Verified RealEstate™

RE REGULATORY RECORD

RERA Document

The document as the regulator published it, reproduced in full behind this page.

Published for reference. The authority's own register is the operative record.

Verified RealEstate™
3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai 600 097, India

hello@verified.realestate
+91 9996 12 9996
verified.realestate

DIGITALLY VERIFIED RECORD

DESIGN CALCULATION

PLAN SHOWING THE PROPOSED CONSTRUCTION OF A COMMERCIAL CUM RESIDENTIAL BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI-600106.T.SMNO:5PART, BLOCK NO:22, OF ARUMBAKKAM CILLAGE, GREATER CHENNAI CORPORATION, ZONE:08, DIVISION:108.

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

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

FOR PLOT PC-51
Razack garden Main Road.
Arumbakkam. Chennai - 106.

Structural Design Calculation for Construction of COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM

CONTENTS

1.0 Design Brief	1
2.0 Design Criteria	
2.1 Project Description	1
2.2 General	1
2.3 Design Codes & Standards	1
3.0 Loading	
3.1 Dead Load	1
3.2 Live Load	2
3.3 Wind Load	2
3.4 Seismic Load	2
3.5 Loading Combinations	2
4.0 Structural Material	
4.1 Steel Material Specification	3
4.2 Concrete Material Specifications	3
4.3 Reinforcement Material Specifications	3
4.4 Concrete Cover	3
5.0 Structural Description	
5.1 Method of Analysis	4
5.2 Framing System, Analysis and Design	5
5.3 Deflection limits	5
Appendix-I Design Calculations	
Appendix-II General Arrangement drawings	

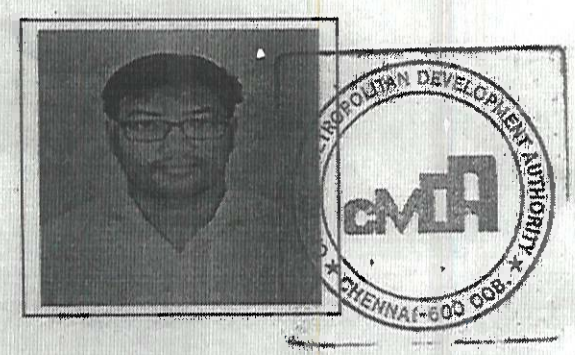
CHENNAJ METROPOLITAN DEVELOPMENT AUTHORJTY
'Tbalamuthu Natarajan Building', No. I, Gandhi Irwin Road,
Egmore, Chennai-600 008.

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.**



(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 COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM

1.0 DESIGN BRIEF:

THIS DOCUMENT PLAN SHOWING THE PROPOSED CONSTRUCTION OF A COMMERCIAL CUM RESIDENTIAL BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI-600106.T.SMNO:5PART, BLOCK NO:22, OF ARUMBAKKAM CILLAGE, GREATER CHENNAI CORPORATION, ZONE:08, DIVISION:108.

2.0 GENERAL DESIGN CRITERIA

2.1. Description of the structure

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

1. Size of the building : 46.93 X 9.14M
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 : Pile foundation as per geotechnical report

2.2. Materials Used

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

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

2.3. Design Codes & Standards

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

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

3.0 LOADING

Primary Load:

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

3.1. Dead load (DL)

Material weight

- Density of Concrete =25 kN/m^3
- D.L. due to partitions
  (Light Partition as per IS 875) =1.50 kN/m^2
- D.L due to floor finish 50mm thick = 0.05x25 = 1.25 kN/m^2

3.2. Live load (LL)

Minimum Uniformly Distributed Live Loads:

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

3.5 Loading Combinations

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

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

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

- 1.0(DL +LL)

4.0 STRUCTURAL MATERIAL:

4.1 Concrete Material Specifications:

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

4.2 Reinforcement:

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

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

4.4 Concrete cover:

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

- Raft Slab = 50mm
- Footing = 50mm

APPENDIX I

Design Calculations

Column Design

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

5.0 Structural Description

5.1. Method of analysis

Structure analysis & design:

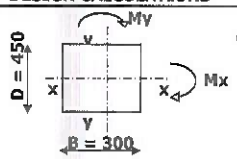
The structure is analyzed as a Space frame structure in STADD Pro Vi8. Columns, Footing, Basement walls, slabs, Beams and Staircases are designed as reinforced concrete members.

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.

PROJECT	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE	Design for a Short Column with Biaxial Bending	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Column No:  **CRITICAL LOAD CASE:**	
1.0	**Basic Data**	
1.1	**Material Data**	
	Grade of Concrete = M 25	
	Grade of Steel = Fe 500	
1.2	**Codal Data**	
	Nominal Cover = 40 mm	Cl 26.4.2.1,IS456:2000
	Diameter of the Bar = 25 mm ≥ 12 mm	
	d' = 52.5 mm	
1.3	**Basic Dimensions**	
	Unsupported Length of the Column L_{ox} = 3000 mm	
	L_{oy} = 3000 mm	
	L_{ex} = 3000 mm	Table 28 ,
	L_{ey} = 3000 mm	IS456:2000
	Size of the Column B X D = 300 x 450 mm	
1.4	**Analysis Results**	
	Factored Axial Load P_u = 780.0 kN	STAAD
	Factored Moment M_{ux} = 22.00 kNm	OUTPUT
	Factored Moment M_{uy} = 71.00 kNm	
2.0	**Check for Slenderness**	
	Slenderness Ratio about Major Axis L_{ex} / D = 6.667	
	Slenderness Ratio about Minor Axis L_{ey} / B = 10.000	
	Since Leff / LLD <12 Designed as Short Column	Cl 25.1.2, IS456:2000
3.0	**Check for Eccentricity**	
	Minimum Eccentricity e_x = L_{ox} / 500 + D / 30 = 21.0 mm >20	Cl 25.4
	e_y = L_{oy} / 500 + B / 30 = 16.0 mm <20	IS456:2000
3.1	**Moments Due to Minimum Eccentricity**	
	Me_x = 16.38 kN.m	
	Me_y = 15.60 kN.m	
4.0	**Design Moment**	
	Design Moment about X axis M_{ux} = 22.00 kN.m	
	Design Moment about Y axis M_{uy} = 71.00 kN.m	
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	

PROJECT	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE	Design for a Short Column with Biaxial Bending	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
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 # + 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 (Based on the area of concrete reqd to resist direct stress)	Cl 26.5.3.1 a & b , 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) , IS 456 : 2000
	ii) 16 times the Smallest dia of Longitudinal Steel = 320 mm	
	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.	

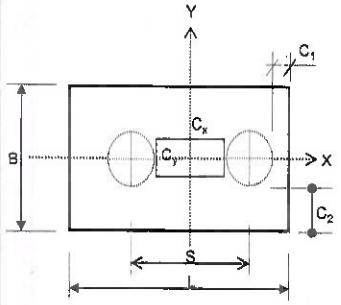
TITLE :	Pilecap Design by Bending Theory	Designed :	Date : 29-Aug-2024
SUBJECT	Two(2) Pile Group - TYPE P2	Checked :	Date : 29-Aug-2024
PROJECT :	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	Job No. :	Page No :

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

Total Column Axial Load	N =	500	kN (Service Load)
Total number of piles	=	2	Nos.
Pile Axial Load	P =	250	kN/pile
Combined Load Factor	Lf =	1.5	
Edge of pile to edge	C1 =	150	mm
of pilecap distance	C2 =	150	mm

1. Pile cap geometry

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



2. Pile cap material

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

3. Reinforcement design

X - direction

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

Reinforcement required			Reinforcement provided			
$M_u/(1/g_{ms} * f_y * z)$ =	731	mm²	As prov =	3436	mm²	
No. of bars =	2	Nos.	No. of bars =	7	Nos.	O.K.!
Bar spacing =	625	mm	Bar spacing =	104	mm	
			100As/bd =	0.67		

Footing Design

Plinth Beam Design

TITLE :	Pilecap Design by Bending Theory	Designed :	Date : 29-Aug-2024
SUBJECT	Two(2) Pile Group - TYPE P2	Checked :	Date : 29-Aug-2024
PROJECT :	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	Job No. :	Page No :

Y - direction

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

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

4. Normal shear

X - direction

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

5. Punching shear

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

6. Bar anchorage

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

X - direction

Anchorage length required = 311 mm
Anchorage length available = 900 mm ==> Anchorage 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/2019/09/036(DTCP)
AURA ENGINEERING CONSULTANTS
#8, 50th Street, 7th Avenue, Ashok Nagar,
Chennai - 600 083. Ph: 9790751378

PROJEC	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT. NO.	DATE	DESIGN RMK	DATE
TITLE		REVISION	DATE	CHECKE RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Check for Shear

Shear		=	149	kN	
Nominal Shear Stress	τv	=	1.92	N/mm²	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm²	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm²	Table 19, IS456:200
Diameter of the Stirrup bar		=	8	mm	Table 20, IS456:200
Number of Legs		=	2		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	250		Cl 26.5.1.5,IS456:20

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

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

A_{st} provided = 603.186 mm²

	Nos	Dia	Nos	Dia
Compression Reinforcem	3	16	0	0

A_{sc} provided = 603.19 mm²

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

Check for Shear

Shear		=	149	kN	
Nominal Shear Stress	τv	=	1.92	N/mm²	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm²	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm²	Table 19, IS456:200
Diameter of the Stirrup bar		=	8	mm	Table 20, IS456:200
Number of Legs		=	2		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	250		Cl 26.5.1.5,IS456:20

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

Span

Positive moment (Span)		=	84	kNm	
Hence the Section is designed as Singly Reinforced Section					
	M_u/bd^2	=	3.325		
Percentage of tension steel reqd	p_t	=	0.029	%	
Percentage of compression steel reqd	p_c	=	0	%	
Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm²	
Required Area of compression steel	$A_{sc\ reqd}$	=	0	mm²	

PROJEC	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT. NO.	DATE	DESIGNI RMK	DATE
TITLE		REVISION	DATE	CHECKEI 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	S 456:200 Table 19
Effective Depth	d	=	337.5	mm	S 456:200
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 %		S 456:200
p_t & p_{cmax}		=	4.00 %		Cl 26.5.1.1

1.2 Force Input

Left negative moment (Support 1)	=	84	kNm	
Mid span positive moment	=	84	kNm	
Right negative moment (Support 2)	=	84	kNm	
Shear @ (Support 1)	=	149	kN	
Shear @ (Span)	=	149	kN	
Shear @ (Support 2)	=	149	kN	

1.3 Limiting Moment

$M_{ulim} = 0.133\ f_{ck}\ b\ d^2$ = 87.11 kNm

1.4 Area of Steel

Minimum Area of Ste = 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 reqd	p_c	=	0	%
Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	0.00	mm^2

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	3	16		
	A_{st} provided = 603.19 mm^2			
Compression Reinforcem	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 prov	p_c	=	0.777	%	Hence O.K

PROJEC	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT. NO.	DATE	DESIGN RMK	DATE
TITLE		REVISION	DATE	CHECKE RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Detail of bars

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

A_{st} provided = 603.19 mm²

A_{sc} provided = 603.19 mm²

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

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

Check for Shear

Shear = 149 kN.

Nominal Shear Stress	τv	=	1.92	N/mm²	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm²	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm²	Table 19, IS456:200
Diameter of the Stirrup bar		=	8	mm	Table 20, IS456:200
Number of Legs		=	2		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	250		Cl 26.5.1.5,IS456:2(

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/mm²	
Modification Factor(Tension Reinforcement)	F_1	=	2.00		
Allowable Span/Depth		=	52.00		
Actual Span/Depth		=	13.33	Hence Safe	

Floor Beam Design

PROJEC	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Nos Dia Nos Dia

Compression Reinforcen 3 20 3 20

A_{sc} provided = 1884.96 mm²

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

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

Check for Shear

Shear = 241 kN

Nominal Shear Stress τv = 1.66 N/mm² — Cl 40.1, IS456:2000

Permissible Shear Stress τc = 0.92 N/mm² — β = 1.000

Maximum Shear Stress $\tau c,max$ = 2.5 N/mm² — Table 19, IS456:2000

Diameter of the Stirrup bar = 8 mm — Table 20, IS456:2000

Number of Legs = 2

Spacing of Shear reinforcement Required = 190.0 — Cl 40.4, IS456:2000

Maximum Spacing of Shear Reinforcement = 300 — Cl 26.5.1.5,IS456:2000

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

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 rec p_c = 0.085 %

Required Area of tension steel $A_{st\ reqd}$ = 1480.79 mm²

Required Area of compression steel $A_{sc\ reqd}$ = 123.04 mm²

Detail of bars

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

A_{st} provided = 1884.956 mm²

	Nos	Dia	Nos	Dia
Compression Reinforcen	3	20	3	20

A_{sc} provided = 1884.96 mm²

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

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

Check for Shear

Shear = 241 kN

Nominal Shear Stress τv = 1.66 N/mm² — Cl 40.1, IS456:2000

Permissible Shear Stress τc = 0.92 N/mm² — β = 1.000

Maximum Shear Stress $\tau c,max$ = 2.5 N/mm² — Table 19, IS456:2000

Diameter of the Stirrup bar = 8 mm — Table 20, IS456:2000

Number of Legs = 2

Spacing of Shear reinforcement Required = 190.0 — Cl 40.4, IS456:2000

Maximum Spacing of Shear Reinforcement = 300 — Cl 26.5.1.5,IS456:2000

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

Span

Positive moment (Span) = 254 kNm

Hence the Section is designed as Doubly Reinforced Section

M_u/bd^2 = 3.325

Percentage of tension steel reqd p_t = 1.023 %

Percentage of compression steel rec p_c = 0.085 %

Required Area of tension steel $A_{st\ reqd}$ = 1480.79 mm²

Required Area of compression steel $A_{sc\ reqd}$ = 123.04 mm²

PROJEC	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES
1.1	**Geomentry Data**					
	Beam Number		=	B3		
	Type of Beam		=	Rectangular Beam		
	Support Condition		=	Continuous Beam		
	Width of beam	b	=	300	mm	
	Overall Depth of Beam	AT PLOT NC D	=	525	mm	
	Dia of bar	JAGADAMBA Φ	=	25	mm	
	Nominal Cover	cc	=	30	mm	IS 456:2000 Table 19
	Effective Depth	d	=	482.5	mm	IS 456:2000
	Effective Cover		=	42.5	mm	Cl 23.0
	Effective Span of beam	l_{eff}	=	3700	mm	
	Concrete grade		=	M 25		
	Steel Grade		=	Fe 500		
	$P_{t,lim}$		=	0.94₹ %		
	$P_{t,min}$		=	0.170 %		IS 456:2000
	p_t & p_{cmax}		=	4.00 %		Cl 26.5.1.1
1.2	**Force Input**					
	Left negative moment (Support 1)		=	254	kNm	
	Mid span positive moment		=	254	kNm	
	Right negative moment (Support 2)		=	254	kNm	
	Shear @ (Support 1)		=	241	kN	
	Shear @ (Span)		=	241	kN	
	Shear @ (Support 2)		=	241	kN	
1.3	**Limiting Moment**					
	$M_{u,lim}$ = 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 rec	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	

PROJEC	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT. NO.	DATE	DESIGNED RMK	DATE
TITLE		REVISION	DATE	CHECKED RMK	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Detail of bars

		I st Layer			II nd Layer		
		Nos	Dia		Nos	Dia	
Tension Reinforcement		3	20		3	20	
	A_{st} provided	=	1884.96	mm²			
Compression Reinforcen		3	20		3	20	
	A_{sc} provided	=	1884.96	mm²			

Percentage of tension steel provided	p_t	=	1.302	%	Hence O.K
Percentage of compression steel pro	p_c	=	1.302	%	Hence O.K

Check for Shear

Shear		=	241	kN	
Nominal Shear Stress	τv	=	1.66	N/mm²	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm²	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm²	Table 19, IS456:2000
Diameter of the Stirrup bar		=	8	mm	Table 20, IS456:2000
Number of Legs		=	2		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	300		Cl 26.5.1.5,IS456:2000

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

Check For Deflection

Basic Value		=	26		Cl.23.2, IS456:2000
Service Stress in Steel	f_s	=	**227.82**	N/mm²	
Modification Factor(Tension Reinforcement)	F_1	=	0.97		
Allowable Span/Depth		=	25.22		
Actual Span/Depth		=	7.67	Hence Safe	

Floor Slab Design

PROJECT	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT.N	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Long Span Direction	
	For positive moment α_y = 0.028	Table 26 Cl D-1.1,
	Positive moment M_y 0.028 x 12.19 x 3.2 ^2 = **3.49** KN-m	IS 456 -2000
	For negative moment α_y = 0.037	Table 26 Cl D-1.1,
	Negative moment M 0.037 x 12.19 x 3.2 ^2 = **4.62** KN-m	IS 456 -2000
	Shear force V_u = 12.19 x 3 x 1 = **19.50** KN	
1.0.4	**Check Effective Depth for Max.Bending Moment**	
	Depth required = $(M_x / (0.13 \times fck \times b))^{1/2}$ = 56.48 mm	Table C,SP 16 :1980
	Depth provided = 125 - 25 - 8 /2 = 96 mm > 56.48 mm	Cl 2.3
	Hence the section is Safe against Bending	
1.0.5	**Check Depth for Shear**	
	Nominal Shear Stress : $\tau_v = V_u / b d$ = 0.20 N/mm^2	Cl.40.1, IS 456:2000
	Design shear strengt (τ_c) = 0.42 N/mm^2	Table 19 , IS 456:200
	k = 1.30	Cl.40.2.1.1,
	$k * \tau_c$ = 0.55 N/mm^2	IS 456:2000
	τ_v < $k * \tau_c$ **Hence the section is Safe against Shear**	
1.0.6	**Check for Maximum Shear Stress:**	
	Nominal Shear Stress : $\tau_v = V_u / b d$ = 0.20 N/mm^2	Cl.40.1, IS 456:2000
	Maximum Shear Stress ($\tau_{c,max}$) = 3.1 N/mm^2	Table 20 , IS 456:200
	$0.5\ \tau_{c,max}$ = 1.55 N/mm^2	
	τ_v < 1 $\tau_{c,max}$ **Hence the section is Safe against Max.Shear S**	Cl.40.2.3.1, IS 456:2
1.0.7	**Reinforcement calculations**	
	Short Span Direction @ Support	
	Mu/bd^2 = $\frac{10.61 \times 10 \wedge 6}{1000 \times 96 \times 96}$ = **1.151**	
	Pt = **0.28** %	Table 2-4, SP16 :198

PROJECT	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT.N	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 = **###**	
	Thickness of slab D = **125** mm	
	Clear cover cc = **25** mm	Table 16 Cl.26.4.2 , IS 456 -2000
	Effective thickness of slab (d_{eff}) 125 - 25 - 4 = 96 mm	
	Unit weight of concrete = 25 KN/m^3	Cl 19.2.1, IS 456-200
	Effective Shorter Span L_x = **3.2** m	
	Effective Longer Span L_y = **6.4** m	
	Aspect ratio L_y/L_x = 2.00 = 2	
	Hence designed as Two way slab	Cl D-1.11, IS 456-200
	Edge Condition **One Long edge Discontinuous**	
1.0.2	**Load Data**	
	Self Weight of Slab = 0.125 x 25 = 3.125 KN/m^2	
	Floor finish = **1.500** KN/m^2	
	Partition Load = **1.500** KN/m^2	
	Sunken Filling = **0.000** KN/m^2	
	Imposed Load = **2.000** KN/m^2	IS 875 (Part 2) -1987
	Extra Load, (if Any) = **0.000** KN/m^2	
	Total load = 8.125 KN/m^2	
	Design load (Wu) = 1.5 x 8.125 = **###** KN/m^2	Table 18 Cl 36.4.1 IS 456 -2000
1.0.3	**Moment and Shear Calculations**	
	Short Span Direction	
	α_x for positive moment 1.75 → 0.059	Table 26 Cl D-1.1, IS 456 -2000
	2 → 0.065	
	for 2.00 α_x = 0.065	
	Positive moment M_x 0.065 x 12.19 x 3.2 ^2 = **8.11** KN-m	
	α_x for negative moment 1.75 → 0.077	Table 26 Cl D-1.1, IS 456 -2000
	2 → 0.085	
	for 2.00 α_x = 0.085	
	Negative moment M 0.085 x 12.19 x 3.2 ^2 = **10.61** KN-m	

PROJECT	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT.NO	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Check for Spacing	
	Minimum of 1) 3d = 288 mm 2) = 300 mm 3) = 334.93 mm	IS 456:2000 Cl:26.3.3.(b).1
	Therefore provide Y 8 @ 280 mm C/C	
	Long Span Direction @ mid Span	
	$Mu/bd^2 = \frac{3.49 \times 10 \wedge 6}{1000 \times 96 \times 96} = 0.379$	
	Pt = 0.089 %	SP16 :1980 Table 2--
	Area of steel As = #### x 1000 x 96 = 85.233 mm^2	IS 456:2000
	Minimum area of ste 0.0012 x 1000 x 125 = 150.00 mm^2	Cl:26.5.2.1
	Spacing of Y 8 bar: 50.27 x 1000 / 150.00 = 334.93 mm	
	Check for Spacing	
	Minimum of 1) 3d = 288 mm 2) = 300 mm 3) = 334.93 mm	IS 456:2000 Cl:26.3.3.(b).1
	Therefore provide Y 8 @ 280 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) = 0.349 %	
	Service stress of steel (fs 0.58 fy (Ast_R/Ast_P = 175.62 N/mm^2	IS456:2000 Fig 4
	Modification Factor for Tension Reinforcemen = 1.98	Page 38
	Allowable Span / Effective Depth Ratio = 51.51	IS 456:2000 Cl:23.2.1
	Actual Span/Eff Depth R = 3.2 x 1000 / 96 = 33.33	
	Hence Safe against Deflectior	

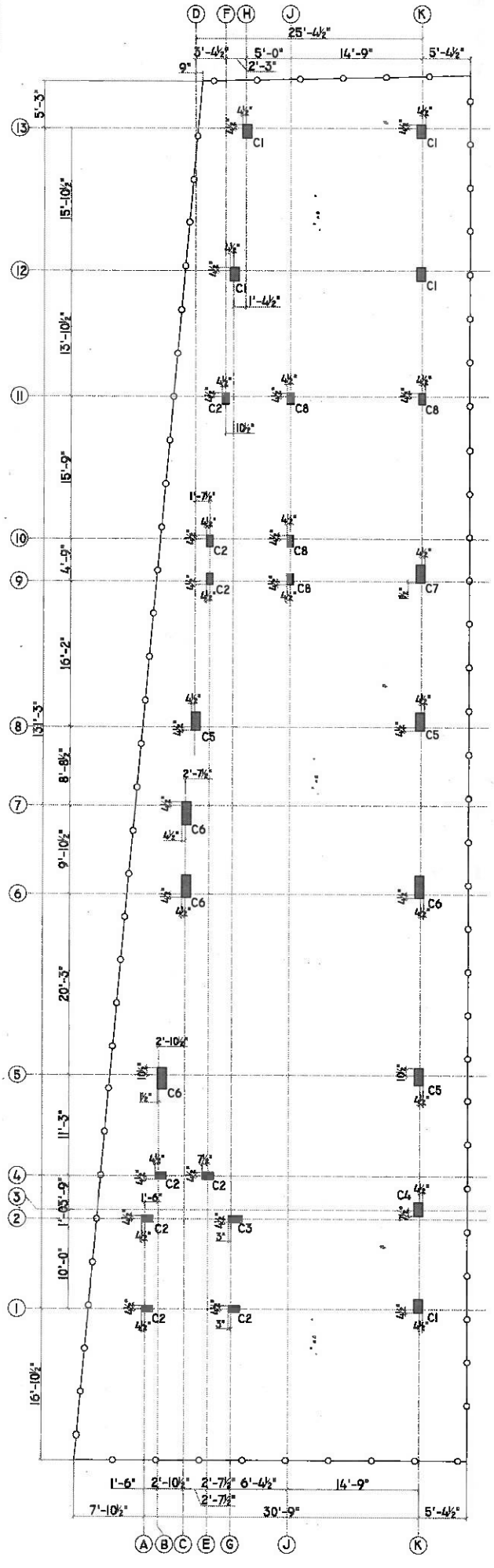
PROJECT	COMMERCIAL CUM RESIDENTIAL(S+3) BUILDING AT PLOT NO:PC-51, RAZACK GARDEN MAIN ROAD, ARUMBAKKAM	DOCUMENT.NO	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Area of steel As = #### x 1000 x 96 = 269.25 mm^2	
	Minimum area of ste 0.0012 x 1000 x 125 = 150.00 mm^2	Cl:26.5.2.1
	Spacing of ϒ 8 bar: 50.27 x 1000 / 269.25 = 186.59 mm	IS 456 -2000
	Check for Spacing	
	Minimum of 1) 3d = 288 mm	
	2) = 300 mm	Cl:26.3.3.(b).1
	3) = 186.59 mm	IS 456 -2000
	Therefore provide ϒ **8** @ **180** mm C/C	
	Short Span Direction @ Mid Span	
	$Mu/bd^2 = \frac{8.11 \times 10 \wedge 6}{1000 \times 96 \times 96} = 0.880$	
	Pt = 0.211 %	SP16 :1980 Table 2
	Area of steel As = #### x 1000 x 96 = 202.93 mm^2	IS 456:2000
	Minimum area of ste 0.0012 x 1000 x 125 = 150.00 mm^2	Cl:26.5.2.1
	Spacing of ϒ 8 bar: 50.27 x 1000 / 202.93 = 247.57 mm	
	Check for Spacing	
	Minimum of 1) 3d = 288 mm	IS 456:2000
	2) = 300 mm	Cl:26.3.3.(b).1
	3) = 247.57 mm	
	Therefore provide ϒ **8** @ **150** mm C/C 150	
	Provided % of Tension Reinforcement (pt) = **0.349** %	
	Long Span Direction @ Support	
	$Mu/bd^2 = \frac{4.62 \times 10 \wedge 6}{1000 \times 96 \times 96} = 0.501$	
	Pt = 0.118 %	SP16 :1980 Table 2
	Area of steel As = #### x 1000 x 96 = 113.3 mm^2	IS 456:2000
	Minimum area of ste 0.0012 x 1000 x 125 = 150.00 mm^2	Cl:26.5.2.1
	Spacing of ϒ 8 bar: 50.27 x 1000 / 150.00 = 334.93 mm	

APPENDIX II

GENERAL ARRANGEMENT DRAWINGS

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



LAYOUT OF COLUMN

COLUMN SCHEDULE		
S.NO.	NAME	SIZE
1.	C1	1'-0" X 1'-6"
2.	C2	0'-9" x 1'-3"
3.	C3	0'-9" x 1'-6"
4.	C4	1'-0" x 1'-6"
5.	C5	1'-0" x 2'-0"
6.	C6	1'-0" X 2'-6"
7.	C7	1'-0" x 2'-0"
8.	C8	0'-9" x 1'-3"

NOTE:

FOR COLUMN RC DETAILS REFER DRAWING NO: 001A

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 -40ϕ

B) DEVELOPMENT LENGTH FOR BEAM BARS -50ϕ

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

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

EXCAVATION AND BACKFILL

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

ii) UNSUITABLE MATERIALS LIKE ROCKS/ EXISTING FOOTINGS ARE DETECTED BELOW FOUNDATION LEVEL IN AREAS OF CUT SHALL BE EXCAVATED TO FIRM GROUND. THE RESULTANT EXCAVATION SHALL BE FILLED TO THE REQUIRED LEVELS WITH MASS CONCRETE GRADE M20. ALSO WHEREVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE GRADE-10.

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

iv) A LAYER OF BLINDING CONCRETE 100 mm THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/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) COLUMN = 1"
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. COLUMNS AND FOOTINGS ARE DESIGNED FOR G+3 FLOOR LOADS
7. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
8. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	A.K	R.M	07.11.20

PROJECT :-

PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

DRAWING TITLE :-

LAYOUT OF COLUMNS

DATE	SCALE	JOB.NO	DRG.NO
07.11.2020	1" : 10'	——	001

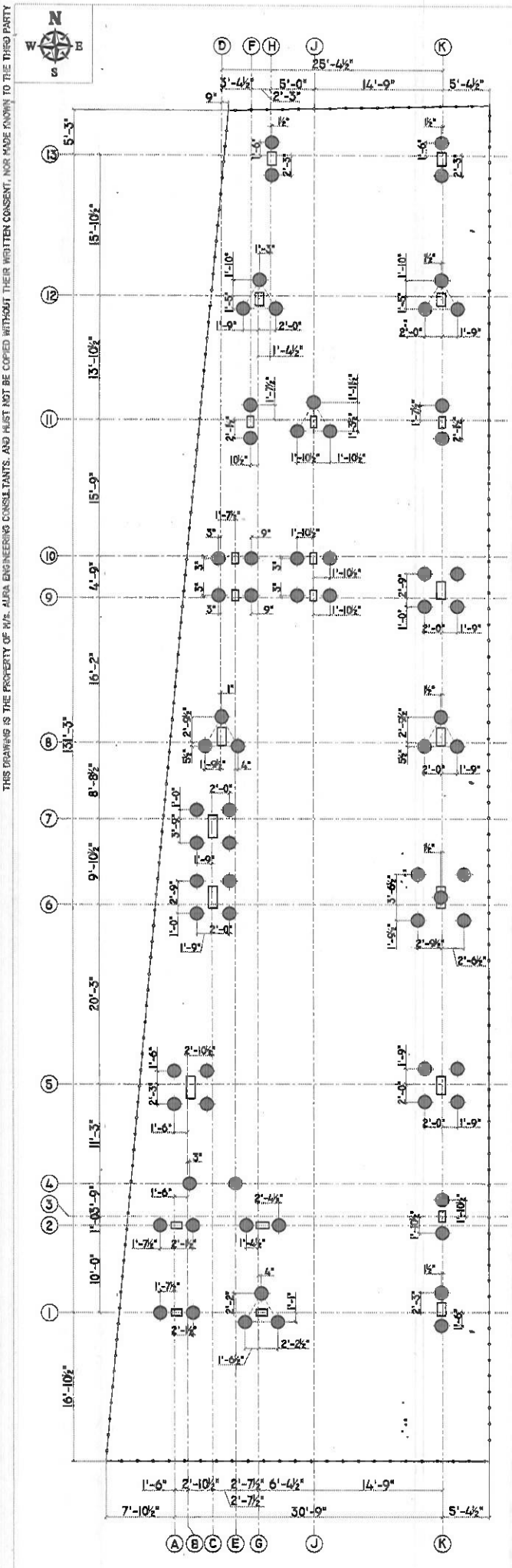
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

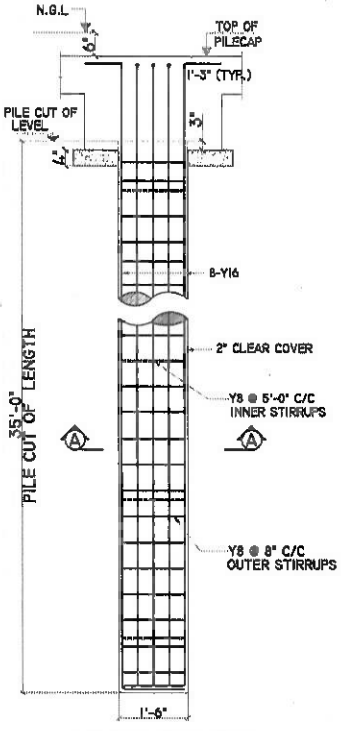
AURA ENGINEERING CONSULTANTS
NO.62,72, 66th STREET
R.V NAGAR, ASHOK NAGAR,CHENNAI- 600 083.
Fixed Line :- 044 4999 7100
projects.aurarags@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

A3

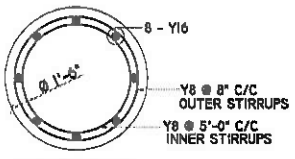
THIS DRAWING IS THE PROPERTY OF M/s. AURA ENGINEERING CONSULTANTS. AND MUST NOT BE COPIED WITHOUT THEIR WRITTEN CONSENT, NOR MADE KNOWN TO THE THIRD PARTY



LAYOUT OF PILE
(TOTAL QUANTITY OF PILE = 71 Nos.)



L.S OF 1'-6" DIA. PILE



SECTION "A-A"

C.S OF PILE - 1'-6" DIA.

NOTE:
N.G.L - NATURAL GROUND LEVEL.

IMPORTANT NOTES:-
MINIMUM M25. THE MINIMUM CEMENT CONTENT SHALL BE 400 KG/M3. HOWEVER WITH PROPER MIX DESIGN AND USE OF PROPER ADMIXTURE THE CEMENT CONTENT MAY BE REDUCED BUT IN NO CASE THE CEMENT CONTENT SHALL BE LESS THAN 350 KG/M3.

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 -40ϕ

b) DEVELOPMENT LENGTH FOR BEAM BARS -50ϕ

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 WHENEVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE, GRADE-15.

iii) BEFORE CASTING FOUNDATIONS, ANY IMMEDIATE OR ADJACENT AREAS OF DISTURBED OR SOFT SOIL MUST BE REMOVED AND REPLACED WITH MASS CONCRETE OF GRADE 15

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:

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. PILE CARRYING CAPACITY
   A. 1'-6" DIA. - 350KN. (AS PER GEOGRAPHICAL REPORT)
5. ROUTINE TESTS OF 1.5 TIMES DESIGN CAPACITY ON ONE PILES OF 1'-6" DIA IS TO BE CARRIED OUT.
6. CLEAR COVER FOR REINFORCEMENT
   A) PILE = 2"
7. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
8. **COLUMNS AND FOOTINGS ARE DESIGNED FOR G+3 FLOOR LOADS**
9. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
10. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	A.K	R.M	07.11.20

PROJECT :-

PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

DRAWING TITLE :-

LAYOUT & R.C DETAILS OF PILE

DATE	SCALE	JOB.NO	DRG.NO
07.11.2020	1" : 10'	——	002

ARCHITECT / CONSULTANTS :-

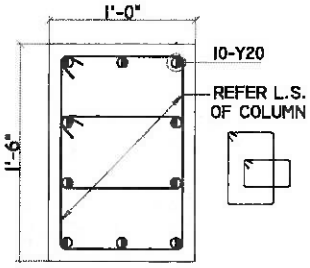
SUSTAIN CONSULTANTS
DOOR NO : 8, PLOT NO: 27, USHA NAGAR, 2nd STREET, ULLAGARAM, CHENNAI - 600 091.
PHONE : 9561213123 / 044-4950 7614.

STRUCTURAL CONSULTANTS :-

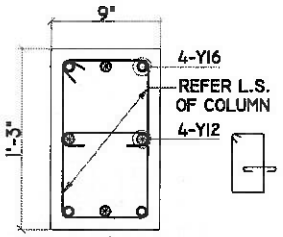
AURA ENGINEERING CONSULTANTS
NO:8(27), 60th STREET
R.V NAGAR, ASHOK NAGAR, CHENNAI- 600 083.
Fixed Line : 044 4950 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
https://auraengineers.co.in/
Engineering Consultants

A3

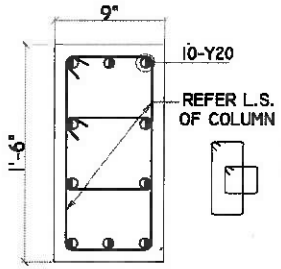
THIS DRAWING IS THE PROPERTY OF M/s. AURA ENGINEERING CONSULTANTS. AND MUST NOT BE COPIED WITHOUT THEIR WRITTEN CONSENT. NOR MADE KNOWN TO THE THIRD PARTY



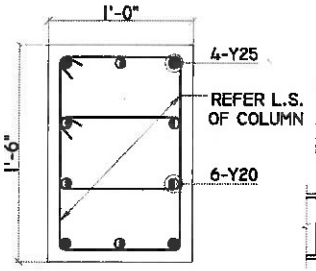
C.S OF COLUMN "C1"
(1'-0" x 1'-6")



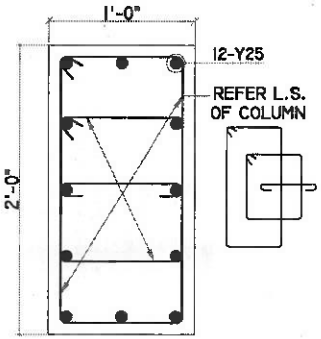
C.S OF COLUMN "C2"
(0'-9" x 1'-3")



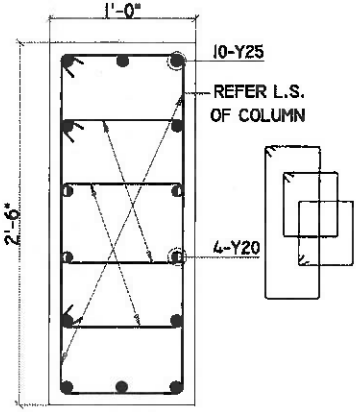
C.S OF COLUMN "C3"
(0'-9" x 1'-6")



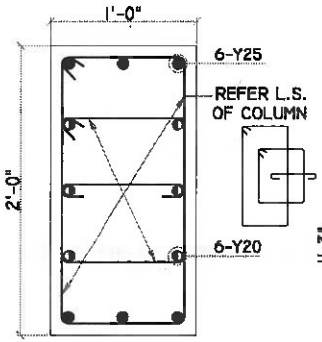
C.S OF COLUMN "C4"
(1'-0" x 1'-6")



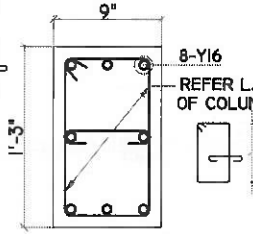
C.S OF COLUMN "C5"
(1'-0" x 2'-0")



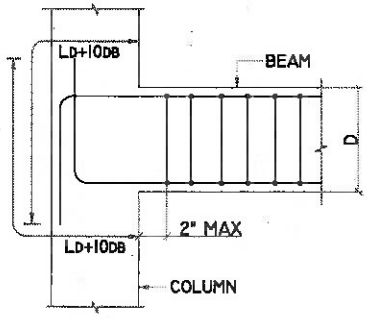
C.S OF COLUMN "C6"
(1'-0" x 2'-6")



C.S OF COLUMN "C7"
(1'-0" x 2'-0")

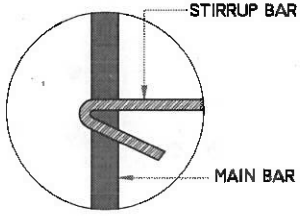


C.S OF COLUMN "C8"
(0'-9" x 1'-3")



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

TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION



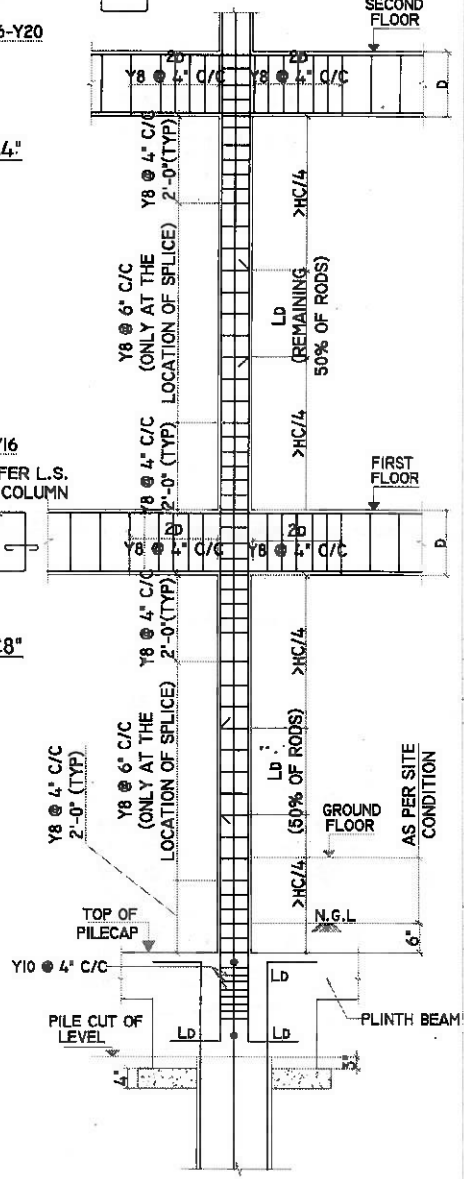
HOOK DETAIL

COLUMN SCHEDULE		
S.NO.	NAME	SIZE
1.	C1	1'-0" X 1'-6"
2.	C2	0'-9" x 1'-3"
3.	C3	0'-9" x 1'-6"
4.	C4	1'-0" x 1'-6"
5.	C5	1'-0" x 2'-0"
6.	C6	1'-0" x 2'-6"
7.	C7	1'-0" x 2'-0"
8.	C8	0'-9" x 1'-3"

NOTE:

N.G.L - NATURAL GROUND LEVEL.

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



COLUMN AND PILECAP JUNCTION
(ALTERNATE RODS TO BE LAPPED IN ALTERNATE FLOORS)
(AS PER SEISMIC DETAILING CODE IS:13920)

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 PSSR) 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% OF 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.

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

EXCAVATION AND BACKFILL :

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

ii) UNSUITABLE MATERIALS LIKE ROCKS/ EXISTING FOOTINGS ARE DETECTED BELOW FOUNDATION LEVEL IN AREAS OF CUT SHALL BE EXCAVATED TO FIRM GROUND. THE RESULTANT EXCAVATION SHALL BE FILLED TO THE REQUIRED LEVELS WITH MASS CONCRETE GRADE M20. ALSO WHEREVER EXCAVATION OCCURS BELOW THE FOUNDATION LEVEL, STATED ON THE DESIGN DRAWING THE RESULTING VOID SHALL BE BACK FILLED WITH MASS CONCRETE GRADE-10.

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

iv) A LAYER OF BLINDING CONCRETE 100 MM THICK SHALL BE PLACED UNDER ALL FOUNDATIONS. BLINDING CONCRETE SHALL HAVE A CHARACTERISTIC STRENGTH OF 10 N/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) COLUMN = 1"
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. COLUMNS AND FOOTINGS ARE DESIGNED FOR G+3 FLOOR LOADS
7. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
8. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	A.K	R.M	07.11.20

PROJECT :-
PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

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

DATE	SCALE	JOB.NO	DRG.NO
07.11.2020	1" : 8'	——	001A

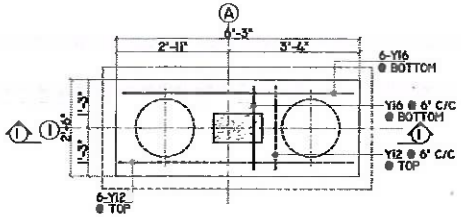
ARCHITECT / CONSULTANTS :-

STRUCTURAL CONSULTANTS :-

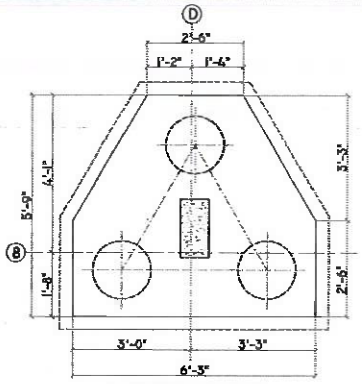
AURA ENGINEERING CONSULTANTS
NO:69/27, 66th STREET
R.V NAGAR, ASHOK NAGAR,CHENNAI- 600 083.
Fixed Line :- 044 4889 7100
projects.auraengg@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

A3

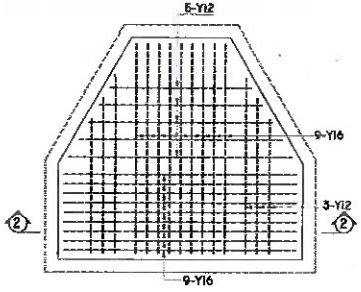
THIS DRAWING IS THE PROPERTY OF M/s. AURA ENGINEERING CONSULTANTS, AND MUST NOT BE COPIED WITHOUT THEIR WRITTEN CONSENT, NOR MADE KNOWN TO THE THIRD PARTY



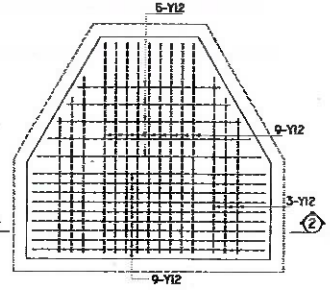
PLAN OF PILECAP "PC2"
(6'-3" X 2'-6")



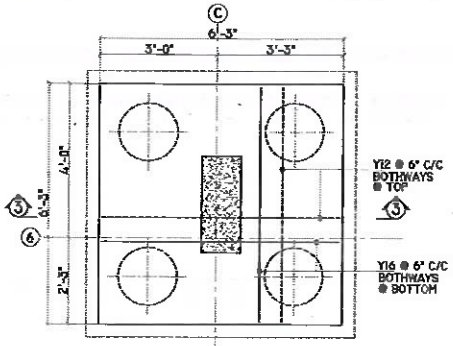
PLAN OF PILECAP "PC3"



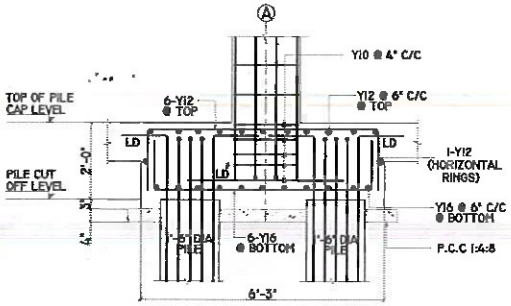
BOTTOM STEEL OF PILECAP - "PC3"



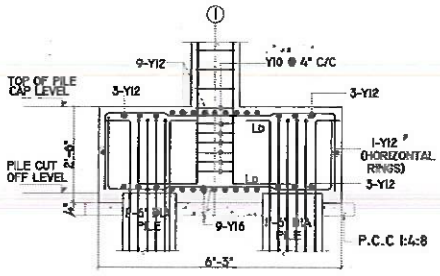
TOP STEEL OF PILECAP - "PC3"



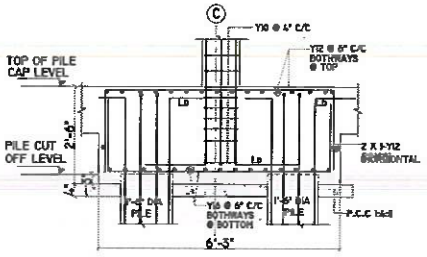
PLAN OF PILECAP "PC4"
(6'-3" X 6'-3")



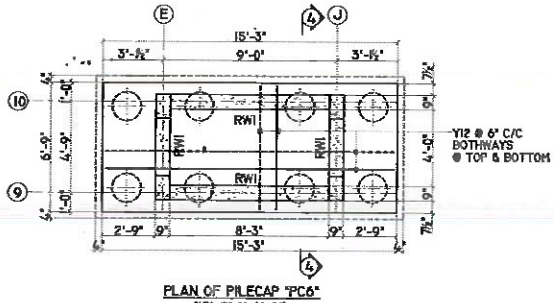
SECTION "1-1"



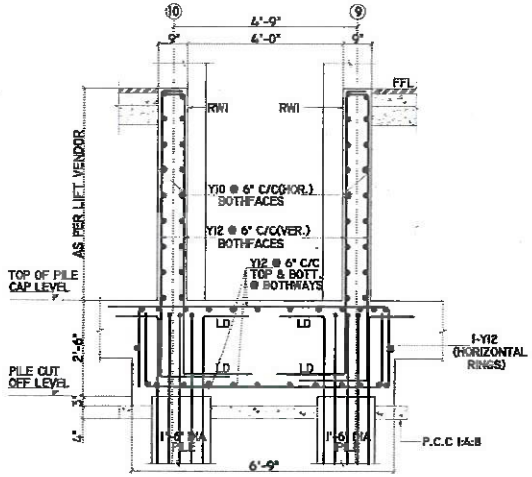
SECTION "2-2"



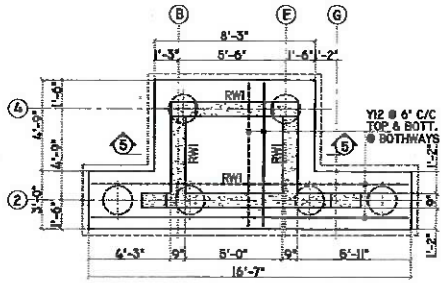
SECTION "3-3"



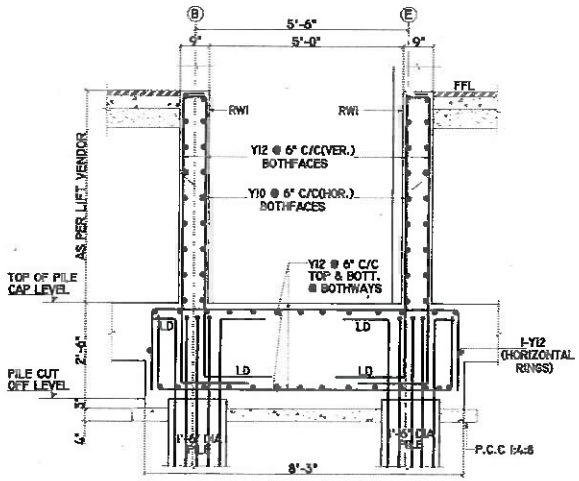
PLAN OF PILECAP "PC6"
(15'-3" X 6'-9")



SECTION "4-4"



PLAN OF PILECAP "PC6A"



SECTION "5-5"

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN FOOT UNITS.
2. FOR OTHER NOTES REFER DWG NO: 003

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	A.K	R.M	07.11.20

PROJECT :-

PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

DRAWING TITLE :-

R.C DETAILS OF PILECAP

DATE	SCALE	JOB.NO	DRG.NO
07.11.2020	1" : 12'	——	003A

ARCHITECT / CONSULTANTS :-

SUSTAIN CONSULTANTS

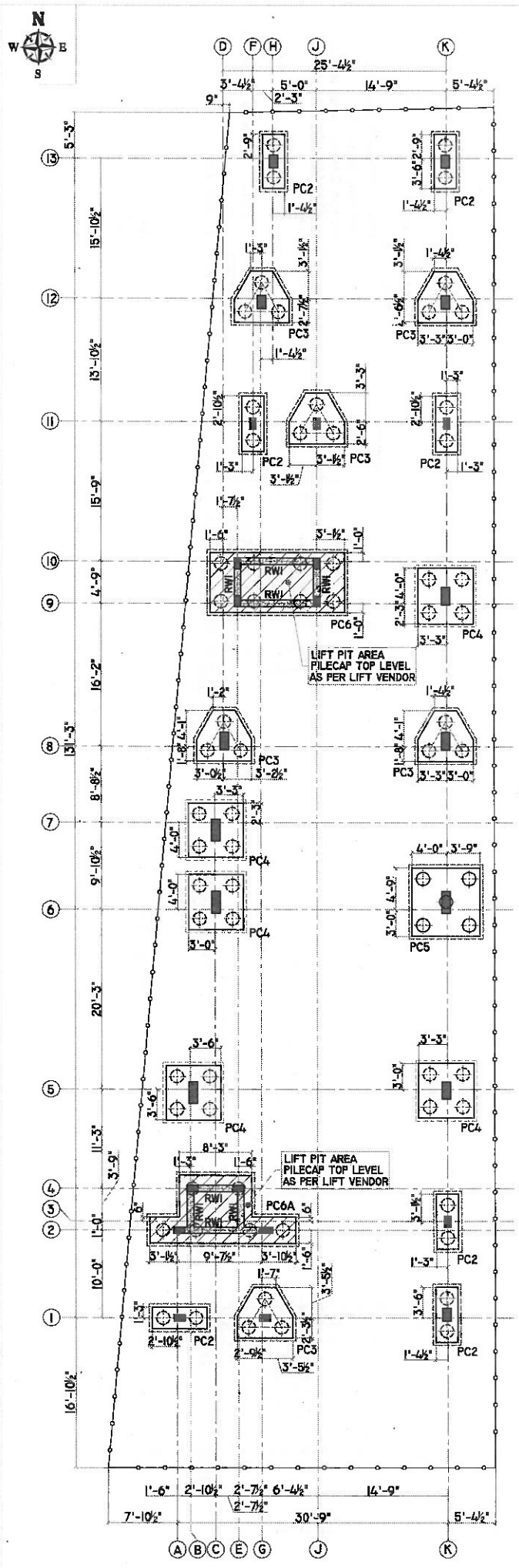
DOOR NO : 6, PLOT NO: 27, USHA NAGAR, 2nd STREET, ULLAGARAM, CHENNAI - 600 091.
PHONE : 9551213123 / 044-4850 7814.

STRUCTURAL CONSULTANTS :-

AURA ENGINEERING CONSULTANTS
NO:B22, 6th STREET
R.V NAGAR, ASHOK NAGAR, CHENNAI- 600 083.
Phone/Line : 044 4850 7100
projects.auraeng@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

A3

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



LAYOUT OF PILECAP

PILECAP SCHEDULE:

S.NO	NAME	SIZE
01.	PC1	2'-6" X 2'-6" X 2'-0"
02.	PC2	6'-3" X 2'-6" X 2'-0"
03.	PC3	D = 2'-6"
04.	PC4	6'-3" X 6'-3" X 2'-6"
05.	PC5	7'-9" X 7'-9" X 2'-6"
06.	PC6	15'-3" X 6'-9" X 2'-6"
07.	PC6A	D = 2'-6"

NOTE:
FOR PILECAP REINFORCEMENT DETAILS REFER DWG.NO: 003A

GENERAL NOTES:

REMOVAL OF FORMWORK(SHUTTERING) :

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

A) VERTICAL SIDE OF SHUTTERING OF COLUMNS,WALLS

LAP JOINTS FOR REINFORCEMENT BARS :

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

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

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

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

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

v) 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 98% 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.

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN FOOT UNITS.
2. CONCRETE GRADE SHALL BE M25 CONFIRMING TO IS 456:2000
3. GRADE OF REINFORCEMENT MARKED THUS (Y) SHALL BE Fe 500 CONFIRMING TO IS 1786-2008
4. CLEAR COVER FOR REINFORCEMENT
   A) COLUMN = 1"
5. THIS DRG. READ IN CONJECTION WITH ARCH.DRGS.
6. COLUMNS AND FOOTINGS ARE DESIGNED FOR G+3 FLOOR LOADS
7. STRUCTURAL ENGINEER RESPONSIBILITY IS LIMITED TO DESIGN & ISSUAL OF STRUCTURAL DRAWING ONLY
8. ONUS OF CONSTRUCTION LIES WITH CONTRACTOR/OWNER

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	A.K.	R.M	07.11.20

PROJECT :-
PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

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

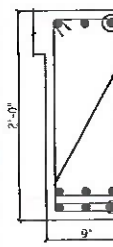
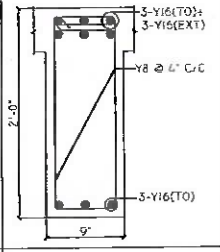
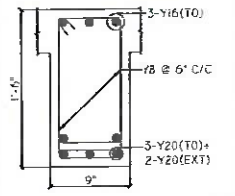
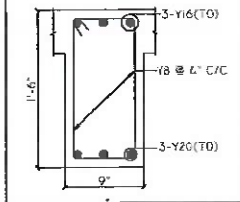
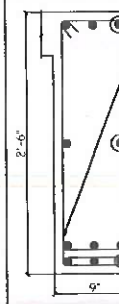
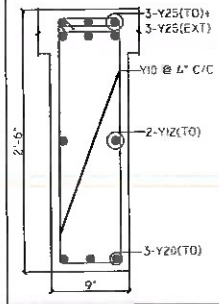
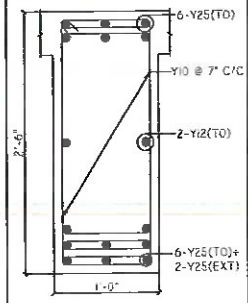
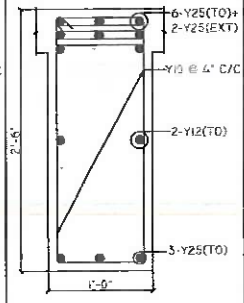
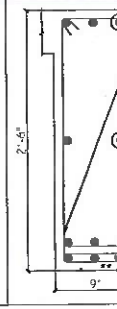
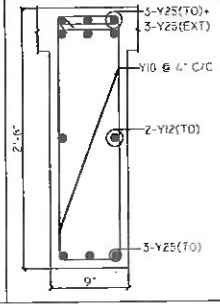
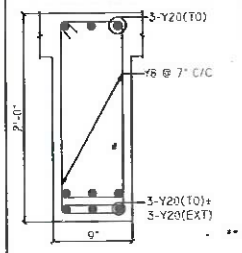
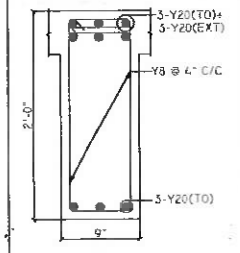
DATE	SCALE	JOB.NO	DRG.NO
07.11.2020	1" : 10'	——	003

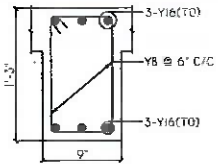
ARCHITECT / CONSULTANTS :-
SUSTAIN CONSULTANTS
DOOR NO : 8, PLOT NO: 27, USHA NAGAR, 2nd STREET, ULLAGARAM, CHENNAI - 600 091.
PHONE : 9551213123 / 044-4860 7814.

STRUCTURAL CONSULTANTS :-
AURA ENGINEERING CONSULTANTS
NO:19/22, 66th STREET
R.V NAGAR, ASHOK NAGAR,CHENNAI- 600 083.
Fixed Line :- 044 4869 7100
projects.auraeng@gmail.com
projects@auraengineers.co.in
http://auraengineers.co.in/
aura Engineering Consultants

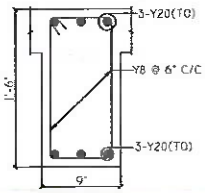
A3

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

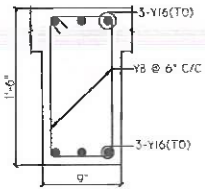
NAME	MID SPAN	END SUPPORT	NAME	MID SPAN	END SUPPORT
B1 (0'-9" X 2'-0")			B3 (0'-9" X 1'-6")		
B5 (0'-9" X 2'-6")			B8 (1'-0" X 2'-6")		
B6 (0'-9" X 2'-6")			B9 (0'-9" X 2'-0")		



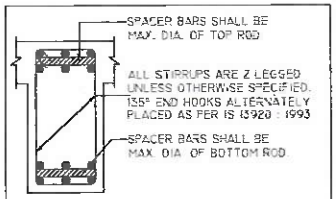
C.S. OF BEAM "B2"
(0'-9" X 1'-3")



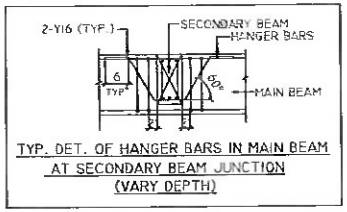
C.S. OF BEAM "B4"
(0'-9" X 1'-6")



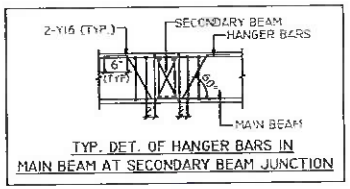
C.S. OF BEAM "B7"
(0'-9" X 1'-6")



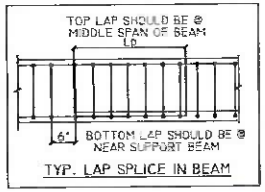
TYP. DETAIL



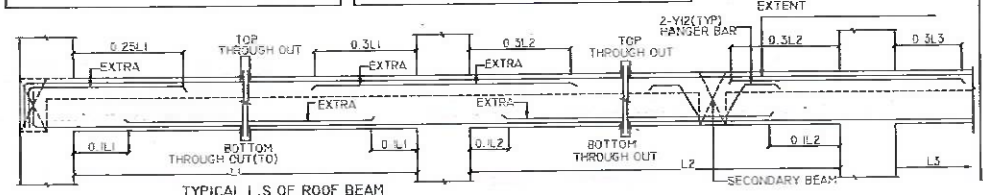
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION (VARY DEPTH)



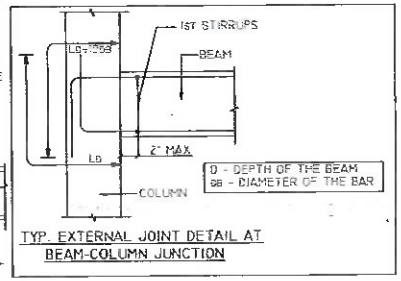
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION



TYP. LAP SPLICE IN BEAM



TYPICAL L.S OF ROOF BEAM



TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	0'-9" x 2'-0"
02	B2	0'-9" x 1'-3"
03	B3	0'-9" x 1'-6"
04	B4	0'-9" x 1'-6"
05	B5	0'-9" x 2'-6"
06	B6	0'-9" x 2'-6"
07	B7	0'-9" x 1'-6"
08	B8	1'-0" x 2'-6"
09	B9	0'-9" x 2'-0"

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 M20 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

REV	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	M.R	R.M	11.02.22

PROJECT :-
PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

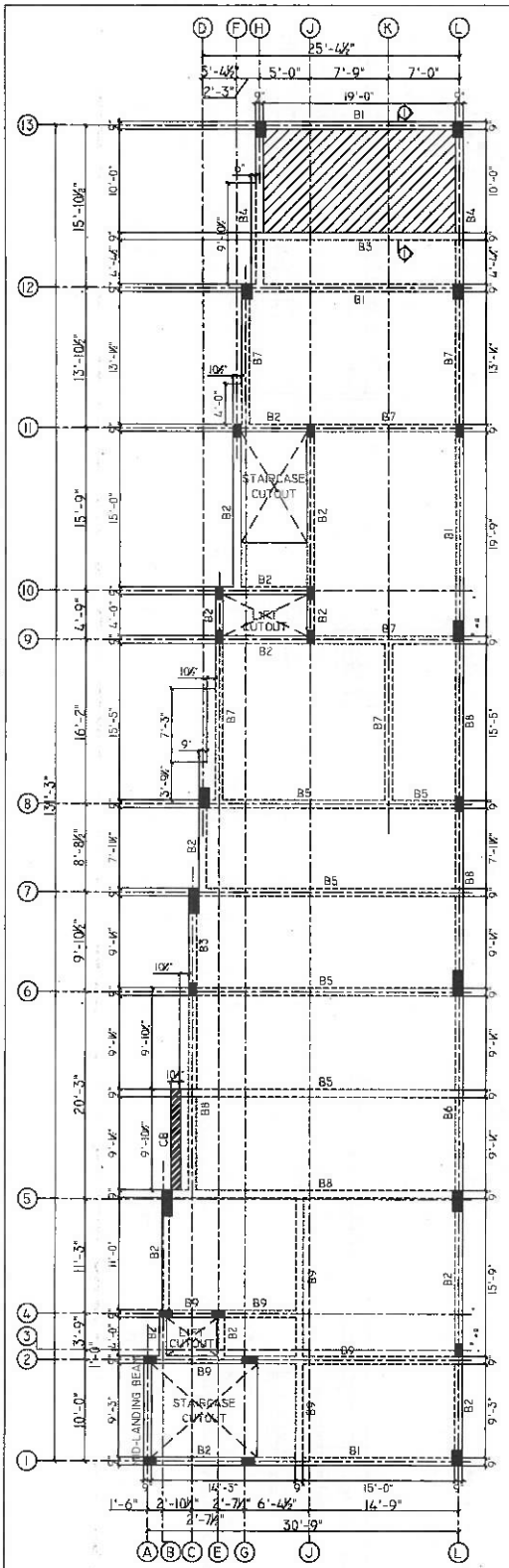
DRAWING TITLE :-
R.C DETAILS OF FIRST FLOOR ROOF BEAM

DATE	SCALE	JOB.NO	DRG.NO
11.02.22	1" : 12"	------	008

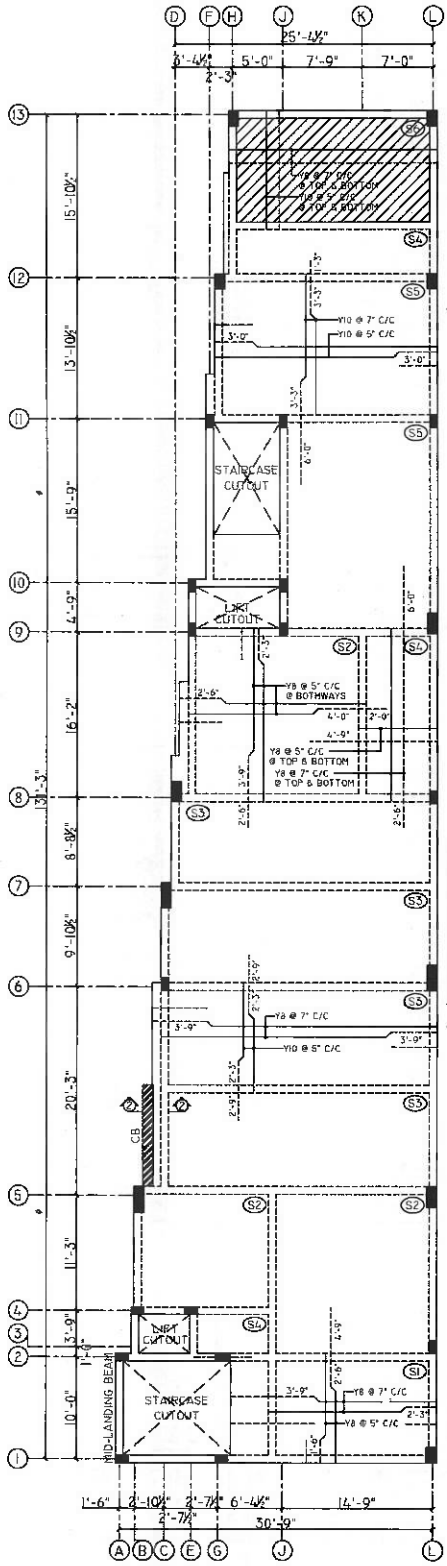
ARCHITECT / CONSULTANTS :-
SUSTAIN CONSULTANTS
DOOR NO : 6 PLOT NO: 27, USHA NAGAR, 2nd STREET, ULLAGARAM, CHENNAI - 600 091.
PHONE : 9551213123 / 044-4850 7614.

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

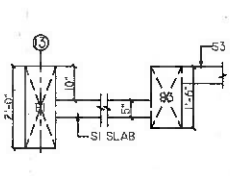
A3



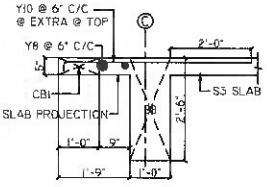
NUMERATION LAYOUT OF FIRST FLOOR ROOF SLAB & BEAMS



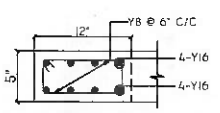
R.C LAYOUT OF FIRST FLOOR ROOF SLAB & BEAMS



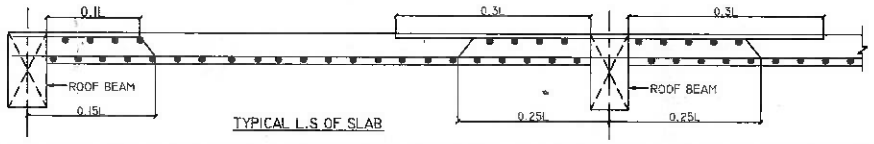
SECTION "1-1"



SECTION "2-2"



C.S OF CONCEALED BEAM-"CB"
(1'-0" X 0'-5")



TYPICAL L.S OF 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 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" b) COLUMN = 1½"
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

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.
06	S6	5" THK.

BEAM SCHEDULE

SL.NO	NAME	SIZE
01	B1	0'-9" x 2'-0"
02	B2	0'-9" x 1'-3"
03	B3	0'-9" x 1'-6"
04	B4	0'-9" x 1'-6"
05	B5	0'-9" x 2'-6"
06	B6	0'-9" x 2'-6"
07	B7	0'-9" x 1'-6"
08	B8	1'-0" x 2'-6"
09	B9	0'-9" x 2'-0"

LEGEND:

▨ - 0'-10" SUNKEN SLAB

NOTE:

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

FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 008

REV	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	SMU	L.D	24.12.2021

PROJECT :-
PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

DRAWING TITLE :-
LAYOUT & R.C DETAILS OF FIRST FLOOR ROOF SLAB & BEAM

DATE	SCALE	JOB.NO	DRG.NO
24.12.2021	1" : 12'	------	007

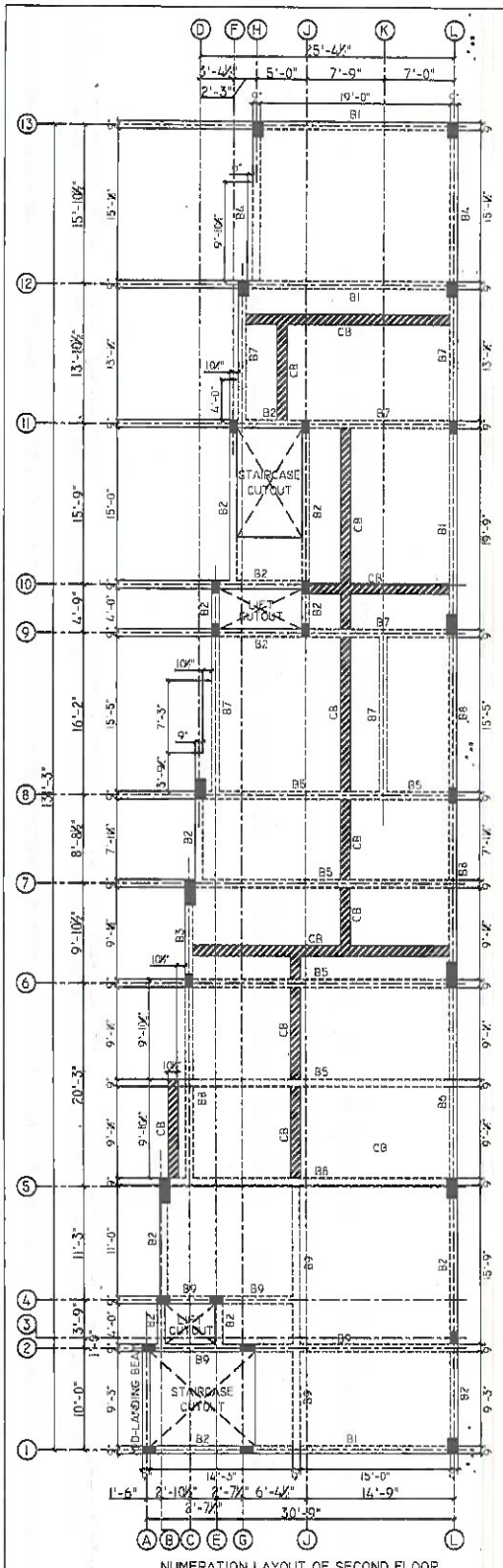
ARCHITECT / CONSULTANTS :-
SUSTAIN CONSULTANTS
DOOR NO : 6, PLOT NO. 27, USHA NAGAR, 2nd STREET, ULLAGARAM, CHENNAI - 600 091.
PHONE : 9551213123 / 044-4850 7614.

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

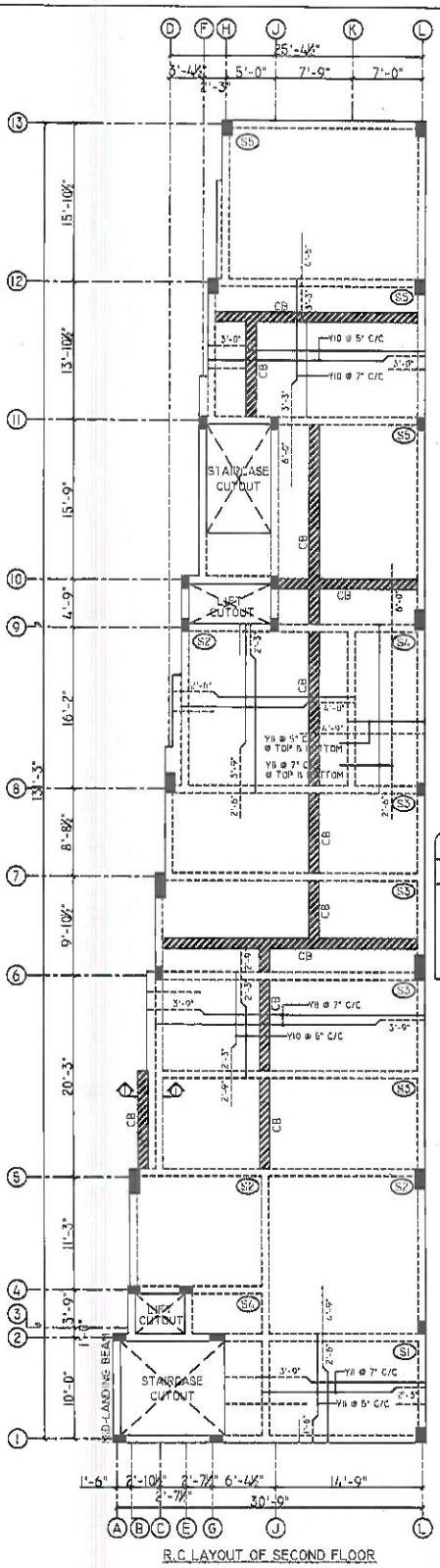
A3

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

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



NUMERATION LAYOUT OF SECOND FLOOR ROOF SLAB & BEAMS



R.C LAYOUT OF SECOND FLOOR ROOF SLAB & BEAMS

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" b) COLUMN = 1½"
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

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 2'-0"
02	B2	0'-9" X 1'-3"
03	B3	0'-9" X 1'-6"
04	B4	0'-9" X 1'-6"
05	B5	0'-9" X 2'-6"
06	B6	0'-9" X 2'-6"
07	B7	0'-9" X 1'-6"
08	B8	1'-0" X 2'-6"
09	B9	0'-9" X 2'-0"

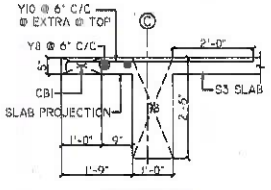
LEGEND:

▨ - 0'-10" SUNKEN SLAB

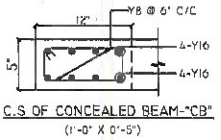
NOTE:

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

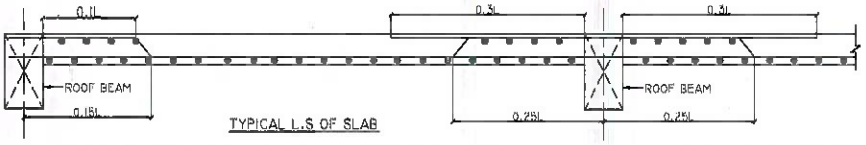
FOR BEAM REINFORCEMENT DETAILS REFER DWG.NO : 010



SECTION "1-1"



C.S OF CONCEALED BEAM-"CB"
(1'-0" X 0'-5")



TYPICAL L.S OF SLAB

REV	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	SMU	L.D	11.02.2022

PROJECT :-
PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

DRAWING TITLE :-
LAYOUT & R.C DETAILS OF SECOND FLOOR ROOF SLAB & BEAM

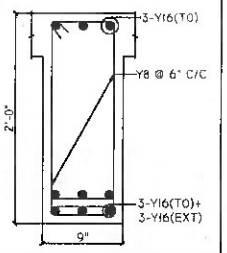
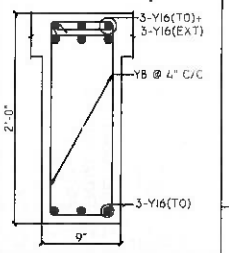
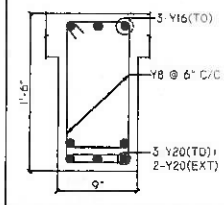
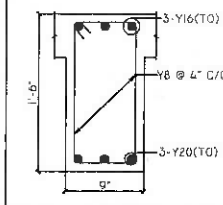
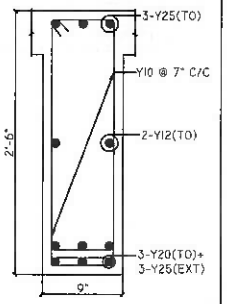
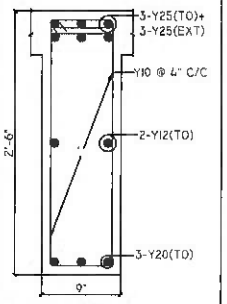
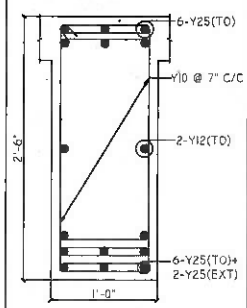
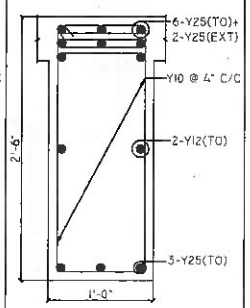
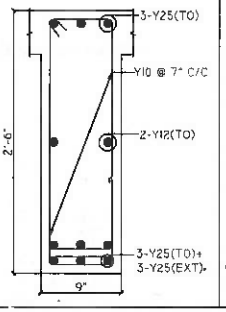
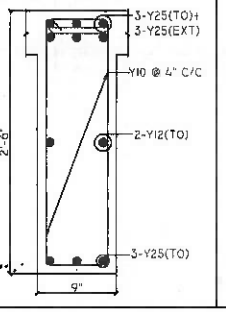
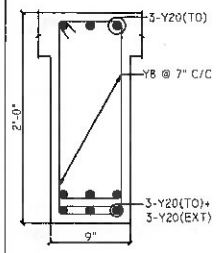
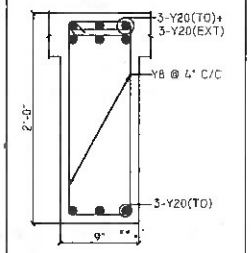
DATE	SCALE	JOB.NO	DRG.NO
11.02.2022	1" : 12'	——	009

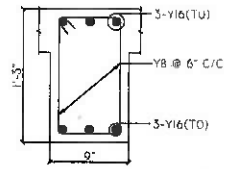
ARCHITECT / CONSULTANTS :-
SUSTAIN CONSULTANTS
DOOR NO : 6, PLOT NO: 27, USHA NAGAR, 2nd STREET, ULLAGARAM, CHENNAI - 600 091.
PHONE : 9551213123 / 044-4850 7014.

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
Engineering Consultants http://auraengineers.co.in/

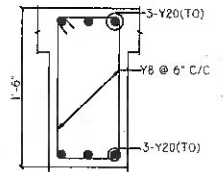
A3

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

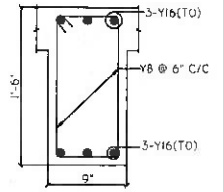
NAME	MID SPAN	END SUPPORT	NAME	MID SPAN	END SUPPORT
B1 (0'-9" X 2'-0")			B3 (0'-9" X 1'-6")		
B5 (0'-9" X 2'-6")			B8 (1'-0" X 2'-6")		
B6 (0'-9" X 2'-6")			B9 (0'-9" X 2'-0")		



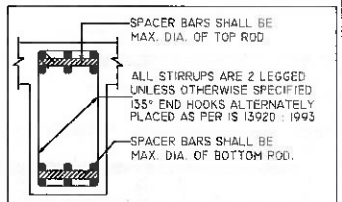
C.S. OF BEAM "B2"
(0'-9" X 1'-3")



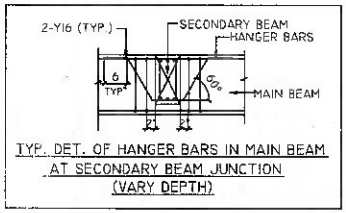
C.S. OF BEAM "B4"
(0'-9" X 1'-6")



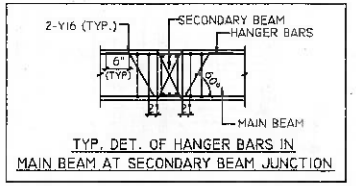
C.S. OF BEAM "B7"
(0'-9" X 1'-6")



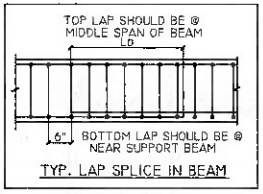
TYP. DETAIL



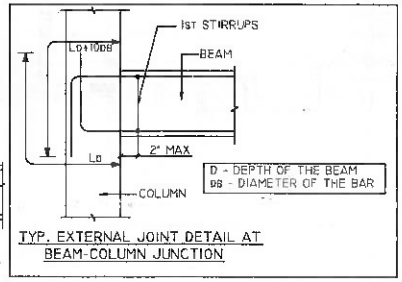
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION (VARY DEPTH)



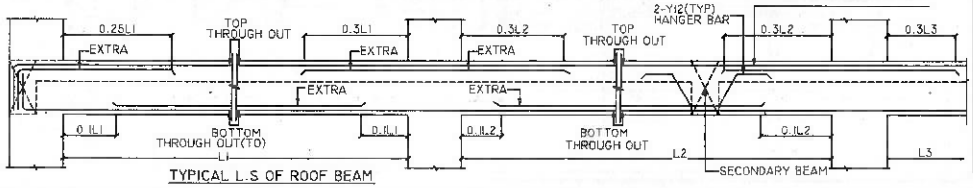
TYP. DET. OF HANGER BARS IN MAIN BEAM AT SECONDARY BEAM JUNCTION



TYP. LAP SPLICE IN BEAM



TYP. EXTERNAL JOINT DETAIL AT BEAM-COLUMN JUNCTION



TYPICAL L.S OF ROOF BEAM

BEAM SCHEDULE		
SL.NO	NAME	SIZE
01	B1	0'-9" x 2'-0"
02	B2	0'-9" x 1'-3"
03	B3	0'-9" x 1'-6"
04	B4	0'-9" x 1'-6"
05	B5	0'-9" x 2'-6"
06	B6	0'-9" x 2'-6"
07	B7	0'-9" x 1'-6"
08	B8	1'-0" x 2'-6"
09	B9	0'-9" x 2'-0"

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 6 BEAMS ----------24 HOURS.
B. BOTTOM SHUTTEPING 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 BAP AND AGAIN WELDING FOR ANOTHER 5 TIMES DIAMETEP OF BAR USING ARC WELDING AND SPECIAL ELECTRODES AFTEP GETTING PRIOP 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 M20 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

REV.	DESCRIPTIONS	DRN	CHK	DATE
00	ISSUE FOR CONSTRUCTION	M.R	R.M	11.02.22

PROJECT :-
PROPOSED COMMERCIAL CUM RESIDENTIAL BUILDING AT RAZACK GARDEN MAIN ROAD, ARUMBAKKAM, CHENNAI

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

DATE	SCALE	JOB.NO	DRG.NO
11.02.22	1" : 12'	------	010

ARCHITECT / CONSULTANTS :-
SUSTAIN CONSULTANTS
DOOR NO : 6, PLOT NO. 27, USHA NAGAR, 2nd STREET, ULLAGARAM, CHENNAI - 600 091.
PHONE : 9551213123 / 044-4850 7614.

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

A3

THE LANDLENS SUITE

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

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

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

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

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

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

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

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

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

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

FREE TOOLS · NO ACCOUNT NEEDED

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

Records and verification

The registers themselves, read for you.

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

Value and duty

What it is worth and what it costs to register.

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

Zoning and land use

What the plan says can happen on this land.

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

Registers and directories

Who holds it, and which office keeps the record.

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

Every free tool
/tools

Services we run for you
/services

The LandLens suite
/landlens/one

Verified RealEstate™

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

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

Verified RealEstate
3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai 600 097, India
hello@verified.realestate
+91 9996 12 9996

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