AMERICAN EAGLE OUTFITTERS

Quantum II Corporate Headquarters

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Spring – 2007

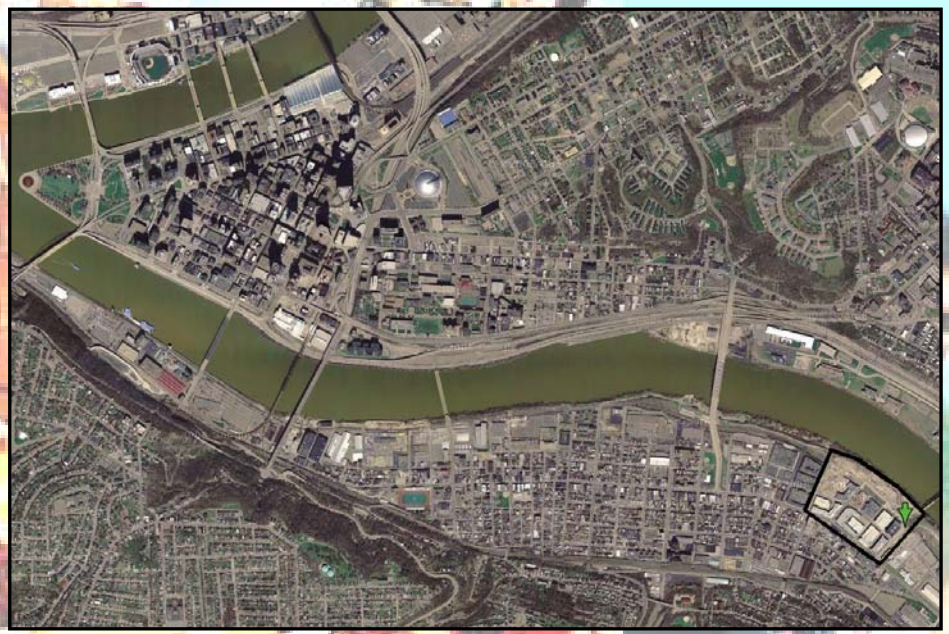
Structural Option

Presentation Outline

- Building Description & Background
- Problem Statement & Proposed Solution
- Depth Study
  - Cross Braced Lateral System
- Breadth Study
  - Cost Analysis & Scheduling
  - Alternative Floor System
- Conclusions

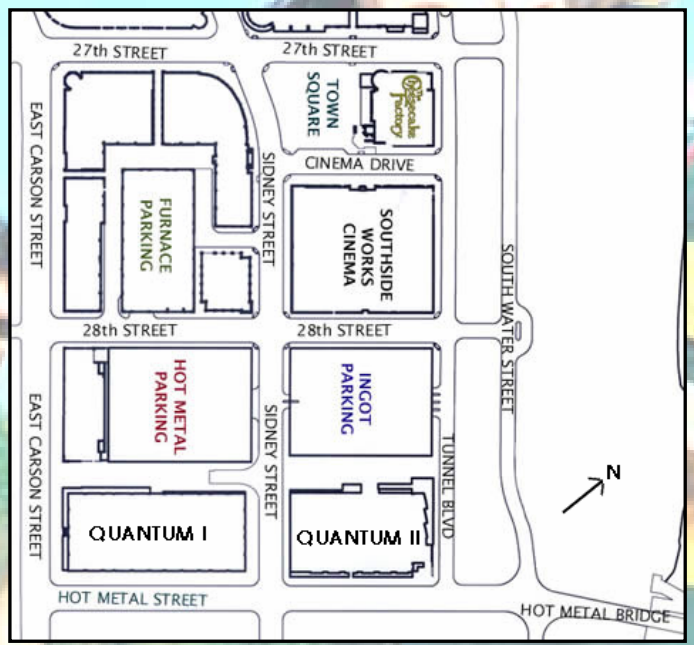
Location & History
The Old South Side Works

- One of many steel manufacturing facilities that made the region an industrial power.
- 2 ½ miles outside the city on the south shore of the Monongahela River.



Location & History
The New South Side Works

- Opened in 2002
- 34 acre, multi-million dollar commercial development
- Includes: retail, dining, offices, cinema, parking, & apartments.



Quantum II

- 6 story 186,000 square foot office.
- Purchased by American Eagle Outfitters
- Currently in tenant fit-out.
- $22.4 million

Project Team

- **Developer: Soffer Development**
- **Owner: American Eagle Outfitters**
- **Base Building Architect: Davis Gardner Gannon Pope**
- **Base Building Engineer: Watson Engineers**
- **Fit-out Architect: The Design Alliance**
- **Fit-out Engineer: Atlantic Engineering Services**
- **Fit-out MEP: Tower Engineering**

Building Systems

Mechanical

- CAV System
- 18000 CFM Roof Top Unit
- 7200 CFM Roof Top Unit

Lighting / Electrical

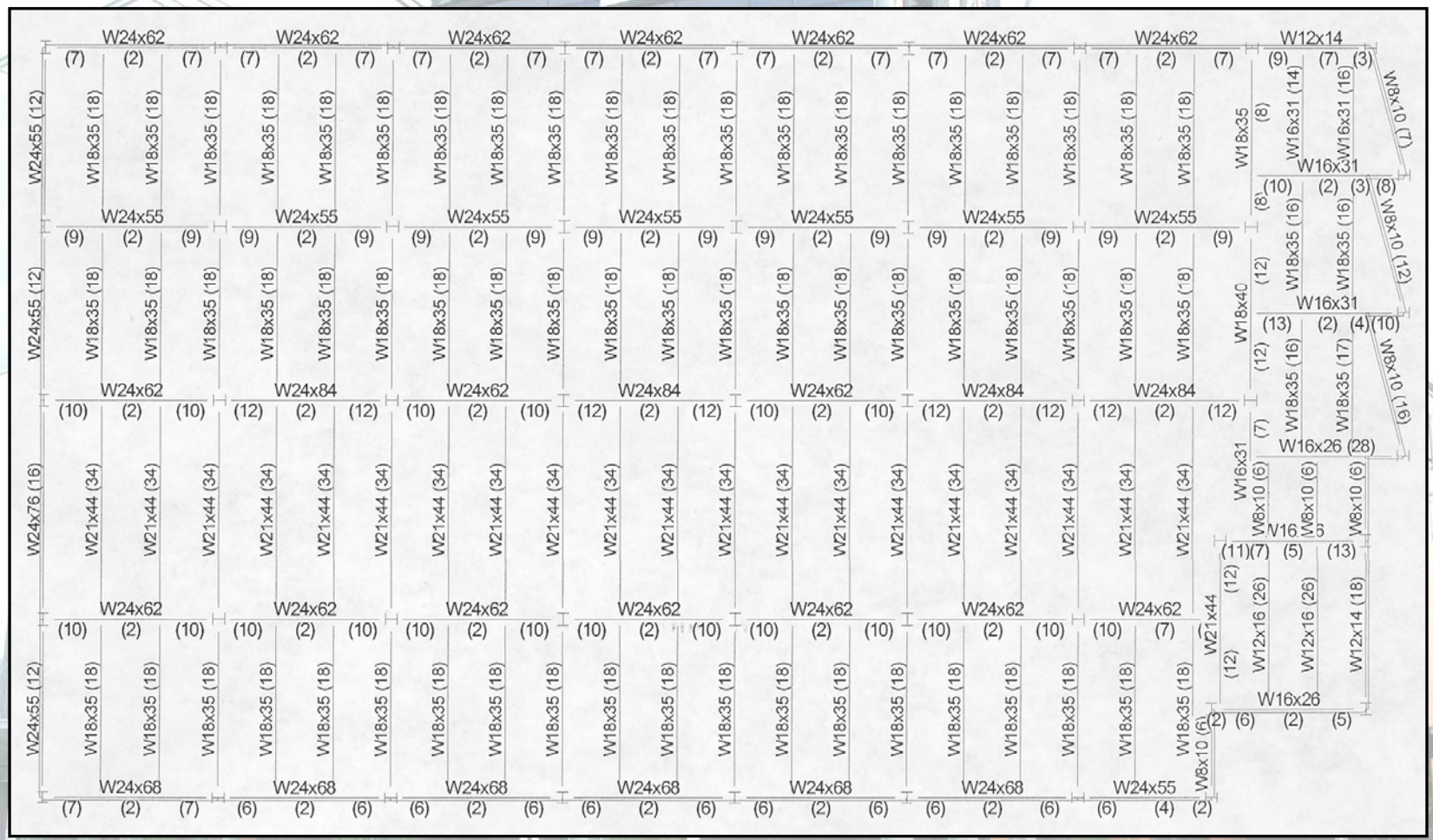
- 480/277V, 3 Phase, 4 Wire Primary System
- 208/120V, 3 Phase, 4 Wire Secondary System

Structural System

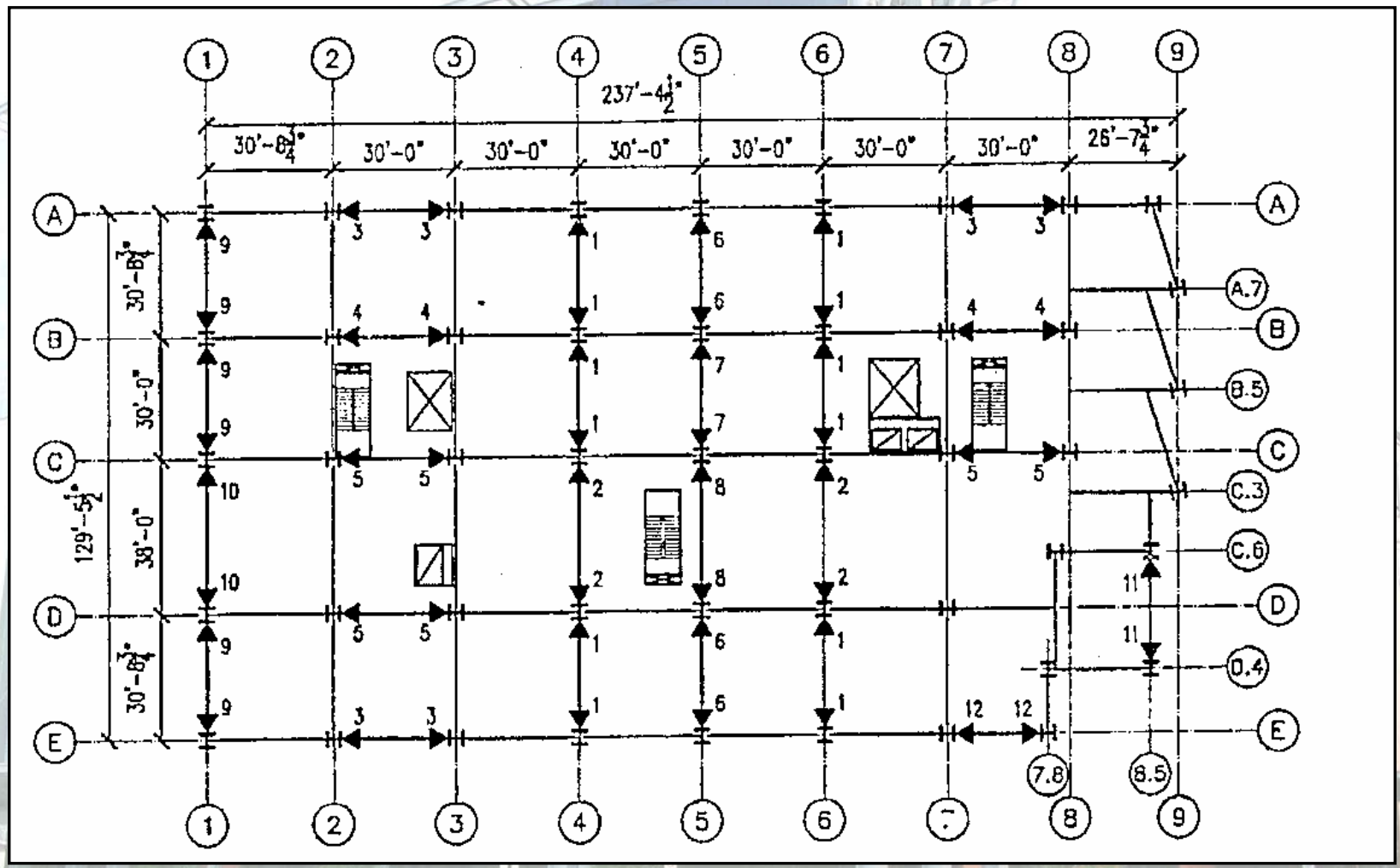
Gravity System

- Composite floor deck: 3” 4 ksi concrete over 3” 20 gauge metal deck
- ¾” diameter 4 ½” long shear studs
- 50 ksi steel members
- 3 rows of 30’x30’ bays
- 1 row of 38’x30’ bays

Gravity System



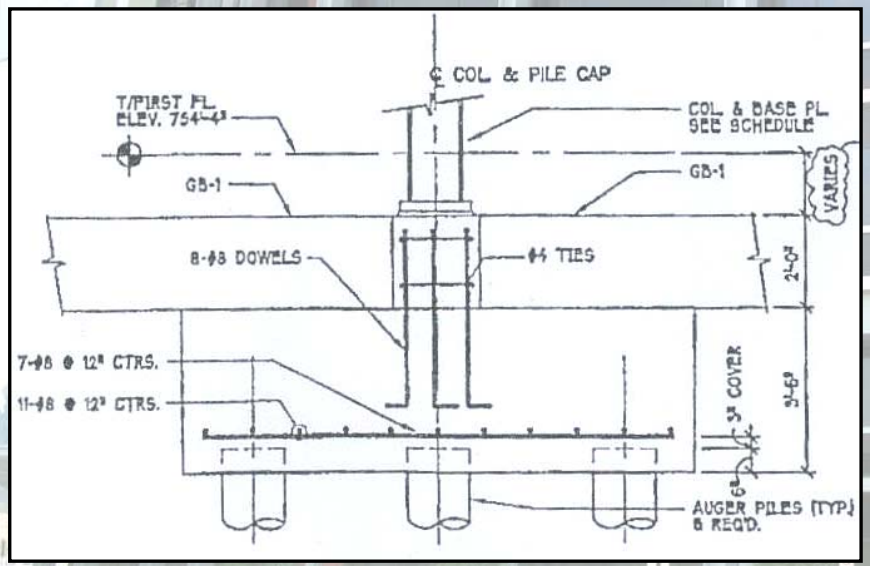
Lateral System

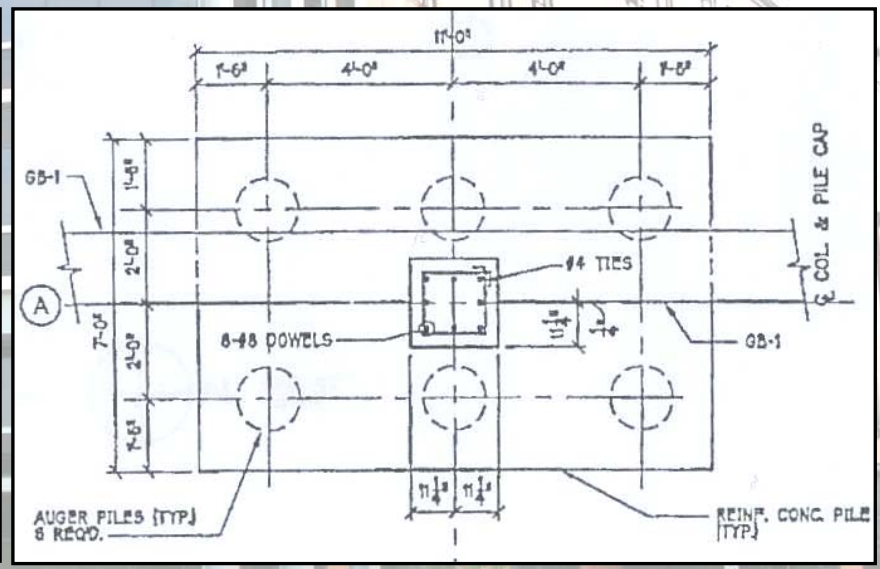


Moment framing plan

Foundation

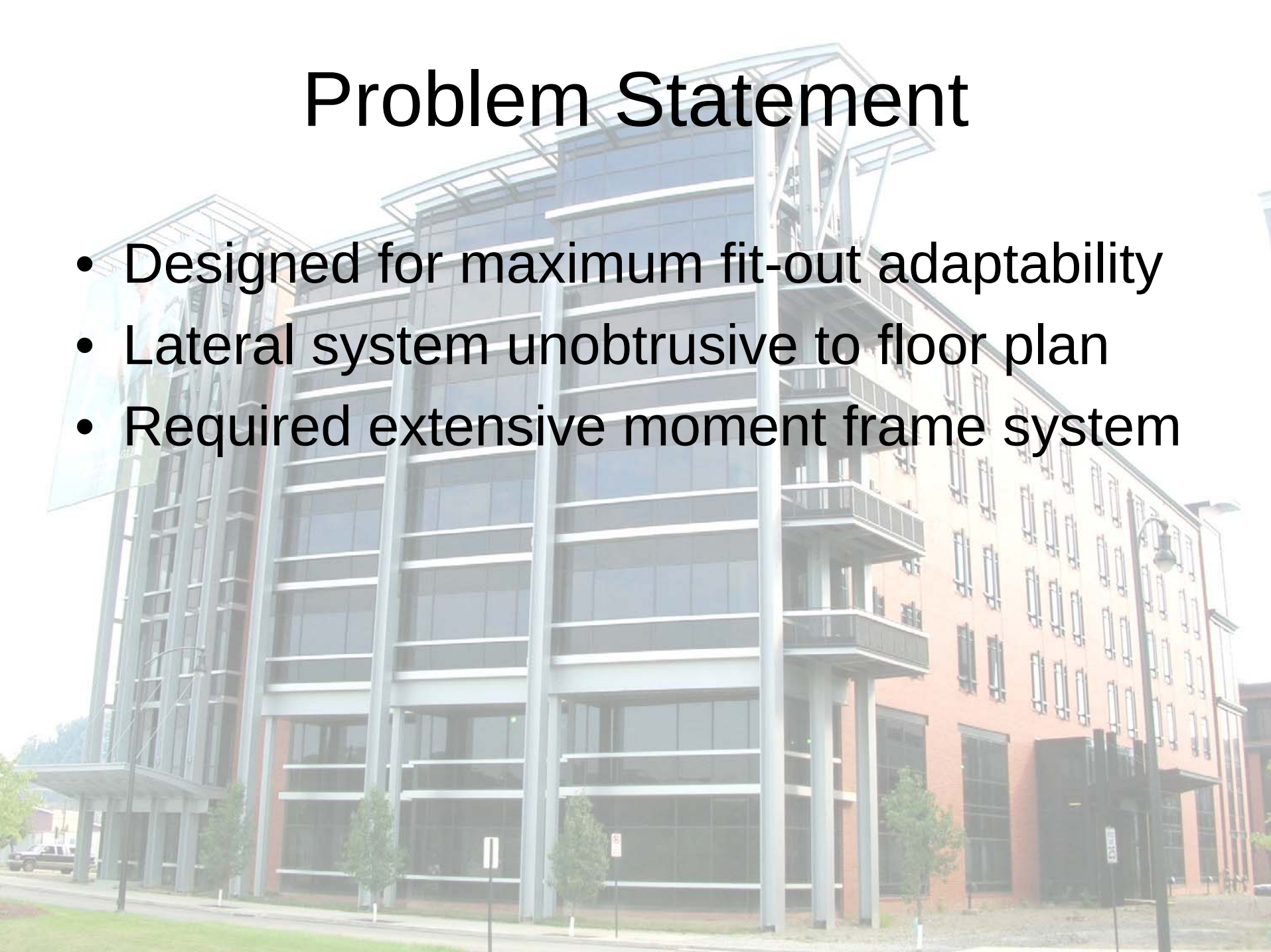
- 45’ concrete piles
- 3 ksi concrete with 60 ksi reinforcing steel
- Grade beams surround building perimeter





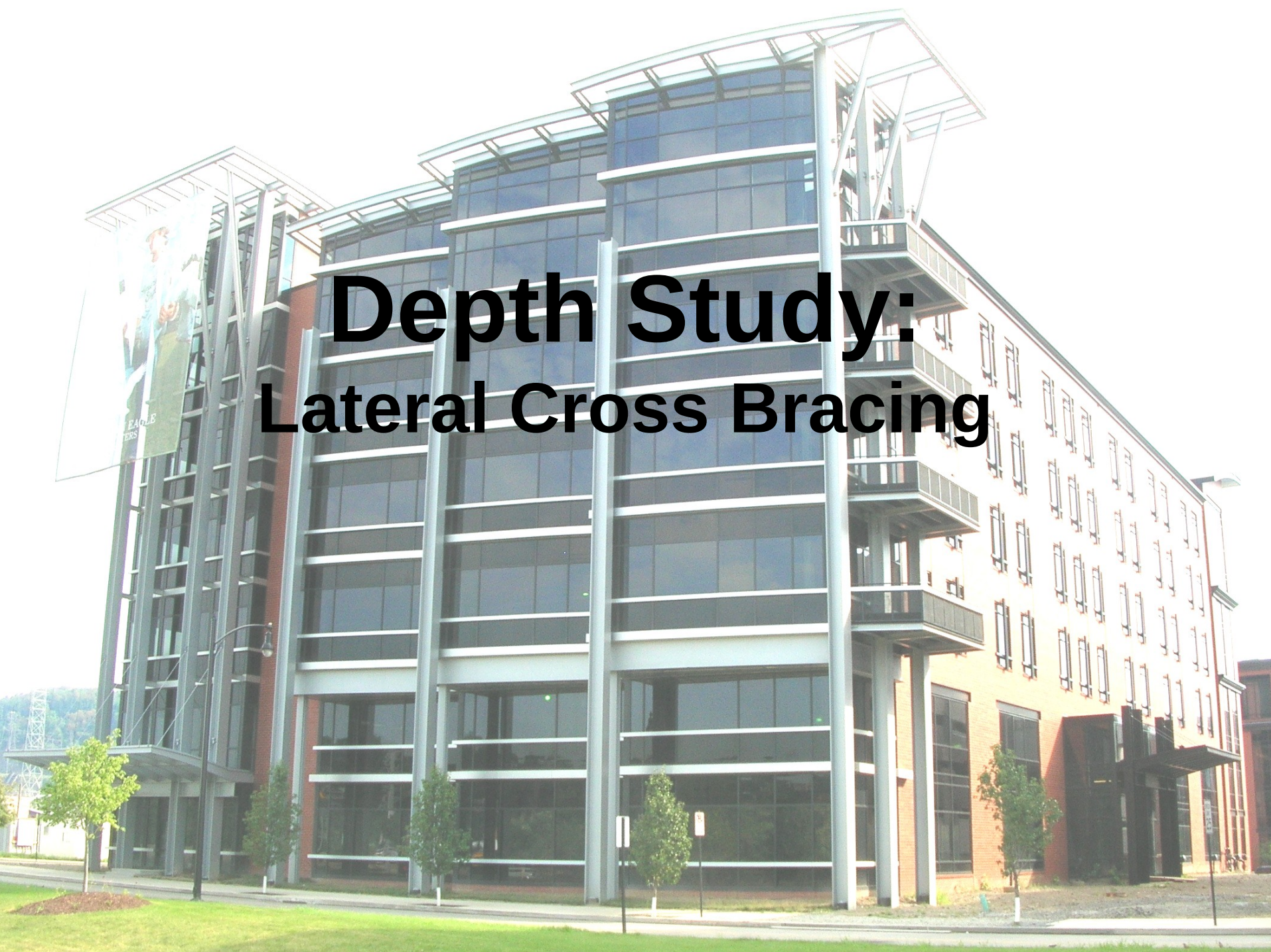
Problem Statement

- Designed for maximum fit-out adaptability
- Lateral system unobtrusive to floor plan
- Required extensive moment frame system



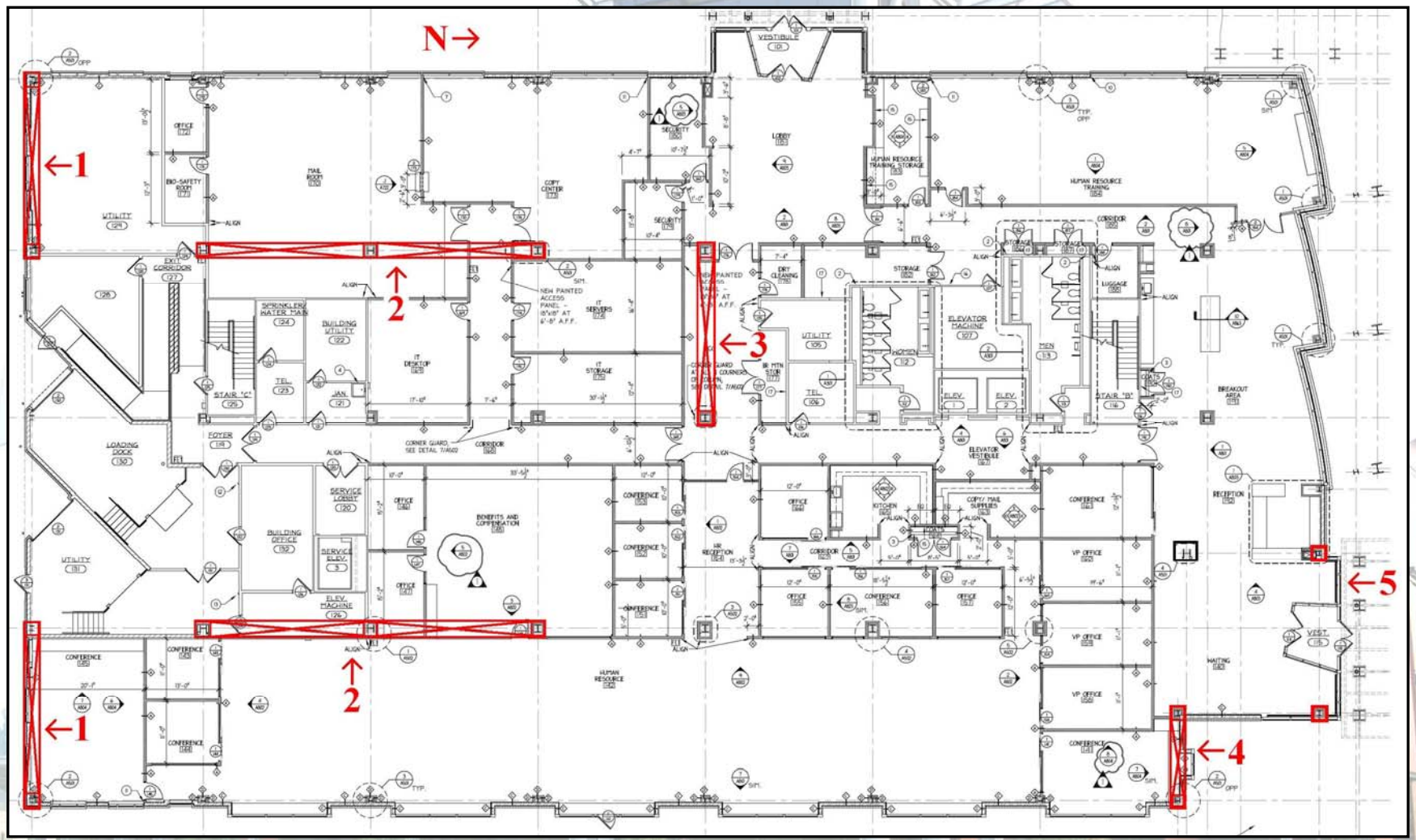
Proposed Solution

- Replace existing lateral system
- Employ diagonal steel cross bracing
- Utilize final architectural plans to retro-fit structure with cross bracing without obstructing floor plan
- Design assisted by RAM Steel



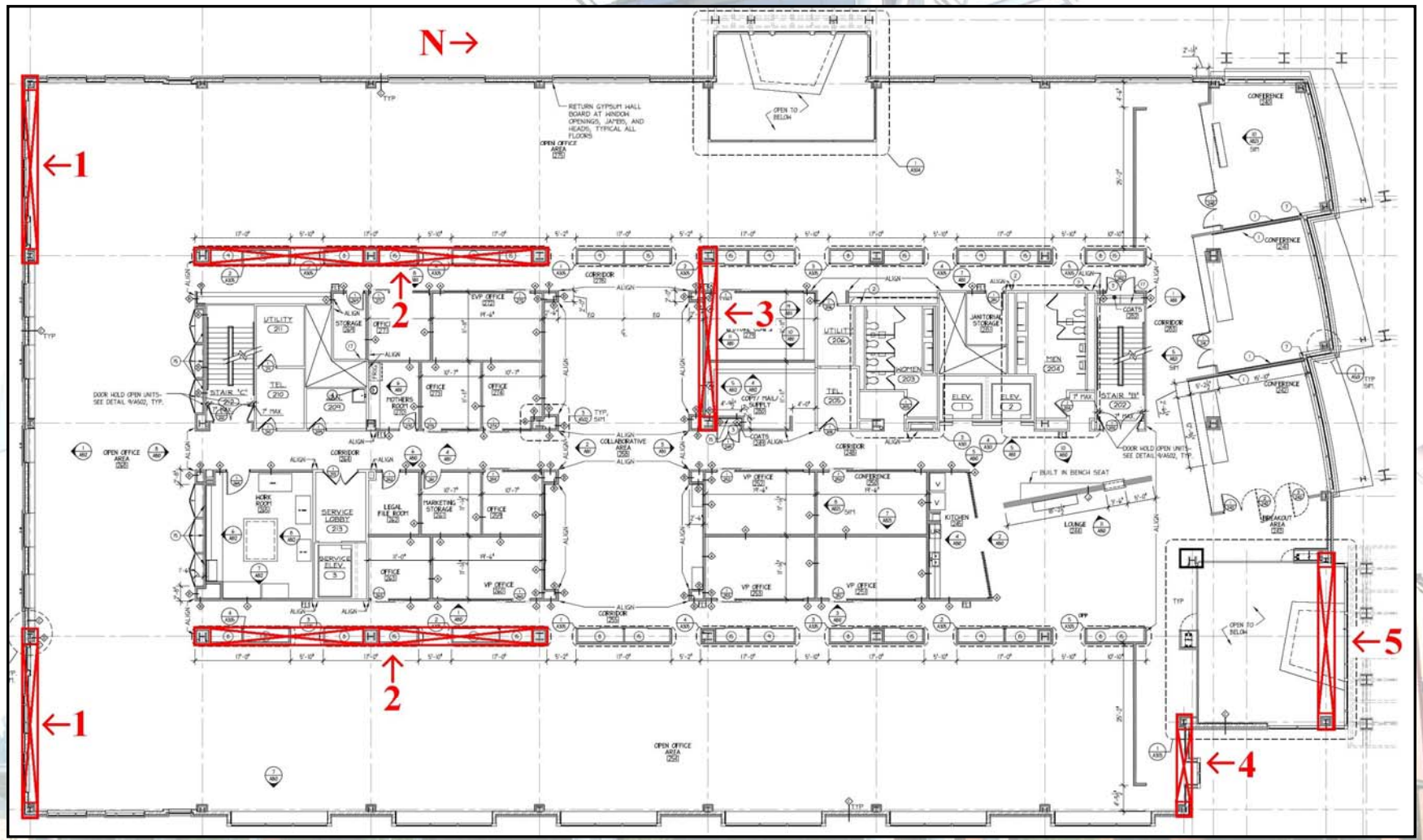
Depth Study:
Lateral Cross Bracing

New Frame Layout:



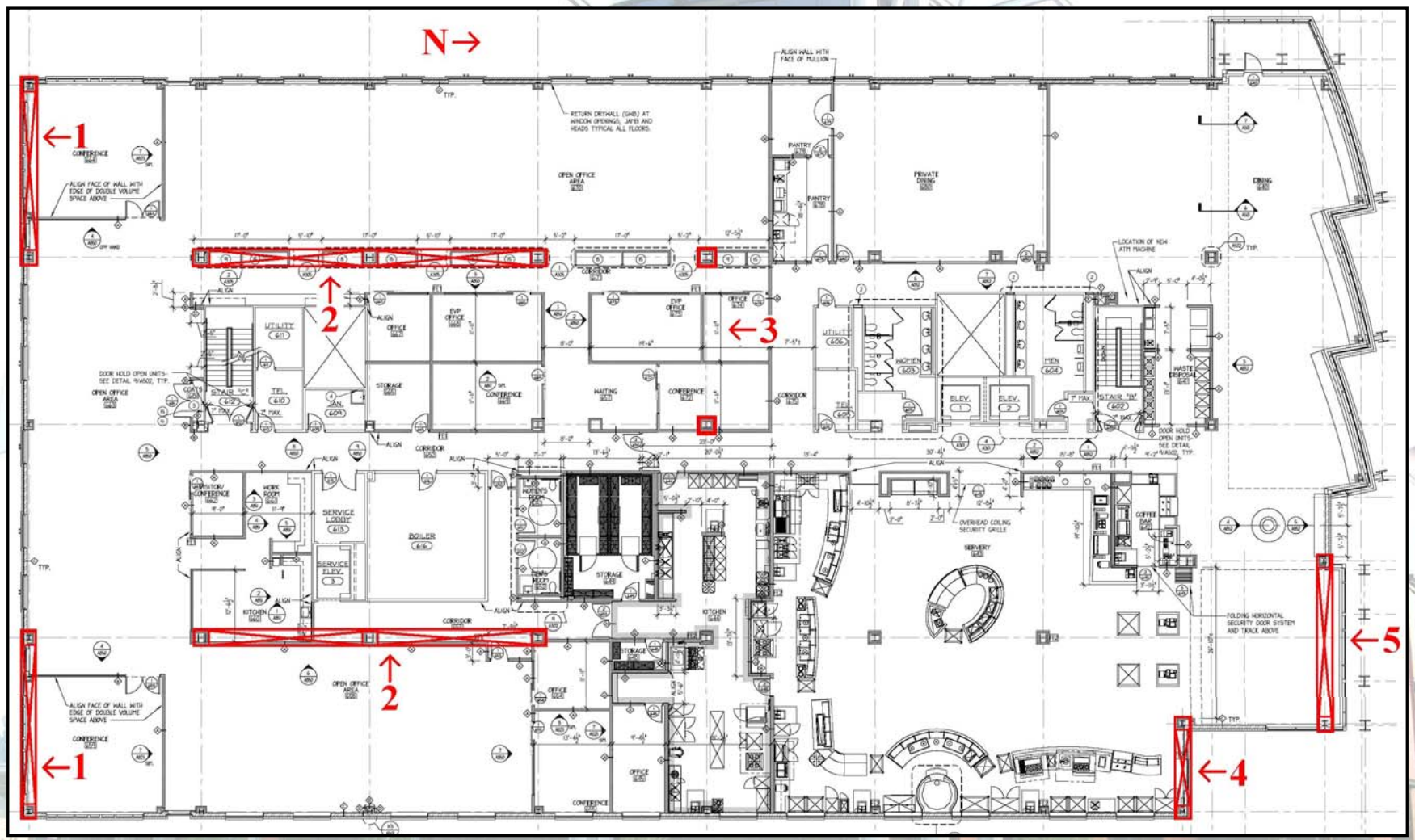
First Floor

New Frame Layout:



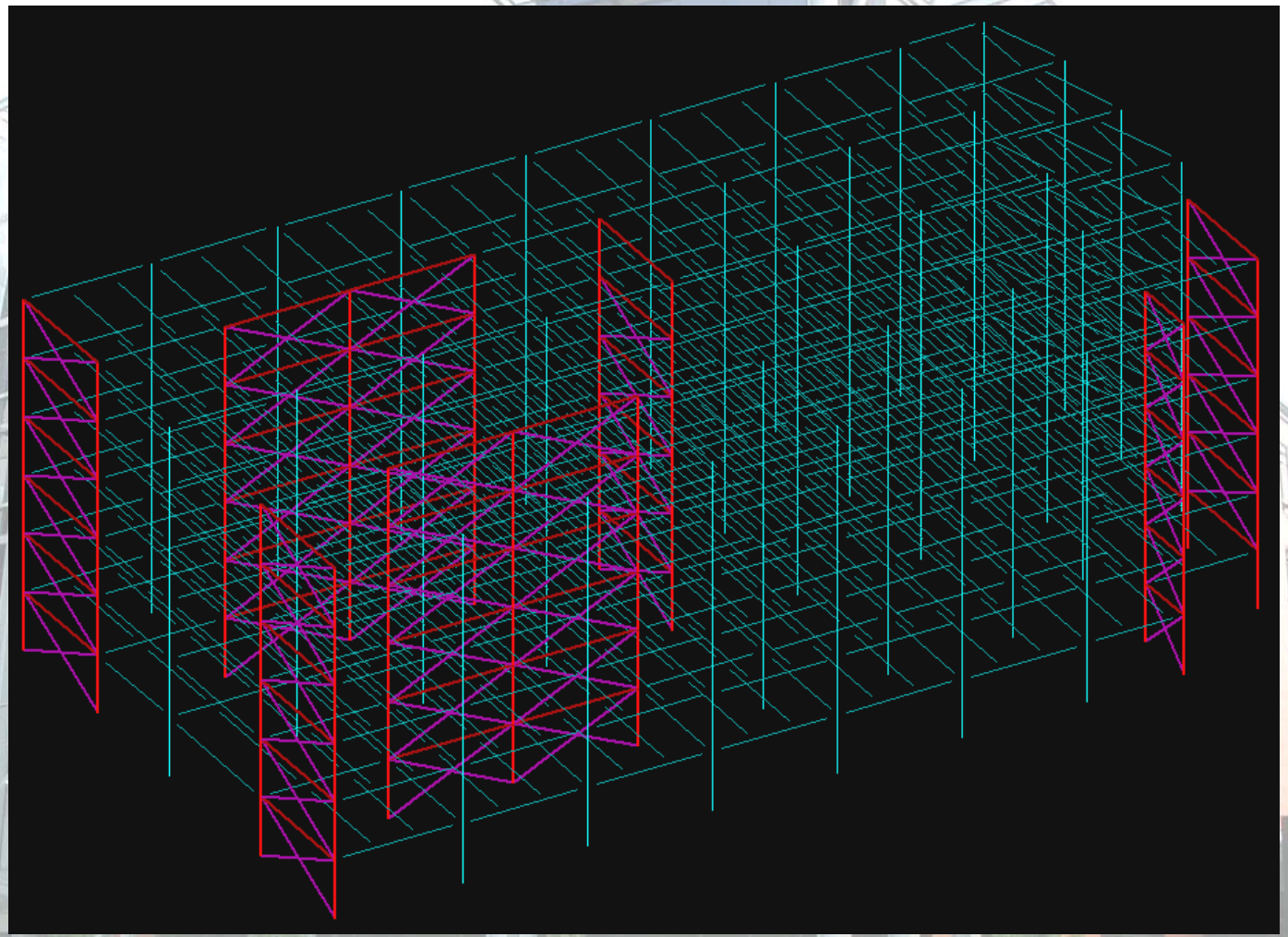
Typical Floor

New Frame Layout:



Sixth Floor

New Frame Layout:



3D View

Loads: Gravity

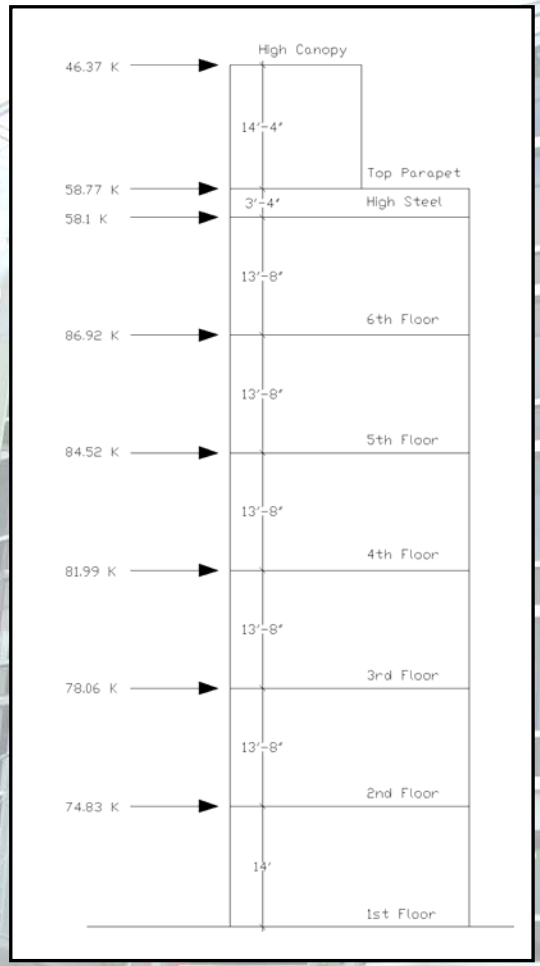
Dead Loads

• Typical Floor Slab	57 psf
• Roof Slab	57 psf
• Exterior Curtin Wall	20 psf
• MEP	10 psf
• Miscellaneous	5 psf

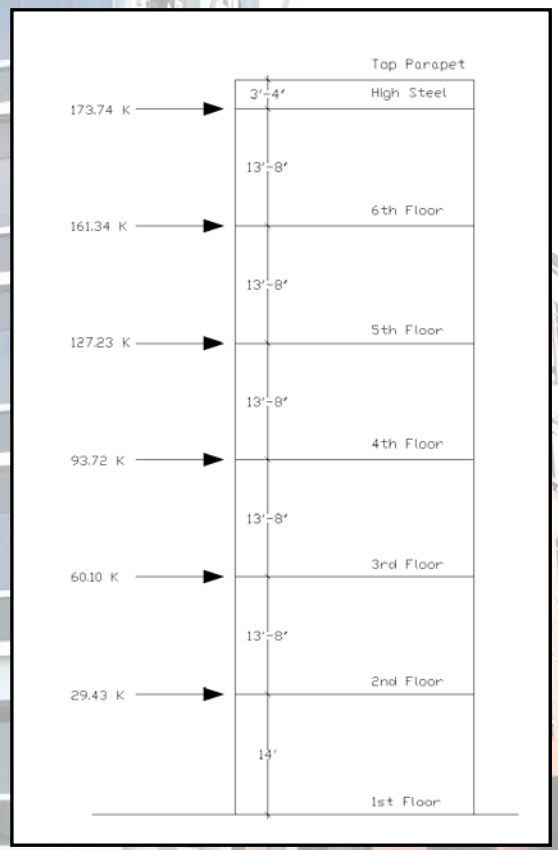
Live Loads

• Roof	30 psf
• All Floors	100 psf
• Stairs	100 psf
• Balconies	100 psf
• Flat Roof Snow	21 psf

Loads: Lateral

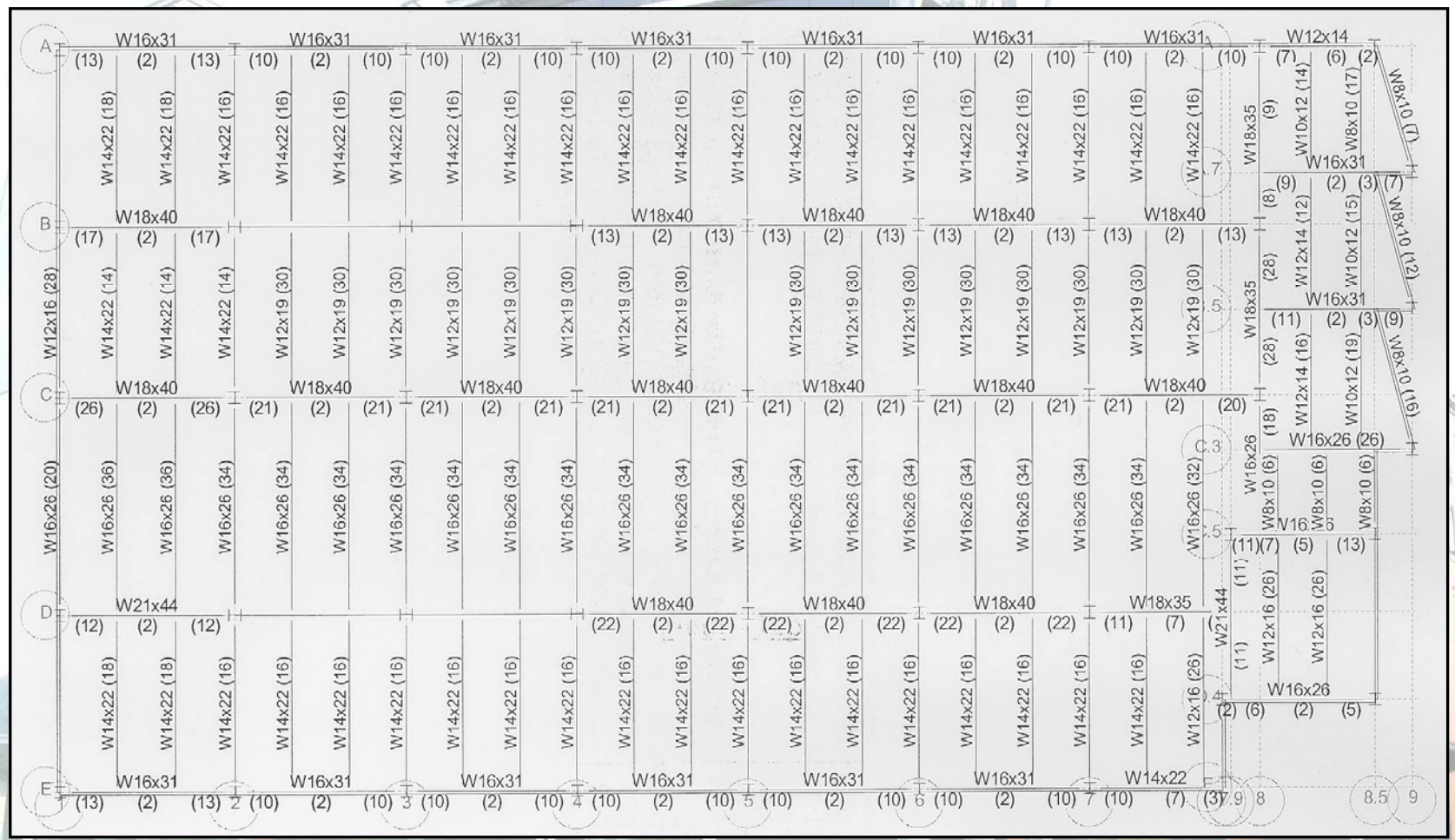


Wind Force Diagram



Seismic Force Diagram

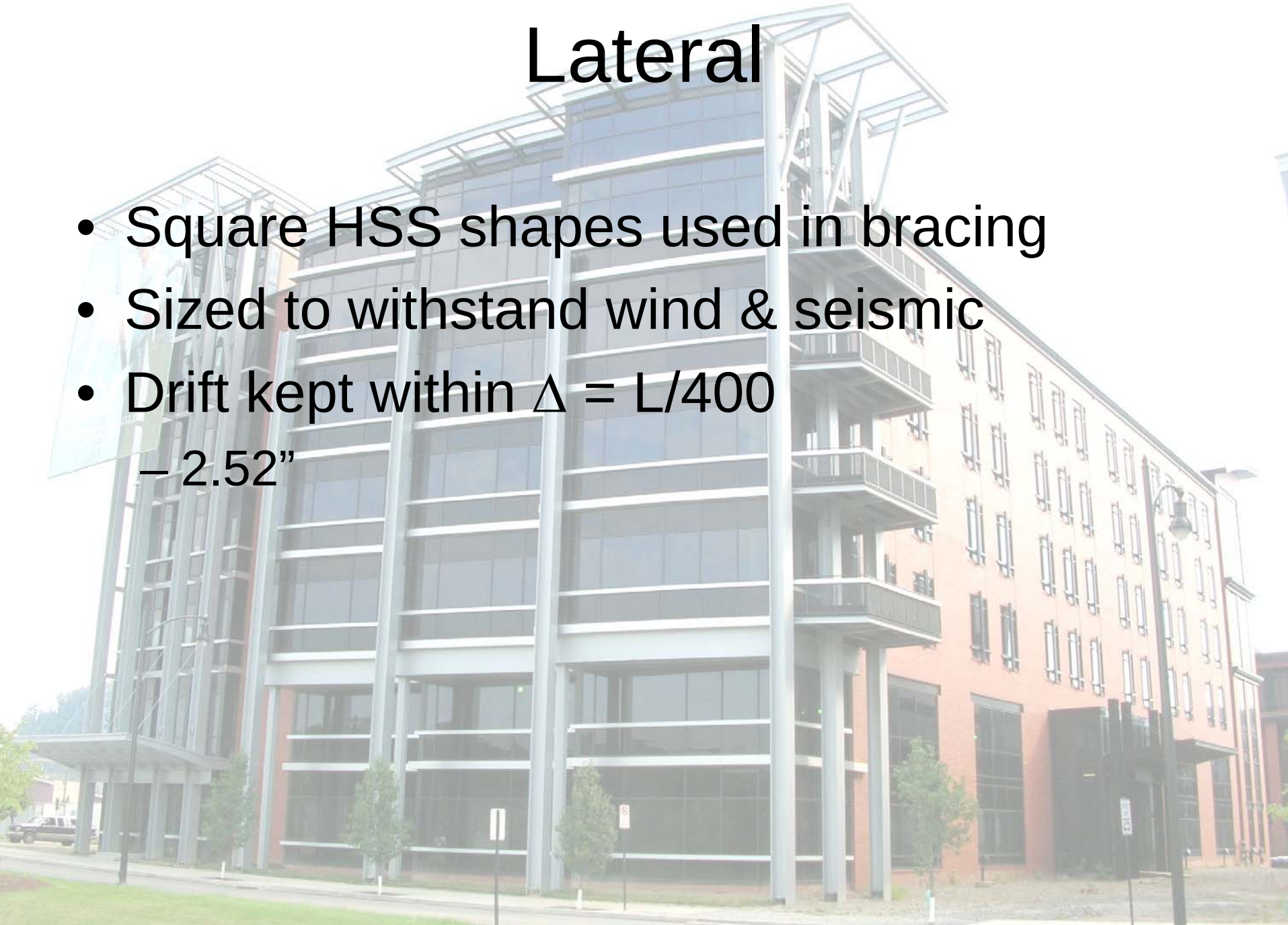
Gravity



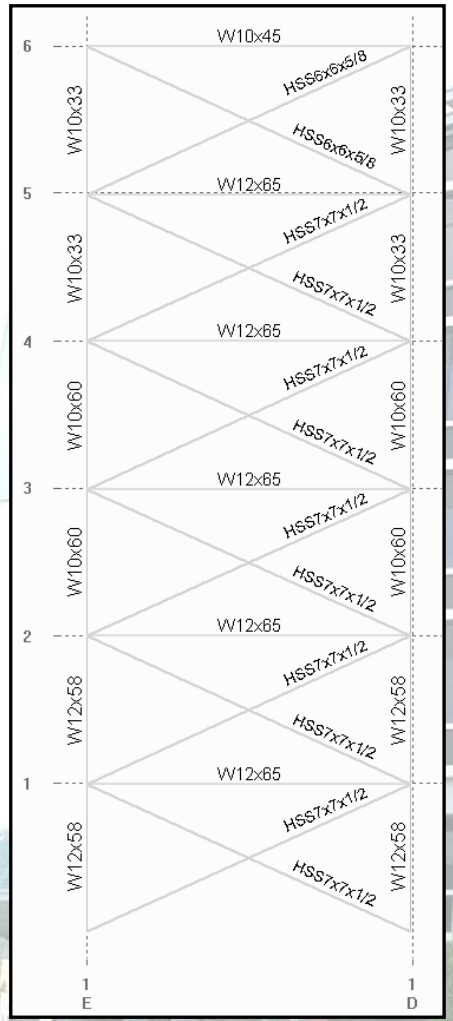
A
B
C
D
E
W16x31
W18x40
W21x44
W12x14
W14x22
W12x16
W12x19
W16x26
W18x35
W10x12
W8x10
W12x14
W14x22
W12x16
W16x26
W8x10

Lateral

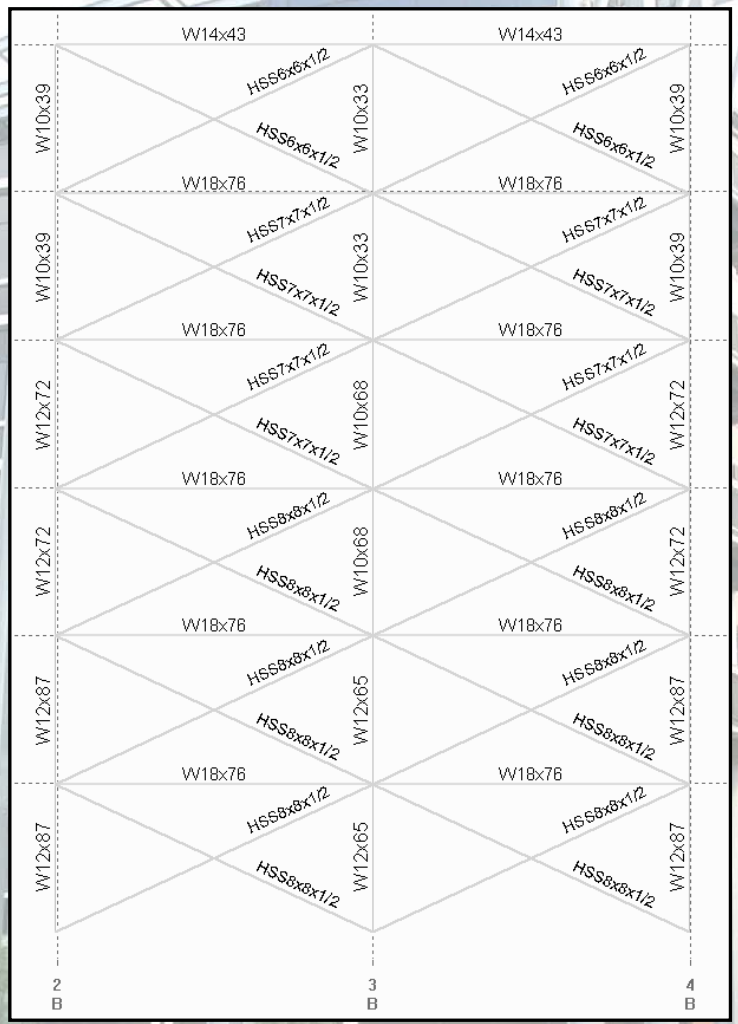
- Square HSS shapes used in bracing
- Sized to withstand wind & seismic
- Drift kept within $\Delta = L/400$
  - 2.52”



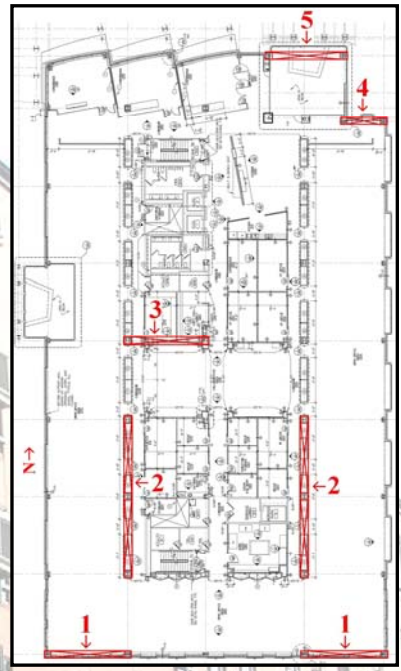
Lateral



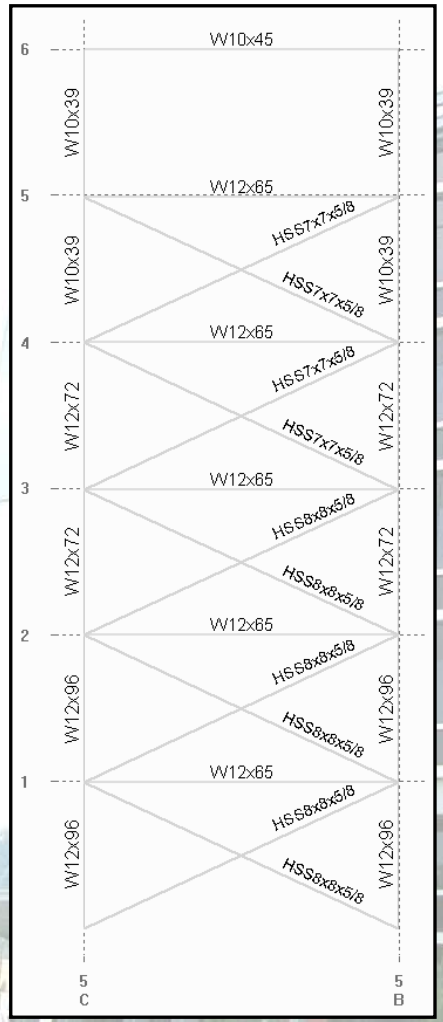
Frame 1



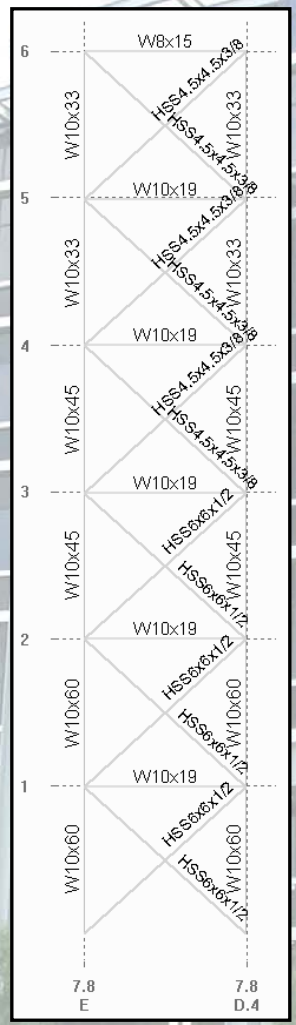
Frame 2



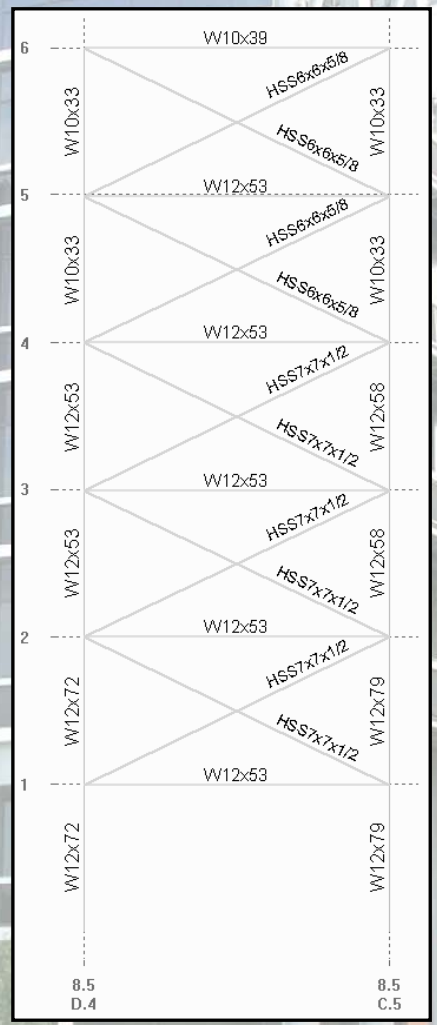
Lateral



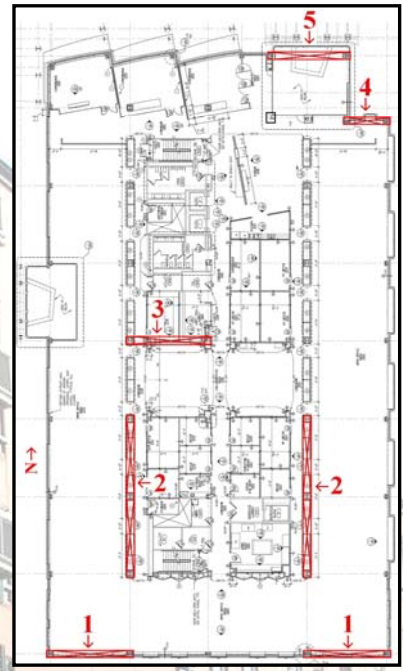
Frame 3



Frame 4



Frame 5



Breadth:

Cost Analysis & Scheduling Alternative Floor

Breadth: Cost Analysis

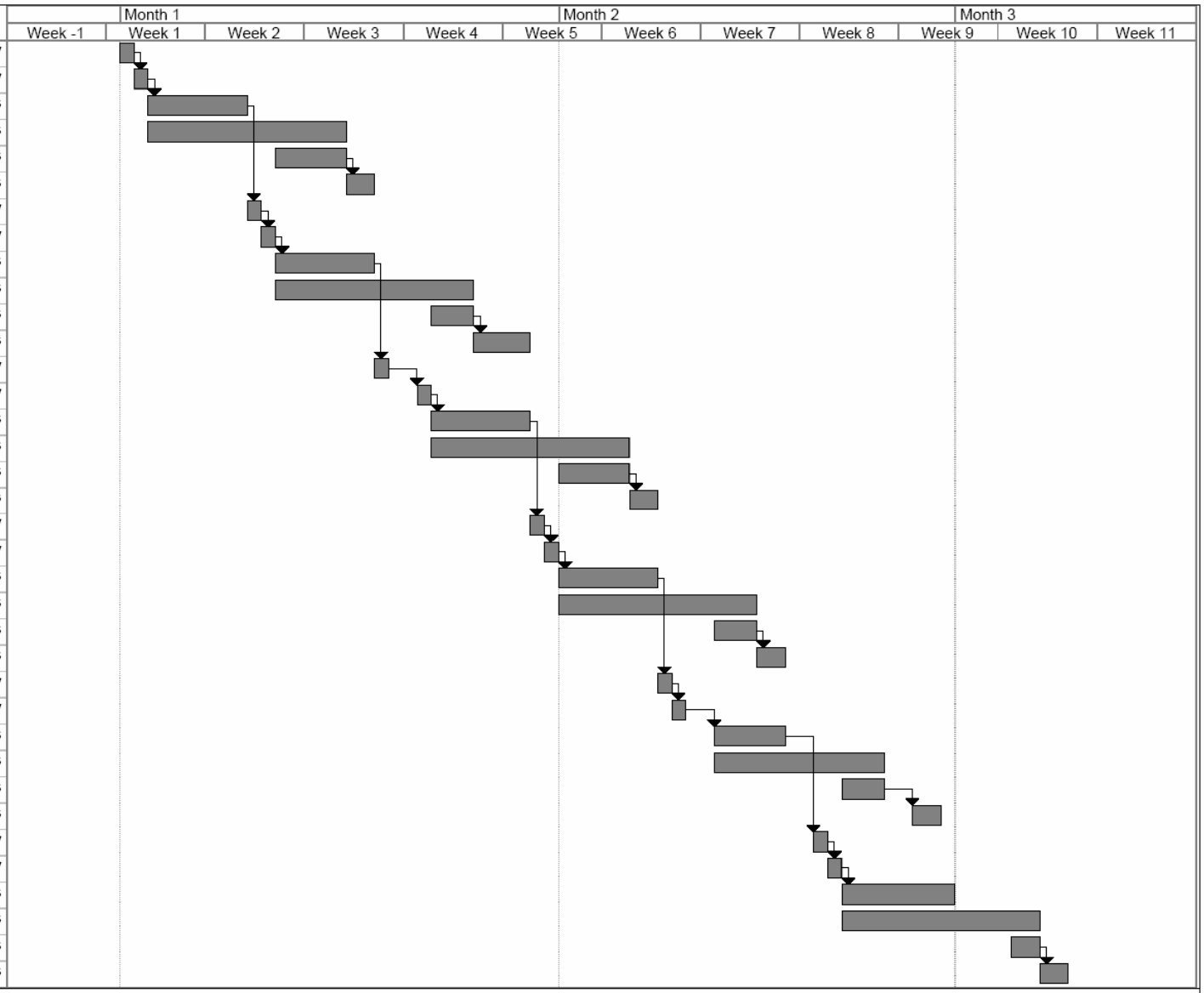
- Cost data taken from RS Means

Existing System	
Typical Floor (x5)	$ 351,851
Roof	$ 298,701
Columns	$ 360,112
Total	$ 2,418,068

Redesigned System	
Typical Floor (x5)	$ 265,690
Roof	$ 207,827
Columns	$ 238,602
Bracing	$ 168,848
Total	$ 1,943,727

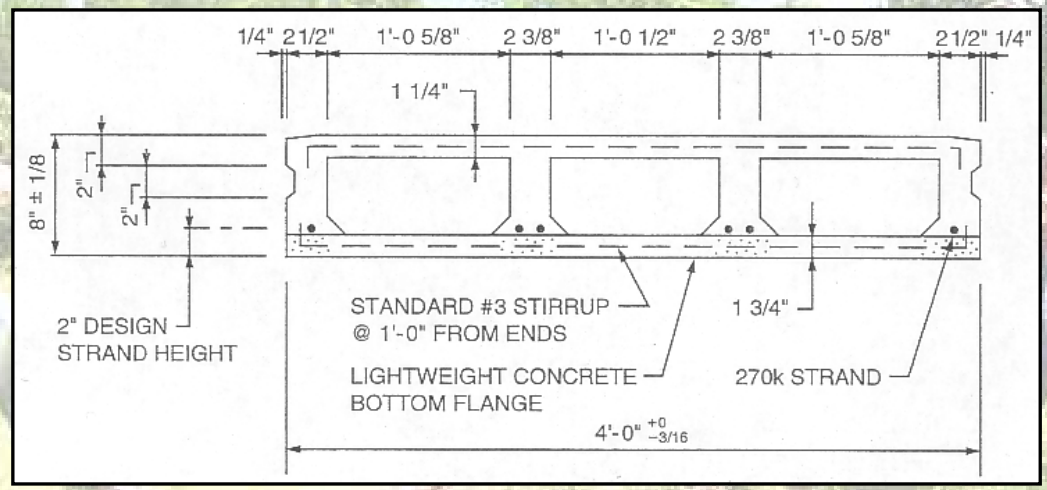
Breadth: Construction Schedule

ID	Task Name	Duration
1	1st Floor Col.	1 day
2	1st Floor Bracing	1 day
3	2nd Floor Beam	5 days
4	2nd Floor Deck	10 days
5	2nd Floor Studs	3 days
6	2nd Floor Slab	2 days
7	2st Floor Col.	1 day
8	2nd Floor Bracing	1 day
9	3rd Floor Beam	5 days
10	3rd Floor Deck	10 days
11	3rd Floor Studs	3 days
12	3rd Floor Slab	2 days
13	3rd Floor Col.	1 day
14	3rd Floor Bracing	1 day
15	4th Floor Beam	5 days
16	4th Floor Deck	10 days
17	4th Floor Studs	3 days
18	4th Floor Slab	2 days
19	4th Floor Col.	1 day
20	4th Floor Bracing	1 day
21	5th Floor Beam	5 days
22	5th Floor Deck	10 days
23	5th Floor Studs	3 days
24	5th Floor Slab	2 days
25	5th Floor Col.	1 day
26	5th Floor Bracing	1 day
27	6th Floor Beam	5 days
28	6th Floor Deck	10 days
29	6th Floor Studs	3 days
30	6th Floor Slab	2 days
31	6th Floor Col.	1 day
32	6Th Floor Bracing	1 day
33	Roof Beam	6 days
34	Roof Deck	10 days
35	Roof Stud	2 days
36	Roof Slab	2 days

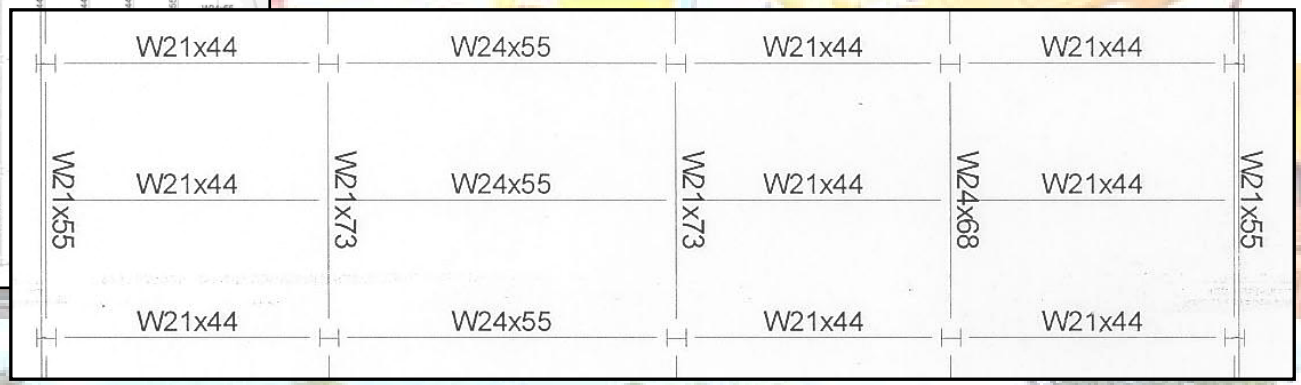


Breadth: Alternative Floor

- 8” Hollow Core Concrete Planks
- Longer span capability – reduces beams
- Self weight = 57 psf – minimal impact on slab weight & seismic loads
- Unable to utilize composite framing

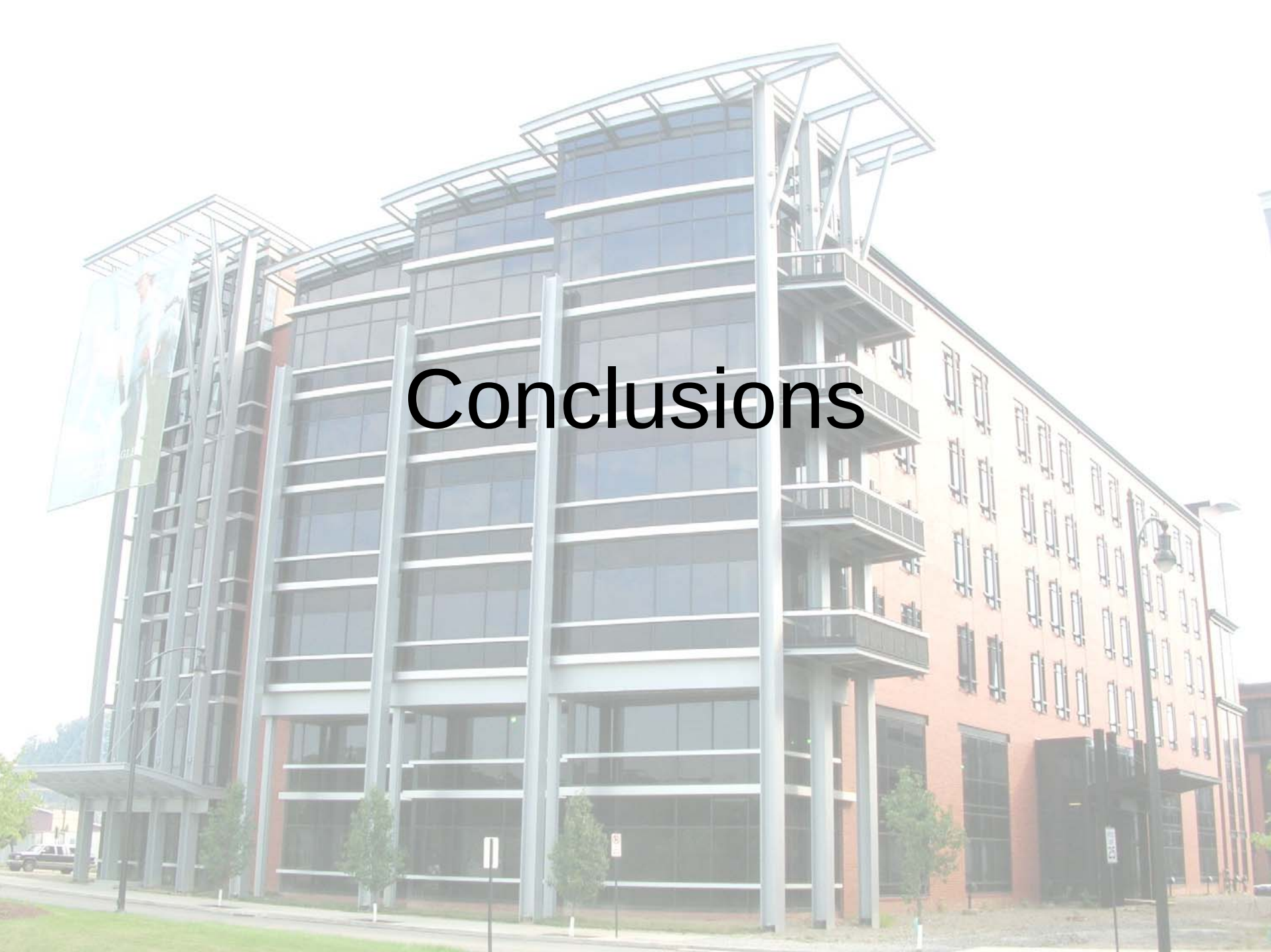


Breadth: Alternative Floor



Hollow Core Plank System		
Steel	$	33,844
Slab	$	36,826
Total	$	70,670

Redesigned System		
Steel	$	21,862
Slab	$	13,452
Total	$	35,314



Conclusions