DESIGN CALCULATION

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR , CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175. ZONE :- 13.

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Structural Design Calculation for Construction of STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR

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1.0 DESIGN BRIEF:

THIS DOCUMENT FURNISHES PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR , CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175. ZONE :- 13.

2.0 GENERAL DESIGN CRITERIA

2.1. Description of the structure

The Residential Building consists of Ground Floor + 4 Upper floors and the structure is designed as a RCC framed structure.

1. Size of the building : 34.44 x 11.81M
2. Height of the building : 19.88m
3. Number of storeys above GL : Stilt Floor + 4 upper floors
4. Floor to floor height of this building : Ground and First floors - 3.0m
   : Typical floor – 3.0m
5. Type of foundation : Pile 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/m^3

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- D.L. due to partitions
  (Light Partition as per IS 875) =1.50 kN/m^2
- D.L due to floor finish 50mm thick = 0.05x25 = 1.25 kN/m^2

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.

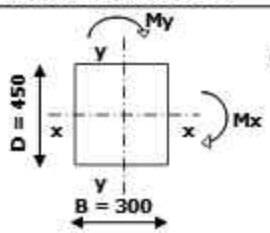
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APPENDIX I

Design Calculations

Column Design

PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE	Design for a Short Column with Biaxial Bending	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Column No:  **CRITICAL LOAD CASE:**	
1.0	**Basic Data**	
1.1	**Material Data**	
	Grade of Concrete: M 25	
	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	
	L_{oy} = 3000 mm	
	L_{ex} = 3000 mm	Table 28 ,
	L_{ey} = 3000 mm	IS456:2000
	Size of the Column B X D = 300 x 450 mm	
1.4	**Analysis Results**	
	Factored Axial Load P_u = 780.0 kN	STAAD
	Factored Moment M_{ux} = 22.00 kNm	OUTPUT
	Factored Moment M_{uy} = 71.00 kNm	
2.0	**Check for Slenderness**	
	Slenderness Ratio about Major Axis L_{ex} / D = 6.667	
	Slenderness Ratio about Minor Axis L_{ey} / B = 10.000	
	Since Leff / LLD <12 Designed as Short Column	Cl 25.1.2, IS456:2000
3.0	**Check for Eccentricity**	
	Minimum Eccentricity e_x = L_{ox} / 500 + D / 30 = 21.0 mm >20	Cl 25.4
	e_y = L_{oy} / 500 + B / 30 = 16.0 mm <20	IS456:2000
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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PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT. NO.	DATE	DESIGNED	DATE
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CL. NO.	DESIGN CALCULATIONS	REFERENCES
5.0	**Uniaxial Moment Carrying capacity of the Section about X & Y- axis**	
	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	Chart 43 - 46
	$M_{uy1} / f_{ck}DB^2$ = 0.119	SP 16 : 1980
	Moment carrying capacity about X axis M_{ux1} = 207.89 kN.m	
	Moment carrying capacity about Y axis M_{uy1} = 120.61 kN.m	
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	
	α_n = 1.186	Cl 39.6 , IS456:2000
7.0	**Criteria for Biaxial Bending (Bresler's Formulation)**	
	$(M_{ux}/M_{ux1})^{\alpha n} + (M_{uy}/M_{uy1})^{\alpha n}$ = **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 Nos Y20 + Nos Y20 $A_{sc,pro}$ = **3142** mm^2	
8.1	**Check for Minimum & Maximum Area of Steel**	
	Minimum Area of steel (0.8 % of A_c 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 steel (4 % of A_c) = **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 / slab.	

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Footing Design

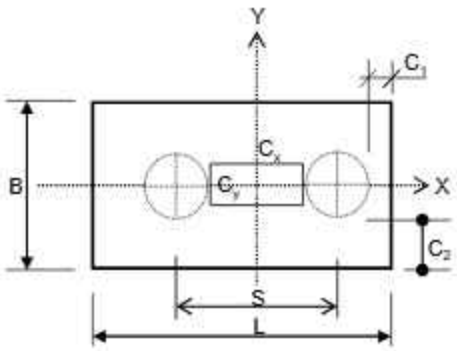
TITLE	: Pilecap Design by Bending Theory	Designed :	Date :	16-Oct-2023
SUBJECT	Two(2) Pile Group - TYPE P2	Checked :	Date :	16-Oct-2023
PROJECT	: STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	Job No. :	Page No :	

Pile spacing from center to center should not exceed 2.5 times the pile diameter

Total Column Axial Load	N =	500	kN (Service Load)
Total number of piles	=	2	Nos.
Pile Axial Load	P =	250	kN/pile
Combined Load Factor	L_f =	1.5	
Edge of pile to edge	C_1 =	150	mm
of pilecap distance	C_2 =	150	mm

1. Pile cap geometry

Pile diameter,	D =	450	mm
Pile spacing,	S =	2.50	x D
Pile cap length	L =	1880	mm
Pile cap breadth	B =	750	mm
Pile cap depth	H =	750	mm
Column length	C_x =	230	mm
Column breadth	C_y =	450	mm
Bottom cover	c =	50	mm
Top cover	c_t =	50	mm
Side cover	c_s =	50	mm
Minimum pilecap depth	=	750	mm
(Per Reynolds's Handbook)			



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2. Pile cap material

Concrete strength	f_{cu} =	25	N/mm²
Steel strength	f_y =	500	N/mm²
Partial safety factor for strength of ste	γ_{ms} =	1.15	

3. Reinforcement design

X - direction

Pile center to pile cap center distance	=	565.0	mm
Pile center to column face distance	=	450.0	mm
Bar diameter, ϕ =		25	mm
Ultimate design moment M_{ux} =		168.8	kNm
Eff. depth d_x =		687.5	mm
$K = M_{ux}/bd^2f_{cu}$ =		0.0190	< 0.156, So O.K !
Lever arm z_x =		653.1	mm

Reinforcement required			Reinforcement provided			
$A_{sx\,req} = M_{ux}/(1/\gamma_{ms} \times f_y \times z)$ =	731	mm²	As prov =	3436	mm²	
No. of bars =	2	Nos.	No. of bars =	7	Nos.	O.K.!
Bar spacing =	625	mm	Bar spacing =	104	mm	
			100As/bd =	0.67		

TITLE	: Pilecap Design by Bending Theory	Designed :	Date :	16-Oct-2023
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Y - direction

Bar diameter, ϕ = 16 mm
Eff. depth d_y = 667 mm

Reinforcement required			Reinforcement provided			
$A_{sy\ req}$ =	1692	mm²	As prov =	1810	mm²	
No. of bars =	9	Nos.	No. of bars =	9	Nos.	O.K.!
Bar spacing =	221	mm	Bar spacing =	221	mm	
			100As/bd =	0.14		

4. Normal shear

X - direction

V_x = 375 kN
v = 0.73 N/mm²
v_c = 0.55 N/mm²
a_v = 315 mm
Enhanced shear = 2.41 N/mm² > v, Normal shear O.K.

5. Punching shear

Allowable punching shear = 4.00 N/mm²
Perimeter of column = 1360 mm
Punching shear stress = 0.80 N/mm² ==> Punching shear O.K.

6. Bar anchorage

f_{bu} = 2.50 N/mm² (Deformed Bar Type 2) Where $f_{bu} = \beta (f_{cu})^{1/2}$

X - direction

Anchorage length required = 311 mm
Anchorage length available = 900 mm ==> Anchorage O.K.

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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	**Geomentry Data**					
	Beam Number		=	PB1		
	Type of Beam		=	Rectangular Beam		
	Support Condition		=	Continuous Beam		
	Width of beam	b	=	230	mm	
	Overall Depth of Beam	D	=	380	mm	
	Dia of bar	Φ	=	25	mm	
	Nominal Cover	cc	=	30	mm	IS 456:2000 Table 19
	Effective Depth	d	=	337.5	mm	IS 456:2000
	Effective Cover		=	42.5	mm	Cl 23.0
	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 %		IS 456:2000
	p_t & p_{cmax}		=	4.00 %		Cl 26.5.1.1
1.2	**Force Input**					
	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	**Limiting Moment**					
	M_{ulim} = 0.133 f_{ck} b d^2		=	87.11	kNm	
1.4	**Area of Steel**					
	Minimum Area of Stee = 0.17% b d		=	131.963	mm^2	
	Support 1					
	Negative moment (Support 1)		=	84	kNm	
	Hence the Section is designed as Singly Reinforced Section					
		M_u/bd^2	=	3.206		
	Percentage of tension steel reqd	p_t	=	0.028	%	
	Percentage of compression steel reqd	p_c	=	0	%	

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TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Detail of bars

	I st Layer Nos	I st Layer Dia	II nd Layer Nos	II nd Layer Dia
Tension Reinforcement	3	16		

A_{st} provided = 603.19 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforcemer	3	16	0	

A_{sc} provided = 603.19 mm^2

Percentage of tension steel provided p_t = 0.777 % **Hence O.K**

Percentage of compression steel provide p_c = 0.777 % **Hence O.K**

Check for Shear

Shear = 149 kN

Nominal Shear Stress	τv	=	1.92	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	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		=	190.0		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 @ 190mm c/c spacing

Support 2

Negative moment = 84 kNm

Hence the Section is designed as Doubly Reinforced Section

	M_u/bd^2	=	3.206	
Percentage of tension steel reqd	p_t	=	0.021	%
Percentage of compression steel reqd	p_c	=	0	%
Required Area of tension steel	$A_{st\,reqd}$	=	131.95	mm^2
Required Area of compression steel	$A_{sc\,reqd}$	=	0	mm^2

Detail of bars

	I st Layer Nos	I st Layer Dia	II nd Layer Nos	II nd Layer Dia
Tension Reinforcement	3	16	0	0

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TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

	Nos	Dia	Nos	Dia
Compression Reinforcemer	3	16	0	0

A_{sc} provided = 603.19 mm^2

Percentage of tension steel provided p_t = 0.777 % **Hence O.K**

Percentage of compression steel provide p_c = 0.777 % **Hence O.K**

Check for Shear

Shear		=	149	kN
Nominal Shear Stress	τv	=	1.92	N/mm^2
Permissible Shear Stress	τc	=	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		=	190.0	
Maximum Spacing of Shear Reinforcement		=	250	

Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing

Nominal Shear Stress				Cl 40.1, IS456:2000
Permissible Shear Stress				β = 1.000
Maximum Shear Stress				Table 19, IS456:2000
Diameter of the Stirrup bar				Table 20, IS456:2000
Number of Legs				
Spacing of Shear reinforcement Required				Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement				Cl 26.5.1.5,IS456:2000

Span

Positive moment (Span)		=	84	kNm
Hence the Section is designed as Singly Reinforced Section				
	M_u/bd^2	=	3.325	
Percentage of tension steel reqd	p_t	=	0.029	%
Percentage of compression steel reqd	p_c	=	0	%
Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm
Required Area of compression steel	$A_{sc\ reqd}$	=	0	mm^2

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Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	3	16	0	0

A_{st} provided = 603.19 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforcemer	3	16	0	0

A_{sc} provided = 603.19 mm^2

PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES
	Check for Shear					
	Shear		=	149	kN	
	Nominal Shear Stress	τ_v	=	1.92	N/mm^2	Cl 40.1, IS456:2000
	Permissible Shear Stress	τ_c	=	0.92	N/mm^2	β = 1.000
	Maximum Shear Stress	$\tau_{c,max}$	=	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		=	190.0		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 @ 190mm c/c spacing					
	Check For Deflection					
	Basic Value		=	26		Cl.23.2, IS456:2000
	Service Stress in Steel	f_s	=	63.44	N/mm^2	
	Modification Factor(Tension Reinforcement)	F_1	=	2.00		
	Allowable Span/Depth		=	52.00		
	Actual Span/Depth		=	13.33	Hence Safe	

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Floor Beam Design

PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES
1.1	**Geomentry Data**					
	Beam Number		=	B3		
	Type of Beam		=	Rectangular Beam		
	Support Condition		=	Continuous Beam		
	Width of beam	b	=	300	mm	
	Overall Depth of Beam AT PLOT JAGADAI	D	=	525	mm	
	Dia of bar	Φ	=	25	mm	
	Nominal Cover	cc	=	30	mm	IS 456:2000 Table 19
	Effective Depth	d	=	482.5	mm	IS 456:2000
	Effective Cover		=	42.5	mm	Cl 23.0
	Effective Span of beam	l_{eff}	=	3700	mm	
	Concrete grade		=	M 25		
	Steel Grade		=	Fe 500		
	$p_{t,lim}$		=	0.944 %		
	$p_{t,min}$		=	0.170 %		IS 456:2000
	p_t & p_{max}		=	4.00 %		Cl 26.5.1.1
1.2	**Force Input**					
	Left negative moment (Support 1)		=	254	kNm	
	Mid span positive moment		=	254	kNm	
	Right negative moment (Support 2)		=	254	kNm	
	Shear @ (Support 1)		=	241	kN	
	Shear @ (Span)		=	241	kN	
	Shear @ (Support 2)		=	241	kN	
1.3	**Limiting Moment**					
	M_{ulim} = 0.133 f_{ck} b d^2		=	232.22	kNm	
1.4	**Area of Steel**					
	Minimum Area of Steel = 0.17% b d		=	246.075	mm^2	
	Support 1					
	Negative moment (Support 1)		=	254	kNm	
	Hence the Section is designed as Doubly Reinforced Section					
		M_u/bd^2	=	3.637		
	Percentage of tension steel reqd	p_t	=	1.023	%	
	Percentage of compression steel reqd	p_c	=	0.085	%	
	Required Area of tension steel	$A_{st\ reqd}$	=	1480.79	mm^2	
	Required Area of compression steel	$A_{sc\ reqd}$	=	123.04	mm^2	

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PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Detail of bars

	I st Layer Nos	Dia	II nd Layer Nos	Dia
Tension Reinforcement	3	20	3	20

A_{st} provided = 1884.96 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforcemen	3	20	3	20

A_{sc} provided = 1884.96 mm^2

Percentage of tension steel provided p_t = 1.302 % **Hence O.K**

Percentage of compression steel provide p_c = 1.302 % **Hence O.K**

Check for Shear

Shear = 241 kN

Nominal Shear Stress	τv =	1.66	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	τc =	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$ =	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	=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement	=	300		Cl 26.5.1.5,IS456:2000

Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing

Support 2

Negative moment = 254 kNm

Hence the Section is designed as Doubly Reinforced Section

	M_u/bd^2 =	3.637		
Percentage of tension steel reqd	p_t =	1.023	%	
Percentage of compression steel reqd	p_c =	0.085	%	
Required Area of tension steel	$A_{st\ reqd}$ =	1480.79	mm^2	
Required Area of compression steel	$A_{sc\ reqd}$ =	123.04	mm^2	

Detail of bars

	I st Layer Nos	Dia	II nd Layer Nos	Dia
Tension Reinforcement	3	20	3	20

A_{st} provided = 1884.956 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforcemen	3	20	3	20

A_{sc} provided = 1884.96 mm^2

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PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Percentage of tension steel provided p_t = 1.302 % **Hence O.K**

Percentage of compression steel provided p_c = 1.302 % **Hence O.K**

Check for Shear

Shear = 241 kN

Nominal Shear Stress	τ_v	=	1.66	N/mm²	Cl 40.1, IS456:2000
Permissible Shear Stress	τ_c	=	0.92	N/mm²	β = 1.000
Maximum Shear Stress	$\tau_{c,max}$	=	2.5	N/mm²	Table 19, IS456:2000
Diameter of the Stirrup bar		=	8	mm	Table 20, IS456:2000
Number of Legs		=	2		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	300		Cl 26.5.1.5,IS456:2000

Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing

Span

Positive moment (Span) = 254 kNm

Hence the Section is designed as Doubly Reinforced Section

	M_u/bd^2	=	3.325	
Percentage of tension steel reqd	p_t	=	1.023	%
Percentage of compression steel reqd	p_c	=	0.085	%
Required Area of tension steel	$A_{st\ reqd}$	=	1480.79	mm²
Required Area of compression steel	$A_{sc\ reqd}$	=	123.04	mm²

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	3	20	3	20

A_{st} provided = 1884.96 mm²

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Compression Reinforcemen	3	20	3	20

A_{sc} provided = 1884.96 mm²

Percentage of tension steel provided p_t = 1.302 % **Hence O.K**

Percentage of compression steel provided p_c = 1.302 % **Hence O.K**

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PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES
	Check for Shear					
	Shear		=	241	kN	
	Nominal Shear Stress	τ_v	=	1.66	N/mm²	Cl 40.1, IS456:2000
	Permissible Shear Stress	τ_c	=	0.92	N/mm²	β = 1.000
	Maximum Shear Stress	$\tau_{c,max}$	=	2.5	N/mm²	Table 19, IS456:2000
	Diameter of the Stirrup bar		=	8	mm	Table 20, IS456:2000
	Number of Legs		=	2		
	Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
	Maximum Spacing of Shear Reinforcement		=	300		Cl 26.5.1.5,IS456:2000
	Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing					
	Check For Deflection					
	Basic Value		=	26		Cl.23.2, IS456:2000
	Service Stress in Steel	f_s	=	227.82	N/mm²	
	Modification Factor(Tension Reinforcement)	F_1	=	0.97		
	Allowable Span/Depth		=	25.22		
	Actual Span/Depth		=	7.67	Hence Safe	



Floor Slab Design

PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT.NO.	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES

1.0 Design of Two Way Slab S3

1.0.1 Basic Input Data

Grade of concrete		=	M 25		
Grade of steel		=	Fe 500		
Thickness of slab	D	=	125	mm	
Clear cover	cc	=	25	mm	Table 16 Cl.26.4.2 , IS 456 -2000
Effective thickness of slab (d_{eff})	= 125 - 25 - 4	=	96	mm	
Unit weight of concrete		=	25	KN/m^3	Cl 19.2.1, IS 456-2000
Effective Shorter Span	L_x	=	3.2	m	
Effective Longer Span	L_y	=	6.4	m	
Aspect ratio	L_y/L_x	=	2.00 = 2		

Hence designed as Two way slab — Cl D-1.11, IS 456-2000

Edge Condition : One Long edge Discontinuous

1.0.2 Load Data

Self Weight of Slab	= 0.125 x 25	=	3.125	KN/m^2
Floor finish		=	1.500	KN/m^2
Partition Load		=	1.500	KN/m^2
Sunken Filling		=	0.000	KN/m^2
Imposed Load		=	2.000	KN/m^2 — IS 875 (Part 2) -1987
Extra Load, (if Any)		=	0.000	KN/m^2
Total load		=	8.125	KN/m^2
Design load (Wu) = 1.5 x 8.125		=	12.188	KN/m^2 — Table 18 Cl 36.4.1 IS 456 -2000

1.0.3 Moment and Shear Calculations

Short Span Direction

α_x for positive moment	1.75	–	0.059		Table 26 Cl D-1.1, IS 456 -2000
	2	–	0.065		
	for 2.00	α_x	= 0.065		
Positive moment M_x : 0.065 x 12.19 x 3.2 ^2		=	8.11	KN-m	
α_x for negative moment	1.75	–	0.077		Table 26 Cl D-1.1, IS 456 -2000
	2	–	0.085		
	for 2.00	α_x	= 0.085		
Negative moment M_x : 0.085 x 12.19 x 3.2 ^2		=	10.61	KN-m	

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PROJECT	STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR	DOCUMENT.NO.	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Long Span Direction	
	For positive moment α_y = 0.028	Table 26 Cl D-1.1,
	Positive moment M_y : 0.028 x 12.19 x 3.2 ^2 = **3.49** KN-m	IS 456 -2000
	For negative moment α_y = 0.037	Table 26 Cl D-1.1,
	Negative moment M_y : 0.037 x 12.19 x 3.2 ^2 = **4.62** KN-m	IS 456 -2000
	Shear force V_u = 12.19 x 3.2 x 0.5 = **19.50** KN	
1.0.4	**Check Effective Depth for Max.Bending Moment**	
	Depth required = $(M_u / (0.133x\ fck \times b))^{1/2}$ = 56.48 mm	Table C,SP 16 :1980
	Depth provided = 125 - 25 - 8 /2 = 96 mm > 56.48 mm	Cl 2.3
	Hence the section is Safe against Bending	
1.0.5	**Check Depth for Shear**	
	Nominal Shear Stress : $\tau_v = V_u / b\,d$ = 0.20 N/mm²	Cl.40.1, IS 456:2000
	Design shear strength (τ_c) = 0.42 N/mm²	Table 19 , IS 456:2000
	k = 1.30	Cl.40.2.1.1,
	k * τ_c = 0.55 N/mm²	IS 456:2000
	τ_v < k * τ_c **Hence the section is Safe against Shear**	
1.0.6	**Check for Maximum Shear Stress:**	
	Nominal Shear Stress : $\tau_v = V_u / b\,d$ = 0.20 N/mm²	Cl.40.1, IS 456:2000
	Maximum Shear Stress ($\tau_{c,max}$) = 3.1 N/mm²	Table 20 , IS 456:2000
	0.5 $\tau_{c,max}$ = 1.55 N/mm²	
	τ_v < 0.5 $\tau_{c,max}$ **Hence the section is Safe against Max.Shear Stress**	Cl.40.2.3.1, IS 456:200
1.0.7	**Reinforcement calculations**	
	Short Span Direction @ Support	
	Mu/bd^2 = $\frac{10.61 \times 10^{6}}{1000 \times 96 \times 96}$ = **1.151**	
	Pt = **0.28** %	Table 2-4, SP16 :1980

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TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES

Area of steel Ast = 0.0028 x 1000 x 96 = 269.25 mm²
Minimum area of steel 0.0012 x 1000 x 125 = 150.00 mm² Cl:26.5.2.1
Spacing of Y 8 bars 50.27 x 1000 / 269.25 = 186.59 mm IS 456 -2000

Check for Spacing

Minimum of
1) 3d = 288 mm
2) = 300 mm Cl:26.3.3.(b).1
3) = 186.59 mm IS 456 -2000

Therefore provide Y **8** @ **180** mm C/C

Short Span Direction @ Mid Span

$Mu/bd^2 = \frac{8.11 \times 10 \wedge 6}{1000 \times 96 \times 96} = 0.880$

Pt = 0.211 % SP16 :1980 Table 2-4

Area of steel Ast = 0.0021 x 1000 x 96 = 202.93 mm² IS 456:2000
Minimum area of steel 0.0012 x 1000 x 125 = 150.00 mm² Cl:26.5.2.1
Spacing of Y 8 bars 50.27 x 1000 / 202.93 = 247.57 mm

Check for Spacing

Minimum of
1) 3d = 288 mm IS 456:2000
2) = 300 mm Cl:26.3.3.(b).1
3) = 247.57 mm

Therefore provide Y **8** @ **150** mm C/C 150
Provided % of Tension Reinforcement (pt) = **0.349** %

Long Span Direction @ Support

$Mu/bd^2 = \frac{4.62 \times 10 \wedge 6}{1000 \times 96 \times 96} = 0.501$

Pt = 0.118 % SP16 :1980 Table 2-4

Area of steel Ast = 0.0012 x 1000 x 96 = 113.3 mm² IS 456:2000
Minimum area of steel 0.0012 x 1000 x 125 = 150.00 mm² Cl:26.5.2.1
Spacing of Y 8 bars 50.27 x 1000 / 150.00 = 334.93 mm

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TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES

Check for Spacing

Minimum of
1) 3d = 288 mm — IS 456:2000
2) = 300 mm — Cl:26.3.3.(b).1
3) = 334.93 mm

Therefore provide Y **8** @ **280** mm C/C

Long Span Direction @ mid Span

$Mu/bd^2 = \frac{3.49 \times 10 \wedge 6}{1000 \times 96 \times 96} = 0.379$

Pt = 0.089 % — SP16 :1980 Table 2-4

Area of steel Ast = 0.0009 x 1000 x 96 = 85.233 mm^2 — IS 456:2000
Minimum area of steel 0.0012 x 1000 x 125 = 150.00 mm^2 — Cl:26.5.2.1
Spacing of Y **8** bars 50.27 x 1000 / 150.00 = 334.93 mm

Check for Spacing

Minimum of
1) 3d = 288 mm — IS 456:2000
2) = 300 mm — Cl:26.3.3.(b).1
3) = 334.93 mm

Therefore provide Y **8** @ **280** mm C/C

1.0.8 **<u>Check for Deflection:</u> (Simplified Approach)**

Basic Span/depth Ratio = **26** — IS 456:2000 Cl:23.2.1
% of Tension Reinforcement provided (p_t) = 0.349 %
Service stress of steel (fs) : 0.58 fy (Ast_R/Ast_P) = 175.62 N/mm^2 — IS456:2000 Fig 4
Modification Factor for Tension Reinforcement (F_1) = 1.98 — Page 38
Allowable Span / Effective Depth Ratio = 51.51 — IS 456:2000 Cl:23.2.1
Actual Span/Eff Depth Ratic = 3.2 x 1000 / 96 = 33.33

Hence Safe against Deflection

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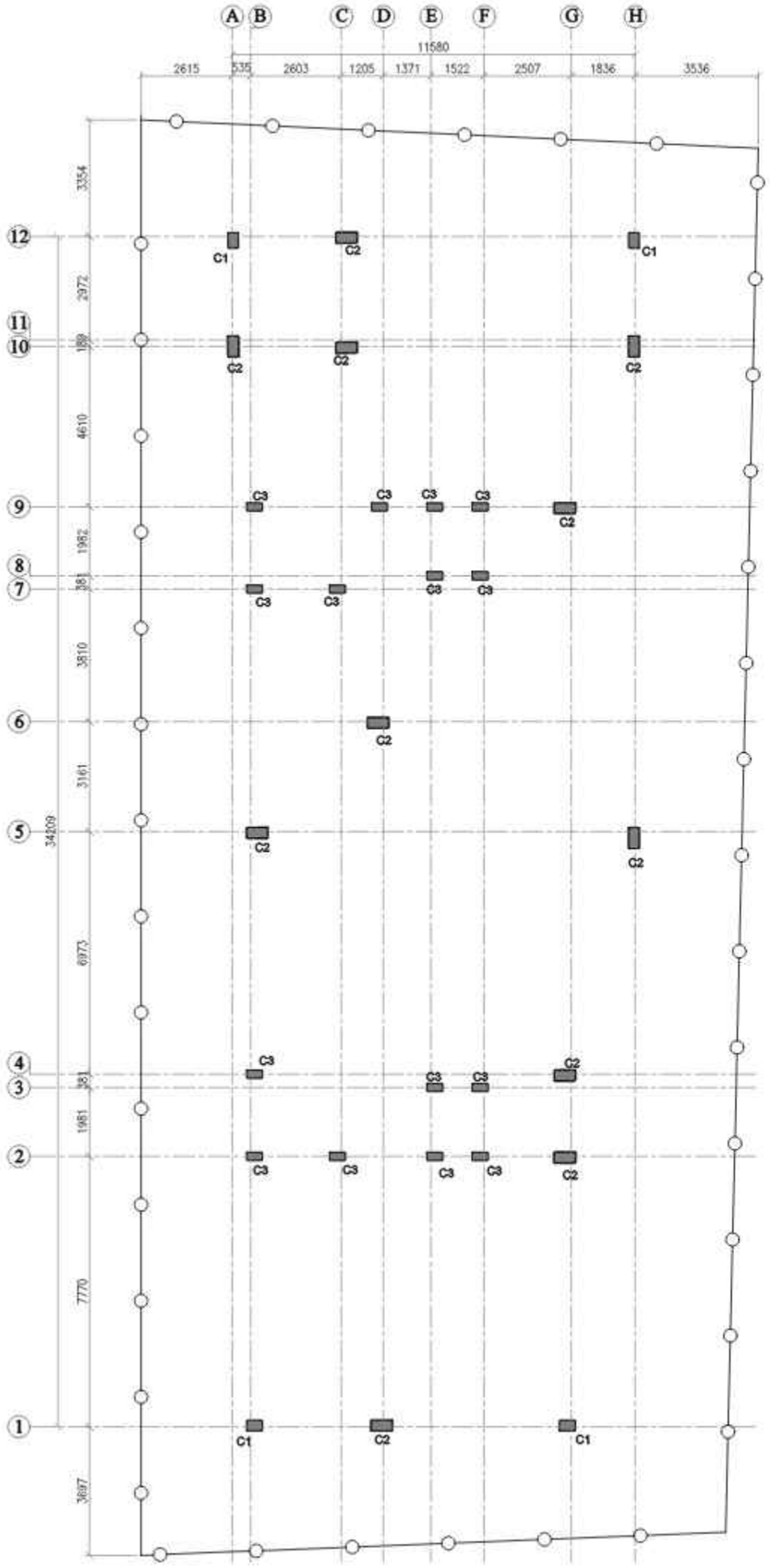
APPENDIX II

GENERAL ARRANGEMENT DRAWINGS

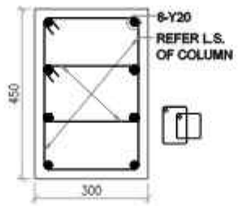
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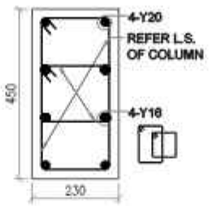
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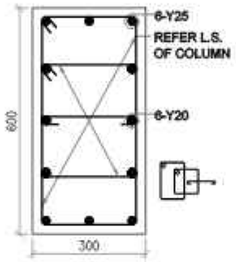
LAYOUT OF COLUMNS



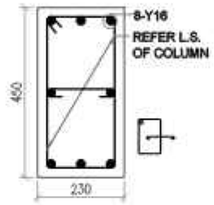
C.S. OF COLUMN "C1"
(300 x 450)
UP TO GFR



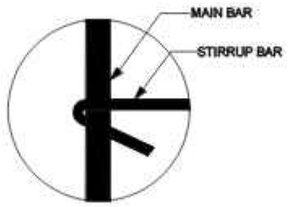
C.S. OF COLUMN "C1"
(230 x 450)
GFR TO TOP



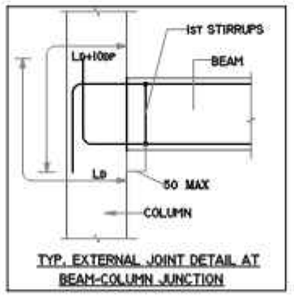
C.S. OF COLUMN "C2"
(300 x 600)
UP TO TOP



C.S. OF COLUMN "C3"
(230 x 450)
UP TO TOP



HOOK DETAIL

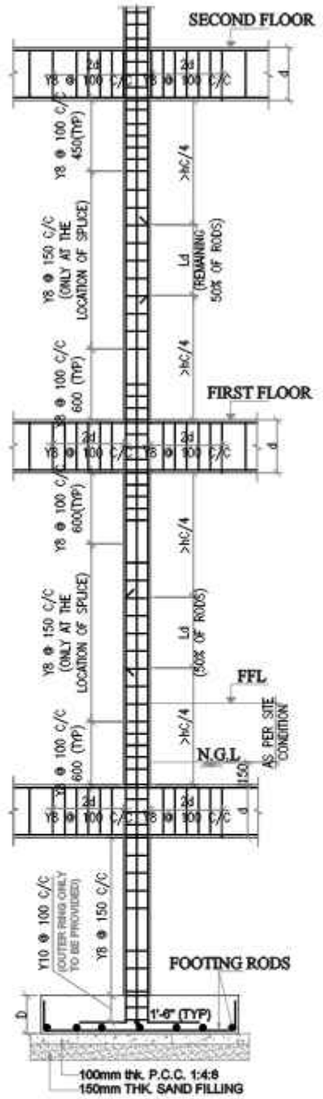


TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION

NOTE:

N.G.L - NATURAL GROUND LEVEL.

ALL HOOKS SHOULD BE BENT TO AN ANGLE OF 135° WITH A LENGTH NOT LESS THAN 75 MM



REINFORCEMENT DETAILING COLUMN
(ALTERNATE RODS TO BE LAPPED IN ALTERNATE FLOORS)

COLUMN SCHEDULE

S.NO.	NAME	SIZE UPTO GFR	SIZE UPTO TOP
1.	C1	300 X 450	230 X 450
2.	C2	300 X 600	300 X 600
3.	C3	230 X 450	230 X 450

GENERAL NOTES:
REMOVAL OF FORMWORK(SHUTTERING) :

SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE 11.3.1, IS 456:2000

A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS

LAP JOINTS FOR REINFORCEMENT BARS :

i) AT ANY CROSS SECTION OF THE MEMBER,NOT MORE THAN 50 % THE BARS SHALL BE LAPPED.

ii) LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF1.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

iii) DEVELOPMENT LENGTH (Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW;

a) DEVELOPMENT LENGTH FOR COLUMN BARS -40D
b) DEVELOPMENT LENGTH FOR BEAM BARS -50D

iv) LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL .

vii) DETAILING OF REBARS SHALL CONFIRM TO IBC

EXCAVATION AND BACKFILL

i) 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.

ii) 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.

iii) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10

iv) 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.

v) EXCAVATED FINE-GRAINED SOIL ENCOUNTERED AT SHALLOW DEPTHS SHALL BE IN NO CASE USED FOR BACK FILLING PURPOSES.

GENERAL NOTES:

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 G+4 FLOOR LOADS
7. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
8. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	R.P	R.M	16.10.23

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR , CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175. ZONE :- 13.

DRAWING TITLE :-

LAYOUT & R.C DETAILS OF COLUMN

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 140	——	001

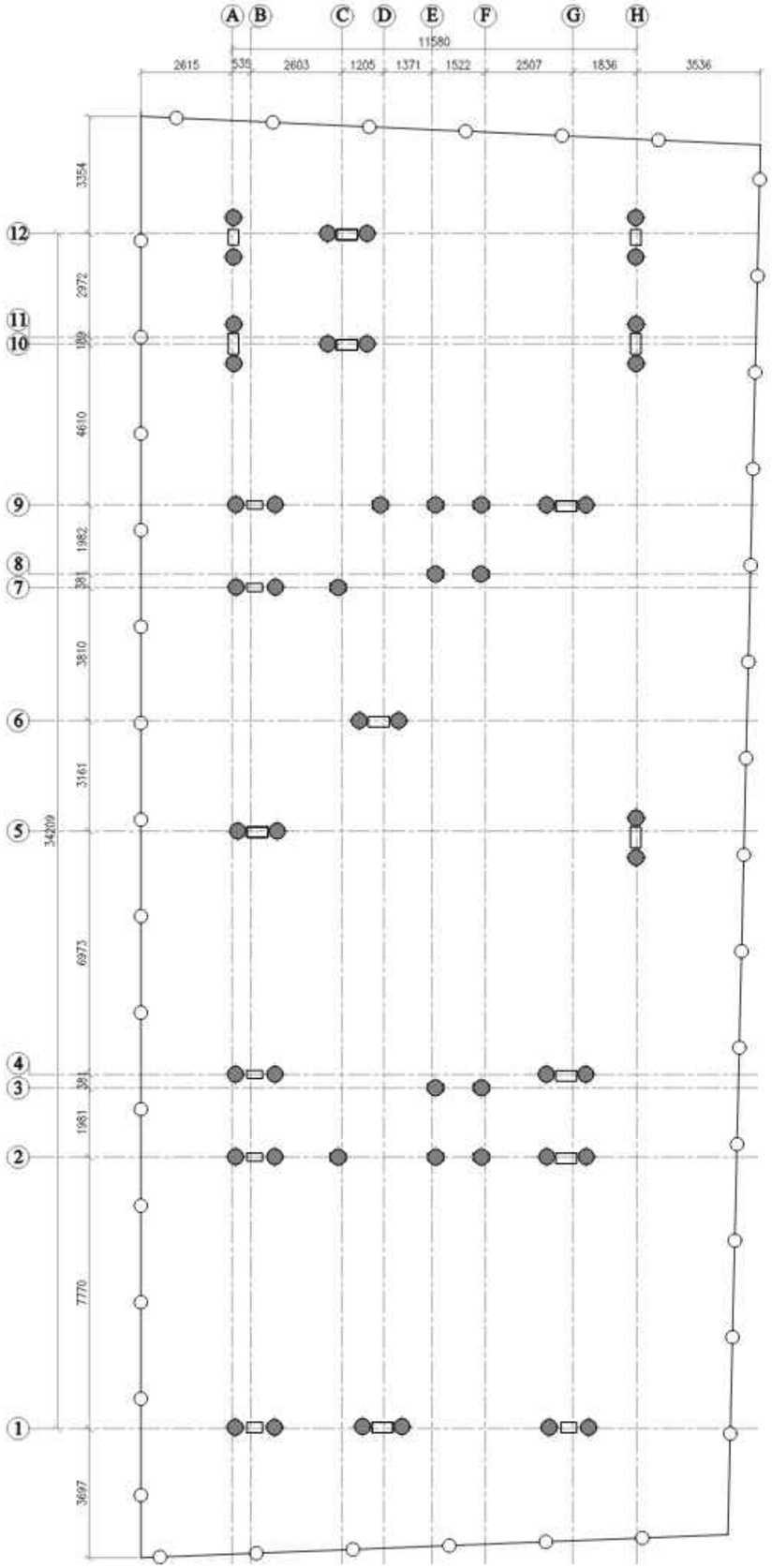
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue,
ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

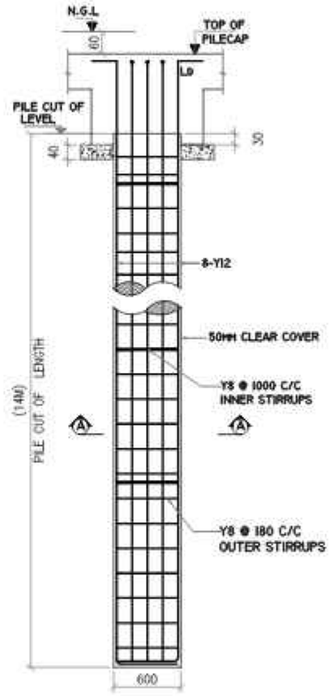
A3

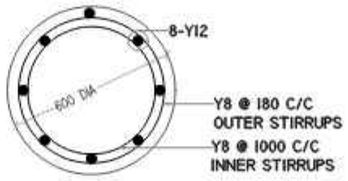
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LAYOUT OF PILE

FOR APPROVAL ONLY





SECTION "A-A"
C.S OF PILE - 600 DIA.

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Vii) DETAILING OF REBARS SHALL CONFIRM TO SP-34 & IS 13920

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i) 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.

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iii) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10

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3. GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE FE 500 CONFIRMING TO IS 1786-1985
4. PILE CARRYING CAPACITY
   A. 600MM DIA. - 310kN. (AS PER GEOGRAPHICAL REPORT)
5. PILE, PILECAP & COLUMNS ARE DESIGNED FOR G+4 FLOORS LOAD ONLY.
6. ROUTINE TESTS OF 1.5 TIMES DESIGN CAPACITY ON 2 PILES OF 450MM DIA IS TO BE CARRIED OUT.
7. CLEAR COVER TO THE MAIN STEEL
   a) R.C. COLUMN = 40MM b) PILE = 50MM
   c) PILECAP BOTTOM = 75MM d) PILECAP SIDES & TOP = 50MM
8. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
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REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	R.P	R.M	16.10.23

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DRAWING TITLE :-

LAYOUT OF PILE

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 140	——	002

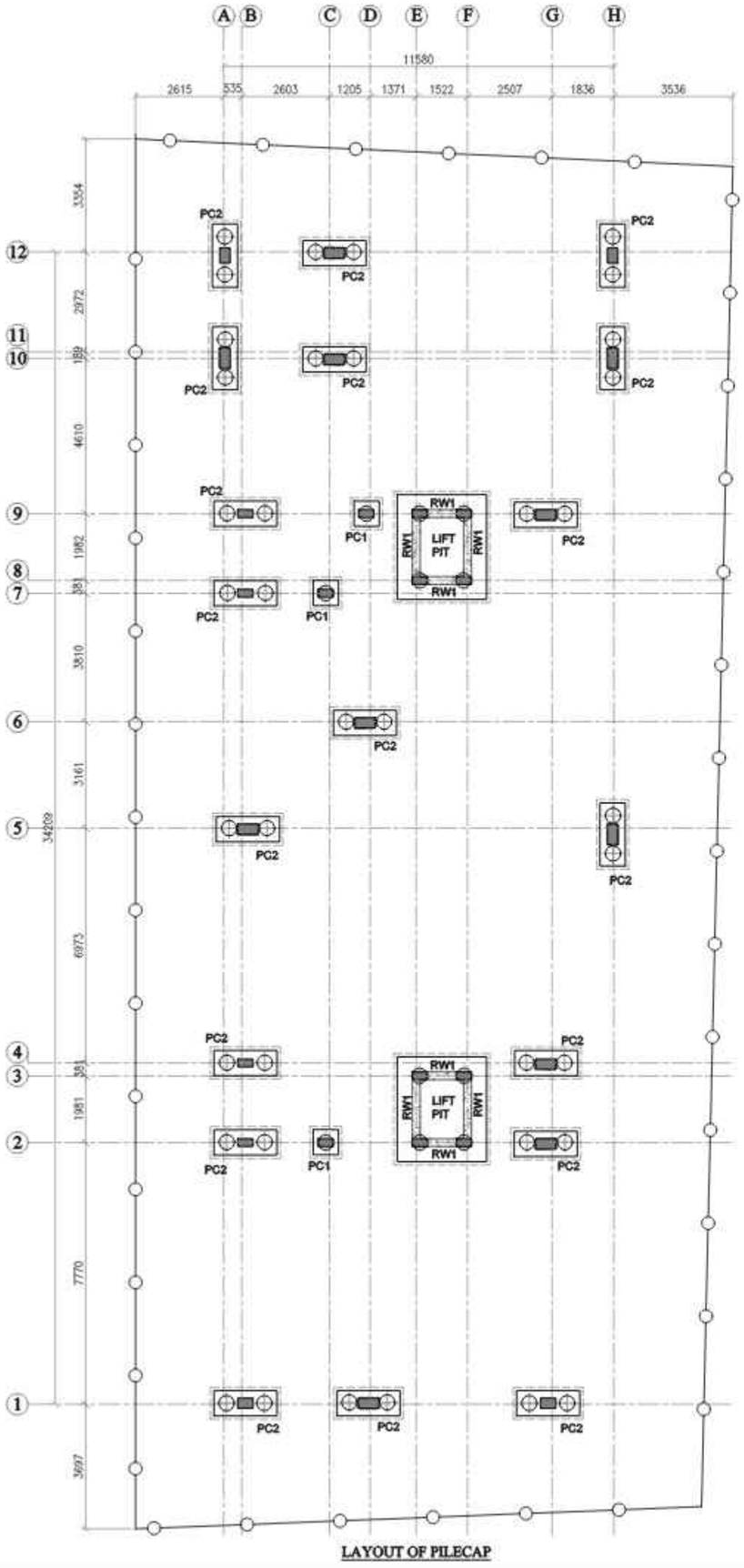
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
NO:13/27, 66th STREET
R.V NAGAR, ASHOK NAGAR,CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

A3

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LAYOUT OF PILECAP

FOR APPROVAL ONLY

PILECAP SCHEDULE:

S.NO.	NAME	SIZE
01.	PC1	750 X 750 X 600
02.	PC2	1875 X 750 X 750
03.	PC4	3800 X 2800 X 750

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a) DEVELOPMENT LENGTH FOR BEAM BARS - 50D

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EXCAVATION AND BACKFILL

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V) EXCAVATED FINE-GRAINED SOIL ENCOUNTERED AT SHALLOW DEPTHS SHALL BE IN NO CASE USED FOR BACK FILLING PURPOSES.

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   A. 600MM DIA. - 310KN. (AS PER GEOGRAPHICAL REPORT)
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REV.	DESCRIPTIONS	DRN	CHK	DATE
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DRAWING TITLE :-

LAYOUT OF PILE CAP

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 120	——	003

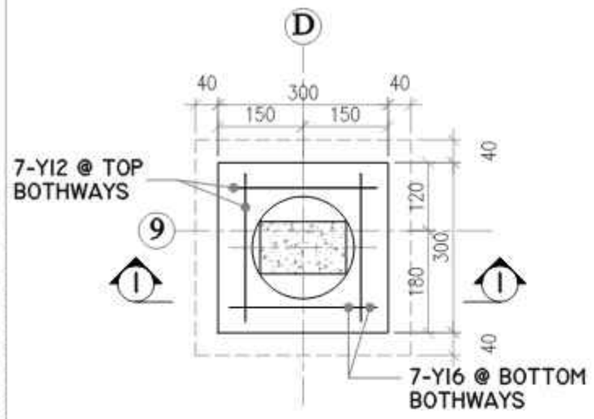
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

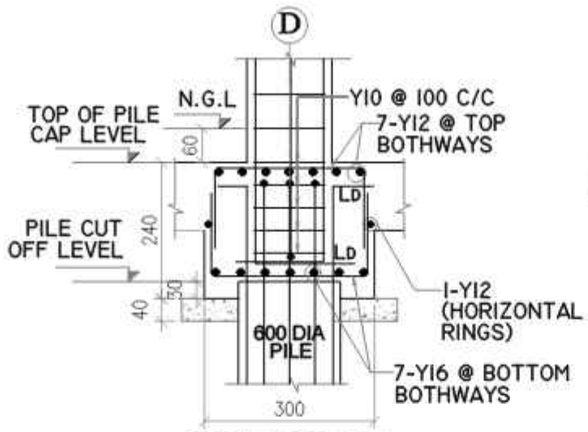
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A3

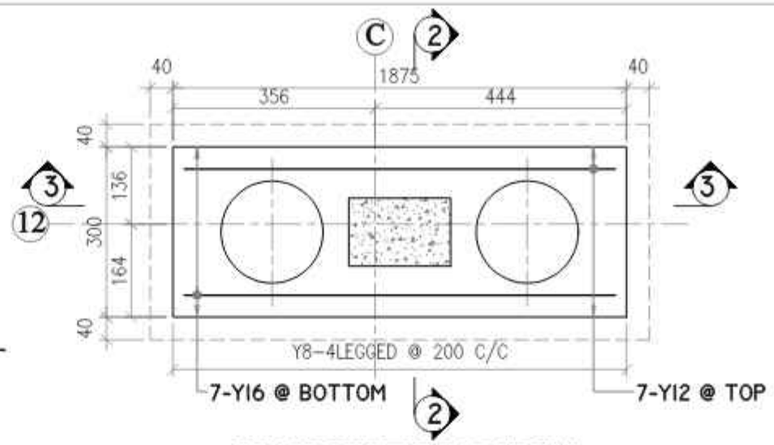
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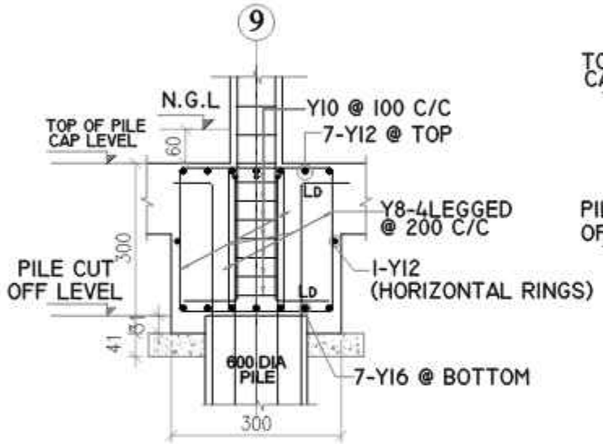
PLAN OF PILECAP "PC1"
(750 X 750 X 600)

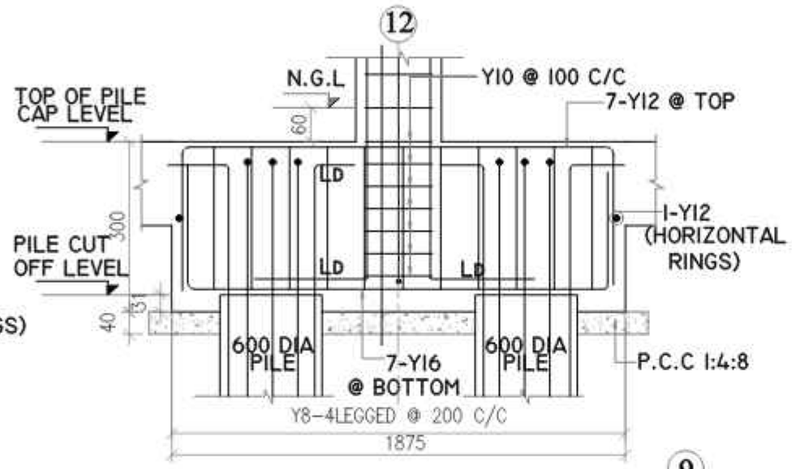


SECTION "1-1"



PLAN OF PILECAP "PC2"
(1835 X 750 X 750)



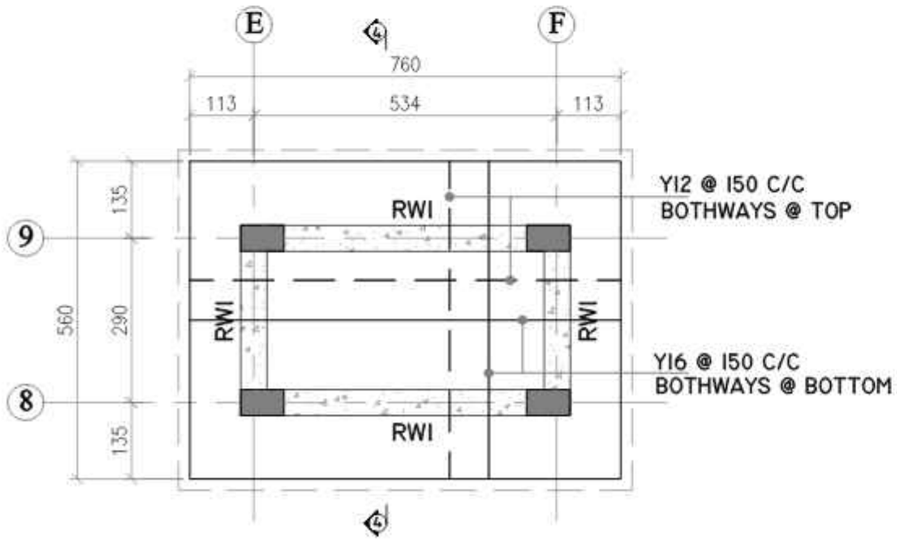


SECTION "3-3"

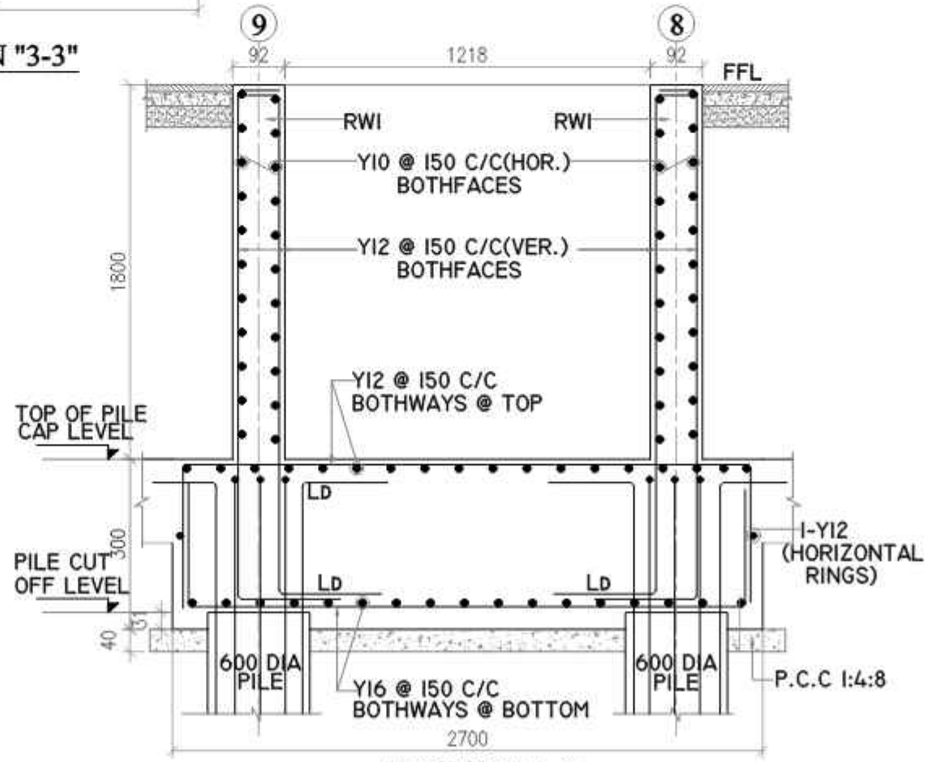
PILECAP SCHEDULE:

S.NO.	NAME	SIZE
01.	PC1	750 X 750 X 600
02.	PC2	1875 X 750 X 750
03.	PC4	2600 X 2700 X 750

FOR APPROVAL ONLY



PLAN OF PILECAP "PC4"
2600 X 2700 X 750



SECTION "4-4"

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B) DEVELOPMENT LENGTH FOR BEAM BARS - 50D

IV) LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL .

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iii) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10

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   A. 600MM DIA. - 400KN. (AS PER GEOGRAPHICAL REPORT)
5. PILE, PILECAP & COLUMNS ARE DESIGNED FOR G+4 FLOORS LOAD ONLY.
6. ROUTINE TESTS OF 1.5 TIMES DESIGN CAPACITY ON 2 PILES OF 450MM DIA IS TO BE CARRIED OUT.
7. CLEAR COVER TO THE MAIN STEEL
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REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	R.P	R.M	16.10.23

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR , CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175.

ZONE :- 13.

DRAWING TITLE :-

R.C DETAILS OF PILECAP

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 120	——	004

ARCHITECT / CONSULTANTS :-

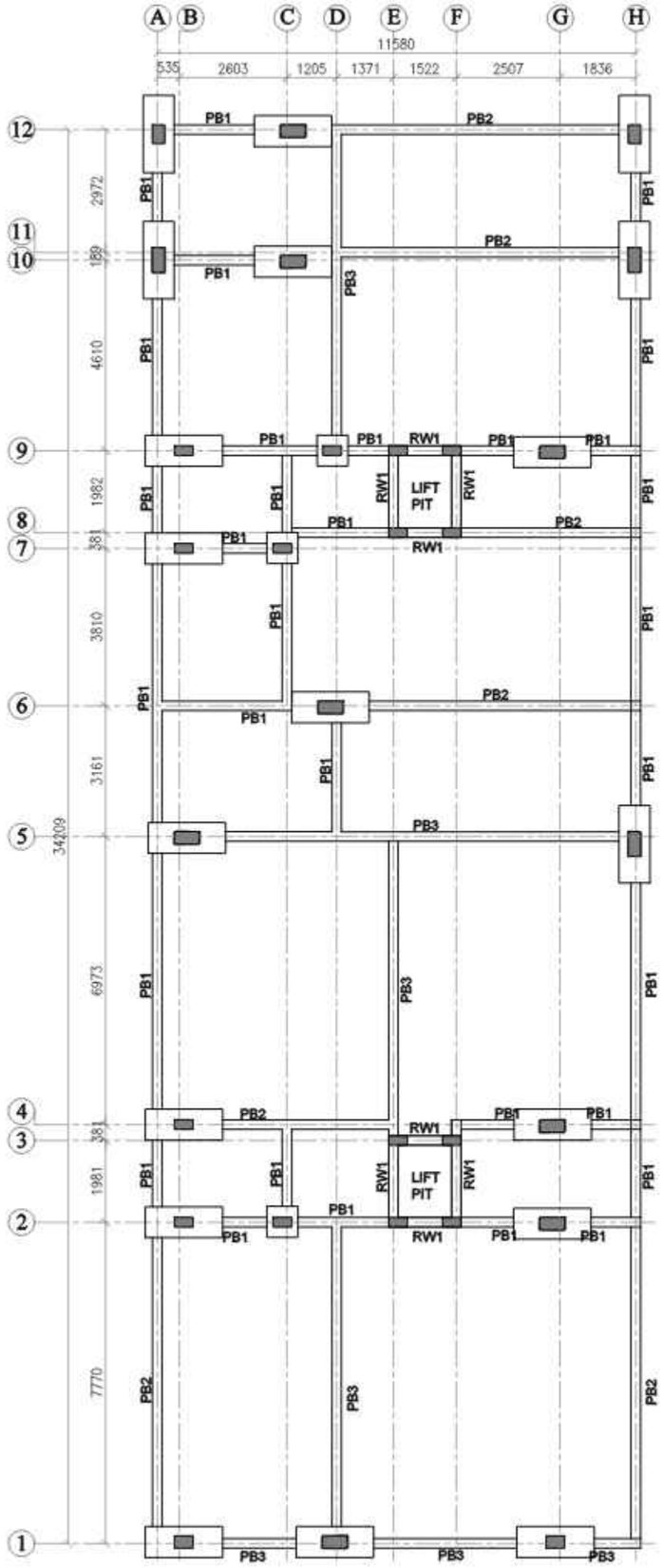
R.C DETAILS OF PILECAPS

STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
NO:13/27, 66th STREET
R.V NAGAR, ASHOK NAGAR,CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

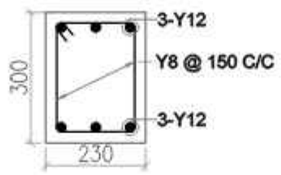
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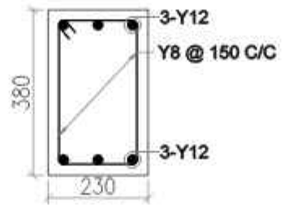


LAYOUT OF PLINTH BEAM

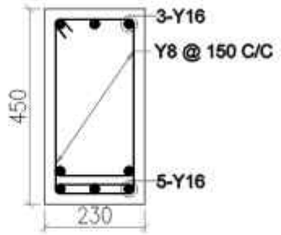
FOR APPROVAL ONLY



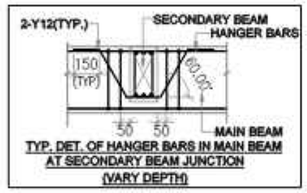
C.S. OF BEAM "PB1"
(230 x 300)



C.S. OF BEAM "PB2"
(230 x 380)

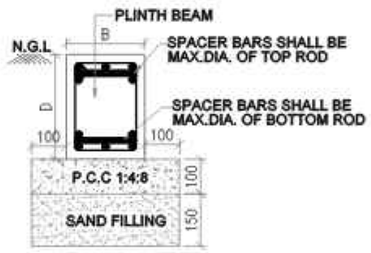


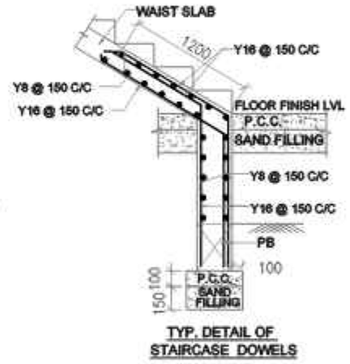
C.S. OF BEAM "PB3"
(230 x 450)



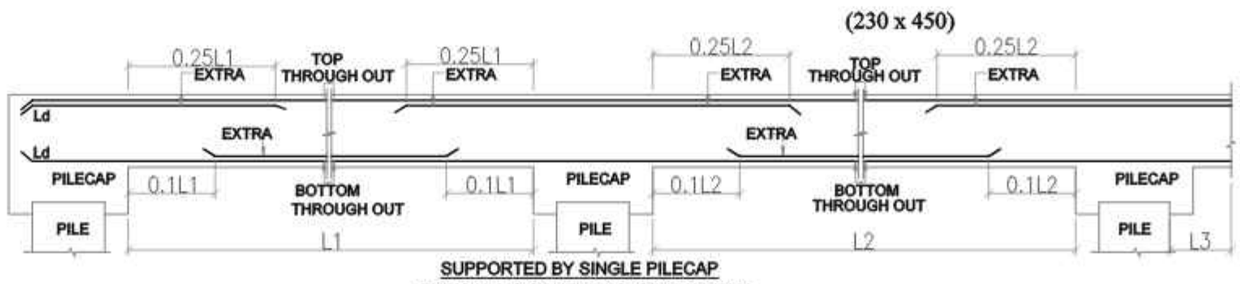
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION (VARY DEPTH)

S.NO.	NAME	SIZE
01.	PB1	230 X 300
02.	PB2	230 X 380
03.	PB3	230 X 450





TYP. DETAIL OF STAIRCASE DOWELS



SUPPORTED BY SINGLE PILECAP
TYPICAL L.S CONTINUES GRADE BEAM

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GENERAL NOTES:

REMOVAL OF FORMWORK(SHUTTERING) :

SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE 11.3.1, IS 456:2000

A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS

LAP JOINTS FOR REINFORCEMENT BARS :

i) AT ANY CROSS SECTION OF THE MEMBER,NOT MORE THAN 50 % THE BARS SHALL BE LAPPED.

ii) LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF1.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

iii) DEVELOPMENT LENGTH (Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

a) DEVELOPMENT LENGTH FOR COLUMN BARS - 40D

a) DEVELOPMENT LENGTH FOR BEAM BARS - 50D

IV) LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL .

Vii) DETAILING OF REBARS SHALL CONFIRM TO SP-34 & IS 13920

EXCAVATION AND BACKFILL

i) 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.

ii) 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 M20. 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.

iii) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10

IV) 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.

V) EXCAVATED FINE-GRAINED SOIL ENCOUNTERED AT SHALLOW DEPTHS SHALL BE IN NO CASE USED FOR BACK FILLING PURPOSES.

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 1786-1985
4. PILE CARRYING CAPACITY
   A. 600MM DIA. - 310KN. (AS PER GEOGRAPHICAL REPORT)
5. PILE, PILECAP & COLUMNS ARE DESIGNED FOR G+4 FLOORS LOAD ONLY.
6. ROUTINE TESTS OF 1.5 TIMES DESIGN CAPACITY ON 2 PILES OF 450MM DIA IS TO BE CARRIED OUT.
7. CLEAR COVER TO THE MAIN STEEL
   a) R.C. COLUMN = 40MM b) PILE = 50MM
   c) PILECAP BOTTOM = 75MM d) PILECAP SIDES & TOP = 50MM
8. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
9. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
10. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	R.P	R.M	16.10.23

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR, CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175. ZONE :- 13.

DRAWING TITLE :-

LAYOUT OF PILNTH BEAM

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 140	——	005

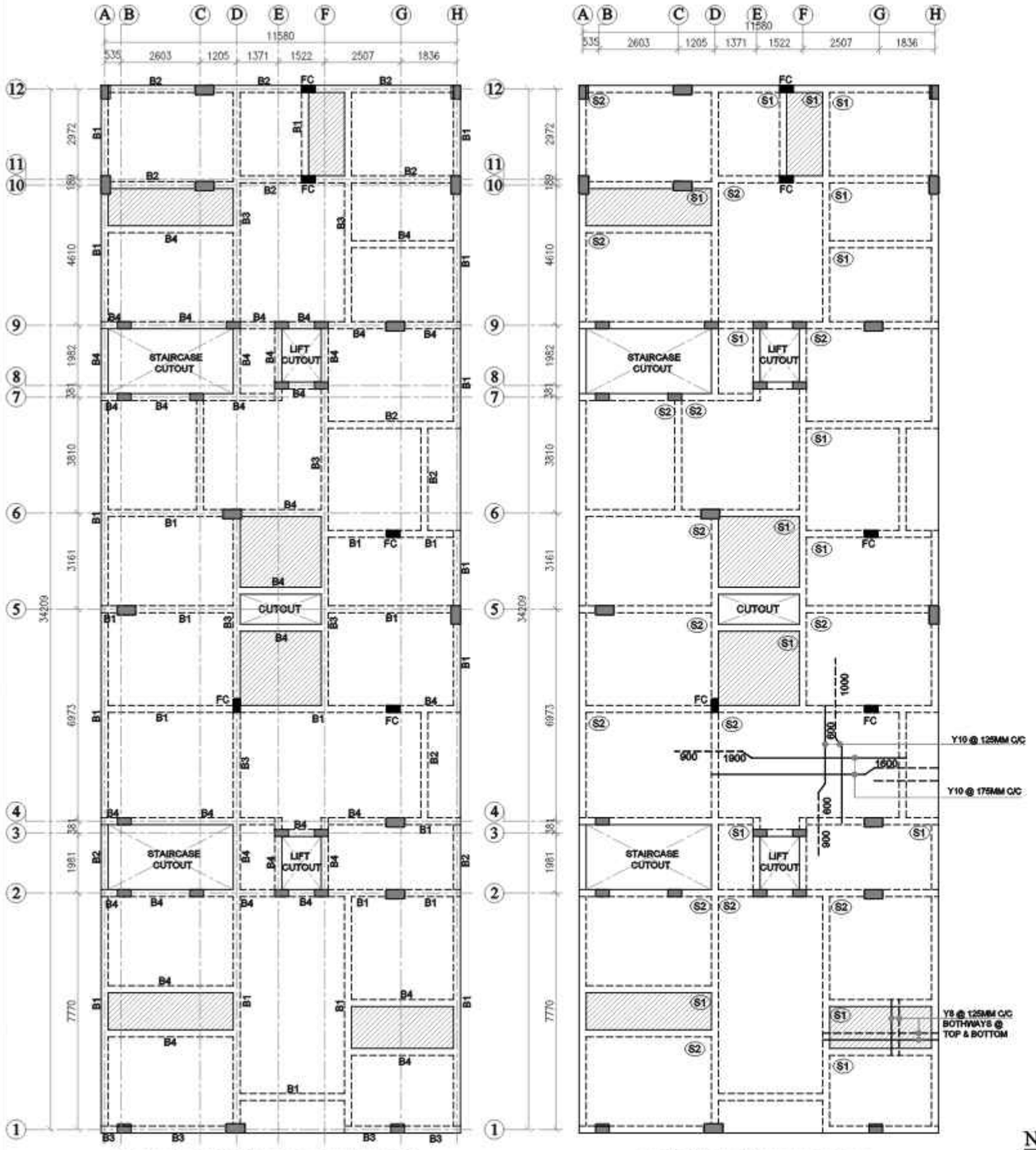
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
NO:13/27, 66th STREET
R.V NAGAR, ASHOK NAGAR,CHENNAI- 600 083.
aura Engineering Consultants
Fixed Line :- 044 4859 7100
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projects@auraengineers.co.in
http://auraengineers.co.in/

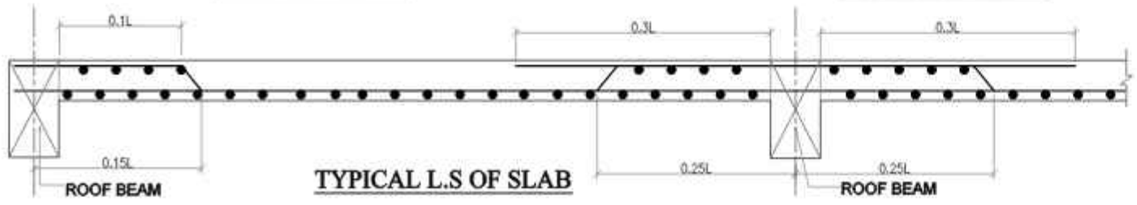
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NUMERATION LAYOUT OF STILT FLOOR ROOF SLAB & BEAM

R.C LAYOUT OF STILT FLOOR ROOF SLAB & BEAM



TYPICAL L.S OF SLAB

FOR APPROVAL ONLY

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	300 x 600
02	B2	230 x 450
03	B3	230 x 600
04	B4	230 x 380

SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	150 THK.
02	S2	150 THK.
03	S3	150 THK.

NOTE:

- SLAB SUNK BY 0'-10"
- PROVIDE Y8 @ 8" C/C AS DISTRIBUTORS WHERE EVER REQUIRED
- COLUMN CURTAILED TO BE BEND IN TO TOP OF THE SLAB
- FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010

GENERAL NOTES:

REMOVAL OF FORMWORK(SHUTTERING) :

SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE 11.3.1, IS 456:2000

A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS

LAP JOINTS FOR REINFORCEMENT BARS :

i) AT ANY CROSS SECTION OF THE MEMBER,NOT MORE THAN 50 % THE BARS SHALL BE LAPPED.

ii) LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF1.5 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

iii) DEVELOPMENT LENGTH (Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

A) DEVELOPMENT LENGTH FOR COLUMN BARS -40D
B) DEVELOPMENT LENGTH FOR BEAM BARS -50D

iv) LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL .

Vii) DETAILING OF REBARS SHALL CONFIRM TO IBC

EXCAVATION AND BACKFILL

i) 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.

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iii) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10

iv) 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.

V) EXCAVATED FINE-GRAINED SOIL ENCOUNTERED AT SHALLOW DEPTHS SHALL BE IN NO CASE USED FOR BACK FILLING PURPOSES.

GENERAL NOTES:

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) BEAM = 30MM B) SLAB = 20MM
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
7. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	R.P	R.M	16.10.23

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR, CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175. ZONE :- 13.

DRAWING TITLE :-

NUMERATION LAYOUT & R.C LAYOUT OF STILT FLOOR ROOF SLAB & BEAMS

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 150	——	006

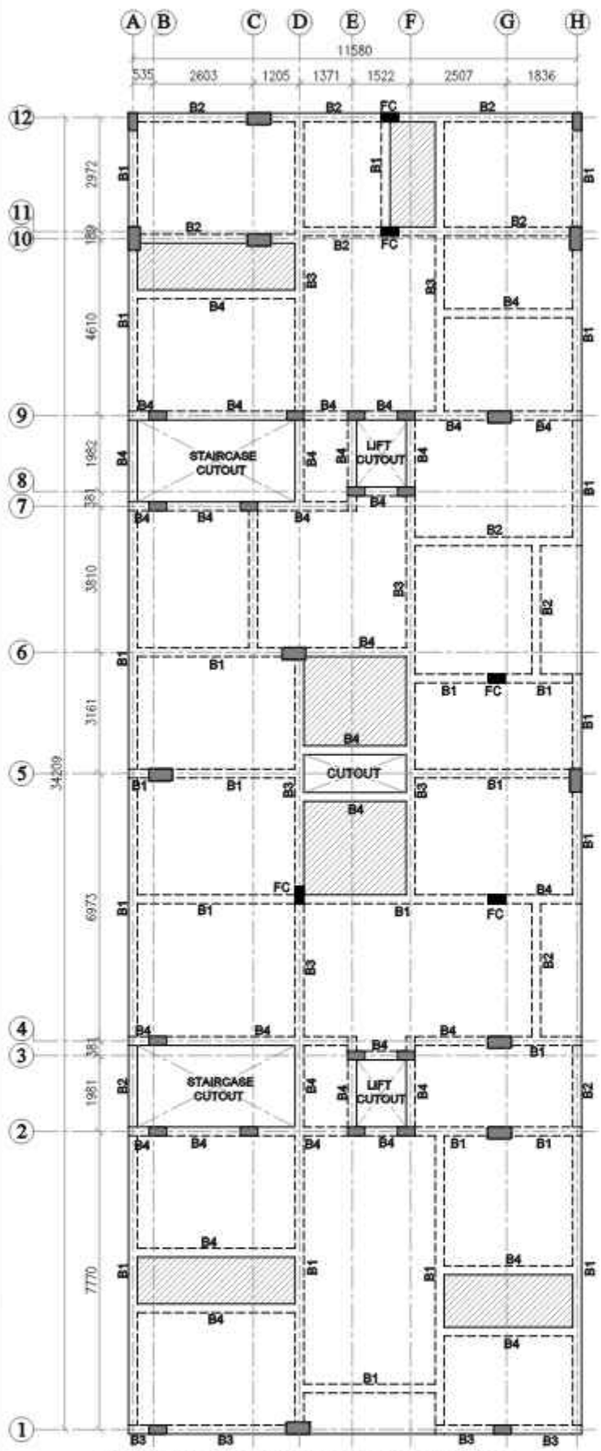
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

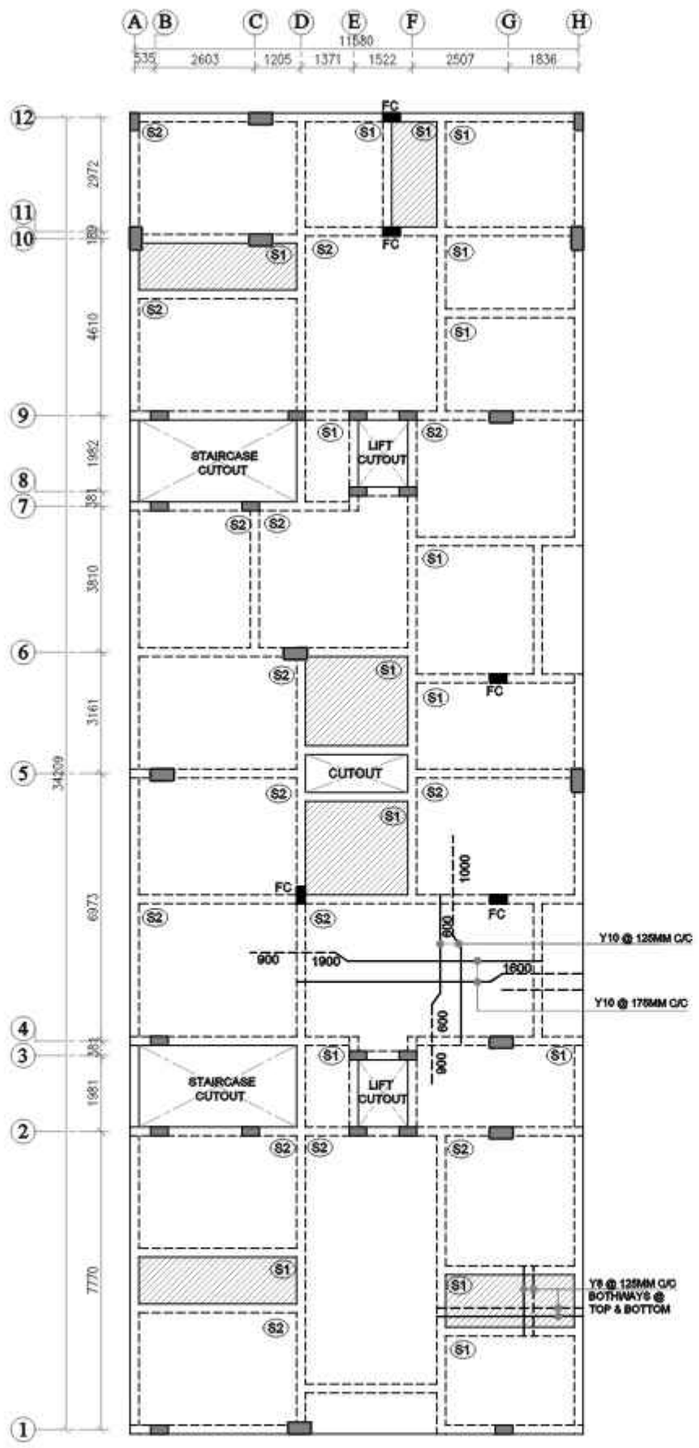
AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue, ASHOK NAGAR, CHENNAI- 600 083.
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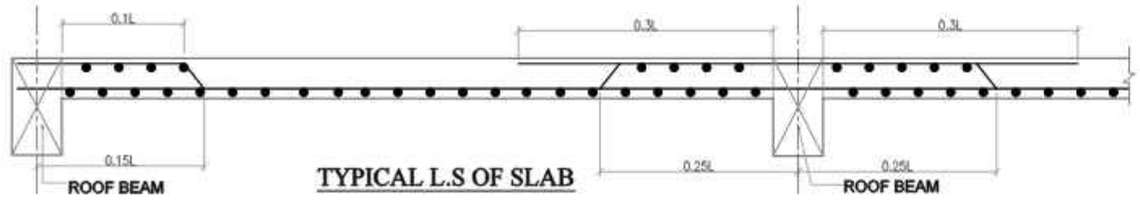
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NUMERATION LAYOUT OF TYPICAL FLOOR
ROOF SLAB & BEAM



R.C LAYOUT OF TYPICAL FLOOR
ROOF SLAB & BEAM



TYPICAL L.S OF SLAB

FOR APPROVAL ONLY

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	300 x 600
02	B2	230 x 450
03	B3	230 x 600
04	B4	230 x 380

SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	150 THK.
02	S2	150 THK.
03	S3	150 THK.

NOTE:

- SLAB SUNK BY 0'-10"
- PROVIDE Y8 @ 8" C/C AS DISTRIBUTORS WHERE EVER REQUIRED
- COLUMN CURTAILED TO BE BEND IN TO TOP OF THE SLAB
- FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010

GENERAL NOTES:

REMOVAL OF FORMWORK(SHUTTERING) :

SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE 11.3.1, IS 456:2000

A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS

LAP JOINTS FOR REINFORCEMENT BARS :

i) AT ANY CROSS SECTION OF THE MEMBER,NOT MORE THAN 50 % THE BARS SHALL BE LAPPED.

ii) LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF1.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

iii) DEVELOPMENT LENGTH (Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

A) DEVELOPMENT LENGTH FOR COLUMN BARS -40D
B) DEVELOPMENT LENGTH FOR BEAM BARS -50D

iv) LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL .

Vii) DETAILING OF REBARS SHALL CONFIRM TO IBC

EXCAVATION AND BACKFILL

I) 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.

II) 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.

III) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10

IV) 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.

V) EXCAVATED FINE-GRAINED SOIL ENCOUNTERED AT SHALLOW DEPTHS SHALL BE IN NO CASE USED FOR BACK FILLING PURPOSES.

GENERAL NOTES:

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) BEAM = 30MM B) SLAB = 20MM
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
7. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	R.P	R.M	16.10.23

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR , CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175. ZONE :- 13.

DRAWING TITLE :-

NUMERATION LAYOUT & R.C LAYOUT OF TYPICAL FLOOR ROOF SLAB & BEAMS (FIRST, SECOND ,THIRD & FOURTH)

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 150	——	007

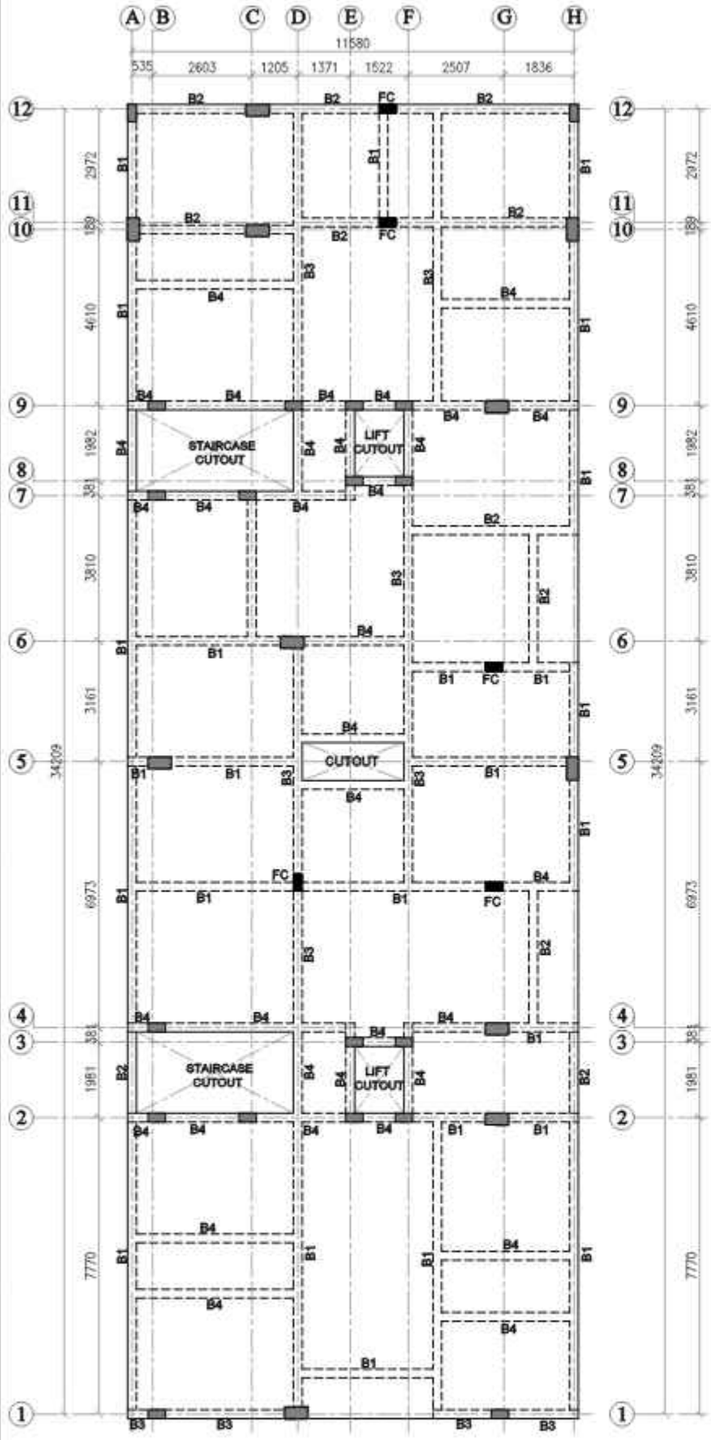
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

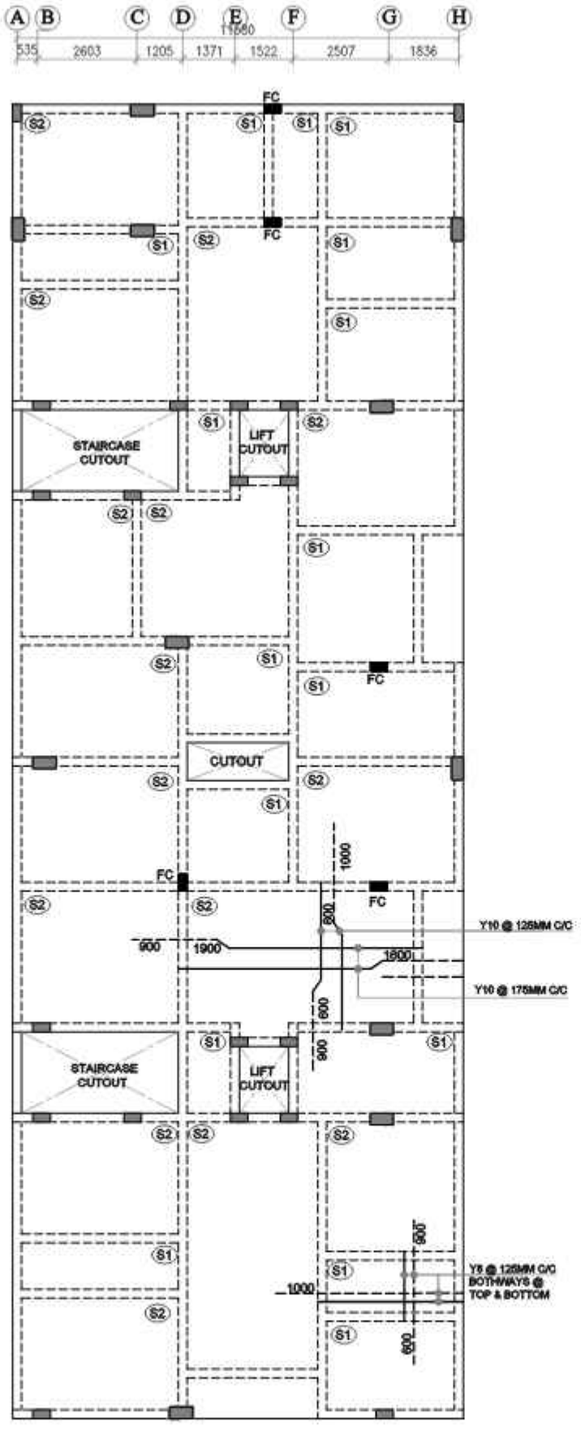
AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue, ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
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A3

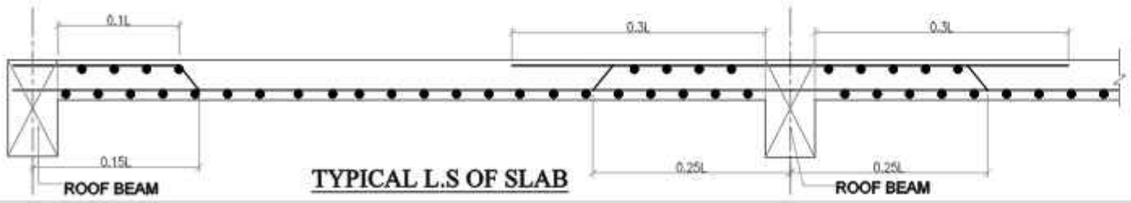
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NUMERATION LAYOUT OF TERRACE FLOOR SLAB & BEAM



R.C LAYOUT OF TERRACE FLOOR SLAB & BEAM



TYPICAL L.S OF SLAB

FOR APPROVAL ONLY

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	300 x 600
02	B2	230 x 450
03	B3	230 x 600
04	B4	230 x 380

SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	150 THK.
02	S2	150 THK.

NOTE:

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

COLUMN CURTAILED TO BE BEND IN TO TOP OF THE SLAB

FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010

GENERAL NOTES:

REMOVAL OF FORMWORK(SHUTTERING) :

SHUTTERING OF ANY PART OF THE STRUCTURE SHALL NOT BE REMOVED UNTIL THE CONCRETE ATTAINS 70% THE SPECIFIED STRENGTH OF CONCRETE. HOWEVER THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE 11.3.1, IS 456:2000

A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS

LAP JOINTS FOR REINFORCEMENT BARS :

i) AT ANY CROSS SECTION OF THE MEMBER,NOT MORE THAN 50 % THE BARS SHALL BE LAPPED.

ii) LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF1.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

iii) DEVELOPMENT LENGTH (Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

A) DEVELOPMENT LENGTH FOR COLUMN BARS -40D
B) DEVELOPMENT LENGTH FOR BEAM BARS -50D

IV) LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL .

Vii) DETAILING OF REBARS SHALL CONFIRM TO IBC

EXCAVATION AND BACKFILL

I) 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.

II) 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.

III) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 10

IV) 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.

V) EXCAVATED FINE-GRAINED SOIL ENCOUNTERED AT SHALLOW DEPTHS SHALL BE IN NO CASE USED FOR BACK FILLING PURPOSES.

GENERAL NOTES:

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) BEAM = 30MM B) SLAB = 20MM
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
7. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	R.P	R.M	16.10.23

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR , CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175. ZONE :- 13.

DRAWING TITLE :-

NUMERATION LAYOUT & R.C LAYOUT OF TERRACE FLOOR SLAB & BEAMS

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 150	——	008

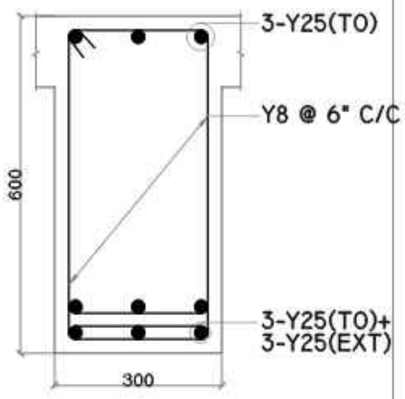
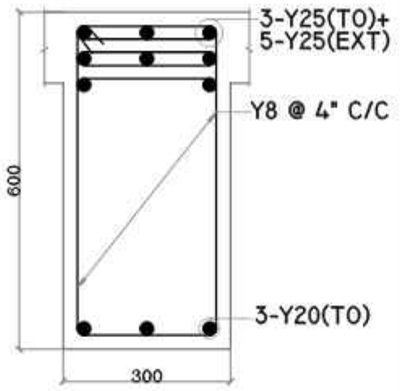
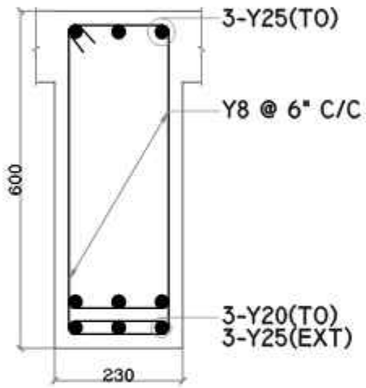
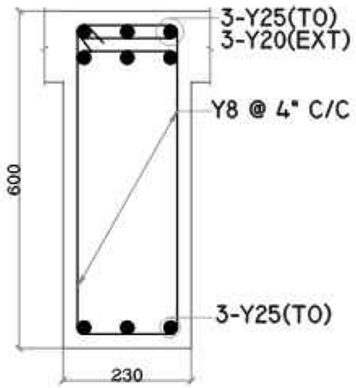
ARCHITECT / CONSULTANTS :-

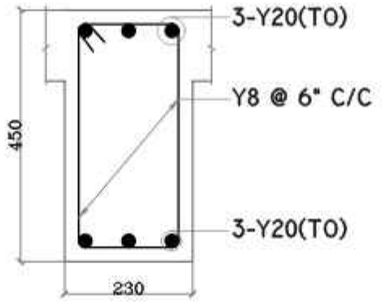
STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue, ASHOK NAGAR, CHENNAI- 600 083.
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projects.auraengg@gmail.com
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aura Engineering Consultants

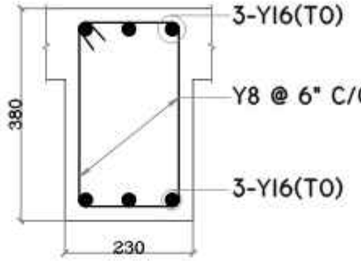
A3

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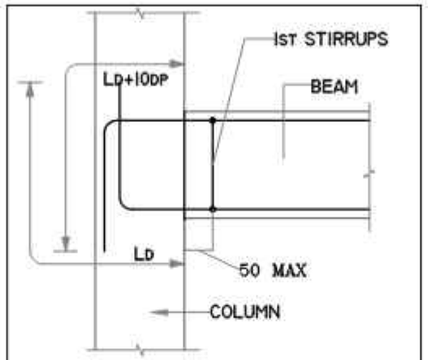
NAME	MID SPAN	END SUPPORT
B1 (300 X 600)		
B3 (230 X 600)		



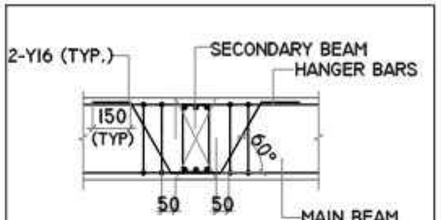
C.S. OF BEAM "B2"
(230 X 450)



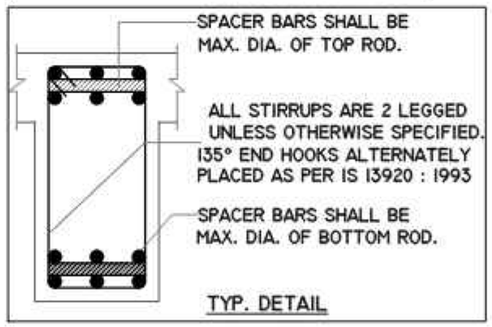
C.S. OF BEAM "B4"
(230 X 380)



TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION

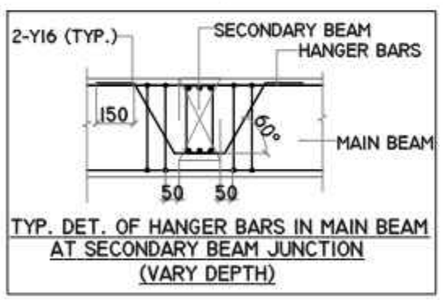


TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION

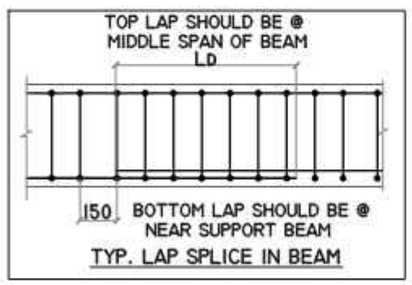


TYP. DETAIL

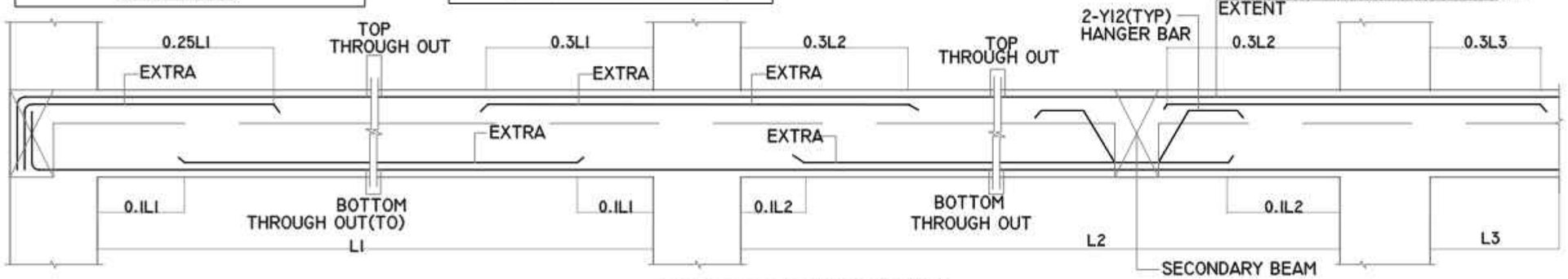
BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	300 x 600
02	B2	230 x 450
03	B3	230 x 600
04	B4	230 x 380



TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION (VARY DEPTH)



TYP. LAP SPLICE IN BEAM



TYPICAL L.S OF ROOF BEAM

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN FOOT UNITS.
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 = 1½" B) BEAM = 1"
   C) SLAB = ¾"
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
7. DEVELOPMENT LENGTH (Ld) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

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

8. DETAILING OF REBARS SHALL CONFIRM TO SP-34 & IS 13920.

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL	R.P	R.M	16.10.23

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS (HEIGHT -15.00M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO:-2, DOOR NO: 4, BALARAM STREET, ADYAR , CHENNAI - 600020. COMPRISED IN OLD S.NO: 16/5BPT, T.S.NO:-55/9, BLOCK NO: 16 OF PALLIPATTU VILLAGE, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION. DIVISION NO:- 175. ZONE :- 13.

DRAWING TITLE :-

R.C. DETAILS BEAMS
GROUND FLOOR ROOF TO TERRACE

DATE	SCALE	JOB.NO	DRG.NO
16.10.23	1 : 130	——	009

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

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A3