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DESIGN CALCULATION

THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT - 18.0M) RESIDENTIAL BUILDING WITH 15 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM, CHENNAI 600091 COMPRISED IN S.NO.168/20, 168/22 & 168/25 OF MADIPAKKAM VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION ZONE : 14, DIVISION NO: 187.

STRUCTURAL CONSULTANTS:-

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*Structural Design Calculation for Construction of RESIDENTIAL BUILDING(S+05) AT
PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET
AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM*

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Structural Stability Certificate

Project Name : Residential Building Stilt+05—Madipakkam Village

Location : The proposed construction of Stilt floor + 5 floors (Height – 18.0m)
Residential Building with 15 Dwelling Units availing Premium FSI at
Plot No.5, 6 & 7, Madurakali Nagar, Karthikeyapuram 2nd Cross
Street and Deivanai Nagar 4th Street, Madipakkam, Chennai 600091
comprised in S.No.168/20, 168/22 & 168/25 of Madipakkam Village
within the Limits of Greater Chennai Corporation ZONE : 14,
DIVISION NO: 187.

Type of structure : R.C.C FRAMED STRUCTURE - Stilt+05

This is to certify that the proposed construction of the Residential building

- The structure is designed and constructed for minimum grade of For Concrete M25 and for steel Fe500
- The structure is analyzed and designed to resist the Dead and Live Load
- The loading is taken as per the requirements of Code of practice IS-875
- The design of the Structure is done as per the latest code IS-456 & IS-1893.

We have designed the structural members and details are issued, with latest STAAD model created by us.

Accordingly , we hereby issue the '**Structural Stability Certificate**'

Accordingly , we hereby issue the Structure is "**Sound and Safe**".


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CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
 'Thalamuthu Natarajan Building', No.1, Gandhi Irwin Road,
 Egmore, Chennai-600 008.

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru. R.MANIKANDAN** has enrolled as **Registered Structural Engineer Grade-I (SE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **M.Tech., (Structural Engg.)** and experience in the relevant field for **5 years**.

He has been given the Registration No.**SE/GR-I/19/06/154** on **10.06.2019**. He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part-V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. dated 04.02.2019.

This Registration is valid upto **09.06.2024**.



N. Muniprasad
 10.6.19

N. MUNIPRASAD
 ASSISTANT PLANNER
 CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
 CHENNAI - 600 008.

R. Manikandan

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Structural Design Calculation for Construction of RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM

1.0 DESIGN BRIEF:

THIS DOCUMENT THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT – 18.0M) RESIDENTIAL BUILDING WITH 15 DWELLING UNITS AVAILING PREMIUM FSI AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM, CHENNAI 600091 COMPRISED IN S.NO.168/20, 168/22 & 168/25 OF MADIPAKKAM VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION ZONE : 14, DIVISION NO: 187.

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 : 8.70X7.10M
2. Height of the building : 12.00M
3. Number of storeys above GL : Stilt Floor +5 upper floors
4. Floor to floor height of this building : Ground and First floors - 3.0m
: Typical floor – 3.0m
5. Type of foundation : Isolated foundation as per geotechnical report

2.2. Materials Used

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

For Concrete Structure

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

2.3. Design Codes & Standards

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

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

3.0 LOADING

Primary Load:

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

3.1. Dead load (DL)

Material weight

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- Density of Concrete = 25 kN/m³
- D.L. due to partitions
(Light Partition as per IS 875) = 1.50 kN/m²
- D.L. due to floor finish 50mm thick = 0.05x25 = 1.25 kN/m²

3.2. Live load (LL)

Minimum Uniformly Distributed Live Loads:

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

3.5 Loading Combinations

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

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

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

- 1.0(DL +LL)

4.0 STRUCTURAL MATERIAL:

4.1 Concrete Material Specifications:

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

4.2 Reinforcement:

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

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

4.4 Concrete cover:

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

- Raft Slab = 50mm
- Footing = 50mm

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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

					Page 1 of 2		
PROJECT	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM			DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE	Design for a Short Column with B axial Bending			REVISION	DATE	CHECKED	DATE
CL. NO.	DESIGN CALCULATIONS					REFERENCES	
1.0	Column No:						

PROJECT	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE	Design for a Short Column with Biaxial Bending	REVISION	DATE	CHECKED	DATE
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 $p = 2.00$ $p / f_{ck} = 0.080$ $p_u / f_{ck} B D = 0.231$ Reinforcement distributed equally on four sides 4 $M_{ux1} / f_{ck} B D^2 = 0.137$ $M_{uy1} / f_{ck} B D^2 = 0.119$ Moment carrying capacity about X axis $M_{ux1} = 207.89 \text{ kN.m}$ Moment carrying capacity about Y axis $M_{uy1} = 120.61 \text{ kN.m}$			Chart 43 - 46 SP 16 : 1980	
6.0	Calculation of P_{uz} $P_{uz} = 0.45 f_{ck} A_c + 0.75 f_y A_{sc} = 2500.88 \text{ kN}$ $P_u / P_{uz} = 0.312$ $\alpha_n = 1.186$			CI 39.6 , IS456:2000 CI 39.6 , IS456:2000	
7.0	Criteria for Biaxial Bending (Bresler's Formulation) $(M_{ux}/M_{ux1})^{\alpha_n} + (M_{uy}/M_{uy1})^{\alpha_n} = 0.603 < 1$ Hence Safe			CI 39.6 , IS456:2000	
8.0	Longitudinal Reinforcement Area of compression Steel $A_{sc,reqd} = 2700 \text{ mm}^2$ 10 Nos Y20 + Nos Y20 $A_{sc,pro} = 3142 \text{ mm}^2$				
8.1	Check for Minimum & Maximum Area of Steel Minimum Area of steel (0.8 % of A_g , dir) $= 441 \text{ mm}^2$ (Based on the area of concrete reqd to resist direct stress) Maximum Area of steel (4 % of A_g) $= 5400 \text{ mm}^2$ 441 < 3142 < 5400 mm² Area of Steel is with in the permissible limit ; Hence O.K			CI 26.5.3.1 a & b , IS 456 : 2000	
9.0	Transverse Reinforcement				
9.1	Diameter of Transverse Reinforcement $= 8 \text{ mm} \geq 6 \text{ mm}$			CI 26.5.3.2 c 2) ,	
9.2	Spacing of Lateral Ties : i) Least Lateral Dimension of the column $= 300 \text{ mm}$ ii) 16 times the Smallest dia of Longitudinal Steel $= 320 \text{ mm}$ iii) Req'd. Spacing of Ties (Minimum of the above) $= 300 \text{ mm}$ Provide 8 mm dia Lateral Ties @ 300 mm Spacing Provide closer spacing on either side of the column above and below beam / slab.			CI 26.5.3.2 c 1) , IS 456 : 2000	

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Footing Design

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Design of Isolated Footing

F3

Node :

38

Basic Data:

Net Safe Bearing Capacity	150 kN/m ²
Unit weight of Soil	18 kN/m ³
Unit weight of Concrete	25 kN/m ³
Grade of Concrete	25 N/mm ²
Grade of Steel	500 N/mm ²
Clear Cover to Reinforcement	50 mm
Earth Fill above FGL	0 mm
Base Area of Footing	3.78 m ²
I _{xx}	1.02 m ⁴
I _{zz}	1.39 m ⁴
Weight of Footing	47.25 kN
Weight of soil	98.42 kN

Gross Bearing Pressure Calculation (kN/m²)

Critical Load Combinations	P _{max}	P _{min}
200	157.58	157.5833333
0	38.54	38.54

Gross SBC (w/o increase) 186 kN/m²

Hence

Factored Net Upward Pressure Calculation

Load Factor for Design 1.5

Critical Load Combinations	P _{max}	P _{min}
200	178.57	178.5714286
0	0.00	0.0

Dsgn.(+ve) BM abt. X-axis M _{ux}	50.22 kN.m
Dsgn.(+ve) BM abt. Z-axis M _{uz}	60.77 kN.m
Dsgn.(-ve) BM abt. X-axis M _{ux}	0.00 kN.m
Dsgn.(-ve) BM abt. Z-axis M _{uz}	0.00 kN.m

Provided Eff. depth for M_{ux} 432.00 mm

Provided Eff. depth for M_{uz} 444.00 mm

M_{u,lim} 621 kN.m

Depth provided is

OK

Bottom Reinforcement

Ast Required for M _{ux}	270.6 mm ²
Ast Required for M _{uz}	319.2 mm ²
Min. Ast Reqd.	600 mm ²

Bottom Reinforcement

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

Ast Provided

754

Ast Required

600.0 mm²

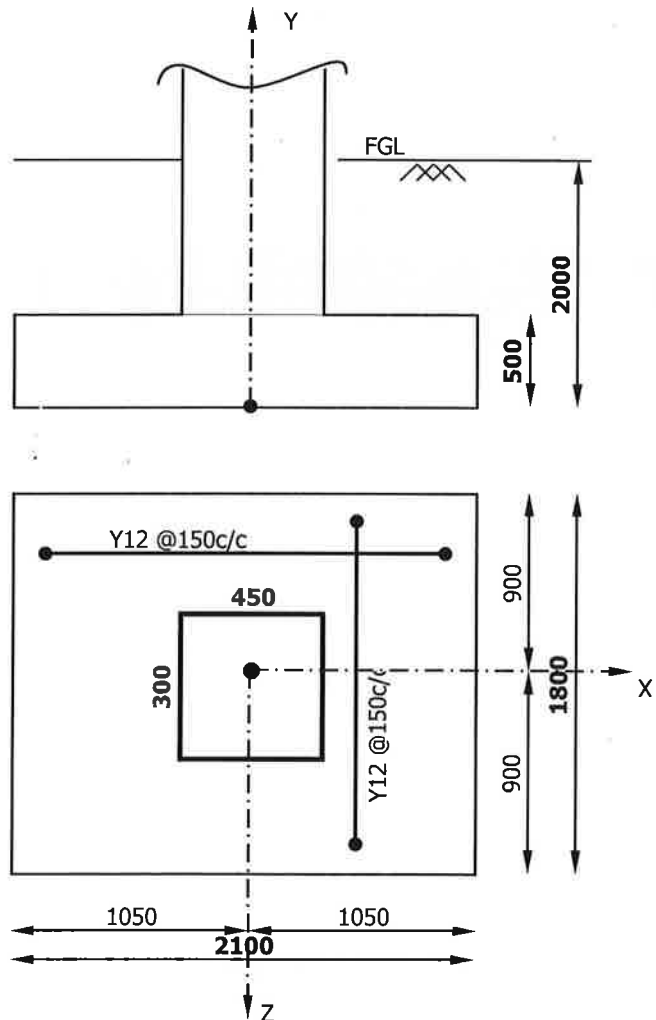
Hence

600.0 mm²

OK

Top Reinforcement

Ast Required for M _{ux}	0.00 mm ²
Ast Required for M _{uz}	0.00 mm ²
Min. Ast Reqd.	Not Reqd. mm ²



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Design of Isolated Footing	F3	Node :	38	
Check For Flexural / Oneway Shear				
	Actual	Allowable		
Shear Stress (Plane II to X)	0.131	0.311	N/mm ²	Hence OK
Shear Stress (Plane II to Z)	0.153	0.308	N/mm ²	Hence OK
Check For Punching / Twoway Shear				
Allowable Shear Stress			1.25 N/mm ²	
Actual Shear Stress			0.46 N/mm ²	Hence OK
Check For Overturning				
Co-efficient of friction	=	0.57		
Factor of safety for overturning, sliding	=	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	=	98.42 kN		
Total downward Load	=	595.67 kN		
Stabilizing moment along X-Dir	=	595.67	1.05	
	=	625.45 kNm		
Actuating moment, M _{zz}	=	0.00 kNm		
Factor of Safety (Along X-Dir)	=	625.45 / 0.0		
		> 1.40		Hence OK
Check For Sliding				
Resistance against Sliding	=	339.5291 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)	=	339.5 / 2.5		
		133.67 > 1.40		Hence OK
Factor of Safety (Along Z-Dir)	=	339.5 / 5.3		
		64.06 > 1.4		Hence OK


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Plinth Beam Design

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TITLE		REVISION		DATE		CHECKED	DATE																																			
						RMK																																				
CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES																																				
1.1	Geometry 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 $\Phi = 25$ mm Nominal Cover $cc = 30$ mm Effective Depth $d = 337.5$ mm Effective Cover = 42.5 mm Effective Span of beam $l_{eff} = 4500$ mm Concrete grade = M 25 Steel Grade = Fe 500 $p_{t,min} = 0.944$ % $p_{t,min} = 0.170$ % $p_t \& p_{c,max} = 4.00$ %					IS 456:2000 Table 19 IS 456:2000 CI 23.0 IS 456:2000 CI 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 $M_{u,lim} = 0.133 f_{ck} b d^2 = 87.11$ kNm																																									
1.4	Area of Steel Minimum Area of Steel = 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 $p_c = 0$ % 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																																									
	<table border="0"> <thead> <tr> <th></th> <th colspan="2">I st Layer</th> <th colspan="2">II nd Layer</th> </tr> <tr> <th></th> <th>Nos</th> <th>Dia</th> <th>Nos</th> <th>Dia</th> </tr> </thead> <tbody> <tr> <td>Tension Reinforcement</td> <td>3</td> <td>16</td> <td></td> <td></td> </tr> <tr> <td></td> <td colspan="2">$A_{st, provided} =$</td> <td colspan="2">603.19 mm²</td> </tr> <tr> <td></td> <td>Nos</td> <td>Dia</td> <td>Nos</td> <td>Dia</td> </tr> <tr> <td>Compression Reinforcement</td> <td>3</td> <td>16</td> <td>0</td> <td></td> </tr> <tr> <td></td> <td colspan="2">$A_{sc, provided} =$</td> <td colspan="2">603.19 mm²</td> </tr> </tbody> </table>						I st Layer		II nd Layer			Nos	Dia	Nos	Dia	Tension Reinforcement	3	16				$A_{st, provided} =$		603.19 mm ²			Nos	Dia	Nos	Dia	Compression Reinforcement	3	16	0			$A_{sc, provided} =$		603.19 mm ²			
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	Nos	Dia	Nos	Dia																																						
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	Nos	Dia	Nos	Dia																																						
Compression Reinforcement	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																																									

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	Check for Shear Shear = 149 kN Nominal Shear Stress $\tau_v = 1.92$ N/mm² Permissible Shear Stress $\tau_c = 0.92$ N/mm² Maximum Shear Stress $\tau_{c,max} = 2.5$ N/mm² 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 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 $A_{st reqd} = 131.96$ mm² Required Area of compression steel $A_{sc reqd} = 0$ mm² Detail of bars <table><tr><td></td><td colspan="2">I st Layer</td><td colspan="2">II nd Layer</td></tr><tr><td></td><td>Nos</td><td>Dia</td><td>Nos</td><td>Dia</td></tr><tr><td>Tension Reinforcement</td><td>3</td><td>16</td><td>0</td><td>0</td></tr><tr><td></td><td colspan="4">$A_{st provided} = 603.1858$ mm²</td></tr><tr><td></td><td>Nos</td><td>Dia</td><td>Nos</td><td>Dia</td></tr><tr><td>Compression Reinforcement</td><td>3</td><td>16</td><td>0</td><td>0</td></tr><tr><td></td><td colspan="4">$A_{sc provided} = 603.19$ mm²</td></tr></table> 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 $\tau_v = 1.92$ N/mm² Permissible Shear Stress $\tau_c = 0.92$ N/mm² Maximum Shear Stress $\tau_{c,max} = 2.5$ N/mm² 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				I st Layer		II nd Layer			Nos	Dia	Nos	Dia	Tension Reinforcement	3	16	0	0		$A_{st provided} = 603.1858$ mm ²					Nos	Dia	Nos	Dia	Compression Reinforcement	3	16	0	0		$A_{sc provided} = 603.19$ mm ²				CI 40.1, IS456:2000 $\beta = 1.000$ Table 19, IS456:2000 Table 20, IS456:2000 CI 40.4, IS456:2000 CI 26.5.1.5, IS456:2000
	I st Layer		II nd Layer																																				
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*Structural Design Calculation for Construction of RESIDENTIAL BUILDING(S+05) AT
PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET
AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM*

Floor Beam Design

PROJECT	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM	DOCUMENT. NO.	DATE	DESIGNED	DATE																																			
				RMK																																				
TITLE		REVISION	DATE	CHECKED	DATE																																			
				RMK																																				
CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES																																				
1.1	<u>Geometry Data</u> Beam Number = B3 Type of Beam = Rectangular Beam Support Condition = Continuous Beam Width of beam b = 300 mm Overall Depth of Beam D = 525 mm Dia of bar ϕ = 25 mm Nominal Cover cc = 30 mm Effective Depth d = 482.5 mm Effective Cover = 42.5 mm 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 % P_t & $P_{t,max}$ = 4.00 %			IS 456:2000 Table 19 IS 456:2000 Cl 23.0 IS 456:2000 Cl 26.5.1.1																																				
1.2	<u>Force Input</u> Left negative moment (Support 1) = 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	<u>Limiting Moment</u> $M_{ultim} = 0.133 f_{ck} b d^2 = 232.22$ kNm																																							
1.4	<u>Area of Steel</u> Minimum Area of Steel = $0.17\% b d = 246.075$ mm ²																																							
	<u>Support 1</u> 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	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM	DOCUMENT. NO.	DATE	DESIGNED	DATE																																													
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CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES																																														
	<u>Check for Shear</u> Shear = 241 kN Nominal Shear Stress $\tau_v = 1.66$ N/mm ² Permissible Shear Stress $\tau_c = 0.92$ N/mm ² Maximum Shear Stress $\tau_{c,max} = 2.5$ N/mm ² Diameter of the Stirrup bar = 8 mm Number of Legs = 2 Spacing of Shear reinforcement Required = 190.0 Maximum Spacing of Shear Reinforcement = 300 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 <u>Detail of bars</u> <table><tr><td></td><td colspan="2">I st Layer</td><td colspan="2">II nd Layer</td></tr><tr><td></td><td>Nos</td><td>Dia</td><td>Nos</td><td>Dia</td></tr><tr><td>Tension Reinforcement</td><td>3</td><td>20</td><td>3</td><td>20</td></tr><tr><td></td><td colspan="4">$A_{st provided} = 1884.956$ mm²</td></tr><tr><td></td><td>Nos</td><td>Dia</td><td>Nos</td><td>Dia</td></tr><tr><td>Compression Reinforcement</td><td>3</td><td>20</td><td>3</td><td>20</td></tr><tr><td></td><td colspan="4">$A_{sc provided} = 1884.96$ mm²</td></tr><tr><td>Percentage of tension steel provided</td><td>p_t</td><td>=</td><td>1.302</td><td>% Hence O.K</td></tr><tr><td>Percentage of compression steel provide</td><td>p_c</td><td>=</td><td>1.302</td><td>% Hence O.K</td></tr></table> <u>Check for Shear</u> Shear = 241 kN Nominal Shear Stress $\tau_v = 1.66$ N/mm ² Permissible Shear Stress $\tau_c = 0.92$ N/mm ² Maximum Shear Stress $\tau_{c,max} = 2.5$ N/mm ² Diameter of the Stirrup bar = 8 mm Number of Legs = 2 Spacing of Shear reinforcement Required = 190.0 Maximum Spacing of Shear Reinforcement = 300 Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing				I st Layer		II nd Layer			Nos	Dia	Nos	Dia	Tension Reinforcement	3	20	3	20		$A_{st provided} = 1884.956$ mm ²					Nos	Dia	Nos	Dia	Compression Reinforcement	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	CI 40.1, IS456:2000 $\beta = 1.000$ Table 19, IS456:2000 Table 20, IS456:2000 CI 40.4, IS456:2000 CI 26.5.1.5, IS456:2000	
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PROJECT	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE																																			
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CL. NO.	BEAM DESIGN CALCULATIONS			REFERENCES																																				
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 $A_{st\ reqd} = 1480.79\ mm^2$ Required Area of compression steel $A_{sc\ reqd} = 123.04\ mm^2$ <u>Detail of bars</u> <table><thead><tr><th></th><th colspan="2">I st Layer</th><th colspan="2">II nd Layer</th></tr><tr><th></th><th>Nos</th><th>Dia</th><th>Nos</th><th>Dia</th></tr></thead><tbody><tr><td>Tension Reinforcement</td><td>3</td><td>20</td><td>3</td><td>20</td></tr><tr><td></td><td colspan="4">$A_{st}\ provided = 1884.96\ mm^2$</td></tr><tr><td></td><td>Nos</td><td>Dia</td><td>Nos</td><td>Dia</td></tr><tr><td>Compression Reinforcement</td><td>3</td><td>20</td><td>3</td><td>20</td></tr><tr><td></td><td colspan="4">$A_{sc}\ provided = 1884.96\ mm^2$</td></tr></tbody></table> Percentage of tension steel provided $p_t = 1.302\%$ Hence O.K Percentage of compression steel provide $p_c = 1.302\%$ Hence O.K <u>Check for Shear</u> Shear = 241 kN Nominal Shear Stress $\tau_v = 1.66\ N/mm^2$ Permissible Shear Stress $\tau_c = 0.92\ N/mm^2$ Maximum Shear Stress $\tau_{c,max} = 2.5\ N/mm^2$ Diameter of the Stirrup bar = 8 mm Number of Legs = 2 Spacing of Shear reinforcement Required = 190.0 Maximum Spacing of Shear Reinforcement = 300 Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing <u>Check For Deflection</u> Basic Value = 26 Service Stress in Steel $f_s = 227.82\ N/mm^2$ Modification Factor(Tension Reinforcement) $F_1 = 0.97$ Allowable Span/Depth = 25.22 Actual Span/Depth = 7.67 Hence Safe							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 Reinforcement	3	20	3	20		$A_{sc}\ provided = 1884.96\ mm^2$			
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*Structural Design Calculation for Construction of' RESIDENTIAL BUILDING(S+05) AT
PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET
AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM*

Floor Slab Design

PROJECT	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM	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 = 150 mm Clear cover cc = 25 mm Effective thickness of slab (d_{eff}) = $150 - 25 - 5 = 120$ mm Unit weight of concrete = 25 KN/m ³ 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 Edge Condition : One Long edge Discontinuous	Table 16 Cl.26.4.2 , IS 456 -2000 Cl 19.2.1, IS 456-2000 Cl D-1.11, IS 456-2000			
1.0.2	Load Data Self Weight of Slab = $0.150 \times 25 = 3.750$ 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 (W_u) = $1.5 \times 8.25 = 12.375$ KN/m ²	IS 875 (Part 2) -1987 Table 18 Cl 36.4.1 IS 456 -2000			
1.0.3	Moment and Shear Calculations Short Span Direction α_x for positive moment $1.5 \rightarrow 0.051$ $1.75 \rightarrow 0.059$ for $1.54 \alpha_x = 0.052$ Positive moment $M_x : 0.052 \times 12.38 \times 5^2 = 16.17$ KN-m α_x for negative moment $1.5 \rightarrow 0.067$ $1.75 \rightarrow 0.077$ for $1.54 \alpha_x = 0.069$ Negative moment $M_x : 0.069 \times 12.38 \times 5^2 = 21.22$ KN-m	Table 26 Cl D-1.1, IS 456 -2000 Table 25 Cl D-1.1, IS 456 -2000			

PROJECT	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM	DOCUMENT.NO	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE
CL. NO.	DESIGN CALCULATIONS			REFERENCES	
1.0.4	Long Span Direction				
	For positive moment $\alpha_y = 0.028$ Positive moment $M_y : 0.028 \times 12.38 \times 5^2 = 8.66$ KN-m			Table 26 Cl D-1.1, IS 456 -2000	
	For negative moment $\alpha_y = 0.037$ Negative moment $M_y : 0.037 \times 12.38 \times 5^2 = 11.45$ KN-m Shear force $V_u = 12.38 \times 5 \times 0.5 = 30.94$ KN			Table 26 Cl D-1.1, IS 456 -2000	
1.0.5	Check Effective Depth for Max.Bending Moment				
	Depth required $= (M_y / (0.133 \times f_{ck} \times b))^{1/2} = 79.89$ mm Depth provided $= 150 - 25 - 10 / 2 = 120$ mm > 79.89 mm			Table C,SP 16 :1980 Cl 2.3	
	Hence the section is Safe against Bending				
1.0.6	Check Depth for Shear				
	Nominal Shear Stress : $\tau_v = V_u / b d = 0.26$ N/mm ² Design shear strength (τ_c) $= 0.46$ N/mm ² $k = 1.30$ $k * \tau_c = 0.60$ N/mm ²			Cl.40.1, IS 456:2000 Table 19 , IS 456:2000 Cl.40.2.1.1, IS 456:2000	
	$\tau_v < k * \tau_c$ Hence the section is Safe against Shear			IS 456:2000	
1.0.7	Check for Maximum Shear Stress:				
	Nominal Shear Stress : $\tau_v = V_u / b d = 0.26$ N/mm ² Maximum Shear Stress ($\tau_{c, max}$) $= 3.1$ N/mm ² $0.5 \tau_{c, max} = 1.55$ N/mm ²			Cl.40.1, IS 456:2000 Table 20 , IS 456:2000	
	$\tau_v < 0.5 \tau_{c, max}$ Hence the section is Safe against Max.Shear Stress			Cl.40.2.3.1, IS 456:2000	
1.0.7	Reinforcement calculations				
	Short Span Direction @ Support				
	$M_u / b d^2 = \frac{21.22 \times 10^6}{1000 \times 120 \times 120} = 1.474$ $P_t = 0.37$ %			Table 2-4, SP16 :1980	

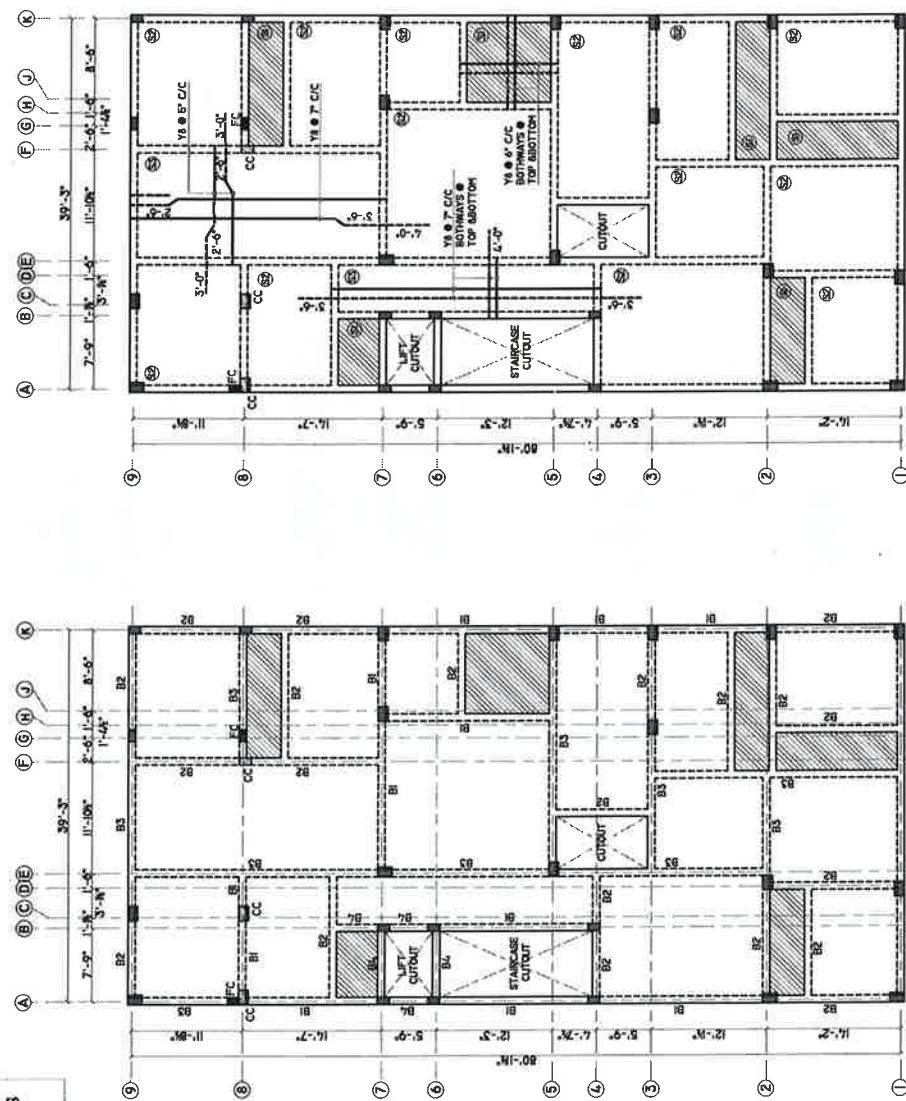
PROJECT	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM	DOCUMENT.NO	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE
CL. NO.	DESIGN CALCULATIONS			REFERENCES	
	Area of steel Ast = 0.0037 x 1000 x 120 = 438.88 mm² Minimum area of steel: 0.0012 x 1000 x 150 = 180.00 mm² Spacing of Y 10 bars 78.54 x 1000 / 438.88 = 178.86 mm Check for Spacing Minimum of 1) 3d = 360 mm 2) = 300 mm 3) = 178.86 mm Therefore provide Y 10 @ 170 mm C/C Short Span Direction @ Mid Span Mu/bd² = $\frac{16.17 \times 10^6}{1000 \times 120 \times 120}$ = 1.123 Pt = 0.273 % Area of steel Ast = 0.0027 x 1000 x 120 = 327.93 mm² Minimum area of steel: 0.0012 x 1000 x 150 = 180.00 mm² Spacing of Y 10 bars 78.54 x 1000 / 327.93 = 239.38 mm Check for Spacing Minimum of 1) 3d = 360 mm 2) = 300 mm 3) = 239.38 mm Therefore provide Y 10 @ 150 mm C/C Provided % of Tension Reinforcement (pt) = 0.436 % Long Span Direction @ Support Mu/bd² = $\frac{11.45 \times 10^6}{1000 \times 120 \times 120}$ = 0.795 Pt = 0.190 % Area of steel Ast = 0.0019 x 1000 x 120 = 228.07 mm² Minimum area of steel: 0.0012 x 1000 x 150 = 180.00 mm² Spacing of Y 10 bars 78.54 x 1000 / 228.07 = 344.2 mm	Cl:26.5.2.1 IS 456 -2000 Cl:26.3.3.(b).1 IS 456 -2000 SP16 :1980 Table 2-4 IS 456:2000 Cl:26.5.2.1 IS 456:2000 Cl:26.3.3.(b).1 SP16 :1980 Table 2-4 IS 456:2000 Cl:26.5.2.1			

PROJECT	RESIDENTIAL BUILDING(S+05) AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADIPAKKAM	DOCUMENT.NO	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE
CL. NO.	DESIGN CALCULATIONS			REFERENCES	
1.0.8	Check for Spacing				
	Minimum of			IS 456:2000	
	1) 3d = 360 mm			Cl:26.3.3.(b).1	
	2) = 300 mm				
	3) = 344.20 mm				
	Therefore provide Y 10 @ 300 mm C/C				
	Long Span Direction @ mid Span				
	$M_u/bd^2 = \frac{8.66 \times 10^6}{1000 \times 120 \times 120} = 0.602$				
	Pt = 0.142 %			SP16 :1980 Table 2-4	
	Area of steel Ast = 0.0014 x 1000 x 120 = 170.9 mm ²			IS 456:2000	
	Minimum area of steel: 0.0012 x 1000 x 150 = 180.00 mm ²			Cl:26.5.2.1	
	Spacing of Y 10 bars 78.54 x 1000 / 180.00 = 436.11 mm				
	Check for Spacing				
	Minimum of			IS 456:2000	
	1) 3d = 360 mm			Cl:26.3.3.(b).1	
	2) = 300 mm				
	3) = 436.11 mm				
	Therefore provide Y 10 @ 300 mm C/C				
	Check for Deflection: (Simplified Approach)				
	Basic Span/depth Ratio = 26			IS 456:2000 Cl:23.2.1	
	% of Tension Reinforcement provided (pt) = 0.436 %				
	Service stress of steel (fs) : 0.58 fy (Ast_R/Ast_P) = 181.63 N/mm ²			IS456:2000 Fig 4	
	Modification Factor for Tension Reinforcement (F1) = 1.71			Page 38	
	Allowable Span / Effective Depth Ratio = 44.47			IS 456:2000 Cl:23.2.1	
	Actual Span/Eff Depth Ratic = 5 x 1000 / 120 = 41.67				
	Hence Safe against Deflection				

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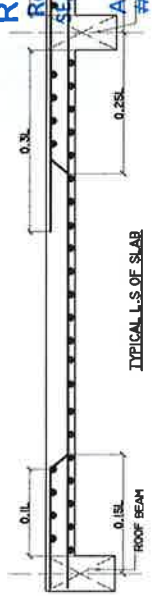
APPENDIX II

GENERAL ARRANGEMENT DRAWINGS



R.C LAYOUT OF STILT FLOOR ROOF BEAM & SLAB

LAYOUT OF STILT FLOOR ROOF BEAM & SLAB



TYPICAL I.S. OF SLAB

Handwritten signature: *[Signature]*

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-17919/154 (CMPA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-172019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#808, 50th STREET, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751378

C.S. OF COLUMN "FC"
(0'-9" x 1'-3")
(LIFT TO TOP)

DRAWING TITLE :-

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

DATE	SCALE	JOB NO	DRG NO
13.02.23	1"=8'	—	004

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

a
AURA ENGINEERING CONSULTANTS
NO.11/27, 66th STREET
RUV NAGAR, ASHOK NAGAR, CHENNAI-600 086.



A3

GENERAL NOTES:
REMOVAL OF FORM WORK (SHUTTERING):

THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR)
SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER
CLAUSE 11.3.1 OF IS:456 : 2000

- A. VERTICAL SIDE OF SHUTTERING OF COLUMNS,
WALLS AND BEAMS. _____-24 HOURS.
- B. BOTTOM SHUTTERING OF SLABS
(KEEP THE PROPS UNDER) _____3 DAYS.
- C. BOTTOM SHUTTERING OF BEAMS
(KEEP THE PROPS UNDER) _____7 DAYS.
- D. BOTTOM PROPS TO SLAB
i) SPANNING UP TO 4.50M _____7 DAYS,
ii) SPANNING OVER 4.50M _____16 DAYS.
- E. BOTTOM PROPS TO BEAMS
i) SPANNING UP TO 6.00M _____14 DAYS,
ii) SPANNING OVER 6.00M _____20 DAYS.

LAP JOINTS FOR REINFORCEMENT BARS:

- i). AT ANY CROSS SECTION OF A HEBER NOT MORE THAN 5% OF THE BARS SHALL BE LAPED
- ii). BARS SHALL BE TIGHTENED WITH A WALKER CENTRE TO CENTRE DISTANCE OF 1/3 TIMES THE LAP LENGTH OF THE BARS FOR TENSION AND COMPRESSION MEMBERS.
- iii). LAPS IN COLUMNS SHALL BE PROVIDED AT END HEIGHT OF FLOORS AND NOT AT SLAB LEVEL.
- iv). LAPS IN BEAM AND SLAB SHALL BE PROVIDED AT THE POINT OF CONTRAST EXHAUST.
- v). WEELDING OF BARS SHALL BE DONE AS A STITCH WELD FOR 5 TIMES THE DIAMETERS OF BAR AND A BAR OF 5 TIMES DIAMETER OF BAR AND AGAIN WEELDING FOR ANOTHER 5 TIMES DIAMETERS OF BAR USING GAS WEELDING AND SPECIAL ELECTRODES AFTER GETTING PRIOR WRITTEN APPROVAL FROM THE STRUCTURAL CONSULTANT.
- vi). DETAILING OF REBARS SHALL CONFORM TO SP-34, IS 13920

GENERAL NOTES:

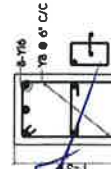
1. ALL DIMENSIONS ARE IN FOOT UNITS.
2. CONCRETE GRADE SHALL BE **M25** CONFORMING TO IS 456:2000
3. GRADE OF REINFORCEMENT MARKED THIS (0) SHALL BE **FE 300** CONFORMING TO IS 1786:2008
4. CLEAR COVER FOR REINFORCEMENT
 - A) BEAM = 1" B) SLAB = 3/4"
5. THIS DRG. IN CONNECTION WITH ARCH. DRGS.
6. STRUCTURAL ENGINEERS RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
7. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

BEAM SCHEDULE		
SL. NO.	NAME	SIZE
01	B1	0'-9" X 1'-6"
02	B2	0'-9" X 1'-6"
03	B3	0'-9" X 1'-6"
04	B4	0'-9" X 1'-6"

SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	5" THK.
02	S2	5" THK.
03	S3	5" THK.

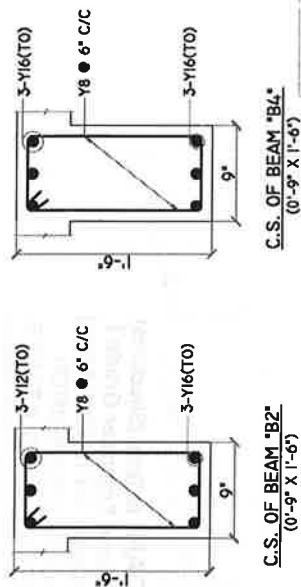
NOTE:

- /// SLAB SUNK BY 0'-10"
PROVIDE TO 8" C/C AS DISTRIBUTORS
WHERE EVER REQUIRED
FOR BEAM REINFORCEMENT
DETAILS REFER DWG.NO : 005
CC - COLUMN CURTAILED & ROOFS TO BE BENT
IN TO TOP OF THE SLAB

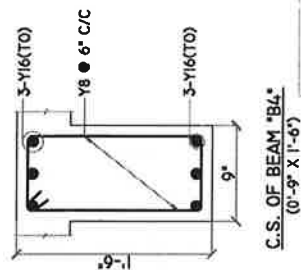


BEAM REINFORCEMENTS

NAME	MID SPAN	END SUPPORT
B1 (0'-9" X 1'-6")		
B3 (0'-9" X 1'-9")		



C.S. OF BEAM "B2"
(0'-9" X 1'-6")

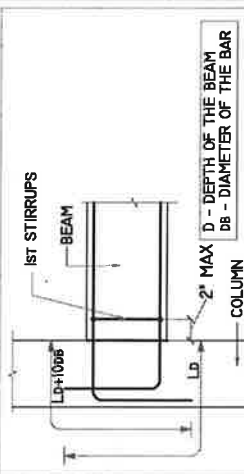


C.S. OF BEAM "B4"
(0'-9" X 1'-6")

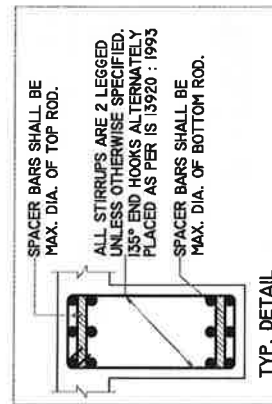
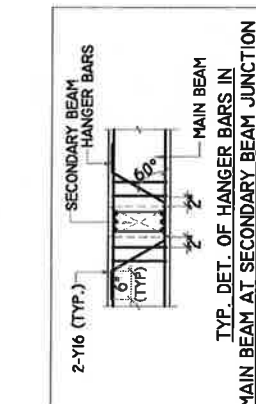
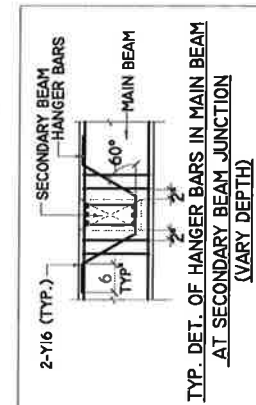
SL.NO	NAME	SIZE
01	B1	0'-9" X 1'-6"
02	B2	0'-9" X 1'-6"
03	B3	0'-9" X 1'-9"
04	B4	0'-9" X 1'-6"

BEAM SCHEDULE

FOR APPROVAL ONLY



TYP. EXTERNAL JOINT DETAIL AT
BEAM-COLUMN JUNCTION

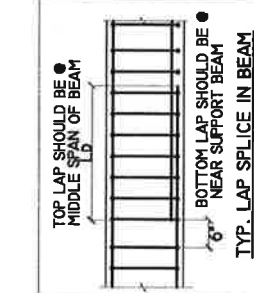
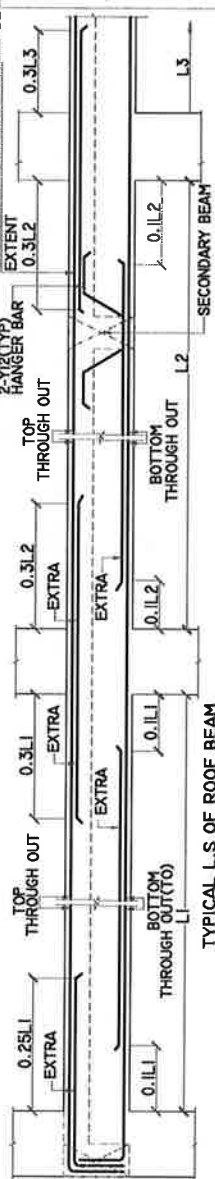


SPACER BARS SHALL BE
MAX. DIA. OF TOP ROD.

ALL STIRRUPS ARE 2 LEGGED
UNLESS OTHERWISE SPECIFIED.
135° END HOOKS ALTERNATELY
PLACED AS PER IS 13920 : 1993

SPACER BARS SHALL BE
MAX. DIA. OF BOTTOM ROD.

IF DIA OF RODS CHANGED THEN
MAX DIA OF EXTRA BAR SHOULD BE



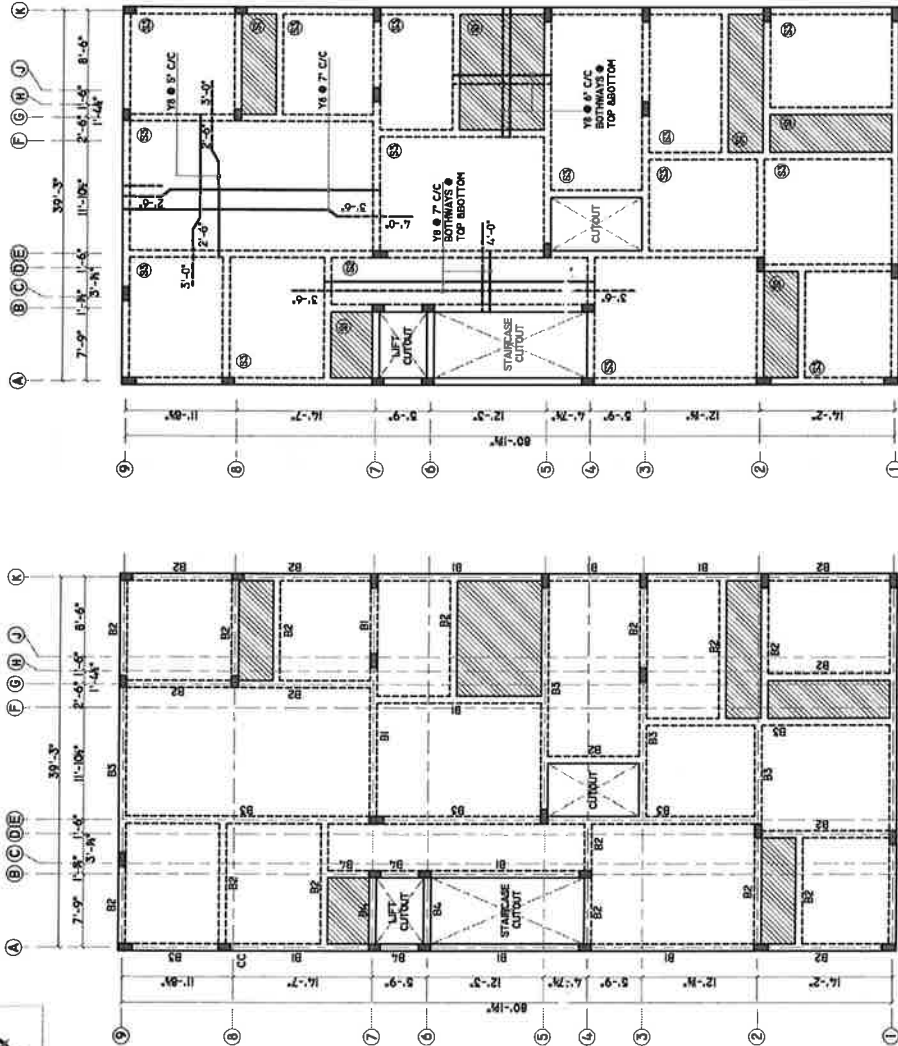
DRAWING TITLE :-
R.C DETAILS OF STILL FLOOR
ROOF SLAB & BEAMS

DATE	SCALE	JOB NO	DRG NO
13.02.23	1" = 10'	---	005

ARCHITECT / CONSULTANTS :-

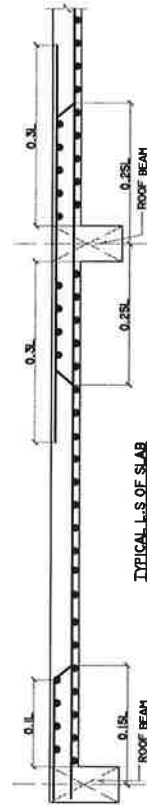
STRUCTURAL CONSULTANTS :-

aura
AURA ENGINEERING CONSULTANTS
NO. 10, 1ST FLOOR, 1ST CROSS, 8th STREET,
MADIPAKKAM, CHENNAI 600016
Ph: 044-2668 7900
Email: info@auraengg.com
www.auraengg.com



LAYOUT OF TYPICAL FLOOR ROOF BEAM & SLAB

R.C LAYOUT OF TYPICAL FLOOR ROOF BEAM & SLAB



TYPICAL L.S OF SLAB

FOR APPROVAL ONLY

SL.NO	NAME	SIZE
01	B1	0'-0" x 1'-0"
02	B2	0'-0" x 1'-0"
03	B3	0'-0" x 1'-0"
04	B4	0'-0" x 1'-0"

SL.NO	NAME	THICK
01	S1	5" THK.
02	S2	5" THK.
03	S3	5" THK.

NOTE:

1. SLAB SUNK BY 0'-0"
2. PROVIDE 18 # 8 C/C AS DISTRIBUTORS
3. FOR BEAM REINFORCEMENT
4. DETAILS REFER DWG.NO : 007

THIS DRAWING IS THE PROPERTY OF M/S. AURA ENGINEERING CONSULTANTS, AND MUST NOT BE COPIED WITHOUT THEIR WRITTEN CONSENT, NOR MADE KNOWN TO THE THIRD PARTY

GENERAL NOTES:

1. REMOVAL OF FORM WORK (SHUTTERING) SHALL BE ALLOWED MINIMUM PERIOD (AFTER FINAL POUR) CLAUSE 11.3.1 OF IS:599 - 2000

- VERTICAL SIDE OF SHUTTERING OF COLUMNS, WALLS AND BEAMS 24 HOURS.
- BOTTOM SHUTTERING OF SLABS (KEEP THE PROPS UNDER) 3 DAYS.
- BOTTOM SHUTTERING OF BEAMS (KEEP THE PROPS UNDER) 7 DAYS.
- BOTTOM PROPS TO SLAB
 - SPANNING UP TO 4.5M 7 DAYS.
 - SPANNING OVER 4.5M 14 DAYS.
- BOTTOM PROPS TO BEAMS
 - SPANNING UP TO 4.5M 7 DAYS.
 - SPANNING OVER 4.5M 14 DAYS.

LAP JOINTS FOR REINFORCEMENT BARS:

- AT ANY CROSS SECTION OF A MEMBER NOT MORE THAN 5% OF THE BARS SHALL BE LAPPED.
- REINFORCEMENT BARS SHALL BE LAPPED WITH A MINIMUM CENTRE TO CENTRE OF THE LAP JOINTS OF 48 TIMES OF THE BAR FOR TENSION AND COMPRESSION MEMBER.
- LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL.
- LAPS IN BEAM AND SLAB SHALL BE PROVIDED AT THE POINT OF CONTRAFLEXURE.
- WELDING OF BARS SHALL BE DONE AS A STITCH WELD FOR 5 TIMES THE DIAMETER OF BAR AND A GAP OF 5 TIMES OF BAR AND AGAIN WELDING FOR ANOTHER 5 TIMES DIAMETER OF BAR. WELDING SHALL BE DONE BY SPECIAL ELECTRODES AFTER GETTING PRIOR WRITTEN APPROVAL FROM THE STRUCTURAL CONSULTANT.
- DETAILING OF REBARS SHALL CONFORM TO SP:34 & IS:1920.

GENERAL NOTES:

- ALL DIMENSIONS ARE IN FOOT UNITS.
- CONCRETE GRADE SHALL BE M25 CONFORMING TO IS 456:2000
- GRADE OF REINFORCEMENT MARKED THIS (Y) SHALL BE 500 CONFORMING TO IS 1786-2008
- CLEAR COVER FOR REINFORCEMENT
 - BEAM = 1"
 - SLAB = 3/4"
- THIS DRG. READ IN CONNECTION WITH ARCHITECTS, 6. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
- ONLINE OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	R.S	R.M	13.02.23

PROJECT :-

THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT - 18.0M) RESIDENTIAL BUILDING WITH STILT FLOOR (HEIGHT - 18.0M) AT PLOT NO. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 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998, 999, 1000

DRAWING TITLE :-

LAYOUT & R.C DETAILS OF TYPICAL FLOOR ROOF SLAB & BEAMS

DATE	SCALE	JOB NO	DRG NO
13.02.23	1" = 8'	---	008

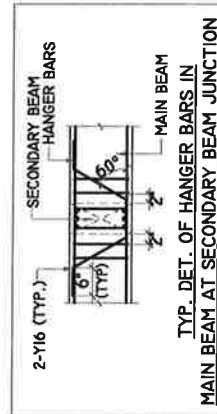
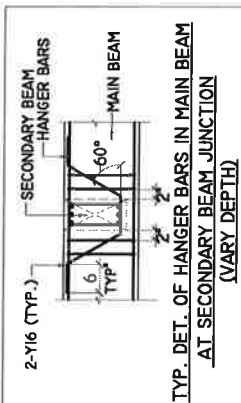
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

AURA
AURA ENGINEERING CONSULTANTS
NO. 27, 4th STREET
BU NO. 4, ACHOR NAGAR, CHENNAI - 600 081.
Phone: 044-2661 7100
Email: aura@auraengg.com
www.auraengg.com
Engineering Consultants

BEAM REINFORCEMENTS

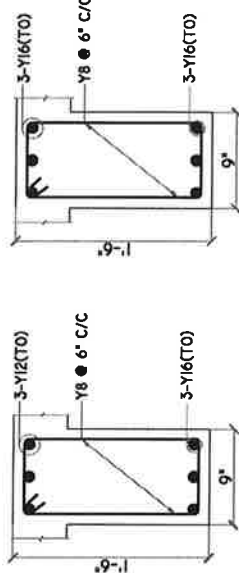
NAME	MID SPAN	END SUPPORT
B1 (0'-9" X 1'-6")		
B3 (0'-9" X 1'-9")		



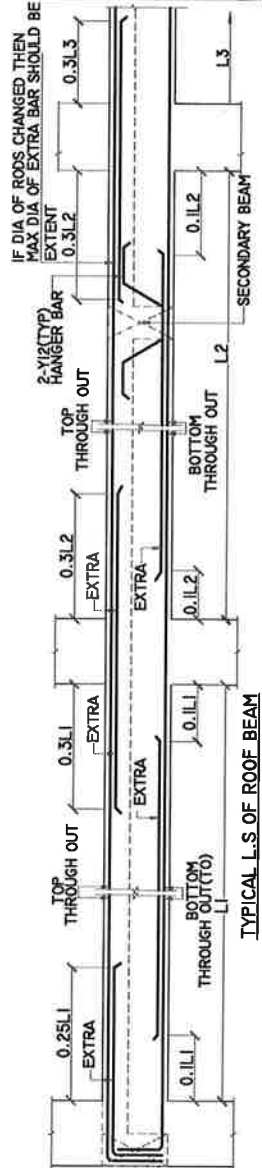
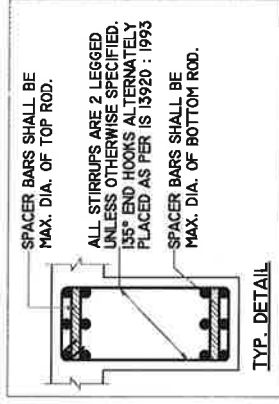
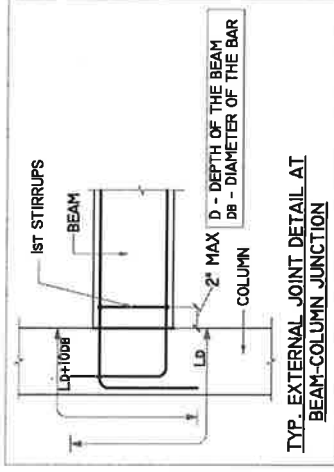
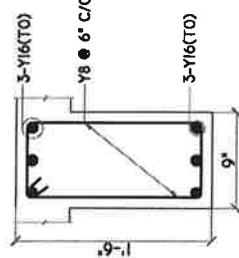
FOR APPROVAL ONLY

SL.NO	NAME	SIZE
01	B1	0'-9" X 1'-6"
02	B2	0'-9" X 1'-6"
03	B3	0'-9" X 1'-9"
04	B4	0'-9" X 1'-6"

C.S. OF BEAM "B2"
(0'-9" X 1'-6")



C.S. OF BEAM "B4"
(0'-9" X 1'-6")



- GENERAL NOTES:
1. ALL DIMENSIONS ARE IN FOOT UNITS.
 2. CONCRETE GRADE SHALL BE M25 CONFORMING TO IS 456:2000
 3. GRADE OF REINFORCEMENT MARKED "TAS C7" SHALL BE FE 500 CONFORMING TO IS 1786:2008
 4. CLEAR COVER FOR REINFORCEMENT
A) BEAM = 1" B) SLAB = 3/4"
 5. THIS DRG. READ IN CONNECTION WITH ARCHDRGS.
 6. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
 7. DULUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	R.S.	R.M.	13.02.23

PROJECT :-

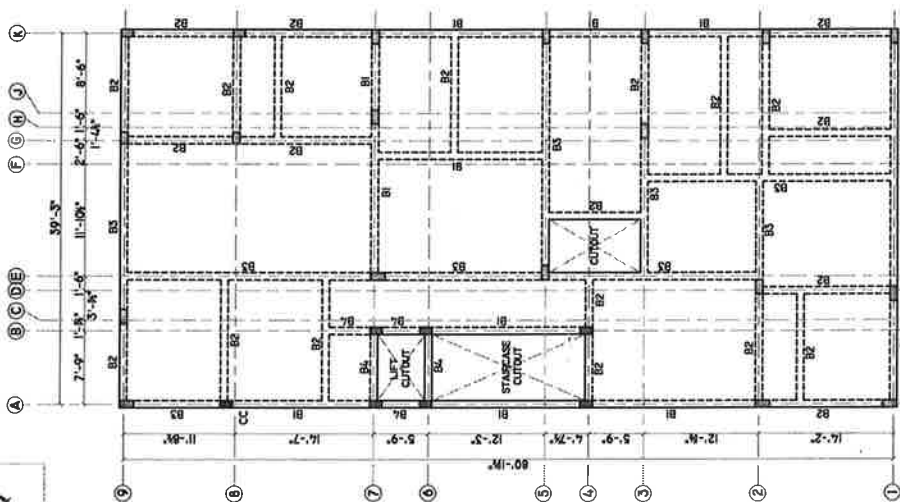
THE PROPOSED CONSTRUCTION OF 8 TILT FLOOR * 5 FLOORS (HEIGHT - 15.0M) RESIDENTIAL BUILDING WITH 15 DWELLING UNITS AVAILING PREMIUM FBI AT PLOT NO.5, 6 & 7, MADURAKALI NAGAR, KARTHIKEYAPURAM 2ND CROSS 8 STREET AND DEIVANAMI NAGAR 4TH STREET, MADIPAKKAM, CHENNAI 600041 COMPRISED IN S.NO.18620, 18622 & 18625 CHENNAI MUNICIPALITY WILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION ZONE : 14, DIVISION NO. 167.

DRAWING TITLE :-			
R.C DETAILS OF TYPICAL FLOOR			
DATE	SCALE	JOB NO	DRG.NO
13.02.23	1" = 10'	---	007
ARCHITECT / CONSULTANTS :-			

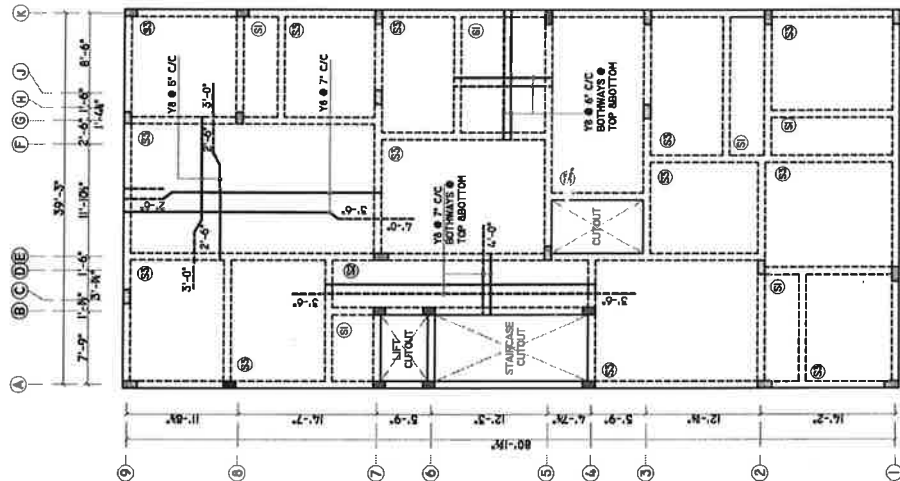
STRUCTURAL CONSULTANTS :-

aura
Engineering Consultants
http://www.aurea.com

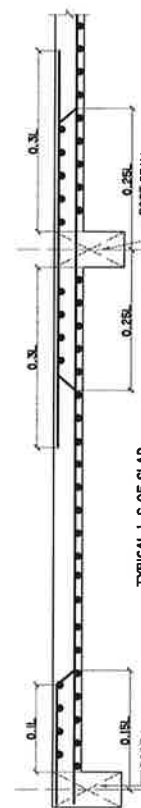
AURA ENGINEERING CONSULTANTS
104/22, ANNA STREET
104/22, ANNA STREET
104/22, ANNA STREET
104/22, ANNA STREET



LAYOUT OF TERRACE FLOOR BEAM & SLAB



R.C LAYOUT OF TERRACE FLOOR BEAM & SLAB



TYPICAL I.S OF SLAB

FOR APPROVAL ONLY

SLAB NO	NAME	SIZE
01	B1	0'-0" x 1'-0"
02	B2	0'-0" x 1'-0"
03	B3	0'-0" x 1'-0"
04	B4	0'-0" x 1'-0"

SLAB NO	NAME	THICK
01	S1	5" THK.
02	S2	5" THK.
03	S3	5" THK.

NOTE:

PROVIDE 18# 8' C/C AS DISTRIBUTORS
FOR REINFORCEMENT
DETAILS REFER DRG NO. 009

CC - COLUMN COTTAGED & ROSS TO BE BENT
IN TO TOP OF THE SLAB

GENERAL NOTES:

REMOVAL OF FORM WORK (SHUTTERING):

THE FOLLOWING MINIMUM PERIOD (AFTER FINAL POUR) SHALL BE ALLOWED BEFORE REMOVAL OF SHUTTERING AS PER CLAUSE 11.3.1 OF IS:456 - 2000

- VERTICAL SIDE OF SHUTTERING OF COLUMNS, WALLS AND BEAMS 24 HOURS.
- BOTTOM SHUTTERING OF SLABS (KEEP THE PROPS UNDER) 3 DAYS.
- BOTTOM SHUTTERING OF BEAMS (KEEP THE PROPS UNDER) 7 DAYS.
- BOTTOM PROPS TO SLAB
 - SPANNING UP TO 4.5M 7 DAYS.
 - SPANNING OVER 4.5M 14 DAYS.
- BOTTOM PROPS TO BEAMS
 - SPANNING UP TO 4.5M 2 DAYS.
 - SPANNING OVER 4.5M 2 DAYS.

LAP JOINTS FOR REINFORCEMENT BARS:

- AT ANY CROSS SECTION OF A MEMBER NOT MORE THAN 50% OF THE BARS SHALL BE LAPPED.
- LAPS SHALL BE STaggerED WITH A MINIMUM CENTRE TO CENTRE OF THE BARS NOT LESS THAN 35 TIMES THE BAR DIAMETER. THE LAP LENGTH OF THE BAR FOR TENSION AND COMPRESSION REBARS.
- LAPS IN COLUMNS SHALL BE PROVIDED AT MID HEIGHT OF FLOOR AND NOT AT SLAB LEVEL.
- LAPS IN BEAM AND SLAB SHALL BE PROVIDED AT THE POINT OF CONTRAFLEXURE.
- WELDING OF BARS SHALL BE DONE AS A STITCH WELD FOR BAR AND AGAIN WELDING FOR ANOTHER 5 TIMES DIAMETER BAR USING ARC WELDING AND SPECIAL ELECTRODES.
- ALL WELDING SHALL BE WRITTEN APPROVAL FROM THE STRUCTURAL CONSULTANT.
- DETAILING OF REBARS SHALL CONFORM TO SP-34 & IS:1920.

GENERAL NOTES:

- ALL DIMENSIONS ARE IN FOOT UNITS.
- CONCRETE GRADE SHALL BE M25 CONFORMING TO IS:456:2000
- GRADE OF REINFORCEMENT MARKED THIS (V) SHALL BE 500 CONFORMING TO IS:1786-2008
- CLEAR COVER FOR REINFORCEMENT
 - BEAM = 1"
 - SLAB = 3/4"
- THIS DRG. READ IN CONNECTION WITH ARCH.DRGS.
- STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
- JOINS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	R.B.	R.M.	DATE
00	ISSUE FOR CONSTRUCTION			13.02.23

PROJECT :-

THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS (HEIGHT - 18.0M) RESIDENTIAL BUILDING WITH 10 DWELLING UNITS AVALING PREMIUM FSI AT PLOT NO. 16/22 & 16/23 OF MADIPANKAM 4TH CROSS STREET, MADIPANKAM, CHENNAI 600091 COMPRISED IN S.NO.08/20, 16/22 & 16/23 OF MADIPANKAM VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION ZONE : 14, DIVISION NO: 187.

DRAWING TITLE :-

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

DATE	SCALE	JOB NO	DRG. NO
13.02.23	1" = 8'		008

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

AURA
AURA ENGINEERING CONSULTANTS
NO.27, 4th STREET
1ST FLOOR, MADIPANKAM-600 091



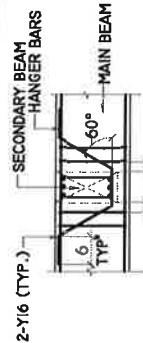
Page 1 of 1

BEAM REINFORCEMENTS

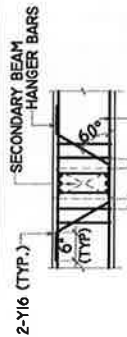
NAME	MID SPAN	END SUPPORT
B1 (0'-9" X 1'-6")		
B3 (0'-9" X 1'-9")		

SL. NO	NAME	SIZE
01	B1	0'-9" X 1'-6"
02	B2	0'-9" X 1'-6"
03	B3	0'-9" X 1'-9"
04	B4	0'-9" X 1'-6"

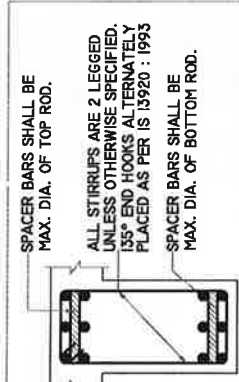
FOR APPROVAL ONLY



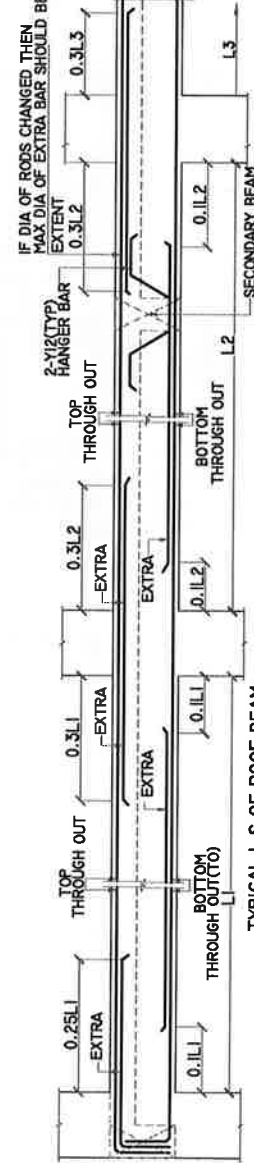
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION (VARY DEPTH)



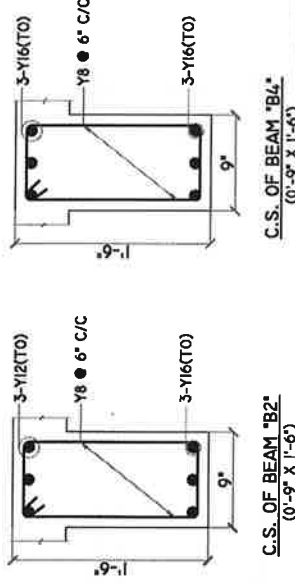
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION



TYP. DETAIL

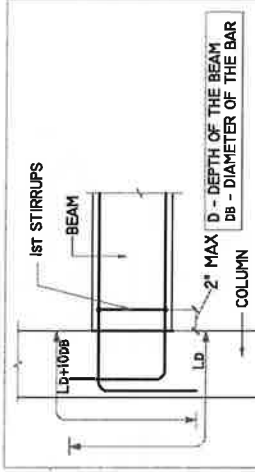


TYPICAL L.S. OF ROOF BEAM



C.S. OF BEAM "B2"
(0'-9" X 1'-6")

C.S. OF BEAM "B4"
(0'-9" X 1'-6")



TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION

- GENERAL NOTES:
1. ALL DIMENSIONS ARE IN FOOT UNITS.
 2. CONCRETE GRADE SHALL BE M25 CONFORMING TO IS 456:2000
 3. GRADE OF REINFORCEMENT MARKED THIS TO SHALL BE FE 500 CONFORMING TO IS 1786-2008
 4. CLEAR COVER FOR REINFORCEMENT
A) BEAM = 1" B) SLAB = 3/4"
 5. THIS DRG. READ IN CONNECTION 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 CONSTRUCTION	R.B	R.M	13.02.23

PROJECT :-

THE PROPOSED CONSTRUCTION OF 6TH FLOOR + 6 FLOORS (HEIGHT - 18.0M) RESIDENTIAL BUILDING WITH 16 DWELLING UNITS AVAILING PREMIUM FRI AT PLOT NO.6, 8 & 7, MADURAKALI NAGAR, KARTHIGEYAPURAM 2ND CROSS STREET AND DEIVANAI NAGAR 4TH STREET, MADURAKALI, CHENNAI AND DEIVANAI NAGAR 4TH STREET, MADURAKALI, CHENNAI. THE PROJECT IS IN THE JURISDICTION OF MADURAKALI VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION ZONE - 14, DIVISION NO. 187.

DRAWING TITLE :-
R.C DETAILS OF TERRACE FLOOR FLOOR SLAB & BEAMS

DATE 13.02.23 SCALE 1"=10' JOB NO. DRG.NO. 009

ARCHITECT / CONSULTANTS :-

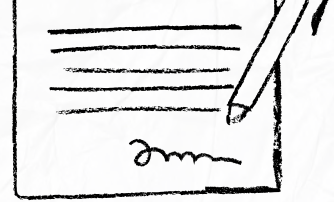
STRUCTURAL CONSULTANTS :-

aura AURA ENGINEERING CONSULTANTS

NO. 45, 4TH STREET, 2ND FLOOR, AVARUNDA, CHENNAI - 600 066

Phone: +91-96000-100000
Email: info@auracivil.com
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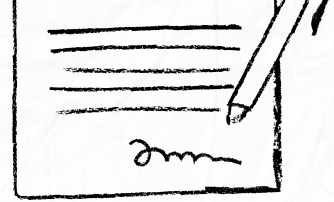
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