Risk Analysis

Presented by Swinerton Mass Timber

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

Learning Objectives

Risk Analysis

Financial Risk

- Delivery Method (Design-Bid-Build vs. CM/GC or Design-Build)
- Tariffs and Trade Wars (or threat of the same)
- Commodity price fluctuation
- Unknown Product Type
- Inefficient Design

Jurisdictional Approval

- Varying levels of acceptance across jurisdictions
- Limited tested assemblies
- Engineering judgements required
- AMMRs and Performance Based Design

Schedule

- Supplier Capacity / Production Availability
- On-site productivity
- Delivery timeline (and design decision-making) for North American vs. European Supply
- Inefficient Details
- Lack of understanding of erection/assembly methods

Product Quality/Failure

- Constructability issues arising from differences in manufacturing and construction tolerances
- Improper detailing
- Water-damage of material
- Rust staining of wood from steel connectors

FINANCIAL RISK

Delivery Method

5% Savings

Neutrality

10% Premium

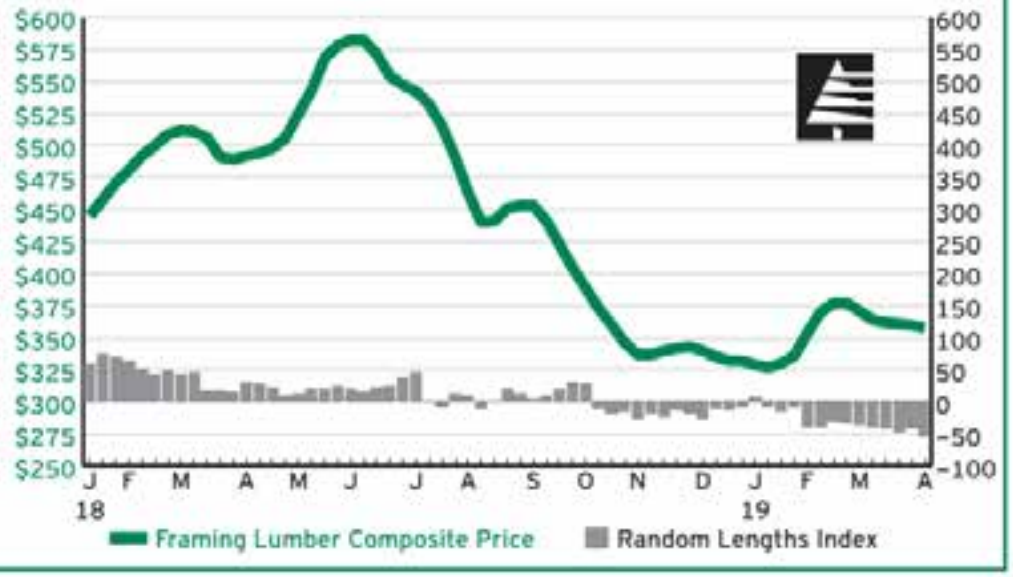
Commodity Price Fluctuation

Lumber Market Report

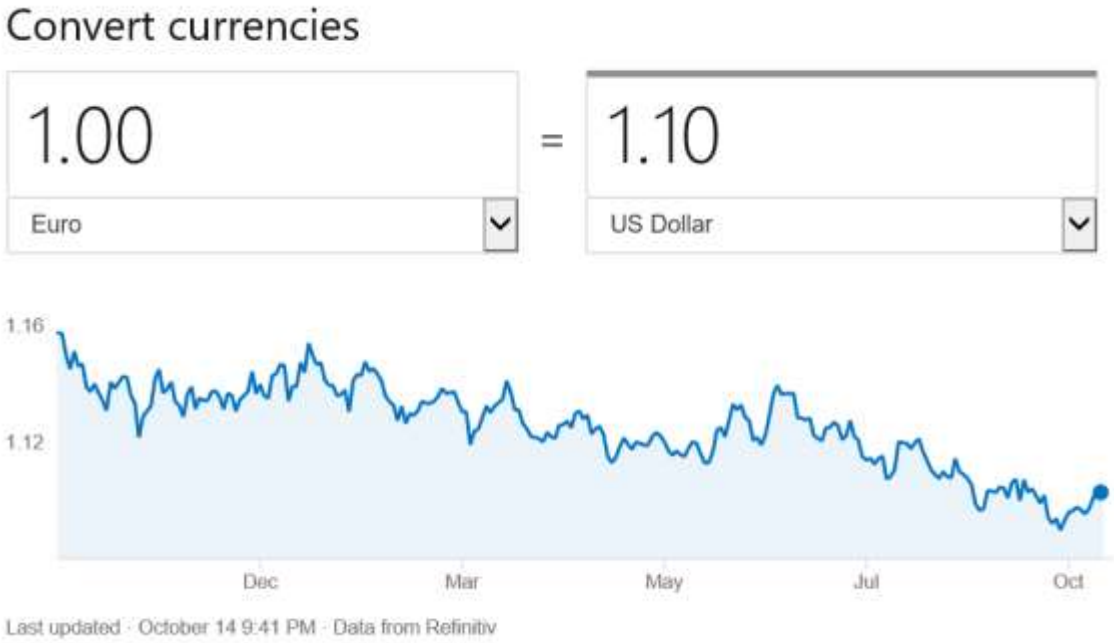
Lumber Market Indicators

	This Week	Last Week	Year Ago
Framing Lumber Composite Price	**$358**	**$360**	**$492**
2x4 #2&Btr KD Western S-P-F	341	350	540
2x4 Std&Btr Grn Douglas Fir (Portland)	302	302	540
2x4 #2 KD SYP (Westside)	405	405	564
2x4-8' PET KD Western S-P-F	270	270	378
1x12 #3 KD Ponderosa Pine	460	460	575
Random Lengths Index*	-53.6	-41.6	+29.9

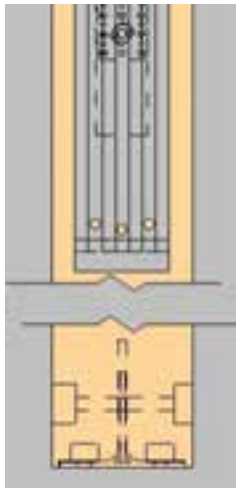
*The index is a numerical representation of market activity, based on a ratio of western sawmill order files to inventories. In computing the index, the data are compared with similar data averaged over the past five years.



Exchange Rate Effects



Unknown Product Type



Detailing

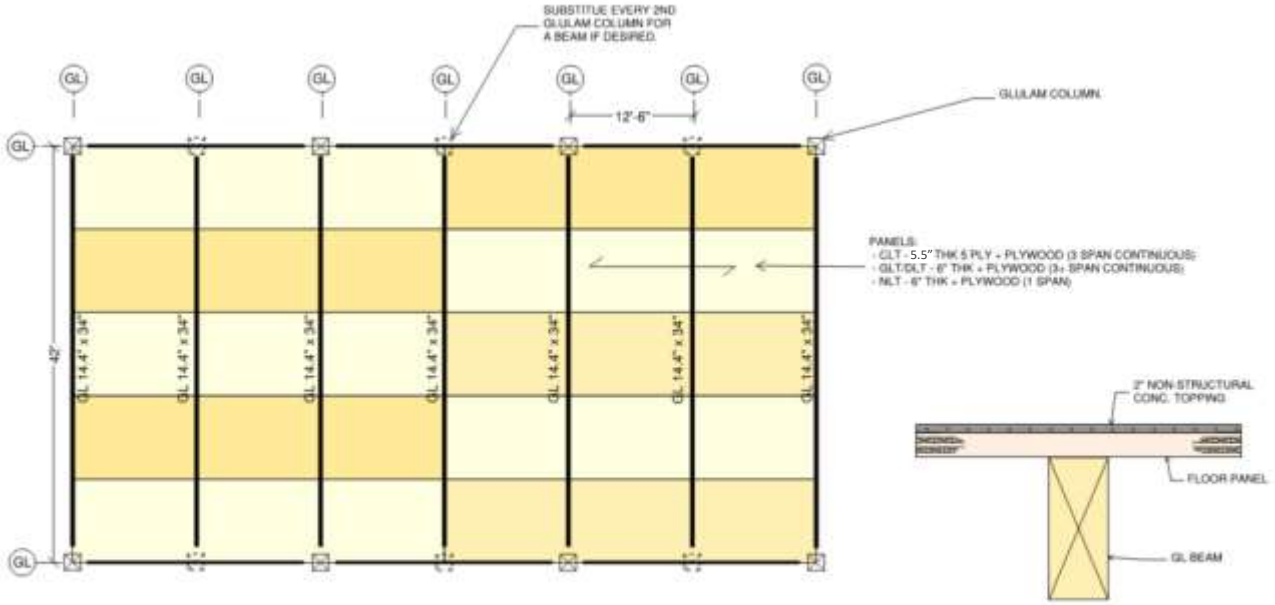
Manufacture

Fabrication

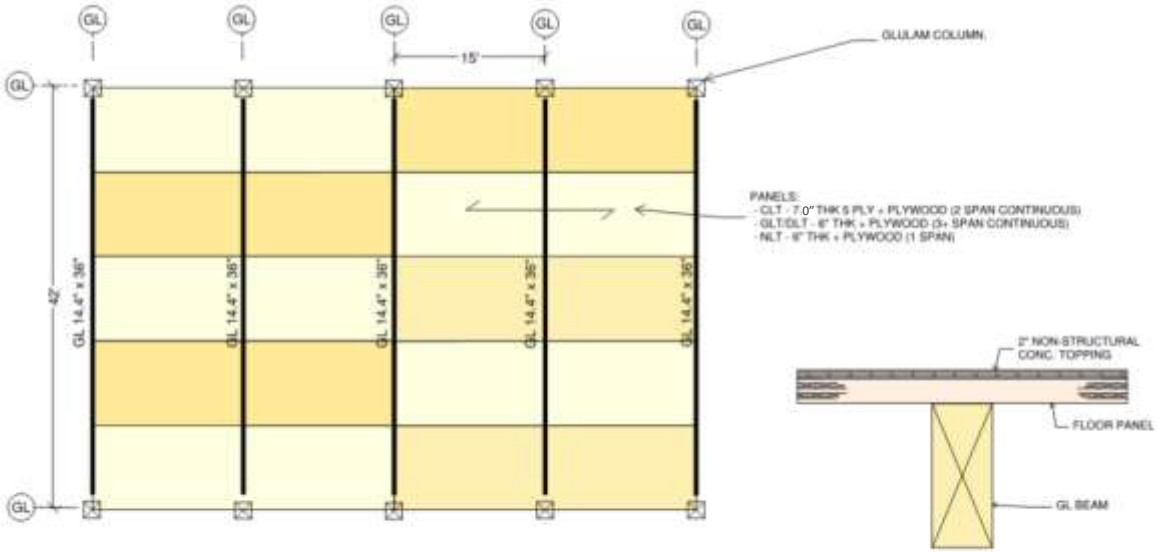
Misc. Metals

Fasteners

Inefficient Design



Baseline



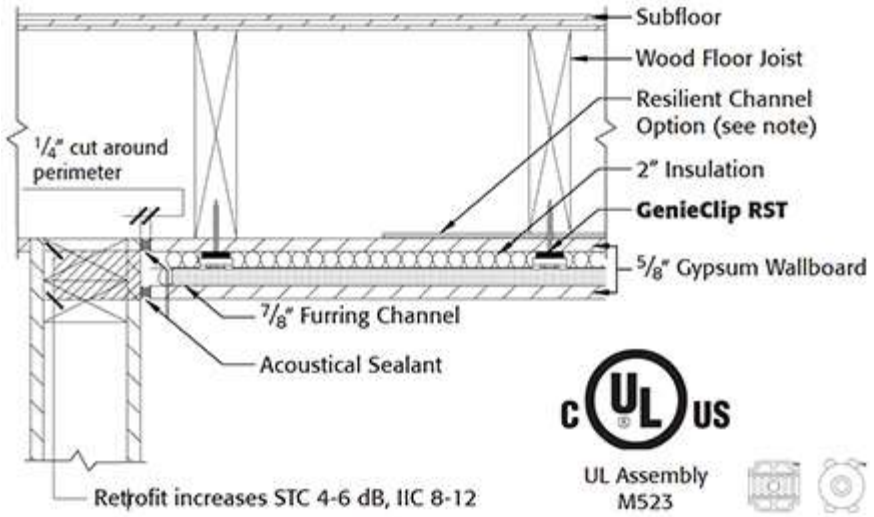
+5%

Source: Seattle Mass Timber Tower Book

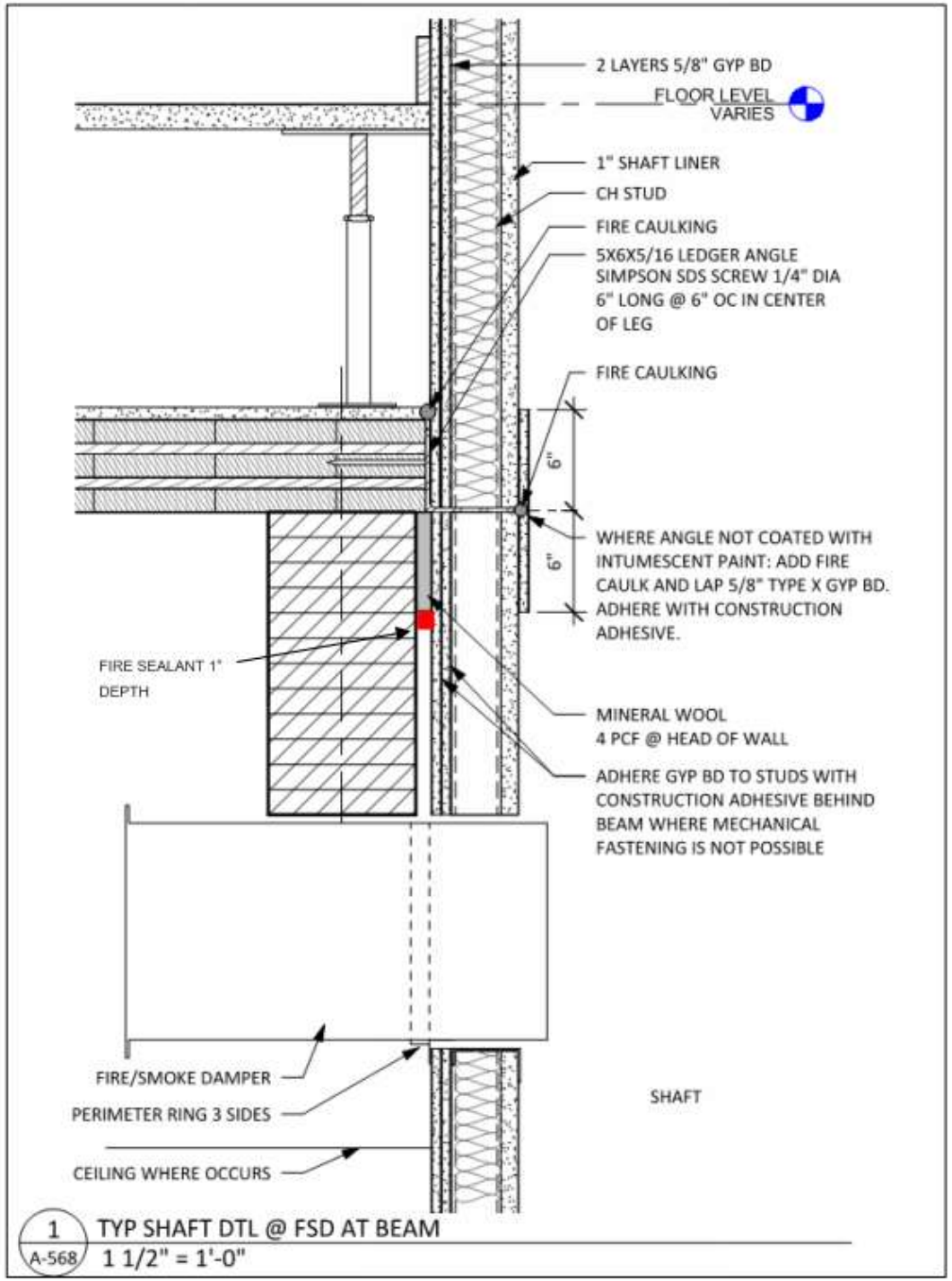
JURISDICTIONAL RISK

Limited Tested Assemblies

- Building Inspectors look for UL rated assemblies
- UL rated assemblies are like pre approved recipes with materials acting like ingredients
- Currently no UL rated assemblies with CLT in floors or walls



http://pliteq.com/products/genieclip/applications/retrofit.php



Engineering Judgments

1hr Floor Panels in 2 Hour Rated Shafts:

- The shaft walls need to be continuous per code, but cannot feasibly be constructed as balloon frame. So to deal with this, First Tech used angle brackets at each floor to support the metal stud wall above.
- The angle bracket at each level needs to be coated with intumescent paint, which can be expensive. Best to coordinate this in advance.
- The shaft openings in the CLT need to be cut to the right size to accommodate whatever ductwork fits inside, and some degree of spacing (6”) between the duct and the wall. Need to understand the wall thickness.

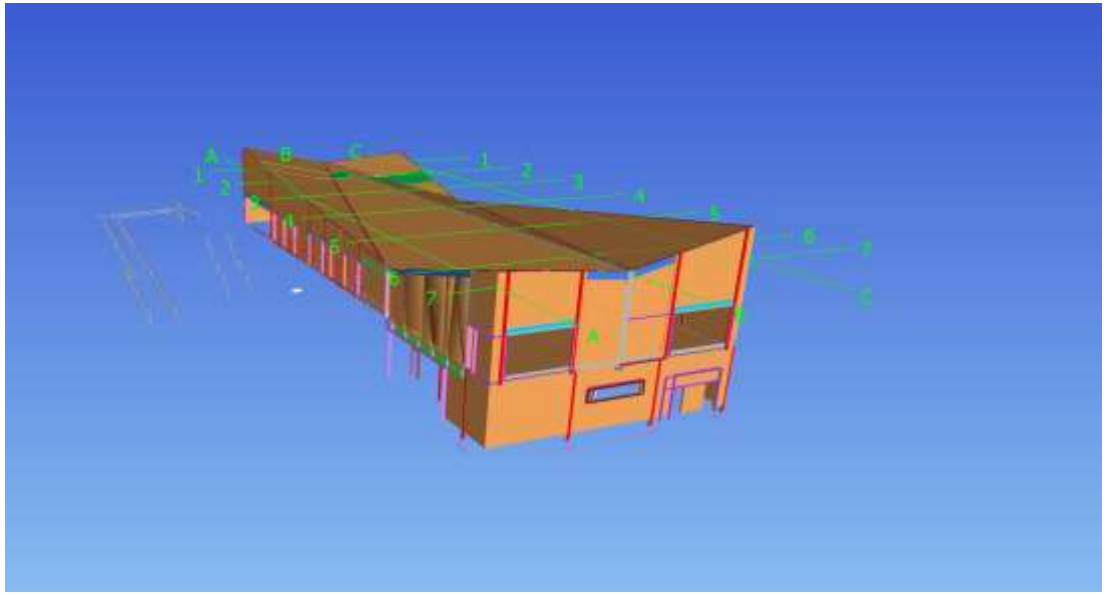
AMMRs & Performance-Based Design

- Need to determine code acceptance path very early
- Engage strong design partners familiar with alternative approaches
- Pre-permit and pre-inspection communication with AHJ is key
- Fire engineering is often overlooked
- Read the general notes and code information!

SCHEDULE RISK

RFI & Shop Drawing Process

- Cloud collaboration is recommended to streamline process
- 3D coordination is a must, 2D documents are formality
- Front end heavy on CA – 3-6 months before project breaks ground
- Need to have all structural trades on-board early
- MEP trades onboard is strongly recommended



Building Permit

- Creative permitting approach is usually needed to make timing work
- Understand how specialty / delegated engineering interacts with other permits

Supplier Capacity | Production Availability

- Manufacturing availability is a huge constraint
- Workflow of information is different for every producer
- Allowances for OT and acceleration help
- Cash flow

On-Site Productivity

Considerations:

- Number of trucks allowed on-site
- Lay-down staging area to sort materials
- Building Geometry
  - Consistency of panel sizes
  - Squareness of panels
- Extent of prefabrication for connections
- CLT Bearing members: glulam or steel?
  - Manufacturing Tolerances
  - Notching around columns

Delivery Timeline

STRUCTURLAM

ID	Task Mode	Task Name	Duration	Start	Finish
1		**25540 LCPD**	**198 days?**	**Mon 18-12-03**	**Tue 19-09-17**
2		Detailing Coordination	35.75 days	Tue 19-05-14	Fri 19-07-12
3		Order Confirmed	1 day?	Mon 18-12-03	Mon 18-12-03
4		Exp. Delivery Date	0 days	Mon 19-06-03	Mon 19-06-03
5		**Shop Drawings**	**34 days**	**Tue 19-06-25**	**Tue 19-08-13**
6		final steel model from client	0 days	Tue 19-06-25	Tue 19-06-25
7		3D model	5 days	Tue 19-06-25	Tue 19-07-02
8		OFA	5 days	Wed 19-07-03	Tue 19-07-09
9		Client Review	4 days	Wed 19-07-10	Mon 19-07-15
10		IFC	10 days	Tue 19-07-16	Mon 19-07-29
11		**Load Plans**	**6 days**	**Tue 19-07-30**	**Wed 19-08-07**
12		Create Load Plans	3 days	Tue 19-07-30	Thu 19-08-01
13		Load Plan Review and Approval	2 days	Fri 19-08-02	Tue 19-08-06
14		Finalize Load Plans	1 day	Wed 19-08-07	Wed 19-08-07
15		IFC Check	1 day	Thu 19-08-08	Thu 19-08-08
16		steel IFC	1 day	Fri 19-08-09	Fri 19-08-09
17		IFC Release	1 day	Mon 19-08-12	Mon 19-08-12
18		CNC Code – CLT	1 day	Tue 19-08-13	Tue 19-08-13
19		**Production and Procurement**	**26 days**	**Mon 19-08-12**	**Tue 19-09-17**
20		spline procurement	10 days	Wed 19-08-14	Tue 19-08-27
21		steel procurement	25 days	Mon 19-08-12	Mon 19-09-16
22		Hardware Procurement	20 days	Wed 19-08-14	Wed 19-09-11
23		**CLT Fabrication**	**21 days**	**Mon 19-08-19**	**Tue 19-09-17**
24		**CLT**	**21 days**	**Mon 19-08-19**	**Tue 19-09-17**
25		CLT Production Slot	0 days	Mon 19-08-19	Mon 19-08-19
26		CLT Press	7 days	Mon 19-08-19	Tue 19-08-27
27		CLT Framing	7 days	Wed 19-08-21	Thu 19-08-29
28		CLT Finishing	7 days	Mon 19-08-26	Wed 19-09-04
29		Ship L1	1 day	Thu 19-08-29	Thu 19-08-29
30		Ship L2	1 day	Fri 19-08-30	Fri 19-08-30
31		Ship L3	1 day	Tue 19-09-03	Tue 19-09-03
32		Ship L4	1 day	Wed 19-09-04	Wed 19-09-04
33		Ship L5	1 day	Thu 19-09-05	Thu 19-09-05
34		Ship L6	1 day	Fri 19-09-06	Fri 19-09-06
35		Ship L7	1 day	Mon 19-09-09	Mon 19-09-09
36		Ship L8	1 day	Tue 19-09-10	Tue 19-09-10
37		Ship L9	1 day	Wed 19-09-11	Wed 19-09-11
38		Ship L10	1 day	Thu 19-09-12	Thu 19-09-12
39		Ship L11	1 day	Fri 19-09-13	Fri 19-09-13
40		Ship L12	1 day	Mon 19-09-16	Mon 19-09-16
41		Ship L13	1 day	Tue 19-09-17	Tue 19-09-17

Considerations:

- Shipping distance
- Modes of transport
- Customs clearance?
- Off-site staging/storage
- Space for trucks on-site

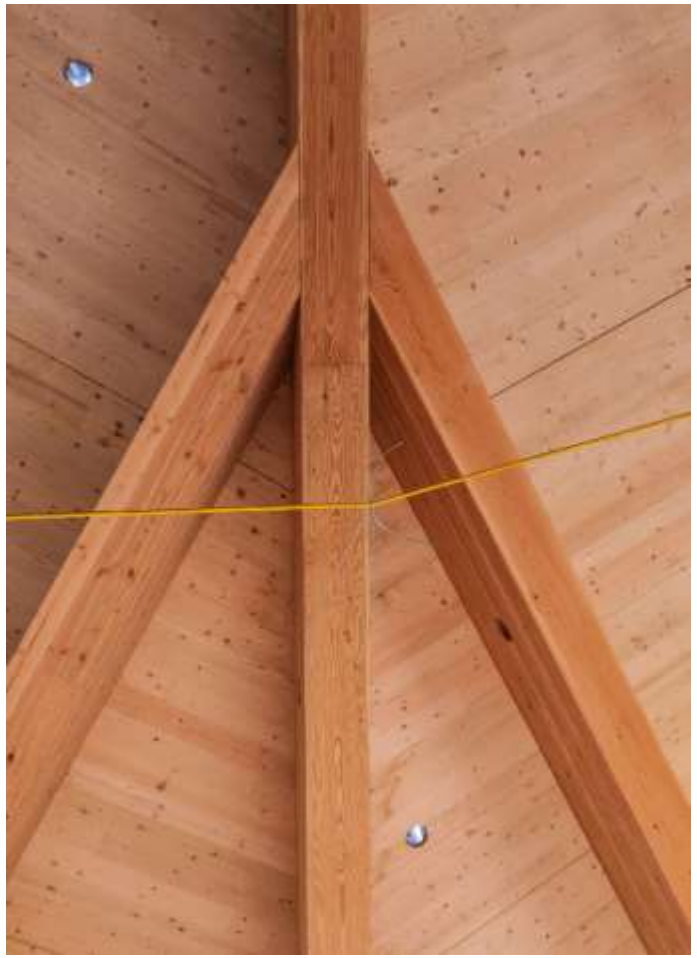
Unfamiliar Erection & Assembly Methods

- All Engineered Pick Plans
- Specialty Rigging Hardware
- Spline Connection vs Butt Joints

PRODUCT QUALITY RISK

Manufacturing Tolerances

Timber to Concrete



Timber to Timber

Timber to Steel

Inefficient Detailing

- Field Cuts cause inefficient productivity
- Ripping down of panels
- Uncoordinated steel and concrete models
- RFI’s post approved fabrication drawings

Water Damage

- Engineered wood products are resilient when it comes to moisture
- Keep tarped as long as possible

Rust & Iron Staining

- Importance of steel coating in high moisture areas
  - Galvanized

QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

Chris Evans

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