

Technical Report 3

11141 Georgia Avenue

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Structural Option
Advisor: Aly Said

Building Information

11141 Georgia Avenue

Height: 158 Feet

14 Stories

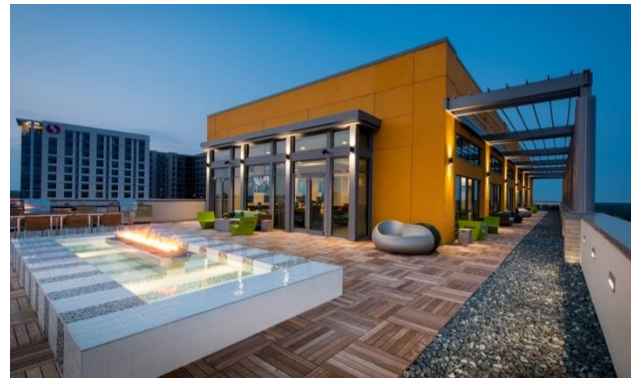
Size: 179,760 GSF

High Rise Apartment Building

- One and two bedroom studios
- Penthouse Terrace

Structure:

- Existing 5-story concrete office building
- 7-story steel addition and renovation



Site and Location – Wheaton, MD

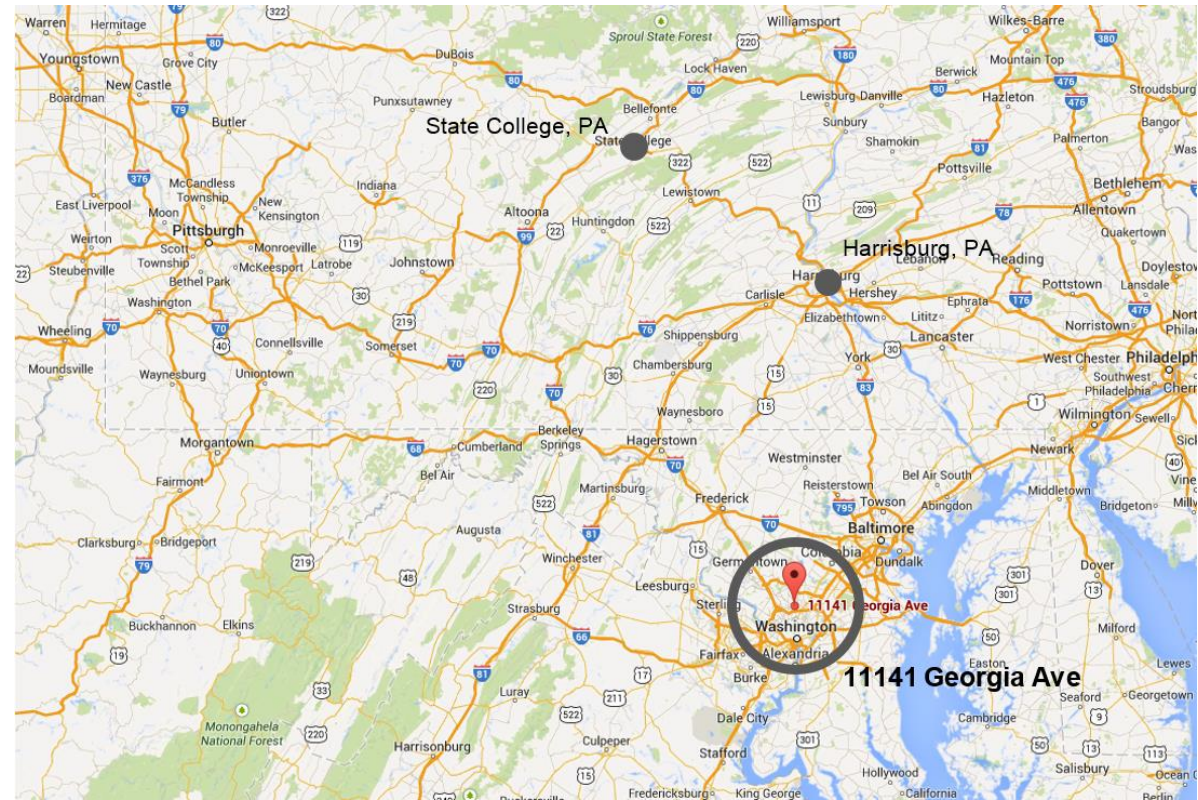


Figure 1: Building Location on Site, Courtesy of Bonstra Haresign Architects

Existing Structural System

Concrete Building with Steel Addition

- Typical Bay Size 20' x 20'
- 60' wide, 214' long

Spread Footings and Retaining Wall

- 2'6" average footing depth

Gravity System

- Flat slab with drops and perimeter beams in concrete portion
- Composite floor joists and deck on wide flange girders in steel addition

Lateral System

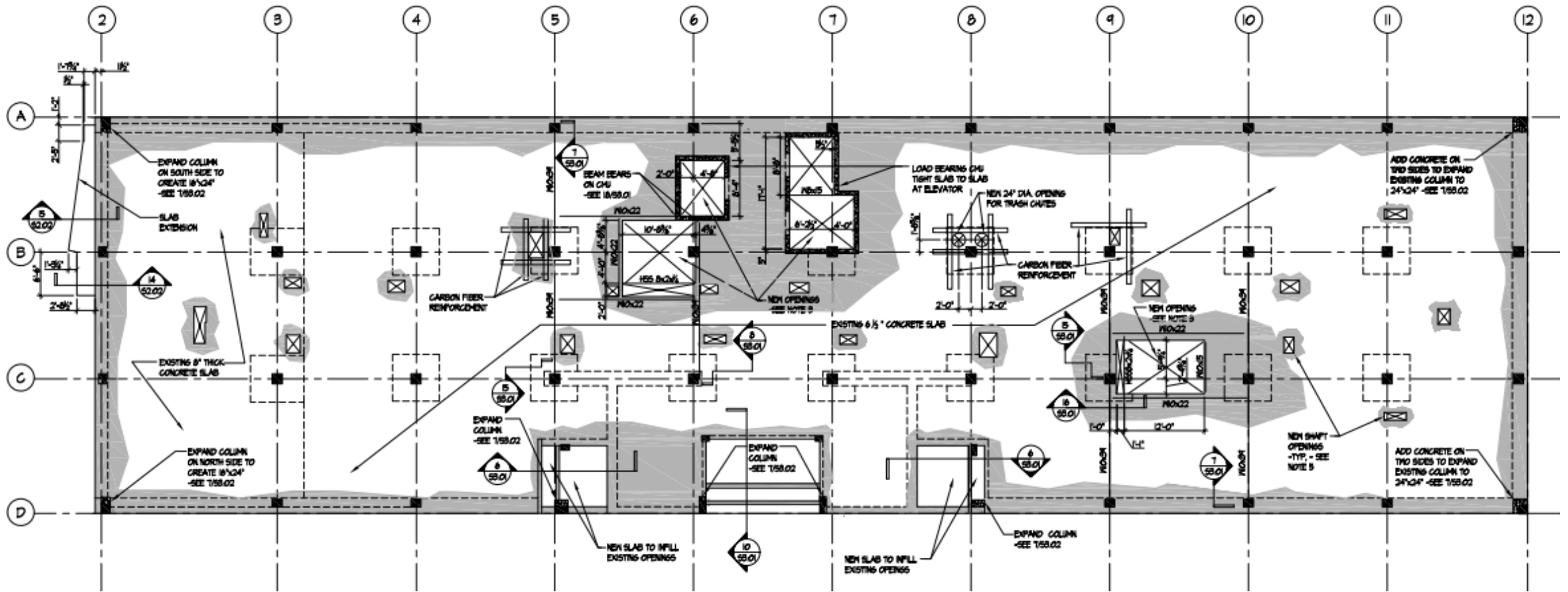
- Concrete Moment Frames
- Steel Moment Frames

Renovations

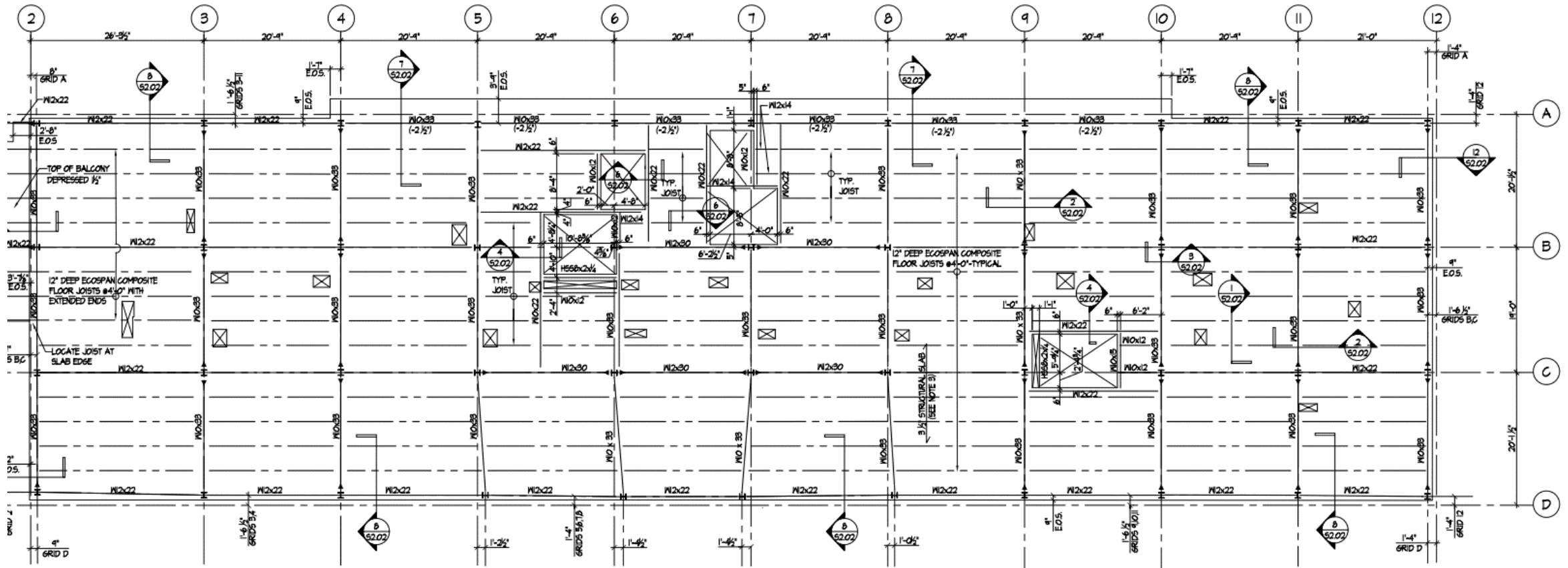
- Accommodations for new stair and elevator locations
- Façade renovation work and carbon fiber reinforcement around new openings



Typical Floor Plan – Original Concrete



Typical Floor Plan – Steel Addition



Typical Bay and Columns

20' x 20'-9" Bay Size

3.5" total deck thickness with WWF

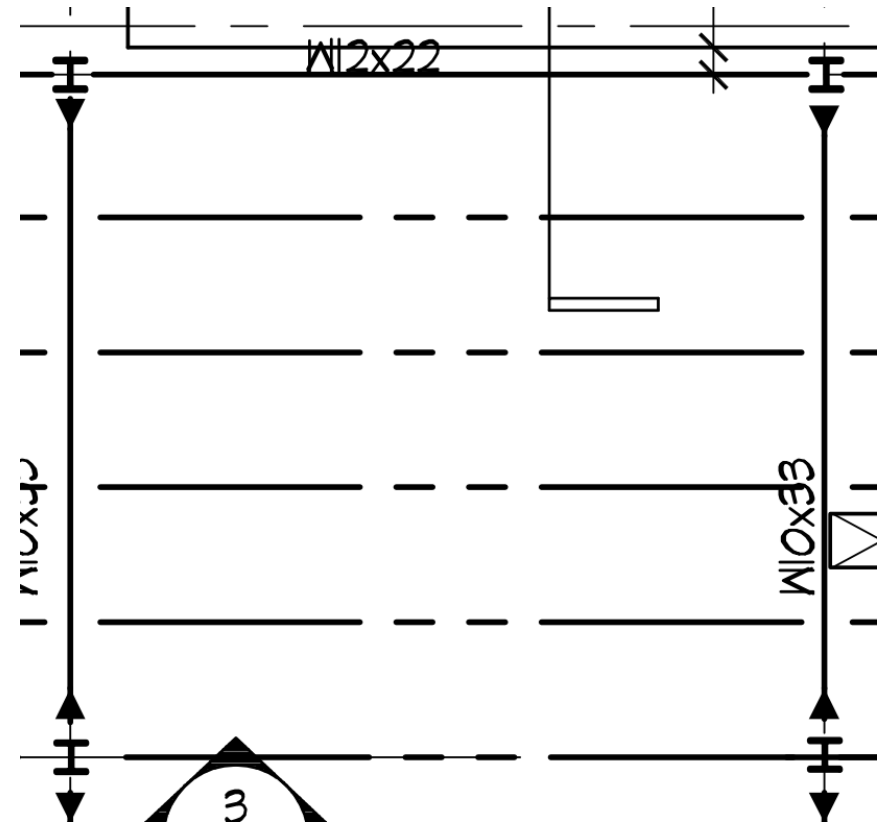
12" deep composite floor joists

W10x33 Girders

- Girders in moment frames

Columns Spot Checked:

- Interior: W10x49
- Exterior: W10x33



Typical Bay – Spot Checks

Deck Check

- Max Construction Clear Span = 5'-10" > 4'-0"
- Meets allowable load and other load requirements

Composite Joist Check

- Checked against factored uniform load in composite joist catalogue

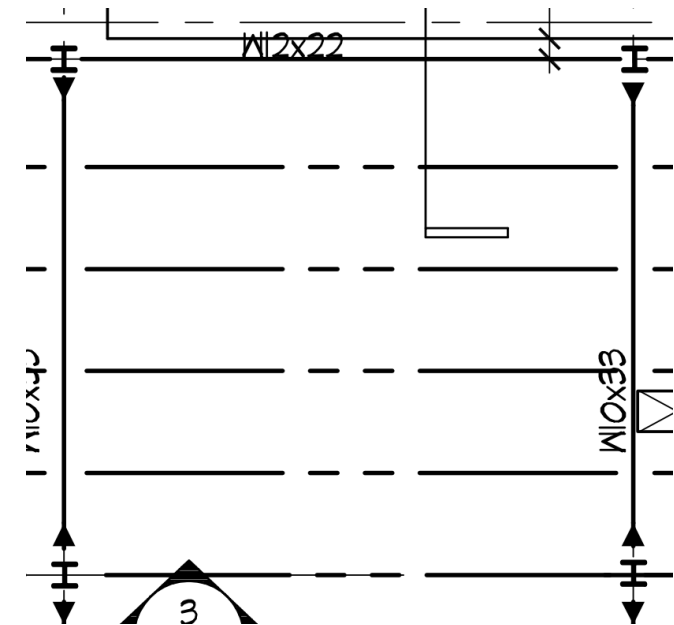
Girder Check

- Strength
- Deflections and camber requirements

Column Check

- Interior and Exterior column
- Check for strength at an effective length of 10'-4" in steel manual

Existing System Meets all Strength, Deflection, and Span Requirements



Alternate Floor Systems

Floor System Design #1: Non-Composite Steel

Floor System Design #2: Two-Way Concrete Slab with Perimeter Beams

Floor System Design #3: One-Way Concrete Slab with Girders

Alternate #1: Non-Composite Steel

Deck Check

- Max Construction Clear Span = 5'-10" > 4'-0"
- Meets allowable load/other load requirements

Beam Design

- Strength and Deflections

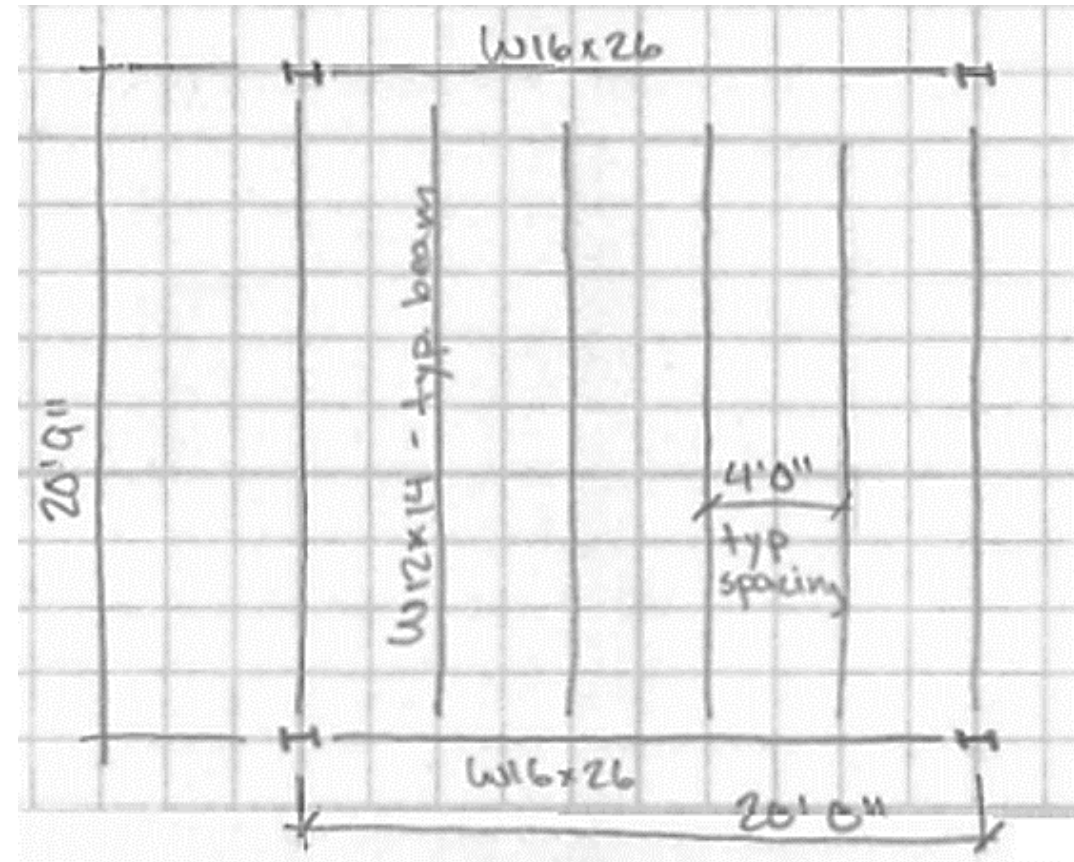
Girder Design

- Strength and Deflections

W12x14 Beams

W16x26 Girders

3.5" total deck thickness with WWF



Alternate #3: One-Way Concrete Slab

Slab depth chosen for deflections

- ACI Table 9.5(c)

Slab Design

- One-way shear
- Strength (moment and reinforcing found)

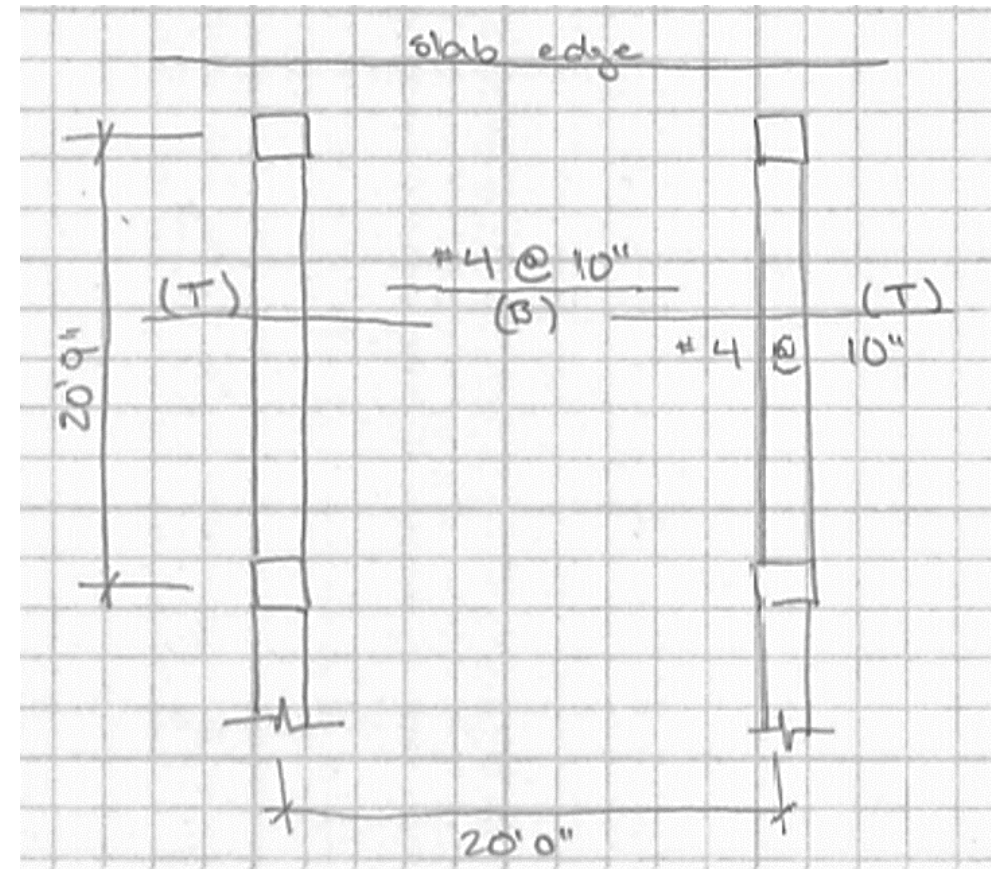
Girder Design

- Deflections, Strength, and Shear

11" thick slab with #4 bars

12" deep, 24" wide Girders with 4 #9

Started with 24" x 24" column



Floor System Comparison

Considerations		Existing Steel	Two-Way Slab	One-Way Slab	Non-Composite Steel
Architectural Considerations					
Total System Depth		16"	12"	12"	19.5"
Fire Rating		2 hr	3 hr +	3 hr +	2 hr
2 hr Fire Rating?		yes	yes	yes	yes
System Statistics					
Durability		acceptable	high durability	high durability	acceptable
Weight		40.7 psf	87.5 psf	138.8 psf	41.8 psf
Cost per square foot		\$15.80	\$13.61	\$18.90	\$21.90
Future Design Considerations					
Lateral System Options	Concrete Shear Walls	No	No	No	Yes
	Concrete Moment Frame	Yes	Yes	Yes	No
	Steel Moment Frame	Yes	No	No	Yes
	Steel Braced Frame	No	No	No	No
Advantages		Lightweight Relatively inexpensive	Least Expensive System Small slab depth No interior beams	Small total depth	Lightweight More layout flexibility
Disadvantages		Not a typical system for new construction	None	Heaviest System Relatively Expensive	Most expensive system Largest total system depth
Future Use?		N/A	Yes	No	Yes

Questions?

