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DIGITALLY VERIFIED RECORD

Design Report & Stability Certificate

Site Address

PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS + 5TH FLOOR(PT) (HEIGHT – 18.30 M) RESIDENTIAL BUILDING WITH 37 DWELLING UNITS (AVAILING AFFORDABLE HOUSING BENEFIT) AT VIGNARAJAPURAM 2ND MAIN ROAD , VENGAIVASAL, CHENNAI 600126,COMPRISED IN OLD S.NO.41/4B4 & 41/4B5 , AS PER PATTA NEW S.NO.41/4B4A2 & 41/4B5A2 OF VENGAIVASAL VILLAGE WITHIN THE LIMITS OF ST.THOMAS MOUNT, PANCHAYAT UNION.

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Stability Certificate

1. The detailed engineering and structure design of The Proposed Construction Of Stilt Floor + 4 Floors + 5th Floor(Pt) (Height – 18.30 M) Residential Building With 37 Dwelling Units (Availing Affordable Housing Benefit) At Vignarajapuram 2nd Main Road , Vengaivasal, Chennai 600126,Comprised In Old S.No.41/4B4 & 41/4B5 , As Per Patta New S.No.41/4B4A2 & 41/4B5A2 Of Vengaivasal Village Within The Limits Of St. Thomas Mount, Panchayat Union. based on the report of Geotechnical investigation (Soil test) done by GLOBE GEOTECHNIQUES report no: GGTQ_FEB25_111_VENGAIVASAL dated on 25.02.2025 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.

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Load calculation

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

Concrete Unit wt	25	kN/m³
Brick work	20	kN/m³
Live load -rooms	2	kN/m²
Live load -stair&cordr	3	kN/m²
Floor finish	1	kN/m²
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** L4 X= 4.83 Y = 5.525

Sl. No	Description	No	L	B	D	Qty	UnitLoad	Total Load
	Ground floor							
1	Column Load	1	0.3	0.675	5.5	1.11	25	27.84
2	Plinth beam	1	10.355	0.23	0.45	1.07	25	26.79
3	Roof beam	1	4.83	0.23	0.46	0.51	25	12.78
		1	5.525	0.23	0.46	0.58	25	14.61
4	Roof slab	1	4.83	5.525	0.14	3.74	25	93.40
5	Live load-all area	1	4.83	5.525	1	26.69	2	53.37
6	Floor finish	1	4.83	5.525	1	26.69	1.5	40.03
7	BW: up to FFL	1	10.355	0.23	0.75	1.79	20	35.72
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
								304.55
	First floor							
1	Column Load	1	0.3	0.675	3.05	0.618	25	15.44
2	Roof slab	1	4.83	5.525	0.14	3.736	25	93.40
3	Roof beam	1	4.83	0.23	0.46	0.511	25	12.78
		1	5.525	0.23	0.46	0.585	25	14.61
4	Live load-all area	1	4.83	5.525	1	26.686	2	53.37
5	Floor finish	1	4.83	5.525	1	26.686	1.5	40.03
6	Brick wall-230 thick	1	0	0.25	2.6	0.000	20	0.00
7	Brick wall -115 thick	1	10.355	0.15	2.6	4.038	20	80.77
	Additional load	1	0	2.5	0.2	0.000	25	0.00
			First floor					310.40
	Parapet load							
1	Brick wall	1	0	0.25	1	0	20	0
2	Weathering coarse material	1	4.83	5.525	0.1	2.67	20	53.37
			Parapet load					53.37

COLUMN TOTAL LOAD **column** L4

Sl.No	Description	Load
1	Stilt floor	304.55
2	First floor	310.40
3	Second floor	310.40
4	Third floor	310.40
5	Fourth floor	310.40
6	Fifth Floor	310.40
7	Terrace	53.37
8	Total	1909.92
	Say	200.00 MT

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COLUMN DESIGN

Column load as per load calculation		=	200	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		=	300	675	mm		
Minimum Eccentricity,e		=	L/500 + Lateral dimension/30				
One direction		=	17.50	mm			
Another Direction		=	30.00	mm			
Minimum eccentricity		=	20	mm			
Consider Minimum Eccentricity		=	30.00	mm			
	0.05*b	=	15.00		<	30.00	
Area of column		=	202500	mm^2			
Number of rod		=					
		=	4	25	2944.88	mm^2	
		=	6	25	2944.88	mm^2	
Area of Steel(A_{sc})		=	5889.75	mm^2			
Area of Concrete(A_c)		=	196610.25	mm^2			
	P_u	=	3464200.2	N			
	P	=	2309466.8	N			
	Say	=	**230.95**	**Tonne**			
% of Reinforcement	**0.8**	<	**2.91**	<	**4**	%	
		SAFE		SAFE			
Column Load	230.95	>	200.00	**Mt**			
		SAFE					

Lateral Ties:

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

Diameter shall not be less than		=	25 / 4				
		=	6.25	mm dia			
Provide		=	10	mm dia			

Spacing

Shall not be more than following							
Least dimension of column		=	300	mm			
16x Smallest dia of column rod		=	400	mm			
Not more than		=	300	mm			
Minimum of above		=	300	mm			
Provide	10	@	150	mm C/c			

Development length in compression

	Ld	=	$\emptyset * \sigma s / 4 * \tau_{bd}$				
	Ø	=	Dia of bar	=	25.00	mm	
(Fy/1.15)	σs	=	Stress in bar	=	360.87	N/mm^2	(0.87*Fy)
Page 43,26.2.1.1	τ_{bd}	=	Bond stress	=	2.8	N/mm^2	
	Ld	=	25 / 4	360.8696 / 2.8			
	Ld	=	**805.512**	mm			

SUMMARY

Column size		=	300	x	675		
Rebar		=	6	25			
			6	25			
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/mm²	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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Isolated Footing- Regular

Load on Column(P)	=	200	Mt		
	=	2000	kN		
Ultimate column Load P_u = (1.5 xP)	=	3000	kN		
Self Weight of footing(0.1P)	=	217.9	kN		
Total Load on column		2217.9	kN		
SBC of soil	=	250	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	=	825	mm	0.825	

Column Size

a	b	
0.3	0.675	m
300	675	mm

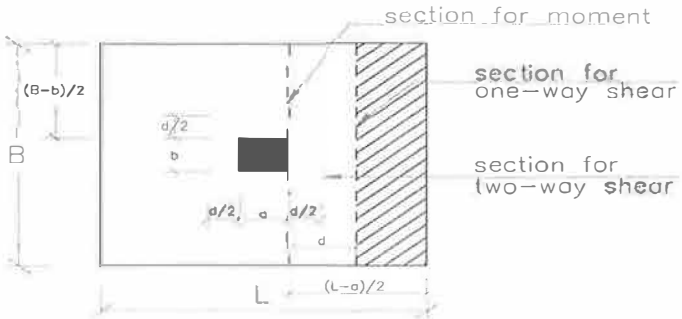
Column rod size	=	25	mm	
Foundation depth	=	2.5	m	
Area of footing, A	=	2200.00 / 250.00		
	=	8.80	m^2	
Size of footing		2.97	m	

Adopt footing size

L(m)	B(m)
3.25	3.25

Footing area provided		10.56	m^2		
Net upward pressure(P/A)	p	189.35	<	250	kN/m^2
		Safe			
Ultimate Design Pressure	(1.5 xp)	284.02	kN/m^2		

Depth Required for B M Consideration



Max. BM along column edge = $\frac{P \times B \times (L-a)^2}{8}$

p	=	189.35				
B	=	3.25				
L-a	=	3.25	-	0.3	=	2.95
$(L-a)^2$	=	8.7025				
BM	=	189.35	3.25	8.7025		
			8			
	=	669.42				
Max. BM	=	669.42	kN.m			0.385

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

0.138	25	1000	564001

= 1945803450.00 Nmm

1945.80 > 669.42

M_u limit > Mu

Safe

M_u(1.5 xBM) = 1004.13 kN.m

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

d^2	=	1004134615.38		d'	=	50 cover
		3457.38			=	16 footing mc
d	=	**538.92** mm			=	8
D	=	825 mm		0.825	**Safe**	74
d	=	751 mm		m	0.751 m	

Check For Gross Bearing Capacity

Service Load	=	2000 kN	Single shear	**Safe**
Weight Of footing	=	217.85 kN		
Weight Of soil	=	29.6 kN		
Total	=	2247.4 kN		
Check For Gross Bearing Capacity		2247.43	**212.77**	
		10.56		

Area of Tension steelfor BM

	BM	=	0.87 x Fy xAt (d - Fy x At / Fck x b)		
	1004134615	=	271148.55 A_t	-	1.844 A_t^2
	a	=	1.844		
	b	=	271148.55		
	c	=	1004134615		
	2a	=	3.69		
	b^2	=	73521536167		
	4ac	=	7407028342		
	sqrt of b^2-4ac	=	257127.42		
	A_t	=	3801.55 mm^2		
	Per Rm	=	1169.71 mm^2		

Alternative method

	M_u/bd^2	=	0.548		
	Pt	=	**0.156** %		
		=	3803.51 mm^2		
Minimum Rebar	0.12%	=	901.2 mm^2		
	Adopt	=	1169.71 mm^2		
		16	mm	140	mm c/c
	1435.98	>	1169.71 mm^2		Per Rm
The design is		Safe			
	P_t	=	**0.19** %		

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	=	3.25	m	
	b	=	0.72	m	
	area	=	2.35		
	V	=	189.35	x	2.35
	V	=	445.54 kN		
	V_u	=	668.31 kN		
	T_v	=	V_u		
		=	bd		
		=	668307.69		
			3250	751	
Nominal Shear Stress	T_v	=	0.274 N/mm^2		
Percentage of steel provided	P_t	=	0.19	%	
Shear strength of concrete	T_c	=			
Percentage of steel	P_t	=	0.19	%	

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	0.19	825	1.00	0.32

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	0.274	<	0.32	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		=	10.56	m^2	
Critical section area		=	1.051	x	1.426
		=	1.50	m^2	
Net area		=	9.06	m^2	
Shear Force		=	Shear area	x	Pressure
			9.06	x	189.35
	V		1716.22	kN	
SF	V_u	=	2574.33	kN	
	T_v	=	V_u / bd		
	b	=	4954	mm	
	d	=	751		
		=	2574326.343		
		=	4954 x 751		
Nominal Shear Stress		=	0.69	N/mm^2	
	T'_c	=	$K_s.T_c$		
	K_s	=	0.5+Bc		
	Bc	=	0.44	(a/b)	
	K_s	=	0.94		
Ks Not more than		=	1		
	K_s	=	0.944444444		
	Tc	=	1.250	(0.25*sqrtFck)	
	T'_c	=	1.181		
	Tv	<	T'_c		
	0.69	<	1.181	N/mm^2	

Safe

Transfer of force at the base of the column

	P_u	=	3000	kN
Compressive bearing resistance		=	0.45fck * area of column	
		=	2278.13 < 3000 kN	

Consider Longitudinal rebar for bond

Development length in Compression

	Ld	=	$\frac{Ø * \sigma s}{4 * T_{bd}}$		
	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		=	1201.0 > 940.2 mm		

Safe

SUMMARY

Footing Size	=	**3.25**	x	**3.25** M
Footing concrete depth	=			**825** mm
Footing rod	=	**16**	@	**140** mm c/c

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

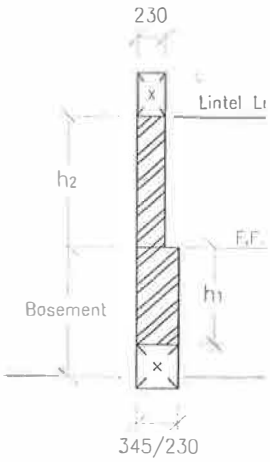
Grade of concrete	Type	M20	M25	M30	M35	M40 & above
Design Bond Stress,N/mm^2	Plain	1.5	1.75	1.875	2.125	2.375
	Deformed	2.4	2.8	3	3.4	3.8

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PLINTH BEAM

Span	=	5.52	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	345	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		
Max Udl	w =	5.61	kN/m	
Max B.M at Mid span	=	(wl²/20)		

5.61	5.52	5.52
	20	

BM = 8.54 kN.M

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

5.61	x	5.52
	3	

SF = 10.32 kN

M_u/bd^2 =

1.5	8.54	1000000
230.00	329	329

= 0.51 N/mm²

Refer SP 16 ,Page 86,Pt = 0.146 % P_t = 0.1

A_{st} =

0.146	230	329
	100	

Ast = 111 mm² = 76 mm²

Provide

2	16		2	16	
1	12		1	12	
0	16		0	12	
"A_{st}" Provided	515.16	> 110.59	SAFE	515.1568	> 75.67 SAFE

Min.Reinf = (0.87 x b x 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 =

% 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 10.32

= 15.473 kN

T_v = V_u/b.d

15.47	1000
75750	329

T_v = 0.20 < 3.10 N/mm² SAFE

0.20 < 0.55 N/mm²

T_v < kT_c SAFE

Total shear strength V_u = 15473.25 N

Shear contribution by concrete T_c.b.d =

0.55	230	329
	41456.1176	

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

15473.25 - 41456.12

25982.87 N

Provide Y 8 460 mm C/C

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Area or 2 legged stps	a	=				101	mm²
Spacing of stirrups		=	0.87* Fy * a * d / V_{us}				
		=	0.87	415	101	329	
				-25982.87			
		=	460	mm C/C			
Provide shear Rebar without considering conc. shear	Y	8				772	mm C/C
Area or 2 legged stps	a	=				101	mm²
		=	0.87* Fy * a * d / V_u				
		=	0.87	415	101	329	
				15473.25			
		=	772	mm C/C			
V_{us}/d		=	-25982.87	10			
			329.00	1000			
		=	0.790	N/mm			
Minimum Stirrups Reinforcement	Y	8					
	A_{sv}	=	100.52	mm²			
	S_v	=	0.87*Fy*Asv/0.4*b				
		=	0.87	415	101		
			0.4	230.69			
		=	36297.16832 / 92				
		=	394	mm	C/C		
Maximum Spacing of Stirrups		=	0.75*d				
		=	246.75	mm			
		=	300	mm			
Least of above			246.75	mm			
				Y @	8		
Provide		394	>	200	<	246.75	
			SAFE		SAFE		
		331	>	200	<	772	
			SAFE		SAFE		

Development length in Tension

Ld		=	$\frac{\phi \sigma_s}{4 \tau_{bd}}$		
Ø		=	Dia of bar	=	16 mm
(0.87*Fy)	σ_s	=	Stress in bar(Fy / 1.15)	=	360.87 N/mm²
Page 43.26.2.1.1	τ_{bd}	=	Bond stress	=	2.24 N/mm²
	Ld	=	16 / 4	360.8695652 / 2.24	
	Ld	=	644.4	mm	

Bond stress for tension : Cl 43,IS 456-2000

Grade of concrete	Type	M20	M25	M30	M35	M40 & above
Design Bond Stress N/mm²	Plain	1.2	1.4	1.5	1.7	1.9
	Deformed	1.92	2.24	2.4	2.72	3.04

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Centre Beam-Continues

Span	=	5.527	m			
Lateral span	=	4.83	m			
Wall height	=	2.6	m			
Wall thickness	=	0.15	m			
b	=	230	mm			
D	=	600	mm	l/12.5	**442**	mm
d'	=	50	mm	d'/d =	0.091	
d	=	550	mm			
f_y	=	415	N/mm²			
f_{ck}	=	25	N/mm²			

Slab Load:

Self wt	=	3.5	kN/m²	slab thk	0.14 m
Live Load	=	2	kN/m²		
Floor Finish	=	1.5	kN/m²		
Mish. Load	=	1	kN/m²		
		8	kN/m²		

Load Calculations:

Brick work/ AAC Block	=	20	kN/m³
Self wt = b x D x 1 x 25	=	3.45	kN/m
Brick work:	=	6.63	kN/m
Udl for slab	=	21.76	kN/m
Max Udl	w =	31.84	kN/m

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

0.138	25	230	302500

= 240033750.00 Nmm

240.03 > 132.62

M_u limit > M_u

Singly Reinforced

"d" - reqd = 408.82 < 550 mm

Safe

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

31.84	5.52	5.527
	13	

BM = 74.81 kN.M

M_u Midspan = **112.22 kN.M**

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

31.84	5.527	5.527
	11	

BM = 88.41 kN.M

M_u Support = **132.62 kN.M**

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

31.84	x	5.527
	2	

SF **87.98 kN**

M_u/bd^2 @Mid span

1.5	74.81	1000000
230.00	550	550

= 1.61 N/mm²

M_u/bd^2 @Support

1.5	88.41	1000000
230.00	550	550

= 1.91 N/mm²

Rebar @ Mid span

P_t	P_c
0.486	0.24

Refer SP 16 ,Page 86,Pt = 0.486 %

A_s =

0.486	230	550
	100	

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	Ast	=	615	mm^2			=	308	mm^2
Provide		2	20				2	20		
		2	16				0	20		
		0					0	16		
"A_{st}" Provided		1030.31	>	615.01	mm^2		628.24	>	307.51
		0.81	Safe				0.50	Safe	

Rebar @ Support

			P_t	P_c						
Refer SP 16 ,Page 86,Pt		=	0.585	0.293				0.585	%	
	A_{st}	=	0.585	230	550					
				100						
	Ast	=	740	mm^2			=	370	mm^2	
Provide		2	20				2	20		
		2	16				2	20		
		0	16				0	16		
"A_{st}" Provided		1030.31	>	740.04	mm^2		1256.48	>	370.02	
		0.81	Safe				0.99	Safe		

Min.Reinf

	=	0.87 x b x d / F_{yl}	mm^2			
	=	0.870	230	550		
			415			
Min.Reinf	=	265.193	mm^2			
"A_{st}" Provided	1030.3136		265.193	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 x fck) /fy)		
	$P_{t\,min}$	=	0.290 %	<	0.81	%
				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 %	>	0.81	%
				Safe		

CHECK FOR SHEAR STRENGTH

As per clause 40.2 (P73) of IS 456-2000	Tc Max	=	0.62 'sqrt(Fck)			
			0.62	5		
		=	3.10 N/mm²			
Percentage of steel	P_t	=	0.81 %			

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	0.81	400	1.00	0.59

	Now	kt_c		0.59	N/mm²	<	3.10 N/mm²
Nominal Shear stress		T_v	=	$V_u/b\,d$		Safe	
		V_u	=	1.5	X	87.98	
				131,970			
		T_v	=	$V_u/b\,d$			
			=	131,97	1000		
				230.00	550		
			=	1.04	<	3.10	N/mm²
					Safe		
	1.04			0.59 N/mm²			
	T_v			kt_c			

Provide Shear Rein

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Total shear strength	V_u	=	131969.88 N
Shear contribution by concrete	$T_c b.d$	=	0.59 × 230 × 550
			74635
Shear contribution by stps	V_{us}	=	V_u - T_c b.d
			131969.88 - 74635
			57334.88 N
Minimum shear resistance	0.4bd	=	50600.00 N
		=	57334.88 N
Provide	Y 10		544 mm C/C
Area or 2 legged stps	a	=	157 mm^2
Spacing of stirrups		=	$\frac{0.87 * Fy * a * d}{V_{us}}$
		=	$\frac{0.87 \times 415 \times 157 \times 550}{57334.88}$
		=	**544** mm C/C
Provide shear Rebar without considering conc. shear	Y 10		**236** mm C/C
	a	=	157 mm^2
		=	$\frac{0.87 * Fy * a * d}{V_u}$
		=	$\frac{0.87 \times 415 \times 157 \times 550}{131969.88}$
		=	**236** mm C/C
Minimum Stirrups Reinforcement	Y 10		
	A_{sv}	=	157.06 mm^2
	S_v	=	0.87*Fy*Asv/0.4*b
			$\frac{0.87 \times 415 \times 157}{0.4 \times 230.00}$
			$\frac{56706.513}{92}$
		=	616 **mm** **C/C**
Maximum Spacing of Stirrups		=	0.75 *d
		=	412.5 mm
		=	300 mm
Least of above			300 mm
			Y 10 @ 175
Provide		616	> < 300
			Safe **Safe**

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SLAB DESIGN AS PER BIS-2000 METHOD

Location:

L_x	=	3.58	m
L_y	=	4.06	m
f_{ck}	=	25	N/mm²
f_y	=	415	N/mm²
L_y/L_x	=	1.13	

Two Way Slab

Span	=	3.58 m	Span/32
Slab thickness	=	125 mm	111.9
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

$M_x = a_x w l_x^2$

$M_y = a_y w l_x^2$

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

Negative Moment at edge

L_y/L_x = 1.13

a_y = 0.047

		Ly/Lx		For
		1.1	**1.2**	1.13
Negative Moment @ edge	a_x	0.047	0.053	0.049
Positive Moment at mid span	a_x	0.035	0.040	0.037

				M_{ux}	M_{uy}
M_x	=	4.16	kNM	6246477.975	
M_y	=	3.99	kNM		5986059.8
Maximum Bm	=	**4.16**	kNM		
"d" - reqd under compression	=	42.55	<	105 mm	
			Safe		

		M_{ux}	M_{uy}	
$M_u/b.d^2$	=	0.57	0.54	N/mm²
As per SP16, Table 2,Page 48,				
P_t	=	**0.161**	**0.154**	
Area of steel	=	169.39	162.14	mm²
Adopt				
Y		10 @ 140	mm C/C	10 @ 140 mm C/C
		560.93 > 169.39 Safe		560.93 > 162.14 Safe

Positive Moment at mid span

a_y = 0.043

				M_{ux}	M_{uy}
M_x	=	3.12	kNM	4674719.25	
M_y	=	3.65	kNM		5476607.9
Maximum Bm	=	**3.651**	kNM		

		M_{ux}	M_{uy}	
$M_u/b.d^2$	=	0.42	0.50	N/mm²
As per SP16, Table 2,Page 48,				
P_t	=	**0.120**	**0.141**	
Area of steel	=	125.88	148.00	mm²
Adopt				
Y		10 @ 140	mm C/C	10 @ 140 mm C/C
		560.93 > 125.88		560.93 > 148.0

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Safe Safe

Check for Shear strength

As per clause 40.2 (P72) T_c Max = 0.62 *sqrt(F_{ck})
of IS 456-2000 = 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 = 17.7313 kN
T_v = 0.17 < 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 = 125.88 mm²
A_{st} Provided = 560.93 mm²

Steel stress for service Load f_s = 0.58 X A_{st} required / A_{st} Provided
As per Fig-4,IS 456-2000,Page38

0.53	415	1.2588
	560.93	

F_s = 54.01 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	54.01	0.12	0.53	2.00

Effective depth ratio
For,Simply supported = 20
Continues = 26
Cantilever =
(Lx/d) Max = 26 x 2.000
52.00
(Lx/d)Provided 30
05
= 52.65
(Lx/d) Max 52 > 52.10 (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	

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STAIRECASE -DOG LEGGED MODEL

Location:

L_x	=	5.21	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	=	3.11			
Step tread	=	0.25	m		
Step riser	=	0.165	m		
Slope length for one step	=	0.300	m		
Number of tread	=	3.11			
	=	0.25			
	=	12.44	No		
Say	=	11	No		
Aditional slope length per flight	=	11	x	0.050	
	=	0.54			
Effective length	=	5.75	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	5.75^2	
	=			12	
	=	29.37	kN.M		
M_u	=	1.5	x	29374568	
		44061851.89	Nmm		

44061851.89		
0.138	25	1000

12771.55

sqrt	=	113.01	mm
Cover	=	20.00	mm
Total	=	133.01	mm
Provide	=	140.00	mm
d		117.00	

$M_u/b.d^2$

44061851.89		
1000.00	117.00	117.00

3.22

As per SP16, Table 2,Page 48,

P_t	=	1.089	%			
Area of steel	=	1.088707773	x	1000	x	117.00

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100

= 1273.79 mm^2

Adopt

Y 16 @ 140 mm C/C

1436 > 1274 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	5.75	10.64
	2	

V_u = 45.938 kN

T_v = $\frac{45.938 \times 1000}{1000 \times 117.00}$

T_v = 0.3926 < 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

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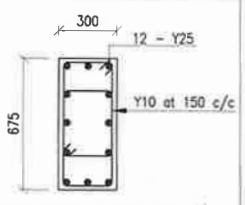
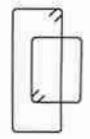
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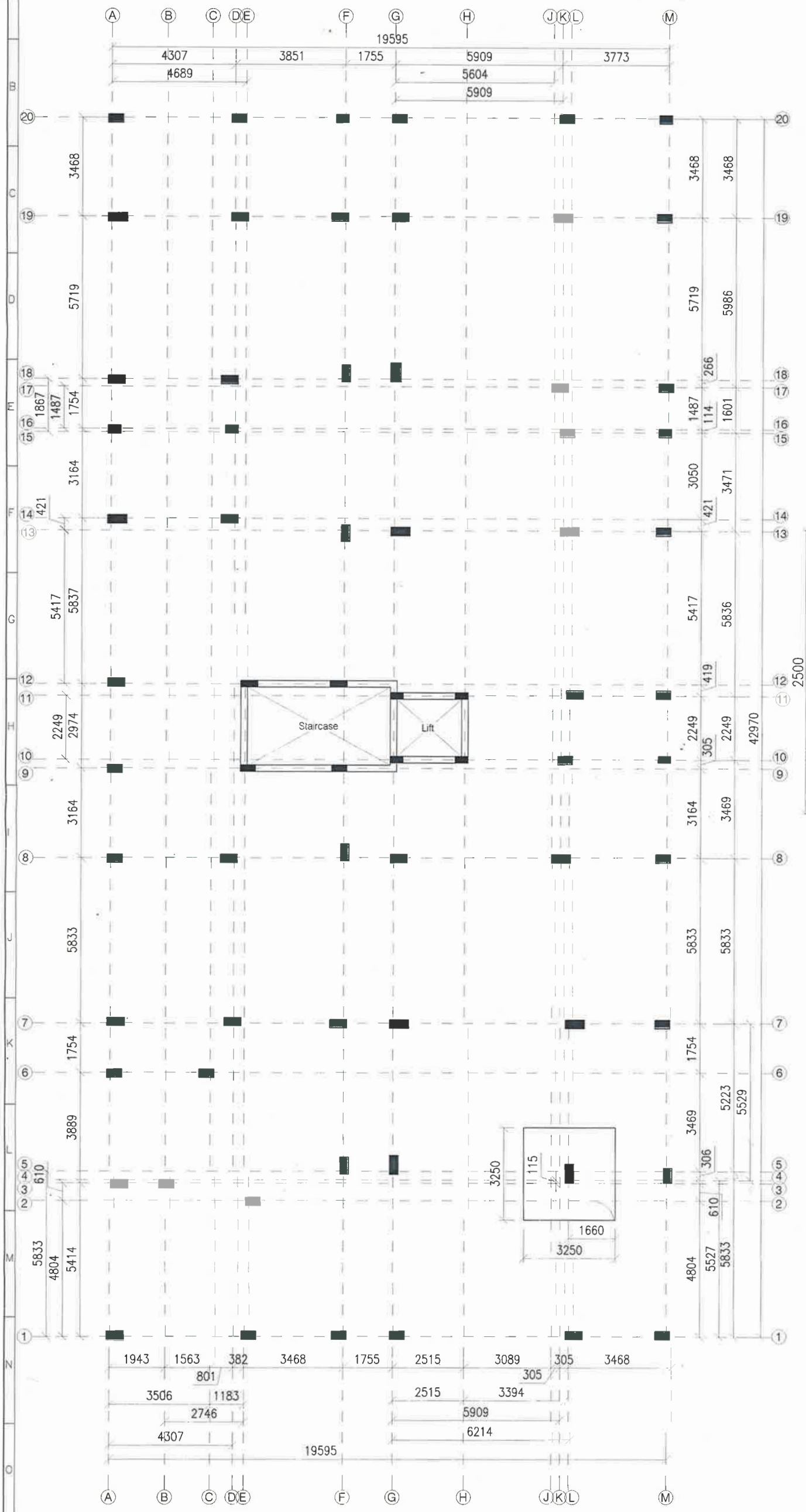
SUNSHADE DESIGN

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			

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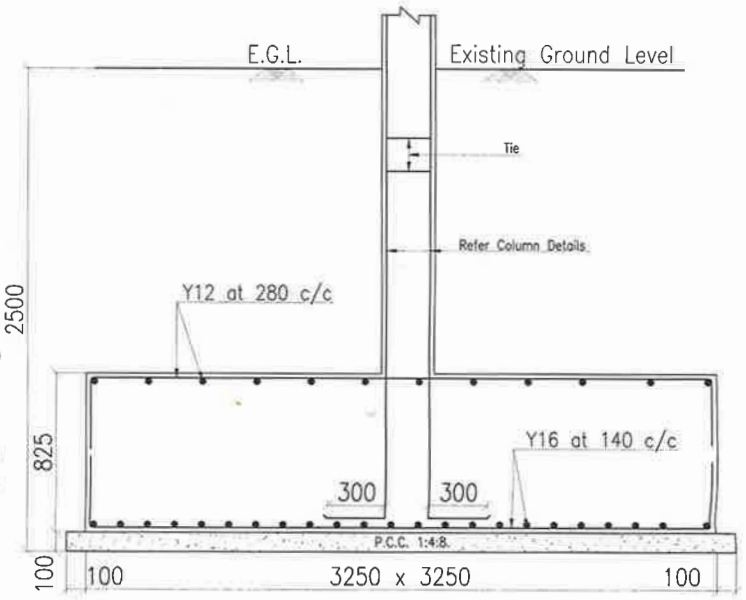
Column Schedule

Legend	Column	Tie Arrangement
Column C1 Size 300 X 675		



Column & Foundation Layout

(Stilt + 5)



C.S. of Footing F1
Size 3250 X 3250

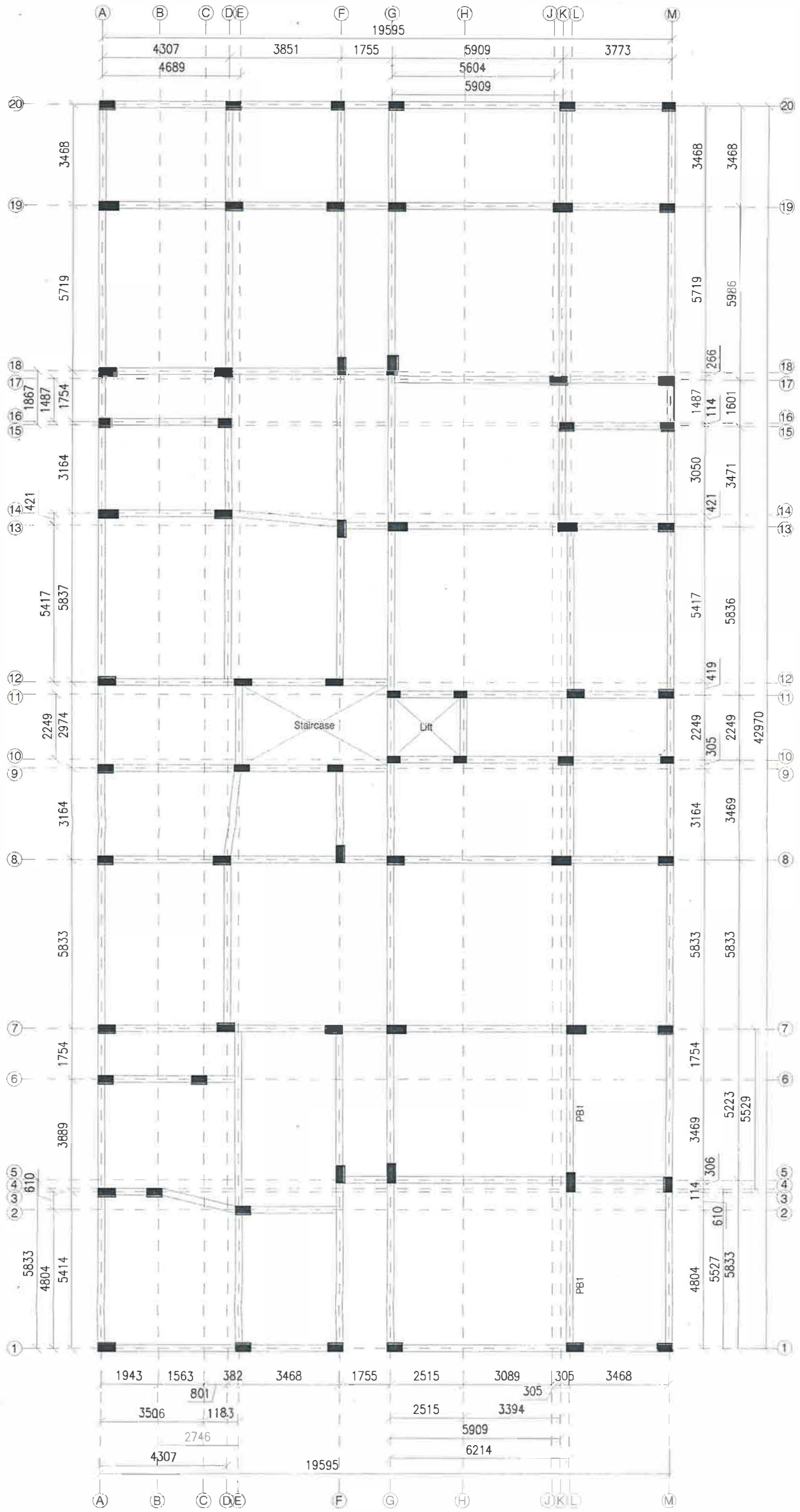
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PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS + 5TH FLOOR(PT) (HEIGHT – 18.30 M) RESIDENTIAL BUILDING WITH 37 DWELLING UNITS (AVAILING AFFORDABLE HOUSING BENEFIT) AT VIGNARAJAPURAM 2ND MAIN ROAD , VENGAIVASAL, CHENNAI 600126,COMPRISED IN OLD S.NO.41/4B4 & 41/4B5 , AS PER PATTA NEW S.NO.41/4B4A2 & 41/4B5A2 OF VENGAIVASAL VILLAGE WITHIN THE LIMITS OF ST.THOMAS MOUNT, PANCHAYAT UNION.

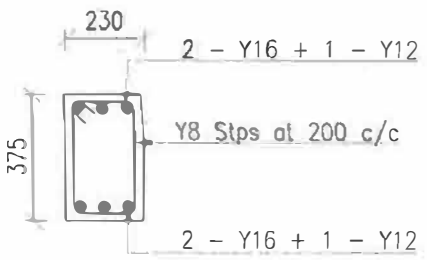
Notes:

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 Footing:50mm Column:40mm,Beam:30mm,Slab:20mm,Rcc Wall:20mm.

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Plinth beam layout



C.S of Plinth Beam PB1
Size 230 x 375

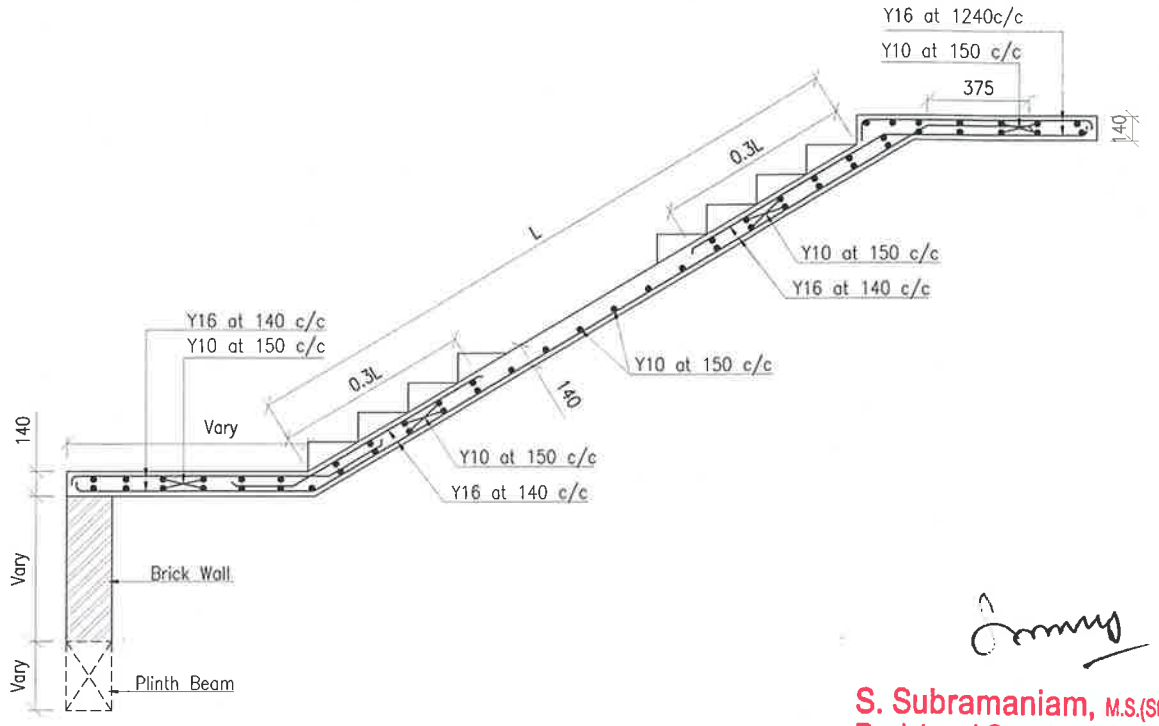
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PLAN SHOWING THE PROPOSED CONSTRUCTION OF STILT FLOOR + 4 FLOORS + 5TH FLOOR(PT) (HEIGHT – 18.30 M) RESIDENTIAL BUILDING WITH 37 DWELLING UNITS (AVAILING AFFORDABLE HOUSING BENEFIT) AT VIGNARAJAPURAM 2ND MAIN ROAD , VENGAIVASAL, CHENNAI 600126,COMPRISED IN OLD S.NO.41/4B4 & 41/4B5 , AS PER PATTA NEW S.NO.41/4B4A2 & 41/4B5A2 OF VENGAIVASAL VILLAGE WITHIN THE LIMITS OF ST.THOMAS MOUNT, PANCHAYAT UNION.

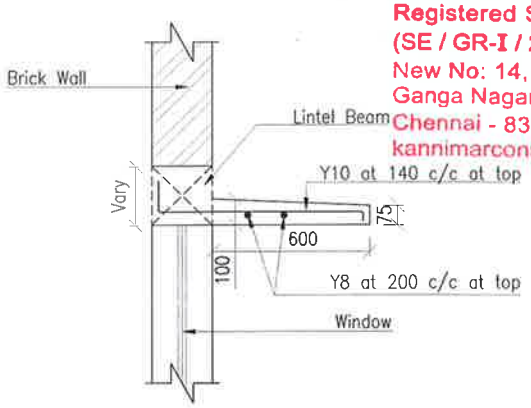
Notes:

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 Footing:50mm Column:40mm,Beam:30mm,Slab:20mm,Rcc Wall:20mm.

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C.S. of Staircase Details



Sunshade Detail (Typ)

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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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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.