

Delegated Design, Shop Drawings, and BIM Coordination for Mass Timber Projects: What You Need to Know

Matt Kantner
EQUILIBRIUM



Mason Brandt
WoodCore
Engineering



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



Course Description

Mass timber construction depends on prefabricated components manufactured to precise tolerances, leaving little room for field modification. This session examines how delegated design, shop drawings, fabrication models, and BIM-based constructability reviews support safe and efficient project delivery. Attendees will learn how architects, engineers, contractors, specialty trades, and fabricators can coordinate connections, penetrations, tolerances, sequencing, logistics, and installation requirements before fabrication. Common coordination failures and practical digital workflows will illustrate how early collaboration can reduce RFIs, rework, schedule delays, and jobsite safety risks.

Learning Objectives

1. Explain how delegated design responsibilities and clearly defined scopes support the structural integrity, code compliance, and safe construction of mass timber buildings.
2. Identify the design and coordination of information required in construction documents, shop drawings, and fabrication models to prevent conflicts involving connections, penetrations, tolerances, and building systems.
3. Evaluate BIM-based constructability workflows for addressing erection sequencing, crane access, site logistics, temporary conditions, and installation safety before fabrication begins.
4. Apply coordination milestones and communication protocols that reduce RFIs, rework, fabrication errors, and field modifications while improving schedule reliability and occupant safety.



October 7, 2026

Delegated Design, Shop Drawings, and BIM Coordination for Mass Timber Projects: What You Need To Know

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25+ Years Of Innovation

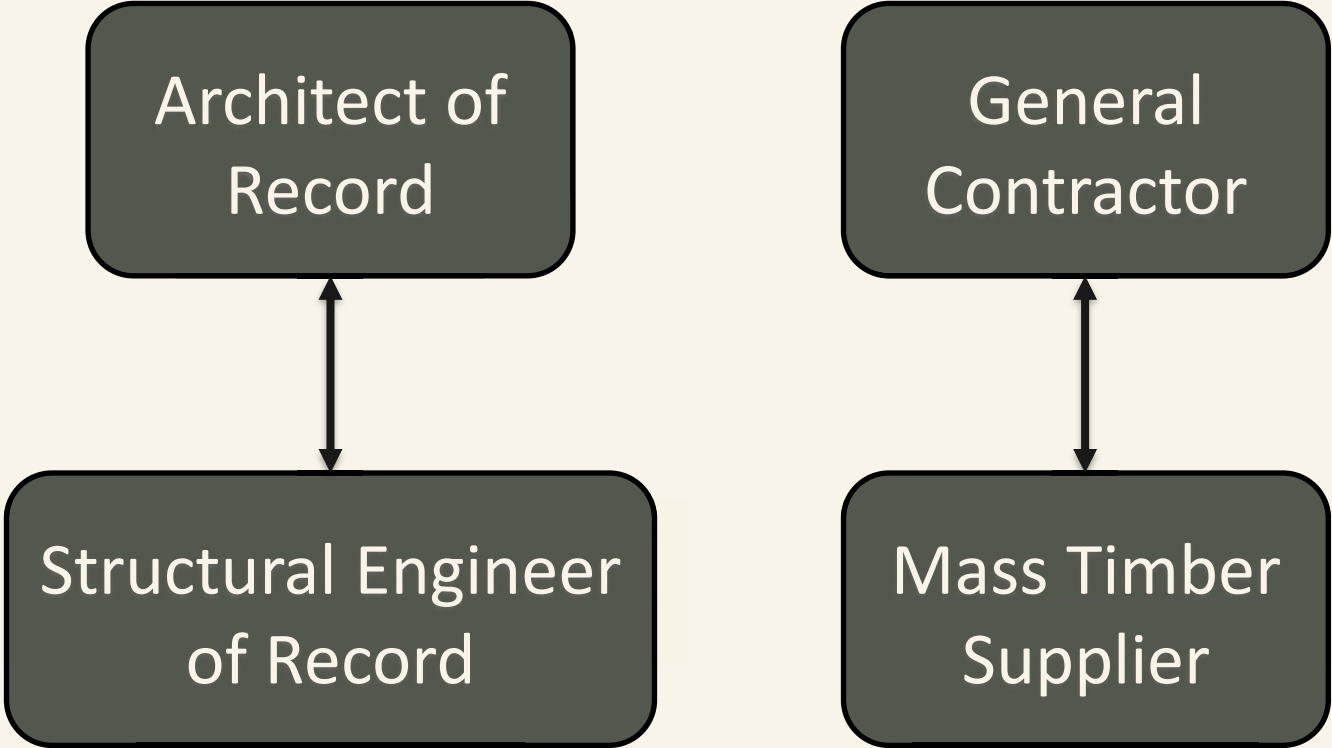
3,000+ Projects

150+ Mass Timber Projects

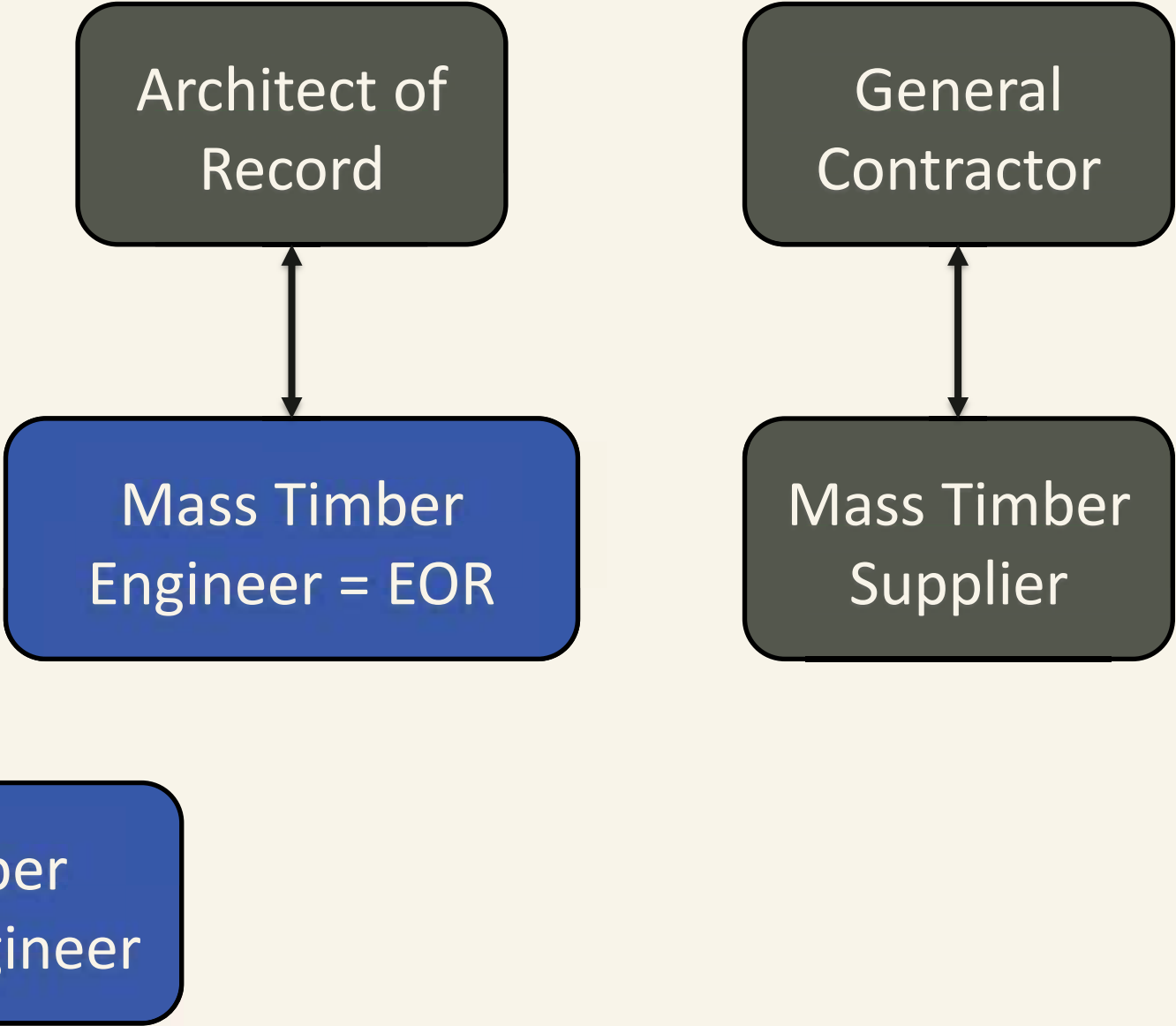


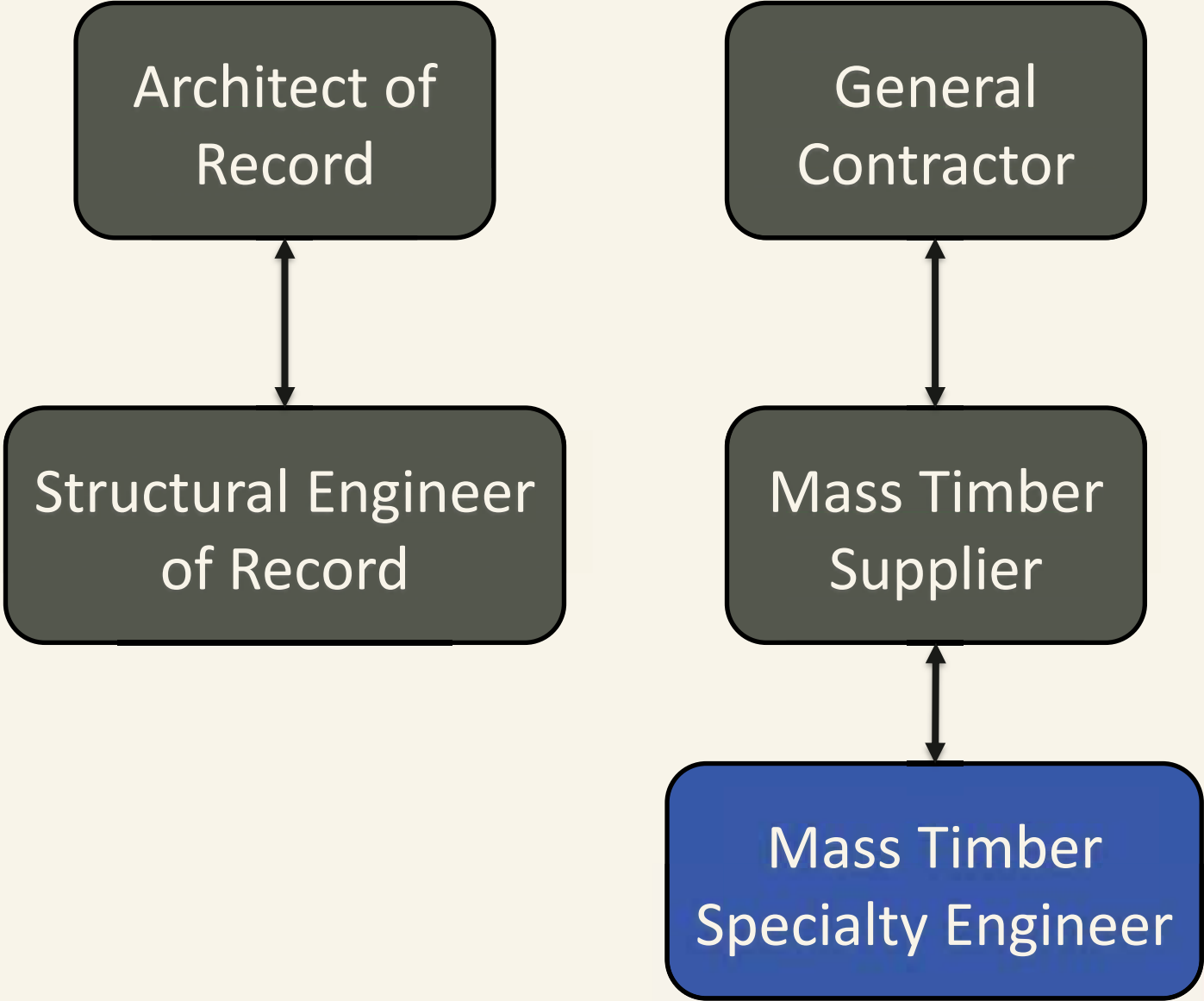


Getting MT Engineering Expertise on the Project Team



Mass Timber
Specialty Engineer





Early supplier involvement to shepherd the design team towards optimal solutions.

Design Assist



RECEIVED

[illegible]

consequently, the data obtained from these two pre-estimates of the effect of the intervention on the prevalence of the disease were not used in the analysis. The data obtained from the two pre-estimates of the effect of the intervention on the prevalence of the disease were not used in the analysis. The data obtained from the two pre-estimates of the effect of the intervention on the prevalence of the disease were not used in the analysis.

DESIGN CRITERIA

U.S. Customs Service

The climate data listed on WDCB website for the meteorological water data approximate location of the WDCB 1011 station (40°48'N, 120°11'W) for the years 1970, 1971 and 1972, and 1973 are shown below.

3.4. 1998-1999

14. 400 is a composite drawing, 30 x 20, produced by Anthony Bonaventura, dated 21 July 2020, on the basis of a request for the primary evidence used.

[illegible]

1. **STUDY OBJECTIVES**

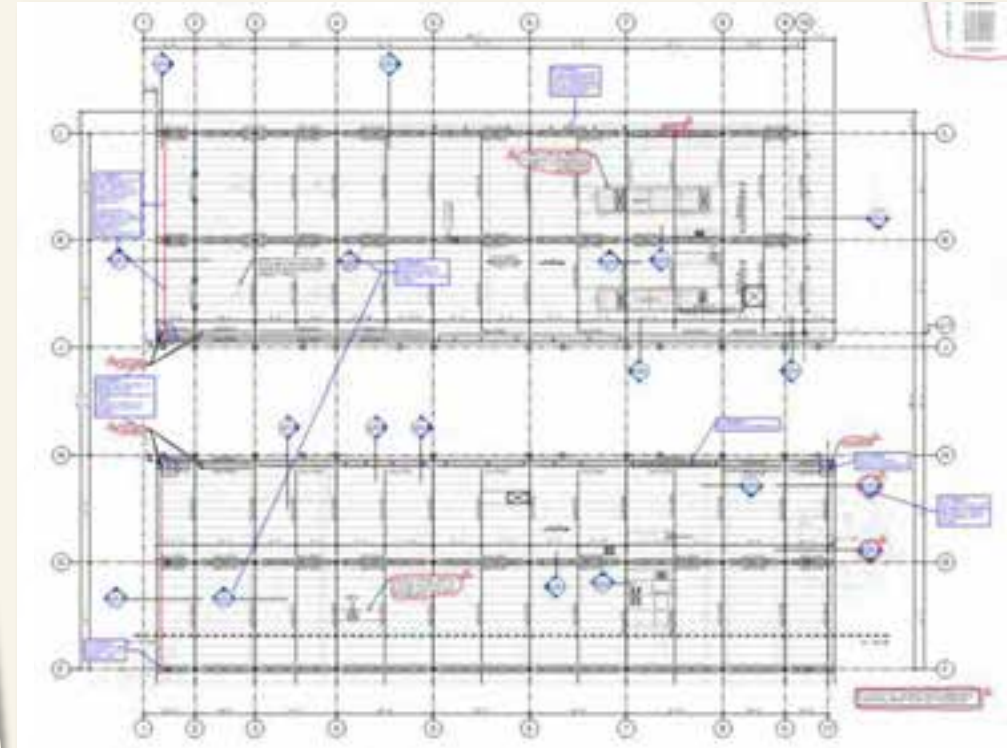
3.1. Nomenclature

5.1. FORMULATIONS

9.5. 1999

0.2. 5000

55.7 years (range 49–63 years) and 50% were female. The mean age of the patients was 55.7 years (range 49–63 years) and 50% were female.



Sheet No: 08
Date: 05/05/23
Sheet #1 of 3

Project Name: Project Name
Project Number: 00000
Subject: SET Design

Input

System	Value
CLT Grade	U.S. (Heavy) Spruce-Pine
CLT Layer	4 Layers
Maximum Contact (Pa)	1.0
Floor or Roof	Floor
Calculate for	Minor Direction

Span Info - Major Direction	Value
Span Length (ft)	30.00
Span Condition	Sp. 1a
Span Info - Minor Direction	Value
Span Length (ft)	N/A
Span Condition	N/A

Applied Loads	Value
Case	Load 1
Typing	0
SCS	11
Partitions	0
L	20
U	0
S	0
H	0
W	0
Partitions (act)	0
Partitions (dead)	0

Adjustment Factors	Value
C - Temperature Rating	1.0
Resistant (Fire Strength Adj. Factor)	2.05
Robust (Fire Strength Adj. Factor)	2.05

Material Properties	Value
Property	Value
E	1,400,000
G	87,500
D	450
F _v	1,250
F _t	175
F _c	35
F _p	0.35

Fire	Value
Total Fire Duration Requirement	0.00 hr
Req. effective char. depth	0.00 in
Fire Protection	Time
Layer	0 min
Protection Layer 1	N/A
Protection Layer 2	0 min
Protection Layer 3	0 min
Total Protection Time	0 min
CLT Fire Duration Requirement	0.00 hr

Deflection Limits

Case	Limit (in)	in
L	1/16	
U	1/16	
Short Term	1/16	
Service	1/16	
Total		

Calculated Results

Property	Value
Major Dir	2.825
Minor Dir	2.420
SCS	200
Partitions	0.00
L	0.00
U	0.00
S	0.00
H	0.00
W	0.00
Partitions (act)	0.00
Partitions (dead)	0.00

This tool has been developed by GGBuildUP (ggbuildup.com)
with funding from the US Forest Service and Southern Lumber Board.

15.5

Sheet No: 08
Date: 05/05/23
Sheet #1 of 3

Project Name: Project Name
Project Number: 00000
Subject: SET Design

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CLT Grade	U.S. (Heavy) Spruce-Pine
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Span Length (ft)	30.00
Span Condition	Sp. 1a
Span Info - Minor Direction <th>Value</th>	Value
Span Length (ft)	N/A
Span Condition	N/A

Applied Loads	Value
Case	Load 1
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SCS	11
Partitions	0
L	20
U	0
S	0
H	0
W	0
Partitions (act)	0
Partitions (dead)	0

Adjustment Factors	Value
C - Temperature Rating	1.0
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Protection Layer 1	N/A
Protection Layer 2	0 min
Protection Layer 3	0 min
Total Protection Time	0 min
CLT Fire Duration Requirement	0.00 hr

Deflection Limits

Case	Limit (in)	in
L	1/16	
U	1/16	
Short Term	1/16	
Service	1/16	
Total		

Calculated Results

Property	Value
Major Dir	2.825
Minor Dir	2.420
SCS	200
Partitions	0.00
L	0.00
U	0.00
S	0.00
H	0.00
W	0.00
Partitions (act)	0.00
Partitions (dead)	0.00

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Span Condition	Sp. 1a
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Applied Loads	Value
Case	Load 1
Typing	0
SCS	11
Partitions	0
L	20
U	0
S	0
H	0
W	0
Partitions (act)	0
Partitions (dead)	0

Adjustment Factors	Value
C - Temperature Rating	1.0
Resistant (Fire Strength Adj. Factor)	2.05
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Layer	0 min
Protection Layer 1	N/A
Protection Layer 2	0 min
Protection Layer 3	0 min
Total Protection Time	0 min
CLT Fire Duration Requirement	0.00 hr

Deflection Limits

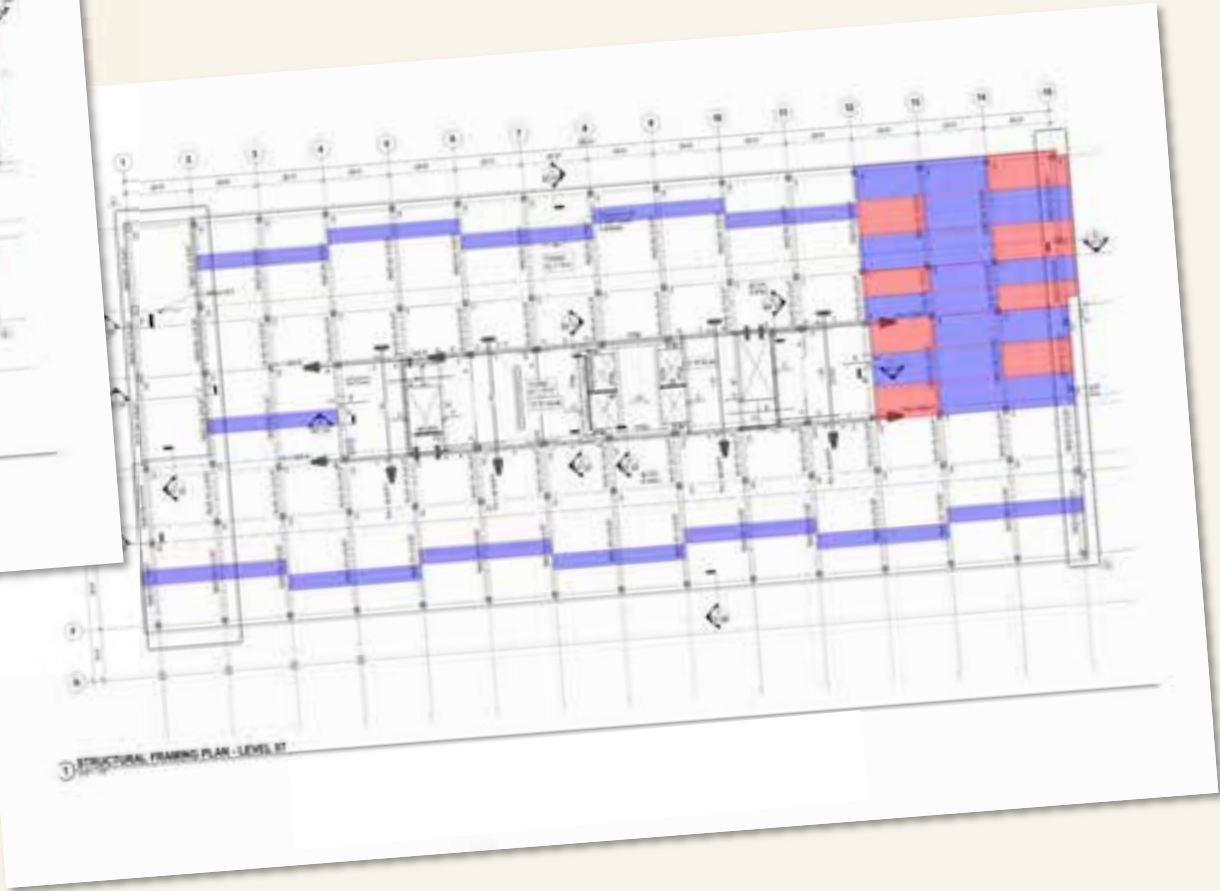
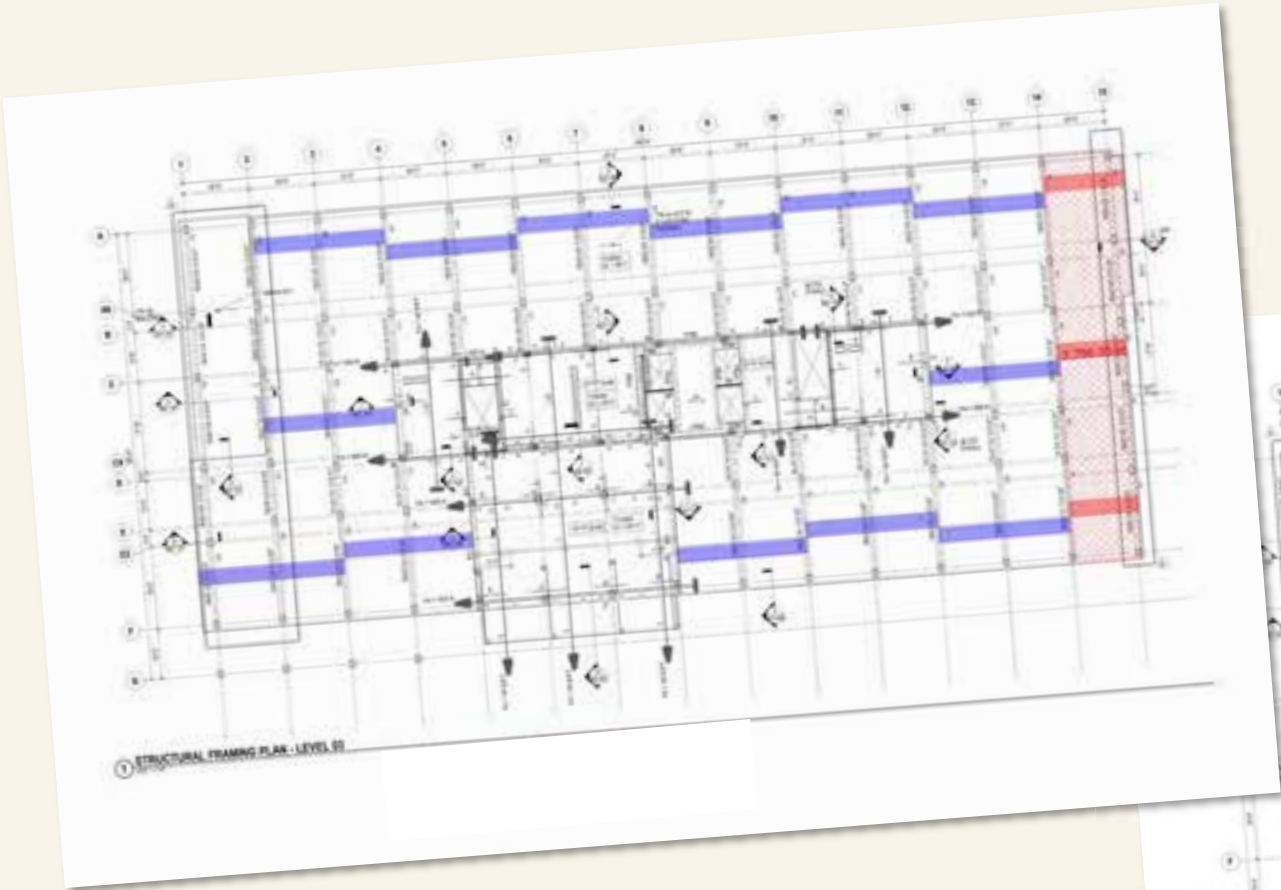
Case	Limit (in)	in
L	1/16	
U	1/16	
Short Term	1/16	
Service	1/16	
Total		

Calculated Results

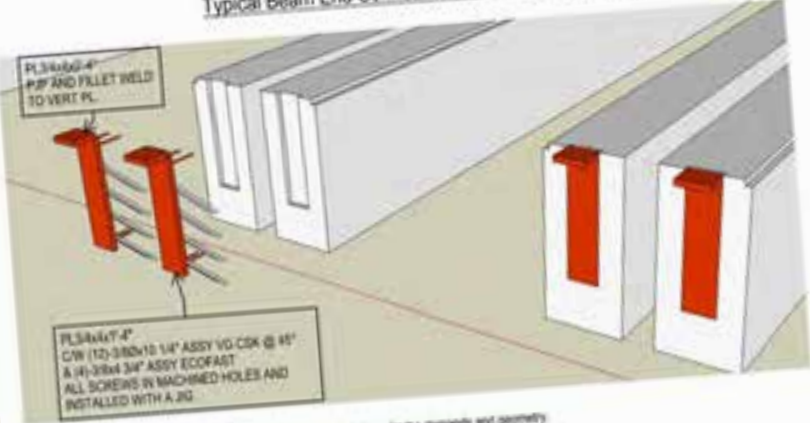
Property	Value
Major Dir	2.825
Minor Dir	2.420
SCS	200
Partitions	0.00
L	0.00
U	0.00
S	0.00
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W	0.00
Partitions (act)	0.00
Partitions (dead)	0.00

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15.5



Typical Beam End Connection at 30'-0" Double Beams

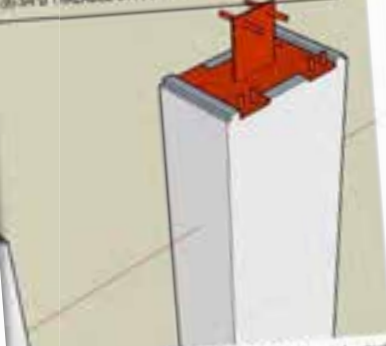


Note: At smaller beams, similar detail will be applied, but scaled down for the demands and geometry.

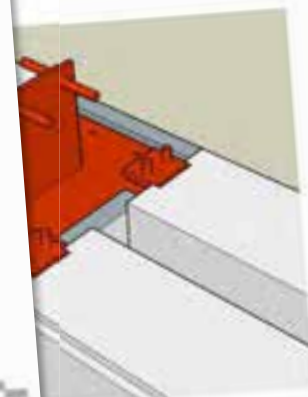
- Option #1 - Minimize Steel

PL 1/2x6x10-12 C/W (2-3/4x8 TIGHT FIT PWS TO BE
INSTALLED IN THE FIELD ONCE UPPER COLUMN IS PLACED

PL 3/4x4 1/4x7-7 1/2" W/ GEOMETRY AS SHOWN
C/W (4) GLEED IN RODS (ALTERNATIVES CAN BE PURSUED)
& (6) 3/4" T-THREAD STUDS TAPPED INTO PLATE

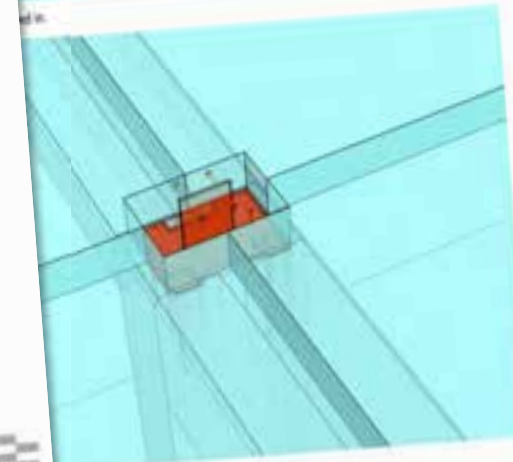
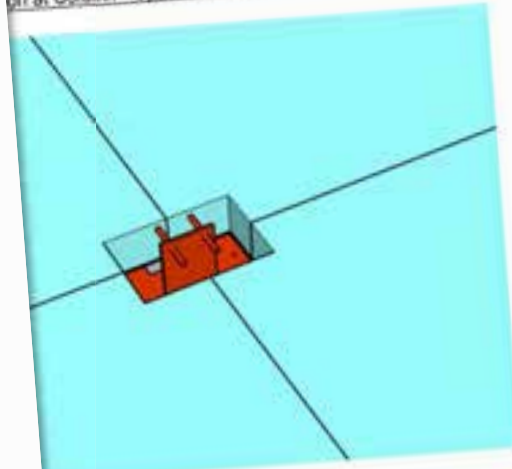


Use steel Tearing plate. Holes in knife plate to be slightly elongated vertically

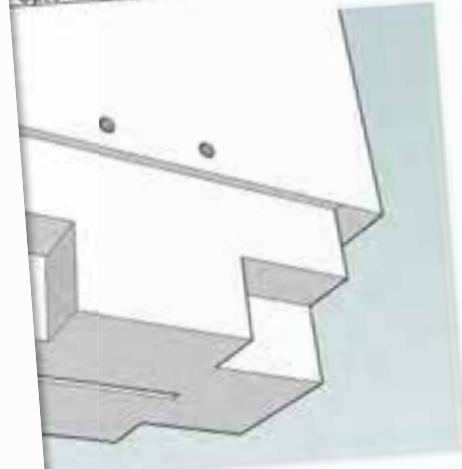


STUDS AND THEN NUTS ARE TIGHTENED

on at Column - Option #1 - Minimize Steel (cont.)



Option #1 - Minimize Steel (cont.)

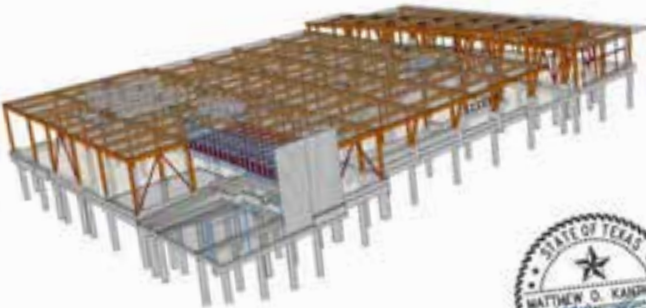


Below and prevent the possibility of a visible gap from beam
beam connections.

Final design of mass timber connections, and sometimes members, by the supplier's engineer.

Delegated Design (aka Specialty Engineering)

SFA Dining Hall
Mass Timber Specialty Engineering
Calculation Package

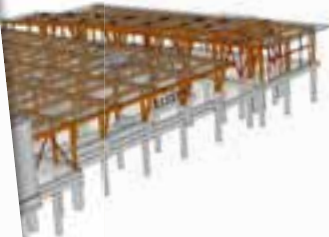


Issued for Fabrication (IFF)

2-2-2024

Equilibrium Consulting USA Inc.

Issued for Fabrication (IFF)



The building is located at 2117 Wilson Dr. in Risk Category III. The design parameters in this package are those of Haynes Whaley, who is responsible for the design.

Design Scope

Equilibrium is responsible for the design and glulam connection design. Equilibrium is not responsible for steel members in this calculation package. Equilibrium is not responsible for the design of the steel members.

Standards

The design is based on the 2015 International Building Code. The following are the design standards used in this calculation package:

2-2-2024

Equilibrium Consulting USA Inc.

Structural Calculation Package – Issued for Fabrication (IFF)

Material Summary

The material summary lists the material grades that fall under Equilibrium's scope of work. The materials are of grade 24F-V8 Southern Pine per Mercer's manufacturing facility standards. The materials are grade 50 N1D4 Southern Pine per Mercer's manufacturing facility standards. The information comes from sheet 50.01 of the EOR's drawings.

SPECIES	
GRADE	SOUTHERN PINE
THICKNESS	V3
MAJOR STRENGTH DIRECTION:	4 1/8 INCHES
• F_b	1,740 LB-FT/FT
• E	95x10 ⁹ LB-IN/FT
• F_v	1,820 LB/FT
MINOR STRENGTH DIRECTION:	
• F_b	140 LB-FT/FT
• E	3.4x10 ⁹ LB-IN/FT
• F_v	605 LB/FT

- RICON-S VS Hangers per ESR-4300
- Tie-rod SDCP-CS & SDCP-CS screws per ESR-3046
- ASSY V8 CYL & V8 CSX screws per ESR-3178
- ASSY EDOFAST & ASSY SK screws per ESR-3179

Design Criteria

The design criteria are based on the design of the building. The design criteria are based on the design of the building. The design criteria are based on the design of the building.

Deflection Criteria

The deflection criteria are based on the design of the building. The deflection criteria are based on the design of the building. The deflection criteria are based on the design of the building.

2-2-2024

Equilibrium Consulting USA Inc.

Issued for Fabrication (IFF)

This section gives information on "typical" design values.

The design values from EOR drawing 50.10 are as follows:

1
2
3
4
5

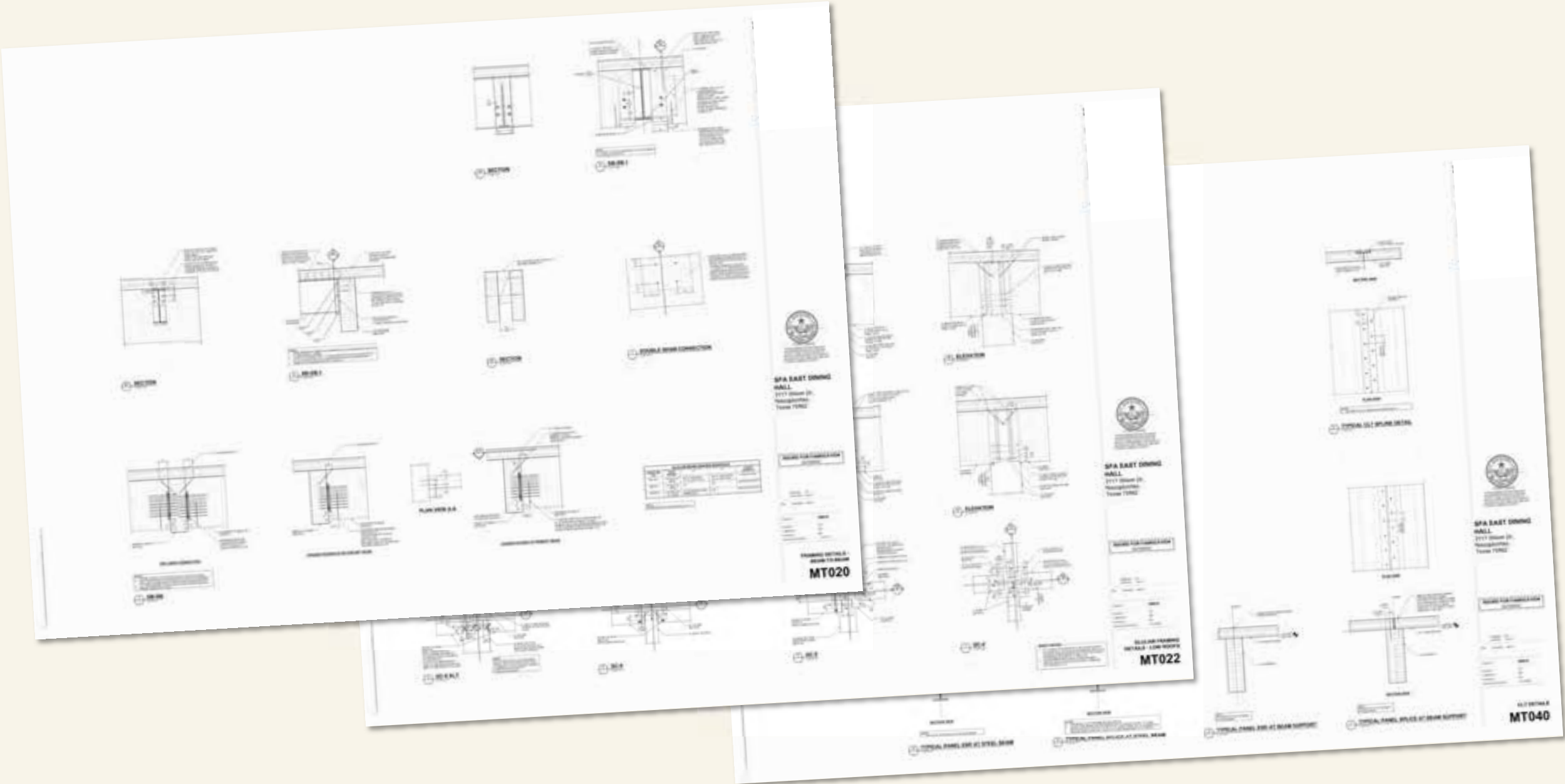
The design values have been included in the design model according to the design values located on EOR drawings.

The design values are considered. Due to the discontinuous nature of the design, the only potential detrimental impact of skipping (lower overall axial loads) to the columns. However, the worst case eccentricity which is already a more

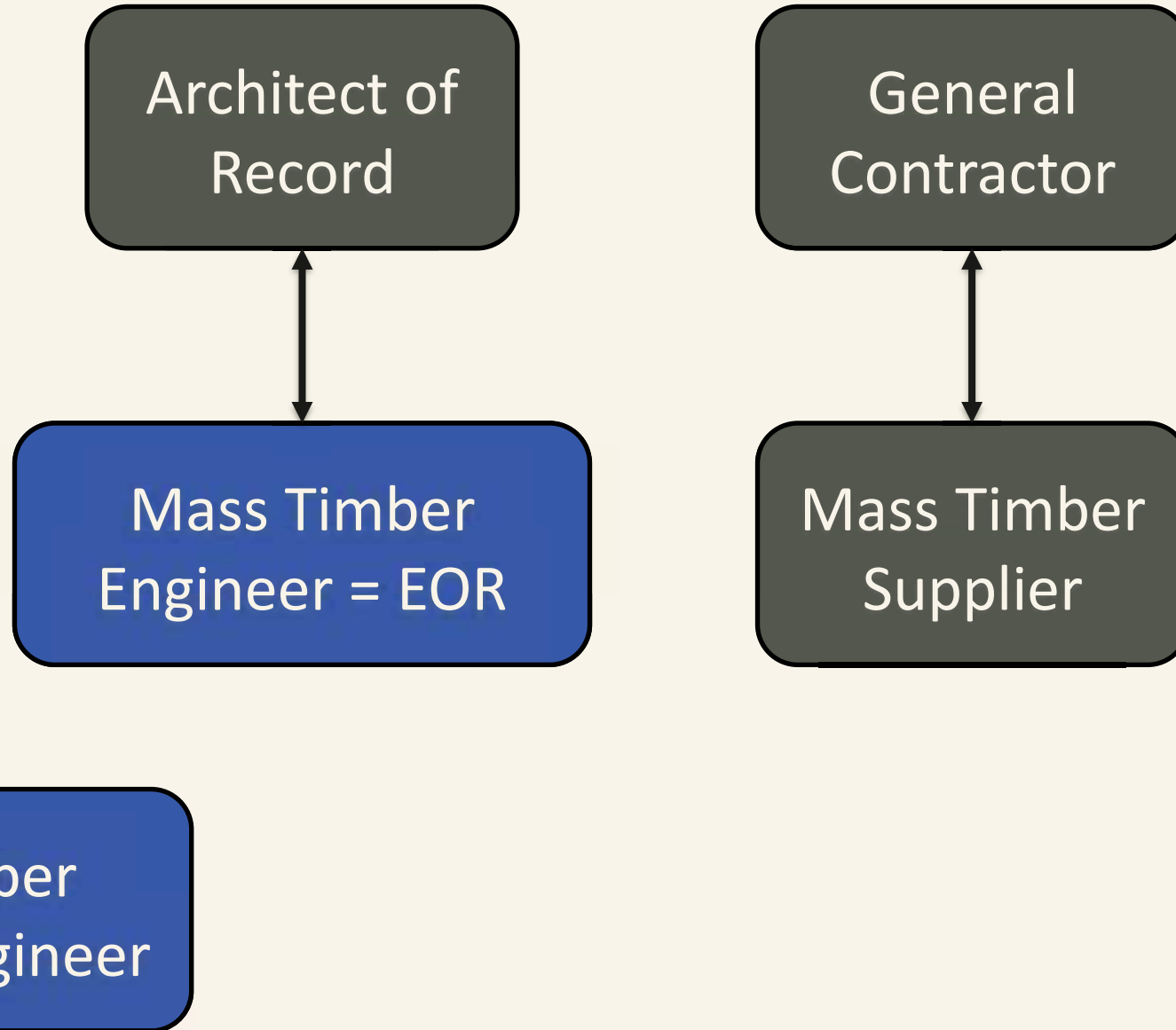
The design values are considered. Due to the discontinuous nature of the design, the only potential detrimental impact of skipping (lower overall axial loads) to the columns. However, the worst case eccentricity which is already a more

1.2
5 psf
0.9
1.2
5 psf
5 psf

2-2-2024



Why Design Assist / Delegated Design?





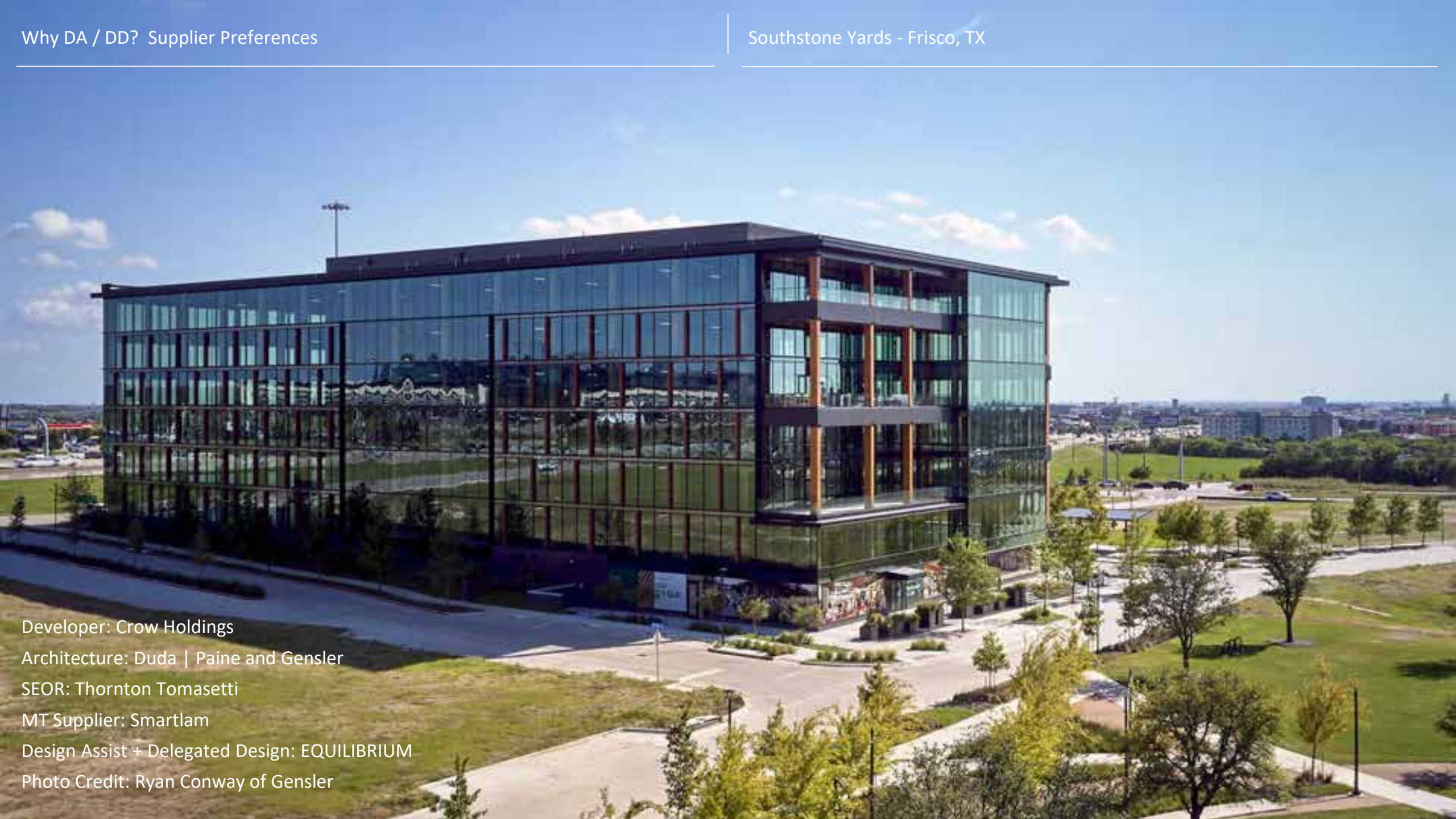












Developer: Crow Holdings

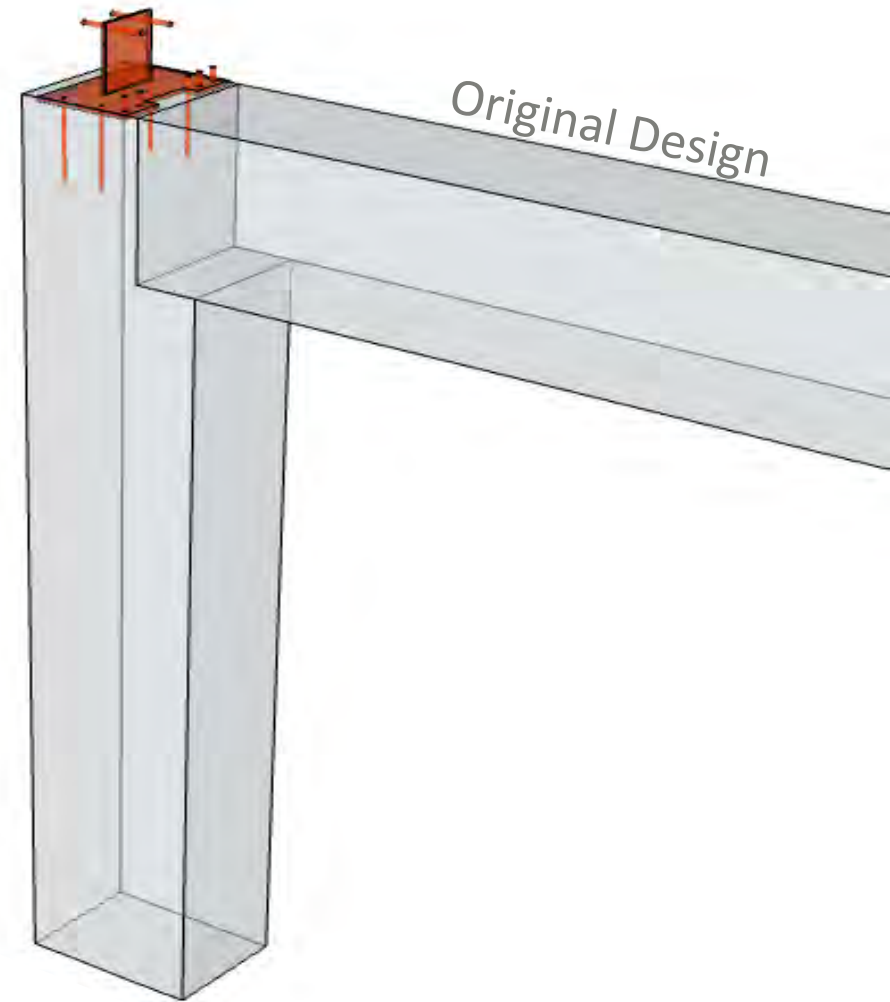
Architecture: Duda | Paine and Gensler

SEOR: Thornton Tomasetti

MT Supplier: Smartlam

Design Assist + Delegated Design: EQUILIBRIUM

Photo Credit: Ryan Conway of Gensler

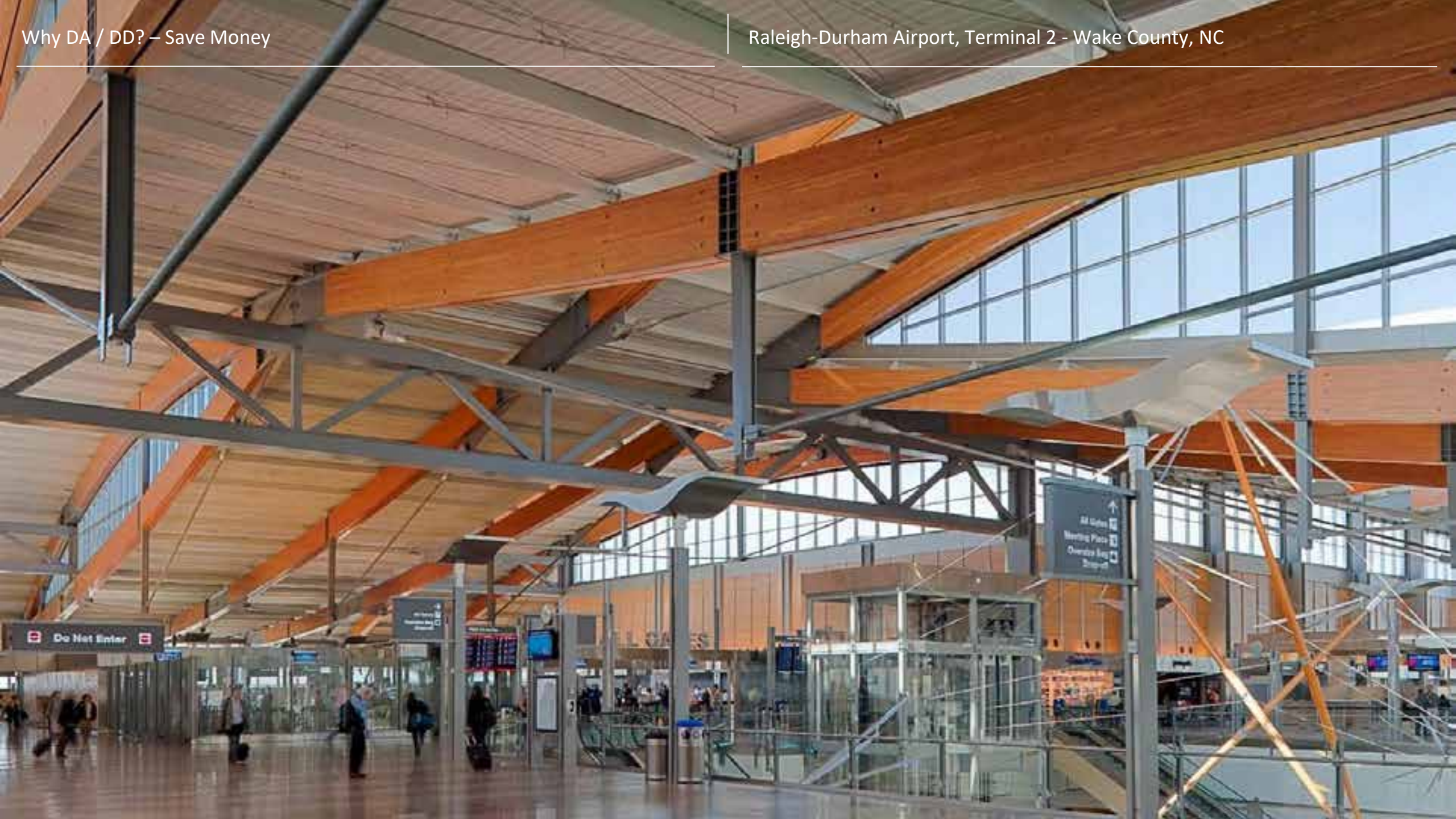


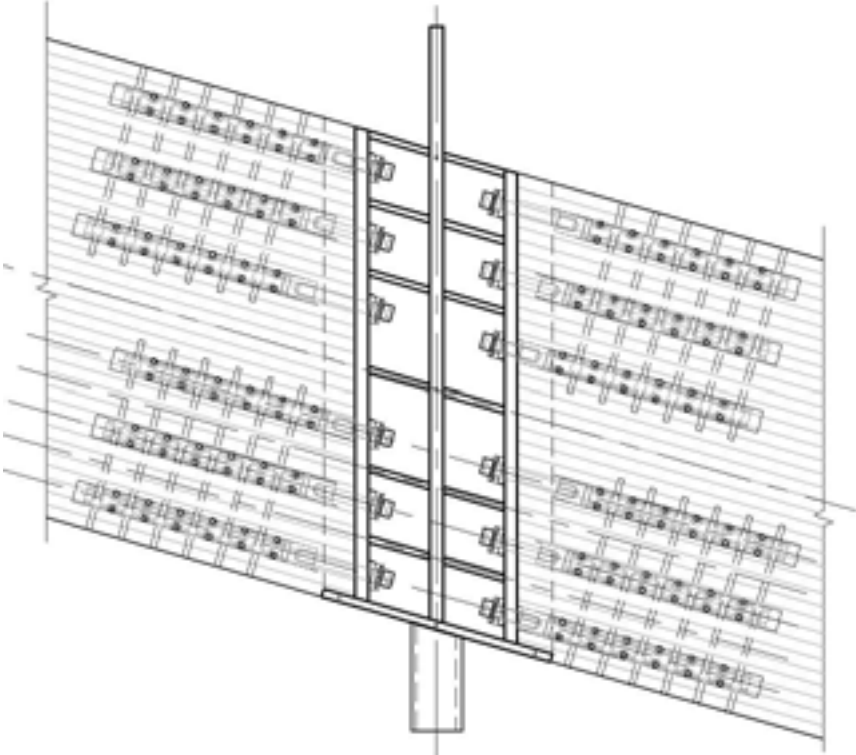
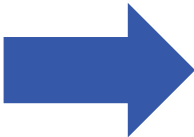
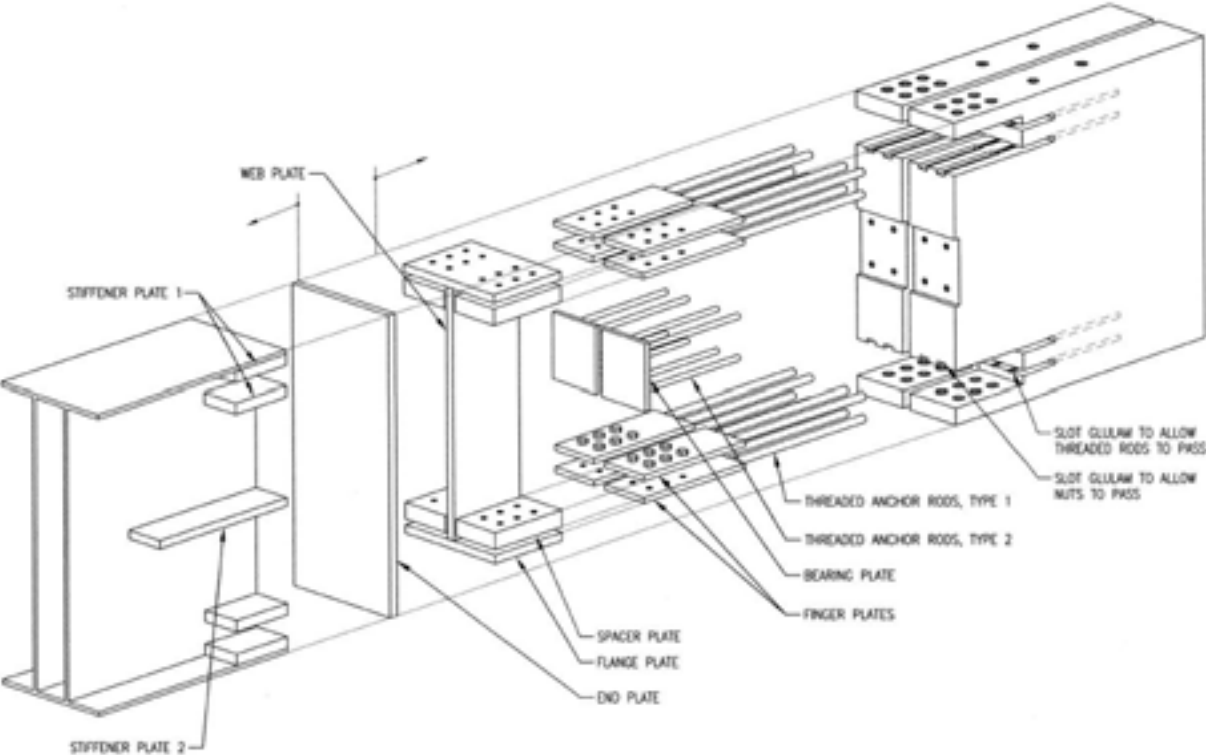




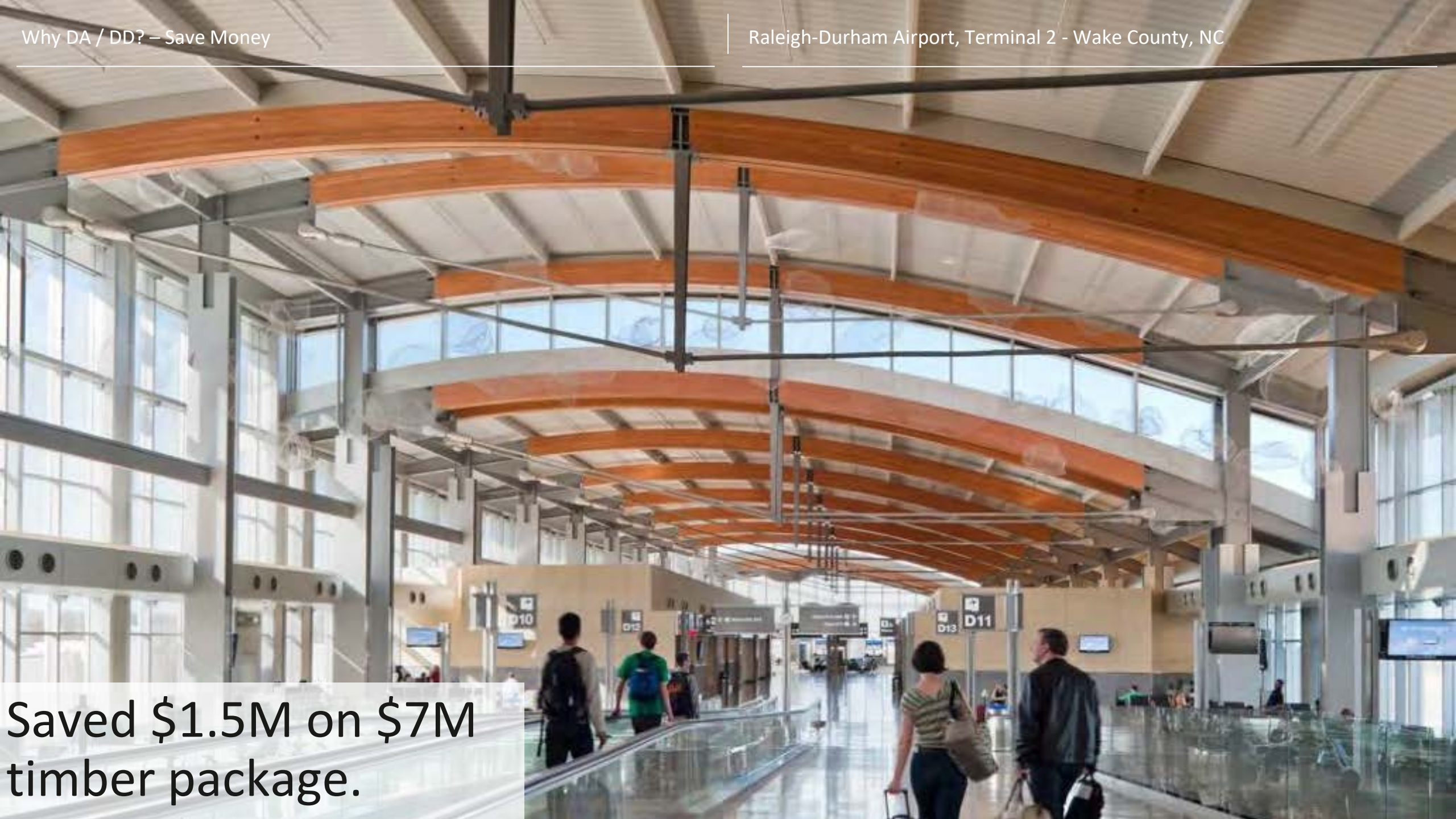
Architecture: Fentress

Delegated Design: EQUILIBRIUM

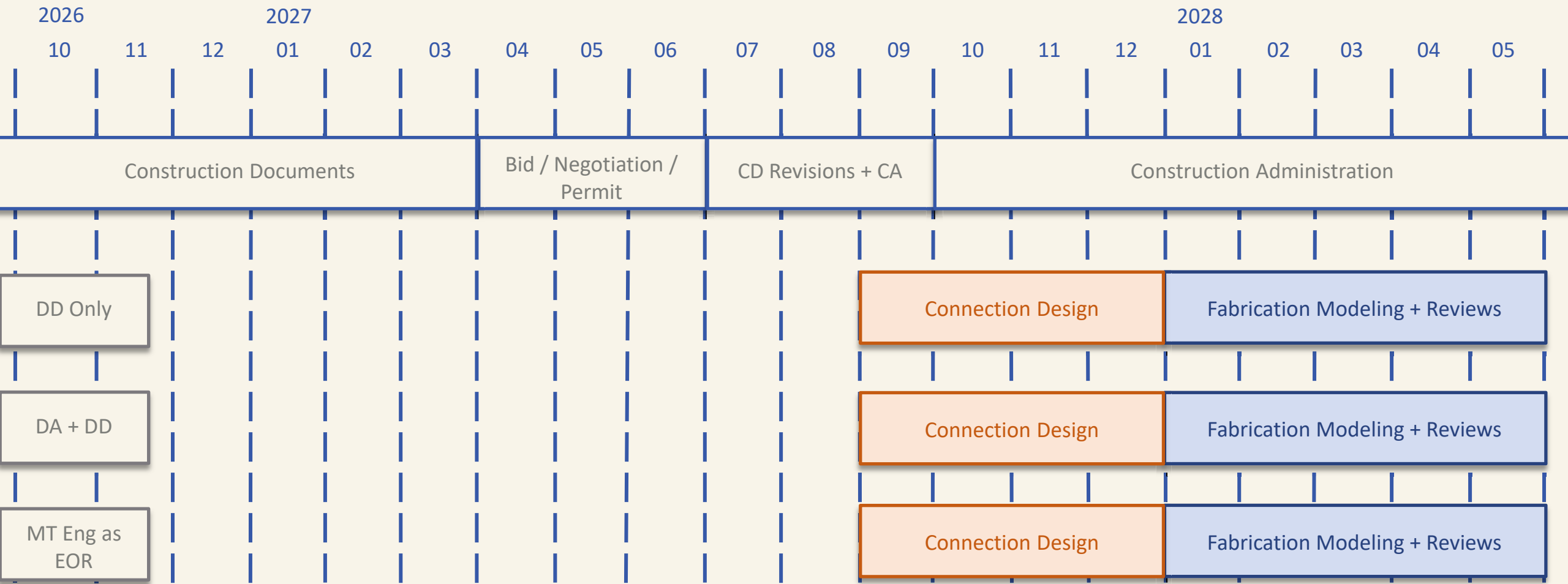




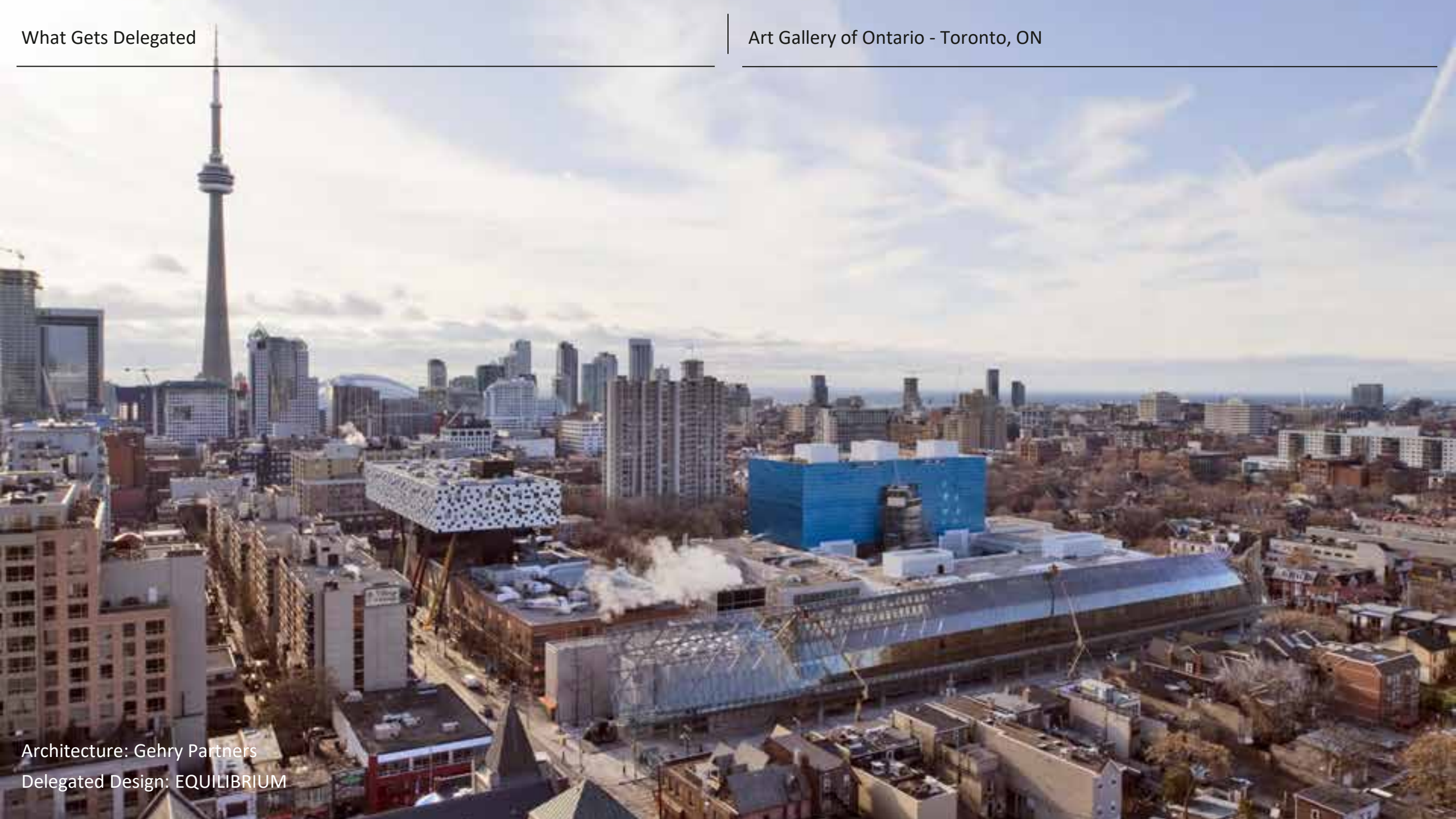
Saved \$1.5M on \$7M
timber package.



Schedule Comparison



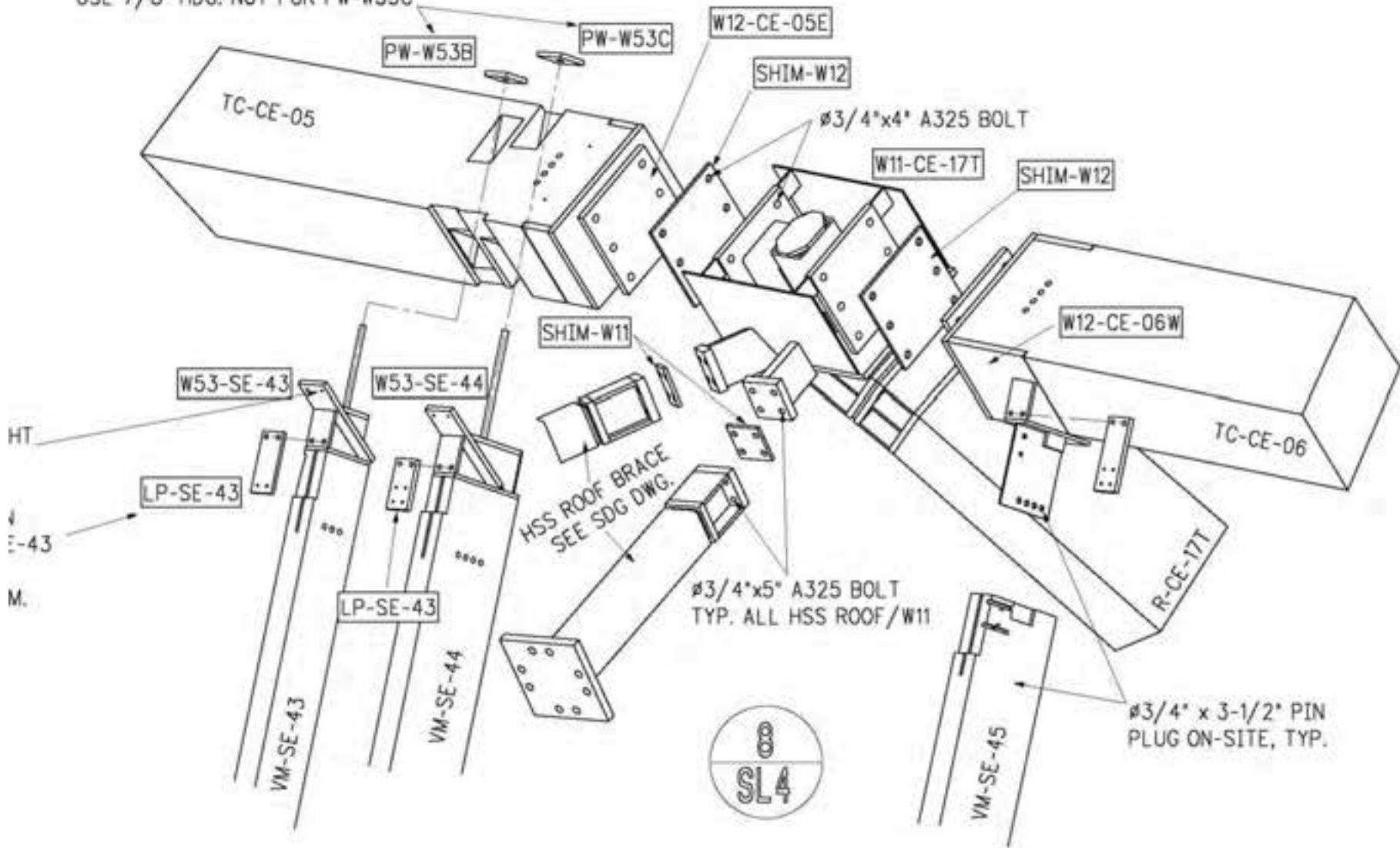
What Gets Delegated?





USE 3/4" HDG. NUT FOR PW-W53B

USE 7/8" HDG. NUT FOR PW-W53C







Architect: Kirksey

EOR: EHW

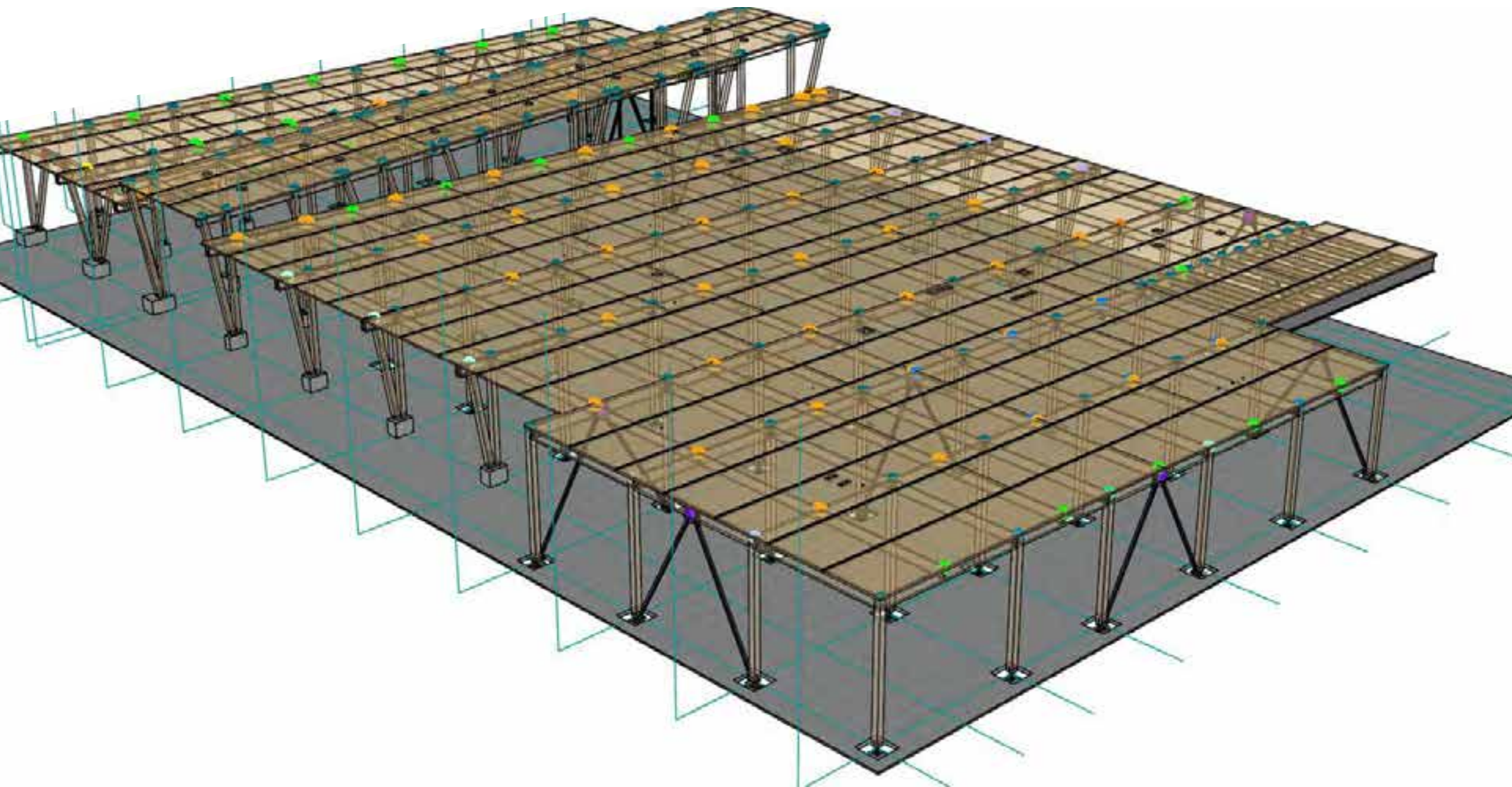
MT Supply: Mercer

Delegated Design + Fabrication Modeling: EQUILIBRIUM

Photo by Aker Imaging







Design Team Requirements for Delegated Design

As early leaders in the structural design of timber buildings, we have learned a lot over the years. We've developed internal guides and tools to help us efficiently design our projects, and now we'll be releasing some of these items publicly. Check this page for up-to-date design resources created by the team at EQUILIBRIUM.

We welcome your questions, comments, and any errata that you may find in our resources. Please drop us a note at designresources@eqcanada.com.



[equilibrium-eq.com/
design-resources](https://equilibrium-eq.com/design-resources)



UPDATE - Version 1.1 Released February 29, 2024

CLT Design Tools (US)

Use these accessible spreadsheet-based tools to design CLT roofs, floors, and walls in accordance with the latest building codes and standards in the United States. These tools cover the majority of real-world design cases and make designing CLT simple and fast. Use the built-in database to quickly select CLT layups that are available today from PRG 320 certified suppliers. This is the tool that Equilibrium engineers use every day on our projects! This project was made possible with funding from a US Forest Service Wood Innovation Grant (FY 2022) and matching funds from the Softwood Lumber Board. Click the link below to download the resource.

[Download Resource](#)



Version 1.0 Released November 19, 2024

Design Team Requirements for Mass Timber Delegated Design

Many mass timber projects utilize delegated design of mass timber connections and sometimes even mass timber members. We have developed this document as a guide for EORs and AORs. It lays out in clear terms what information is required for a successful handoff to a delegated mass timber designer (aka specialty engineer). The information contained within is useful for any project with mass timber delegated design.

[Download Resource](#)

SPECIALTY ENGINEERING SCHEDULE		
Section	Items requiring specialty engineering	Additional Submittal or Review Requirements
TIMBER		
Glued-laminated timber (Glulam)	Connections not fully detailed in the drawings.	Detailed connection drawings, detailed calculations, and associated design capacities are to precede regular shop drawings.
Cross-laminated timber	a) Design of CLT panels, including location of splices, thickness of panels and layup if different from noted on drawings. b) Design of connections not shown on structural drawings, including CLT to CLT members, CLT to glulam, CLT to steel and CLT to concrete connections	a) Detailed connection drawings, detailed calculations, and associated design capacities are to precede regular shop drawings. b) Panel drawings for erection procedures including lift hardware and bracing requirements if required

Fabrication Design / Shop Drawings



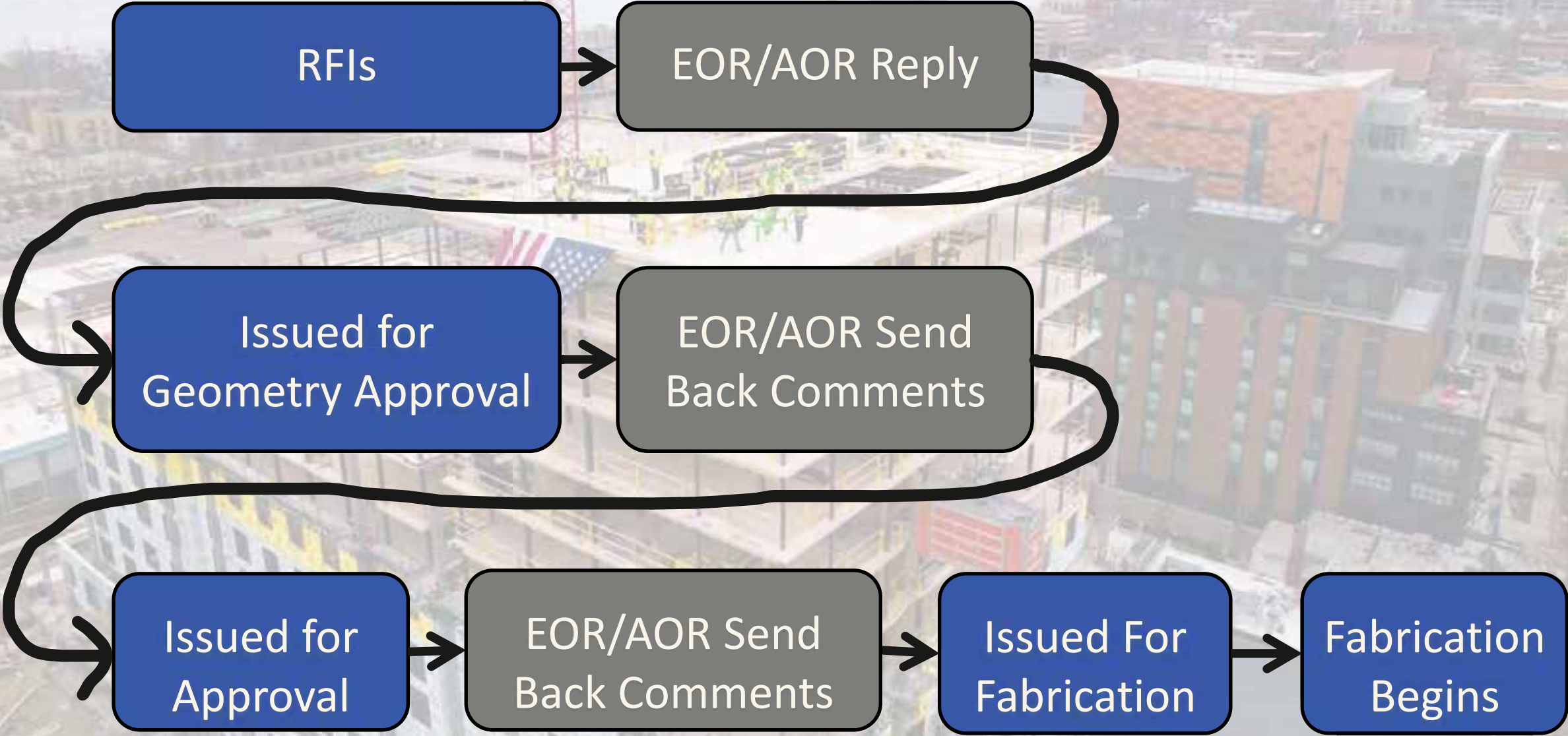
Fully Baked Shop
Drawings

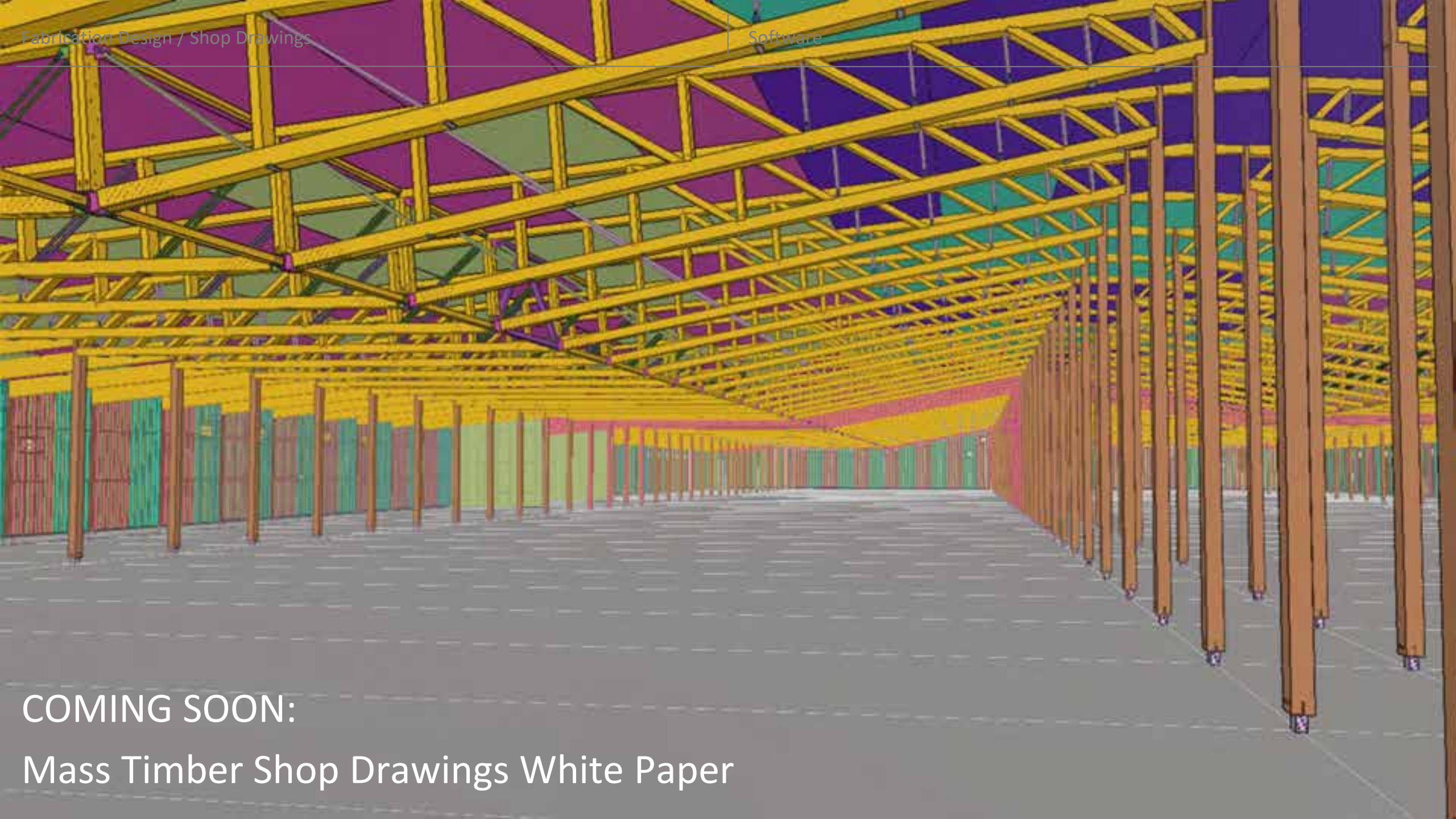


EOR/AOR Send
Back Comments



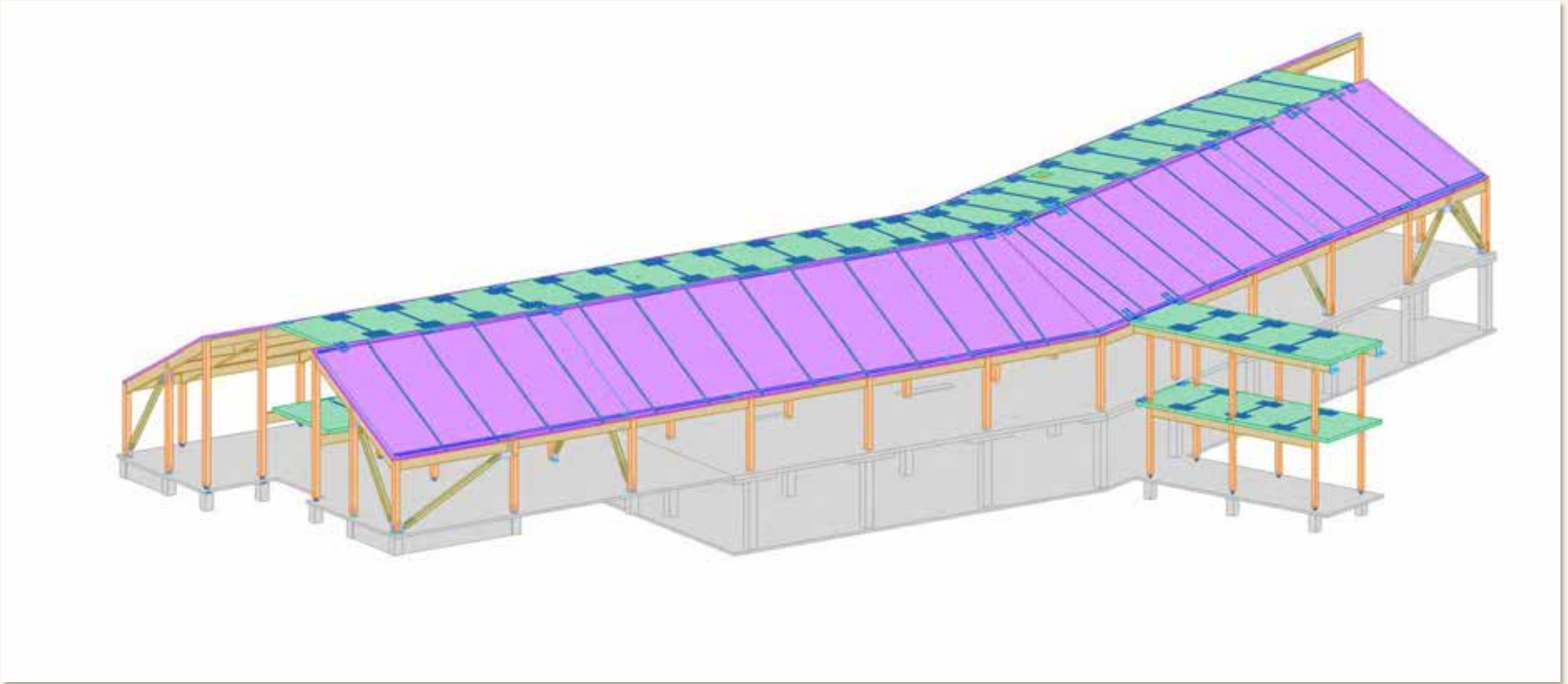
Fabrication
Begins

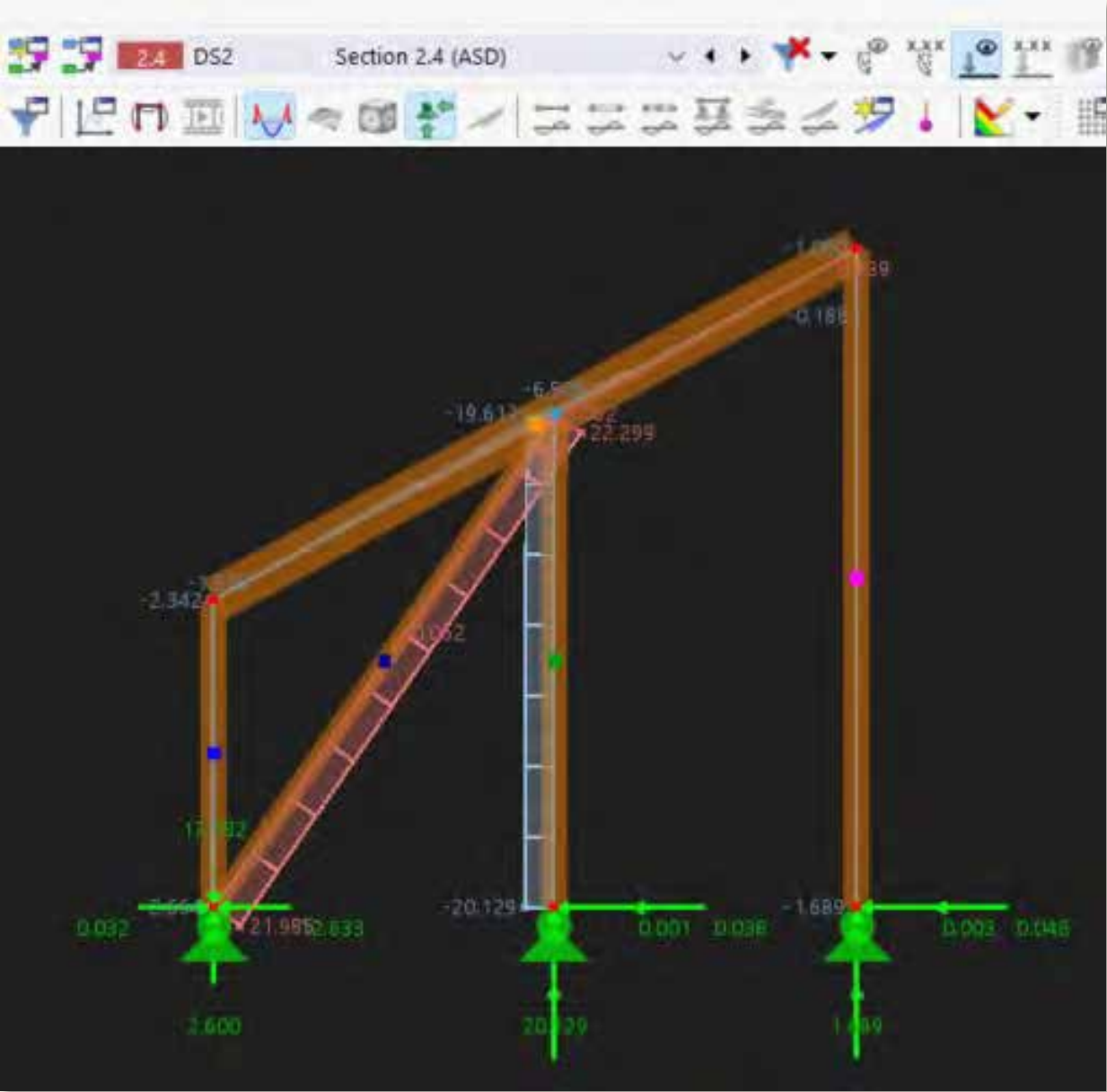
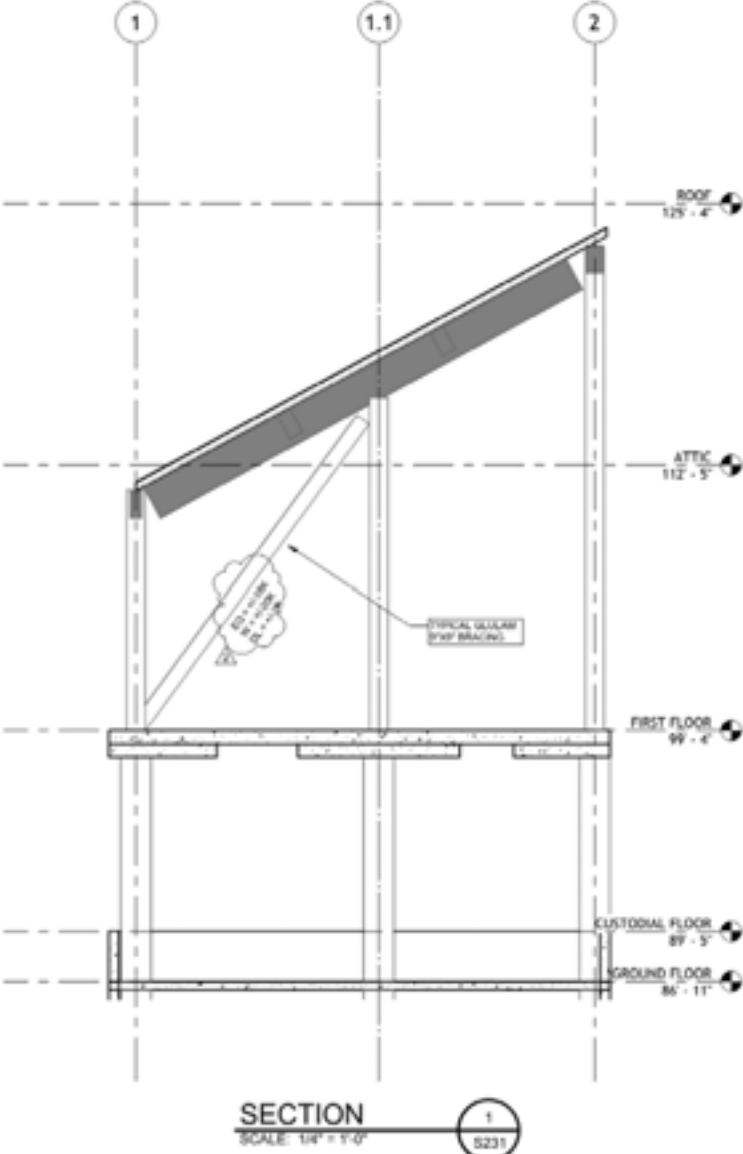


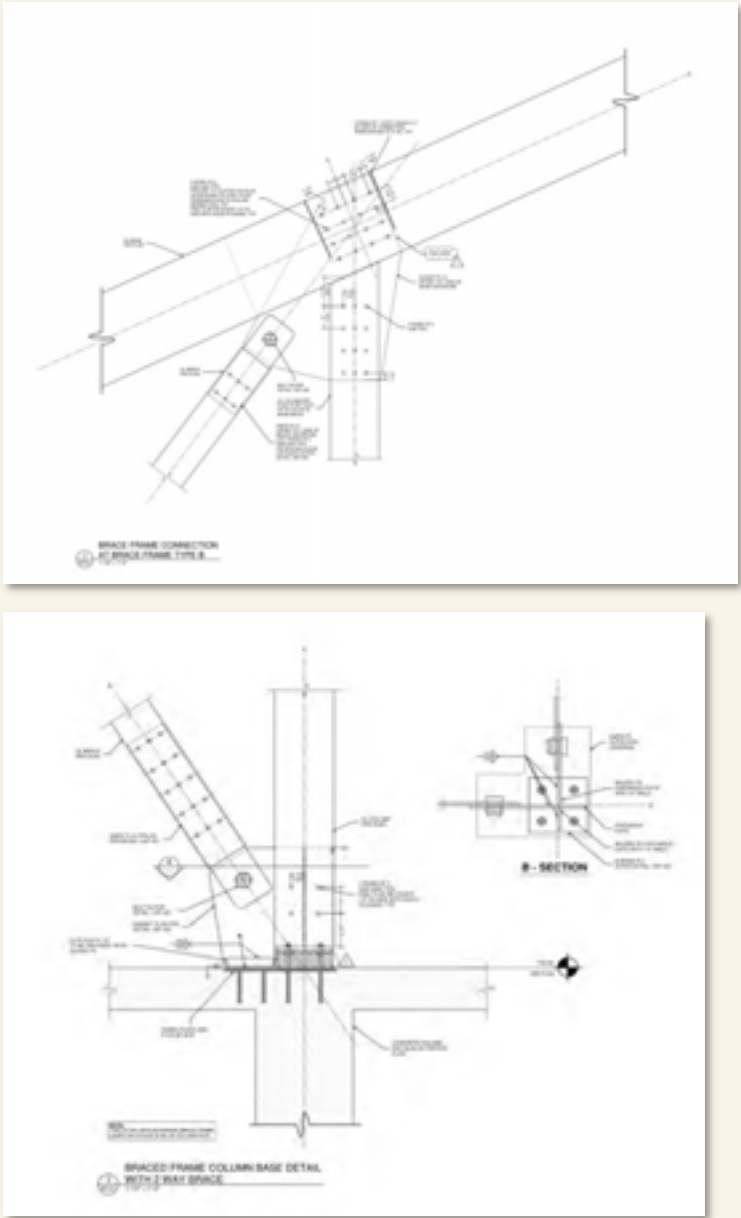
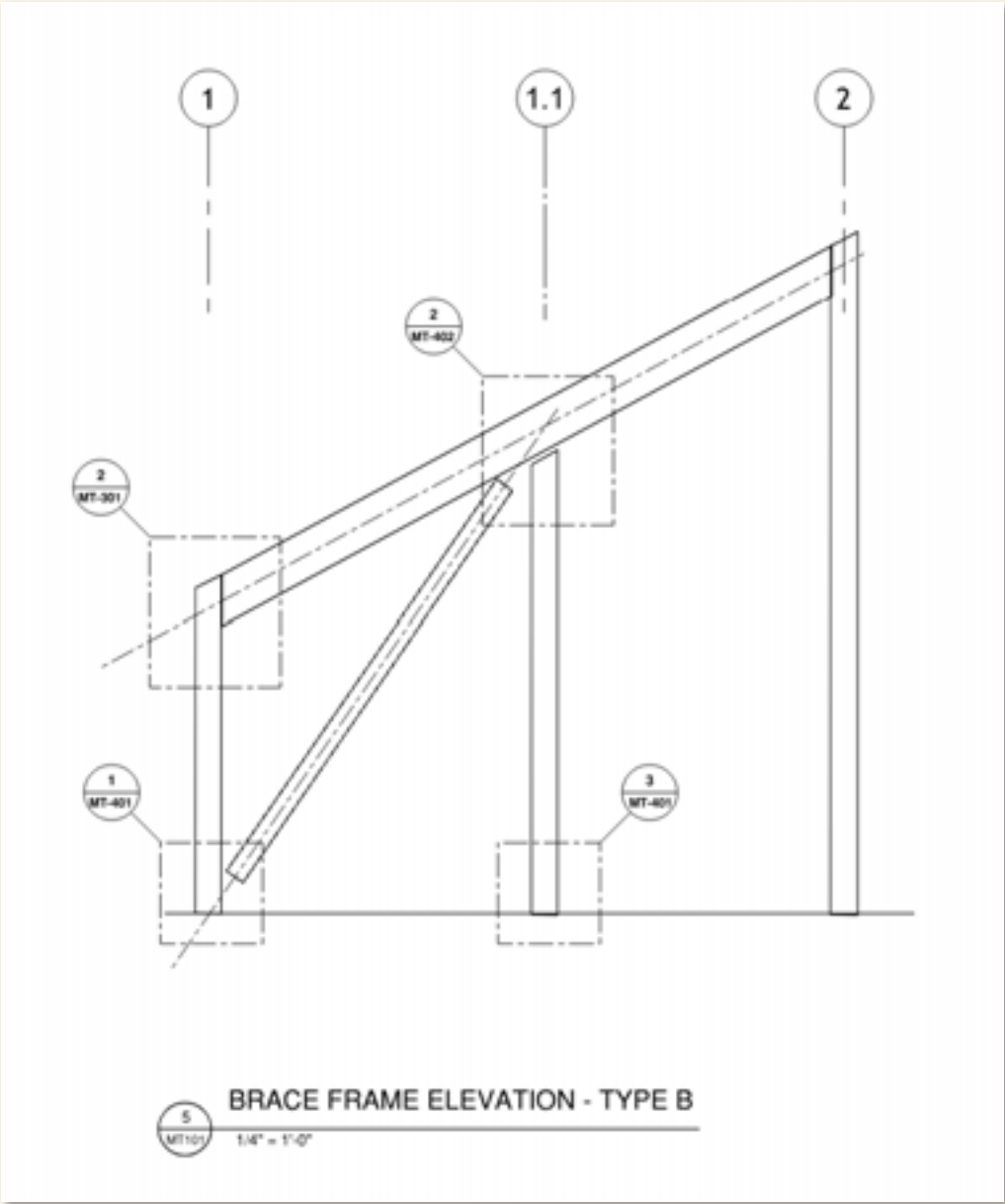


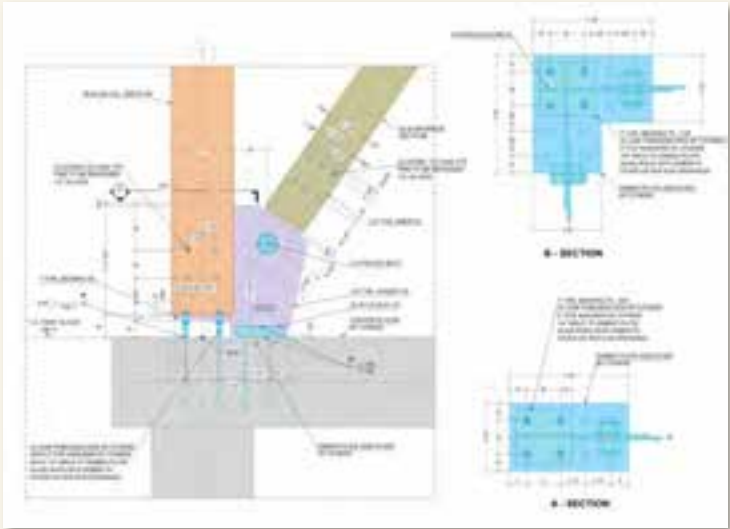
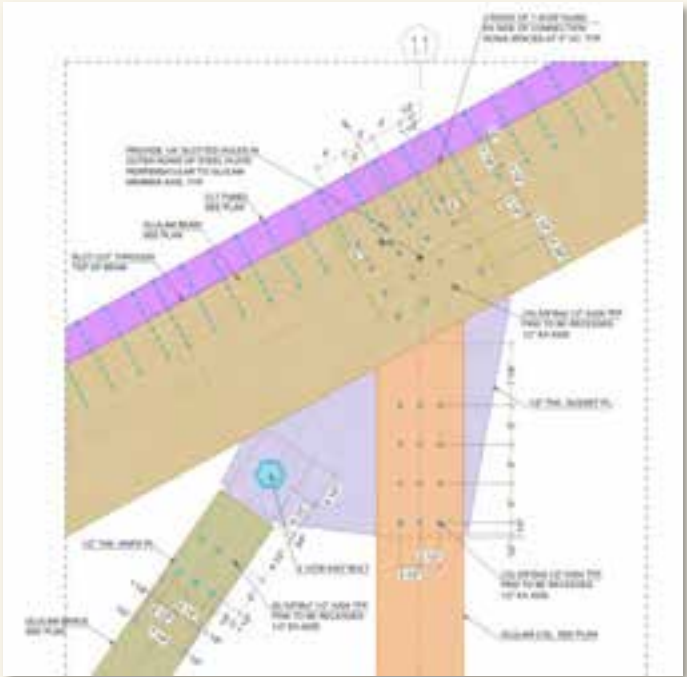
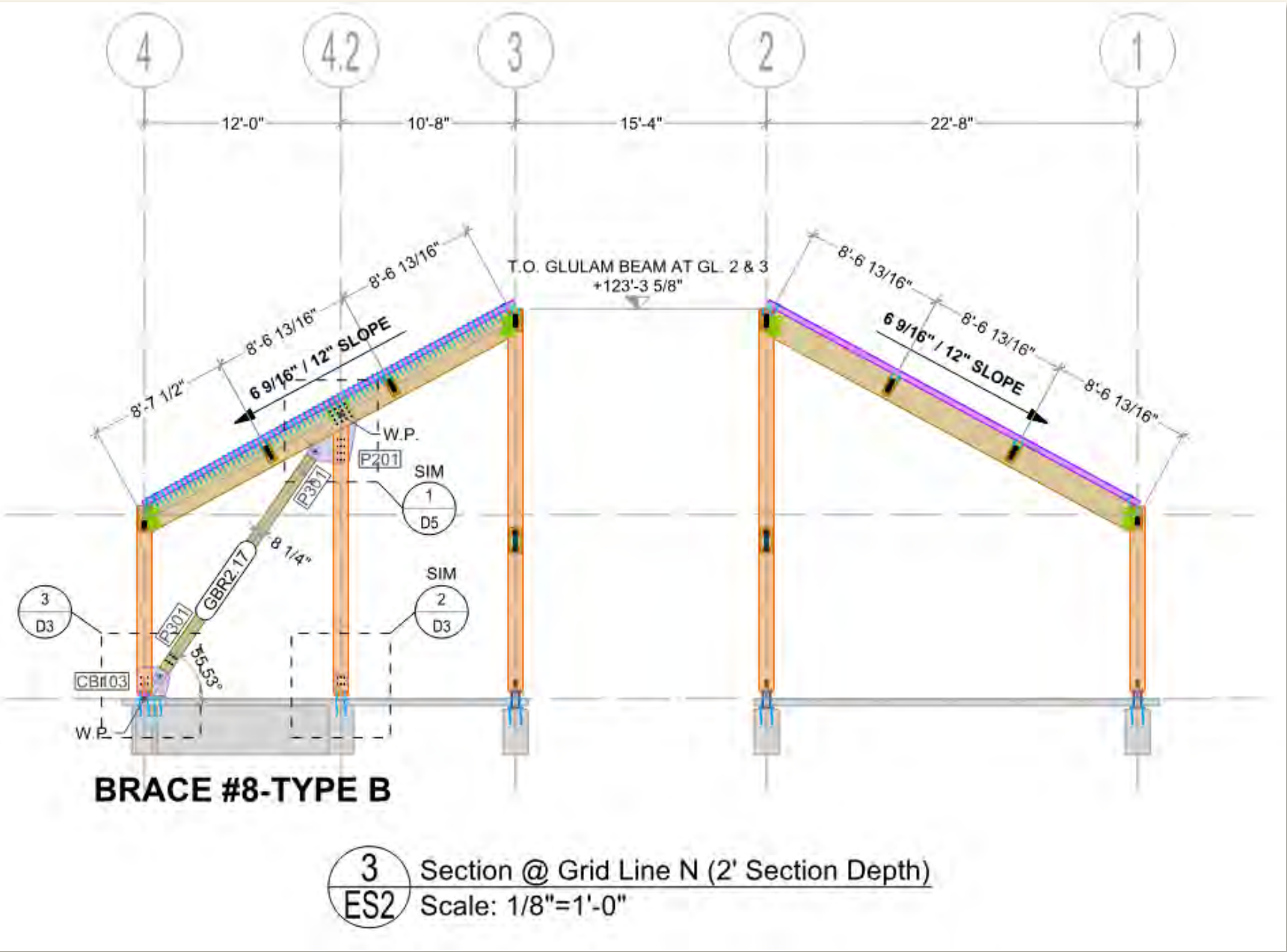
COMING SOON:
Mass Timber Shop Drawings White Paper

Burroughs Elementary School in Washington, DC















Contact:
Matt Kantner, PE, SE
Principal and US Lead
mkantner@equilibrium-eq.com

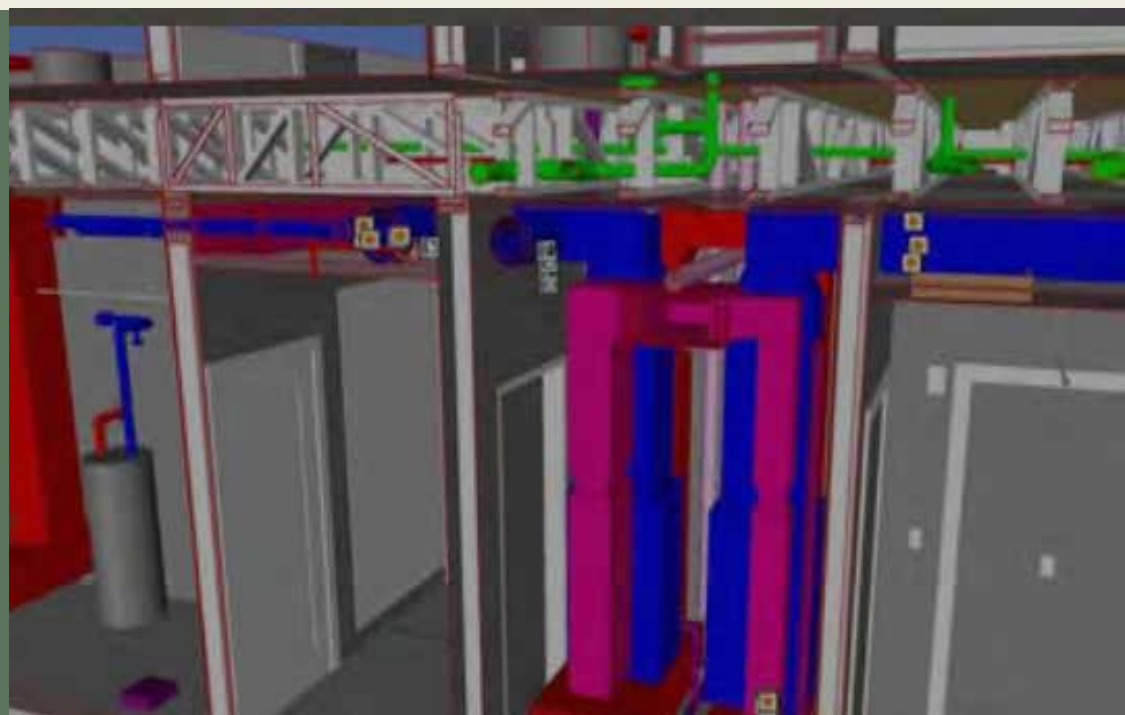




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BIM: Models, Coordination & Constructability

Using digital engineering to de-risk construction



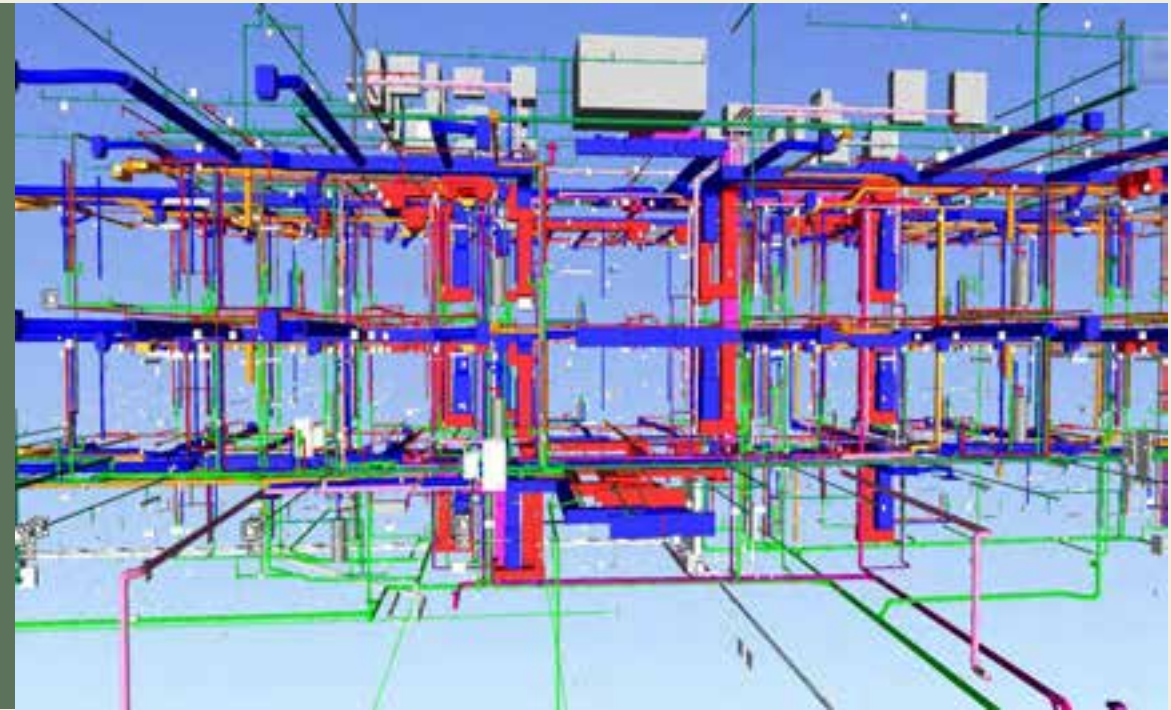
MASON BRANDT, P.E. | WOODCORE ENGINEERING

BIM Introduction

Central Idea

Successful BIM means building the structure digitally before it is built physically. The model represents the building as it will ***actually be constructed***, with every member, connection, and penetration resolved to fabrication-level detail, so that design, manufacturing, and field assembly all work from the same verified information.

The result is ***faster delivery, fewer conflicts*** in the field, and ***tighter control of cost***.



3-story all-inclusive MEP model

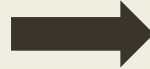
Build it twice: first virtually, then physically

What Successful BIM Delivers

Successful BIM can yield specific results.

Goals of BIM

- Coordinate Architecture, Structure, MEPF systems for seamless integration - Provides a "Single Source of Truth" on the project.
- Early decision making leads to clash-free coordination. Supports Offsite Construction at Construction at **SCALE** and **COMPLEXITY**
- Continuity of information from design through through fabrication, construction, and operation operation



Results of BIM

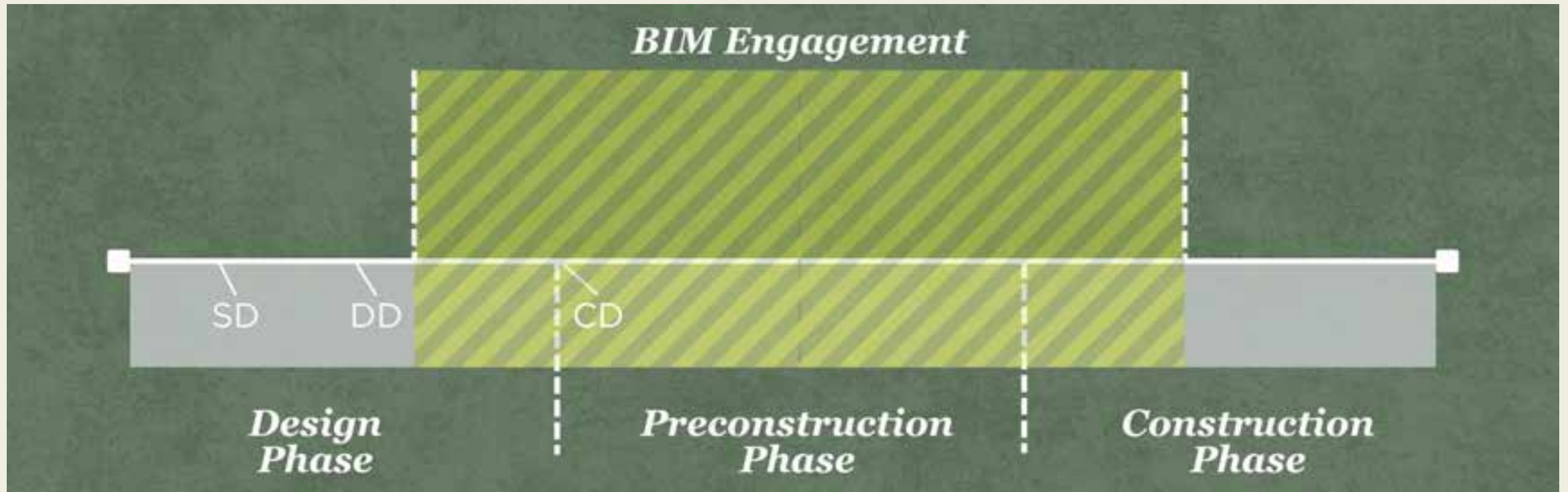
1 Schedule Compression

2 Coordination & Quality

3 Cost Certainty

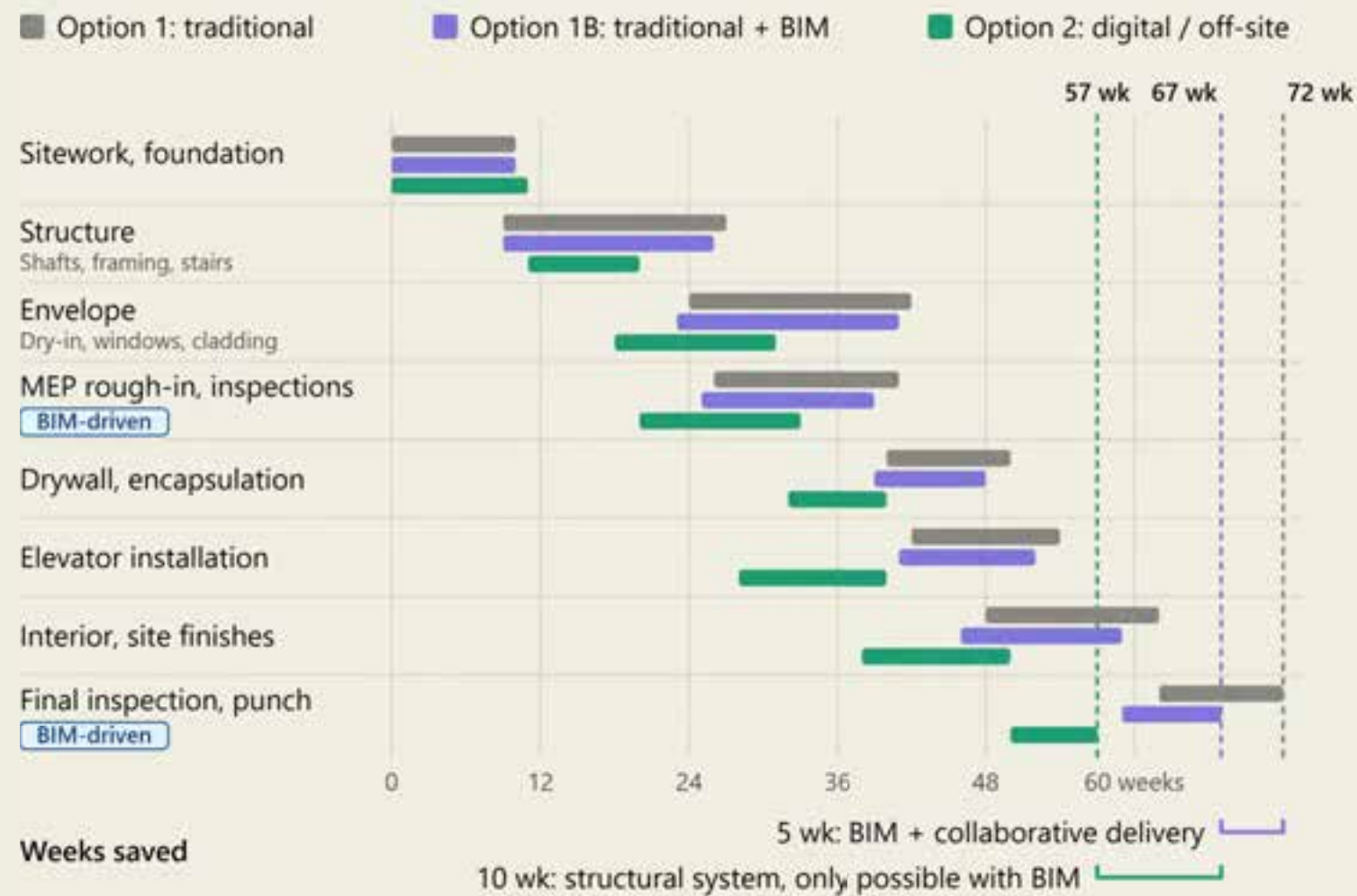
An hour in the office can save days on-site.

Coordination Decisions Do Not Have the Same Impact at Every Project Phase.



Pulling items off the jobsite at the end of construction into the conference room

Schedule Comparisons with or without BIM.



Projected, planning-level estimates. Weeks from mobilization. Four-story, 48-unit apartment building.

Case study: Woodward lofts

Hybrid Coordination in Practice.

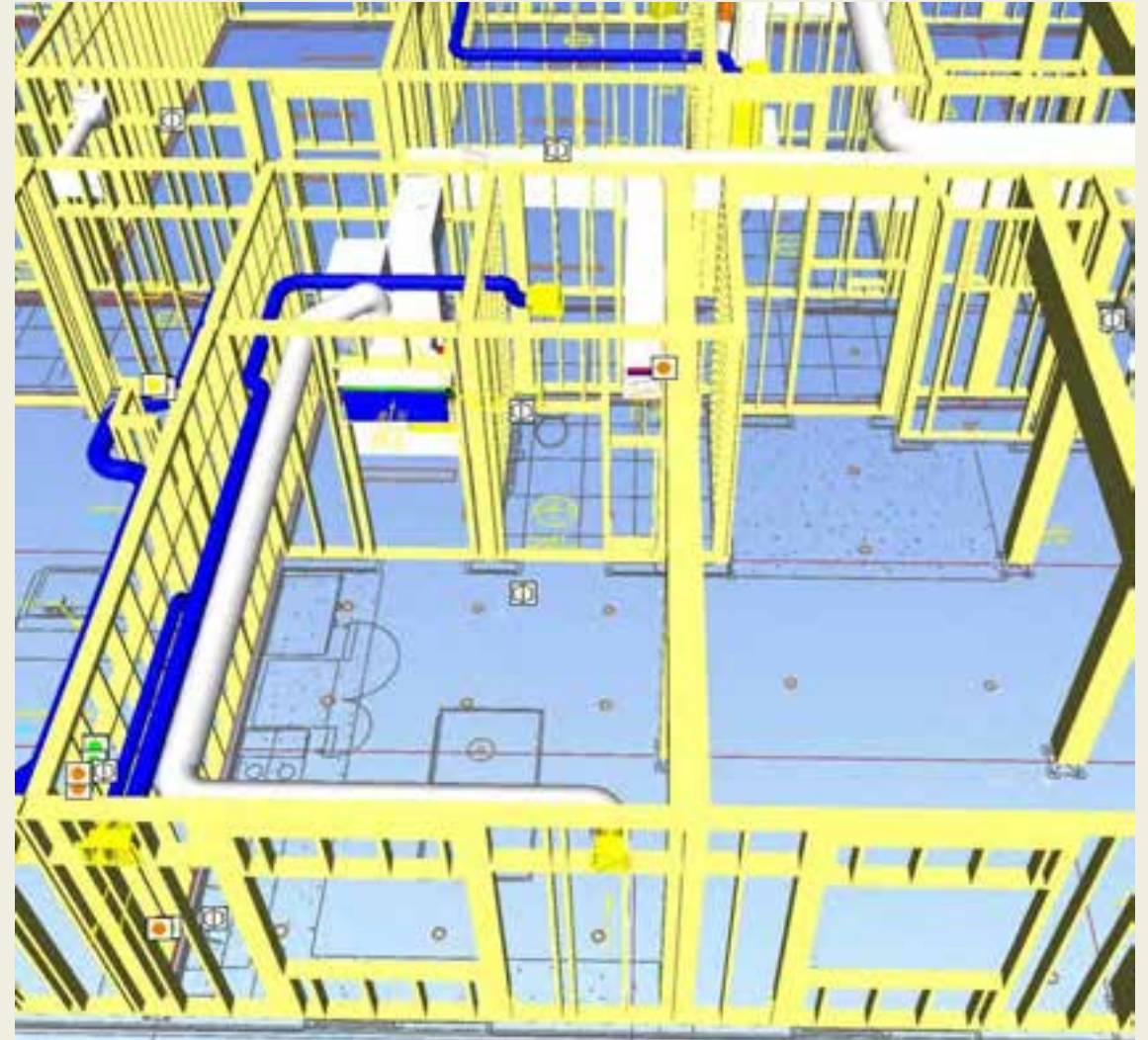


Woodward Lofts | Harrisburg, PA

48 affordable senior housing units | Hybrid mass timber

Hybrid coordination required multiple structural and building systems to be resolved within the same model.

To learn more – see Elmer Zook’s presentation tomorrow.
tomorrow.



Prefab Walls, CLT Floors, CLT Elevator Cores.

- Floor slab up = off-site
- Pre-fab walls, CLT floor panels, CLT elevator shafts
- 1-Hour fire rating in all common areas
 - All openings, penetrations, etc. were coordinated

Time Savings Example

	Woodward Lofts – Fully off-site structure	Traditional CMU, Light Frame Built on Site, Floor Trusses
Stairs/Elevators	1 week for 3	Roughly 6 weeks
Floors	1-2 days per floor	5-7 days per floor
Total	2 weeks	9 – 11 weeks

NOTE: Difference solely between 2 factors, additional weeks or months considering Prefab walls vs. onsite lwf & MEP coordinated vs. onsite.



Case study: Colby College Student Housing

Off-Site Construction & BIM over Six Buildings



Colby College| Waterville, ME

**6 Student Housing Buildings | Hybrid mass timber & light-
& light-framed wall panels**

Hybrid coordination required multiple structural and building resolved within the same model.

To learn more join tomorrow's presentation by Elmer Zook



Mass Timber+ Presentation | Delegated Design, Shop Drawings & BIM Coordination for Mass Timber Projects

Example: Colby College

Light Framed Walls & CLT Floors

Model-coordinated penetrations fabricated before installation

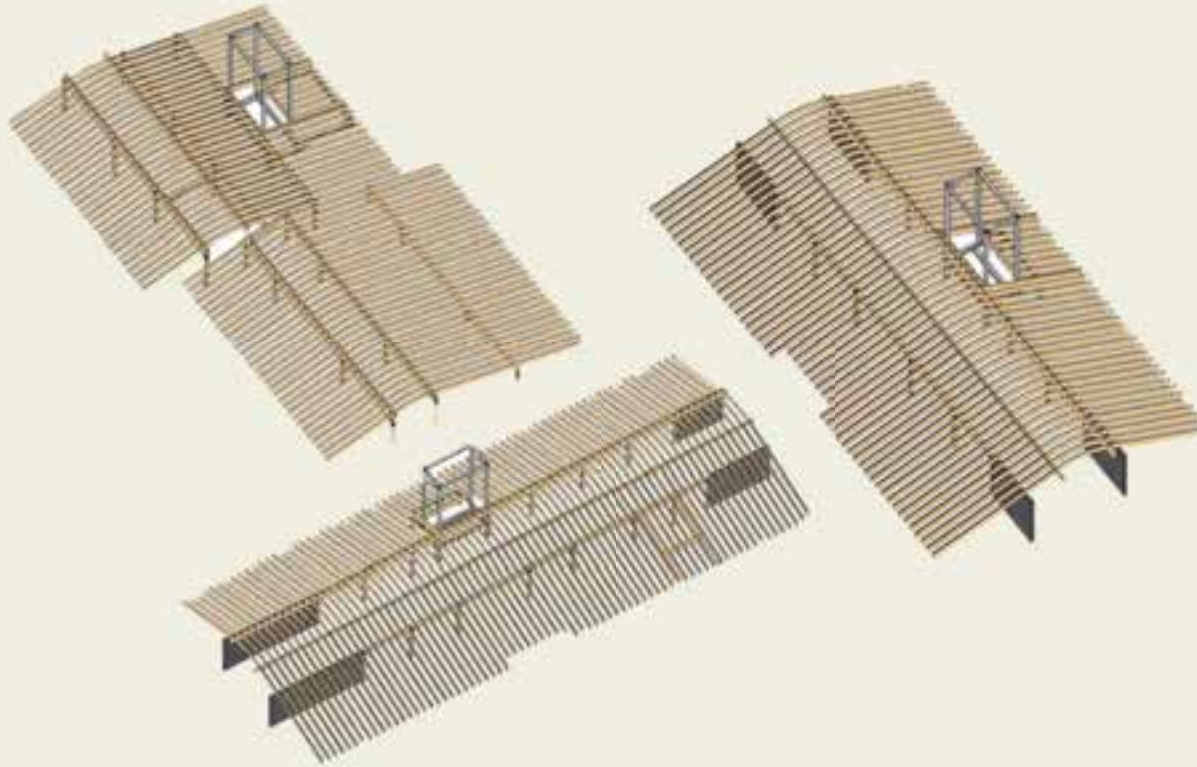


Pre-drilled & coordinated penetrations

Example: Colby College

Prefabricated Curved LVL Roof Rafters

Model ready drawings and design for seamless field execution



Modeling and designing led to a repeatable system. Exact shop drawings & CAD file to ensure fabrication & CNC was precise.

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Case study: PASPA

Composite Construction with Timber.



PA State Police Academy Marquee Building | Hershey, PA

Marquee building on new state police campus | Hybrid mass timber & hybrid steel



Example: PASPA

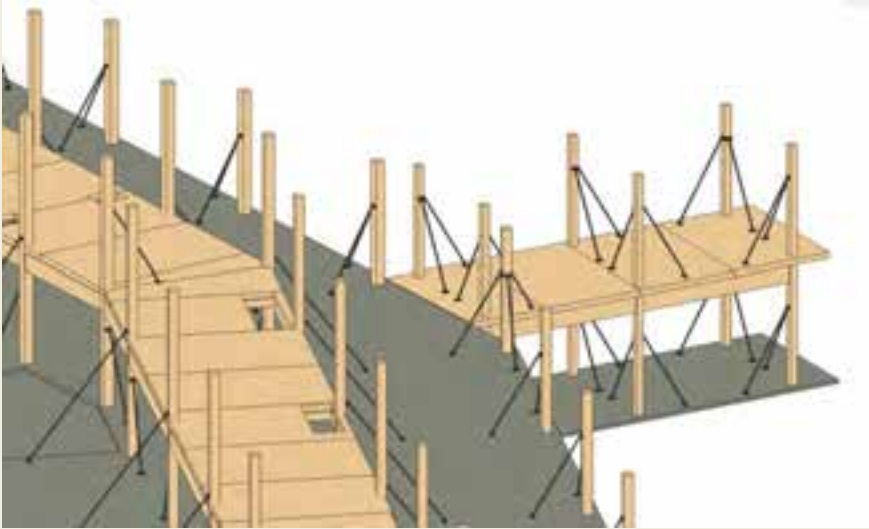
Steel Nelson Studs & CLT Panel Coordination



Over 10,000 coordinated steel nelson studs with CLT decking
288 CLT panels

Case study: Burroughs ES

Designing for Constructability.



Burroughs ES| Washington, D.C.

Multi-use educational wing addition | Mass timber columns, beams, & panels



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Example: Burroughs ES

Off-the-Shelf vs. Custom Connections



Example of Off the Shelf Hardware



Example of custom hardware with construction tolerance.

What has to change on your next project?

Work backward from the fabrication release date.

Owners — Put the fabrication release date on the schedule in week one.

Designers — Freeze the decisions that drive fabrication.

Contracts — Define what the model holds, who owns it, who resolves it.

Hard bid? — You can still require the coordination.

Build it twice: first virtually, then physically

QUESTIONS?

This concludes the American Institute of Architects Continuing Education Systems Course.