RISK ANALYSIS AND SCHEDULING APPROACHES

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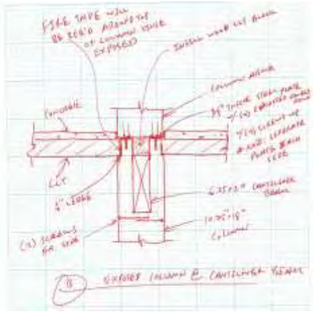
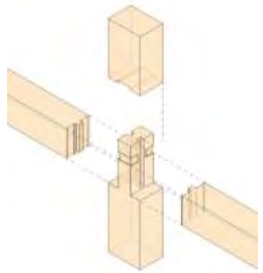
Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.

EXPERTISE

TIMBER ENGINEERING



VIRTUAL CONSTRUCTION

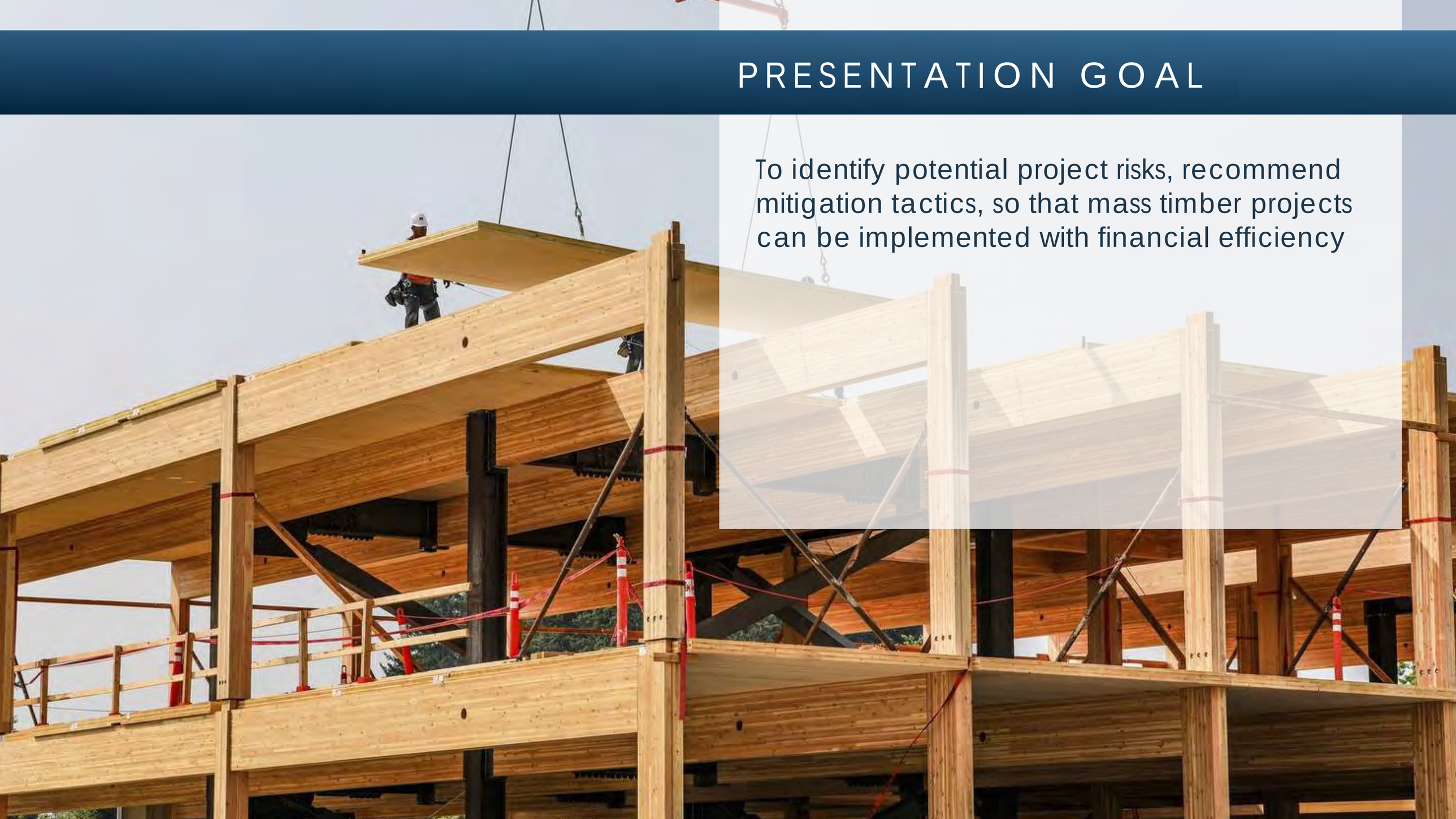


FABRICATION

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
- 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 METHOD

Project Delivery Matters: Why?

5% Savings

Neutrality

10% Premium

CMGC, GC/CM, CMAR, Design-Build

Design-Bid-Build

RISK MITIGATION FOR SEAMLESS TRANSITION TO CONSTRUCTION

Avoid Design-Bid-Build

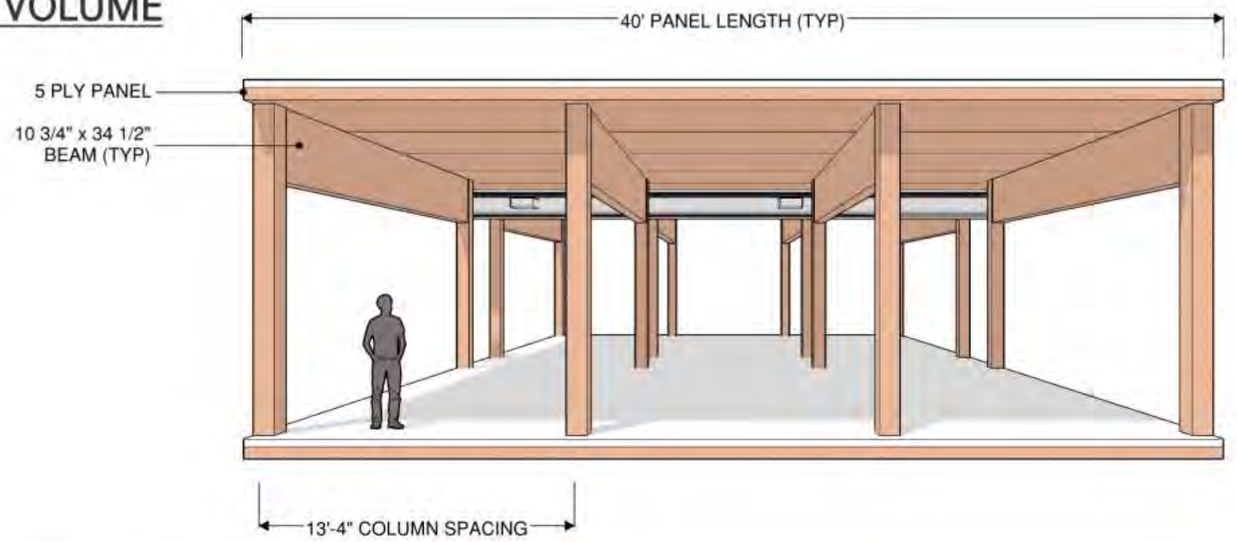
Hire and use a CM or GC during design for paid precon = > spend $ to save $$$

Engage with a mass timber firm during precon to optimize system costs

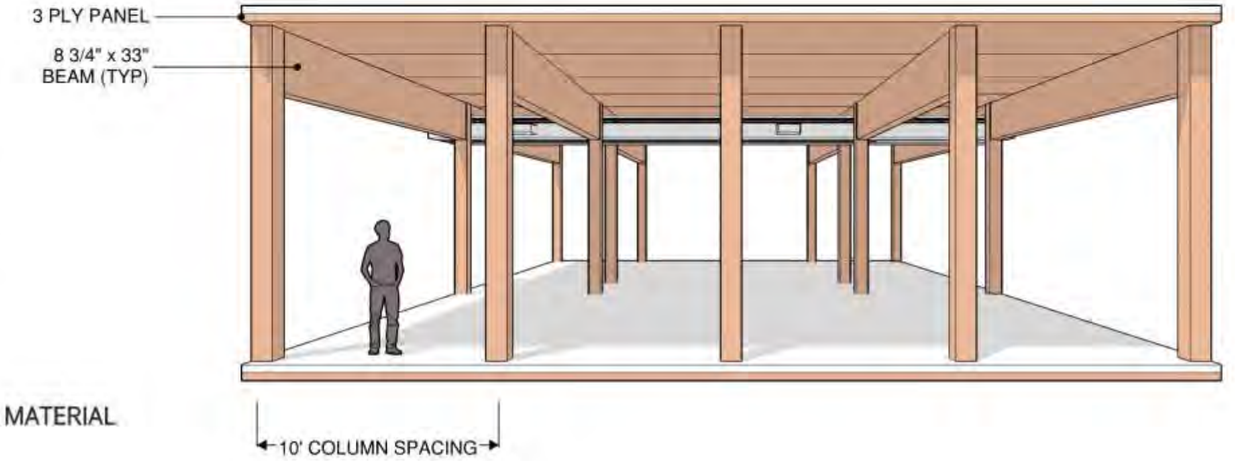
DESIGN EFFICIENCY

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

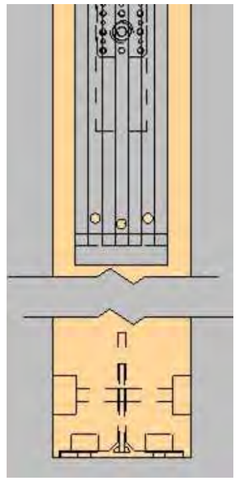


3 PLY PANEL WITH 10'-0" O.C. COLUMN SPACING
CLT BY VOLUME (APPROX):
18,700 CUBIC FT
FRAMING BY VOLUME (APPROX):
11,750 CUBIC FT
TOTAL WOOD VOLUME (APPROX):
30,450 CUBIC FT



25-30% REDUCTION IN STRUCTURAL MATERIAL

PROJECT DELIVERY



Detailing

Manufacturing Constraints

Fabrication Limitations

Hardware Choices

Fasteners and Proper Use

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.

PURCHASING: EXCHANGE RATE EFFECTS

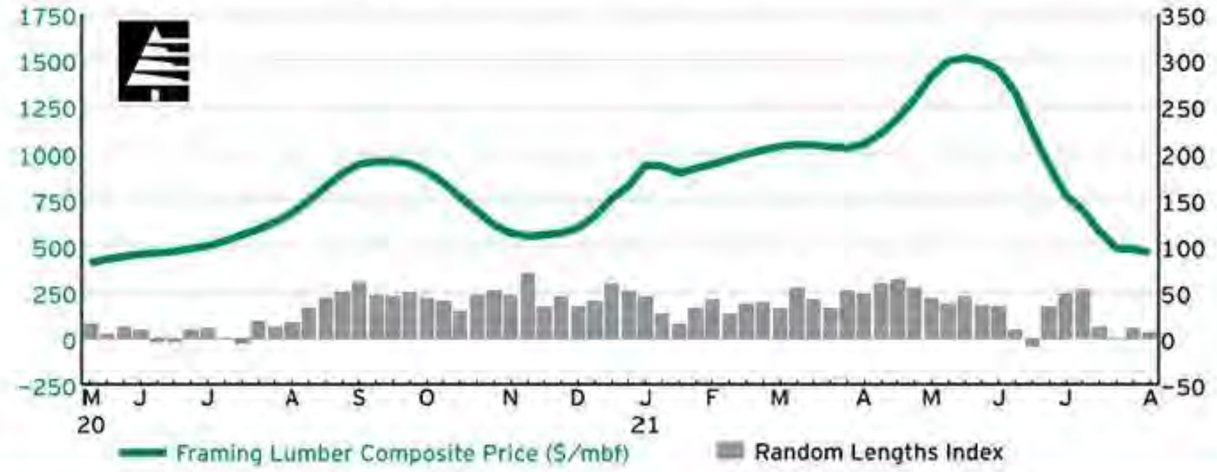
Lumber Market Indicators

	This Week	Last Week	Year Ago
Framing Lumber Composite Price[1]	**463**	**479**	**627**
Key Lumber Prices			
2x4 #2&Btr KD Western S-P-F	490	525	632
2x4 Std&Btr Grn Douglas Fir (Por)	425	475	645
2x4 #2 KD SYP (Westside)	477	460	580
2x4-8' PET KD Western S-P-F	345	360	615
1x12 #3 KD Ponderosa Pine	1,000	1,025	610
Random Lengths Index[2]	+5.7	+10.2	+12.3

1 – For a list of items included in each composite, go to www.rlpi.com and click on In Depth > Useful Data > Monthly Composite Prices.

2– The index is a numerical representation of market activity, based on a ratio of western sawmill order files to inventories. In computing the index, the data are compared with similar data averaged over the past five years.

	This Week	Last Week	Year Ago
Lumber Group Composites[1]			
Random-Length Dimension	491	504	590
Stud	472	493	611
Low-Grade Random Dimension	347	356	333
Board	1,281	1,293	699
Shop and Mldg&Btr	1,549	1,549	690
Coast Dry Random and Stud	461	482	577
Inland	739	758	643
Southern Pine	450	443	638
Western S-P-F	464	492	595
Eastern S-P-F	568	584	669
Green Douglas Fir	613	658	637



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.

PROJECT EXECUTION

Risk:

Delivery, install, crane proximity, trucking access

Mitigation:

Model the design, Model the plan, work the plan

PROJECT QUALITY

Risk:

Water management, TI detailing, Protection during construction

Mitigation:

Water management plan, Mock-ups

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CODE PATH

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

CODE INTERPRETATION

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

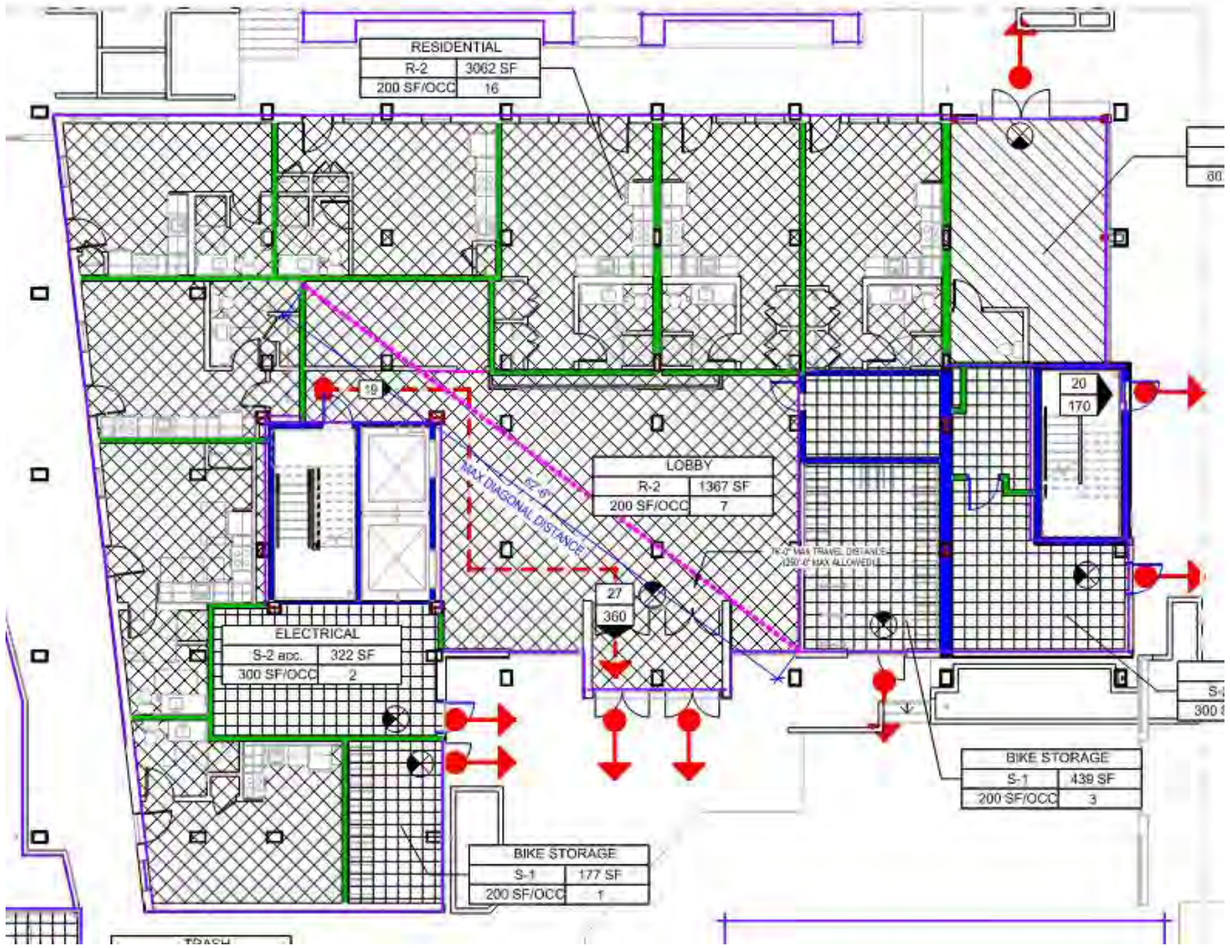
-Verify Fire Blocking Materials 718.2.1

Special Inspections in-situ or at factory 1705.5.3

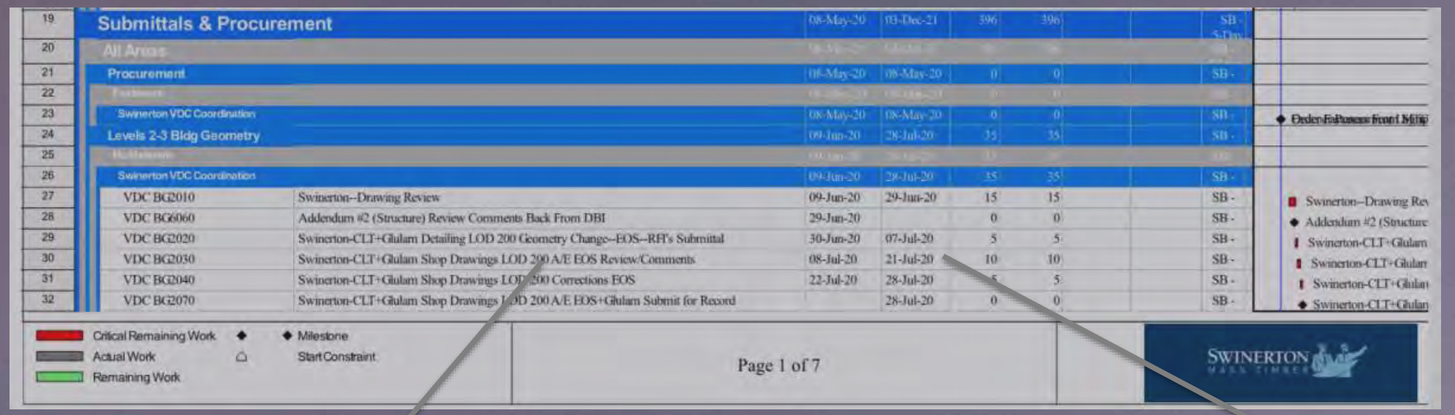
Daily fire safety inspection 3303.3

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.



INCORPORATE PERMIT COMMENTS INTO SHOP DRAWINGS



19	Submittals & Procurement		08-May-20	03-Dec-21	396	396		SB
20	All Areas							
21	Procurement		08-May-20	08-May-20	0	0		SB
22	Fasteners							
23	Swinerton VDC Coordination		08-May-20	08-May-20	0	0		SB
24	Levels 2-3 Bldg Geometry		09-Jun-20	28-Jul-20	35	35		SB
25	Hardware							
26	Swinerton VDC Coordination		09-Jun-20	28-Jul-20	35	35		SB
27	VDC BG2010	Swinerton--Drawing Review	09-Jun-20	29-Jun-20	15	15		SB
28	VDC BG6060	Addendum #2 (Structure) Review Comments Back From DBI	29-Jun-20		0	0		SB
29	VDC BG2020	Swinerton-CLT+Glulam Detailing LOD 200 Geometry Change--EOS--RFI's Submittal	30-Jun-20	07-Jul-20	5	5		SB
30	VDC BG2030	Swinerton-CLT+Glulam Shop Drawings LOD 200 A/E EOS Review/Comments	08-Jul-20	21-Jul-20	10	10		SB
31	VDC BG2040	Swinerton-CLT+Glulam Shop Drawings LOD 200 Corrections EOS	22-Jul-20	28-Jul-20	5	5		SB
32	VDC BG2070	Swinerton-CLT+Glulam Shop Drawings LOD 200 A/E EOS+Glulam Submit for Record		28-Jul-20	0	0		SB

Order Fabricate Front Mfg

Swinerton--Drawing Rev
Addendum #2 (Structure
Swinerton-CLT+Glulam
Swinerton-CLT+Glulam
Swinerton-CLT+Glulam
Swinerton-CLT+Glulam

Critical Remaining Work
Actual Work
Remaining Work
Milestone
Start Constraint

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SWINERTON

Addendum #2 (Structure) Review Comments Back From DBI

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:

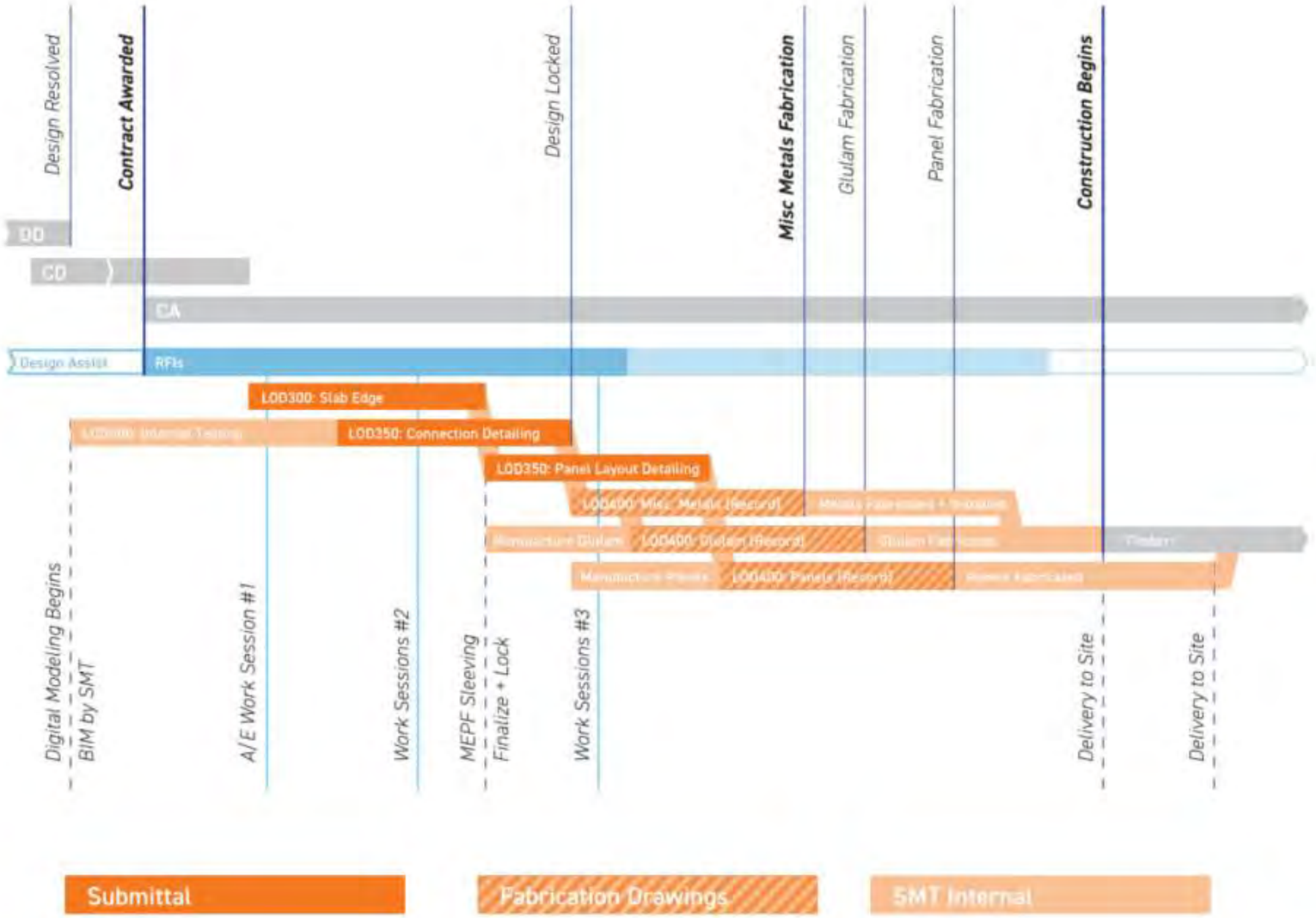
Failure to engage MEPF partners early leads to difficulty field fabricating penetrations

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

SHOP DRAWING SCHEDULE



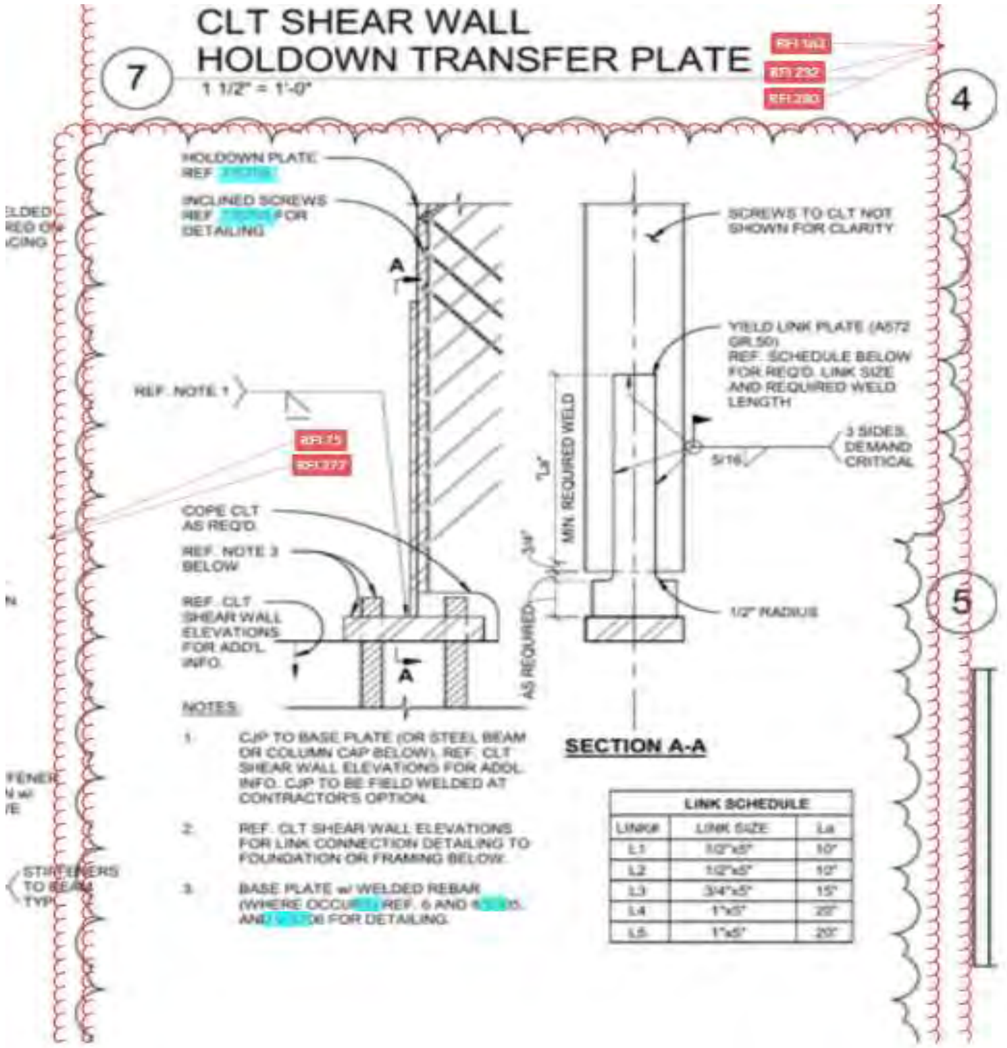
RFI SUBMISSION & RESPONSE TIMING

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



MODEL ADJACENT STRUCTURAL SYSTEMS

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.

ERECTION SEQUENCING CONSTRUCTABILITY

THANK YOU!

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TIMBERLAB