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DESIGN CALCULATION

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT – 18.30M) RESIDENTIAL BUILDING WITH 19 DWELLING UNITS AVAILING PREMIUM FSI AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, CHENNAI 600028, COMPRISED IN R.S.NO.4249/1, BLOCK NO.91 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

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CONTENTS

1.0 Design Brief 1

2.0 Design Criteria

2.1 Project Description 1

2.2 General 1

2.3 Design Codes & Standards 1

3.0 Loading

3.1 Dead Load 1

3.2 Live Load 2

3.3 Wind Load 2

3.4 Seismic Load 2

3.5 Loading Combinations 2

4.0 Structural Material

4.1 Steel Material Specification 3

4.2 Concrete Material Specifications 3

4.3 Reinforcement Material Specifications 3

4.4 Concrete Cover 3

5.0 Structural Description

5.1 Method of Analysis 4

5.2 Framing System, Analysis and Design 5

5.3 Deflection limits 5

Appendix-I Design Calculations

Appendix-II General Arrangement drawings

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1.0 DESIGN BRIEF:

THIS DOCUMENT PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT – 18.30M) RESIDENTIAL BUILDING WITH 19 DWELLING UNITS AVAILING PREMIUM FSI AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, CHENNAI 600028, COMPRISED IN R.S.NO.4249/1, BLOCK NO.91 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

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 : 22.35 X 16.92M
2. Height of the building : 18.30M
3. Number of storeys above GL : Stilt Floor +5 upper floors
4. Floor to floor height of this building : Stilt and First floors - 3.05m
   : Typical floor – 3.05m
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

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- Density of Concrete =25 kN/m^3
- 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

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- RC Wall = 30mm
- 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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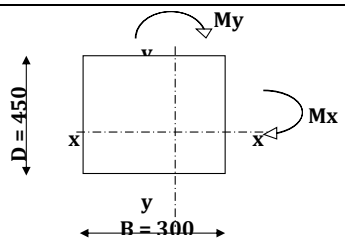
APPENDIX I

Design Calculations

Column Design

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PROJECT	RESIDENTIAL BUILDING (S+5) AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, MYLAPORE	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 Eccentricit 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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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**	
	$M_{ux1} / f_{ck}BD^2$ =	Chart 43 - 46
	$M_{uy1} / f_{ck}DB^2$ =	SP 16 : 1980
	Moment carrying capacity about X axis M_{ux1} = kN.m	
	Moment carrying capacity about Y axis M_{uy1} = 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)**	
	$(M_{ux}/M_{ux1})^{an} + (M_{uy}/M_{uy1})^{an}$ = 1	Cl 39.6 , IS456:2000
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 / slab.	

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Footing Design

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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 Reinforceme	50	mm
Earth Fill above FGL	0	mm
Base Area of Footing	3.78	m^2
Ixx	1.02	m^4
Izz	1.39	m^4
Weight of Footing	47.25	kN
Weight of soil	85.29	kN

Gross Bearing Pressure Calculatio (kN/m^2)

Critical Load Combinations	Pmax	Pmin
200	154.11	154.111905
0	35.06	35.06

Gross SB((w/o increase) 182.4 kN/m^2

Hence **OK**

Factored Net Upward Pressure Calculation

Load Factor for Design 1.5

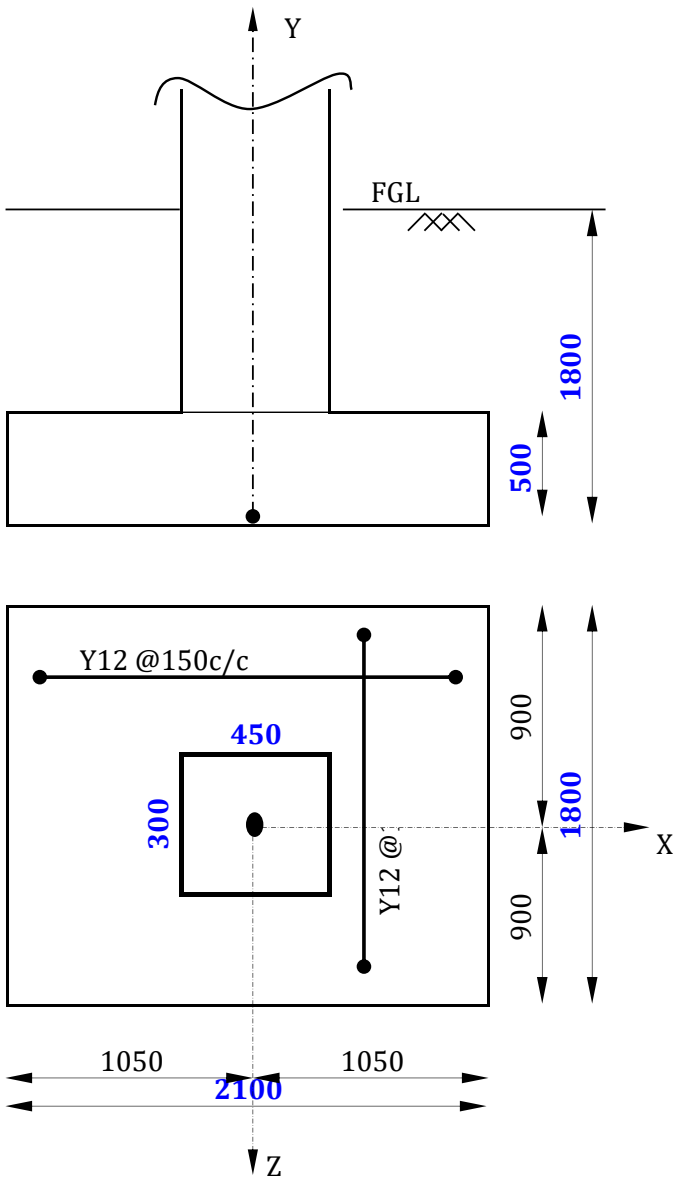
Critical Load Combinations	Pmax	Pmin
200	178.57	178.571429
0	0.00	0.0

Dsgn.(+ve) BM abt. X-axis M	50.22	kN.m
Dsgn.(+ve) BM abt. Z-axis M	60.77	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	432.00	mm
Provided Eff. depth for Muz	444.00	mm
Mu,lim	#####	kN.m

Depth provided is #####

Bottom Reinforcement

Ast Required for Mux	#####	mm^2
Ast Required for Muz	#####	mm^2
Min. Ast Reqd.	600	mm^2



Bottom Reinforcement

						Ast Provided	Ast Required	
Provide	12	@	150	C/C	along Z	754	#NAME? mm^2	Hence
Provide	12	@	150	C/C	along X	754	#NAME? mm^2	#####

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Design of Isolated Footing **F2** **Node :** **38**

Top Reinforcement

Ast Required for Mux	0.00	mm^2
Ast Required for Muz	0.00	mm^2
Min. Ast Reqd.	Not Req	mm^2

Check For Flexural / Oneway Shear

	Actual	Allowable		Hence
Shear Stress (Plane ll to X)	0.131	#NAME?	N/mm^2	#NAME?
Shear Stress (Plane ll to Z)	0.153	#NAME?	N/mm^2	#NAME?

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	=	47.25	kN			
Weight of Over burden Earth	=	85.29	kN			
Total downward Load	=	582.54	kN			
Stabilizing moment along X-Dir	=	582.54	x	1.05		
	=	611.67	kNm			
Actuating moment, M_{zz}	=	0.00	kNm			
Factor of Safety (Along X-Dir)	=	611.67	/	0.0		
		-	>	1.40	Hence	**OK**

Check For Sliding

Resistance against Sliding	=	332.05	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)	=	332.0	/	2.5		
		130.73	>	1.40	Hence	**OK**
Factor of Safety (Along Z-Dir)	=	332.0	/	5.3		
		62.65	>	1.4	Hence	**OK**

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Plinth Beam Design

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CL. NO.	**BEAM DESIGN CALCULATIONS**				**REFERENCES**

1.1 **Geomentry Data**

Beam Number		=	**PB2**		
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 Steel = 0.17% b d = 131.96 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	%
Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	0.00	mm^2

Detail of bars

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

A_{st} provided = 603.19 mm^2

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CL. NO.	**BEAM DESIGN CALCULATIONS**				**REFERENCES**

	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 provid p_c = 0.777 % **Hence O.K**

Check for Shear

Shear = 149 kN

Nominal Shear Stress	tv	= 1.92	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	tc	= 0.92	N/mm^2	β = 1.000
Maximum Shear Stress	tc,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	= 0.028	%
Percentage of compression steel reqd	p_c	= 0	%
Required Area of tension steel	$A_{st\ reqd}$	= 131.96	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	= 0	mm^2

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

	Nos	Dia	Nos	Dia
Compression Reinforcemer	3	16	0	0

A_{sc} provided = 603.19 mm

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

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

Check for Shear

Shear = 149 kN

Nominal Shear Stress	tv	= 1.92	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	tc	= 0.92	N/mm^2	β = 1.000
Maximum Shear Stress	tc,max	= 2.5	N/mm^2	Table 19, IS456:2000
Diameter of the Stirrup bar		= 8	mm	Table 20, IS456:2000

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PROJECT	RESIDENTIAL BUILDING (S+5) AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, MYLAPORE	DOCUMENT. NO	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE
CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES	

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					

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^2	
Required Area of compression steel	$A_{sc\ reqd}$	=	0	mm	

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	

Percentage of tension steel provided	p_t	=	0.777	%	Hence O.K
Percentage of compression steel provid	p_c	=	0.777	%	Hence O.K

Check for Shear

Shear		=	149	kN	
Nominal Shear Stress	tv	=	1.92	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	tc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	tc,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	
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

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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	=	230	mm	
Overall Depth of Beam	D	=	530	mm	
Dia of bar	Φ	=	25	mm	
Nominal Cover	cc	=	30	mm	IS 456:2000 Table 19
Effective Depth	d	=	487.5	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_{cmax}		=	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 = 181.75 kNm

1.4 **Area of Steel**

Minimum Area of Ste = 0.17% b d = 190.6125 mm^2

Support 1

Negative moment (Support 1) = 254 kNm

Hence the Section is designed as Doubly Reinforced Section

	M_u/bd^2	=	4.647	
Percentage of tension steel reqd	p_t	=	1.277	%
Percentage of compression steel reqd	p_c	=	0.359	%
Required Area of tension steel	$A_{st\ reqd}$	=	1431.84	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	402.53	mm^2

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	3	20	3	20
A_{st} provided = 1884.96 mm^2				
	Nos	Dia	Nos	Dia
Compression Reinforceme	3	20	3	20

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CL. NO.	**BEAM DESIGN CALCULATIONS**				**REFERENCES**

A_{sc} provided = 1884.96 mm^2

Percentage of tension steel provided p_t = 1.681 % **Hence O.K**

Percentage of compression steel provided p_c = 1.681 % **Hence O.K**

Check for Shear

Shear = 241 kN

Nominal Shear Stress	tv	=	2.15	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	tc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	tc,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		=	150.0		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 @ 150mm c/c spacing

Support 2

Negative moment = 254 kNm

Hence the Section is designed as Doubly Reinforced Section

M_u/bd^2	=	4.647		
Percentage of tension steel reqd	p_t	=	1.277	%
Percentage of compression steel reqd	p_c	=	0.359	%
Required Area of tension steel	$A_{st\ reqd}$	=	1431.84	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	402.53	mm^2

Detail of bars

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

A_{st} provided = 1884.956 mm^2

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

A_{sc} provided = 1884.96 mm^2

Percentage of tension steel provided p_t = 1.681 % **Hence O.K**

Percentage of compression steel provided p_c = 1.681 % **Hence O.K**

Check for Shear

Shear = 241 kN

Nominal Shear Stress	tv	=	2.15	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	tc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	tc,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		=	150.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	300		Cl 26.5.1.5,IS456:2000

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CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES	

Provide 8 mm dia 2 legged stirrups @ 150mm 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	=	1.277	%	
Percentage of compression steel reqd	p_c	=	0.359	%	
Required Area of tension steel	$A_{st\ reqd}$	=	1431.84	mm^2	
Required Area of compression steel	$A_{sc\ reqd}$	=	402.53	mm^2	

Detail of bars

	I st Layer		II nd Layer		
	Nos	Dia	Nos	Dia	
Tension Reinforcement	3	20	3	20	
A_{st} provided	=	1884.96	mm^2		
	Nos	Dia	Nos	Dia	
Compression Reinforceme	3	20	3	20	
A_{sc} provided	=	1884.96	mm^2		

Percentage of tension steel provided	p_t	=	1.681	%	Hence O.K
Percentage of compression steel provided	p_c	=	1.681	%	Hence O.K

Check for Shear

Shear		=	241	kN	
Nominal Shear Stress	tv	=	2.15	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	tc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	tc,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		=	150.0		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 @ 150mm c/c spacing

Check For Deflection

Basic Value		=	26		Cl.23.2, IS456:2000
Service Stress in Steel	f_s	=	**220.29**	N/mm^2	
Modification Factor(Tension Reinforcement)	F_1	=	0.93		
Allowable Span/Depth		=	24.18		
Actual Span/Depth		=	7.59		Hence Safe

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Floor Slab Design

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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	=	**150**	mm	
Clear cover	cc	=	**25**	mm	Table 16 Cl.26.4.2 , IS 456 -2000
Effective thickness of slab (d_{eff})	150 - 25 - 5	=	120	mm	
Unit weight of concrete		=	25	KN/m^3	Cl 19.2.1, IS 456-2000
Effective Shorter Span	L_x	=	**5**	m	
Effective Longer Span	L_y	=	**7.7**	m	
Aspect ratio	L_y/L_x	=	1.54	< 2	
Hence designed as Two way slab					Cl D-1.11, IS 456-2000
Edge Conditio	**One Long edge Discontinuous**				

1.0.2 Load Data

Self Weight of Slab	= 0.150 x 25	=	3.750	KN/m^2
Floor finish		=	**1.500**	KN/m^2
Partition Load		=	**0.000**	KN/m^2
Sunken Filling		=	**0.000**	KN/m^2
Imposed Load		=	**3.000**	KN/m^2
Extra Load, (if Any)		=	**0.000**	KN/m^2
Total load		=	8.250	KN/m^2
Design load (Wu) = 1.5 x 8.25		=	**12.375**	KN/m^2

Table 18 Cl 36.4.1 IS 456 -2000

1.0.3 Moment and Shear Calculations

Short Span Direction

a_x for positive moment	1.5	→	0.051		Table 26 Cl D-1.1, IS 456 -2000
	1.75	→	0.059		
	for 1.54	a_x =	0.052		
Positive moment	0.052 x 12.38 x 5 ^2	=	**16.17**	KN-m	
a_x for negative moment	1.5	→	0.067		Table 26 Cl D-1.1, IS 456 -2000
	1.75	→	0.077		
	for 1.54	a_x =	0.069		
Negative momen	0.069 x 12.38 x 5 ^2	=	**21.22**	KN-m	

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Long Span Direction

For positive moment a_y = 0.028 — Table 26 Cl D-1.1, IS 456 -2000

Positive moment 0.028 x 12.38 x 5 ^2 = **8.66** KN-m

For negative moment a_y = 0.037 — Table 26 Cl D-1.1, IS 456 -2000

Negative moment 0.037 x 12.38 x 5 ^2 = **11.45** KN-m

Shear force V = 12.38 x 5 x 1 = **30.94** KN

1.0.4 Check Effective Depth for Max.Bending Moment

Depth required = $(M_u / (0.133 \times fck \times b))^{1/2}$ = 79.89 mm — Table C,SP 16 :1980

Depth provided = 150 - 25 - 10 /2 = 120 mm > ### mm — Cl 2.3

Hence the section is Safe against Bending

1.0.5 Check Depth for Shear

Nominal Shear Stress $t_v = V_u / b d$ = 0.26 N/mm^2 — Cl.40.1, IS 456:2000

Design shear stress (t_c) = 0.46 N/mm^2 — Table 19 , IS 456:2000

k = 1.30 — Cl.40.2.1.1, IS 456:2000

k * t_c = 0.60 N/mm^2

t_v < k * t_c **Hence the section is Safe against Shear**

1.0.6 Check for Maximum Shear Stress:

Nominal Shear Stress $t_v = V_u / b d$ = 0.26 N/mm^2 — Cl.40.1, IS 456:2000

Maximum Shear Stress ($t_{c,max}$) = 3.1 N/mm^2 — Table 20 , IS 456:2000

$t_{c,max}$ = 1.55 N/mm^2

t_v < 1 $t_{c,max}$ **Hence the section is Safe against Max.Shear Stres** — Cl.40.2.3.1, IS 456:200

1.0.7 Reinforcement calculations

Short Span Direction @ Support

$Mu/bd = \frac{21.22 \times 10 \wedge 6}{1000 \times \# \times 120}$ = **1.474**

Pt = **0.37** % — Table 2-4, SP16 :1980

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CL. NO.	DESIGN CALCULATIONS	REFERENCES

Area of steel = 0.0037 x 1000 x 120 = 439 mm^2
Minimum area of 0.001 x 1000 x 150 = #### mm^2 Cl:26.5.2.1
Spacing of # bar 78.54 x 1000 / 438.88 = 179 mm IS 456 -2000

Check for Spacing

Minimum of 1) 3d = 360 mm
2) = 300 mm Cl:26.3.3.(b).1
3) = 178.86 mm IS 456 -2000
Therefore provid # @ **170** mm C/C

Short Span Direction @ Mid Span

$$Mu/bd = \frac{16.17 \times 10 \wedge 6}{1000 \times \# \times 120} = 1.123$$

Pt = 0.273 % SP16 :1980 Table 2-4

Area of steel = 0.0027 x 1000 x 120 = 328 mm^2 IS 456:2000
Minimum area of 0.001 x 1000 x 150 = #### mm^2 Cl:26.5.2.1
Spacing of # bar 78.54 x 1000 / 327.93 = 239 mm

Check for Spacing

Minimum of 1) 3d = 360 mm IS 456:2000
2) = 300 mm Cl:26.3.3.(b).1
3) = 239.38 mm

Therefore provid # @ **150** mm C/C 150
Provided % of Tension Reinforcement (pt) = **0.436** %

Long Span Direction @ Support

$$Mu/bd = \frac{11.45 \times 10 \wedge 6}{1000 \times \# \times 120} = 0.795$$

Pt = 0.190 % SP16 :1980 Table 2-4

Area of steel = 0.0019 x 1000 x 120 = 228 mm^2 IS 456:2000
Minimum area of 0.001 x 1000 x 150 = #### mm^2 Cl:26.5.2.1
Spacing of # bar 78.54 x 1000 / 228.07 = 344 mm

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CL. NO.	DESIGN CALCULATIONS	REFERENCES

Check for Spacing

Minimum of 1) 3d = 360 mm — IS 456:2000
2) = 300 mm — Cl:26.3.3.(b).1
3) = 344.20 mm
Therefore provid # @ **300** mm C/C

Long Span Direction @ mid Span

$Mu/bd = \frac{8.66 \times 10 \wedge 6}{1000 \times \# \times 120} = 0.602$

Pt = 0.142 % — SP16 :1980 Table 2-4

Area of steel = 0.0014 x 1000 x 120 = 171 mm^2 — IS 456:2000
Minimum area of 0.001 x 1000 x 150 = #### mm^2 — Cl:26.5.2.1
Spacing of # bar 78.54 x 1000 / 180.00 = 436 mm

Check for Spacing

Minimum of 1) 3d = 360 mm — IS 456:2000
2) = 300 mm — Cl:26.3.3.(b).1
3) = 436.11 mm
Therefore provid # @ **300** 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) = 0.436 %
Service stress of stee 0.58 fy (Ast_R/Ast_P) = 181.63 N/mm^2 — IS456:2000 Fig 4
Modification Factor for Tension Reinforcen = 1.71 — Page 38
Allowable Span / Effective Depth Ratio = 44.47 — IS 456:2000 Cl:23.2.1
Actual Span/Eff Dept = 5 x 1000 / 120 = 41.67

Hence Safe against Deflection

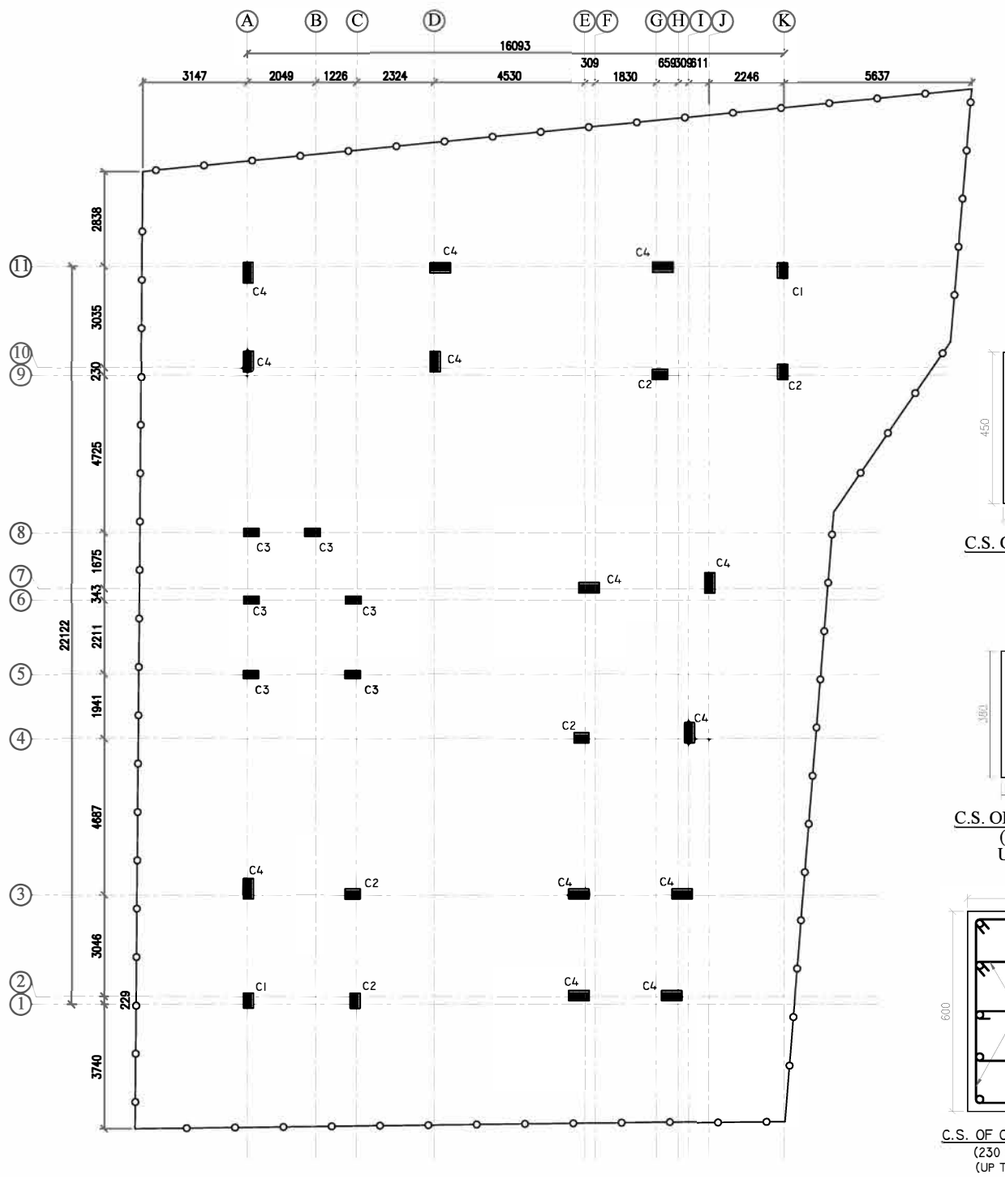
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APPENDIX II

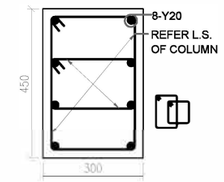
GENERAL ARRANGEMENT DRAWINGS

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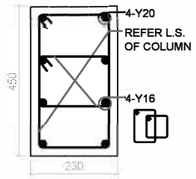
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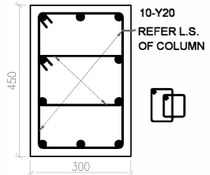
LAYOUT OF COLUMN



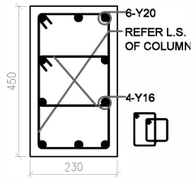
C.S. OF COLUMN "C1"
(300 x 450)
UP TO GFR



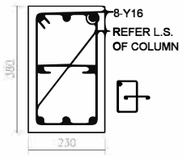
C.S. OF COLUMN "C1"
(230 x 450)
GFR TO TOP



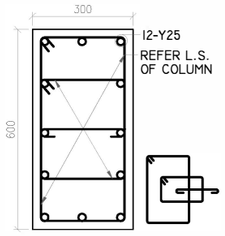
C.S. OF COLUMN "C2"
(300 x 450)
UP TO GFR



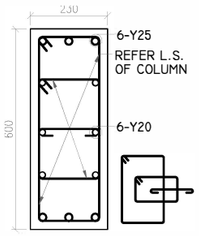
C.S. OF COLUMN "C2"
(230 x 450)
GFR TO TOP



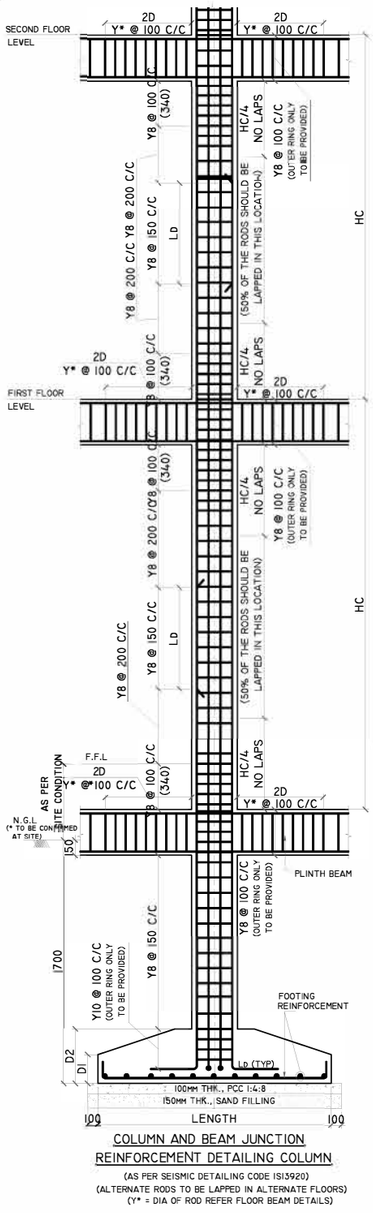
C.S. OF COLUMN "C3"
(230 x 380)
UP TO TOP



C.S. OF COLUMN "C4"
(230 x 600)
(UP TO SFR)



C.S. OF COLUMN "C4"
(230 x 600)
(SFR TO TOP)



COLUMN AND BEAM JUNCTION
REINFORCEMENT DETAILING COLUMN
(AS PER SEISMIC DETAILING CODE IS13920)
(ALTERNATE RODS TO BE LAPPED IN ALTERNATE FLOORS)
(Y* = DIA OF ROD REFER FLOOR BEAM DETAILS)

COLUMN SCHEDULE

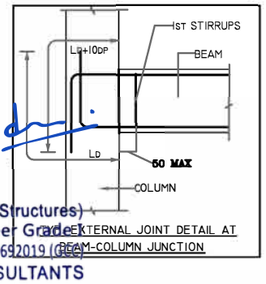
S.NO.	NAME	SIZE	
		UPTO STILT ROOF	STILT ROOF TO TOP
1.	C1	300 X 450	230 X 450
2.	C2	300 X 450	230 X 450
3.	C3	230 X 380	230 X 380
4.	C4	300 X 600	300 X 600

NOTE:

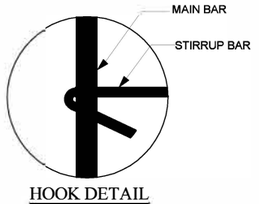
N.G.L - NATURAL GROUND LEVEL.

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

FOR APPROVAL ONLY



EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION



HOOK DETAIL

NOTE:

ISSUE FOR APPROVAL / NOT FIT FOR CONSTRUCTION

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

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

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B) DEVELOPMENT LENGTH FOR BEAM BARS -50D

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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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   A) COLUMN = 40MM
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6. COLUMNS AND FOOTINGS ARE DESIGNED FOR S+5 FLOOR LOADS AND SBC OF THE SOIL IS 150KN/ SQM. @ 1800 BELOW N.G.L.
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8. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL / NOT FIT FOR CONSTRUCTION	J.V	R.M	23.03.26

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT – 18.30M) RESIDENTIAL BUILDING WITH 19 DWELLING UNITS AVAILING PREMIUM FSI AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, CHENNAI 600028, COMPRISED IN R.S.NO.4249/1, BLOCK NO.91 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

DRAWING TITLE :-

LAYOUT & R.C DETAILS OF COLUMN

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 120	--------	001

ARCHITECT / CONSULTANTS :-

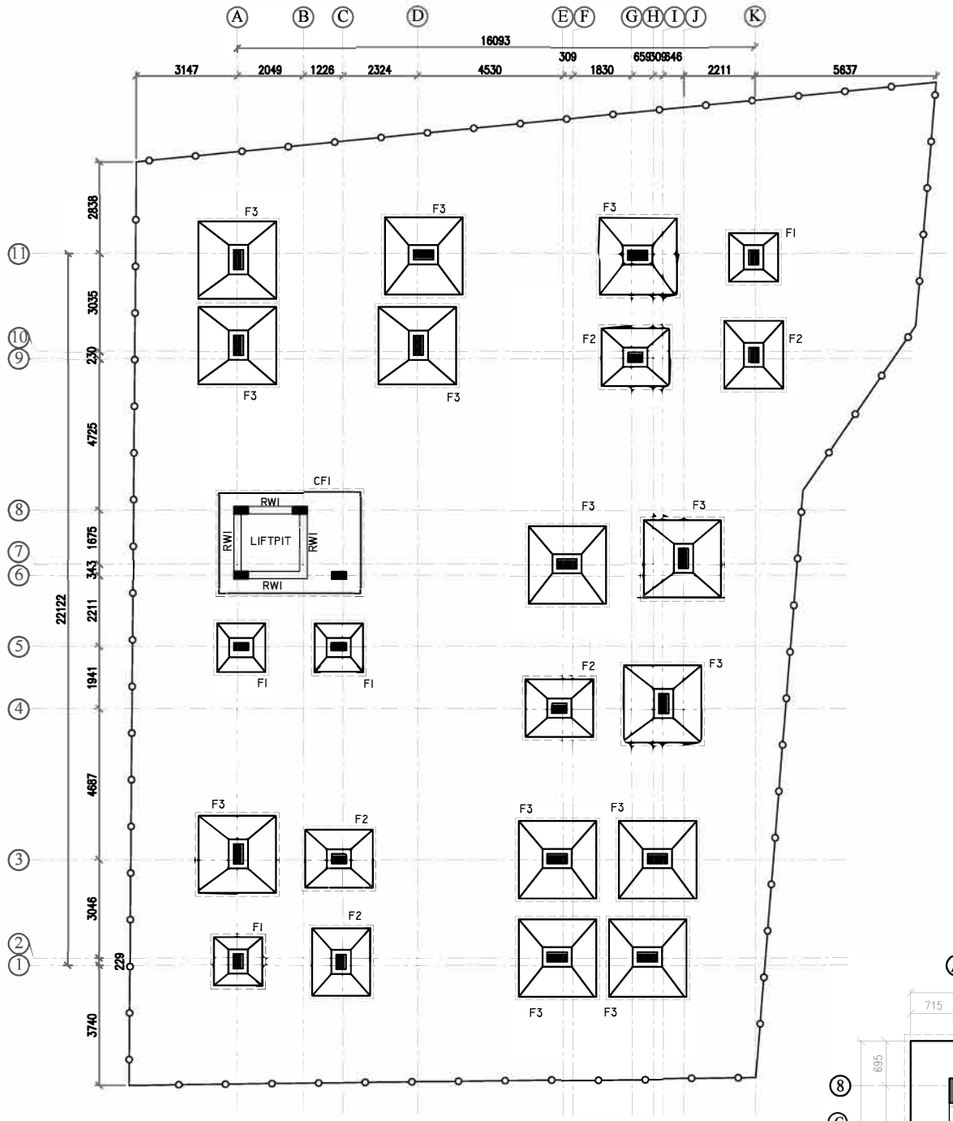
STRUCTURAL CONSULTANTS :-

R. MANIKANDAN, M.Tech.,(Structures)
Registered Structural Engineer Grade-I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (TNSE)
AURA ENGINEERING CONSULTANTS
13/27, 67th Street, R.V. Nagar,
Ashok Nagar, Chennai-600 083.
Ph: 044-48597100 Cell: 9790751378

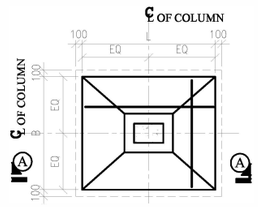
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ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
Engineeering Consultants

A3

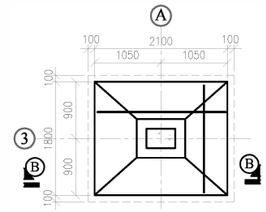
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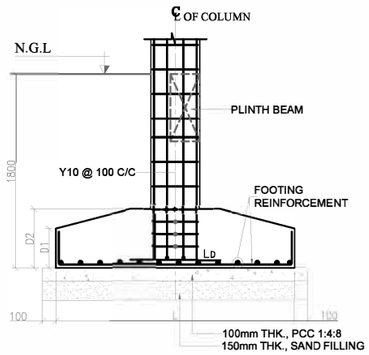
LAYOUT OF FOOTINGS



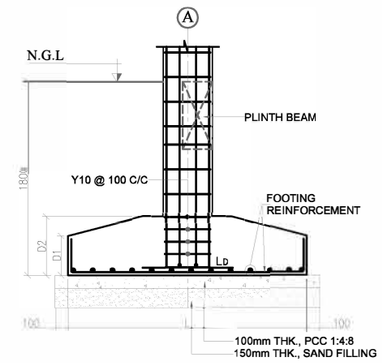
PLAN OF SLOPED FOOTING



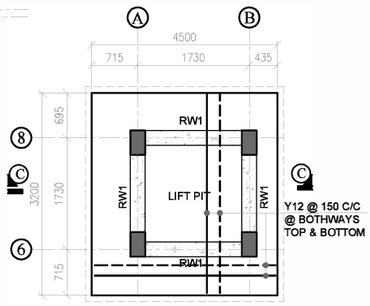
PLAN OF SLOPED FOOTING-F2



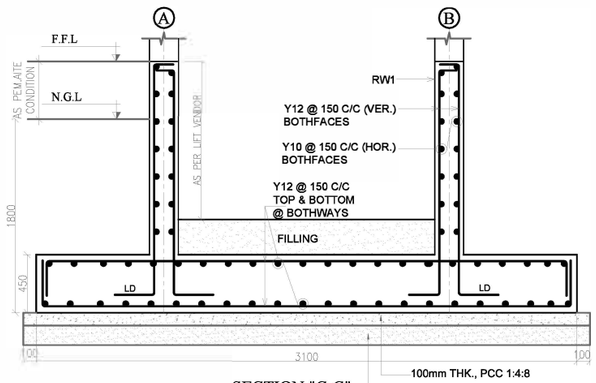
SECTION "A-A"



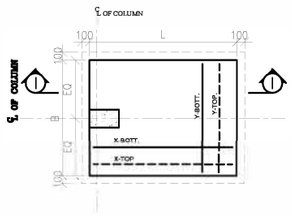
SECTION "B-B"



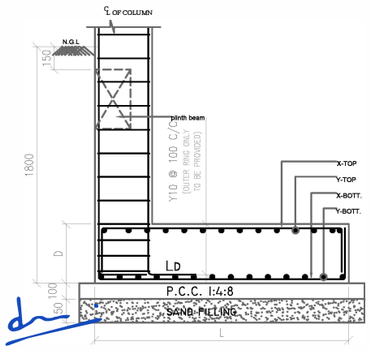
PLAN OF COMBINED FOOTING



SECTION "C-C"



PLAN OF TYPICAL FOOTING



SECTION "1-1"

FOOTINGS SCHEDULE:-

SI.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT
01	F1	1500 X 1500 SLOPED FOOTING D1=250 , D2=450	Y10 @ 150 C/C BOTHWAYS @ BOTTOM
02	F2	1800 X 2100 SLOPED FOOTING D1=300 , D2=550	Y12 @ 150 C/C BOTHWAYS @ BOTTOM
03	F3	2400 X 2400 SLOPED FOOTING D1=300 , D2=550	Y12 @ 150 C/C BOTHWAYS @ BOTTOM

COMBINED FOOTINGS SCHEDULE:-

SI.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT
01	CF1	4500 X 3200 D=600	Y12 @ 150 C/C @ BOTHWAYS TOP & BOTTOM

NOTE:

N.G.L - NATURAL GROUND LEVEL

FOR APPROVAL ONLY

NOTE:

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4. CLEAR COVER FOR REINFORCEMENT
   A) FOOTING = 50MM B) R.C WALL = 25MM
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REV.	DESCRIPTIONS	DRN	CHK	DATE
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DRAWING TITLE :-

LAYOUT & R.C DETAILS OF FOOTING

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 140	---------	002

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

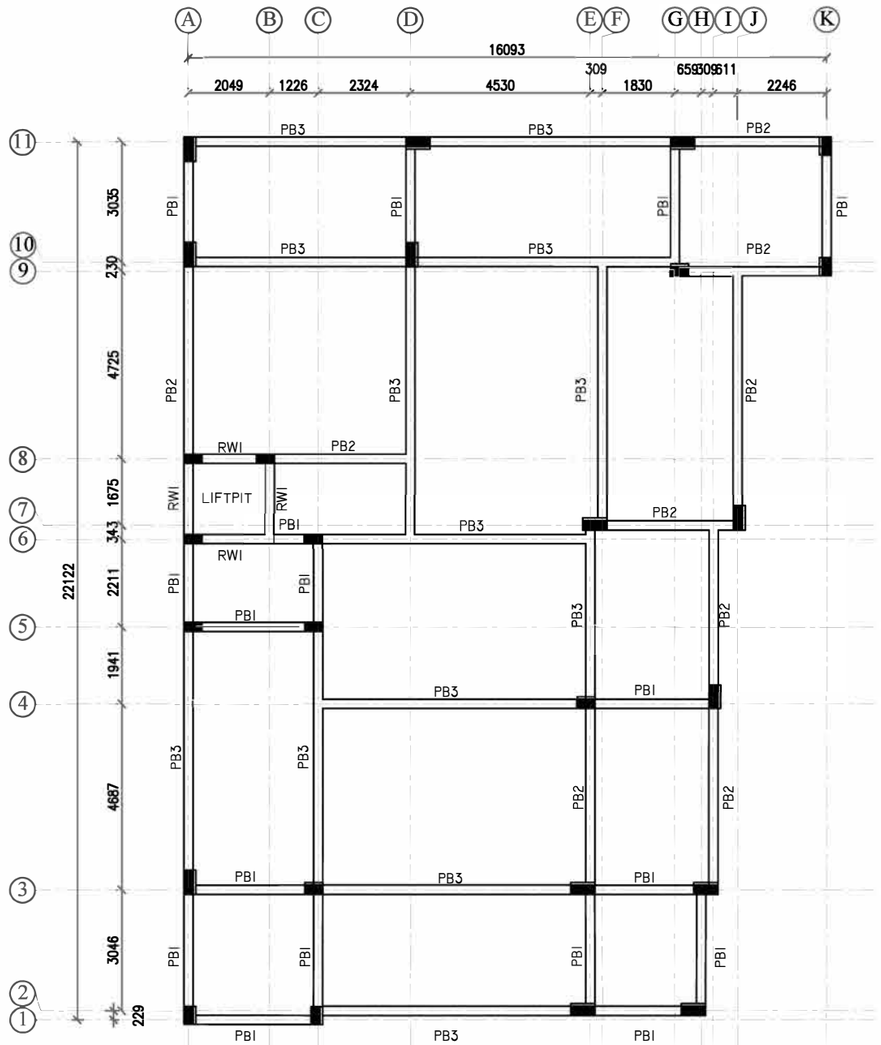
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Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
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http://auraengineers.co.in/
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A3

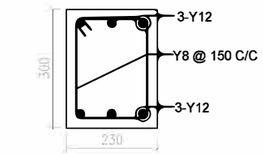
R. MANIKANDAN, M.Tech.,(Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
AURA ENGINEERING CONSULTANTS
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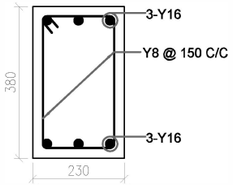
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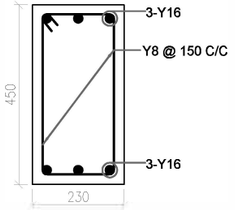
LAYOUT OF PLINTH BEAM



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



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



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

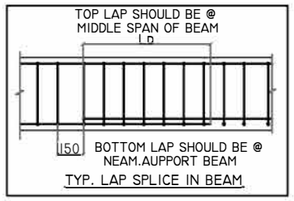
BEAM SCHEDULE

SL.NO	NAME	SIZE
01	PB1	230 x 300
02	PB2	230 x 380
03	PB3	230 x 450

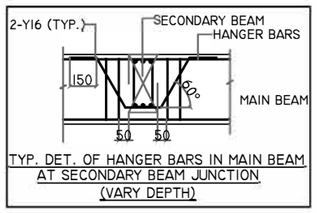
NOTE:

N.G.L - NATURAL GROUND LEVEL.

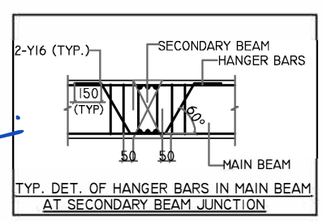
F.F.L - FLOOR FINISH LEVEL



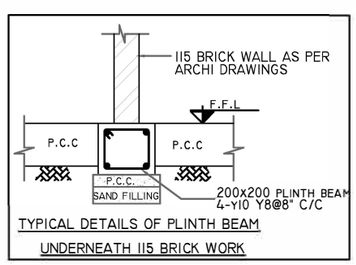
TYP. LAP SPLICE IN BEAM



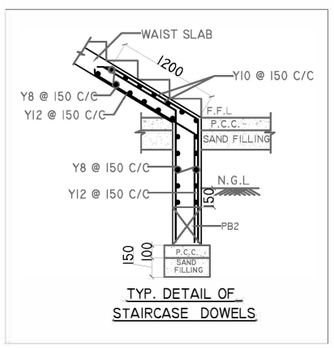
TYP. DET. OF HANGER BARS IN MAIN BEAM
AT SECONDARY BEAM JUNCTION
(VARY DEPTH)



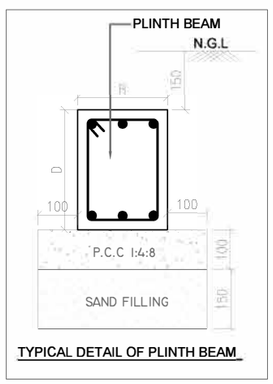
TYP. DET. OF HANGER BARS IN MAIN BEAM
AT SECONDARY BEAM JUNCTION



TYPICAL DETAILS OF PLINTH BEAM
UNDERNEATH 115 BRICK WORK



TYP. DETAIL OF
STAIRCASE DOWELS



TYPICAL DETAIL OF PLINTH BEAM

NOTE:

ISSUE FOR APPROVAL / NOT FIT FOR CONSTRUCTION

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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) R.C WALL = 25MM
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 150KN/ SQM. @ 1800 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

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL / NOT FIT FOR CONSTRUCTION	J.V	R.M	23.03.26

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT – 18.30M) RESIDENTIAL BUILDING WITH 19 DWELLING UNITS AVAILING PREMIUM FSI AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, CHENNAI 600028, COMPRISED IN R.S.NO.4249/1, BLOCK NO.91 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

DRAWING TITLE :-

LAYOUT & R.C DETAILS OF PLINTH BEAM

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 100	--------	003

ARCHITECT / CONSULTANTS :-

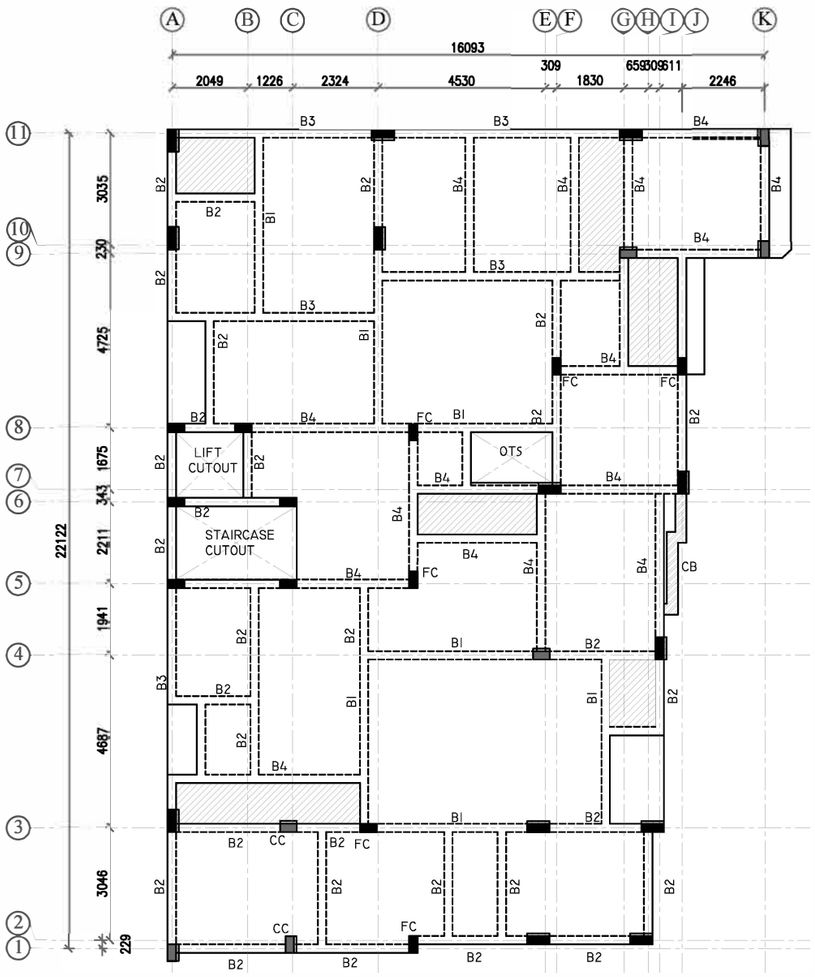
STRUCTURAL CONSULTANTS :-

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Engineering Consultants

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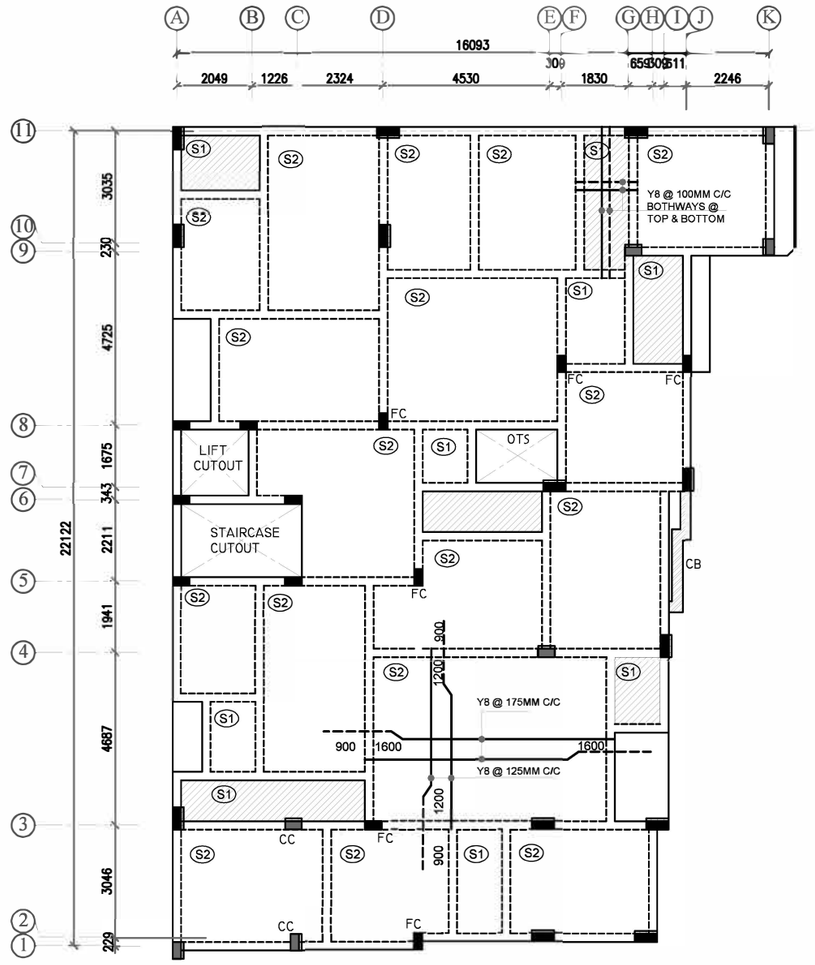
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NUMERATION LAYOUT OF STILT FLOOR

ROOF SLAB & BEAM



R.C LAYOUT OF STILT FLOOR

ROOF SLAB & BEAM

NOTE:

SLAB SUNK BY 0'-10"

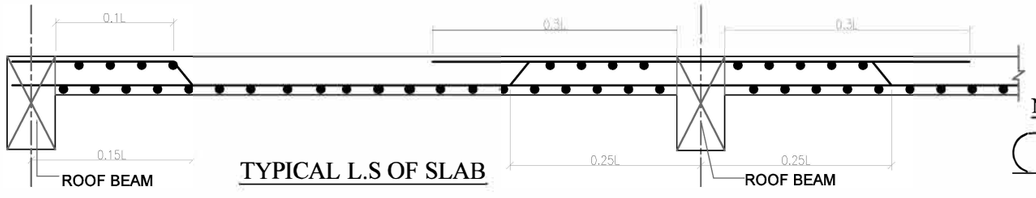
PROVIDE Y8 @ 8" C/C AS DISTRIBUTORS WHERE EVER REQUIRED

FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010

COLUMN CURTAILED TO BE BEND IN TO TOP OF THE SLAB

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	230 x 450
02	B2	230 x 450
03	B3	230 x 530
04	B4	230 x 450

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



TYPICAL L.S OF SLAB

FOR APPROVAL ONLY

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NOTE:

ISSUE FOR APPROVAL / NOT FIT FOR CONSTRUCTION

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 OFI.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

III) DEVELOPMENT LENGTH (LD) SHALL BE AS PER (SP:34-1999) TABLE BELOW:

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B) DEVELOPMENT LENGTH FOR BEAM BARS -50D

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VII) DETAILING OF REBARS SHALL CONFIRM TO IBC

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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 OM.AOFT 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.

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REV.	DESCRIPTIONS	DRN	CHK	DATE
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DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 100	-------	004

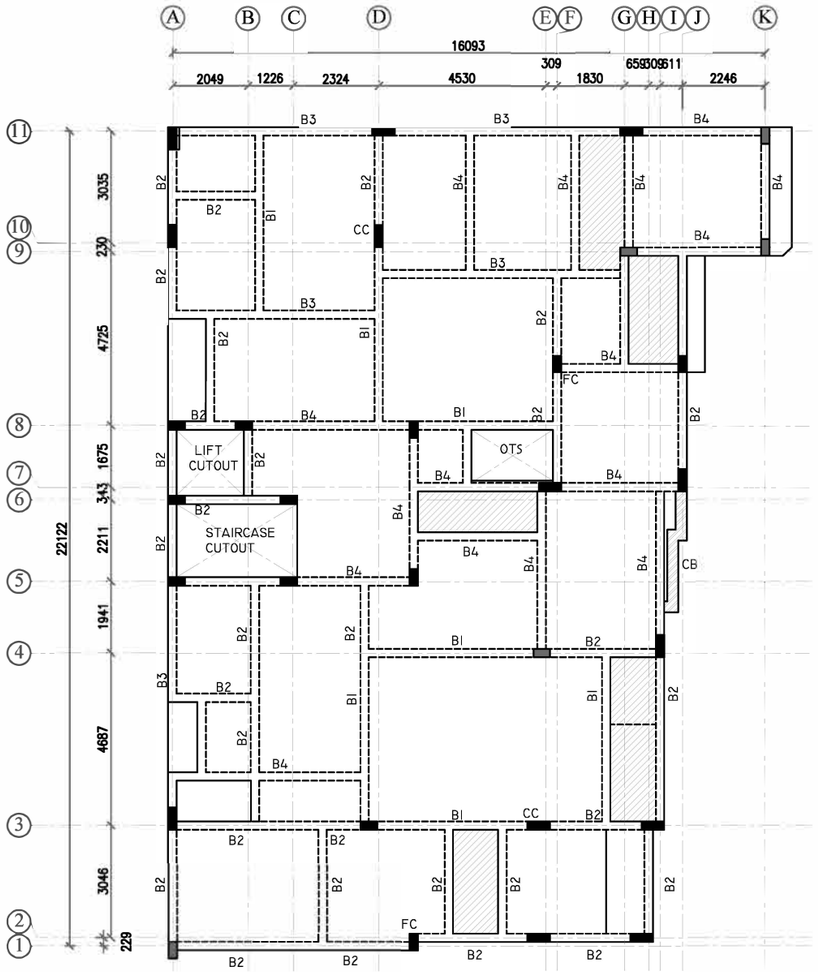
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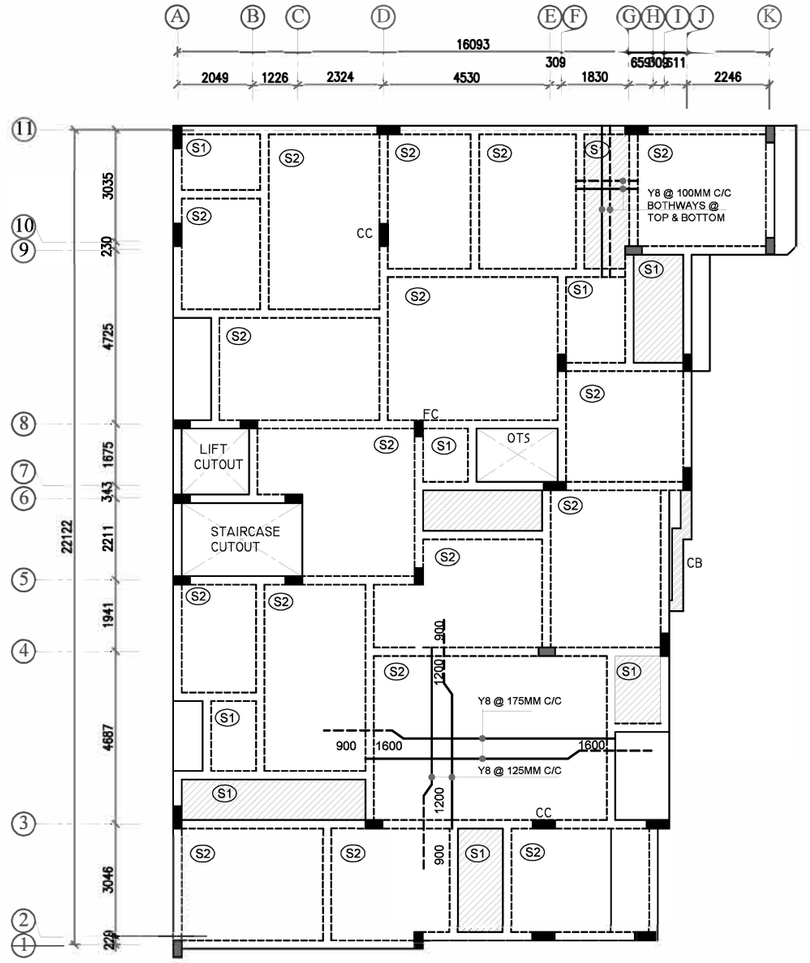
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NUMERATION LAYOUT OF FIRST FLOOR

ROOF SLAB & BEAM



R.C LAYOUT OF FIRST FLOOR

ROOF SLAB & BEAM

NOTE:

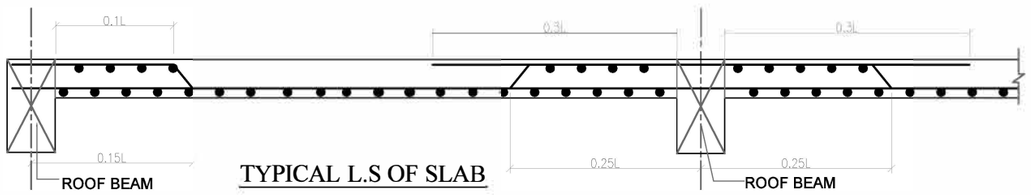
SLAB SUNK BY 0'-10"

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

FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	230 x 450
02	B2	230 x 450
03	B3	230 x 530
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SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	150 THK.
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TYPICAL L.S OF SLAB

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III) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED 0M.40FT 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.

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REV.	DESCRIPTIONS	DRN	CHK	DATE
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DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 100	-------	005

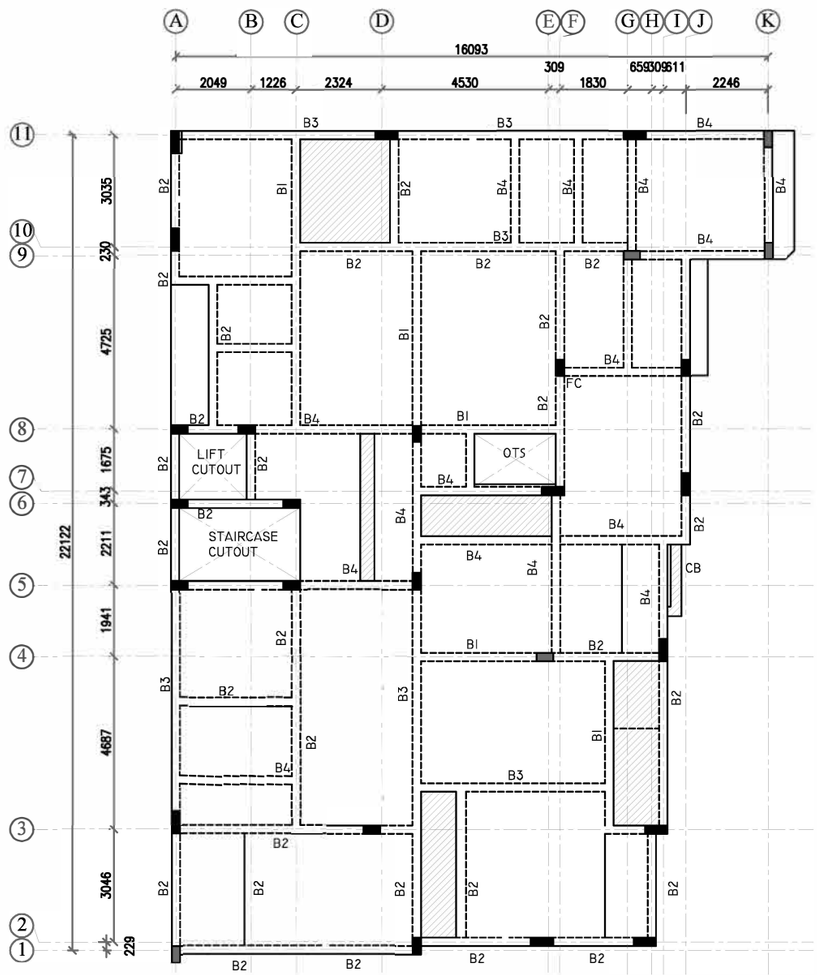
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

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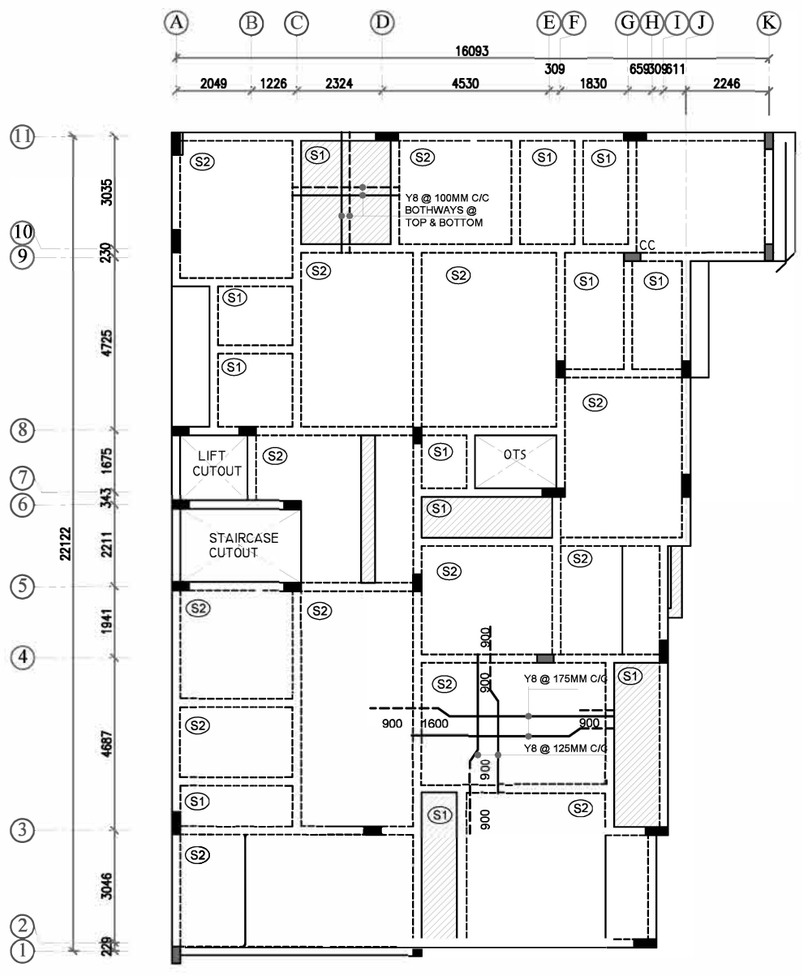
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NUMERATION LAYOUT OF SECOND FLOOR

ROOF SLAB & BEAM



NUMERATION LAYOUT OF SECOND FLOOR

ROOF SLAB & BEAM

NOTE:

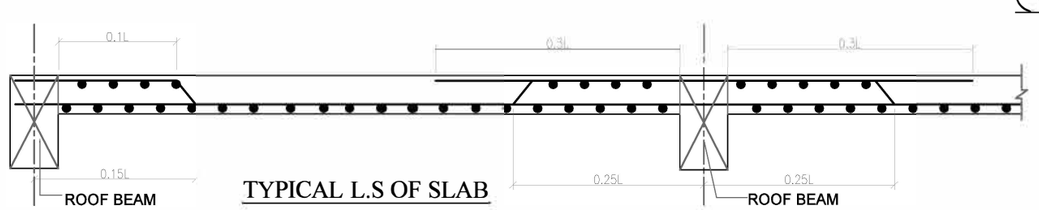
SLAB SUNK BY 0'-10"

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

FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	230 x 450
02	B2	230 x 450
03	B3	230 x 530
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SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	150 THK.
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TYPICAL L.S OF SLAB

R. Manikandan

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DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 100	-------	006

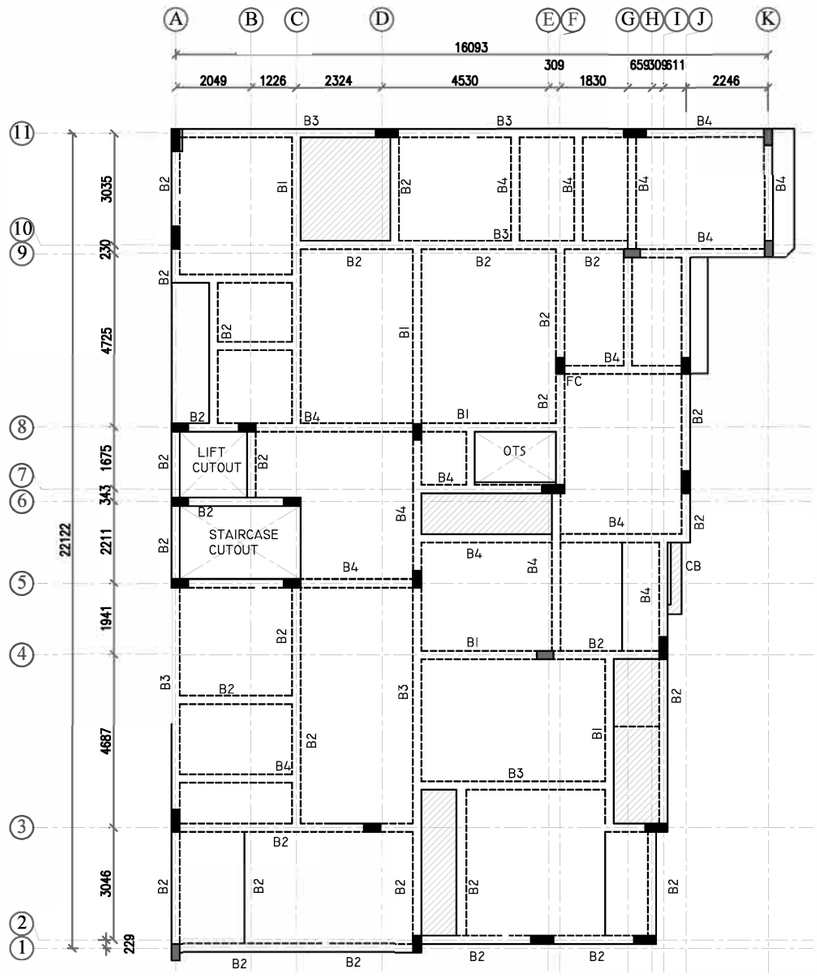
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

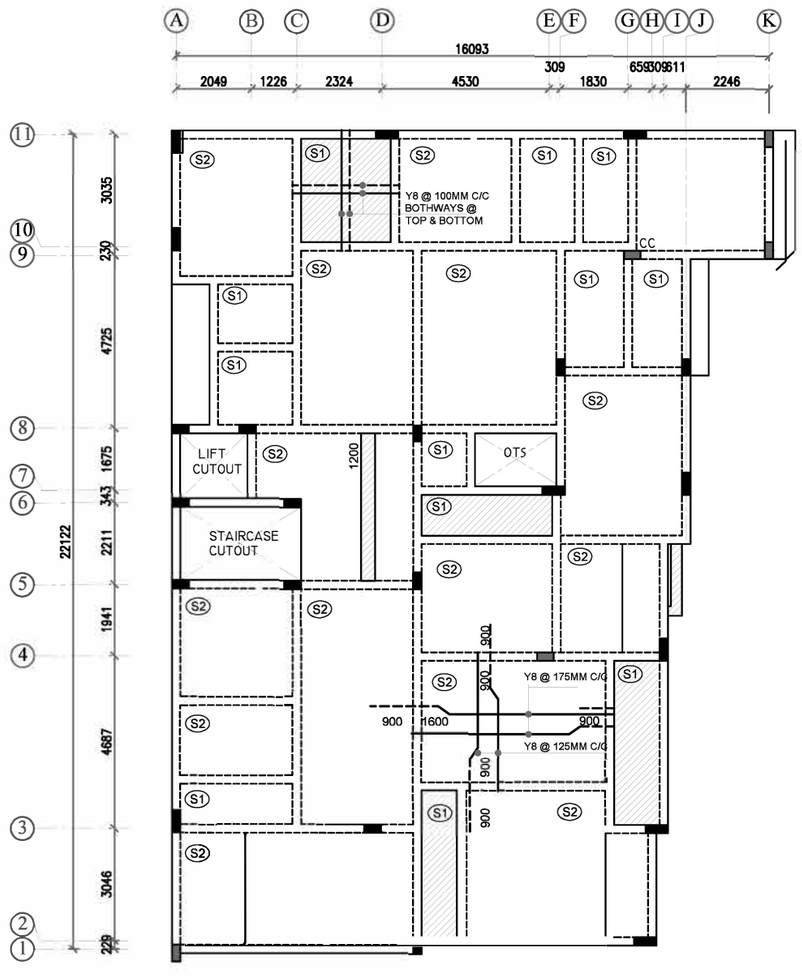
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NUMERATION LAYOUT OF THIRD FLOOR ROOF SLAB & BEAM



NUMERATION LAYOUT OF THIRD FLOOR ROOF SLAB & BEAM

NOTE:

SLAB SUNK BY 0'-10"

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

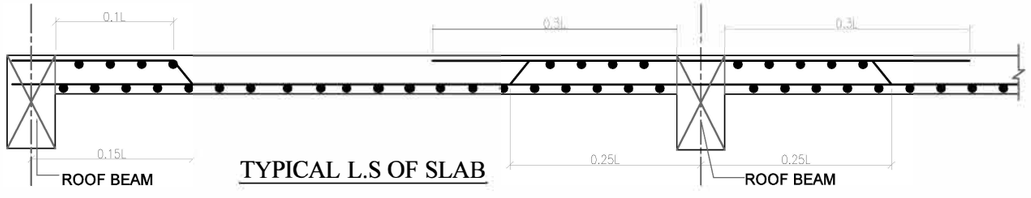
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A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS

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 OM.AOFT 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 (1:1.5:3) 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 / NOT FIT FOR CONSTRUCTION	J.V	R.M	23.03.26

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT – 18.30M) RESIDENTIAL BUILDING WITH 19 DWELLING UNITS AVAILING PREMIUM FSI AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, CHENNAI 600028, COMPRISED IN R.S.NO.4249/1, BLOCK NO.91 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 100	-------	007

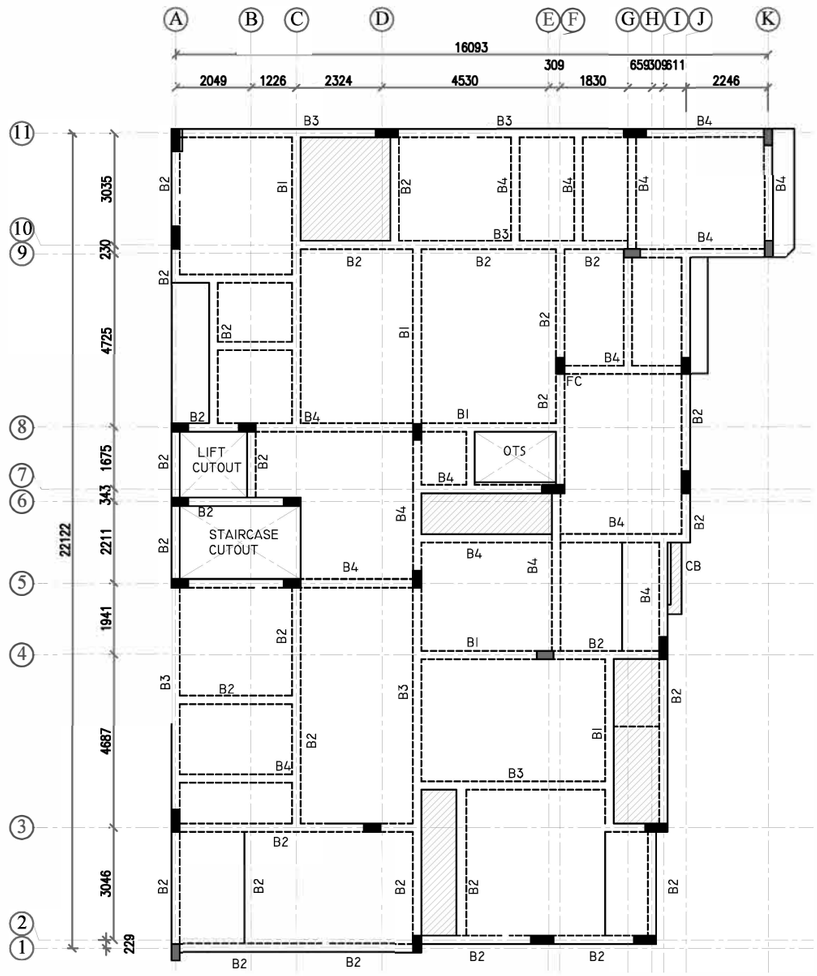
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

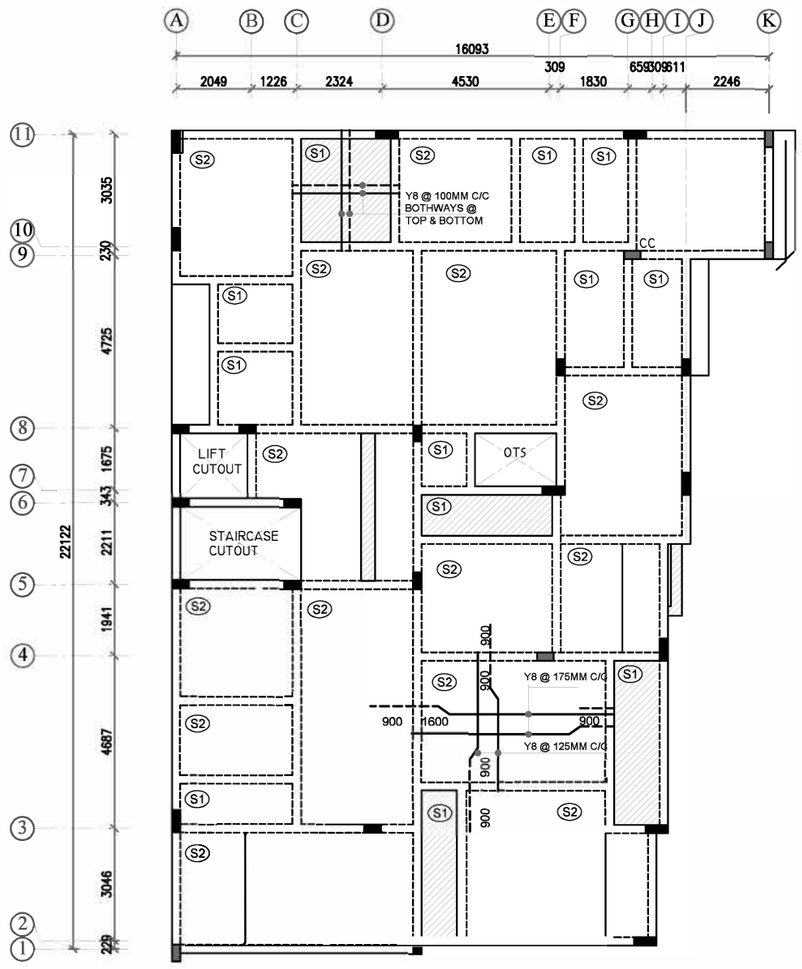
AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue,
ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4859 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

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NUMERATION LAYOUT OF FOURTH FLOOR
ROOF SLAB & BEAM



NUMERATION LAYOUT OF FOURTH FLOOR
ROOF SLAB & BEAM

NOTE:

SLAB SUNK BY 0'-10"

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

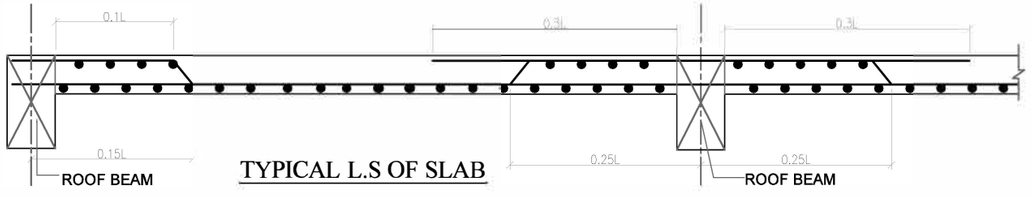
FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010

BEAM SCHEDULE

SL.NO	NAME	SIZE
01	B1	230 x 450
02	B2	230 x 450
03	B3	230 x 530
04	B4	230 x 450

SLAB SCHEDULE

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



TYPICAL L.S OF SLAB

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

NOTE:

ISSUE FOR APPROVAL / NOT FIT FOR CONSTRUCTION

FOR APPROVAL ONLY

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 OFI.3 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

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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 OM.AOFT 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:

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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
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REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR APPROVAL / NOT FIT FOR CONSTRUCTION	J.V	R.M	23.03.26

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT – 18.30M) RESIDENTIAL BUILDING WITH 19 DWELLING UNITS AVAILING PREMIUM FSI AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, CHENNAI 600028, COMPRISED IN R.S.NO.4249/1, BLOCK NO.91 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 100	-------	008

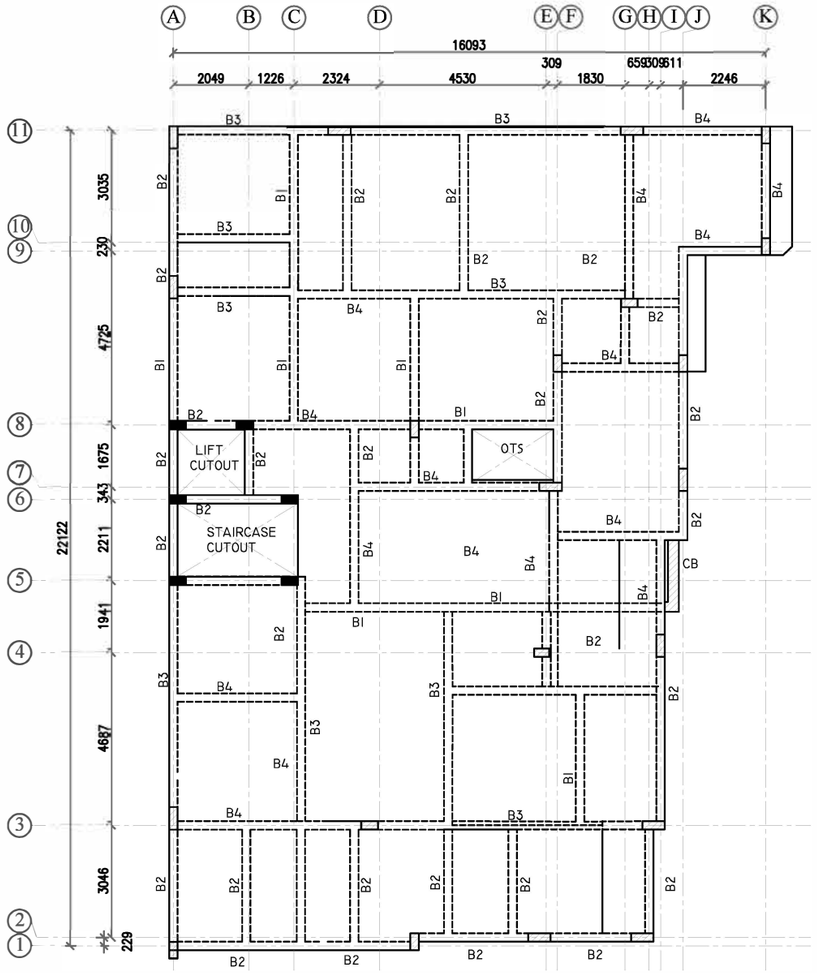
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue,
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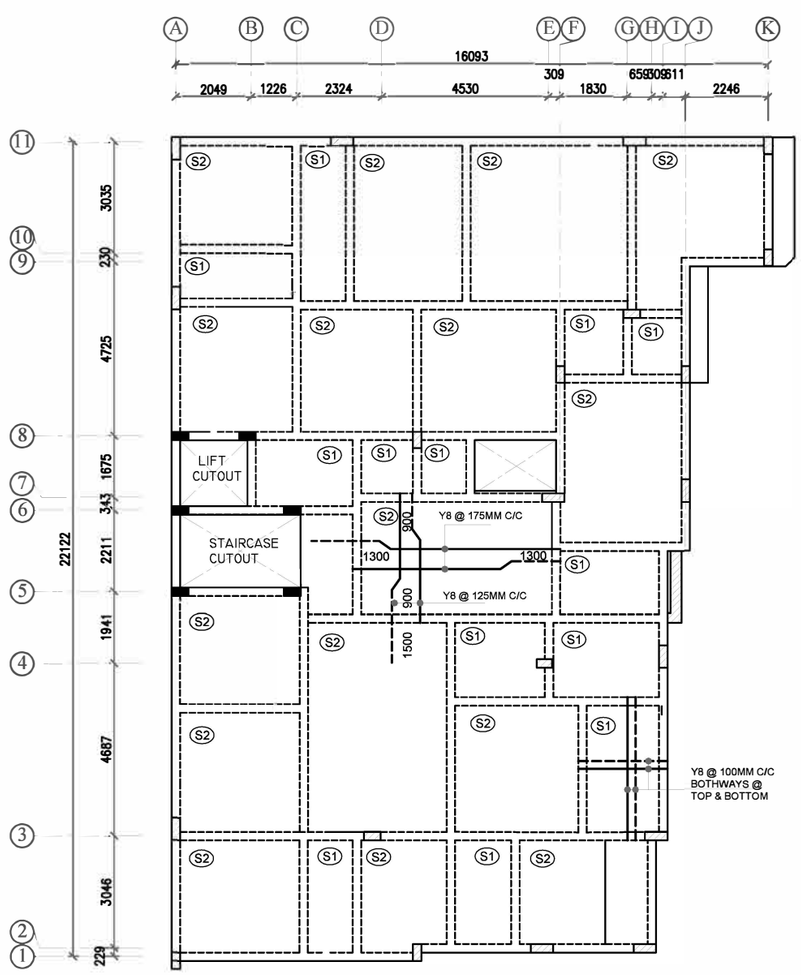
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NUMERATION LAYOUT OF TERRACE FLOOR

ROOF SLAB & BEAM



NUMERATION LAYOUT OF TERRACE FLOOR

ROOF SLAB & BEAM

NOTE:

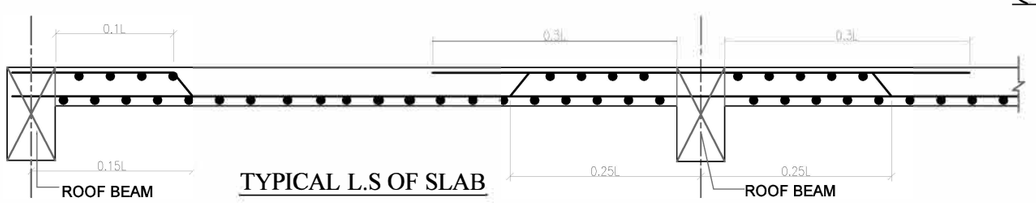
- COLUMN CURTAILED TO BE BEND IN TO TOP OF THE SLAB

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

FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	230 x 450
02	B2	230 x 450
03	B3	230 x 530
04	B4	230 x 450

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



TYPICAL L.S OF SLAB

R. Manikandan

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

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4. CLEAR COVER FOR REINFORCEMENT
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REV.	DESCRIPTIONS	DRN	CHK	DATE
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PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT – 18.30M) RESIDENTIAL BUILDING WITH 19 DWELLING UNITS AVAILING PREMIUM FSI AT 3RD CROSS STREET, OLD DOOR NO.11, NEW DOOR NO.21, R.K NAGAR, MANDAVELI, CHENNAI 600028, COMPRISED IN R.S.NO.4249/1, BLOCK NO.91 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
23.03.26	1 : 100	-------	009

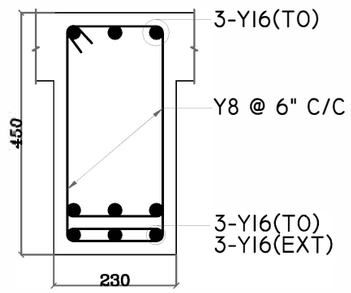
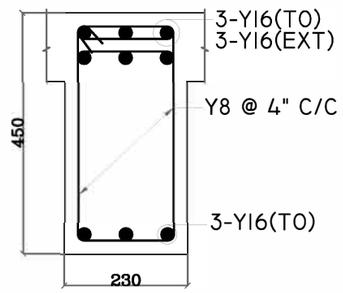
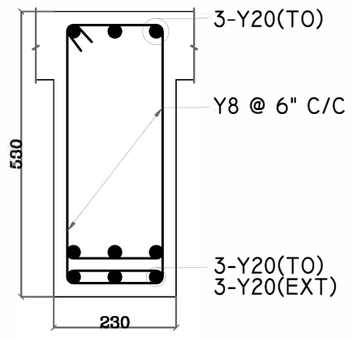
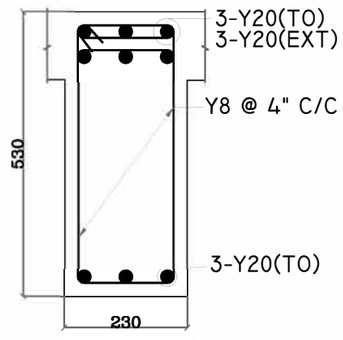
ARCHITECT / CONSULTANTS :-

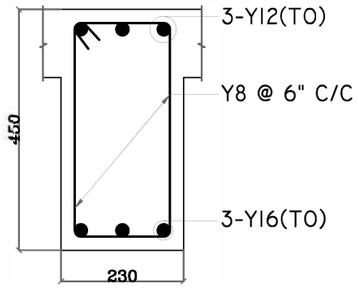
STRUCTURAL CONSULTANTS :-

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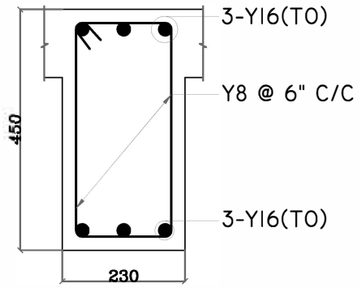
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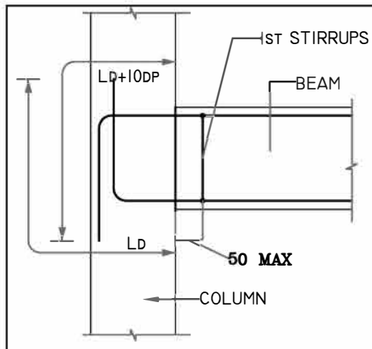
NAME	MID SPAN	END SUPPORT
B1 (230 X 450)		
B3 (230 X 530)		



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



C.S. OF BEAM "B4"
(230 X 450)



TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION

BEAM SCHEDULE

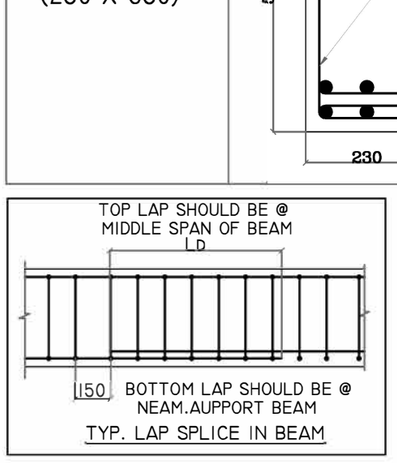
SL.NO	NAME	SIZE
01	B1	230 X 450
02	B2	230 X 450
03	B3	230 X 530
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GENERAL NOTES:

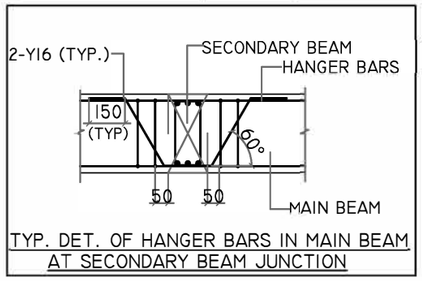
1. ALL DIMENSIONS ARE IN FOOT UNITS.
2. CONCRETE GRADE SHALL BE M25 CONFIRMING TO IS 456:2000
3. GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
4. CLEAR COVER FOR REINFORCEMENT
   A) COLUMN = 1½" B) BEAM = 1"
   C) SLAB = ¾"
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
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DEVELOPMENT LENGTH FOR BEAMS	= 50D

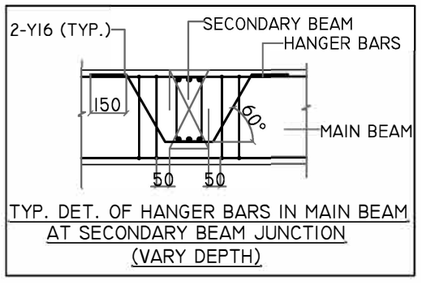
8. DETAILING OF REBARS SHALL CONFIRM TO SP-34 & IS 13920.



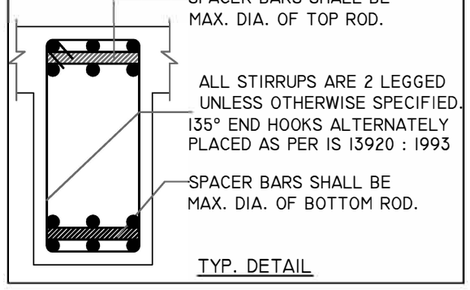
TYP. LAP SPLICE IN BEAM



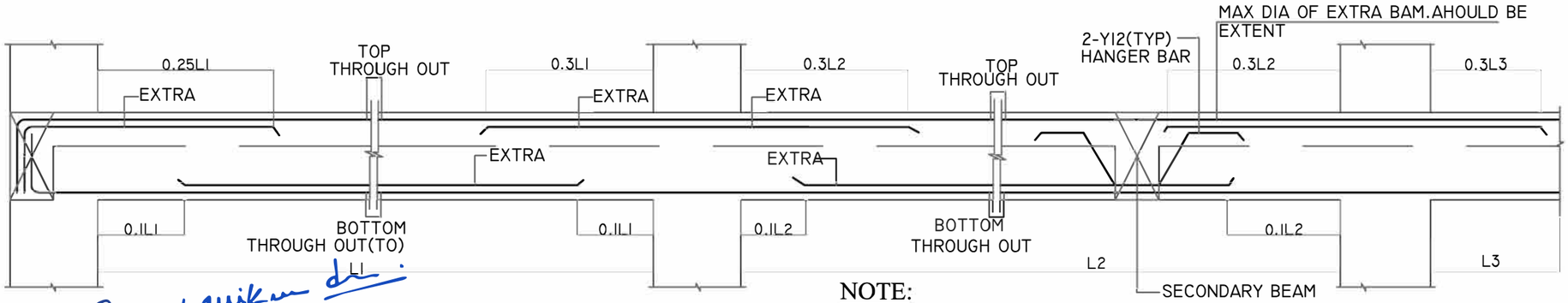
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION



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



TYP. DETAIL



TYPICAL L.S OF ROOF BEAM

NOTE:

ISSUE FOR APPROVAL / NOT FIT FOR CONSTRUCTION

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Registered Structural Engineer Grade I
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REV.	DESCRIPTIONS	DRN	CHK	DATE
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DRAWING TITLE :-

R.C. DETAILS FOR ALL FLOOR BEAMS

DATE	SCALE	JOB.NO	DRG.NO
23.04.26	1 : 130	--------	010

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

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A3

THE LANDLENS SUITE

Eight ways to know a piece of land before you pay for it.

This report covers one part of the picture. These cover the rest, drawn from the same government records, for any property in Tamil Nadu.

LandLens One
Ask anything about a property and get an answer grounded in live government records, with the sources shown.
/landlens/one

Verify My Land
Every record check run on one property and returned as a single report.
/landlens/verify-my-land

Legal Opinion
An advocate's written opinion on the title, built on the records we pull for it.
/landlens

One Map
Every layer on one map: the parcel, its boundary, zoning, water bodies and what sits around it.
/landlens/one/map

PriceMap
What land actually changed hands for around this plot, taken from the registered deeds.
/landlens/pricemap

Build Scope
What you are allowed to build here: floor space, height, coverage and setbacks.
/landlens/build-scope

Property Tracker
Watch a property and hear about it when something new is registered against it.
/landlens/property-tracker

Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
/landlens/deal-room

FREE TOOLS · NO ACCOUNT NEEDED

Twenty-four checks you can run yourself, at no cost.

Records and verification

The registers themselves, read for you.

- Encumbrance Certificate
- Patta and Chitta
- Field Measurement Sketch
- EC Analyzer
- Bank charge check
- Court case search
- Seller background check
- Approval check by survey

Value and duty

What it is worth and what it costs to register.

- Guideline value by street
- Guideline value by survey
- Stamp duty and registration fees
- Capital gains
- Floor space index
- Area unit converter

Zoning and land use

What the plan says can happen on this land.

- Land use zone finder
- CMDA land use check
- Coastal regulation zone
- Master plan check
- Water bodies finder
- Airport height clearance

Registers and directories

Who holds it, and which office keeps the record.

- Find your registering office
- Temple property check
- Waqf property check
- RERA register

Every free tool
/tools

Services we run for you
/services

The LandLens suite
/landlens/one

Verified RealEstate™

Every claim in this document traces back to a government record.

- Legal opinions, due diligence and title verification
- Building plan, layout and sub-division approvals
- Completion and occupancy certificates, regularisation
- Escrow, negotiation and NRI property management
- Land survey, soil testing, architecture and construction

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Prepared from the registers named on the page each finding sits on. Where a register could not be read, this document says so in its place rather than leaving the gap to be read as a clean result.