CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
Thalamuthu Natarajan Building, No.1, Gandhi Irwin Road, Egmore,
Chennai - 600 008
Phone : 28414855. Fax: 91-044-28548416
E-mail: mscmda@tn.gov.in
Web site: www.cmdachennai.gov.in.

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the Thiru / Tmt. / M/s. **Benny Gabriel J** has enrolled as **Registered Structural Engineer Grade-I (SE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **M.E Structures** and experience in the relevant field for 8 years.

He/She has been given the Registration No. **SE/I/2024/7/0105** on **11-Jul-2024** He/She shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(ms) No.18 MAWS (MA1) Dept. Dated. 04.02.2019.

This Registration is valid upto **10-Jul-2029**.

Signature valid.
Name A. Meganathan
Designation Superintendent
Date 07/1[illegible]2024 3:10:07 PM

A Meganathan

Superintendent

J.BENNY GABRIEL, B.E., M.Tech.,
Structural Engineer Grade - I (SE)
Reg.No.RSE-I/TKDTCP/December/02/2022
No:11-A/1,Toovipuram 11th Street,
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Email : bennygabrielj@gmail.com

DESIGN ANALYSIS REPORT

FOR THE PROPOSED RESIDENTIAL BUILDING AT PLOT NO.1 to 4, PADASALAI STREET, NOLAMBUR, CHENNAI 600095. COMPRISED IN S.NO.208/1A1, 2A1, NOLAMBUR VILLAGE IN GREATER CHENNAI CORPORATION.

CERTIFICATE

With respect to the proposed Stilt + 5 Floor Residential Building at Plot No.1 To 4, Padasalai Street, Nolambur, Chennai 600095, comprised in S.No.208/1A1, 2A1, Nolambur Village In Greater Chennai Corporation, it is certified that the structural plans of the building meet the structural safety including earthquake loads as stipulated under I.S. 456:2000, I.S. 1893:2016 and I.S. 875 (Part 1 and 2) and other relevant codes for residential loading conditions and is structurally safe and sound.

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CONTENTS

EXECUTIVE SUMMARY

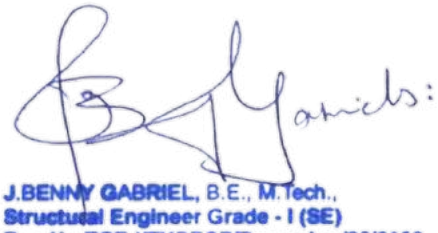
This report pertains to the construction of a residential Building at Nolambur, Chennai. The proposed structure is a STILT + FIVE (S+5) residential building,

As Chennai city is falling under the Zone III area of seismicity, classified as per Indian Standard I.S.1893:2016, the building is designed considering the seismic loads in addition to the gravity loads.

The building will be modeled and analysed using STAAD PRO and the design results are used for the design of footings, grade beams, columns and roof beams based on I.S. 456:2000.

Pile foundation is proposed as per the soil report and 600 dia pile is used with a capacity of 80t at a depth of 27m

The grade of concrete and steel considered in the design is M25 and Fe500 respectively. Llight weight partition blocks shall be used for infilling and partitions. Detailed structural drawings based on the design are prepared catering to all the codal requirements.



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I. INTRODUCTION

1. SCOPE:

This document describes the general requirements and various design parameters that are to be considered in the design of Stilt + 5 floors.

2. UNITS OF MEASUREMENT:

The units of measurement adopted in design shall be the SI system of units.

3. COMPUTER PROGRAM / SOFTWARE:

STAAD Pro is used for the analysis of the structures.

4. DESIGN STANDARDS AND CODES OF PRACTICES:

All design shall be prepared in accordance with Indian Standards and Codes of Practices. Various codes of practices being referred to are listed below. Any other Indian Code not Listed shall not be considered.

 IS 875 - 1987 Code of practices for Design loads (other than Earth Quake) for building and structures

 SP -16 Code of practices for design aids for reinforced concrete

 IS 456-2000 Code of practices for plain and reinforced concrete

 IS 1893-2016 Criteria for Earthquake resistance design of structure

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II. DESIGN DETAILS

The proposed structure is a Stilt + 5 Floors residential building. The type of the structure proposed is a regular class 1 R.C.C. framed structure, designed for gravity loads and seismic loads

1. Foundation Type:

As per the soil report received, pile foundation is suggested

Depth of pile: 27m

Safe carrying capacity: 80t

2. Building Materials Used:

Grade of Concrete: M25

Grade of Steel: Fe500

Brick: Class 1 bricks with unit weight 20kN/m3

3. Load Calculations:

a. Dead load

Slab load incl. floor finish from (Ground to 5^{th} floor) = 6.5 kN/m^2

Slab load (Terrace floor) incl. floor finish = 6.5 kN/m^2

Slab load (Bath floor) incl. floor finish = 10.00 kN/m^2

Wall load 230mm Thk (Light weight blocks) = 5.00 kN/m

Wall load 115mm Thk (Light weight blocks) = 2.50 kN/m

Parapet wall load on terrace – 1000mm height. = 5.00 kN/m

Slab Load for Lift Machine Room =15.0 kN/m^2

b. Live Load

1^{st} to 5^{th} floor = 2.00 kN/m^2

Terrace floor = 1.50 kN/m^2

c. Seismic Load

Zone classification as per I.S. 1893:2016 – ZONE 3 (Chennai)

Zone factor 'Z' = 0.16

Important factor = 1.0 (General Buildings)

Reduction Factor = 5 (Special Moment Resisting Frame)

Type of Structure = 5 (Building with infills)

Damping Factor = 5%

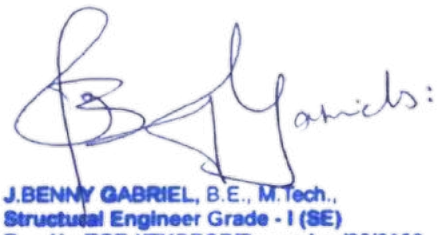
4. Method of analysis

The structure will be analyzed by Equivalent Static Method (ESM) as per I.S. 1893:2016 and linear elastic analysis by using STAAD Pro software.

The structure is idealized in the form of horizontal and vertical members using beam element and loads are applied and analyzed for various load combinations as given in I.S. 456:2000

5. Interpretation of results

The support reactions obtained from the analysis shall be used for the design of foundations. The beam end forces in the form of shear forces and bending moments from the horizontal and vertical members shall be used for the design of beams and columns respectively.



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DESIGN OF RECTANGULAR/SQUARE COLUMN

COLUMN No. C8 300X950

DATA

Length of column	D	950	mm
Breadth of column	b	300	mm
Unsupported length (longer direction)	L_x	3200	mm
Unsupported length (shorter direction)	L_y	3200	mm
Eff. length (longer direction)	L_{ex}	3840	mm
Eff. length (shorter direction)	L_{ey}	3840	mm
Braced/Unbraced		**Unbraced**	
Factored axial load	P_u	2147	kN
Factored moment (longer direction)	M_{ix}	541	kNm
Factored moment (shorter direction)	M_{iy}	152	kNm
Charac. comp strength of concrete	f_{ck}	25	N/mm^2
Yield stress of steel	f_y	500	N/mm^2
Effective cover	d'	52.5	mm

Check for slenderness

Longer Direction

Slenderness ratio	L_{ex}/D	4.04	**short**
Additional moment due to slenderness	M_{ax}	0	kN-m

Shorter Direction

Slenderness ratio	L_{ey}/b	12.80	**slender**
Additional moment due to slenderness	M_{ay}	52.76467	kN-m

Calculation of P_{uz}

Assumed percentage of reinforcement	p_t	2.750	%
Area of concrete	Ag	285000	mm^2
Ultimate axial load (without moments)	P_{uz}	6057	kN

Calculation of P_b:

Longer Direction

	d'/D	0.055	
Coefficient k_1(from TABLE 60 of SP:1980)	k_{1x}	0.21	
Coefficient k_2(from TABLE 60 of SP:1980)	k_{2x}	0.454	
Axial load corresponding to balanced failure	P_{bx}	1852	kN
Reduction factor for additional moments	k_x	0.930	
Moment due to slenderness	M_{ax}	**0.00**	kN-m

Shorter Direction

	d'/b	0.175	
Coefficient k_1(from TABLE 60 of SP:1980)	k_{1y}	0.21	
Coefficient k_2(from TABLE 60 of SP:1980)	k_{2y}	0.454	
Axial load corresponding to balanced failure	P_{by}	1852	kN
Reduction factor for additional moments	k_y	0.930	
Moment due to slenderness	M_{ax}	**49.06**	kN-m

Check for moments due to min. eccentricity

Longer Direction			
Minimum eccentricity	e_x	38.07	mm
Moment due to min. eccentricity	M_x	81.73	kN-m
Moment in longer direction	M_{ux}	541	kNm
Shorter direction			
Minimum eccentricity	e_y	16.40	mm
Moment due to min. eccentricity	M_y	35.21	kN-m
Moment in shorter direction	M_{uy}	152	kNm
Final design moments			
Moment in longer direction	M_{ux}	**541.00**	kNm
Moment in shorter direction	M_{uy}	**201.06**	kNm
Check for interaction			
p/f_{ck}	p/f_{ck}	0.110	
$P_u/f_{ck}bD$ value	$P_u/f_{ck}bD$	0.301	
$M_{ux1}/f_{ck}bD^2$ value (from SP 16:1980 charts)	$M_{ux1}/f_{ck}bD^2$	0.21	
Uniaxial moment capacity (longer direction)	M_{ux1}	**1421.438**	kNm
$M_{uy1}/f_{ck}bD^2$ value (from SP 16:1980 charts)	$M_{uy1}/f_{ck}bD^2$	0.21	
Uniaxial moment capacity (shorter direction)	M_{uy1}	**448.875**	kNm
P_u/P_{uz} ratio	P_u/P_{uz}	**0.354**	
Value of exponent	α_n	1.258	
Interaction ratio		**0.661**	
Percentage reinforcement satisfactory or not		**safe**	
Special confinement steel			
b/D ratio	b/D	0.315789	
Status of dimensions		**REVISE**	
Gross area	A_g	285000	mm^2
Area of core	A_k	202400	mm^2
Spacing of lateral ties	S	75	mm
Larger dimension of the hoop	H	230	mm
Cross sectional area of hoop	A_{sh}	63.36	mm^2

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1 GRADE BEAM

Calculation of Ast req for beams

Ref IS 456-2000 Cl G-1.1b & G-1.1c For sections without compression reinforcement

f_y N/mm^2	f_{ck} N/mm^2	b mm	D mm	Cc mm	Cg of bar mm	d mm	$M_{u\ lim}$ kN.m	$p_{t\ lim}$ %
500	25	230	450	30	8	412	129.81	0.94

$M_{u\ support}$ kNm	Ast req. spt mm^2	p_t req.spt %	$M_{u\ span}$ kNm	Ast span mm^2	p_t req.span %	check for depth		
						d req mm	d prov mm	Result
75	464.16	0.49	75	464.16	0.49	313.16	412	okay

Reinforcement details provided at support and span of beam

Reinf. details at support					Reinf. details at span				
Nos.	dia mm	Ast support mm^2	pt support %	Result	Nos.	dia mm	Ast span mm^2	pt span %	Result
3	16	1206.37	1.27	okay	3	16	829.38	0.88	okay
3	16				2	12			

Check for shear in beams (limit state design method)

Ref IS 456-2000 Cl 40.1, Cl 40.2.3, Table 19, Table 20 & Cl 40.2.1

f_{ck} N/mm^2	V_u kN	pt prov. %	τ_v Cl 40.1 N/mm^2	τ_c Table 19 N/mm^2	$\tau_{c\ max}$ Table 20 N/mm^2	Result
						Provide min shear reinf, Cl 26.5.1.6
25	58	1.27	0.61	0.7	3.1	tau_v <tau_cmax, Ok

Design for shear reinforcement (vertical stirrups)

Ref IS 456-2000 Cl 40.4a

V_u kN	τ_c b d kN	V_{us} req kN	V_{us}/d req kN/cm	f_y N/mm^2	assuming stirrup dia mm	no. of stirrup legs	stirrup sp assumed mm	V_{us}/d prov. kN/cm Cl 40.4 a	Result Cl 40.4a
58	66.33	-8.33	-0.20	415	8	2	150	2.420	Hence ok

Check for minimum and maximum spacing of stirrup

Min stirrup spacing mm Cl 26.5.1.6	Max stirrup spacing mm Cl 26.5.1.5	stirrup sp prov. mm	Result
475.34	300	150	Hence ok

Side face reinforcement

Ref IS 456-2000 Cl 26.5.1.3

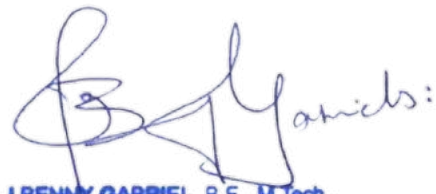
b mm	D of web mm	side face reinf. req. / face Cl 26.5.1.3	side face reinf. mm^2 /face prov.			spc b/w bars not to exceed Cl 26.5.1.3
			no. per face	dia of bar	Ast prov. mm^2	
230	450	not req	2	10	157.08	230 mm

Check for span to depth ratio

Ref IS 456-2000 Cl 23.2.1

Type of beam	f_y N/mm^2	span mm	d mm	$p_{t\ req.}$ %	$p_{t\ prov.}$ %	p_c %	MFt	MFc
Cont.Beam	500	5500	412	0.49	0.88	0	1.406	1

l/d prov	l/d Cl 23.2.1	Result Cl 23.2.1
13.35	36.56	Okay



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DESIGN OF BEAM 300 X 680

Ref IS 456-2000 Cl G-1.2 For sections with compression reinforcement

f_y N/mm^2	f_{ck} N/mm^2	b mm	D mm	clear cover on ten.face mm	clear cover on com.face mm	c_g of tension face steel mm	c_g of comp. face steel mm	d for tension face steel mm	d/ for comp. face steel mm
500	25	300	680	30	30	30	30	620	60

Check for section : **doubly** Ref IS 456-2000 Cl G 1.2

Ref IS 456-2000 Cl G-1.2

$M_{u\ lim}$ SP 16 Table C kN.m	$p_{t\ lim}$ SP 16 Table E %	Ast_1 req mm^2	M_u kNm	$M_u - M_{ulim}$ Cl G 1.2	d/ /d obtained value	d/ /d considered value	f_{sc} N/mm^2	Asc req Cl G-1.2 mm^2	Ast_2 req Cl G-1.2 mm^2
383.44	0.94	1754.91	657	273.56	0.097	0.15	395	1236.71	1122.99

Total Ast req on tension face mm^2	Ast prov on tension face Nos.	dia mm	pt prov %	Result reg tesion steel	Asc req on compression face mm^2	Ast prov on comp. face Nos.	dia mm	pc prov %	Result reg comp. steel
	3	25				3	25		
2877.90	3	25	1.58	Prov > req	1236.71	3	25	1.58	Prov>req
	Ast prov-	2945.24				Ast prov-	2945.24		

Check for shear in beams (limit state design method)

Ref IS 456-2000 Cl 40.1, Cl 40.2.3, Table 19, Table 20 & Cl 40.2.1

f_{ck} N/mm^2	V_u kN	pt prov. %	τ_v Cl 40.1 N/mm^2	τ_c Table 19 N/mm^2	$\tau_{c\ max}$ Table 20 N/mm^2	Result
						tau_v > tau_c,design for shear
25	420	1.58	2.26	0.76	3.1	tau_v <tau_cmax, Ok

Design for shear reinforcement (vertical stirrups)

Ref IS 456-2000 Cl 40.4a

V_u kN	τ_c b d kN	V_{us} req kN	V_{us}/d req kN/cm	f_y N/mm^2	assuming stirrup dia mm	no. of stirrup legs	stirrup sp assumed mm	V_{us}/d prov. kN/cm Cl 40.4 a	Result Cl 40.4a
420	141.36	278.64	4.49	415	10	2	100	5.671	Hence ok

Check for minimum and maximum spacing of stirrup

Min stirrup spacing mm Cl 26.5.1.6	Max stirrup spacing mm Cl 26.5.1.5	stirrup sp prov. mm	Result
569.41	300	100	Hence ok

Side face reinforcement

Ref IS 456-2000 Cl 26.5.1.3

b mm	D of web mm	side face reinf. req. / face Cl 26.5.1.3	side face reinf. mm^2 /face prov. no. per face	dia of bar	Ast prov. mm^2	spc b/w bars not to exceed Cl 26.5.1.3
300	680	not req	2	12	226.19	300 mm

Check for span to depth ratio

Ref IS 456-2000 Cl 23.2.1

Type of beam	f_y N/mm^2	span mm	d mm	$p_{t\ req.}$ %	$p_{t\ prov.}$ %	p_c %	MFt	MFc
Cont.Beam	500	7200	620	1.55	1.58	1.58	0.792	1.36

l/d prov	l/d Cl 23.2.1	Result Cl 23.2.1
11.61	28.01	Okay

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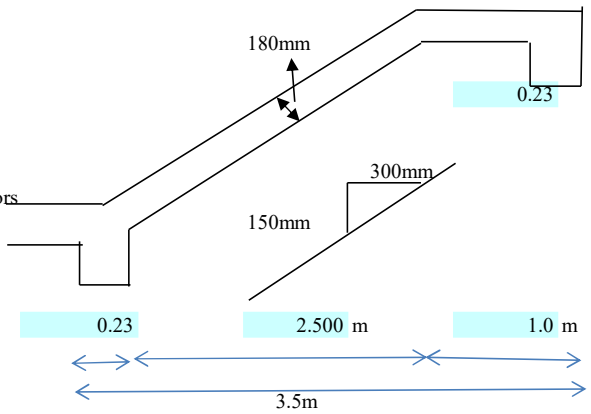
STAIR CASE

Data

T	=	300	mm
R	=	150.0	mm
Slab thick	=	180	mm
Floor finish	=	1.5	KN/m2
Fck	=	25	
Fymain	=	500	main
Fysec	=	500	Distributors
Effective span	=	2.915	m



Load

Loding on going

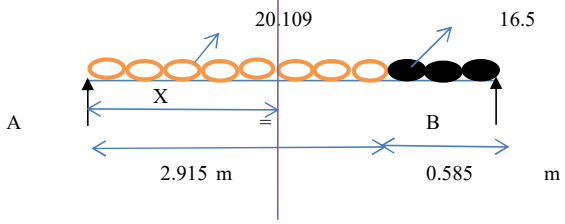
Effective depth d	=	154	mm
Dead load	=	5.03	KN/m2
Step load	=	1.88	KN/m2
Floor finish	=	1.50	KN/m2
Live load	=	5.00	KN/m2
Total dead load	=	13.41	KN/m2
Factored total load	=	**20.11**	**KN/m2**

Loding on landing

Dead load	=	4.50	KN/m2
Floor finish	=	1.50	KN/m2
Live load	=	5.00	KN/m2
Total load	=	11.00	KN/m2
factored total load	=	**16.5**	**KN/m2**

Reinforcement

Maximum moment occur at X



X	=	1.741	m
Max.Factored moment	=	30.484	KN

Reaction

A	=	35.01	KN
B	=	33.26	KN
Vu	=	31.918	KN
ζv	=	0.207	N/mm2
ζc	=	0.570	N/mm2

Main bar

Mu/Bd^2	R		Ast req	Min Ast		Ast.pro	Diameter	Spacing
			mm2	mm2		mm2	mm	mm
1.285	0.3154		485.726	184.8		1130.40	12	100

Distributors

Ast req	Min Ast		Ast.pro	Diameter	Spacing
mm2	mm2		mm2	mm	mm
184.800	184.8		334.93	8	150

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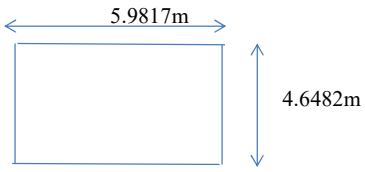
PROJECT NUMBER:

PROJECT NAME:

DESIGNED BY: JB

DATA:

Floor	=			
S. No.	=	S1		
Grade of concrete	=	25	N/mm2	
Grade of steel	=	500	N/mm2	
Cover	=	25	mm	
Ly (Long span)	=	5.9817	m	19.625
Lx (Short span)	=	4.6482	m	15.25
Ly/Lx	=	1.29	< 2	Two way slab condition satisfied



Slab

Slab thickness	D	=	0.15	m
	d	=	125	mm
Sunkan depth		=	0	m

Partion wall

Position of partion wall	=	Parallel to the span	
Wall thick	=	0.115	m
Wall height	=	3.1	m

LOAD:

Dead load	=	3.75	kN/m2
F.Finish	=	1.5	kN/m2
Wall load	=	1.20	kN/m2
Sunkan load	=	0	kN/m2
Live load	=	3	kN/m2
1.5 (DL+LL)	=	**14.18**	**kN/m2**

1 All edge continuous
2 One short edge discontinuous
3 One long edge discontinuous
4 Two adjacent edge discontinuous
5 Two short edge discontinuous
6 Two long edge discontinuous
7 Three edge discontinuous (one long edge continuous)
8 Three edge discontinuous (one short edge continuous)
9 Four edge discontinuous

DESIGN:

Edge conditions = **2**

Moment

Mx	(+ve)	=	11.800	kNm
Mx	(-ve)	=	15.733	kNm
My	(+ve)	=	8.422	kNm
My	(-ve)	=	11.230	kNm

Load on beam

	dead load	live load	
Short span C.edge Reaction			kN/m
Short span D.C edge Reaction			kN/m
Long span C.edge Reaction			kN/m
Long span D.C edge Reaction			kN/m

Depth check

Short span Effective depth d = 49.41 < 125 mm **Hence Safe**

Deflection

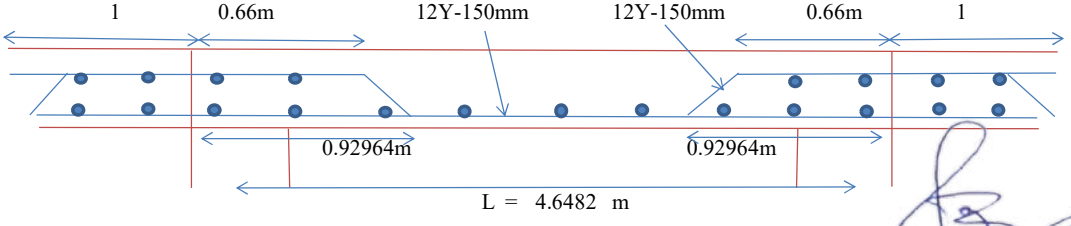
Basic	L/d	=	20.000		M.F	=	2.00
Allowabl	L/d	=	40.000	> Actual	L/d	=	37.186

Hence safe

REINFORCEMENT

			Pt	Ast req (mm2/m)	Min Ast (mm2/m)		Ast provided (mm2/m)		dia of bar mm	Spacing mm
Mx	(+ve)	=	0.1801	225.13	180		754		12	150
Mx	(-ve)	=	0.2433	304.16	180		754		12	150
My	(+ve)	=	0.1272	158.94	180		754		12	150
My	(-ve)	=	0.1711	213.85	180		754		12	150

Shorts span



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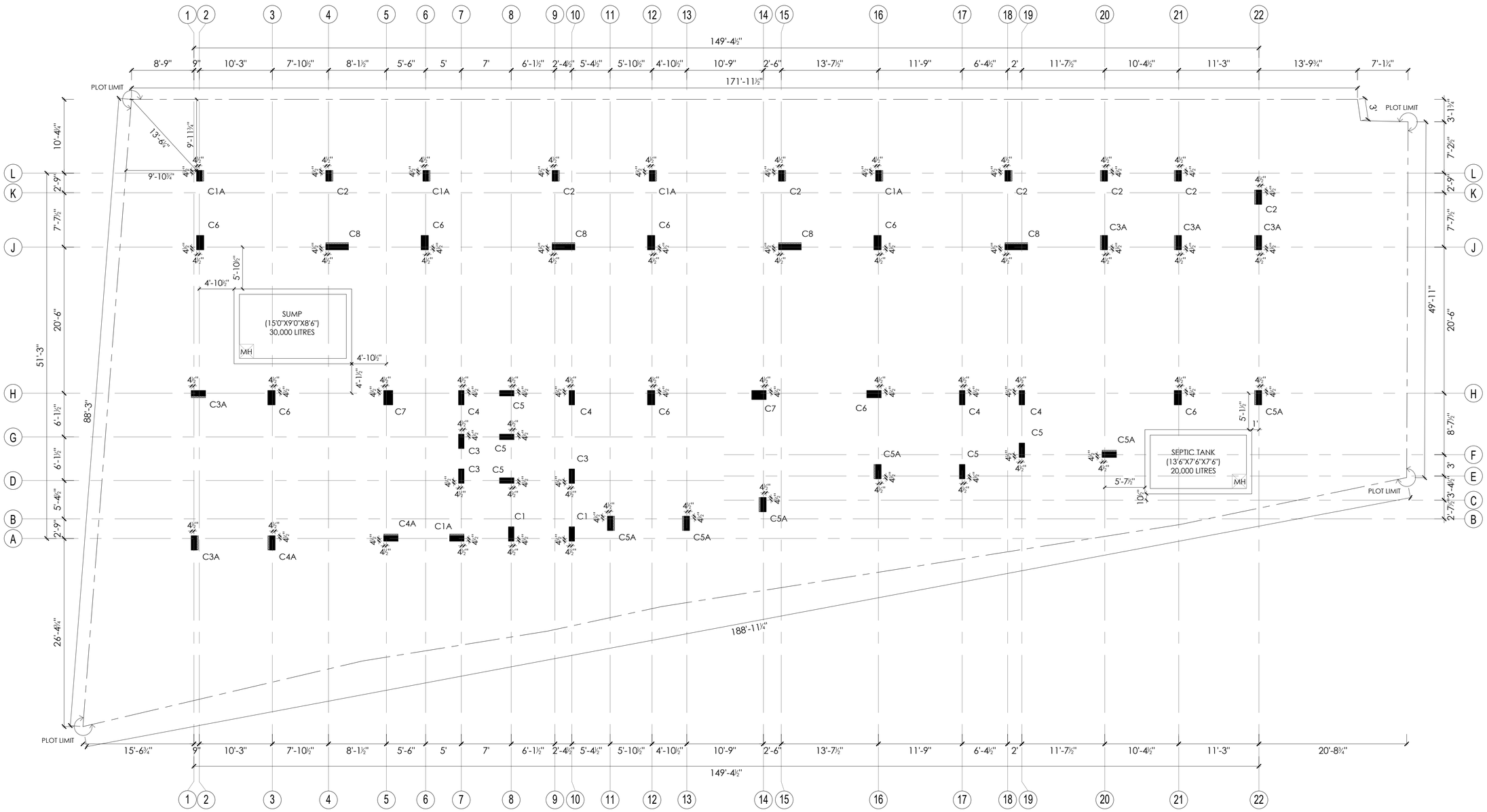
No:11-A/1,Toovipuram 11th Street,
Thoothukudi - 628003. M : 9894290905.
Email : bennygabrielj@gmail.com



J.BENNY GABRIEL, B.E., M.Tech.,
Structural Engineer Grade - I (SE)
Reg.No.RSE-I/TKDTCP/December/02/2022
No:11-A/1,Toovipuram 11th Street,
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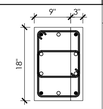
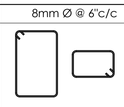
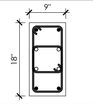
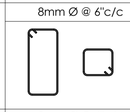
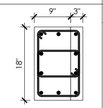
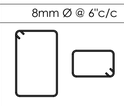
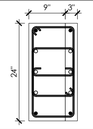
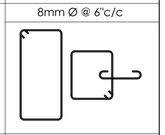
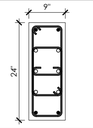
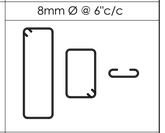
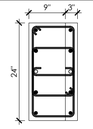
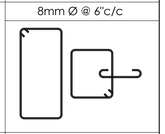
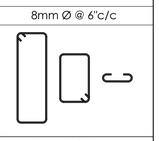
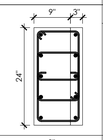
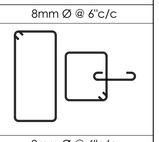
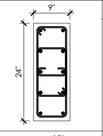
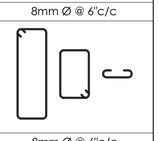
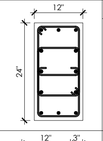
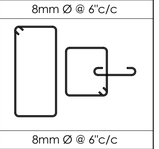
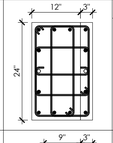
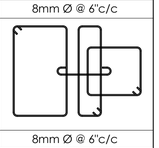
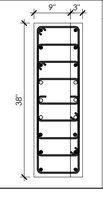
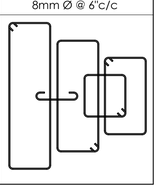
Email : bennygabrielj@gmail.com

A | COLUMN AXIS LAYOUT

COLUMN SCHEDULE :

NO. OF FLOORS : (STILT + 5 FLOORS FLOOR)

GRADE OF STEEL : Fe550-TMT BARS
GRADE OF CONCRETE : M25

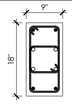
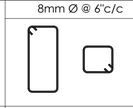
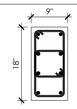
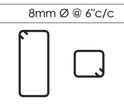
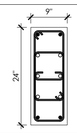
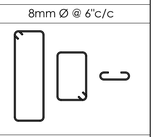
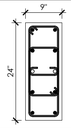
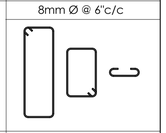
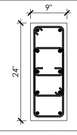
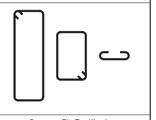
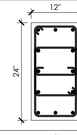
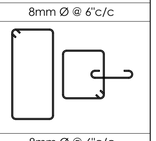
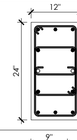
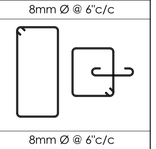
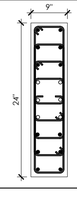
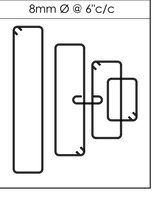
SI. NO.	COLUMN NO.	COLUMN MARKING	NO. OF COLUMNS	UPTO GROUND ROOF			
				COLUMN SIZE	MAIN BARS	SKETCH	LATERAL TIES & SHAPE
1.	C1A	A7, L2, L6, L12, L16	5	12" x 18"	4 nos 25 mm Ø ● + 6 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
2.	C1	A8, A10	2	9" x 18"	4 nos 25 mm Ø ● + 4 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
3.	C2	K22, L4, L9, L15, L18, L20, L21	7	12" x 18"	10 nos 20 mm Ø●		8mm Ø @ 6"c/c 
4.	C3A	A1, H1, J20, J21, J22	5	12" x 24"	4 nos 25 mm Ø ● + 6 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
5.	C3	D7, D10, G7	3	9" x 24"	4 nos 25 mm Ø ● + 6 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
6.	C4A	A3, A5	2	12" x 24"	8 nos 25 mm Ø ● + 2 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
7.	C4	H7, H10, H17, H19	4	9" x 24"	8 nos 25 mm Ø ● + 2 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
8.	C5A	B11, B13, C14, E16, E20, H22	6	12" x 24"	10 nos 20 mm Ø●		8mm Ø @ 6"c/c 
9.	C5	D8, E17, F19, H8, G8	5	9" x 24"	10 nos 20 mm Ø●		8mm Ø @ 6"c/c 
10.	C6	H3, H12, H16, H21, J2, J6, J12, J16	8	12" x 24"	12 nos 25 mm Ø●		8mm Ø @ 6"c/c 
11.	C7	H5, H14	2	15" x 24"	12 nos 25 mm Ø● + 2 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
12.	C8	J4, J9, J15, J19	4	12" x 38"	12 nos 25 mm Ø● + 6 nos 20 mm Ø ○		8mm Ø @ 6"c/c 

A **COLUMN SCHEDULE (UPTO GROUND ROOF)**

COLUMN SCHEDULE :

NO. OF FLOORS : (STILT + 5 FLOORS FLOOR)

GRADE OF STEEL : Fe550-TMT BARS
GRADE OF CONCRETE : M25

SI. NO.	COLUMN NO.	COLUMN MARKING	NO. OF COLUMNS	ABOVE GROUND ROOF			
				COLUMN SIZE	MAIN BARS	SKETCH	LATERAL TIES & SHAPE
1.	C1	A7, A8, A10, L2, L6, L12, L16	7	9" x 18"	4 nos 25 mm Ø ● + 4 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
2.	C2	K22, L4, L9, L15, L18, L20, L21	7	9" x 18"	8 nos 20 mm Ø ●		8mm Ø @ 6"c/c 
3.	C3	A1, D7, D10, G7, H1, J20, J21, J22	8	9" x 24"	4 nos 25 mm Ø ● + 6 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
4.	C4	A3, A5, H7, H10, H17, H19	6	9" x 24"	8 nos 25 mm Ø ● + 2 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
5.	C5	B11, B13, C14, E16, E20, H22,D8, E17, F19, H8, G8	11	9" x 24"	10 nos 20 mm Ø●		8mm Ø @ 6"c/c 
6.	C6	H3, H12, H16, H21, J2, J6, J12, J16	8	12" x 24"	12 nos 25 mm Ø●		8mm Ø @ 6"c/c 
7.	C7	H5, H14	2	15" x 24"	10 nos 25 mm Ø● + 2 nos 20 mm Ø ○		8mm Ø @ 6"c/c 
8.	C8	J4, J9, J15, J19	4	9" x 38"	12 nos 25 mm Ø● + 6 nos 20 mm Ø ○		8mm Ø @ 6"c/c 

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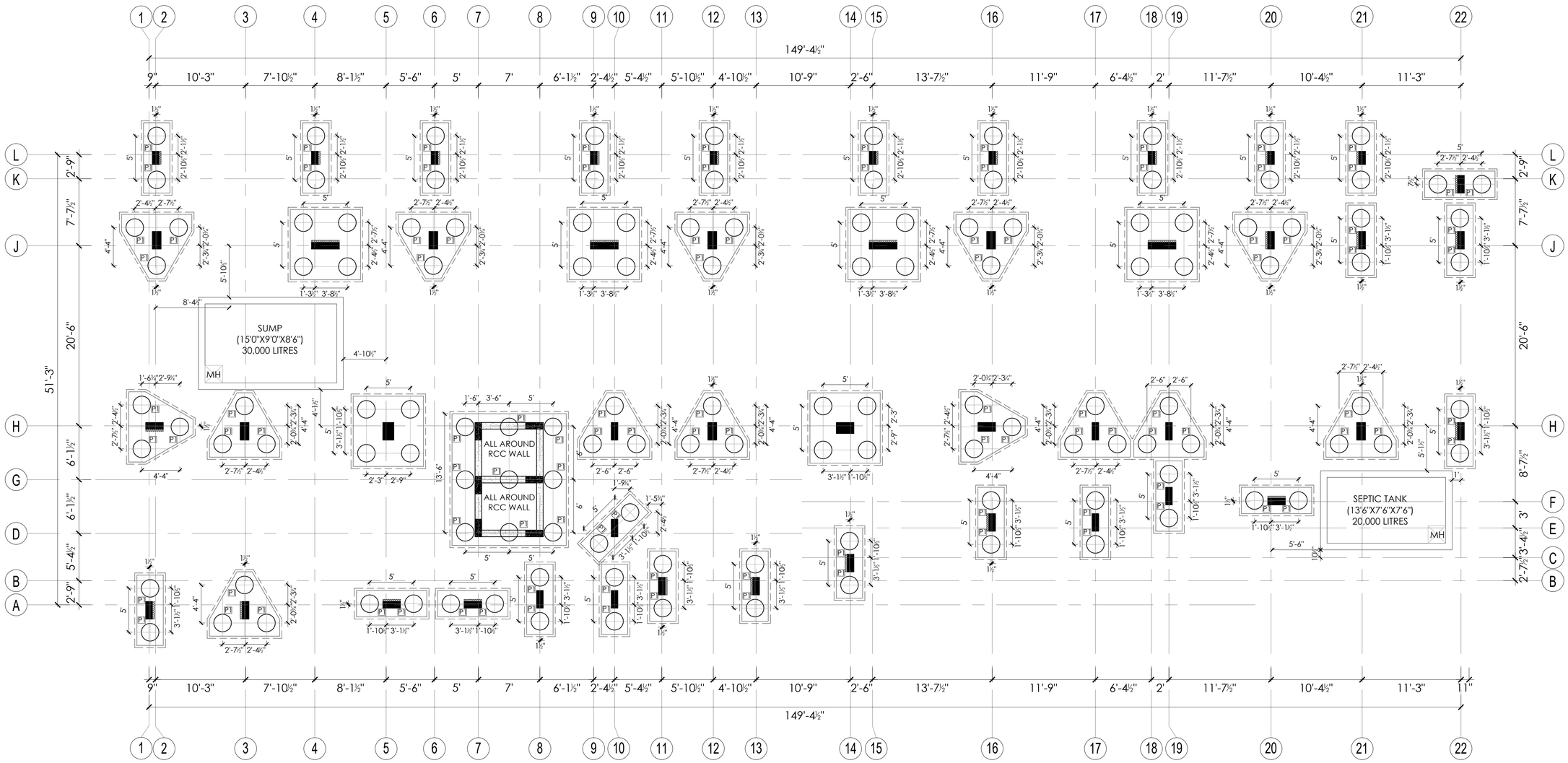
Email : bennygabrielj@gmail.com

B **COLUMN SCHEDULE (ABOVE GROUND ROOF)**



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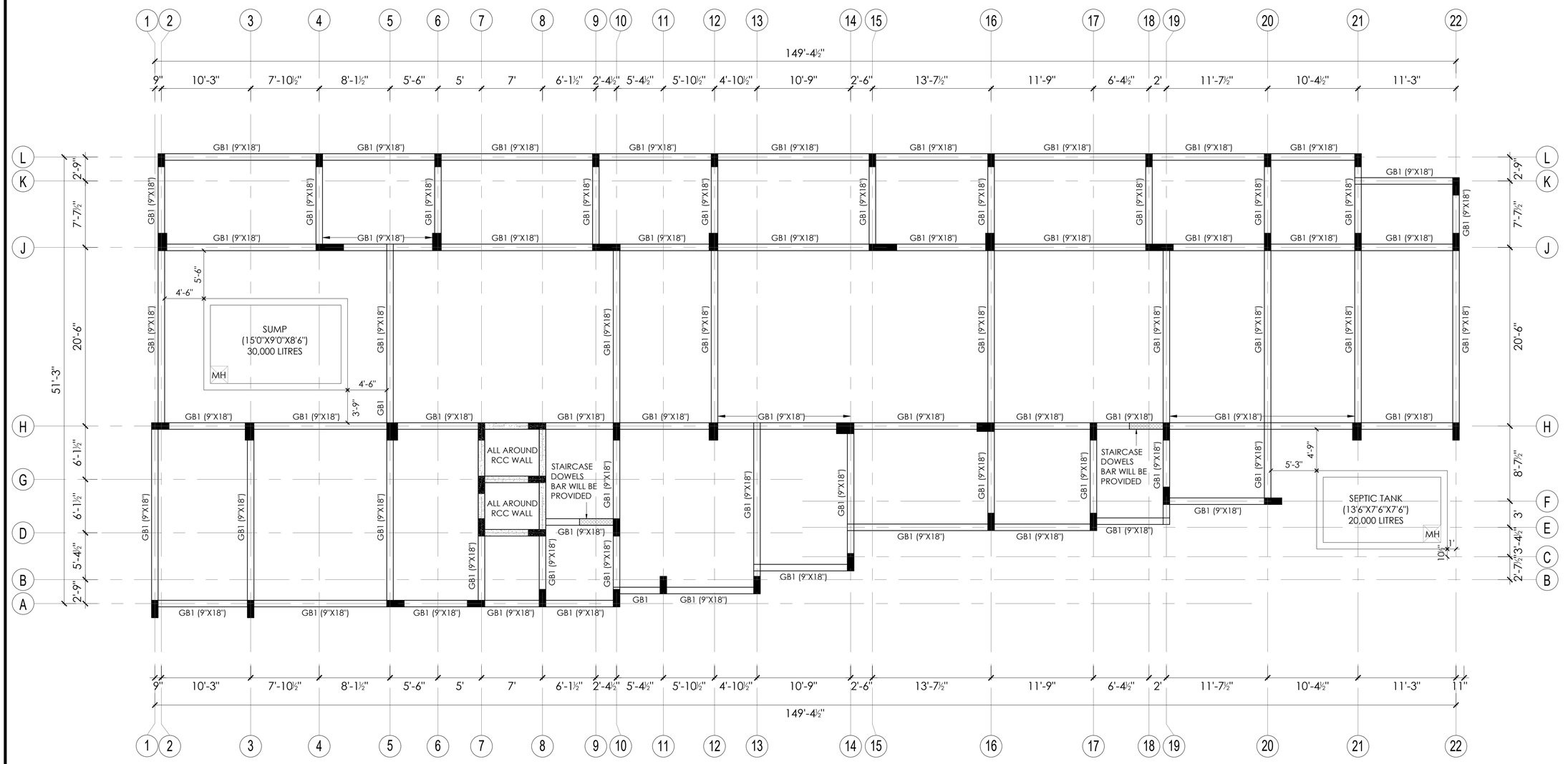
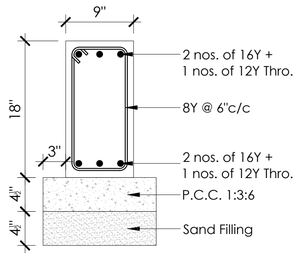
Email : bennygabrielj@gmail.com

A **PILE LAYOUT**

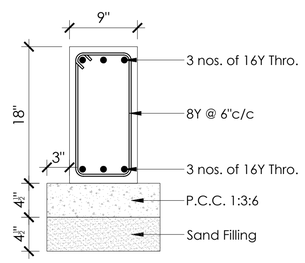
GRADE OF CONCRETE M25



A GRADE BEAM LAYOUT



B GRADE BEAM - GB1 (9" X 18")



C GRADE BEAM - GB2 (9" X 18")

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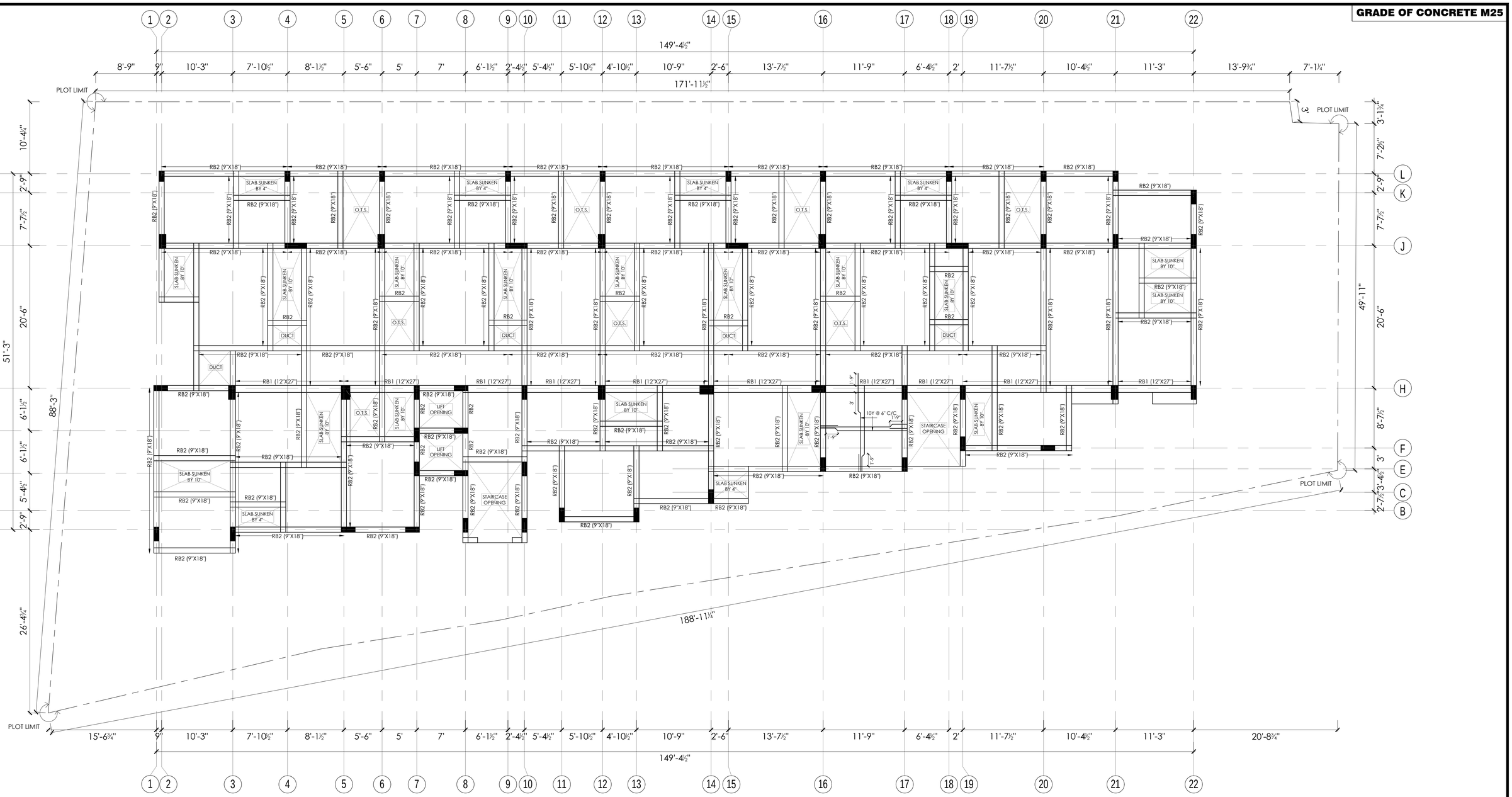
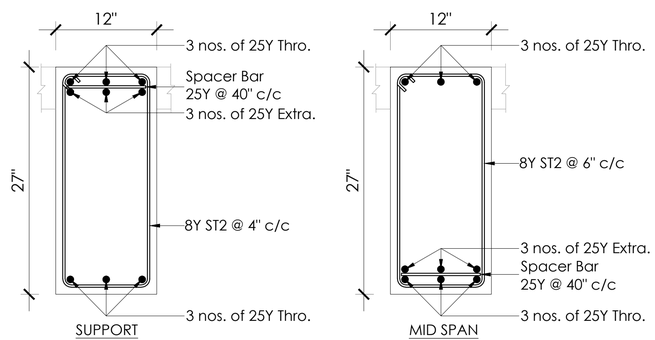
Email : bennygabrielj@gmail.com

GRADE OF CONCRETE M25



A **TYPICAL ROOF BEAM AND SLAB LAYOUT**



B **ROOF BEAM - RB1 (12" X 27")**