

HARMONY RESIDENCES PVT. LTD.

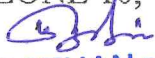
DESIGN CALCULATION

FOR

RESIDENTIAL BUILDING

STILT + 5 FLOORS 15 DWELLING UNITS IN SINGLE BLOCK

AT NEW NO. 12, OLD NO. 179, RANGARAJAPURAM MAIN ROAD, KODAMBAKKAM, CHENNAI – 600 024 COMPRISED IN T. S. NO. 66, BLOCK 37, PULIYUR VILLAGE, EGMORE TALUK, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION, DIVISION 134, NEW DIVISION NO. N132, ZONE 10, TAMILNADU.


M. PUNITHAN B.Sc., M.I.E.

Registered Structural Engineer Grade-II
CMDA Reg. No. SE/GR 11/19/04/044

Renewed 10-04-2024. Valid upto 09-04-2029

52/141, Flat C2, PJM Apartments, East Vanniar Street,
West K.K. Nagar, Chennai-600 078.

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COLUMN A1


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COLUMN N4

No. of floors	=	1	+	5	=	6
Foundation depth	=	1.8	m			
Ground to floor level	=	1	m			
GFloor to floor height	=	3.00	m			
FFloor to floor height	=	3.00	m			
Thickness of slab assumed	=	0.125	m			
Slab loading t/ sqm	=	0.623	t			
Breadth of beams	=	0.23	m			
Depth of beams assumed	=	0.413	m			
Parapet wall height	=	1	m			
Plinth beams assumed	=	0.413	m			
Total height of wall	=	16.77	m			
Total height of column	=	21.8	m			
Size of column	=	0.45	x	0.3	m	

Total load:

Due to slab	=	6	x	3.43	x	4.823	x	0.623	=	61.78	t
Wall	=	2	x	0.23	x	8.253	x	16.77	=	63.68	t
Roof beams	=	2.5	x	0.23	x	0.288	x	0.413	x	6	= 0.409 t
Plinth beam	=	2.5	x	0.23	x	0.413	x	0.413	x	1	= 0.098 t
Self wt	=	2.5	x	0.45	x	0.3	x	21.8	=	7.358	t

133.3 tTotal = 133.3 t

Using size of column to be = 450 X 300 mm

With 8/20 + 4/12 Rods, Ast = 8 x 314 + 3 x 113 = 2851 sqmm

Capacity of column = 450 x 300 x 6 + 2851 x 190

= 135.2 t > 200 t

Minimum Reinforcement = 0.008 x 45 x 30 = 10.8 sqcm < 28.51 sqcm

% of Reinforcement = 2851 / 45 x 30 = 2.112 < 4


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COLUMN N4

No. of floors	=	1	+	5	=	6
Foundation depth	=	1.8	m			
Ground to floor level	=	1	m			
GFloor to floor height	=	3.00	m			
FFloor to floor height	=	3.00	m			
Thickness of slab assumed	=	0.125	m			
Slab loading t/ sqm	=	0.623	t			
Breadth of beams	=	0.23	m			
Depth of beams assumed	=	0.314	m			
Parapet wall height	=	1	m			
Plinth beams assumed	=	0.243	m			
Total height of wall	=	17.36	m			
Total height of column	=	21.8	m			
Size of column	=	0.45	x	0.23	m	

Total load:

Due to slab	=	6	x	3.43	x	2.855	x	0.623	=	36.58	t
Wall	=	2	x	0.23	x	4.858	x	17.36	=	38.8	t
Roof beams	=	2.5	x	0.2	x	0.189	x	0.243	x	6	= 0.138 t
Plinth beam	=	2.5	x	0.2	x	0.243	x	0.243	x	1	= 0.029 t
Self wt	=	2.5	x	0.45	x	0.23	x	21.8	=	5.641	t
										<u>81.18</u>	t
										<u>81.18</u>	t

Total

= 81.18 t

Using size of column to be
With 10/32 Rods, Ast

=	450	X	230	mm
=	8	x	314	+ 3 x 113 = 2851 sqmm

D

Capacity of column	=	450	x	230	x	6	+ 2851	x	190
	=	116.3	t	>	122	t			

Minimum Reinforcement	=	0.008	x	45	x	23	=	8.28	sqcm	<	28.51	sqcm
% of Reinforcement	=	2851	/	45	x	23	=	2.755	<	4		


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Design of sections

Piles

Using M30 concrete and TMT bars 500 grade

$$\sigma_{ac} \text{ in concrete} = 81.6 \text{ kg/sq-cm}$$

$$\sigma_{bc} \text{ in concrete} = 102 \text{ kg/sq-cm}$$

$$\sigma_{ac} \text{ in steel} = 1938 \text{ kg/sq-cm}$$

$$\text{Vertical load, } V (t) = 220 / 2 = 110$$

I. For 500 dia. pile with end bearing

$$\begin{aligned} \text{a) Safe bearing capacity of pile (t)} &= 3.142 \times 0.5 \times 0.5 \times 750 / 4 \\ &= 147.3 \end{aligned}$$

$$\begin{aligned} \text{b) Bearing load / sq-m.} &= 110 / 0.785 \\ &= 140 < 147.3 \text{ o.k} \end{aligned}$$

$$\begin{aligned} \text{c) } V / bc \text{ d d} &= 110 \times 1500 / 250000 \times 30 \\ &= 0.022 \end{aligned}$$

$$\begin{aligned} \text{d) } V_e / bc \text{ d d d} &= 0 \times 1500 / 1.25E+08 \times 30 \\ &= 0.000 \end{aligned}$$

$$\text{Using 16 dia HSD rods } d/D = 83 / 450 = 0.184$$

Using chart 57 & 58 of SP:16-1980

$$\begin{aligned} \text{e) } A_s \text{ required (sq-cm.)} &= 0 \times 3.142 \times 450 \times 450 \times 30 / 400 \\ &= 0.0 \end{aligned}$$

$$\begin{aligned} \text{Min area of reinforcement} &= 0.004 \times 3.142 \times 45 \times 45 / 4 \\ &= 6.362 \text{ sq-cm} \end{aligned}$$

$$\begin{aligned} \text{Use 6/16 dia. HSD rods} &= 6 \times 2.011 \\ &= 12.06 \text{ sq-cm} > 6.36 \text{ sq-cm} \end{aligned}$$



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Pile cap

$$\begin{aligned}\text{Column size} &= 300 \times 450 \\ \text{Pedestal size} &= 650 \times 1775 \\ \text{Area of pedestal} &= 65 \times 177.5 = 11537.5 \text{ sq-cm} \\ \text{Actual stress} &= 110 \times 1500 / 11537.5 \\ &= 14.3 \text{ kg/sq-cm} \\ \text{Permissible stress} &= 0.45 \times 300 / 11537.5 \times 1350 \\ &= 135 \times 2.923 = 395 \text{ kg/sq-cm}\end{aligned}$$

So use plain concrete pedestal of 30cm all around

Coinciding the critical section for shear with outersurface of the pile in each direction

$$\begin{aligned}0.5 / 2 + 0.225 + d/2 &= 0.63 + 0.25 \\ 0.475 + d/2 &= 0.875 \\ d/2 &= 0.875 - 0.475 = 0.4 \\ d &= 0.8 \\ \text{Provide } d &= 0.715 \\ D &= 0.8 \\ \text{BM} &= 1 \times 110 (0.75 - 0.3) \\ &= 49.5 \text{ m-t} \\ \text{Mu/bd}^2 &= 49.5 \times 1.5 \times 100000 / (225.0 \times 71.5 \times 71.5 \times 300) \\ &= 0.022 \times 30 = 0.65 \\ \text{Area of steel required} &= 0.09 \times 225.0 \times 71.5 / 100 \\ &= 14.8 \text{ sq-cm} \\ \text{Min steel required} &= 0.0012 \times 90 \times 225 \\ &= 24.3 \text{ sq-cm} \\ \text{Use 20dia. HSD bars At 100} &= 10 \times 3.14 = 31.40\end{aligned}$$

Shear

$$\begin{aligned}\text{Critical section for shear} &= 250 + 300 + 357.5 = 907.5 \text{ mm} \\ \text{The pile outer edge} &= 625 + 250 = 875 < 907.5\end{aligned}$$

So shear reinforcement is not provided

For top of pile cap and pedestal use nominal Reinforcement
Use 16 dia. At 200 crs


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DESIGN OF PLINTH BEAM

Span considered	=	5.525 m							
Assuming beam size to be		230 x	450	mm					
Load /m :									
Self wt. of beam	=	2.5 x	0.23	x	0.45	=	0.26 t		
Wall	=	2.0 x	0.23	x	2.400	=	1.10 t		
							<u>1.36 t</u>		
Effective Depth of beam	=	450	-	25	-	8	=	417	mm
Design negative B.M	=	1.36 x	5.525	x	5.525	x	0.100	=	4.16 t-m
Mu/ fck bdd	=	<u>4.16 x</u>	<u>1.5</u>	<u>x</u>	<u>100000</u>			=	0.062
		250 x	23	x	41.70	x	41.70		
Ast required	=	<u>0.0905 x</u>	<u>250</u>	<u>x</u>	<u>23.00</u>	<u>x</u>	<u>41.70</u>	=	4.34 sqcm
			5000						
Use 2/12 + 2/16 dia hsd rods,			Ast	=	8.54 sqcm		>	4.34 sqcm	
Design Positive B.M	=	1.36 x	5.525	x	5.525	x	0.08333	=	3.47 t-m
Mu/ fck bdd	=	<u>3.47 x</u>	<u>1.5</u>	<u>x</u>	<u>100000</u>			=	0.052
		250 x	23	x	41.70	x	41.70		
Ast required	=	<u>0.0754 x</u>	<u>250</u>	<u>x</u>	<u>23.00</u>	<u>x</u>	<u>41.70</u>	=	4.30 sqcm
			4200						
Use 2/12 + 2/16 dia hsd rods,			Ast	=	6.28 sqcm		>	4.30 sqcm	
Shear force	=	1.36 x	1.000	/	1.00	=	1.36	t	
Shear stress	=	1.36 x	1.00	x	10000	/	230	x	417 = 0.14 N/sqmm
100As/ bd	=	100 x	8.54	/	23.00	x	41.70	=	0.89
Permissible shear stress	=	0.44 N/sqmm		<	0.14 N/sqmm				
Unbalanced shear stress	=	0.14 -	0.442	=	-0.30 N/sqmm				
Unbalanced shear force	=	-0.30 x	230	x	417	/	10000	=	-2.88 t
Using 8 dia TMT 2 legged stirrups at			100	crs					
Shear Capacity	=	0.87 x	415	x	100.48	x	417 /	100 x	10000
	=	15.1 t	>	-3	t				
RESULT :									
Beam section	=	230 X	450	mm					
Use 2/12 + 2/16 dia hsd rods,		at top							
Use 2/12 + 2/16 dia hsd rods,		at bottom							
Using 8 dia TMT 2 legged stirrups at		100 crs							


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DESIGN OF PLINTH BEAM

Span considered	=	8.041 m							
Assuming beam size to be		230 x	450	mm					
Load /m :									
Self wt. of beam	=	2.5 x	0.23	x	0.45	=	0.26 t		
Wall	=	2.0 x	0.23	x	1.500	=	0.69 t		
							0.95 t		

Effective Depth of beam	=	450	-	25	-	8	=	417	mm
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Design negative B.M	=	0.95 x	8.041	x	8.041	x	0.100	=	6.14 t-m
	=	6.14 x	1.5	x	100000			=	0.092
		250 x	23	x	41.70	x	41.70		

Ast required	=	0.1335 x	250	x	23.00	x	41.70	=	6.40 sqcm
			5000						

Use 2/12+4/16 dia hsd rods, **Ast = 10.30 sqcm > 6.40 sqcm**

Design Positive B.M	=	0.95 x	8.041	x	8.041	x	0.08333	=	5.11 t-m
Mu/ fck bdd	=	5.11 x	1.5	x	100000			=	0.077
		250 x	23	x	41.70	x	41.70		

Ast required	=	0.1112 x	250	x	23.00	x	41.70	=	6.35 sqcm
			4200						

Use 2/12+4/16 dia hsd rods, **Ast = 10.30 sqcm > 6.35 sqcm**

Shear force	=	0.95 x	8.041	/	2.00	=	3.81	t	
Shear stress	=	3.81 x	1.50	x	10000	/	230	x	417 = 0.60 N/sqmm
100As/ bd	=	100 x	10.30	/	23.00	x	41.70	=	1.07
Permissible shear stress	=	0.44	N/sqmm	<	0.60	N/sqmm			
Unbalanced shear stress	=	0.60	-	0.442	=	0.15	N/sqmm		
Unbalanced shear force	=	0.15 x	230	x	417	/	10000	=	1.48 t
Using 8 dia TMT 2 legged stirrups at			100	crs					
Shear Capacity	=	0.87 x	415	x	100.48	x	417	/	100 x 10000
	=	15.1 t	>	1	t				

RESULT :

Beam section	=	230 X	450	mm
Use 2/12+4/16 dia hsd rods,		at top		
Use 2/12+4/16 dia hsd rods,		at bottom		
Using 8 dia TMT 2 legged stirrups at		100 crs		


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DESIGN OF PLINTH BEAM

Span considered	=	4.382 m							
Assuming beam size to be		230 x	450	mm					
Load /m :									
Self wt. of beam	=	2.5 x	0.23	x	0.45	=	0.26 t		
Wall	=	2.0 x	0.23	x	3.900	=	1.79 t		
							2.05 t		
Effective Depth of beam	=	450	-	25	-	8	=	417	mm
Design negative B.M	=	2.05 x	4.382	x	4.382	x	0.083	=	3.28 t-m
Mu/ fck bdd	=	3.28 x	1.5	x	100000			=	0.049
		250 x	23	x	41.70	x	41.70		
Ast required	=	0.0714 x	250	x	23.00	x	41.70	=	4.08 sqcm
			4200						
Use 2/12+1/16 dia hsd rods,			Ast	=	4.27 sqcm			>	4.08 sqcm
Design Positive B.M	=	2.05 x	4.382	x	4.382	x	0.08333	=	3.28 t-m
Mu/ fck bdd	=	3.28 x	1.5	x	100000			=	0.049
		250 x	23	x	41.70	x	41.70		
Ast required	=	0.0714 x	250	x	23.00	x	41.70	=	4.08 sqcm
			4200						
Use 2/12+1/16 dia hsd rods,			Ast	=	4.27 sqcm			>	4.08 sqcm
Shear force	=	2.05 x	4.382	/	2.00	=	4.50	t	
Shear stress	=	4.50 x	1.50	x	10000	/	230	x	417 = 0.70 N/sqmm
100As/ bd	=	100 x	4.27	/	23.00	x	41.70	=	0.45
Permissible shear stress	=	0.44 N/sqmm		<	0.70 N/sqmm				
Unbalanced shear stress	=	0.70 -	0.442	=	0.26 N/sqmm				
Unbalanced shear force	=	0.26 x	230	x	417	/	10000	=	2.51 t
Using 8 dia TMT 2 legged stirrups at			150	crs					
Shear Capacity	=	0.87 x	415	x	100.48	x	417	/	150 x 10000
	=	10.1 t	>	3	t				
RESULT :									
Beam section	=	230 X	450	mm					
Use 2/12+1/16 dia hsd rods,			at top						
Use 2/12+1/16 dia hsd rods,			at bottom						
Using 8 dia TMT 2 legged stirrups at			150 crs						


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DESIGN OF ROOF BEAM

Span considered = 5.525 m

Assuming beam size to be 230 x 450 mm 2.76225

Load /m : 7.63003

Self wt. of beam = 2.5 x 0.23 x 0.325 = 0.19 t

Wall = 2.0 x 0.23 x 2.591 = 1.19 t

Slab = 0.71 x 2.40 / 1.000 = 1.71 t

3.09 t

Effective Depth of beam = 450 - 25 - 8 = 417 mm

Breadth of flange = $\frac{3867}{12} + 230 + 3 \times 150$

= 1002 mm

Design negative B.M = 3.09 x 5.525 x 5.525 x 0.100 = 9.43 t-m

Mu/ fck bdd = $\frac{9.43 \times 1.5 \times 100000}{250 \times 23 \times 41.70 \times 41.70}$ = 0.141

Ast required = $\frac{0.2121 \times 250 \times 23.00 \times 41.70}{5000}$ = 10.17 sqcm

Use 6/16 dia hsd rods, Ast = 12.06 sqcm > 10.17 sqcm

Design Positive B.M = 3.09 x 5.525 x 5.525 x 0.1 = 9.43 t-m

Mu/ fck bdd = $\frac{9.43 \times 1.5 \times 100000}{200 \times 100.2263 \times 41.70 \times 41.70}$ = 0.041

Ast required = $\frac{0.0588 \times 200 \times 100.23 \times 41.70}{5000}$ = 9.83 sqcm

Use 6/16 dia hsd rods, Ast = 12.06 sqcm > 9.83 sqcm

Shear force = 3.09 x 5.525 / 2.00 = 8.53 t

Shear stress = $\frac{8.53 \times 1.50 \times 10000}{230 \times 417}$ = 1.33 N/sqmm

100As/ bd = $\frac{100 \times 12.06}{23.00 \times 41.70}$ = 1.26

Permissible shear stress = 0.53 N/sqmm < 1.33 N/sqmm

Unbalanced shear stress = 1.33 - 0.525 = 0.81 N/sqmm

Unbalanced shear force = 0.81 x 230 x 417 / 10000 = 7.76 t

Using 8 dia TMT 2 legged stirrups at

Shear Capacity = $\frac{0.87 \times 500 \times 100.48 \times 417}{150 \times 10000}$

= 12.2 t > 8 t

RESULT :

Beam section = 230 X 450 mm

Use 6/16 dia hsd rods, at top

Use 6/16 dia hsd rods, at bottom

Using 8 dia TMT 2 legged stirrups at 150 crs

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DESIGN OF ROOF BEAM

Span considered = 7.584 m

Assuming beam size to be 230 x 450 mm 3.792069

Load /m : 14.3798

Self wt. of beam = 2.5 x 0.23 x 0.325 = 0.19 t

Wall = 2.0 x 0.23 x 2.591 = 1.19 t

Slab = 0.91 x 2.40 / 1.000 = 2.19 t

3.57 t

Effective Depth of beam = 450 - 25 - 8 = 417 mm

Breadth of flange = $\frac{5309}{12} + 230 + 3 \times 150$

= 1122 mm

Design negative B.M = 3.57 x 7.584 x 7.584 x 0.100 = 20.53 t-m

Mu/ fck bdd = $\frac{10.00 \times 1 \times 100000}{250 \times 23 \times 41.70 \times 41.70}$ = 0.100Ast required = $\frac{0.1450 \times 250 \times 23.00 \times 41.70}{5000}$ = 6.95 sqcm

Use 2/16+4/32 dia hsd rods, Ast = 25.91 sqcm > 6.95 sqcm

Design Positive B.M = 3.57 x 7.584 x 7.584 x 0.1 = 20.53 t-m

Mu/ fck bdd = $\frac{20.53 \times 1.5 \times 100000}{250 \times 112.2408 \times 41.70 \times 41.70}$ = 0.063Ast required = $\frac{0.0915 \times 250 \times 112.24 \times 41.70}{5000}$ = 21.41 sqcm

Use 2/16+4/25 dia hsd rods, Ast = 23.64 sqcm > 21.41 sqcm

Shear force = 3.57 x 7.584 / 2.00 = 13.53 t

Shear stress = $\frac{13.53 \times 1.50 \times 10000}{230 \times 417}$ = 2.12 N/sqmm100As/ bd = $\frac{100 \times 25.91}{23.00 \times 41.70}$ = 2.70

Permissible shear stress = 0.75 N/sqmm < 2.12 N/sqmm

Unbalanced shear stress = 2.12 - 0.75 = 1.37 N/sqmm

Unbalanced shear force = 1.37 x 230 x 417 / 10000 = 13.11 t

Using 8 dia TMT 2 legged stirrups at

Shear Capacity = $\frac{0.87 \times 500 \times 100.48 \times 417}{125 \times 10000}$

= 14.6 t > 13 t

RESULT :

Beam section = 230 X 450 mm

Use 2/16+4/32 dia hsd rods, at top

Use 2/16+4/25 dia hsd rods, at bottom

Using 8 dia TMT 2 legged stirrups at 125 crs

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DESIGN OF ROOF BEAM

Span considered = 4.382 m

Assuming beam size to be 230 x 450 mm 2.19075

Load /m : 4.79939

Self wt. of beam = 2.5 x 0.23 x 0.325 = 0.19 t

Wall = 2.0 x 0.23 x 3.150 = 1.45 t

Slab = 0.91 x 4.19 / 1.000 = 3.82 t

5.46 t

Effective Depth of beam = 450 - 25 - 8 = 417 mm

Breadth of flange = $\frac{3067}{12} + 230 + 3 \times 150$

= 936 mm

Design negative B.M = 5.46 x 4.382 x 4.382 x 0.083 = 8.73 t-m

Mu/ fck bdd = $\frac{8.73 \times 1.5 \times 100000}{250 \times 20 \times 41.70 \times 41.70} = 0.151$ Ast required = $\frac{0.2260 \times 250 \times 20.00 \times 41.70}{5000} = 9.42 \text{ sqcm}$

Use 2/25 + 6/32 dia hsd rods, Ast = 58.04 sqcm > 9.42 sqcm

Design Positive B.M = 5.46 x 4.382 x 4.382 x 0.1 = 10.48 t-m

Mu/ fck bdd = $\frac{10.48 \times 1.5 \times 100000}{250 \times 93.55875 \times 41.70 \times 41.70} = 0.039$ Ast required = $\frac{0.0560 \times 250 \times 93.56 \times 41.70}{4200} = 13.02 \text{ sqcm}$

Use 2/25 + 6/32 dia hsd rods, Ast = 58.04 sqcm > 13.02 sqcm

Shear force = 5.46 x 4.382 / 2.00 = 11.96 t

Shear stress = 11.96 x 1.50 x 10000 / 230 x 417 = 1.87 N/sqmm

100As/ bd = 100 x 58.04 / 23.00 x 41.70 = 6.05

Permissible shear stress = 0.53 N/sqmm < 1.87 N/sqmm

Unbalanced shear stress = 1.87 - 0.525 = 1.35 N/sqmm

Unbalanced shear force = 1.35 x 230 x 417 / 10000 = 12.90 t

Using 8 dia TMT 2 legged stirrups at

Shear Capacity = 0.87 x 415 x 100.48 x 417 / 150 x 10000

= 10.1 t > 13 t

RESULT :

Beam section = 230 X 450 mm

Use 2/25 + 6/32 dia hsd rods, at top

Use 2/25 + 6/32 dia hsd rods, at bottom

Using 8 dia TMT 2 legged stirrups at 150 crs


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ROOF SLAB DESIGN

LOAD/ m2

Clear short span	=	3950 mm	3.95				
	=	5220 mm	5.22				
Ly / Lx	=	1.3215	<	1.50	DESIGN AS TWO WAY SLAB		
Slab Thickness Assumed	=	125 mm					
Self weight of slab	=	2.4	x	0.125	=	0.3	t
LIVE LOAD	=				=	0.50	t
Floor finish	=	0.1	x	2.00	=	0.20	t
				Total	=	1.000	or 1.00 t
Effective Depth of slab	=	125	-	25	=	4	= 96 mm
Effective short span	=	3950	+	96	=	4046	mm
Effective long span	=	5220	+	96	=	5316	mm

Three edges discontinuous, one short edge continuous

B.M. due to UDL

Negative short span B.M	=	0.054 x	4.046	x	4.046	x	1.00	=	0.884 m.t
positive short span B.M	=	0.076 x	4.046	x	4.046	x	1.00	=	1.244 m.t
Negative long span B.M	=	0.057 x	4.046	x	4.046	x	1.00	=	0.933 m.t
positive long span B.M	=	0.043 x	4.046	x	4.046	x	1.00	=	0.704 m.t

Short span

Mu / bdd	=	0.88 x	1.00	x	100000			=	0.98
		9.807 x	100	x	9.60	x	9.6	=	
Ast Required	=	0.2400 x	1.00	x	100.00	x	9.60	=	2.3 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast	=	50.24	/	15.00	=	3.3 Sqcm > 2.3 Sqcm
Mu / bdd	=	1.24 x	1.00	x	100000			=	1.38
		9.807 x	100	x	9.60	x	9.6	=	
Ast Required	=	0.2400 x	1.00	x	100.00	x	9.60	=	2.3 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast	=	50.24	/	15.00	=	3.3 Sqcm > 2.3 Sqcm

Long span

Mu / bdd	=	0.93 x	1.50	x	100000			=	1.84
		9.807 x	100.00	x	8.80	x	8.8	=	
Ast Required	=	0.3250 x	1.00	x	100.00	x	8.80	=	2.9 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast	=	50.24	/	15.00	=	3.3 Sqcm > 2.9 Sqcm
Mu / bdd	=	0.70 x	1.50	x	100000			=	1.39
		9.807 x	100.00	x	8.80	x	8.8	=	
Ast Required	=	0.2430 x	1.00	x	100.00	x	8.80	=	2.1 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast	=	50.24	/	15.00	=	3.3 Sqcm > 2.1 Sqcm

RESULT :

Use Thickness of Slab	=	125 mm		
Main rods	=	Use 8 dia hsd rods at	150	crs
Distributors	=	Use 8 dia hsd rods at	150	crs



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LOAD/ m²

Clear short span	=	3950 mm	3.95						
	=	10475 mm	10.48						
Ly / Lx	=	2.6519	<	1.00	DESIGN AS One WAY SLAB				
Slab Thickness Assumed	=	125 mm							
Self weight of slab	=	2.4	x	0.115	=	0.276	t		
LIVE LOAD	=				=	0.75	t		
Floor finish	=	0.1	x	2.00	=	0.20	t		
				Total	=	1.226	or	1.25	t
Effective Depth of slab	=	115	-	20	-	5	=	90	mm
Effective short span	=	3950	+	90	=	4040	mm		
Effective long span	=	10475	+	90	=	10565	mm		

Two long edges discontinuous

B.M. due to UDL

Negative short span B.M	=	0.100 x	4.040	x	4.04	x	1.25	=	2.04 m.t
positive short span B.M	=	0.056 x	4.040	x	4.04	x	1.25	=	1.143 m.t
Negative long span B.M	=	0.000 x	4.040	x	4.04	x	1.25	=	0 m.t
positive long span B.M	=	0.056 x	4.040	x	4.04	x	1.25	=	1.143 m.t

Short span

Mu / bdd	=	2.04 x	1.00	x	100000			=	2.57
		9.807 x	100	x	9.00	x	9.0	=	
Ast Required	=	0.3600 x	1.00	x	100.00	x	9.00	=	3.2 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 3.2 Sqcm

Mu / bdd	=	1.14 x	1.00	x	100000			=	1.44
		9.807 x	100	x	9.00	x	9.0	=	
Ast Required	=	0.2590 x	1.00	x	100.00	x	9.00	=	2.3 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 2.3 Sqcm

Long span

Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100.00	x	8.20	x	8.2	=	
Ast Required	=	0.2520 x	1.00	x	100.00	x	8.20	=	2.1 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 2.1 Sqcm

Mu / bdd	=	1.14 x	1.50	x	100000			=	2.60
		9.807 x	100.00	x	8.20	x	8.2	=	
Ast Required	=	0.1950 x	1.00	x	100.00	x	8.20	=	1.6 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 1.6 Sqcm

RESULT :**Use Thickness of Slab**

	=	125 mm							
Main rods	=	Use 8 dia hsd rods at	150	crs					
Distributors	=	Use 8 dia hsd rods at	150	crs					



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LOAD/ m²

Clear short span	=	3.77 mm	0.00						
	=	6900 mm	6.90						
Ly / Lx	=	1830.2	<	1.20	DESIGN AS TWO WAY SLAB				
Slab Thickness Assumed	=	125 mm							
Self weight of slab	=	2.4	x	0.175	=	0.42	t		
LIVE LOAD	=				=	0.20	t		
Floor finish	=	0.05	x	2.00	=	0.10	t		
				Total	=	0.720	or	0.72	t
Effective Depth of slab	=	175	-	20	-	5	=	150	mm
Effective short span	=	4	+	150	=	154	mm		
Effective long span	=	6900	+	150	=	7050	mm		

one long edges continuous

B.M. due to UDL

Negative short span B.M	=	0.071 x	0.154	x	0.15377	x	0.72	=	0.001 m.t
positive short span B.M	=	0.053 x	0.154	x	0.15377	x	0.72	=	9E-04 m.t
Negative long span B.M	=	0.000 x	0.154	x	0.15377	x	0.72	=	0 m.t
positive long span B.M	=	0.043 x	0.154	x	0.15377	x	0.72	=	7E-04 m.t

Short span

Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100	x	15.00	x	15.0	=	
Ast Required	=	0.3590 x	1.00	x	100.00	x	15.00	=	5.4 sqcm
				100					
Use 10 dia hsd rods at	150	crs	Ast		=	78.50	/	15.00	= 5.2 Sqcm > 5.4 Sqcm

Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100	x	15.00	x	15.0	=	
Ast Required	=	0.2590 x	1.00	x	100.00	x	15.00	=	3.9 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 3.9 Sqcm

Long span

Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100.00	x	14.20	x	14.2	=	
Ast Required	=	0.2520 x	1.00	x	100.00	x	14.20	=	3.6 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 3.6 Sqcm
Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100.00	x	14.20	x	14.2	=	
Ast Required	=	0.1950 x	1.00	x	100.00	x	14.20	=	2.8 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 2.8 Sqcm

RESULT :**Use Thickness of Slab**

	=	125 mm							
Main rods	=	Use 10 dia hsd rods at	150	crs					
Distributors	=	Use 8 dia hsd rods at	150	crs					



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CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
'ThalamuthuNatarajan Building', No.1, Gandhi Irwin Road,
Egmore, Chennai-600 008.

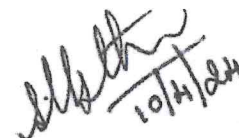
PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the **Thiru. M. PUNITHAN** has enrolled as **Registered Structural Engineer Grade-II (SE)** with Chennai Metropolitan Development Authority (CMDA) who has the qualification of **A.M.I.E.,(Civil Engg.)** and experience in the relevant field for **26 years**.

He has been given the Registration No.**SE/GR-II/2019/04/044** Renewed on **10.04.2024**. 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 **09.04.2029**.




(A. MEGANATHAN)
Superintendent



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HARMONY RESIDENCES PVT. LTD.

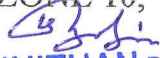
DESIGN CALCULATION

FOR

RESIDENTIAL BUILDING

STILT + 5 FLOORS 15 DWELLING UNITS IN SINGLE BLOCK

AT NEW NO. 12, OLD NO. 179, RANGARAJAPURAM MAIN ROAD, KODAMBAKKAM, CHENNAI – 600 024 COMPRISED IN T. S. NO. 66, BLOCK 37, PULIYUR VILLAGE, EGMORE TALUK, WITHIN THE LIMIT OF GREATER CHENNAI CORPORATION, DIVISION 134, NEW DIVISION NO. N132, ZONE 10, TAMILNADU.


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ARCHITECTS:

M/S Diastyle

NO.65/55, 12th AVENUE

ASHOK NAGAR,

CHENNAI-600 083.

PHONE : 65853326

ENGINEERS:

M/S MURUGU CONSULTANT

NO.9A/10, UMAPATHI STREET EXT,

WEST MAMBALAM,

CHENNAI – 600 033.

PHONE : 9884400273.

MURUGU CONSULTANT

9A/10, 1st Floor, Umapathy Street Ext.
West Mambalam, Chennai – 600 033.

PH: 91 – 9884400273

To

The Principal Cheif Engineer,
Greater Chennai Corporation,
Rippen Building, Chennai.

Dated : 29 - 08 - 2025

Dear Sir

Sub : Construction of Residential Building stilt + 5 floors in Kodambakkam – Stability certificate

The Residential buildings in the address at New door no.12, Old door no.179, Rangarajapuram Main road, Kodambakkam, Chennai – 600 024, Comprised in T. S. no- 66, Block No. 37, in Puliur Village, Egmore Taluk, Within limits of Greater Chennai Corporation, Division 137, New Division No. N132, Zone 10, is designed as per IS : 456, 2000, IS 1893 (part 1) : 2002 for seismic zone 3 and loading has been taken from IS 875 part 1 & 2 for dead load, live load. & seismic load and for Pile foundation and found structurally sound and safe.

Thanking you

Yours truly,

For MURUGU CONSULTANT



M.PUNITHAN, B.Sc., M.I.E
M-1371961



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RESIDENTIAL FLATS

COLUMN A1

No. of floors	=	1	+	5	=	6
Foundation depth	=	1.8	m			
Ground to floor level	=	1	m			
GFloor to floor height	=	3.00	m			
FFloor to floor height	=	3.00	m			
Thickness of slab assumed	=	0.125	m			
Slab loading t/ sqm	=	0.623	t			
Breadth of beams	=	0.23	m			
Depth of beams assumed	=	0.681	m			
Parapet wall height	=	1	m			
Plinth beams assumed	=	0.34	m			
Total height of wall	=	15.17	m			
Total height of column	=	21.8	m			
Size of column	=	0.45	x	0.3	m	

Total load:

Due to slab	=	6	x	3.43	x	3.375	x	0.623	=	43.24 t		
Wall	=	2	x	0.23	x	6.805	x	15.17	=	47.48 t		
Roof beams	=	2.5	x	0.23	x	0.556	x	0.34	x	6	=	0.652 t
Plinth beam	=	2.5	x	0.23	x	0.34	x	0.34	x	1	=	0.067 t
Self wt	=	2.5	x	0.45	x	0.3	x	21.8	=	7.358 t		
										<u>98.79</u>	t	
										<u>98.79</u>	t	
										<u>98.79</u>	t	

Total

Using size of column to be	=	450	X	300	mm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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Capacity of column	=	450	x	300	x	6	+	2462	x	190
	=	127.8	t	>	148	t				

Minimum Reinforcement	=	0.008	x	45	x	30	=	10.8	sqcm	<	24.62	sqcm
% of Reinforcement	=	2462	/	45	x	30	=	1.824	<	4		


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COLUMN N4

No. of floors	=	1	+	5	=	6
Foundation depth	=	1.8	m			
Ground to floor level	=	1	m			
G Floor to floor height	=	3.00	m			
F Floor to floor height	=	3.00	m			
Thickness of slab assumed	=	0.125	m			
Slab loading t/ sqm	=	0.623	t			
Breadth of beams	=	0.23	m			
Depth of beams assumed	=	0.413	m			
Parapet wall height	=	1	m			
Plinth beams assumed	=	0.413	m			
Total height of wall	=	16.77	m			
Total height of column	=	21.8	m			
Size of column	=	0.45	x	0.3	m	

Total load:

Due to slab	=	6	x	3.43	x	4.823	x	0.623	=	61.78	t
Wall	=	2	x	0.23	x	8.253	x	16.77	=	63.68	t
Roof beams	=	2.5	x	0.23	x	0.288	x	0.413	x	6	= 0.409 t
Plinth beam	=	2.5	x	0.23	x	0.413	x	0.413	x	1	= 0.098 t
Self wt	=	2.5	x	0.45	x	0.3	x	21.8	=	7.358	t

										<u>133.3</u>	t
										<u>133.3</u>	t

Total

Using size of column to be	=	450	X	300	mm						
With 8/20 + 4/12 Rods, Ast	=	8	x	314	+	3	x	113	=	2851	sqmm

Capacity of column	=	450	x	300	x	6	+	2851	x	190	
	=	135.2	t		>	200	t				

Minimum Reinforcement	=	0.008	x	45	x	30	=	10.8	sqcm	<	28.51	sqcm
% of Reinforcement	=	2851	/	45	x	30	=	2.112	<	4		



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COLUMN N4

No. of floors	=	1	+	5	=	6
Foundation depth	=	1.8	m			
Ground to floor level	=	1	m			
GFloor to floor height	=	3.00	m			
FFloor to floor height	=	3.00	m			
Thickness of slab assumed	=	0.125	m			
Slab loading t/ sqm	=	0.623	t			
Breadth of beams	=	0.23	m			
Depth of beams assumed	=	0.314	m			
Parapet wall height	=	1	m			
Plinth beams assumed	=	0.243	m			
Total height of wall	=	17.36	m			
Total height of column	=	21.8	m			
Size of column	=	0.45	x	0.23	m	

Total load:

Due to slab	=	6	x	3.43	x	2.855	x	0.623	=	36.58	t
Wall	=	2	x	0.23	x	4.858	x	17.36	=	38.8	t
Roof beams	=	2.5	x	0.2	x	0.189	x	0.243	x	6	= 0.138 t
Plinth beam	=	2.5	x	0.2	x	0.243	x	0.243	x	1	= 0.029 t
Self wt	=	2.5	x	0.45	x	0.23	x	21.8	=	5.641	t
										<u>81.18</u>	t
										<u>81.18</u>	t

Total

Using size of column to be	=	450	X	230	mm						
With 10/32 Rods, Ast	=	8	x	314	+	3	x	113	=	2851	sqmm

D

Capacity of column	=	450	x	230	x	6	+	2851	x	190	
	=	116.3	t		>	122	t				
Minimum Reinforcement	=	0.008	x	45	x	23	=	8.28	sqcm	<	28.51 sqcm
% of Reinforcement	=	2851	/	45	x	23	=	2.755	<	4	

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Design of sections

Piles

Using M30 concrete and TMT bars 500 grade

$$\sigma_{ac} \text{ in concrete} = 81.6 \text{ kg/sq-cm}$$

$$\sigma_{bc} \text{ in concrete} = 102 \text{ kg/sq-cm}$$

$$\sigma_{ac} \text{ in steel} = 1938 \text{ kg/sq-cm}$$

$$\text{Vertical load, } V \text{ (t)} = 220 / 2 = 110$$

I. For 500 dia. pile with end bearing

$$\begin{aligned} \text{a) Safe bearing capacity of pile (t)} &= 3.142 \times 0.5 \times 0.5 \times 750 / 4 \\ &= 147.3 \end{aligned}$$

$$\begin{aligned} \text{b) Bearing load / sq-m.} &= 110 / 0.785 \\ &= 140 < 147.3 \text{ o.k} \end{aligned}$$

$$\begin{aligned} \text{c) } V / bc \text{ d d} &= 110 \times 1500 / 250000 \times 30 \\ &= 0.022 \end{aligned}$$

$$\begin{aligned} \text{d) } V_e / bc \text{ d d d} &= 0 \times 1500 / 1.25E+08 \times 30 \\ &= 0.000 \end{aligned}$$

$$\text{Using 16 dia HSD rods } d'/D = 83 / 450 = 0.184$$

Using chart 57 & 58 of SP:16-1980

$$\begin{aligned} \text{e) As required (sq-cm.)} &= 0 \times 3.142 \times 450 \times 450 \times 30 / 400 \\ &= 0.0 \end{aligned}$$

$$\begin{aligned} \text{Min area of reinforcement} &= 0.004 \times 3.142 \times 45 \times 45 / 4 \\ &= 6.362 \text{ sq-cm} \end{aligned}$$

$$\begin{aligned} \text{Use 6/16 dia. HSD rods} &= 6 \times 2.011 \\ &= 12.06 \text{ sq-cm} > 6.36 \text{ sq-cm} \end{aligned}$$



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Pile cap

$$\begin{aligned}\text{Column size} &= 300 \times 450 \\ \text{Pedestal size} &= 650 \times 1775 \\ \text{Area of pedestal} &= 65 \times 177.5 = 11537.5 \text{ sq-cm} \\ \text{Actual stress} &= 110 \times 1500 / 11537.5 \\ &= 14.3 \text{ kg/sq-cm} \\ \text{Permissible stress} &= 0.45 \times 300 / 11537.5 / 1350 \\ &= 135 \times 2.923 = 395 \text{ kg/sq-cm}\end{aligned}$$

So use plain concrete pedestal of 30cm all around

Coinciding the critical section for shear with outface of the pile in each direction

$$\begin{aligned}0.5 / 2 + 0.225 + d/2 &= 0.63 + 0.25 \\ 0.475 + d/2 &= 0.875 \\ d/2 &= 0.875 - 0.475 = 0.4 \\ d &= 0.8 \\ \text{Provide } d &= 0.715 \\ D &= 0.8 \\ \text{BM} &= 1 \times 110 (0.75 - 0.3) \\ &= 49.5 \text{ m-t} \\ \text{Mu/bd}^2 &= 49.5 \times 1.5 \times 100000 / (225.0 \times 71.5 \times 71.5 \times 300) \\ &= 0.022 \times 30 = 0.65 \\ \text{Area of steel required} &= 0.09 \times 225.0 \times 71.5 / 100 \\ &= 14.8 \text{ sq-cm} \\ \text{Min steel required} &= 0.0012 \times 90 \times 225 \\ &= 24.3 \text{ sq-cm} \\ \text{Use 20dia. HSD bars At 100} &= 10 \times 3.14 = 31.40\end{aligned}$$

Shear

$$\begin{aligned}\text{Critical section for shear} &= 250 + 300 + 357.5 = 907.5 \text{ mm} \\ \text{The pile outer edge} &= 625 + 250 = 875 < 907.5\end{aligned}$$

So shear reinforcement is not provided

For top of pile cap and pedestal use nominal Reinforcement
Use 16 dia. At 200 crs


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DESIGN OF PLINTH BEAM

Span considered	=	5.525 m					
Assuming beam size to be		230 x	450	mm			
Load /m :							
Self wt. of beam	=	2.5 x	0.23	x	0.45	=	0.26 t
Wall	=	2.0 x	0.23	x	2.400	=	1.10 t
							1.36 t
Effective Depth of beam	=	450	-	25	-	8	= 417 mm
Design negative B.M	=	1.36 x	5.525	x	5.525	x	0.100 = 4.16 t-m
Mu/ fck bdd	=	4.16 x	1.5	x	100000		= 0.062
		250 x	23	x	41.70	x	41.70
Ast required	=	0.0905 x	250	x	23.00	x	41.70 = 4.34 sqcm
			5000				

Use 2/12 + 2/16 dia hsd rods, Ast = 8.54 sqcm > 4.34 sqcm

Design Positive B.M	=	1.36 x	5.525	x	5.525	x	0.08333 = 3.47 t-m
Mu/ fck bdd	=	3.47 x	1.5	x	100000		= 0.052
		250 x	23	x	41.70	x	41.70

Ast required = 0.0754 x 250 x 23.00 x 41.70 = 4.30 sqcm
4200

Use 2/12 + 2/16 dia hsd rods, Ast = 6.28 sqcm > 4.30 sqcm

Shear force	=	1.36 x	1.000	/	1.00	=	1.36 t	
Shear stress	=	1.36 x	1.00	x	10000	/	230 x	417 = 0.14 N/sqmm
100As/ bd	=	100 x	8.54	/	23.00	x	41.70	= 0.89
Permissible shear stress	=	0.44 N/sqmm		<	0.14 N/sqmm			
Unbalanced shear stress	=	0.14 -	0.442	=	-0.30 N/sqmm			
Unbalanced shear force	=	-0.30 x	230	x	417	/	10000	= -2.88 t
Using 8 dia TMT 2 legged stirrups at			100	crs				
Shear Capacity	=	0.87 x	415	x	100.48	x	417 /	100 x 10000
	=	15.1 t	>	-3	t			

RESULT :

Beam section = 230 X 450 mm
Use 2/12 + 2/16 dia hsd rods, at top
Use 2/12 + 2/16 dia hsd rods, at bottom
Using 8 dia TMT 2 legged stirrups at 100 crs


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DESIGN OF PLINTH BEAM

Span considered = 8.041 m

Assuming beam size to be 230 x 450 mm

Load /m :

Self wt. of beam = 2.5 x 0.23 x 0.45 = 0.26 t

Wall = 2.0 x 0.23 x 1.500 = 0.69 t

0.95 t

Effective Depth of beam = 450 - 25 - 8 = 417 mm

Design negative B.M = 0.95 x 8.041 x 8.041 x 0.100 = 6.14 t-m

= $\frac{6.14 \times 1.5 \times 100000}{250 \times 23 \times 41.70 \times 41.70}$ = 0.092

Ast required = $\frac{0.1335 \times 250 \times 23.00 \times 41.70}{5000}$ = 6.40 sqcm

Use 2/12+4/16 dia hsd rods, Ast = 10.30 sqcm > 6.40 sqcm

Design Positive B.M = 0.95 x 8.041 x 8.041 x 0.08333 = 5.11 t-m

Mu/ fck bdd = $\frac{5.11 \times 1.5 \times 100000}{250 \times 23 \times 41.70 \times 41.70}$ = 0.077

Ast required = $\frac{0.1112 \times 250 \times 23.00 \times 41.70}{4200}$ = 6.35 sqcm

Use 2/12+4/16 dia hsd rods, Ast = 10.30 sqcm > 6.35 sqcm

Shear force = 0.95 x 8.041 / 2.00 = 3.81 t

Shear stress = 3.81 x 1.50 x 10000 / 230 x 417 = 0.60 N/sqmm

100As/ bd = 100 x 10.30 / 23.00 x 41.70 = 1.07

Permissible shear stress = 0.44 N/sqmm < 0.60 N/sqmm

Unbalanced shear stress = 0.60 - 0.44 = 0.15 N/sqmm

Unbalanced shear force = 0.15 x 230 x 417 / 10000 = 1.48 t

Using 8 dia TMT 2 legged stirrups at 100 crs

Shear Capacity = 0.87 x 415 x 100.48 x 417 / 100 x 10000 = 15.1 t > 1 t

RESULT :

Beam section = 230 X 450 mm

Use 2/12+4/16 dia hsd rods, at top

Use 2/12+4/16 dia hsd rods, at bottom

Using 8 dia TMT 2 legged stirrups at 100 crs



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DESIGN OF PLINTH BEAM

Span considered	=	4.382 m							
Assuming beam size to be		230 x	450	mm					
Load /m :									
Self wt. of beam	=	2.5 x	0.23	x	0.45	=	0.26 t		
Wall	=	2.0 x	0.23	x	3.900	=	1.79 t		
							2.05 t		
Effective Depth of beam	=	450	-	25	-	8	=	417	mm
Design negative B.M	=	2.05 x	4.382	x	4.382	x	0.083	=	3.28 t-m
Mu/ fck bdd	=	3.28 x	1.5	x	100000			=	0.049
		250 x	23	x	41.70	x	41.70		
Ast required	=	0.0714 x	250	x	23.00	x	41.70	=	4.08 sqcm
			4200						
Use 2/12+1/16 dia hsd rods,			Ast	=	4.27 sqcm		>	4.08 sqcm	
Design Positive B.M	=	2.05 x	4.382	x	4.382	x	0.08333	=	3.28 t-m
Mu/ fck bdd	=	3.28 x	1.5	x	100000			=	0.049
		250 x	23	x	41.70	x	41.70		
Ast required	=	0.0714 x	250	x	23.00	x	41.70	=	4.08 sqcm
			4200						
Use 2/12+1/16 dia hsd rods,			Ast	=	4.27 sqcm		>	4.08 sqcm	
Shear force	=	2.05 x	4.382	/	2.00	=	4.50 t		
Shear stress	=	4.50 x	1.50	x	10000	/	230 x	417 =	0.70 N/sqmm
100As/ bd	=	100 x	4.27	/	23.00	x	41.70	=	0.45
Permissible shear stress	=	0.44 N/sqmm		<	0.70 N/sqmm				
Unbalanced shear stress	=	0.70 -	0.442	=	0.26 N/sqmm				
Unbalanced shear force	=	0.26 x	230	x	417	/	10000	=	2.51 t
Using 8 dia TMT 2 legged stirrups at			150	crs					
Shear Capacity	=	0.87 x	415	x	100.48	x	417 /	150 x	10000
	=	10.1 t	>	3 t					
RESULT :									
Beam section	=	230 X	450	mm					
Use 2/12+1/16 dia hsd rods,		at top							
Use 2/12+1/16 dia hsd rods,		at bottom							
Using 8 dia TMT 2 legged stirrups at		150 crs							


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DESIGN OF ROOF BEAM

Span considered	=	7.584 m							
Assuming beam size to be		230 x	450 mm	3.792069					
Load /m :				14.3798					
Self wt. of beam	=	2.5 x	0.23 x	0.325	=	0.19 t			
Wall	=	2.0 x	0.23 x	2.591	=	1.19 t			
Slab	=	0.91 x	2.40 /	1.000	=	2.19 t			
						3.57 t			
Effective Depth of beam	=	450 -	25 -	8	=	417 mm			
Breadth of flange	=	5309 +	230 +	3	x	150			
		12							
	=	1122 mm							
Design negative B.M	=	3.57 x	7.584 x	7.584 x	0.100 =	20.53 t-m			
Mu/ fck bdd	=	10.00 x	1 x	100000	=	0.100			
		250 x	23 x	41.70 x	41.70				
Ast required	=	0.1450 x	250 x	23.00 x	41.70 =	6.95 sqcm			
			5000						
Use 2/16+4/32 dia hsd rods,		Ast	=	25.91 sqcm	>	6.95 sqcm			
Design Positive B.M	=	3.57 x	7.584 x	7.584 x	0.1 =	20.53 t-m			
Mu/ fck bdd	=	20.53 x	1.5 x	100000	=	0.063			
		250 x	112.2408 x	41.70 x	41.70				
Ast required	=	0.0915 x	250 x	112.24 x	41.70 =	21.41 sqcm			
			5000						
Use 2/16+4/25 dia hsd rods,		Ast	=	23.64 sqcm	>	21.41 sqcm			
Shear force	=	3.57 x	7.584 /	2.00 =	13.53 t				
Shear stress	=	13.53 x	1.50 x	10000 /	230 x	417 =	2.12 N/sqmm		
100As/ bd	=	100 x	25.91 /	23.00 x	41.70 =	2.70			
Permissible shear stress	=	0.75 N/sqmm	<	2.12 N/sqmm					
Unbalanced shear stress	=	2.12 -	0.75 =	1.37 N/sqmm					
Unbalanced shear force	=	1.37 x	230 x	417 /	10000 =	13.11 t			
Using 8 dia TMT 2 legged stirrups at			125 crs						
Shear Capacity	=	0.87 x	500 x	100.48 x	417 /	125 x	10000		
	=	14.6 t	>	13 t					
RESULT :									
Beam section	=	230 X	450 mm						
Use 2/16+4/32 dia hsd rods,		at top							
Use 2/16+4/25 dia hsd rods,		at bottom							
Using 8 dia TMT 2 legged stirrups at		125 crs							


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DESIGN OF ROOF BEAM

Span considered	=	4.382 m							
Assuming beam size to be		230 x	450 mm		2.19075				
<u>Load /m :</u>					4.79939				
Self wt. of beam	=	2.5 x	0.23 x		0.325	=	0.19 t		
Wall	=	2.0 x	0.23 x		3.150	=	1.45 t		
Slab	=	0.91 x	4.19 /		1.000	=	3.82 t		
							5.46 t		
Effective Depth of beam	=	450 -	25 -	8	=	417 mm			
Breadth of flange	=	3067 +	230 +	3	x	150			
		12							
	=	936 mm							
Design negative B.M	=	5.46 x	4.382 x		4.382 x	0.083 =	8.73 t-m		
Mu/ fck bdd	=	8.73 x	1.5 x		100000	=	0.151		
		250 x	20 x		41.70 x	41.70			
Ast required	=	0.2260 x	250 x		20.00 x	41.70 =	9.42 sqcm		
			5000						
Use 2/25 + 6/32 dia hsd rods,			Ast	=	58.04 sqcm	>	9.42 sqcm		
Design Positive B.M	=	5.46 x	4.382 x		4.382 x	0.1 =	10.48 t-m		
Mu/ fck bdd	=	10.48 x	1.5 x		100000	=	0.039		
		250 x	93.55875 x		41.70 x	41.70			
Ast required	=	0.0560 x	250 x		93.56 x	41.70 =	13.02 sqcm		
			4200						
Use 2/25 + 6/32 dia hsd rods,			Ast	=	58.04 sqcm	>	13.02 sqcm		
Shear force	=	5.46 x	4.382 /		2.00 =	11.96 t			
Shear stress	=	11.96 x	1.50 x		10000 /	230 x	417 =	1.87 N/sqmm	
100As/ bd	=	100 x	58.04 /		23.00 x	41.70 =	6.05		
Permissible shear stress	=	0.53 N/sqmm			1.87 N/sqmm				
Unbalanced shear stress	=	1.87 -	0.525 =		1.35 N/sqmm				
Unbalanced shear force	=	1.35 x	230 x		417 /	10000 =	12.90 t		
Using 8 dia TMT 2 legged stirrups at			150 crs						
Shear Capacity	=	0.87 x	415 x		100.48 x	417 /	150 x	10000	
	=	10.1 t	>	13 t					
<u>RESULT :</u>									
Beam section	=	230 X	450 mm						
Use 2/25 + 6/32 dia hsd rods,			at top						
Use 2/25 + 6/32 dia hsd rods,			at bottom						
Using 8 dia TMT 2 legged stirrups at			150 crs						

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ROOF SLAB DESIGN

LOAD/ m2

Clear short span	=	3950 mm	3.95				
	=	5220 mm	5.22				
L_y / L_x	=	1.3215	<	1.50	DESIGN AS TWO WAY SLAB		
Slab Thickness Assumed	=	125 mm					
Self weight of slab	=	2.4	x	0.125	=	0.3	t
LIVE LOAD	=				=	0.50	t
Floor finish	=	0.1	x	2.00	=	0.20	t
				Total	=	1.000	or 1.00 t
Effective Depth of slab	=	125	-	25	-	4	= 96 mm
Effective short span	=	3950	+	96	=	4046 mm	
Effective long span	=	5220	+	96	=	5316 mm	

Three edges discontinuous, one short edge continuous

B.M. due to UDL

Negative short span B.M	=	0.054	x	4.046	x	4.046	x	1.00	=	0.884 m.t
positive short span B.M	=	0.076	x	4.046	x	4.046	x	1.00	=	1.244 m.t
Negative long span B.M	=	0.057	x	4.046	x	4.046	x	1.00	=	0.933 m.t
positive long span B.M	=	0.043	x	4.046	x	4.046	x	1.00	=	0.704 m.t

Short span

M_u / bdd	=	0.88	x	1.00	x	100000		=	0.98
	=	9.807	x	100	x	9.60	x	9.6	=
Ast Required	=	0.2400	x	1.00	x	100.00	x	9.60	=
						100			
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	=
									3.3 Sqcm > 2.3 Sqcm

M_u / bdd	=	1.24	x	1.00	x	100000		=	1.38
	=	9.807	x	100	x	9.60	x	9.6	=
Ast Required	=	0.2400	x	1.00	x	100.00	x	9.60	=
						100			
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	=
									3.3 Sqcm > 2.3 Sqcm

Long span

M_u / bdd	=	0.93	x	1.50	x	100000		=	1.84
	=	9.807	x	100.00	x	8.80	x	8.8	=
Ast Required	=	0.3250	x	1.00	x	100.00	x	8.80	=
						100			
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	=
									3.3 Sqcm > 2.9 Sqcm
M_u / bdd	=	0.70	x	1.50	x	100000		=	1.39
	=	9.807	x	100.00	x	8.80	x	8.8	=
Ast Required	=	0.2430	x	1.00	x	100.00	x	8.80	=
						100			
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	=
									3.3 Sqcm > 2.1 Sqcm

RESULT :

Use Thickness of Slab

	=	125 mm			
Main rods	=	Use 8 dia hsd rods at	150	crs	
Distributors	=	Use 8 dia hsd rods at	150	crs	


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LOAD/ m2

Clear short span	=	3950 mm	3.95						
	=	10475 mm	10.48						
Ly / Lx	=	2.6519	<	1.00	DESIGN AS One WAY SLAB				
Slab Thickness Assumed	=	125 mm							
Self weight of slab	=	2.4	x	0.115	=	0.276	t		
LIVE LOAD	=				=	0.75	t		
Floor finish	=	0.1	x	2.00	=	0.20	t		
				Total	=	1.226	or	1.25	t
Effective Depth of slab	=	115	-	20	-	5	=	90	mm
Effective short span	=	3950	+	90	=	4040	mm		
Effective long span	=	10475	+	90	=	10565	mm		

Two long edges discontinuous

B.M. due to UDL

Negative short span B.M	=	0.100 x	4.040	x	4.04	x	1.25	=	2.04 m.t
positive short span B.M	=	0.056 x	4.040	x	4.04	x	1.25	=	1.143 m.t
Negative long span B.M	=	0.000 x	4.040	x	4.04	x	1.25	=	0 m.t
positive long span B.M	=	0.056 x	4.040	x	4.04	x	1.25	=	1.143 m.t

Short span

Mu / bdd	=	2.04 x	1.00	x	100000			=	2.57
		9.807 x	100	x	9.00	x	9.0	=	
Ast Required	=	0.3600 x	1.00	x	100.00	x	9.00	=	3.2 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		= 50.24	/	15.00	=	3.3 Sqcm > 3.2 Sqcm

Mu / bdd	=	1.14 x	1.00	x	100000			=	1.44
		9.807 x	100	x	9.00	x	9.0	=	
Ast Required	=	0.2590 x	1.00	x	100.00	x	9.00	=	2.3 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		= 50.24	/	15.00	=	3.3 Sqcm > 2.3 Sqcm

Long span

Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100.00	x	8.20	x	8.2	=	
Ast Required	=	0.2520 x	1.00	x	100.00	x	8.20	=	2.1 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		= 50.24	/	15.00	=	3.3 Sqcm > 2.1 Sqcm

Mu / bdd	=	1.14 x	1.50	x	100000			=	2.60
		9.807 x	100.00	x	8.20	x	8.2	=	
Ast Required	=	0.1950 x	1.00	x	100.00	x	8.20	=	1.6 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		= 50.24	/	15.00	=	3.3 Sqcm > 1.6 Sqcm

RESULT :**Use Thickness of Slab**

	=	125 mm			
Main rods	=	Use 8 dia hsd rods at	150	crs	
Distributors	=	Use 8 dia hsd rods at	150	crs	


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LOAD/ m²

Clear short span	=	3.77 mm	0.00						
	=	6900 mm	6.90						
Ly / Lx	=	1830.2	<	1.20	DESIGN AS TWO WAY SLAB				
Slab Thickness Assumed	=	125 mm							
Self weight of slab	=	2.4	x	0.175	=	0.42	t		
LIVE LOAD	=				=	0.20	t		
Floor finish	=	0.05	x	2.00	=	0.10	t		
				Total	=	0.720	or	0.72	t
Effective Depth of slab	=	175	-	20	-	5	=	150	mm
Effective short span	=	4	+	150	=	154	mm		
Effective long span	=	6900	+	150	=	7050	mm		

one long edges continuous

B.M. due to UDL

Negative short span B.M	=	0.071 x	0.154	x	0.15377	x	0.72	=	0.001 m.t
positive short span B.M	=	0.053 x	0.154	x	0.15377	x	0.72	=	9E-04 m.t
Negative long span B.M	=	0.000 x	0.154	x	0.15377	x	0.72	=	0 m.t
positive long span B.M	=	0.043 x	0.154	x	0.15377	x	0.72	=	7E-04 m.t

Short span

Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100	x	15.00	x	15.0	=	
Ast Required	=	0.3590 x	1.00	x	100.00	x	15.00	=	5.4 sqcm
				100					
Use 10 dia hsd rods at	150	crs	Ast		=	78.50	/	15.00	= 5.2 Sqcm > 5.4 Sqcm

Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100	x	15.00	x	15.0	=	
Ast Required	=	0.2590 x	1.00	x	100.00	x	15.00	=	3.9 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 3.9 Sqcm

Long span

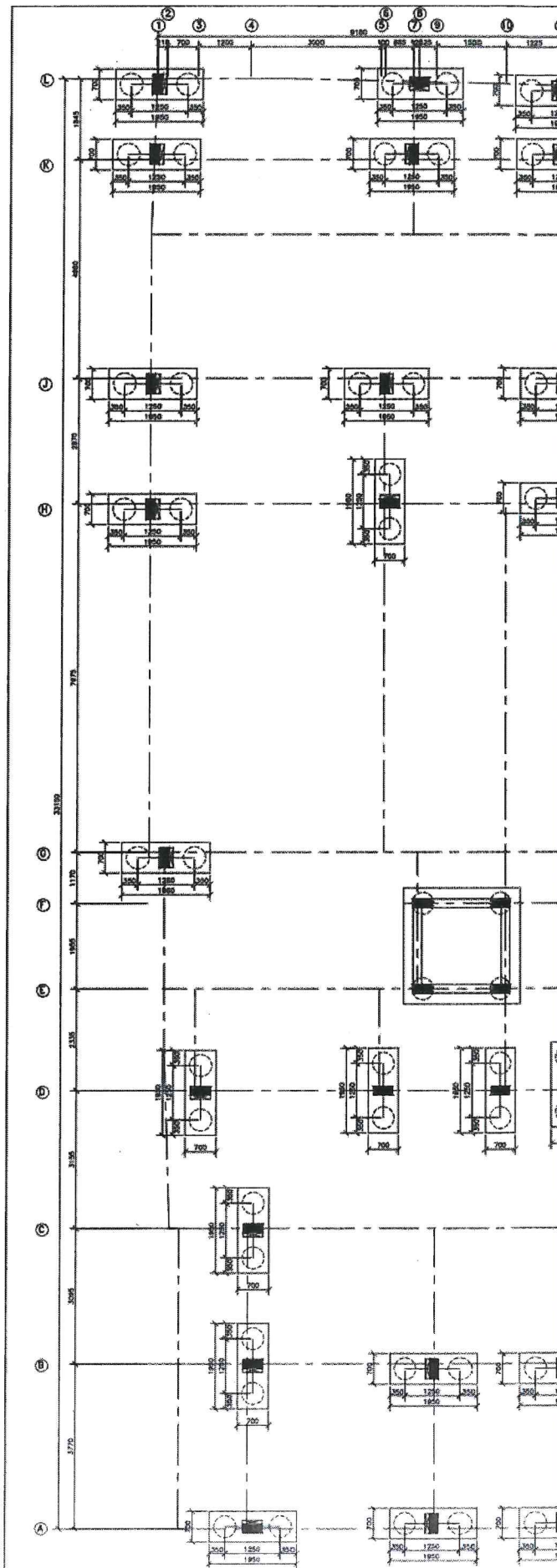
Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100.00	x	14.20	x	14.2	=	
Ast Required	=	0.2520 x	1.00	x	100.00	x	14.20	=	3.6 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 3.6 Sqcm

Mu / bdd	=	0.00 x	1.50	x	100000			=	0.00
		9.807 x	100.00	x	14.20	x	14.2	=	
Ast Required	=	0.1950 x	1.00	x	100.00	x	14.20	=	2.8 sqcm
				100					
Use 8 dia hsd rods at	150	crs	Ast		=	50.24	/	15.00	= 3.3 Sqcm > 2.8 Sqcm

RESULT :**Use Thickness of Slab**

	=	125 mm							
Main rods	=	Use 10 dia hsd rods at	150	crs					
Distributors	=	Use 8 dia hsd rods at	150	crs					


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180 CRS

TMT 4 LEGGED STIRRUPS AT 180 CRS

RS

180 TMT BARS

TMT HELICAL LINKS AT 180 CRS

COLUMNS

[Signature]

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NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. ALL RCC WORKS TO BE WITH M30 CONCRETE AND TO BE CHECKED AS PER IS : 456 - 2000, USING 20mm GRADED GRANITE METAL WATER CEMENT RATIO NOT EXCEEDING 0.45. HIGH YIELD STRENGTH DEFORMED BARS (TOP SHALL CONFORM TO IS: 1786 - 2008 (Fe 500)).
3. LAP LENGTH FOR ALL BARS TO BE 45 TIMES THE DIAMETER.
4. CONCRETE COVER FOR ALL MAIN RODS IN FOUNDATION AND PLINTH BEAMS TO BE 40 UNLESS OTHERWISE STATED.

ALT	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	28/02/25	AS DRAWN			
CONSULTANTS MURUGU CONSULTANT 9A/10, UNAPATHY STREET EXT. W.MAMBALAM, CHENNAI - 33. Ph.No.9884400273.					
CLIENT	M/S HORMONY HOMES 12TH AVENUE, ASHOK NAGAR CHENNAI - 600 083.		PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING IN KODAMBARKAM, LAYOUT AND RCC DETAILS PILE FOUNDATION		
ARCHITECT	diastyle PROP. CHENNAI - 600 083. PHONE : 69655326, 65359407.		SCALE : 1 : 50, 1 : 25 DRG.No: MC-11 Z/2025 SHEET 1		



CHENNAI METROPOLITAN DEVELOPMENT AUTHORITY
'ThalamuthuNatarajan Building', No.1, Gandhi Irwin Road,
Egmore, Chennai-600 008.

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that the Thiru. M. PUNITHAN has enrolled as Registered Structural Engineer Grade-II (SE) with Chennai Metropolitan Development Authority (CMDA) who has the qualification of A.M.I.E.,(Civil Engg.) and experience in the relevant field for 26 years.

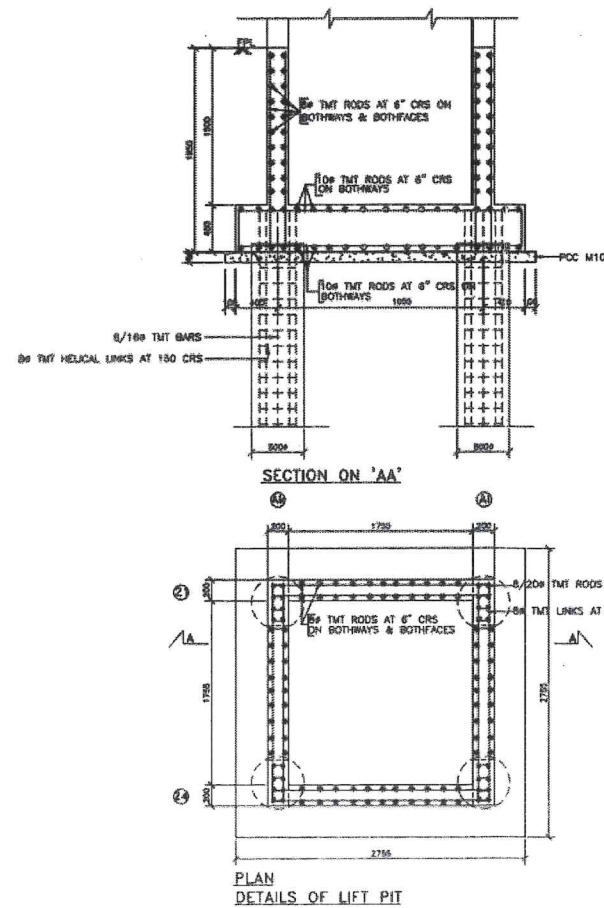
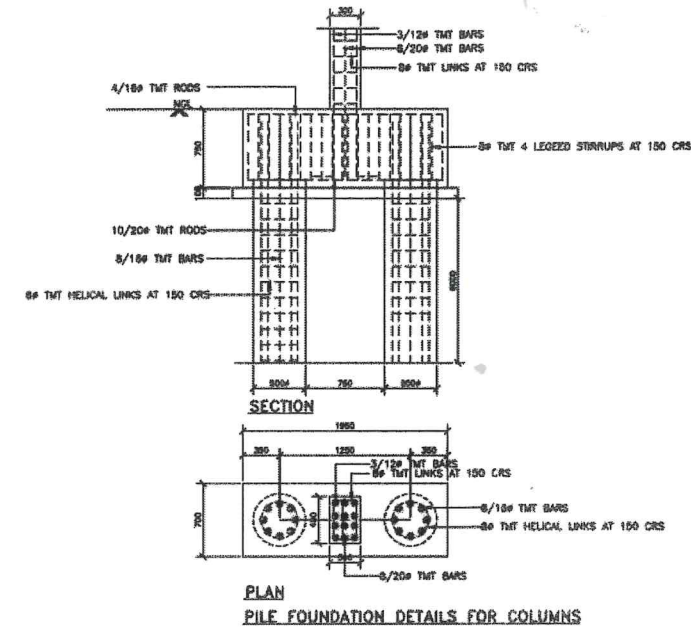
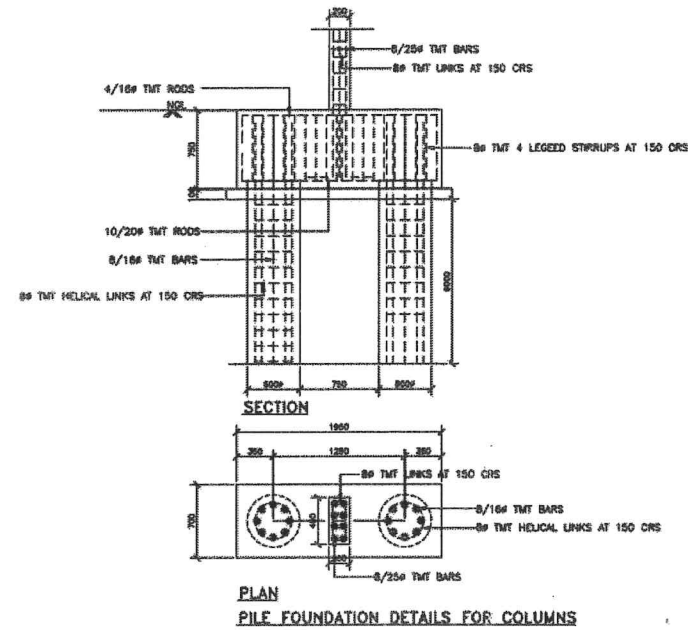
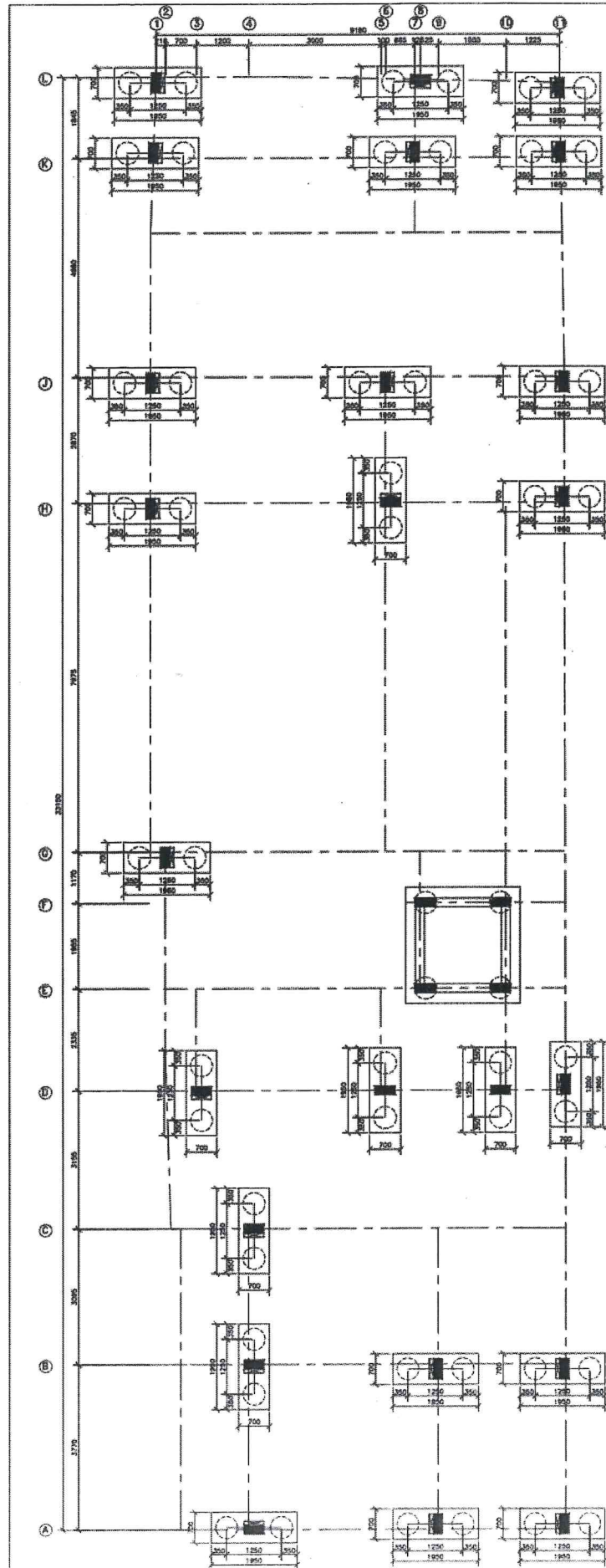
He has been given the Registration No.SE/GR-II/2019/04/044 Renewed on 10.04.2024. He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part-V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. dated 04.02.2019.

This Registration is valid upto 09.04.2029.



(Signature)
10/4/24.
(A. MEGANATHAN)
Superintendent

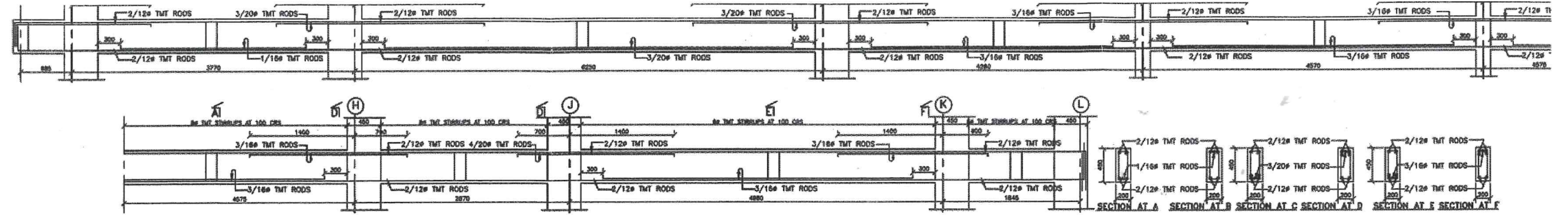
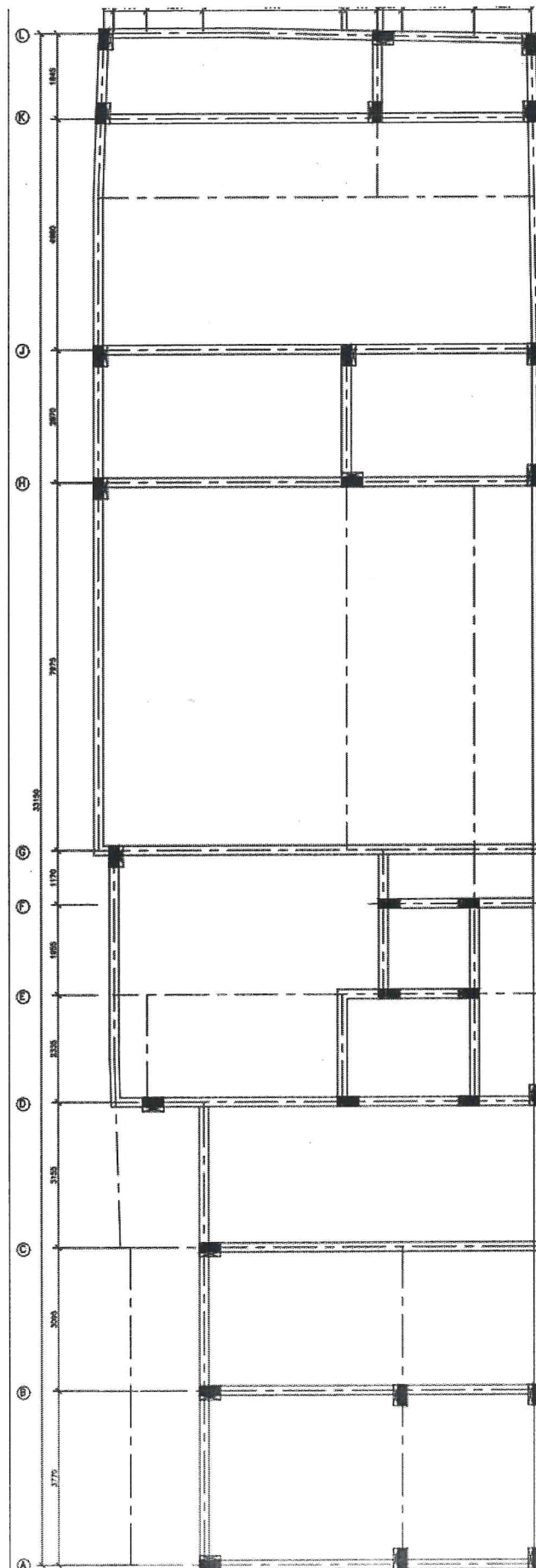
(Signature)
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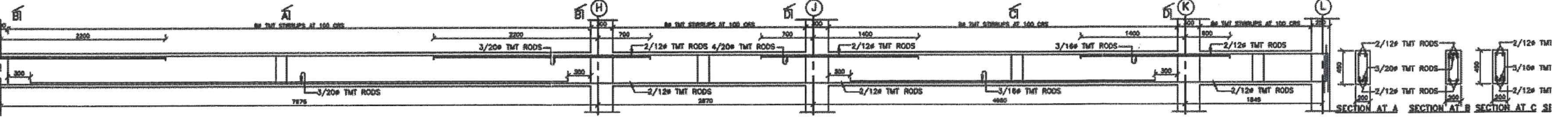
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- NOTES:**
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 - LAP LENGTH FOR ALL BARS TO BE 45 TIMES THE DIAMETER.
 - CONCRETE COVER FOR ALL MAIN RODS IN FOUNDATION AND PLINTH BEAMS TO BE 40 UNLESS OTHERWISE STATED.

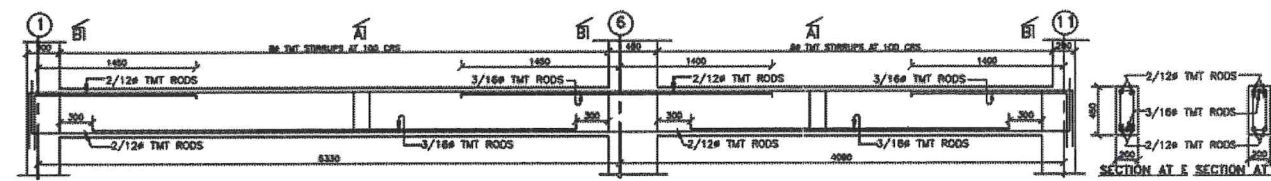
ALT	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
0	28/02/24	AS DRAWN			
CONSULTANTS					
MURUGU CONSULTANT					
28/10, UMAPATHY STREET EXT. W. MAMBALAM, CHENNAI - 33. Ph. No. 9884400273.					
CLIENT			PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING IN KODAMBARKAM.		
M/S HORMONY HOMES			LAYOUT AND RCC DETAILS		
12TH AVENUE, ASHOK NAGAR			PILE FOUNDATION		
CHENNAI - 600 083.			SCALE : 1 : 50, 1 : 25		
ARCHITECT			DRG.No: MC-112/2025 SHEET 1		
diastyle					
PROP					
CHENNAI - 600 083.					
PHONE : 65855326, 65369407.					



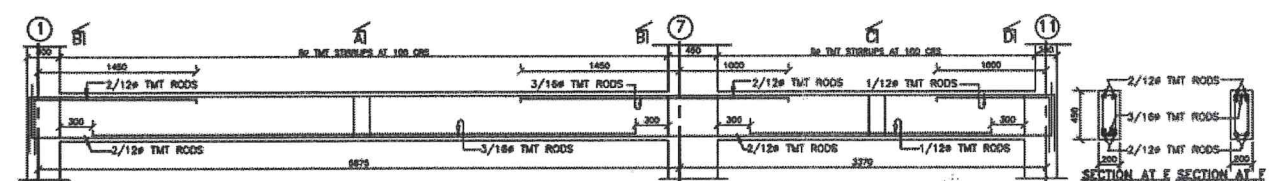
DETAIL OF PLINTH BEAM IN ROW 11



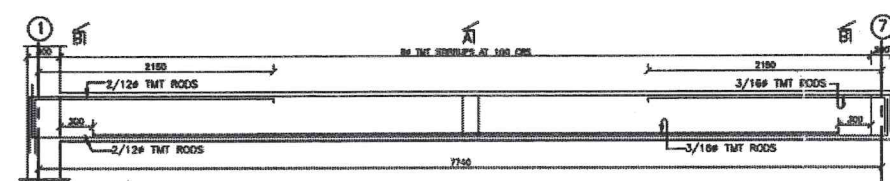
DETAIL OF PLINTH BEAM IN ROW 1



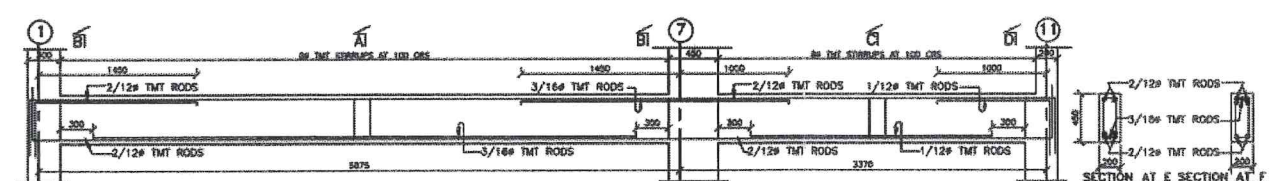
DETAIL OF PLINTH BEAM IN ROWS H & J



DETAIL OF PLINTH BEAM IN ROWS K & L



DETAIL OF PLINTH BEAM IN ROW C



DETAIL OF PLINTH BEAM IN ROWS A & B

M. Punithan

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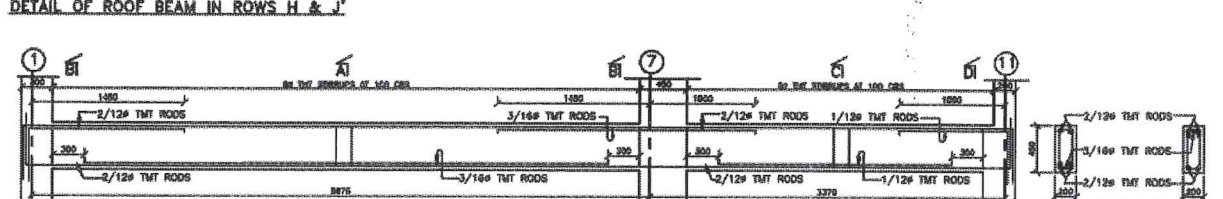
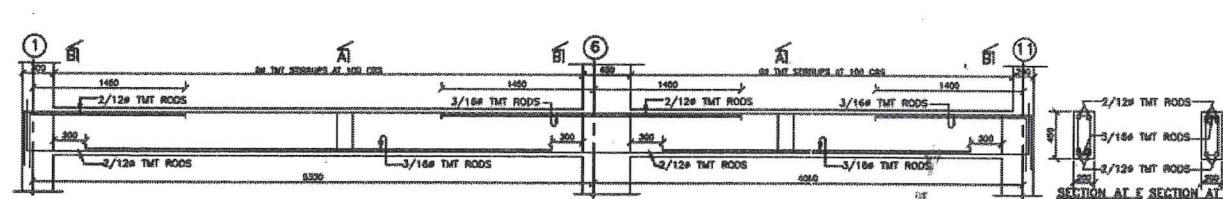
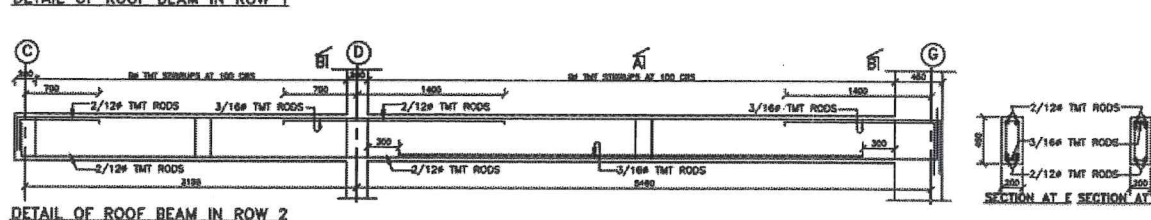
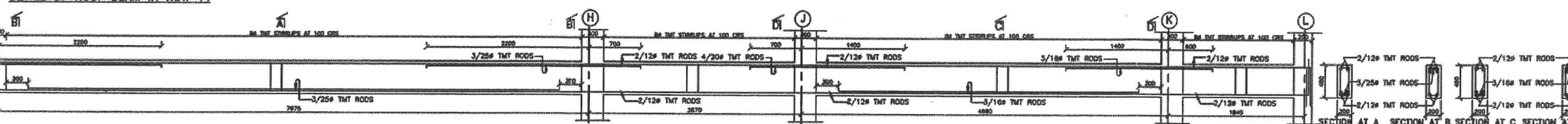
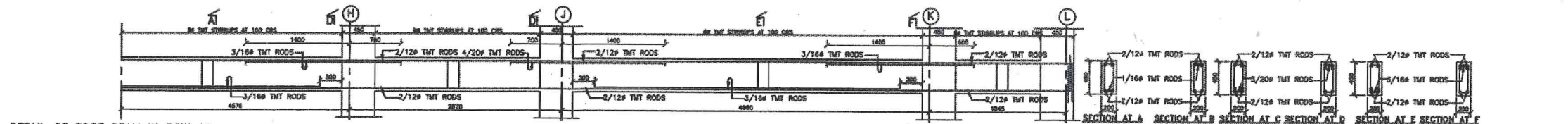
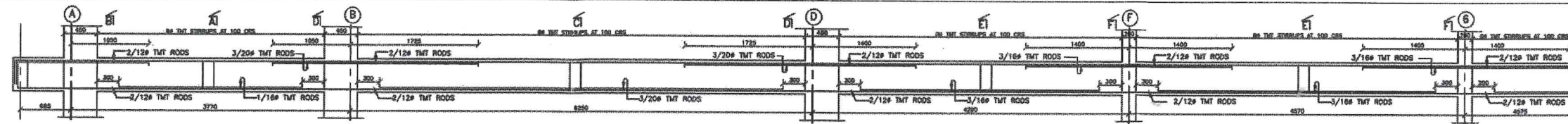
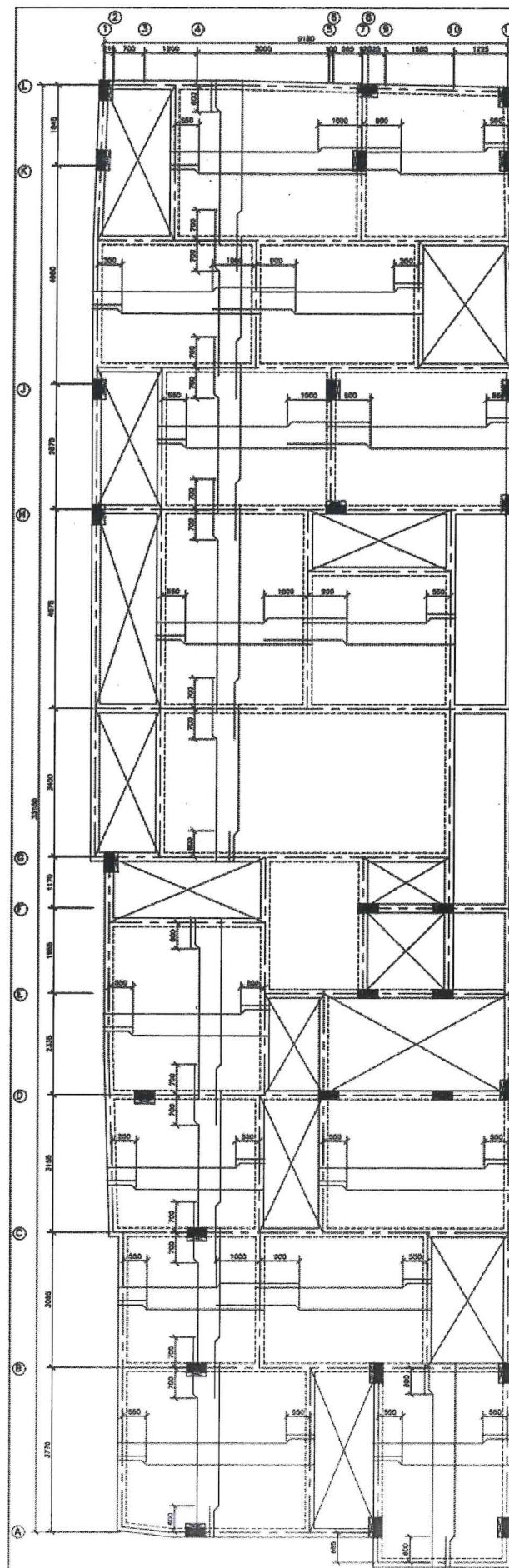
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. ALL RCC WORKS TO BE WITH M30 CONCRETE AND TO BE EXECUTED AS IS : 456 - 2000, USING 20mm GRADED GRANITE METAL WATER CEMENT EXCEEDING 0.45. HIGH YIELD STRENGTH DEFORMED BARS (TOR SHALL BE IS: 1786 - 2008 (Fe 500)).
3. LAP LENGTH FOR ALL BARS TO BE 45 TIMES THE DIAMETER.
4. CONCRETE COVER FOR ALL MAIN RODS IN FOUNDATION AND PLINTH BEAM TO BE 40 UNLESS OTHERWISE STATED.

ALT	DATE	DESCRIPTION	DRAWN	CHECKED
0	28/02/25	AS DRAWN		

CONSULTANTS	MURUGU CONSULTANTS
CLIENT	BA/10, UMAPPATHY STREET EXT. W.MAMBALAM, CHENNAI - 33. Ph. H M/S HORMONY HOMES 12TH AVENUE, ASHOK NAGAR CHENNAI - 600 083.
ARCHITECT	dststyle PROP CHENNAI - 600 083. PHONE : 65855326, 65389407.

PROPOSED CONSTRUCTION OF BUILDING IN KODAMBAKK. LAYOUT AND RCC PLINTH BEAM SCALE : 1 : 50, 1 : 25 DRG.No: MC-112/2025
--



DETAIL OF ROOF BEAM IN ROW L

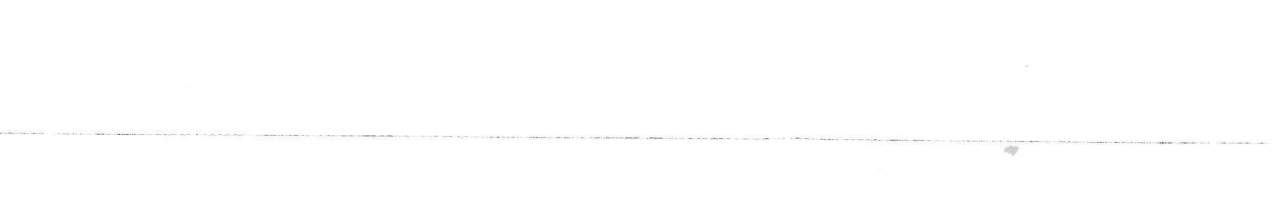
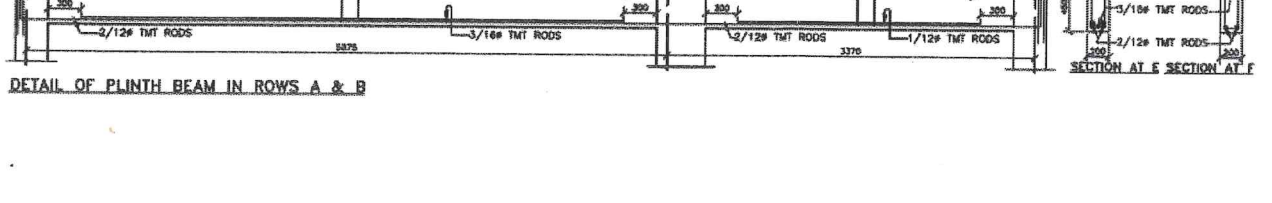
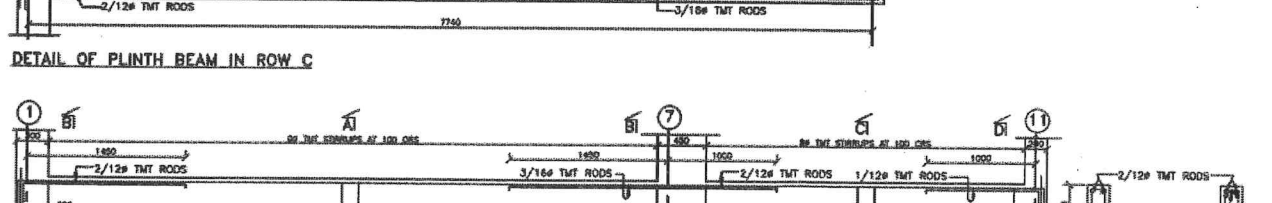
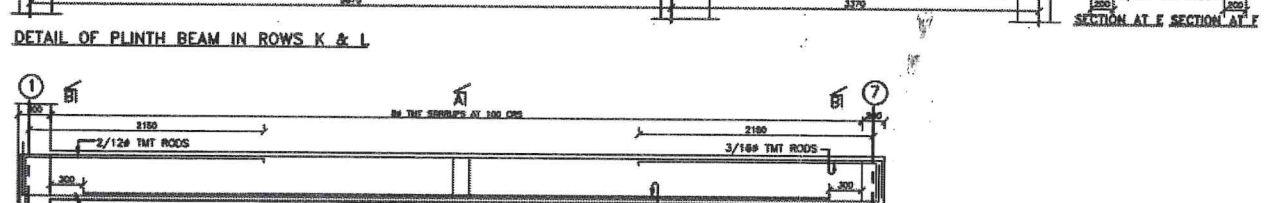
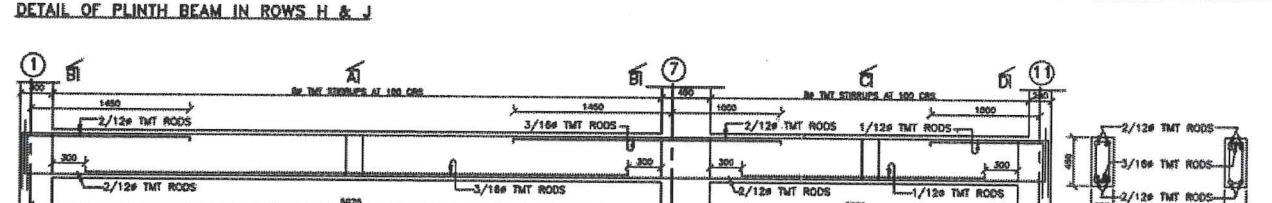
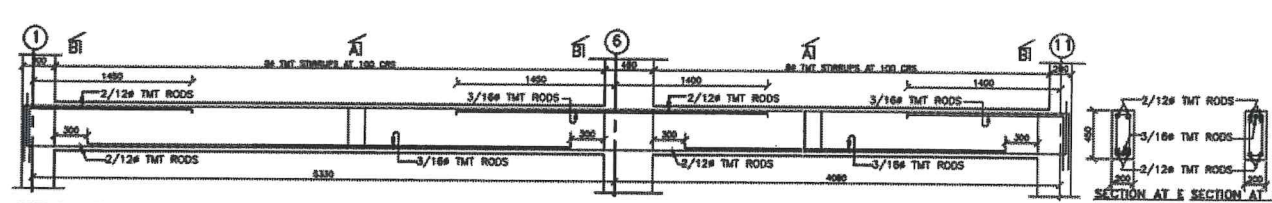
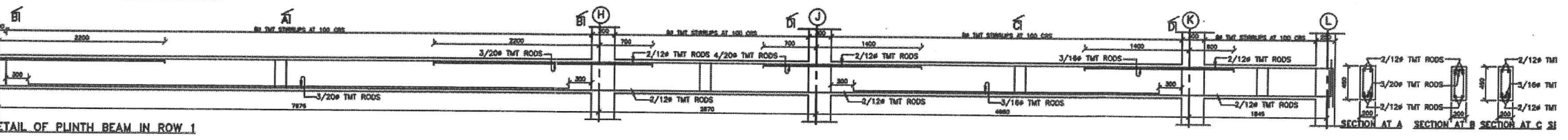
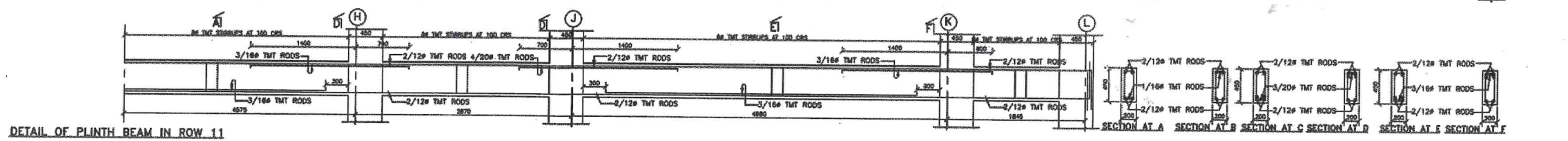
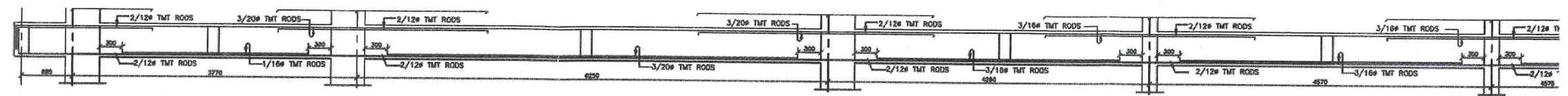
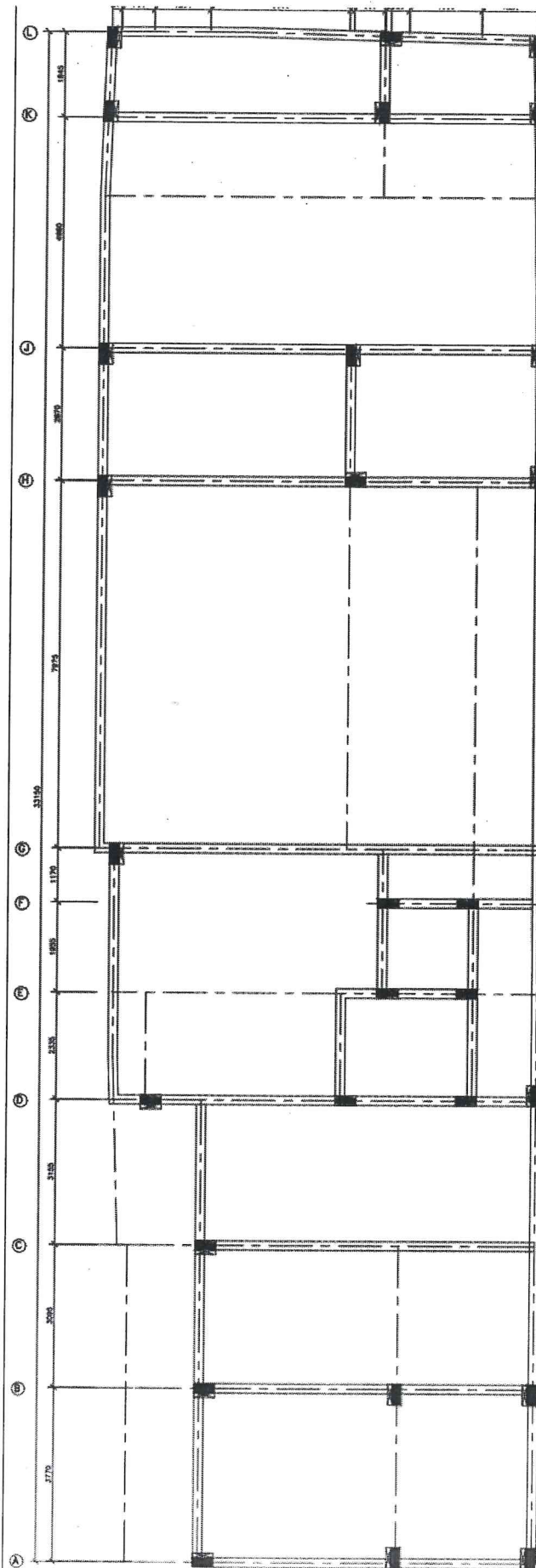
[Signature]

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 Mobile: 9884400273, Email: mpunithan@yahoo.com

NOTES:

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- CONCRETE COVER FOR ALL MAIN RODS IN FOUNDATION AND PLINTH BEAMS TO BE 40 UNLESS OTHERWISE STATED.

	0	24/02/24	AS DRAWN			
	ALT	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
CONSULTANTS  MURUGU CONSULTANT						
3A/10, UNAPATHY STREET EXT. W. MAMBALAM, CHENNAI - 53, Ph. No.9884400273.						
CLIENT	M/S HORMONY HOMES 12TH AVENUE, ASHOK NAGAR CHENNAI - 600 083.			PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING IN KODAMBAKKAM. LAYOUT AND RCC DETAILS ROOF BEAM & SLAB		
ARCHITECT	diastyle PROP CHENNAI - 600 083. PHONE : 65953326, 65359407.			SCALE : 1 : 50, 1 : 25 DRG.No: MC-112/2025 SHEET 3		



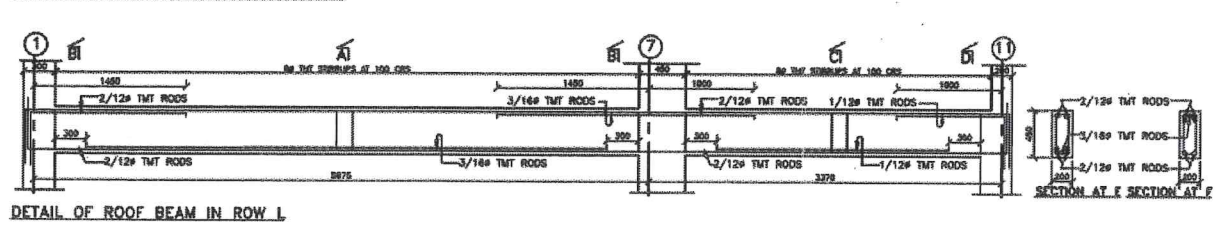
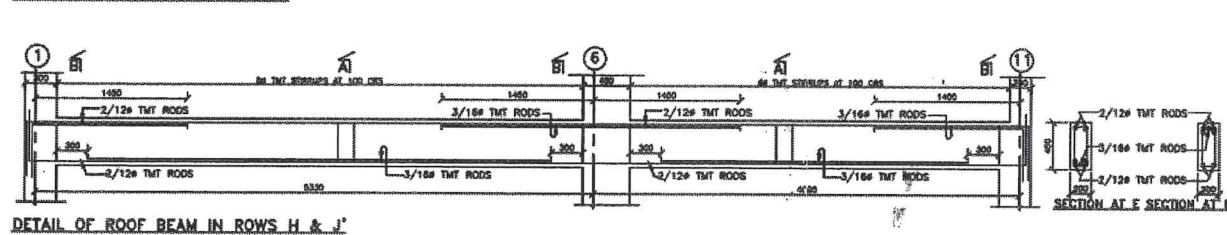
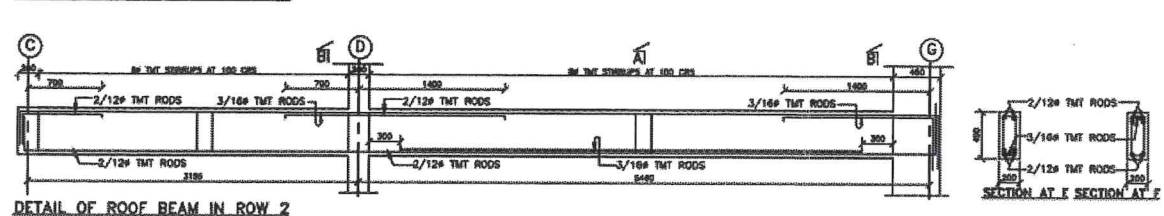
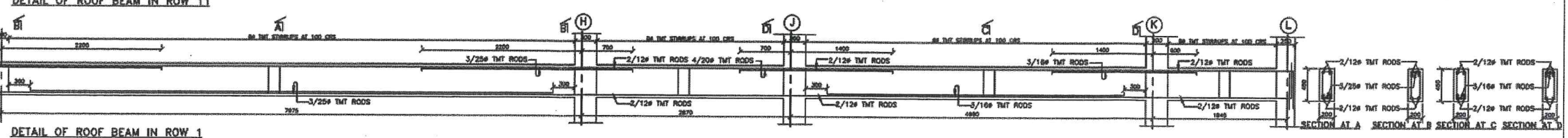
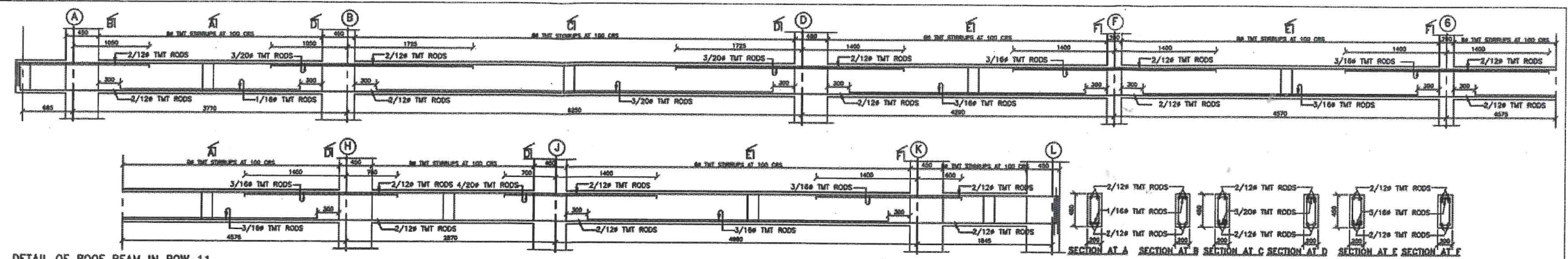
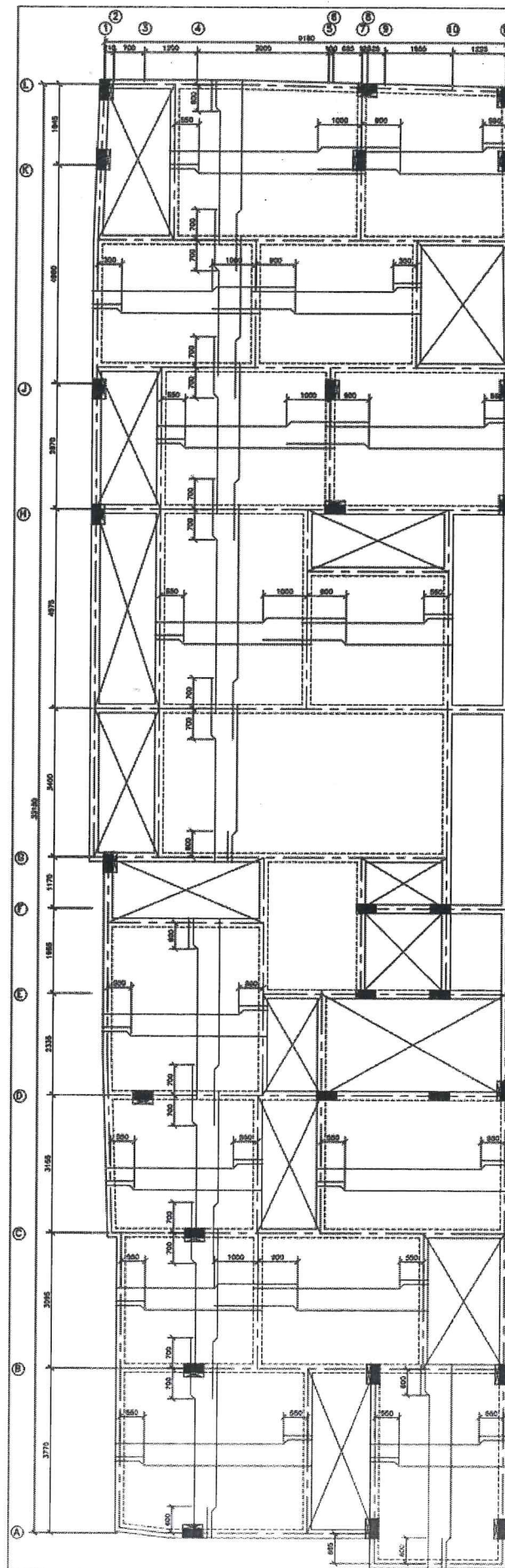
Signature

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 Mobile: 9884400273, Email: mpunithan@yahoo.com

NOTES:

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3. LAP LENGTH FOR ALL BARS TO BE 45 TIMES THE DIAMETER.
4. CONCRETE COVER FOR ALL MAIN BARS IN FOUNDATION AND PLINTH BEAM TO BE 40 UNLESS OTHERWISE STATED.

DATE	AS DRAWN	DATE	DESCRIPTION	DRAWN	CHECKED
01/02/25					
MURUGU CONSULTANTS					
BA/10, UMAPATHY STREET EXT. W.MAMBALAM, CHENNAI - 600 083.					
CLIENT	M/S HORMONY HOMES		PROPOSED CONSTRUCTION OF BUILDING IN KODAMBAKK.		
	12TH AVENUE, ASHOK NAGAR, CHENNAI - 600 083.		LAYOUT AND RCC PLINTH BEAM		
ARCHITECT	diastyle		SCALE : 1 : 50, 1 : 25		
	PROP. CHENNAI - 600 083.		DRG.No: MC-112/2025		
	PHONE: 65555526, 65559407.				



M. Punithan

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DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
01/05/2024	AS DRAWN			
CONSULTANTS MURUGU CONSULTANT				
3A/10, UNAPATHY STREET EXT. W. MAMBALAM, CHENNAI - 33. Ph No. 9884400273.				
CLIENT	M/S HORMONY HOMES 12TH AVENUE, ASHOK NAGAR CHENNAI - 600 083.	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING IN KODAMBAKKAM. LAYOUT AND RCC DETAILS ROOF BEAM & SLAB		
ARCHITECT	diastyle PROP. CHENNAI - 600 083. PHONE : 63855326, 65359407.	SCALE : 1 : 50, 1 : 35 DRG.No: MC-112/2025 SHEET 3		