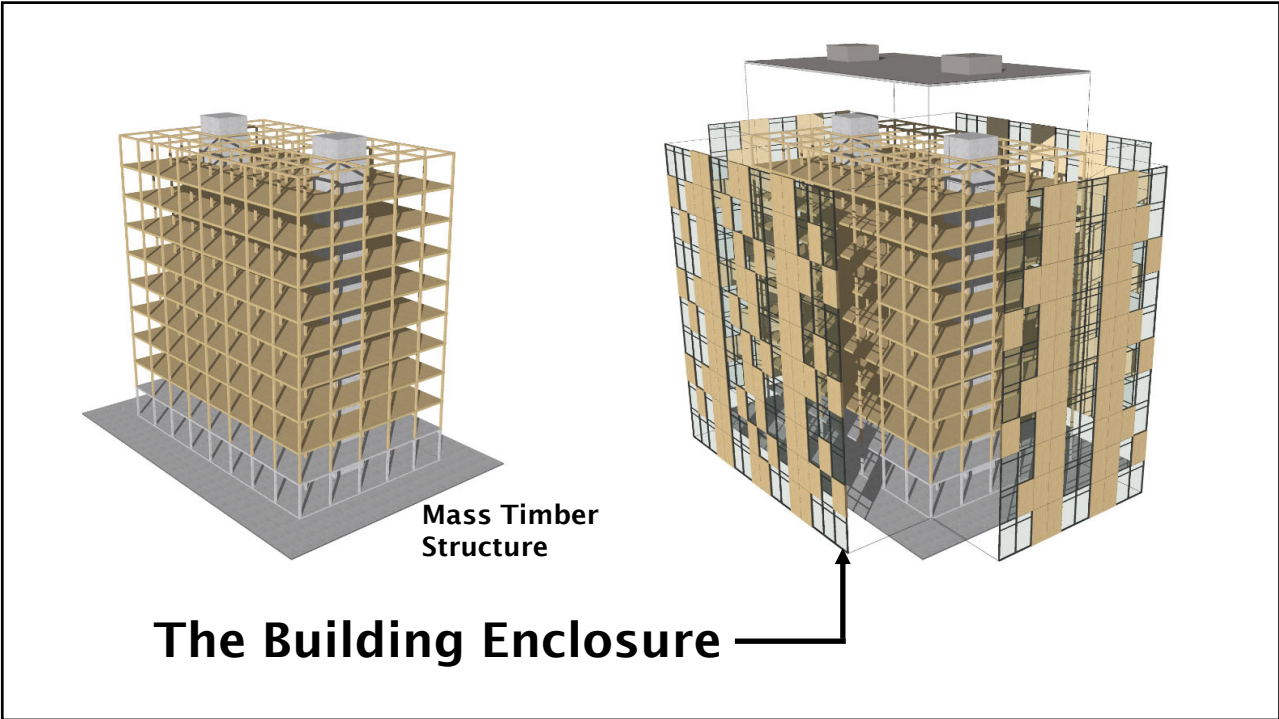
- **Operating Carbon**
  - Carbon equivalent emitted as part of operation and maintenance
  - Reduced with *energy efficiency measures (ie NZ/PH)*
- **Embodied Carbon**
  - Cumulative equivalent emitted carbon from acquisition, manufacture, transport, and installation of material
  - Reduced with *low carbon or carbon sequestering materials (ie wood)*
- **Trend** - In jurisdictions with low carbon energy grids and energy efficient building standards - embodied carbon is becoming increasingly scrutinized)

18

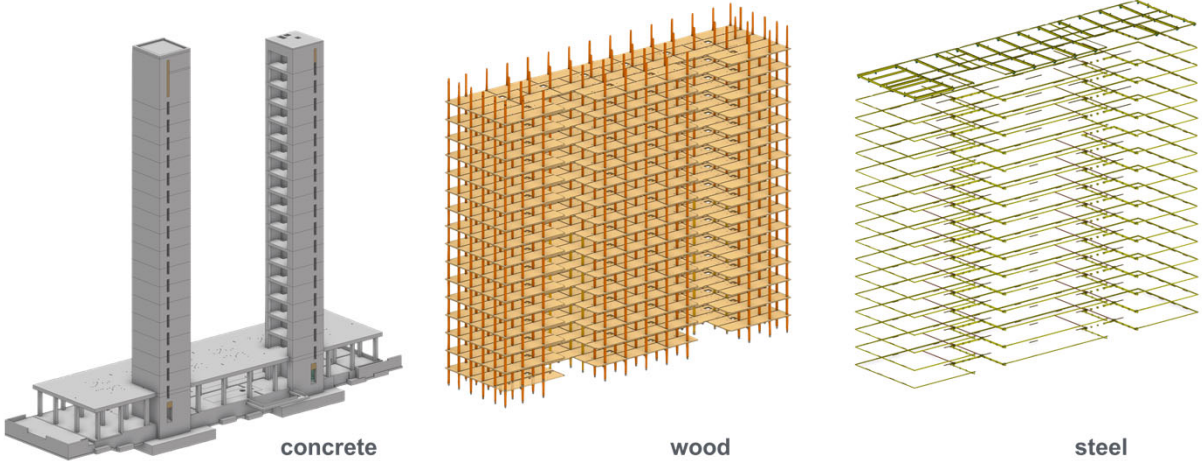


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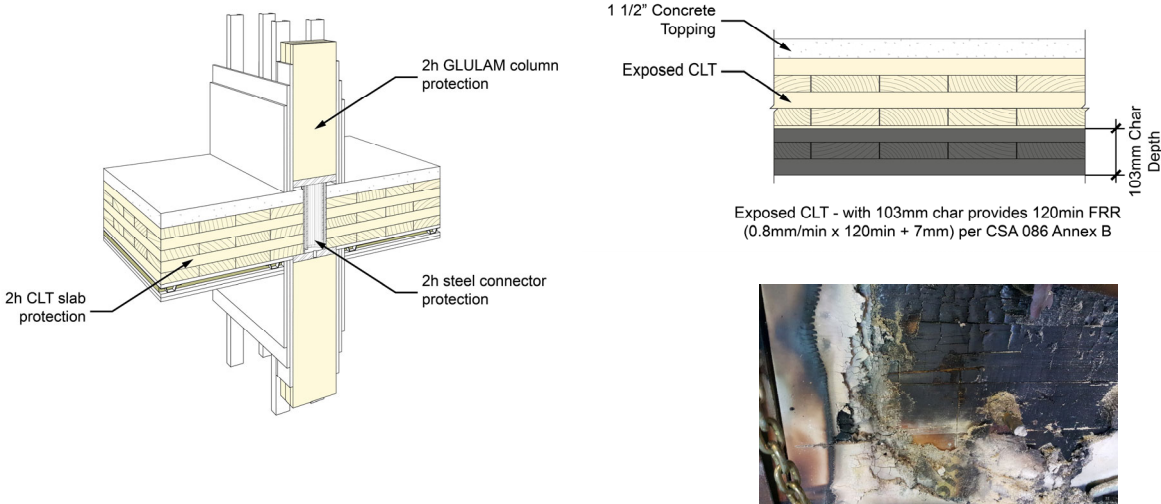
# Use Wood Where Wood Makes Sense



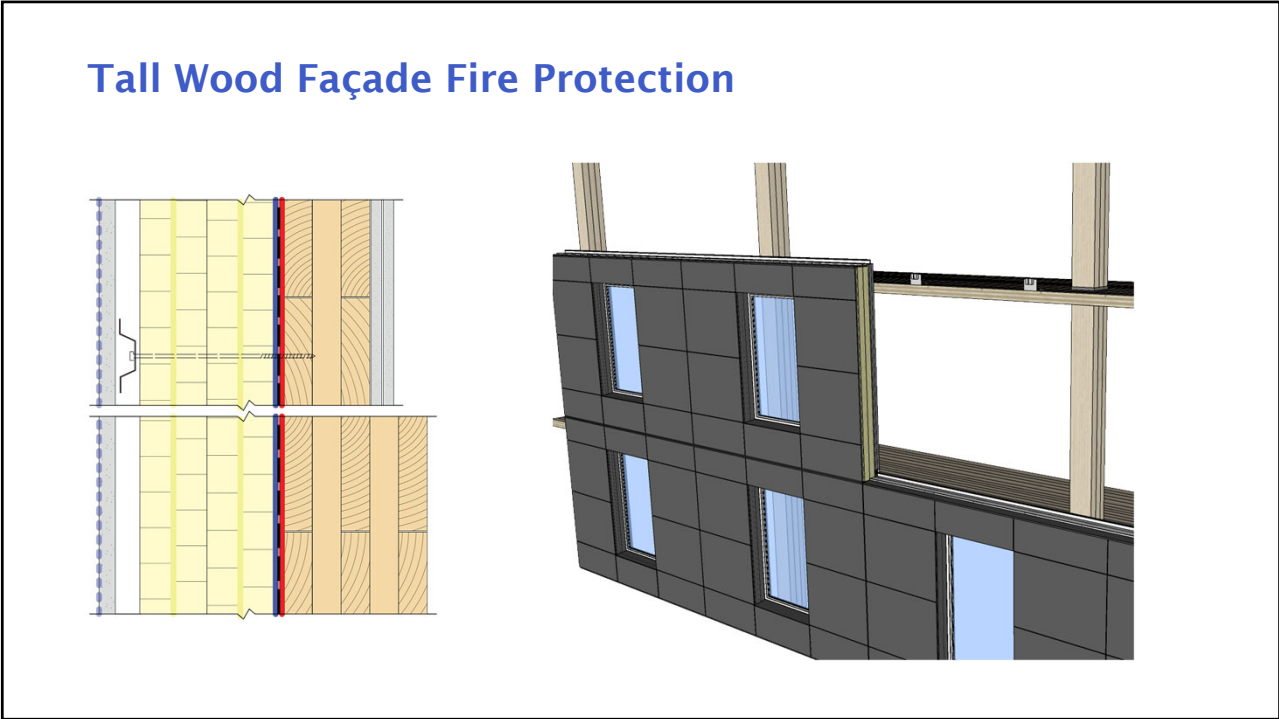
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# Tall Wood Fire Protection = Encapsulation and/or Char



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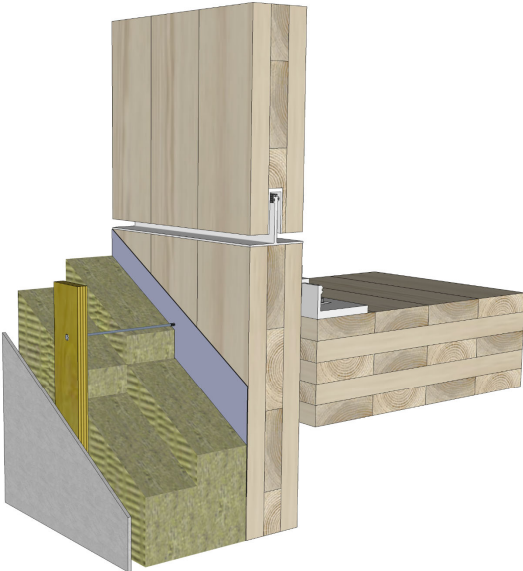


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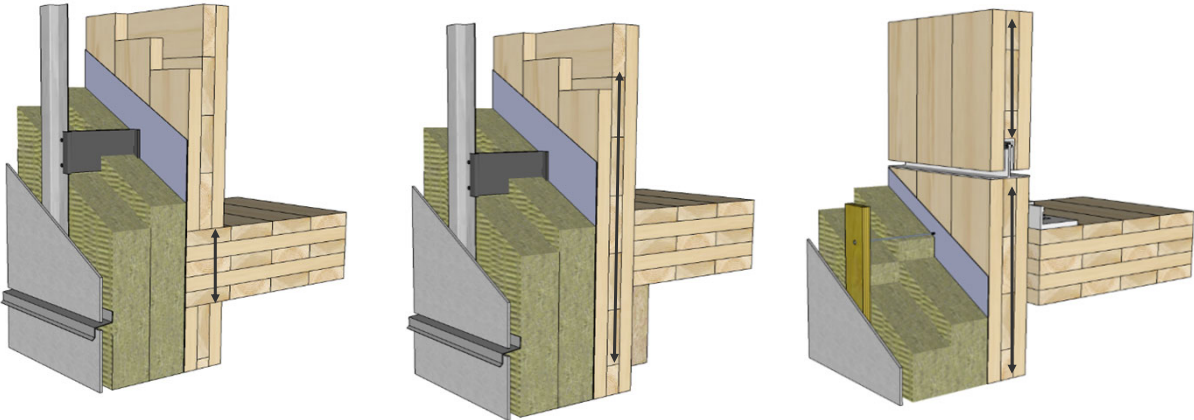
### Facades for Mass Timber Buildings?



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### Mass Timber Facade Considerations - Bearing vs. Non Load Bearing & Movement



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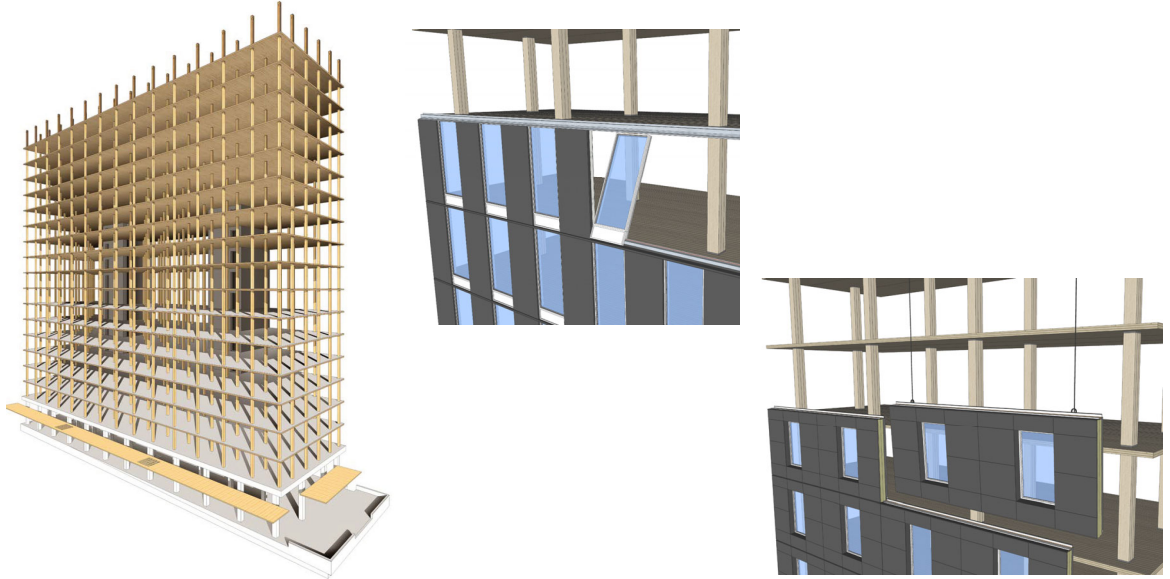
26

## UBC Tall Wood - First Steps Towards Prefabricated Mass Timber Facades

AOA



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## UBC Tall Wood - Prefabricated Façade Competition



Prefabricated wood, steel, & concrete façade systems all prototyped, built and judged



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## Steel Frame Prefabricated Façade for Tall Wood

**Exterior Envelope Layers**

- A. Wood fibre laminated panels + punched windows
- B. Stone-wool insulation
- C. Liquid-applied membrane
- D. Weather-proof drywall
- E. Steel studs

**Interior Envelope Layers**

- F. Batt insulation + vapour barrier
- G. Drywall

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## Alternate Mass Timber Prefabricated Façade Option

- 1 Mass timber back-up wall structure. 3 or 5-ply CLT.
- 2 Vapour permeable and WRB. Multiple products available but self-adhered membrane recommended for ease of install.
- 3 Punched windows installed to specifications. Step is omitted if curtain or window walls are specified.
- 4 Thermal clip and rail cladding attachment. Cheaper option to install hat tracks or Z-girts pinned through insulation with long screws. Cladding is to include an exterior air gap for rainscreen cavity.
- 5 Exterior mineral insulation of required thickness.
- 6 WSS. Cladding of choice must be durable as it experiences frequent wetting and drying cycles. Flashing detail is critical where panels join.

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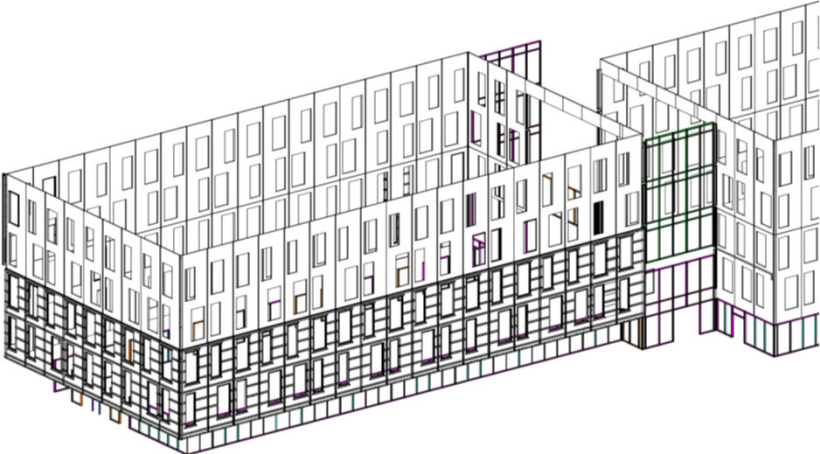
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# Catalyst – First Gen. Panelized Mass Timber Facade



Net Zero Performance Goal, Passive House  
Building Enclosure & Airtightness Goals



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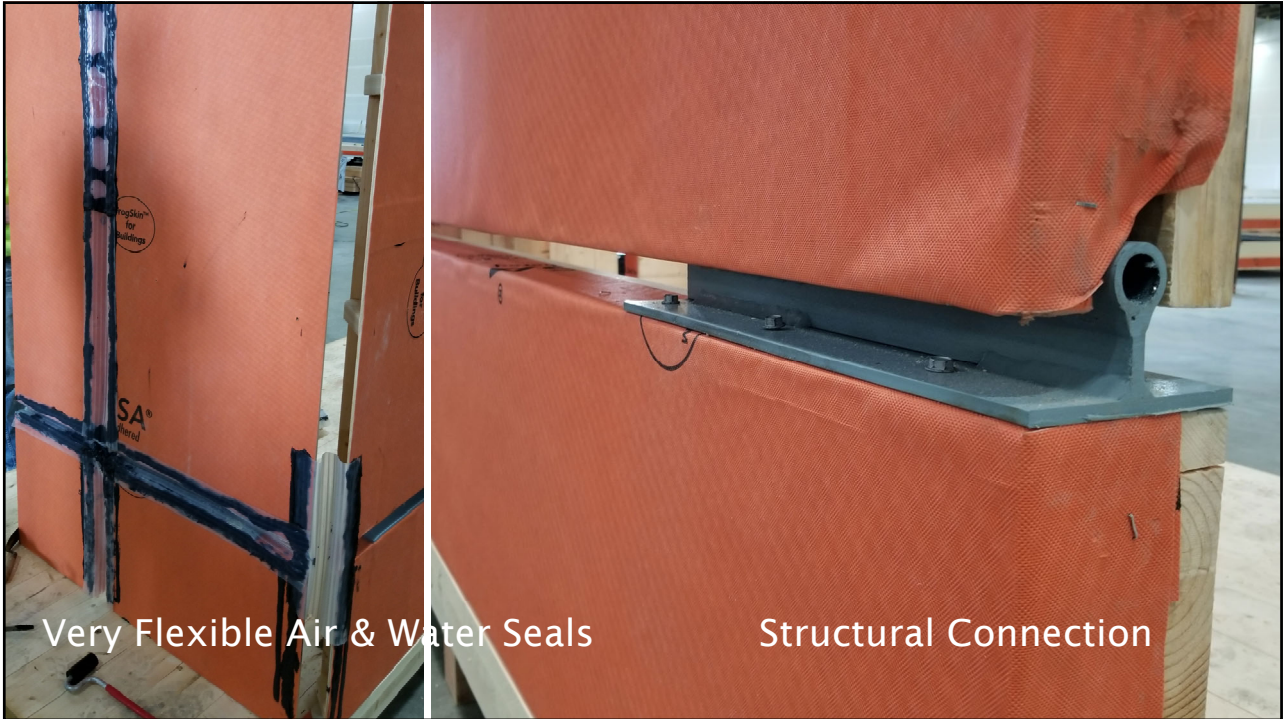
Mass Timber Structure

34



Prefabricated CLT Façade Panels to Cladding Supports

35



Very Flexible Air & Water Seals

Structural Connection

36



Structural Brackets

37



Site Panel Installation & Window Installation

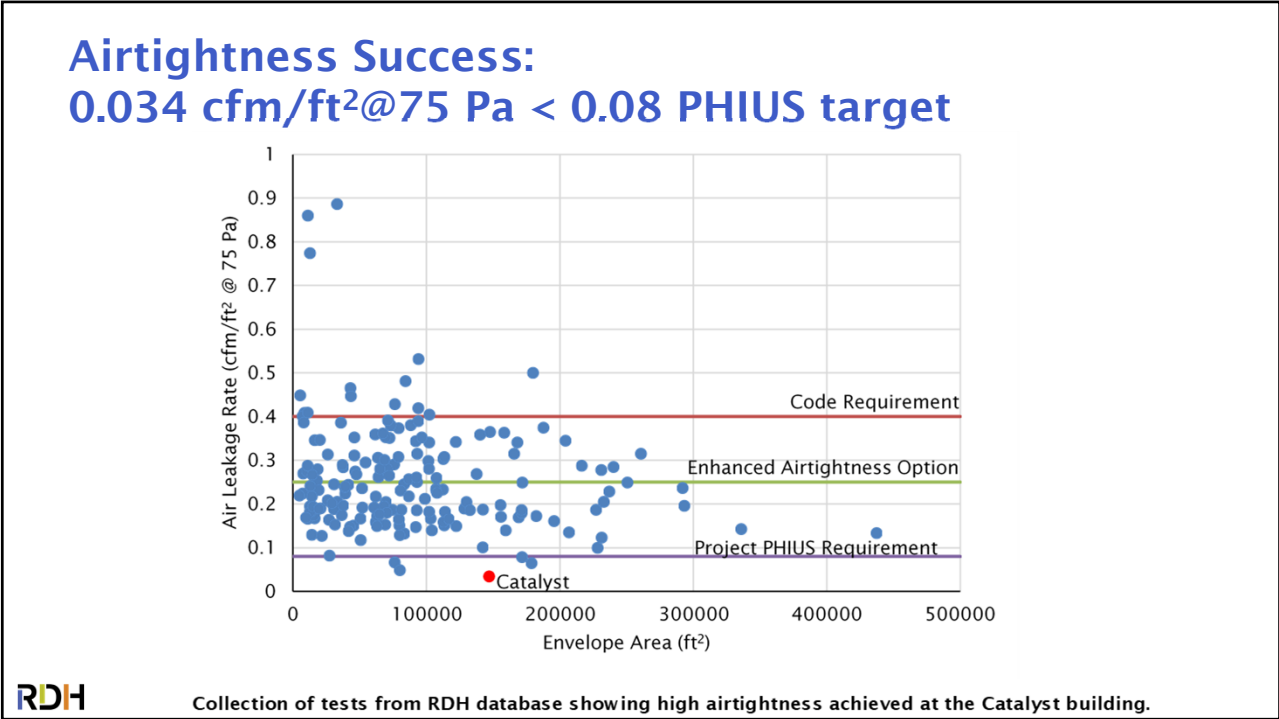
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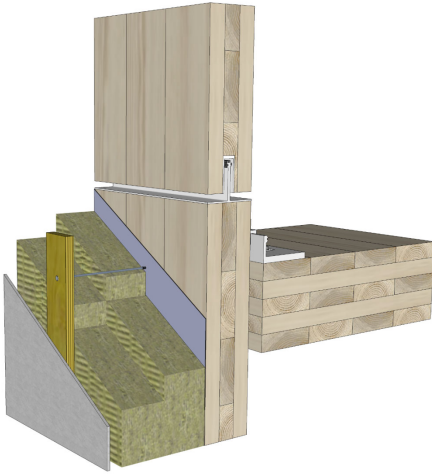


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# Next Generation Panelized Mass Timber Prototypes



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## Canada's Earth Tower: The Next Catalyst for Mass Timber Facades



Perkins&Will

DELTA GROUP

45

DELTA LAND DEVELOPMENT — CANADA'S EARTH TOWER

### DESIGN AND PROTOTYPE COMPETITION

Prefabricated Wood-Based Façade Systems for Tall Wood Buildings



**Client:** Delta Land Developments

**Participants:** Manufacturer-led teams that may include contractors, engineers, architects, material suppliers, trades etc.

**Key Objectives:**

- To spur innovation in commercially available wood-based façade systems for mass timber and other projects
- To generate specific, implementation-ready solutions appropriate for use on Canada's Earth Tower, an industry-leading tall wood project anticipated to be up to 40 storeys

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## Competition

- Created to get ahead of the need for a low carbon, low energy, wood-based façade for mass timber wood buildings
- Approached over 40 companies across Canada and the US
  - Included façade contractors, existing façade system manufacturers (steel, curtainwall, concrete, wood, window), mass timber producers, wood prefabricators, modular builders, new startups in sector
- 1 partial, 5 complete/viable product entries received and narrowed down to a top 3 based on competition criteria
  - Top 3 each contracted \$50k to produce small scale mock-up
  - Top team contracted additional \$75k for performance mockup

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## Key Design Parameters

- Wood as primary structural element, exposed if possible where allowed\*
- Entirely prefabricated w/ exceptions\*
- Flexibility in design concept and pairing of punched windows, large balcony doors, adjoining curtainwall, roof decks etc.
- Suitable for high-rise buildings in high seismic regions
- Meet stringent fire code requirements for tall wood buildings through design and later testing



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## Key Design Parameters

- Thermally efficient and suitable for Passive House projects
  - ~R-40 walls, R-6+ windows
  - Minimal bridging at balconies and other penetrations (<10% reduction in performance)
  - Extremely airtight
- Cost effective, competitive vs. other systems of similar performance
- Durable, high-rise water tightness
- Low embodied carbon, sustainably harvested wood
- Socially equitable manufacturing



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## Scoring & 6 Entries

- Use of Wood
- Acceptance by Building Code
- Acceptance by Fire Code
- Design Flexibility
- Aesthetics
- Durability
- Acoustics
- Thermal Performance
- Constructability
- Sustainable Wood
- Social Equity
- Cost
- Manufacturing Experience
- Engineering Experience
- Façade Systems Experience
- Overall Submittal



**ELEMENT5**  
MASS TIMBER STRUCTURES

**SIDE WALK LABS**



**KATERRA**



**F3 Timber Technologies**

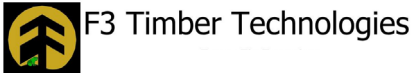
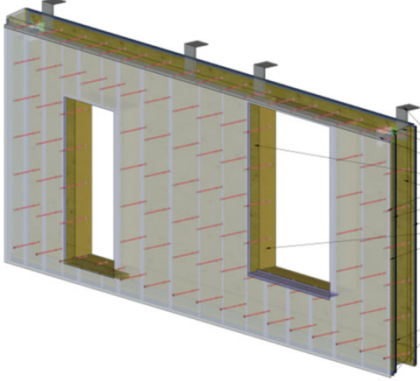
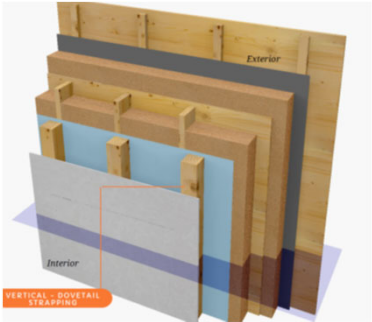


**MANASC  
ISAAC**



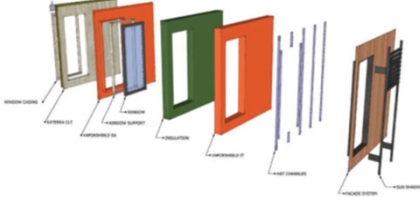
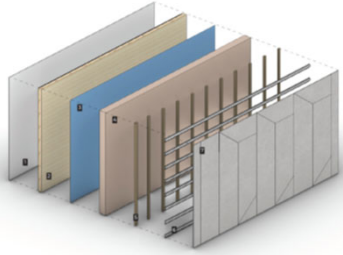
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### The 6 Entries



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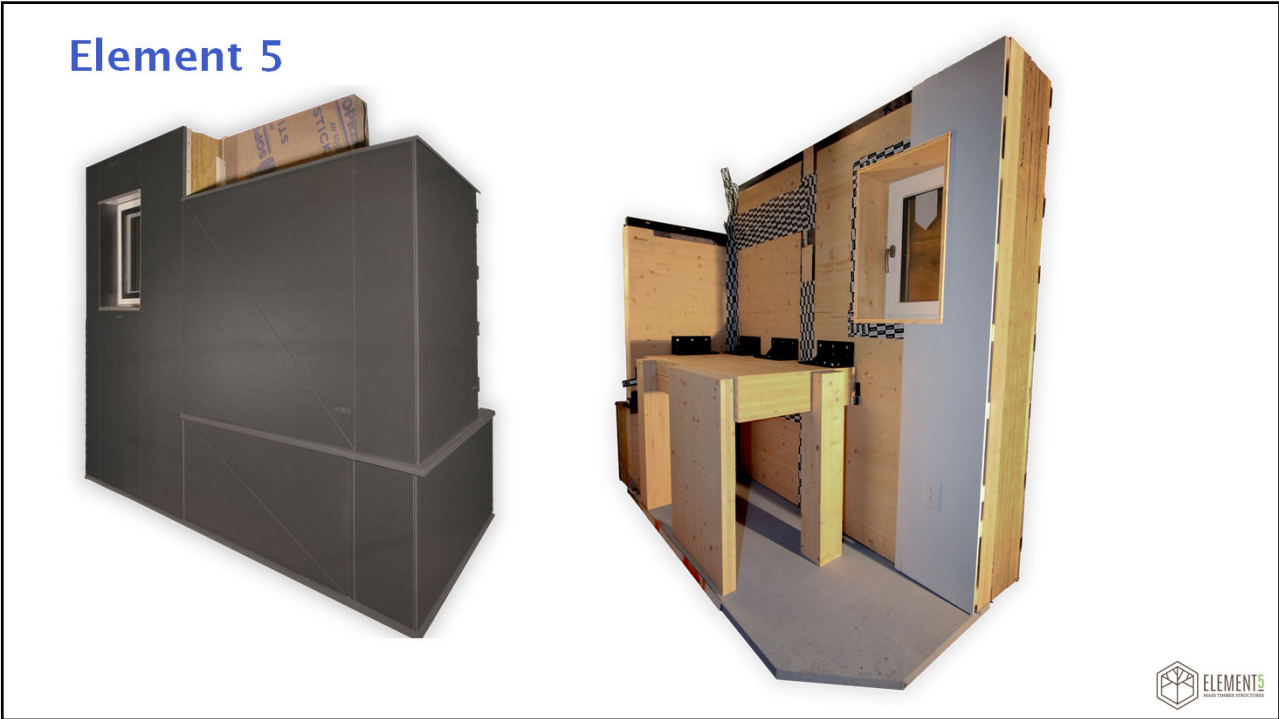
### The 6 Entries



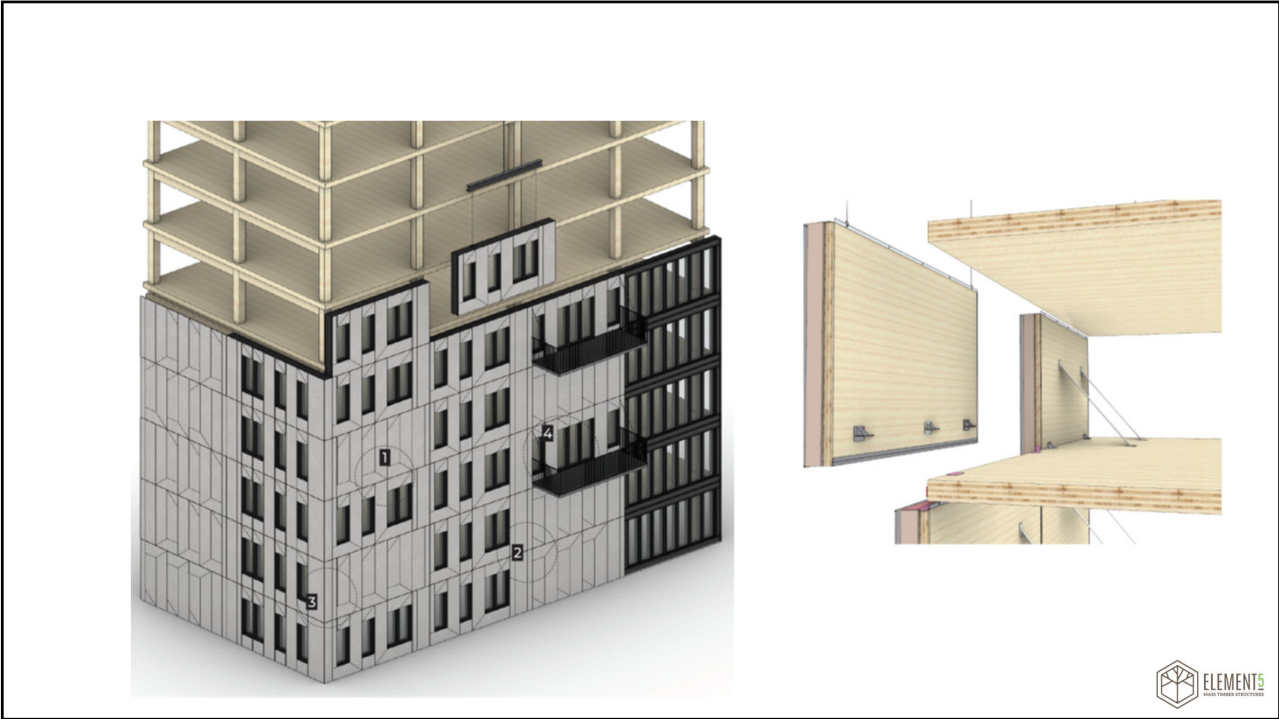
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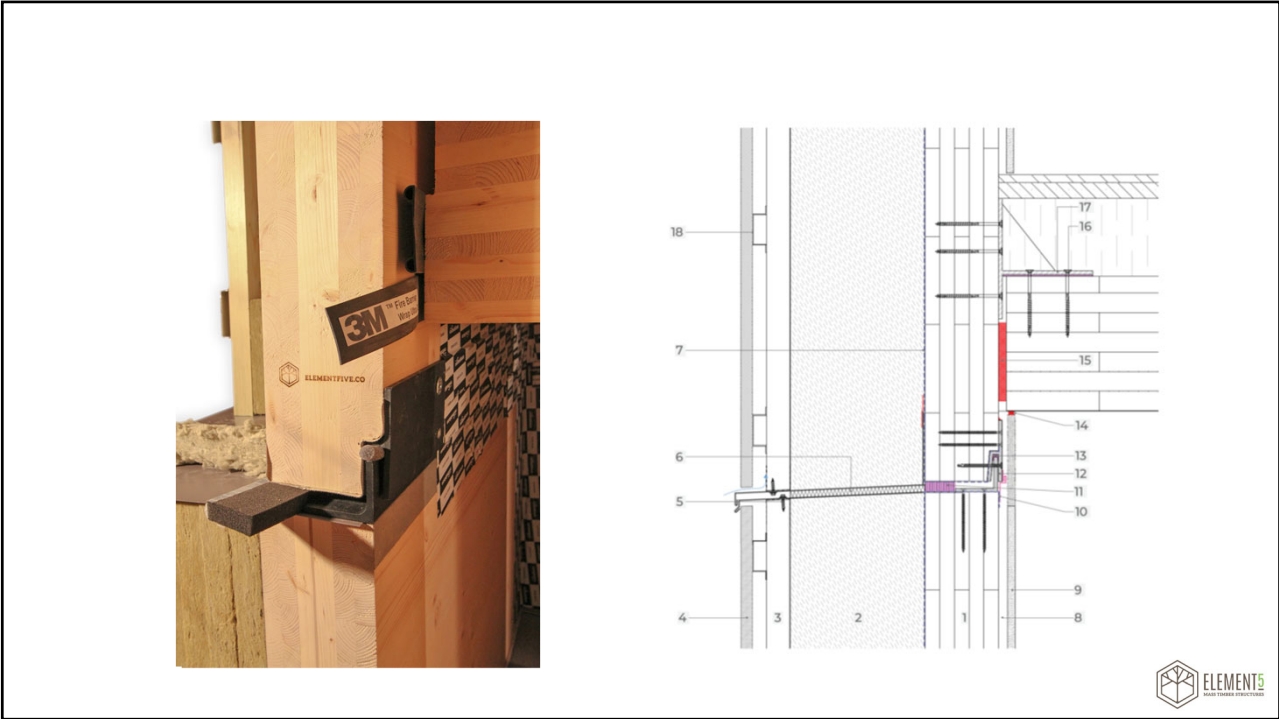
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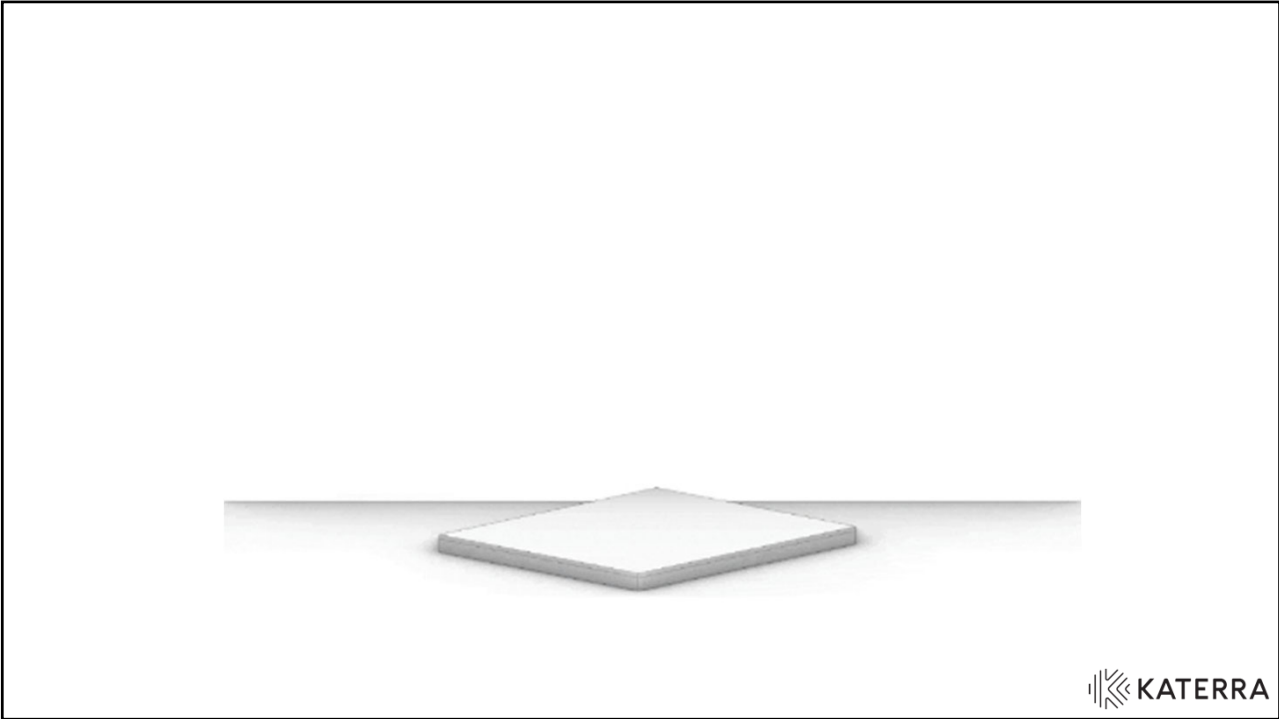
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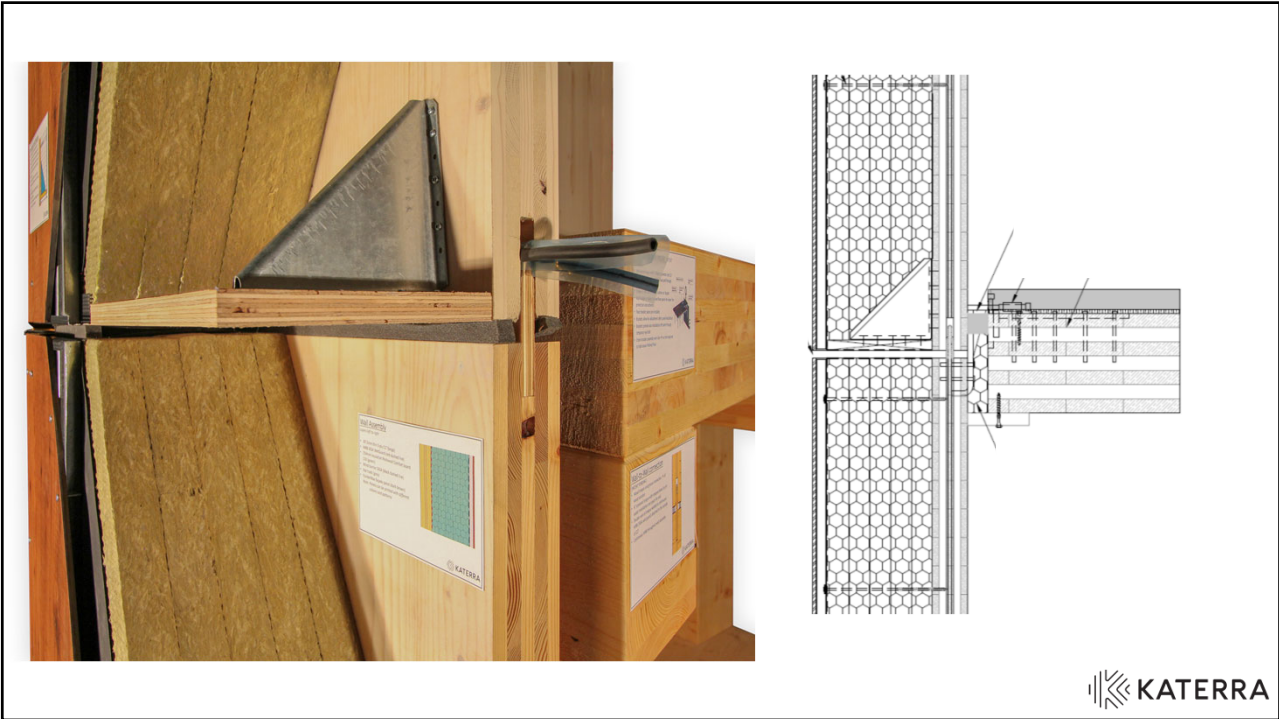
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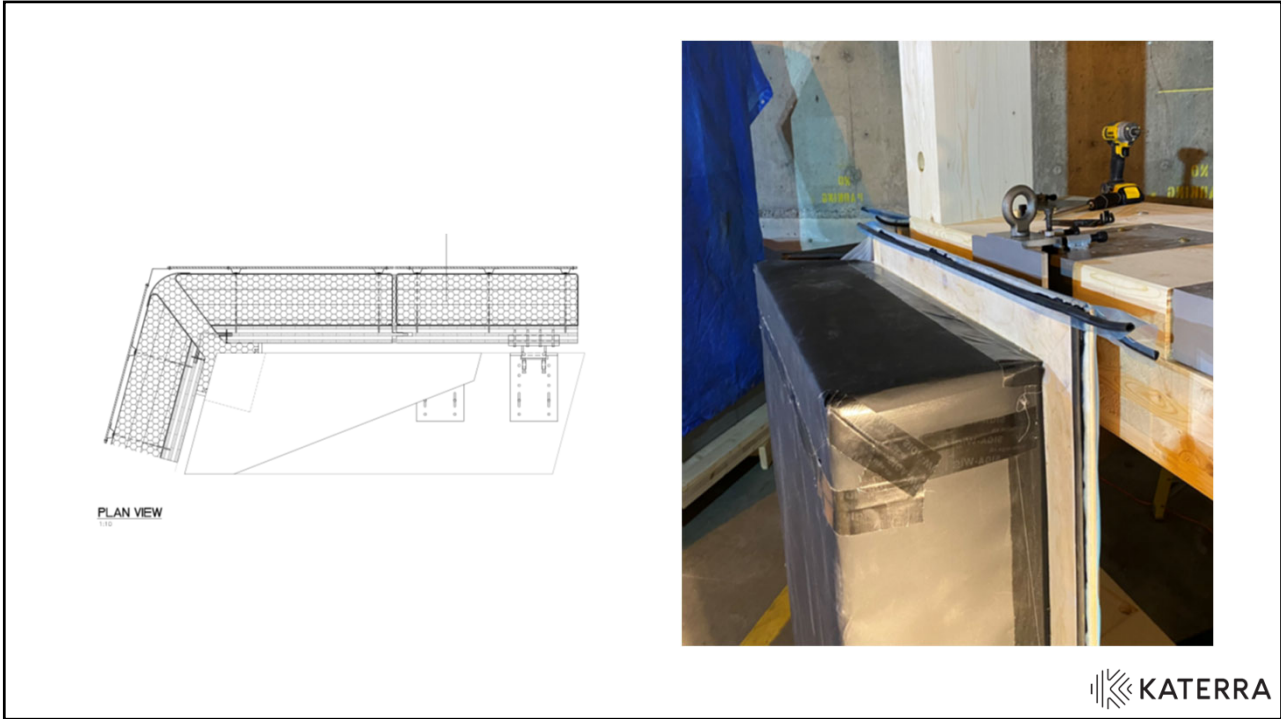
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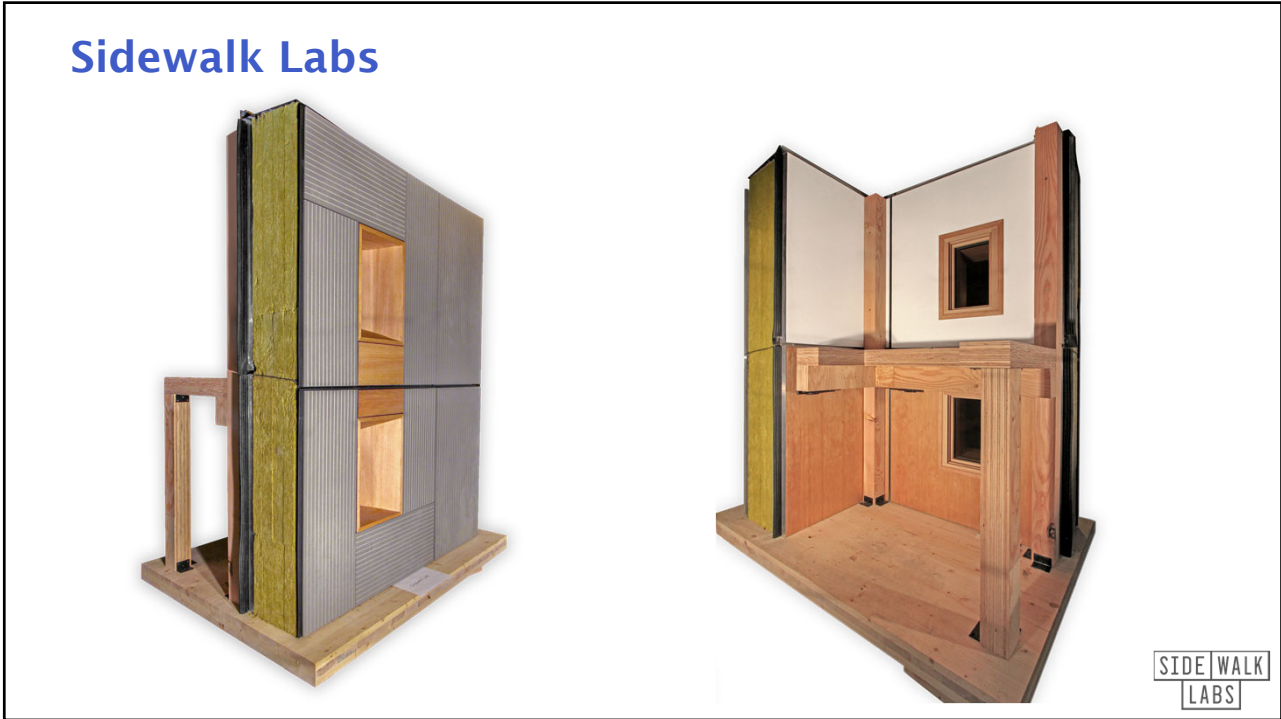


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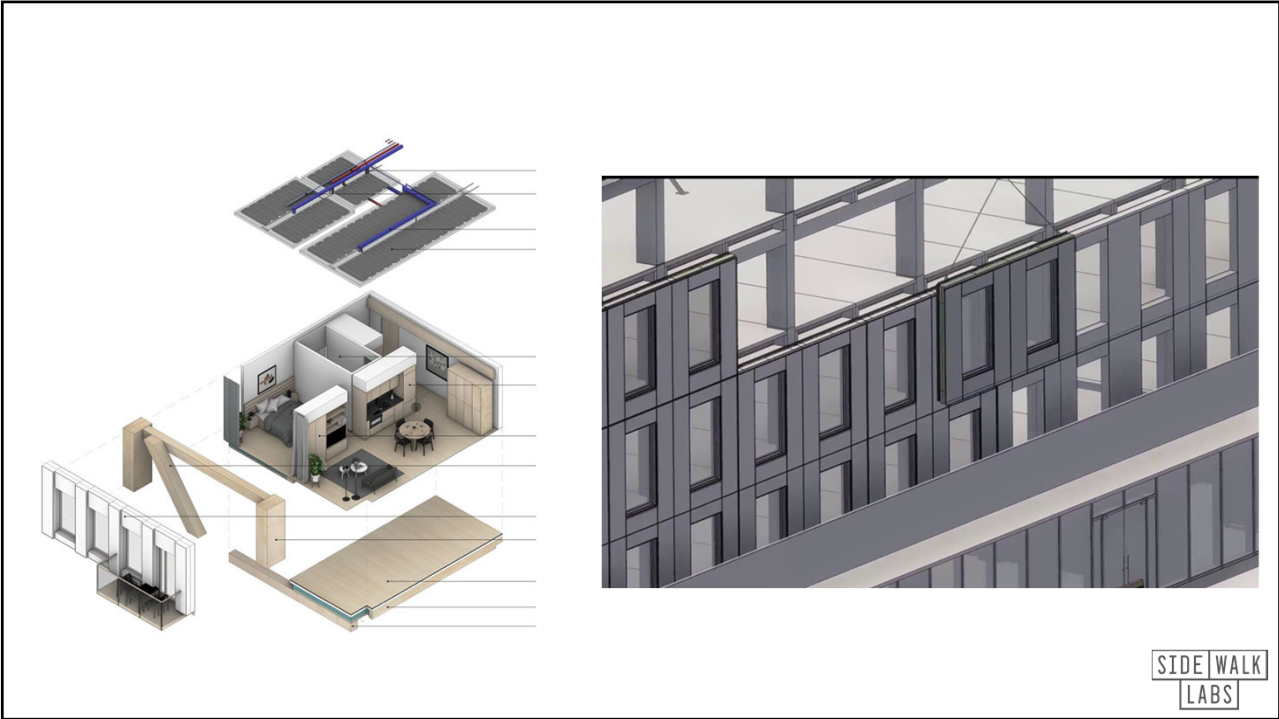
KATERRA

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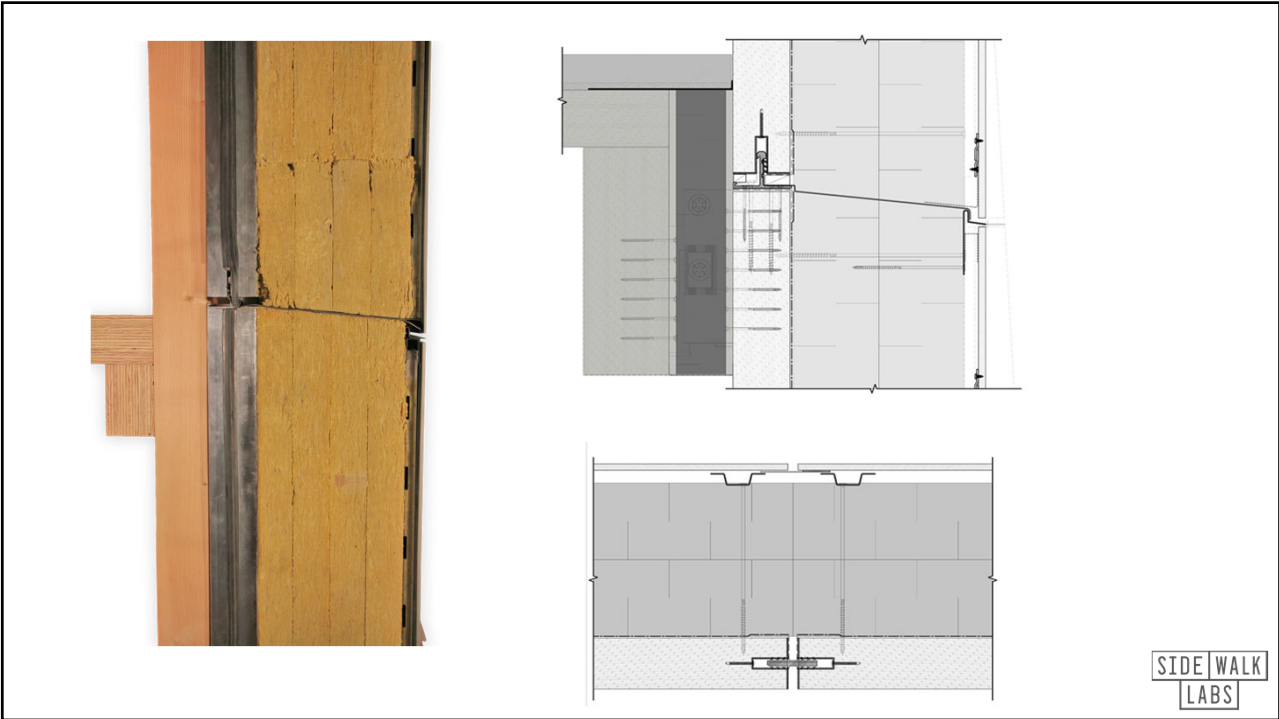


SIDE WALK LABS

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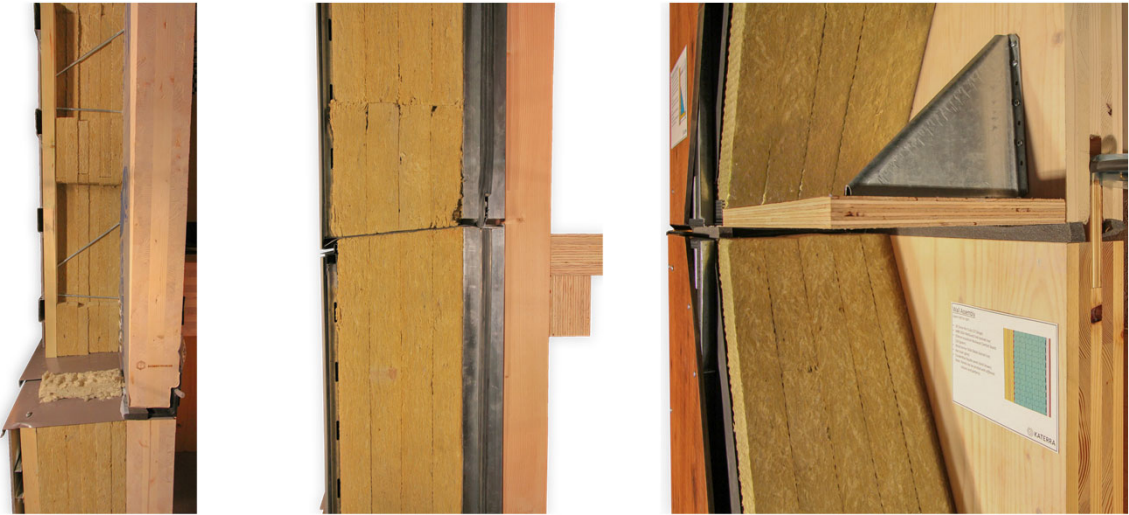
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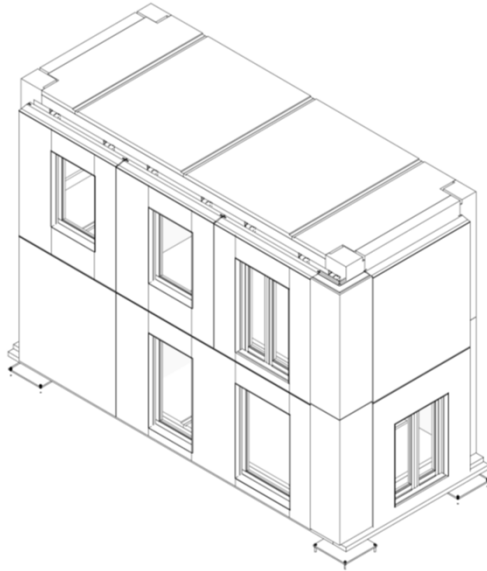
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**Same: Wood Structure, Dry Joints, AB/WRB on Wood, MW Insulation, Cladding Support, Rainscreen Cladding**



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## Next Steps – Full Scale Air, Water, Structural, Fire Testing



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## The Opportunity of Tall Wood Facades/Enclosures

- Prefabricated façade systems erected at same pace as structural systems for tall wood buildings – build fast & dry
- Growing market opportunities for large panel prefabricated wall & window assemblies
  - Thermally efficient, low carbon (wood-based) options desirable to align with overall project carbon goals
  - Many new systems currently under development and being incorporated into building designs
  - Catalyst opportunity for suppliers to produce prefabricated & glazed high performance wall systems



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- Research topics must be in the field of Building Science
- Application deadline is May 31, 5 PM PDT
- Learn more and apply at rdh.com: <https://www.rdh.com/blog/rdh-research-scholarships/>

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