Presentation Day

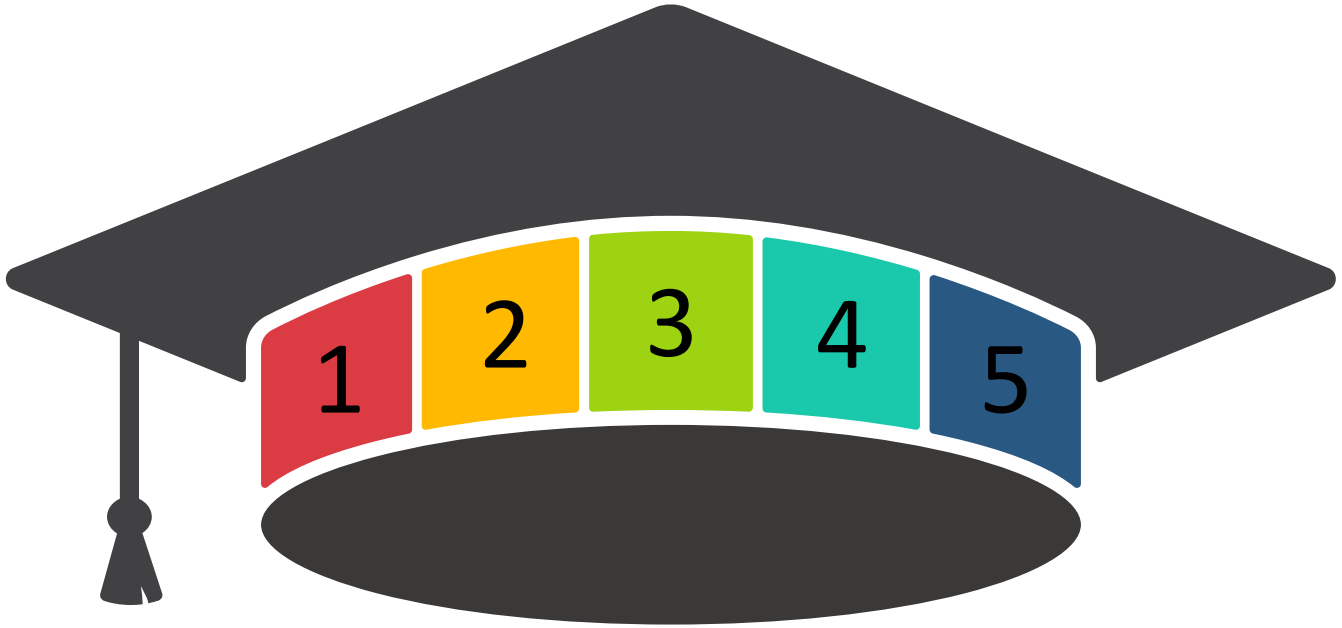
"Integrated Design and Structural Analysis of a Multi-Storied Residential Building in Pink City, Raozan"

Course Code – CE 412

Team - Equilibrium

ID– 1901042-49

Objective of our Project



Space Optimization

Structural Safety

Code Compliance

Sustainable Materials

Cost Efficiency

Previous work

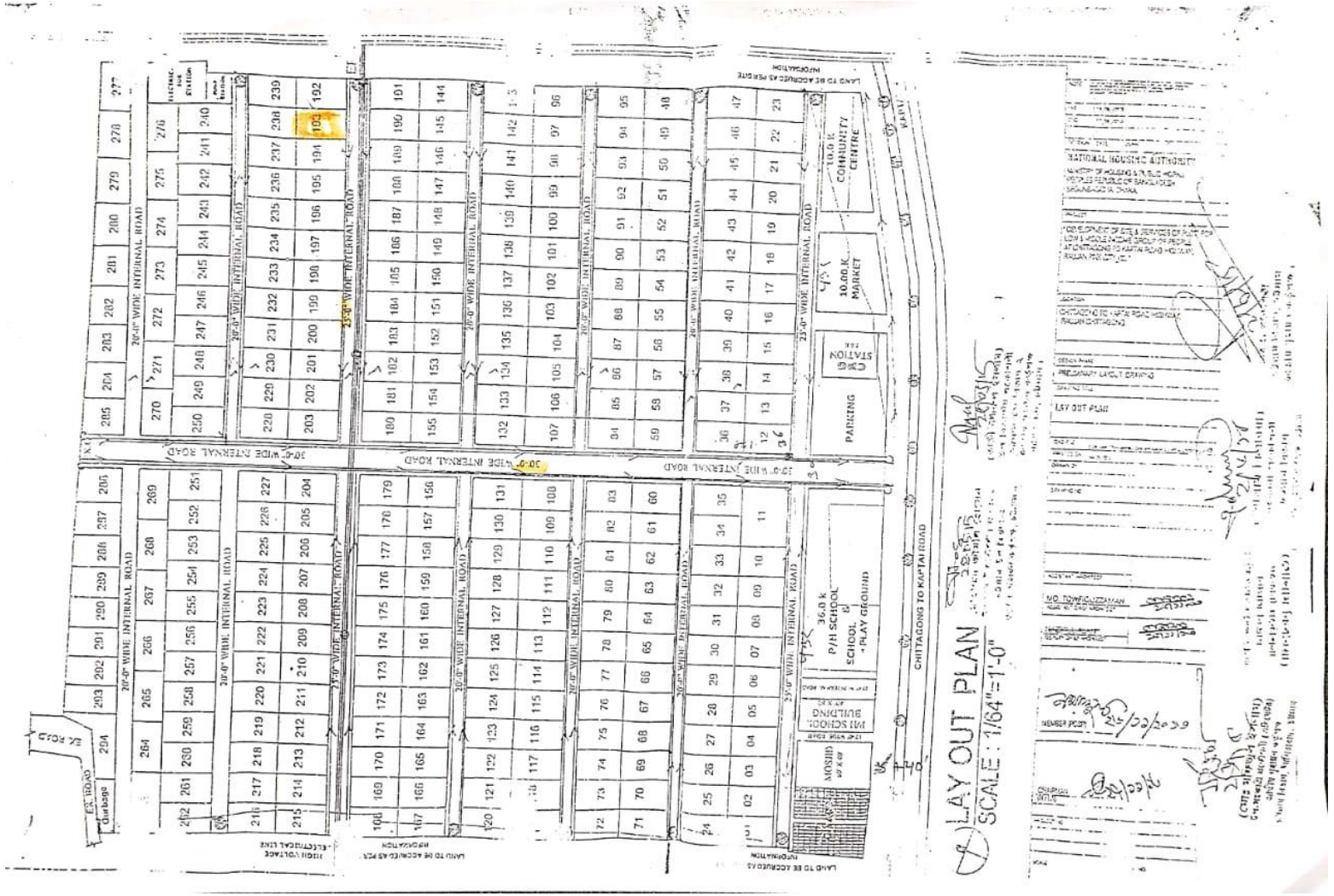
- Site Visit
- Masterplan Collection
- Study BNBC 2020
- FAR, MGC Calculation
- AutoCAD Design
- Revise Design
- ETABS Modeling
- Serviceability Check
- Bearing Capacity Calculation

Recent work

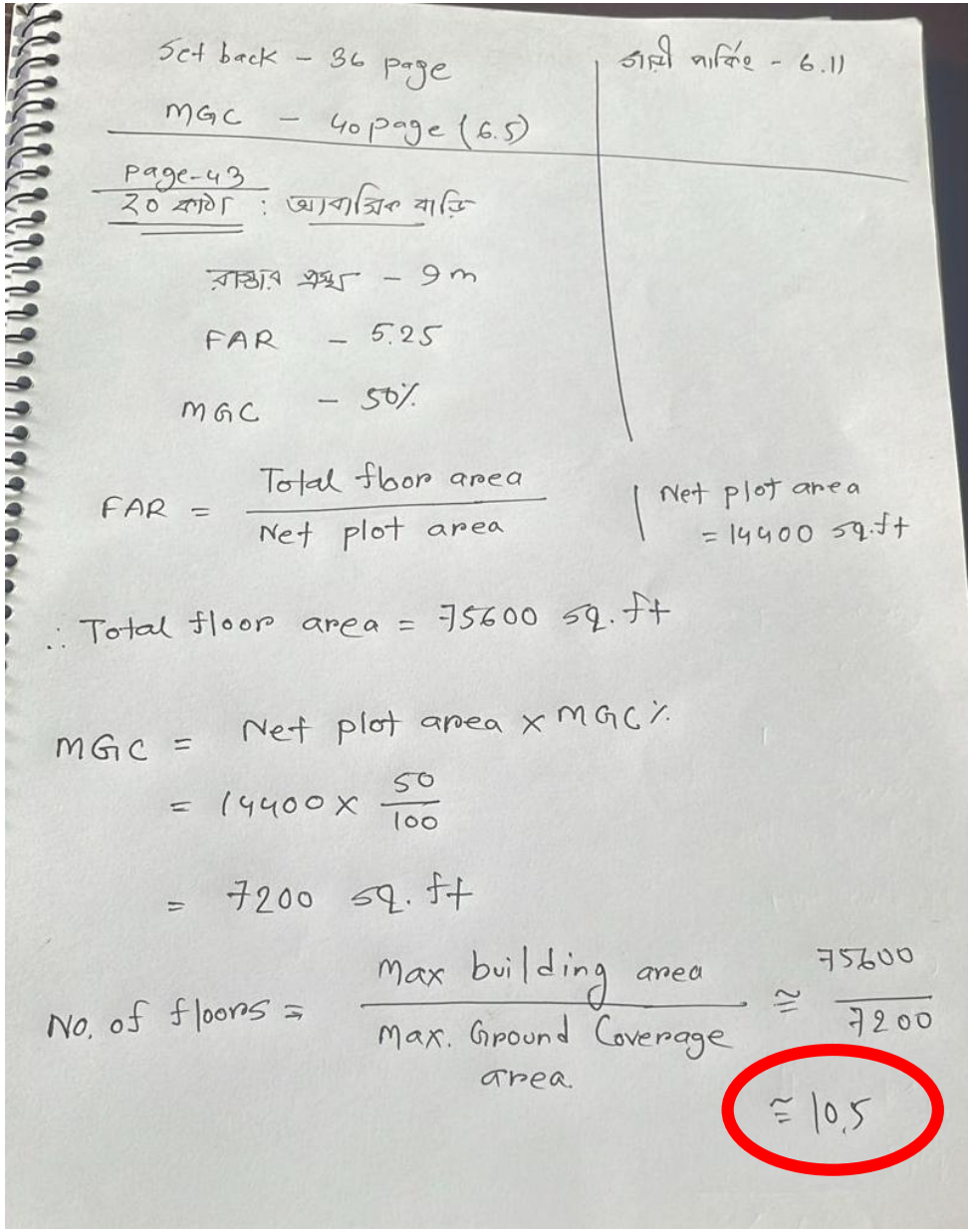
- Founftion design
- Masterplan Collection
- Study BNBC 2020
- FAR, MGC Calculation
- AutoCAD Design
- Revise Design
- ETABS Modeling
- Serviceability Check
- Bearing Capacity Calculation

Site Visit

Masterplan



FAR Analysis



Set back – 36 page

MGC – 40 page (6.5)

গাড়ী পার্কিং – 6.11

Page-43

20 ফ্ল্যাট : আবাসিক বাড়ি

রাস্তার প্রস্থ – 9m

FAR – 5.25

MGC – 50%

$$FAR = \frac{\text{Total floor area}}{\text{Net plot area}}$$

Net plot area = 14400 sq.ft

∴ Total floor area = 75600 sq.ft

MGC = Net plot area × MGC%

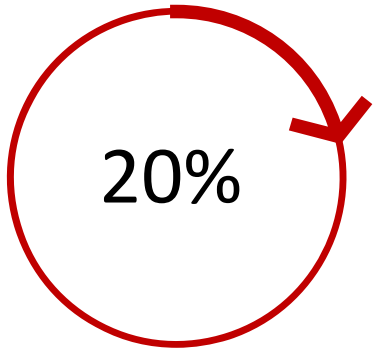
$= 14400 \times \frac{50}{100}$

$= 7200$ sq.ft

$$\text{No. of floors} = \frac{\text{Max building area}}{\text{Max. Ground Coverage area}} \cong \frac{75600}{7200}$$

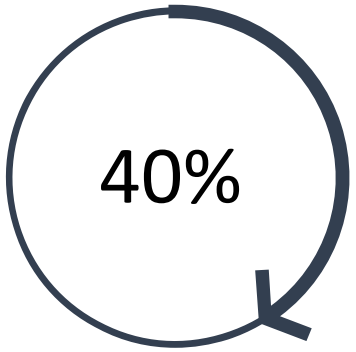
$\cong 10.5$

Remaining Work

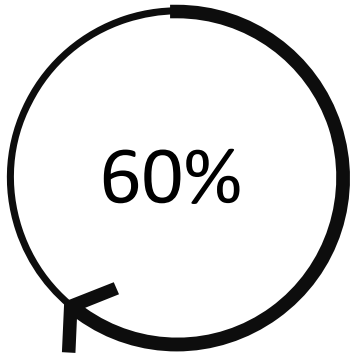


Reinforcement Check

- Column Rebar
- Beam Rebar
- Shear wall

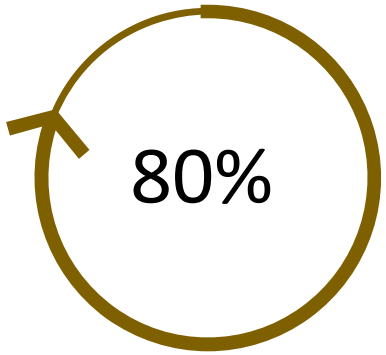


Overstress Check



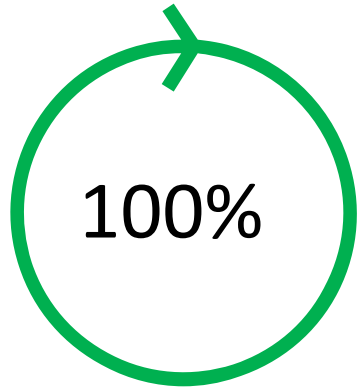
Detailing

- Column Rebar
- Beam Rebar
- Foundation



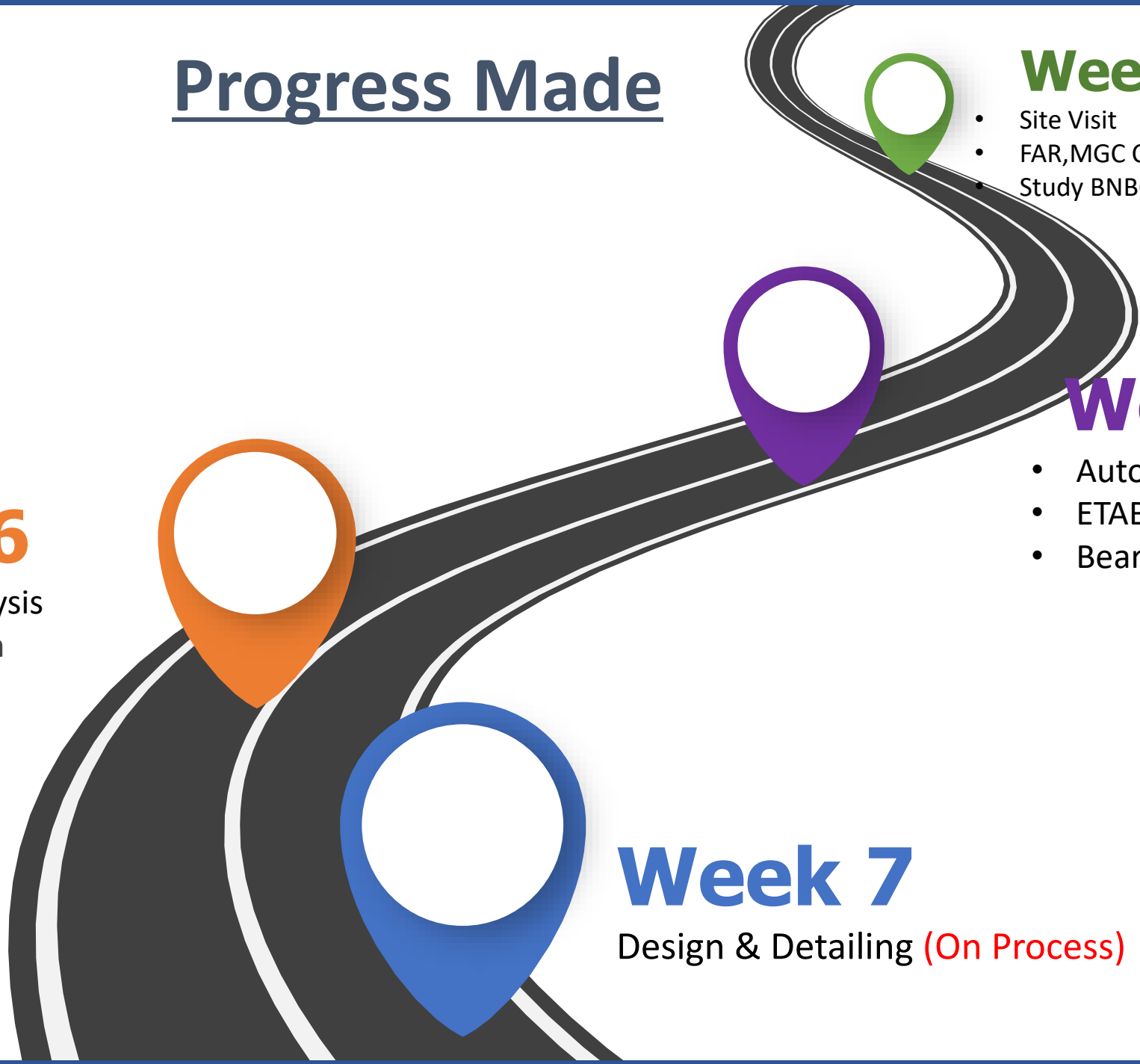
Extra Design

- Overhead Tank
- Pipe network
- Electricity line



Cost Benefit Ratio

Progress Made



Week 2-3

- Site Visit
- FAR,MGC Calculation
- Study BNBC 2020

Week 4-5

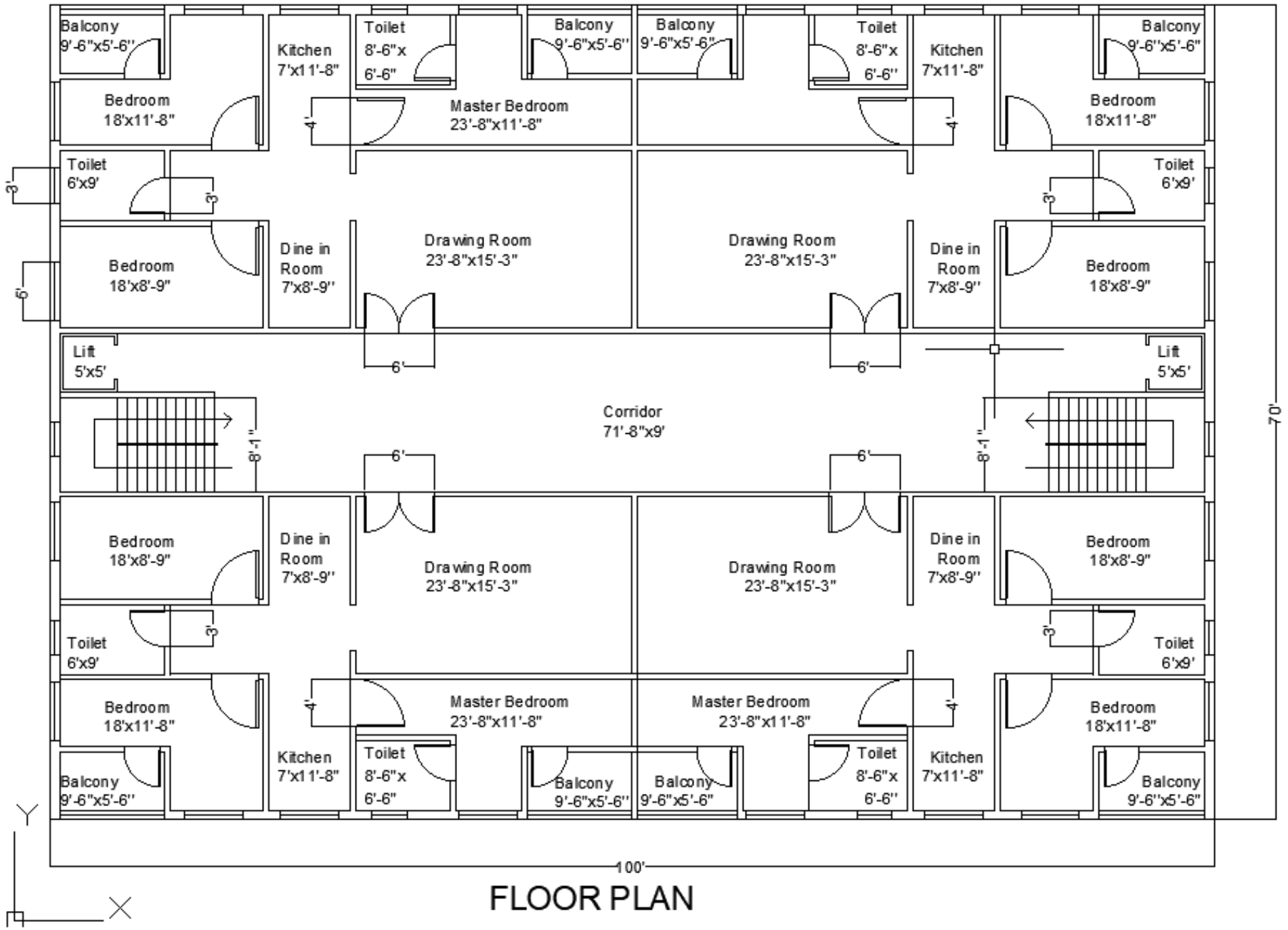
- AutoCAD Drafting
- ETABS Modeling & Analysis
- Bearing Capacity Calculation

Week 6

- Chapter 01 Analysis
- Revise Floor plan

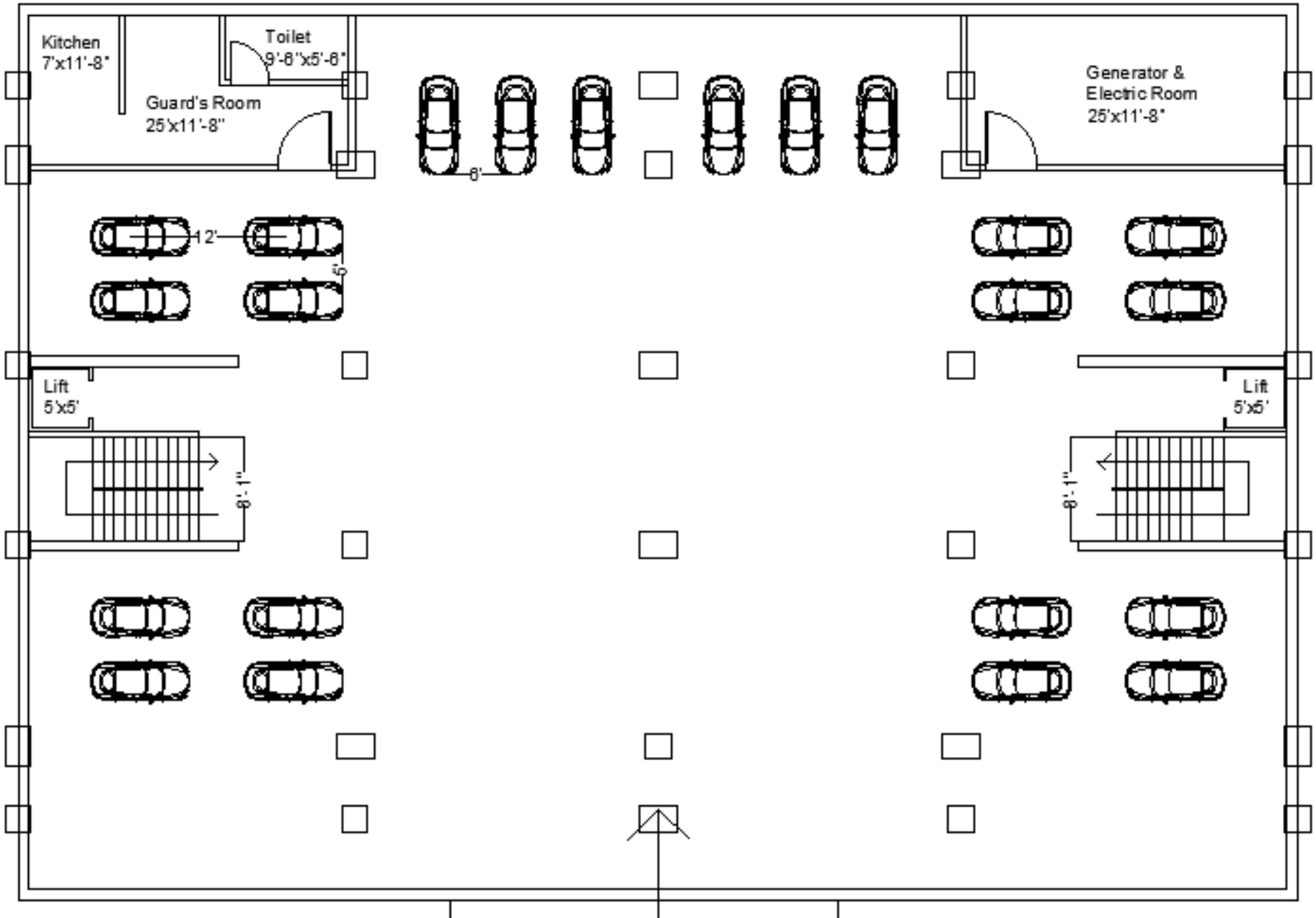
Week 7

Design & Detailing (On Process)

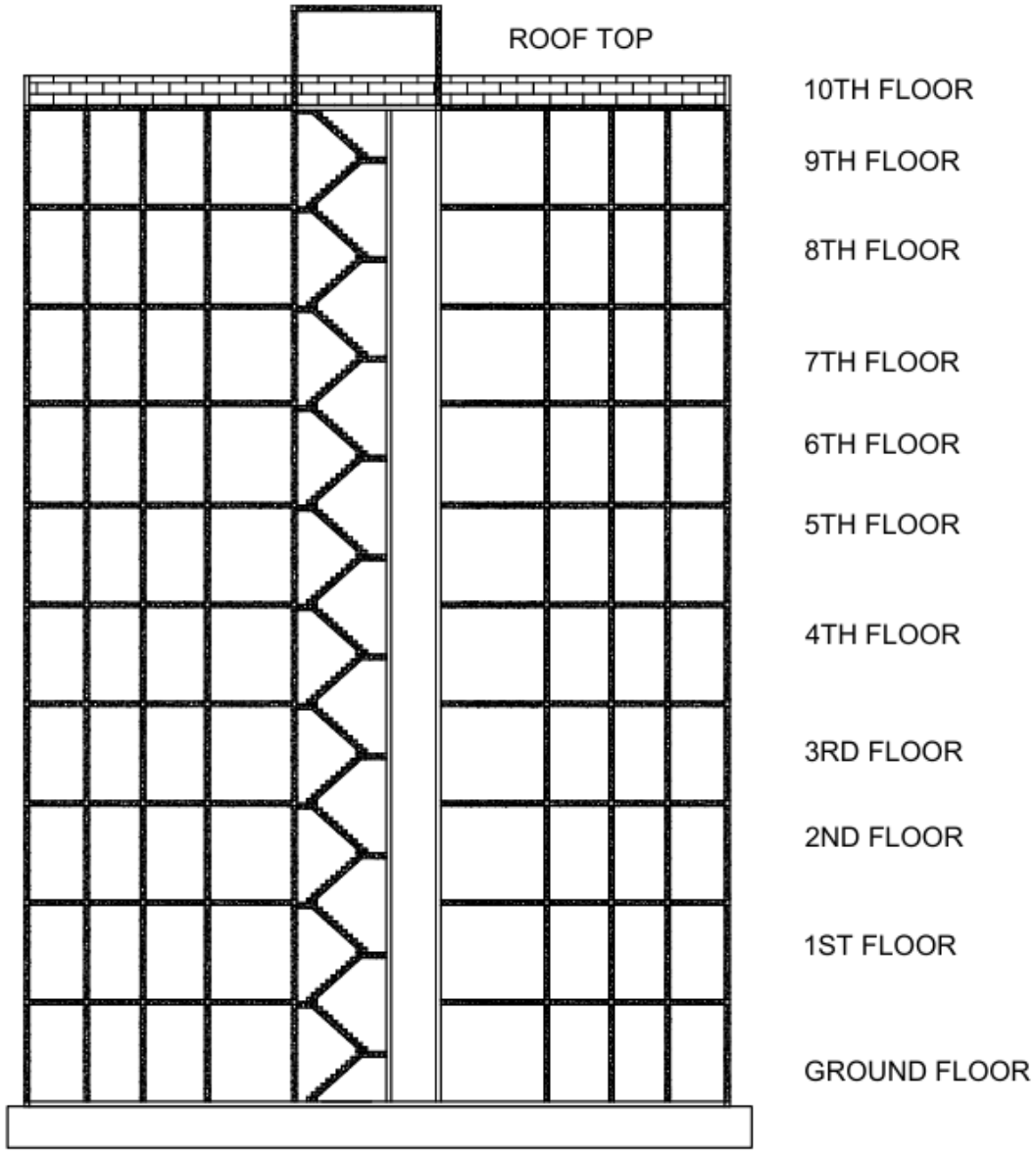

Balcony
9'-6"x5'-6"
Kitchen
7'x11'-8"
Toilet
8'-6"x
6'-6"
Balcony
9'-6"x5'-6"
Balcony
9'-6"x5'-6"
Toilet
8'-6"x
6'-6"
Kitchen
7'x11'-8"
Balcony
9'-6"x5'-6"
Bedroom
18'x11'-8"
Master Bedroom
23'-8"x11'-8"
Bedroom
18'x11'-8"
Toilet
6'x9'
Toilet
6'x9'
Bedroom
18'x8'-9"
Dine in
Room
7'x8'-9"
Drawing Room
23'-8"x15'-3"
Drawing Room
23'-8"x15'-3"
Dine in
Room
7'x8'-9"
Bedroom
18'x8'-9"
Lift
5'x5'
Lift
5'x5'
Corridor
71'-8"x9'
Bedroom
18'x8'-9"
Dine in
Room
7'x8'-9"
Drawing Room
23'-8"x15'-3"
Drawing Room
23'-8"x15'-3"
Dine in
Room
7'x8'-9"
Bedroom
18'x8'-9"
Toilet
6'x9'
Toilet
6'x9'
Bedroom
18'x11'-8"
Master Bedroom
23'-8"x11'-8"
Master Bedroom
23'-8"x11'-8"
Bedroom
18'x11'-8"
Balcony
9'-6"x5'-6"
Kitchen
7'x11'-8"
Toilet
8'-6"x
6'-6"
Balcony
9'-6"x5'-6"
Balcony
9'-6"x5'-6"
Toilet
8'-6"x
6'-6"
Kitchen
7'x11'-8"
Balcony
9'-6"x5'-6"
100'
70'
3'
5'
4'
6'
8'-1"
Y
X

FLOOR PLAN

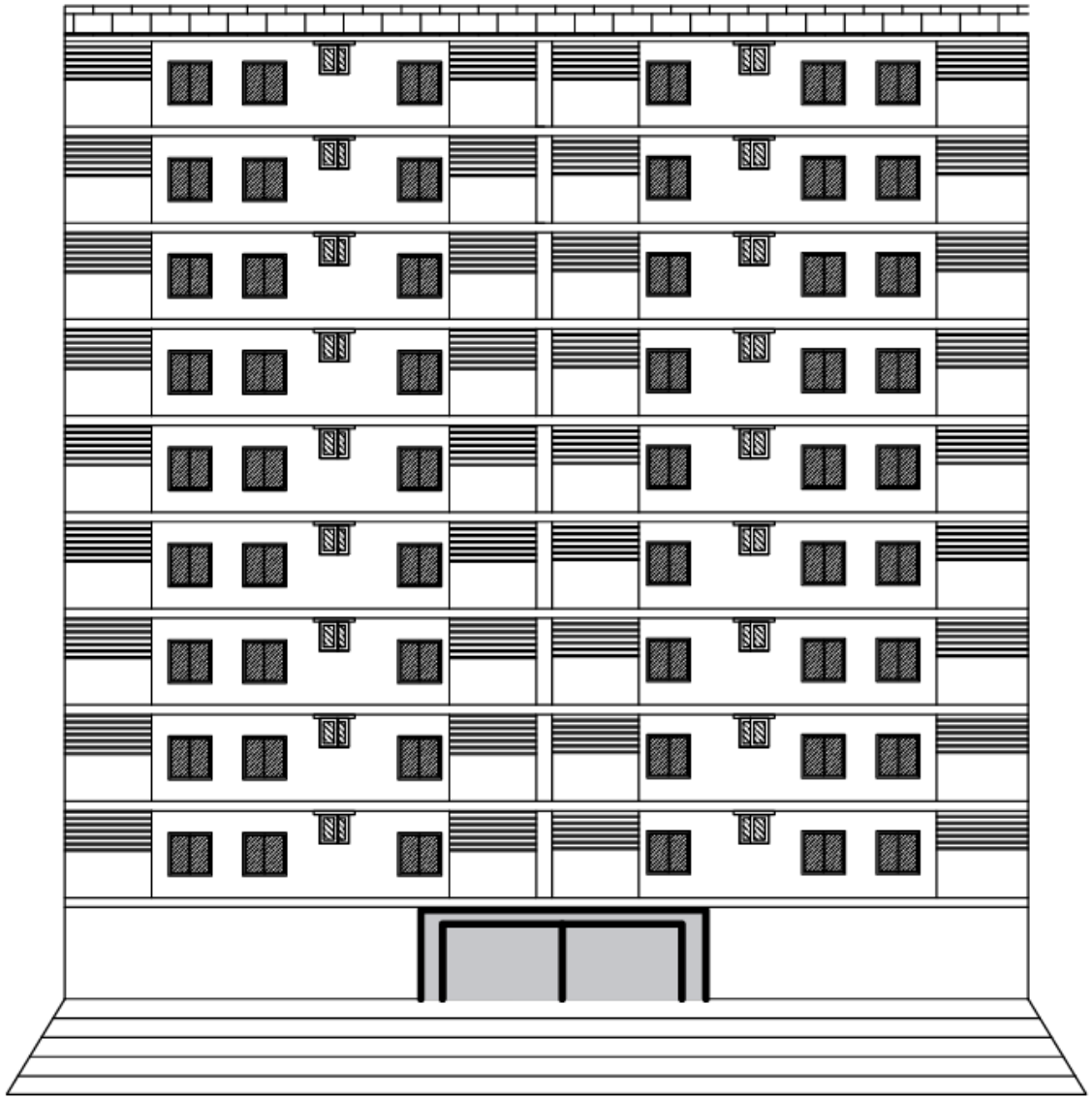
Parking Plan



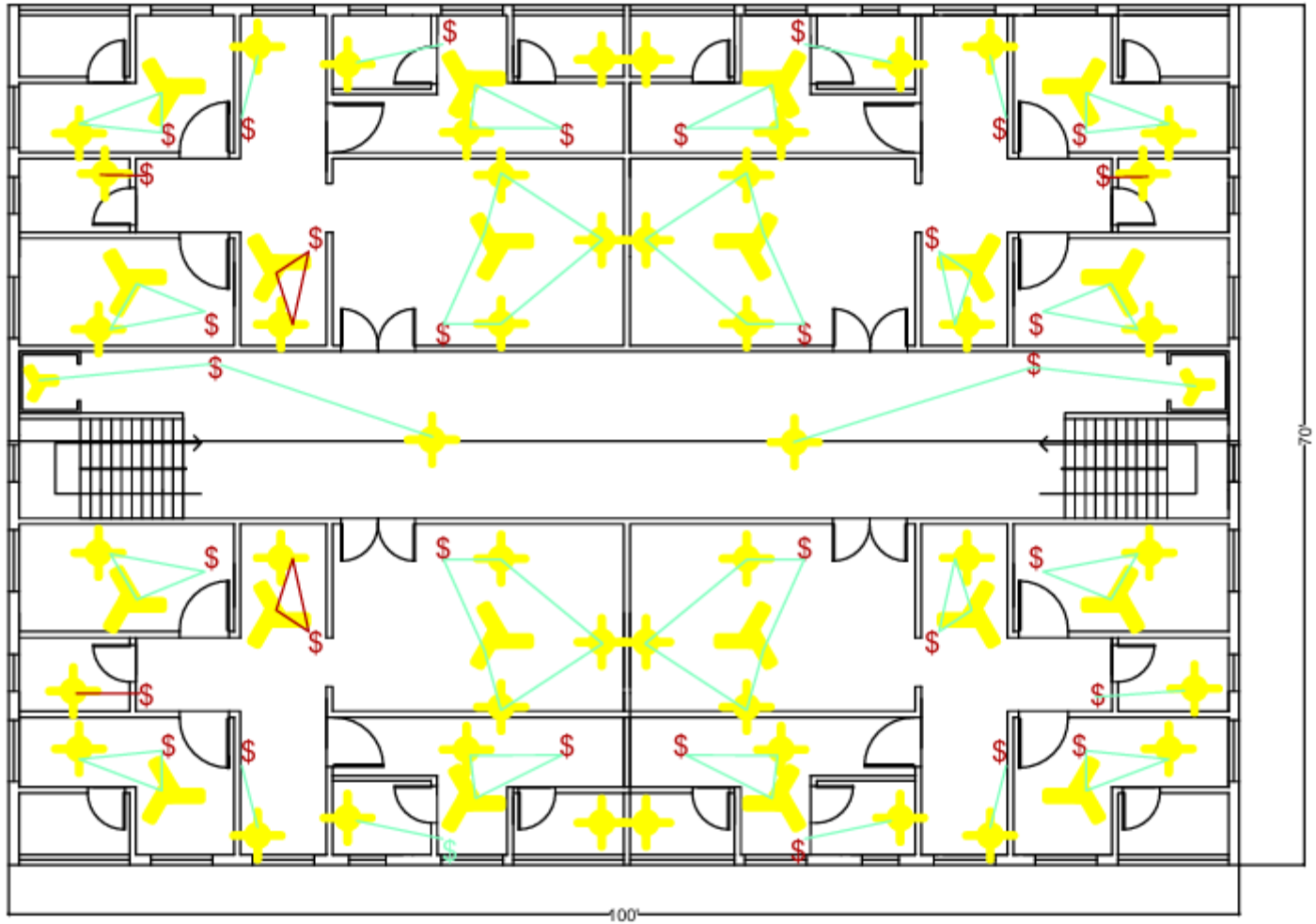
Cross section



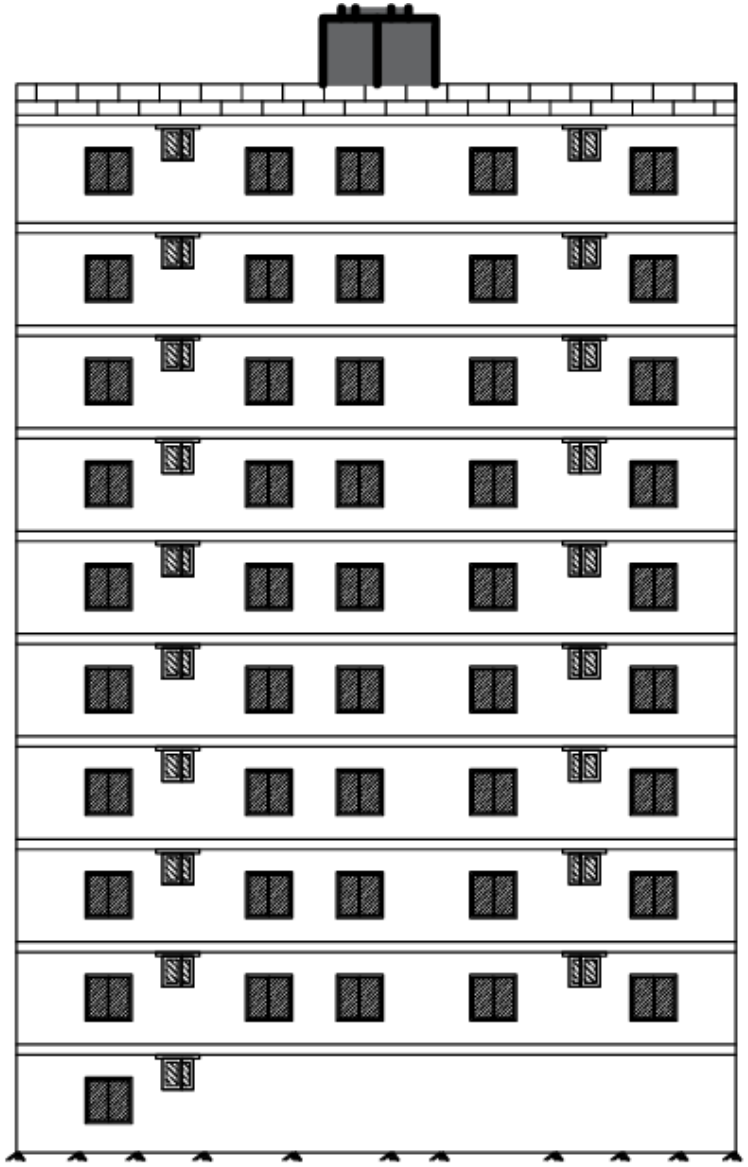
Front Elevation



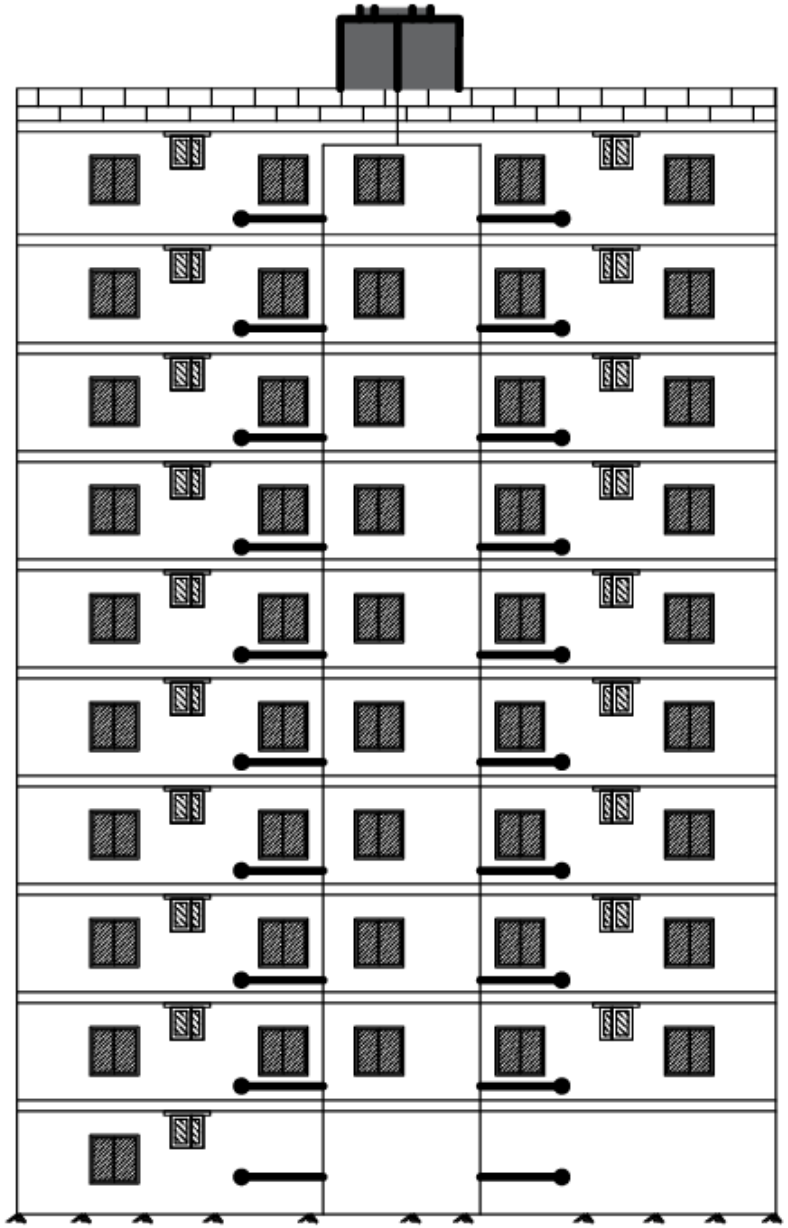
Electrical Plan



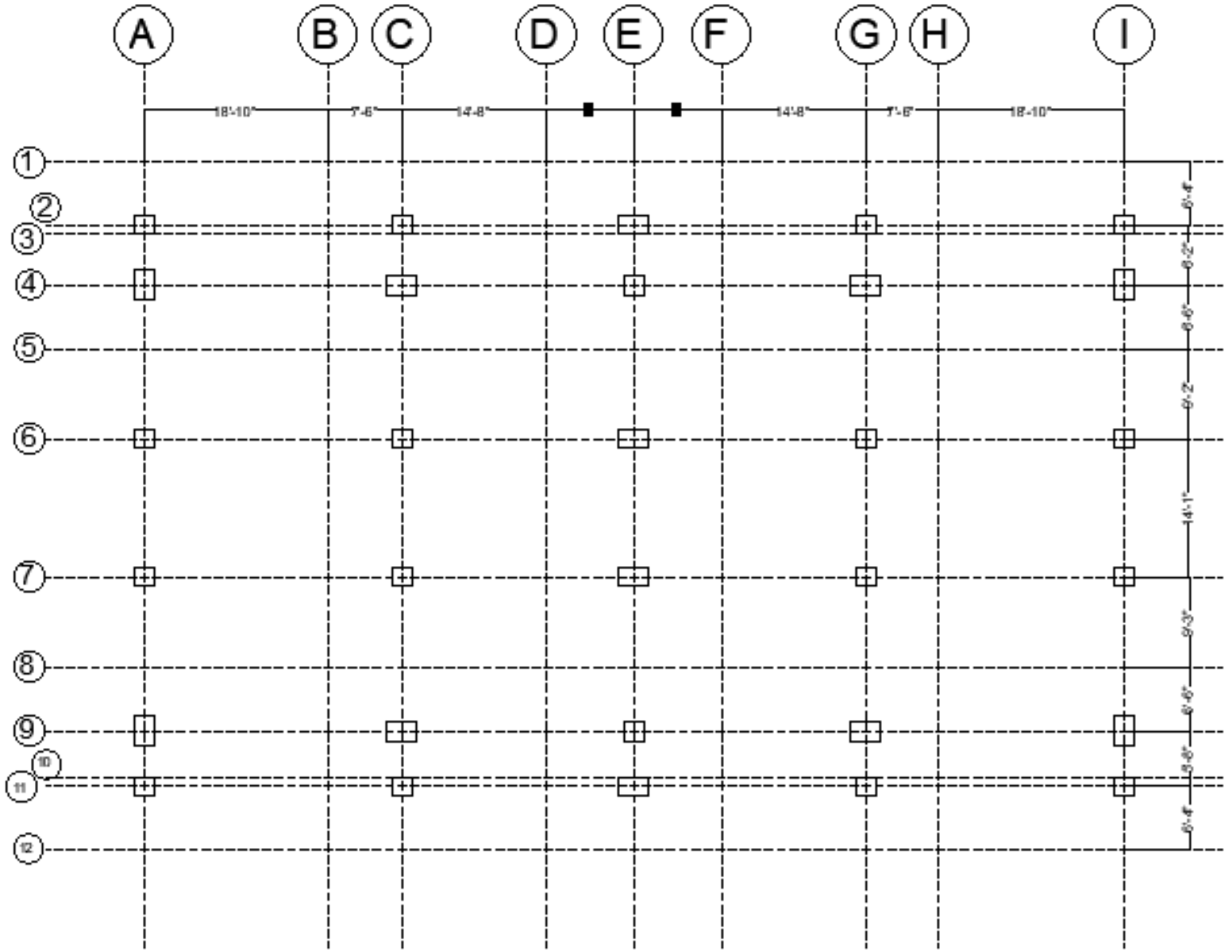
Side Elevation



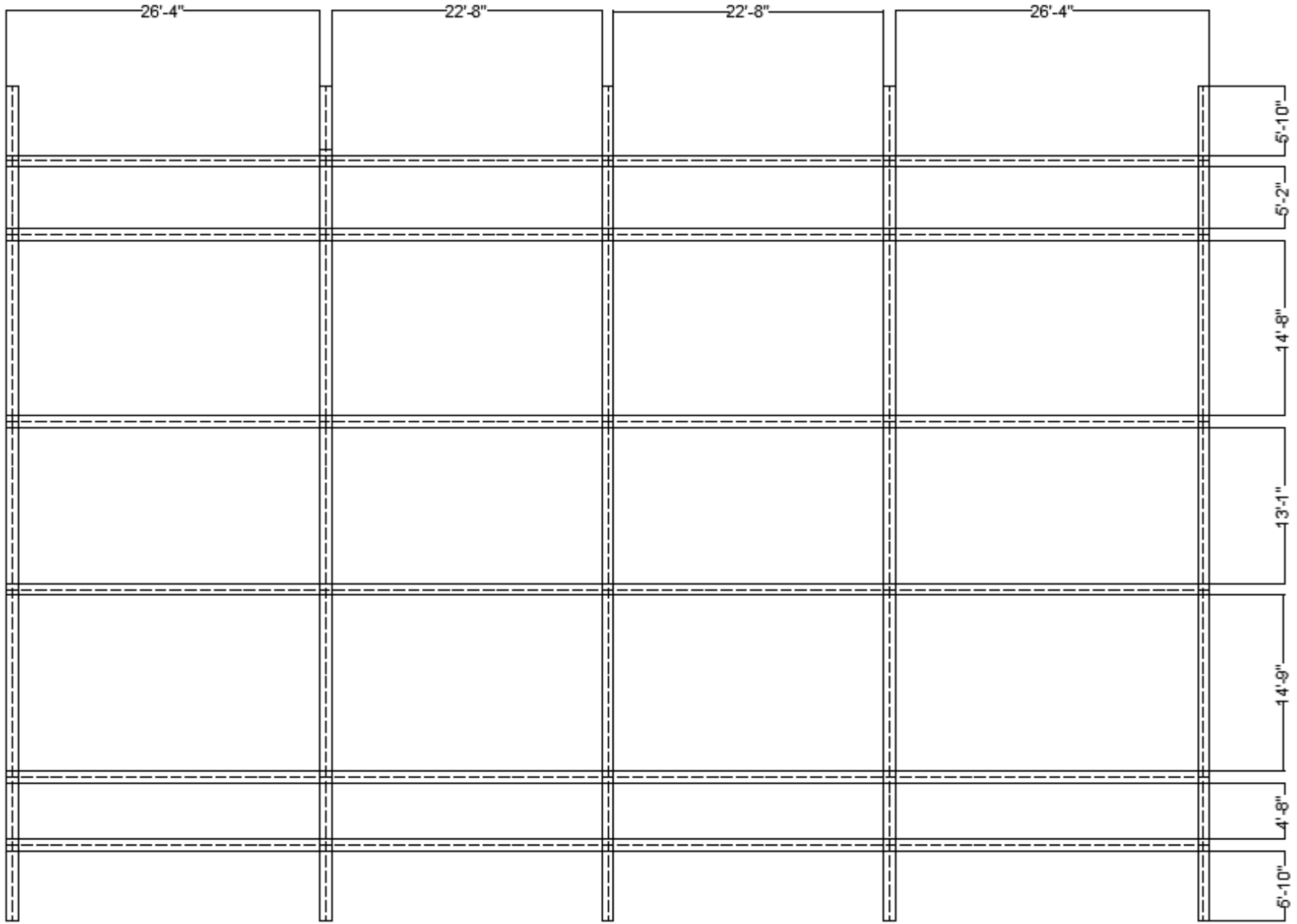
Plumbing Layout



Plan

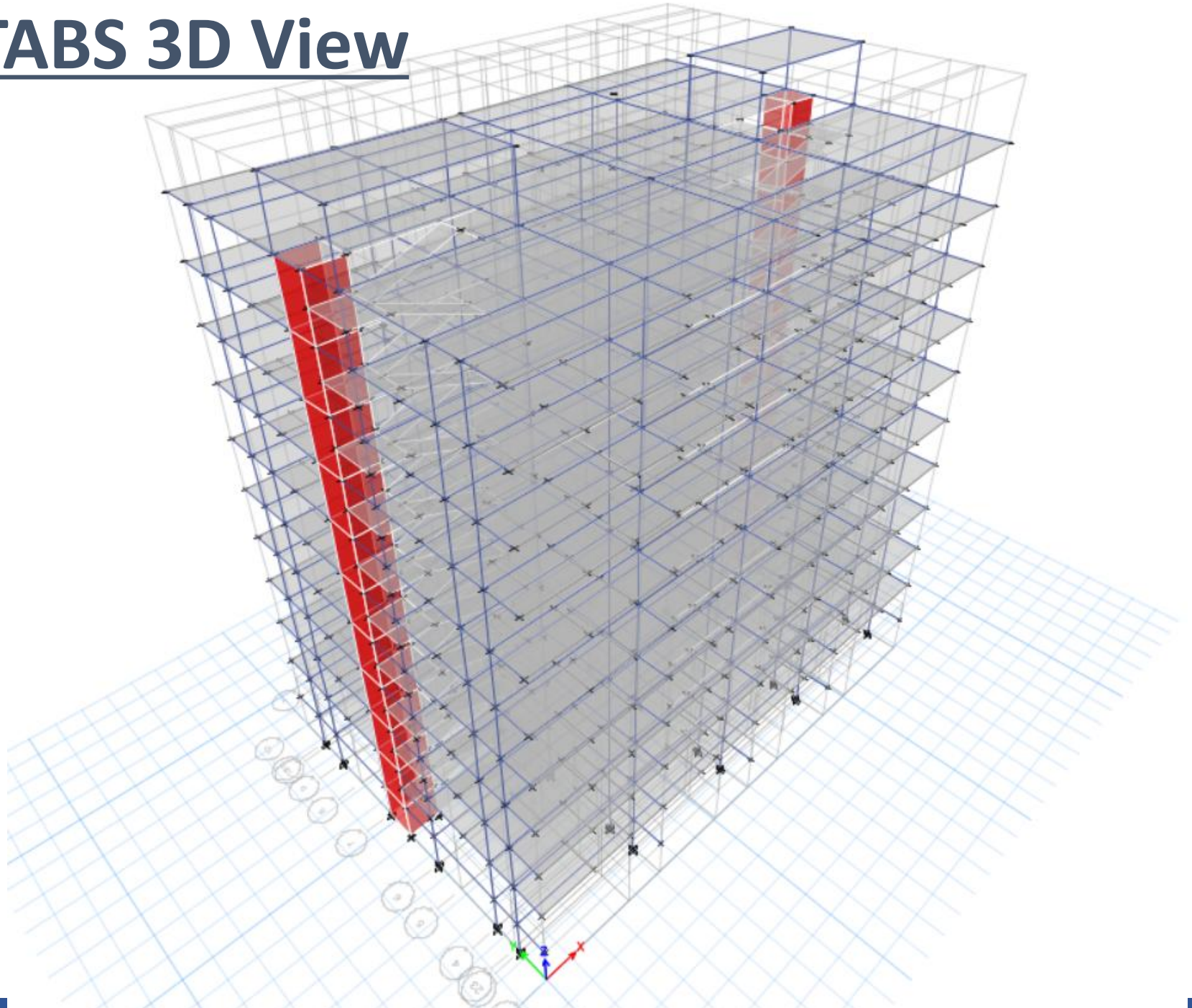


COLUMN LAYOUT PLAN

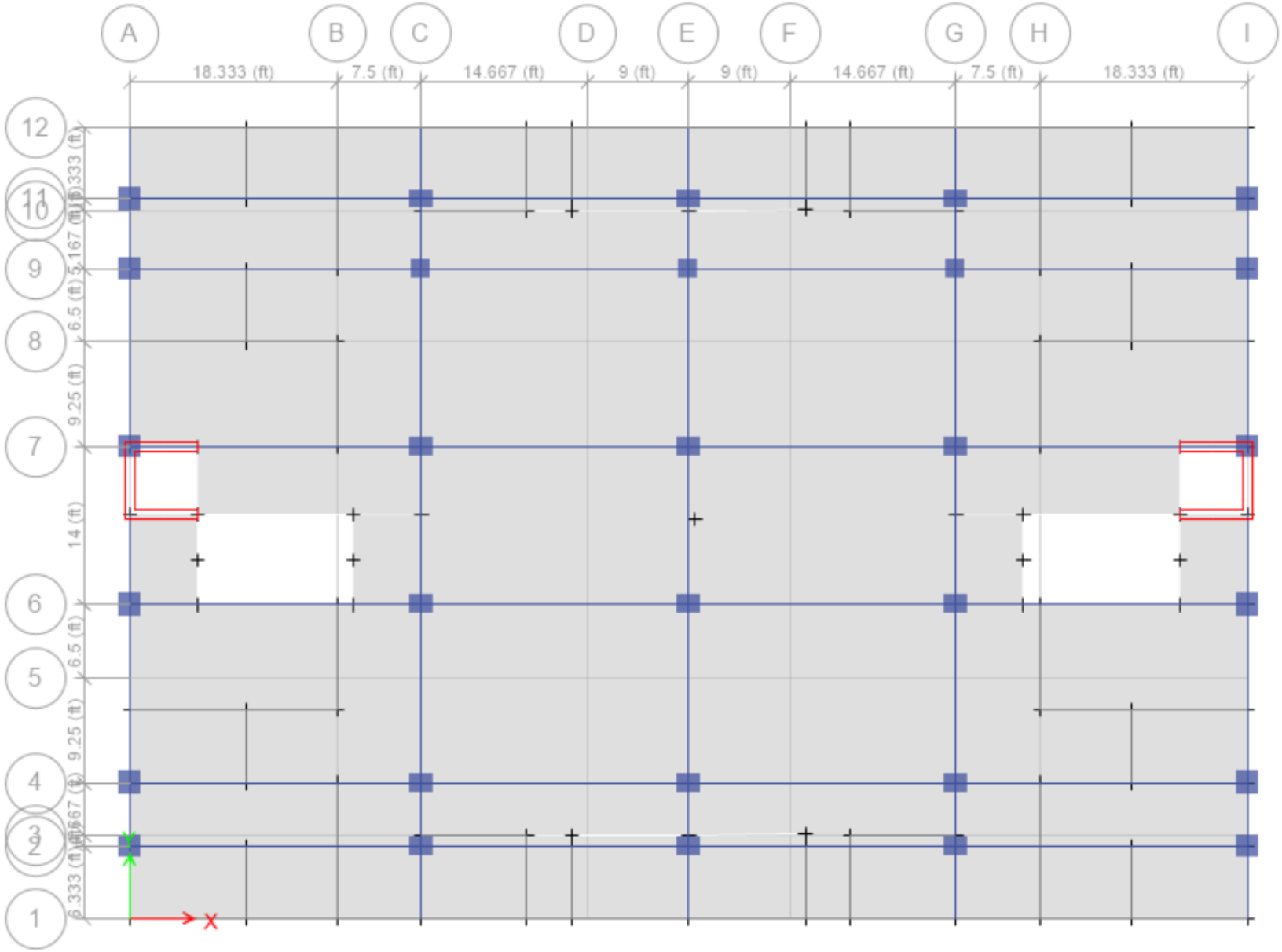


BEAM LAYOUT PLAN

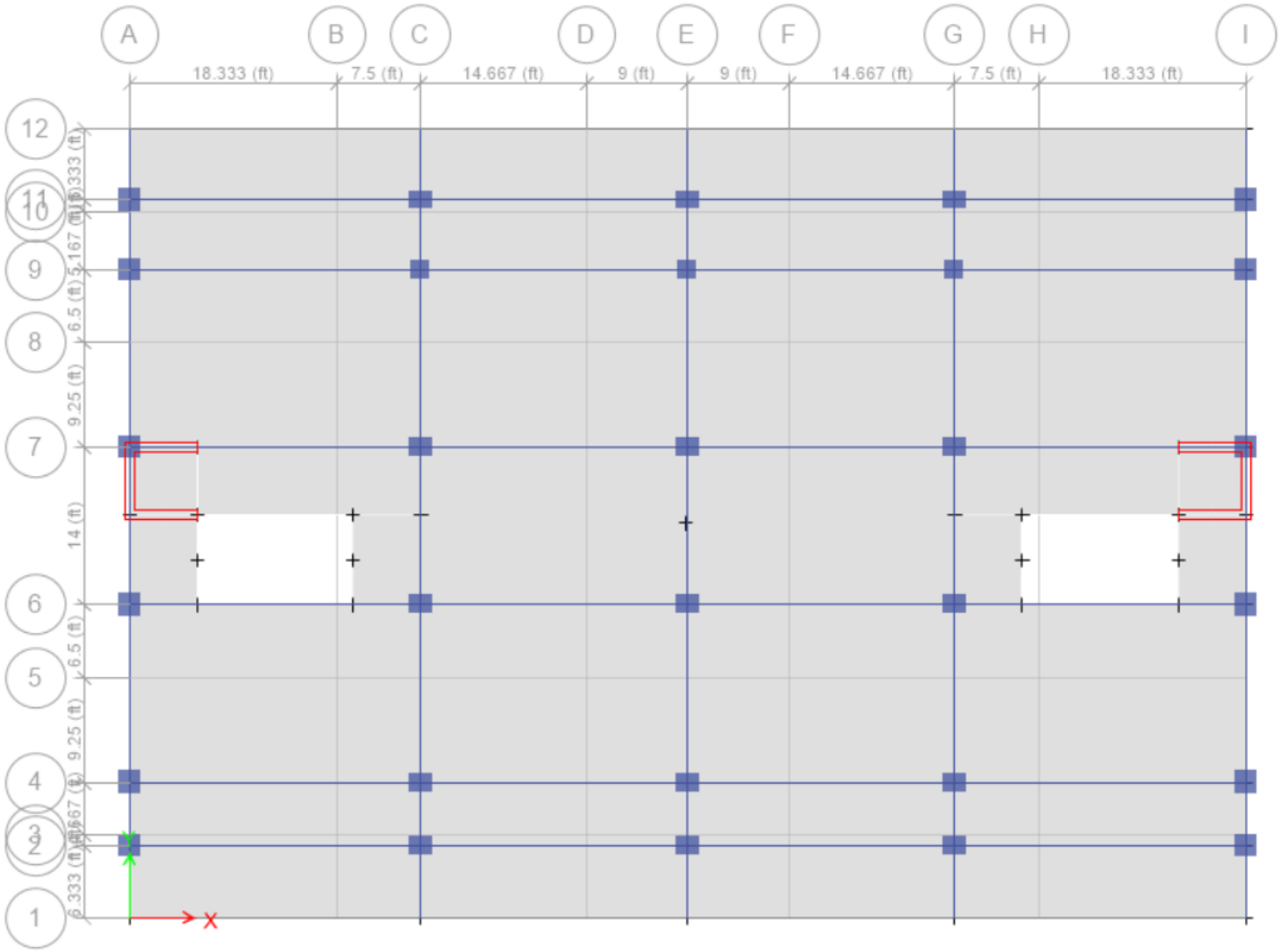
ETABS 3D View



ETABS Plan View (from 1st to 9th floor)



ETABS Plan View (10th floor)



2.2.4 Weight of Materials and Constructions

Load assign

In estimating dead loads, the actual weights of materials and constructions shall be used, provided that in the absence of definite information, the weights given in Tables 6.2.1 and 6.2.2 shall be assumed for the purposes of design.

Table 6.2.1: Unit Weight of Basic Materials

Material	Unit Weight (kN/m³)	Material	Unit Weight (kN/m³)
Aluminium	27.0	Granite, Basalt	26.4
Asphalt	21.2	Iron - cast	70.7
Brass	83.6	- wrought	75.4
Bronze	87.7	Lead	111.0
Brick	18.9	Limestone	24.5
Cement	14.7	Marble	26.4
Coal, loose	8.8	Sand, dry	15.7

Table 6.2.2: Weight of Construction Materials.

Material/Component/Member	Veight per Unit Area (kN/m²)	Material/Component/Member	Weight per Unit Area (kN/m²)
Floor		**Walls and Partitions**	
Asphalt, 25 mm thick	0.526	Acrylic resin sheet, flat, per mm thickness	0.012
Clay tiling, 13 mm thick	0.268	Asbestos cement sheeting:	
Concrete slab (stone aggregate)*:		4.5 mm thick	0.072
solid, 100 mm thick	2.360	6.0 mm thick	0.106
solid, 150 mm thick	3.540	Brick masonry work, excl. plaster:	
Galvanized steel floor deck (excl. topping)	0.147-0.383	burnt clay, per 100 mm thickness	1.910
Magnesium oxychloride:		sand-lime, per 100 mm thickness	1.980
normal (sawdust filler), 25 mm thick	0.345	Concrete (stone aggregate)*:	
heavy duty (mineral filler), 25 mm thick	0.527	100 mm thick	2.360
Terrazzo paving 16 mm thick	0.431	150 mm thick	3.540
		250 mm thick	5.900
		Fibre insulation board, per 10 mm thickness	0.034
		Fibrous plaster board, per 10 mm thickness	0.092
		Glass, per 10 mm thickness	0.269
		Hardboard, per 10 mm thickness	0.961
		Particle or flake board, per 10 mm thickness	0.075
		Plaster board, per 10 mm thickness	0.092
		Plywood, per 10 mm thickness	0.061
		Ceiling	
		Fibrous plaster, 10 mm thick	0.081
		Cement plaster, 13 mm thick	0.287
		Suspended metal lath and plaster (two faced incl. studding)	0.480
		Miscellaneous	
		Felt (insulating), per 10 mm thickness	0.019
		Plaster:	
		Cement plaster, per 10 mm thickness	0.230
		Lime plaster, per 10 mm thickness	0.191
		PVC sheet, per 10 mm thickness	0.153
		Rubber paving, per 10 mm thickness	0.151
		Terra-cotta Hollow Block Masonry:	
		75 mm thick	0.671
		100 mm thick	0.995
		150 mm thick	1.388

Material/Component/Member	Veight per Unit Area (kN/m²)	Material/Component/Member	Weight per Unit Area (kN/m²)
Roof			
Acrylic resin sheet, corrugated:			
3 mm thick, standard corrugations	0.043		
3 mm thick, deep corrugations	0.062		
Aluminium, corrugated sheeting: (incl. lap and fastenings)			
1.2 mm thick	0.048		
0.8 mm thick	0.028		
0.6 mm thick	0.024		
Aluminium sheet(plain):			
1.2 mm thick	0.033		
1.0 mm thick	0.024		
0.8 mm thick	0.019		
Bituminous felt (5 ply) and gravel	0.431		
Slates:			
4.7 mm thick	0.335		
9.5 mm thick	0.671		
Steel sheet, flat galvanized:			
1.00 mm thick	0.082		
0.80 mm thick	0.067		
0.60 mm thick	0.053		
Steel, galvanized std. corrugated sheeting: (incl. lap and fastenings)			
1.0 mm thick	0.120		
0.8 mm thick	0.096		
0.6 mm thick	0.077		
Tiles :			
terra-cotta tiles (French pattern)	0.575		
concrete , 25 mm thick	0.527		
clay tiles	0.6-0.9		

* For brick aggregate, 90% of the listed values may be used.

Occupancy or Use	Uniform kN/m²	Concentrated kN
Hotels	See *Residential*	
Libraries		
Reading rooms	2.90	4.50
Stack rooms	7.20 [d]	4.50
Corridors above first floor	3.80	4.50
Manufacturing*		
Light	4.00	6.00
Medium	6.00	9.00
Heavy	12.00	13.40
Garments manufacturing floor except stacking or storage area	4.00[e]	--
Stacking or storage area of garments manufacturing industry	6.00 [f]	10.00 [f]
Marquees	3.60	--
Office Buildings		
File and computer rooms shall be designed for heavier loads based on anticipated occupancy		
Lobbies and first-floor corridors	4.80	9.00
Offices	2.40	9.00
Corridors above first floor	3.80	9.00
Penal Institutions		
Cell blocks	2.00	--
Corridors	4.80	--
Residential		
Dwellings (one- and two-family)		
Uninhabitable attics without storage	0.50	--
Uninhabitable attics with storage	1.00	--
Habitable attics and sleeping areas	1.50	--
All other areas except stairs and balconies	2.00	--
Hotels and multifamily houses		
Private rooms and corridors serving them	2.00	--
Public rooms and corridors serving them	4.80	--
Reviewing stands, grandstands, and bleachers	4.80 [g]	--

Occupancy or Use	Uniform kN/m²	Concentrated kN
Roofs		
Ordinary flat roof	1.00 [h]	--
Pitched and curved roofs	See Table 6.2.4	
Roofs used for promenade purposes	2.90	--
Roofs used for roof gardens or assembly purposes	4.80	--
Roofs used for other special purposes	See Note [i] below	
Awnings and canopies		
Fabric construction supported by a lightweight rigid skeleton structure	0.24 (nonredu-ceable)	--
All other construction	1.00	--
Primary roof members exposed to a work floor		
Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages	--	9.00
All other occupancies	--	1.33
All roof surfaces subject to maintenance workers	--	1.33
Schools		
Classrooms	2.00	4.50
Corridors above first floor	3.80	4.50
First-floor corridors	4.80	4.50
Scuttles, skylight ribs, and accessible ceilings		0.90
Sidewalks, vehicular driveways, and yards subject to trucking	12.00 [j]	35.60 [k]
Stadiums and arenas		
Bleachers	4.80[g]	--
Fixed seats (fastened to floor)	2.90[g]	--
Stairs and exit ways	4.80	See Note[l] below
One- and two-family residences only	2.00	--

Table 6.2.20: Values for Coefficients to Estimate Approximate Period

Structure type	C_t	m	
Concrete moment-resisting frames	0.0466	0.9	Note: Consider moment resisting frames as frames which resist 100% of seismic force and are not enclosed or adjoined by components that are more rigid and will prevent the frames from deflecting under seismic forces.
Steel moment-resisting frames	0.0724	0.8	
Eccentrically braced steel frame	0.0731	0.75	
All other structural systems	0.0488	0.75	

Earthquake load assign

Site Class	Description of soil profile up to 30 meters depth	Average Soil Properties in top 30 meters: Shear wave velocity, $\bar{V}_s$ (m/s)	SPT Value, $\bar{N}$ (blows/30cm)	Undrained shear strength, $\bar{S}_u$ (kPa)
SC	Deep deposits of dense or medium dense sand, gravel or stiff clay with thickness from several tens to many hundreds of metres.	180 – 360	15 - 50	70 - 250
SD	Deposits of loose-to-medium cohesionless soil (with or without some soft cohesive layers), or of predominantly soft-to-firm cohesive soil.	< 180	< 15	< 70
SE	A soil profile consisting of a surface alluvium layer with V_s values of type SC or SD and thickness varying between about 5 m and 20 m, underlain by stiffer material with V_s > 800 m/s.	--	--	--
S_1	Deposits consisting, or containing a layer at least 10 m thick, of soft clays/silts with a high plasticity index (PI > 40) and high water content	< 100 (indicative)	--	10 - 20
S_2	Deposits of liquefiable soils, of sensitive clays, or any other soil profile not included in types SA to SE or S_1	--	--	--

Table 6.2.15: Seismic Zone Coefficient Z for Some Important Towns of Bangladesh

Town	Z	Town	Z	Town	Z	Town	Z
Bagerhat	0.12	Gaibandha	0.28	Magura	0.12	Patuakhali	0.12
Bandarban	0.28	Gazipur	0.20	Manikganj	0.20	Pirojpur	0.12
Barguna	0.12	Gopalganj	0.12	Maulvibazar	0.36	Rajbari	0.20
Barisal	0.12	Habiganj	0.36	Meherpur	0.12	Rajshahi	0.12
Bhola	0.12	Jaipurhat	0.20	Mongla	0.12	Rangamati	0.28
Bogra	0.28	Jamalpur	0.36	Munshiganj	0.20	Rangpur	0.28
Brahmanbaria	0.28	Jessore	0.12	Mymensingh	0.36	Satkhira	0.12
Chandpur	0.20	Jhalokati	0.12	Narail	0.12	Shariatpur	0.20
Chapainababganj	0.12	Jhenaidah	0.12	Narayanganj	0.20	Sherpur	0.36
Chittagong	0.28	Khagrachari	0.28	Narsingdi	0.28	Sirajganj	0.28
Chuadanga	0.12	Khulna	0.12	Natore	0.20	Srimangal	0.36
Comilla	0.20	Kishoreganj	0.36	Naogaon	0.20	Sunamganj	0.36
Cox's Bazar	0.28	Kurigram	0.36	Netrakona	0.36	Sylhet	0.36
Dhaka	0.20	Kushtia	0.20	Nilphamari	0.12	Tangail	0.28
Dinajpur	0.20	Lakshmipur	0.20	Noakhali	0.20	Thakurgaon	0.20
Faridpur	0.20	Lalmanirhat	0.28	Pabna	0.20		
Feni	0.20	Madaripur	0.20	Panchagarh	0.20		

Table 6.2.18: Seismic Design Category of Buildings

Site Class	Occupancy Category I, II and III				Occupancy Category IV			
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone
SA	B	C	C	D	C	D	D	D
SB	B	C	D	D	C	D	D	D
SC	B	C	D	D	C	D	D	D
SD	C	D	D	D	D	D	D	D
SE, S_1, S_2	D	D	D	D	D	D	D	D

Seismic Force–Resisting System	Response Reduction Factor, R	System Overstrength Factor, Ω_o	Deflection Amplification Factor, C_d	Seismic Design Category B	Seismic Design Category C	Seismic Design Category D
				Height limit (m)		
B. BUILDING FRAME SYSTEMS (with bracing or shear wall)						
1. Steel eccentrically braced frames, moment resisting connections at columns away from links	8	2	4	NL	NL	50
2. Steel eccentrically braced frames, non-moment-resisting, connections at columns away from links	7	2	4	NL	NL	50
3. Special steel concentrically braced frames	6	2	5	NL	NL	50
4. Ordinary steel concentrically braced frames	3.25	2	3.25	NL	NL	11
5. Special reinforced concrete shear walls	6	2.5	5	NL	NL	50
6. Ordinary reinforced concrete shear walls	5	2.5	4.25	NL	NL	NP
7. Ordinary reinforced masonry shear walls	2	2.5	2	NL	50	NP
8. Ordinary plain masonry shear walls	1.5	2.5	1.25	18	NP	NP
C. MOMENT RESISTING FRAME SYSTEMS (no shear wall)						
1. Special steel moment frames	8	3	5.5	NL	NL	NL
2. Intermediate steel moment frames	4.5	3	4	NL	NL	35
3. Ordinary steel moment frames	3.5	3	3	NL	NL	NP

Table 6.2.16: Site Dependent Soil Factor and Other Parameters Defining Elastic Response Spectrum

Soil type	S	T_B(s)	T_C(s)	T_D(s)
SA	1.0	0.15	0.40	2.0
SB	1.2	0.15	0.50	2.0
SC	1.15	0.20	0.60	2.0
SD	1.35	0.20	0.80	2.0
SE	1.4	0.15	0.50	2.0

PART VI
Appendix C
Seismic Design Parameters for Alternative Method of Base Shear Calculation

Table 6.C.1: Spectral Response Acceleration Parameter S_S and S_1 for Different Seismic Zone

Parameters	Zone-1	Zone-2	Zone-3	Zone-4
S_S	0.3	0.5	0.7	0.9
S_1	0.12	0.2	0.28	0.36

Table 6.C.2: Site Coefficient F_a for Different Seismic Zone and Soil Type

Soil Type	Zone-1	Zone-2	Zone-3	Zone-4
SA	1.0	1.0	1.0	1.0
SB	1.2	1.2	1.2	1.2
SC	1.15	1.15	1.15	1.15
SD	1.35	1.35	1.35	1.35
SE	1.4	1.4	1.4	1.4

Table 6.C.3: Site Coefficient F_v for Different Seismic Zone and Soil Type

Soil Type	Zone-1	Zone-2	Zone-3	Zone-4
SA	1.0	1.0	1.0	1.0
SB	1.5	1.5	1.5	1.5
SC	1.725	1.725	1.725	1.725
SD	2.7	2.7	2.7	2.7
SE	1.75	1.75	1.75	1.75

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PART VI
Appendix C
Seismic Design Parameters for Alternative Method of Base Shear Calculation

Table 6.C.1: Spectral Response Acceleration Parameter S_S and S_1 for Different Seismic Zone

Parameters	Zone-1	Zone-2	Zone-3	Zone-4
S_S	0.3	0.5	0.7	0.9
S_1	0.12	0.2	0.28	0.36

Table 6.C.2: Site Coefficient F_a for Different Seismic Zone and Soil Type

Soil Type	Zone-1	Zone-2	Zone-3	Zone-4
SA	1.0	1.0	1.0	1.0
SB	1.2	1.2	1.2	1.2
SC	1.15	1.15	1.15	1.15
SD	1.35	1.35	1.35	1.35
SE	1.4	1.4	1.4	1.4

Table 6.C.3: Site Coefficient F_v for Different Seismic Zone and Soil Type

Soil Type	Zone-1	Zone-2	Zone-3	Zone-4
SA	1.0	1.0	1.0	1.0
SB	1.5	1.5	1.5	1.5
SC	1.725	1.725	1.725	1.725
SD	2.7	2.7	2.7	2.7
SE	1.75	1.75	1.75	1.75

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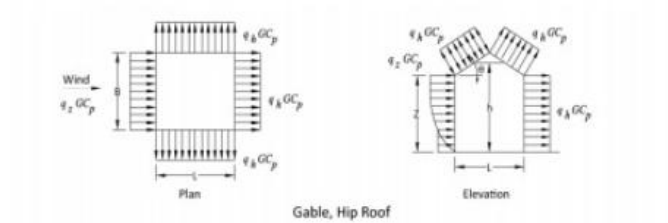
Table 6.2.16: Site Dependent Soil Factor and Other Parameters Defining Elastic Response Spectrum

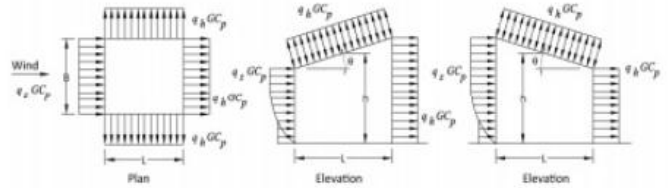
Soil type	S	T_B(s)	T_C(s)	T_D(s)
SA	1.0	0.15	0.40	2.0
SB	1.2	0.15	0.50	2.0
SC	1.15	0.20	0.60	2.0
SD	1.35	0.20	0.80	2.0
SE	1.4	0.15	0.50	2.0

Wind load assign

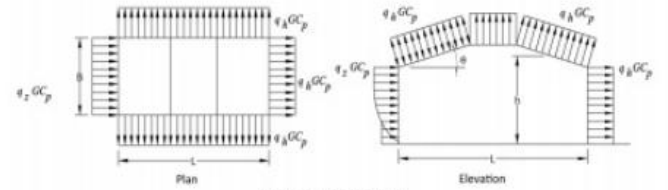
Enclosed, Partially Enclosed Buildings: Walls & Roofs



Gable, Hip Roof



Monoslope Roof (Note 4)



Mansard Roof (Note 8)

Wall Pressure Coefficients, C_p			
Surface	*L/B*	C_p	Use With
Windward Wall	All values	0.8	q_z
Leeward Wall	0-1	-0.5	q_h
	2	-0.3	
	≥ 4	-0.2	
Side Wall	All values	-0.7	q_h

Figure 6.2.6 External Pressure Coefficients, C_p main wind force resisting system - Method 2 (All Heights)

Table 6.2.8: Basic Wind Speeds, *V*, for Selected Locations in Bangladesh

Location	Basic Wind Speed (m/s)	Location	Basic Wind Speed (m/s)
Angarpota	47.8	Lalmonirhat	63.7
Bagerhat	77.5	Madaripur	68.1
Bandarban	62.5	Magura	65.0
Barguna	80.0	Manikganj	58.2
Barisal	78.7	Meherpur	58.2
Bhola	69.5	Maheshkhali	80.0
Bogra	61.9	Moulvibazar	53.0
Brahmanbaria	56.7	Munshiganj	57.1
Chandpur	50.6	Mymensingh	67.4
Chapai Nawabganj	41.4	Naogaon	55.2
Chittagong	80.0	Narail	68.6
Chuadanga	61.9	Narayanganj	61.1
Comilla	61.4	Narsinghdi	59.7
Cox's Bazar	80.0	Natore	61.9
Dahagram	47.8	Netrokona	65.6
Dhaka	65.7	Nilphamari	44.7
Dinajpur	41.4	Noakhali	57.1
Faridpur	63.1	Pabna	63.1
Feni	64.1	Panchagarh	41.4
Gaibandha	65.6	Patuakhali	80.0
Gazipur	66.5	Pirojpur	80.0
Gopalganj	74.5	Rajbari	59.1
Habiganj	54.2	Rajshahi	49.2
Hatiya	80.0	Rangamati	56.7
Ishurdi	69.5	Rangpur	65.3
Joypurhat	56.7	Satkhira	57.6
Jamalpur	56.7	Shariatpur	61.9
Jessore	64.1	Sherpur	62.5
Jhalakati	80.0	Sirajganj	50.6
Jhenaidah	65.0	Srimangal	50.6
Khagrachhari	56.7	St. Martin's Island	80.0
Khulna	73.3	Sunamganj	61.1
Kutubdia	80.0	Sylhet	61.1
Kishoreganj	64.7	Sandwip	80.0

2.4.6 Exposure

For each wind direction considered, the upwind exposure category shall be based on ground surface roughness that is determined from natural topography, vegetation, and constructed facilities.

2.4.6.1 Wind directions and sectors

For each selected wind direction at which the wind loads are to be evaluated, the exposure of the building or structure shall be determined for the two upwind sectors extending 45° either side of the selected wind direction.

The exposures in these two sectors shall be determined in accordance with Sections 2.4.6.2 and 2.4.6.3 and the exposure resulting in the highest wind loads shall be used to represent the winds from that direction.

2.4.6.2 Surface roughness categories

A ground surface roughness within each 45° sector shall be determined for a distance upwind of the site as defined in Sec 2.4.6.3 from the categories defined in the following text, for the purpose of assigning an exposure category as defined in Sec 2.4.6.3.

Surface Roughness A: Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

Surface Roughness B: Open terrain with scattered obstructions having heights generally less than 9.1 m. This category includes flat open country, grasslands, and all water surfaces in cyclone prone regions.

Surface Roughness C: Flat, unobstructed areas and water surfaces outside cyclone prone regions. This category includes smooth mud flats and salt flats.

2.4.6.3 Exposure categories

Exposure A: Exposure A shall apply where the ground surface roughness condition, as defined by Surface Roughness A, prevails in the upwind direction for a distance of at least 792 m or 20 times the height of the building, whichever is greater.

Exception: For buildings whose mean roof height is less than or equal to 9.1 m, the upwind distance may be reduced to 457 m

Table 6.2.9: Importance Factor, I (Wind Loads)

Occupancy Category[1] or Importance Class	Non-Cyclone Prone Regions and Cyclone Prone Regions with V = 38-44 m/s	Cyclone Prone Regions with V > 44 m/s
I	0.87	0.77
II	1.0	1.00
III	1.15	1.15
IV	1.15	1.15

[1] The building and structure classification categories are listed in Table 6.1.1

Table 6.2.20: Values for Coefficients to Estimate Approximate Period

Structure type	C_t	m	
Concrete moment-resisting frames	0.0466	0.9	Note: Consider moment resisting frames as frames which resist 100% of seismic force and are not enclosed or adjoined by components that are more rigid and will prevent the
Steel moment-resisting frames	0.0724	0.8	
Eccentrically braced steel frame	0.0731	0.75	
All other structural systems	0.0488	0.75	

2.4.7.2 Topographic factor

The wind speed-up effect shall be included in the calculation of design wind loads by using the factor K_{zt}:

$$K_{zt} = (1 + K_1 K_2 K_3)^2 \qquad (6.2.5)$$

Where, K_1, K_2, and K_3 are given in Figure 6.2.4. If site conditions and locations of structures do not meet all the conditions specified in Sec 2.4.7.1 then K_{zt}= 1.0.

2.4.8 Gust Effect Factor

2.4.8.1 Rigid structures

For rigid structures as defined in Sec 2.1.3, the gust-effect factor shall be taken as 0.85 or calculated by the formula:

$$G = 0.925 \frac{1+1.7 g_Q I_z Q}{1+1.7 g_v I_z} \qquad (6.2.6)$$

$$I_z = c \left(\frac{10}{\bar{z}}\right)^{1/6} \qquad (6.2.7)$$

Drift check for Ey in X direction

Story	hsx(ft)	hsx (in)	Elastic displacement(in)	Amplified displacement (in)	Dflection Amplification factor,Cd	Importance factor, I	Story drift (in)	Allowable drift limit	Allowable drift (in)	Result
Stair Room Roof	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story10	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story9	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story8	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story7	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story6	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story5	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story4	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story3	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story2	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story1	10	120	0	0	5	1	0.00	0.02	2.4	OK
Plinth Level	8	96	0	0	5	1	0.00	0.02	1.92	OK
Foundation Level	0	0	0	0	5	1	0.00	0.02	0	OK

P delta for Ey												
Story	Height (ft)	Height (in)	Gravity force/Story force (P)	Story shear (Vy)	Displacement	Story drift	θ	Cd	Importance factor	β	θ_{max}	Result
Stair Room Roof	10	120	184.607	-26.515	3.38112	1.146545	0.013304	5	1	1	0.1	No P delta
Story10	10	120	1801.416	-268.128	3.151811	1.1619	0.01301	5	1	1	0.1	No P delta
Story9	10	120	4151.701	-550.945	2.919431	1.33436	0.016759	5	1	1	0.1	No P delta
Story8	10	120	6501.985	-795.909	2.652559	1.48796	0.020259	5	1	1	0.1	No P delta
Story7	10	120	8852.27	-1004.44	2.354967	1.6169	0.02375	5	1	1	0.1	No P delta
Story6	10	120	11202.56	-1178.06	2.031587	1.71591	0.027195	5	1	1	0.1	No P delta
Story5	10	120	13552.84	-1318.47	1.688405	1.76971	0.030319	5	1	1	0.1	No P delta
Story4	10	120	15903.12	-1427.53	1.334463	1.762655	0.032727	5	1	1	0.1	No P delta
Story3	10	120	18253.41	-1507.37	0.981932	1.679855	0.033903	5	1	1	0.1	No P delta
Story2	10	120	20603.69	-1560.48	0.645961	1.50501	0.033119	5	1	1	0.1	No P delta
Story1	10	120	22956.46	-1590.02	0.344959	1.724795	0.041504	5	1	1	0.1	No P delta
Plinth Level	8	96	23961.23	-1594.86	0	0	0	5	1	1	0.1	No P delta
Foundation Level	0	0	0	0	0	0	0	5	1	1	0.1	No P delta

P Delta Check According to BNBC 2020

P delta for Ex												
Story	Height (ft)	Height (in)	Gravity force/Story force (P)	Story shear (Vx)	Displacement	Story drift	θ	Cd	Importance factor	β	θ_{max}	Result
Stair Room Roof	10	120	184.607	-26.515	2.742222	0.9717	0.011276	5	1	1	0.1	No P delta
Story10	10	120	1801.416	-268.128	2.936562	0.94157	0.010543	5	1	1	0.1	No P delta
Story9	10	120	4151.701	-550.945	2.748248	1.13071	0.014201	5	1	1	0.1	No P delta
Story8	10	120	6501.985	-795.909	2.522106	1.31406	0.017891	5	1	1	0.1	No P delta
Story7	10	120	8852.27	-1004.44	2.259294	1.488105	0.021858	5	1	1	0.1	No P delta
Story6	10	120	11202.56	-1178.06	1.961673	1.627625	0.025796	5	1	1	0.1	No P delta
Story5	10	120	13552.84	-1318.47	1.636148	1.718085	0.029434	5	1	1	0.1	No P delta
Story4	10	120	15903.12	-1427.53	1.292531	1.74325	0.032367	5	1	1	0.1	No P delta
Story3	10	120	18253.41	-1507.37	0.943881	1.673485	0.033775	5	1	1	0.1	No P delta
Story2	10	120	20603.69	-1560.48	0.609184	1.47756	0.032515	5	1	1	0.1	No P delta
Story1	10	120	22956.46	-1590.02	0.313672	1.56836	0.03774	5	1	1	0.1	No P delta
Plinth Level	8	96	23961.23	-1594.86	0	0	0	5	1	1	0.1	No P delta
Foundation Level	0	0	0	0	0	0	0	5	1	1	0.1	No P delta

Drift check for Ey in Y direction

Story	Drift ratio	Amplified drift ratio	Dflection Amplification factor,Cd	Importance factor, I	Allowable drift ratio limit	Result
Stair Room Roof	0.001932	0.00966	5	1	0.02	OK
Story10	0.001994	0.00997	5	1	0.02	OK
Story9	0.002229	0.011145	5	1	0.02	OK
Story8	0.002488	0.01244	5	1	0.02	OK
Story7	0.002715	0.013575	5	1	0.02	OK
Story6	0.002882	0.01441	5	1	0.02	OK
Story5	0.002967	0.014835	5	1	0.02	OK
Story4	0.002949	0.014745	5	1	0.02	OK
Story3	0.002817	0.014085	5	1	0.02	OK
Story2	0.002545	0.012725	5	1	0.02	OK
Story1	0.002068	0.01034	5	1	0.02	OK
Plinth Level	0.001434	0.00717	5	1	0.02	OK
Foundation Level	0	0	5	1	0.02	OK

Drift check for Wy in Y direction

Story	hsx(ft)	hsx (in)	Elastic displacement(in)	Story drift	Allowable drift limit	Allowable drift	Result
Stair Room Roof	10	120	2.163801	0.252871	0.004	0.48	OK
Story10	10	120	1.91093	0.149785	0.004	0.48	OK
Story9	10	120	1.761145	0.162272	0.004	0.48	OK
Story8	10	120	1.598873	0.174906	0.004	0.48	OK
Story7	10	120	1.423967	0.187574	0.004	0.48	OK
Story6	10	120	1.236393	0.19869	0.004	0.48	OK
Story5	10	120	1.037703	0.206701	0.004	0.48	OK
Story4	10	120	0.831002	0.209782	0.004	0.48	OK
Story3	10	120	0.62122	0.204739	0.004	0.48	OK
Story2	10	120	0.416481	0.18951	0.004	0.48	OK
Story1	10	120	0.226971	0.226971	0.004	0.48	OK
Plinth Level	8	96	0	0	0.004	0.384	OK
Foundation Level	0	0	0	0	0.004	0	OK

Torsional Irregularity Check According to BNBC 2020

load case	1st end displacement of upper story	1st end displacement of lower story	2nd end displacement of upper story	2nd end displacement of lower story	1st end drift	2nd end drift	Maximum Drift	Average drift	Maximum Drift / Average drift	Torsional irregularity check result	Extreme torsional irregularity check result
Ex	3.040601	2.945547	1.890641	1.778645	0.095054	0.111996	0.111996	0.103525	1.081825646	REGULAR	REGULAR
Ey	3.150017	2.914758	3.145142	2.909723	0.235259	0.235419	0.235419	0.235339	1.000339935	REGULAR	REGULAR

For wind load

Drift check for Wx in X direction

Story	hsx(ft)	hsx (in)	Elastic displacement(in)	Story drift	Allowable drift limit	Allowable drift	Result
Stair Room Roof	10	120	0.958275	0.042034	0.004	0.48	OK
Story10	10	120	1.000309	0.059779	0.004	0.48	OK
Story9	10	120	0.94053	0.070377	0.004	0.48	OK
Story8	10	120	0.870153	0.081275	0.004	0.48	OK
Story7	10	120	0.788878	0.093076	0.004	0.48	OK
Story6	10	120	0.695802	0.10424	0.004	0.48	OK
Story5	10	120	0.591562	0.113707	0.004	0.48	OK
Story4	10	120	0.477855	0.12006	0.004	0.48	OK
Story3	10	120	0.357795	0.120364	0.004	0.48	OK
Story2	10	120	0.237431	0.111482	0.004	0.48	OK
Story1	10	120	0.125949	0.125949	0.004	0.48	OK
Plinth Level	8	96	0	0	0.004	0.384	OK
Foundation Level	0	0	0	0	0.004	0	OK

Drift Check According to BNBC 2020

For earthquake load

Drift check for Ex in X direction

Story	hsx(ft)	hsx (in)	Elastic displacement(in)	Amplified displacement (in)	Dflection Amplification factor,Cd	Importance factor, I	Story drift (in)	Allowable drift limit	Allowable drift (in)	Result
Stair Room Roof	10	120	2.742222	13.71111	5	1	0.97	0.02	2.4	OK
Story10	10	120	2.936562	14.68281	5	1	0.94	0.02	2.4	OK
Story9	10	120	2.748248	13.74124	5	1	1.13	0.02	2.4	OK
Story8	10	120	2.522106	12.61053	5	1	1.31	0.02	2.4	OK
Story7	10	120	2.259294	11.29647	5	1	1.49	0.02	2.4	OK
Story6	10	120	1.961673	9.808365	5	1	1.63	0.02	2.4	OK
Story5	10	120	1.636148	8.18074	5	1	1.72	0.02	2.4	OK
Story4	10	120	1.292531	6.462655	5	1	1.74	0.02	2.4	OK
Story3	10	120	0.943881	4.719405	5	1	1.67	0.02	2.4	OK
Story2	10	120	0.609184	3.04592	5	1	1.48	0.02	2.4	OK
Story1	10	120	0.313672	1.56836	5	1	1.57	0.02	2.4	OK
Plinth Level	8	96	0	0	5	1	0.00	0.02	1.92	OK
Foundation Level	0	0	0	0	5	1	0.00	0.02	0	OK

Story Displacement Check/Sway Limitation/Lateral Displacement/Horizontal Displacement check

Load Combination	Maximum Story Displacement (in)	Story Height Avobe Ground (ft)	Story Height Avobe Ground (in)	Allowable Story Displacement (in)	Result
D + L + 0.7Wx	0.719742	110	1320	2.64	OK
D + L - 0.7Wx	0.271884	110	1320	2.64	OK
D + L + 0.7Wy	1.327721	110	1320	2.64	OK
D + L - 0.7Wy	0.271555	110	1320	2.64	OK

Story Displacement Check/Sway Limitation/Lateral Displacement/Horizontal Displacement check

Load Combination	Maximum Story Displacement (in)	Story Height Avobe Ground (ft)	Story Height Avobe Ground (in)	Allowable Story Displacement (in)	Result
D + L + 0.7Wx	0.719742	110	1320	2.64	OK
D + L - 0.7Wx	0.271884	110	1320	2.64	OK
D + L + 0.7Wy	1.327721	110	1320	2.64	OK
D + L - 0.7Wy	0.271555	110	1320	2.64	OK

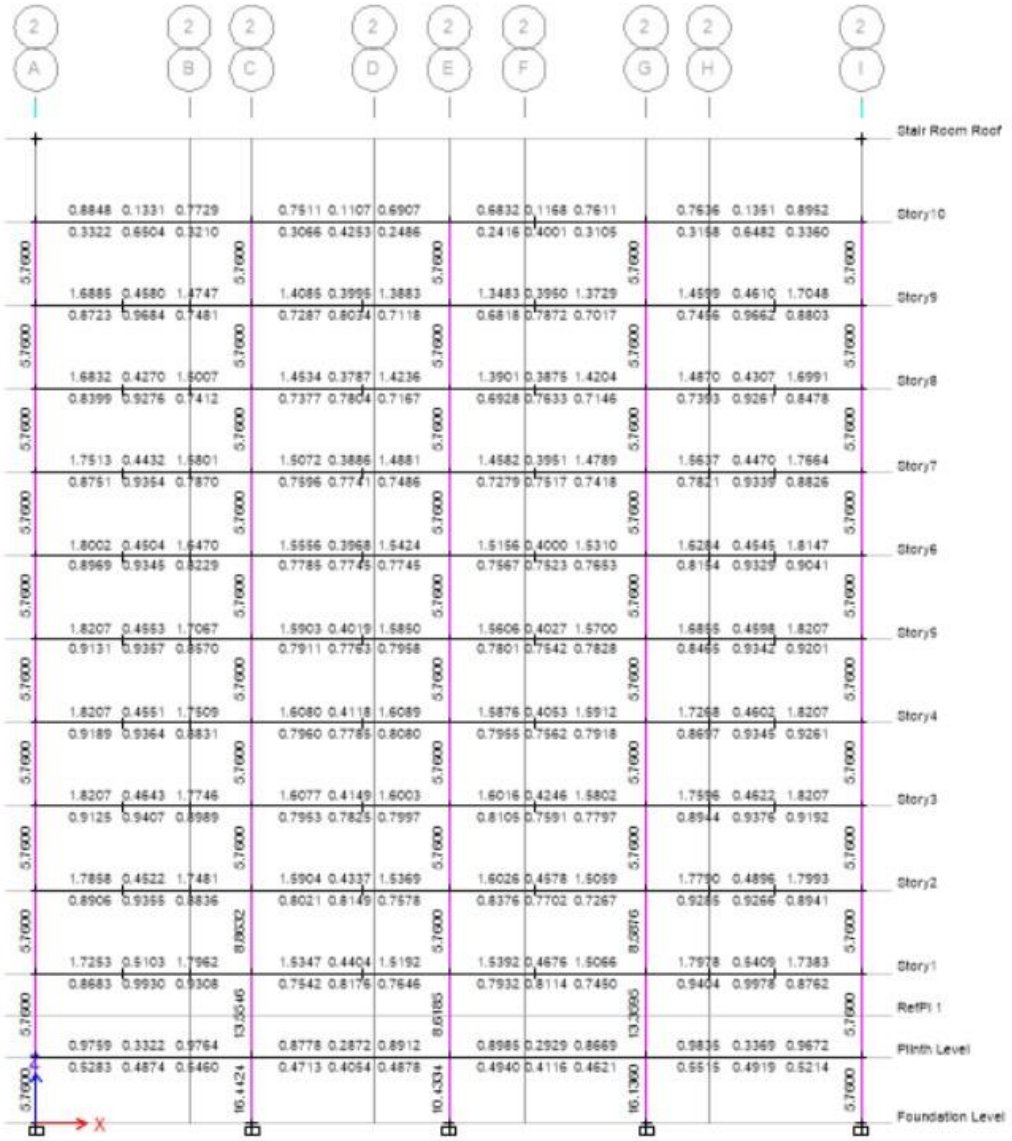
Drift check for Ey in Y direction

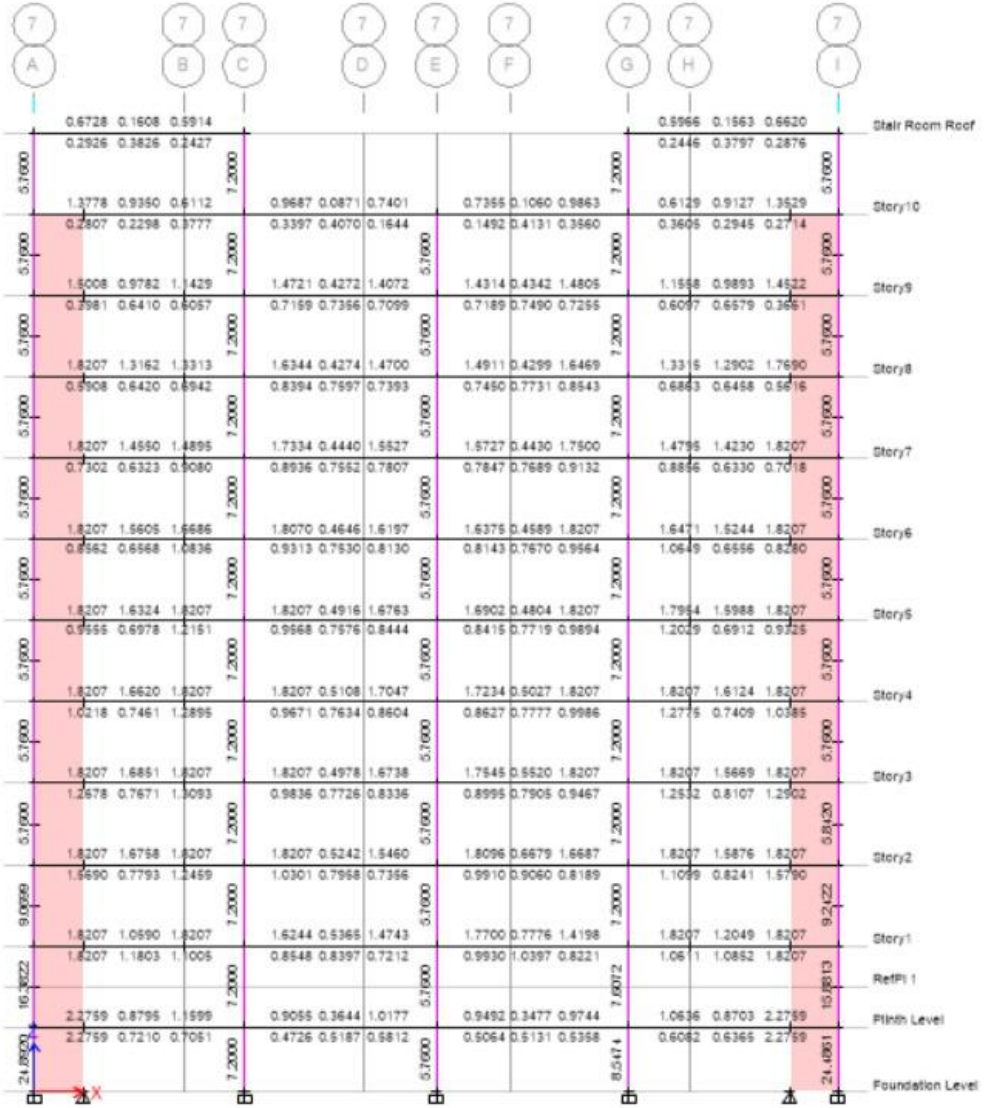
Story	hsx(ft)	hsx (in)	Elastic displacement(in)	Amplified displacement (in)	Dflection Amplification factor,Cd	Importance factor, I	Story drift (in)	Allowable drift limit	Allowable drift (in)	Result
Stair Room Roof	10	120	3.38112	16.9056	5	1	1.15	0.02	2.4	OK
Story10	10	120	3.151811	15.759055	5	1	1.16	0.02	2.4	OK
Story9	10	120	2.919431	14.597155	5	1	1.33	0.02	2.4	OK
Story8	10	120	2.652559	13.262795	5	1	1.49	0.02	2.4	OK
Story7	10	120	2.354967	11.774835	5	1	1.62	0.02	2.4	OK
Story6	10	120	2.031587	10.157935	5	1	1.72	0.02	2.4	OK
Story5	10	120	1.688405	8.442025	5	1	1.77	0.02	2.4	OK
Story4	10	120	1.334463	6.672315	5	1	1.76	0.02	2.4	OK
Story3	10	120	0.981932	4.90966	5	1	1.68	0.02	2.4	OK
Story2	10	120	0.645961	3.229805	5	1	1.51	0.02	2.4	OK
Story1	10	120	0.344959	1.724795	5	1	1.72	0.02	2.4	OK
Plinth Level	8	96	0	0	5	1	0.00	0.02	1.92	OK
Foundation Level	0	0	0	0	5	1	0.00	0.02	0	OK

Drift check for Ex in Y direction

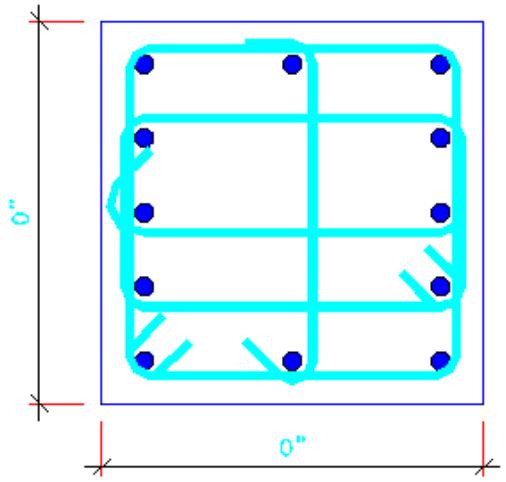
Story	hsx(ft)	hsx (in)	Elastic displacement(in)	Amplified displacement (in)	Dflection Amplification factor,Cd	Importance factor, I	Story drift (in)	Allowable drift limit	Allowable drift (in)	Result
Stair Room Roof	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story10	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story9	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story8	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story7	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story6	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story5	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story4	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story3	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story2	10	120	0	0	5	1	0.00	0.02	2.4	OK
Story1	10	120	0	0	5	1	0.00	0.02	2.4	OK
Plinth Level	8	96	0	0	5	1	0.00	0.02	1.92	OK
Foundation Level	0	0	0	0	5	1	0.00	0.02	0	OK

Column

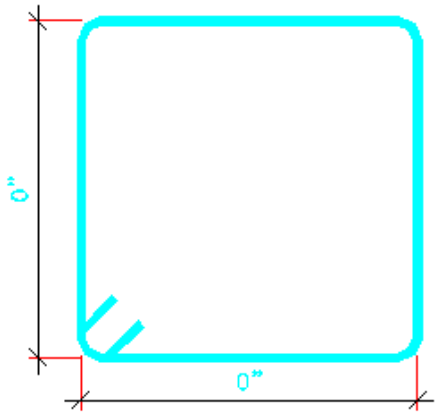

2
A
B
C
D
E
F
G
H
I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
X


7
A
B
C
D
E
F
G
H
I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
X

C2	Story10	C 24 X 24	L0B=0.61 S0B=0.15	L1=1.067 S1=0.15	L0T=1.372 S0T=0.15

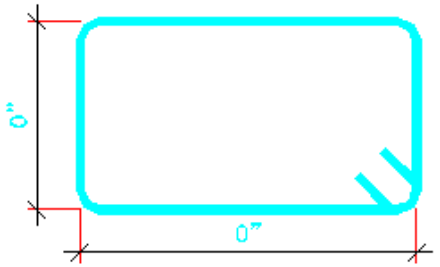


12ø#9

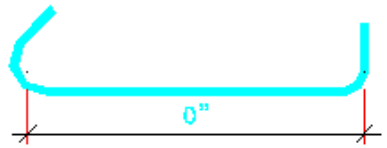


27ø#4
Hook=0.0762

27ø#4
Hook=0.0762



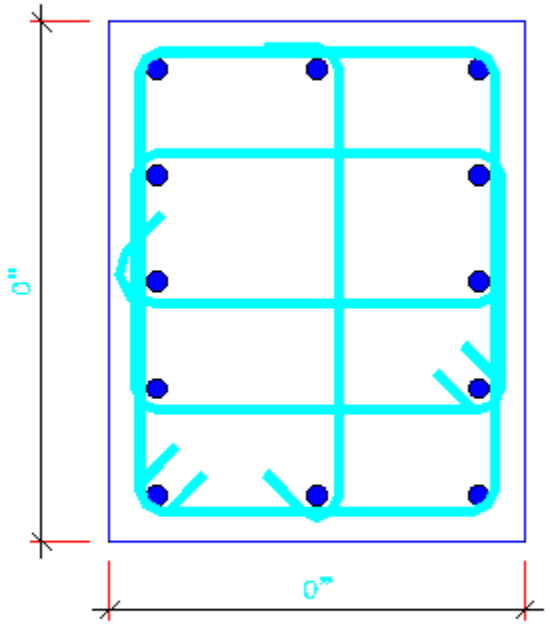
27ø#4
Hook=0.0762



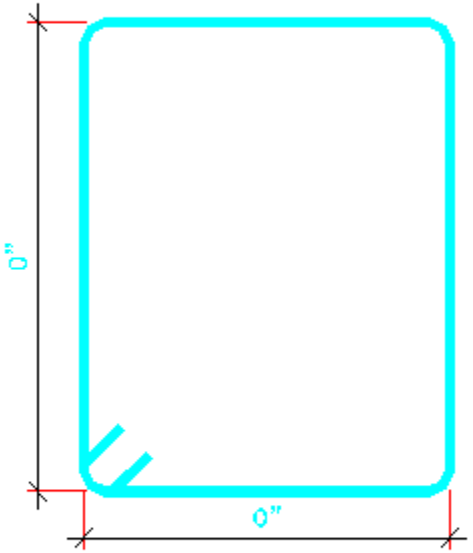
27ø#4
Hook=0.0762

Units: Mts

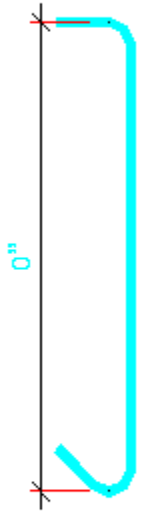
C24	Story10	C 30 X 24	L0B=0.762 S0B=0.15	L1=0.762 S1=0.15	L0T=1.524 S0T=0.15



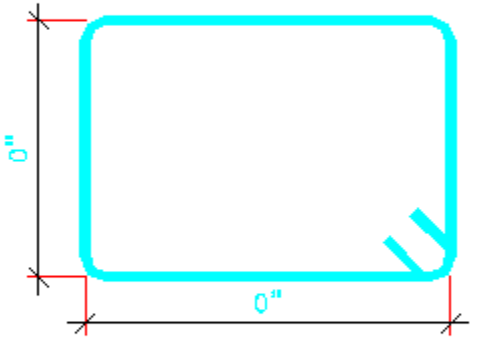
12ø#9



28ø#4
Hook=0.0762



28ø#4
Hook=0.0762

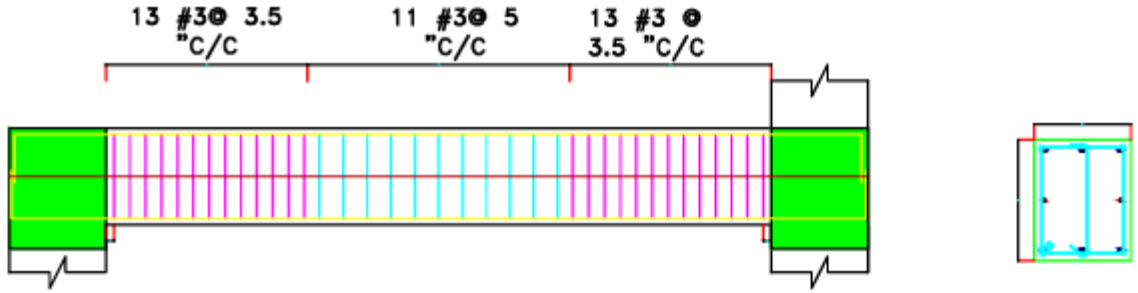


28ø#4
Hook=0.0762

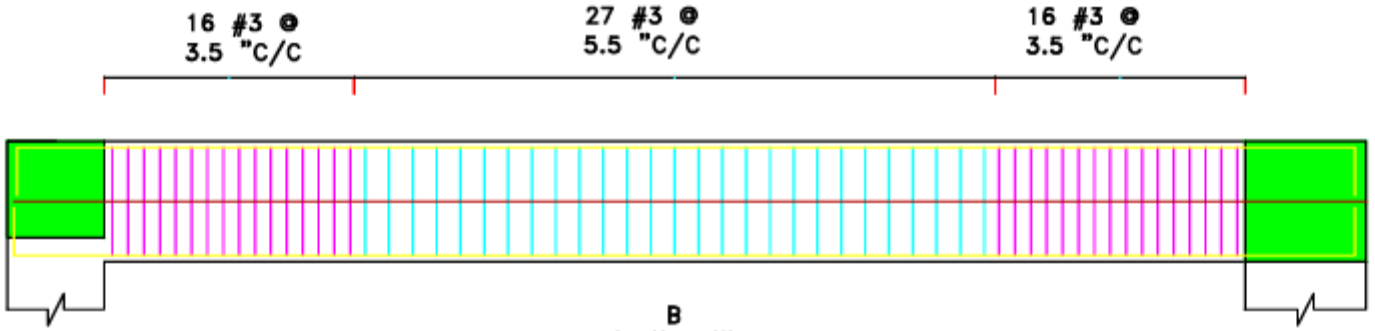
28ø#4
Hook=0.0762

Units: Mts

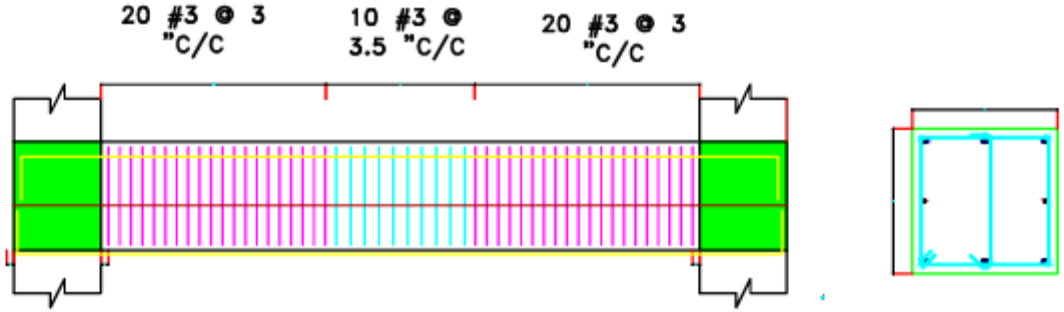
Beam



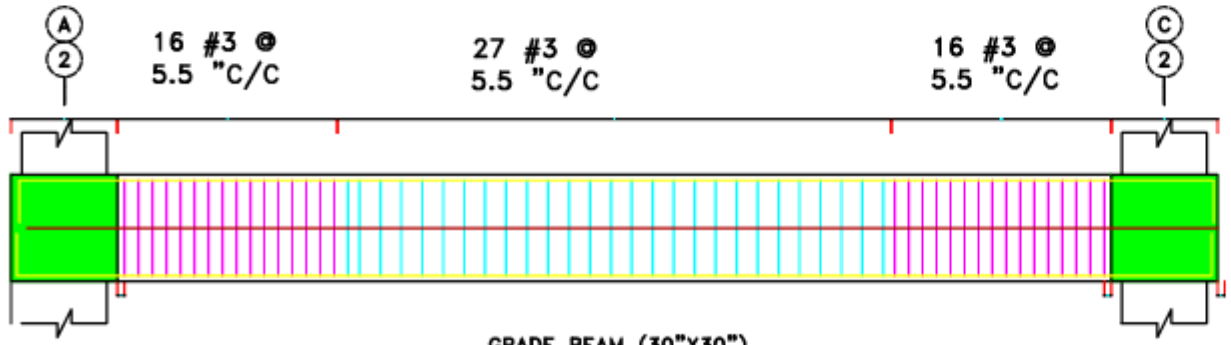
B(24''x24'')



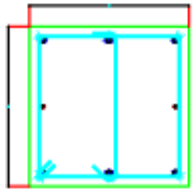
B
(24''x30'')



B
(30''x30'')



GRADE BEAM (30"X30")



Project: Residential Building, Pink City, Pahartali, Raozan, Chittagong

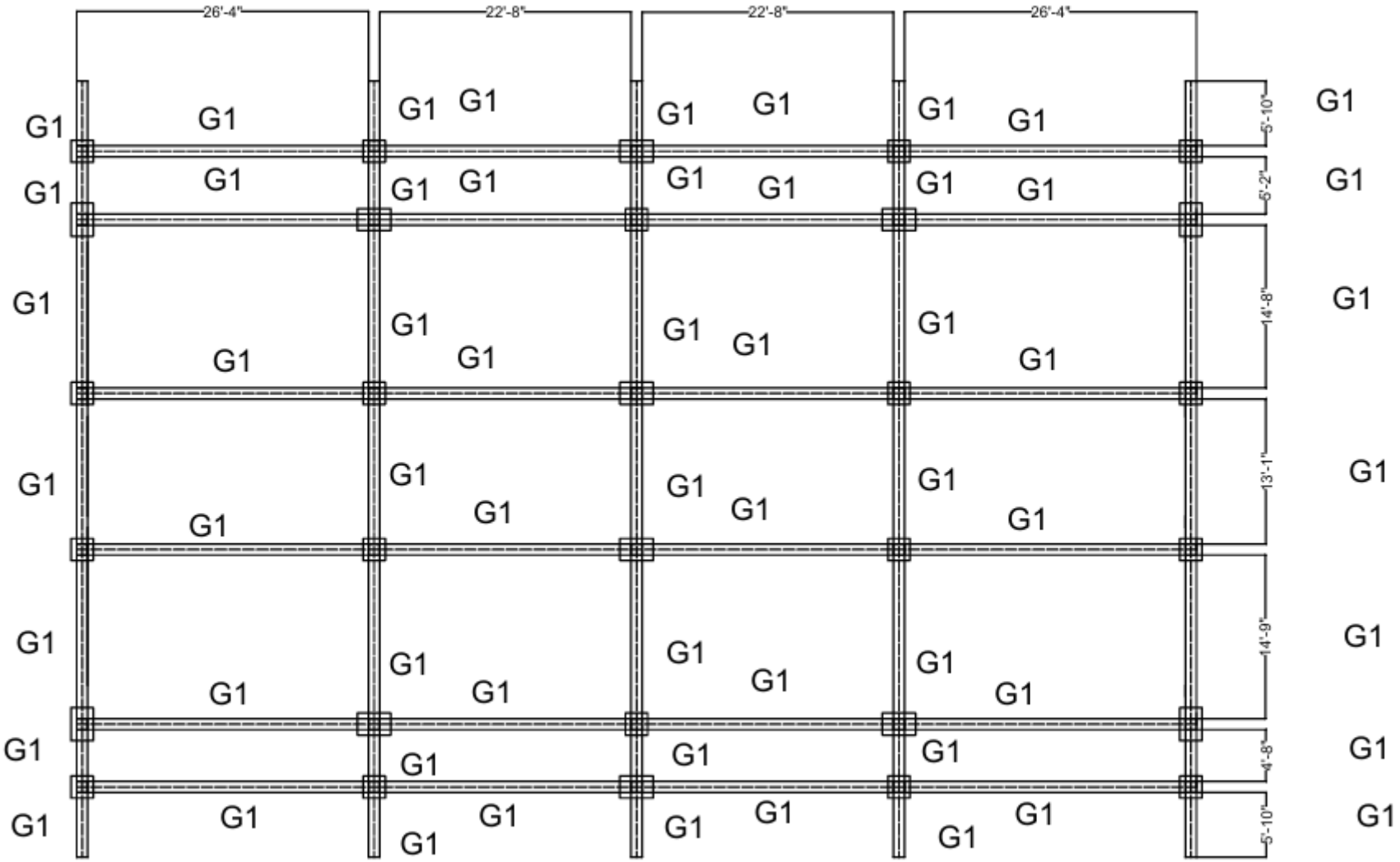
Typical Floor Plan (1st Floor-9th Floor)

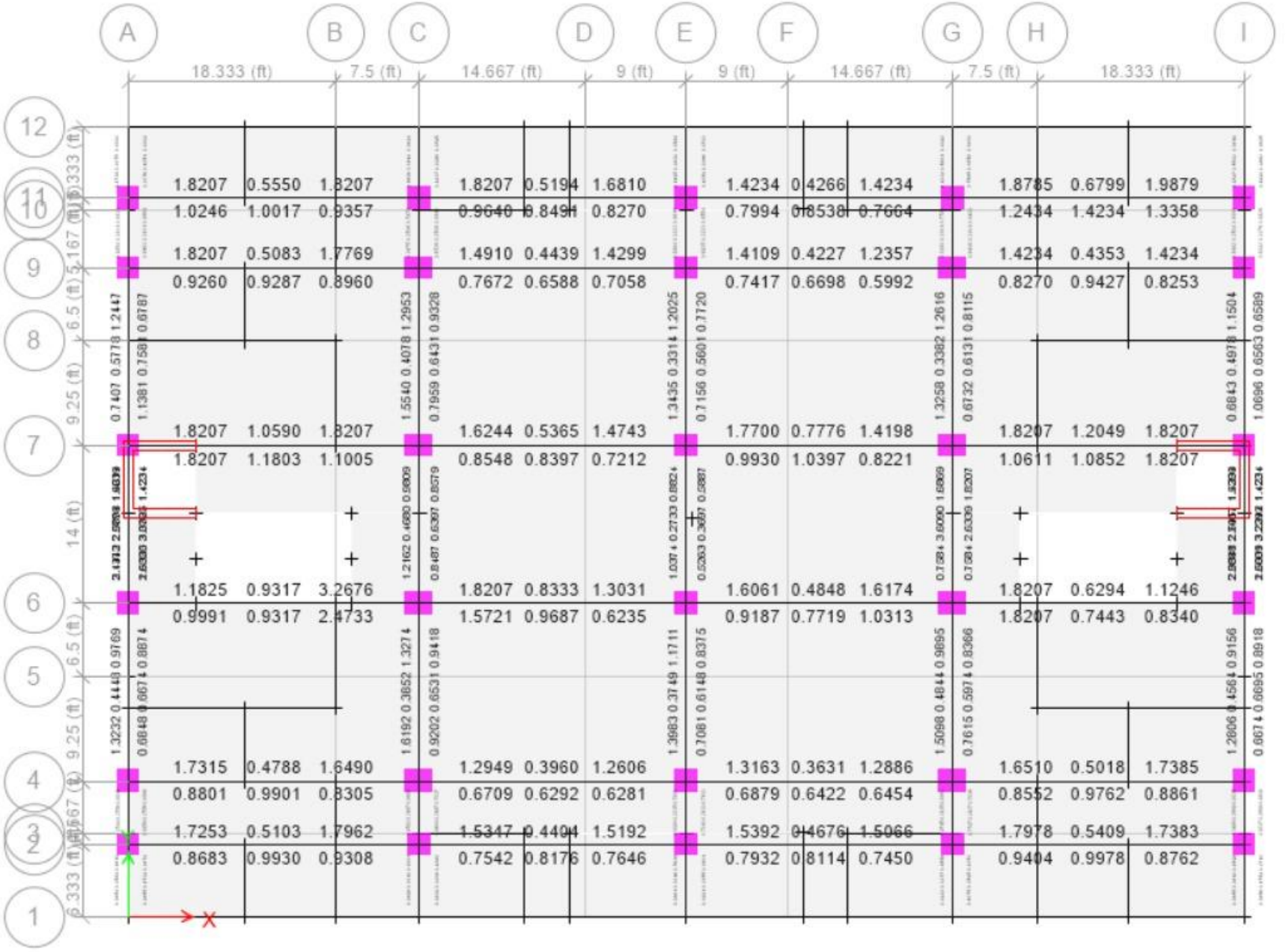
Structural Design Engineer:

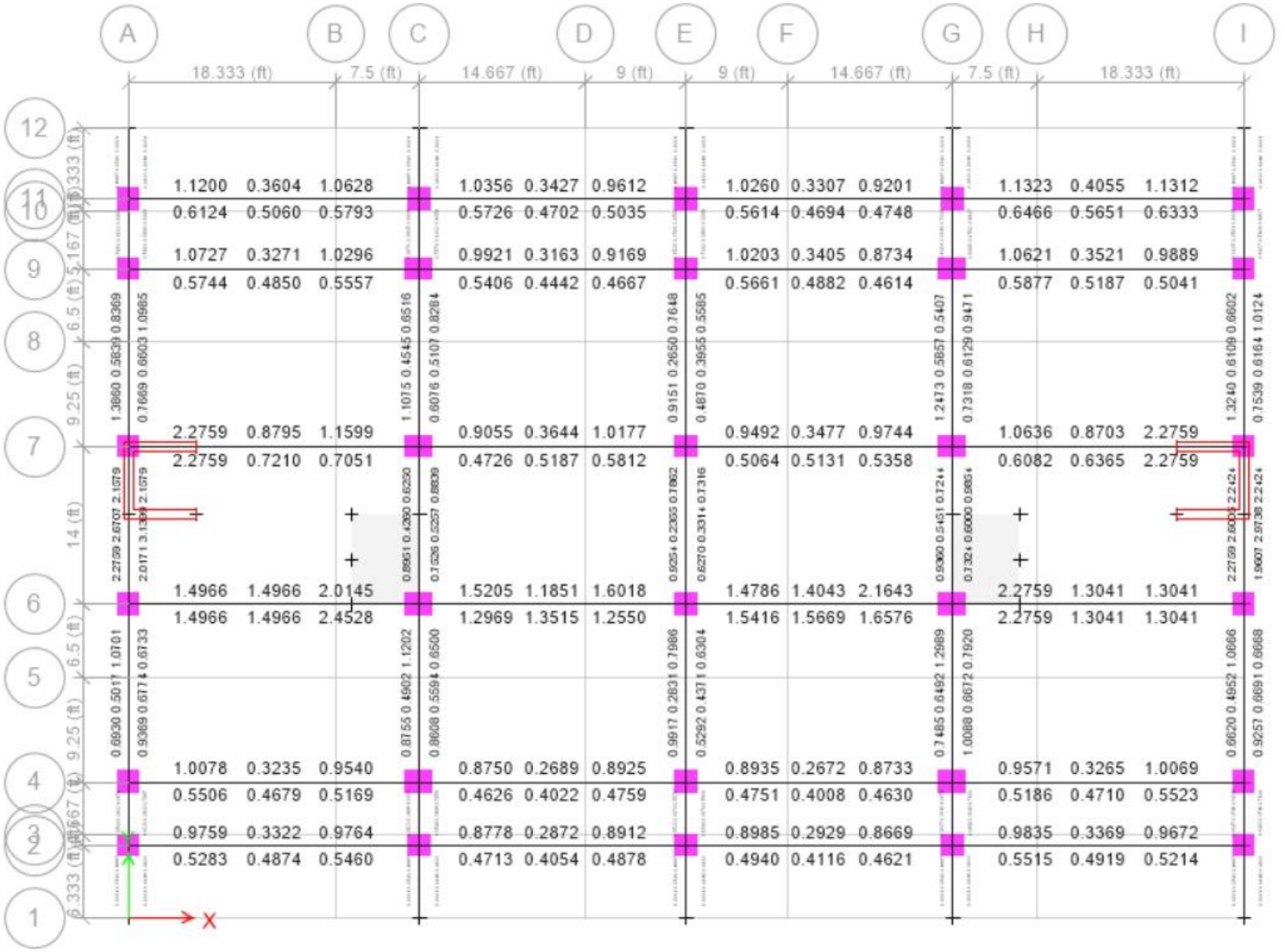
1901042 - 1901049

GRADE BEAM DETAILING LAYOUT

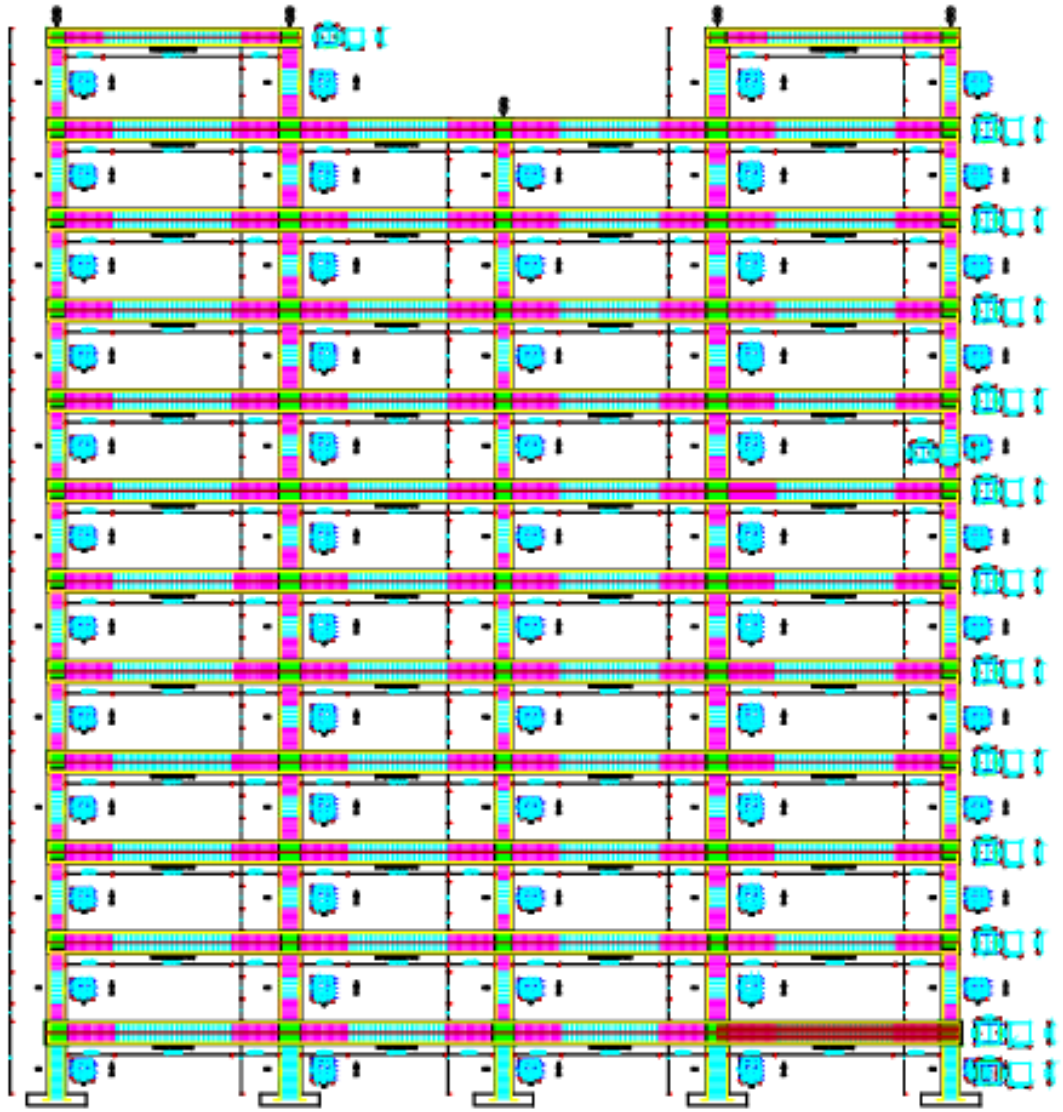
CHECK AND APPROVED BY :


26'-4"
22'-8"
22'-8"
26'-4"
5'-10"
5'-2"
14'-8"
13'-1"
14'-9"
4'-8"
5'-10"
G1

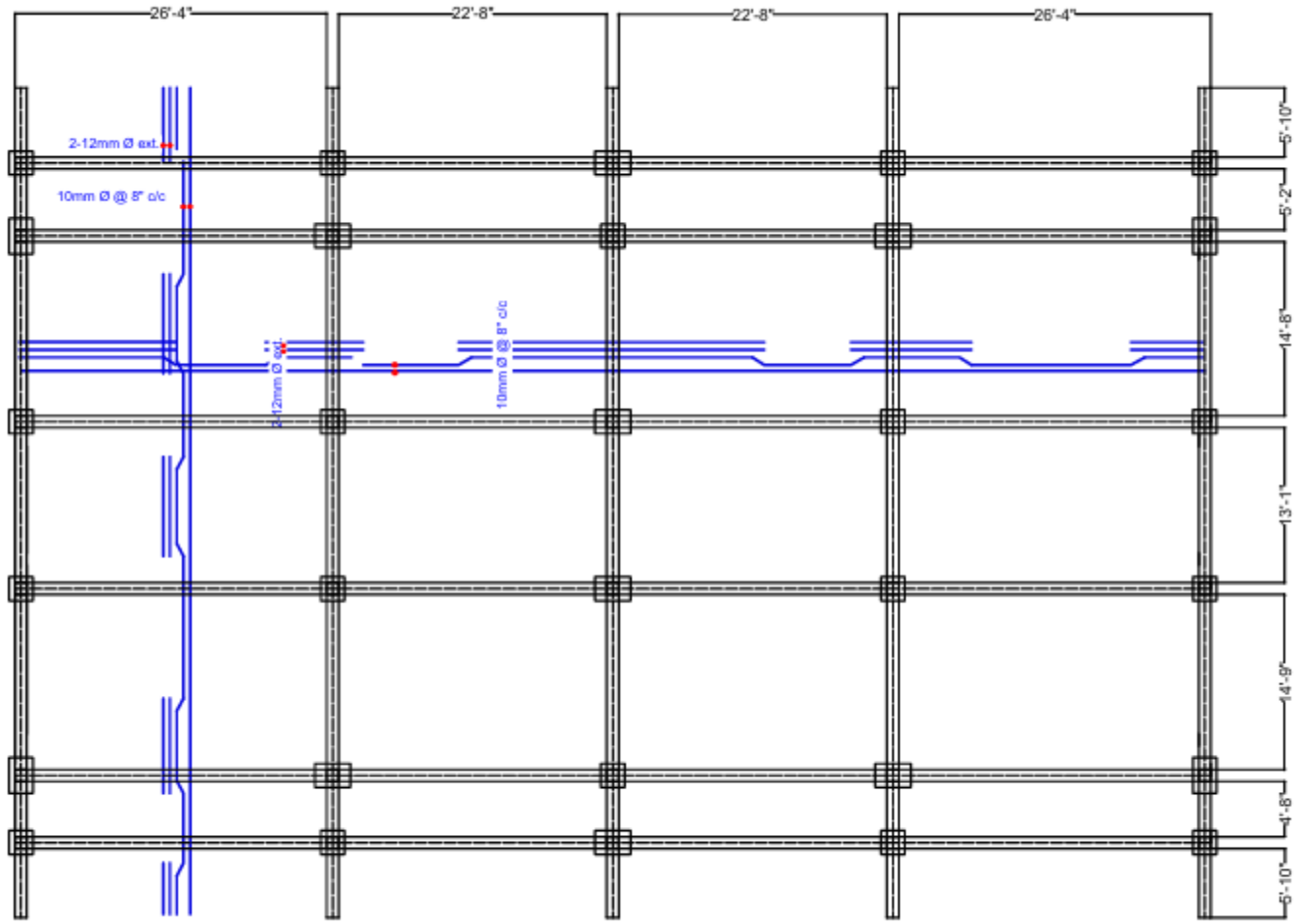

A
B
C
D
E
F
G
H
I
18.333 (ft)
7.5 (ft)
14.667 (ft)
9 (ft)
9 (ft)
14.667 (ft)
7.5 (ft)
18.333 (ft)
12
11
10
9
8
7
6
5
4
3
2
1
6.333 (ft)
5.167 (ft)
6.5 (ft)
9.25 (ft)
14 (ft)
6.5 (ft)
9.25 (ft)
6.667 (ft)
1.8207 0.5550 1.8207 1.8207 0.5194 1.6810 1.4234 0.4266 1.4234 1.8785 0.6799 1.9879
1.0246 1.0017 0.9357 0.9640 0.8491 0.8270 0.7994 0.8538 0.7664 1.2434 1.4234 1.3358
1.8207 0.5083 1.7769 1.4910 0.4439 1.4299 1.4109 0.4227 1.2357 1.4234 0.4353 1.4234
0.9260 0.9287 0.8960 0.7672 0.6588 0.7058 0.7417 0.6698 0.5992 0.8270 0.9427 0.8253
1.8207 1.0590 1.8207 1.6244 0.5365 1.4743 1.7700 0.7776 1.4198 1.8207 1.2049 1.8207
1.8207 1.1803 1.1005 0.8548 0.8397 0.7212 0.9930 1.0397 0.8221 1.0611 1.0852 1.8207
1.1825 0.9317 3.2676 1.8207 0.8333 1.3031 1.6061 0.4848 1.6174 1.8207 0.6294 1.1246
0.9991 0.9317 2.4733 1.5721 0.9687 0.6235 0.9187 0.7719 1.0313 1.8207 0.7443 0.8340
1.7315 0.4788 1.6490 1.2949 0.3960 1.2606 1.3163 0.3631 1.2886 1.6510 0.5018 1.7385
0.8801 0.9901 0.8305 0.6709 0.6292 0.6281 0.6879 0.6422 0.6454 0.8552 0.9762 0.8861
1.7253 0.5103 1.7962 1.5347 0.4494 1.5192 1.5392 0.4676 1.5066 1.7978 0.5409 1.7383
0.8683 0.9930 0.9308 0.7542 0.8176 0.7646 0.7932 0.8114 0.7450 0.9404 0.9978 0.8762

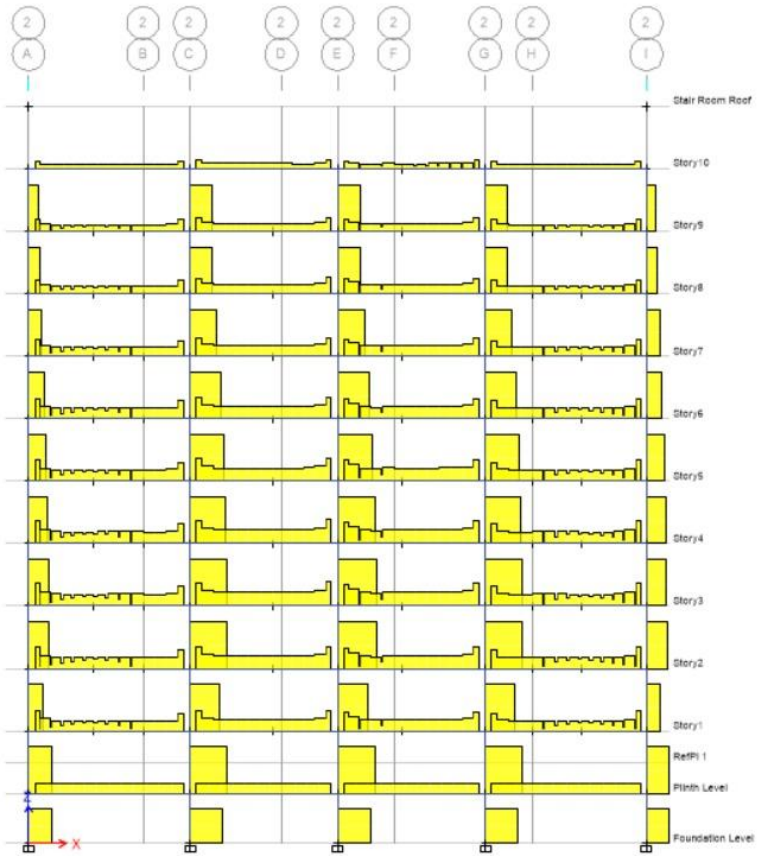

A
B
C
D
E
F
G
H
I
18.333 (ft)
7.5 (ft)
14.667 (ft)
9 (ft)
9 (ft)
14.667 (ft)
7.5 (ft)
18.333 (ft)
12
11
10
9
8
7
6
5
4
3
2
1
6.333 (ft)
5.167 (ft)
6.5 (ft)
9.25 (ft)
14 (ft)
6.5 (ft)
9.25 (ft)
6.333 (ft)
1.1200 0.3604 1.0628
0.6124 0.5060 0.5793
1.0356 0.3427 0.9612
0.5726 0.4702 0.5035
1.0260 0.3307 0.9201
0.5614 0.4694 0.4748
1.1323 0.4055 1.1312
0.6466 0.5651 0.6333
1.0727 0.3271 1.0296
0.5744 0.4850 0.5557
0.9921 0.3163 0.9169
0.5406 0.4442 0.4667
1.0203 0.3405 0.8734
0.5661 0.4882 0.4614
1.0621 0.3521 0.9889
0.5877 0.5187 0.5041
2.2759 0.8795 1.1599
2.2759 0.7210 0.7051
0.9055 0.3644 1.0177
0.4726 0.5187 0.5812
0.9492 0.3477 0.9744
0.5064 0.5131 0.5358
1.0636 0.8703 2.2759
0.6082 0.6365 2.2759
1.4966 1.4966 2.0145
1.4966 1.4966 2.4528
1.5205 1.1851 1.6018
1.2969 1.3515 1.2550
1.4786 1.4043 2.1643
1.5416 1.5669 1.6576
2.2759 1.3041 1.3041
2.2759 1.3041 1.3041
1.0078 0.3235 0.9540
0.5506 0.4679 0.5169
0.8750 0.2689 0.8925
0.4626 0.4022 0.4759
0.8935 0.2672 0.8733
0.4751 0.4008 0.4630
0.9571 0.3265 1.0069
0.5186 0.4710 0.5523
0.9759 0.3322 0.9764
0.5283 0.4874 0.5460
0.8778 0.2872 0.8912
0.4713 0.4054 0.4878
0.8985 0.2929 0.8669
0.4940 0.4116 0.4621
0.9835 0.3369 0.9672
0.5515 0.4919 0.5214
X

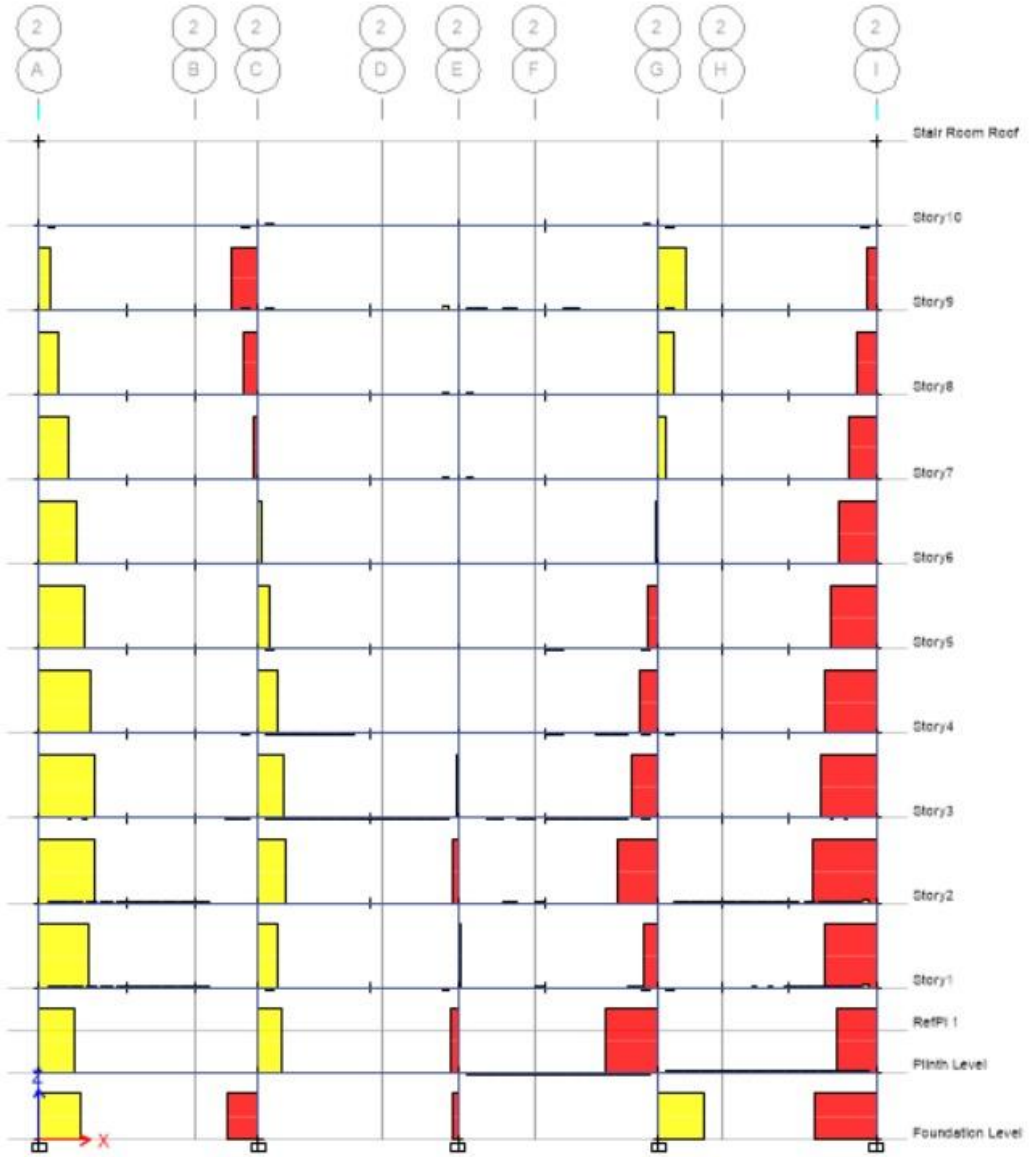
Full Frame Layout

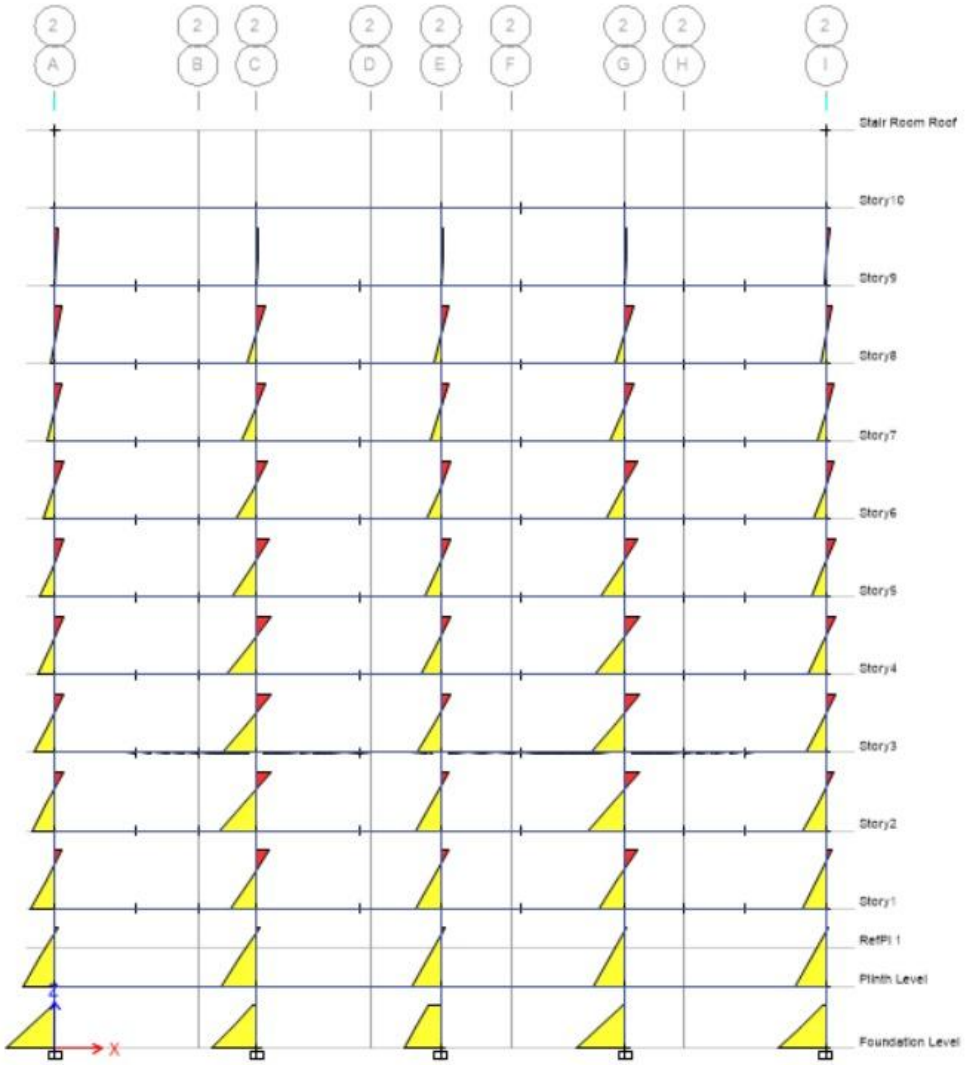


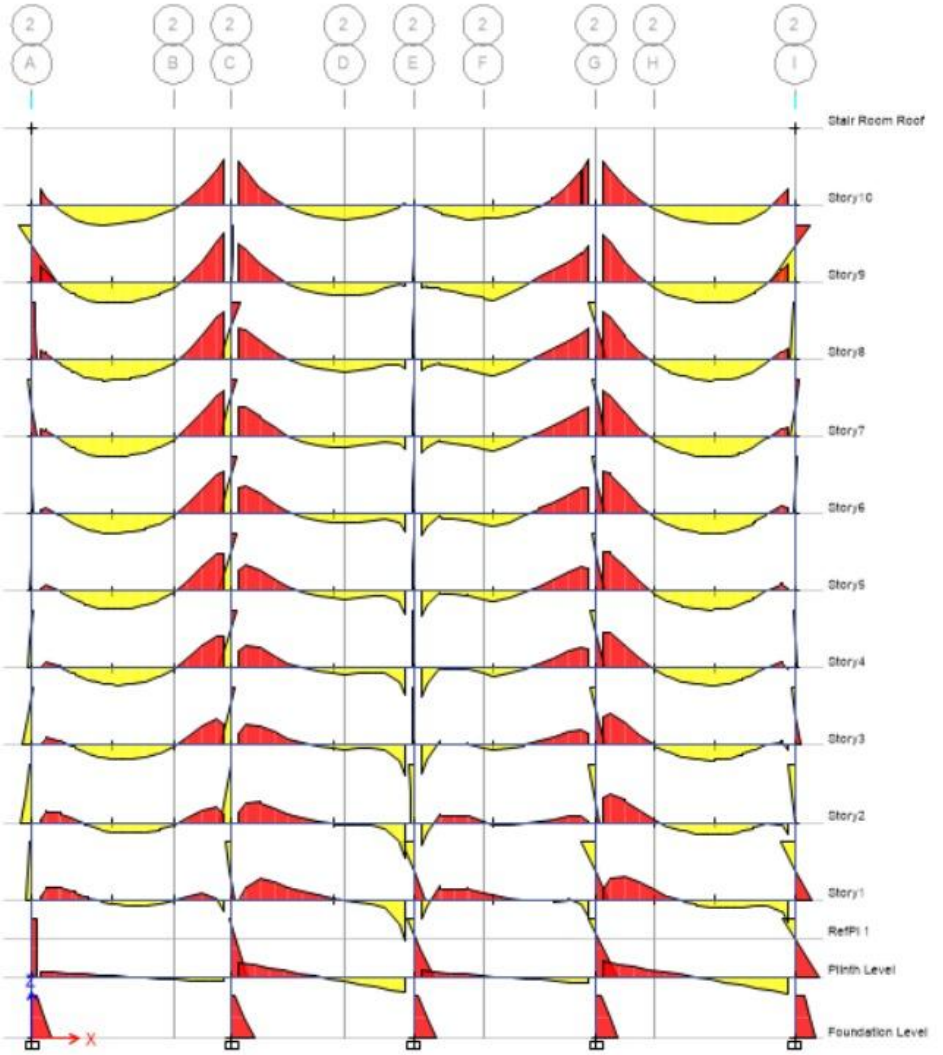
Slab

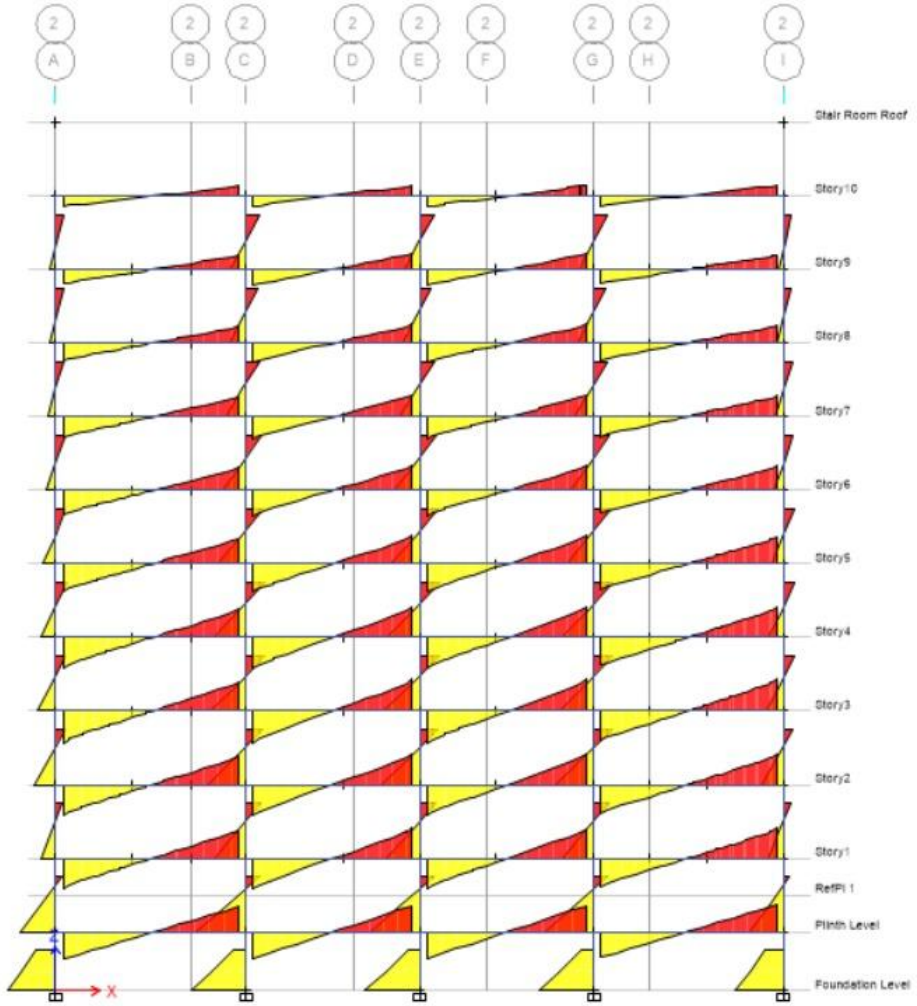

26'-4"
22'-8"
22'-8"
26'-4"
2-12mm Ø ext.
10mm Ø @ 8" c/c
2-12mm Ø ext.
10mm Ø @ 8" c/c
5'-10"
5'-2"
14'-8"
13'-1"
14'-9"
4'-8"
5'-10"

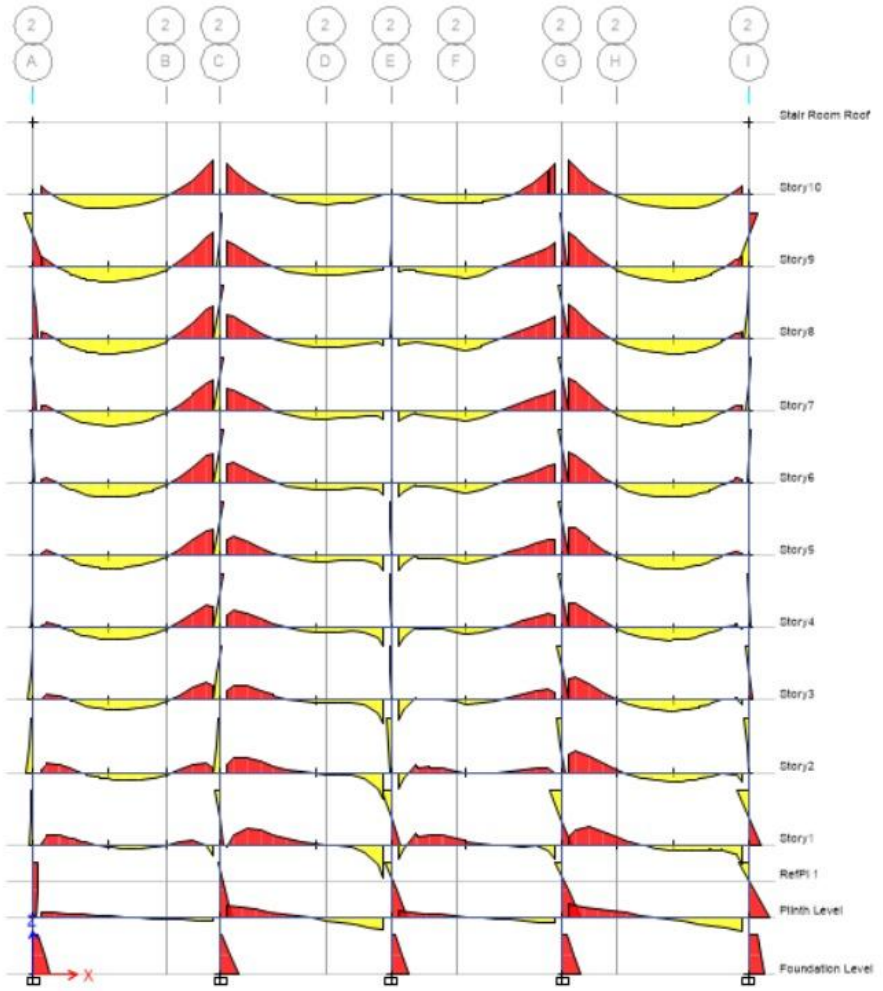

2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
X

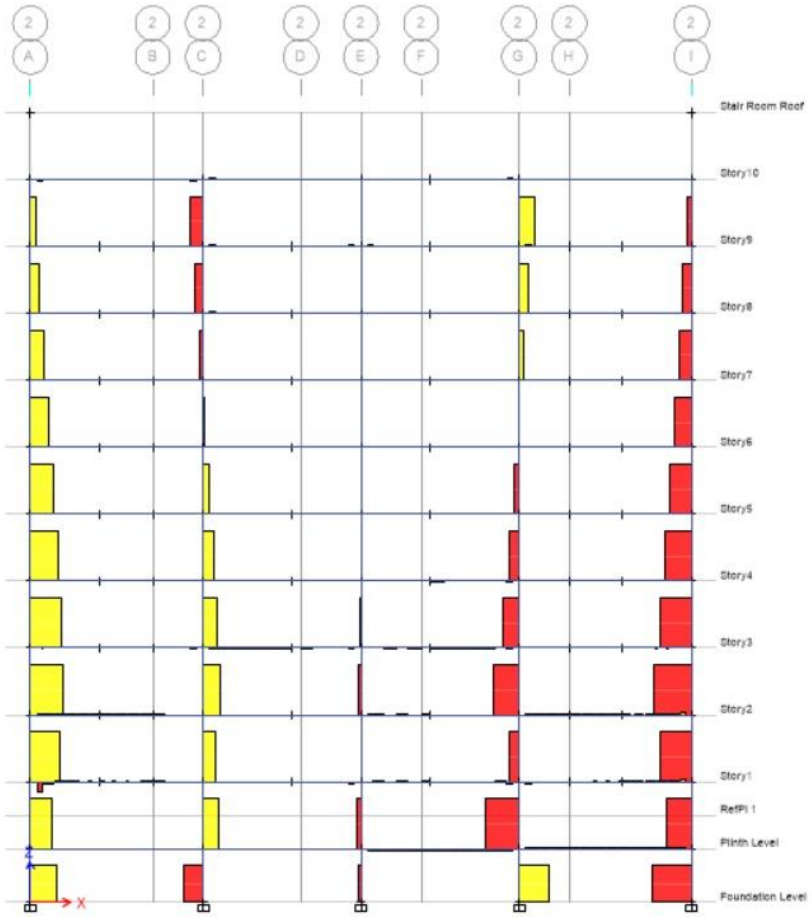

2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
X

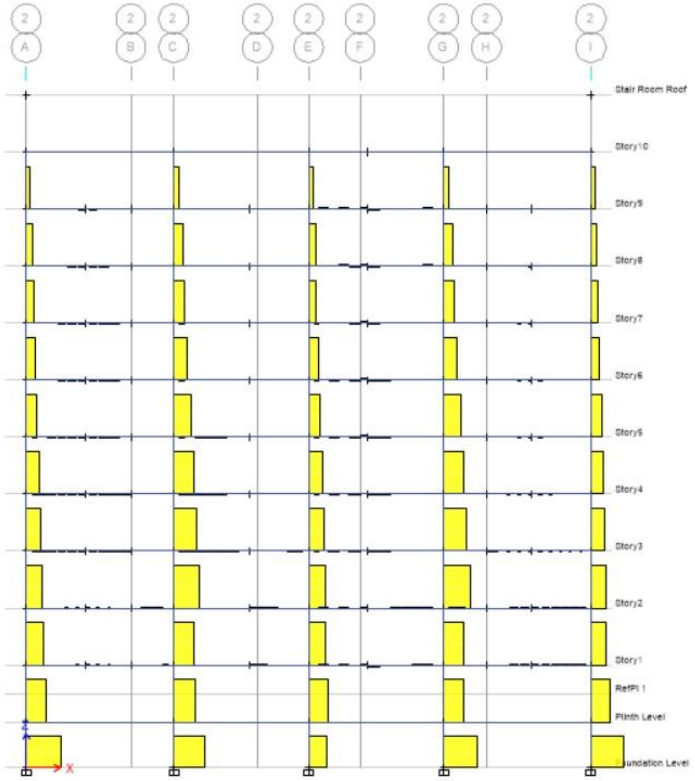

2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
Z
X

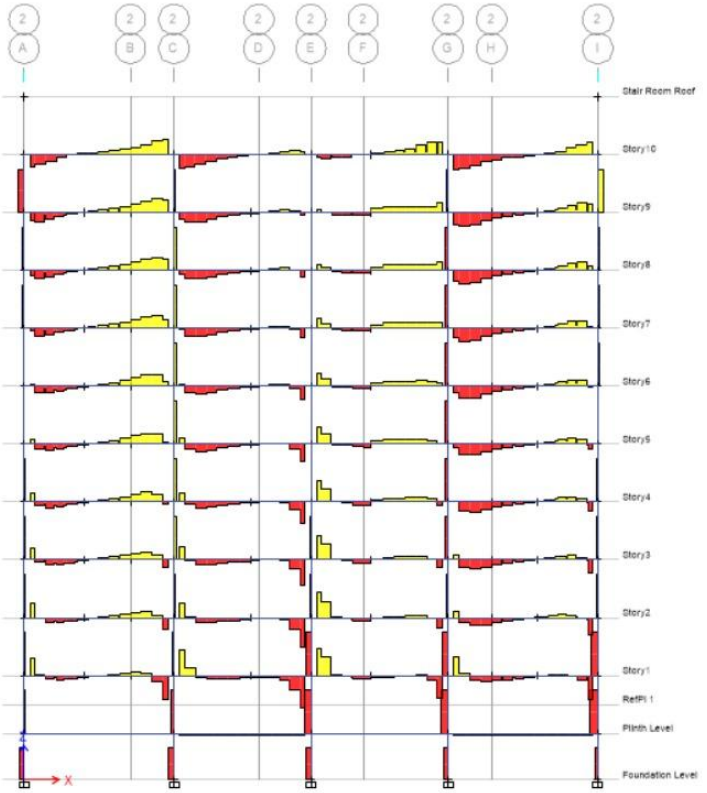

2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
Z
X


2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
X

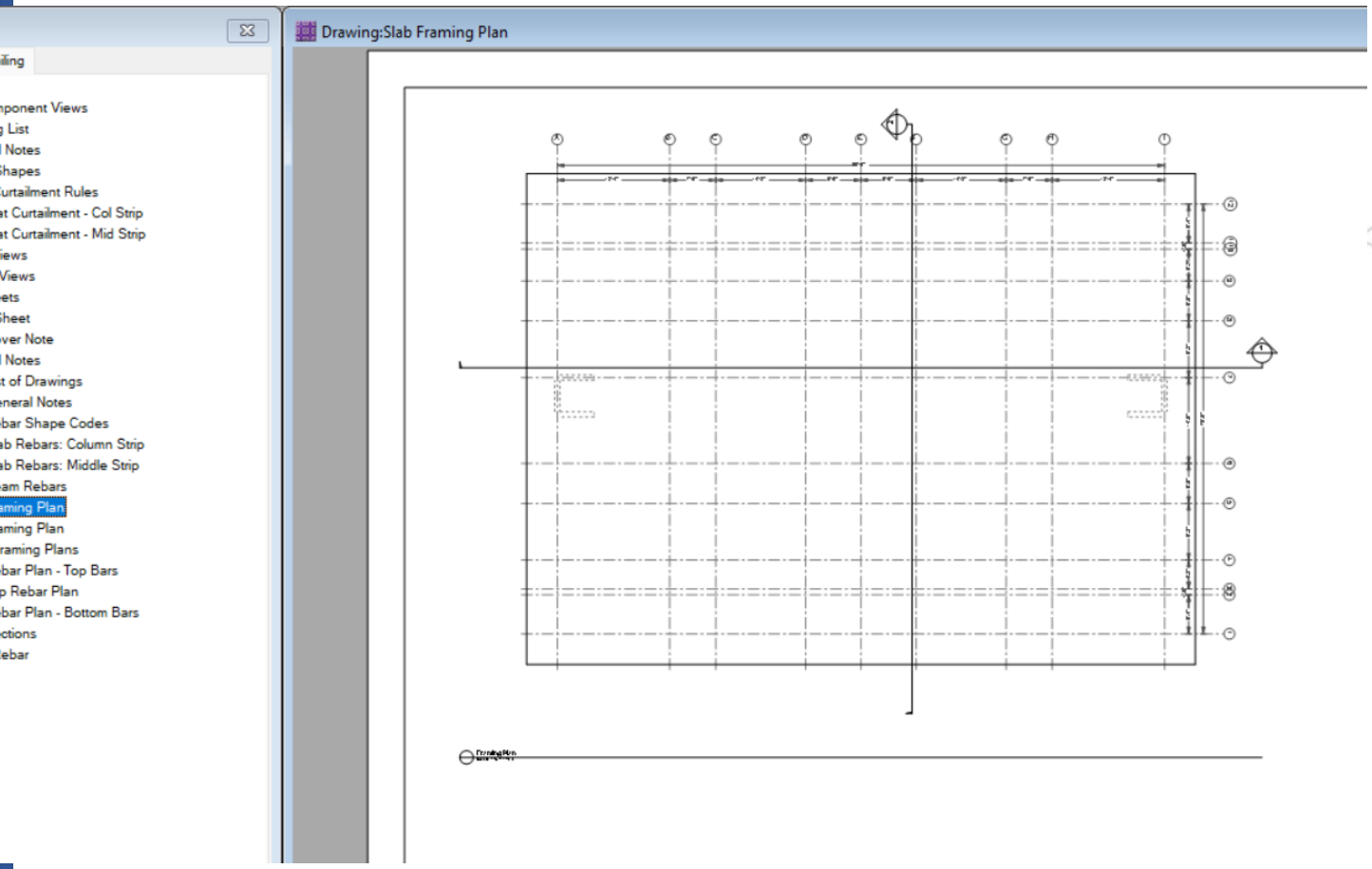

2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
X

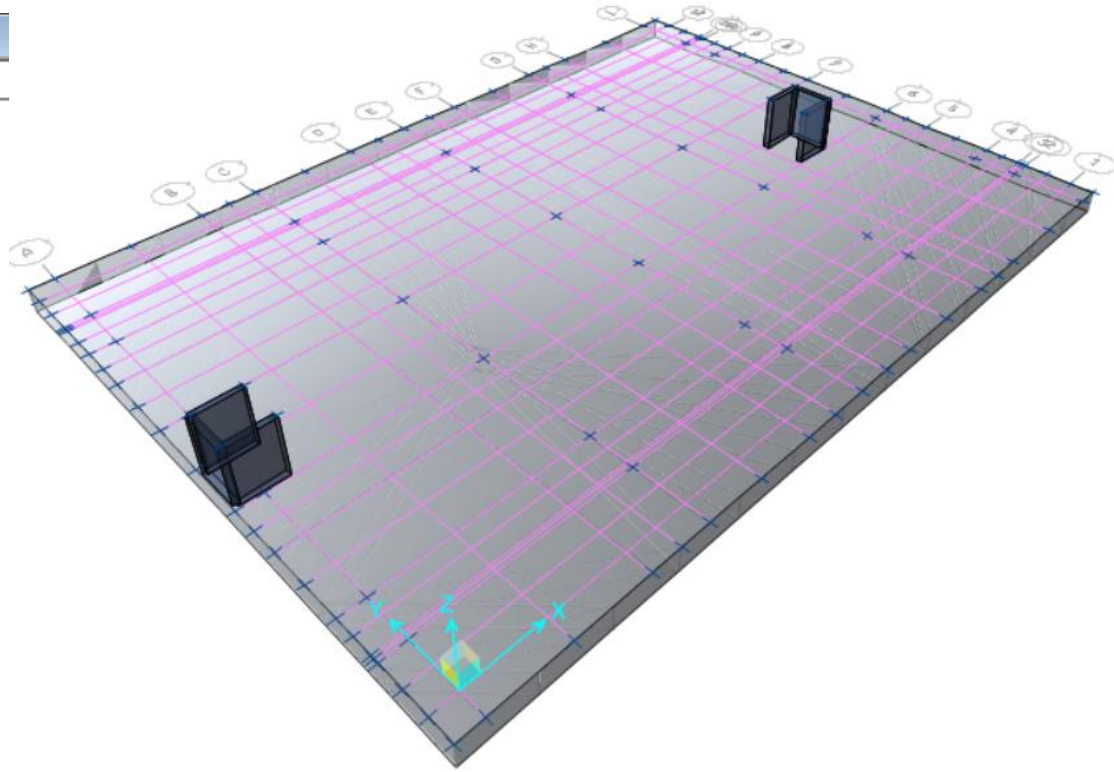

2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
X


2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
X


2 A
2 B
2 C
2 D
2 E
2 F
2 G
2 H
2 I
Stair Room Roof
Story10
Story9
Story8
Story7
Story6
Story5
Story4
Story3
Story2
Story1
RefPl 1
Plinth Level
Foundation Level
X

Foundation Design



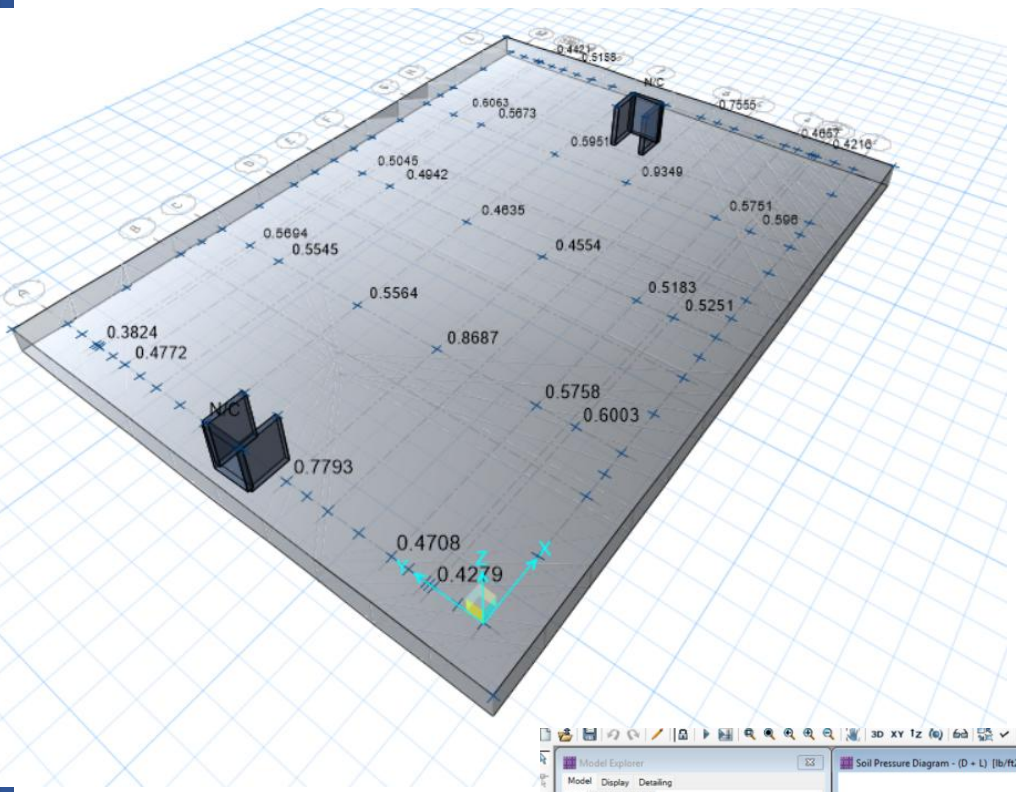


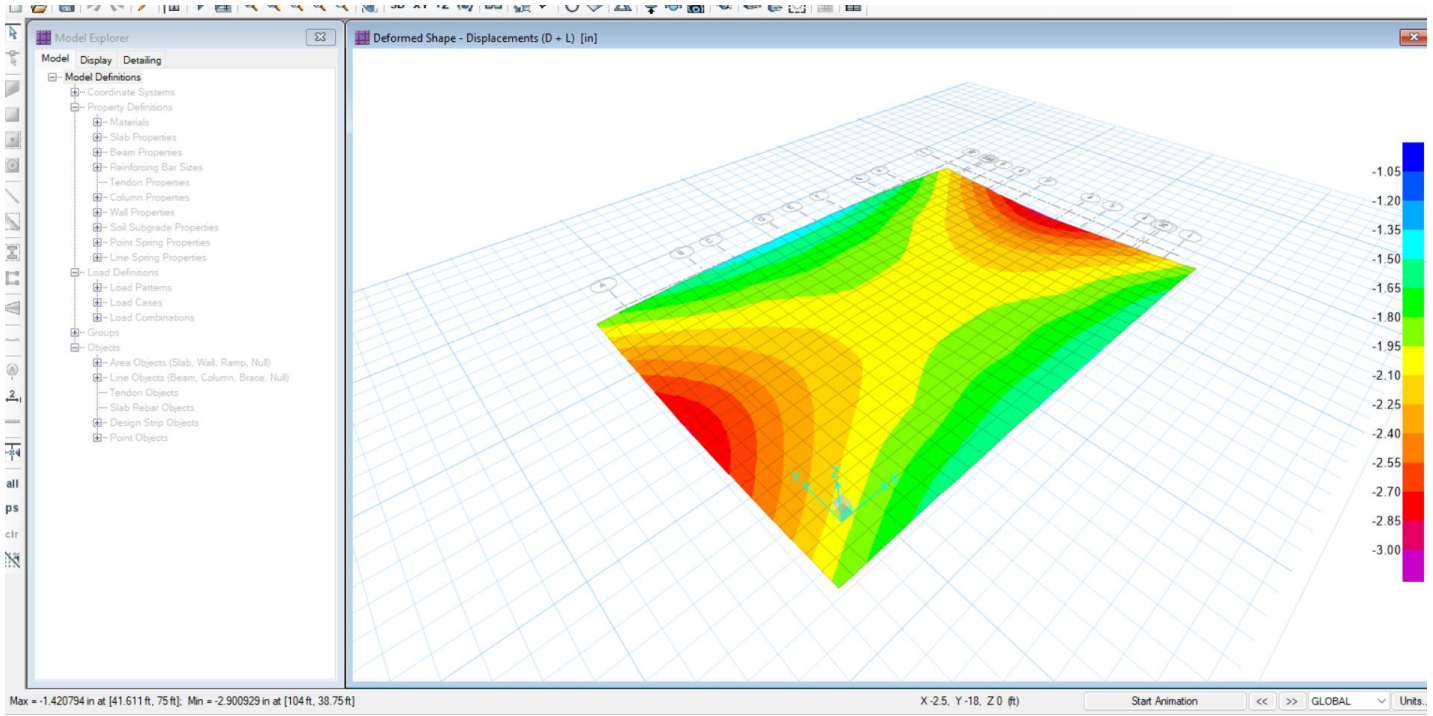
Borehole : 2

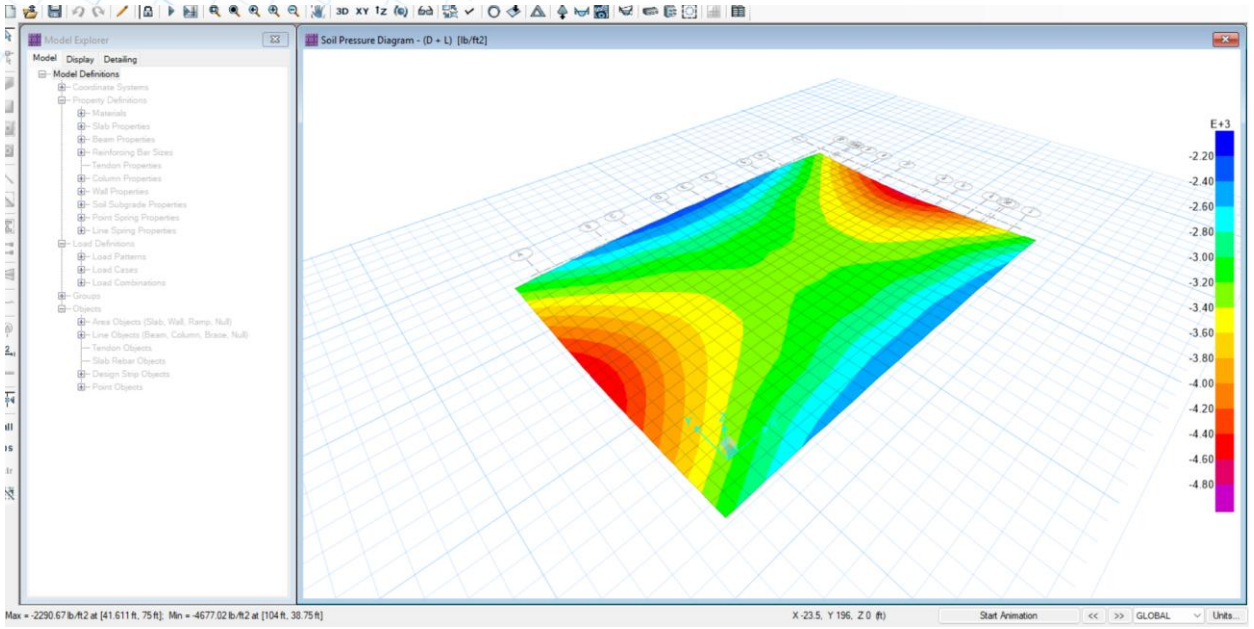
Calculation of site classification :

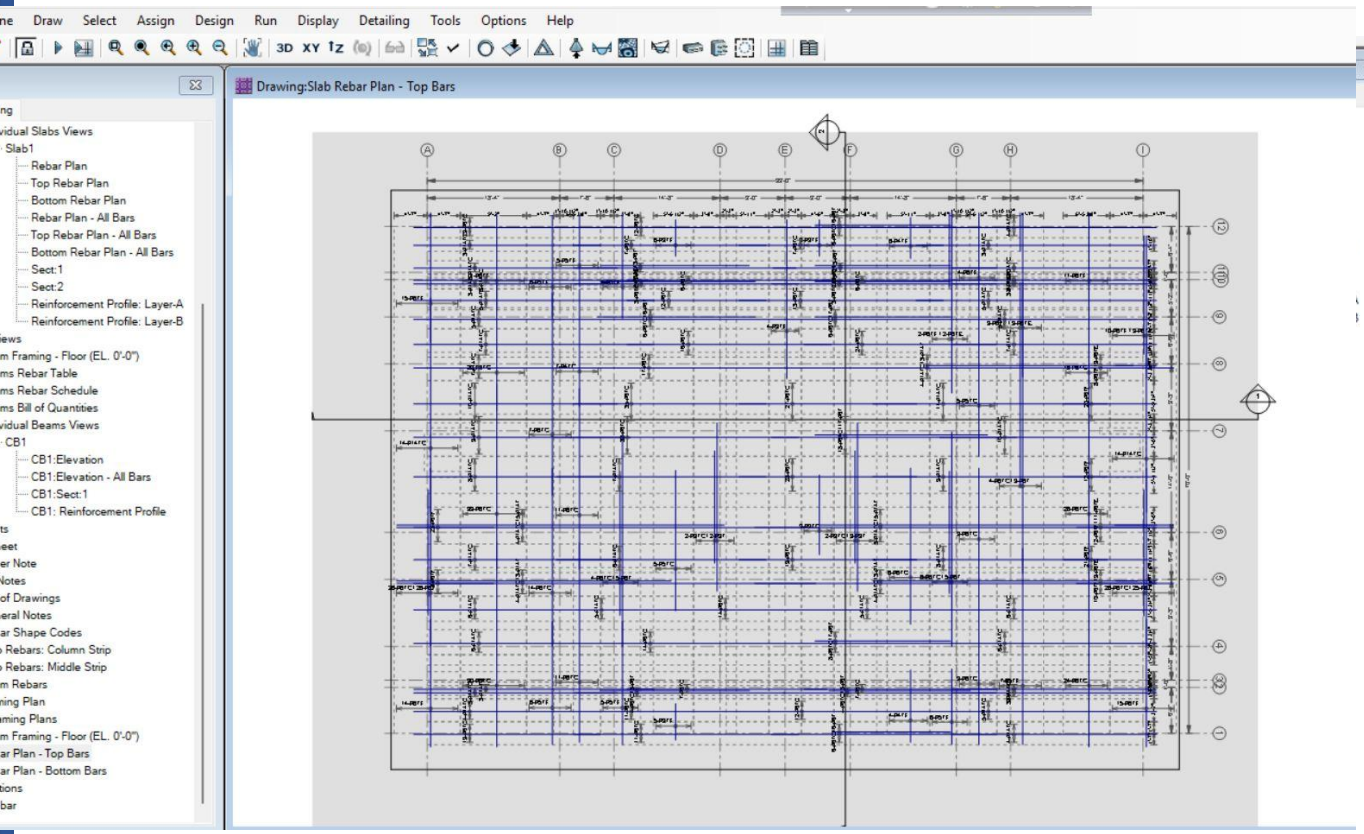
Depth (m)	SPT - N	d (m)	d/SPT -N	N
0	0	0	0	12.61644207
1	3	1	0.333333333	
2	3	1	0.333333333	
3	4	1	0.25	
4	25	1	0.04	
5	31	1	0.032258065	
6	50	1	0.02	
7.5	50	1.5	0.03	
9	50	1.5	0.03	
10.5	50	1.5	0.03	
12	50	1.5	0.03	
13.5	50	1.5	0.03	
15	50	1.5	0.03	
Sum		15	1.188924731	

Site class : **SD**

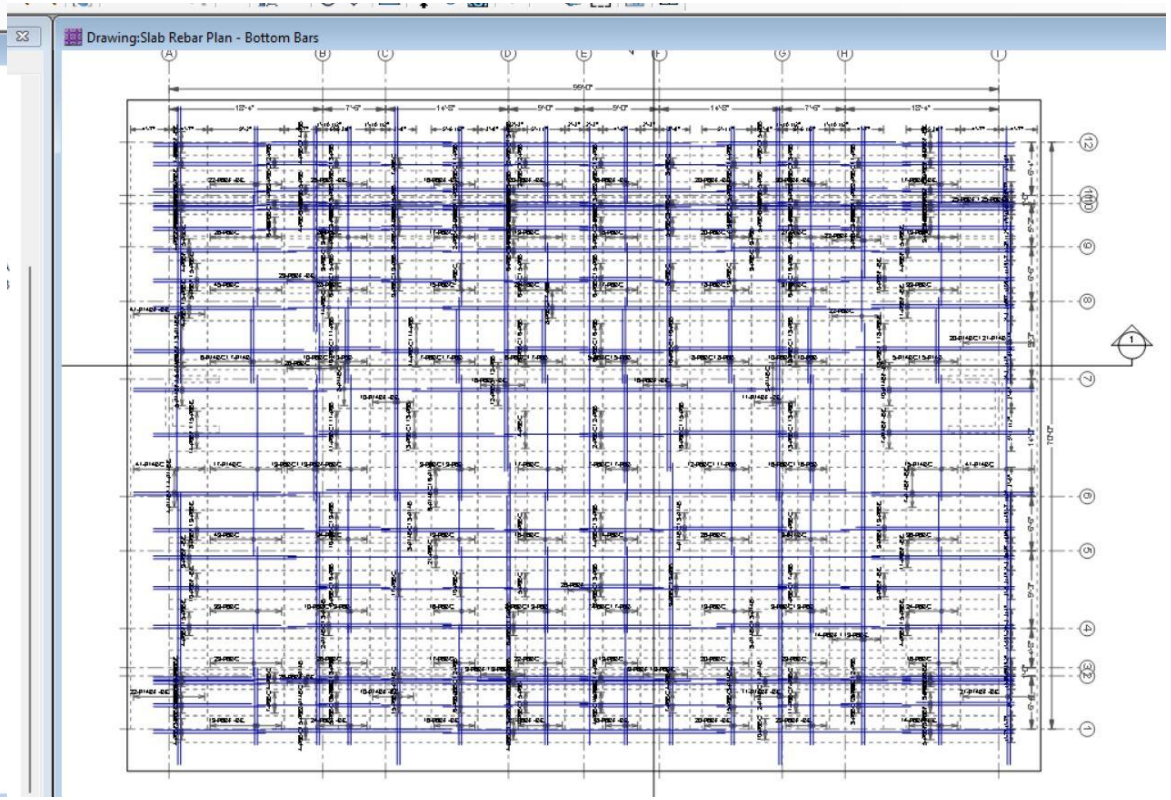

0.4421
0.5188
N/C
0.6063
0.5673
0.7555
0.4657
0.4216
0.5951
0.9349
0.5045
0.4942
0.4635
0.5751
0.598
0.5694
0.5545
0.4554
0.5564
0.5183
0.5251
0.3824
0.4772
0.8687
0.5758
0.6003
N/C
0.7793
0.4708
0.4279


Model Explorer
Model
Display
Detailing
Model Definitions
Coordinate Systems
Property Definitions
Materials
Slab Properties
Beam Properties
Reinforcing Bar Sizes
Tendon Properties
Column Properties
Wall Properties
Soil Subgrade Properties
Point Spring Properties
Line Spring Properties
Load Definitions
Load Patterns
Load Cases
Load Combinations
Groups
Objects
Area Objects (Slab, Wall, Ramp, Null)
Line Objects (Beam, Column, Brace, Null)
Tendon Objects
Slab Rebar Objects
Design Strip Objects
Point Objects
Deformed Shape - Displacements (D + L) [in]
-1.05
-1.20
-1.35
-1.50
-1.65
-1.80
-1.95
-2.10
-2.25
-2.40
-2.55
-2.70
-2.85
-3.00
Max = -1.420794 in at [41.611 ft, 75 ft]; Min = -2.900929 in at [104 ft, 38.75 ft]
X -2.5, Y -18, Z 0 ft)
Start Animation
GLOBAL
Units..

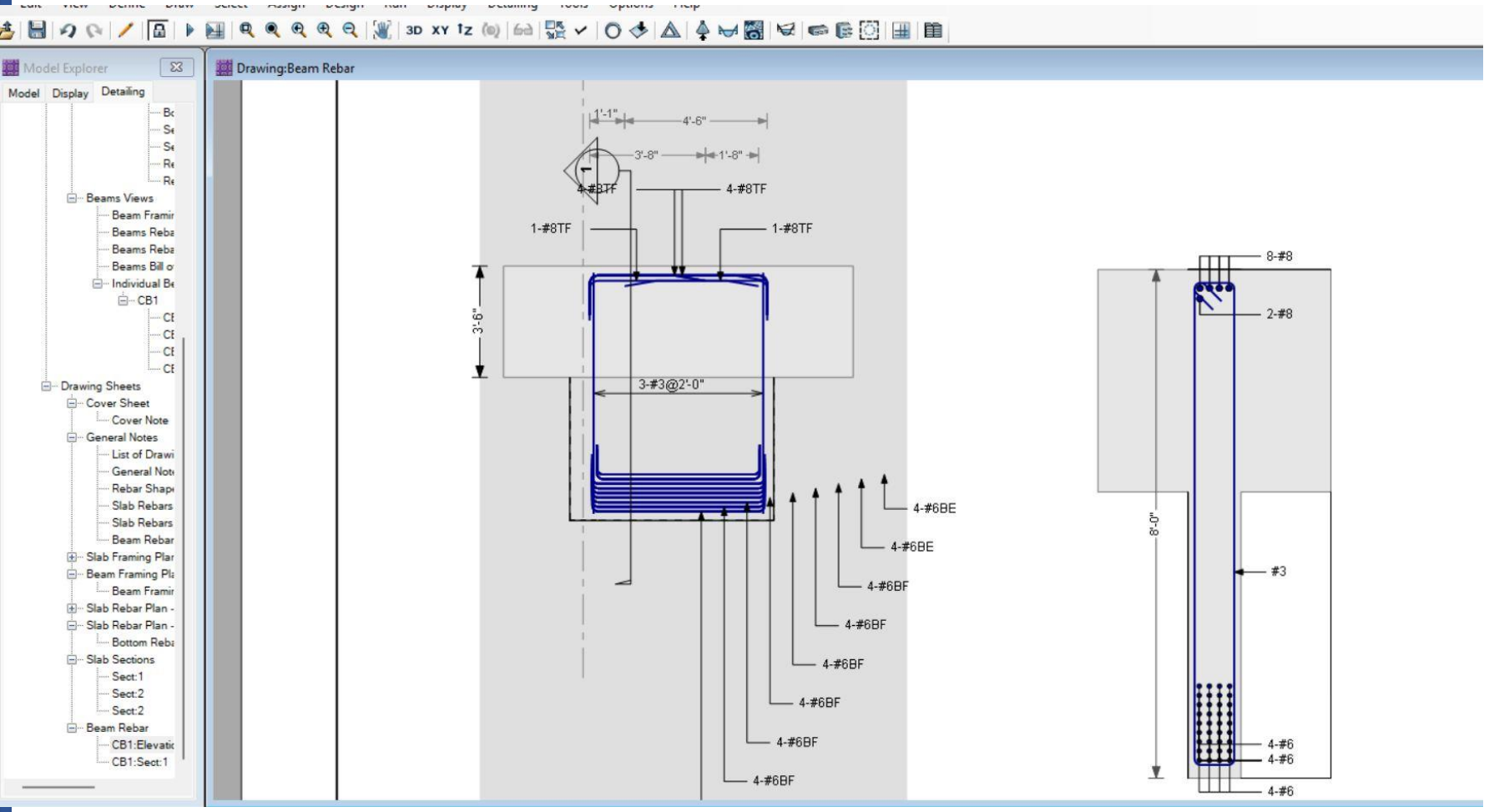

Model Explorer
Model
Display
Detailing
Model Definitions
Soil Pressure Diagram - (D + L) [lb/ft2]
E+3
-2.20
-2.40
-2.60
-2.80
-3.00
-3.20
-3.40
-3.60
-3.80
-4.00
-4.20
-4.40
-4.60
-4.80
Max = -2290.67 lb/ft2 at [41.611 ft, 75 ft]; Min = -4677.02 lb/ft2 at [104 ft, 38.75 ft]
X -23.5, Y 196, Z 0 ft)
Start Animation
GLOBAL
Units...



Reber plan Top view

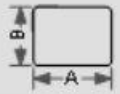
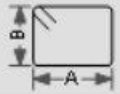
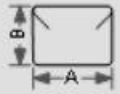


Reber plan bottom view



Beam Elevation

REBAR SHAPE CODES

CODE	SHAPE
00	
11	
12	
13	
14	
51	
52	
62	
63	

Cost Analysis

The Estimate & BOQ of Proposed 10-Storied Residential Building

Floor Area:-

Ground Floor=	7000.00	Sft
1st Floor=	7000.00	Sft
2nd Floor=	7000.00	Sft
3rd Floor=	7000.00	Sft
4th Floor=	7000.00	Sft
5th Floor=	7000.00	Sft
6th Floor=	7000.00	Sft
7th Floor=	7000.00	Sft
8th Floor=	7000.00	Sft
9th Floor=	7000.00	Sft
Total=	**70000.00**	**Sft**

Foundation Work:-

Sl.No	Description	Quantity	Rate	Unit	Amount. TK
1	**Earth cutting**	35000.00	70.00	Cft	**2450000.00**
2	**Earth & Sand Filling**	2500.00	20.00		**50000.00**
a	Cement	1000.00	520.00	bag	520000.00
b	Sand (Local)	600.00	50.00	Cft	30000.00
c	Sand (Sylhet)	500.00	100.00	Cft	50000.00
d	Stone Chips	3000.00	180.00	Cft	540000.00
e	Rebar	123740	90.00	Kg	11136600.00
		Total			**12276600.00**
3	**Septic Tank**				
	10" Brick wall				
	RCC Base & Slab Casting, 1:2:4(Brick Chip)				
a	Cement	30.00	520.00	bag	15600.00
b	Sand (Local)	150.00	50.00	Cft	7500.00
c	Brick	1500.00	10.00	No	15000.00
		Total			**38100.00**
4	**Under Ground Water Reservoir, Base & Rcc Wall Stone Casting, 1:1.5:3 Slab- Brick Chips Casting,1:2:4**				
a	Cement	250.00	520.00	bag	130000.00
b	Sand (Local)	220.00	50.00	Cft	11000.00
c	Sand (Sylhet)	200.00	100.00	Cft	20000.00
d	Stone Chips	1200.00	180.00	Cft	216000.00
e	Brick for Soling& outer wall	7000.00	10.00	No	70000.00
f	Rebar	3000	90.00	Kg	270000.00
g					0.00
		Total			**717000.00**
	Labour Cost				**500000.00**
	Foundation Total				**16031700.00**

Total Cost For Project:-					
SL	**Description**				**Amount TK.**
1	**Foundation**				**16031700.00**
2	**Ground Flooor**				**3868080.00**
3	**1st to 9th floor**	7148400.00		9	**64335600.00**
4	**Lift, Generator**				**4000000.00**
5	**Net Total**				**88235380.00**
6	**5% Over Head Cost**				**4411769.00**
	Gross Total				**92647149.00**

Total Cost For Project:-					
SL	Description				Amount TK.
1	Foundation				15144520.00
3	Ground Flooor				3788700.00
4	1st to 9th floor	6967744.00		9	62709696.00
5	Lift, Generator				4000000.00
6	Net Total				85642916.00
7	5% Over Head Cost				4282145.80
	Gross Total				89925061.80


THE
END