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aura
Engineering Consultants

No.13/27,67th Street,
R.V Nagar, Ashok Nagar,
Chennai-83

+91 44 4859 7100
+91–97907 51378

info@auraengineers.co.in

www.auraengineers.co.in

STABILITY CERTIFICATE

The detailed engineering and structure design of the proposed building comprising of Stilt Floor + 3 Floors Residential Building with 12dwelling units at Old Door No.36, New Door No.163, East Mada Street, Thiruvanmiyur, Chennai, Old S.No.193/44A, T.S.No.57, Block No.60, Ward 1 of Thiruvanmiyur Village has been done by me/us based on the report of geotechnical investigation(soil test) done by A.NIVEDHITHA (BOOSHNAM ASSOCIATES) Report No. BAG/K. MUTHU RAMAN/M-2029/23-24 Dated 15.06.2023 and considering the functional requirement of the building.

2. It is certified that among other factors, the proposed building has been designed to resist earthquake. I/We have checked various parameters and found that the proposed building would be safe.

3. I/We further certify that:

   (i) The minimum grade of concrete is M25

   (ii) The design and analysis has been done using the code of practice for plain and reinforced concrete as per IS 456, design loads as per IS 875 And Design of earthquake resistant structure as per IS 1893-2016

4. The building will be safe and sound when used for the purpose for which it is designed.

R. Manikandan

Stamp and Signature

For AURA Engineering Consultants

For Aura Engineering Consultants

DESIGN CALCULATION

PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO:163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

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

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751378

Structural Design Calculation for Construction of RESIDENTIAL BUILDING (S+03), AT PLOT NO:163, EAST MADA STREET, THIRUVANMIYUR

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R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

CHENNAJ METROPOLITAN DEVELOPMENT AUTHORJTY
'Tbalamuthu Natarajan Building', No. I, 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-1/2019/06/154 Renewed** on **10.06.2024.** 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 (MAI) Dept. dated 04.02.2019.

This Registration is valid upto **09.06.2029.**



18/6/24

(A. MEGANATHAN)
Superintendent

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751378

Structural Design Calculation for Construction of RESIDENTIAL BUILDING (S+03), AT PLOT NO:163, EAST MADA STREET, THIRUVANMIYUR

1.0 DESIGN BRIEF:

THIS DOCUMENT PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO:163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

2.0 GENERAL DESIGN CRITERIA

2.1. Description of the structure

The Residential Building consists of Stilt Floor + 3 Upper floors and the structure is designed as a RCC framed structure.

1. Size of the building : 879.65 X 86.41M
2. Height of the building : 12.00M
3. Number of storeys above GL : Stilt Floor +3 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

- Density of Concrete =25 kN/m^3
- D.L. due to partitions

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

(Light Partition as per IS 875) =1.50 kN/m^2

- D.L due to floor finish 50mm thick = 0.05x25 = 1.25 kN/m^2

3.2. Live load (LL)

Minimum Uniformly Distributed Live Loads:

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

3.5 Loading Combinations

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

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

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

- 1.0(DL +LL)

4.0 STRUCTURAL MATERIAL:

4.1 Concrete Material Specifications:

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

4.2 Reinforcement:

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

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

4.4 Concrete cover:

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

- Raft Slab = 50mm
- Footing = 50mm
- RC Wall = 30mm
- Columns = 40mm
- Beams = 30mm

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

- 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.

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/08/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

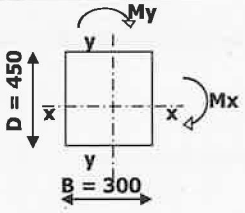
APPENDIX I

Design Calculations

Column Design

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

PROJECT	RESIDENTIAL BUILDING (S+03), AT PLOT NO:163, EAST MADA STREET, THIRUVANMIYUR	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 , IS456:2000
	L_{ey} = **3000** mm	
	Size of the Column B X D = **300** x **450** mm	
1.4	**Analysis Results**	
	Factored Axial Load P_u = **780.0** kN	STAAD OUTPUT
	Factored Moment M_{ux} = **22.00** kNm	
	Factored Moment M_{uy} = **71.00** kNm	
2.0	**Check for Slenderness**	
	Slenderness Ratio about Major Axis L_{ex} / D = 6.667	
	Slenderness Ratio about Minor Axis L_{ey} / B = 10.000	
	Since Leff / LLD <12 Designed as Short Column	Cl 25.1.2, IS456:2000
3.0	**Check for Eccentricity**	
	Minimum Eccentricity e_x = L_{ox} / 500 + D / 30 = 21.0 mm >20	Cl 25.4 IS456:2000
	e_y = L_{oy} / 500 + B / 30 = 16.0 mm <20	
3.1	**Moments Due to Minimum Eccentricity**	
	Me_x = 16.38 kN.m	
	Me_y = 15.60 kN.m	
4.0	**Design Moment**	
	Design Moment about X axis M_{ux} = 22.00 kN.m	
	Design Moment about Y axis M_{uy} = 71.00 kN.m	

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

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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	
	$p_u / f_{ck}BD$ = 0.231	
	Reinforcement distributed equally on four sides = **4**	
	$M_{ux1} / f_{ck}BD^2$ = 0.137	Chart 43 - 46
	$M_{uy1} / f_{ck}DB^2$ = 0.119	SP 16 : 1980
	Moment carrying capacity about X axis M_{ux1} = 207.89 kN.m	
	Moment carrying capacity about Y axis M_{uy1} = 120.61 kN.m	
6.0	**Calculation of P_{uz}**	
	$P_{uz} = 0.45 f_{ck} A_c + 0.75 f_y A_{sc}$ = 2500.88 kN	Cl 39.6 , IS456:2000
	P_u/P_{uz} = 0.312	
	α_n = 1.186	Cl 39.6 , IS456:2000
7.0	**Criteria for Biaxial Bending (Bresler's Formulation)**	
	$(M_{ux}/M_{ux1})^{\alpha n} + (M_{uy}/M_{uy1})^{\alpha n}$ = **0.603** < 1 **Hence Safe**	Cl 39.6 , IS456:2000
8.0	**Longitudinal Reinforcement**	
	Area of compression Steel $A_{sc,reqd}$ = **2700** mm^2	
	10 Nos Y20 + Nos Y20 $A_{sc,pro}$ = **3142** mm^2	
8.1	**Check for Minimum & Maximum Area of Steel**	
	Minimum Area of steel (0.8 % of A_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 steel (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.	

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100092019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

Footing Design

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2018/08/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

RESIDENTIAL BUILDING (S+03), AT PLOT NO:163, EAST MADA STREET, THIRUVANMIYUR

Design of Isolated Footing F3 **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 Reinforcement	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	98.42	kN

Gross Bearing Pressure Calculation (kN/m^2)

Critical Load Combinations	Pmax	Pmin
200	157.58	157.5833333
0	38.54	38.54

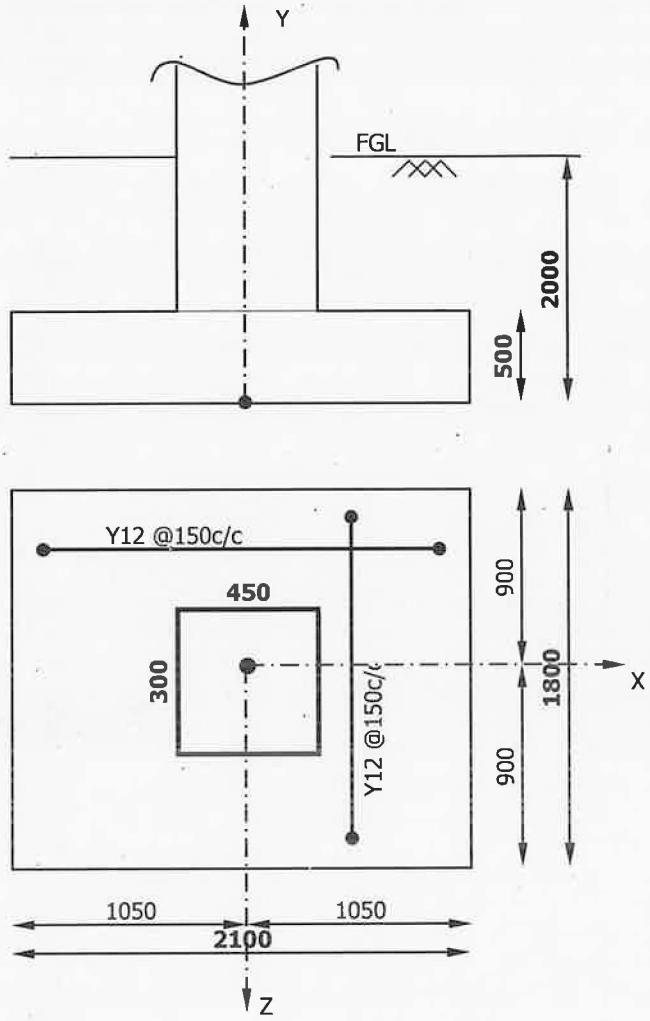
Gross SBC (w/o increase) 186 kN/m^2

Hence **OK**

Factored Net Upward Pressure Calculation

Load Factor for Design 1.5

Critical Load Combinations	Pmax	Pmin
200	178.57	178.5714286
0	0.00	0.0



Dsgn.(+ve) BM abt. X-axis Mux	50.22	kN.m
Dsgn.(+ve) BM abt. Z-axis Muz	60.77	kN.m
Dsgn.(-ve) BM abt. X-axis Mux	0.00	kN.m
Dsgn.(-ve) BM abt. Z-axis Muz	0.00	kN.m
Provided Eff. depth for Mux	432.00	mm
Provided Eff. depth for Muz	444.00	mm
Mu,lim	621	kN.m

Depth provided is **OK**

Bottom Reinforcement

Ast Required for Mux	270.6	mm^2
Ast Required for Muz	319.2	mm^2
Min. Ast Reqd.	600	mm^2

Bottom Reinforcement

						Ast Provided	Ast Required		
Provide	12	@	150	C/C	along Z	754	600.0	mm^2	Hence
Provide	12	@	150	C/C	along X	754	600.0	mm^2	**OK**

Top Reinforcement

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

R. MANIKANDAN, M.Tech, (Structures)
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CGLRGN/SE/Gr-I/2018/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751376

RESIDENTIAL BUILDING (S+03), AT PLOT NO:163, EAST MADA STREET, THIRUVANMIYUR

Design of Isolated Footing **F3** **Node :** 38

Check For Flexural / Oneway Shear

	Actual	Allowable		Hence
Shear Stress (Plane II to X)	0.131	0.311	N/mm^2	OK
Shear Stress (Plane II to Z)	0.153	0.308	N/mm^2	OK

Check For Punching / Twoway Shear

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

Check For Overturning

Co-efficient of friction	=	0.57				
Factor of safety for overturning, 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	x	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**

R. MANIKANDAN, M.Tech, (Structures)
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SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
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AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

Plinth Beam Design

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/05/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751376

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TITLE		REVISION'	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES
1.1	**Geomentry Data**					
	Beam Number		=	**PB1**		
	Type of Beam		=	Rectangular Beam		
	Support Condition		=	Continuous Beam		
	Width of beam	b	=	230	mm	
	Overall Depth of Beam	D	=	380	mm	
	Dia of bar	Φ	=	25	mm	
	Nominal Cover	cc	=	30	mm	IS 456:2000 Table 19
	Effective Depth	d	=	337.5	mm	IS 456:2000
	Effective Cover		=	42.5	mm	Cl 23.0
	Effective Span of beam	l_{eff}	=	4500	mm	
	Concrete grade		=	M 25		
	Steel Grade		=	Fe 500		
	$p_{t,lim}$		=	0.944 %		
	$p_{t,min}$		=	0.170 %		IS 456:2000
	p_t & p_{cmax}		=	4.00 %		Cl 26.5.1.1
1.2	**Force Input**					
	Left negative moment (Support 1)		=	84	kNm	
	Mid span positive moment		=	84	kNm	
	Right negative momer (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 S = 0.17% b d		=	131.9625	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	p_c	=	0	%	
	Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm^2	
	Required Area of compression ste	$A_{sc\ reqd}$	=	0.00	mm^2	
	Detail of bars					
		I st Layer		**II nd Layer**		
		Nos	Dia	Nos	Dia	
	Tension Reinforcemer	**3**	#			
		A_{st} provide	=	603.19	mm^2	
		Nos	Dia	Nos	Dia	
	Compression Reinforc	**3**	#	**0**		
		A_{sc} provide	=	603.19	mm^2	
	Percentage of tension steel provi	p_t	=	0.777	%	**Hence O.K**
	Percentage of compression steel	p_c	=	0.777	%	**Hence O.K**

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SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2018/05/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

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CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Check for Shear

Shear = 149 kN

Nominal Shear Stress	τv	=	1.92	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm^2	Table 19, IS456:2000
Diameter of the Stirrup bar		=	**8**	mm	Table 20, IS456:2000
Number of Legs		=	**2**		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcemer		=	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	p_c	=	0	%
Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm^2
Required Area of compression ste	$A_{sc\ reqd}$	=	0	mm^2

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcemer	**3**	**#**	**0**	**0**

A_{st} provide = 603.186 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforc	**3**	**#**	**0**	**0**

A_{sc} provide = 603.19 mm^2

Percentage of tension steel provi	p_t	=	0.777	%	**Hence O.K**
Percentage of compression steel	p_c	=	0.777	%	**Hence O.K**

Check for Shear

Shear = 149 kN

Nominal Shear Stress	τv	=	1.92	$N/m.n^2$	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm^2	Table 19, IS456:2000
Diameter of the Stirrup bar		=	**8**	mm	Table 20, IS456:2000
Number of Legs		=	**2**		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcemer		=	250		Cl 26.5.1.5,IS456:2000

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

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

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CL. NO.	BEAM DESIGN CALCULATIONS				REFERENCES
	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	p_c	= 0	%	
	Required Area of tension steel	$A_{st\ reqd}$	= 131.96	mm^2	
	Required Area of compression ste	$A_{sc\ reqd}$	= 0	mm^2	
	Detail of bars				
		I st Layer		**II nd Layer**	
		Nos	Dia	Nos	Dia
	Tension Reinforcemer	**3**	**#**	**0**	**0**
		A_{st} provide	= 603.19	mm^2	
		Nos	Dia	Nos	Dia
	Compression Reinforc	**3**	**#**	**0**	**0**
		A_{sc} provide	= 603.19	mm^2	
	Percentage of tension steel provi	p_t	= 0.777	% **Hence O.K**	
	Percentage of compression steel	p_c	= 0.777	% **Hence O.K**	
	Check for Shear				
	Shear		= 149	kN	
	Nominal Shear Stress	τv	= 1.92	N/mm^2	Cl 40.1, IS456:2000
	Permissible Shear Stress	τc	= 0.92	N/mm^2	β = 1.000
	Maximum Shear Stress	$\tau c,max$	= 2.5	N/mm^2	Table 19, IS456:2000
	Diameter of the Stirrup bar		= **8**	mm	Table 20, IS456:2000
	Number of Legs		= **2**		
	Spacing of Shear reinforcement Required		= 190.0		Cl 40.4, IS456:2000
	Maximum Spacing of Shear Reinforcemer		= 250		Cl 26.5.1.5,IS456:2000
	Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing				
	Check For Deflection				
	Basic Value		= **26**		Cl.23.2, IS456:2000
	Service Stress in Steel	f_s	= **63.44**	N/mm^2	
	Modification Factor(Tension Reinforcemer	F_1	= 2.00		
	Allowable Span/Depth		= 52.00		
	Actual Span/Depth		= 13.33	**Hence Safe**	

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

Floor Beam Design

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

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CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

1.1 Geomentry Data

Beam Number		=	B3		
Type of Beam		=	Rectangular Beam		
Support Condition		=	Continuous Beam		
Width of beam	b	=	300	mm	
Overall Depth of Beam	D	=	525	mm	
Dia of bar	Φ	=	25	mm	
Nominal Cover	cc	=	30	mm	S 456:200(Table 19
Effective Depth	d	=	482.5	mm	S 456:200(
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 %		S 456:200(
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

$M_{ulim} = 0.133\ f_{ck}\ b\ d^2$ = 232.22 kNm

1.4 Area of Steel

Minimum Area of S = 0.17% b d = 246.075 mm^2

Support 1

Negative moment (Support 1)		=	254	kNm
Hence the Section is designed as Doubly Reinforced Section				
	M_u/bd^2	=	3.637	
Percentage of tension steel reqd	p_t	=	1.023	%
Percentage of compression steel reqd	p_c	=	0.085	%
Required Area of tension steel	$A_{st\ reqd}$	=	1480.79	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	123.04	mm^2

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 Reinforcem	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 provid	p_c	=	1.302	%	Hence O.K	

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/06/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar
Chennai - 600 083. Ph: 9790751379

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CL.NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Check for Shear

Shear = 241 kN

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

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

Support 2

Negative moment = 254 kNm

Hence the Section is designed as Doubly Reinforced Section

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

Detail of bars

	I st Layer		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 Reinforcem	**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 provic	p_c	= 1.302	%	**Hence O.K**

Check for Shear

Shear = 241 kN

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

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

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/06/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

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TITLE		REVISION	DATE	CHECKED RMK	DATE

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

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 Reinforcem	**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 provid p_c = 1.302 % **Hence O.K**

Check for Shear

Shear = 241 kN

Nominal Shear Stress	τv	=	1.66	N/mm^2
Permissible Shear Stress	τc	=	0.92	N/mm^2
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm^2
Diameter of the Stirrup bar		=	**8**	mm
Number of Legs		=	**2**	
Spacing of Shear reinforcement Required		=	190.0	
Maximum Spacing of Shear Reinforcement		=	300	

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

Cl 40.1, IS456:2000				
β = 1.000				
Table 19, IS456:2000				
Table 20, IS456:2000				
Cl 40.4, IS456:2000				
Cl 26.5.1.5,IS456:2000				

Check For Deflection

Basic Value		=	**26**	
Service Stress in Steel	f_s	=	**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**

Cl.23.2, IS456:2000

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/06/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

Floor Slab Design

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

PROJECT	RESIDENTIAL BUILDING (S+03), AT PLOT NO:163, EAST MADA STREET, THIRUVANMIYUR	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	Table 16 Cl.26.4.2 ,
	Effective thickness of slab (d_{eff}) = 150 - 25 - 5 = 120 mm	IS 456 -2000
	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 Condition : **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	IS 875 (Part 2) -1987
	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	
	α_x for positive moment 1.5 → 0.051	Table 26 Cl D-1.1,
	1.75 → 0.059	IS 456 -2000
	for 1.54 α_x = 0.052	
	Positive moment M_x : 0.052 x 12.38 x 5 ^2 = **16.17** KN-m	
	α_x for negative moment 1.5 → 0.067	Table 26 Cl D-1.1,
	1.75 → 0.077	IS 456 -2000
	for 1.54 α_x = 0.069	
	Negative moment M_x : 0.069 x 12.38 x 5 ^2 = **21.22** KN-m	

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

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TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Long Span Direction	
	For positive moment α_y = 0.028	Table 26 Cl D-1.1,
	Positive moment M_y : 0.028 x 12.38 x 5 ^2 = **8.66** KN-m	IS 456 -2000
	For negative moment α_y = 0.037	Table 26 Cl D-1.1,
	Negative moment M_y : 0.037 x 12.38 x 5 ^2 = **11.45** KN-m	IS 456 -2000
	Shear force V_u = 12.38 x 5 x 0.5 = **30.94** KN	
1.0.4	**Check Effective Depth for Max.Bending Moment**	
	Depth required = $(M_x / (0.133x\ fck \times b))^{1/2}$ = 79.89 mm	Table C,SP 16 :1980
	Depth provided = 150 - 25 - 10 /2 = 120 mm > 79.89 mm	Cl 2.3
	Hence the section is Safe against Bending	
1.0.5	**Check Depth for Shear**	
	Nominal Shear Stress : $\tau_v = V_u / b\ d$ = 0.26 N/mm^2	Cl.40.1, IS 456:2000
	Design shear strength (τ_c) = 0.46 N/mm^2	Table 19 , IS 456:2000
	k = 1.30	Cl.40.2.1.1,
	k * τ_c = 0.60 N/mm^2	IS 456:2000
	τ_v < k * τ_c **Hence the section is Safe against Shear**	
1.0.6	**Check for Maximum Shear Stress:**	
	Nominal Shear Stress : $\tau_v = V_u / b\ d$ = 0.26 N/mm^2	Cl.40.1, IS 456:2000
	Maximum Shear Stress ($\tau_{c,max}$) = 3.1 N/mm^2	Table 20 , IS 456:2000
	0.5 $\tau_{c,max}$ = 1.55 N/mm^2	
	τ_v < 0.5 $\tau_{c,max}$ **Hence the section is Safe against Max.Shear Stress**	Cl.40.2.3.1, IS 456:200
1.0.7	**Reinforcement calculations**	
	Short Span Direction @ Support	
	Mu/bd^2 = $\frac{21.22 \times 10 \wedge 6}{1000 \times 120 \times 120}$ = **1.474**	
	Pt = **0.37** %	Table 2-4, SP16 :1980

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100092019 (GCC)
CGLRGN/SE/Gr-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

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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 mm^2	
	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 / 438.88 = 178.86 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 provide Y **10** @ **170** mm C/C	
	Short Span Direction @ Mid Span	
	$Mu/bd^2 = \frac{16.17 \times 10 \wedge 6}{1000 \times 120 \times 120} = 1.123$	
	Pt = 0.273 %	SP16 :1980 Table 2-4
	Area of steel Ast = 0.0027 x 1000 x 120 = 327.93 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 / 327.93 = 239.38 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 provide Y **10** @ **150** mm C/C 150	
	Provided % of Tension Reinforcement (pt) = **0.436** %	
	Long Span Direction @ Support	
	$Mu/bd^2 = \frac{11.45 \times 10 \wedge 6}{1000 \times 120 \times 120} = 0.795$	
	Pt = 0.190 %	SP16 :1980 Table 2-4
	Area of steel Ast = 0.0019 x 1000 x 120 = 228.07 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 / 228.07 = 344.2 mm	

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

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TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES

Check for Spacing

Minimum of
1) 3d = 360 mm
2) = 300 mm
3) = 344.20 mm

IS 456:2000 Cl:26.3.3.(b).1

Therefore provide Y **10** @ **300** mm C/C

Long Span Direction @ mid Span

$Mu/bd^2 = \frac{8.66 \times 10 \wedge 6}{1000 \times 120 \times 120} = 0.602$

Pt = 0.142 %

SP16 :1980 Table 2-4

Area of steel Ast = 0.0014 x 1000 x 120 = 170.9 mm^2
Minimum area of steel: 0.0012 x 1000 x 150 = 180.00 mm^2
Spacing of Y **10** bars 78.54 x 1000 / 180.00 = 436.11 mm

IS 456:2000 Cl:26.5.2.1

Check for Spacing

Minimum of
1) 3d = 360 mm
2) = 300 mm
3) = 436.11 mm

IS 456:2000 Cl:26.3.3.(b).1

Therefore provide Y **10** @ **300** mm C/C

1.0.8 **Check for Deflection: (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 steel (fs) : 0.58 fy (Ast_R/Ast_P)	= 181.63 N/mm^2	IS456:2000 Fig 4
Modification Factor for Tension Reinforcement (F_1)	= 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

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

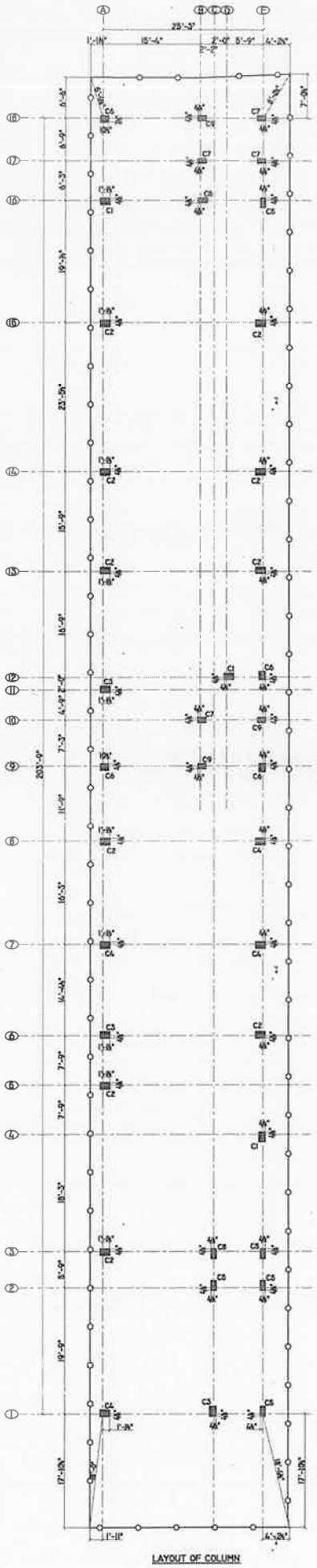
APPENDIX II

GENERAL ARRANGEMENT DRAWINGS

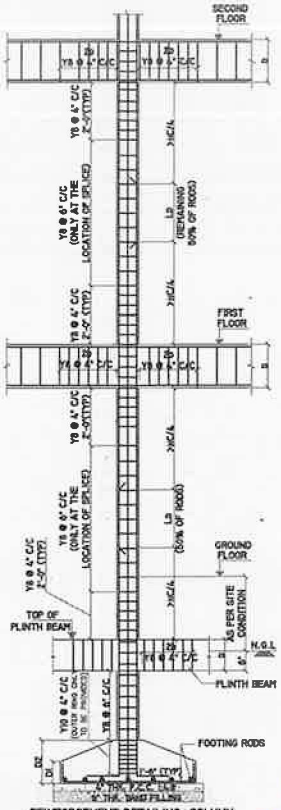
R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
CGLRGN/SE/Gr-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

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LAYOUT OF COLUMN



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

NOTE:
FOR COLUMN REINFORCEMENT DETAILS REFER DWG.NO : 001A

COLUMN SCHEDULE

S.NO.	NAME	SIZE LPTO GROUND ROOF	SIZE GROUND ROOF TO TOP
1.	C1	1'-0" X 1'-6"	0'-9" X 1'-6"
2.	C2	1'-0" X 1'-6"	0'-9" X 1'-6"
3.	C3	1'-0" X 1'-6"	0'-9" X 1'-6"
4.	C4	1'-0" X 1'-6"	0'-9" X 1'-6"
5.	C5	0'-9" X 1'-6"	0'-9" X 1'-6"
6.	C6	1'-0" X 1'-3"	0'-9" X 1'-3"
7.	C7	0'-9" X 1'-3"	0'-9" X 1'-3"
8.	C8	0'-9" X 1'-6"	0'-9" X 1'-6"
9.	C9	0'-9" X 1'-3"	0'-9" X 1'-3"



TYPICAL COLUMN
REDUCTION DETAILS

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 OF 1.5 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

iii) DEVELOPMENT LENGTH (Ld) SHALL BE AS PER CP-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 SP-34 & IS 13920

EXCAVATION AND BACKFILL

I) BACKFILL FOR FOUNDATIONS AND PITS SHALL BE PLACED EVENLY LAYERS OF 300 MM THICKNESS AND SHALL BE WELL COMPACTED. THE FILL SHALL CONTAIN NO STONES WITH A DIAMETER GREATER THAN 100 MM. THE DEGREE OF COMPACTION OF BACKFILL SHALL BE 95% OF THE MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT OBTAINED BY THE MODIFIED PROCTOR COMPACTION TEST.

II) UNSUITABLE MATERIALS LIKE ROCKS/ EXISTING FOOTINGS ARE DETECTED BELOW FOUNDATION LEVEL IN AREAS OF CUT SHALL BE EXCAVATED TO FIRM GROUND. THE RESULTANT EXCAVATION SHALL BE FILLED TO THE REQUIRED LEVELS WITH MASS CONCRETE GRADE M10, ALSO WHEREVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL, STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE GRADE-10.

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

IV) A LAYER OF BLINDING CONCRETE 100 MM THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/MM AT 28 DAYS.

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SE/GR-I/19/05/154 (CMDA), RSE 100692019 (GCC)
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AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
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GENERAL NOTES:

1. ALL DIMENSIONS ARE IN FOOT UNITS.
2. CONCRETE GRADE SHALL BE M25 CONFIRMING TO IS 456:2000
5. GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
4. CLEAR COVER FOR REINFORCEMENT
   A) COLUMN = 1½ "
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. COLUMNS AND FOOTINGS ARE DESIGNED FOR G+3 FLOOR LOADS AND SBC OF THE SOIL IS 100KN/SQM. @ 8'-0" 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 CONSTRUCTION	M.R	R.M	10.12.24

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO: 163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

DRAWING TITLE :-

LAYOUT & R.C DETAILS OF COLUMN

DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" = 11'	——	001

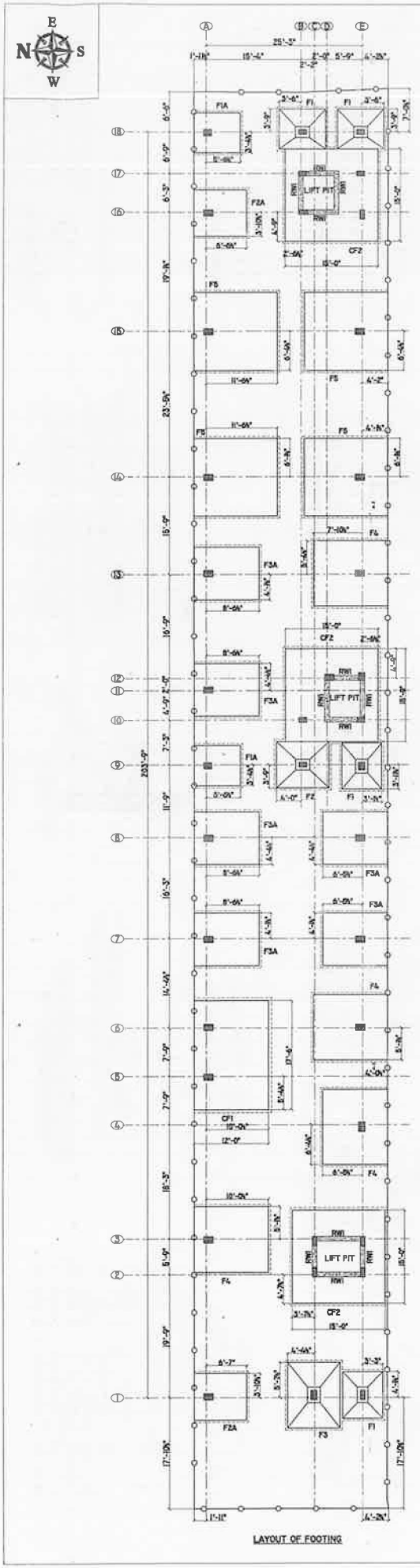
APCHITECT / CONSULTANTS :-

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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LAYOUT OF FOOTING

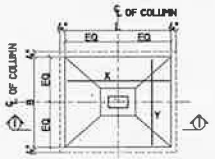
FOOTINGS SCHEDULE:-

SI.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT (X MAIN REINFO Y DISTRIBUTOR REINFO)
01	F1	7'-6" X 6'-6" D1=1'-0" D2=1'-6" SLOPED FOOTING	Y10 @ 4" C/C BOTHWAYS @ BOTTOM
02	F1A	7'-6" X 6'-6" D=1'-0" FLAT FOOTING	Y10 @ 4" C/C BOTHWAYS @ TOP & BOTTOM
03	F2	8'-6" X 7'-6" D1=1'-3" D2=2'-0" SLOPED FOOTING	Y12 @ 6" C/C BOTHWAYS @ BOTTOM
04	F2A	8'-6" X 7'-6" D=2'-0" FLAT FOOTING	Y12 @ 6" C/C BOTHWAYS @ TOP & BOTTOM
05	F3	10'-0" X 8'-6" D1=1'-6" D2=2'-3" SLOPED FOOTING	Y12 @ 5" C/C BOTHWAYS @ BOTTOM
06	F3A	10'-0" X 8'-6" D=2'-3" FLAT FOOTING	Y12 @ 5" C/C BOTHWAYS @ TOP & BOTTOM
07	F4	12'-0" X 10'-6" D=2'-6" FLAT FOOTING	Y12 @ 4" C/C BOTHWAYS @ TOP & BOTTOM
08	F5	13'-6" X 12'-6" D=2'-6" FLAT FOOTING	Y16 @ 8" C/C BOTHWAYS @ TOP & BOTTOM

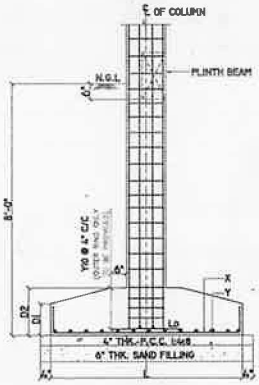
COMBINED FOOTINGS SCHEDULE:-

SI.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT
01	CF1	12'-0" X 17'-6" X 2'-0"	Y12 @ 4" C/C BOTHWAYS @ TOP & BOTTOM
02	CF2	15'-0" X 15'-0" X 2'-0"	Y12 @ 4" C/C BOTHWAYS @ TOP & BOTTOM

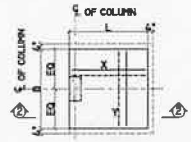
NOTE:
N.G.L - NATURAL GROUND LEVEL
FOR COMBINED FOOTING REINFORCEMENT DETAILS REFER DWG.NO : 002A



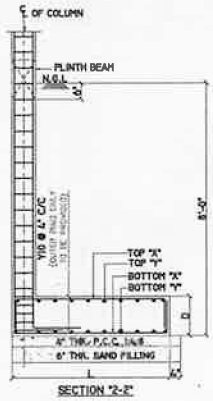
TYPICAL PLAN OF SLOPED FOOTING



SECTION "1-1"



TYPICAL PLAN OF FLAT FOOTING



SECTION "2-2"

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.

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B) DEVELOPMENT LENGTH FOR BEAM BARS -50D

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

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

EXCAVATION AND BACKFILL

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

IV) A LAYER OF BLINDING CONCRETE 100 MM THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/MM AT 28 DAYS.

GENERAL NOTES:

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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) FOOTING = 2" B) R.C WALL = 1"
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. COLUMNS AND FOOTINGS ARE DESIGNED FOR G+3 FLOOR LOADS AND SBC OF THE SOIL IS 100KN/SQM. @ 8'-0" BELOW N.G.L.
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R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/09/154 (CMDA), RSE 100092019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
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REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	M.R	R.M	10.12.24

PROJECT :-
PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO: 163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

DRAWING TITLE :-
LAYOUT & R.C DETAILS OF FOOTING

DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" : 11'	——	001

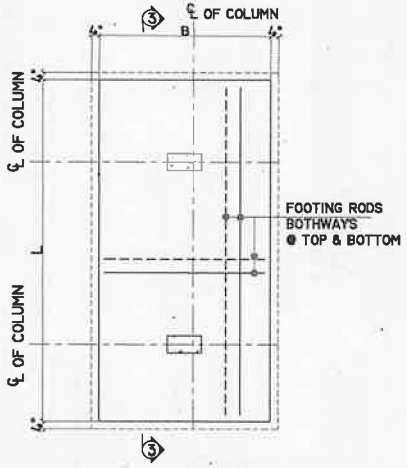
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

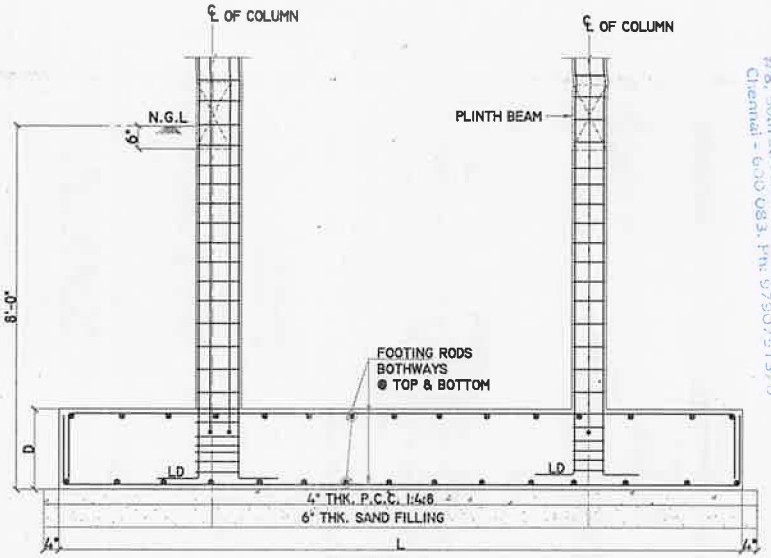
AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue, ASHOK NAGAR, CHENNAI- 600 083.
Head Line - 044 4869 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
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TYPICAL PLAN OF COMBINED FOOTING



SECTION "3-3"

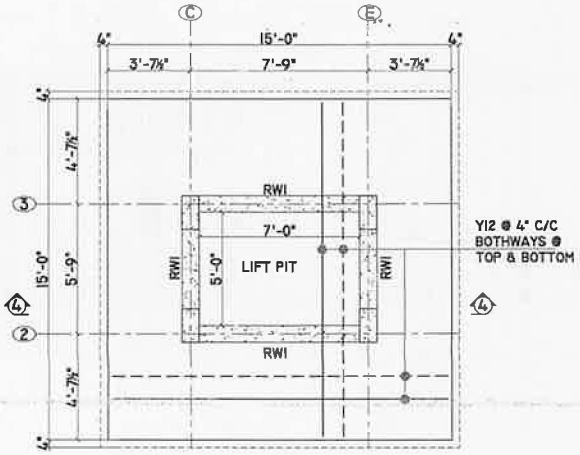
COMBINED FOOTINGS SCHEDULE:-

Sl.	FOOTING NAME	FOOTING SIZE	FOOTING REINFORCEMENT
01	CF1	12'-0" X 17'-6" X 2'-0"	Y12 @ 4" C/C BOTHWAYS @ TOP & BOTTOM
02	CF2	15'-0" X 15'-0" X 2'-0"	Y12 @ 4" C/C BOTHWAYS @ TOP & BOTTOM

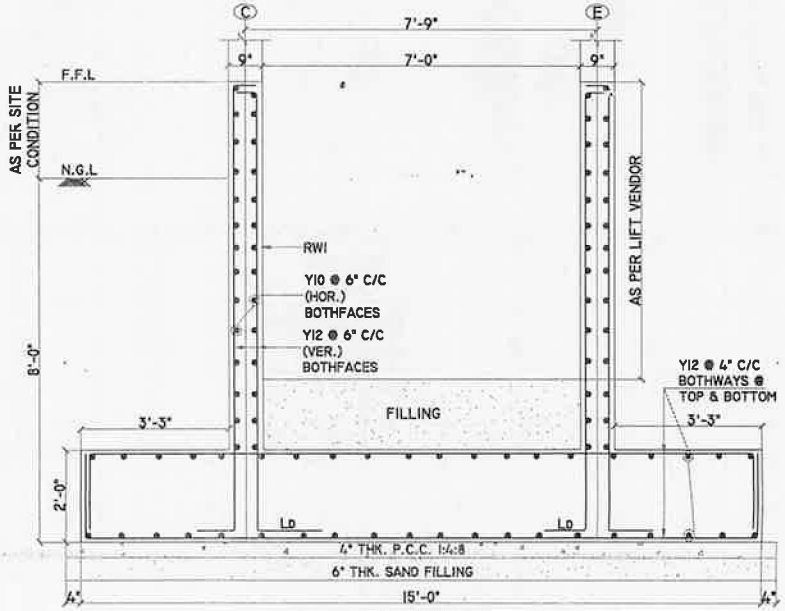
NOTE:

N.G.L - NATURAL GROUND LEVEL

F.F.L - FLOOR FINISH LEVEL



PLAN OF COMBINED FOOTING -"CF2"



SECTION "4-4"

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 OF 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% OF THE BARS SHALL BE LAPPED.

ii) LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF 1.5 TIMES LAP LENGTH OF THE BAR FOR TENSION & COMPRESSION MEMBERS.

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

A) DEVELOPMENT LENGTH FOR COLUMN BARS -40Ø

B) DEVELOPMENT LENGTH FOR BEAM BARS -50Ø

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

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

EXCAVATION AND BACKFILL:

I) BACKFILL FOR FOUNDATIONS AND PITS SHALL BE PLACED EVENLY LAYERS OF 300 MM THICKNESS AND SHALL BE WELL COMPACTED. THE FILL SHALL CONTAIN NO STONES WITH A DIAMETER GREATER THAN 100 MM. THE DEGREE OF COMPACTION OF BACKFILL SHALL BE 95% OF THE MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT OBTAINED BY THE MODIFIED PROCTOR COMPACTION TEST.

II) UNSUITABLE MATERIALS LIKE ROCKS/ EXISTING FOOTINGS ARE DETECTED BELOW FOUNDATION LEVEL IN AREAS OF CUT SHALL BE EXCAVATED TO FIRM GROUND, THE RESULTANT EXCAVATION SHALL BE FILLED TO THE REQUIRED LEVELS WITH MASS CONCRETE GRADE M10. ALSO WHEREVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE GRADE-10.

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

IV) A LAYER OF BLINDING CONCRETE 100 MM THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/MM² AT 28 DAYS.

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) FOOTING = 2" B) R.C WALL = 1"
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. COLUMNS AND FOOTINGS ARE DESIGNED FOR G+3 FLOOR LOADS AND SBC OF THE SOIL IS 200KN/SQM. @ 7'-0" BELOW N.G.L.
7. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
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ISSUE FOR CONSTRUCTION	M.R	R.M	10.12.24
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PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO: 163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

DRAWING TITLE :-

R.C DETAILS OF FOOTING

DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" : 10'	——	002A

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

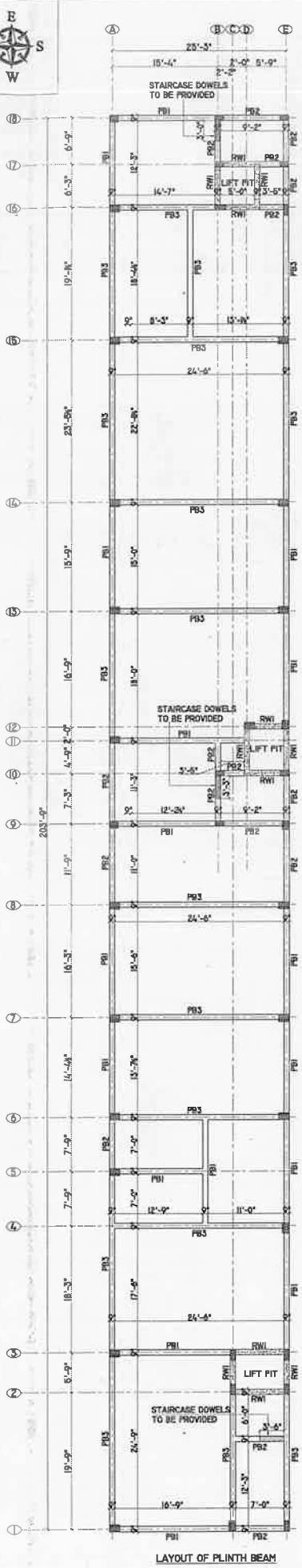
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A3

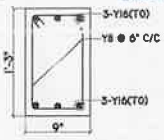
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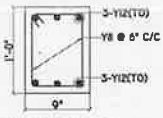
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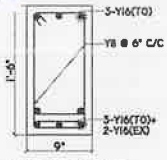
LAYOUT OF PLINTH BEAM



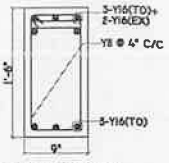
PLINTH BEAM "PB1"
(0'-9" x 1'-3")



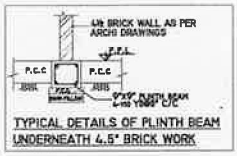
PLINTH BEAM "PB2"
(0'-9" x 1'-0")



PLINTH BEAM "PB3"
(0'-9" x 1'-6")
(@ MID SUPPORT)



PLINTH BEAM "PB3"
(0'-9" x 1'-6")
(@ END SUPPORT)



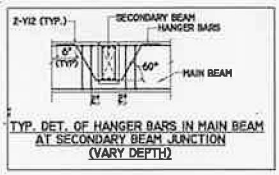
TYPICAL DETAILS OF PLINTH BEAM UNDERNEATH 4.5" BRICK WORK

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	PB1	0'-9" x 1'-3"
02	PB2	0'-9" x 1'-0"
03	PB3	0'-9" x 1'-6"

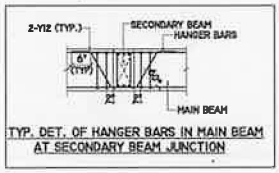
NOTE:

N.G.L - NATURAL GROUND LEVEL.

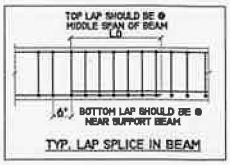
F.F.L - FLOOR FINISH LEVEL



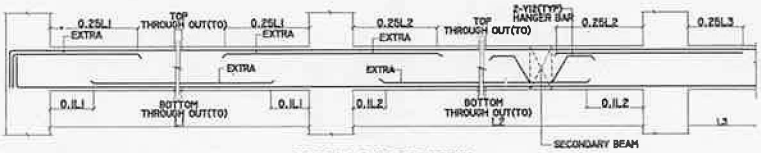
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION (VARY DEPTH)



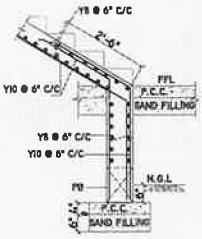
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION



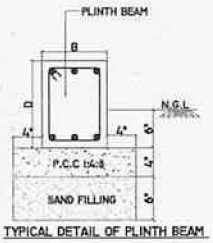
TYP. LAP SPLICE IN BEAM



TYPICAL L.S OF PLINTH BEAM



TYP. DETAIL OF STAIRCASE DOWELS



TYPICAL DETAIL OF PLINTH BEAM

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN FOOT UNITS.
2. CONCRETE GRADE SHALL BE M25 CONFIRMING TO IS 456:2000
3. GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
4. CLEAR COVER FOR REINFORCEMENT
   A) BEAM = 1" B) R.C WALL = 1"
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. COLUMNS AND FOOTINGS ARE DESIGNED FOR G+3 FLOOR LOADS AND SBC OF THE SOIL IS 100KN/SQM. @ 8'-0" 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

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 OF 1.3 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.

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

EXCAVATION AND BACKFILL

I) BACKFILL FOR FOUNDATIONS AND PITS SHALL BE PLACED EVENLY LAYERS OF 300 MM THICKNESS AND SHALL BE WELL COMPACTED. THE FILL SHALL CONTAIN NO STONES WITH A DIAMETER GREATER THAN 100 MM. THE DEGREE OF COMPACTION OF BACKFILL SHALL BE 95% OF THE MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT OBTAINED BY THE MODIFIED PROCTOR COMPACTION TEST.

II) UNSUITABLE MATERIALS LIKE ROCKS/ EXISTING FOOTINGS ARE DETECTED BELOW FOUNDATION LEVEL IN AREAS OF CUT SHALL BE EXCAVATED TO FIRM GROUND. THE RESULTANT EXCAVATION SHALL BE FILLED TO THE REQUIRED LEVELS WITH MASS CONCRETE GRADE M15. ALSO WHEREVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE GRADE-M15.

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

IV) A LAYER OF BLINDING CONCRETE 100 MM THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/MM AT 28 DAYS.

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	M.R	R.M	10.12.24

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO: 163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

DRAWING TITLE :-

LAYOUT & R.C DETAILS OF PLINTH BEAM

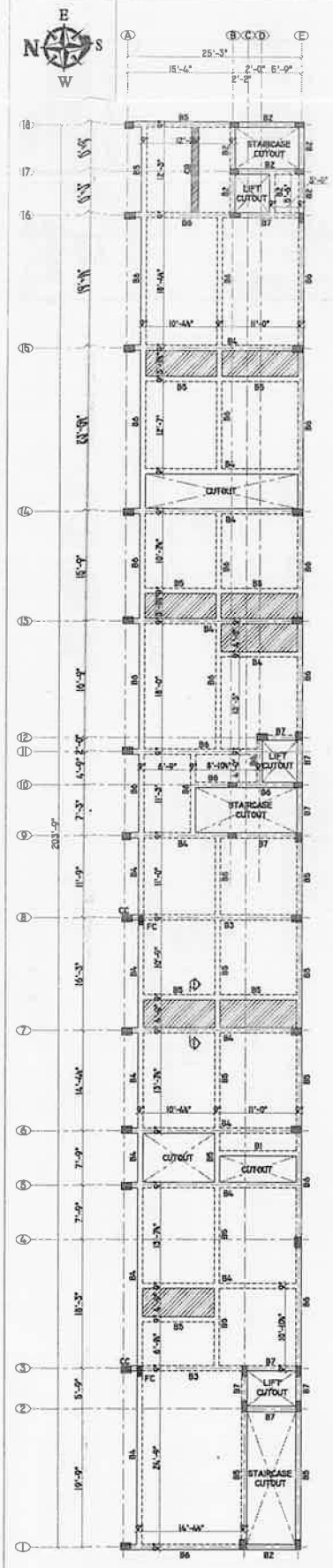
DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" : 10'	——	003

ARCHITECT / CONSULTANTS :-

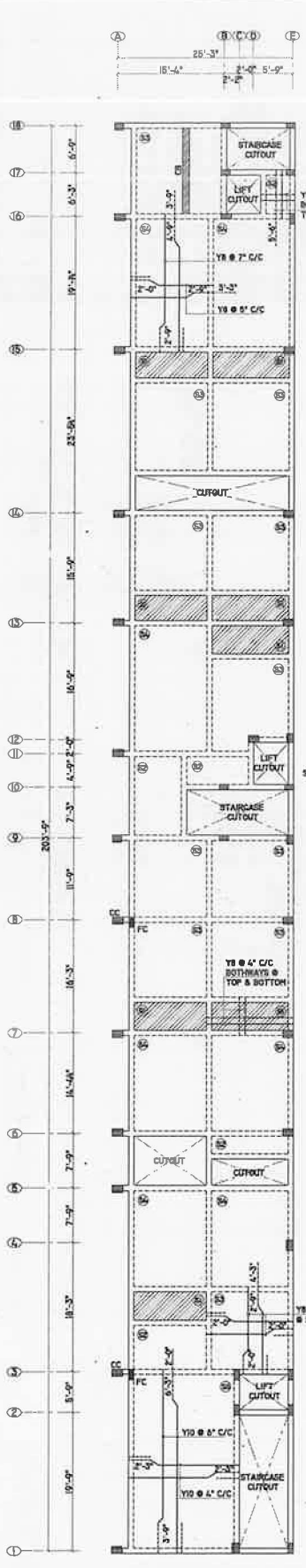
STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
#8, 50th St, Saravanangala Colony, 7th Avenue, ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line : 044 4299 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

A2



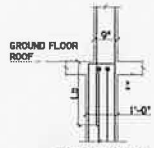
LAYOUT OF GROUND FLOOR ROOF BEAM & SLAB



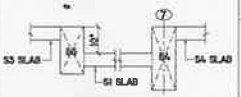
R.C LAYOUT OF GROUND FLOOR ROOF BEAM & SLAB

SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	5" THK.
02	S2	6" THK.
03	S3	6" THK.
04	S4	5" THK.
05	S5	6" THK.

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	0'-9" x 1'-6"
02	B2	0'-9" x 1'-3"
03	B3	0'-9" x 2'-0"
04	B4	0'-9" x 2'-0"
05	B5	0'-9" x 1'-6"
06	B6	0'-9" x 2'-0"
07	B7	0'-9" x 1'-3"



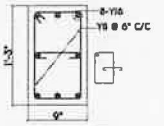
TYPICAL COLUMN REDUCTION DETAILS



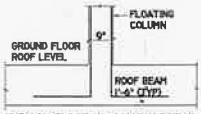
SECTION "1-1"

NOTE:

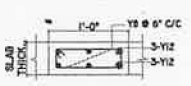
- SLAB SUNK BY 0'-10"
- PROVIDE Y8 @ 8" C/C AS DISTRIBUTORS WHERE EVER REQUIRED
- FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 005
- FC- FLOATING COLUMN TAKEN FROM GROUND FLOOR ROOF
- CC - COLUMN CURTAILED & RODS TO BE BEND IN TO TOP OF THE SLAB



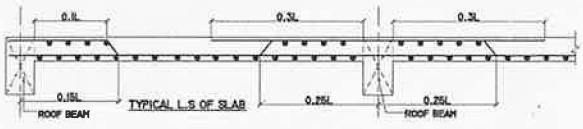
C.S. OF COLUMN "FC"
(0'-9" X 1'-3")
(UPTO TOP)



TYPICAL FLOATING COLUMN DETAIL



C.S OF CONCEALED BEAM-"CB"
(1'-0" X "SLAB THICKNESS")



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 IS456 : 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 ——— 14 DAYS.

E. BOTTOM PROPS TO BEAMS
- i) SPANNING UP TO 6.00M ——— 14 DAYS.
- ii) SPANNING OVER 6.00M ——— 21DAYS.

LAP JOINTS FOR REINFORCEMENT BARS:

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

II). LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF 1.3 TIMES THE LAP LENGTH OF THE BAR FOR TENSION AND COMPRESSION MEMBERS.

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

IV). LAPS IN BEAM AND SLAB SHALL BE PROVIDED AT THE POINT OF CONTRAFLEXURE.

V). 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 USING ARC WELDING AND SPECIAL ELECTRODES AFTER GETTING PRIOR WRITTEN APPROVAL FROM THE STRUCTURAL CONSULTANT.

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

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) BEAM = 1" B) SLAB = 3/4"
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

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/05/154 (CMDA), RSE 100092019 (GCC)
CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	M.R	R.M	10.12.24

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO: 163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" : 11'	——	004

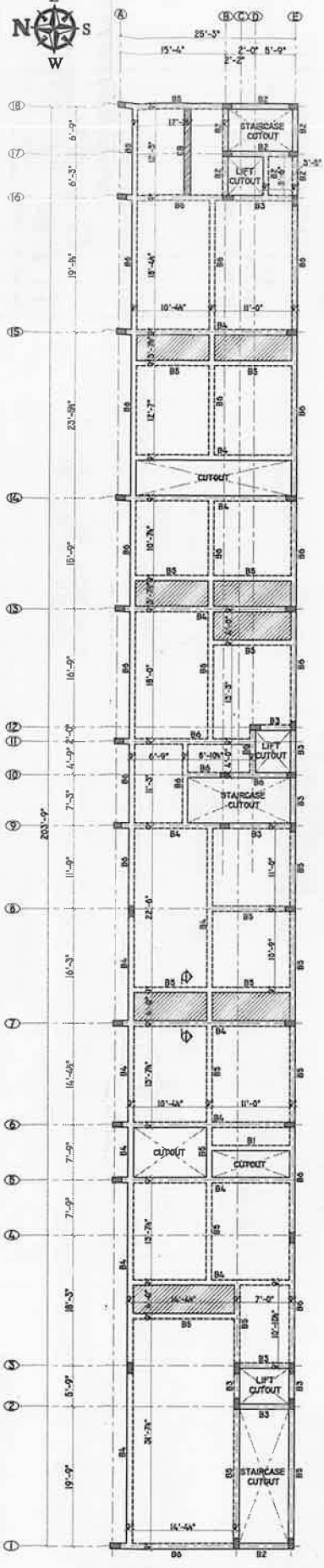
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

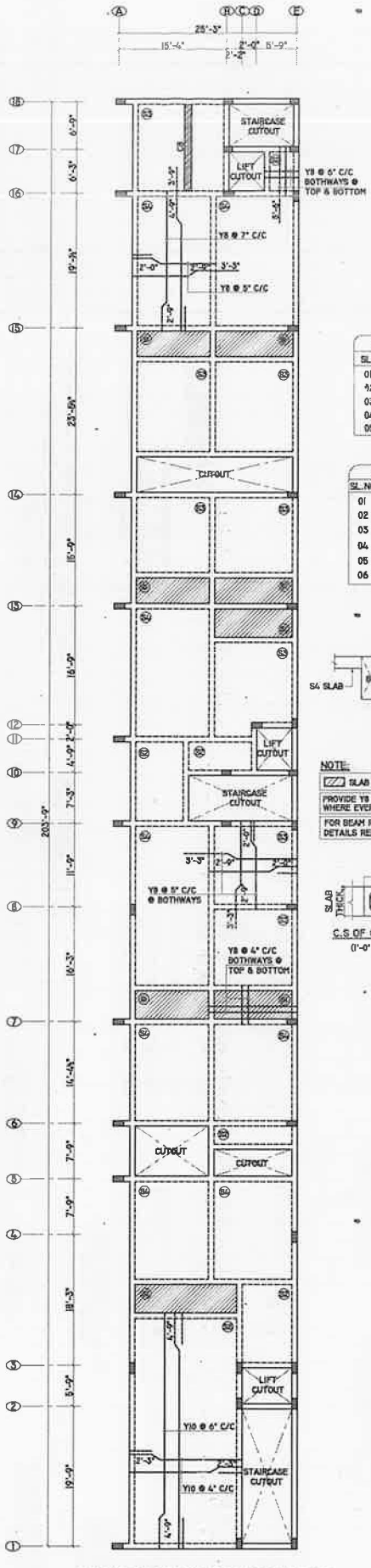
AURA ENGINEERING CONSULTANTS
#8, 50th St, Saravanangalla Colony, 7th Avenue, ASHOK NAGAR, CHENNAI- 600 083.
Phone Line :- 044 4999 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
https://auraengineers.co.in/
aura Engineering Consultants

A2

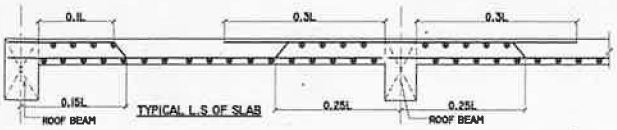
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LAYOUT OF TYPICAL FLOOR ROOF BEAM & SLAB

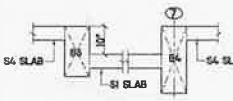


R.C LAYOUT OF TYPICAL FLOOR ROOF BEAM & SLAB



SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	5" THK.
02	S2	5" THK.
03	S3	5" THK.
04	S4	5" THK.
05	S5	6" THK.

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	0'-9" x 1'-6"
02	B2	0'-9" x 1'-3"
03	B3	0'-9" x 1'-3"
04	B4	0'-9" x 2'-0"
05	B5	0'-9" x 1'-6"
06	B6	0'-9" x 2'-0"



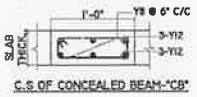
SECTION "1-1"

NOTE:

SLAB SUNK BY 0'-10"

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

FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 007



C.S OF CONCEALED BEAM-"CB"
(1'-0" X "SLAB THICKNESS")

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 IS456 : 2000

A. VERTICAL SIDE OF SHUTTERING OF COLUMNS, WALLS AND B 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 ——— 14 DAYS.

E. BOTTOM PROPS TO BEAMS
- i) SPANNING UP TO 6.00M ——— 14 DAYS.
- ii) SPANNING OVER 6.00M ——— 21DAYS.

LAP JOINTS FOR REINFORCEMENT BARS:

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

ii). LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF 1.3 TIMES THE LAP LENGTH OF THE BAR FOR TENSION AND COMPRESSION MEMBERS.

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

iv). LAPS IN BEAM AND SLAB SHALL BE PROVIDED AT THE POINT OF CONTRAFLEXURE.

v). 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 USING ARC WELDING AND SPECIAL ELECTRODES AFTER GETTING PRIOR WRITTEN APPROVAL FROM THE STRUCTURAL CONSULTANT.

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

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) BEAM = 1" B) SLAB = 3/4"
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

R. MANIKANDAN, M.Tech, (Structures)
Registered Structural Engineer Grade I
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CGLRGN/SE/GR-I/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751379

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	M.R	R.M	10.12.24

PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO: 163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" : 11'	——	006

ARCHITECT / CONSULTANTS :-

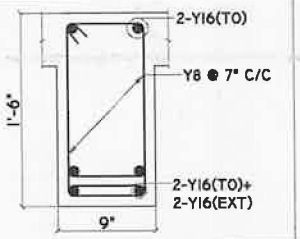
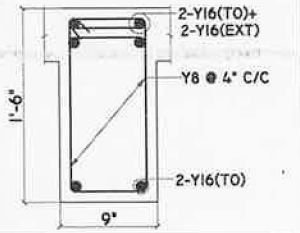
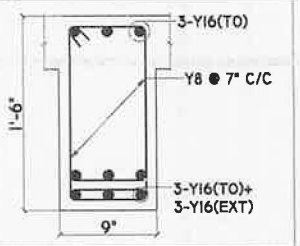
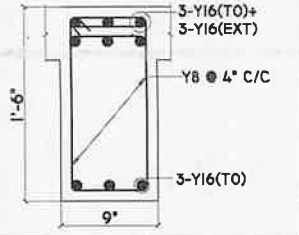
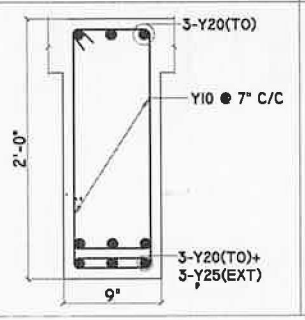
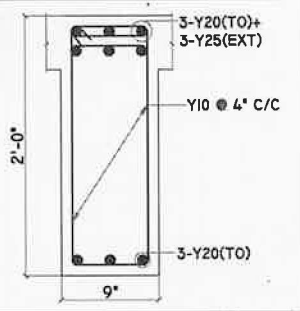
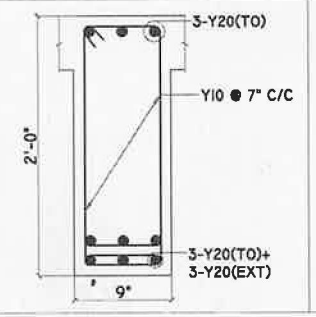
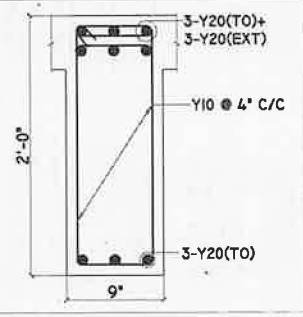
STRUCTURAL CONSULTANTS :-

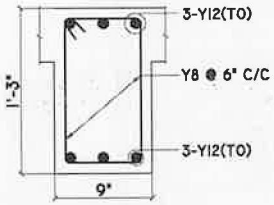
AURA ENGINEERING CONSULTANTS
#8, 50th St, Sarvamangala Colony, 7th Avenue,
ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4899 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

A2

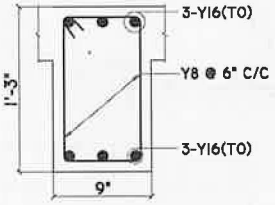
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NAME	MID SPAN	END SUPPORT	NAME	MID SPAN	END SUPPORT
B1 (0'-9" X 1'-6")			B5 (0'-9" X 1'-6")		
B4 (0'-9" X 2'-0")			B6 (0'-9" X 2'-0")		



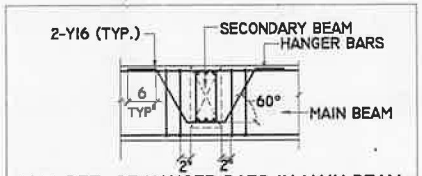
C.S. OF BEAM "B2"
(0'-9" X 1'-3")



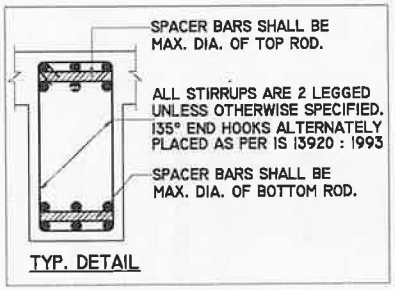
C.S. OF BEAM "B3"
(0'-9" X 1'-3")

BEAM SCHEDULE

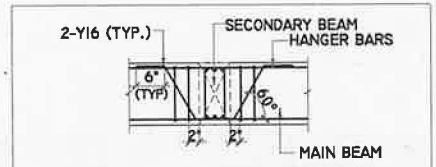
SL.NO	NAME	SIZE
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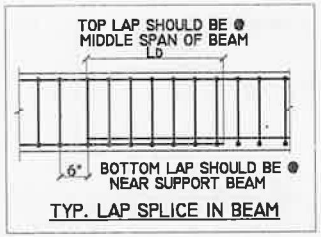
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION (VARY DEPTH)



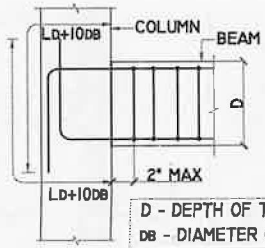
TYP. DETAIL



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

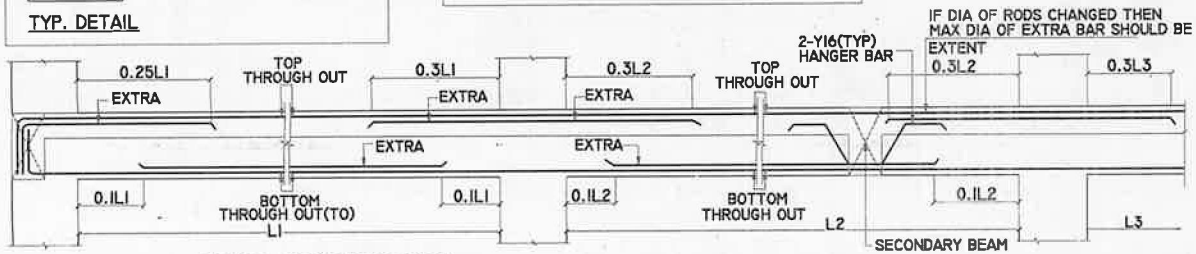


TYP. LAP SPLICE IN BEAM



D - DEPTH OF THE BEAM
DB - DIAMETER OF THE BAR

TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION



TYPICAL L.S OF ROOF BEAM

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN FOOT UNITS.
2. CONCRETE GRADE SHALL BE M25 CONFIRMING TO IS 456:2000
3. GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
4. CLEAR COVER FOR REINFORCEMENT
   A) BEAM = 1" B) SLAB = 3/4"
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

R. MANIKANDAN, M.Tech (Structures)
Registered Structural Engineer Grade I
SE/GR-I/19/06/15 (CMDA), IAE 100693015 (GCC)
CGLRGN/SE/GR-I/2015/06/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, South Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751375

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	M.R	R.M	10.12.24

PROJECT :-
PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO: 163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

DRAWING TITLE :-
R.C DETAILS OF TYPICAL FLOOR ROOF BEAM

DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" : 10"	------	007

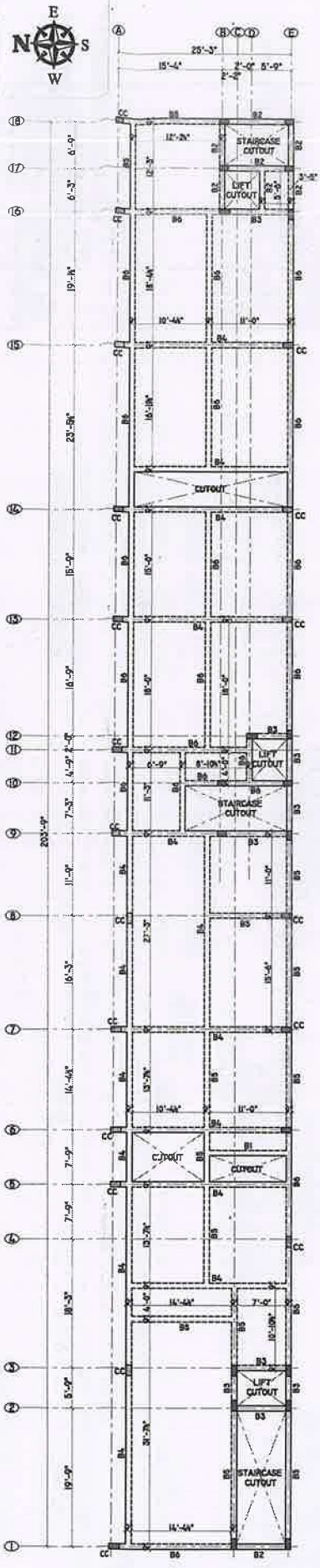
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

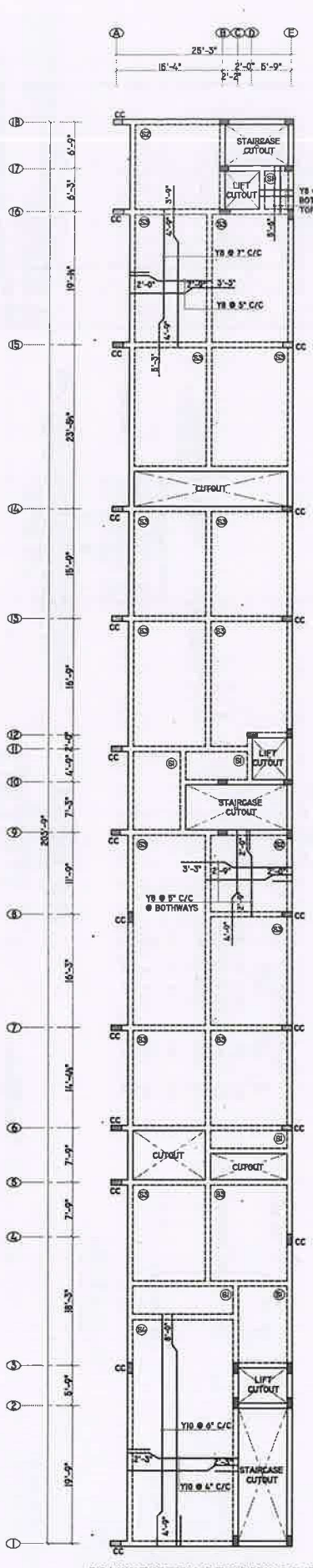
AURA ENGINEERING CONSULTANTS
NO:8/27, 66th STREET
R.V NAGAR, ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4555 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
https://auraengineers.co.in/
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LAYOUT OF TERRACE FLOOR BEAM & SLAB



R.C LAYOUT OF TERRACE FLOOR BEAM & SLAB

SLAB SCHEDULE		
SL.NO	NAME	THICK
01	S1	5" THK.
02	S2	5" THK.
03	S3	5" THK.
04	S4	6" THK.

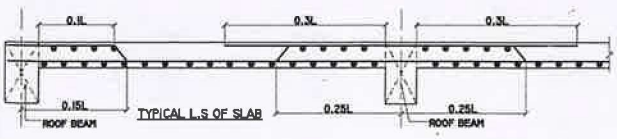
BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	0'-9" X 1'-6"
02	B2	0'-9" X 1'-3"
03	B3	0'-9" X 1'-3"
04	B4	0'-9" X 2'-0"
05	B5	0'-9" X 1'-6"
06	B6	0'-9" X 2'-0"

NOTE:

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

FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 009

CC - COLUMN CURTAILED & RODS TO BE BEND 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 IS456 : 2000

A. VERTICAL SIDE OF SHUTTERING OF COLUMNS, WALLS AND S 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 ——— 14 DAYS.

E. BOTTOM PROPS TO BEAMS
I) SPANNING UP TO 6.00M ——— 14 DAYS.
II) SPANNING OVER 6.00M ——— 28DAYS.

LAP JOINTS FOR REINFORCEMENT BARS:

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

II). LAPS SHALL BE STAGGERED WITH A MINIMUM CENTRE TO CENTRE DISTANCE OF 1.3 TIMES THE LAP LENGTH OF THE BAR FOR TENSION AND COMPRESSION MEMBERS.

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

IV). LAPS IN BEAM AND SLAB SHALL BE PROVIDED AT THE POINT OF CONTRAFLEXURE.

V). 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 USING ARC WELDING AND SPECIAL ELECTRODES AFTER GETTING PRIOR WRITTEN APPROVAL FROM THE STRUCTURAL CONSULTANT.

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

GENERAL NOTES:

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REV.	DESCRIPTIONS	DRN	CHK	DATE
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PROJECT :-

PLAN SHOWING THE PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING AT PLOT NO: 163, EAST MADA STREET, THIRUVANMIYUR, CHENNAI-600041.

DRAWING TITLE :-

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

DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" : 11'	——	008

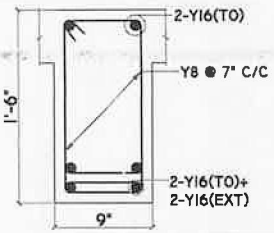
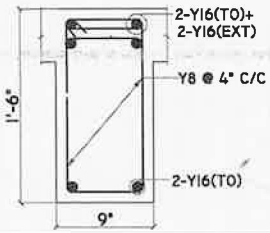
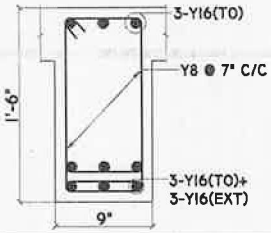
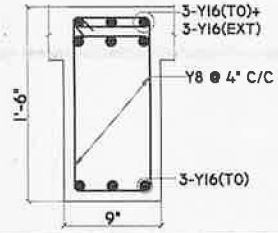
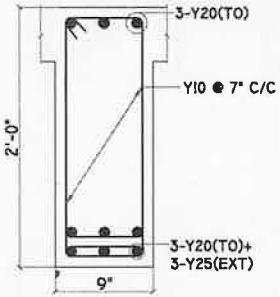
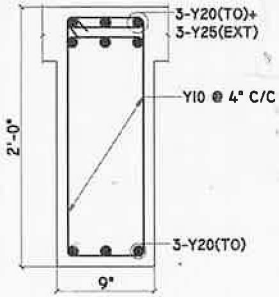
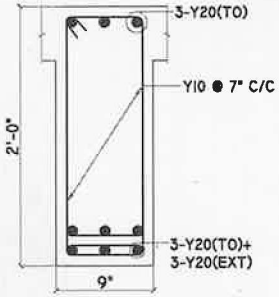
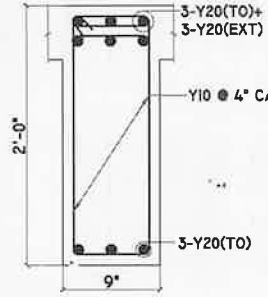
ARCHITECT / CONSULTANTS :-

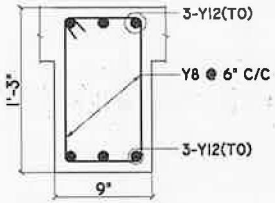
STRUCTURAL CONSULTANTS :-

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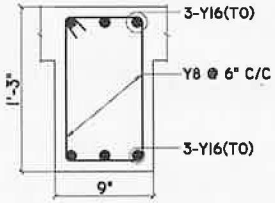
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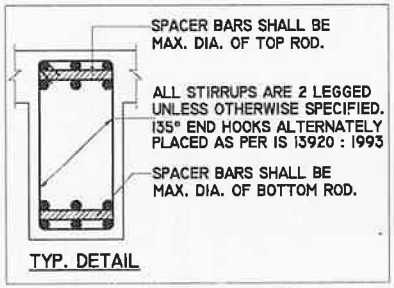
C.S. OF BEAM "B2"
(0'-9" X 1'-3")



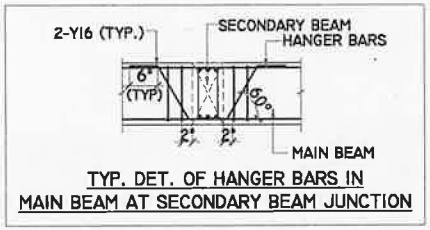
C.S. OF BEAM "B3"
(0'-9" X 1'-3")

BEAM SCHEDULE

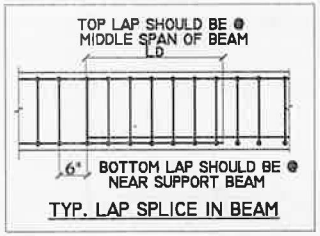
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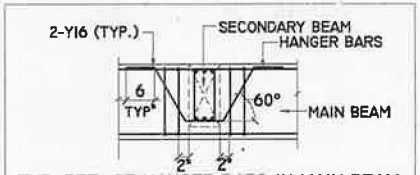
TYP. DETAIL



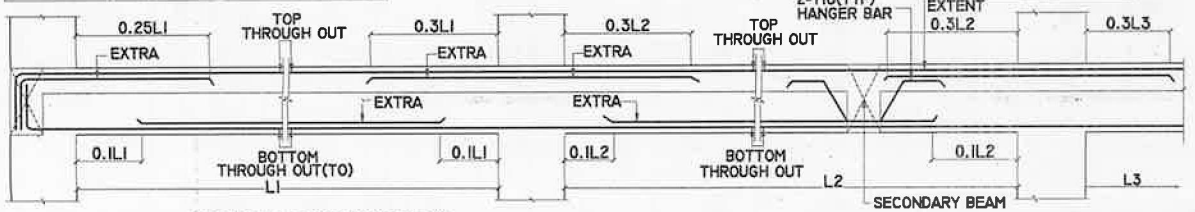
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION



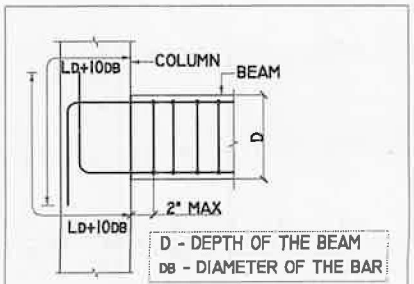
TYP. LAP SPLICE IN BEAM



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



TYPICAL L.S OF ROOF BEAM



TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION

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DRAWING TITLE :-
R.C DETAILS OF TERRACE FLOOR BEAM

DATE	SCALE	JOB.NO	DRG.NO
10.12.24	1" : 10'	———	009

ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
NO:163,27, 44th STREET
R.V NAGAR, ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line :- 044 4989 7100
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Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator

Property Documentation & Workflow Tools

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