

**IPRO 315
DESIGN OF A
LARGE SCALE
STRUCTURE**

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IPRO 315

Phantasy Hotel

- ❑ PROJECT OVERVIEW
- ❑ TEAM ORGANIZATION
- ❑ ARCHITECTURAL GROUP
- ❑ MECHANICAL GROUP
- ❑ STRUCTURAL GROUP



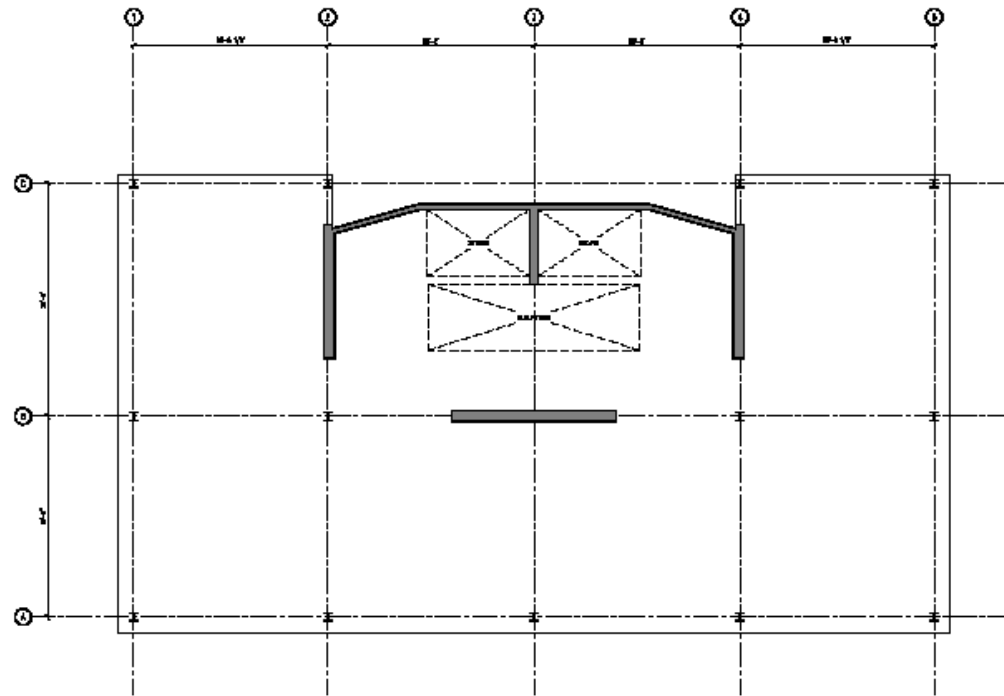
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PROJECT OVERVIEW

Objective:

Design a 22-story hotel located in Oakbrook, IL.



PROBLEM ORGANIZATION

STRUCTURAL

ARCHITECTURAL

MECHANICAL

PRELIMINARY (ARCH DESIGN) PHASE

- FOUNDATION SITE
- ICB CODE
- SAP2000 MODEL
- LOAD CASES

- INITIAL DESIGN
- FLOOR PROGRAM
- FLOOR PLANS
- FINALIZE DESIGN

- MEP CODES
- HVAC CALCS

ENGINEERING DESIGN PHASE

- FINALIZE LOADS
- FINALIZE MODEL
- DESIGN STEEL
- FOUNDATION

- GREEN ROOF DESIGN
- FAÇADE DESIGN
- AESTHETIC DESIGN
- FINALIZE SCHEDULE

- FINALIZE LOAD CALC
- DESIGN HVAC
- MEP ROUTING

END PHASE

- FINALIZE SCHEDULE
- FINILIZE PLANS

- SCALE MODEL

- MEP SCHEDULE



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TEAM ORGANIZATION

ARCHITECTURE DESIGN GROUP

Team Lead: Ben O'Neil

Ben O'Neil
Adam Newman
Shin Young Park
Kaitlyn Conley
Fabian Aguilar

STRUCTURAL GROUP

*Team Lead: Corina Abrudun
Chris Adams*

Load Cases

Models

Foundations

CAD

Rusty Kutcher
Brian Crowley
Karolis Kozys

Luca Lollino
Joseph Jurasits

Karl Ekstrand
Adam Nizich

Andrew Witek
Kwong Cheung

MECHANICAL GROUP

Team Lead: Gustavo Zarazua

Garrett Ezell
Gustavo Zarazua
Rodrigo Aihara
Adnan Bhat
Algirdas Bielskus
Jesus Cervantes

Major Ideas

- Create detailed floor plans and wall sections
- Build a physical model
- Create a sustainable Green Roof
- Floor by floor layout that accommodates the needs of the community
 - Restaurant, Conference Center, Ballroom

Challenges

- Difficult to design without exact site location
- Designing the layout based on the given shear wall drawing



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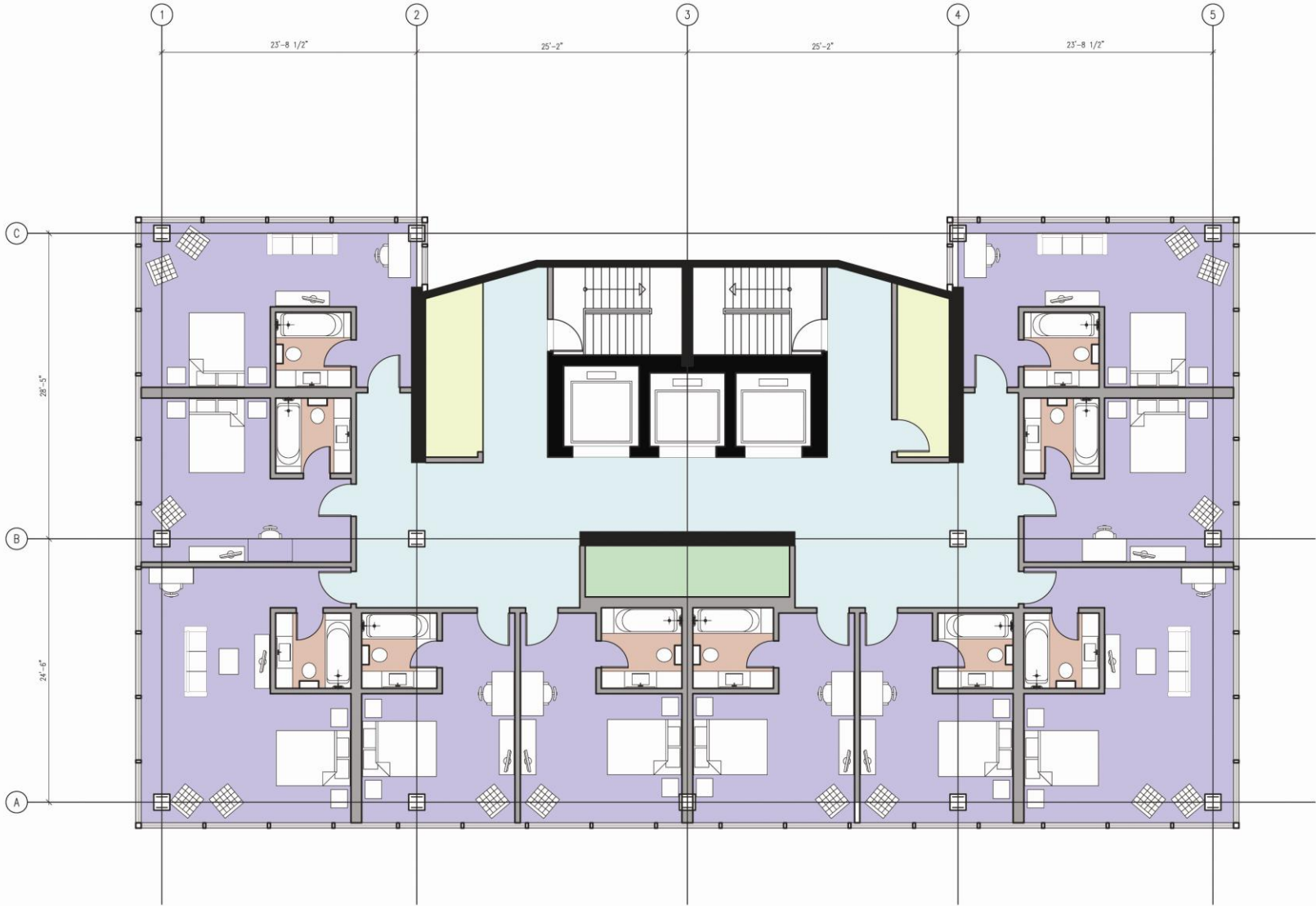
Floor Heights:

- Hotel rooms: 13'
- Ballroom: 19'
- Restaurant: 16'
- Cafe': 13'
- Mechanical/Security: 19'
- Conference Rooms: 16'
- Gym: 16'
- Offices: 13'
- Lobby: 19'

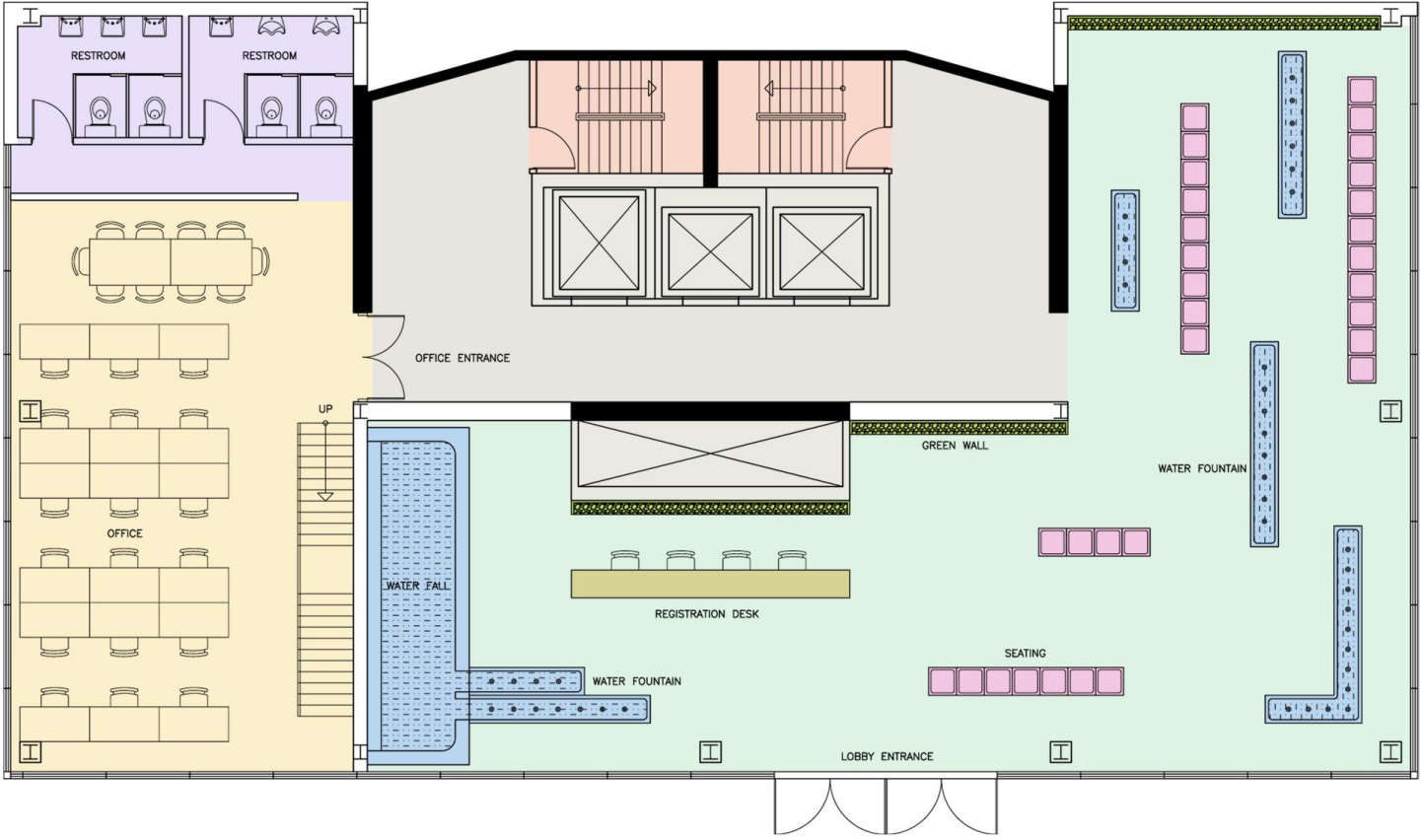
Building Program Layout:

- Hotel rooms: (floors)
- (A-107) - 9,12,15,18
- (A-108) - 10,13,17,20
- (A-109) - 7,8,14,16,19
- Ballroom: floor 22
- Restaurant: floor 21
- Cafe': floor 11
- Mechanical/Security: floor 6
- Conference Rooms: floor 5
- Spa/Locker Rooms: floor 4
- Gym: floor 3
- Offices: floor 2
- Lobby: floor 1

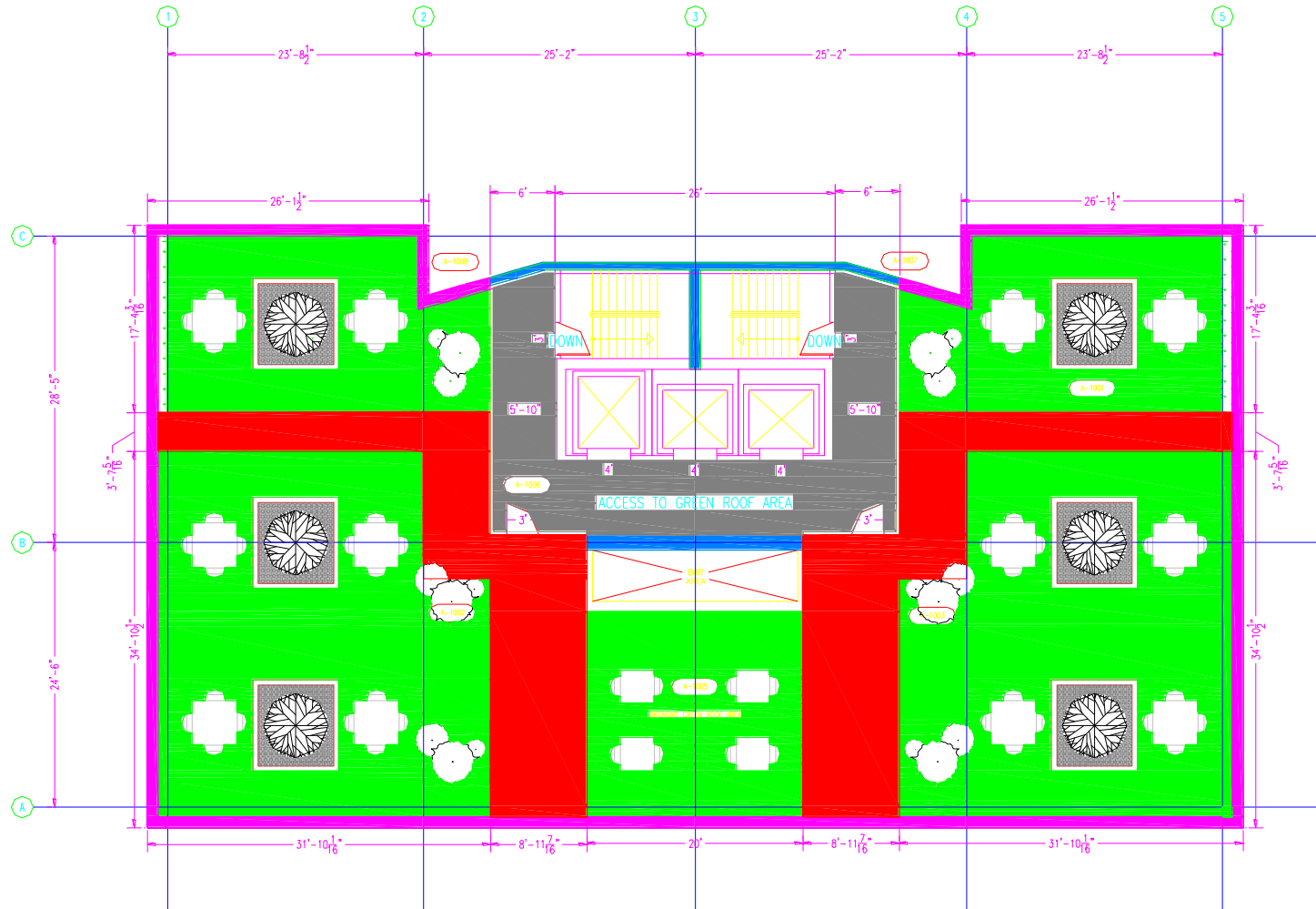
Typical Guest Floor Layout with Elevator/Stair Shafts and Bedrooms



First Floor Lobby



Green Roof



1 GREEN ROOF

SCALE: 1/4" = 1'-0"

Major Ideas

- Design HVAC System for sustainability
- Design Plumbing and Electrical Routing
- Mechanical Room Design around given Shear Walls

Challenges

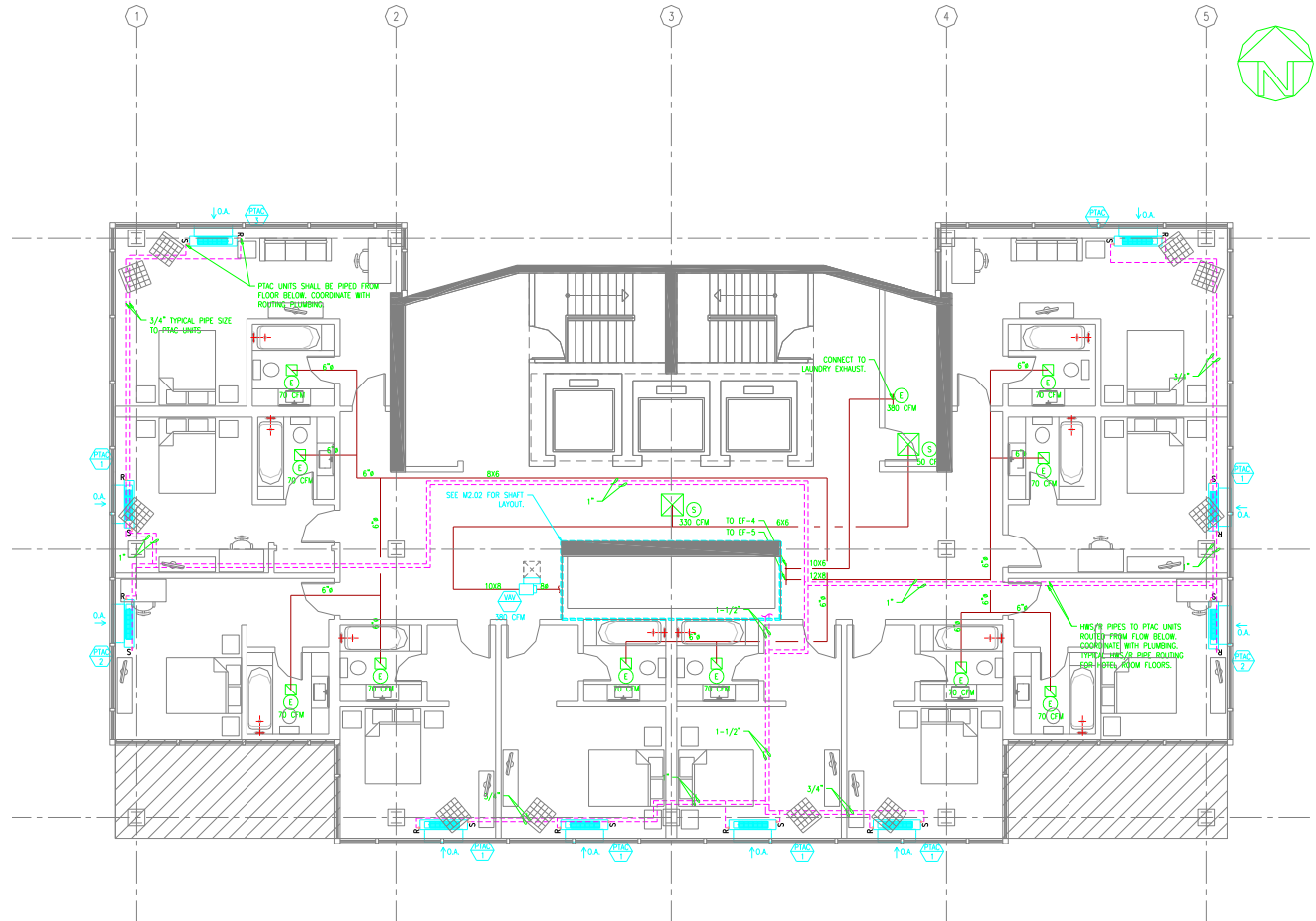
- Utilization of space efficiently to fit necessary equipment
- Selection of appropriate equipment to meet building code requirements
- Incorporating Energy Recovery where Possible



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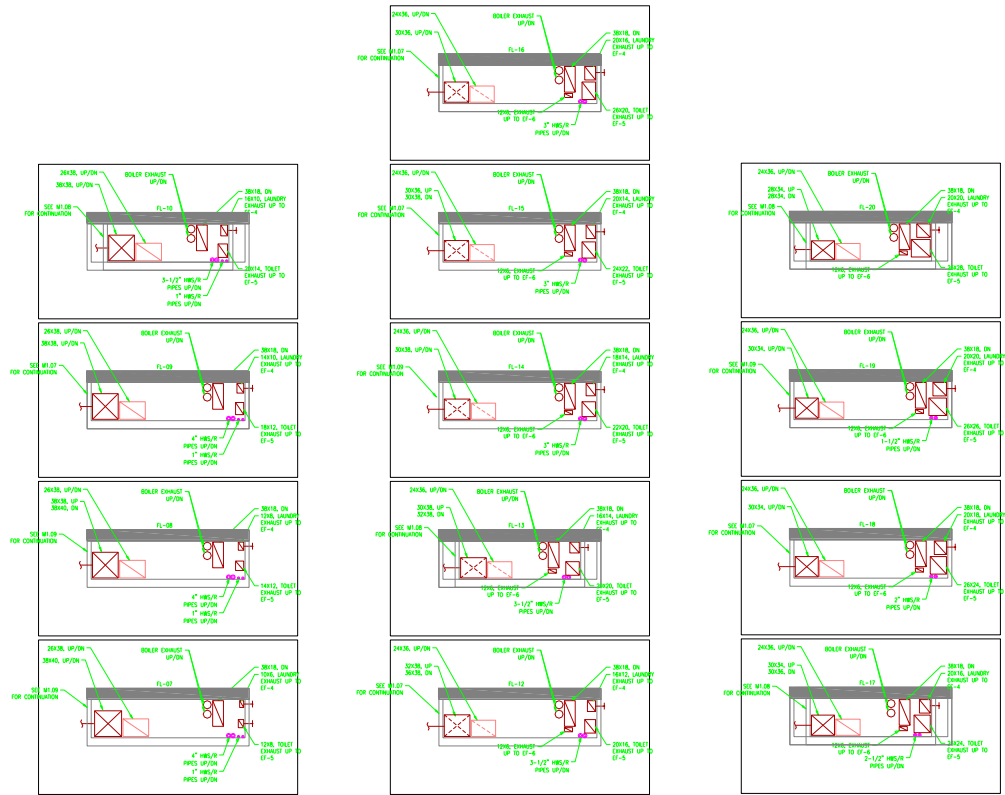
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Mechanical Group



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Mechanical Group



Major Ideas

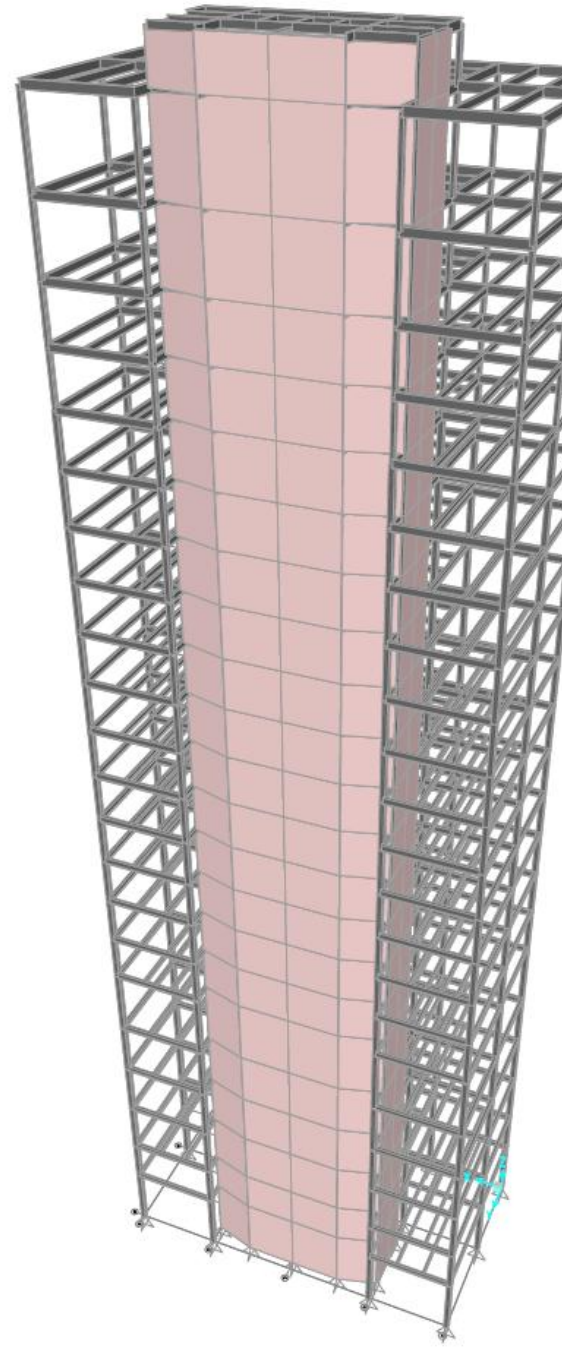
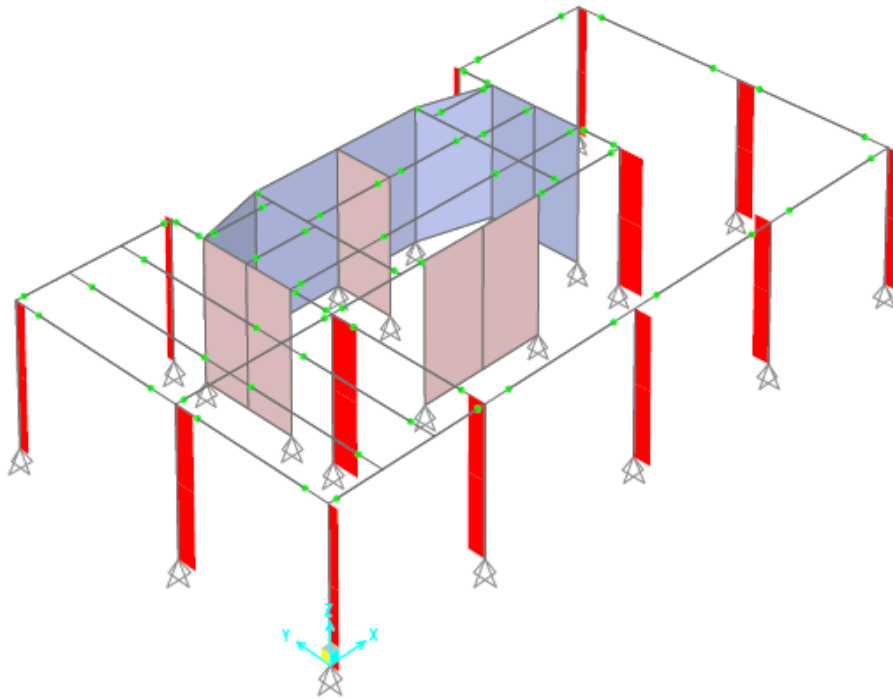
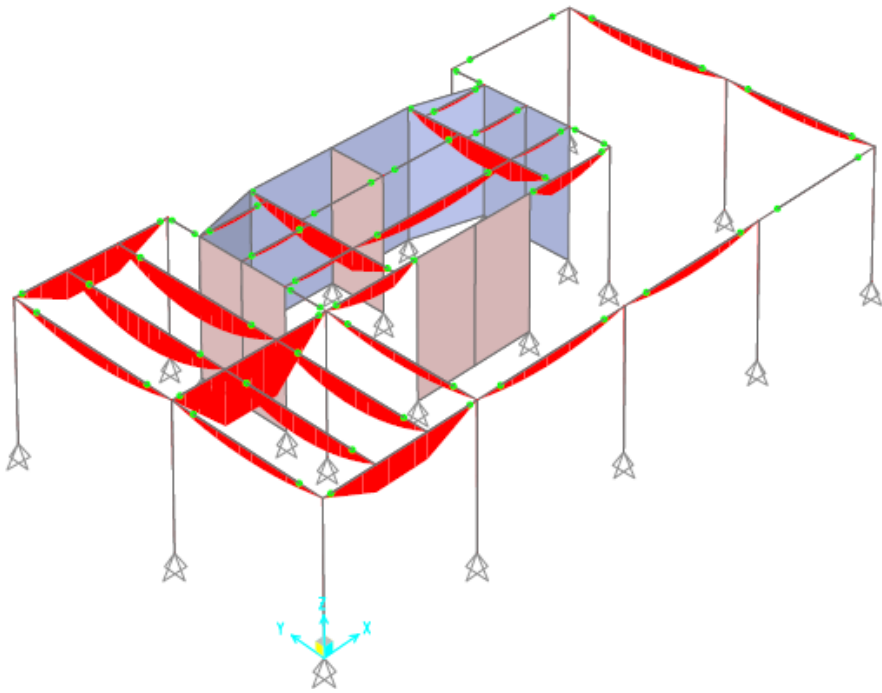
- Analysis of all load cases
- Design steel columns and composite steel beams to resist multiple loads
- Working Finite Element model
- Concrete spread footings and caissons

Challenges

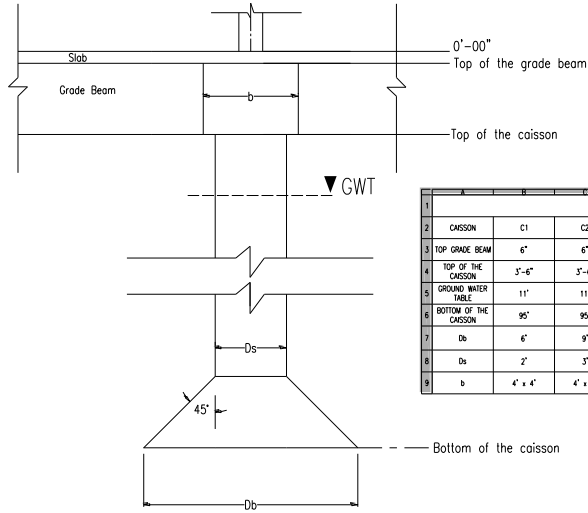
- 20 possible load cases
- Adjusting models to accommodate deviations from original plan



Finite Model and Loading



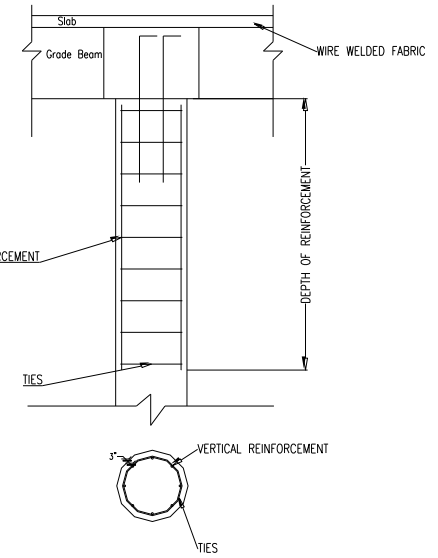
Foundation Design



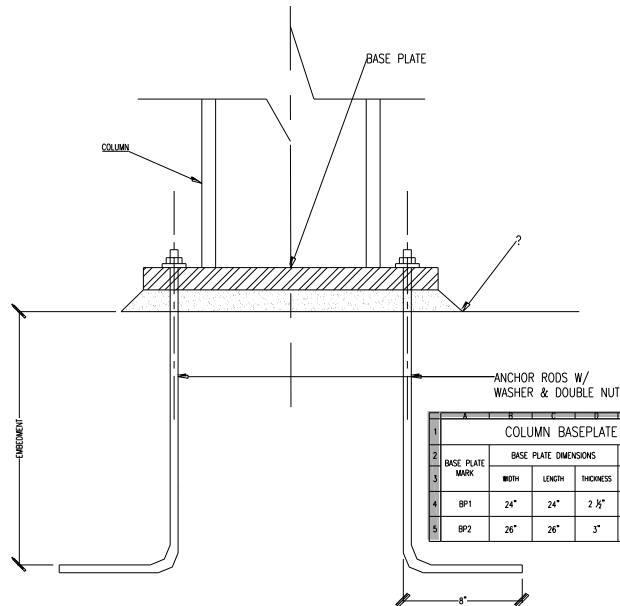
CAISSON REINFORCEMENT SCHEDULE						
	C1	C2	C3	C3b	C4	C5
2 CAISSON	C1	C2	C3	C3b	C4	C5
3 VERTICAL REINFORCEMENT	8 #10	8 #10	8 #14	12 #14	12 #14	8 #18
4 TIES	#4 AT 18" O.C.	#4 AT 18" O.C.	#4 AT 18" O.C.	#4 AT 18" O.C.	#4 AT 18" O.C.	#4 AT 18" O.C.
5 DEPTH OF REINFORCEMENT	6'	9'	12'	36'	45'	51'

CAISSON SCHEDULE						
	C1	C2	C3	C3b	C4	C5
2 CAISSON	C1	C2	C3	C3b	C4	C5
3 TOP GRADE BEAM	6"	6"	6"	6"	6"	6"
4 TOP OF THE CAISSON	3'-6"	3'-6"	3'-6"	3'-6"	3'-6"	4'-6"
5 GROUND WATER TABLE	11'	11'	11'	11'	11'	11'
6 BOTTOM OF THE CAISSON	95'	95'	95'	95'	95'	95'
7 Ds	6'	9'	12'	12'	15'	17'
8 Ds	2'	3'	4'	12'	15'	17'
9 b	4' x 4'	4' x 4'	5' x 5'			

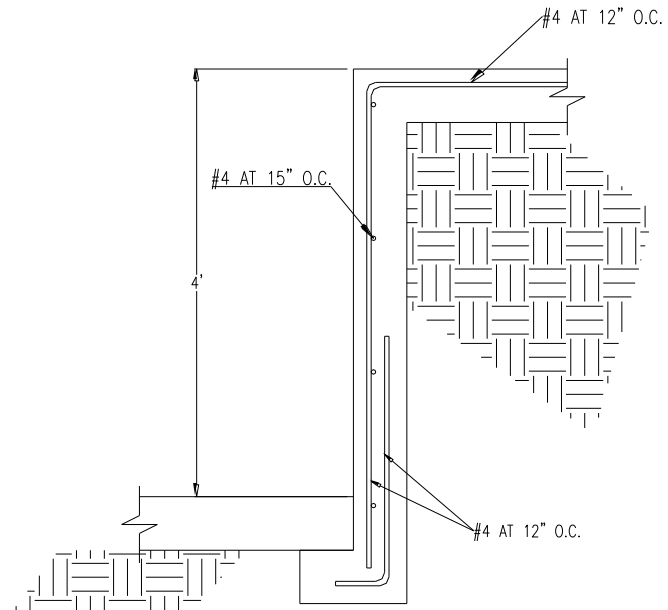
CAISSON PROFILE (1/1)



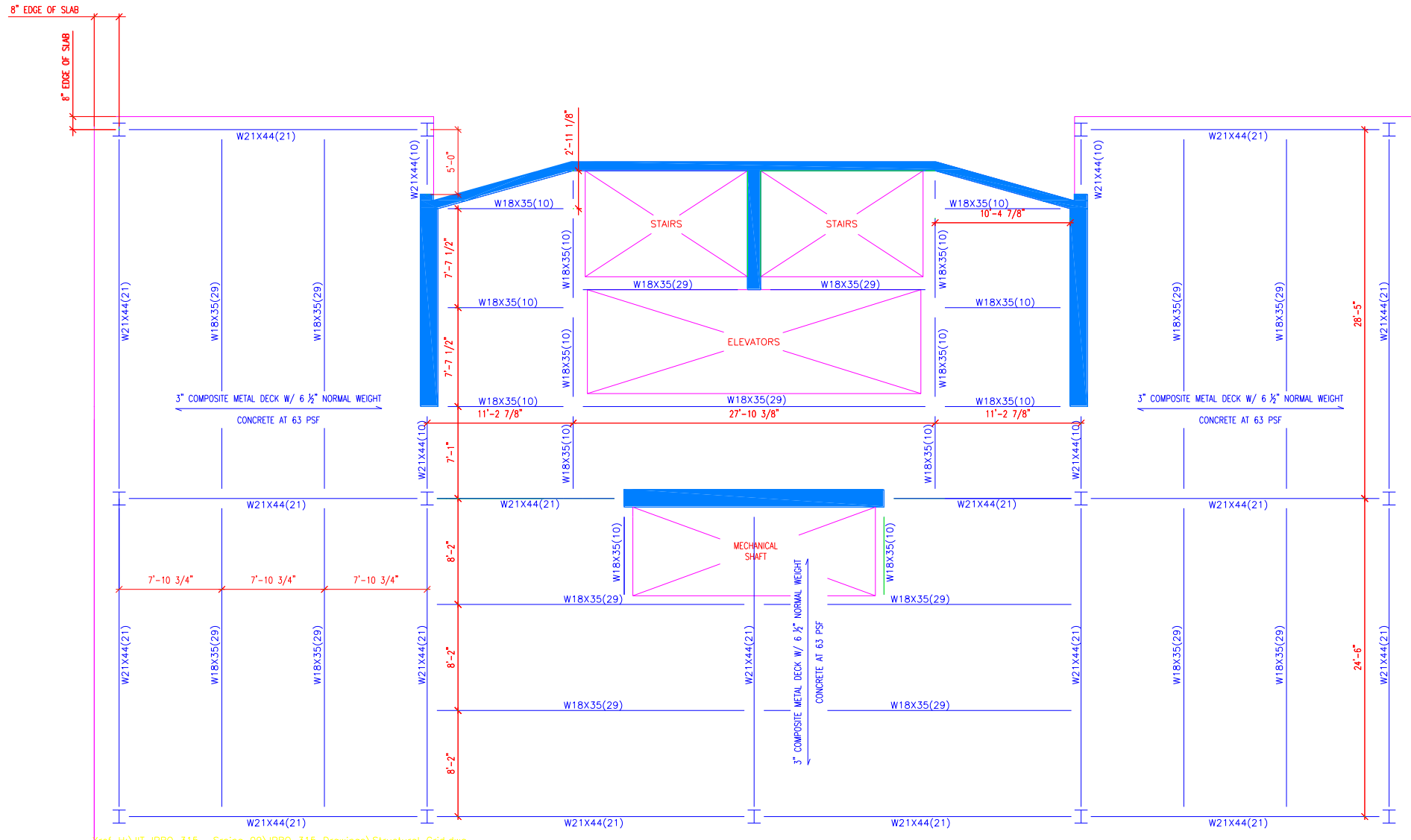
CAISSON REINFORCEMENT (1/1)



COLUMN BASEPLATE SCHEDULE					
2 BASE PLATE MARK	BASE PLATE DIMENSIONS			ANCHOR BOLT	
	WIDTH	LENGTH	THICKNESS	NO.	SIZE (DIAMETER) EMBEDDED LENGTH
4 BP1	24"	24"	2 1/2"	12	1" 30"
5 BP2	26"	26"	3"	12	1 1/2" 30"



Typical Beam Design Layout



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Conclusion

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QUESTIONS

