



## Mass Timber - Highrise Lessons Learned

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## Outline



- **Virtual Construction**
  - Clash Detection + Trade Coordination
  - 4D Schedule Animation
  - Precision of Workmanship
- **Managing Expectations**
  - Importance of Offsite Mock-ups
  - Mold and Staining Management
  - Site Water Management
  - Fire Mitigation During Construction
  - Settlement of Building
- **Benefits of Mass Timber**
  - Shortened Duration of Construction
  - Increased Offsite Construction
- **Social Responsibility**
  - Reduction in Footprint

## Virtual Construction

### Clash Detection + Trade Coordination

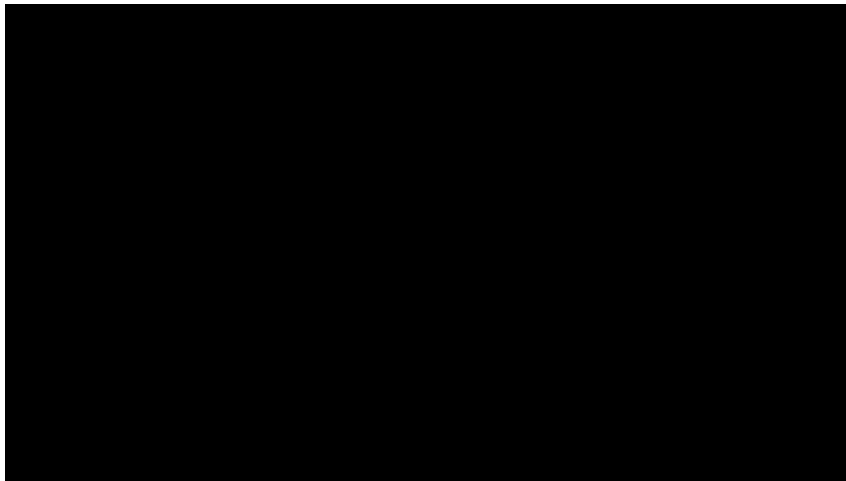
- **Installation** Run-through
- **Sequencing** with Multiple Trade Participation
- **Safety** Accessibility



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## Virtual Construction

### 4D Schedule Animation - Cores



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## Virtual Construction

### 4D Schedule Animation - Cores

#### Concrete Cores :

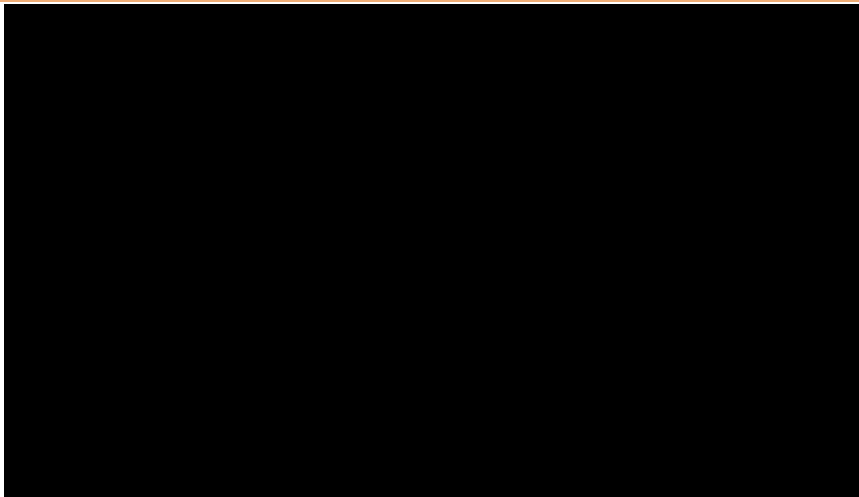
- 5 days cycles
- 18 floors (2 cores) in 9 weeks



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## Virtual Construction

### 4D Schedule Animation - Tower



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## Virtual Construction

### 4D Schedule Animation – Mechanical Room



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## Virtual Construction

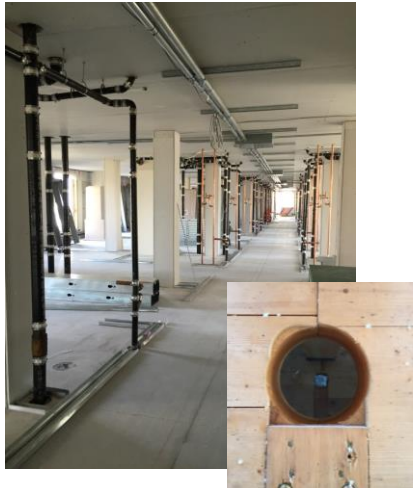
### 4D Schedule Animation – Mechanical Room



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## Virtual Construction

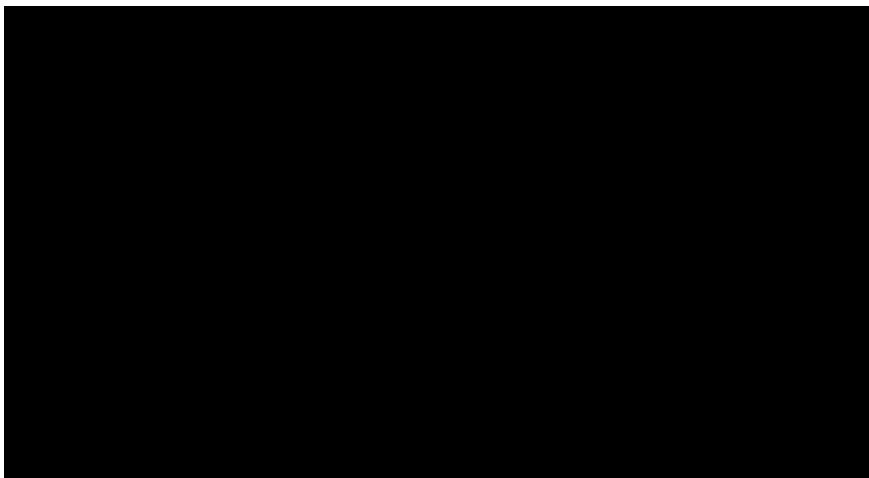
### Precision of Workmanship



- The **level of precision** of the manufactured panels allows following trades to work more **effectively** and **efficiently**
- **Reduces** RFI's during construction
- **Reduces** trade **conflict** changes
- Allows **multiple** trades to **prefabricate** hence **reducing** installation **time** on site

## Virtual Construction

### Moving Forward



## Managing Expectations

### Importance of Offsite Mock-ups



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## Managing Expectations

### Mold and Staining Management

- End Grain Wax
- Manufacturer-installed Sealant
- Site-applied Sealant
- Final Coat



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## Managing Expectations

### Site Water Management



- **M & E penetration protected** after installation
- **Concrete Topping**
- Shower **Drains**, Kiddy Pools
- Interior **Tarpping**
- Use of **Fans** to Control Moisture
- **Chamfer Strips**
- **SIGA Tape**
- **Prep of CLT**

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## Managing Expectations

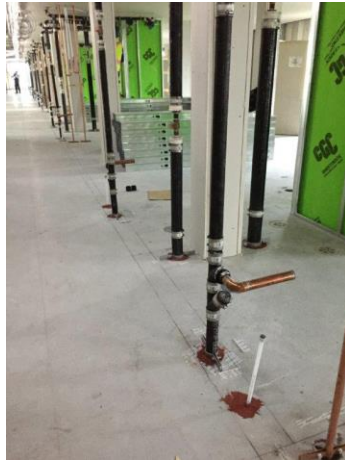
### Site Water Management



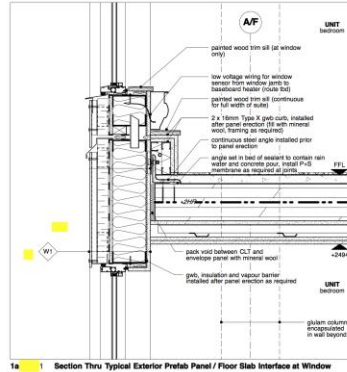
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## Managing Expectations

### Fire Mitigation During Construction



- Required Vs. Installed
- Drywall Detail of the curbs
- Standpipes



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## Managing Expectations

### Fire Mitigation During Construction



Video:

**Fire test: wooden house vs. ordinary house**

By

[Paulius Milčius](#)

<https://bit.ly/2xWl827>

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## Managing Expectations

### Fire Mitigation During Construction



## Managing Expectations

### Fire Mitigation During Construction

- **Exposed Timber Charring Vs. Type X Drywall Protection**



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## Managing Expectations

### Settlement of Building

- **Line & Plumb** Column Installation
- **Surveying** of L-Angles on every floor
- **Continuous** monitoring of CLT Moisture
- Cutting **down steel** connections



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## Benefits of Mass Timber

### Shortened Construction Duration

#### CLT Panels

- **5 ½ hrs** to drop in 10,000sqft of CLT, 29 panels
- Installing **splines, drag straps** and **handrails**



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## Benefits of Mass Timber

### Shortened Construction Duration

#### Envelope Panels

- **22 envelope panels** per floor (windows are installed in the panel at the factory)
- **One floor installed in a single day** sequence (8-9 hrs.)



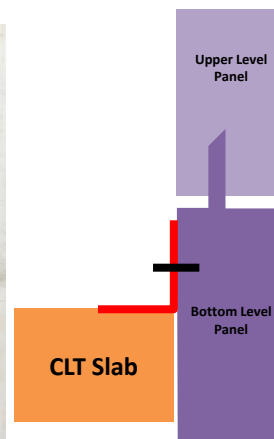
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## Benefits of Mass Timber

### Shortened Construction Duration

#### Envelope Panels

- Envelope panels **clip** similar to a curtain wall
- System **flashing** connecting panels
- Installation of flashing from above **eliminates the need of a scaffold system**



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## Benefits of Mass Timber

Increased Offsite Construction

### Envelope Panels



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## Benefits of Mass Timber

Increased Offsite Construction

### Millwork



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## Benefits of Mass Timber

Increased Offsite Construction

### Mechanical Kit-of-parts



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## Social Responsibility

Reduction in Footprint



- **6 people** to install 1 CLT floor vs **27 people** to install concrete, reinforcing, formwork, reshoring
- **Eliminates 4 floors** of reshore below the active floor installation
- **6 people** to install 1 envelope vs **12 multiple layers**
- **Eliminates scaffold** installation and removal



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## Social Responsibility

### Reduction in Footprint



- Reduces trucking per 1 floor to **5 trucks of acoustic concrete**
- **3 trucks of CLT**
- **2 trucks of Envelope panels per floor**
- Currently project waste is **92% recycled**

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**Thanks! Questions?**