

Peggy Ryan Williams Center

Ithaca, New York

Angela Mincemoyer | Structural
Dr. Boothby

Site and Location Plan

○ Ithaca, New York

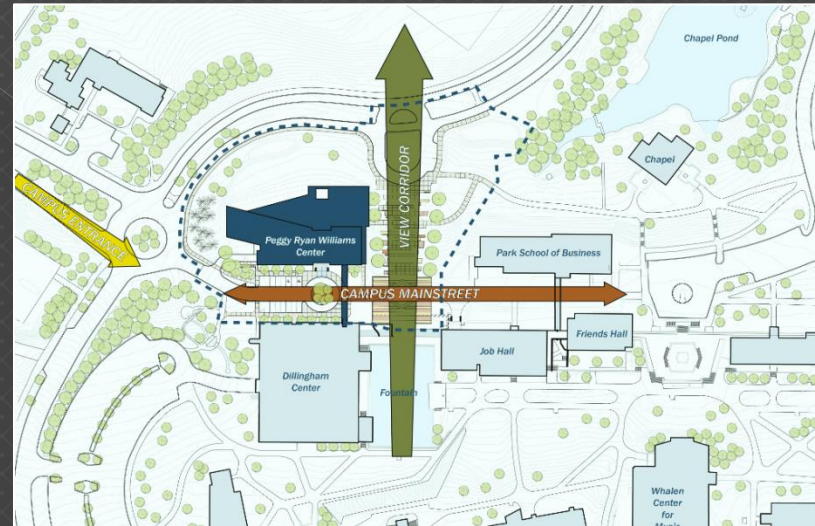
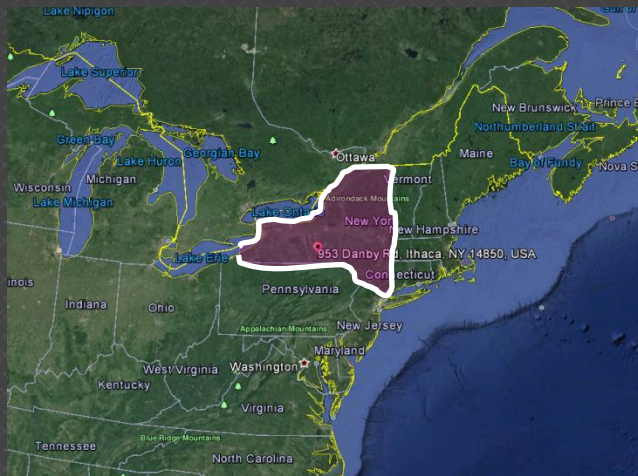


Photo provided courtesy of Holt Architects

General Information

- Occupant
 - > Ithaca College
- Occupancy
 - > Office Use
- Size
 - > 58,200 gross square feet
- Stories
 - > 4 stories
- Substantial Completion
 - > March 2010



Photo provided courtesy of Holt Architects

Existing Structural System

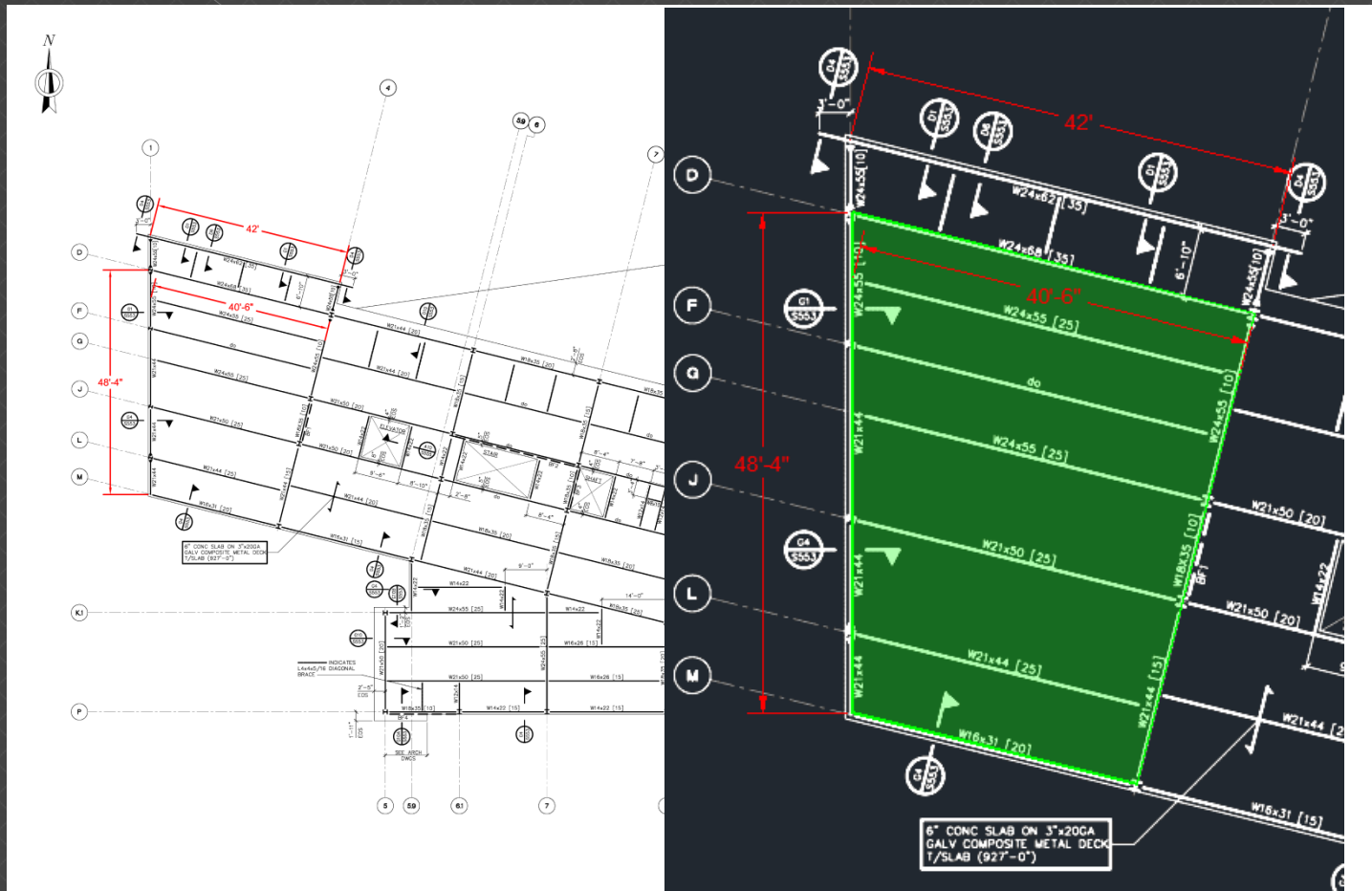
- Steel Framing

- > Composite metal deck
- > Wide flange beams, girders, and columns
 - Most beams and girders are composite action

- Lateral System

- > Concentrically braced structural steel frames

Typical Floor Plan/Typical Bay



Gravity Spot Checks

Deck Checks



- > Shoring
 - May be unshored for 2 and 3 span conditions
- > Strength

Beam Checks



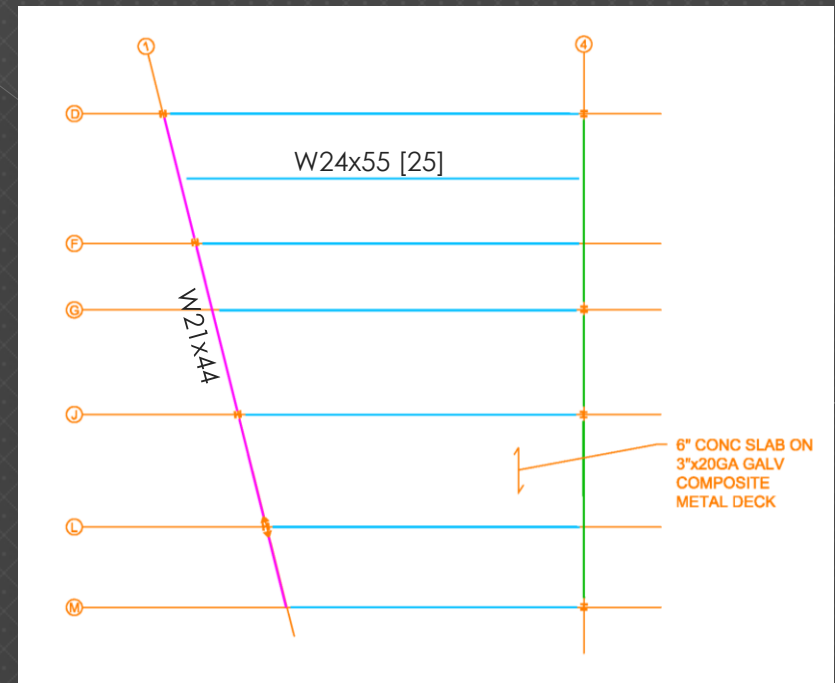
- > Strength
- > Shoring
 - No shoring is required for strength
- > Wet concrete deflections
- > Live load deflections

Girder Checks



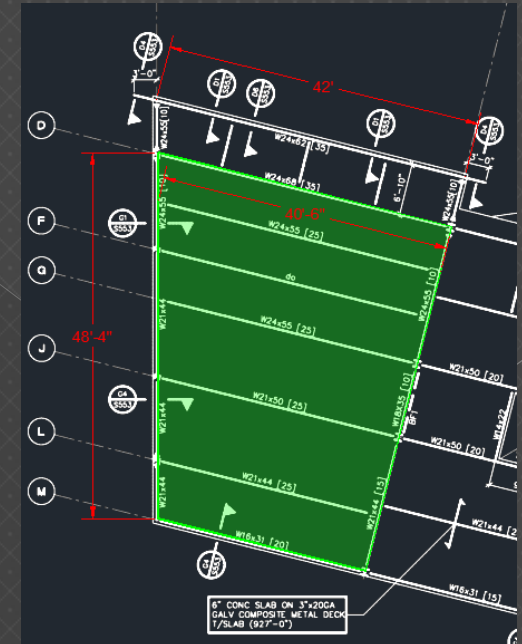
- > Strength
- > Deflections

Interior & Exterior Columns



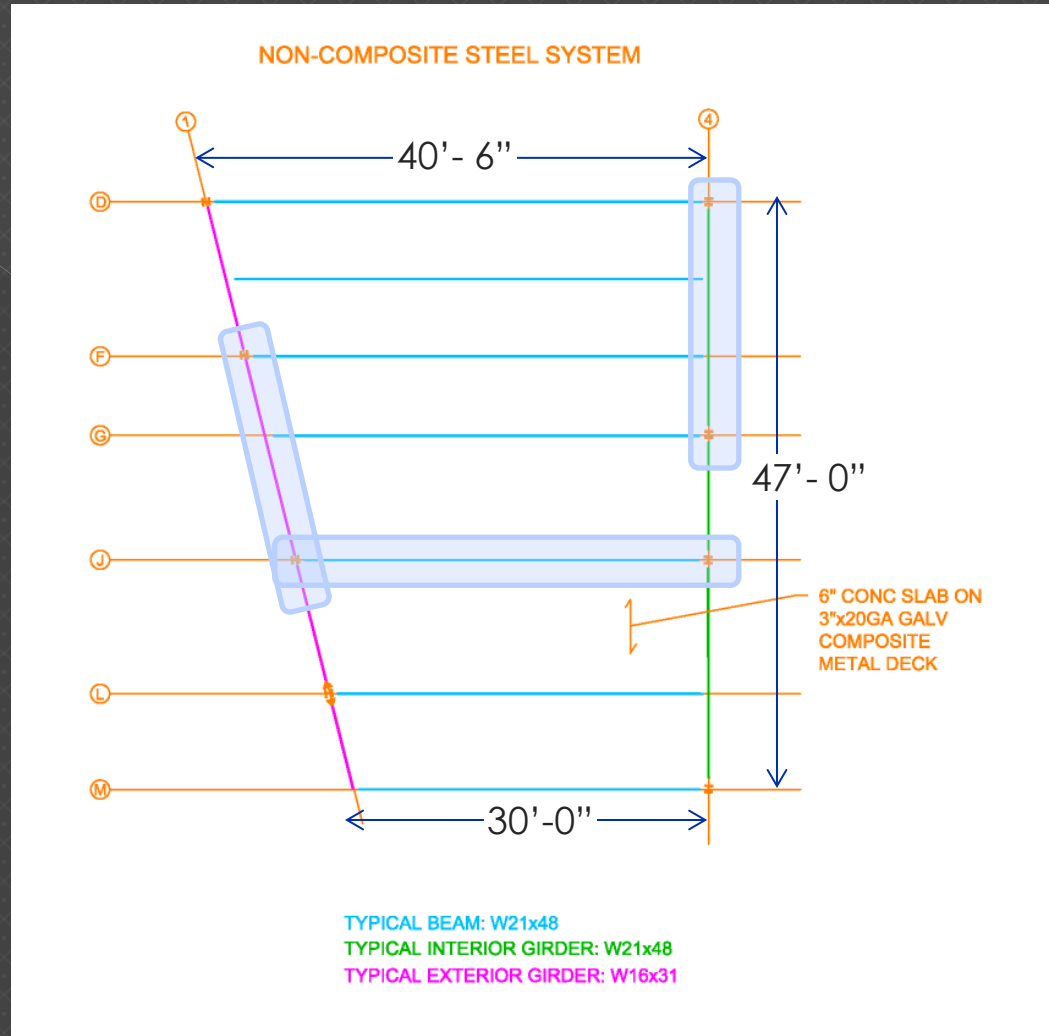
Alternative Framing Systems

- Typical Bay used includes a cantilever
 - > Made more “typical” by removing cantilever
 - > Briefly mention how to design for cantilever
- Alternatives
 - > Non-Composite Steel
 - > Glulam
 - > Prestressed Concrete
 - Post-tensioned slab
 - Reinforced Concrete Beams



Non-Composite Steel

- Existing Deck
- Existing beam/girder layout
 - > Avoids moving/adding columns



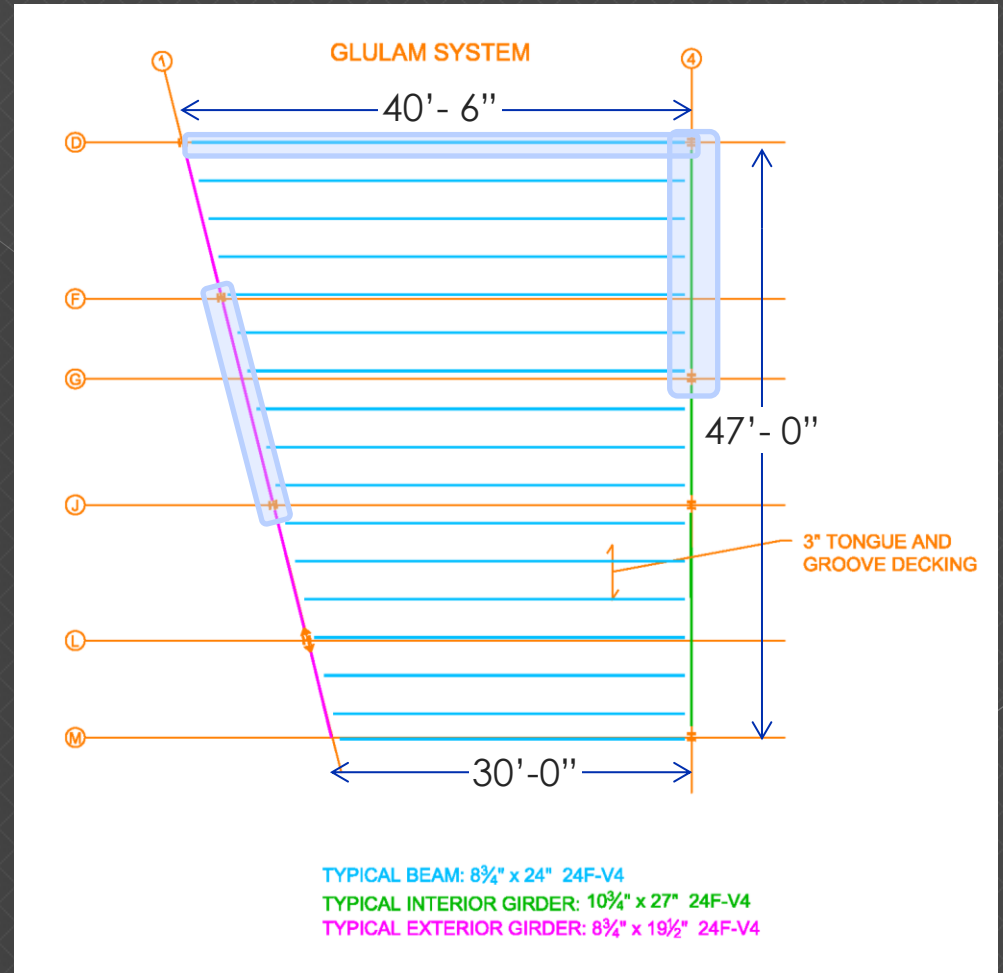
Non-Composite Steel

- Advantages:
 - > Works well if use precast concrete plank floor system
 - > Cantilevers
- Disadvantages:
 - > Not economical (not as much strength for \$\$)
 - > Deeper
 - > Floor vibrations
- Cantilever design
 - > Moment Connections
- Possible Lateral Systems
 - > Concentrically braced structural steel frames
- Better than existing composite system?
 - > No!
 - Even though this system is possible, it is not recommended.



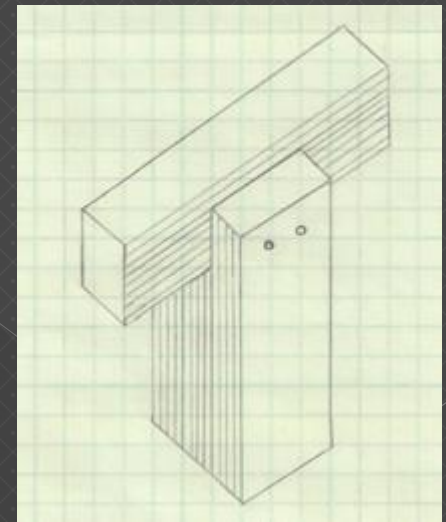
Glulam

- 3" Tongue & Groove Decking
- Typical beams spaced @ 3'-0"
- Existing girder layout
 - > Avoids moving/adding columns



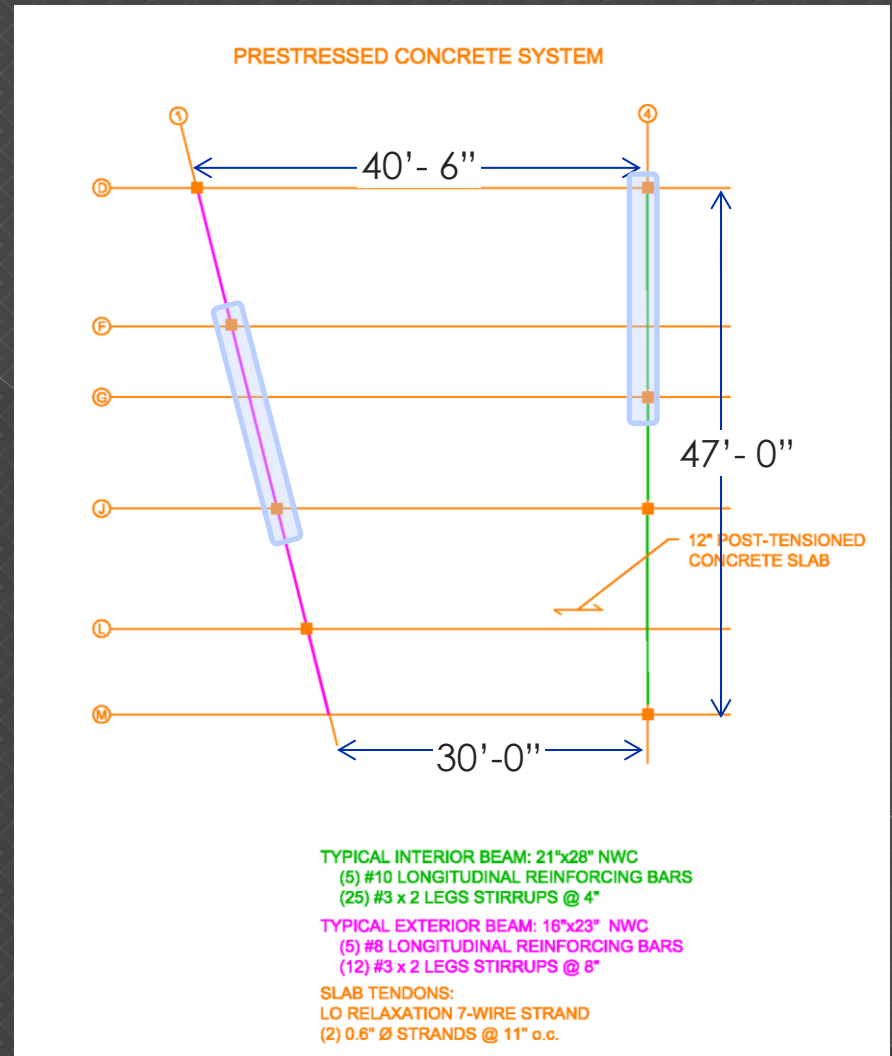
Glulam

- Advantages:
 - > Lighter
 - > 1 hour fire rating
 - > Cheaper
- Disadvantages:
 - > Depth
 - > Floor vibrations
 - > Connections
- Cantilever design
 - > Continuous girder
- Possible Lateral Systems
 - > Wood moment frame
 - > Wood shear walls
 - > Current system
 - Concentrically braced steel frame
- Better than existing composite system?
 - > Further investigation is required.



Prestressed Concrete

- One way post-tensioned concrete slab
 - $f'c = 4000$ psi
 - $f'ci = 3500$ psi
- Existing girder layout used for beams
 - Avoids moving/adding columns
 - $f'c = 4000$ psi



Prestressed Concrete

- Advantages:

- > More shallow
- > 2 hour fire rating
- > Long spans

- Cantilever design

- > Continuous beam

- Possible Lateral Systems

- > Shear walls
- > Moment frame

- Better than existing composite system?

- > Further investigation is required.

- Disadvantages:

- > Heavier

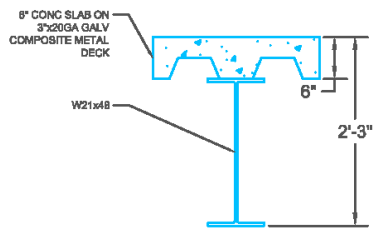


Overall Comparison

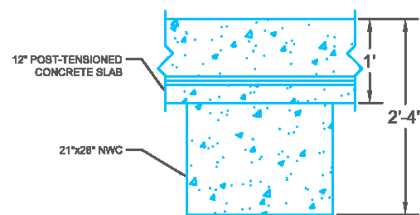
Considerations	System							
	Composite Steel (Existing System)	Rank	Non-Composite Steel	Rank	Glulam	Rank	Prestressed Concrete (Post-tensioned Slab)	Rank
General								
Cost (\$/SF)	\$25.88	3	\$35.31	4	\$8.74	1	\$23.48	2
System Weight (psf)	74.79	3	66.13	2	22.90	1	179.81	4
Durability	acceptable	1	acceptable	1	acceptable	1	acceptable	1
Architectural								
System Depth (in)	30.125	4	27	1	30	3	28	2
Additional Fire Proofing Req'd	none		none		none		none	
Fire Rating (hours)	0	3	0	3	1**	1	2	2
Conclusion								
Viable?	yes	14	yes (not recommended)	11	yes	7	yes	11
Future Investigation?	n/a		no		yes		yes	

* NOTE: PRWC is Type IIB Construction Type → According to IBC 2009 Section 601 (Table 601), no additional fire proofing is required on structural elements.

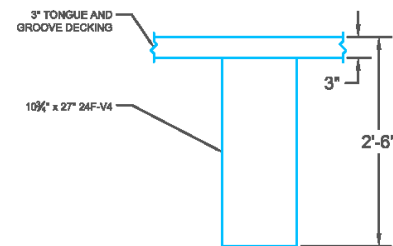
** Glulam is rated at 1 hour. After this 1 hour, 1.5" have been charred and the structural element is no longer reliable.



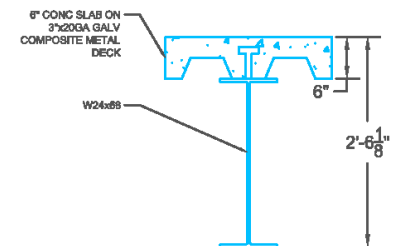
NON-COMPOSITE STEEL SYSTEM



PRESTRESSED SYSTEM



GLULAM SYSTEM



COMPOSITE STEEL SYSTEM

Thank You



Photo provided courtesy of Holt Architects