RISK ANALYSIS AND SCHEDULING APPROACHES

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EXPERTISE

TIMBER ENGINEERING
VIRTUAL CONSTRUCTION
FABRICATION
PREFABRICATION
ASSEMBLY
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
- Permit Comments
- Field Inspections

## Schedule Risk
- MEPF Penetration Incorporation
- Schedule Critical Shop Drawing Dates
- Adjacent Structural Systems
- Manage RFI Process
- Factory Backlog
- Erection Sequencing
- Constructability
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Project Delivery Matters: Why?

5% Savings  Neutrality

CMGC, GC/CM, CMAR, Design-Build

10% Premium

Design-Bid-Build
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
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Which Code?

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.
Risk:
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
LIMITED TESTED ASSEMBLIES

Penetrations through 2 HR rated elements

2 HR rated Timber to Timber Connections

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

Risk:
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.
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

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
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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

Risks:
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
Risk:
Failure to model all structural materials

Failing to consider differing tolerances between materials

Mitigation:
Coordinate timber model with other structural models

Ensure subcontractor performing steel and concrete structures build to a model and agreed tolerances
FACTORY BACKLOG

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.