

DESIGN CALCULATION

PLAN SHOWING THE PROPOSED CONSTRUCTION
OF RESIDENTIAL BUILDING (STILT +5) AT TOWN
SURVEY NO. 30/7 OLD S.NO 310/7 BLOCK 25
WARD- B , ZAMIN PALLAVARAM , PALLAVARAM
TALUK ,CHENGALPATTU DISTRICT.

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Structural Design Calculation for Construction of RESIDENTIAL BUILDING
(STILT +5) AT TOWN SURVEY NO. 30/7 OLD S.NO 310/7 BLOCK 25 WARD- B ,
ZAMIN PALLAVARAM.

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1.0 DESIGN BRIEF:

THIS DOCUMENT PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT +5) AT TOWN SURVEY NO. 30/7 OLD S.NO 310/7 BLOCK 25 WARD- B , ZAMIN PALLAVARAM , PALLAVARAM TALUK ,CHENGALPATTU DISTRICT.

2.0 GENERAL DESIGN CRITERIA

2.1. Description of the structure

The Residential Building consists of Stilt Floor + 5 Upper floors and the structure is designed as a RCC framed structure.

- | | |
|---|---|
| 1. Size of the building | : 149.99 X 24.05M |
| 2. Height of the building | : 14.00M |
| 3. Number of storeys above GL | : Stilt Floor +5 upper floors |
| 4. Floor to floor height of this building | : Stilt and First floors - 3.0m
: Typical floor – 3.0m |
| 5. Type of foundation | : Isolated foundation as per geotechnical report |

2.2. Materials Used

Following materials are generally used in the design of the various components of the structure.

For Concrete Structure

- M25 grade concrete for all reinforced concrete parts of the structure
- Fe500 grade Structural reinforcement steel
- Masonry for all walls : Brick / Block

2.3. Design Codes & Standards

Following codes and specifications have been generally used in the design of the members of the structure.

- IS 456 : 2000 Code of practice for Plain and Reinforced concrete
- SP: 16 Design Aids for Reinforced concrete
- IS 875 : 1987 Design Loads for building and structures
- IS 1893 : 2002 Criteria for Earthquake Resistant design of structures
- IS 13920: 1993 Ductile Detailing of R.C structures subjected to Seismic forces
- SP: 34 Handbook on Concrete Reinforcement & Detailing
- IS 800 : 1984 Code of practice for general construction in steel
- IS 2062 : 1999 Steel for general structural purposes specification
- IS 1786: 1985 Specification for high strength deformed bars and wires for concrete reinforcement

3.0 LOADING

Primary Load:

- Dead Load (DL)
- Live Load (LL)

3.1. Dead load (DL)

Material weight

- Density of Concrete =25 kN/m³

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- D.L. due to partitions
(Light Partition as per IS 875) =1.50 kN/m²
- D.L due to floor finish 50mm thick = 0.05x25 = 1.25 kN/m²

3.2. Live load (LL)

Minimum Uniformly Distributed Live Loads:

Occupancy or use	Live Load (kn/m ²)
• All rooms and kitchens	2.00
• Toilet and bath rooms	3.00
• Corridors, passages, staircases	3.00
• Balconies	3.00
• Terrace Floor	1.50
• Basic wind speed	=50 m/sec
• Seismic Zone	=Zone III

3.5 Loading Combinations

The following combinations of Loads as per IS 1893 is considered in the STAAD Analysis

- 1.5(DL +LL)
- 1.2(DL + LL)

The below load combinations are used to check the structure in serviceability condition.

- 1.0(DL +LL)

4.0 STRUCTURAL MATERIAL:

4.1 Concrete Material Specifications:

Concrete compressive cube strength	- 25 N/mm ²
Minimum cement content	- Refer standard drawings for general & Legends
Cement type	- OPC
Free water cement ratio	- 0.5 (Maximum)
Nominal maximum size of aggregate	- 20mm UNO

4.2 Reinforcement:

Steel reinforcement shall be deformed bars, the characteristic of reinforcement bars shall conform to the following specification:

Grade of Steel	Actual Yield Strength (MPa)
Grade Fe500	Minimum 500 MPa,

4.4 Concrete cover:

Cover for Reinforcement is considered as per Table 16A of NBC, for a Fire resistance of 2 hrs.

- Raft Slab = 50mm
- Footing = 50mm
- RC Wall = 30mm

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- Columns = 40mm
- Beams = 30mm
- Slabs = 25mm

5.0 Structural Description

5.1. Method of analysis

Structure analysis & design:

The structure is analyzed as a Space frame structure in STADD Pro Vi8. Columns, Footing, Basement walls, slabs, Beams and Staircases are designed as reinforced concrete members.

5.2. Framing System, Analysis and Design

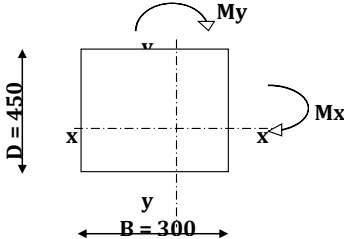
Limit State concept of design will be used as per IS: 456-2000 & SP - 16. The detailing of reinforcement shall be done satisfying the requirements of IS: 456-2000, SP-16, IS: 13920, IS: 4326-1993 and SP-34.

The Slabs and beams are checked for deflection as per IS 456:2000. Cover for Reinforcement is considered as per Table 16A of NBC, for a Fire resistance of 2 hrs.

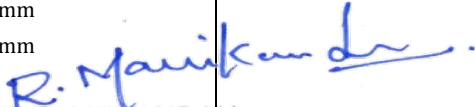

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APPENDIX I
Design Calculations
Column Design

PROJECT	RESIDENTIAL BUILDING (STILT +5) AT TOWN SURVEY NO. 30/7 OLD S.NO 310/7 BLOCK 25 WARD- B , ZAMIN PALLAVARAM.	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE	Design for a Short Column with Biaxial Bending	REVISION	DATE	CHECKED	DATE
CL. NO.	DESIGN CALCULATIONS			REFERENCES	
1.0	Column No:	 CRITICAL LOAD CASE:			
1.1	Basic Data				
1.1	Material Data				
1.2	Grade of Concrete				
1.2	Grade of Steel	Fe 500			
1.2	Codal Data				
	Nominal Cover	=	40 mm		Cl 26.4.2.1,IS456:2000
	Diameter of the Bar	=	25 mm	≥ 12 mm	
	d'	=	52.5 mm		
1.3	Basic Dimensions				
	Unsupported Length of the Column	L _{ox}	=	3000 mm	Table 28 , IS456:2000
		L _{oy}	=	3000 mm	
		L _{ex}	=	3000 mm	
		L _{ey}	=	3000 mm	
	Size of the Column	B X D	=	300 x 450 mm	
1.4	Analysis Results				
	Factored Axial Load	P _u	=	780.0 kN	STAAD OUTPUT
	Factored Moment	M _{ux}	=	22.00 kNm	
	Factored Moment	M _{uy}	=	71.00 kNm	
2.0	Check for Slenderness				
	Slenderness Ratio about Major Axis	L _{ex} / D	=	6.667	Cl 25.1.2, IS456:2000
	Slenderness Ratio about Minor Axis	L _{ey} / B	=	10.000	
	Since Leff / LLD <12 Designed as Short Column				
3.0	Check for Eccentricity				
	Minimum Eccentricit e _x	= L _{ox} / 500 + D / 30	=	21.0 mm >20	Cl 25.4 IS456:2000
	e _y	= L _{oy} / 500 + B / 30	=	16.0 mm <20	
3.1	Moments Due to Minimum Eccentricity				
		Me _x	=	16.38 kN.m	
		Me _y	=	15.60 kN.m	
4.0	Design Moment				
	Design Moment about X axis	M _{ux}	=	22.00 kN.m	
	Design Moment about Y axis	M _{uy}	=	71.00 kN.m	

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CL. NO.	DESIGN CALCULATIONS			REFERENCES	
5.0	Uniaxial Moment Carrying capacity of the Section about X & Y- axis			Chart 43 - 46 SP 16 : 1980	
	d' / D	=	0.117		
	d' / B	=	0.175		
	Assume the Reinforcement Percentage p	=	2.00		
	p / f_{ck}	=	0.080		
	$p_u / f_{ck}BD$	=	0.231		
	Reinforcement distributed equally on four sides		4		
	$M_{ux1} / f_{ck}BD^2$	=	0.137		
	$M_{uy1} / f_{ck}DB^2$	=	0.119		
	Moment carrying capacity about X axis M_{ux1}	=	207.89 kN.m		
	Moment carrying capacity about Y axis M_{uy1}	=	120.61 kN.m		
	Pu < Axial Load Carrying capacity ; Hence O.K				
6.0	Calculation of P_{uz}				
	$P_{uz} = 0.45 f_{ck} A_c + 0.75 f_y A_{sc}$	=	2500.88 kN	Cl 39.6 , IS456:2000	
	P_u / P_{uz}	=	0.312		
	a_n	=	1.186	Cl 39.6 , IS456:2000	
7.0	Criteria for Biaxial Bending (Bresler's Formulation)				
	$(M_{ux}/M_{ux1})^{an} + (M_{uy}/M_{uy1})^{an}$	=	0.603 < 1	Cl 39.6 , IS456:2000	
	Hence Safe				
8.0	Longitudinal Reinforcement				
	Area of compression Steel $A_{sc,reqd}$	=	2700 mm ²		
	10 No Y20 + No Y20 $A_{sc,pro}$	=	3142 mm ²		
8.1	Check for Minimum & Maximum Area of Steel				
	Minimum Area of ste (0.8 % of $A_{g,dir}$)	=	441 mm ²	Cl 26.5.3.1 a & b ,	
	(Based on the area of concrete reqd to resist direct stress)			IS 456 : 2000	
	Maximum Area of ste (4 % of A_g)	=	5400 mm ²		
	441 < 3142 < 5400 mm ²				
	Area of Steel is with in the permissible limit ; Hence O.K				
9.0	Transverse Reinforcement				
9.1	Diameter of Transverse Reinforcement	=	8 mm ≥ 6 mm	Cl 26.5.3.2 c 2) ,	
9.2	Spacing of Lateral Ties :				
	i) Least Lateral Dimension of the column	=	300 mm	Cl 26.5.3.2 c 1) ,	
	ii) 16 times the Smallest dia of Longitudinal Steel	=	320 mm	IS 456 : 2000	
	iii)	=	300 mm		
	Reqd. Spacing of Ties (Minimum of the above)	=	300 mm		
	Provide 8 mm dia Lateral Ties @ 300 mm Spacing				
	Provide closer spacing on either side of the column above and below beam				


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Footing Design

**RESIDENTIAL BUILDING (STILT +5) AT TOWN SURVEY NO. 30/7 OLD S.NO 310/7 BLOCK 25 WARD- B ,
ZAMIN PALLAVARAM.**

Design of Isolated Footing

F2

Node : 38

Basic Data:

Net Safe Bearing Capacity	150 kN/m ²
Unit wieght of Soil	18 kN/m ³
Unit wieght of Concrete	25 kN/m ³
Grade of Concrete	25 N/mm ²
Grade of Steel	500 N/mm ²
Clear Cover to Reinforcemen	50 mm
Earth Fill above FGL	0 mm
Base Area of Footing	5.76 m ²
Ixx	2.76 m ⁴
Izz	2.76 m ⁴
Weight of Footing	72.00 kN
Weight of soil	151.88 kN

Gross Bearing Pressure Calculation (kN/m²)

Critical Load Combinations	Pmax	Pmin
200	116.99	116.99219
0	38.87	38.87

Gross SB(w/o increase) 186 kN/m²

Hence **OK**

Factored Net Upward Pressure Calculation

Load Factor for Design 1.5

Critical Load Combinations	Pmax	Pmin
200	117.19	117.1875
0	0.00	0.0

Dsgn.(+ve) BM abt. X-axis M 64.60 kN.m

Dsgn.(+ve) BM abt. Z-axis M 55.70 kN.m

Dsgn.(-ve) BM abt. X-axis M 0.00 kN.m

Dsgn.(-ve) BM abt. Z-axis M 0.00 kN.m

Provided Eff. depth for Mux 444.00 mm

Provided Eff. depth for Muz 432.00 mm

Mu,lim 621 kN.m

Depth provided is **OK**

Bottom Reinforcement

Ast Required for Mux 339.7 mm²

Ast Required for Muz 300.6 mm²

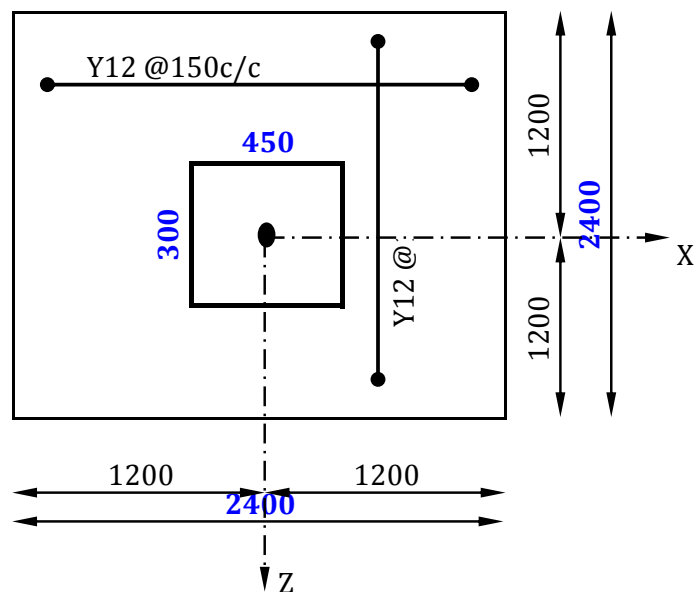
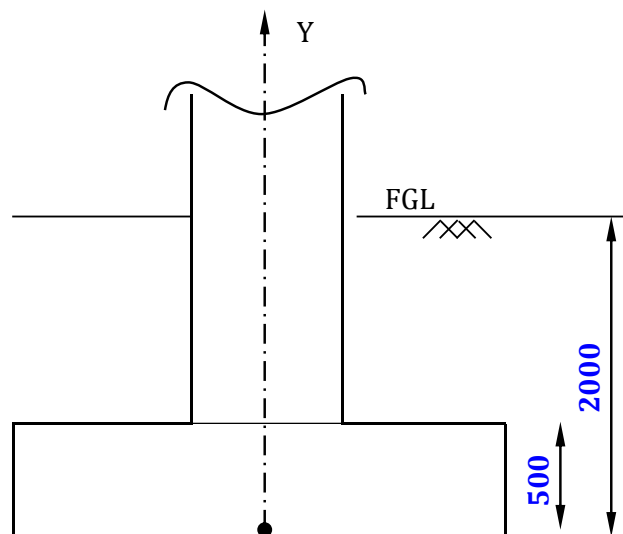
Min. Ast Req'd. 600 mm²

Bottom Reinforcement

Provide	12	@	150	C/C	along Z
Provide	12	@	150	C/C	along X

Ast Provided Ast Required

754	600.0	mm ²	Hence
754	600.0	mm ²	OK



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Design of Isolated Footing

F2

Node : 38

Top Reinforcement

Ast Required for Mux 0.00 mm²

Ast Required for Muz 0.00 mm²

Min. Ast Req'd. Not Req'd mm²

Check For Flexural / Oneway Shear

	Actual	Allowable		Hence
Shear Stress (Plane ll to X)	0.160	0.308	N/mm ²	OK
Shear Stress (Plane ll to Z)	0.147	0.311	N/mm ²	OK

Check For Punching / Twoway Shear

Allowable Shear Stress	1.25 N/mm ²		
Actual Shear Stress	0.46 N/mm ²	Hence	OK

Check For Overturning

Co-efficient of friction = **0.57**

Factor of safety for overturning, slidi = **1.4**

Net Moments acting at Pad Level, M_{xx} = 0.00 kNm

Net Moments acting at Pad Level, M_{zz} = 0.00 kNm

Weight of pad = 72.00 kN

Weight of Over burden Earth = 151.88 kN

Total downward Load = 673.88 kN

Stabilizing moment along X-Dir = 673.88 x 1.20

= 808.65 kNm

Actuating moment, M_{zz} = 0.00 kNm

Factor of Safety (Along X-Dir) = 808.65 / 0.0
- > 1.40

Hence **OK**

Check For Sliding

Resistance against Sliding = 384.109 kN

Max. Shear Load @ Pad level in X-Dir = 2.5 kN

Max. Shear Load @ Pad level in Z-Dir = 5.3 kN

Factor of Safety (Along X-Dir) = 384.1 / 2.5
151.22 > 1.40

Hence **OK**

Factor of Safety (Along Z-Dir) = 384.1 / 5.3
72.47 > 1.4

Hence **OK**

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Plinth Beam Design

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TITLE				REVISION	DATE	CHECKED RMK	DATE															
CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES																
1.1	<u>Geometry Data</u> Beam Number = PB1 Type of Beam = Rectangular Beam Support Condition = Continuous Beam Width of beam b = 200 mm Overall Depth of Beam D = 380 mm Dia of bar Φ = 25 mm Nominal Cover cc = 30 mm Effective Depth d = 337.5 mm Effective Cover = 42.5 mm Effective Span of beam l _{eff} = 4500 mm Concrete grade = M 25 Steel Grade = Fe 500 p _{t,lim} = 0.944 % p _{t,min} = 0.170 % p _t & p _{cmax} = 4.00 %					IS 456:2000 Table 19 IS 456:2000 Cl 23.0 IS 456:2000 Cl 26.5.1.1																
1.2	<u>Force Input</u> Left negative moment (Support 1) = 84 kNm Mid span positive moment = 84 kNm Right negative moment (Support 2) = 84 kNm Shear @ (Support 1) = 149 kN Shear @ (Span) = 149 kN Shear @ (Support 2) = 149 kN																					
1.3	<u>Limiting Moment</u> M _{ulim} = 0.133 f _{ck} b d ² = 75.75 kNm																					
1.4	<u>Area of Steel</u> Minimum Area of Steel = 0.17% b d = 114.75 mm ² <u>Support 1</u> Negative moment (Support 1) = 84 kNm Hence the Section is designed as Doubly Reinforced Section M _u /bd ² = 3.687 Percentage of tension steel reqd p _t = 1.039 % Percentage of compression steel reqd p _c = 0.106 % Required Area of tension steel A _{st reqd} = 701.33 mm ² Required Area of compression steel A _{sc reqd} = 71.55 mm ² <u>Detail of bars</u> <table><tr><td></td><td colspan="2">I st Layer</td><td colspan="2">II nd Layer</td></tr><tr><td></td><td>Nos</td><td>Dia</td><td>Nos</td><td>Dia</td></tr><tr><td>Tension Reinforcement</td><td>3</td><td>16</td><td></td><td></td></tr></table> A _{st} provided = 603.19 mm						I st Layer		II nd Layer			Nos	Dia	Nos	Dia	Tension Reinforcement	3	16				
	I st Layer		II nd Layer																			
	Nos	Dia	Nos	Dia																		
Tension Reinforcement	3	16																				

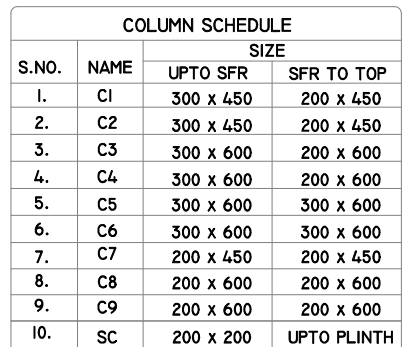
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TITLE				REVISION	DATE	CHECKED RMK	DATE
CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES	
	Nos 3 Dia 16 Compression Reinforcement A_{sc} provided Nos 0 Dia 16 = 603.19 mm²						
	Percentage of tension steel provided p_t = 0.894 % Not safe						
	Percentage of compression steel provided p_c = 0.894 % Hence O.K						
	Check for Shear						
	Shear = 149 kN						
	Nominal Shear Stress t_v = 2.21 N/mm ²					Cl 40.1, IS456:2000	
	Permissible Shear Stress t_c = 0.92 N/mm ²					β = 1.000	
	Maximum Shear Stress $t_{c,max}$ = 2.5 N/mm ²					Table 19, IS456:2000	
	Diameter of the Stirrup bar = 8 mm					Table 20, IS456:2000	
	Number of Legs = 2						
	Spacing of Shear reinforcement Required = 160.0					Cl 40.4, IS456:2000	
	Maximum Spacing of Shear Reinforcement = 250					Cl 26.5.1.5, IS456:2000	
	Provide 8 mm dia 2 legged stirrups @ 160mm c/c spacing						
	Support 2						
	Negative moment = 84 kNm						
	Hence the Section is designed as Doubly Reinforced Section						
	M_u/bd^2 = 3.687						
	Percentage of tension steel reqd p_t = 1.039 %						
	Percentage of compression steel reqd p_c = 0.106 %						
	Required Area of tension steel $A_{st \text{ reqd}}$ = 701.33 mm ²						
	Required Area of compression steel $A_{sc \text{ reqd}}$ = 71.55 mm ²						
	Detail of bars						
	I st Layer Nos 3 Dia 16 Tension Reinforcement A_{st} provided Nos 0 Dia 16 = 603.19 mm²						
	II nd Layer Nos 0 Dia 16 Compression Reinforcement A_{sc} provided Nos 3 Dia 16 = 603.19 mm²						
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	Span Positive moment (Span) = 84 kNm Hence the Section is designed as Doubly Reinforced Section M_u/bd^2 = 3.325 Percentage of tension steel reqd p_t = 1.039 % Percentage of compression steel reqd p_c = 0.106 % Required Area of tension steel $A_{st\ reqd}$ = 701.33 mm ² Required Area of compression steel $A_{sc\ reqd}$ = 71.55 mm ²																																		
	Detail of bars <table><thead><tr><th></th><th colspan="2">I st Layer</th><th colspan="2">II nd Layer</th></tr><tr><th></th><th>Nos</th><th>Dia</th><th>Nos</th><th>Dia</th></tr></thead><tbody><tr><td>Tension Reinforcement</td><td>3</td><td>16</td><td>0</td><td>0</td></tr><tr><td></td><td colspan="2">$A_{st\ provided}$</td><td colspan="2">$= 603.19\ mm^2$</td></tr><tr><td>Compression Reinforcement</td><td>3</td><td>16</td><td>0</td><td>0</td></tr><tr><td></td><td colspan="2">$A_{sc\ provided}$</td><td colspan="2">$= 603.19\ mm^2$</td></tr></tbody></table> Percentage of tension steel provided p_t = 0.894 % Not safe Percentage of compression steel provided p_c = 0.894 % Hence O.K				I st Layer		II nd Layer			Nos	Dia	Nos	Dia	Tension Reinforcement	3	16	0	0		$A_{st\ provided}$		$= 603.19\ mm^2$		Compression Reinforcement	3	16	0	0		$A_{sc\ provided}$		$= 603.19\ mm^2$			
	I st Layer		II nd Layer																																
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	$A_{sc\ provided}$		$= 603.19\ mm^2$																																
	Check for Shear Shear = 149 kN Nominal Shear Stress τ_v = 2.21 N/mm ² Permissible Shear Stress τ_c = 0.92 N/mm ² Maximum Shear Stress $\tau_{c,max}$ = 2.5 N/mm ² Diameter of the Stirrup bar = 8 mm Number of Legs = 2 Spacing of Shear reinforcement Required = 160.0 Maximum Spacing of Shear Reinforcement = 250 Provide 8 mm dia 2 legged stirrups @ 160mm c/c spacing			Cl 40.1, IS456:2000 β = 1.000 Table 19, IS456:2000 Table 20, IS456:2000 Cl 40.4, IS456:2000 Cl 26.5.1.5,IS456:2000																															
	Check For Deflection Basic Value = 26 Service Stress in Steel f_s = 337.19 N/mm ² Modification Factor(Tension Reinforcement) F_1 = 0.78 Allowable Span/Depth = 20.28 Actual Span/Depth = 13.33 Hence Safe			Cl.23.2, IS456:2000																															

Structural Design Calculation for Construction of RESIDENTIAL BUILDING
(STILT +5) AT TOWN SURVEY NO. 30/7 OLD S.NO 310/7 BLOCK 25 WARD- B ,
ZAMIN PALLAVARAM.

APPENDIX II
GENERAL ARRANGEMENT DRAWINGS


R. MANIKANDAN, M.Tech,(Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
AURA ENGINEERING CONSULTANTS
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Ashok Nagar, Chennai-600 083.
Ph: 044-48597100 Cell: 9790751378



1. ALL DIMENSIONS ARE IN MM.
2. CONCRETE GRADE SHALL BE M25
CONFIRMING TO IS 456:2000
3. GRADE OF REINFORCEMENT MARKED THUS (Y)
SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
4. CLEAR COVER FOR REINFORCEMENT
A) COLUMN = 40MM
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGs.
6. COLUMNS AND FOOTINGS ARE DESIGNED FOR S+5
FLOOR LOADS AND SBC OF THE SOIL IS
200KN/ SQM. @ 2000 BELOW N.G.L.
7. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO
DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
8. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

00	ISSUE FOR APPROVAL	A.P	R.M	03.01.26
REV.	DESCRIPTIONS	DRN	CHK	DATE

THE PROPOSED CONSTRUCTION OF SKI APARTMENT
AT PALLAVARAM, CHENNAI.

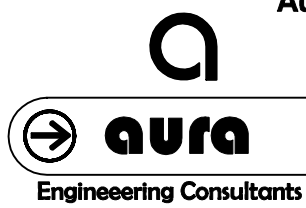
LAYOUT OF COLUMN

DATE	SCALE	JOB.NO	DRG.NO
03.01.26	1 : 150	-----	001

STRUCTURAL CONSULTANTS :-

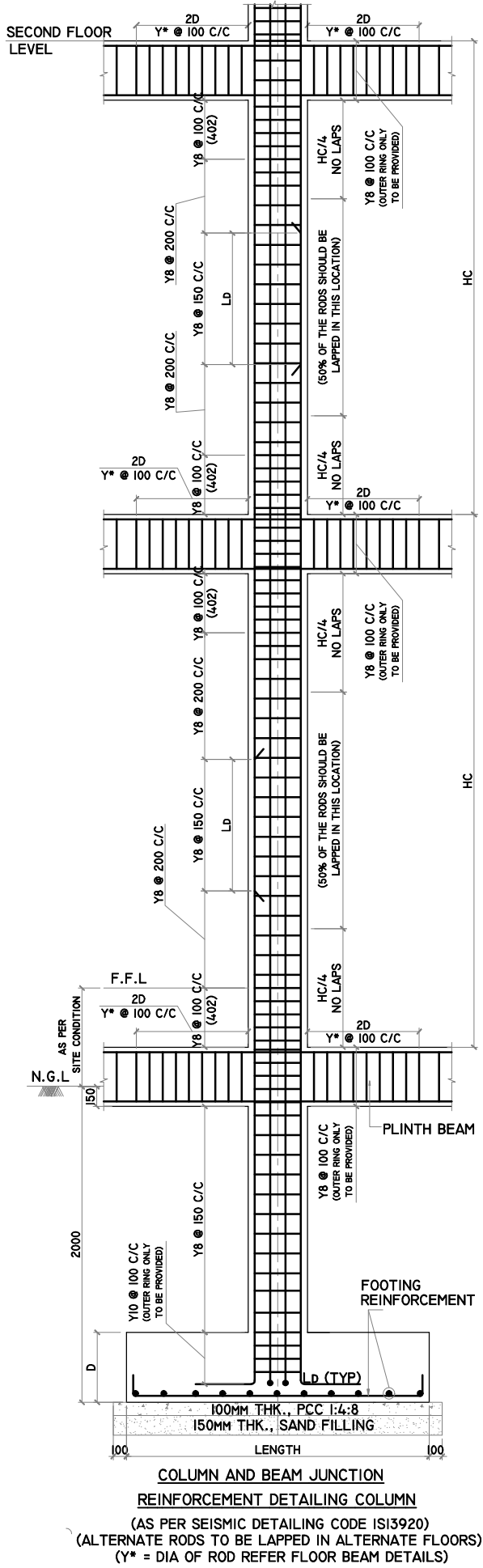
**#8, 50th St, Sarvamangala Colony, 7th Avenue,
ASHOK NAGAR, CHENNAI- 600 083.**

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projects@auraengineers.co.in
<http://auraengineers.co.in/>



COLUMN SCHEDULE					
S.NO.	NAME	SIZE			
		UPTO SFR	(SFR TO 1ST FR)	(1ST FR TO 3rd FR)	(3rd FR TO TOP)
1.	C1	200 100 450 300 (300 x 450) 10-Y20 REFER L.S. OF COLUMN 5-Y12	450 200 (200 x 450) 10-Y20 REFER L.S. OF COLUMN	450 200 (200 x 450) 6-Y20 REFER L.S. OF COLUMN 4-Y16	450 200 (200 x 450) 10-Y16 REFER L.S. OF COLUMN
2.	C2	200 100 450 300 (300 x 450) 6-Y25 REFER L.S. OF COLUMN 5-Y12 4-Y20	450 200 (200 x 450) 6-Y25 REFER L.S. OF COLUMN 4-Y20	450 200 (200 x 450) 10-Y20 REFER L.S. OF COLUMN 4-Y16	450 200 (200 x 450) 6-Y20 REFER L.S. OF COLUMN 4-Y16
3.	C3	200 100 600 300 (300 x 600) 8-Y25 REFER L.S. OF COLUMN 6-Y12 4-Y20	600 200 (200 x 600) 8-Y25 REFER L.S. OF COLUMN 4-Y20	600 200 (200 x 600) 12-Y20 REFER L.S. OF COLUMN 4-Y16	600 200 (200 x 600) 8-Y20 REFER L.S. OF COLUMN 4-Y16
4.	C4	200 100 600 300 (300 x 600) 12-Y25 REFER L.S. OF COLUMN 6-Y12	600 200 (200 x 600) 12-Y25 REFER L.S. OF COLUMN	600 200 (200 x 600) 8-Y25 REFER L.S. OF COLUMN 4-Y20	600 200 (200 x 600) 12-Y20 REFER L.S. OF COLUMN

COLUMN SCHEDULE				
S.NO.	NAME	SIZE		
		UPTO FFR	(1st FR TO 3rd FR)	(3rd FR TO TOP)
5.	C5			
6.	C6			
7.	C7			
8.	C8			
9.	C9			



GENERAL NOTES:
REMOVAL OF FORMWORK(SHUTTERING) :
SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% OF THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE II.3.1, IS 456:2000

A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS & BEAMS - 24HOURS

LAP JOINTS FOR REINFORCEMENT BARS :

- AT ANY CROSS SECTION OF THE MEMBER,NOT MORE THAN 50% OF THE BARS SHALL BE LAPPED.
- LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF 1.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.
- DEVELOPMENT LENGTH(Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

DEVELOPMENT LENGTH FOR COLUMNS ROD = 40d
DEVELOPMENT LENGTH FOR BEAMS ROD = 50d

- LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL.
- DETAILING OF REBARS SHALL CONFIRM TO SP-34 & IS 13920

EXCAVATION AND BACKFILL

- BACKFILL FOR FOUNDATIONS AND PITS SHALL BE PLACED EVENLY LAYERS OF 300 MM THICKNESS AND SHALL BE WELL COMPACTED. THE FILL SHALL CONTAIN NO STONES WITH A DIAMETER GREATER THAN 100 MM. THE DEGREE OF COMPACTION OF BACKFILL SHALL BE 95% OF THE MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT OBTAINED BY THE MODIFIED PROCTOR COMPACTION TEST.
- UNSUITABLE MATERIALS LIKE ROCKS/ EXISTING FOOTINGS ARE DETECTED BELOW FOUNDATION LEVEL IN AREAS OF CUT SHALL BE EXCAVATED TO FIRM GROUND. THE RESULTANT EXCAVATION SHALL BE FILLED TO THE REQUIRED LEVELS WITH MASS CONCRETE GRADE M10. ALSO WHEREVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE GRADE-10.
- BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10
- A LAYER OF BLINDING CONCRETE 100 MM THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/MM² AT 28 DAYS.

GENERAL NOTES:

- ALL DIMENSIONS ARE IN MM.
- CONCRETE GRADE SHALL BE M25 CONFIRMING TO IS 456:2000
- GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE CONFIRMING TO IS 1786-2008
- CLEAR COVER FOR REINFORCEMENT.
A) COLUMN = 40MM
- THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
- COLUMNS AND FOOTINGS ARE DESIGNED FOR S+5
FLOOR LOADS AND SBC OF THE SOIL IS 200KN/ SQM. @ 2000 BELOW N.G.L.
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PROJECT :-

THE PROPOSED CONSTRUCTION OF SKI APARTMENT AT PALLAVARAM, CHENNAI.

DRAWING TITLE :-

R.C DETAILS OF COLUMN

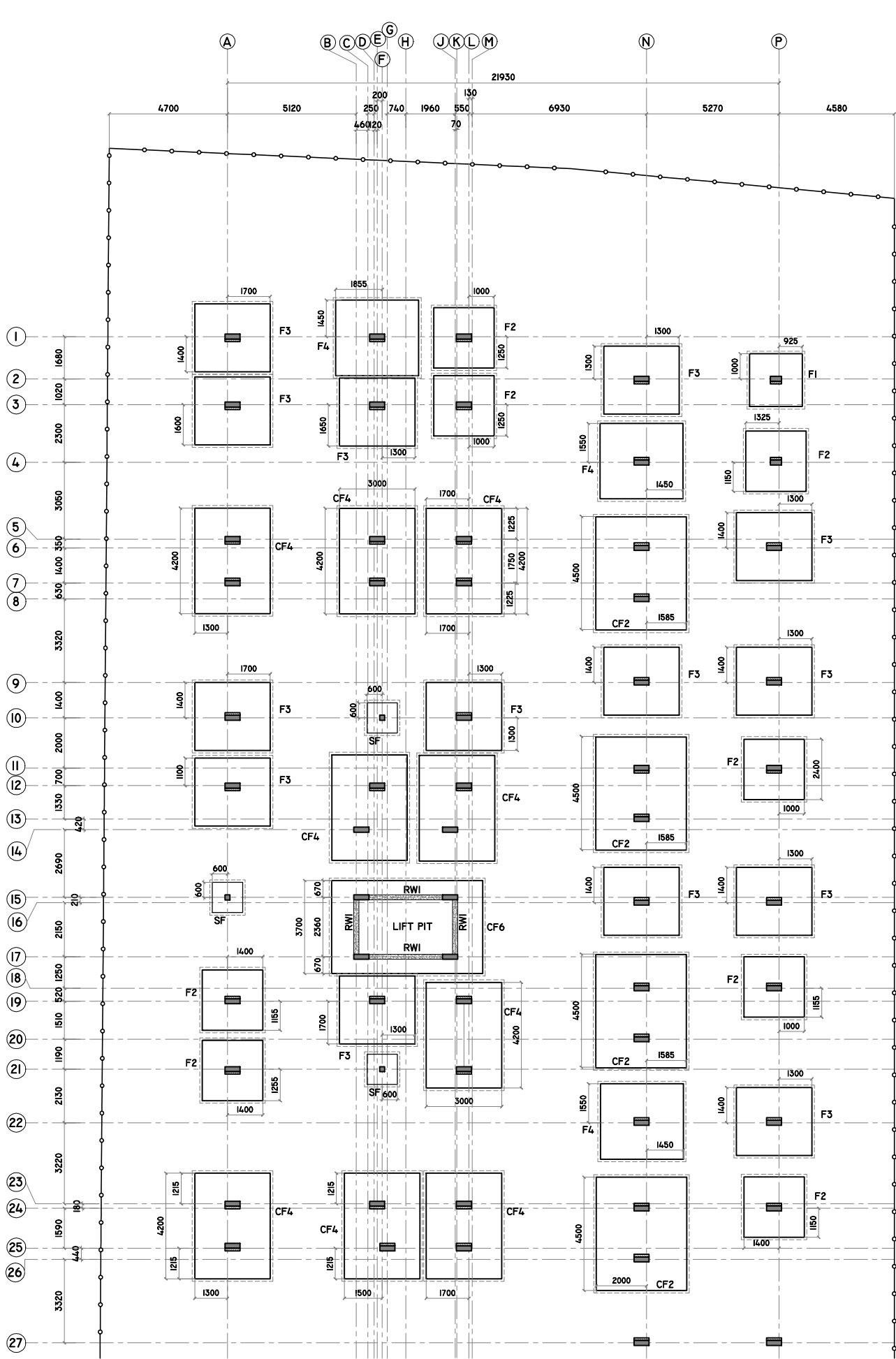
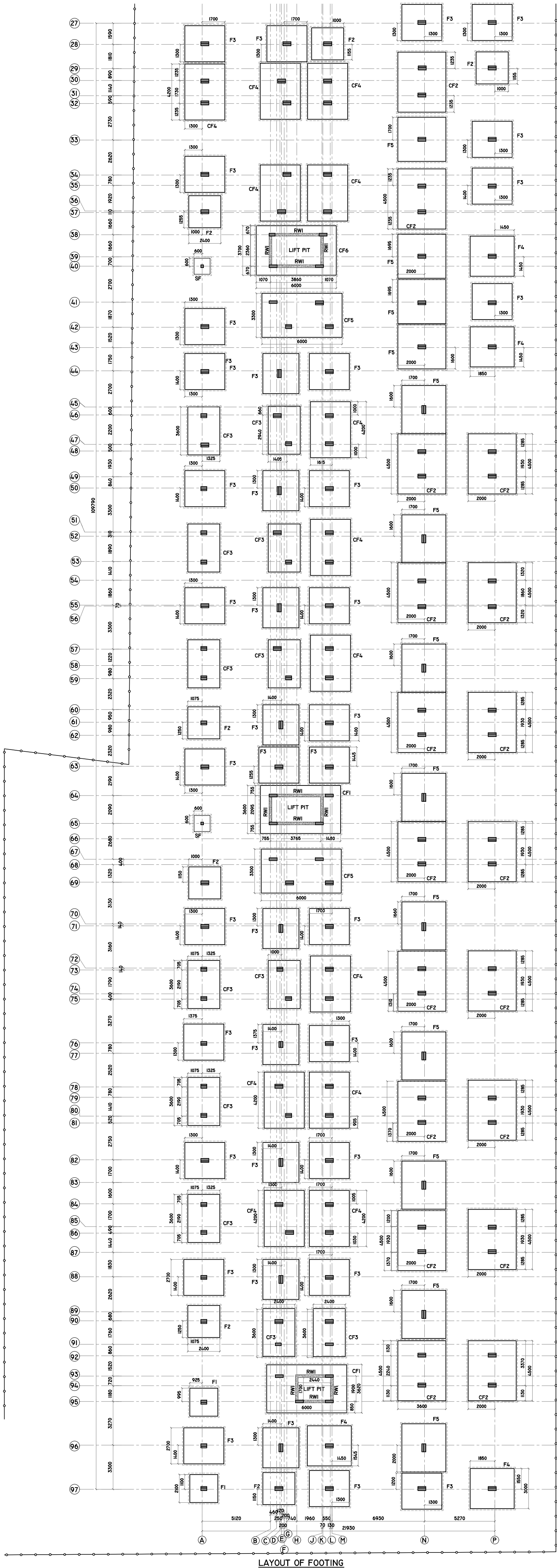
DATE	SCALE	JOB.NO	DRG.NO
03.01.26	1 : 120	-----	001A

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-



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ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects@auraengineers.co.in
http://auraengineers.co.in/



FOOTINGS SCHEDULE:-

Sl.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT X-MAIN REINFOR Y-DISTRIBUTOR REINFD
01	F1	2100 X 2100 D=530	Y12 @ 125 C/C BOTHWAYS @ BOTTOM
02	F2	2400 X 2400 D=600	Y12 @ 125 C/C BOTHWAYS @ BOTTOM
03	F3	2700 X 3000 D=750	Y12 @ 100 C/C BOTHWAYS @ BOTTOM
04	F4	3000 X 3300 D=750	Y12 @ 100 C/C BOTHWAYS @ BOTTOM
05	F5	3600 X 3600 D=750	Y16 @ 100 C/C BOTHWAYS @ BOTTOM
06	SF	1200 X 1200 D=300	Y10 @ 125 C/C BOTHWAYS @ BOTTOM

COMBINED FOOTINGS SCHEDULE:-

Sl.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT
01	CF1	6000 X 3600 X 680	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
02	CF2	4500 X 3600 X 750	Y16 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
03	CF3	3600 X 2400 X 750	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
04	CF4	4200 X 5000 X 750	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
05	CF5	6000 X 3300 X 750	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
06	CF6	6000 X 3700 X 750	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM

NOTE:

N.G.L. - NATURAL GROUND LEVEL.

GENERAL NOTES:

- ALL DIMENSIONS ARE IN MM.
- CONCRETE GRADE SHALL BE M25
CONFIRMING TO IS 456:2000
- GRADE OF REINFORCEMENT MARKED THUS (Y)
SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
- CLEAR COVER FOR REINFORCEMENT
A) COLUMN = 40MM
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PROJECT :-

THE PROPOSED CONSTRUCTION OF SKI APARTMENT
AT PALLAVARAM, CHENNAI.

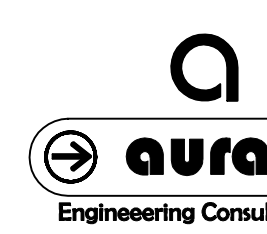
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LAYOUT OF FOOTING

DATE	SCALE	JOB.NO	DRG.NO
03.01.26	1 : 150	-----	002

ARCHITECT / CONSULTANTS :-

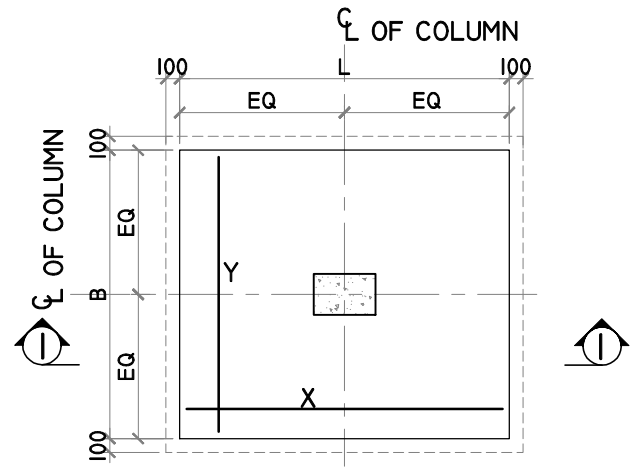
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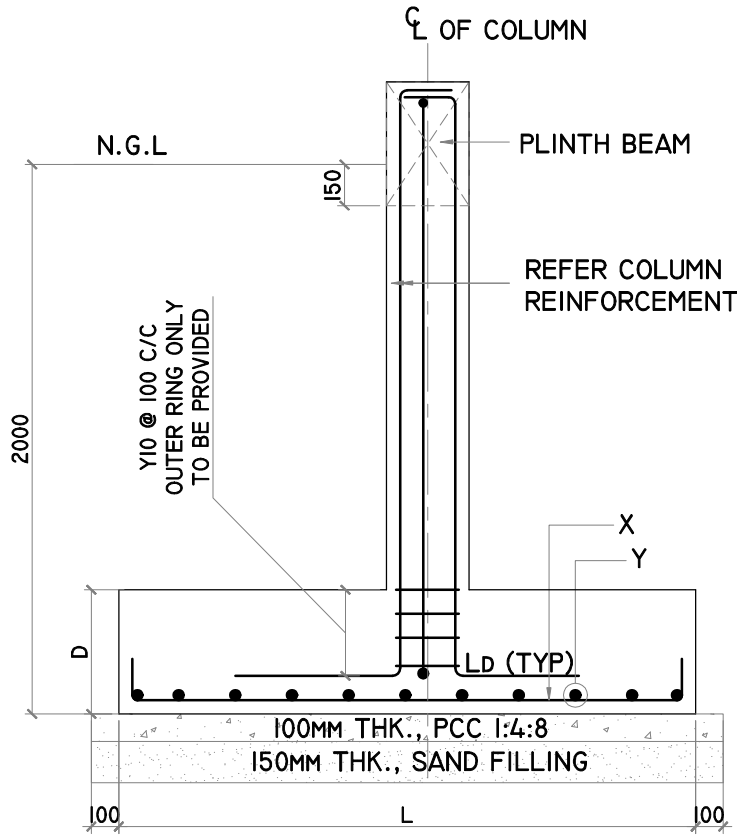
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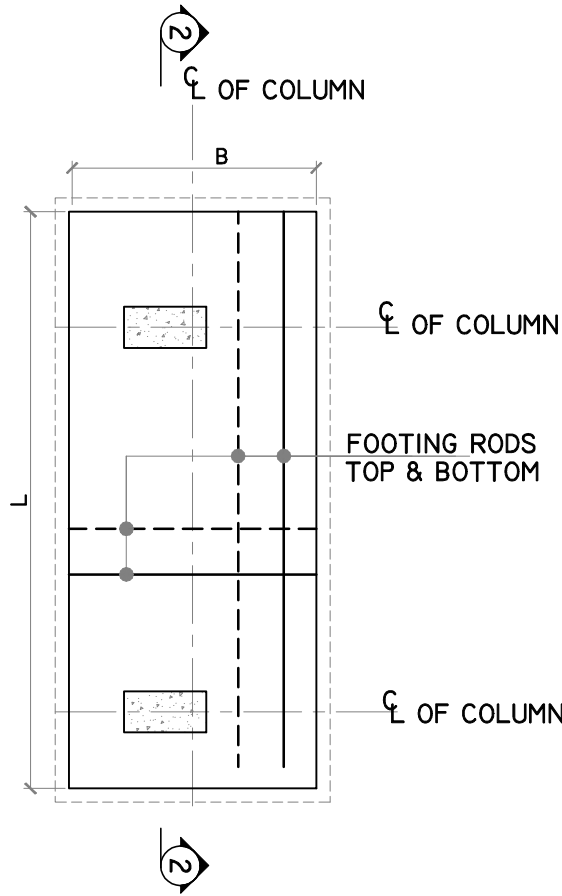
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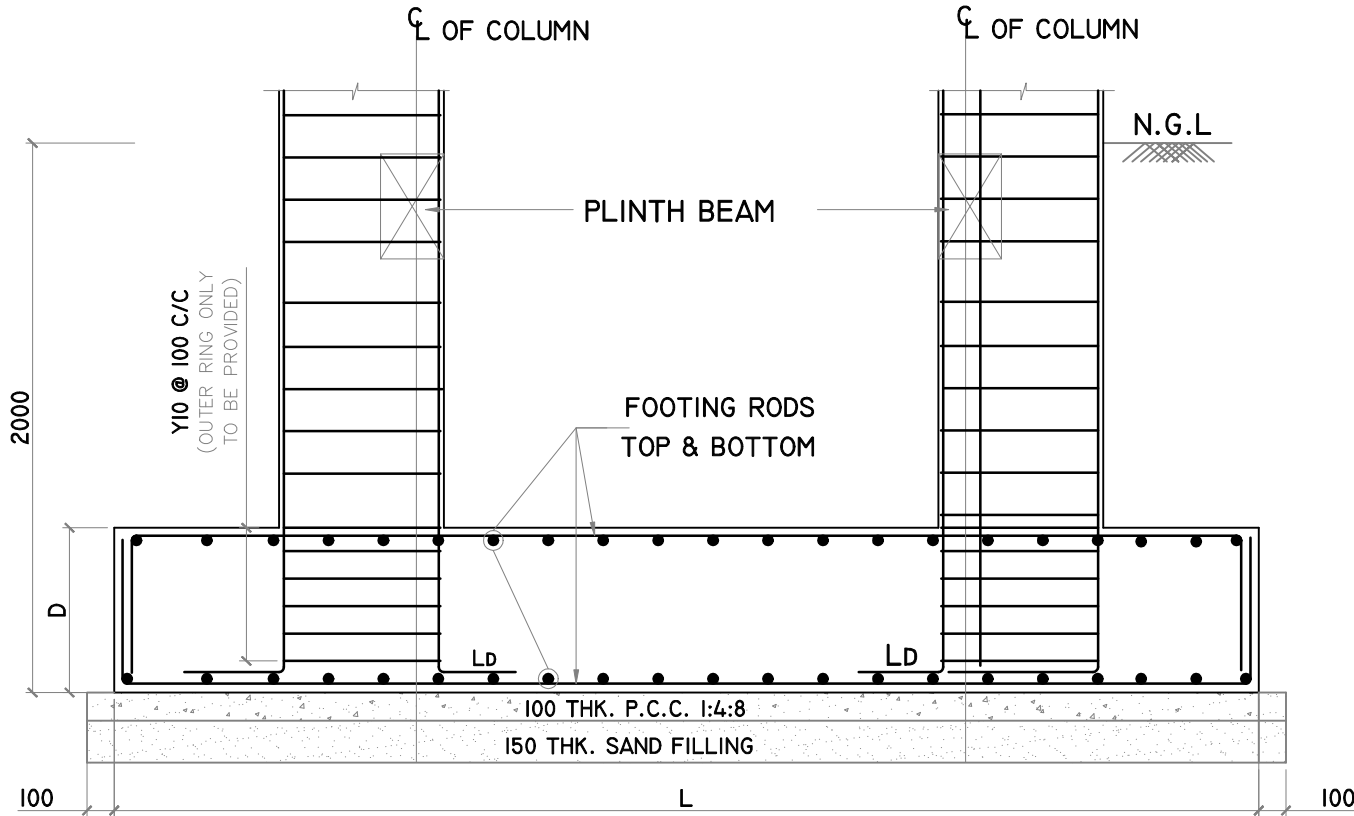
TYPICAL PLAN OF FLAT FOOTING



SECTION "I-I"



SECTION "2-2"



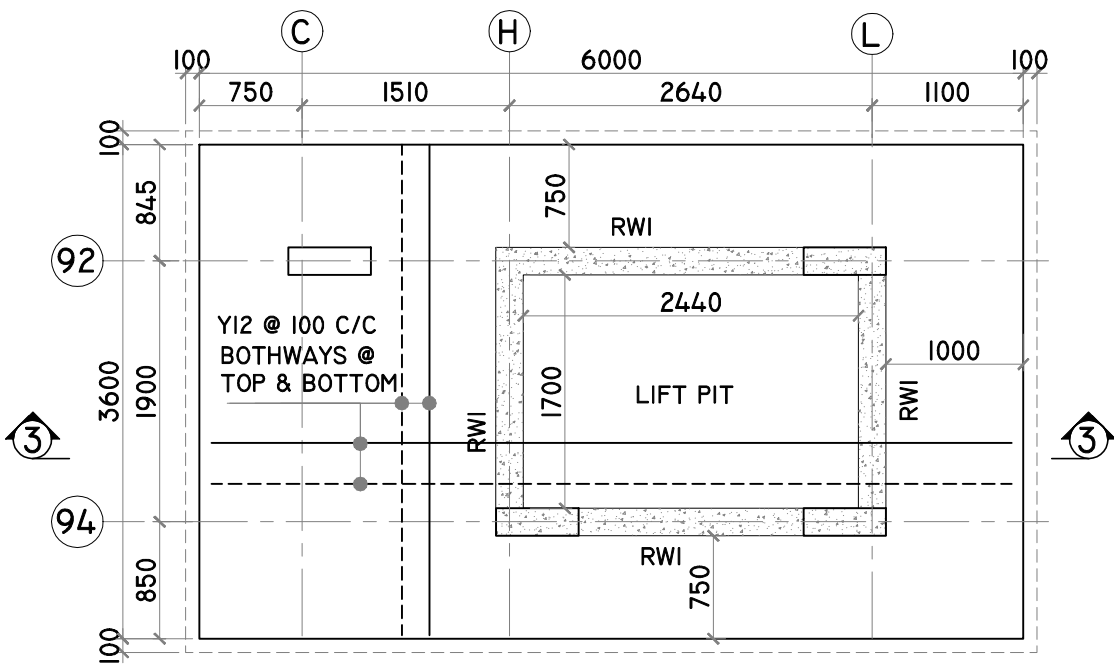
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NOTE:

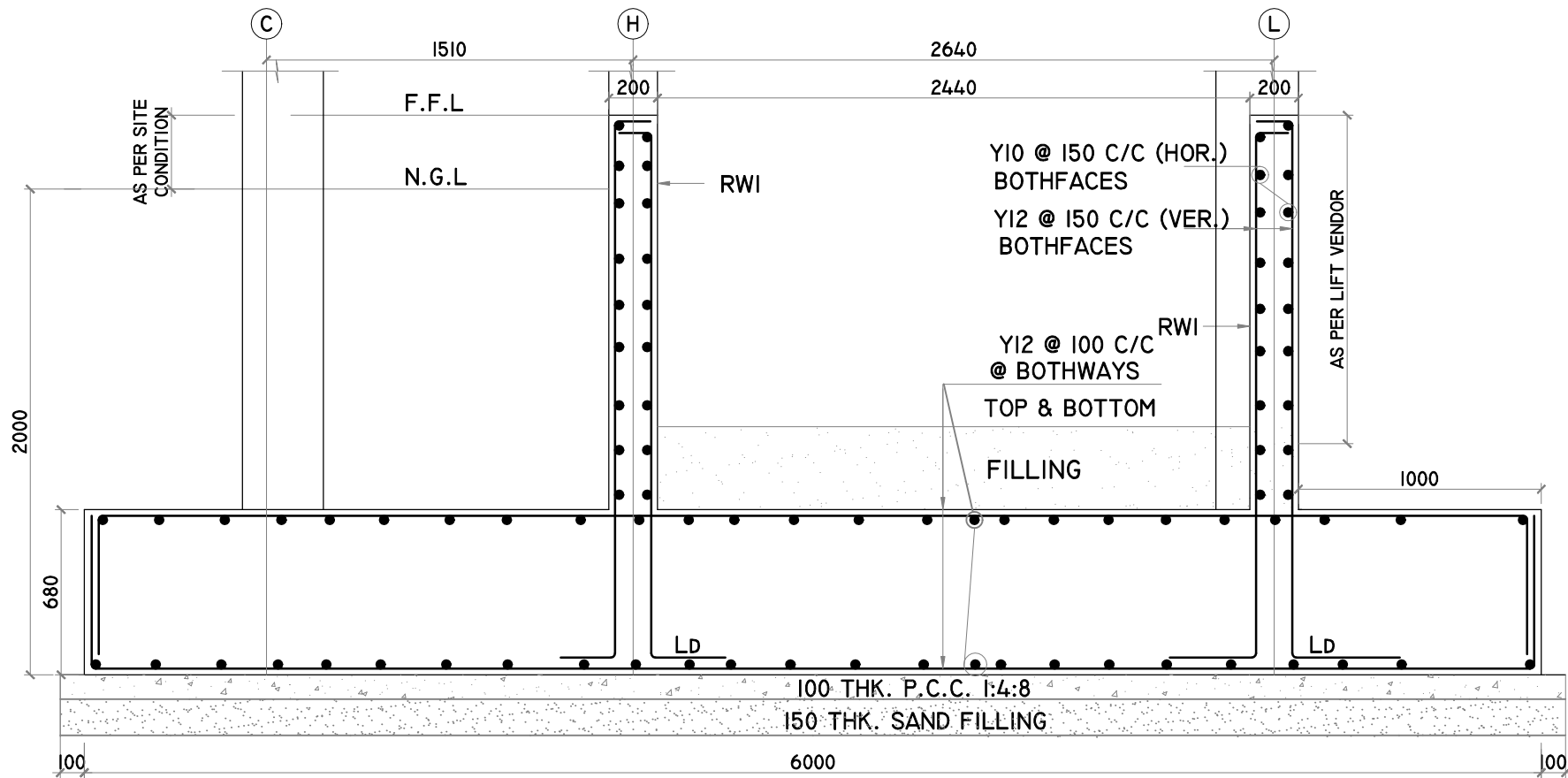
N.G.L - NATURAL GROUND LEVEL.

COMBINED FOOTINGS SCHEDULE:-

SI.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT
01	CF1	6000 X 3600 X 680	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
02	CF2	4500 X 3600 X 750	Y16 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
03	CF3	3600 X 2400 X 750	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
04	CF4	4200 X 3000 X 750	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
05	CF5	6000 X 3300 X 750	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM
06	CF6	6000 X 3700 X 750	Y12 @ 100 C/C @ BOTHWAYS TOP & BOTTOM



PLAN OF COMBINED FOOTING "CF1"



SECTION "3-3"

GENERAL NOTES:

REMOVAL OF FORMWORK(SHUTTERING) :

SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% OF THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE II.3.1, IS 456:2000

A) VERTICAL SIDE OF SHUTTERING OF - 24HOURS
COLUMNS,WALLS & BEAMS

LAP JOINTS FOR REINFORCEMENT BARS :

- AT ANY CROSS SECTION OF THE MEMBER,NOT MORE THAN 50% OF THE BARS SHALL BE LAPPED.
- LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF 1.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.
- DEVELOPMENT LENGTH(Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

DEVELOPMENT LENGTH FOR COLUMNS ROD = 40d
DEVELOPMENT LENGTH FOR BEAMS ROD = 50d

- LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL
- DETAILING OF REBARS SHALL CONFIRM TO SP-34 & IS 13920

EXCAVATION AND BACKFILL

- BACKFILL FOR FOUNDATIONS AND PITS SHALL BE PLACED EVENLY LAYERS OF 300 MM THICKNESS AND SHALL BE WELL COMPACTED. THE FILL SHALL CONTAIN NO STONES WITH A DIAMETER GREATER THAN 100 MM. THE DEGREE OF COMPACTION OF BACKFILL SHALL BE 95% OF THE MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT OBTAINED BY THE MODIFIED PROCTOR COMPACTION TEST.
- UNSUITABLE MATERIALS LIKE ROCKS/ EXISTING FOOTINGS ARE DETECTED BELOW FOUNDATION LEVEL IN AREAS OF CUT SHALL BE EXCAVATED TO FIRM GROUND. THE RESULTANT EXCAVATION SHALL BE FILLED TO THE REQUIRED LEVELS WITH MASS CONCRETE GRADE M10. ALSO WHEREVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE GRADE-10.
- BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10
- A LAYER OF BLINDING CONCRETE 100 MM THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/MM AT 28 DAYS.

GENERAL NOTES:

- ALL DIMENSIONS ARE IN MM.
- CONCRETE GRADE SHALL BE M25 CONFIRMING TO IS 456:2000
- GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE FE 500 CONFIRMING TO IS 1786-2008
- CLEAR COVER FOR REINFORCEMENT.
A) COLUMN = 40MM B) FOOTING = 50MM
- THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
- COLUMNS AND FOOTINGS ARE DESIGNED FOR S+5 FLOOR LOADS AND SBC OF THE SOIL IS 250KN/ SQM. @ 2000 BELOW N.G.L.
- STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
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REV.	DESCRIPTIONS	DRN	CHK	DATE

PROJECT :-

THE PROPOSED CONSTRUCTION OF SKI APARTMENT AT PALLAVARAM, CHENNAI.

DRAWING TITLE :-

R.C DETAILS OF COMBINED FOOTING

DATE	SCALE	JOB.NO	DRG.NO
03.01.26	1 : 125	-----	002A

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS

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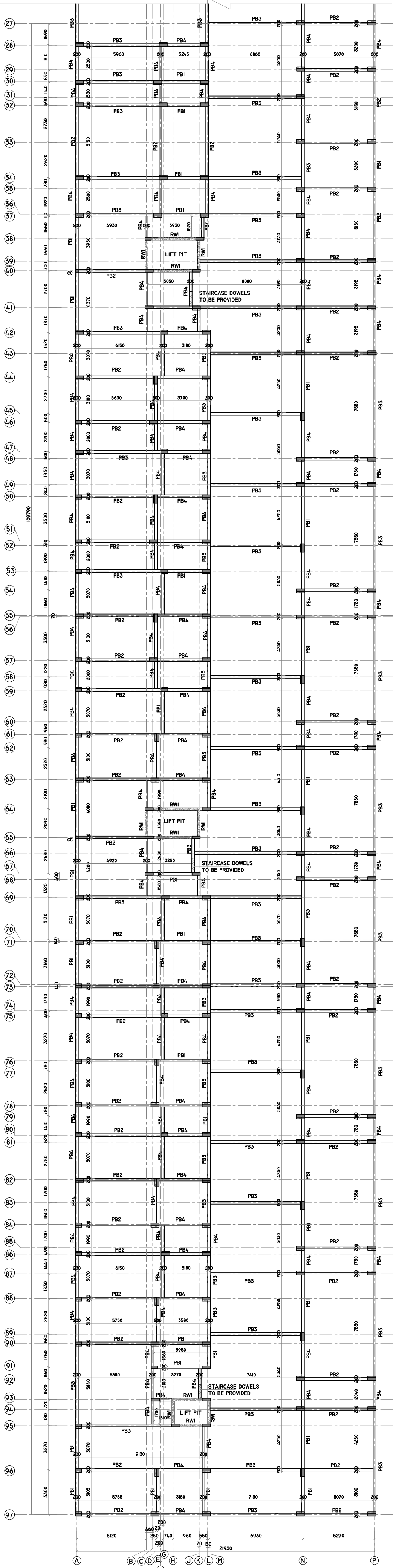
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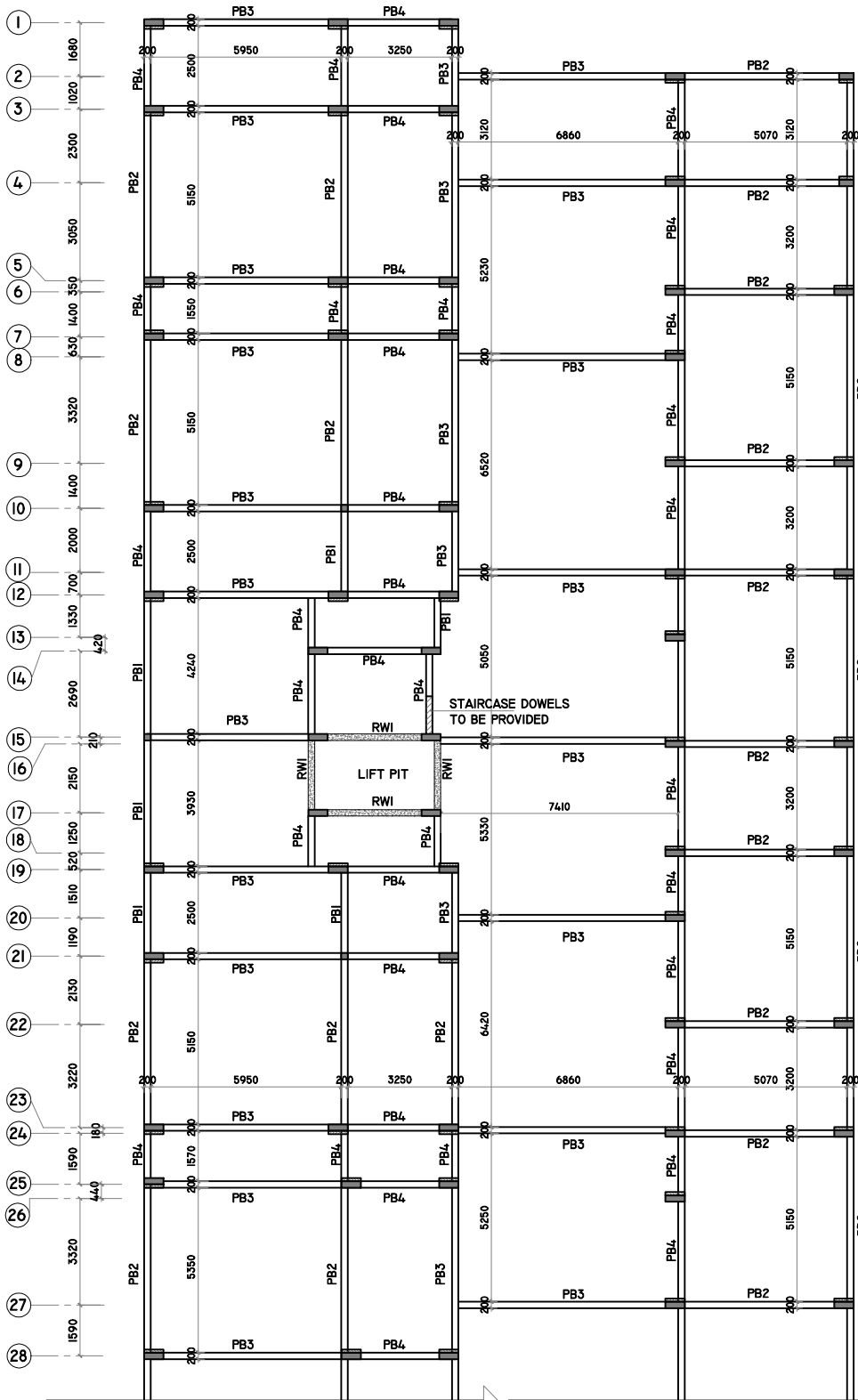
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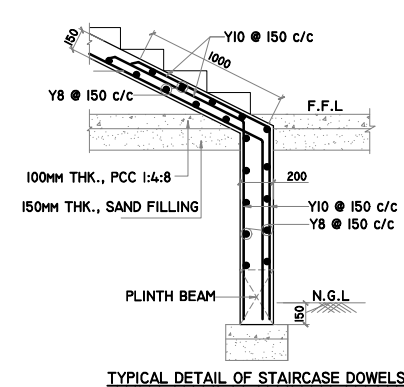
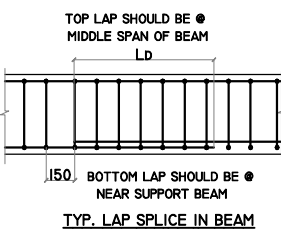
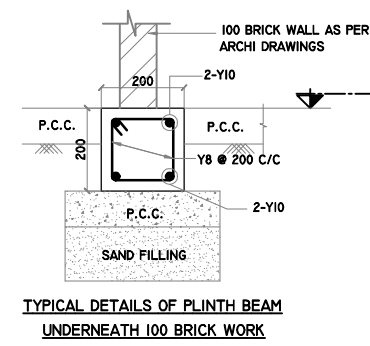
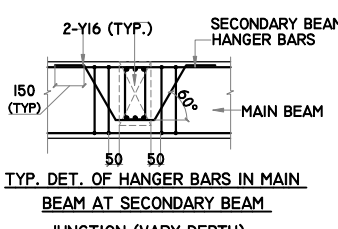
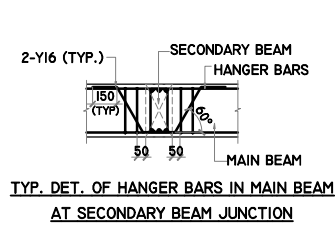
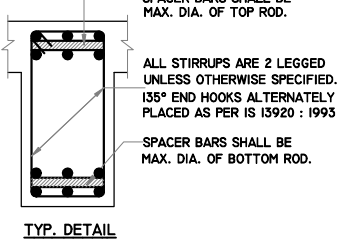
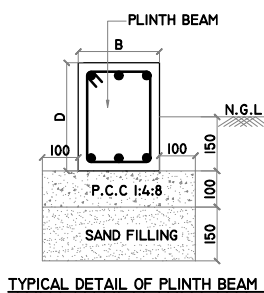
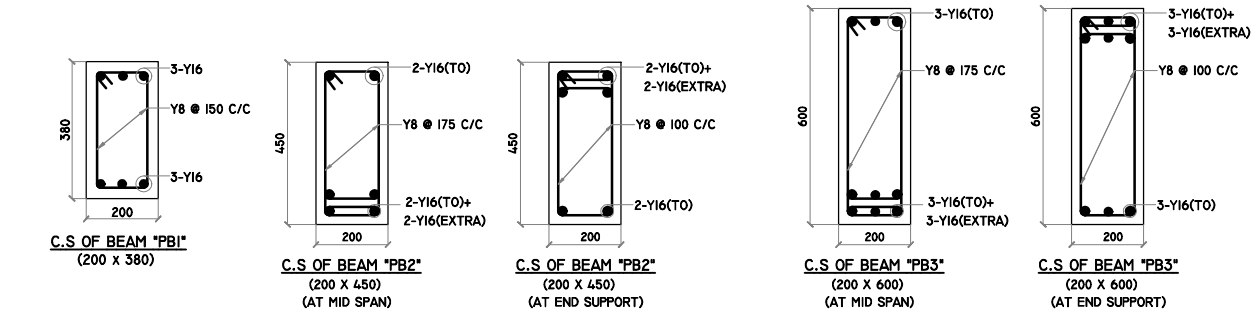




LAYOUT OF PLINTH BEAM



SL.NO	NAME	SIZE
01	PB1	200 X 380
02	PB2	200 X 450
03	PB3	200 X 600
04	PB4	200 X 380



NOTE:
PROVIDE Y8 @ 8" C/C AS DISTRIBUTORS
WHERE EVER REQUIRED

NOTE:
N.G.L. - NATURAL GROUND LEVEL.
F.F.L. - FINISHED FLOOR LEVEL.

GENERAL NOTES:

- ALL DIMENSIONS ARE IN MM.
- CONCRETE GRADE SHALL BE **M25** CONFIRMING TO IS 456:2000
- GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE **Fe 500** CONFIRMING TO IS 1786-2008
- CLEAR COVER FOR REINFORCEMENT
a) BEAM = 25MM b) R.C WALL = 25MM
- THIS DRG. READ IN CONJUNCTION WITH ARCH.DRGS.
- COLUMNS AND FOOTINGS ARE DESIGNED FOR S+5 FLOOR LOADS AND SBC OF THE SOIL IS 200KN/ SQM. @ 2000 BELOW N.G.L.
- STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
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REV.	DESCRIPTIONS	DRN	CHK	DATE

PROJECT :-

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DRAWING TITLE :-

LAYOUT OF PLINTH BEAM

DATE	SCALE	JOB.NO	DRG.NO
03.01.26	1 : 150	-----	003

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-



AURA ENGINEERING CONSULTANTS
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