



Planning

- Anatomy of a Mass Timber Package
- Procurement, Supply Chain, Schedule Drivers

Environmental Exposure

- Site Planning
- Moisture Planning and Mitigation
- UV Planning and Mitigation

Workforce Training

- Strategic Partnerships
- Training/Education
 - Resources

Holistic Costing



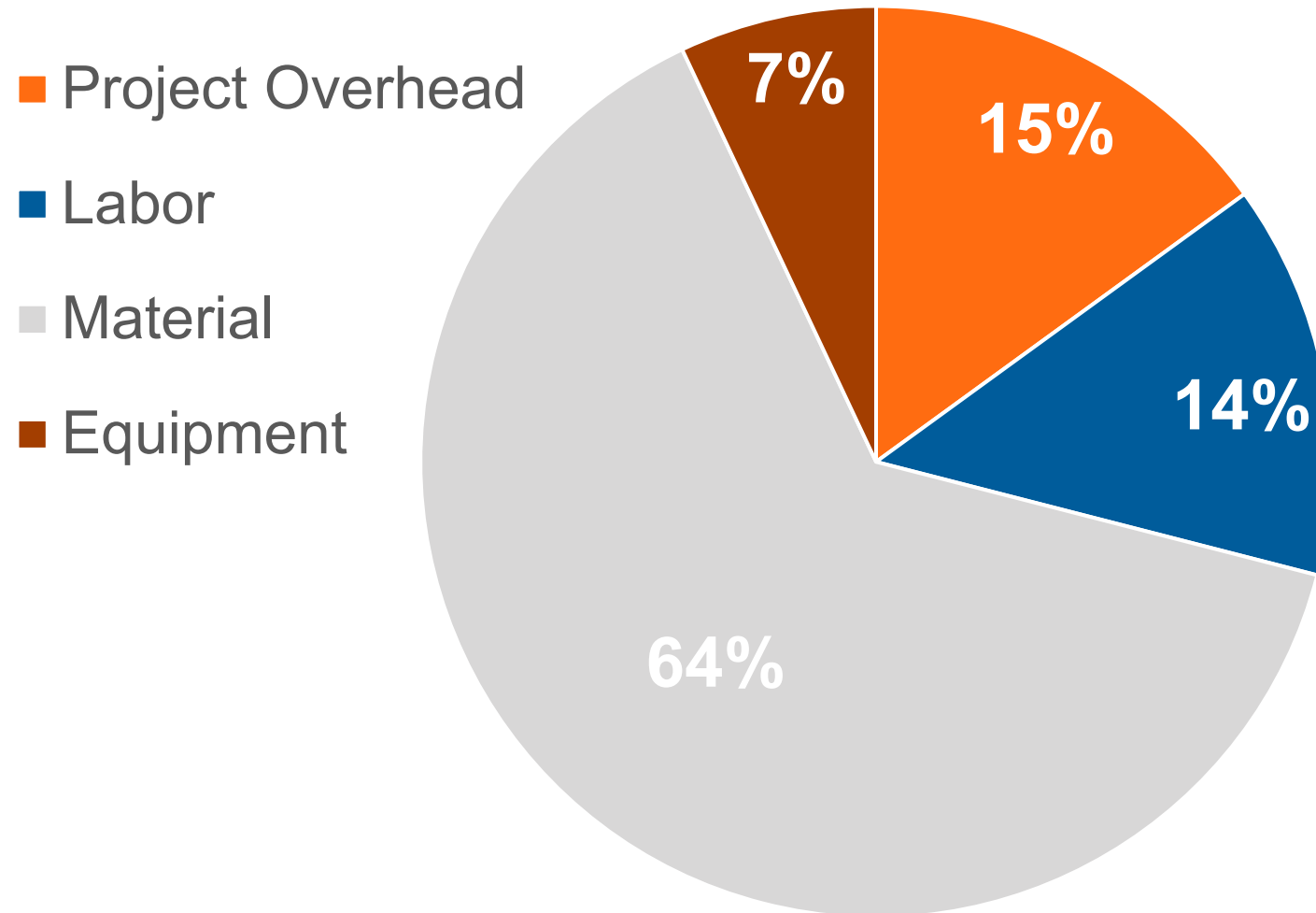
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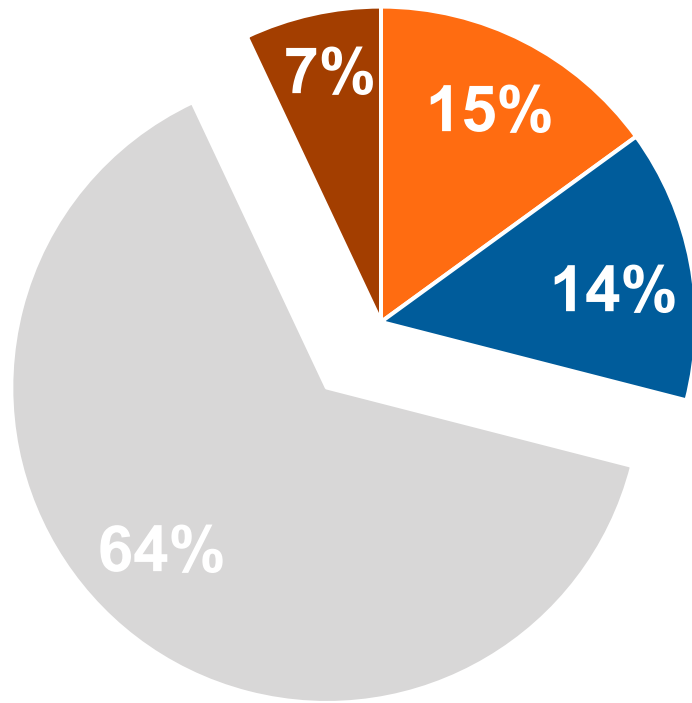
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Image: GBD Architects

Anatomy of a Turnkey Mass Timber Package



Material (Direct Cost)



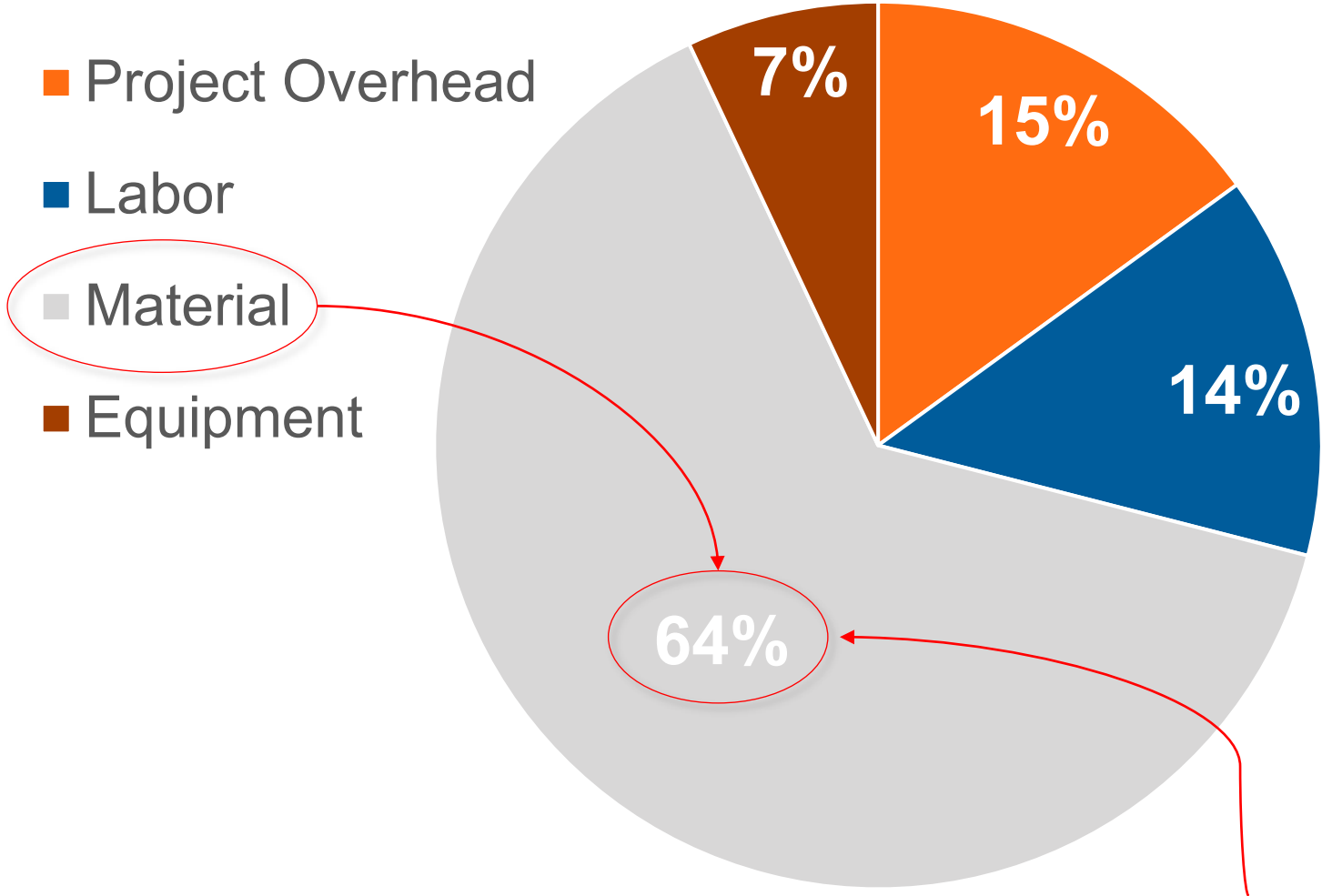
Turnkey Mass Timber Package



or

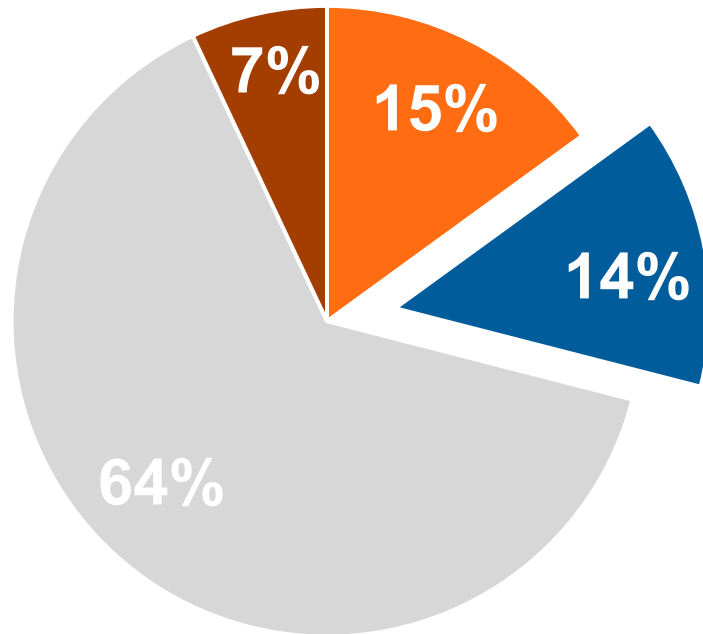


Mass Timber Package Costs



Panels are the biggest part of the biggest piece of the cost pie

Labor (Direct Cost)

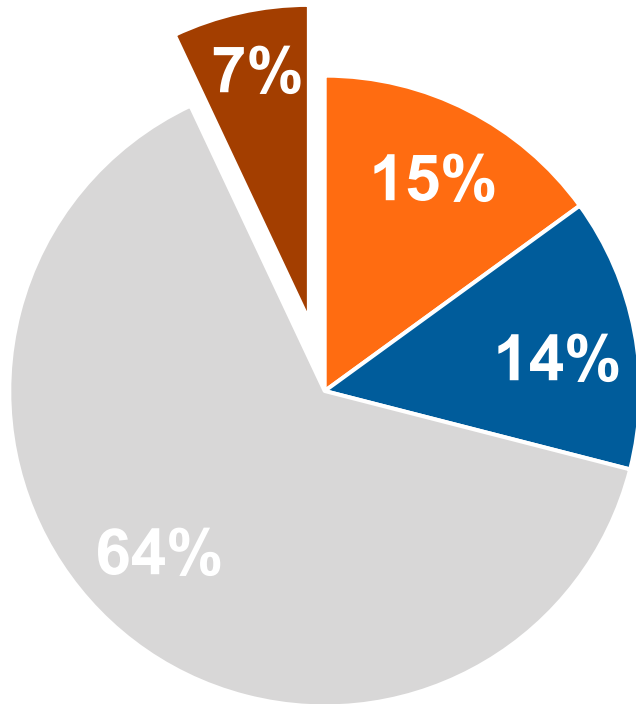


Turnkey Mass Timber Package



Photo: Swinerton

Equipment (Direct Cost)



Turnkey Mass Timber Package

Source: Swinerton

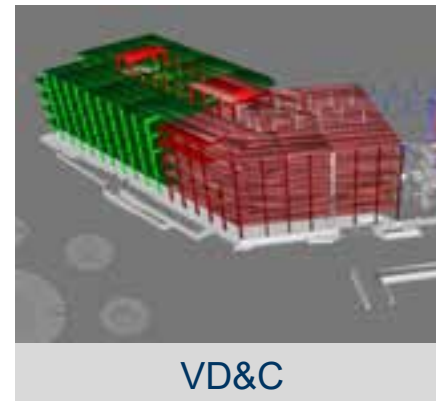
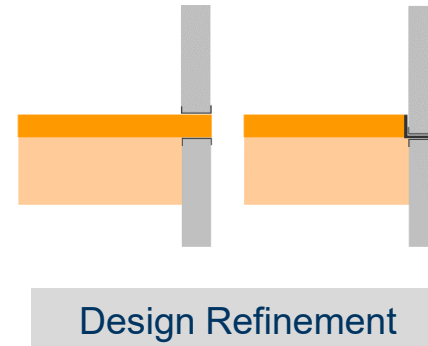
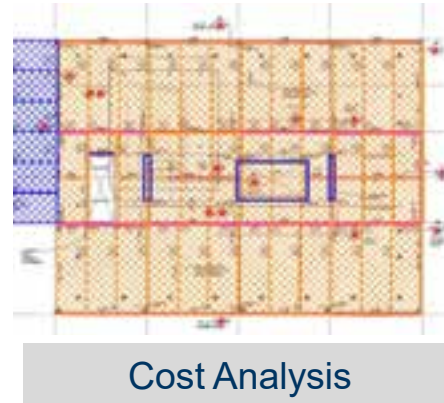
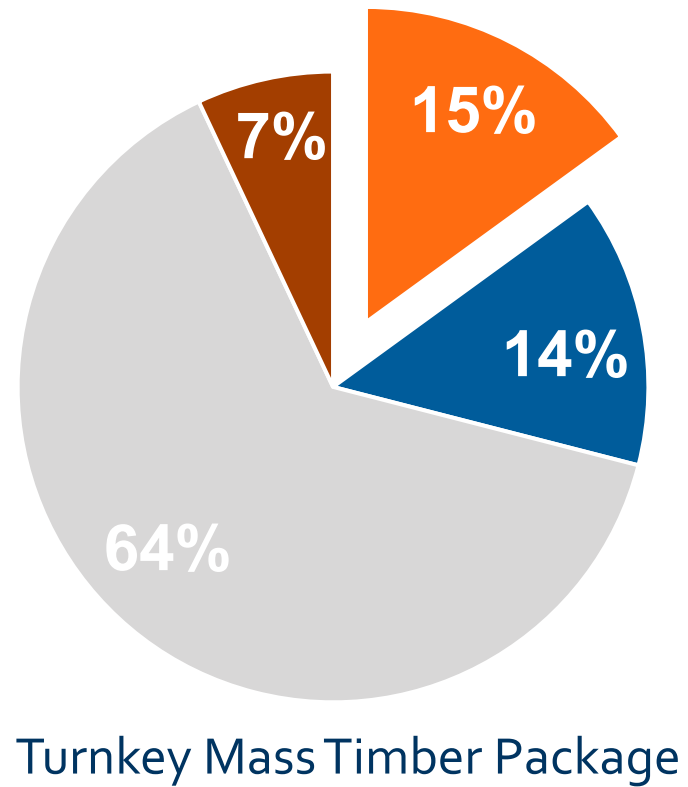


Photo: Swinerton



Photo: Alex Schreyer

Project Overhead



Photos: Swinerton

Total Project Cost Analysis

CONSIDERATIONS:

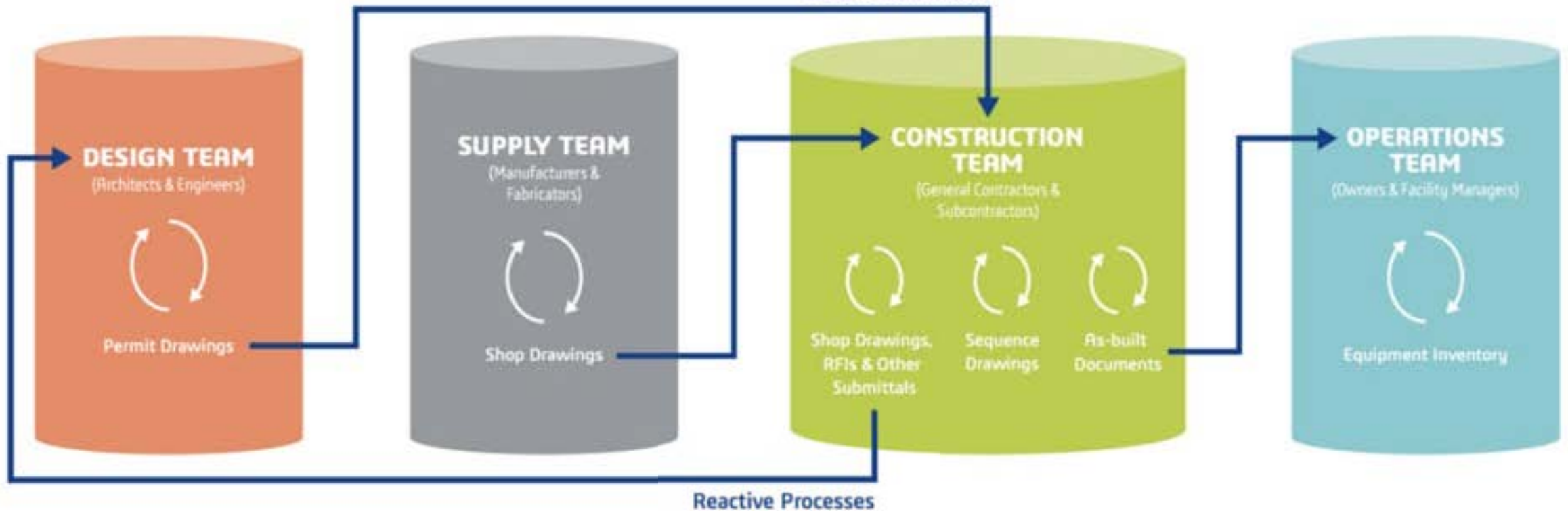
- Ceiling Treatment
- Floor Topping
- HVAC System & Route
- Foundation Size
- Material Savings
- Perimeter glazing
- Value of Time
- Completion Bonds/Insurance



Sample Procurement Strategies

GC/CM Hires Turnkey Mass Timber Subcontractor	GC/CM Buys Material, Self-Performs Installation and Coordinates	GC/CM Buys Material, Subcontracts Labor and Coordinates
RISK SPECTRUM		
<ul style="list-style-type: none"> + Hiring experience + Single point of responsibility 	<ul style="list-style-type: none"> + Hiring experience + Single point of responsibility + Financial security of strong GC/CM 	<ul style="list-style-type: none"> + Potential added mark-up
<ul style="list-style-type: none"> – Prequalify capacity of subs – Potential added mark-up 	<ul style="list-style-type: none"> – Lack of familiarity with supply chain – Steep learning curve for coordination 	<ul style="list-style-type: none"> – Multiple layers of coordination – Prequalify capacity of sub

Potential Cost Impacts: Design-Bid-Build Procurement



Alternate Procurement Option: Trade Partner/Master Builder Approach



Procurement Strategy is Key to Success



5% Savings

Neutrality

10% Premium

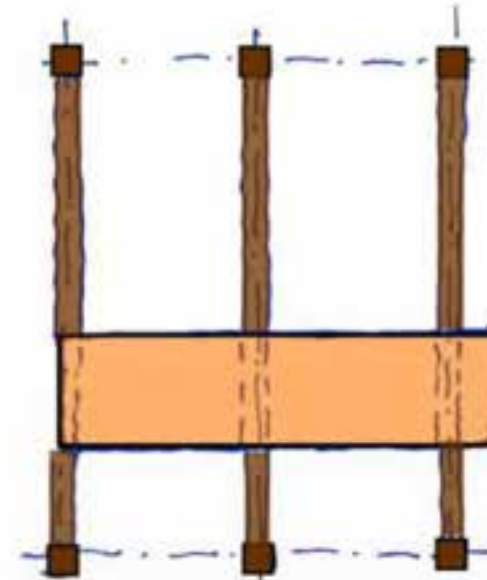
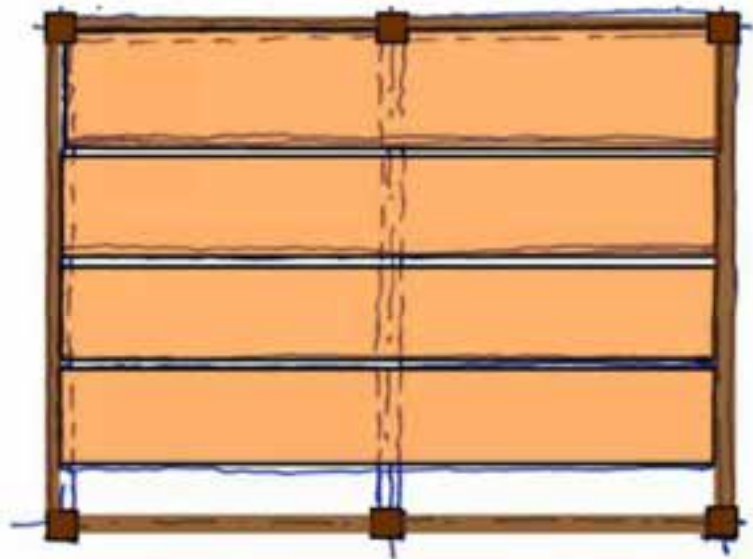
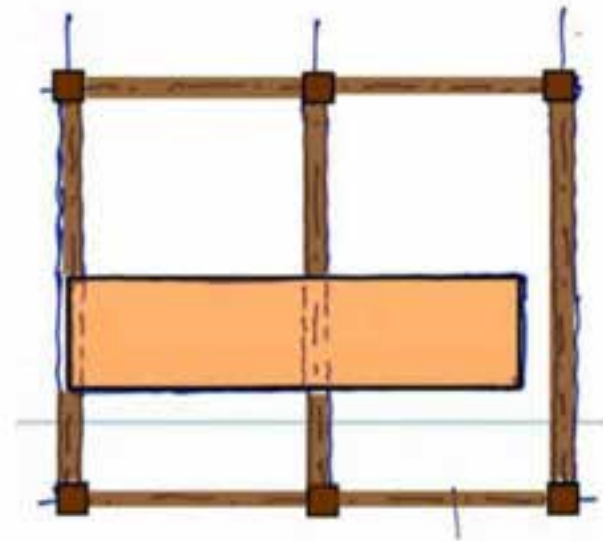
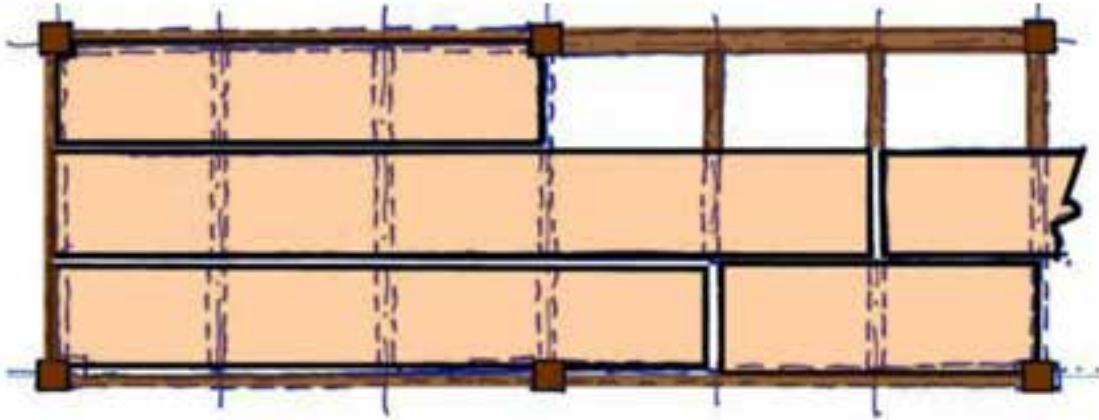
Material Fabrication Planning



Understand the Supply Chain



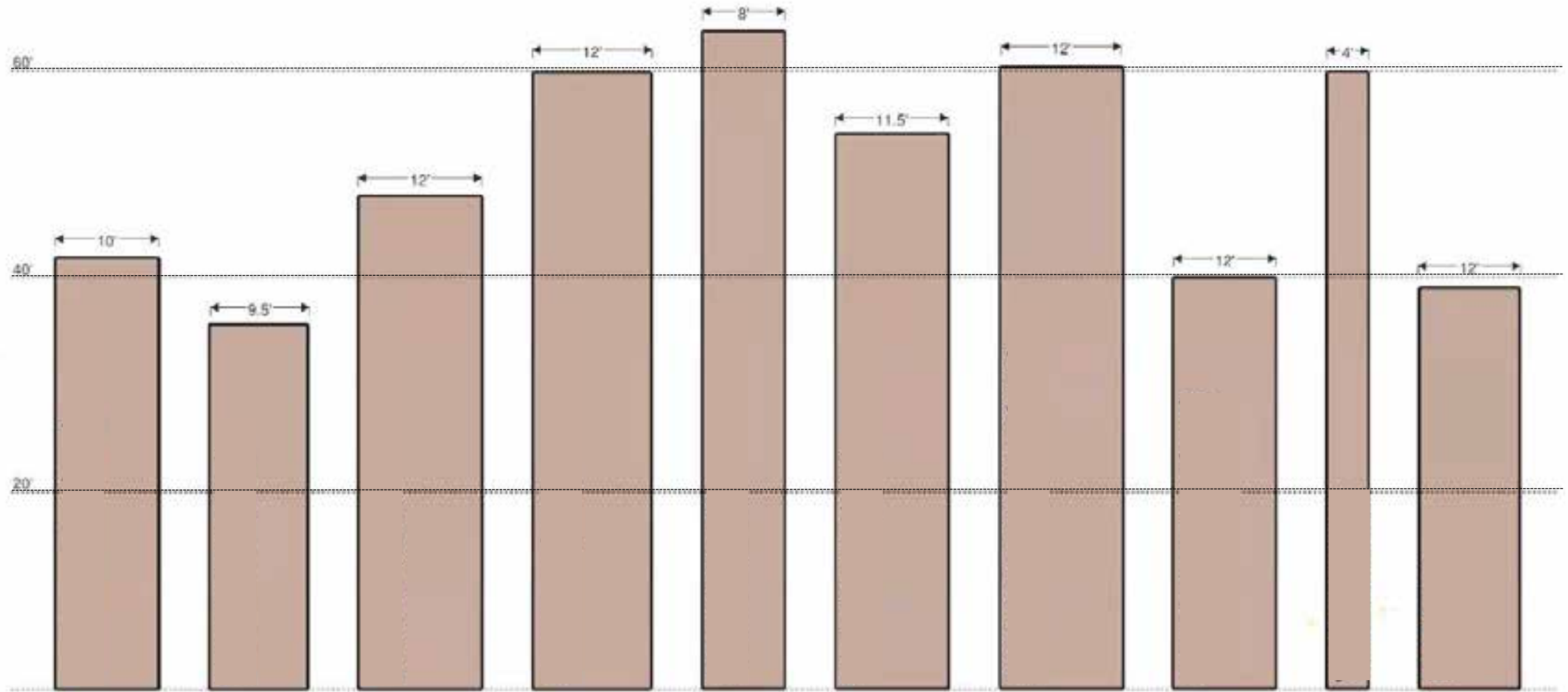
Photo: Swinerton




Credit: Tanya Luthi, Entuitive

Understand Manufacturer's Capabilities

Understand Manufacturer's Capabilities



Credit: TimberLab



Embrace the
Prefab Advantage

Photo: Swinerton

Tolerances: Interface with Other Structural Materials



Photos: Swinerton

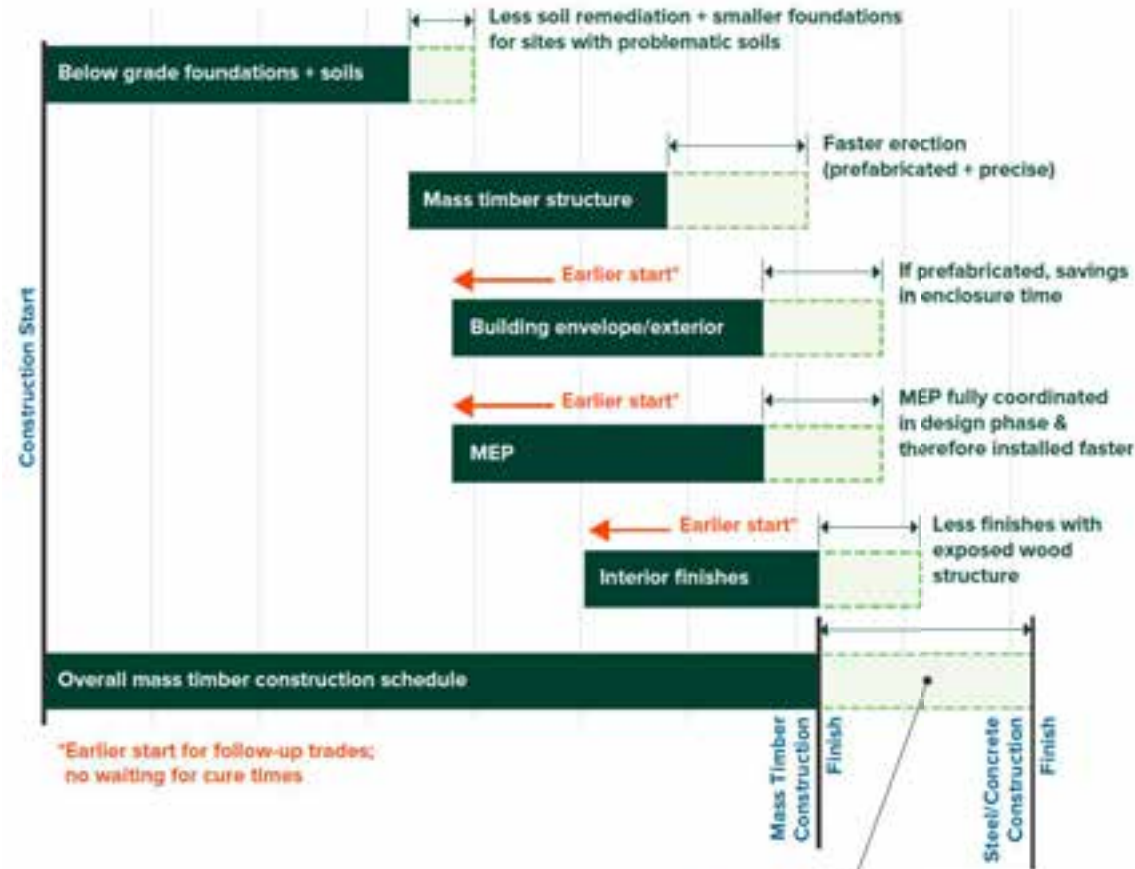
Schedule Drivers



Procurement Approach Determines Schedule

Compressing the Typical Construction Schedule with Mass Timber^{13, 15, 16}

Look for these potential schedule savings in comparison to steel and concrete



Up to 25% schedule savings

- = Less carrying costs
- + Less GC overhead
- + Ability to lease/occupy sooner

Procurement Logic for Scheduling

Shop drawings, Planning, Fabrication, Delivery

Mass
Timber
Installation

Nov

Dec

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Source: Swinerton

Example 6 Story Type IIIA Project

Procurement Approach Determines Schedule



Photo: Alex Schreyer

Schedule Comparison

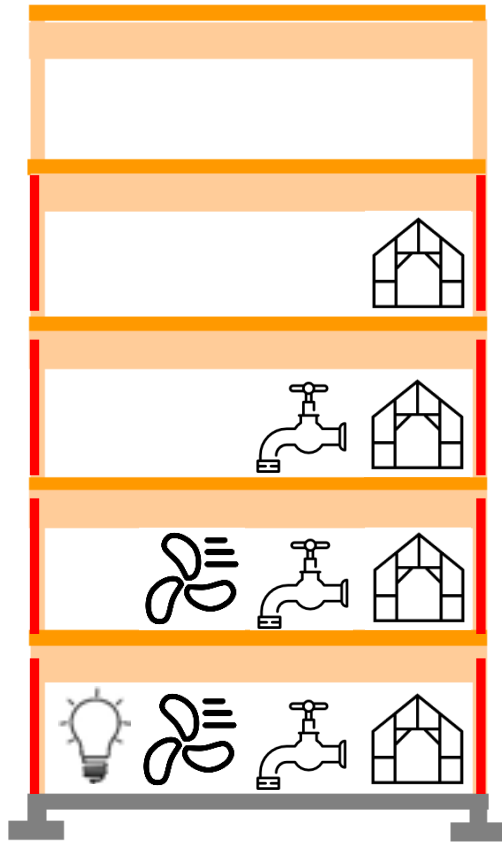


Image: Swinerton

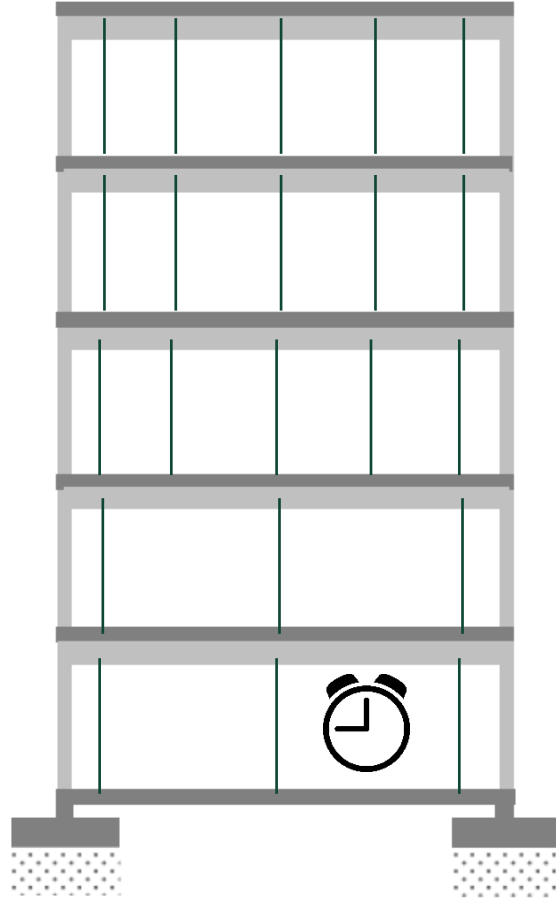
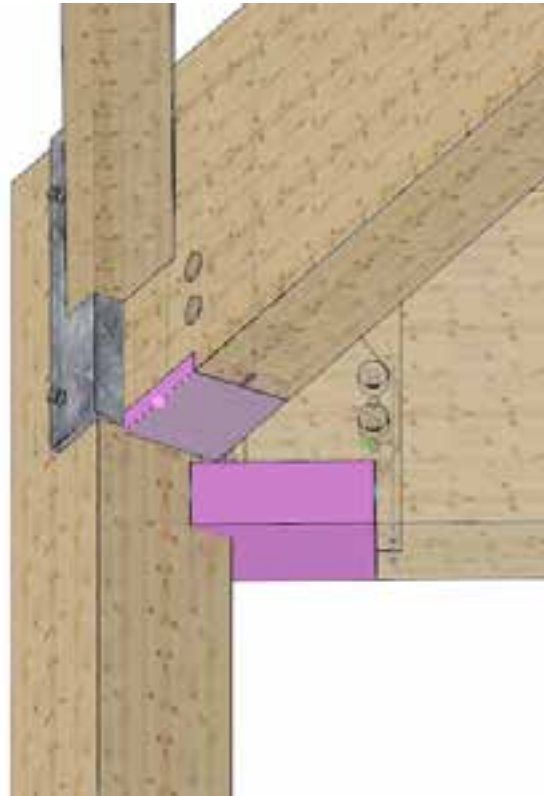
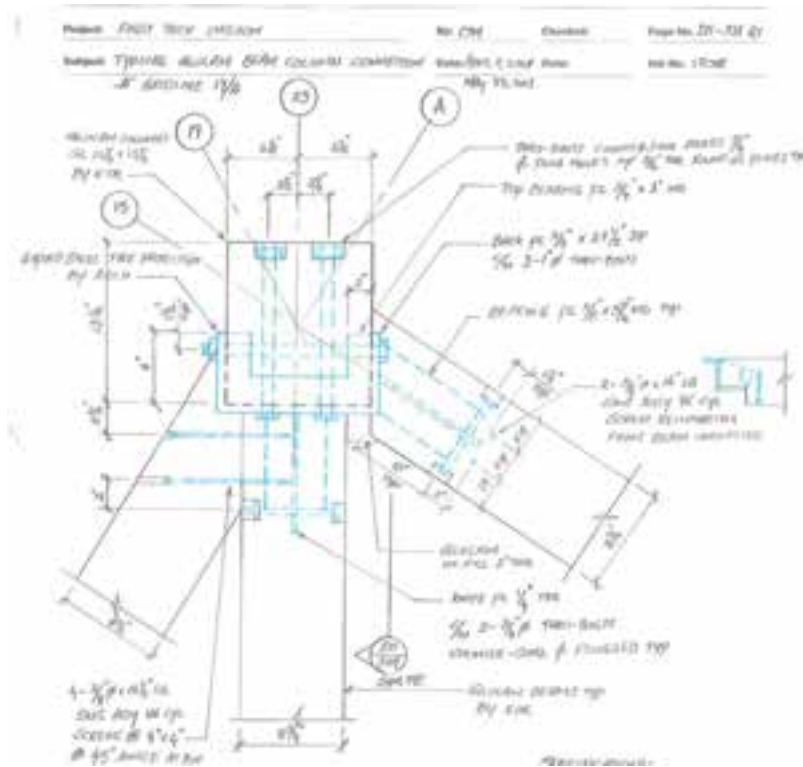


Photo: WoodWorks

Schedule Drivers



BIM/Digital Twins




Photos: Swinerton

Schedule Impacts: Hybrid Structures



Photos: Swinerton

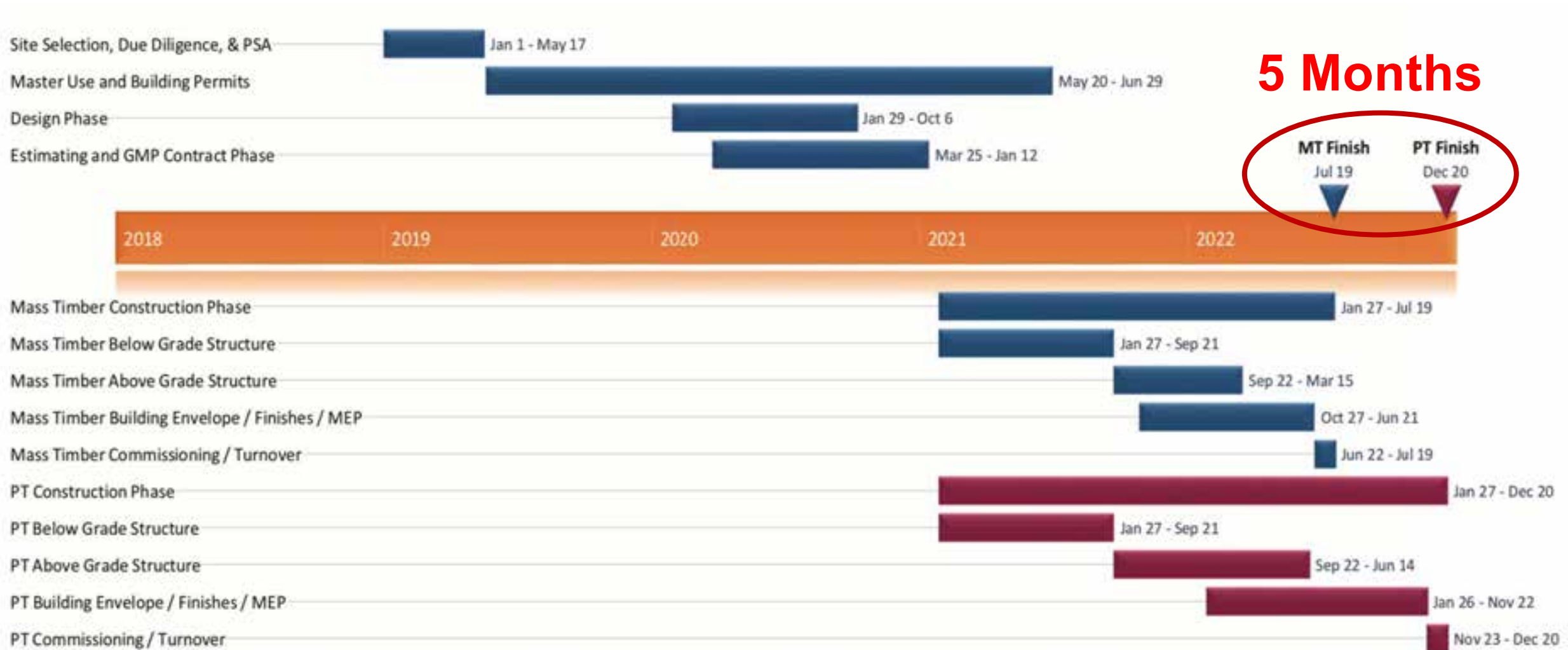


The image shows a large-scale construction project in an urban setting. A multi-story building is under construction, featuring a complex system of yellow wooden formwork and blue steel framing. The structure is built on a concrete base. A crane is visible at the bottom of the frame, and a road runs alongside the construction site. In the background, various city buildings and a hill are visible under a clear sky.

Look At Schedule Holistically

Photo: StructureCraft Builders

Overall Project Schedule Analysis: 12 Story Type IV-B



Schedule Impact on Cost | Value of Time

A large scale MT project can be up to 2% higher in direct costs, but a minimum of 20% lower in project overhead costs. The net result is cost-neutrality and higher value.

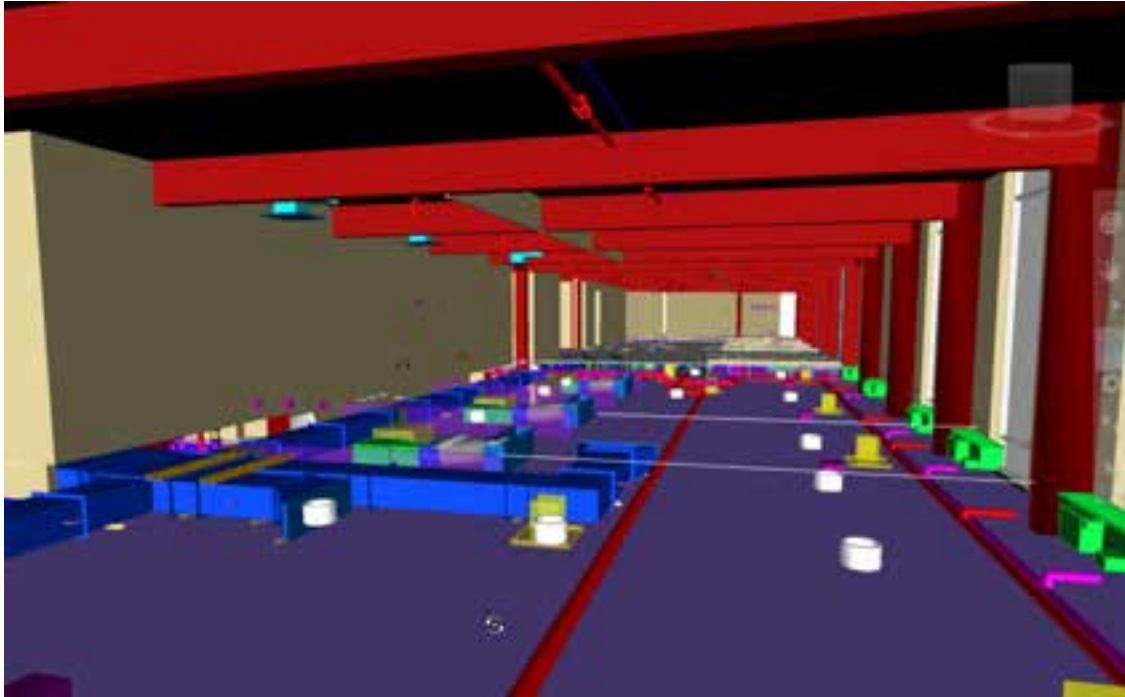
Early Move-In for Rough-In Trades.



Photos: Swinerton



Embracing BIM for Fabrication



Photos: Swinerton

MEP Layout & Integration



MEP Layout & Integration

Smaller grid bays at central core (more head height)

- Main MEP trunk lines around core, smaller branches in exterior bays



Credit: Blaine Brownell



Credit: WoodWorks

MEP Layout & Integration

Dropped below MT framing

- Can simplify coordination (fewer penetrations)
- Bigger impact on head height



MEP Layout & Integration

In penetrations through MT framing

- Requires more coordination (penetrations)
- Bigger impact on structural capacity of penetrated members
- Minimal impact on head height



Credit: WoodWorks



Credit: WoodWorks

MEP Layout & Integration

In chases above beams and below panels

- Fewer penetrations
- Bigger impact on head height (overall structure depth is greater)
- FRR impacts: top of beam exposure



Credit: JC Buck



Credit: KL&A Engineers & Builders

MEP Layout & Integration

In gaps between MT panels

- Fewer penetrations, can allow for easier modifications later



Credit: Ema Peter/MGA

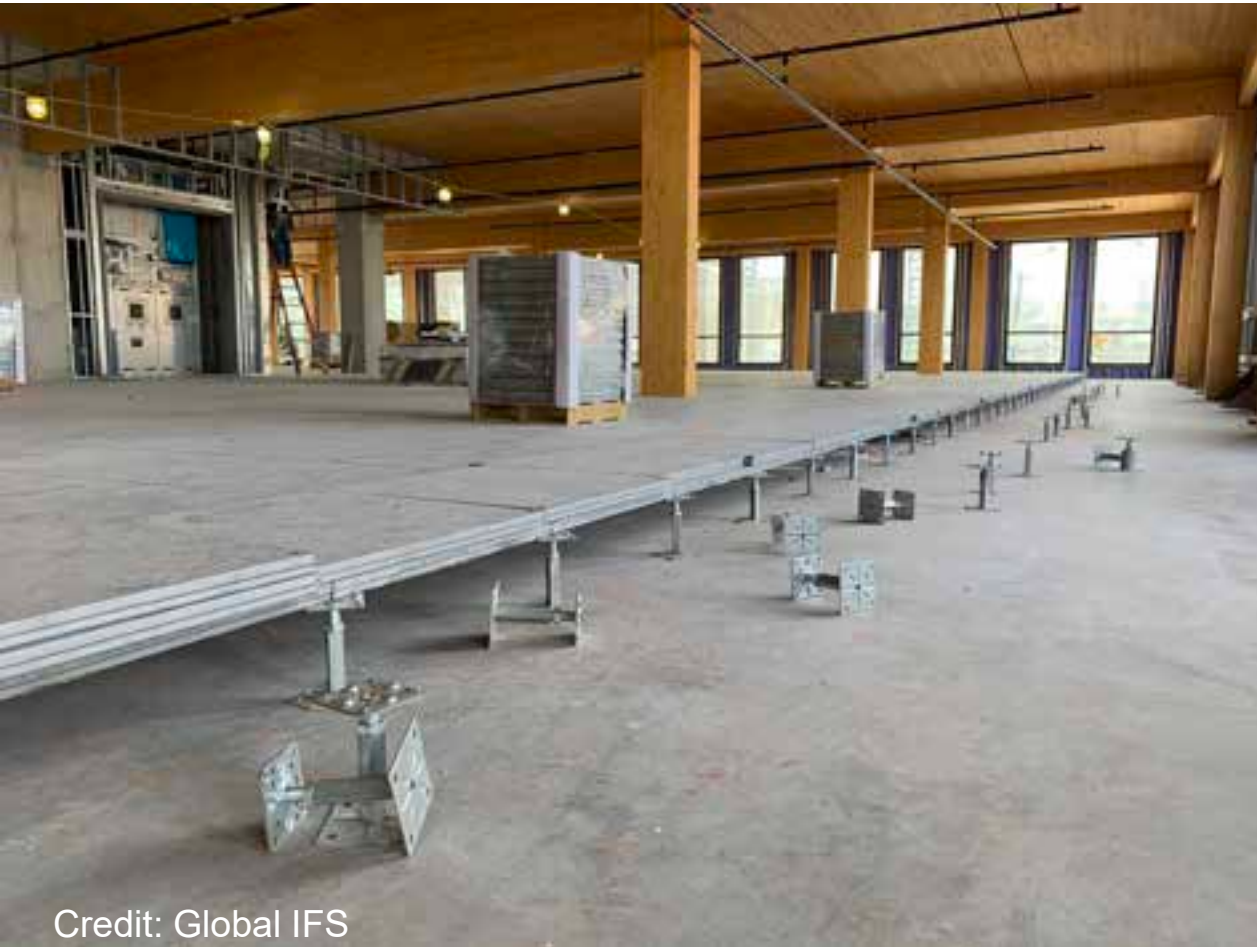


Credit: Hacker Architects

MEP Layout & Integration

In raised access floor (RAF) above MT

- Impact on head height
- Concealed space code provisions



Credit: Global IFS



MEP Layout & Integration

In topping slab above MT

- Greater need for coordination prior to slab pour
- Limitations on what can be placed (thickness of topping slab)
- No opportunity for renovations later



SITE PLANNING



QA/QC



Photo: Swinerton

SITE INSPECTIONS



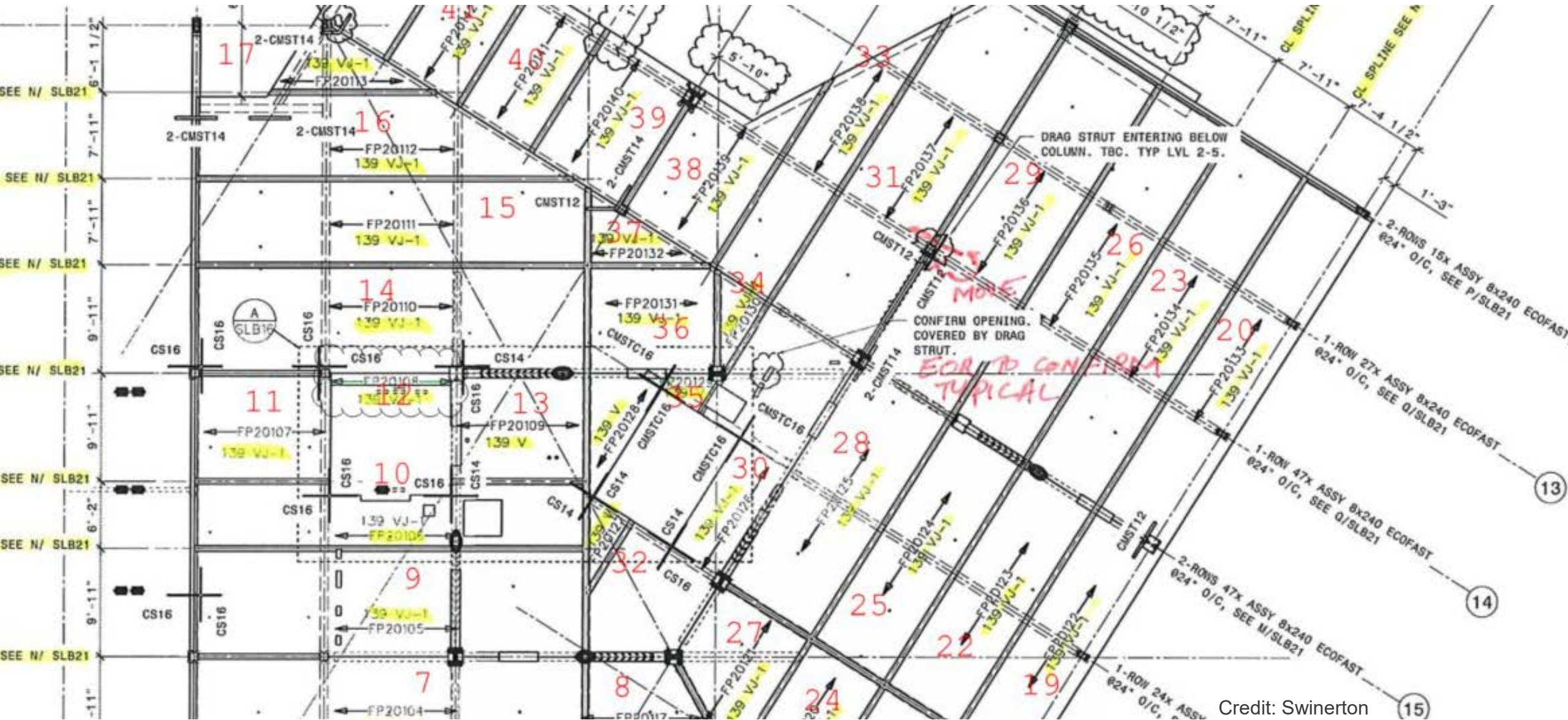
Photo: H+O Structural Engineering, Kure Creative

Tall Mass Timber Special Inspections

TABLE 1705.5.3
REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION

<u>Type</u>	<u>Continuous Special Inspection</u>	<u>Periodic Special Inspection</u>
<u>1. Inspection of anchorage and connections of mass timber construction to timber deep foundation systems.</u>		X
<u>2. Inspect erection of mass timber construction</u>		X
<u>3. Inspection of connections where installation methods are required to meet design loads.</u>		
<u>3.1. Threaded fasteners</u>		
<u>3.1.1. Verify use of proper installation equipment.</u>		X
<u>3.1.2. Verify use of pre-drilled holes where required.</u>		X
<u>3.1.3. Inspect screws, including diameter, length, head type, spacing, installation angle, and depth.</u>		X
<u>3.2. Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads</u>	X	
<u>3.3. Adhesive anchors not defined in 3.2.</u>		X
<u>3.4. Bolted connections</u>		X
<u>3.5. Concealed connections</u>		X

Sequencing



PICK PLAN



Photo: Swinerton

MATERIAL DELIVERY



Photo: Swinerton



Photo: Swinerton

STAGING

Planning for Environmental Exposures



- Plan Early
- Risk Evaluation
- Develop Construction Phase Plan
- Execute the Design and Moisture Management Plan
- Monitor

RDH Moisture
Management Guide 1st Ed



Photo: Swinerton



Material Environmental Exposure and Moisture Management

Enroute
Onsite
Post-Install
Other Material

Photo: Alex Schreyer



Enroute Exposure



On Site Considerations



On Site Considerations



Onsite Considerations



Other Materials



Workforce Development

Training is the key to efficiency
Training takes time and money

Training versus Education

Resources available to all

MT Construction Manual
Installer Curriculum
Other WW Resources
CM Workshops
Previous recorded versions
Learning Management System

Mass Timber Construction Management Program



MASS TIMBER CONSTRUCTION
MANUAL



8- & 16-HOUR INSTALLER
TRAINING PACKAGE AND
TRAINING CENTERS



COMMUNITY COLLEGE
AND UNIVERSITY CM
PROGRAMS



VIRTUAL AND/OR IN-PERSON
WORKSHOPS



PARTNER WITH
CONSTRUCTION ASSOCIATIONS



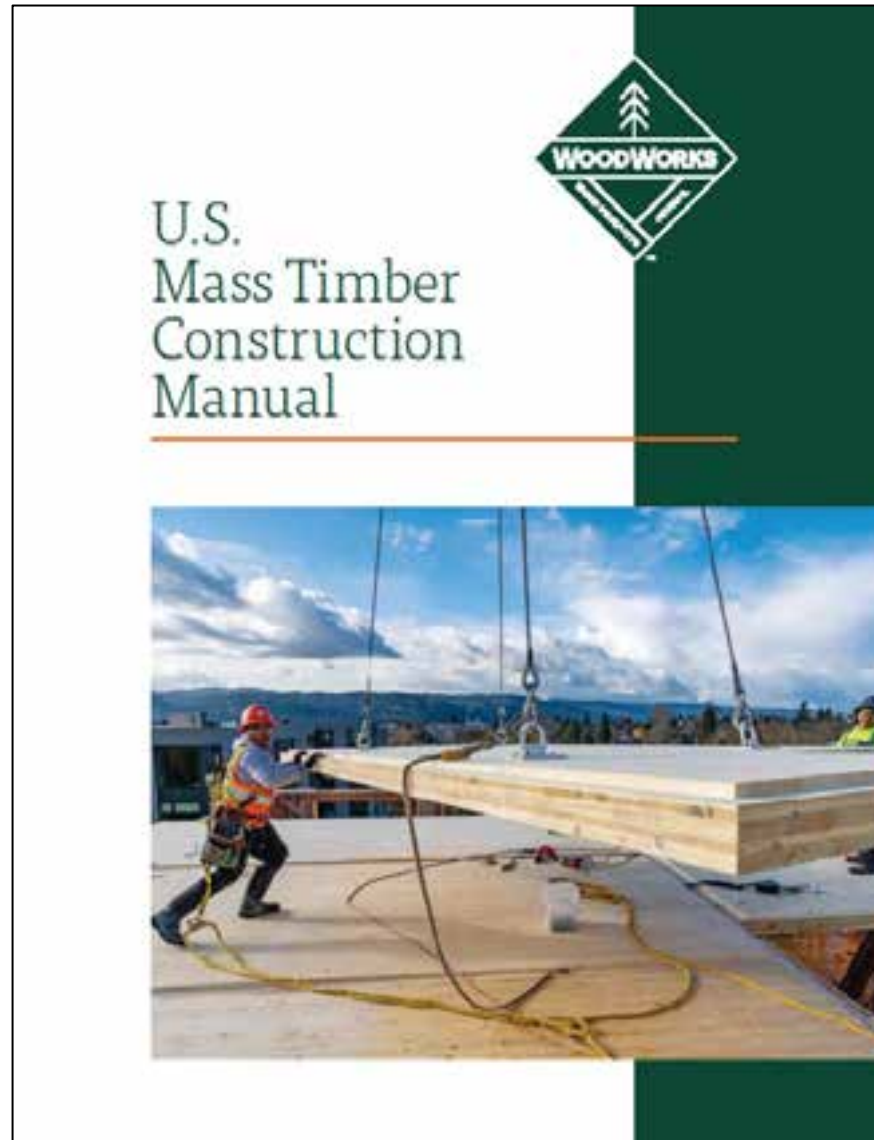
PROJECT TOURS



ENGAGE WITH GENERAL
CONTRACTORS ACROSS THE US



<https://www.woodworks.org/mass-timber-construction-management-program/>





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John W. Olver Design Building at UMass Amherst
Leers Weinzapfel Associates, Equilibrium Consulting
photo © Albert Vecerka / Esto

Questions? Ask me anything.



David Hanley
Regional Director
CO, MT, NE, ND, SD, WY

(303) 570-8293
david.hanley@woodworks.org



Brandon Brooks, MBA, PMP
Construction Management
Program Manager

(760) 271-3722
brandon.brooks@woodworks.org



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