Risk Analysis and Scheduling Approaches

with Dean Lewis

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The mission of Swinerton Mass Timber is to accelerate the mainstream adoption of mass timber construction by providing comprehensive engineering, procurement, and construction (EPC) services in the US commercial construction market.
SWINERTON MASS TIMBER

TIMBER ENGINEERING
VIRTUAL CONSTRUCTION
CNC FABRICATION
PREFABRICATION
ASSEMBLY
Presentation Goal:
To identify potential project risks, recommend mitigation tactics, so that mass timber projects can be implemented with financial efficiency.
# Risk and Schedule Management Learning Objectives

## Financial Risk
- Project Delivery Method
- Design Efficiency
- Purchasing: Exchange Rate
- Purchasing: Commodity Pricing
- Project Execution
- Quality

## Jurisdictional Risk
- Code Path
- Code Interpretation
- Limited Tested Assemblies
- Field Inspections

## Schedule
- MEPF Penetration Incorporation
- Schedule Critical Shop Drawing Dates
- Adjacent Structural Systems
- Manage RFI Process
- Factory Backlog & OPP
- Erection Sequencing Constructability
FINANCIAL RISK

Project Delivery Method
Purchasing: Exchange Rate
Purchasing: Commodity Pricing
Project Delivery Method

Project Delivery Matters: Why?

CMGC, GC/CM, CMAR, Design-Build
Risk Mitigation For Seamless Transition to Construction

Risk Mitigation Strategies:
Avoid Design-Bid-Build
Hire and use a CM or GC during design for paid precon => spend $ to save $$$
Engage with a mass timber firm during precon to optimize system costs
COLUMN SPACING V. MATERIAL VOLUME

5 PLY PANEL WITH 13'-4" O.C.
COLUMN SPACING
CLT BY VOLUME (APPROX):
30,070 CUBIC FT
FRAMING BY VOLUME (APPROX):
10,670 CUBIC FT
TOTAL WOOD VOLUME (APPROX):
40,740 CUBIC FT

3 PLY PANEL WITH 10'-0" O.C.
COLUMN SPACING
CLT BY VOLUME (APPROX):
18,700 CUBIC FT
FRAMING BY VOLUME (APPROX):
11,750 CUBIC FT
TOTAL WOOD VOLUME (APPROX):
30,450 CUBIC FT

25-30% REDUCTION IN STRUCTURAL MATERIAL
Risk: New and unfamiliar products can lead to unoptimized design => $$$$ 
Mitigation: Gain technical knowhow from industry experts => $
Purchasing: Exchange Rate Effects

Bid Date: May 15th, 2020
Bid Amount: $1,000,000
Bid Amount is not locked, varies with exchange rate
Bid Leveling, Approvals, Etc.: May 15th – July 28th
LOI Date: July 28th
Purchase Price: $1,096,500
Financial Risk: $96,500 or 9.65%

Risk: Purchase of material has exchange rate risk
Mitigation: Be prepared to execute an LOI to lock in exchange rate risk at time of bid. This approach requires teaming effort with owner, contractor, architect, and engineer.
Risk: Purchase of material has commodity index risk, similar to steel and concrete
Mitigation: Be prepared to execute an LOI to avoid commodity price risk at time of bid. This approach requires teaming effort with owner, contractor, architect, and engineer.
Risk: Delivery, install, crane proximity, trucking access
Mitigation: Model the design, Model the plan, work the plan
Risk: Water management, TI detailing, Protection during construction
Mitigation: Water management plan, Mock ups
JURISDICTIONAL RISK

Code Path

Code Interpretation

Limited Tested Assemblies

Permit Comments

Field Inspections
Risk: Local adoption of code influences what can and can’t be done with mass timber
Mitigation: Understand code path and required variances at inception of project
Each jurisdiction may interpret the code slightly differently.

Mitigation:

- Meet with the AHJ for pre-app conferences to discuss code interpretation for project
- Are solutions codified or do you need Alternate Means and Methods (AMMR) or Performance Based Design (PBD)
- Mock up to set expectations and
Limited Tested Assemblies

Penetrations through 2 HR rated elements
2 HR rated Timber to Timber Connections
Limitations of tested connections (loading in Kips)

Risks:
- Tested assemblies may be required

Mitigation:
- Engage consultants and system experts to determine what project details require engineering judgements or project specific testing. Can the design be modified to remove engineering judgements or project specific testing?
Fire Egress & Protection During Construction

Fire Protection During construction 3308.4
- Facilitate construction egress (stairs, man hoist, Elevator)
- Meeting required protection of elements during construction
  - Sealing of Adjacent mass timber elements 703.7
  - Verify Fire Blocking Materials 718.2.1

Special Inspections in-situ or at factory 1705.5.3

Daily fire safety inspection 3303.3

Mitigation:

Engage city officials early to verify proposed plan meets city official requirements. Determine what project details require coordination with special inspector. Fire protection and protection from moisture will require fire Engineer, structural, architect, envelope consultant, and waterproofing consultant.
Incorporate Permit Comments into Shop Drawings

Risk: Permit comments required to complete mass timber shop drawings

Mitigation:

- Know when first round of structural comments are anticipated, place date in schedule
- Ensure structural comment date is tied to critical path in schedule
Field Inspections

Issued Building Permit ≠ Approved Inspections

Risk: Approved permit does not limit field inspector interpretation of the plans.
Mitigation:

Determine assemblies requiring engineering judgements
Proactively plan for inspections and engage inspector prior to onsite inspections
SCHEDULE RISK
MEPF Penetration Incorporation
Schedule Critical Shop Drawing Dates
Adjacent Structural Systems
Manage RFI Process
Factory Backlog & OPP
Erection Sequencing Constructability
Early MEPF Involvement Leads to Schedule Enhancement

Risk: Failure to engage MEPF partners early leads to difficulty field fabricating penetrations

Mitigation:

Take advantage of CNC Technology, coordinate MEPF trades early in project design
Prefabricating MEPF openings leads to quicker field installation times and better quality
RFI Submission & Response Timing

Protracted RFI submittal and response period leads to hold ups with fabrication drawing development

Mitigation:
Teamwork and RFI meetings between AEC teams will speed up RFI period and facilitate timely execution of fabrication drawings

Risks:
Model Adjacent Structural Systems

Risk: Failure model, and build off of model, for adjacent structural systems (concrete/steel)

Mitigation:

Ensure subcontractor performing steel and concrete structures build off of a model
Coordinate timber model with other structural models
Factory Backlog and Other Peoples Projects (OPP)

Risk: If large projects ahead of you in the factory’s queue get delayed then your material may become delayed

Mitigation: Understand the manufacturer’s backlog and risk associated with those projects.
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Thank you!

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