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

Eric Wood | Mass Timber Façade Specialist

Eric specializes in the prefabrication of Mass Timber to facilitate the early design and detail development rationale leading to optimized supply and constructability. His experience includes design-assist specialty engineering, supply-installation logistics, and infield review of complex prefabricated Mass Timber projects.
1.0 Mass Timber Building Envelope Durability
Assemblies are critical for ensuring long-term durability and certainly challenged to increase envelope performance without creating environmental barrier deficiencies.

Determine where to use mass timber appropriately for your project. Consider the long-term durability for:

- floor and roof systems
- load-bearing walls
- prefabricated façades
Detailing is key to long-term durability of the CLT slab edge:

Exterior Structures and Penetrations can significantly reduce R-value, and provide a path for water ingress and air leakage

CLT is not air-tight and can not be relied upon as part of the air-barrier.
CLT at the Slab Edge – Below Windows and Doors

Detailing is key to long-term durability of the CLT slab edge:

- Windows and Doors present the most risk for water ingress.
- CLT has a much larger storage capacity for moisture.
- If bulk water leaks behind the exterior membrane it is trapped within the CLT structure even when using permeable membranes.
CLT at the Slab Edge – Below Windows and Doors

Detailing is key to long-term durability of the CLT slab edge:

- Structural damage can occur within a short period of time, often unnoticed.
- Can’t rely on membranes and detailing alone.
- Avoid designing CLT and Mass Timber at the slab edge where at risk from Window and Door leaks.
2.0 Mass Timber Innovation
Alternatives at the Slab Edge for Façade Efficiency

Detail 7.3.8

Interior Insulated Cross Laminated Timber (CLT) Spandrel at Window and Dowel Laminated Timber (DLT) – Intermediate Floor Intersection with Edge of Floor and Glulam Beam Aligned.
Alternatives at the Slab Edge for Façade Efficiency

- Pros/Cons of technical options to achieve aesthetic goals
- Durability
- Cost + Availability
# Alternatives at the Slab Edge for Façade Efficiency

## Thermal Performance Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly 1D (Nominal) R-Value at Beam</td>
<td>$R_{1D}$ = $R-15.4$ (2.71 RSI) + insulation</td>
</tr>
<tr>
<td>Transmittance without Anomaly</td>
<td>$U_g = \begin{cases} U_{g,\text{top}} &amp; \text{window including framing} \ U_{g,\text{bottom}} &amp; \text{g top = sill} \ g &amp; \text{bottom = head} \ g &amp; \text{combined sill + head} \end{cases}$</td>
</tr>
<tr>
<td>Transmittance / Resistance</td>
<td>$U_o, R_o$, $U_s, R_s$, $U_t, R_t$ = $U$ and $R$-values for $o$ = spandrel with floor without glazing $s$ = spandrel including window to wall interface $t$ = combined glazing + spandrel</td>
</tr>
<tr>
<td>Linear Transmittance</td>
<td>$\psi$ = Incremental increase in transmittance per linear length of window to wall interface</td>
</tr>
</tbody>
</table>

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**View from Exterior**

**View from Interior**
ALTERNATIVES AT THE SLAB EDGE FOR FAÇADE EFFICIENCY

Thermal Performance Indicators

<table>
<thead>
<tr>
<th>Assembly 1D (Nominal) R-Value at Beam</th>
<th>R_1D</th>
<th>R-15.4 (2.71 RSU) + insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmittance without Anomaly</td>
<td>U_g</td>
<td>top</td>
</tr>
<tr>
<td>Transmittance / Resistance</td>
<td>U_o, R_o</td>
<td>U_s, R_s</td>
</tr>
<tr>
<td>Linear Transmittance</td>
<td>( \psi )</td>
<td>Incremental increase in transmittance per linear length of window to wall interface</td>
</tr>
</tbody>
</table>

Temperature Indices

<table>
<thead>
<tr>
<th>( T_{i_1} )</th>
<th>R-8.4</th>
<th>R-16.8</th>
<th>R-25.2</th>
<th>R-33.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min T on window glass, at top corner of window head</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_{i_2} )</td>
<td>0.52</td>
<td>0.52</td>
<td>0.52</td>
<td>0.52</td>
</tr>
<tr>
<td>Min T on window frame, on vertical mullion at deflection header</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_{i_3} )</td>
<td>0.89</td>
<td>0.92</td>
<td>0.94</td>
<td>0.95</td>
</tr>
<tr>
<td>Min T on beam, at plywood closure, along connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Alternatives at the Slab Edge for Façade Efficiency

Thermal Performance Indicators

| Assembly 1D (Nominal) R-Value at Beam | $R_{1D}$ | $R_{15.4}$ (2.71 RSI) + insulation |
| Transmittance without Anomaly | $U_{az}$, $U_{bz}$, $U_{gd}$, $U_{hd}$ |
| Transmittance / Resistance | $U_0$, $R_0$, $U_e$, $R_e$, $U_{sp}$, $R_{sp}$ |
| Linear Transmittance | $\psi$ |

Incremental increase in transmittance per linear length of window to wall interface.

Window to Wall Linear Transmittance

<table>
<thead>
<tr>
<th>ISO-CONNECT Spacing</th>
<th>Spandrel Insulation 1D R-Value (RSI)</th>
<th>$R_{1D}$</th>
<th>$R_0$</th>
<th>$U_0$</th>
<th>$R_s$</th>
<th>$U_s$</th>
<th>$R_t$</th>
<th>$U_l$</th>
<th>$\psi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>36° o.c.</td>
<td>R-8.4 (1.48)</td>
<td>0.076</td>
<td>0.117</td>
<td>0.287</td>
<td>0.008</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R-16.8 (2.96)</td>
<td>0.060</td>
<td>0.093</td>
<td>0.276</td>
<td>0.007</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R-25.2 (4.44)</td>
<td>0.052</td>
<td>0.080</td>
<td>0.270</td>
<td>0.006</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R-33.6 (5.92)</td>
<td>0.047</td>
<td>0.073</td>
<td>0.267</td>
<td>0.006</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.0 Mass Timber Case Study
The Chip and Shannon Wilson – School of Design
Largest Glulam beam: 2 ply – 600mm x 1,320mm deep beam x 9,040mm Long @ 7000lbs

Longest Glulam Beam: 14,005mm Long

Longest Spliced Beam: 17,400mm Long
1224 pre-fabricated CLT and Glulam pieces, shipped in 23 containers, fully integrated with Mechanical, Electrical, Sprinkler, and Communication rough-in
Number of Pitzl pieces installed: 1069

Number of Structural screws installed: 66,725
Glulam was installed up to three levels prior to concrete and Q-deck diaphragms installed.
Mass Timber digital design is the solution for proving constructability, predictability of schedule, and sustainability that reduces risk and incentivizes an entirely new market for development.
Mass Timber digital design is the solution for proving sustainability and durability that reduces risk and incentivizes an entirely new market for development.
Mass Timber digital design is the solution for visualizing building envelope interfaces and developing integrated solutions for thermal, moisture, and air barrier systems.
Digital Fabrication provided the collision detection to locate the various holes depending on slope, and elevation not seen in 2D.

840 holes ranging in size from 80mm to 600mm.
From Digital Design… to Supply and install. Maximizing the amount of fabrication completed prior to Sansin KP12w Factory Sealer.
Interior and Exterior zones were developed to house the Mechanical systems integrated within the Timber

CLT completed, photo in December
Interior and Exterior zones were developed to house the Mechanical systems integrated within the Timber

CLT completed, photo in May
Interior and Exterior zones were developed to house the Mechanical systems integrated within the Timber

Wet and Dry Sprinkler system installed June
Interior and Exterior zones were developed to house the Mechanical systems integrated within the Timber.

Storefront Glazing and thermal insulation installed November.
Façade is a mixture of thermally broken Curtainwall and Steel stud panel with exterior insulation hung from the slab edge.

Interior view of the Façade Showing exposed Timber frame within
Façade is a mixture of thermally broken Curtainwall and Prefab steel stud panel with exterior insulation at the slab edge.

Mockup developed at the transition
Thank You!

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