Risk Management

Presented by Zach Brehm

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

Learning Objectives

Risk Management

Financial Risk
- Delivery Method (Design-Bid-Build vs. CM/GC or Design-Build)
- Commodity Price Fluctuation
- Exchange Rate Effects
- Unknown Product Type

Jurisdictional Risk
- Limited tested assemblies
- Engineering judgements
- AMMRs and Performance Based Design

Schedule
- Connection Design
- Shop Drawing Process
- RFI Process
- Trade Sequencing
- On-Site Productivity
- Supplier Capacity / Production Availability
- Delivery timeline (and design decision-making) for North American vs. European Supply

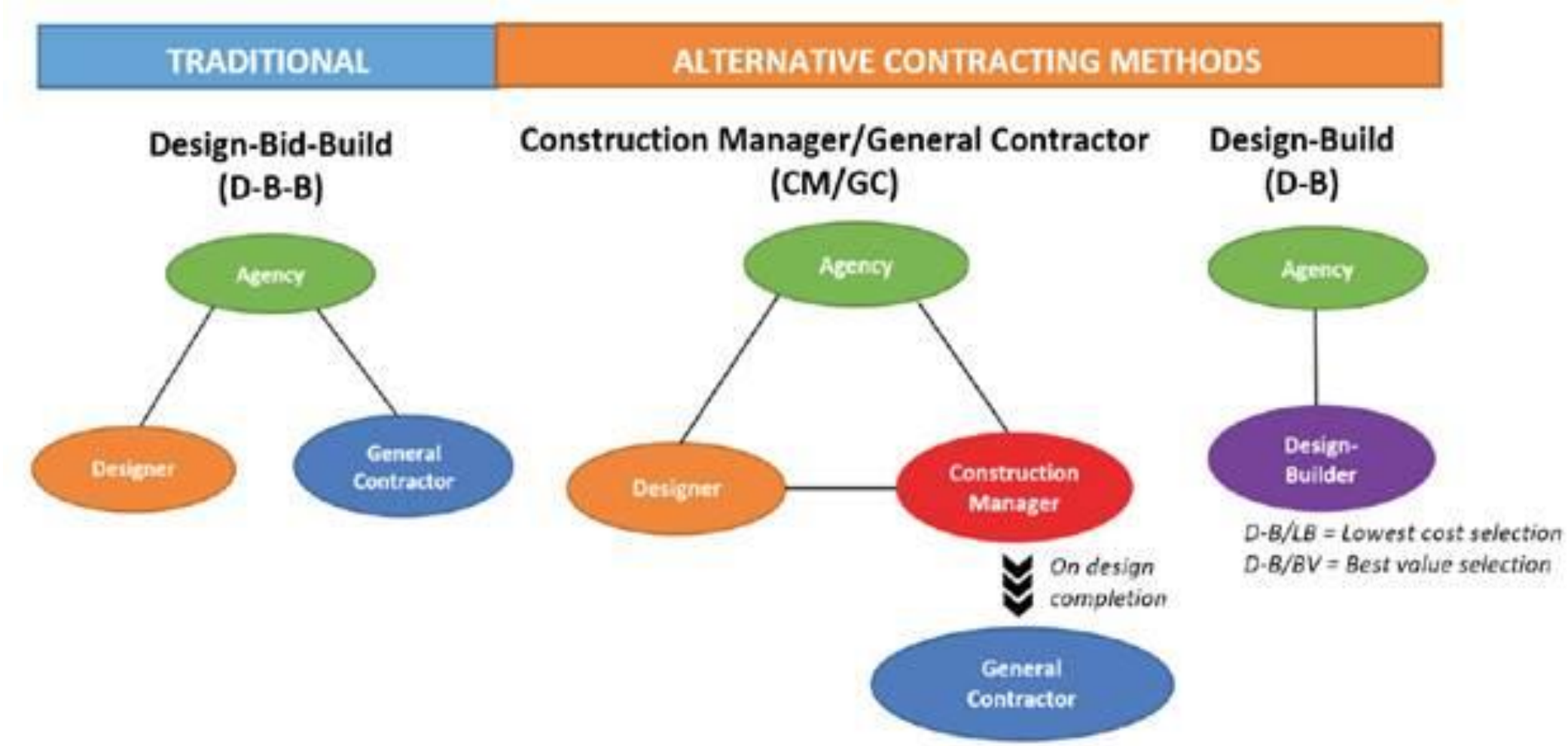
Product Quality
- Manufacturing Tolerances
- Constructability issues arising from differences in manufacturing and construction tolerances
- Inefficient detailing

Types of Risk

- Financial
- Jurisdictional Approval
- Schedule
- Product/Quality Control

FINANCIAL RISK

Delivery Method



SOURCE: https://www.fhwa.dot.gov/publications/research/infrastructure/17100/index.cfm

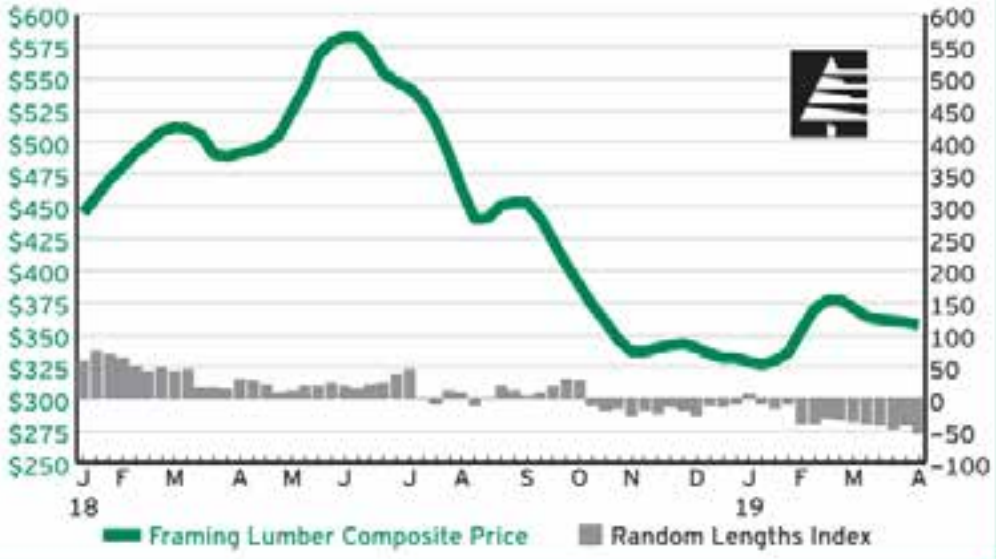
Commodity Price Fluctuation

Lumber Market Report

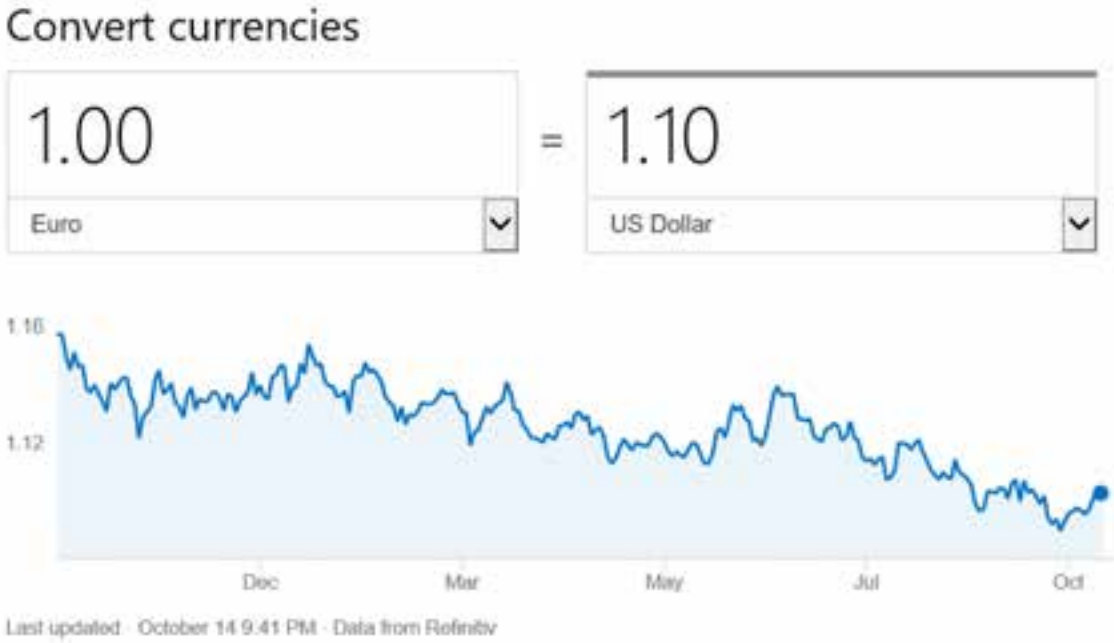
Lumber Market Indicators

	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

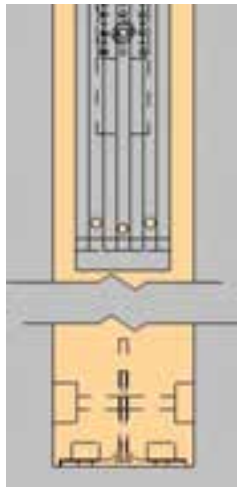
*The index is a numerical representation of market activity, based on a ratio of western sawmill order files to inventories. In computing the index, the data are compared with similar data averaged over the past five years.



Exchange Rate Effects



Unknown Product Type



Detailing

Manufacture

Fabrication

Misc. Metals

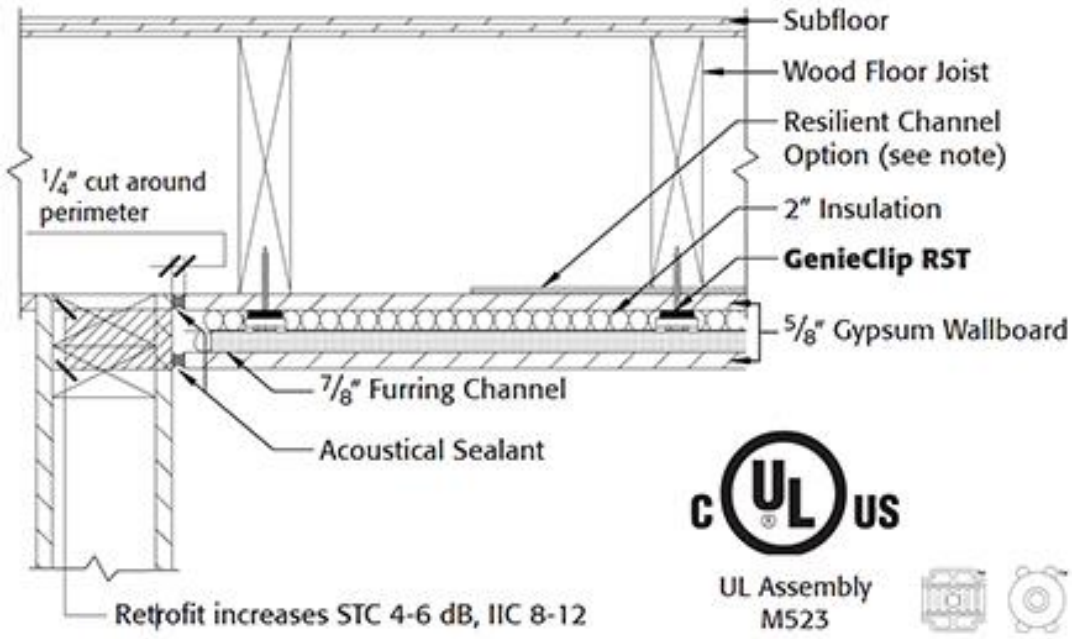
Fasteners

Mass Timber

JURISDICTIONAL RISK

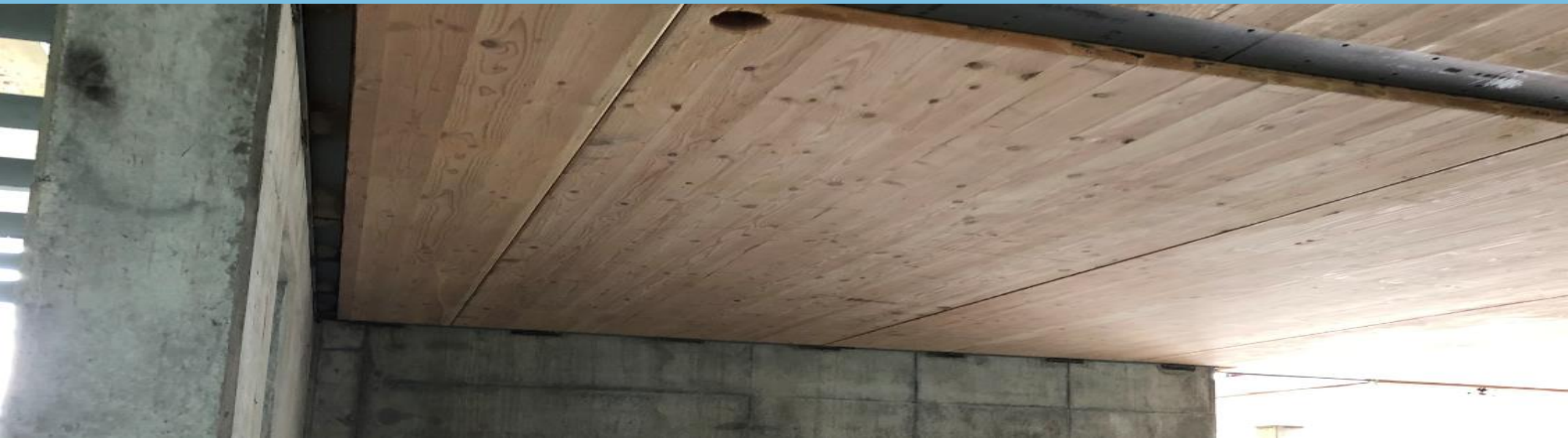
Limited Tested Assemblies

- 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

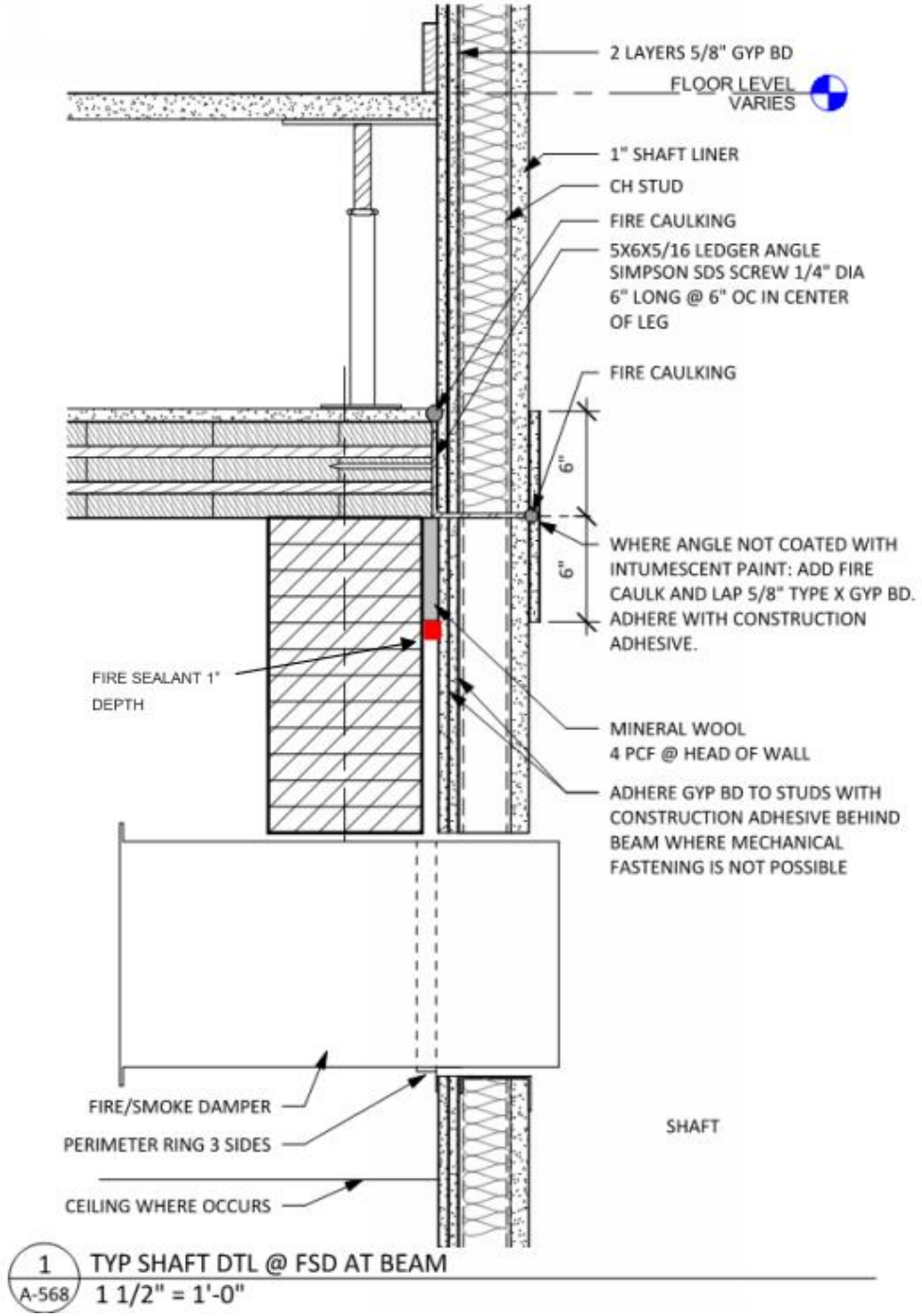


http://pliteq.com/products/genieclip/applications/retrofit.php

Limited Tested Assemblies



Building Permit ≠ Inspectable Condition



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!

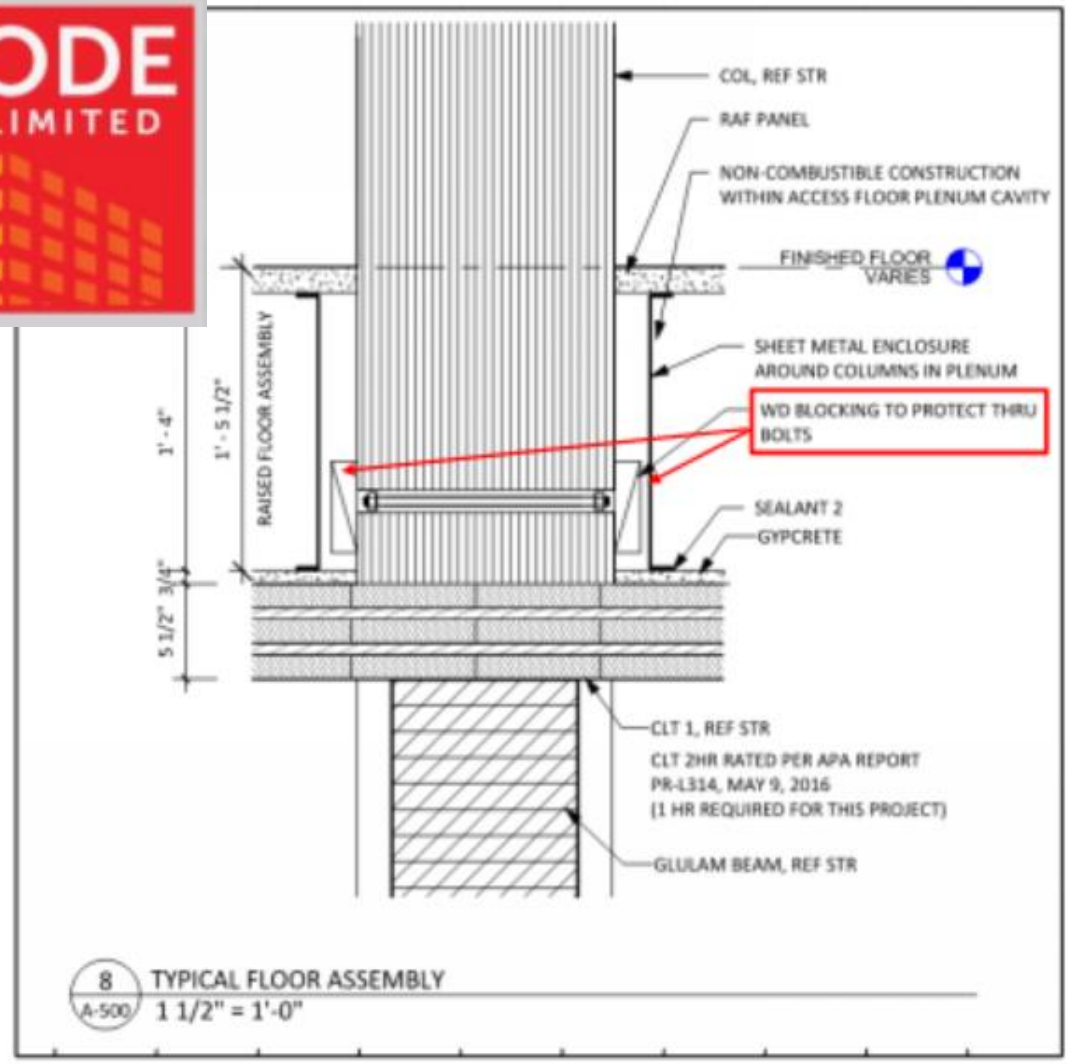
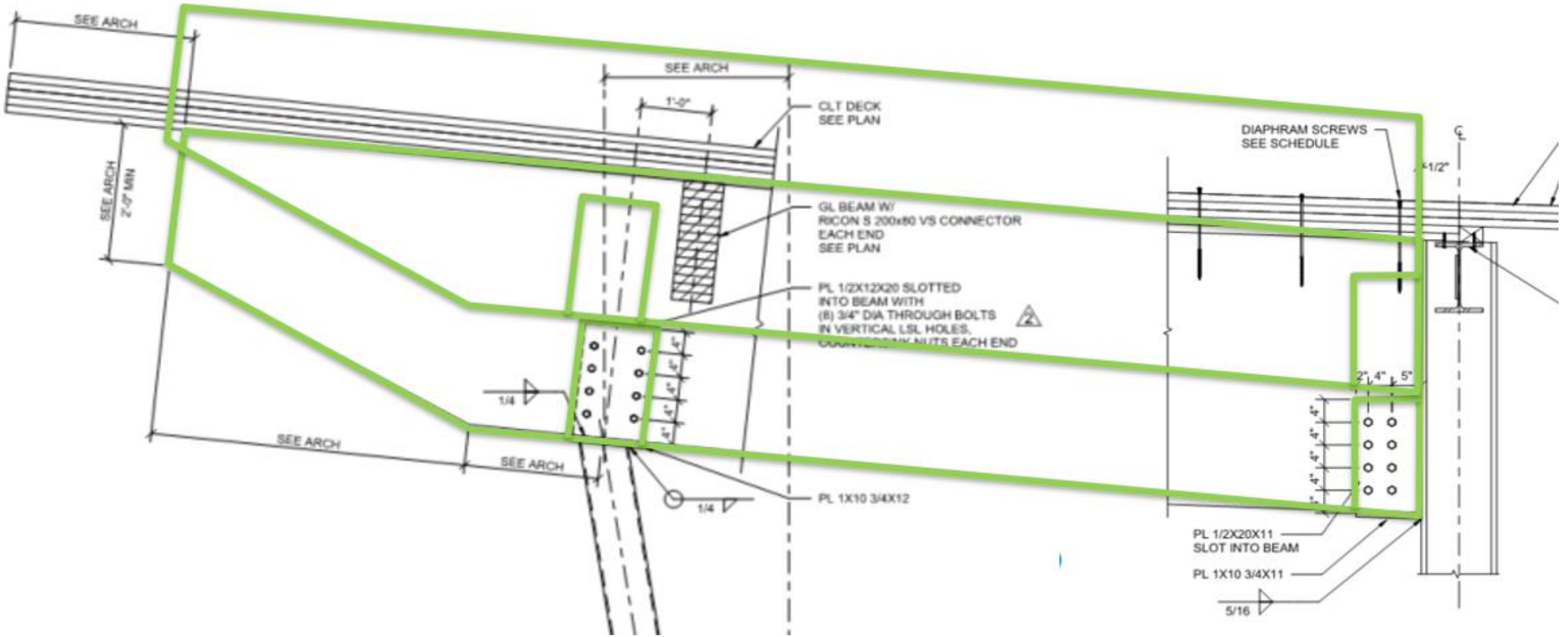


Figure 2: Proposed protection of steel bolts in 1hr rated (Concealed) column assembly

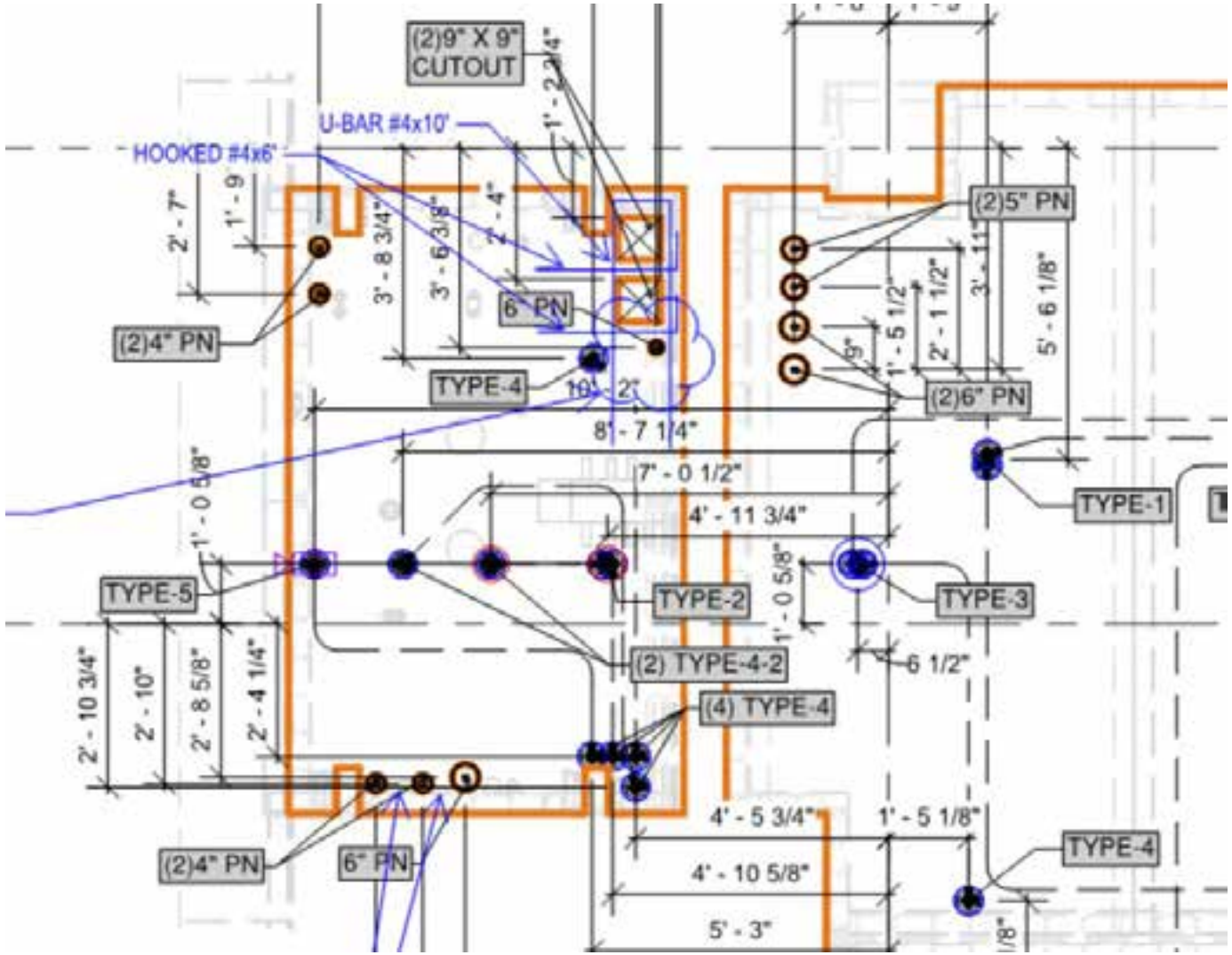
SCHEDULE RISK

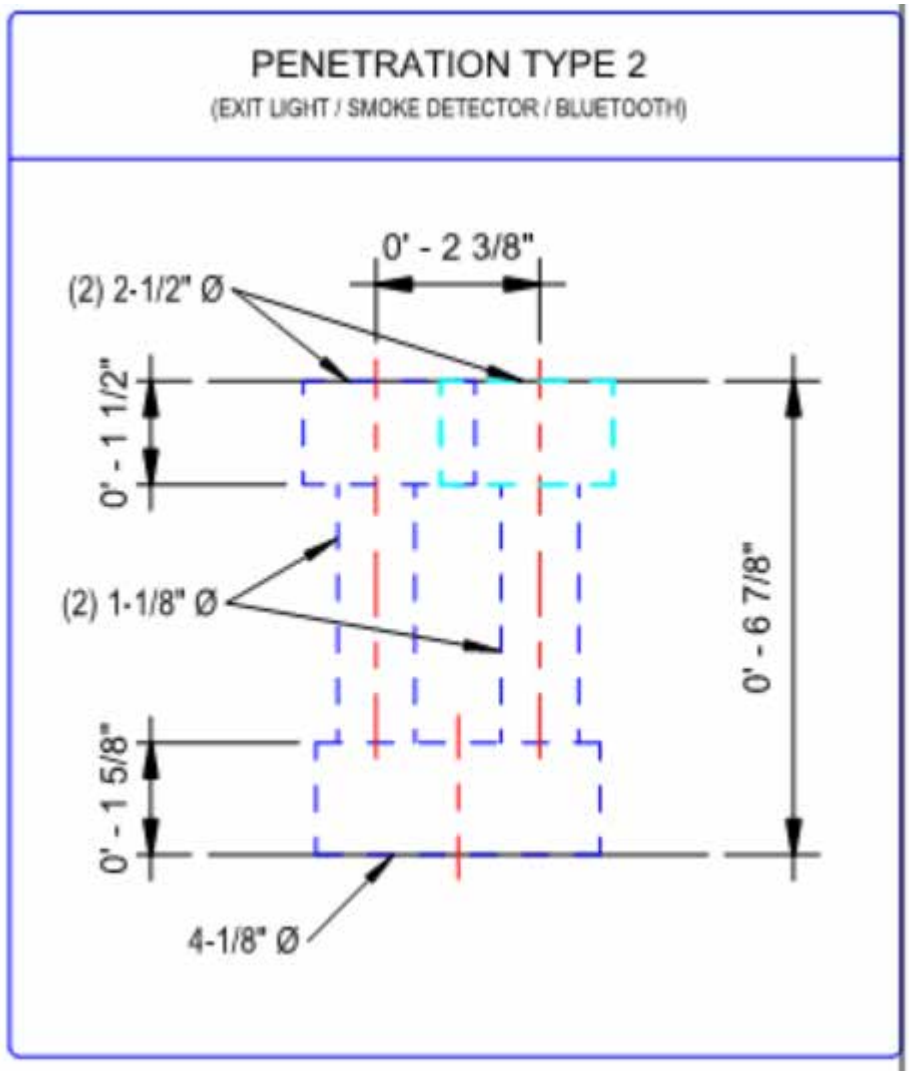
Connection Design

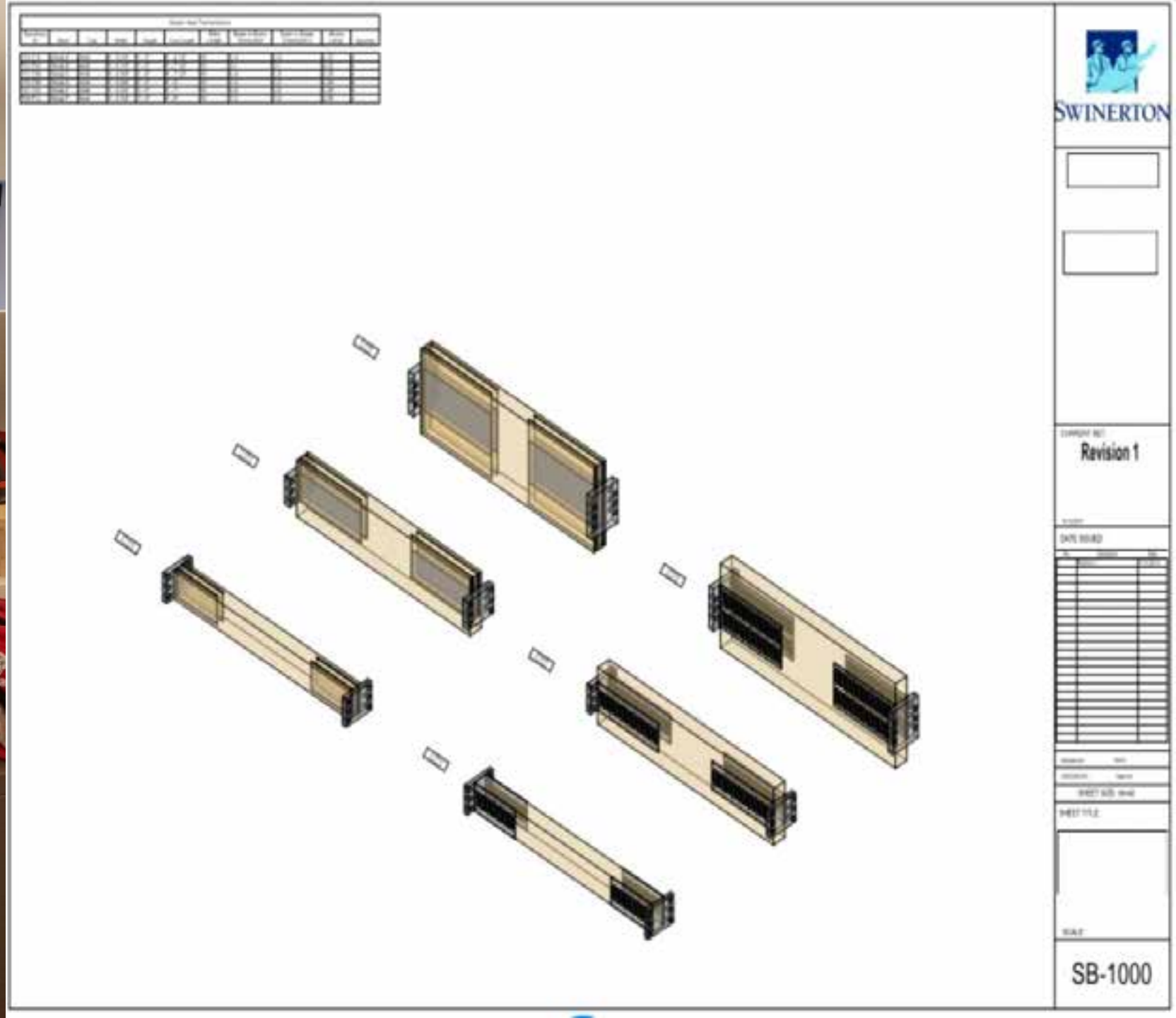


Connection Design

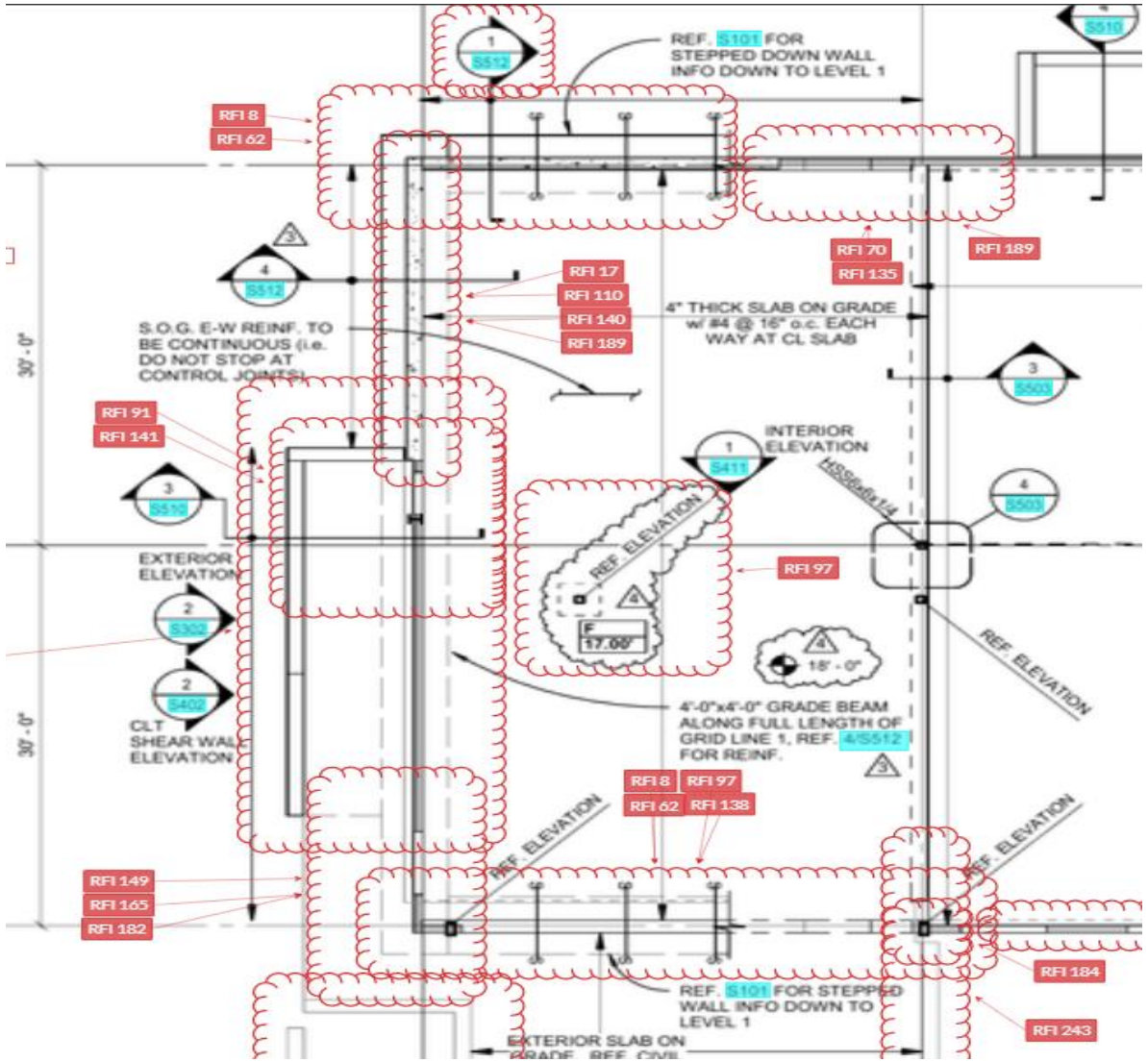
Shop Drawing Process

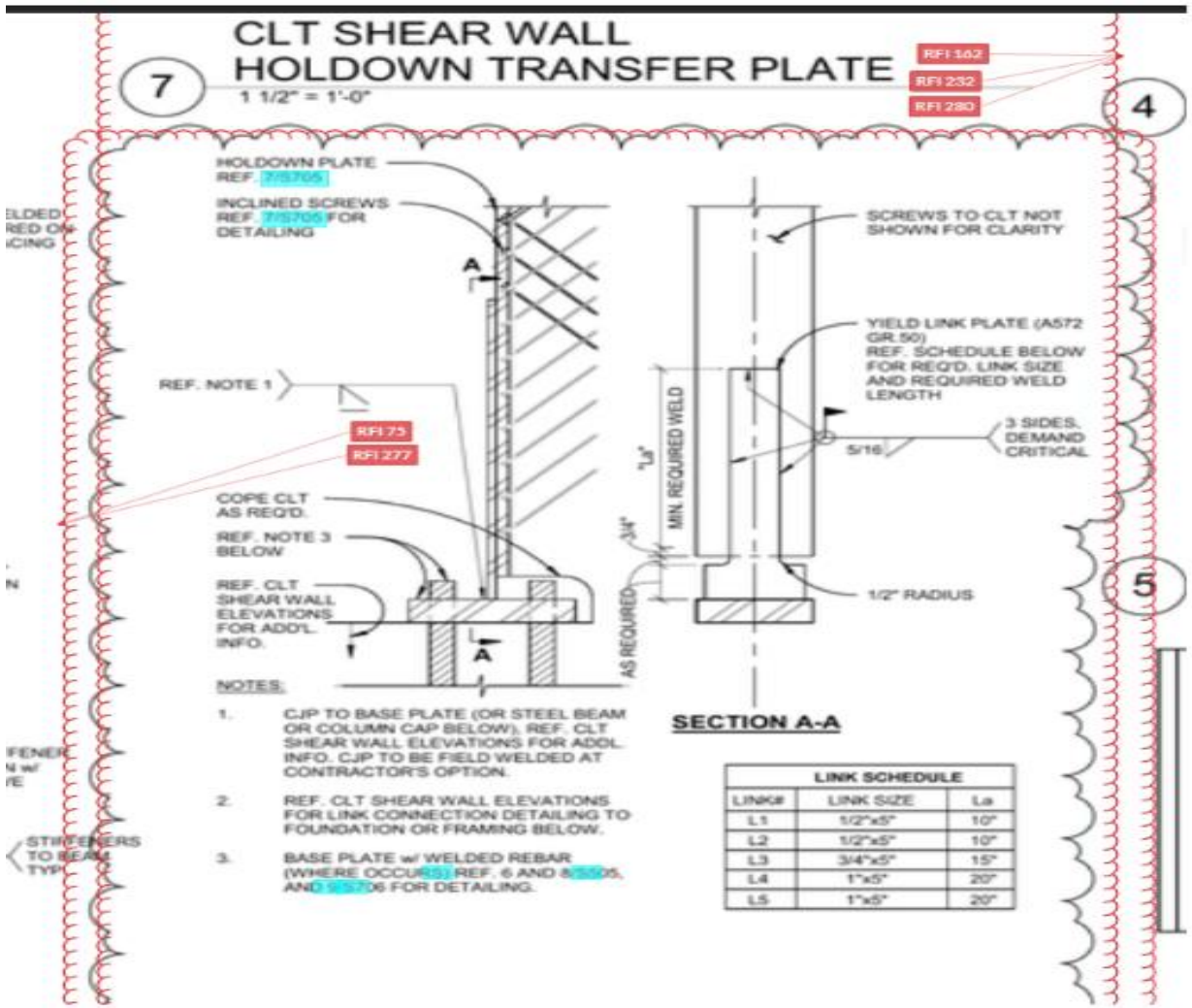





SWINERTON
Revision 1
SB-1000

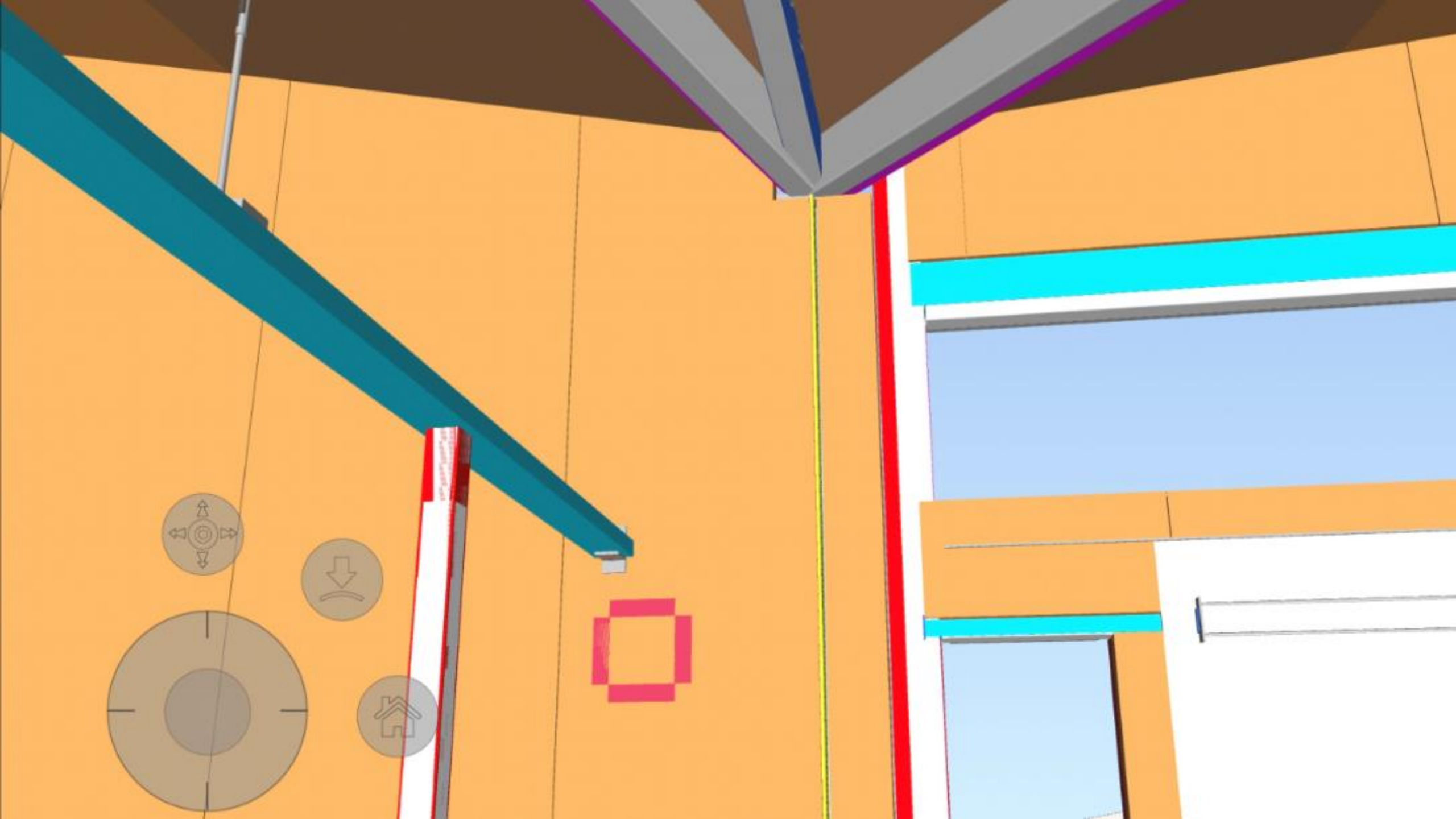
RFI Process


REF. S101 FOR STEPPED DOWN WALL INFO DOWN TO LEVEL 1
RFI 8
RFI 62
RFI 70
RFI 135
RFI 189
RFI 17
RFI 110
RFI 140
RFI 189
4" THICK SLAB ON GRADE w/ #4 @ 16" o.c. EACH WAY AT CL SLAB
S.O.G. E-W REINF. TO BE CONTINUOUS (i.e. DO NOT STOP AT CONTROL JOINTS)
INTERIOR ELEVATION
RFI 91
RFI 141
EXTERIOR ELEVATION
CLT SHEAR WALL ELEVATION
REF. ELEVATION
RFI 97
4'-0"x4'-0" GRADE BEAM ALONG FULL LENGTH OF GRID LINE 1, REF. 4/S512 FOR REINF.
RFI 8
RFI 97
RFI 62
RFI 138
RFI 149
RFI 165
RFI 182
RFI 184
RFI 243
REF. S101 FOR STEPPED WALL INFO DOWN TO LEVEL 1
EXTERIOR SLAB ON GRADE, REF. CIVIL
30' - 0"
30' - 0"

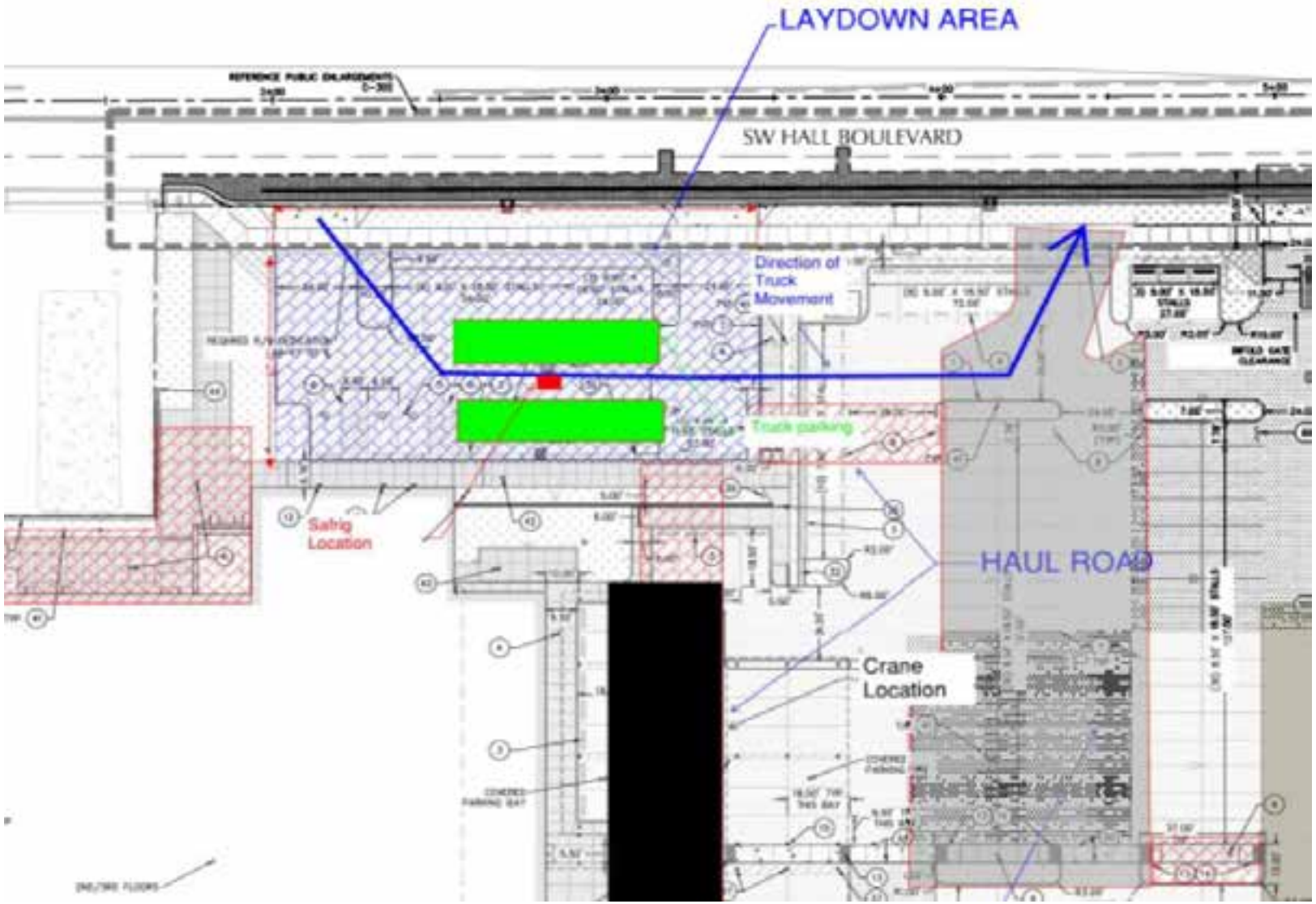

CLT SHEAR WALL HOLDOWN TRANSFER PLATE
7
1 1/2" = 1'-0"
RFI 162
RFI 232
RFI 280
HOLDOWN PLATE REF. 7/S705
INCLINED SCREWS REF. 7/S705 FOR DETAILING
REF. NOTE 1
RFI 75
RFI 277
COPE CLT AS REQ'D.
REF. NOTE 3 BELOW
REF. CLT SHEAR WALL ELEVATIONS FOR ADD'L INFO.
NOTES:
1. CJP TO BASE PLATE (OR STEEL BEAM OR COLUMN CAP BELOW). REF. CLT SHEAR WALL ELEVATIONS FOR ADDL INFO. CJP TO BE FIELD WELDED AT CONTRACTOR'S OPTION.
2. REF. CLT SHEAR WALL ELEVATIONS FOR LINK CONNECTION DETAILING TO FOUNDATION OR FRAMING BELOW.
3. BASE PLATE w/ WELDED REBAR (WHERE OCCURS) REF. 6 AND 8/S505, AND 9/S706 FOR DETAILING.
SCREWS TO CLT NOT SHOWN FOR CLARITY
YIELD LINK PLATE (A572 GR 50) REF. SCHEDULE BELOW FOR REQ'D. LINK SIZE AND REQUIRED WELD LENGTH
3 SIDES, DEMAND CRITICAL
5/16
1/2" RADIUS
MIN. REQUIRED WELD
"La"
AS REQUIRED
SECTION A-A
LINK SCHEDULE
LINK# | LINK SIZE | La
L1 | 1/2"x5" | 10"
L2 | 1/2"x5" | 10"
L3 | 3/4"x5" | 15"
L4 | 1"x5" | 20"
L5 | 1"x5" | 20"
4
5

Trade Sequencing

(1)Steel hold down plate was attached to the CLT wall,
(2)CLT wall was set
(3)Hold down transfer plate was welded to Connection Link
(4)Tube steel column set
(5)CLT panel infill
(6)Steel beam set on CLT wall
(7)Remaining CLT walls set on top of HSS tube steel.



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
- CLT Bearing members: glulam or steel?
  - Manufacturing Tolerances
  - Notching around columns

Supplier Capacity | Production Availability

- Best Practice is Working Backward From Construction to Find a “Manufacturing Window”
  - Delivery Duration
  - Manufacturing Duration
  - Manufacturing Window
  - LOD 450/CNC Coding
  - A/E Review
  - VE process
  - MEP Coordination
  - Steel/Concrete Detailing
  - Structural Design
  - DD 100 Drawings

Delivery Timeline

Considerations:

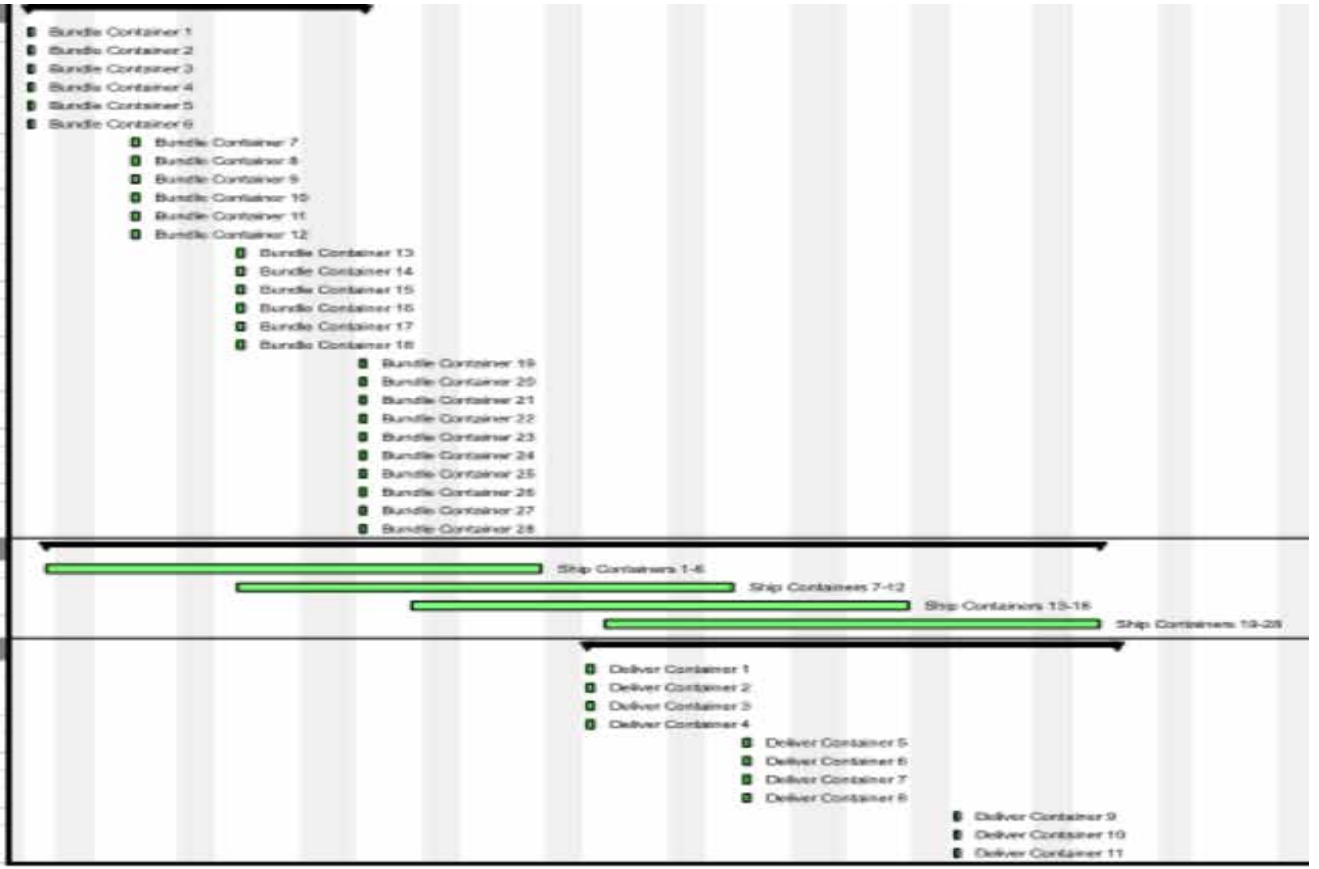
- North American Delivery
  - 2-3 Work day duration
- European Delivery
  - 27-31 Calendar day delivery
- Ultimately both delivery options arrive onsite via truck
- Plan for off-Site staging/storage up to 1 month
- Evaluate storage space for trucks on-site to decrease delivery risk and cost savings

North American Procurement

Delivery Yard		07-Jun-19	10-Jul-19	27	27
CLT Delivery To Yard Load 1	Yard Deliv1010	07-Jun-19*	10-Jun-19	2	2
CLT Delivery To Yard Load 2	Yard Deliv1020	10-Jun-19	11-Jun-19	2	2
CLT Delivery To Yard Load 3	Yard Deliv1030	11-Jun-19	12-Jun-19	2	2
CLT Delivery To Yard Load 4	Yard Deliv1040	12-Jun-19	13-Jun-19	2	2
CLT Delivery To Yard Load 5	Yard Deliv1050	13-Jun-19	14-Jun-19	2	2
CLT Delivery To Yard Load 6	Yard Deliv1060	13-Jun-19	14-Jun-19	2	2
CLT Delivery To Yard Load 7	Yard Deliv1070	14-Jun-19	17-Jun-19	2	2
CLT Delivery To Yard Load 8	Yard Deliv1080	17-Jun-19	18-Jun-19	2	2
CLT Delivery To Yard Load 9	Yard Deliv1090	18-Jun-19	19-Jun-19	2	2
CLT Delivery To Yard Load 10	Yard Deliv1100	18-Jun-19	19-Jun-19	2	2
CLT Delivery To Yard Load 11	Yard Deliv1110	19-Jun-19	20-Jun-19	2	2
CLT Delivery To Yard Load 12	Yard Deliv1120	20-Jun-19	21-Jun-19	2	2
CLT Delivery To Yard Load 13	Yard Deliv1130	21-Jun-19	24-Jun-19	2	2
CLT Delivery To Yard Load 14	Yard Deliv1140	24-Jun-19	25-Jun-19	2	2
CLT Delivery To Yard Load 15	Yard Deliv1150	25-Jun-19	26-Jun-19	2	2
CLT Delivery To Yard Load 16	Yard Deliv1160	26-Jun-19	27-Jun-19	2	2
CLT Delivery To Yard Load 17	Yard Deliv1170	27-Jun-19	28-Jun-19	2	2
CLT Delivery To Yard Load 18	Yard Deliv1180	28-Jun-19	01-Jul-19	2	2
CLT Delivery To Yard Load 19	Yard Deliv1190	01-Jul-19	02-Jul-19	2	2
CLT Delivery To Yard Load 20	Yard Deliv1200	02-Jul-19	03-Jul-19	2	2
CLT Delivery To Yard Load 21	Yard Deliv1210	03-Jul-19	05-Jul-19	2	2
CLT Delivery To Yard Load 22	Yard Deliv1220	05-Jul-19	08-Jul-19	2	2
CLT Delivery To Yard Load 23	Yard Deliv1230	08-Jul-19	09-Jul-19	2	2
CLT Delivery To Yard Load 24	Yard Deliv1240	09-Jul-19	10-Jul-19	2	2
CLT Delivery To Yard Load 25	Yard Deliv1250	10-Jul-19	11-Jul-19	2	2
CLT Delivery To Yard Load 26	Yard Deliv1260	11-Jul-19	12-Jul-19	2	2
CLT Delivery To Yard Load 27	Yard Deliv1270	12-Jul-19	15-Jul-19	2	2
CLT Delivery To Yard Load 28	Yard Deliv1280	15-Jul-19	16-Jul-19	2	2

European Procurement

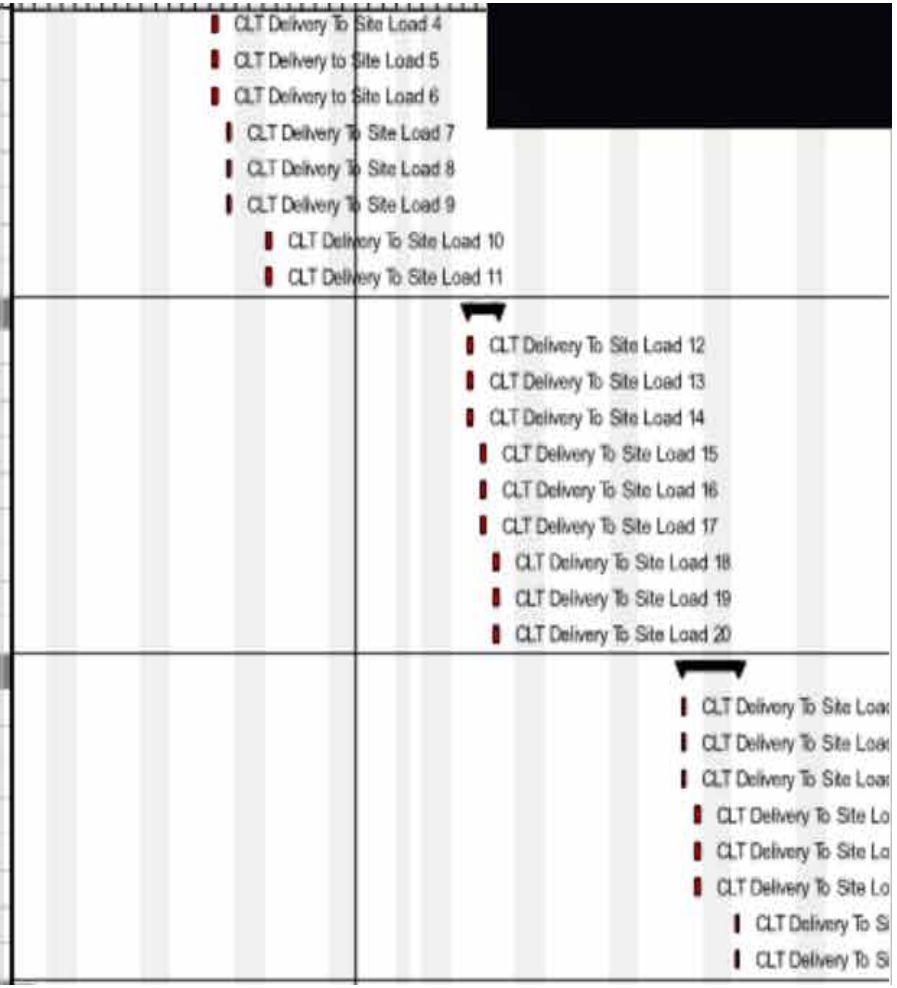
Bundle					
Bundle Container 1	Deliv 1000	02-Jan-20	02-Jan-20	1d	1d
Bundle Container 2	Deliv 1010	02-Jan-20	02-Jan-20	1d	1d
Bundle Container 3	Deliv 1020	02-Jan-20	02-Jan-20	1d	1d
Bundle Container 4	Deliv 1030	02-Jan-20	02-Jan-20	1d	1d
Bundle Container 5	Deliv 1040	02-Jan-20	02-Jan-20	1d	1d
Bundle Container 6	Deliv 1050	02-Jan-20	02-Jan-20	1d	1d
Bundle Container 7	Deliv 1060	06-Jan-20	06-Jan-20	1d	1d
Bundle Container 8	Deliv 1070	06-Jan-20	06-Jan-20	1d	1d
Bundle Container 9	Deliv 1080	06-Jan-20	06-Jan-20	1d	1d
Bundle Container 10	Deliv 1090	06-Jan-20	06-Jan-20	1d	1d
Bundle Container 11	Deliv 1100	06-Jan-20	06-Jan-20	1d	1d
Bundle Container 12	Deliv 1110	06-Jan-20	06-Jan-20	1d	1d
Bundle Container 13	Deliv 1120	14-Jan-20	14-Jan-20	1d	1d
Bundle Container 14	Deliv 1130	14-Jan-20	14-Jan-20	1d	1d
Bundle Container 15	Deliv 1140	14-Jan-20	14-Jan-20	1d	1d
Bundle Container 16	Deliv 1150	14-Jan-20	14-Jan-20	1d	1d
Bundle Container 17	Deliv 1360	14-Jan-20	14-Jan-20	1d	1d
Bundle Container 18	Deliv 1370	14-Jan-20	14-Jan-20	1d	1d
Bundle Container 19	Deliv 1380	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 20	Deliv 1390	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 21	Deliv 1400	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 22	Deliv 1410	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 23	Deliv 1420	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 24	Deliv 1430	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 25	Deliv 1440	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 26	Deliv 1450	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 27	Deliv 1460	21-Jan-20	21-Jan-20	1d	1d
Bundle Container 28	Deliv 1470	21-Jan-20	21-Jan-20	1d	1d
Shipment		03-Jan-20	03-Mar-20	41d	41d
Ship Containers 1-6	Deliv 1160	03-Jan-20	31-Jan-20	20d	20d
Ship Containers 7-12	Deliv 1170	14-Jan-20	11-Feb-20	20d	20d
Ship Containers 13-18	Deliv 1180	24-Jan-20	21-Feb-20	20d	20d
Ship Containers 19-28	Deliv 1190	04-Feb-20	03-Mar-20	20d	20d
Delivery		03-Feb-20	04-Mar-20	22d	22d
Deliver Container 1	Deliv 1200	03-Feb-20	03-Feb-20	1d	1d
Deliver Container 2	Deliv 1210	03-Feb-20	03-Feb-20	1d	1d
Deliver Container 3	Deliv 1220	03-Feb-20	03-Feb-20	1d	1d
Deliver Container 4	Deliv 1230	03-Feb-20	03-Feb-20	1d	1d
Deliver Container 5	Deliv 1240	12-Feb-20	12-Feb-20	1d	1d
Deliver Container 6	Deliv 1250	12-Feb-20	12-Feb-20	1d	1d
Deliver Container 7	Deliv 1260	12-Feb-20	12-Feb-20	1d	1d
Deliver Container 8	Deliv 1270	12-Feb-20	12-Feb-20	1d	1d
Deliver Container 9	Deliv 1280	24-Feb-20	24-Feb-20	1d	1d
Deliver Container 10	Deliv 1290	24-Feb-20	24-Feb-20	1d	1d
Deliver Container 11	Deliv 1300	24-Feb-20	24-Feb-20	1d	1d



From	To	Vessel	Voy No.	ETD	ETA
NTB North Sea Terminal Bremerhaven	Port Newark Container Terminal F577	ORCA I	931W	2019-08-01	2019-08-12
Port Newark Container Terminal F577	Chicago CSX Bedford Park			2019-08-14	2019-08-17
Chicago CSX Bedford Park	Chicago BNSF Cicero Intermodal			2019-08-17	2019-08-18
Chicago BNSF Cicero Intermodal	Portland-Bn Rr			2019-08-18	2019-08-24

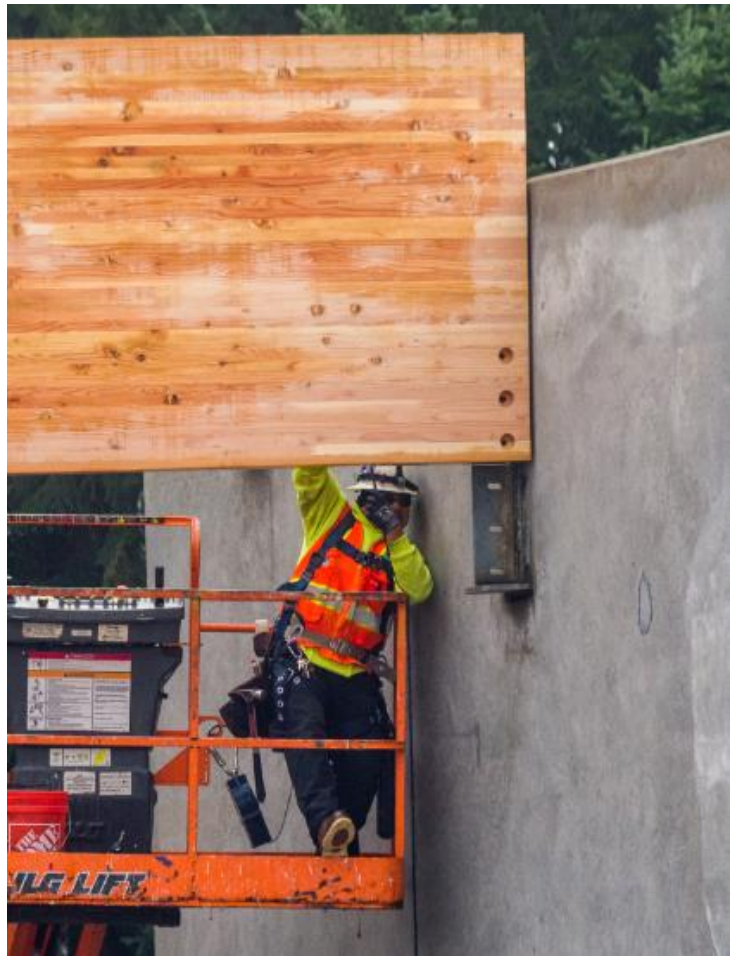
Delivery to Site

CLT Delivery To Site Load 4	Site Deliv 1040	20-Jun-19	20-Jun-19	1	1
CLT Delivery to Site Load 5	Site Deliv 1050	20-Jun-19	20-Jun-19	1	1
CLT Delivery to Site Load 6	Site Deliv 1060	20-Jun-19	20-Jun-19	1	1
CLT Delivery To Site Load 7	Site Deliv 1070	21-Jun-19	21-Jun-19	1	1
CLT Delivery To Site Load 8	Site Deliv 1080	21-Jun-19	21-Jun-19	1	1
CLT Delivery To Site Load 9	Site Deliv 1090	21-Jun-19	21-Jun-19	1	1
CLT Delivery To Site Load 10	Site Deliv 1100	24-Jun-19	24-Jun-19	1	1
CLT Delivery To Site Load 11	Site Deliv 1110	24-Jun-19	24-Jun-19	1	1
Level 3		09-Jul-19	11-Jul-19	3	3
CLT Delivery To Site Load 12	Site Deliv 1120	09-Jul-19	09-Jul-19	1	1
CLT Delivery To Site Load 13	Site Deliv 1130	09-Jul-19	09-Jul-19	1	1
CLT Delivery To Site Load 14	Site Deliv 1140	09-Jul-19	09-Jul-19	1	1
CLT Delivery To Site Load 15	Site Deliv 1150	10-Jul-19	10-Jul-19	1	1
CLT Delivery To Site Load 16	Site Deliv 1160	10-Jul-19	10-Jul-19	1	1
CLT Delivery To Site Load 17	Site Deliv 1170	10-Jul-19	10-Jul-19	1	1
CLT Delivery To Site Load 18	Site Deliv 1180	11-Jul-19	11-Jul-19	1	1
CLT Delivery To Site Load 19	Site Deliv 1190	11-Jul-19	11-Jul-19	1	1
CLT Delivery To Site Load 20	Site Deliv 1200	11-Jul-19	11-Jul-19	1	1
Roof		25-Jul-19	29-Jul-19	3	3
CLT Delivery To Site Load 21	Site Deliv 1210	25-Jul-19	25-Jul-19	1	1
CLT Delivery To Site Load 22	Site Deliv 1220	25-Jul-19	25-Jul-19	1	1
CLT Delivery To Site Load 23	Site Deliv 1230	25-Jul-19	25-Jul-19	1	1
CLT Delivery To Site Load 24	Site Deliv 1240	26-Jul-19	26-Jul-19	1	1
CLT Delivery To Site Load 25	Site Deliv 1250	26-Jul-19	26-Jul-19	1	1
CLT Delivery To Site Load 26	Site Deliv 1260	26-Jul-19	26-Jul-19	1	1
CLT Delivery To Site Load 27	Site Deliv 1270	29-Jul-19	29-Jul-19	1	1
CLT Delivery To Site Load 28	Site Deliv 1280	29-Jul-19	29-Jul-19	1	1



PRODUCT QUALITY

Manufacturing Tolerances



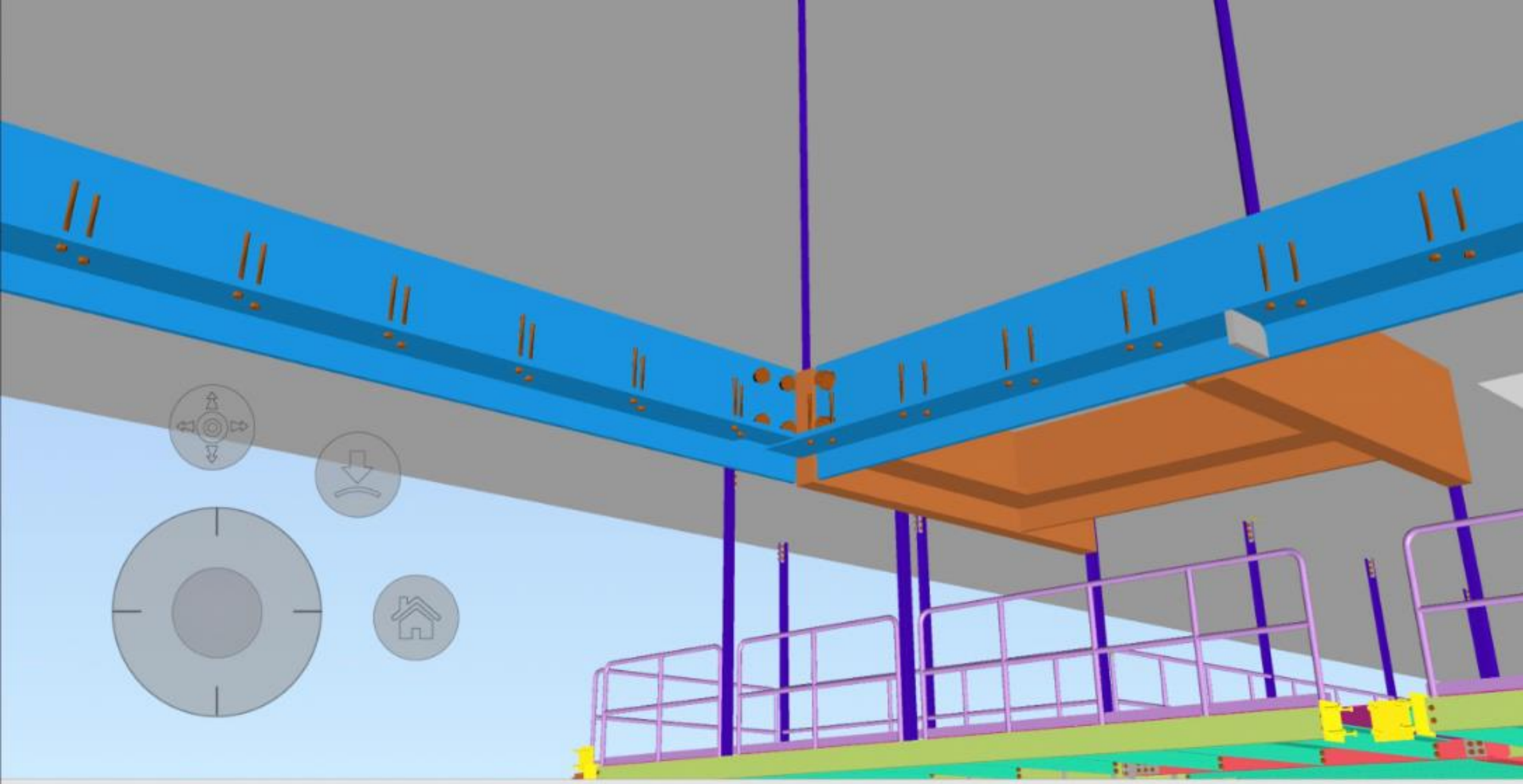
Concrete +/- 3/4”

Timber <=1/16”

Steel +/- ½”

Inefficient Detailing

Field cuts like this cause inefficient productivity most of this is from uncoordinated or lack of Steel and Concrete Modeling



Risk Category	Mitigation Phase					
	Project Start	Design	Permitting	Procurement	Planning	Construction
Financial						
Delivery Method	X					
Tariffs and Trade Wars				X		
Commodity Price Fluctuation				X		
Unknown Product Type		X				
Inefficient Design		X				
Jurisdictional						
Varying levels of acceptance		X	X			
Limited tested assemblies		X	X			
Engineering judgements required		X	X			
AMMRs & Performance-Based Design		X	X			
Schedule						
Production Availability				X		
Building Permit		X	X			
Delivery Timeline				X	X	
On-site productivity					X	
Inefficient Details		X				
Lack of assembly know-how				X		
Quality						
Manufacturing Tolerances		X				
Improper Detailing		X				
Water damage					X	X
Rust staining					X	X

Risk Category	Mitigation Phase					
	Project Start	Design	Permitting	Procurement	Planning	Construction
Financial						
Delivery Method				$		
Tariffs and Trade Wars					$	
Commodity Price Fluctuation					$	
Unknown Product Type			$			
Inefficient Design			$			
Jurisdictional						
Varying levels of acceptance			$	$		
Limited tested assemblies			$	$		
Engineering judgements required			$	$		
AMMRs & Performance-Based Design			$	$		
Schedule						
Production Availability					$	
Building Permit			$	$		
Delivery Timeline					$	$
On-site productivity						$
Inefficient Details			$			
Lack of assembly know-how					$	
Quality						
Manufacturing Tolerances			$			
Improper Detailing			$			
Water damage					$	$
Rust staining					$	$

QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

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