S.NAGESH, M.Asc., F.I.E.,
Consulting Engineer & Regd: Valuer,
15, 3rd Cross street,
Karpagam Gardens, Adyar,
Chennai- 600 020.

nagesh.somadev@gmail.com
Phone: 24464410

December 23,2022

STRUCTURAL STABLITY CERTIFICATE

It is certified that the residential / Commercial building at
Srirangam Municipal, Srirangam Taluk, Tiruchirappalli District
T.S.No:2189 / 10A, 10B, 36, 37 Block No:49, Ward-B, Vellithirumutham Village, Srirangam Municipal, Srirangam Taluk, Tiruchirappalli District

is designed to resist for earthquake. Check has been made and found safe and I hereby certify that

1. The minimum grade of concrete is M25
2. The design analysis using the code of practice for loading . standards as per BIS-875 and Seismic forces as per the latest code BIS-1893 & BIS-456
3. Least dimension of column is 300mm in stilt floor.
4. The building will be structurally safe and sound for residential use.

S. NAGESH, B.E. (CIVIL), M.A.Sc., F.I.E.
STRUCTURAL ENGINEER GRADE I (SE)
DTCP REG NO. SE/GR-I/19/05/004
New No. 15, 3rd Cross Street,
Karpagam Gardens, Adyar, Chennai - 600 020.
Email : nagesh.somadev@gmail.com
Mobile : 96492 31666

PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT CUM PROFESSIONAL CONSULTING OFFICE BUILDING IN T.S.No:2189/10A, 10B, 36,37, BLOCK No: 49, WARD-B, VELLITHIRUMUTHAM VILLAGE, SRIRANGAM MUNICIPAL, SRIRANGAM TALUK, TIRUCHIRAPPALLI DISTRICT.

TYPICAL STRUCTURAL DESIGN CALCULATION

1 **General:**

Proposed Building construction is B + G+ 2 for residential / Commercial

Basement is used for vehicular parking. Upper floors are for

residential use.

2 **Design Basis:**

Latest Design codes of BIS-456, 875 and 1893 are followed with SP-16 Design Aid book.

Since the building is 4 stories, wind force is not taken into account

Live load reduction factor is applied in design.

Raft foundation is proposed in soil report .

Fe-500 steel is used as main steel and minimum grade of concrete is M25

S. NAGESH, B.E. (CIVIL), M.A.Sc., F.I.E.
STRUCTURAL ENGINEER GRADE I (SE)
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3 **Earthquake consideration:**

For better stability during earhquake, the columns are braced in both direction with beams. Continuous lintels are specified for outer walls and column ties are closely spaced for better ductility. For building on stilt, minimum size is taken as 300 mm(12")

EARTHQUAKE LOAD

Design horizontal Seismic coeff. Ag = $\frac{Z}{2} \times \frac{I}{R} \times \frac{Sa}{g}$

Z = Zone Factor = 0.10 for Trichy

I = Importance Factor = 1.0

R = Response reduction Factor = 5

$\frac{Sa}{g}$ = Avg. response acc.coeff. Depends on Ta

Ta = Fundamental natural period

= $\frac{0.09\ h}{\sqrt{d}}$ for infill walls
h = height of the building
d = Width of the building

= $0.075\ h^{\boxed{0.75}}$ for office building

W = seismic weight of building
= 100% D.L + 25% L.L for residential <=300
= 100% D.L + 50% L.L for residential >300

Base Seismic Shear Vb = Ag x W

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4 **WIND LOAD**

Vz = Vb x K1 x K2 x k3 = 50

Vb = 50 m/sec in Chennai

K1 = Probability Factor = 1

K2 = Terrain, Height Factor = 1

K3 = Topography Factor = 1

p = 0.6 x Vz x Vz

= 0.6 x 50.0 x 50

= 1500 N/Sq.m

150 Kg/Sq.m

5 **Design Loads:**

Slab 130 mm thick avg.	=	3.25 KN/sq.m
Live load	=	2.00 KN/sq.m
Finishes	=	1.50 KN/sq.m
		6.75 KN/sq.m

Applying live load reduction of = 0 ,
For column and foundation design, 6.75 Kn/sqm is taken.

This value is also taken for frame analysis

Block work 230 thick for exterior walls, AAC blocks

0.23 x 2.55 x 10 = 5.87 KN/m/floor

Beams 0.23 x 0.45 x 25 .= 2.59 KN/m/floor

Columns 0.23 x 0.60 x 3.00 x 25 .= 10.35 KN/floor

These are taken for analysis with WL+LL+DL combination.

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6 **SLAB DESIGN:**

Thickness	=	130 mm	Fck	= M 30	N/sq.mm
Cover	=	20 mm	Fy	=Fe 500	N/sq.mm
Eff.Depth	=	100 mm			

Effective slab size (3.83 x 5.38) m ratio : 1.4

Support condition - TWO WAY SLAB, 1 Short side discontinuous

short span=	α x	=	0.055 (- BM at continuous edge)	Table:26
		=	0.041 (+ BM at midspan)	in IS-456-2000
Long span=	α y	=	0.037 (- BM at continuous edge)	
		=	0.028 (+ BM at midspan)	

Designed for **0.055**

Mu= 8.17 Knm

Mu/bd^2= 0.82 n/sqmm

From Table- 3, of SP-16, Pt 0.20 %

Minimum Pt = 0.12 % as per code, for Fe-500

At = 0.202 x 1000 100.0 ./ 100 = **202** sq.mm/m

Provide 8 dia @ 130 = **386.7** sq.mm/m Short span

Provide 8 dia @ 170 = **295.7** sq.mm/m Long span

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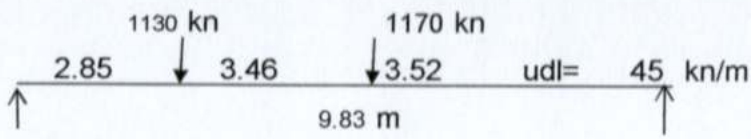
7 **Beam design:**

span = **9.83** m Beam size 1200 x 900

Fck = M 35 d = 830 mm



Max. Bending Moment occurs at top of support

Max. UDL B.M =	434.83 kn.m
1St point load moment =	1623.8 kn.m
2nd point load moment=	946.66 kn.m
	3005.3 kn.m

Mu = 3005 x 1.5 x 10-e6

4508 x **10-e6** Nmm

Mu/b.d.d = $\frac{4508 \times 10\text{-e}6}{1200 \times 830 \times 830}$ = 5.45 N/sq.mm

From table- 56, SP-16 for d'/d = 70 / 830 = 0.08

Pt = **1.519** % Pc = **0.421** %

At = 1.519 x 1200 x 830 / 100 = **15129** sq.mm (top)

Ac = 0.421 x 1200 x 830 / 100 = **4193** sq.mm (bot)

provided 10 No 32 = 8042 sq.mm

\+

extra 10 No 32 = 8042 sq.mm

16085 sq.mm AT TOP OF SUPPORT

Shear Design:

Shear force = 442.4 Kn

802.4 Kn

419.0 Kn

Total= **1663.7** Kn

Factored shear force = 1.5 x 1663.7 = 2496 KN

%age of steel at support = 0.81

for 0.81 % steel Shear resisted by concrete section

from table-61 0.61 x 1200 x 830 / 1000 = 608 KN

Balance shear (Vus) = 2496 - 608 = 1888 KN

Vus/d = 1888 / 83 = 22.75 KN/cm

from table 62 of SP-16

Required 8 legged 12 stirrups @ 140 mm c/c

Provided 8 legged **12** stirrups @ **130** mm c/c

S. NAGESH, B.E. (CIVIL), M.A.Sc., F.I.E.
STRUCTURAL ENGINEER GRADE I (SE)
DTCP REG NO. SE/GR-I/19/05/004
New No. 15, 3rd Cross Street,
Karpagam Gardens, Adyar, Chennai - 600 020.
Email : nagesh.somadev@gmail.com
Mobile : 98402 31666

8 **COLUMN DESIGN:** COL-A COL SIZE **600** X **600**

Maximum load is with wind force P = **310** t

Pu = 1.5 x 310 x10 = 4650 KN

Max.Bending Moment = 5 t.m Mu = 1.5 x 5.0 x10= 75 Kn.m

Cover = 40 mm

d'/d = 0.07

Fck = 40 N/sq.mm

Provide bars equaly all sides

Refer chart 47 of SP-16

$$\frac{Pu}{Fck\ b\ d} = \frac{\mathbf{4650} \times 1000}{40 \times 600 \times 600} = 0.32$$

$$\frac{Mu}{Fck\ b\ d^2} = \frac{\mathbf{75} \times 10^6}{40.00 \times 600 \times 600} = 0.009$$

$$\frac{p}{Fck} = \frac{0.05}{x\ 600}$$

p% = 0.05 x 40 = 2 %

As = 2 x 600 x 600 /100

= 7200 sq.mm

Provided 10 Nos 25 dia = 4909 sq.mm

\+ 6 Nos 25 dia = 2945 sq.mm

7854 sq.mm

Ties 8 @ 120c/c and 8 @ 200c/c

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New No. 15, 3rd Cross Street,
Karpagam Gardens, Adyar, Chennai - 600 020.
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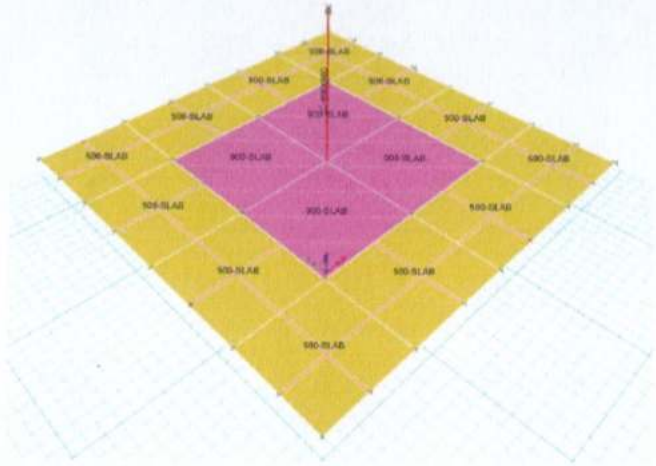
9 **Foundation F1** Refer sheet 1 of drawing

Load on column = 310 t sbc=7.50 t/sq.m M-30 mix



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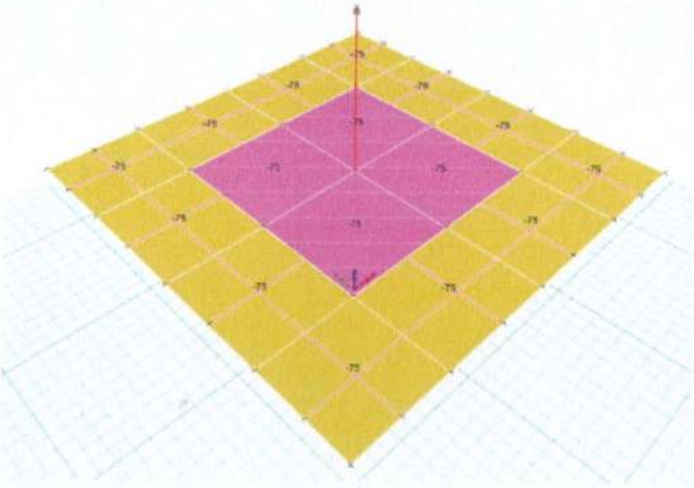

Load applied = 75kn/sq.m

S. NAGESH, B.E. (CIVIL), M.A.Sc., F.I.E.
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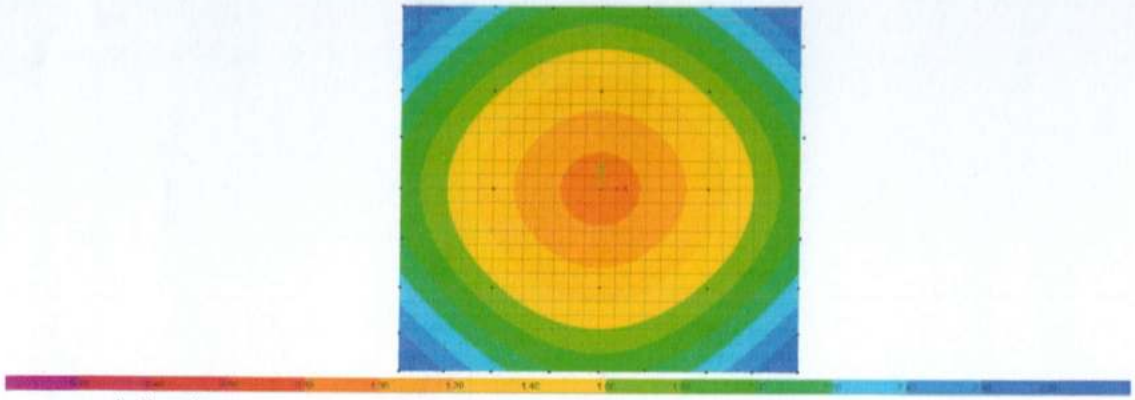
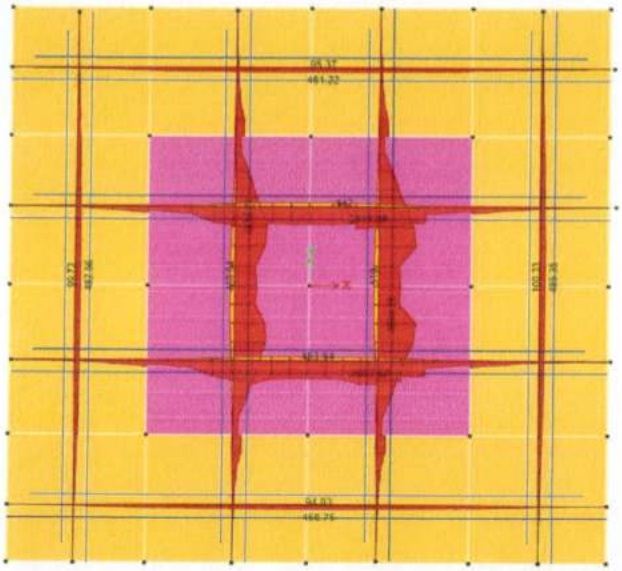


deflection



Required Reinforcement Maximum 39 sq.cm

So provide 25 @ 125 c/c

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*Mobile : 98402 **31666***

10 **RAFT SLAB DESIGN** refer sheet - 1 of drawing

Net upward thrust on raft slab= 2.00 x 10 = 20.00 Kn/Sq.m

Thickness = 500 mm Concrete mix Fck = M 30 N/sq.mm

Cover = 50 mm Steel Grade Fy =Fe 500 N/sq.mm

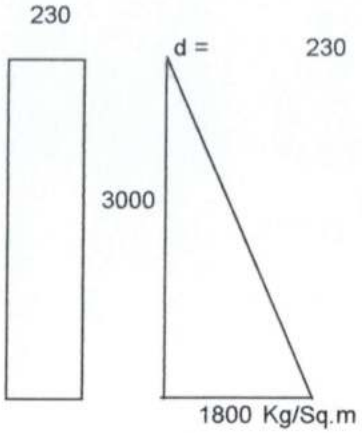
Eff.Depth = 444 mm

Since the upward pressure is less, nominal steel is provided in raft

Provide 12 dia @ 130 c/c for Short span = **870** sq.mm/m

12 dia @ 130 c/c for long span = **870** sq.mm/m

11 **Design as a R.C.Wall**



Pressure at the base = Kr x r x h

Kr = 0.3

= 0.3 x 2000 x 3.00

= 1800 Kg/Sq.m

Bending Moment = 1/2 x 1800 x 3.0 x 3.0 / 3

= 2700.0 Kg.m

= 27 Kn.m

$$\frac{Mu}{b \times d \times d} = \frac{1.5 \times 27.00 \times 1E+06}{1000 \times 230 \times 230}$$

= 0.77 N/Sq.mm

From table-4 SP-16

Pt = **0.190** %

At = 0.190 x 1000 x 230 / 100 = **437** sq.mm

Provide 10 dia @ 150 c/c for earth side = **524** sq.mm/m

Provide on both face and both ways

S. NAGESH, B.E. (CIVIL), M.A.Sc., F.I.E.
STRUCTURAL ENGINEER GRADE I (SE)
DTCP REG NO. SE/GR-I/19/05/004
New No. 15, 3rd Cross Street,
Karpagam Gardens, Adyar, Chennai - 600 020.
Email : nagesh.somadev@gmail.com
Mobile : 98402 31566

DTCP **MAMALLAPURAM LOCAL PLANNING AUTHORITY**

Five Rathas Shopping Complex,

Mamallapuram-603 104.

e - mail Id : ms.mmlpa@gmail.com

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru NAGESH SOMADEVA** has enrolled as **Structural Engineer Grade-I (SE)** with Mamallapuram Local Planning Authority (MLPA) who has the qualification of **MASTER OF APPLIED SCIENCE (Structural Engg.)** and experience in the relevant field for **30** year.

He has been given the Registration No.**SE/GR-I/19/05/004** on **08.05.2019** He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(ms) No.18 MAWS (MA1) Dept. Dated. 04.02.2019

This Registration is valid upto **07.05.2024**



8.5.19

Member Secretary,
Mamallapuram Local Planning Authority,
Mamallapuram.

S. NAGESH, B.E. (CIVIL), M.A.Sc., F.I.E.
STRUCTURAL ENGINEER GRADE I (SE)
DTCP REG NO. SE/GR-I/19/05/004
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Karpagam Gardens, Adyar, Chennai - 600 020.
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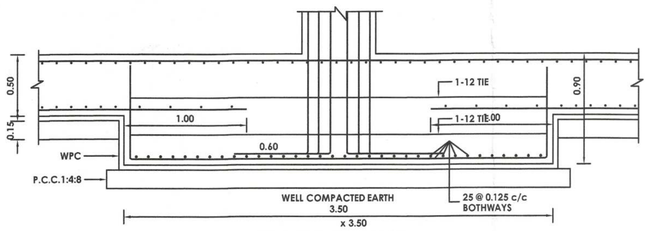
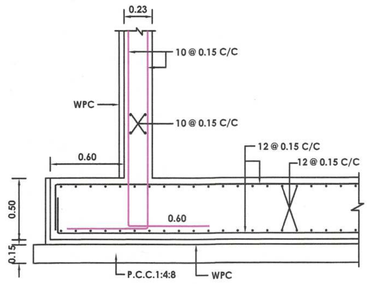


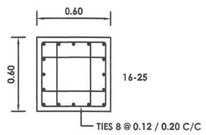
DETAIL OF F1 FOUNDATION

MIX M-30



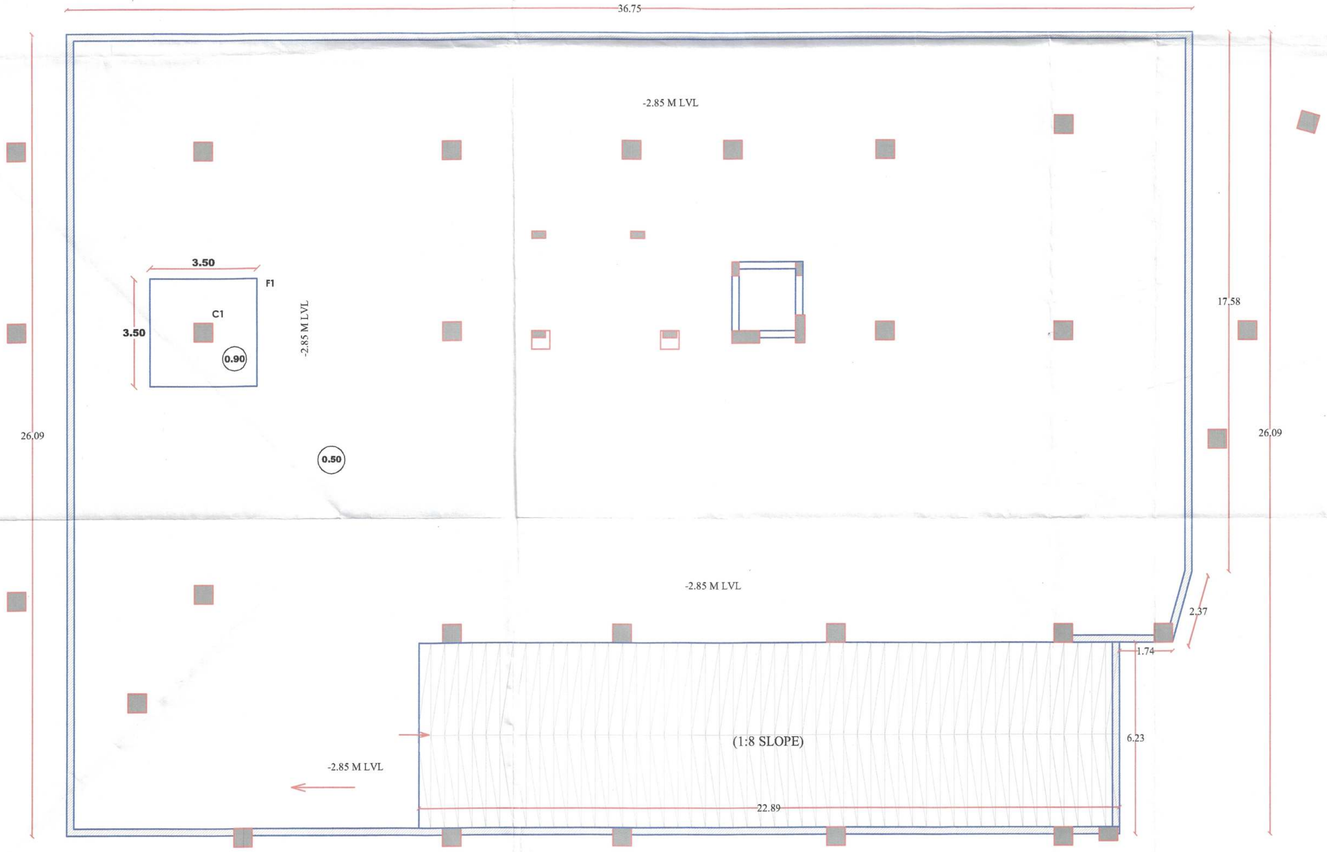
DETAIL OF RC-WALL AND RAFT SLAB

MIX M-30



DETAIL OF C1 COLUMN

MIX M-40



PLAN AT FOUNDATION

SUBMISSION DRAWING

NOTES:-

* CONCRETE MIX SHOULD BE M-30 WITH MINIMUM 380 Kg/Cu.m OPC
* CONCRETE MIX FOR COLUMN AS PER COLUMN DETAIL
* CLEAR COVER TO THE MAIN REINFORCEMENT FOR FOUNDATION-0.05, RC-WALL-0.025, RAFT SLAB-0.04, COLUMN-0.03.
* LAP LENGTH FOR -50d

* REFER SOIL REPORT FOR SUGGESTED PRECAUTIONS
* SBC - 7.50 t / sq.m AT 3.00m DEPTH
* DESIGNED FOR SEISMIC ZONE-2
* FOUNDATION DESIGNED FOR B+G+2 UPPER FLOORS

TITLE

PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT CUM PROFESSIONAL CONSULTING OFFICE BUILDING IN T.S NO:2189/10A,10B,36,37 BLOCK NO:49,WARD :B, VELLITHIRUMUTHAM VILLAGE, SRIRANGAM MUNICIPAL,SRIRANGAM TALUK,TIRUCHIRAPPALLI DISTRICT.

LAYOUT OF FOUNDATION AND DETAILS

NORTH POINT

DATE: 23-12-2022

DRAWN: SAMPATH

SCALE : 1 : 100

SHEET : 01

STRUCTURAL ENGINEER

S. NAGESH, B.E. (CIVIL), M.A.Sc., F.I.E.
STRUCTURAL ENGINEER GRADE I (SE)
DTCP REG NO. SE/GR-I/19/05/004
New No. 15, 3rd Cross Street,
Karpagam Gardens, Adyar, Chennai - 600 020.
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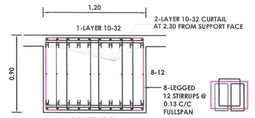
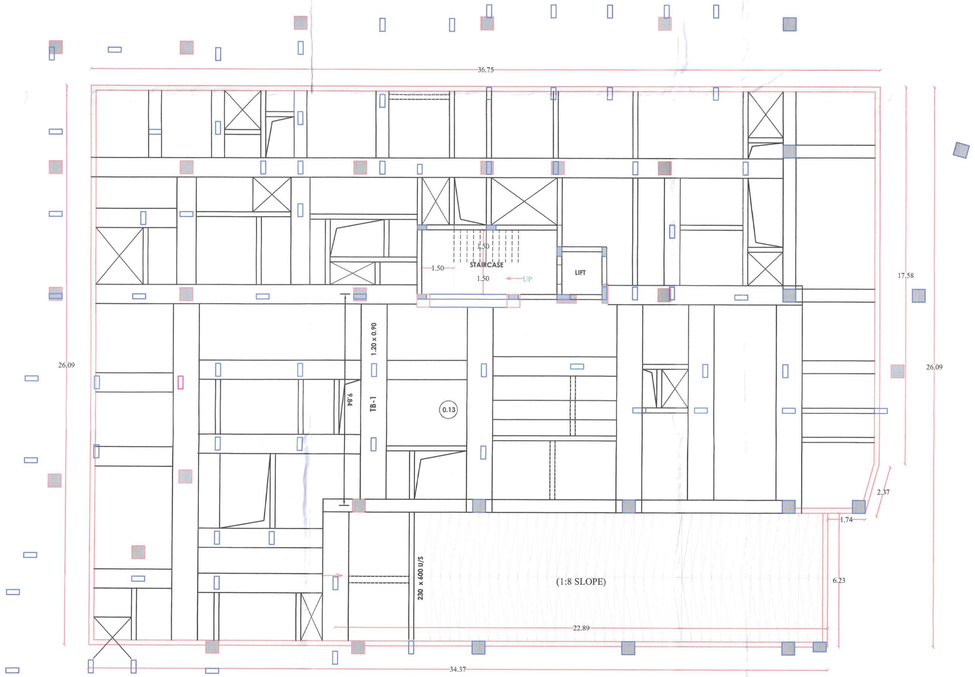
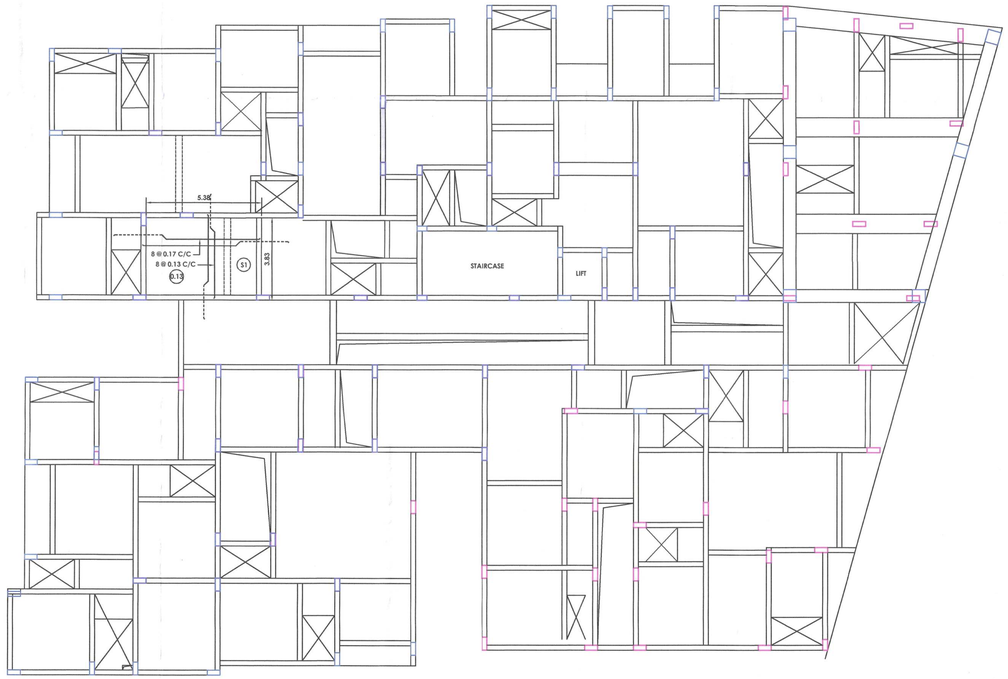


DETAIL OF TB-1

MIX M-35



PLAN AT GROUND FLOOR LEVEL



PLAN AT TYPICAL FLOOR LEVEL

SUBMISSION DRAWING

NOTES:-
* CONCRETE MIX SHOULD BE M-30 WITH MINIMUM 380 Kg/Cu.m OPC
* CONCRETE MIX FOR COLUMN AS PER COLUMN DETAIL
* CLEAR COVER TO THE MAIN REINFORCEMENT FOR SLAB-0.025, COLUMN-0.03, BEAM-0.025.
* LAP LENGTH FOR -50d

TITLE

PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL APARTMENT CUM PROFESSIONAL CONSULTING OFFICE BUIDING IN T.S NO:2189/10A,10B,36,37 BLOCK NO:49,WARD :B, VELLITHIRUMUTHAM VILLAGE, SRIRANGAM MUNICIPAL,SRIRANGAM TALUK,TIRUCHIRAPPALLI DISTRICT.

LAYOUT OF GROUND AND TYPICAL FLOOR LEVEL

NORTH POINT

DATE: 23-12-2022

DRAWN: SAMPATH

SCALE : 1 : 100

SHEET : 02

STRUCTURAL ENGINEER

S. NAGESH, B.E. (CIVIL), M.A.Sc., F.I.E.
STRUCTURAL ENGINEER GRADE I (SE)
DTCP REG NO. SE/GR-I/1995/004
New No. 15, 3rd Cross Street,
Karpagam Gardens, Adyar, Chennai - 600 020.
Email : nagesh.sonsdrv@gmail.com
Mobile : 98402 31666