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KRITI
Structural Engineering Consultants

24 (Old 26) Vaidyarama St.,
T.Nagar, Chennai - 600 017.
Tel : 24838896.

STRUCTURAL STABILITY CERTIFICATE

STRUCTURAL STABILITY CERTIFICATE FOR THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS(HEIGHT 18.30m) RESIDENTIAL BUILDING WITH 10 DWELLING UNITSAVAILING PREMIUM FSI WITH TOD BENEFIT ATPLOT No.47, OLD DOOR NO:16, NEW DOOR NO:35, MASILAMANI ROAD AND HANUMANTHA ROAD, MYLAPORE CHENNAI COMPRISED IN O.S.NO.3952, R.S.NO.629/A(AS PER DOCUMENT), R.S.NO.629/53,(AS PER PATTA) BLOCK NO:11 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION.

The Proposed Building referred to above is a framed structure with Stilt (car parking) + 5 Upper Floors .The Structural Design and Drawing for the building are being prepared by us conforming to the relevant Bureau of Indian Standard viz. IS 456:2000 for Plain and Reinforced Concrete, IS 875(Part II)—1987 for Imposed Loads and IS 1893:2002(part 1) for Seismic Force. We certify that the building when constructed according to our Structural Designs and Drawings will be structurally safe and sound and fit for occupation.

1. The minimum grade of concrete is M25.
2. Column width @ Stilt Floor is 300mm

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DESIGN REPORT FOR THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS(HEIGHT 18.30m) RESIDENTIAL BUILDING WITH 10 DWELLING UNITSAVAILING PREMIUM FSI WITH TOD BENEFIT ATPLOT No.47, OLD DOOR NO:16, NEW DOOR NO:35, MASILAMANI ROAD AND HANUMANTHA ROAD, MYLAPORE CHENNAI COMPRISED IN O.S.NO.3952, R.S.NO.629/A(AS PER DOCUMENT), R.S.NO.629/53,(AS PER PATTA) BLOCK NO:11 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION..

STRUCTURAL DESIGN CALCULATION

Structural Consultant

Kriti Structural Consultant

24,Vaidhyarama Street,

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DEISGN CALUCALTION FOR THE PROPOSED CONSTRUCTION OF STILT FLOOR + 5 FLOORS(HEIGHT 18.30m) RESIDENTIAL BUILDING WITH 10 DWELLING UNITSAVAILING PREMIUM FSI WITH TOD BENEFIT ATPLOT No.47, OLD DOOR NO:16, NEW DOOR NO:35, MASILAMANI ROAD AND HANUMANTHA ROAD, MYLAPORE CHENNAI COMPRISED IN O.S.NO.3952, R.S.NO.629/A(AS PER DOCUMENT), R.S.NO.629/53,(AS PER PATTA) BLOCK NO:11 OF MYLAPORE VILLAGE WITHIN THE LIMITS OF GREATER CHENNAI CORPORATION..

1. General:

The Proposed building is a Framed Structure with Stilt (car park) +5 Upper floors.

2. Design Basis:

Latest design codes of BIS-456,875 and 1893 are followed with SP-16 design aid book .A typical 3 D Wire Frame was made for analysis to arrive Moment and Axial force for Column. Isolated Footing is proposed as per Soil report. Fe415 & Fe500 Grade Steel is used for main reinforcement and a minimum grade of Concrete is M25.

3. Wind Load:

$Vz=VbxK_1xK_2xK_3$.
Vb=50m/sec in Chennai.

Check for direct stress (shear)

Critical section for shear is at a distance d=800mm from the face of the column.

Max. Shear force at critical section = 131x2.75x (1.26-0.8/2)=310KN.

$Tv=\frac{310x10^3}{2520x790}$ =0.155.

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Check for nominal shear stress<Design nominal shear stress

Tv(0.155)<Ts(0.36).

Check for punching shear.

Tv=Vp/d x Perimeter of critical section.

$$=\frac{1.5x1244x1000}{1360x800}$$

Tv=2.4N/sqmm.

Tv=1.71<Tc=2.8 (Hence safe).

K_1 = Probability factor = 1

K_2 = Terrain, Height Factor = 1

K_3 = Topography factor = 1

p= 0.6xVzxVb

=0.6x50x50

=15000N/sqmm.

4. Earthquake Consideration:

For Better Stability during Earthquake condition, the columns are braced in both direction with beams and slab. Continuous lintels are specified for outer walls and column ties are closely spaced for better ductility. For Building on stilt, min size is taken as 300mm for Column.

Zone Factor, Z for Chennai seismic Zone III : 0.16 (table 2,Clause 6.4.2)

I, Importance Factor :4,(From table 6)

R, Response Reduction Factor : 3 for OMRF(Ordinary Moment resisting Frame, Table 7)

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Fundamental Natural Period along X direction $Tx = 0.09xh/(dx)^{½}$

$=0.09x15.25/(14.4)^{½} = 0.36$(clause 7.6.2)

The Soil at the site is medium $Sa/g = 2.5$ as $0.1 \leq T \leq 0.55$

Fundamental Natural Period along Z direction $Tz = 0.09xh/(dz)^{½}$

$=0.09x15.25/(15.5)^{½} = 0.349$(clause 7.6.2)

The Soil at the site is medium $Sa/g = 2.5$ as $0.1 \leq T \leq 0.5$

Design Horizontal Seismic Coefficient

$Ah = ZISa/2Rg$ (Clause 6.4.2)

$= 0.16x1x2.5/2x3=0.0667$

Seismic Weight of the Building : Total Gravity Load + 0.25 Super imposed Load

$W = 12729$ KN

Design Seismic Base Shear

$Vb = AhW$

$= 0.0667 \times 12729 = 849$ KN

Shear Per Column $= 849/12 = 70.75$ KN

Seismic Moment per Column $= 70.75x3.05/2=107.89$Nm.

LOAD CALCULATION FOR MAXIMUM LOADED COLUMN

Loading Area for the column $= 4.32x6.76 = 29.2$ sqm

Gravity Load Reaction from the roof $= 6.125x29.2 = 178.87$ KN

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Self Weight of the beams = 0.3x0.475x25x11.08 = 27.04 KN

Weight of the Parapet wall = 1x0.23x20x11.08 = 50.97 KN

Total Gravity Load = 256.87 KN

Super impose Load Reaction from roof = 1.5x29.2 = 43.8 KN

Super impose Load Reaction from Floor = 2x 29.2 = 58.41 KN

Gravity Load Reaction from the floor = 4.125x29.2 = 120.46 KN

Self weight of the beams = 0.3x0.475x25x11.08 = 27.04 KN

Reaction from water tank = 141.37 KN

Weight from Head room = 80 KN

Total Gravity Load = 269.38 KN

Self weight of Column = 0.23x0.6x20.05x25 = 69.17 KN

Total Gravity Load at the Foundation = 256.87+269.38x4+69.17

Level KN +141.37+80 = 1624.93 KN

Total Super imposed Load at the Foundation = (43.8+(58.41x4))x0.6

Level KN 166.46 KN

Total Load =1624.93+166.46= 1791.39KN

The loads of other column calculated in similar way.

5. Design Loads:

Slab 125 mm thick	= 3.125 KN/sqm.
Live load (Residence)	=2.00 KN/sqm.
Floor finishes	=2.00 KN/sqm.

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This Value is also taken for frame analysis.

Block work 200mm thick for exterior walls

0.2x7x3 = 4.2 KN/m/floor.

Block work 100mm thick for interior walls

0.1x7x3 = 2.1 KN/m/floor.

Beams 0.2x0.45x25 = 3.375 KN/m/floor.

Column 0.2x0.45x25 = 3.375K N/m/floor.

Foundation details

Type of Foundation	Pile Foundation.
Depth of Foundation	>20 mt (Socketed into Weathered Rock for a depth of 1000mm
Pile carrying capacity	570 KN.

Slab details

Type of Slab	Two way Slab.
Thickness of Slab Provided	125mm.
Cover to reinforcement	20mm.
Diameter of bar used	10mm,12mm.

Beam details

Size of Beam Provided	200x600
Cover to Reinforcement	30mm.
Diameter of main bar	25mm,20mm,16mm,12mm.
Stirrups	2/4 legged stirrups of 8mm/10mm dia.

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Column details

Size of Column Provided	300x500,300x400,200x500, 200x450.
Cover to reinforcement	for 12mm bar 25mm For 16mm or greater 40mm.
Diameter of main bar	25mm,20mm,16mm,12mm
Lateral ties	8mm.

Design of Column

Column size = 300mmx400mm.

Cover = 40mm.

Ground Floor Ht = 2.75mt.

First Floor Ht = 3.05 mt.

Fy = 415 & Fck = 25

Effective Length ratio 0.65 as per IS456:2000

Leff1 = 0.65 x L

Leff2 = 0.65 L

Check for Slenderness

Leff1/D = 3.30 Leff1/b = 8.62.

Leff2/D = 3.30 Leff2/b = 8.62.

All Columns are short about both axis

Size of Column and check e_{min} .

e_{min} = Leff/500+D/30 = 23.97

Find Mmin = 0.02397x1791.39 = 42.94KNm.

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Design Axial Load Pu = 1791.39KN.

Design Moment Mx = Mmin = 42.94KNm.

Designing the column as an axially loaded column with uniaxial moment

Calculation of Area of Steel.

Cover = 40mm

Design Axial Load Pu 1791.39KN.

Design Moment Mx = Pux e_{min} 42.94KNm.

D = 450mm,b=300mm Cover 40mm.

d' = 40+25/2 = 52.5mm

d'/D = 52.5/600 = 0.875

$Mu/FckbD^2$ =42.94x1.5x10^6 /25x300x450x450 = 0.03

Pu/Fckbd = 1791.39x1.5x10^3/25x300x450 = 0.78

From SP 16 Chart 44,

p/Fck = 0.087

Ast = 0.082x25x230x450/100 = 1187sqmm

However 6 Nos of 16 tor are Provided.

Also Lateral ties 8 tor rod @ 150c/c are Provided.

Check for Column steel for earthquake load.

As per Clause 7.10.3 the partial safety factor for limit state design of reinforced concrete is given by 1.2 (DL+IL+EL)

The Load coming on the column Pu = 1.2(1791.39+70.75)=2234.47KN

Moment on Column Mu = 1.2(42.94+107.89)=181KNm

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$Pu/FckxbxD = 2234.47x10^3/25x300x450 = 0.647$

$Mu/Fckbd^2 = 181x10^6/25x300x450x450 = 0.087$

From Chart 44 of SP 16 P/Fck = 0.082

Ast = 0.082x25x230x450/100 = 1138sqmm

However 6 nos of 16 tor rods are provided which is found to be safe for the requirement of steel, Others Column are also designed in similar way. Hence the design satisfies the requirement of extra steel for earthquake loads.

And Design of other columns calculated in similar way.

DESIGN OF PILE

600 diameter circular Pile

As the Pile has the carrying capacity of 570KN the pile is designed for the same load.

Ultimate load = 1.5x570 = 855KN Length of Pile = app > 20m (socketed inside the Weathered Rock)

fck = 25N/sqmm.
fy = 500 N/sqmm.

Longitudinal Reinforcement

Pu = 0.4fckAg+(0.67fy-0.4fck)Asc.

855x1000 = 0.4 x 25 x (3.14/4)x600x600 + (0.67 x 500 – 0.4 x 25)Asc.

85000 = 844125 + 325 Asc.

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Asc = 1095 sqmm. Use 8nos of 16 Tor with Clear cover of 50mm.(1600 sqmm)

DESIGN OF PILE CAP(TWO PILE GROUP)

A column 230mmx600mm has to carry a Axial load of 680 KN to be supported on 2 Piles each of 600 mm diameter and spaced at 1800 mm centers. fck =25N/sqmm and fy=500N/sqmm.

Pile diameter = 600mm Spacing of Pile = 1800mm

Column size = 230mm x 600mm

Service Load = 680KN

Factored Load = 1020KN

Safe Load on Single Pile = 340 KN

Concrete Grade = M25 Steel Grade = Fe500

Pile cap dimension

Length of Pile cap = 1800 +300+300 = 2400

Width of Pile cap = 450+300 = 750

Depth of pile cap

Empirical formula = 1/3(8xdia of pile +600) = 1066mm (too high)

Adopting over all depth as 750mm.

Effective depth of pile cap = 750-10-75 = 665mm

Pile cap size 2400mmx750mmx750mm.

Self wt of Pile cap = 1.5(2.40 x 0.75 x 0.75 x 25) = 453KN

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Check for truss action

av = 345 , d = 715mm

ratio of av/d = 0.37 < 2

Beam theory action exists.

Total Factored Load = 1020 + 45 = 1065 KN

Tension steel:

Tx = P/12Ld x (3LxL – axa)

= [1065/(12 x 1800 x 715)] (3 x 1800x 1800 – 750x750)

=1356KN

As = 1356 x 750/0.87x500 = 1520 sqmm

Percentage of steel p = 3117 x 100 /750 x 1115 = 0.31% > 0.2%

Provide 8nos of 16 Tor rod 1600sqmm. @ TOP & BOTTOM.

Check for shear (fck = 25) using enhanced shear theory,

Spacing of Piles 450dia = 1350mm(3 times Pile diameter)

Hence enhanced shear is allowed in the section

= 0.36 x 2 x 915/345 = 1.9N/sqmm but < 3.1N/sqmm(Enhanced shear)

Shear = 2927 x 1000/2(900x915) = 1.77 N/sqmm < 1.9 N/sqmm.

And Design of other Pile Foundation is calculated in similar way

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Design of Plinth Beam

Assuming a plinth beam of size = 200mmx500mm

Self weight of the Plinth beam = 0.2x0.50x25=3.375KN/m

Weight of the 230mm wall = 0.2x2.45x20 = 11.27KN/m

Total Load on the Plinth beam = 3.375+11.27 = 14.645KN/m

Maxium Moment for a span of 5 mt = 14.645x1.5x5x5/8 = 31.54KNm

$Mu/bd^2 = 31.54x10^6/230x330x330 = 1.26$

From Table 3 of SP16 Pt = 0.3722

Ast = 0.3622x200x460/100=310sqmm

Top and Bottom steel of 3Nos of 12 Tor is provided.

Area of steel provided = 336 sqmm.

And Design of other Plinth beam calculated in similar way.

Design of Floor Beam

Beam size	=	200mmx500mm
Effective depth	=	415mm
Span	=	4.34m
Self wt of slab	=	0.125x24x4.34 = 13KN/m
Self wt of beam	=	0.2x0.5x25=2.5KN/m

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Wall Load = 0.20x2.8x7.5=14KN/m

Live load = 2x4.34=8.68KN/m

Floor finish = 2x4.34=8.68KN/m

Total = 49KN/m

Factored Load = 74KN/m

$M_u = \frac{wl^2}{12} = \frac{74 \times 4.34^2}{12}$

= 116KN.m.

$M_u/bxd^2 = 11.6X\ 10^7 / 230\ X\ 600^2 = 1.4$

From table 2 Sp-16
$P_t = 0.65\%$

$A_{st} = 0.65x200x600/100=580mm^2$.

Provide tor steel Rod

Bottom rod - 3 nos - 16 tor
Top rod - 3 nos - 16 tor

Check for Shear

Shear Stress $Vu = \frac{W1}{2}$

$= \frac{74.2x4.34}{2}$

Vu = 161. KN

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From table 61, Page 178, Sp-16

For 0.369 % Steel shear is resisted by concrete section.

(0.45x200x415)/1000 = 37KN

Balance shear =161-37

Vus=124KN

Vus/d = 124/41.5 = 2.98KN/cm

Required 8 Tor @ 160mmc/c. So Provide 8 Tor @ 150mmc/c

And Design of other Floor beam calculated in similar way.

Design of Floor Slab

Self weight of the slab 125mm thk = 3.125KN/sqm

Floor Finish =21KN/sqm

Live Load = 2KN/sqm Total Load = 7.125KN/sqm

The slab has one short edge discontinuous as a two way slab

Ly/lx = 4.38/3 = 1.46<2.The slab is designed as a two way slab

From Table 26 of IS456:2000 for ly/lx = 1.46 Alpha x = 0.0562 and

Alpha y = 0.037

Negative moment at continuous edge for shorter side

$$Mx = alphax \times w \times lx \times lx$$

$$Mx = 0.0562x7.125x3x3x1.5 = 4.65KNm$$

Effective depth = $(4.65x10^6 / 0.138x25x1000)^{1/2}$

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= 106.71 mm

slab depth of 125 mm provided.

$Mu/bd^2 = 4.65x10^6 / 1000x100x100 = 0.465$

From Table 3 of SP16 Pt =0.1315

Ast required = 0.1315x1000x125/100

However 8 tor @ 150mm c/c is provided along the

Shorter span

Positive moment at mid span for the longer side

My = Alphay x w x lx x lx

My = 0.037x7.125x3x3x1.5 = 3KNm

$Mu/bd^2 = 3x10^6 / 1000x100x100 = 0.3$

From Table 3 of SP16 Pt = 0.084

Ast required = 0.1315x1000x125/100

However 8 tor @ 150mm c/c is provided along the longer span

And Design of other slab calculated in similar way.

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CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
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Egmore, Chennai-600 008

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru. R.V.NARENDRAN** has enrolled as **Registered Structural Engineer Grade-I (SE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **M.S., (Structural Engg.)** and experience in the relevant field for **34 years.**

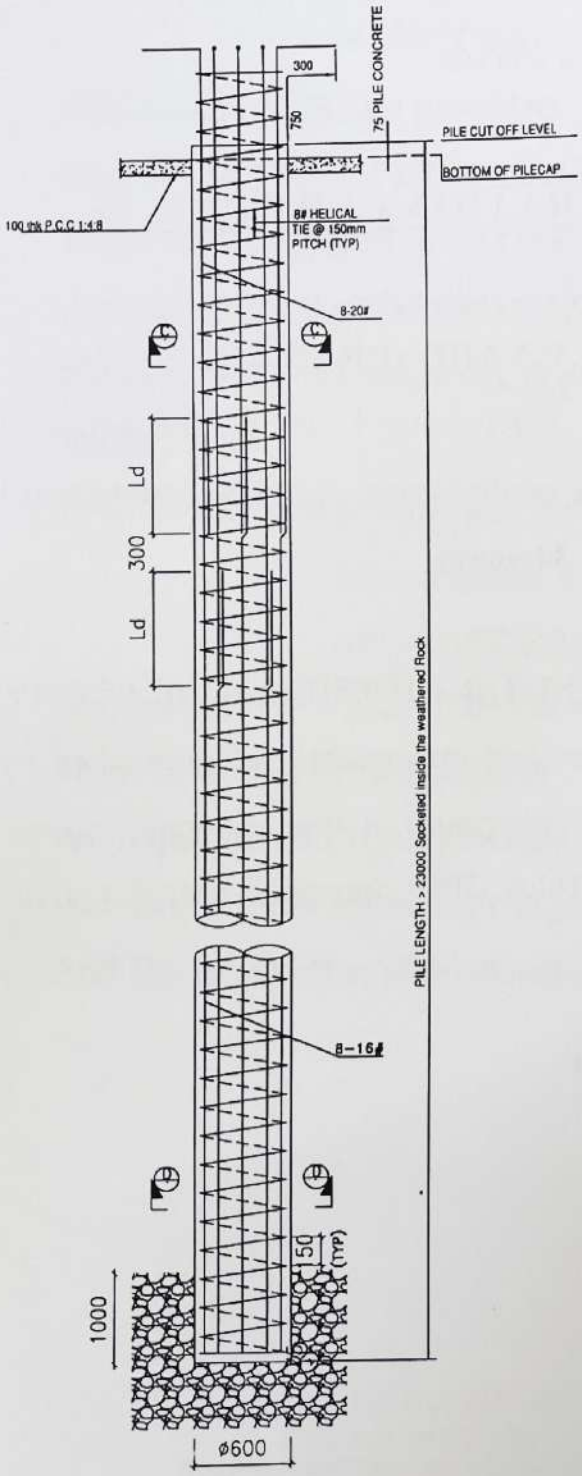
He has been given the Registration No.**SE/GR-I/19/05/116** on 02.05.2019. He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part-V. "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. dated 04.02.2019.

This Registration is valid upto **01.05.2024**.

CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY ★ CHENNAI-600 008 ★

N. MUNIPRASAD
ASSISTANT PLANNER
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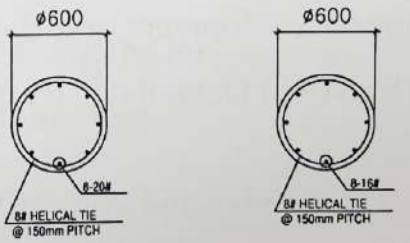


PILE DETAILS P2 PILE

REINF. DETAILS OF 600ø PILE

NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. REFER THE RELEVANT PILE LAYOUT DRAWING FOR PILE CUT OFF LEVEL.
3. THE BORED CAST INSUT PILE SHALL BE TERMINATED @ HARD ROCK MORE THAN 7m FROM PILE CUT OFF LEVEL AND AT N > 100.
4. CLEAR COVER TO MAIN REINFORCEMENT SHALL BE 50mm.
5. GRADE OF CONCRETE SHALL BE M30 – Fe500
6. MAIN REINFORCEMENT SHALL BE HYSD BARS CONFORMING TO IS:1786, HELICAL TIE SHALL BE MILD STEEL BARS CONFORMING TO IS:432.
7. 12ϕ INNER RINGS SHALL BE PROVIDED IN 450ø PILE @ 2m SPACING ALONG THE LENGTH OF THE PILE FOR CAGE STABILITY. THESE BARS SHALL BE HYSD BARS CONFORMING TO IS:1786.
8. ALL LAPS & INNER RINGS SHALL BE STITCH WELDED



SECTION C (SCALE 1:20)

SECTION D (SCALE 1:20)

IMPORTANT NOTE:
LOCATION OF PILE TO BE CHECK WITH DWG BEFORE EXECUTION
DMC METHOD (DIRECT MUD CIRCULATION METHOD) SHALL BE FOLLOWED
TREMIE PIPE SHALL BE USED FOR POURING CONCRETING.
IT IS BEEN ADVISED TO USE CASING PIPE FOR CASTING PILE PRIOR TO BEGINNING OF CONCRETING USING TREMIE-PIPE, THE PILE BORE SHALL BE FLUSHED CLEAN, UNTIL NO SOIL PARTICLES COME OUT OF THE PILE BORE FROM THE DRILLING MUD BEING CIRCULATED.
THE PILE BORE CAN BE TERMINATED AT A DEPTH OF UP TO WEATHERED ROCK BY SOCKETING IT INSIDE THE ROCK WHERE AN EQUIVALENT SPT VALUE OF AT LEAST 150 IS OBTAINED. CORRELATIONS DEVELOPED BETWEEN DROPPING OF THE CHISEL AND THE SPT VALUE SHOW THAT CHISELING MAY BE TERMINATED AT A DEPTH WHERE 100 BLOWS OF DROP OF 1 TONNE CHISEL WITH 1.2 M HEIGHT OF FALL DOES NOT CAUSE A PENETRATION OF MORE THAN 150 MM. IF THE CHISEL WEIGHT OR HEIGHT OF DROP IS DIFFERENT AN EQUIVALENT ENERGY CRITERION MAY BE ADOPTED

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NOTES:-

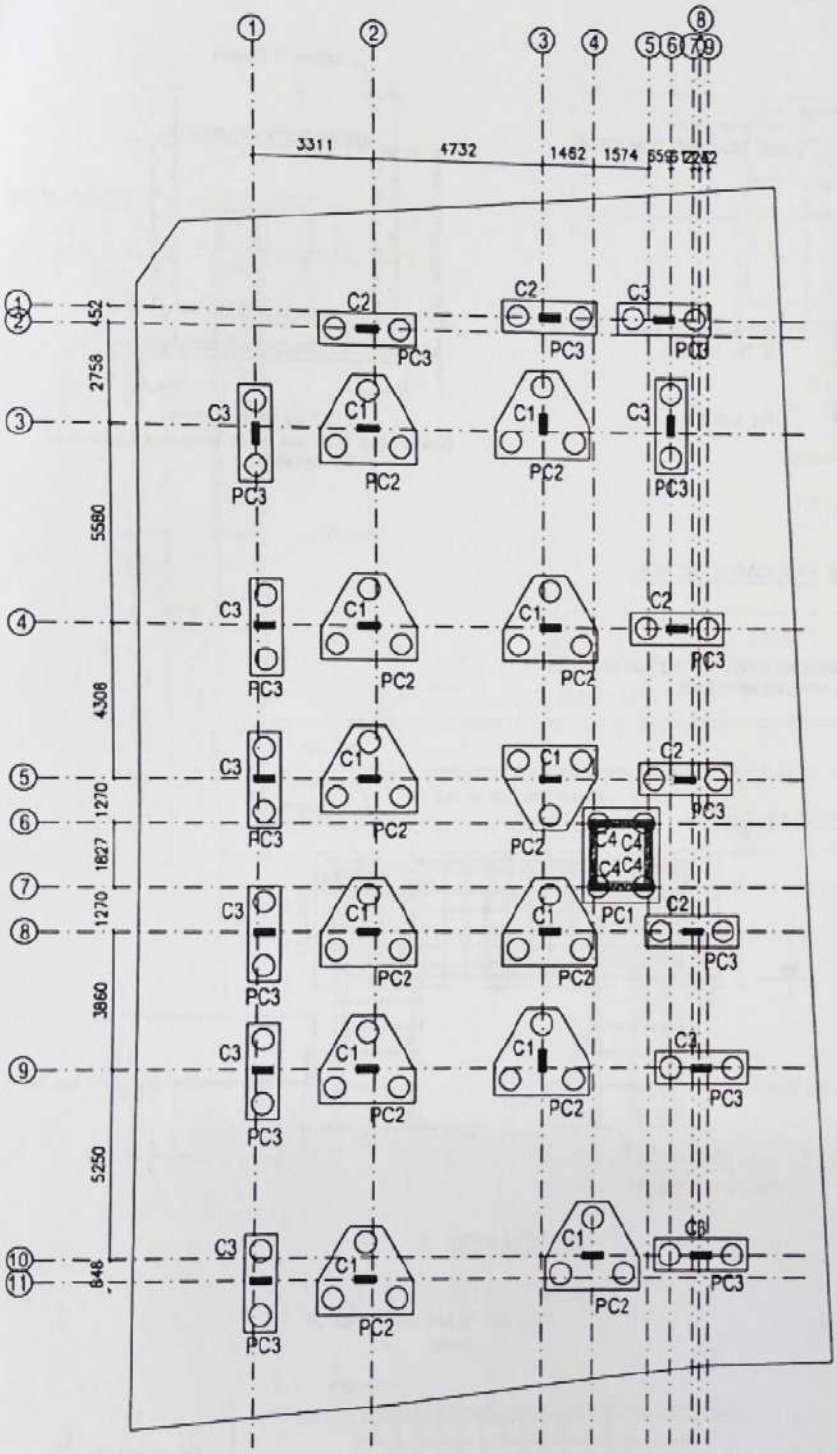
1. All dimensions are in mm.
2. Dimensions to be read, not scaled, and to be Checked with arch. dwg only.
3. Clear cover to the main reinf. as follows

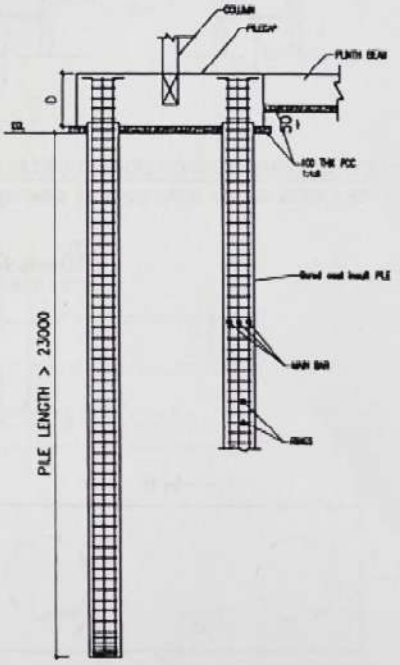
a) Pile cap 75mm c) Col 25mm for 12mm bars & 40mm for >12mm

b) Pile 50mm

4. Depth of pile > 23 mt Socketed inside the Weathered Rock From NGL.
5. No. of piles to be tested 1%
6. For Any Mis refer arch dwg only.
7. Use M30 Conc & Fe500 for pile & pile cap
8. Leave dowels wherever necessary.
9. Grid Dimension and number refer arch dwg only
10. 12ϕ inner rings shall be provided in pile @ 1m spacing along the length of the pile for cage stability. these bars shall be fe500 bars confirming to IS:1786.
11. All laps shall be 50dia.

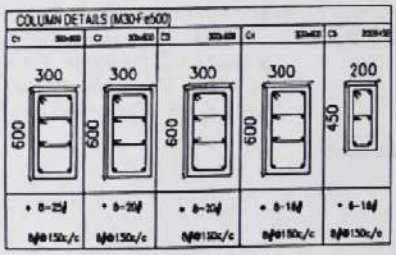
PILE TO BE PROJECTED 50MM INSIDE THE PILE CAP





TYP SECTION OF A PILE & PILE CAP

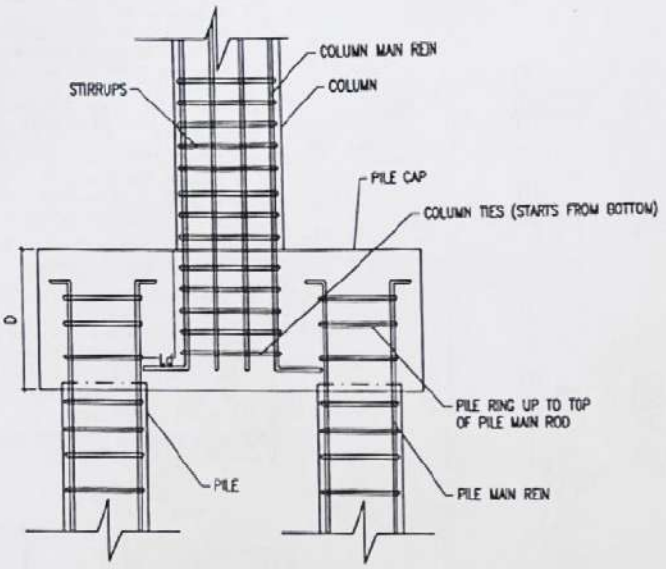
COLUMN DETAILS (M30-Fe500)

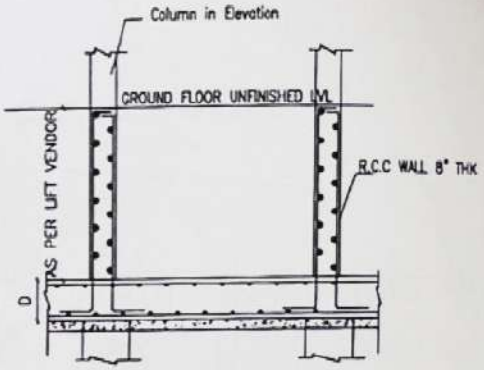


SCHEDULE OF PILE CAP-(M30-Fe500)

PILE CAP MARK	D	BOTTOM R/F	TOP R/F	STIRRUPS	BINDERS
PC1	30"	12ϕ@6"c/c(B/W)	12ϕ@6"c/c(B/W)	-	12ϕ@6"c/c
PC2	30"	16ϕ@6"c/c(B/W)	16ϕ@6"c/c(B/W)	-	12ϕ@6"c/c
PC3	30"	8-16ϕ	8-16ϕ	4-12ϕ@6"c/c	12ϕ@6"c/c

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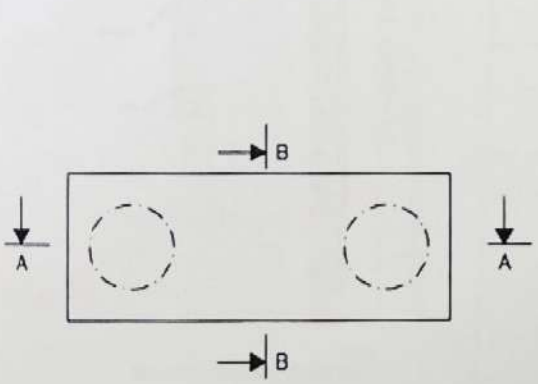


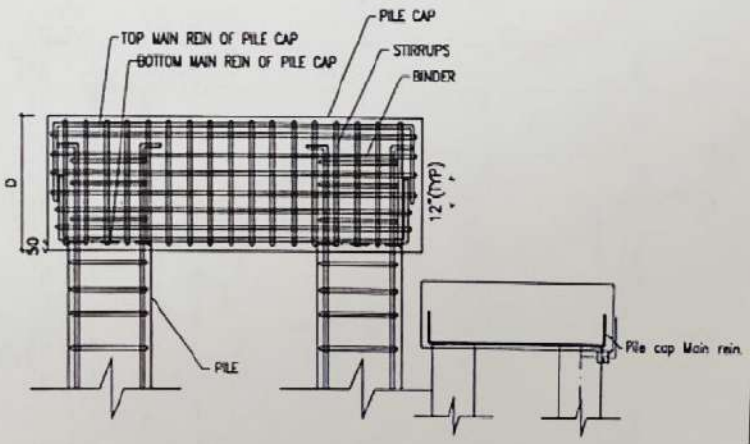
LIFT PART SECTION
(water proofing to be done as per Manufacture Specification)
CA DRAWING NTS

TYP COLUMN REINFORCEMENT DETAILS @ PILE CAP JUNCTION

TOP / BOTTOM MAIN REIN OF PILE CAP IS NOT SHOWN HERE

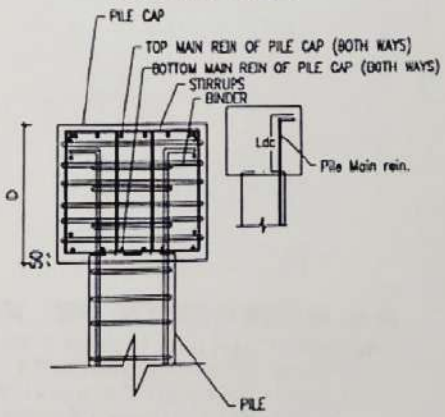
NOTE:
1.) DRAWING SHOWN HERE IS FOR TYP PILE CAP ONLY AND IT IS A GENERAL ARRANGEMENT DWG.

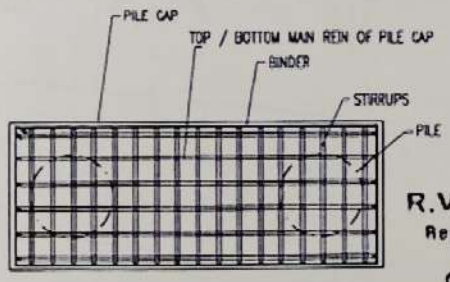




TWO PILE GROUP

SECTION VIEW - A



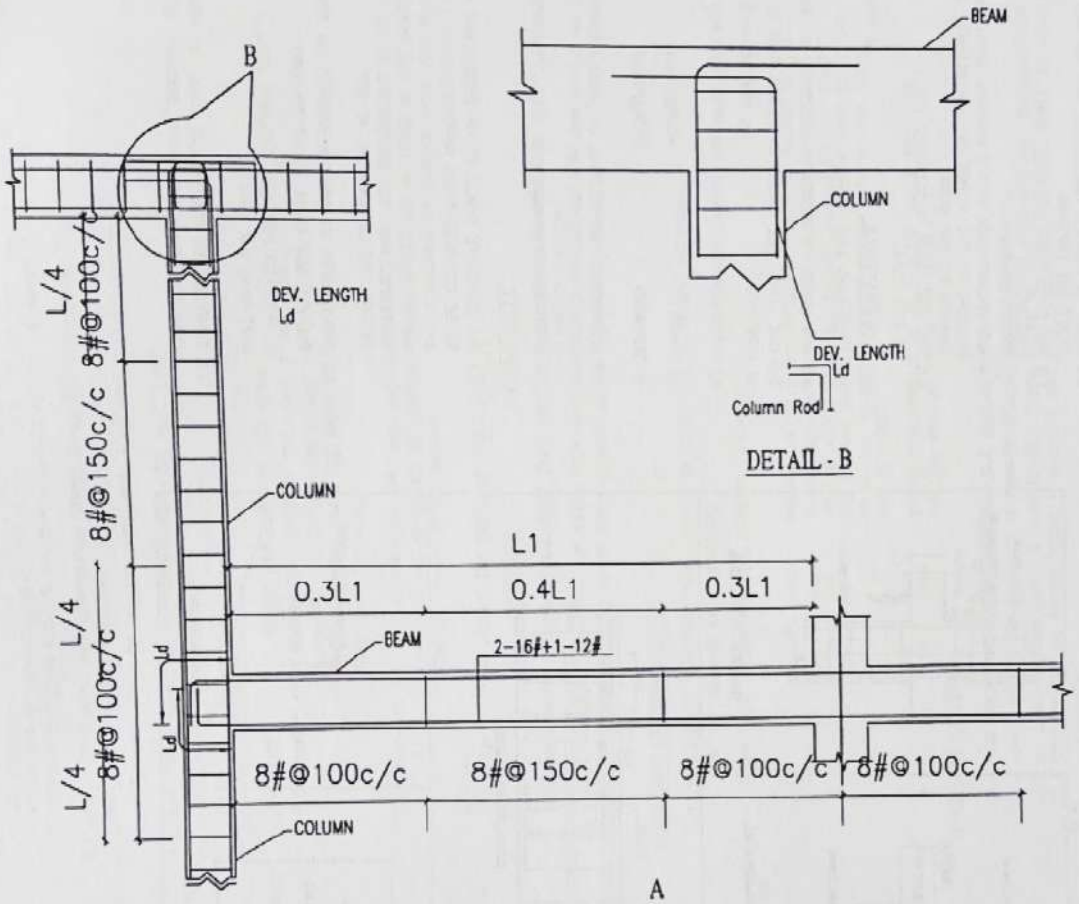


TOP / BOTTOM VIEW OF TWO PILE GROUP

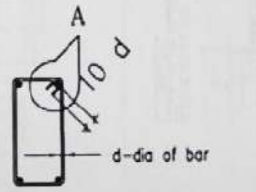
SECTION VIEW - B

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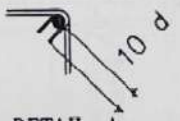
GENERAL ARRANGEMENT DWG.



DETAIL - B



CLOSED STIRRUPS / TIES
FOR BEAM & COLUMN

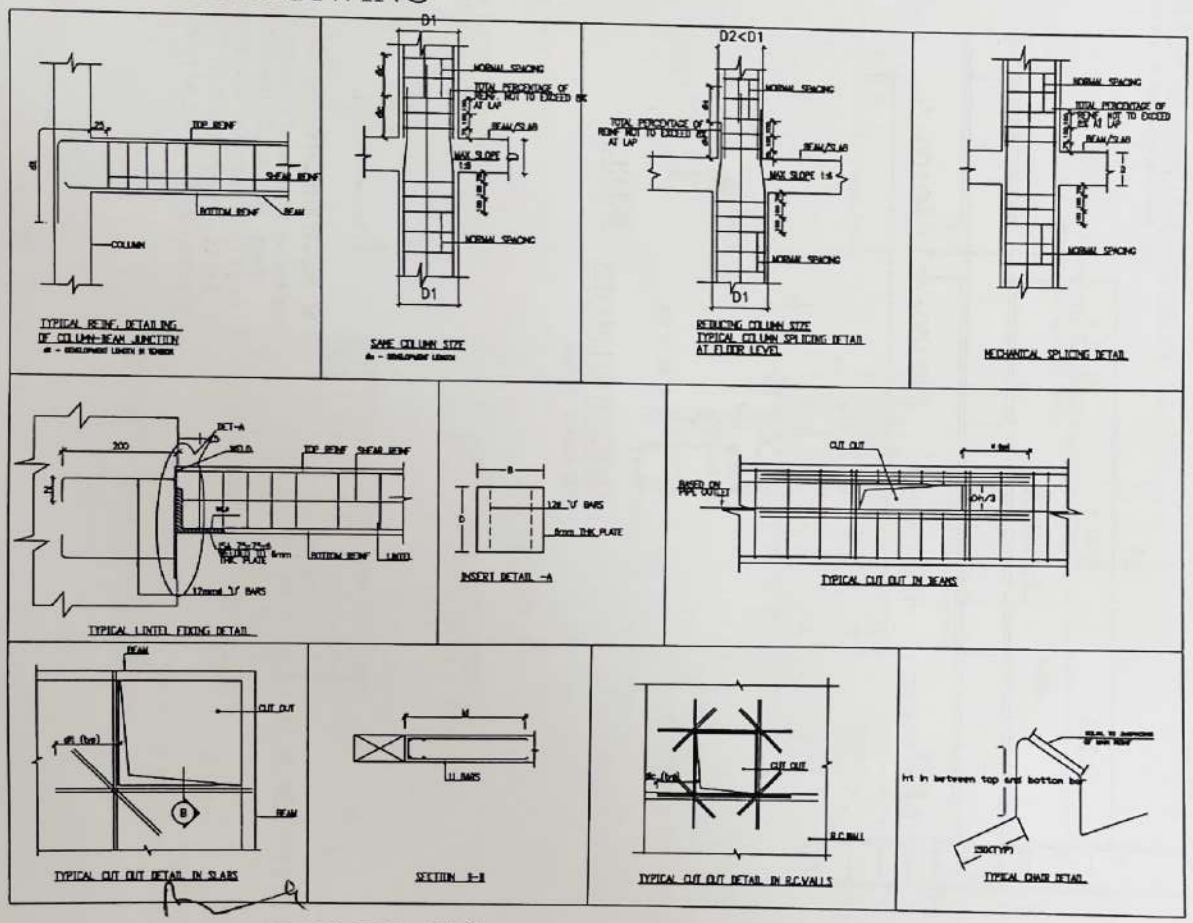


DETAIL - A

SEISMIC DETAILING

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GENERAL DRAWING



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GENERAL DETAILS

GENERAL NOTES

1. GENERAL

1.1 ALL DIMENSIONS ARE IN MM.

1.2 WORK TO FIGURED DIMENSIONS AND DO NOT SCALE THE DRAWING.

1.3 ALL STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH RELEVANT ARCHITECTURAL AND SERVICE DRAWINGS.

1.4 ANY DISCREPANCY IN THE DRAWING SHALL BE BROUGHT TO THE NOTICE OF CONSULTANTS BEFORE COMMENCING THE WORK.

1.5 THE STRUCTURE IS DESIGNED FOR :
AS PER PLAN

2. DESIGN CRITERIA — AS PER ARCHI. DRGS.

2.0 STANDARDS AND LOADS.

2.1 THE CONCRETE DESIGN IS BASED ON IS: 456–2000.

2.2 LIVE LOADS ARE BASED ON IS:875 PART II:

a) GENERATORS : AS PER ACTUALS

b) LIVE,ELECTRICAL PANNEL EQIPMENT: 300 Kg/Sq.m

c) STAIRS : 400Kg/Sq.m

d) TERRACES : 200Kg/Sq.m

2.3 SHUTTERING FOR FOOTING BY STEEL/PLYWOOD SHEETING.
SHUTTERING FOR COLUMN AND BEAMS BY STEEL/ PLYWOOD SHEETING.
SHUTTERING FOR SLABS BY STEEL/PLYWOOD SHEETING.

3. CONCRETE

3.1 ALL CONCRETE SHALL BE OF DESIGN MIX AND ARE TO BE OBTAINED FROM REPUTEDTESTING LABORATORIES AND APPROVED BY CONSULTANTS, THE MATERIALS THAT ARE PROPOSED TO BE USED IN THE PROJECT SHALL BE TESTED AND TEST CERTIFICATE TO BE FURNISHED BEFORE USE OF MATERIAL AT SITE.

3.2 IRRESPECTIVE OF WHAT MENTIONED ON DRAWING THE PCC MIX SHALL BE AS FOLLOWS.

I). PCC FOR PILE CAP / PLINTH BEAM / RAFT SLAB MIX 1:4:8

3.3 CANTILEVERED SLAB/BEAMS SHALL BE PROPPED TILL COUNTER BALANCING WEIGHT BECOMES EFFECTIVE.

4 REINFORCING STEEL/DEVELOPMENT AND ANCHORAGE LENGTHS

4.1 ALL REINFORCEMENT STEEL SHALL CONFORM TO IS:1786 –1985 HIGH STRENGTH DEFORMED STEEL BARS,PRODUCED BY THE THERMO–MECHANICAL TREATMENT PROCESS, OF GRADE Fe500, HAVING ELONGATION MORE THAN 14.5% CAN BE USED

4.4 COUPLER CAN BE PROVIDED INSTEAD OF LAPPING.

Developed Length & Anchorage length

FOR Fe500 in mm	BAR IN TENSION	BAR IN COMPRESSION
10	485	388
12	583	466
16	777	621
20	971	777
25	1214	971

5. SOIL DATA & WATER TABLE

5.1 FOOTING CARRYING CAPACITY IS BASED ON SOIL REPORT.
5.2 MINIMUM DEPTH OF EXCAVATION SHALL BE AS INDICATED IN DRAWINGS.
5.3 FOR LIME SAND COMPACTION FILLING REFER ARCH DWG.
5.4 GROUND WATER LVL AS PER SOIL REPORT.

6. CONCRETE CLEAR COVER TO MAIN REINFORCEMENT

6.1 CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH 75MM.

6.2

PILE ---	50MM (BOTTOM), 50MM (SIDES)
PILE CAP	75MM (BOTTOM), 75MM (TOP)
FOOTING	50MM (BOTTOM & SIDES)
LINTELS	20MM
BEAMS	30MM
COLUMNS	40MM >12ϕRod & 25MM≤12ϕRod
SLABS	20MM
RCC WALLS	40MM ON EARTH SIDE/WATER SIDE
	20MM ON ATMOSPHERE SIDE

6.3 COVER BLOCKS SHALL BE USED TO GIVE CORRECT COVER TO REINFORCEMENT.

7. WATER PROOFING

7.1 WATER PROOFING SHALL BE DONE FOR : SUMP TANKS, OVERHEAD TANK, TOILET SLABS, TERRACE, LIFT RCC WALL, AS PER STANDARD SPECIFICATIONS.

8. CURING

8.1 CURING BY WATER SHALL BE DONE FOR ALL RCC STRUCTURE FOR A MINIMUM PERIOD OF 10 DAYS FOR OPC AND 12 DAYS FOR PPC CONCRETE.

9. DESHUTTERING TIME

9.1

TYPE OF FORM WORK FOR :	MINIMUM PERIOD BEFORE STRIKING (EXCLUDING THE DAY OF CASTING)
a. SLABS	14 DAYS
b. BEAMS UPTO 6.0M	14 DAYS
OVER 6.0M	21 DAYS
c. WALL/COLUMN VERTICAL FACES	1 DAY

9.2 SHUTTERING CAN BE RELEASED EARLIER THAN SPECIFIED ABOVE PROVIDED THE PROPS ARE RETAINED AT REASONABLE SPACINGS AND CONCRETE ATTAINS THE FULL STRENGTH AT THE TIME OF DESHUTTERING AS PER IS 456 – 2000. DESHUTTERING SHALL BE DONE BY PROVIDING DAMPENING MATERIAL BELOW IN ORDER TO REDUCE THE IMPACT AT THE LOWER LEVEL.

9.3 SIMPLY SUPPORTED AND CONTINUOUS SPANS SHALL BE DESHUTTERED FROM MID SPAN TOWARDS SUPPORTS.

CANTILEVERS SHALL BE DESHUTTERED FROM FREE END TOWARDS SUPPORTS

9.4 SLAB/BEAMS SHALL BE REPROPPED UNTIL THE NEXT LEVEL SLAB IS CAST AND DESHUTTERED.

10. CONSTRUCTION JOINTS

10.1 SLABS : AT MIDDLE ONE THIRD OF THE SPAN.

10.2 BEAMS : AT MIDDLE ONE THIRD OF THE SPAN. IF ANY CROSS BEAMS ARE LOCATED IN THIS REGION THE JOINT SHALL BE LOCATED TWO TIMES THE WIDTH OF THE BEAM AWAY FROM THE BEAM.

10.3 RETAINING WALL : AT THE JUNCTION OF THE WALL AND FOOTING WITH A KEY JOINT AND AT MIDDLE OF VERTICAL SPAN, VERTICAL JOINTS TO BE AVOIDED.

10.4 RAFT SLAB : AT MIDDLE ONE THIRD OF THE SPAN.

10.5 CANTILEVERS : CONSTRUCTION JOINT SHALL NOT BE PROVIDED IN CANTILEVERS.

10.6 AT CONSTRUCTION JOINTS OF WATER RETAINING STRUCTURES AND BASEMENTS: PRE FORMED PLASTIC WATER STOP (SYNKOFLEX OR EQUIVALENT) SHALL BE PROVIDED.

11. SLUMP OF CONCRETE

11.1 SLUMP OF CONCRETE SHALL RANGE BETWEEN 100 TO 180MM DEPENDING ON THE MANNER OF CONCRETING.

THE TABLE BELOW GIVE THE GENERAL GUIDANCE:

PILING	SLUMP(in mm) Min.	Max.	
A	100	180	POURING IN TO WATER–FREE UNLINED BORE HAVING WIDELY SPACED REINFORCEMENT. WHERE REINFORCEMENT IS NOT SPACED WIDELY ENOUGH, CUT–OFF LVL OF PILE IS WITHIN THE CASTING AND DIAMETER OF PILE IS LESS THAN OR EQUAL TO 600MM, HIGHER ORDER OF SLUMP WITH IN THIS RANGE MAY BE USED.
B	150	180	WHERE CONCRETE IS TO BE PLACED UNDER WATER OR DRILLING MUD BY TREMIE OR BY PLACER.

12. MISCELLANEOUS

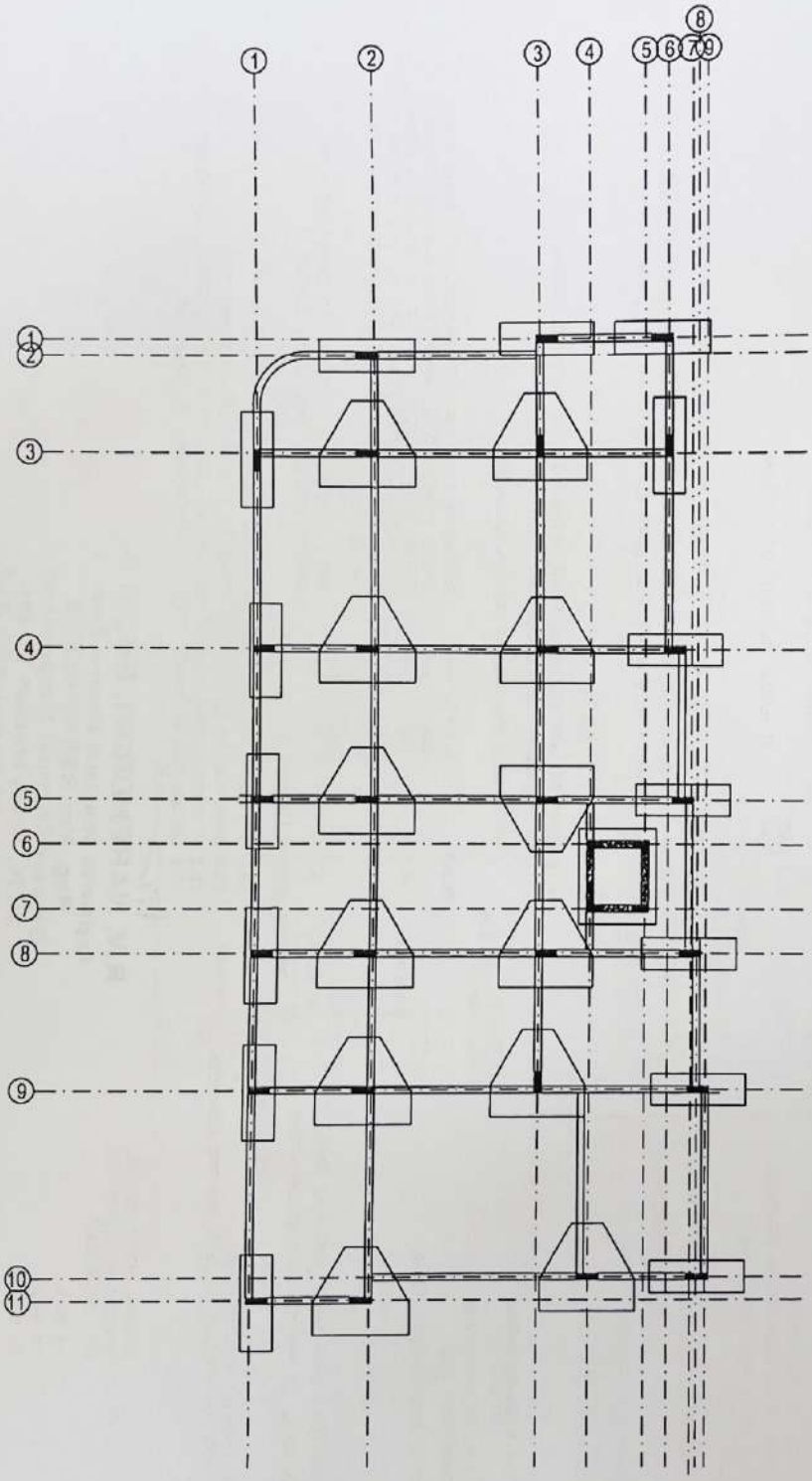
12.1 ROD EQUAL AND ABOVE 20mm DOUBLE BINDING TO BE DONE.
12.2 CHAIR ROD TO BE PROVIDED AT PROPER SPACING NOT MORE THAN 3'0".
12.3 AT CONSTRUCTION JOINTS A COAT OF SBR–LATEX TO BE APPLIED BEFORE CONCRETING
12.4 COLUMN CAN BE RAISED AFTER 1 COMPLETE DAY FOR CONCRETING.

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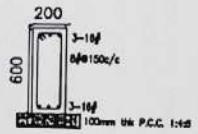
NOTES:-

1. All dimensions are in mm.
2. Dimensions to be read, not scaled, and to be Checked with arch. dwg only.
3. Clear cover to the main reinf. as follows
   a) Pile cap 75mm c) Col 25mm for 12mm bars & 40mm for >12mm
   b) Pile 50mm
4. Depth of pile > 23 mt Socketed inside the Weathered Rock From NGL.
5. No. of piles to be tested 1%
6. For Any Ivis refer arch dwg only.
7. Use M30 Conc & Fe500 for pile & pile cap
8. Leave dowels wherever necessary.
9. Grid Dimension and number refer arch dwg only
10. 12ϕ inner rings shall be provided in pile @ 1m spacing along the length of the pile for cage stability. these bars shall be fe500 bars confirming to IS:1786.
11. All laps shall be 50dia.

PILE TO BE PROJECTED 50MM INSIDE THE PILE CAP



PLINTH BEAM LAYOUT

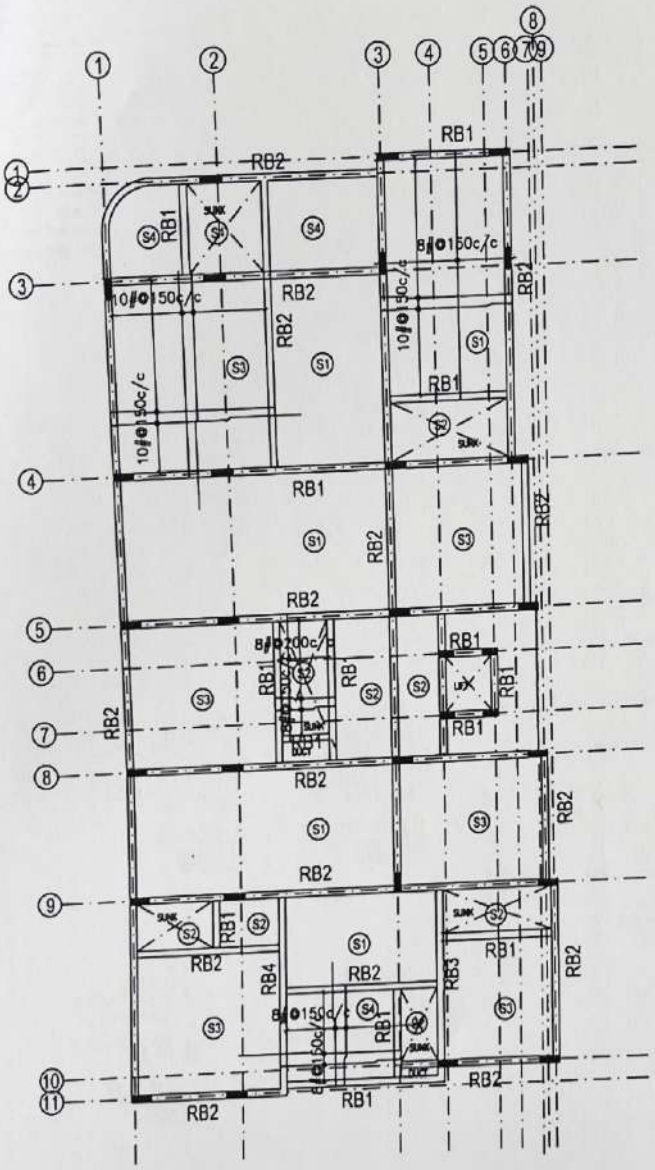


C.S OF PLINTH BEAM
200x600
(USE M30-Fe500)

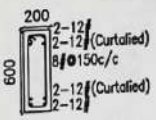
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NOTES

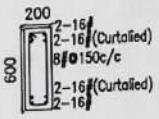
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2. Dimensions to be read, not scaled. Check in arch. drg
3. Clear cover to the main rebf. as follows
   a) Col 25mm for 12mm bars & 40mm for >12mm
   b) Slab 20mm
   c) Beams 30mm
4. Use M30 Conc & Fe500 unless specified otherwise.
5. Slab thickness 150mm unless specified otherwise.
6. Crank length 0.3L of span.
7. Top rod extn. 0.3L of span.
8. Sunk the slab as per arch drg.
9. Roof Levels refer to Arch. Drg.
10. Leave dowels/Sleeves wherever necessary.



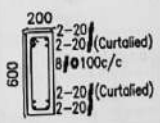
TYP ROOF DETAILS



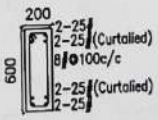
C.S OF RB1
200x600



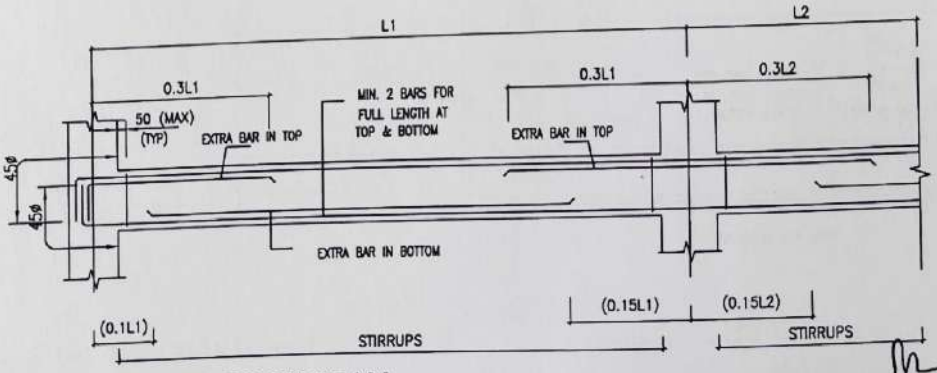
C.S OF RB2
200x600



C.S OF RB3
200x600



C.S OF RB4
200x600

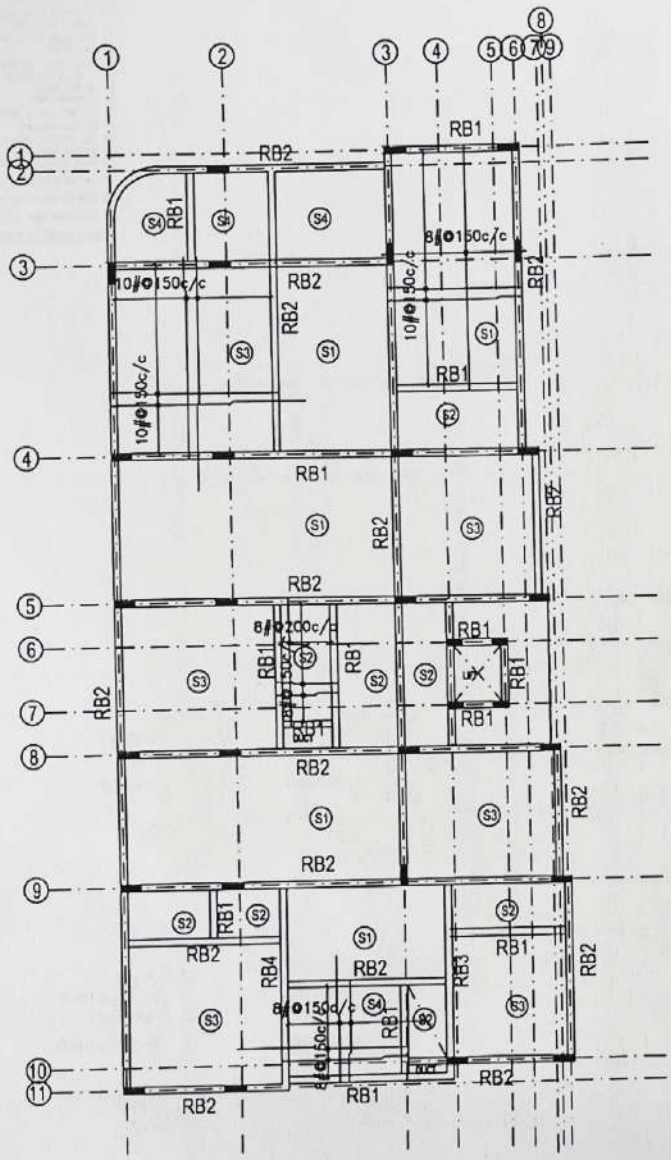


TYP.L/S OF ROOF BEAM

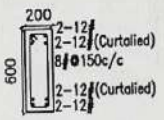
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NOTES

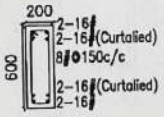
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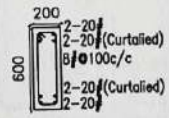
FINAL ROOF DETAILS



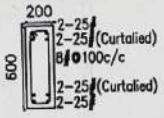
C.S OF RB1
200x600



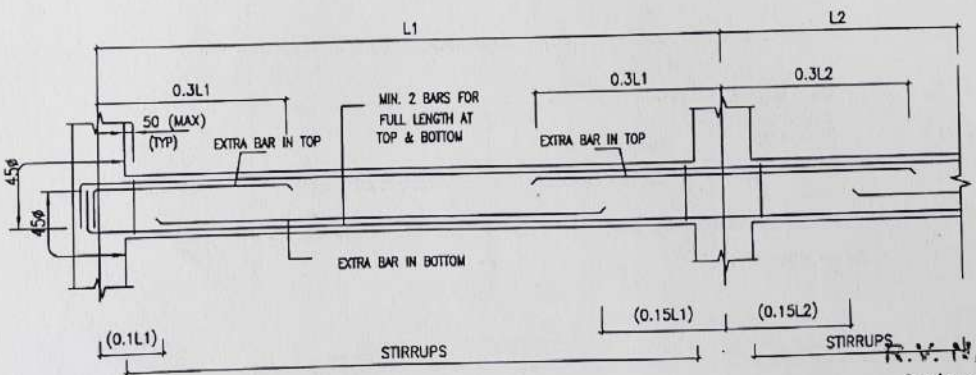
C.S OF RB2
200x600



C.S OF RB3
200x600



C.S OF RB4
200x600



TYP.L/S OF ROOF BEAM

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