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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 Report & Stability Certificate

Site Address

The proposed construction of stilt floor + 5 floors + 5th floor (part) (height -18.30m) residential building with 48 dwelling units availing premiun FSI with affordable housing benefit at Vignarajapuram 4th street extension, vengaivasal, chennai -100 comprised in old. S.Nos.38/4A. As per patta S.NO: 38/4B1A1, 38/4B1B1, vengaivasal village, within the limits of St. Thomas mount panchayat union.

S.Subramaniam, MS.(Struc).PDQS.DRTM.
Registered Structural Engineer Grade – 1
CMDA : (SE/GR-I/2024/02/008)
DTCP : (CGLDIST/SE/Grade-1/2019/05/005)

Kannimar Consultants

Industrial Building Consultants
Structural Design

New No.14, Kannimar Villa, Ganga Nagar, Jafferkhanpet, Ashok Nagar, Chennai – 83.
Ph: 24749439, 95000 74947.
kannimarconsultants@gmail.com

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

KC-6700

Kannimar Consultants
Industrial Building Consultants
Structural Design
New No. 14, Old No. 17A, Kannimar Villa, Ganga Nagar, Jafferkhanpet,
Ashok Nagar, Chennai - 83. Ph. : 24749439, 94441 83538, 9500074947

S. Subramaniam, M.S. (Struc). PDQS. DRTM.
Chartered Engineer
Registered Structural Engineer Grade - I
E-mail : kannimarconsultants@gmail.com

07/08/2026

Stability Certificate

1. The detailed engineering and structure design for the Plan showing stilt floor + 5 floors + 5th floor (part) (height -18.30m) residential building with 48 dwelling units availing premiun FSI with affordable housing benefit at Vignarajapuram 4th street extension, vengaivasal, chennai -100 comprised in old. S.Nos.38/4A. As per patta S.NO: 38/4B1A1, 38/4B1B1, vengaivasal village, within the limits of St. Thomas mount panchayat union has been done by me/us based on the report of Geotechnical investigation (Soil test) done by GeoGlobe Foundation having Report no: GGTQ_JUNE24_24_VENGAIVASAL Dated :17-06-2024 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 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 codes No **IS:875-part-2 (1987)** and design of earthquake resistant structure as per IS code No. **IS:1893:2016 part -I.**
4. The building will be safe and sound when used for the purpose for which it is designed.

Stamp and Signature

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
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(SE/GR-I/2024 / 02 / 008).
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Kannimar Consultants
Chennai
24749439

Load calculation

Building Name: Residential flats
Number of Floor: Stilt + 5

Concrete Unit wt	25	kN/m^3
Brick work	20	kN/m^3
Live load -rooms	2	kN/m^2
Live load -stair&cordr	3	kN/m^2
Floor finish	1	kN/m^2

Floor Height

Stilt floor	=	3 m	Parking
First floor	=	3.05 m	Residence
Second floor	=	3.05 m	Residence
Third floor	=	3.05 m	Residence
Fourth floor	=	3.05 m	Residence
Fifth Floor	=	3.05 m	Residence
Head room	=	2.8 m	

Load on Column **column** **C3** X= 3.97 Y = 3.5

Sl. No	Description	No	L	B	D	Qty	UnitLoad	Total Load
	Ground floor							
1	Column Load	1	0.23	0.525	5.5	0.66	25	16.6
2	Plinth beam	1	7.47	0.23	0.45	0.77	25	19.33
3	Roof beam	1	3.97	0.23	0.31	0.28	25	7.08
		1	3.5	0.23	0.31	0.25	25	6.24
4	Roof slab	1	3.97	3.5	0.14	1.95	25	48.63
5	Live load-all area	1	3.97	3.5	1	13.90	2	27.79
6	Floor finish	1	3.97	3.5	1	13.90	1.5	20.84
7	BW: up to FFL	1	7.47	0.23	0.75	1.29	20	25.77
8	BW: Above FFL							
	230 thick	1	0	0.25	0	0.000	20	0.00
	115 thick	1	0	0.15	0	0.000	20	0.00
								172.28
	First floor							
1	Column Load	1	0.23	0.525	3.05	0.368	25	9.21
2	Roof slab	1	3.97	3.5	0.14	1.945	25	48.63
3	Roof beam	1	3.97	0.23	0.31	0.283	25	7.08
		1	3.5	0.23	0.31	0.250	25	6.24
4	Live load-all area	1	3.97	3.5	1	13.895	2	27.79
5	Floor finish	1	3.97	3.5	1	13.895	1.5	20.84
6	Brick wall-230 thick	1	0	0.25	2.6	0.000	20	0.00
7	Brick wall -115 thick	1	7.47	0.15	2.6	2.913	20	58.27
	Additional load	1	1	2.5	0.2	0.500	25	12.50
			First floor					**190.55**
	Parapet load							
1	Brick wall	1	0	0.25	1	0	20	0
2	Weathering coarse material	1	3.97	3.5	0.1	1.39	20	27.79
			Parapet load					**27.79**

COLUMN TOTAL LOAD **column** **C3**

Sl.No	Description	Load	
1	Still floor	172.28	
2	First floor	190.55	
3	Second floor	190.55	
4	Third floor	190.55	
5	Fourth floor	190.55	
6	Fifth Floor	190.55	
7	Terrace	27.79	
8	Total	1152.84	kN
	Say	120.00	Mt

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Kannimar Consultants,
Chennai
24749439

COLUMN DESIGN

Column load as per load calculation		=	120	Mt			
Long Column design as per IS456-2000, Page 71							
Factored Load	P_u	=	$C_r(0.4 f_{ck}. A_c + 0.67 f_y. A_{sc})$				
Working load	P	=	$P_u/1.5$				
	C_r	=	$1.25 - [(l_e/D)/48]$				
PROCEDURE:							
	F_{ck}	=	25	N/mm^2			
	F_y	=	415	N/mm^2			
Length of column	L	=	3.75	m			
	l_e	=	3.19	m	0.85* L		
	C_r	=	0.96				
Modulus of elasticity of concrete	E_c	=	25000.00	N/mm^2			
Ref IS 456-2000 Cl 6.2.3.1							
Flexural strength of concrete	f_{cr}	=	3.50	N/mm^2			
Ref IS 456-2000 Cl 6.2.2							
Maximum shear stress in concrete for limit state method of design							
Ref IS 456-2000 Table 20 Cl 40.2.3	$t_{c\,max}$	=	3.1	N/mm^2			
Permissible bearing stress		=	0.45*Fck				
		=	0.45	x	25		
Permissible bearing stress		=	11.25	N/mm^2			
Column size		=	230	525	mm		
Minimum Eccentricity.e		=	L/500 + Lateral dimension/30				
One direction		=	15.17	mm			
Another Direction		=	25.00	mm			
Minimum eccentricity		=	20	mm			
Consider Minimum Eccentricity		=	25.00	mm			
0.05*b		=	11.50		<	25.00	
Area of column		=	120750	mm^2			
Number of rod		=					
		=	5	20	1570.60	mm^2	
		=	5	20	1570.60	mm^2	
Area of Steel(A_{sc})		=	3141.20	mm^2			
Area of Concrete(A_c)		=	117608.80	mm^2			
	P_u	=	1970136.28	N			
	P	=	1313424.187	N			
	Say	=	**131.34**	**Tonne**			
% of Reinforcement	**0.8**	<	**2.60**	<	**4**	%	
		SAFE		SAFE			
Column Load	131.34	>	120.00	**Mt**			
		SAFE					

Lateral Ties:

As per IS 456-2000; Clause 26.5.3.2.c-Page 49

Diameter shall not be less than		=	20 / 4				
		=	5	mm dia			
Provide		=	10	mm dia			
Spacing							
Shall not be more than following							
Least dimension of column		=	230	mm			
16x Smallest dia of column rod		=	320	mm			
Not more than		=	300	mm			
Minimum of above		=	**230**	mm			
Provide	10	@	150	mm C/c			

Development length in compression

	Ld	=	$\emptyset * \sigma s / 4 * T_{bd}$				
	Ø	=	Dia of bar	=	20.00	mm	
(Fy/1.15)	σs	=	Stress in bar	=	360.87	N/mm^2	(0.87*Fy)
Page 43.26.2.1.1	T_{bd}	=	Bond stress	=	2.8	N/mm^2	
	Ld	=	20 / 4	360.8696 / 2.8			
	Ld	=	644.410	mm			

SUMMARY

Column size		=	230	x	525		
Rebar		=	5	20			
			5	20			
Lateral tie	10	@	**150**	mm C/c			

Bond stress for **Compression** 43,IS 456-2000

Grade of concrete	Type	M20	M25	M30	M35	M40 & above
Design Bond Stress,N/mm^2	Plain	1.5	1.75	1.875	2.125	2.375
	Deformed	2.4	2.8	3	3.4	3.8

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kannimarconsultants@gmail.com

Isolated Footing- Regular

Load on Column(P)	=	125	Mt		
	=	1250	kN		
Ultimate column Load P_u = (1.5 xP)	=	1875	kN		
Self Weight of footing(0.1P)	=	86.4	kN		
Total Load on column		1336.4	kN		
SBC of soil	=	350	kN/m^2		
f_{ck}	=	25	N/mm^2		
f_y	=	415	N/mm^2		
T_c max	=	3.1	N/mm^2	IS456-2000,P73	
$X_{u\,max}/d$	=	0.48		IS456-2000,P70	a
Assume footing concrete depth	=	600	mm	0.6	

Column Size

a	b	
0.3	0.525	m
300	525	mm

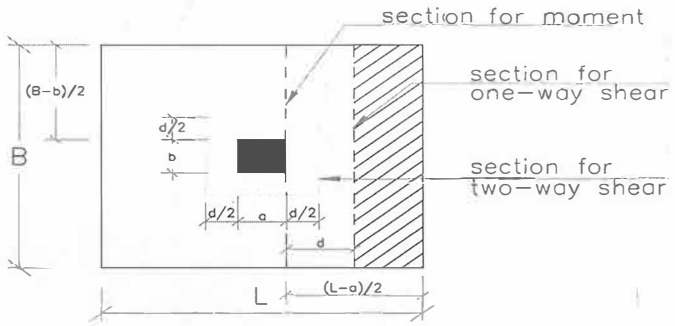
Column rod size	=	25	mm	
Foundation depth	=	3	m	
Area of footing, A	=	1375.00 / 350.00		
	=	3.93	m^2	
Size of footing		1.98	m	

Adopt footing size

L(m)	B(m)
2.4	2.4

Footing area provided		5.76	m^2		
Net upward pressure(P/A)	p	217.01	<	350	kN/m^2
		Safe			
Ultimate Design Pressure	(1.5 xp)	325.52	kN/m^2		

Depth Required for B M Consideration



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Max. BM along column edge	=	$\frac{P \times B \times (L-a)^2}{8}$						
p	=	217.01						
B	=	2.4						
L-a	=	2.4	-	0.3	=	2.1		
$(L-a)^2$	=	4.41						
BM	=	217.01	2.4	4.41				
			8					
	=	287.11						
Max. BM	=	287.11	kN.m					0.165
M_u Limit	=	$0.138\, f_{ck}\, bd^2$						
		0.138	25	1000	276676			
	=	954532200.00	Nmm					
		954.53	>	287.11				
		M_u limit	>	Mu				
		Safe						
M_u(1.5 xBM)	=	430.66	kN.m					

$$d^2 = \frac{Mu}{0.36 f_{ck} (X_u/d)(1-.416X_u/d)1000}$$

d^2	=	430664062.50		d'	=	50 cover
		3457.38			=	16 footing mc
d	=	**352.94** mm			=	8
D	=	600 mm		0.6	**Safe**	74
d	=	526 mm		m	0.526 m	

Check For Gross Bearing Capacity

Service Load	=	1250 kN	Single shear	**Safe**
Weight Of footing	=	86.40 kN		
Weight Of soil	=	221.2 kN		
Total	=	1557.6 kN		
Check For Gross Bearing Capacity		1557.58	**270.41**	
		5.76		

Area of Tension steelfor BM

BM = 0.87 x Fy xAt (d - Fy x At / Fck x b)

430664062.5	=	189912.3 A_t	-	2.497 A_t^2	
a	=	2.497			
b	=	189912.3			
c	=	430664062.5			
2a	=	4.99			
b^2	=	36066681691			
4ac	=	4301924854			
sqrt of b^2-4ac	=	178226.70			
A_t	=	2339.68 mm^2			
Per Rm	=	974.87 mm^2			

Alternative method

M_u/bd^2	=	0.649			
Pt	=	**0.185** %			
	=	2340.89 mm^2			
Minimum Rebar 0.12%	=	631.2 mm^2			
Adopt	=	974.87 mm^2			
	16	mm	140	mm c/c	
1435.98	>	974.87 mm^2	Per Rm		
The design is	**Safe**				
P_t	=	**0.27** %			

Depth Required for Punching shear

Single Shear :Critical section is taken at distance "d" from the face of the column

Shear Force	V	=	Shear area	x	Pressure
Shear area	L	=	2.4	m	
	b	=	0.52	m	
	area	=	1.26		
	V	=	217.01	x	1.26
	V	=	272.92 kN		
	V_u	=	409.38 kN		
	T_v	=	V_u		
		=	bd		
		=	409375.00		
			2400	526	
Nominal Shear Stress	T_v	=	0.324 N/mm^2		
Percentage of steel provided	P_t	=	0.27	%	
Shear strength of concrete	T_c	=			
Percentage of steel	P_t	=	0.27	%	

Permissible shear stress in concrete (kt_c) for solid slabs in limit state design method

Ref IS 456:2000 Cl 40.2.1.1, Table 19

f_{ck} N/mm²	P_t %	D of slab	k	$k\,t_c$ N/mm²
25	**0.27**	**600**	1.00	0.38

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	0.324	<	0.38	N/mm^2
	T_v	<	kT_c	

The design is **Safe**

Double Shear :Critical section is taken at distance "0.5d" from the face of the column

Footing area		=	5.76	m^2	
Critical section area		=	0.826	x	1.051
		=	0.87	m^2	
Net area		=	4.89	m^2	
Shear Force		=	Shear area	x	Pressure
			4.89	x	217.01
	V		1061.60	kN	
SF	V_u	=	1592.41	kN	
	T_v	=	V_u / bd		
	b	=	3754	mm	
	d	=	526		
		=	1592406.901		
		=	3754 x 526		
Nominal Shear Stress		=	0.81	N/mm^2	
	T'_c	=	$K_s.T_c$		
	K_s	=	0.5+Bc		
	Bc	=	0.57	(a/b)	
	K_s	=	1.07		
Ks Not more than		=	1		
	K_s	=	1.000		
	Tc	=	1.250	(0.25*sqrtFck)	
	T'_c	=	1.250		
	Tv	<	T'_c		
	0.81	<	1.250	N/mm^2	

Safe

Transfer of force at the base of the column

	P_u	=	1875	kN
Compressive bearing resistance		=	0.45fck * area of column	
		=	1771.88 <	1875 kN

Consider Longitudinal rebar for bond

Development length in Compression

	Ld	=	$\frac{\emptyset * \sigma s}{4 * T_{bd}}$			
	Ø	=	Dia of bar	=	25	mm
(0.87*Fy)	σs	=	Stress in bar(Fy/1.15)	=	361.05	N/mm^2
Page 43.26.2.1.1	T_{bd}	=	Bond stress	=	2.4	N/mm^2
	L_d	=	25 x 361.05 / 4 x 2.4			
Required Development Lenth	L_d	=	940.2	mm		
Available Development Lenth		=	976.0	>	940.2	mm

Safe

SUMMARY

Footing Size	=	**2.4**	x	**2.4**	M
Footing concrete depth	=			**600**	mm
Footing rod	=	**16**	@	**140**	mm c/c

Bond stress for **Compression** P 43,IS 456-2000

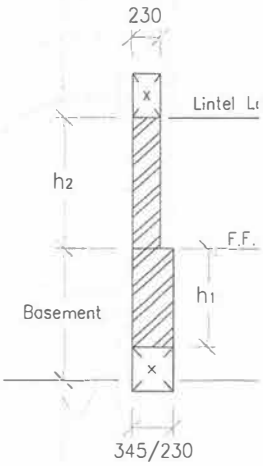
Grade of concrete	Type	M20	M25	M30	M35	M40 & above
Design Bond Stress,N/mm^2	Plain	1.5	1.75	1.875	2.125	2.375
	Deformed	2.4	2.8	3	3.4	3.8

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Chennai
24749439

PLINTH BEAM

Span	=	4.612	m			
Wall thickness-Below basement	=	0.23	m			
Wall height	=	0.75	m			
Wall thick-above basement	=	0.25	m			
Wall height	=	0	m			
Beam Size b	=	230	mm			
D	=	375	mm	l/16	288	mm
d'	=	46	mm	d'/d =	0.140	
d	=	329	mm			
F_y	=	415	N/mm²			
F_{ck}	=	25	N/mm²			



LOAD CALCULATIONS:

Self wt = b x D x 1 x 25	=	2.16	kN/m	
Brick masonry weight below basement	=	3.45	kN/m	
Brick masonry weight above basement	=	0		
Mox Udl	w =	5.61	kN/m	
Max B.M at Mid span	=	$(wl^2/20)$		

5.61	4.612	4.612
	20	

BM = 5.96 kN.M

SF = wl/3 (0.5 x w x l)

5.61	x	4.612
	3	

SF = 8.62 kN

M_u/bd^2 =

1.5	5.96	1000000
230.00	329	329

= **0.36** N/mm²

Refer SP 16 ,Page 86,Pt = **0.101** % P_c = 0.1

A_{st} =

0.101	230	329
	100	

Ast = 77 mm² = 76 mm²

Provide						
	2	16		2	16	
	1	12		1	12	
	0	16		0	12	
"A_{st}" Provided	515.16	>	76.62	515.1568	>	75.67
		SAFE			**SAFE**	

Min.Reinf = $(0.87 \times b \times d / F_y)$ mm²

=	0.870	230	329
		415	

Min.Reinf = 158.633 mm²

"A_{st}" Provided 515.2 > 158.6 mm²

SAFE

CHECK FOR SHEAR STRENGTH

T_c Max = $0.62 * \sqrt{F_{ck}}$

0.62	5

= 3.10 N/mm²

As per clause 40.2 (P73) of IS 456-2000

Percentage of steel P_t = **0.68** %

Shear strength = kT_c

k = 1

% of steel	T_c
0.5	0.49
0.75	0.57

For 0.68 0.55

kT_c = 1.00 X 0.55

Now kT_c = 0.55 N/mm² < 3.10 N/mm²

Nominal Shear stress T_v = $V_u/b.d$ **SAFE**

V_u = 1.5 X 8.62

12.928 kN

T_v = $V_u/b.d$

T_v =

12.93	1000
230.00	329

T_v = 0.17 < 3.10 N/mm²

SAFE

0.17 < 0.55 N/mm²

T_v < kT_c

SAFE

Total shear strength V_u = 12928.01 N

Shear contribution by concrete $T_c b.d$ =

0.55	230	329

41456.1176

Shear contribution by stps V_{us} = V_u - T_c b.d

12928.01 - 41456.12

-28528.11 N

Provide Y 8 -419 mm C/C

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Area or 2 legged stps a = 101 mm^2

Spacing of stirrups = $\frac{0.87 * Fy * a * d}{V_{us}}$

0.87	415	101	329
	-28528.11		

= **-419** mm C/C

Provide shear Rebar without considering conc. shear Y 8 **924** mm C/C

Area or 2 legged stps a = 101 mm^2

$= \frac{0.87 * Fy * a * d}{V_u}$

0.87	415	101	329
	12928.01		

= **924 mm C/C**

V_{us}/d = $\frac{-28528.11}{329.00}$ $\frac{10}{1000}$

= -0.867 kN/cm

Minimum Stirrups Reinforcement Y 8

A_{sv} = 100.52 mm^2

S_v = 0.87*Fy*Asv/0.4*b

0.87	415	101
0.4	230.00	

= 36292.16832 / 92

= **394 mm C/C**

Maximum Spacing of Stirrups

= 0.75 *d

= 246.75 mm

= 300 mm

Least of above 246.75 mm

Provide Y 8 @

394 > 200 < 246.75

SAFE **SAFE**

531 > 200 < 924

SAFE **SAFE**

Development length in Tension

Ld = $\frac{\emptyset * \sigma s}{4 * \tau_{bd}}$

Ø = Dia of bar = 16 mm

(0.87*Fy) σs = Stress in bar(Fy/1.15) = 360.87 N/mm^2

Page 43,26.2.1.1 τ_{bd} = Bond stress = 2.24 N/mm^2

Ld = $\frac{16}{4}$ $\frac{360.8695652}{2.24}$

Ld = 644.4 mm

Bond stress for **tension** P 43,IS 456-2000

Grade of concrete	Type	M20	M25	M30	M35	M40 & above
Design Bond Stress,N/mm^2	Plain	1.2	1.4	1.5	1.7	1.9
	Deformed	1.92	2.24	2.4	2.72	3.04

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

Centre Beam-Continues

Span	=	4.612	m			
Lateral span	=	3.5	m			
Wall height	=	2.6	m			
Wall thickness	=	0.23	m			
b	=	230	mm			
D	=	450	mm	l/12.5	**369**	mm
d'	=	50	mm	d'/d =	0.125	
d	=	400	mm			
f_y	=	415	N/mm^2			
f_{ck}	=	25	N/mm^2			

Slab Load:

Self wt	=	3.125	kN/m^2	slab thk	0.125 m
Live Load	=	2	kN/m^2		
Floor Finish	=	1.5	kN/m^2		
Mish. Load	=	1	kN/m^2		
		7.625	kN/m^2		

Load Calculations:

Brick work/ AAC Block	=	20	kN/m^3
Self wt = b x D x 1 x 25	=	2.59	kN/m
Brick work:	=	10.17	kN/m
Udl for slab	=	16.56	kN/m
Max Udl	w =	29.31	kN/m

M_u Limit = $0.138\ f_{ck}\ bd^2$

0.138	25	230	160000

= 126960000.00 Nmm

126.96 > 85.03

M_u limit > M_u

Singly Reinforced

"d" - reqd = 327.35 < 400 mm

Safe

Max B.M at Mid span = $(wl^2/13)$

29.31	4.612	4.612
	13	

BM = 47.96 kN.M

M_u Midspan = **71.95 kN.M**

Max B.M at Support = $(wl^2/11)$

29.31	4.612	4.612
	11	

BM = 56.69 kN.M

M_u Support = **85.03 kN.M**

SF = wl/2 (0.5 x w x l)

29.31	x	4.612
	2	

SF **67.60 kN**

M_u/bd^2 @Mid span =

1.5	47.96	1000000
230.00	400	400

= 1.96 N/mm^2

M_u/bd^2 @Support =

1.5	56.69	1000000
230.00	400	400

= **2.31 N/mm^2**

Rebar @ Mid span

	P_t	P_c
Refer SP 16 ,Page 86.Pt =	0.602	0.30

0.602 %

A_{st} =

0.602	230	400
	100	

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

	Ast	=	554	mm^2			=	277	mm^2
Provide	2	16					2	16	
	2	16					0	20	
	0	16					0	16	
"A_{st}" Provided	804.15	>	553.75	mm^2			402.0736	>	276.88
	0.87	**Safe**					**0.44**	**Safe**	

Repar @ Support

		P_t	P_c			
Refer SP 16 ,Page 86,Pt	=	*0.728*	*0.364*		**0.728**	%

	A_{st}	=	0.728	230	400				
				100					
	Ast	=	670	mm^2			=	335	mm^2
Provide	2	16					2	16	
	3	16					2	20	
	0	16					0	16	
"A_{st}" Provided	1005.18	>	670.06	mm^2			1030.314	>	335.03
	1.09	**Safe**					**1.12**	**Safe**	

Min.Reinf	=	0.87 x b x d / F_y	mm^2		
	=	0.870	230	400	
			415		
Min.Reinf	=	192.867	mm^2		
"A_{st}" Provided	804.1472	>	192.867	mm^2	
		Safe			

Min. % of steel required

As per Cl.26.5.1.1 IS456:2000	=	0.205 %				
As per Cl.6.2.1 IS13920:1993	=	0.290 %		(0.24 √ fck) /fy)		
$p_{t\,min}$	=	**0.290** %		<	1.09	%
				Safe		

Max. % of steel to be used =

As per Cl.26.5.1.1 IS456:2000	=	4.000 %				
As per Cl.6.2.1 IS13920:1993	=	2.500 %				
$p_{t\,max}$	=	**2.500** %		>	1.09	%
				Safe		

CHECK FOR SHEAR STRENGTH

As per clause 40.2 (P73)	Tc Max	=	0.62 *sqrt(Fck)		
of IS 456-2000		=	0.62	5	
		=	3.10 N/mm^2		
Percentage of steel	P_t	=	**0.87** %		

Permissible shear stress in concrete (kt_c) for solid slabs in limit state design method

Ref IS 456:2000 Cl 40.2.1.1, Table 19

f_{ck} N/mm^2	p_t %	D of slab	k	$k\,t_c$ N/mm^2
25	0.87	450	1.00	0.61

	Now	kT_c	=	0.61	N/mm^2	<	3.10 N/mm^2
Nominal Shear stress		T_v	=	$V_u/b.d$		**Safe**	
		V_u	=	1.5	X	67.60	
				101.399			
		T_v	=	$V_u/b.d$			
			=	101.40	1000		
				230.00	400		
			=	1.10	<	3.10	N/mm^2
					Safe		
		1.10	>	0.61	N/mm^2		
		T_v	>	kT_c			

Provide shear Bar

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

Total shear strength	V_u	=	101399.08 N			
Shear contribution by concrete	$T_c b.d$	=	0.61	230	400	
			56120			
Shear contribution by stps	V_{us}	=	V_u	-	$T_c b.d$	
			101399.08	-	56120	
			45279.08 N			
Minimum shear resistance	0.4bd	=	36800.00 N			
		=	45279.08 N			
Provide	Y 10		501 mm C/C			
Area or 2 legged stps	a	=	157 mm^2			
Spacing of stirrups		=	$\frac{0.87 * Fy * a * d}{V_{us}}$			
		=	0.87	415	157	400
				45279.08		
		=	**501** mm C/C			
Provide shear Rebar without considering conc. shear	Y 10		**224** mm C/C			
	a	=	157 mm^2			
		=	$\frac{0.87 * Fy * a * d}{V_u}$			
		=	0.87	415	157	400
				101399.08		
		=	**224 mm C/C**			
Minimum Stirrups Reinforcement	Y 10					
	A_{sv}	=	157.06 mm^2			
	S_v	=	0.87*Fy*Asv/0.4*b			
			0.87	415	157	
			0.4	230.00		
			56706.513			
			92			
		=	**616** mm C/C			
Maximum Spacing of Stirrups		=	0.75 *d			
		=	300 mm			
		=	300 mm			
Least of above			300 mm			
				Y	10	
				@		
Provide		616	>	150	<	300
			Safe		**Safe**	



S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

SLAB DESIGN AS PER BIS-2000 METHOD

Location:

L_x	=	3.43 m	
L_y	=	4.04 m	
f_{ck}	=	25 N/mm²	
f_y	=	415 N/mm²	
L_y/L_x	=	1.18	
		Two Way Slab	
Span	=	3.43 m	Span/32
Slab thickness	=	125 mm	107.2
Cover		20 mm	
Effective depth		105 mm	
Concrete wt	=	25 kN/m³	
Live Load on Slab	=	2 kN/m²	
Floor finish	=	1.5 kN/m²	
Design Load:			
slab weight	=	3.125 kN/m²	
Live + Floor finish Load	=	3.5 kN/m²	
Total Load	=	6.63 kN/m²	
M_x	=	$\alpha_x w l^2_x$	
M_y	=	$\alpha_y w l^2_x$	

As per IS456-2000-Table 26-Page No:91

Negative Moment at edge

L_y/L_x = **1.18**

α_y = 0.047

		Ly/Lx		For
		1.1	**1.2**	1.18
Negative Moment @ edge	α_x	*0.047*	*0.053*	0.052
Positive Moment at mid span	α_x	*0.035*	*0.040*	0.039

				M_{ux}	M_{uy}
M_x	=	4.03	kNM	6040995.319	
M_y	=	3.66	kNM		5494943.6
Maximum Bm	=	**4.03**	kNM		
"d" - reqd under compression	=	41.85	<	105 mm	
			Safe		

		M_{ux}	M_{uy}	
$M_u/b.d^2$	=	0.55	0.50	N/mm²

As per SP16, Table 2,Page 48,

P_t	=	%	**0.156**	**0.141**	
Area of steel	=	mm²	163.66	148.51	
Adopt					
Y	10	140	mm C/C	10	140	mm C/C
	560.93	>	163.66	560.93	>	148.51
		Safe			**Safe**

Positive Moment at mid span

α_y = 0.043

				M_{ux}	M_{uy}
M_x	=	3.03	kNM	4547022.375	
M_y	=	3.35	kNM		5027288.8
Maximum Bm	=	**3.352**	kNM		

		M_{ux}	M_{uy}	
$M_u/b.d^2$	=	**0.41**	**0.46**	N/mm²

As per SP16, Table 2,Page 48,

P_t	=	%	**0.117**	**0.129**	
Area of steel	=	mm²	122.37	135.58	
Adopt					
Y	10	140	mm C/C	10	140	mm C/C
	560.93	>	122.37	560.93	>	135.6

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

Safe Safe

Check for Shear strength

As per clause 40.2 (P72) of IS 456-2000

T_c Max = $0.62 * \sqrt{F_{ck}}$

0.62	5

= 3.10 N/mm²

For slab as per 40.2.3.1

T_c Max = $0.5 * T_c max$

0.50	3.10

T_c Max = 1.55 N/mm²

Percentage of steel P_t = **0.53 %**

Shear strength = $k\,t_c$

Permissible shear stress in concrete (kt_c) for solid slabs in limit state design method

Ref IS 456:2000 Cl 40.2.1.1, Table 19

f_{ck} N/mm²	p_t %	D of slab	k	$k\,t_c$ N/mm²
25	0.53	125	1.30	0.65

Now,kTc $k\,t_c$ = 0.65 < 1.55 N/mm²

Safe

Nominal Shear stress T_v = $V_u/b.d$

V_u = 17.04281 kN

T_v = 0.16 < 1.55 N/mm²

Safe

T_v < kT_c

Safe

Check for Defflection

Live Load 2 < 3.01 kN/m²

Defflection calculation is Not Necessary

A_{st} required = 122.37 mm²

A_{st} Provided = 560.93 mm²

Steel stress for service Load F_s = $0.58 \times F_y \times \frac{A_{st}\ required}{A_{st}\ Provided}$

As per Fig-4,IS 456-2000,Page38

0.58	415	122.37
	560.93	

F_s = **52.51 N/mm²**

Percentage of steel provided = **0.53 %**

Modification factor-Fig-4 Asper IS 456-2000-Page 38

f_y N/mm²	f_s N/mm²	$p_{t\,req.}$ %	$p_{t\,prov.}$ %	MF_t IS 456 Fig 4
415	52.51	0.12	0.53	2.00

Effective depth ratio

For,Simply supported = 20

Continues = 26

Cantilever = 7

(Lx/d) Max = 26 x 2.000

= 52.00

(Lx/d)Provided = $\frac{3430}{105}$

= 32.667

(Lx/d) Max 52 > 32.67 (Lx/d)Provided

Safe

Maximum diameter of bars for slabs

Ref IS 456-2000 Cl 26.5.2.2

D of slab mm	dia of bar mm	Result Cl 26.5.2.2
125	10	Ok

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

Kannimar Consultants,
Chennai
24749439

STAIRECASE -DOG LEGGED MODEL

Location:

L_x	=	4.9	m		
F_{ck}	=	25	N/mm^2		
F_y	=	415	N/mm^2		
Step weight		20	kN/m^3		
Landing width	=	1.05			
Slope length	=	2.8			
Step tread	=	0.25	m		
Step riser	=	0.165	m		
Slope length for one step	=	0.300	m		
Number of tread	=	2.8			
	=	0.25			
	=	11.2	No		
Say	=	11	No		
Aditional slope length per flight	=	11	x	0.050	
	=	0.54			
Effective length	=	5.44	m		
Concrete wt	=	25	kN/m^3		
Waist slab thickness	=	0.140	m	(Assumed)	

Loads:

Dead load of Waist slab	=	3.5	kN/m^2		
Ceiling finish	=	0.25	kN/m^2		
Sub total	=	3.75	kN/m^2		
Dead Load on plan area	=	3.75	x	0.300	
				0.25	
	=	4.49	kN/m^2		
Brick load	=	0.165	x	20	
				2	
		1.65	kN/m^2		
Live load	=	3	kN/m^2		
Floor finish	=	1.5	kN/m^2		
Total load on staire	=	10.64	kN/m^2		

Maximum BM($w \times l^2/12$)	=	10.64	x	5.44^2	
	=			12	
	=	26.30	kN.M		
M_u	=	1.5 x		26295184	
		39442775.47	Nmm		

39442775.47		
0.138	25	1000

	11432.69		
sqrt	=	106.92	mm
Cover	=	20.00	mm
Total	=	126.92	mm
Provide	=	140.00	mm
d		117.00	

$M_u/b.d^2$

39442775.47		
1000.00	117.00	117.00

2.88

As per SP16, Table 2,Page 48,

P_t	=	**0.947**	%			
Area of steel	=	0.947461227	x	1000	x	117.00

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

Kannimar Consultants,
Chennai
24749439

100

= 1108.53 mm^2

Adopt

Y 16 @ 140 **mm C/C**

1436 **>** 1109 mm^2

Safe

Distributer:

Provide minimum steel = 0.12%

0.12	1000	117.00
	100	

= **140.4** mm^2

Adopt

Y 10 @ 150 **mm C/C**

524 **>** 140 mm^2

Safe

Check for Shear strength

As per clause 40.2 (P72)
of IS 456-2000

Percentage of steel P_t = $\frac{1435.98 \times 100}{1000 \times 117.00}$

P_t = **1.23 %**

Shear strength = kT_c

k = 1.2

IS456-2000,Page73,table19

% of steel	T_c
1	0.64
1.25	0.7

For **1.23** 0.69 N/mm^2

kT_c = 1.200 x 0.695

0.833

Nominal Shear stress T_v = $V_u/b.d$

V_u

1.5	5.44	10.64
	2	

V_u = 43.4635 kN

T_v = $\frac{43.4635 \times 1000}{1000 \times 117.00}$

T_v = 0.3715 < 0.8335

T_v < kT_c

SAFE

SUMMARY

Waist slab thick = **140.00 mm**

Main Rebar = **Y 16 @ 140 mm C/C**

Distributer = Y 10 @ 150 **mm C/C**

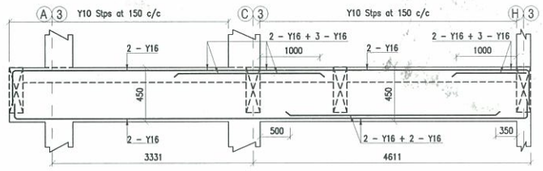
S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

Kannimar Consultants
Chennai
24749439

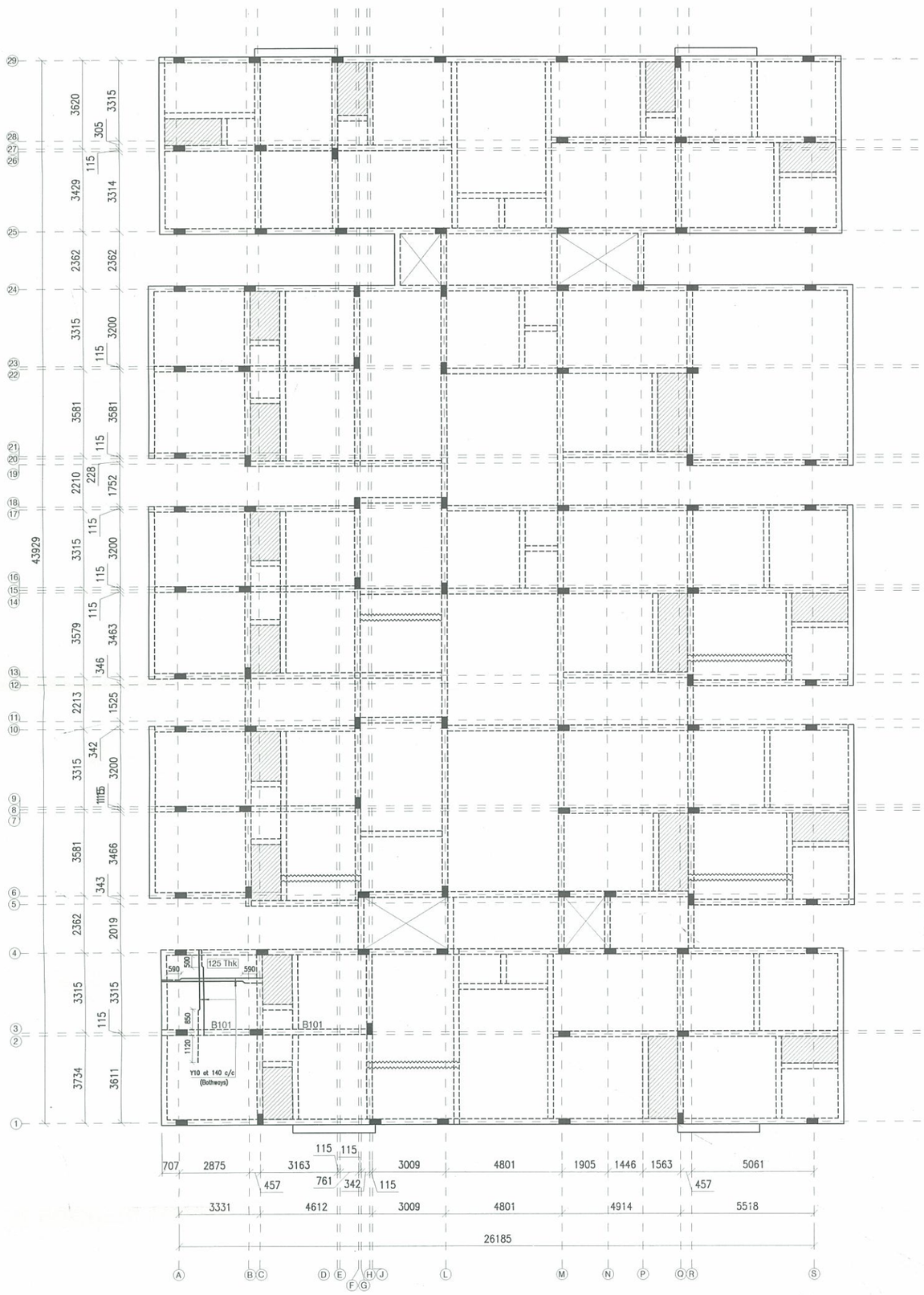
SUNSHADE DESIGN

1	Grade of concrete		F_{ck}	=	**25**	N/mm^2	
2	grade of steel		Fy	=	**415**	N/mm^2	
3	Width of sunshade			=	**0.6**	m	
4	Sunshade thickness -	t_{max}		=	0.075	m	**75** mm
		t_{min}		=	0.1	m	**100** mm
		average		=	0.0875		87.5
		cover		=	0.014		**15**
		effective depth d		=	0.061	m	61 mm
5	Self weight of sunshade			=	2.19	kN/m^2	
	Finishes			=	1	kN/m^2	
	Live load			=	0.75	kN/m^2	
				Total	3.94	kN/m^2	
6	Maximum BM	$W L^2/2$		=	0.71	kN.M	
		"d" req		=	16.02	<	61 mm
						SAFE	
7	M_u/ bd^2			=	**0.29**	N/mm^2	
		P_t		=	**0.085**		
	Area of steel			=	51.85	mm^2	
	Adopt						
		Y 10			**140**	**mm C/C**	
		560.93		>	51.85	mm^2	
				Safe			

S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com



L.S of Beam B101 : 230 x 450



Roof Beam Layout

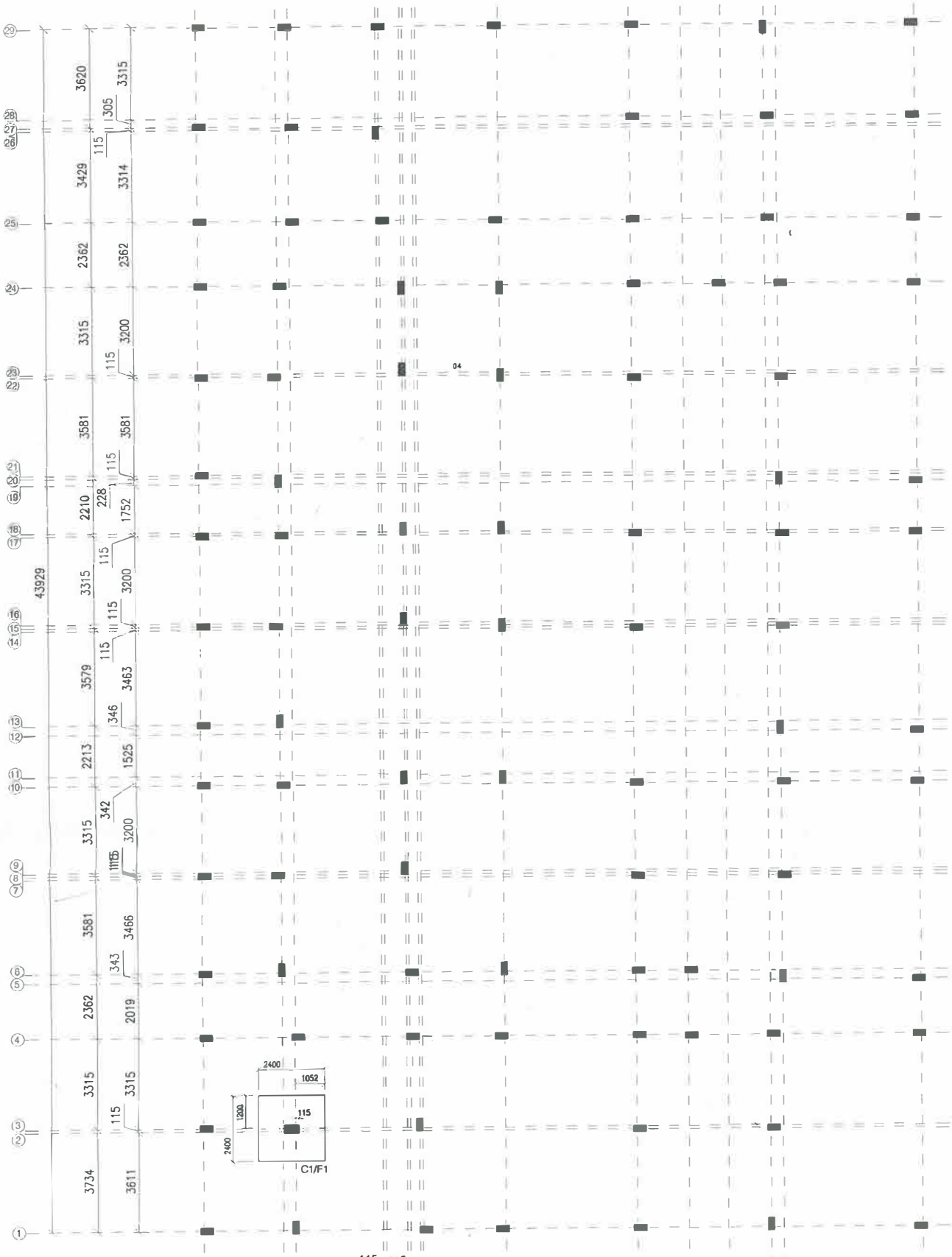
S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
Ganga Nagar, Jafferkhanpet, Ashok Nagar,
Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

Notes:

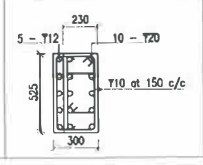
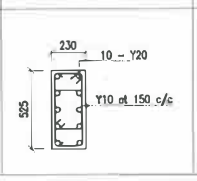
1.	All Dimensions Are In MM.
2.	Use Fe415/Fe500 Grade Steel.
3.	Use Mix M25 For all Works
4.	Clear Cover To The Reinforcement For Raft / Footing:50mm Column:40mm,Beam:30mm,Slab:20mm,Rcc Wall:20mm.

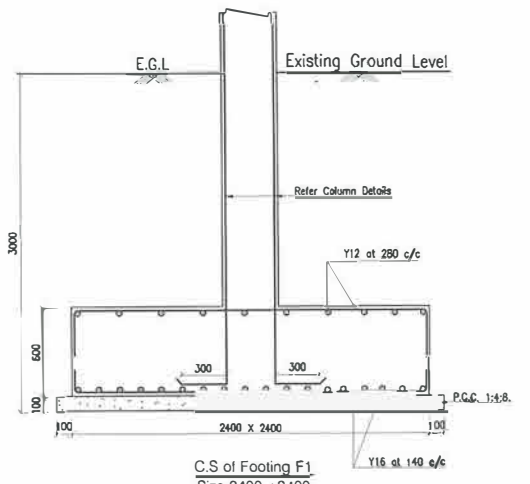
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Kannimar Consultants
Engineering Project Consultants
Structural Design
New No : 14,Old No . 17A, Kannimar Villa,
Ganga Nagar,Jafferkhanpet,Ashok Nagar,
Chennai- 83.Ph: 24749439/89 , 95000-74947
kannimarconsultants@gmail.com



Footing & Column Layout
(Stilt + 5)

Marked As	Column		Tie Arrangement
	Upto Slab 1	Above Slab 1	
C1 230 x 525			



C.S of Footing F1
Size 2400 x 2400

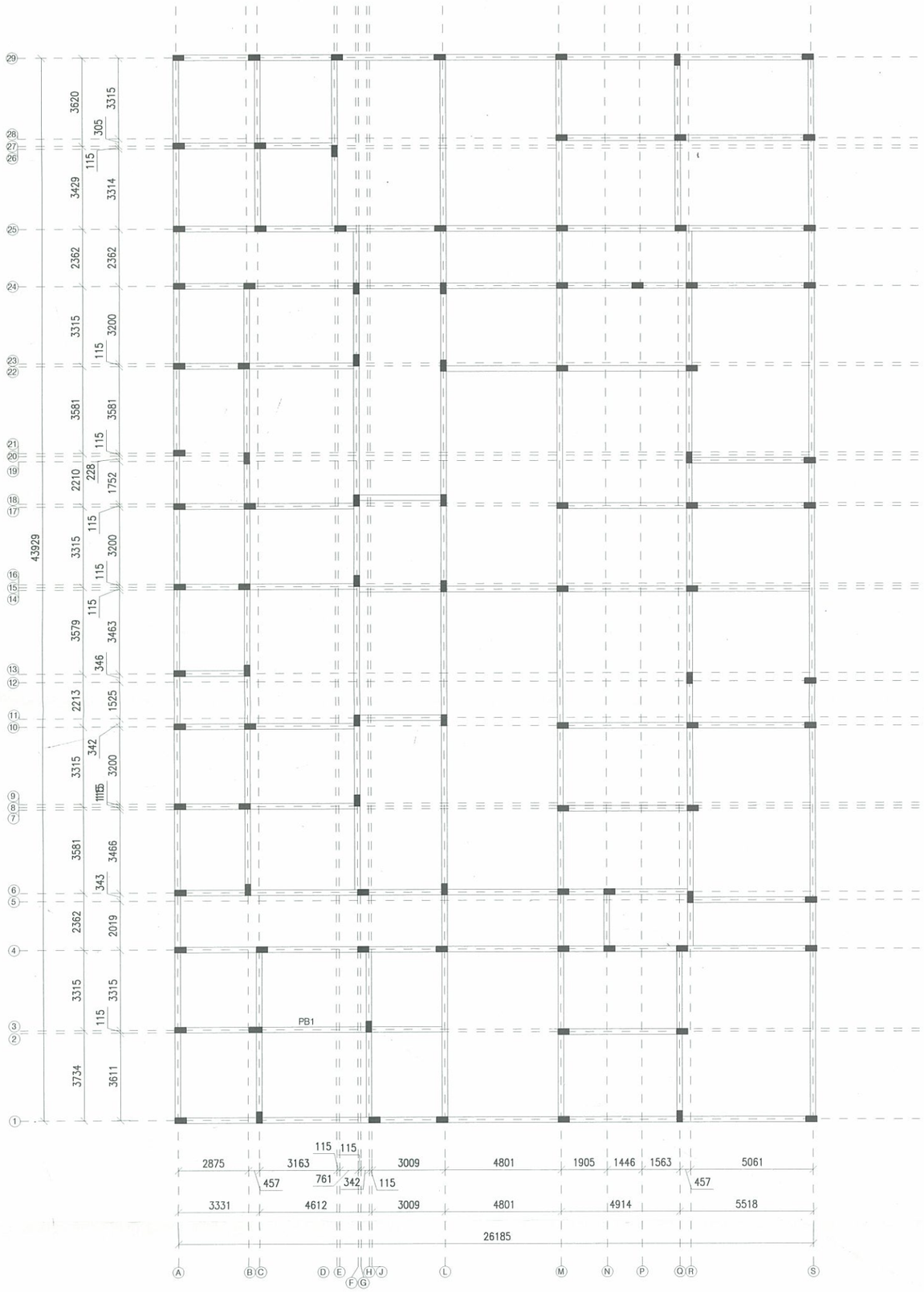
S. Subramaniam, M.S. (Struc)., PDQS, DRTM.
Chartered Engineer (AM 82130/91)
Registered Structural Engineer Grade-I.
(SE/GR-I/2024 / 02 / 008).
New No: 14, Old No. 17A, Kannimar Villa,
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Chennai - 83, Ph: 24749439, 9500074947
kannimarconsultants@gmail.com

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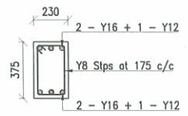
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Plinth Beam Layout



C.S of Beam PB1
Size 230 x 375

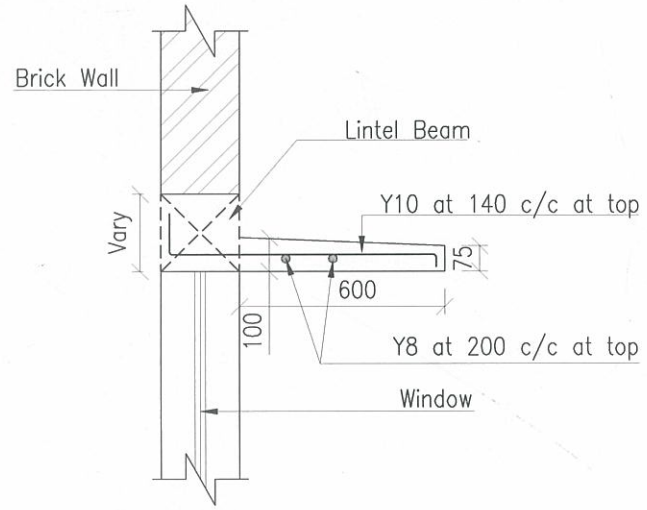
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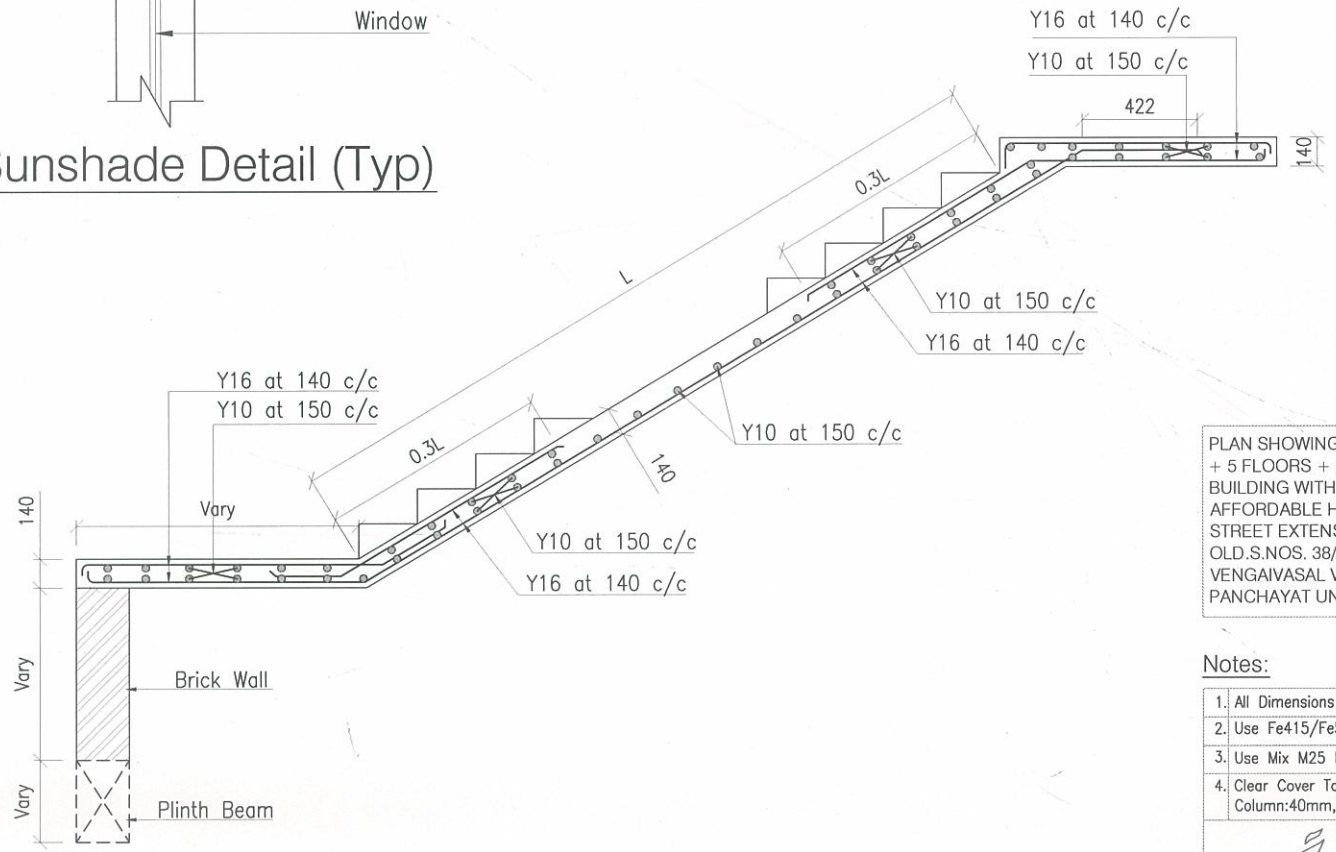
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Sunshade Detail (Typ)



C.S. of Staircase Details

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New No: 14, Old No. 17A, Kannimar Villa,
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THE LANDLENS SUITE

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

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

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

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

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

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

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

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

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

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

FREE TOOLS · NO ACCOUNT NEEDED

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

Records and verification

The registers themselves, read for you.

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

Value and duty

What it is worth and what it costs to register.

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

Zoning and land use

What the plan says can happen on this land.

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

Registers and directories

Who holds it, and which office keeps the record.

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

Every free tool
/tools

Services we run for you
/services

The LandLens suite
/landlens/one

Verified RealEstate™

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

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

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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.