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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Mass timber is an innovative building material with many benefits, including construction speed, aesthetics, sustainability, and strength-to-weight ratio. The beauty of the finished product has inspired many owners and designers to pursue mass timber for their projects. However, while design and code aspects receive a great deal of focus, it is the construction aspects that often decide whether a project goes forward. While mass timber draws installation techniques from other construction types, it also has unique attributes—and a complete understanding of the differences is key to efficient estimating, planning and construction. This workshop is designed to address critical gaps in knowledge and skills among contractors and installers, with topics such as cost considerations, site planning, schedule, and risk mitigation. It will also include three brief case studies highlighting design team interaction, challenges, benefits and lessons learned during construction. Intended for construction industry professionals looking to gain a deep understanding of the unique attributes of mass timber, this workshop will leave attendees with information they need to successfully bid and construct a mass timber project.

- 1. Understand the unique attributes and considerations of mass timber construction.
- 2. Determine how to manage mass timber building sites and mitigate potential risks to personnel, material and ultimately, schedule.
- 3. Discuss project workflows to identify potential construction schedule savings and maintaining thorough construction safety practices.
- 4. Explore best practices for coordination with the mass timber manufacturer, planning and scheduling for cost efficiency, and safety on site.

# C.D. SMITH CONSTRUCTION

- » History
- » Capacity
- » Construction Management
- » Hard Bid
- » Self-Perform Capabilities

# THE BEGINNING

**FEBRUARY 2019:** C.D. Smith bid on concrete package to Catalyst Construction (Foundations, PT Parking Decks, 7<sup>th</sup> Floor Transfer Deck, (2) Concrete Shear Walls to Top)

**SEPTEMBER 27, 2019:** Catalyst and New Land bring C.D. Smith on board under a preconstruction agreement. C.D. Smith provides CM services for the core and shell trades including mass timber and MEPs (77% of the contract value).

**AUGUST 21, 2020:** Construction Agreement executed with New Land Enterprises.

# C.D. SMITH SELF-PERFORM TRADES ON ASCENT

- » General Conditions + Safety
- » Virtual Design + Construction (VDC)
- » Project Requirements Labor
- » Hoisting + Equipment Operation
- » Concrete Forming/Placement, including rebar and PT placement
- » Masonry
- » Structural Steel Erection + Misc. Metals Installation
- » Roof Davit Installation
- » Cable Vehicle Barrier Installation
- » Mass Timber Erection
- » Rough Carpentry
- » Exterior Cold Formed Framing and Sheathing
- » Site Concrete

- » Preconstruction, buyout, planning, logistics development, scheduling and budget
- » Oversight on the project from a higher level, master schedule and budget management
  - Background includes high rises, residential development, corporate, industrial, high institution, labs, plants, healthcare and parking structures.
  - Primary construction method experience prior to mass timber includes cast-in-place concrete, precast, structural steel, cold formed high rise, wood framed (stick and panelized).

# PARTNERSHIP = KEY TO SUCCESSFUL PRECONSTRUCTION

- » New Land Enterprises
- » Catalyst Construction
- » Korb + Associates
- » Thornton Tomasetti
- » Swinerton Mass Timber (Now Timberlab)
- » Site Visits

# LESSONS LEARNED DISCUSSIONS + BID MANUAL

- » Review details from a previous mass timber building "framework"
- » Thorough preconstruction process with Architect, Engineer and Mass Timber partners
  - Develop details with Architect and Engineer as a team to meet code, constructability, tolerance
  - Follow Architect's lead on code-required items and permit applications
  - Detail out lessons learned requirements in Project Manual to get requirements to coordinating contractors





#### **PROJECT MANUAL INDEX**

- 1. GENERAL SCOPE
- 2. SITE LOGISTICS PLAN
- 3. FOUNDATION SEQUENCE AND CONCRETE POUR BREAK PLANS
- 4. SCHEDULE
- 5. SUBMITTAL PROCUREMENT LOG TEMPLATE
- 6. SITE SAFETY PLAN
- 7. QUALITY CONTROL PLAN
- 8. BIM EXECUTION PLAN
- 9. PAY APPLICATION SCHEDULE
- 10. SUBCONTRACT TERMS and CONDITIONS
- 11. CERTIFICATE OF INSURANCE REQUIREMENTS

#### ATTACHMENTS

- PROJECT SPECIFICATIONS DATED 2020.02.21
- ARCHITECTURAL DRAWINGS DATED 2020.02.21
- STRUCTURAL DRAWINGS DATED 2020.02.21

# BID MANUAL BIM EXECUTION

# Develop BIM Execution Plan with LOD requirements for timber fabrication

				LOD = Level of Development	Phase 1 (Permit Set)		Phase 2 (Locked-in Pens			Phase 3 (Fully Coordinated)			
				MEA = Model Element Author	1			and Main Runs)			, , ,		
UniFormat Level Authors - AR= Architect, ST= Structural Engineer,						2.14 1.141.13							
		_		CL= Civil/Landscape Engineers, MEP= Mechanical/Electrical/Plumbing Contractors, CO=	LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes
	2	3	4	Other Contractors									
Α				SUBSTRUCTURE									
Α	10			Foundations									
Α	10	10		Standard Foundations (Wall and Column Foundations)	300	ST		300/350			300/350		
Α	10	20		Special Foundations (Grade Beams, Piles, Caps, Caissons, Underpinning)	300	ST		300	ST/CO		300	ST/CO	
Α	20			Subgrade Enclosures									
Α	20	10		Walls for Subgrade Enclosures	300	ST		300	ST/CO		300	ST/CO	
Α	40			Slabs-on-Grade									
Α	40	10		Standard Slabs-on-Grade	300	ST		300	ST/CO		300	ST/CO	
Α	40	20		Structural Slabs-on-Grade	300	ST		300	ST/CO		300	ST/CO	
Α	40	30		Slab Trenches	300	ST		300	ST/CO		300	ST/CO	
Α	40	40		Pits and Bases	300	ST		300	ST/CO		300	ST/CO	
Α	40	90		Slab-on-Grade Supplementary Components	100	AR/ST		100	AR/ST		100*	AR/ST	*Covered
				(Insulation, Vapor Retarder, Waterproofing, Mud Slab)									by details
Α	60			Water and Gas Mitigation									
Α	60	10		Building Subdrainage (Foundation Drainage, Underslab Drainage)	100	MEP		200	MEP		200	MEP	
В				SHELL									
В	10			Superstructure									
В	10	10		Floor Construction									
В	10	10	.10	Floor Structural Frame									
В	10	10	.10	Concrete	300	ST		300	со		300	со	
В	10	10	.10	Steel Framing Columns	300	ST		300	ST		350/400	со	
В	10	10	.10	Steel Framing Beams	300	ST		300	ST		350/400	со	
В	10	10	.10	Steel Framing Bracing Rods	300	ST		300	ST		350/400	со	
В	10	10	.10	Steel Joists	300	ST		300	ST		350/400	со	
В	10	10	.10	Cold-Formed Metal Framing	200	ST		200	ST		350	со	
В	10	10	.10	Glue Laminated Columns	300	ST		300	ST		450	со	
В	10	10	.10	Glue Laminated Beams	300	ST		300	ST		450	со	
В	10	10	.20	Floor Decks, Slabs, and Toppings									
В	10	10	.20	Wood Floor Deck	300	ST		300	ST		300	ST	
В	10	10	.20	Cross Laminated Timber Panel Deck	300	ST		300	ST		450	со	

PLUMBING SHALL DESIGN TO LOD 350; INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

- · PRIMARY UTILITY LINES INTO BUILDING.
- · WASTE LINES.
- STORM LINES WITH PROPER GRADE.
- · SUPPORTS.
- · VENT.
- CONDENSATE IF APPLICABLE.
- · GREASE TRAPS AND LINES.
- WATER SUPPLY/BRANCH.
- · ANY SUPPORTS THAT INTERACT WITH STRUCTURAL CONCRETE, CLT, STEEL, CRITICAL FRAMING.
- · SLEEVES / PENETRATIONS 3D GEOMETRY BLOCKS REPRESENTING NET/ROUGH OPENING REQUIREMENT FOR RESPECTIVE PIPING.

MASS TIMBER (GLULAM AND CLT PANELS) WILL DETAIL TO LEVEL 450; INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

- · ACCURATE PERIMETER SETBACKS BASED ON INTERACTION WITH EXTERIOR WALLS/CORE.
- · CLT PANEL SEAMS/SPLICE.
- · GLULAM BEAMS.
- BLOCKOUTS/SLEEVES.
- WOOD-TO-WOOD STEEL CONNECTIONS.

#### SECTION G: BIM MODELING SCOPE / ELEMENTS / LEVEL OF DEVELOPMENT (LOD)

#### THE BASIS FOR LOD DETERMINATION AND MPS COMPLETION

The LOD as defined in the BIMForum 2015 Level Of Development Specification For Building Information Models (April 30, 2015)

#### Fundamental LOD Definitions<sup>1</sup>

LOD 100	The Model Element may be graphically represented in the Model with a symbol or other representation, but does not satisfy the requirements for LOD 200. Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.				
LOD 200	The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.				
LOD 300	The Model Element is graphically represented within the Model as a specific system, object				

The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of quantity, size, shape, location, and orientation, Non-graphic

information may also be attached to the Model Element.

LOD 350 The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and interfaces with other building systems. Non-graphic information may also be attached to the Model Element.

LOD 400 The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing,

fabrication, assembly, and installation information. Non-graphic information may also be attached to the Model Element.

LOD 500

The Model Element is a field verified representation in terms of size, shape, location, quantity, and orientation. Non-graphic information may also be attached to the Model

- » Preconstruction only contracts with alternates to complete work
- » October 11, 2019 Bid November 18, 2019 Award
  - Test Pile Program: Full coordination, installation, reporting
  - Mass Timber Supply: Preconstruction only
  - Tower Crane/Hoist/Concrete Placing: Engineering/shop drawings only
  - Project Requirements Engineering
  - Window Wall: Preconstruction/shop drawings only
  - Elevator: Preconstruction/shop drawings only
  - MEPFP Contractors: Preconstruction, full design and VDC only

# KEY PRECONSTRUCTION CONTRACT DELIVERABLES

# BID RELEASE #1 | Issued October 11, 2019 | Awarded November 18, 2019

### **Test Piles**

- » December 3, 2019: Award | February 21, 2020: Final Report
- » Needed for Bid Release #2 Set (Footing and Foundation Set/Permit)

### **Elevator**

- » Shaft sizes to determine concrete shear wall size to establish limits of timber
- » Issued February 21, 2020 in Bid Release #2

### **Timber Coordination**

- » Work through details to get material bid set
- » Issued timber materials bid set February 21, 2020 in Bid Release #2

# KEY PRECONSTRUCTION CONTRACT DELIVERABLES

# BID RELEASE #1 Issued October 11, 2019 | Awarded November 18, 2019

## **Material Hoist**

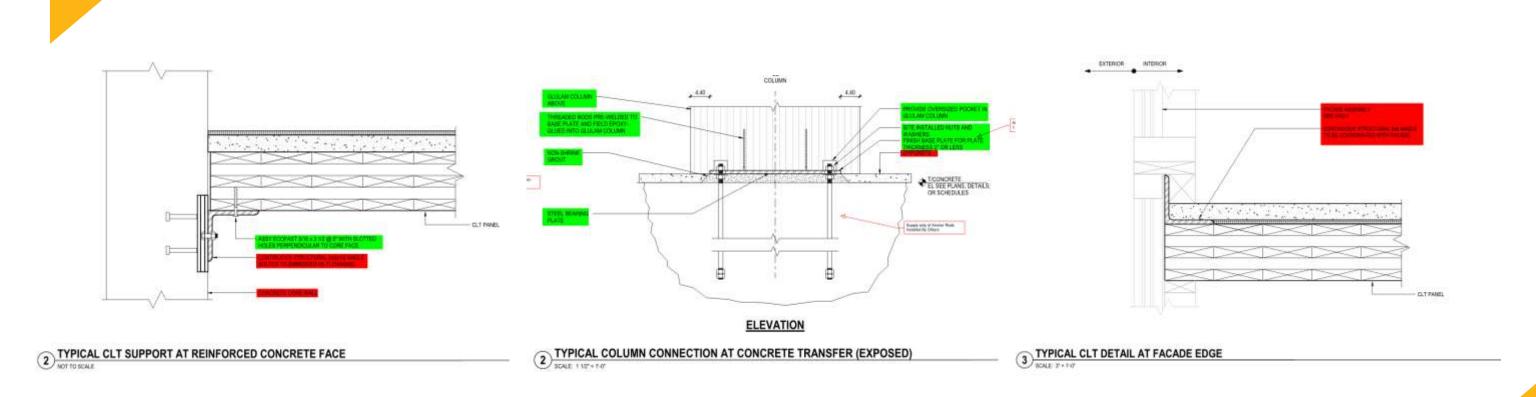
» Loading for specialty connection to timber structure

## **Façade**

- » Connection details, loading and slab edge plan established
- » Issued April 3, 2020 in Bid Release #3

#### **MEPFP**

- » Equipment sizing/location/loading
- » Routing to establish shaft sizes Issued April 3, 2020 in Bid Release #3
- » Routing to establish penetrations 4" and larger Issued April 3, 2020 in Bid Release #3
- » Routing to establish all penetrations less than 4" Issued August 17, 2020 in Bid Release #4



- Determine inclusions/exclusions from drawings and specification requirements with mass timber supplier/fabricator.
- Fill in the blanks on anything missing.

# COORDINATION WORKFLOW

# **EXPECTATIONS**

#### PART 2 - PRODUCTS

#### 2.1 MATERIALS

Lumber: Lumber used shall be uniformly manufactured and shall be Austrian Spruce, Grade Combination as noted in the Structural Drawings, graded in accordance with ANSI-117 or Glulam Design Specification, Form Y117 or European Equivalent (manufacturer to provide reference) with the following additional requirements: Each piece shall be grade marked or certified prior to selection for laminating. When lumber to be used for lamination is resawn, the new size shall meet the grade requirements. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark; place mark on surfaces that are not exposed in the completed work.

GLULAM WILL MEET EN14080

OR OR OTHER ENGINEER

HIRED BY DESIGN TEAM TO

PROVIDE EQUIVALENCE IF

REQUIRED

Appearance Grade: Architectural or Industrial as indicated in drawings, complying with AITC 110. For Architectural appearance grade, fill voids as required by AITC 110.

SUPPLIER CAN MEET ALL REQUIREMENTS BUT 4MM CRACKS/CHECKS WILL BE ALLOWED AND NOT BE FILLED

GLUE WILL MEET EN14080 SPECIFICATIONS Glues: Use exterior type adhesive conforming to ASTM D2559, resin adhesive of phenol, or melamine base applied in accordance with manufacturer's recommendations. Approved adhesives shall be those which have been acceptably certified as performing satisfactorily for mixing, spreading, storage life, pot life, working life and assembly life recommendations.

- Laminating Combinations shall meet lamination requirements as specified in drawings, including cantilevered beam requirements (tension lams top and bottom).
- E. Laminating Combinations for European Spruce shall meet:
  - GL28h. Allowable stresses shall meet at least the following minimum values:

GLULAM WILL MEET EN14080, EOR OR OTHER ENGINEER HIRED BY DESIGN TEAM TO PROVIDE ALLOWABLE STRESSES TO BE USED. Bending  $F_b = 1600 \text{ PSI (11 MPa)}$ Compression Perp. to Grain  $F_c = 215 \text{ PSI (1.5 MPa)}$ Horizontal Shear  $F_V = 176 \text{ PSI (1.2 MPa)}$ Modules of Elasticity E = 1.825,000 PSI (12,600 MPa)

#### SUMMARY OF APPEARANCE GRADE SPECIFICATIONS WIEHAG comment / deviation Description Item Framing Appearance Industrial Architectural Premium Appearance Grade Appearance Grade ppearance Grade Natural growth characteristics of lumber grade Allowed Allowed Allowed Allowed OKAY Paragraph reference 421 521 6.2.1 3.2.1 Filling of voids on edge of laminations Not required Not required Required for voids Required for all over 3/4 in. OKAY 422 522,522.1 Paragraph reference 622 Wide face of laminations exposed to view Loose knots, open Void filling required Free of loose knots. Selected for knot holes permitted except for trusses void filling required pearance, free of pose knots, void ling required, knot Cracks of max 4 mm to be allowed sizes limited 3.2.3 Paragraph reference 423 Edge joints appearing on wide faces of Filling not required Filling not required Filling required for Fiting required for laminations exposed to view voids over 1/16 in. votts over 1/16 in. wide Cracks of max 4 mm to be allowed 6.23 Paragraph reference 4.2.3 523 3.2.3 Surfacing of sides Required "Hit or Required Limited Required Misses quired. Misses Miss", Low amounts of misses not permitted not permitted laminations low laminations and permitted, Limited wane permitted. OKAY amount of wane permitted 5.2.4 Paragraph reference 4.2.4, 4.2.5 324, 3.25 Surfacing of wide face of laminations exposed Not required Not required Required. Misses Required. Misses not permitted nat permitted OKAY Paragraph reference 424 5.2.4 624 Eased edges Not required Not required Required Required Paragraph reference 5.2.5 6.2.5 4 mm edge (measured diagonal)

Determine the species, grade, appearance, sizes, fiber content, sizing and connections to get mass timber material bid set.

# **Early Procurement Schedule**

- » Bid Release #2 Material Bidding and Award **February 21, 2020** Bid Set
- » Notice to Proceed to timber supplier May 26, 2020
- » Down payment to procure materials July 2020 Pay App
- » Shop drawings with cross-laminated timber (CLT)/glulam beam penetrations and slab edge established July 17, 2020 October 2, 2020
- » Shop drawing review and approvals October 2, 2020 November 16, 2020
- » Production drawings **November 17, 2020 February 5, 2021**
- » CLT manufacturing started February 8, 2021
- » Glulam manufacturing started **February 9, 2021**
- » Base plats for column at L7 arrived June 1, 2021
- » Glulam columns L7-L8 started June 2, 2021

## **Build the Master Schedule**

- » Procurement and coordination
- » Coordination sign off schedule to fabrication drawings
- » Fabrication of 12 weeks
- » Shipping time 7 weeks (Pre COVID / Suez Canal Impacts)

# Complete a Coordination Sign Off Schedule by Phases/ Releases Working Up the Building

- » **Phase 1:** Levels 7-10
- » **Phase 2A:** Levels 10-18
- » **Phase 2B:** Levels 18-23
- » Phase 3: Levels 23 Roof (26)

# **Procure a Mockup and Erect It**

# **Ensure Permitting Is On Track for Work to Start**

- » Glulam Fire Testing: Complete **December 17, 2020**
- » CLT Fire Testing: Built March 2, 2020 March 6, 2020. Complete March 11, 2020. CLT testing submittal March 24, 2020.
- » Building structure variance approvals: Submitted February 13, 2020 Obtained July 22, 2020
- » Footing and Foundation Permit: Submitted **February 21, 2020** Obtained **July 27, 2020**
- » Full Building Permit: Submitted **August 17, 2020** Obtained **October 30, 2020**

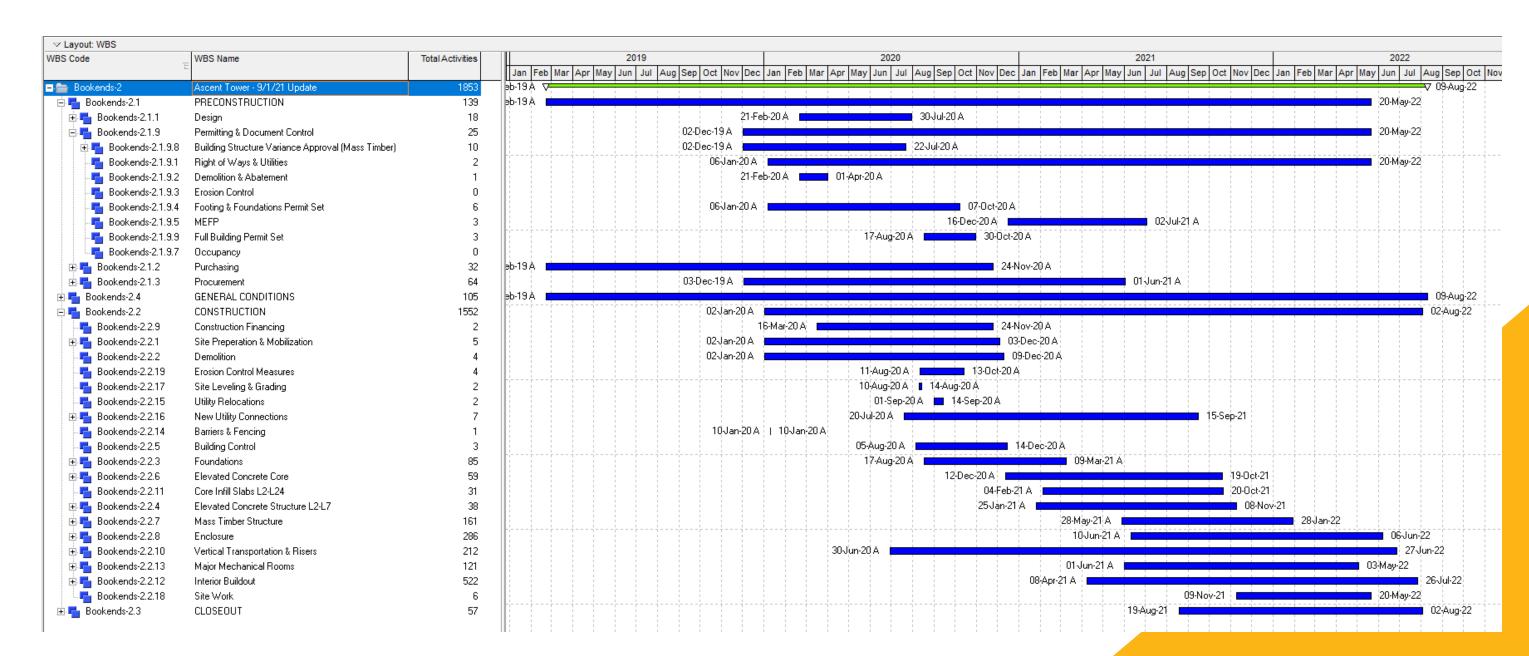
# Date ready onsite (concrete complete with anchor bolts)

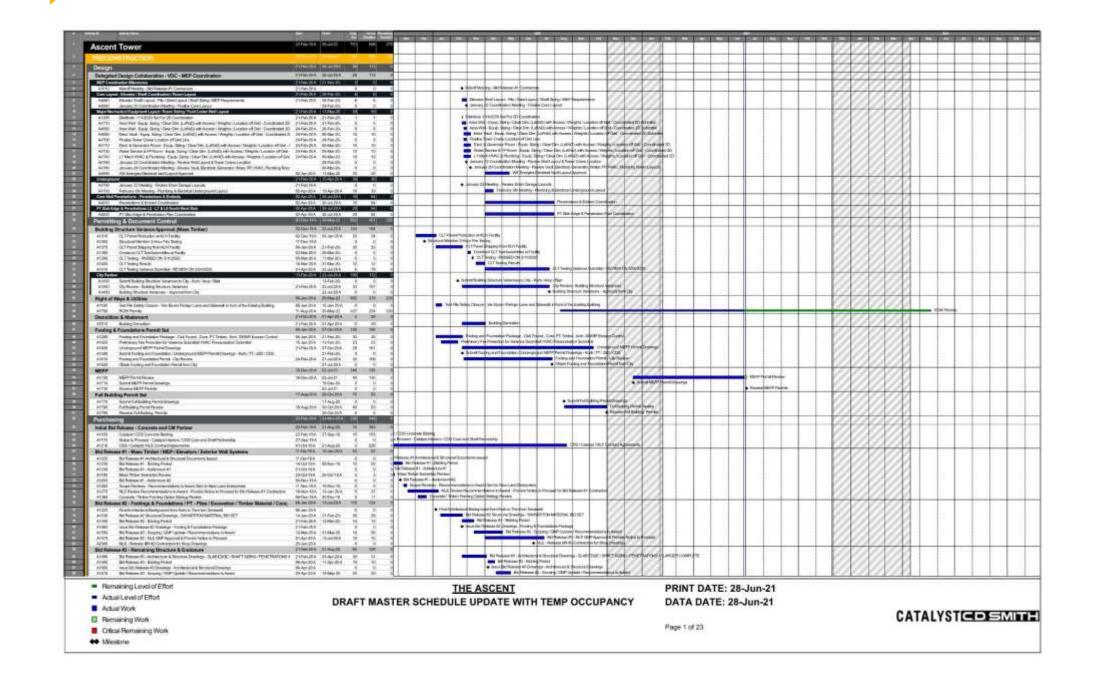
= Date timber will be arriving.

## **Concurrent Work On Site**

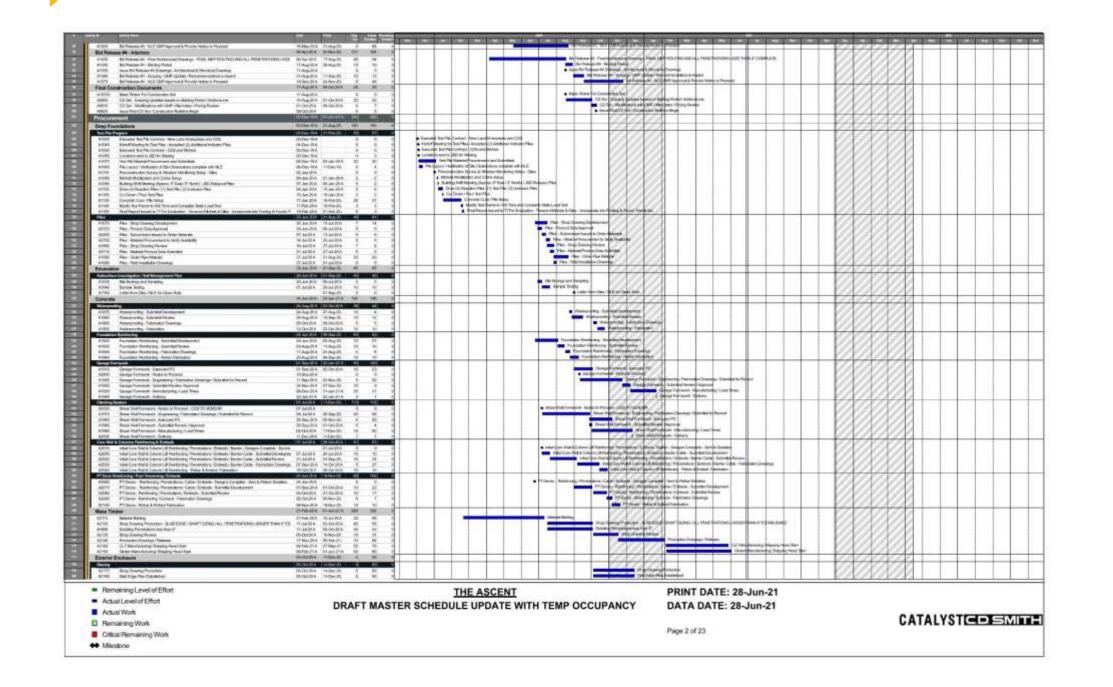
- » NTP to procure pip pile material: **July 2020**
- » Executed prime contract: August 24, 2020
- » Pile driving started: **September 1, 2020**
- » Concrete shear walls ahead of decks
- » Executed fGMP amendment: **November 20, 2020**
- » Concrete SOG/elevated parking structure/L7 transfer slab: Complete May 20, 2021
- » L9 transfer slab above pool at Southwest corner: Complete June 19, 2021
- » Concrete shear walls complete **September 17, 2021** North, **October 1, 2021** South
- » Currently installing L19 CLT with anticipated erection completion in December

## Develop the Work Breakdown Structure » Input Activities » Coordinate and Link





# Preconstruction Schedule



# Preconstruction Schedule

# **COORDINATION WORKFLOW**

# PLAN + ESTIMATE ERECTION

- » Equipment
- » Management
- » Mockup Erection
- » Safety
- » Protection
- » Snow/Water Removal
- » Ladders/Stairs/Access
- » Cleanup
- » Firestopping
- » Get Baseplates Early
- » Baseplate Grouting
- » Connection Review
- » Piece Counts of Glulam Columns and Beams
- » Piece Counts of CLT Panels

- » CLT Connection Details
- » CLT Spline Details
- » Specialty Connections of Timber to Concrete
- » Specialty Connections of
  Succeeding Trades to CLT –
  Balconies Window Wall
- » Unloading of Trucks
- » Breakdown of Dunnage, Protection
- Labor Makeup of Crew –Ironworkers, Carpenters, Laborers

# EXECUTE IN THE FIELD

- » Delivery Tracking
- » Quality Assurance/Quality Control (QA/QC)
- » Logistics of Delivery Unloading
- » Piece-by-piece Erection Sequences

# TRACKING IN THE FIELD

# What is going to be completed in the factory?

- » Beam columns cut to size?
- » Notches/brackets?
- » Recessed pockets/plugs?
- » Screws/nails?

# Identify what needs to be ordered for field installation:

- » Identify who will be tracking and try to keep it to one person.
- » Lots of information!

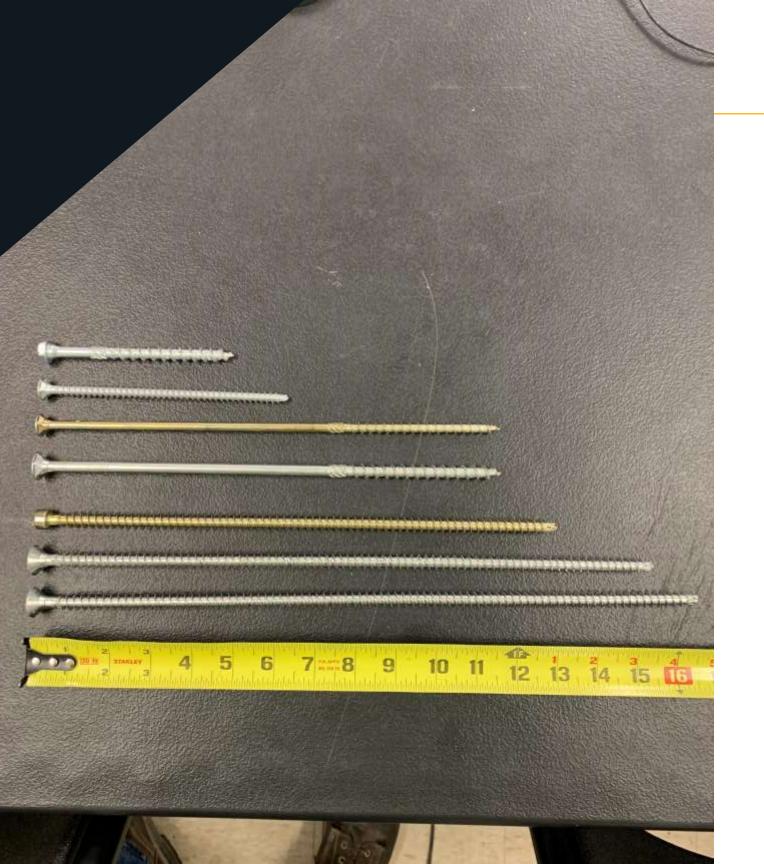


# MASS TIMBER INSTALLATION DOCUMENTS

01. P1 Base Plate Anchor Bolt Layout Diagram 06112021 REV02.pdf
02. P1 Misc Metals Connections 05282021 REV01.pdf
03. P1 Glulam Column Installation 04292021 REV01.pdf
04. P1 Glulam Beam To Column Fastening 05282021 REV01.pdf
05. P1 Glulam To CLT Fastening 06152021 REV03.pdf
06. P1 Fasteners Above 06152021 REV03.pdf
07. P1 Fasteners Below 05272021 REV01.pdf
08. P1 Spline Fastening 06152021 REV04.pdf
09. P1 Infill and CLT Support Blocks 06152021 Rev02.pdf
10a. P1 CLT Sequencing Plan Views 0610201 REV02 - **
11. CD Smith Bracing Plan 2021.04.16.pdf
13a. P1 Glulam Container Drawings 05042021.pdf
13b. P1 Glulam Container Loading Floor Plans 0504202
Ascent_CD Smith Lift Load Plan_210518.pdf
Ascent_Recommended Load Plan_210518.pdf
SB1-SB61 Steel Connections.pdf

Installed									
Onsite /									
Factory		Spacing	Phase 1	Phase 2A	Phase 2B	Phase 3	Count	Waste	Total
Onsite		2 Per Connection	182	624	1,170	224	1,272	64	1,336
Onsite	VG CSK 3/8 x 12-5/8	3 Per Connection	84	240	594	657	615	31	646
Onsite	VG CSK 3/8 x 16-7/8	16 Per Connection	576	2,688	1,680	576	5,520	276	5,796
Onsite	VG CSK 3/8 x 16-7/8	28 Per Connection	896	4,704	2,940	1,092	9,632	482	10,114
Onsite	VG CSK 3/8 x 16-7/8	32 Per Connection	128	512	320	128	1,088	54	1,143
Onsite	VG CSK 3/8 x 16-7/8	64 Per Connection	128	1,024	640	256	2,048	102	2,151
Onsite	Ecofast 5/16 x 8-1/4"	2 Per Block	-	-	-	-	-	-	-
Onsite	Ecofast 5/16 x 7-7/8	2 Per Block	-	-	-	-	-	-	-
Onsite	Ecofast 3/8 x 9-1/2	4 Per Connection	112	320	792	876	820	41	861
Onsite		4 Per Connection	364	1,248	2,340	448	2,544	127	2,672
Onsite		8 Per Column	320	1,152	720	112	2,304	115	2,420
Onsite	VG CSK 3/8 x 15	8 Per Column	-	-	-	-	-	-	-
Onsite	Ecofast 3/8 x 4	4 Per Connection	-	-	-	20	20	1	21
Onsite	VG CSK 3/8 x 16-7/8	Varies	-	-	-	208	208	10	219
Onsite	VG CSK 3/8 x 20-7/8	Varies	-	-	-	880	880	44	924
N/a	Ecofast 5/16 x 8-1/4	2 Per Block	-	-	-	-	-	-	
Onsite	VG CSK 1/2 x 10"	16 per column	-	-		32	32	2	34
Onsite	VG CSK 1/2 x 15"	16 per column	-	-	-	288	288	14	303
Onsite	VG CSK 3/8 x 16-7/8	6 per beam	-	-	-	264	264	13	278
Onsite	VG CSK 3/8	Varies				See 2/S502 C	See 2/S502 C	lty	
Onsite	Kombi 3/8 x 4	8 Per Connection	-	-		32	32	2	34
Onsite	VG CSK 3/8 x 8-5/8 / VG CYL 3/8 x 8-5/8	Varies	2,731	9,032	5,645	See below	17,408	870	18,279
Onsite	VG CSK 5/16 x 11-7/8	Varies	72	192	120	See below	384	19	404
Onsite	Ecofast 5/16 x 11-7/8	Varies	4,674	15,864	9,915	See below	30,453	1,523	31,976
Onsite	Ecofast 3/8 x 11-7/8	Varies	720	1,920	1,200	See below	3,840	192	4,032
Onsite	VG CSK 3/8 x 11-7/8	Varies	42	112	70	See below	224	11	236
Onsite		12" (two rows)	1,278	3,600	2,250	See below	7,128	356	7,485
Onsite		6" & 12" oc	-	-	-	2,164	2,164	108	2,273
Onsite		12" oc				563	563	28	592
Onsite		Varries		-		1,564	1,564	78	1,643
Onsite		12" oc	-	_	-	72	72	4	76
Onsite		Varies	-	_	_	862	862	43	905
Onsite		12" oc	-	_	-	444	444	22	467
Onsite	1 1	6" oc				648	648	32	681
Onsite		12" oc	_	_	_	556	556	28	584
Onsite		12" oc	-	_	_	358	358	18	376
Onsite	1	2 Per Block	220	560	350	128	1,258	63	1,321
Onsite		2 Per Block				84	84	4	89
Onsite		2 Per Block	72	112	70	42	296	15	311
Onsite		4 Per Block	76	224	140	80	520	26	546
Onsite		4 Per Block	208	576	360	176	1,320	66	1,386
Onsite		9 Per Block	27	216	135	189	567	28	596
Onsite		3 per block	156	432	270	132	990	50	1,040
Onsite		4-1/2" & 5" oc	999	1,679	1,049	415	4,142	207	4,350
Onsite		3-1/2", 4-1/2" & 5" o	713	2,297	1,436	897	5,342	267	5,610
Onsite		4" oc		- 2,231	- 1,430	168	168	8	177
Onsite		5" oc				30	30	2	32
Onsite		6 at conn - D6G				6	6	0	7
Onsite		4 at conn - D2S		-		4	4	0	5
			-	-				0	5
Onsite		6 at conn - D9F				4	4	_	
Onsite		4 at conn - D6I				6	6	0	7
Onsite		4 at conn - D6C		1 770	964	4	2 600	105	2 002
Onsite		Varies	552	1,728	864		3,698	185	3,883
Onsite		Varies	25	104	52		203	10	214
Onsite		Varies	34	48	24		154	8	162
Onsite	VG CSK 5/16 x 7-7/8	Varies	680	2,048	1,024	584	7,866		7,866

	Floor 19	Floor 20	Floor 21	Floor 22	Floor 23	Floor 24	Floor 25	Floor 26	
	234	234	234	234	234	224	0	0	
	150	138	126	90	90	87	570	0	
	336	336	336	336	336	320	256	0	
	588	588	588	588	588	588	504	0	
	64	64	64	64	64	64	64	0	
	128	128	128	128	128	128	128	0	
	220		120	120	120	110	22.0	J	
	200	184	168	120	120	116	760	0	
	468	468	468	468	468	448	0	0	
	144	144	144	144	144	112	0	0	
	0	0	0	0	0	4	16	0	
		0	0	0	16	192	0	0	
	0	0	0	0	0	0	880	0	
						22			
	0	0	0	0	0	32	0	0	
	0	0	0	0	0	0	288	0	
	0	0	0	0	0	48	216	0	
	1129	1129	1129	1129	1129	0	0	0	
	24	24	24	24	24	0	0	0	
	1,983	1983	1983	1983	1983	0	0	0	
	240	240	240	240	240	0	0	0	
	14	14	14	14	14	0	0	0	
	450	450	450	450	450	0	0	0	
	0	0	0	0	0	2164	0	0	
	0	0	0	0	0	0	563	0	
	0	0	0	0	0	458	1106	0	
	0	0	0	0	0	0	72	0	
	0	0	0	0	0	763	98	0	
	0	0	0	0	0	444	0	0	
	0	0	0	0	0	0	0	648	
	0	0	0	0	0	0	0	556	
	0	0	0	0	0	0	358	0	
	70	70	70	70	70	74	0	54	
	0	0	0	0	0	0	84	0	
	14	14	14	14	14	14	14	14	
	28	28	28	28	28	28	28	24	
	72	72	72	72	72	80	76	20	
	27	27	27	27	27	27	81	81	
	54	54	54	54	54	60	57	15	
	210	210	210	210	210	210	205	0	
	287	287	287	287	287	287	143	466	
	0	0	0	0	0	0	168	0	
	0	0	0	0	0		_		
	0	0	0	0	0	0	6	0	
	0	0	0	0	0	0	4	0	
	0	0	0	0	0	0	4	0	
	0	0	0	0	0	0	4	0	
	0 216	0 216	216	0 216	216	0 214	124	0	
	13	13	216 13	13	216 13	6	124		
	6		6	6	6		30	0	
	256	6 256	256	256	256	12 224	104	0	
	236	236	230	236	236	224	104	0	



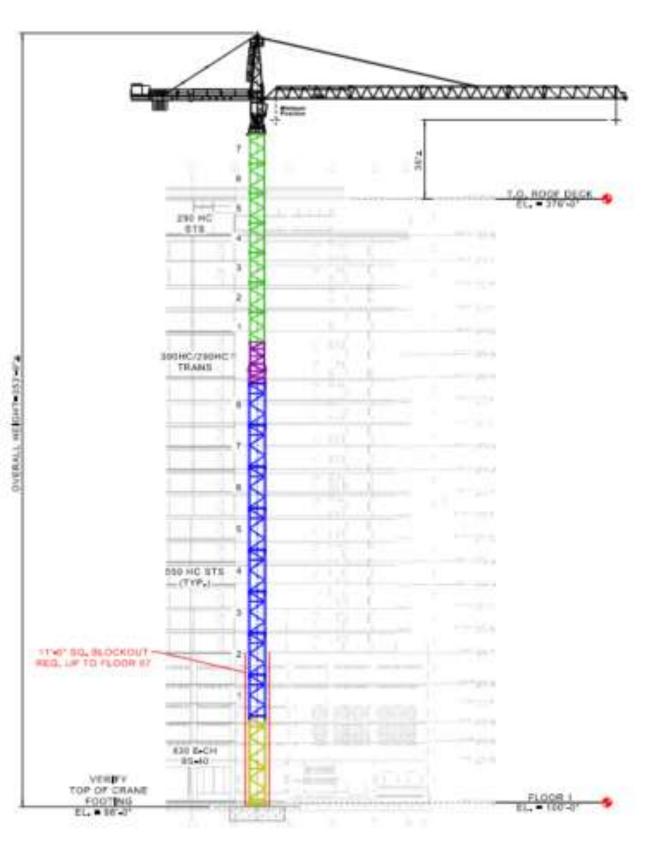
# **SCREWS**

- » Ascent has over 600,000 fasteners.
- » What can be installed in the factory?
- » How do we track what is installed in the field (~5,500 field-installed screws per floor)?

# **QUALITY CONTROL**

- » Field Measuring
- » 3<sup>rd</sup> Party Inspections
  - Who is contracting –
    owner or GC/CM?
  - Identify the specific scope.
  - Review install sequence to confirm duration inspectors are needed onsite.





# LOGISTICS

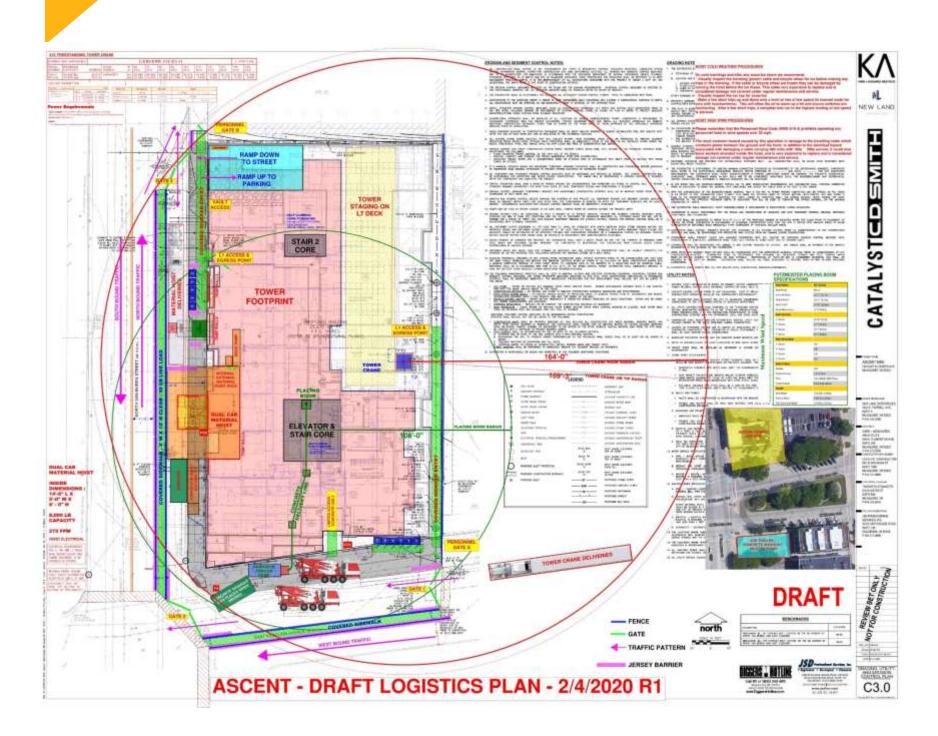
# » How is material arriving on jobsite?

 Do you need a large forklift to pull material from connex boxes? If so, source a facility that has these capabilities.

## » Location of:

- Conventional Crane or Tower Crane
  - Heaviest pick vs. radius of crane
  - Dedicated to timber from
    7:00 AM 3:00 PM
- Hoist: Get design included in Structural Drawings
- Concrete Placing: Get design included in Structural Drawings

# TIMBER DELIVERIES



- » Dedicated access into jobsite
- » How to trucks access the jobsite?



TIMBER + BRACKETS ARRIVING ON JOBSITE

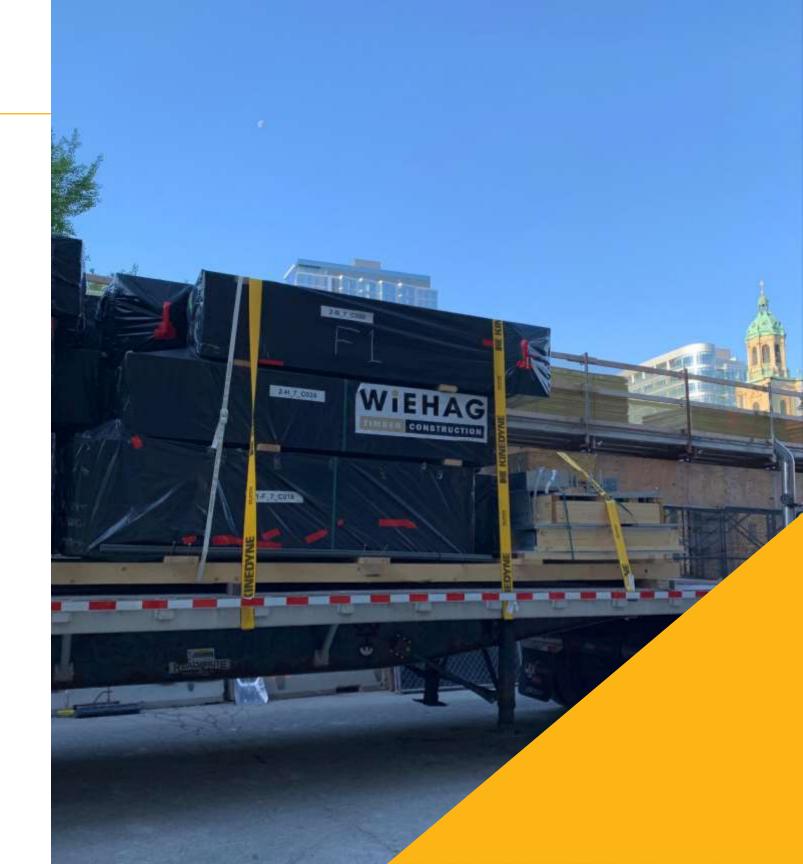
# TIMBER "SLEDS"

Sleds are used to pull the material out of the connex box via industrial forklift.

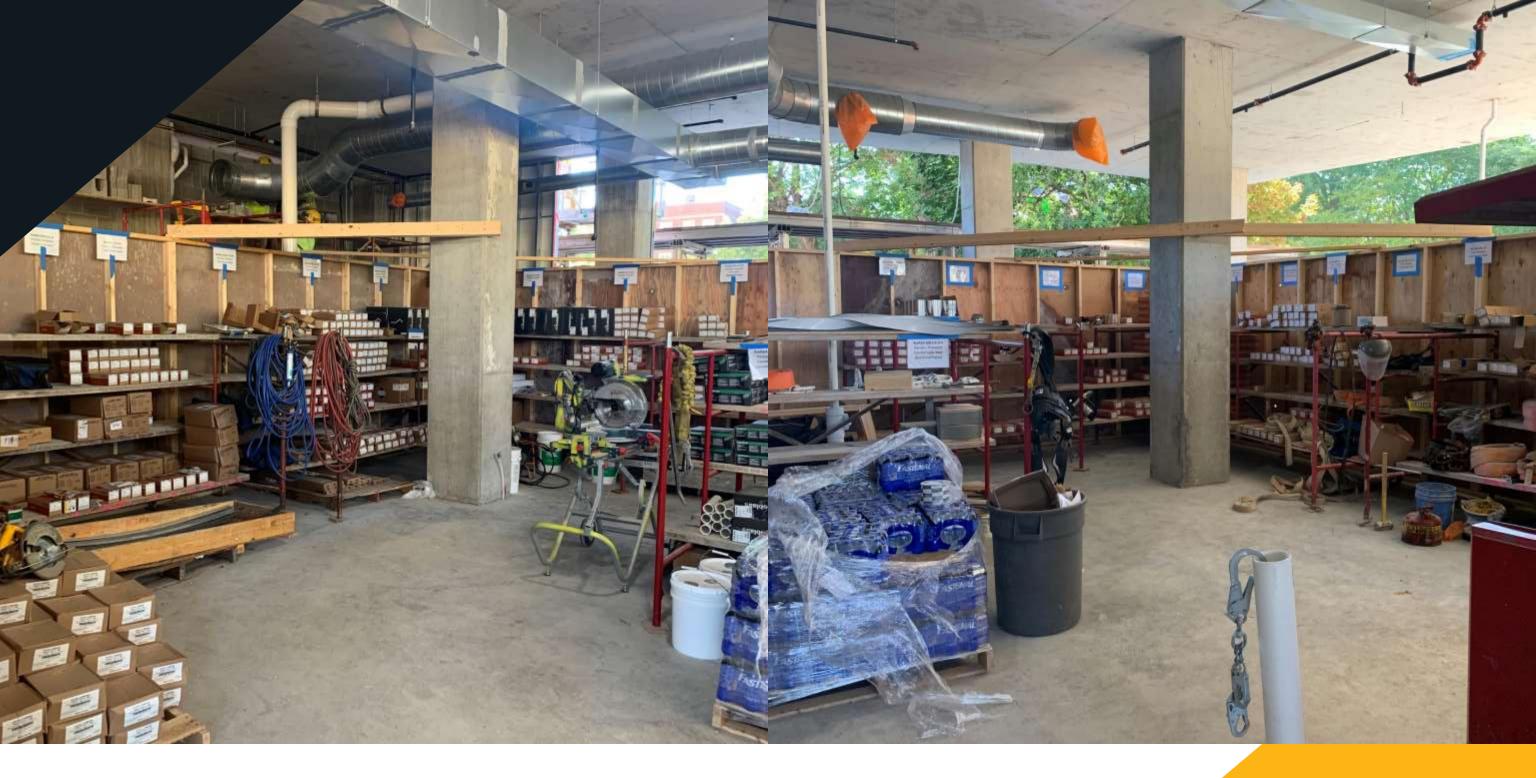


# COLUMNS + BEARING PLATES

Each column has its own identification.





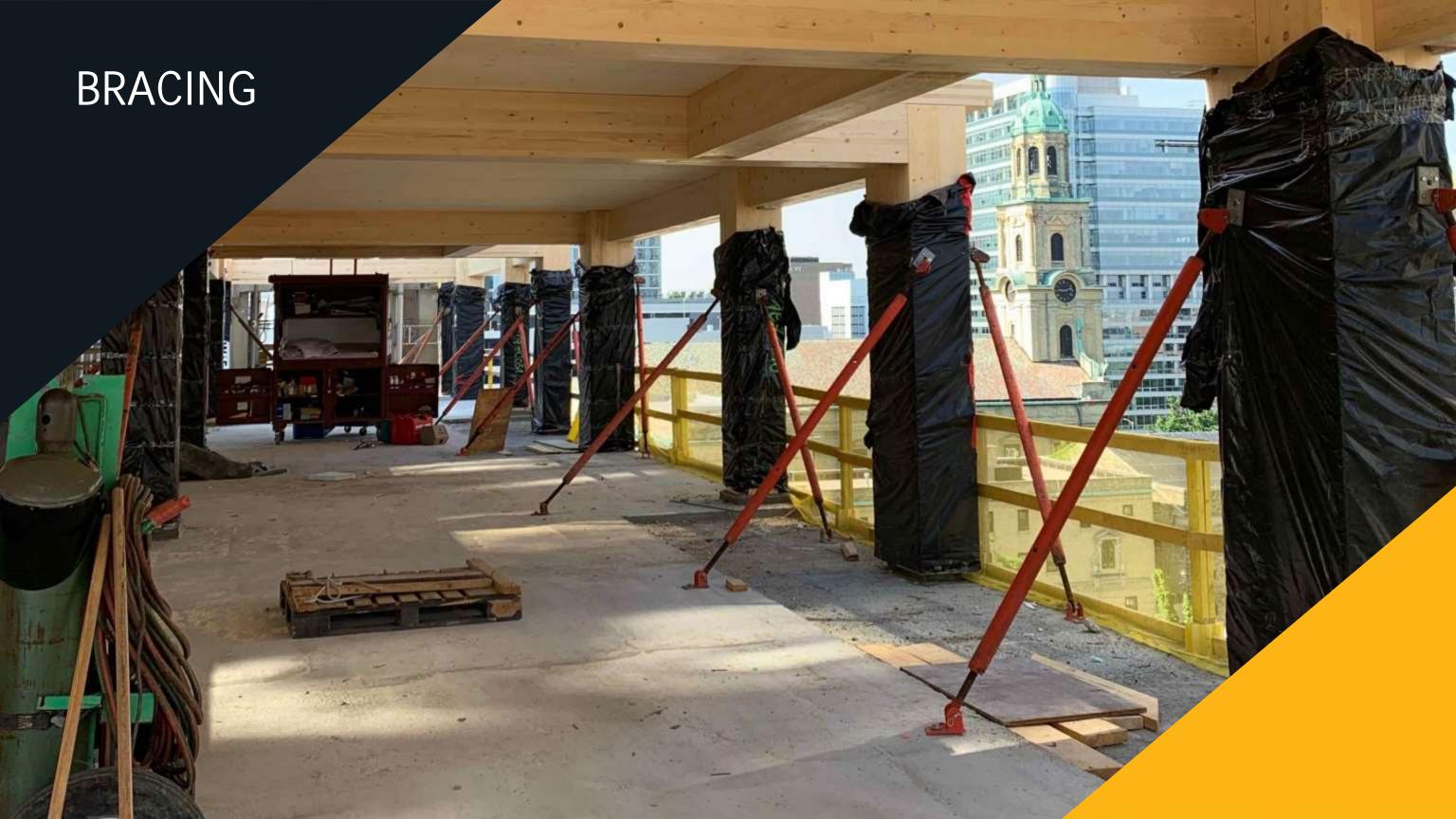


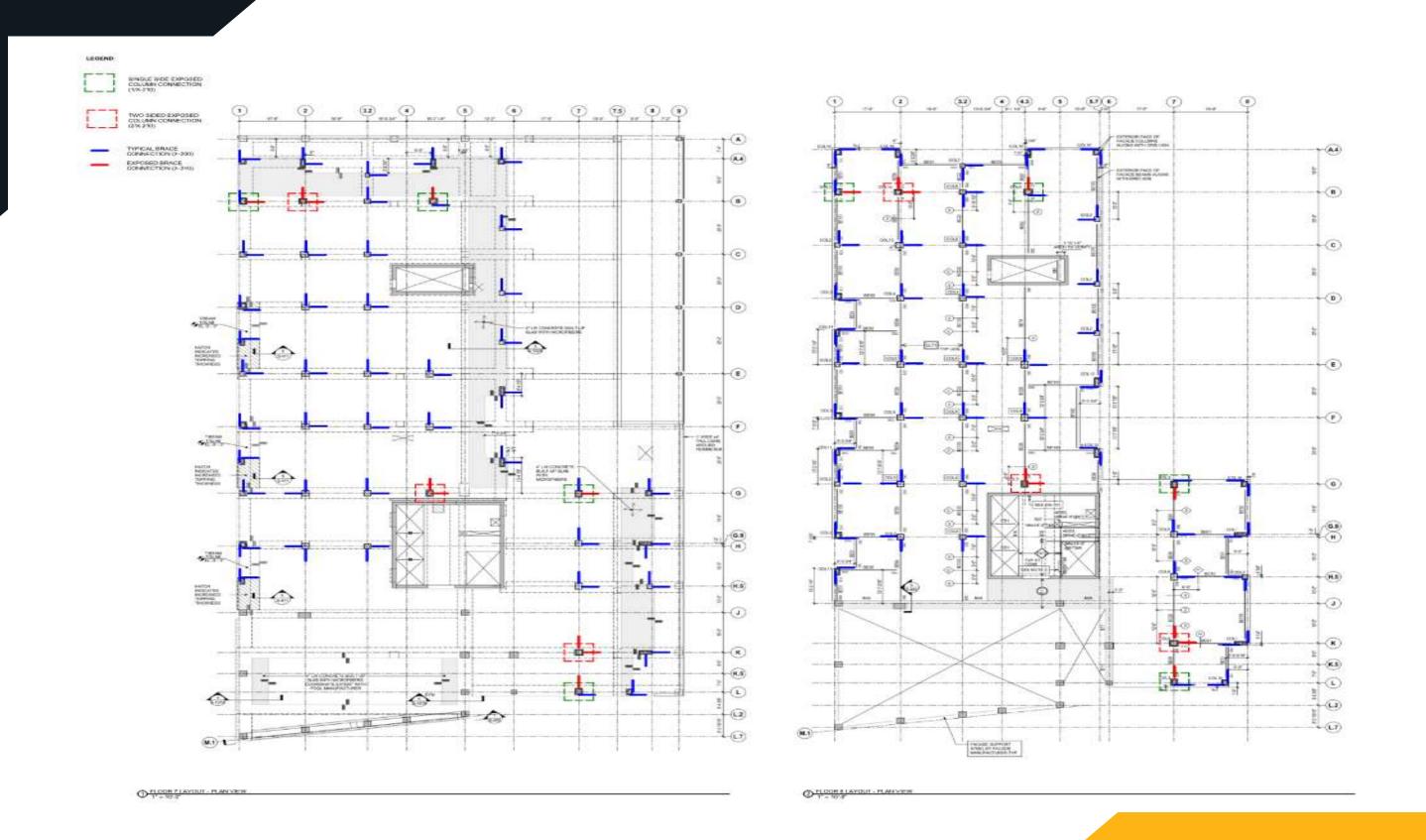
FASTENER STORAGE OVER 100,000 FIELD-INSTALLED!

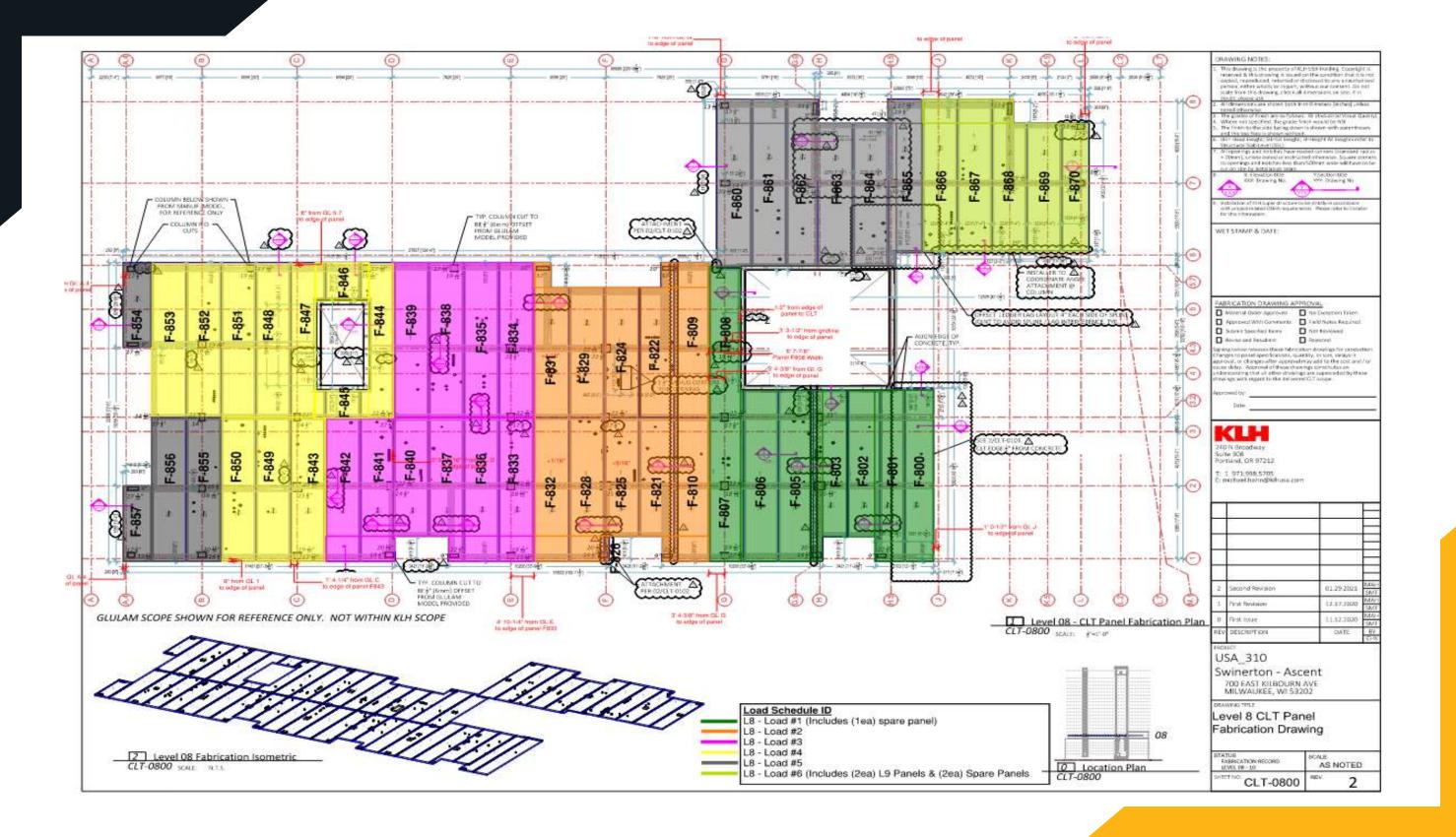




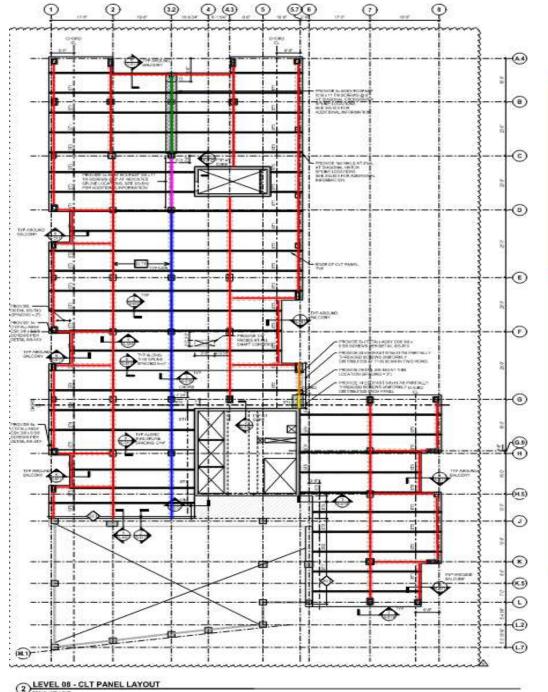
**ERECTION SEQUENCE** 

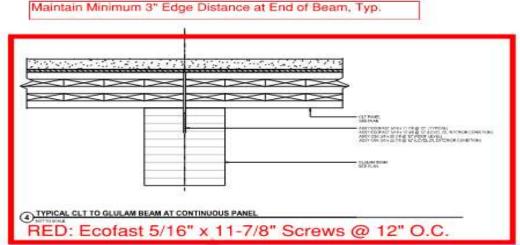


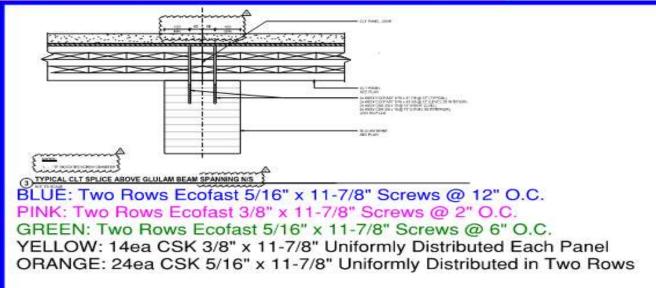




## Level 8 Fasteners Above - Bearing Fasteners





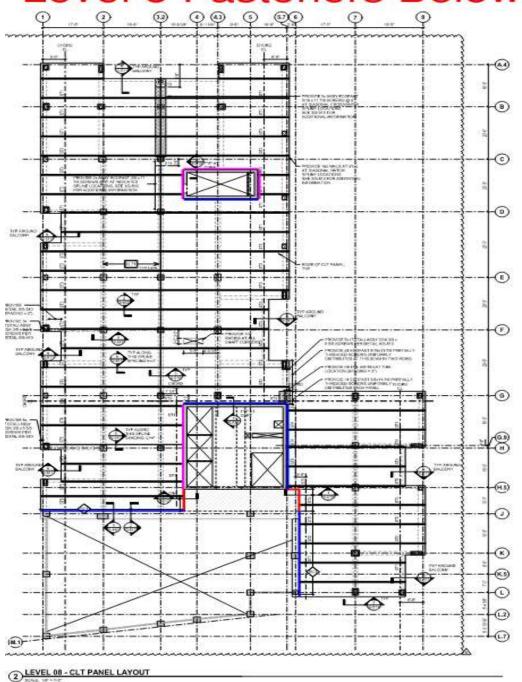


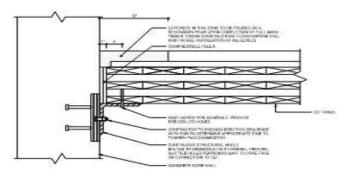






## Level 8 Fasteners Below





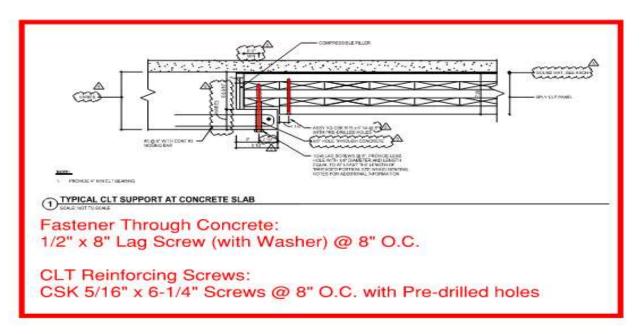
TYPE	AND RESERVED	Martinia cut tro annua			MUTABLE			567
		1998	arected.	DISTANCE ON	Desert	80.1	MACHE	SECURIOR STATES
621	448492	SOURCE AND DRIVE	10	10"	TAC NO SHORE FY	Has his arramain	190	96
800	616110	MOVEMENT STATE	-	121	Facility Indian	ENCTORISME	lier .	100
923	416113	888Y BEREITST 58+4	49	te:	ENC-10/1000M17	ESCTESTISMS	(Her.)	96
601	Seletif.	A807 KERRS 12 45 LC	81	2	NOTE WATER	Feet True latters	19	20
500	R4514E	4600 HOMB/102+5402	91	- 7	FHC-TH 900HLF	HBC-TESTIMONIA	1985	90
904	British .	N001 10100110 1512	dr -	2	WAS-758 400000 F /*1	FSG-TEXP landwid	19	
567	8 65 8 52	esprication objects	395	.7	19070 19990	HESTERNOON	1987	
104	A chin 15	. AGON MOREOVED 4-04-0-	-	E	AND TO WORK	FRC-TER Imbell	10	2.
ic.	800950	NAME ADDRESS OF A \$ 4.00.	38	-	Lacintrialistic	FOOTER NEWS	196	- 47
3010	846112	AMERICAN STREET	- 81		AAD-Strikking Fry	HIS/109 Union	1 ie	- 2

"BLUE: Ecofast 3/8" x 4" Screws

PINK: Kombi 1/2" x 5-1/2" Screws

GREEN: Kombi 1/2" x 7-1/2" Screws

2) TYPICAL CLT SUPPORT AT REINFORCED CONCRETE FACE

















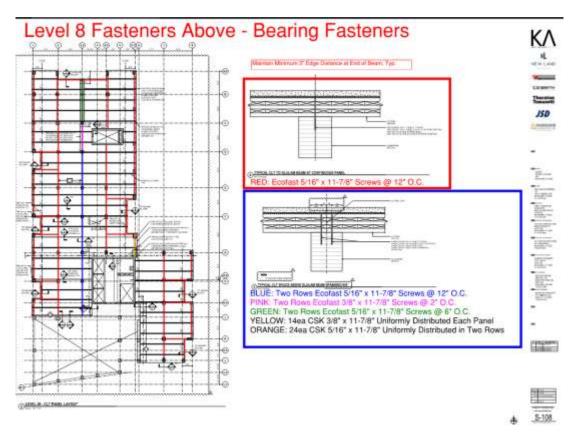






## **COLOR-CODED BOXES**

Simplify install and eliminate confusion.















## QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

**Dave Kwiatkowski** 

**Chris Johansen** 

C.D. Smith Construction















