Risk Analysis and Scheduling Approaches

with Dean Lewis

SWINERTON MASS TIMBER

Woodworks | April 23, 2021

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

MISSION STATEMENT

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

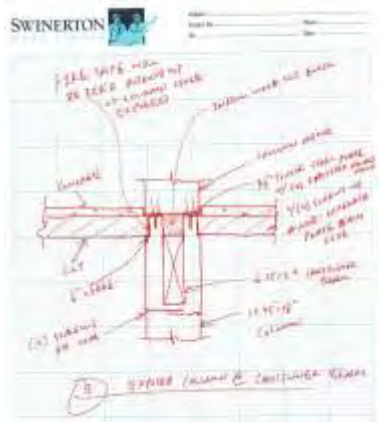
TIMBER ENGINEERING

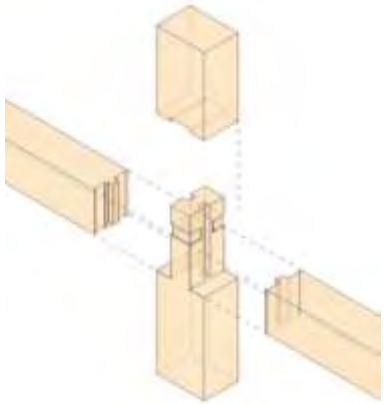
VIRTUAL CONSTRUCTION

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?

5% Savings

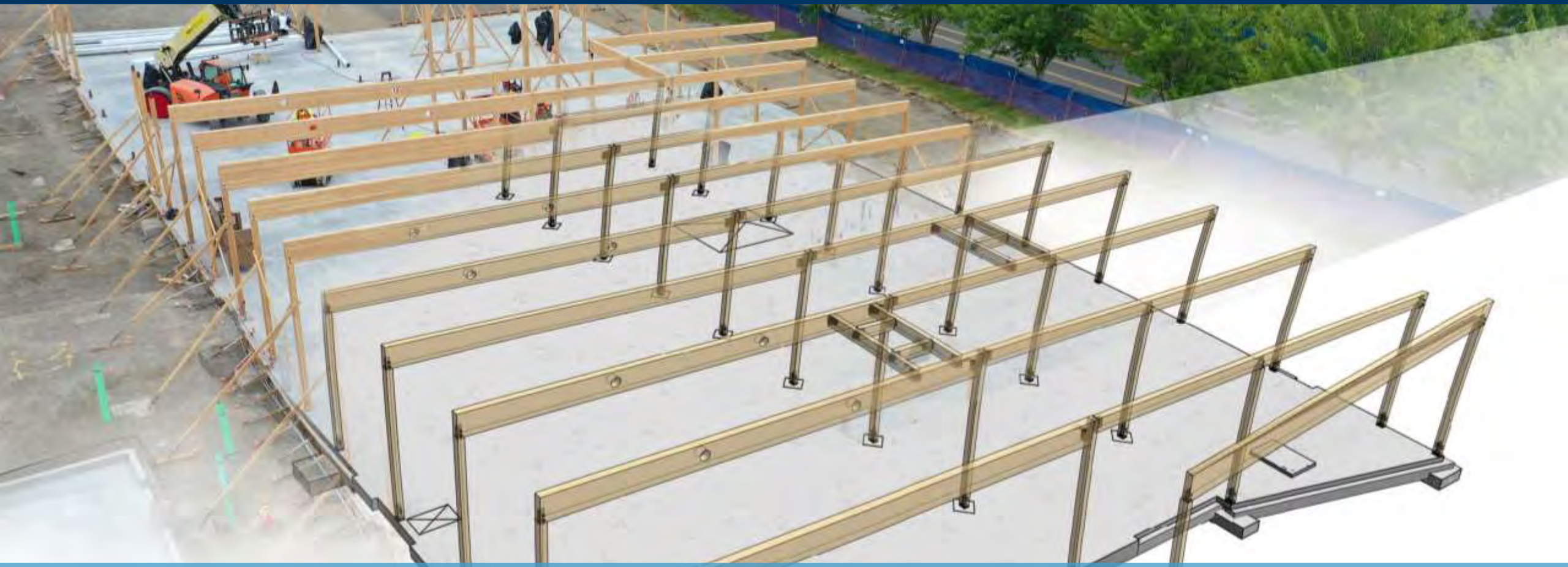
Neutrality

10% Premium

Design-Bid-Build

CMGC, GC/CM, CMAR, Design-Build

Risk Mitigation For Seamless Transition to Construction



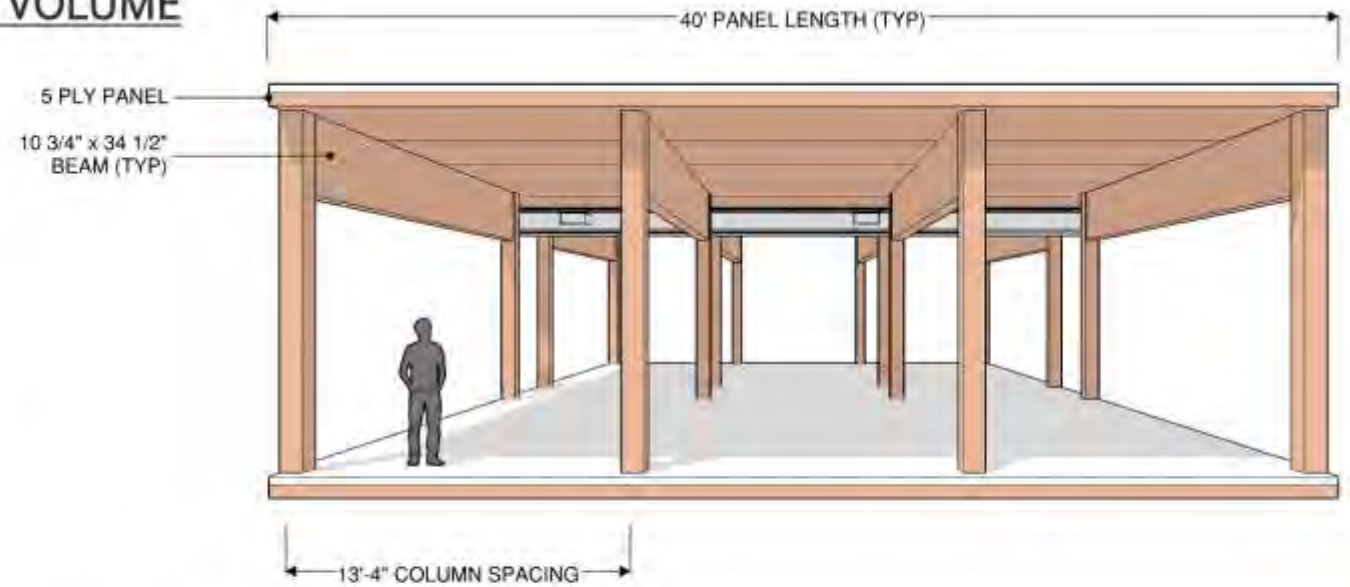
Risk Mitigation Strategies:

- 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

Design Efficiency

COLUMN SPACING V. MATERIAL VOLUME

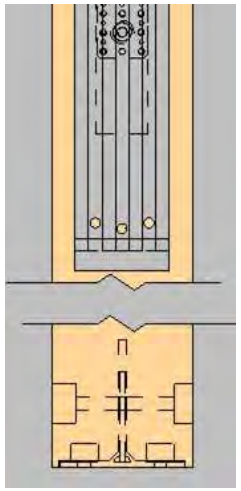
5 PLY PANEL WITH 13'-4" O.C. COLUMN SPACING
CLT BY VOLUME (APPROX):
30,070 CUBIC FT
FRAMING BY VOLUME (APPROX):
10,670 CUBIC FT
TOTAL WOOD VOLUME (APPROX):
40,740 CUBIC FT



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: Commodity Index Effects

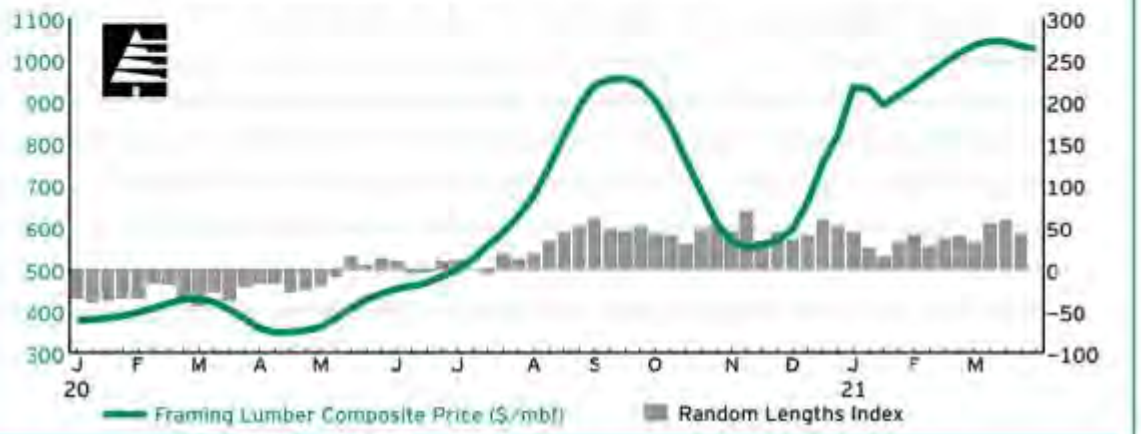
Lumber Market Indicators

	This Week	Last Week	Year Ago
Framing Lumber Composite Price[1]	**1,026**	**1,032**	**381**
Key Lumber Prices			
2x4 #2&Btr KD Western S-P-F	1,045	1,025	318
2x4 Std&Btr Grn Douglas Fir (Por)	950	970	475
2x4 #2 KD SYP (Westside)	1,070	1,105	336
2x4-8' PET KD Western S-P-F	990	975	310
1x12 #3 KD Ponderosa Pine	1,035	1,020	480
Random Lengths Index[2]	n.a.	+41.4	-20.8

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.

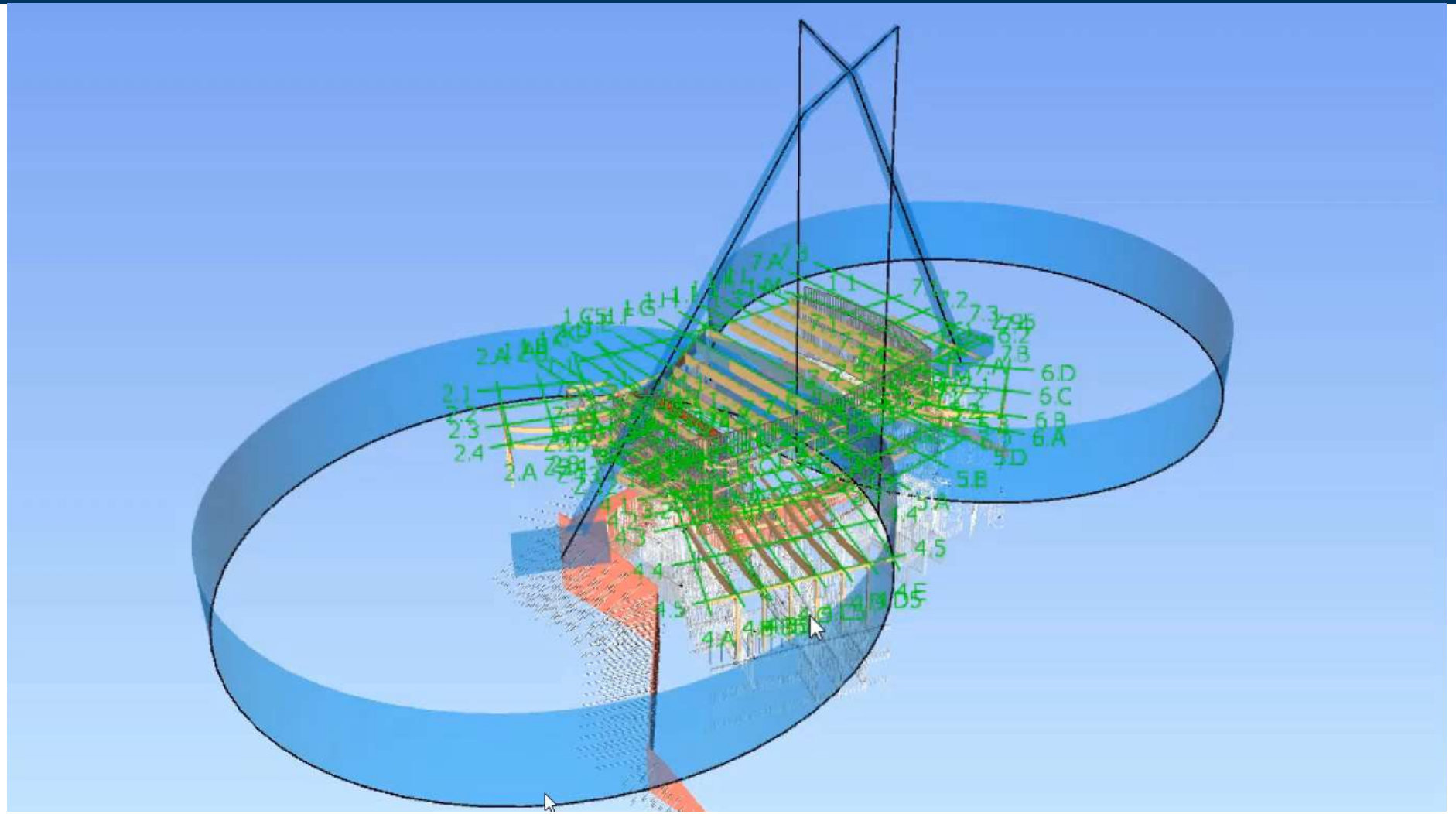
	This Week	Last Week	Year Ago
Lumber Group Composites[1]			
Random-Length Dimension	1,010	1,010	370
Stud	1,085	1,079	382
Low-Grade Random Dimension	763	752	262
Board	1,223	1,208	603
Shop and Mldg&Btr	1,190	1,151	661
Coast Dry Random and Stud	1,087	1,083	405
Inland	1,168	1,162	474
Southern Pine	895	908	343
Western S-P-F	1,032	1,017	326
Eastern S-P-F	1,161	1,151	415
Green Douglas Fir	968	967	486



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



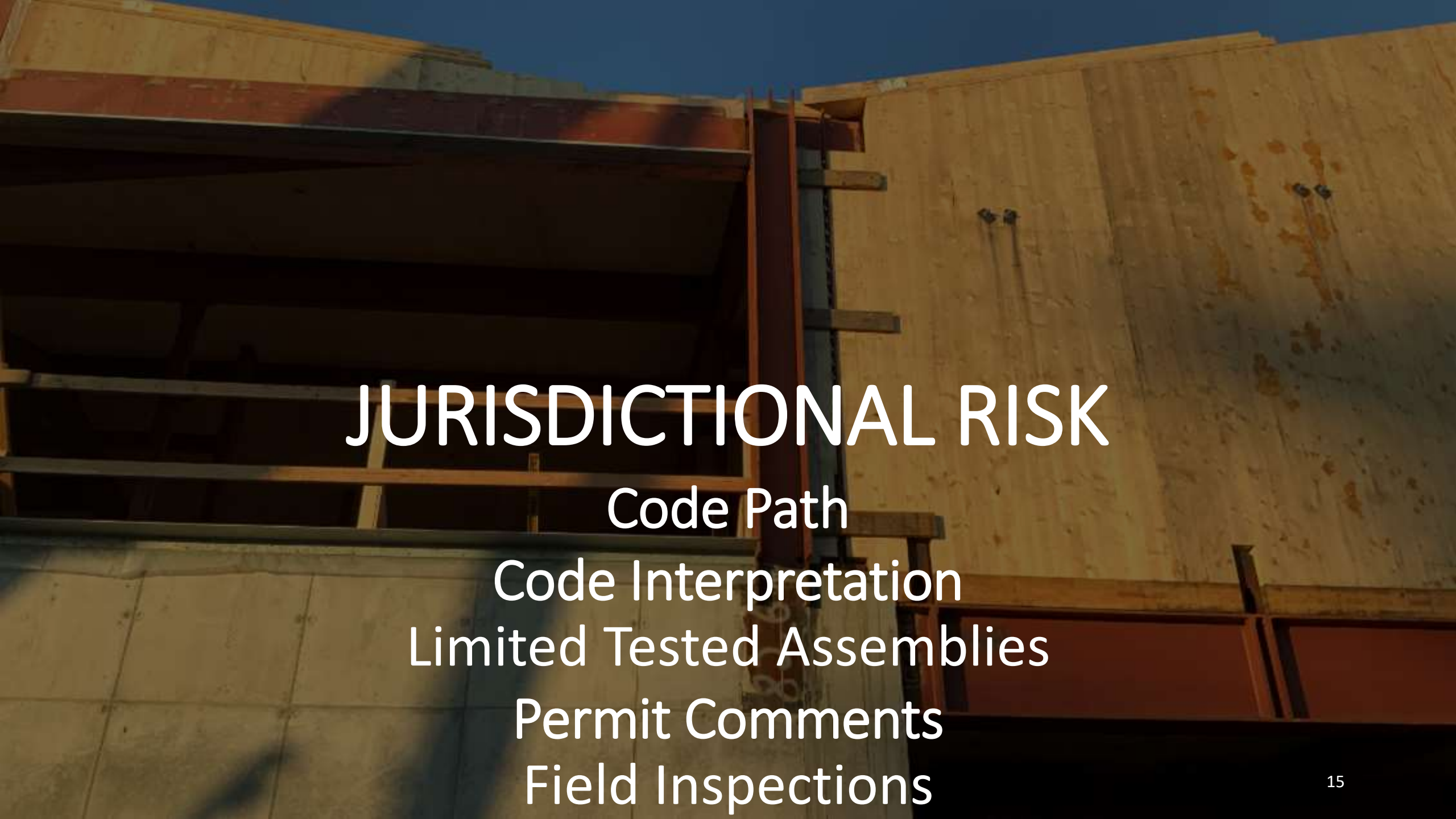
Risk: Delivery, install, crane proximity, trucking access

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



JURISDICTIONAL RISK

Code Path

Code Interpretation

Limited Tested Assemblies

Permit Comments

Field Inspections

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 and

Limited Tested Assemblies

Penetrations through 2 HR rated elements

2 HR rated Timber to Timber Connections

Limitations of tested connections (loading in Kips)

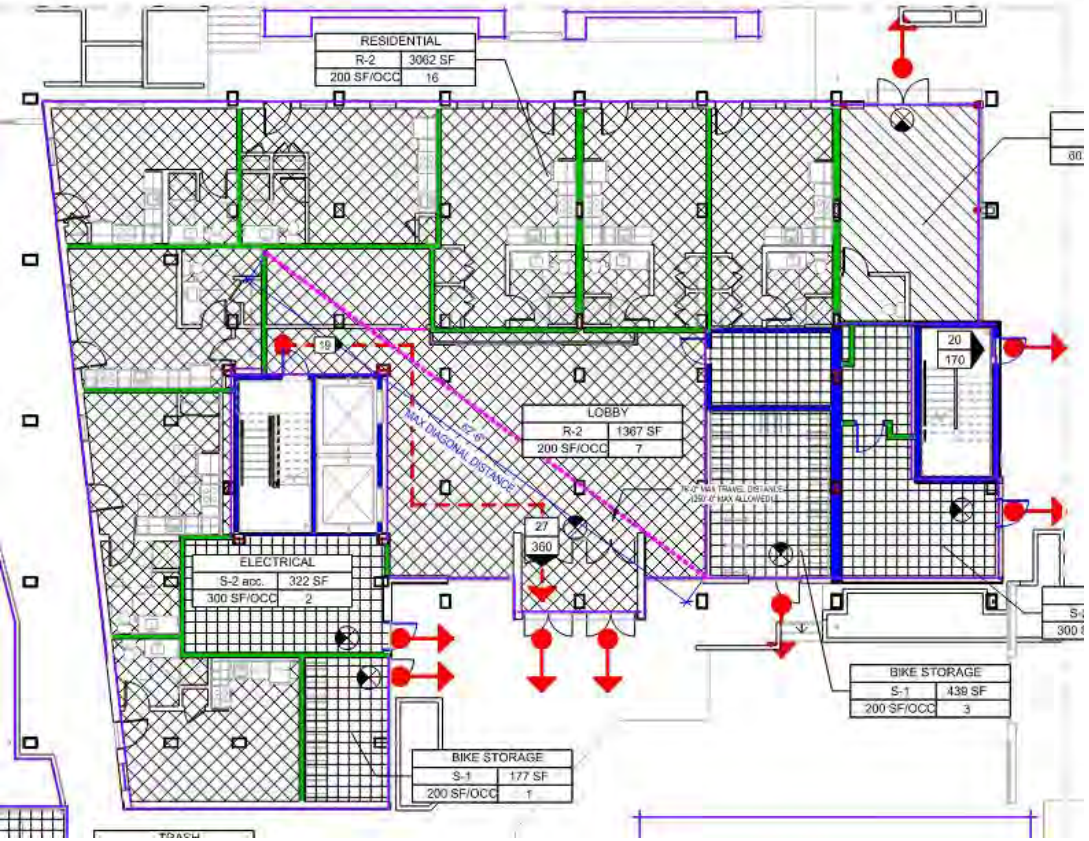
Risks:

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

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								
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								
26	Swinerton VDC Coordination		09-Jun-20	29-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 -

Critical Remaining Work · Milestone
Actual Work · Start Constraint
Remaining Work

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SWINERTON MASS TIMBER

Addendum #2 (Structure) Review Comments Back From DBI

Risk: Permit comments required to complete mass timber shop drawings

Mitigation:

Know when first round of structural comments are anticipated, place date in schedule

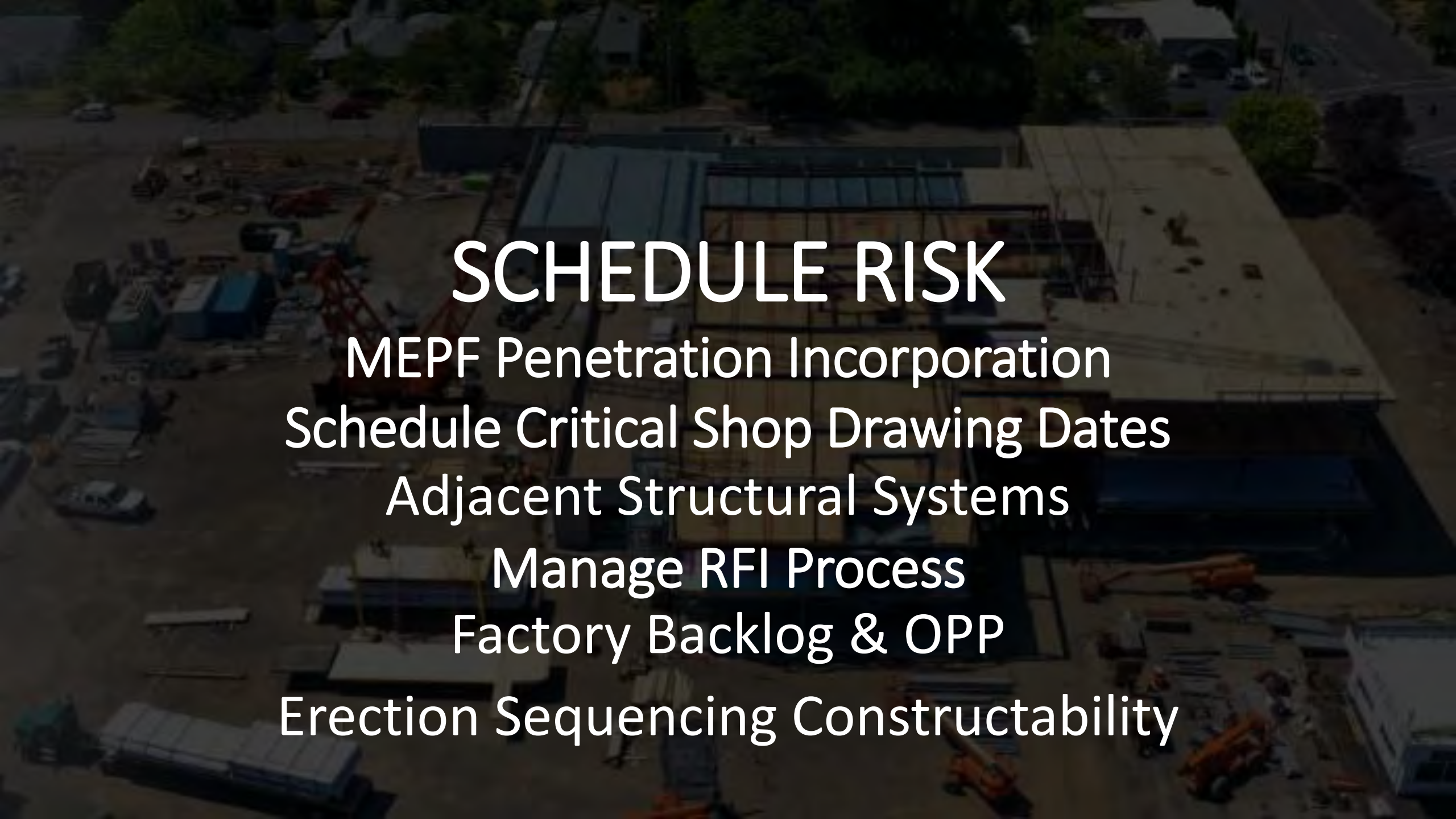
Ensure structural comment date is tied to critical path in schedule

Field Inspections

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

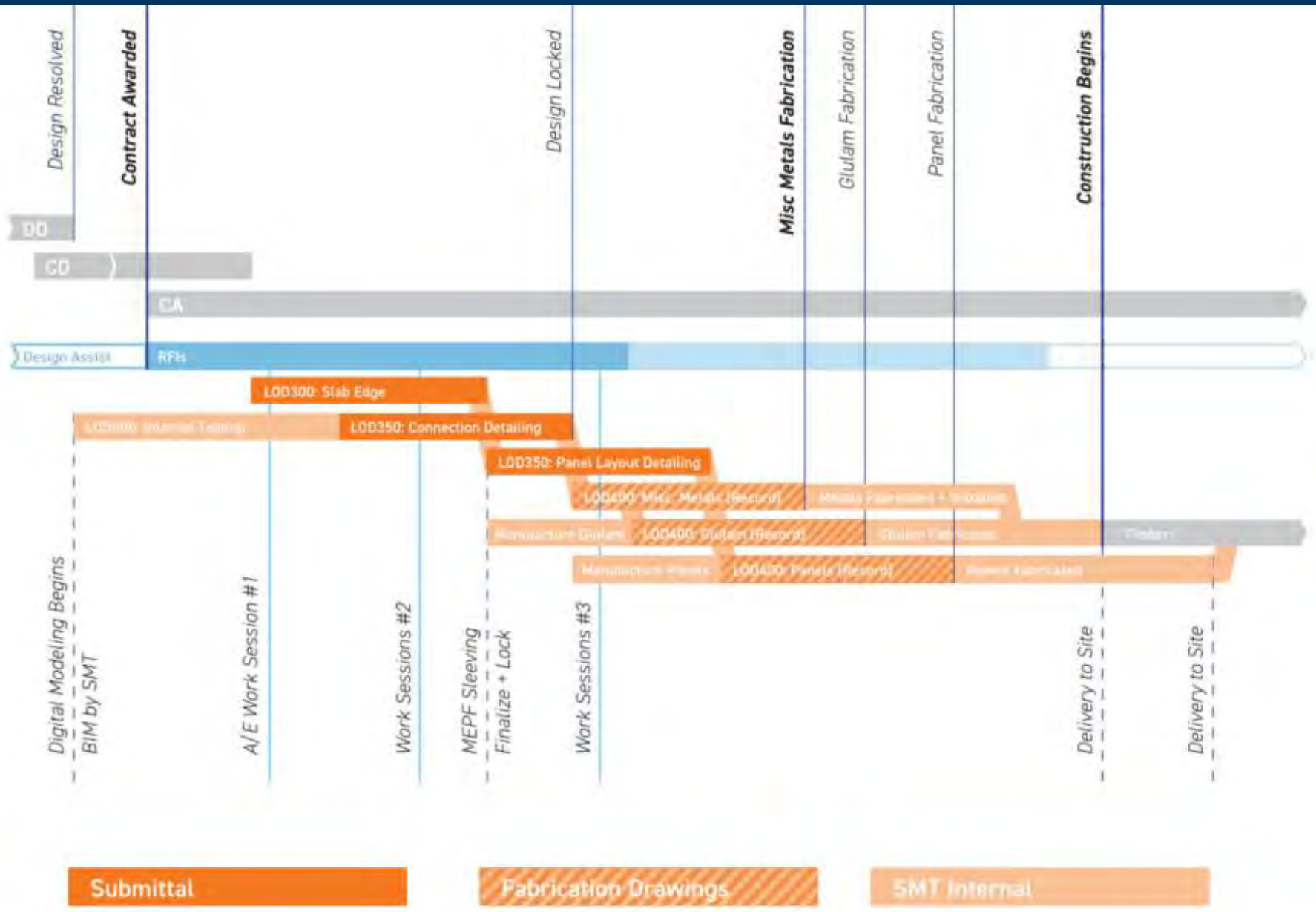
Risk: Failure to engage MEPF partners early leads to difficulty field fabricating penetrations

Mitigation:

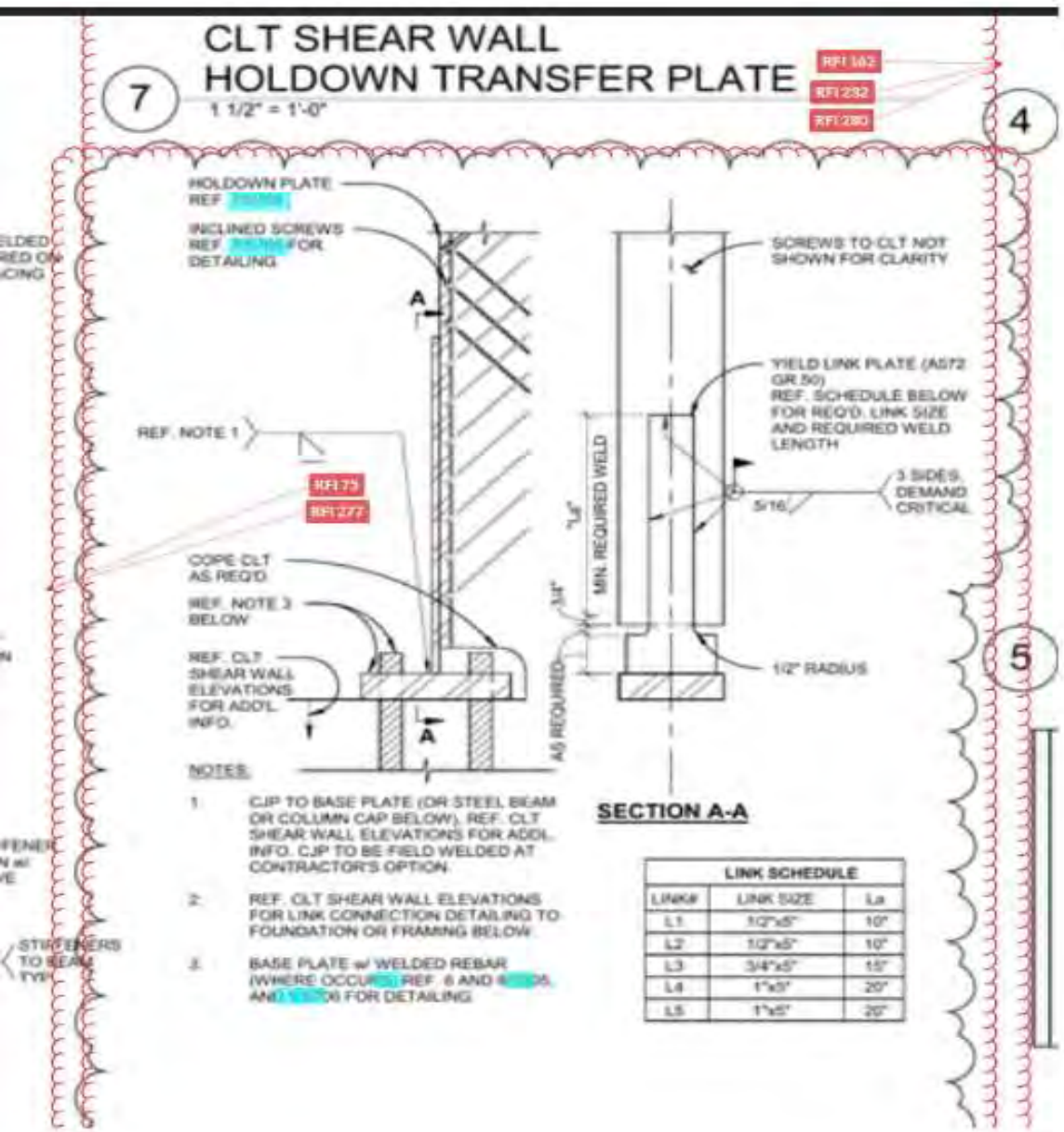
Take advantage of CNC Technology, coordinate MEPF trades early in project design

Prefabricating MEPF openings leads to quicker field installation times and better quality

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 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.

Erection Sequencing Constructability

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

Thank you!

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