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DESIGN CALCULATION

PROPOSED CONSTRUCTION OF A COMMERCIAL CUM RESIDENTIAL BUILDING (STILT+3) AT PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091

OWNER

M/s Sri Suprabhatham Builder

STRUCTURAL CONSULTANT

Er.D. KABILAN, M.Tech.,
P o: no 13 Shiridi Sai Nagar,Poonamalee,Chennai -600056.
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CMDA Reg No : SE/GR-II/2019/04/047
PL. No.13, SHIRIDI SAI NAGAR,
POONAMALLEE, CHENNAI-56.
CELL : 98843 99903

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1.0 DESIGN BRIEF:

1. PROPOSED CONSTRUCTION OF A COMMERCIAL CUM RESIDENTIAL BUILDING (STILT+3) PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091

2.0 GENERAL DESIGN CRITERIA

Description of the structure

The Residential Building consists of Stilt Floor + 3 Upper floors and the structure is designed as a RCC framed structure.

1. Size of the building : 15.24 x 34.74m
2. Height of the building : 12.0m
3. Number of storeys above GL : Stilt Floor + 3 upper floors
4. Floor to floor height of this building : Stilt floors - 3.0m
   : Typical floor – 3.0m
5. Type of foundation : Pile foundation as per geotechnical report

Materials Used

Following materials are generally used in the design of the various components of the structure.
For Concrete Structure

- M25 grade concrete for all reinforced concrete parts of the structure
- Fe500 grade Structural reinforcement steel
- Masonry for all walls : Brick / Block

Design Codes & Standards

Following codes and specifications have been generally used in the design of the members of the structure.

- IS 456 : 2000 Code of practice for Plain and Reinforced concrete
- SP: 16 Design Aids for Reinforced concrete
- IS 875 : 1987 Design Loads for building and structures
- IS 1893 : 2002 Criteria for Earthquake Resistant design of structures
- IS 13920: 1993 Ductile Detailing of R.C structures subjected to Seismic forces
- SP: 34 Handbook on Concrete Reinforcement & Detailing
- IS 800 : 1984 Code of practice for general construction in steel
- IS 2062 : 1999 Steel for general structural purposes specification
- IS 1786: 1985 Specification for high strength deformed bars and wires for concrete reinforcement

LOADING

Primary Load:

- Dead Load (DL)
- Live Load (LL)

Dead load

(DL)

Material

weight

- Density of Concrete =25 kN/m^3
- D.L. due to partitions

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(Light Partition as per IS 875) =1.50 kN/m^2

- D.L due to floor finish 50mm thick = 0.05x25 = 1.25 kN/m^2

Live load (LL)

Minimum Uniformly Distributed Live Loads:

Occupancy or use	Live Load (kn/m^2)
• All rooms and kitchens	2.00
• Toilet and bath rooms	3.00
• Corridors, passages, staircases	3.00
• Balconies	3.00
• Terrace Floor	1.50
• Basic wind speed	=50 m/sec
• Seismic Zone	=Zone III

Loading Combinations

The following combinations of Loads as per IS 1893 is considered in the STAAD Analysis

- 1.5(DL +LL)
- 1.2(DL + LL)

The below load combinations are used to check the structure in serviceability condition.

- 1.0(DL +LL)

STRUCTURAL MATERIAL:

Concrete Material Specifications:

Concrete compressive cube strength	- 25 N/mm^2
Minimum cement content	- Refer standard drawings for general & Legends
Cement type	- OPC
Free water cement ratio	- 0.5 (Maximum)
Nominal maximum size of aggregate	- 20mm UNO

Reinforcement:

Steel reinforcement shall be deformed bars, the characteristic of reinforcement bars shall conform to the following specification:

Grade of Steel	Actual Yield Strength (MPa)
Grade Fe500	Minimum 500 MPa,

Concrete cover:

Cover for Reinforcement is considered as per Table 16A of NBC, for a Fire resistance of 2 hrs.

- Raft Slab = 50mm
- Footing = 50mm
- RC Wall = 30mm
- Columns = 40mm

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- Beams = 30mm
- Slabs = 25mm

5.0 Structural Description

Method of analysis

Structure analysis & design:

The structure is analyzed as a Space frame structure in STADD Pro Vi8. Columns, Footing, Basement walls, slabs, Beams and Staircases are designed as reinforced concrete members.

Framing System, Analysis and Design

Limit State concept of design will be used as per IS: 456-2000 & SP - 16. The detailing of reinforcement shall be done satisfying the requirements of IS: 456-2000, SP-16, IS: 13920, IS: 4326-1993 and SP-34.

The Slabs and beams are checked for deflection as per IS 456:2000. Cover for Reinforcement is considered as per Table 16A of NBC, for a Fire resistance of 2 hrs.

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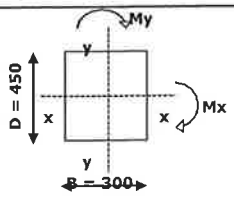
APPENDIX I

Design Calculations

Column Design

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PROJECT	PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE	Design for a Short Column with Biaxial Bending	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Column No:  **CRITICAL LOAD CASE:**	
1.0	**Basic Data**	
1.1	**Material Data**	
	Grade of Concrete = M **25**	
	Grade of Steel = Fe **500**	
1.2	**Codal Data**	
	Nominal Cover = **40** mm	Cl 26.4.2.1,IS456:2000
	Diameter of the Bar = **25** mm ≥ 12 mm	
	d' = 52.5 mm	
1.3	**Basic Dimensions**	
	Unsupported Length of the Column L_{ox} = **3000** mm	
	L_{oy} = **3000** mm	
	L_{ex} = **3000** mm	Table 28 ,
	L_{ey} = **3000** mm	IS456:2000
	Size of the Column B X D = **300** x **450** mm	
1.4	**Analysis Results**	
	Factored Axial Load P_u = **780.0** kN	STAAD
	Factored Moment M_{ux} = **22.00** kNm	OUTPUT
	Factored Moment M_{uy} = **71.00** kNm	
2.0	**Check for Slenderness**	
	Slenderness Ratio about Major Axis L_{ex} / D = 6.667	
	Slenderness Ratio about Minor Axis L_{ey} / B = 10.000	
	Since Leff / LLD <12 Designed as Short Column	Cl 25.1.2, IS456:2000
3.0	**Check for Eccentricity**	
	Minimum Eccentricity e_x = L_{ox} / 500 + D / 30 = 21.0 mm >20	Cl 25.4
	e_y = L_{oy} / 500 + B / 30 = 16.0 mm <20	IS456:2000
3.1	**Moments Due to Minimum Eccentricity**	
	Me_x = 16.38 kN.m	
	Me_y = 15.60 kN.m	
4.0	**Design Moment**	
	Design Moment about X axis M_{ux} = 22.00 kN.m	
	Design Moment about Y axis M_{uy} = 71.00 kN.m	

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TITLE	Design for a Short Column with Biaxial Bending	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
5.0	**Uniaxial Moment Carrying capacity of the Section about X & Y- axis**	
	d' / D = 0.117	
	d' / B = 0.175	
	Assume the Reinforcement Percentage p = **1.50**	
	p / f_{ck} = 0.060	
	$p_u / f_{ck}BD$ = 0.231	
	Reinforcement distributed equally on four sides **4**	
	$M_{ux1} / f_{ck}BD^2$ = 0.116	Chart 43 - 46
	$M_{uy1} / f_{ck}DB^2$ = 0.102	SP 16 : 1980
	Moment carrying capacity about X axis M_{ux1} = 175.47 kN.m	
	Moment carrying capacity about Y axis M_{uy1} = 103.22 kN.m	
6.0	**Calculation of P_{uz}**	
	$P_{uz} = 0.45 f_{ck} A_c + 0.75 f_y A_{sc}$ = 2255.34 kN	Cl 39.6 , IS456:2000
	P_u/P_{uz} = 0.346	
	α_n = 1.243	Cl 39.6 , IS456:2000
7.0	**Criteria for Biaxial Bending (Bresler's Formulation)**	
	$(M_{ux}/M_{ux1})^{\alpha n} + (M_{uy}/M_{uy1})^{\alpha n}$ = **0.704** < 1 **Hence Safe**	Cl 39.6 , IS456:2000
8.0	**Longitudinal Reinforcement**	
	Area of compression Steel $A_{sc,reqd}$ = **2025** mm^2	
	8 Nos Y20 $A_{sc,pro}$ = **3142** mm^2	
8.1	**Check for Minimum & Maximum Area of Steel**	
	Minimum Area of steel (0.8 % of $A_{g,dir}$) = **441** mm^2	Cl 26.5.3.1 a & b ,
	(Based on the area of concrete reqd to resist direct stress)	IS 456 : 2000
	Maximum Area of steel (4 % of A_g) = **5400** mm^2	
	441 < **3142** < **5400** mm^2	
	Area of Steel is with in the permissible limit ; Hence O.K	
9.0	**Transverse Reinforcement**	
9.1	Diameter of Transverse Reinforcement = **8** mm ≥ 6 mm	Cl 26.5.3.2 c 2) ,
9.2	**Spacing of Lateral Ties :**	
i)	Least Lateral Dimension of the column = 300 mm	Cl 26.5.3.2 c 1) ,
ii)	16 times the Smallest dia of Longitudinal Steel = 320 mm	IS 456 : 2000
iii)	= 300 mm	
	Reqd. Spacing of Ties (Minimum of the above) = 300 mm	
	Provide 8 mm dia Lateral Ties @ **300** mm Spacing	
	Provide closer spacing on either side of the column above and below beam / slab.	

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Footing Design

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TITLE : Pilecap Design by Bending Theory — Designed : _____ Date : _____

SUBJECT Two(2) Pile Group - TYPE P2 — Checked : _____ Date : _____

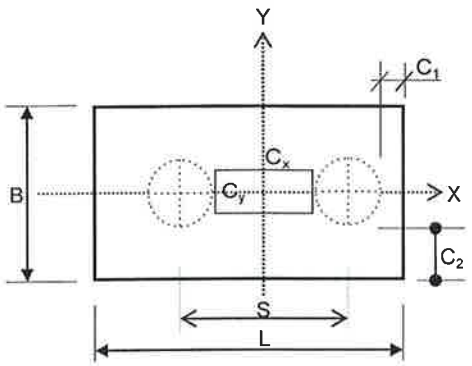
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Pile spacing from center to center should not exceed 2.5 times the pile diameter

Total Column Axial Load	N =	480	kN (Service Load)
Total number of piles	=	2	Nos.
Pile Axial Load	P =	240	kN/pile
Combined Load Factor	L_f =	1.5	
Edge of pile to edge	C_1 =	150	mm
of pilecap distance	C_2 =	150	mm

1. Pile cap geometry

Pile diameter,	D =	600	mm
Pile spacing,	S =	2.50 x D	
Pile cap length	L =	1880	mm
Pile cap breadth	B =	750	mm
Pile cap depth	H =	600	mm
Column length	C_x =	600	mm
Column breadth	C_y =	450	mm
Bottom cover	c =	50	mm
Top cover	c_t =	50	mm
Side cover	c_s =	50	mm
Minimum pilecap depth (Per Reynolds's Handbook)	=	750	mm



2. Pile cap material

Concrete strength	f_{cu} =	25	N/mm²
Steel strength	f_y =	500	N/mm²
Partial safety factor for strength of stee	γ_{ms} =	1.15	

3. Reinforcement design

X - direction

Pile center to pile cap center distance	=	565.0 mm
Pile center to column face distance	=	265.0 mm
Bar diameter, ϕ =		25 mm
Ultimate design moment M_{ux} =		95.4 kNm
Eff. depth d_x =		537.5 mm
$K = M_{ux}/bd^2f_{cu}$ =		0.0176 < 0.156, So O.K !
Lever arm z_x =		510.6 mm

Reinforcement required

$A_{sx\ req} = M_u/(1/\gamma_{ms} \times f_y \times z)$ =	585	mm²
No. of bars =	6	Nos.
Bar spacing =	625	mm

Reinforcement provided

As prov =	3436	mm²
No. of bars =	6	Nos.
Bar spacing =	104	mm
100As/bd =	0.85	

O.K.!

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TITLE : Pilecap Design by Bending Theory — Designed : — Date :
SUBJECT Two(2) Pile Group - TYPE P2 — Checked : — Date :
PROJECT : PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091 — Job No. : — Page No:

Y - direction

Bar diameter, ϕ = 16 mm
Eff. depth d_y = 517 mm

Reinforcement required			Reinforcement provided			
$A_{sy\ req}$ =	1354	mm²	As prov =	1407	mm²	
No. of bars =	6	Nos.	No. of bars =	6	Nos.	O.K.!
Bar spacing =	294	mm	Bar spacing =	294	mm	
			100As/bd =	0.14		

4. Normal shear

X - direction

V_x = 360 kN
v = 0.89 N/mm²
v_c = 0.60 N/mm²
a_v = 130 mm
Enhanced shear = 4.00 N/mm² > v, Normal shear O.K.

5. Punching shear

Allowable punching shear = 4.00 N/mm²
Perimeter of column = 2100 mm
Punching shear stress = 0.64 N/mm² ==> Punching shear O.K.

6. Bar anchorage

f_{bu} = 2.50 N/mm² (Deformed Bar Type 2) Where $f_{bu} = \beta (f_{cu})^{1/2}$

X - direction

Anchorage length required = 311 mm
Anchorage length available = 750 mm ==> Anchorage O.K.

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Plinth Beam Design

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CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES
1.1	**Geomentry Data**					
	Beam Number		=			
	Type of Beam		=	Rectangular Beam		
	Support Condition		=	Continuous Beam		
	Width of beam	b	=	230	mm	
	Overall Depth of Beam	D	=	380	mm	
	Dia of bar	Φ	=	25	mm	
	Nominal Cover	cc	=	30	mm	IS 456:2000 Table 19
	Effective Depth	d	=	337.5	mm	IS 456:2000
	Effective Cover		=	42.5	mm	Cl 23.0
	Effective Span of beam	l_{eff}	=	4500	mm	
	Concrete grade		=	M 25		
	Steel Grade		=	Fe 500		
	$p_{t,lim}$		=	0.944 %		
	$p_{t,min}$		=	0.170 %		IS 456:2000
	p_t & p_{cmax}		=	4.00 %		Cl 26.5.1.1
1.2	**Force Input**					
	Left negative moment (Support 1)		=	84	kNm	
	Mid span positive moment		=	84	kNm	
	Right negative moment (Support 2)		=	84	kNm	
	Shear @ (Support 1)		=	149	kN	
	Shear @ (Span)		=	149	kN	
	Shear @ (Support 2)		=	149	kN	
1.3	**Limiting Moment**					
	M_{ullm} = 0.133 f_{ck} b d^2		=	87.11	kNm	
1.4	**Area of Steel**					
	Minimum Area of Ste = 0.17% b d		=	131.963	mm^2	
	Support 1					
	Negative moment (Support 1)		=	84	kNm	
	Hence the Section is designed as Singly Reinforced Section					
		M_u/bd^2	=	3.206		
	Percentage of tension steel reqd	p_t	=	0.028	%	
	Percentage of compression steel reqd	p_c	=	0	%	
	Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm^2	
	Required Area of compression steel	$A_{sc\ reqd}$	=	0.00	mm^2	

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CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	3	12		

A_{st} provided = 339.29 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforceme	3	12	0	

A_{sc} provided = 339.29 mm^2

Percentage of tension steel provided p_t = 0.437 % **Hence O.K**

Percentage of compression steel provid p_c = 0.437 % **Hence O.K**

Check for Shear

Shear		=	149	kN	
Nominal Shear Stress	τv	=	1.9	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.9	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm^2	Table 19, IS456:2000
Diameter of the Stirrup bar		=	8	mm	Table 20, IS456:2000
Number of Legs		=	2		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	250		Cl 26.5.1.5,IS456:2000

Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing

Support 2

Negative moment		=	84	kNm
Hence the Section is designed as Doubly Reinforced Section				
	M_u/bd^2	=	3.206	
Percentage of tension steel reqd	p_t	=	0.028	%
Percentage of compression steel reqd	p_c	=	0	%
Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	0	mm^2

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	3	12	0	0

A_{st} provided = 339.292 mm^2

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CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

	Nos	Dia	Nos	Dia
Compression Reinforceme	**3**	**12**	**0**	**0**

A_{sc} provided = 339.29 mm^2

Percentage of tension steel provided p_t = 0.437 % **Hence O.K**

Percentage of compression steel provid p_c = 0.437 % **Hence O.K**

Check for Shear

Shear = 14[illegible] kN

Nominal Shear Stress	τv	=	1.92	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm^2	Table 19, IS456:2000
Diameter of the Stirrup bar		=	**8**	mm	Table 20, IS456:2000
Number of Legs		=	**2**		
Spacing of Shear reinforcement Required		=	190.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	250		Cl 26.5.1.5,IS456:2000

Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing

Span

Positive moment (Span) = 84 kNm

Hence the Section is designed as Singly Reinforced Section

	M_u/bd^2	=	3.325	
Percentage of tension steel reqd	p_t	=	0.029	%
Percentage of compression steel reqd	p_c	=	0	%
Required Area of tension steel	$A_{st\ reqd}$	=	131.96	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	0	mm^2

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	**3**	**12**	**0**	**0**

A_{st} provided = 339.29 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforceme	**3**	**12**	**0**	**0**

A_{sc} provided = 339.29 mm^2

Percentage of tension steel provided p_t = 0.437 % **Hence O.K**

Percentage of compression steel provid p_c = 0.437 % **Hence O.K**

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PROJECT	PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE		REVISION	DATE	CHECKED	DATE

CL. NO.	BEAM DESIGN CALCULATIONS				REFERENCES
	Check for Shear				
	Shear		= 149	kN	
	Nominal Shear Stress	τv	= 1.92	N/mm^2	Cl 40.1, IS456:2000
	Permissible Shear Stress	τc	= 0.92	N/mm^2	β = 1.000
	Maximum Shear Stress	$\tau c,max$	= 2.5	N/mm^2	Table 19, IS456:2000
	Diameter of the Stirrup bar		= **8**	mm	Table 20, IS456:2000
	Number of Legs		= **2**		
	Spacing of Shear reinforcement Required		= 190.0		Cl 40.4, IS456:2000
	Maximum Spacing of Shear Reinforcement		= 250		Cl 26.5.1.5,IS456:2000
	Provide 8 mm dia 2 legged stirrups @ 190mm c/c spacing				
	Check For Deflection				
	Basic Value		= **26**		Cl.23.2, IS456:2000
	Service Stress in Steel	f_s	= **112.79**	N/mm^2	
	Modification Factor(Tension Reinforcement)	F_1	= 2.00		
	Allowable Span/Depth		= 52.00		
	Actual Span/Depth		= 13.33	**Hence Safe**	

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PROPOSED CONSTRUCTION OF A COMMERCIAL CUM RESIDENTIAL BUILDING (STILT+3) PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091

Floor Beam Design

KAV STRUCTURAL DESIGN CONSULTANT
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PROJECT	PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE		REVISION	DATE	CHECKED	DATE

CL. NO.	BEAM DESIGN CALCULATIONS					REFERENCES
1.1	**Geomentry Data**					
	Beam Number		=	B1		
	Type of Beam		=	Rectangular Beam		
	Support Condition		=	Continuous Beam		
	Width of beam	b	=	230	mm	
	Overall Depth of Beam	D	=	530	mm	
	Dia of bar	Φ	=	25	mm	
	Nominal Cover	cc	=	30	mm	IS 456:2000 Table 19
	Effective Depth	d	=	487.5	mm	IS 456:2000
	Effective Cover		=	42.5	mm	Cl 23.0
	Effective Span of beam	l_{eff}	=	3700	mm	
	Concrete grade		=	M 25		
	Steel Grade		=	Fe 500		
	$p_{t,lim}$		=	0.944 %		
	$p_{t,min}$		=	0.170 %		IS 456:2000
	p_t & p_{cmax}		=	4.00 %		Cl 26.5.1.1
1.2	**Force Input**					
	Left negative moment (Support 1)		=	145	kNm	
	Mid span positive moment		=	145	kNm	
	Right negative moment (Support 2)		=	145	kNm	
	Shear @ (Support 1)		=	158	kN	
	Shear @ (Span)		=	158	kN	
	Shear @ (Support 2)		=	158	kN	
1.3	**Limiting Moment**					
	M_{ulim} = 0.133 f_{ck} b d^2		=	181.75	kNm	
1.4	**Area of Steel**					
	Minimum Area of Ste = 0.17% b d		=	190.613	mm^2	
	Support 1					
	Negative moment (Support 1)		=	145	kNm	
	Hence the Section is designed as Singly Reinforced Section					
		M_u/bd^2	=	2.653		
	Percentage of tension steel reqd	p_t	=	0.011	%	
	Percentage of compression steel reqd	p_c	=	0	%	
	Required Area of tension steel	$A_{st\ reqd}$	=	190.61	mm^2	
	Required Area of compression steel	$A_{sc\ reqd}$	=	0.00	mm^2	

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PROJECT	PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE		REVISION	DATE	CHECKED	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	**3**	**20**	**2**	**20**

A_{st} provided = 1570.80 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforceme	**3**	**20**	**2**	**20**

A_{sc} provided = 1570.80 mm^2

Percentage of tension steel provided p_t = 1.401 % **Hence O.K**

Percentage of compression steel provid p_c = 1.401 % **Hence O.K**

Check for Shear

Shear = 15ℰ kN

Nominal Shear Stress	τv	=	1.41	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm^2	Table 19, IS456:2000
Diameter of the Stirrup bar		=	**8**	mm	Table 20, IS456:2000
Number of Legs		=	**2**		
Spacing of Shear reinforcement Required		=	380.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	300		Cl 26.5.1.5,IS456:200

Provide 8 mm dia 2 legged stirrups @ 300mm c/c spacing

Support 2

Negative moment = 14ℰ kNm

Hence the Section is designed as Doubly Reinforced Section

	M_u/bd^2	=	2.653	
Percentage of tension steel reqd	p_t	=	0.011	%
Percentage of compression steel reqd	p_c	=	0	%
Required Area of tension steel	$A_{st\ reqd}$	=	190.61	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	0	mm^2

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	**3**	**20**	**2**	**20**

A_{st} provided = 1570.8 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforceme	**3**	**20**	**2**	**20**

A_{sc} provided = 1570.80 mm^2

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PROJECT	PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091	DOCUMENT. NO.	DATE	DESIGNED	DATE
TITLE		REVISION	DATE	CHECKED	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Percentage of tension steel provided p_t = 1.401 % **Hence O.K**

Percentage of compression steel provid p_c = 1.401 % **Hence O.K**

Check for Shear

Shear = 158 kN

Nominal Shear Stress	τv	=	1.4:	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.9:	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm^2	Table 19, IS456:2000
Diameter of the Stirrup bar		=	8	mm	Table 20, IS456:2000
Number of Legs		=	2		
Spacing of Shear reinforcement Required		=	380.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	300		Cl 26.5.1.5,IS456:200

Provide 8 mm dia 2 legged stirrups @ 300mm c/c spacing

Span

Positive moment (Span) = 145 kNm

Hence the Section is designed as Singly Reinforced Section

	M_u/bd^2	=	3.325	
Percentage of tension steel reqd	p_t	=	0.014	%
Percentage of compression steel reqd	p_c	=	0	%
Required Area of tension steel	$A_{st\ reqd}$	=	190.61	mm^2
Required Area of compression steel	$A_{sc\ reqd}$	=	0	mm^2

Detail of bars

	I st Layer		II nd Layer	
	Nos	Dia	Nos	Dia
Tension Reinforcement	**3**	**20**	**2**	**20**

A_{st} provided = 1570.80 mm^2

	Nos	Dia	Nos	Dia
Compression Reinforceme	**3**	**20**	**2**	**20**

A_{sc} provided = 1570.80 mm^2

Percentage of tension steel provided p_t = 1.401 % **Hence O.K**

Percentage of compression steel provid p_c = 1.401 % **Hence O.K**

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PROJECT	PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091	DOCUMENT. NO	DATE	DESIGNED	DATE
TITLE		REVISION	DATE	CHECKED	DATE

CL. NO.	BEAM DESIGN CALCULATIONS	REFERENCES

Check for Shear

Shear		=	158	kN	
Nominal Shear Stress	τv	=	1.41	N/mm^2	Cl 40.1, IS456:2000
Permissible Shear Stress	τc	=	0.92	N/mm^2	β = 1.000
Maximum Shear Stress	$\tau c,max$	=	2.5	N/mm^2	Table 19, IS456:2000
Diameter of the Stirrup bar		=	**8**	mm	Table 20, IS456:2000
Number of Legs		=	**2**		
Spacing of Shear reinforcement Required		=	380.0		Cl 40.4, IS456:2000
Maximum Spacing of Shear Reinforcement		=	300		Cl 26.5.1.5,IS456:200

Provide 8 mm dia 2 legged stirrups @ 300mm c/c spacing

Check For Deflection

Basic Value		=	**26**		Cl.23.2,:2000
Service Stress in Steel	f_s	=	**35.19**	N/mm^2	
Modification Factor(Tension Reinforcement)	F_1	=	2.00		
Allowable Span/Depth		=	52.00		
Actual Span/Depth		=	7.59	**Hence** IS456**Safe**	

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PROPOSED CONSTRUCTION OF A COMMERCIAL CUM RESIDENTIAL BUILDING (STILT+3) PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091

Floor Slab Design

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PROJECT	PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091	DOCUMENT.NO	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
1.0	**Design of Two Way Slab S3**	
1.0.1	**Basic Input Data**	
	Grade of concrete = **M 25**	
	Grade of steel = **Fe 500**	
	Thickness of slab D = **125** mm	
	Clear cover cc = **25** mm	Table 16 Cl.26.4.2 , IS 456 -2000
	Effective thickness of slab (d_{eff}) = 125 - 25 - 4 = 96 mm	
	Unit weight of concrete = 25 KN/m^3	Cl 19.2.1, IS 456-2000
	Effective Shorter Span L_x = **4.2** m	
	Effective Longer Span L_y = **6.6** m	
	Aspect ratio L_y/L_x = 1.57 < 2	
	Hence designed as Two way slab	Cl D-1.11, IS 456-2000
	Edge Condition : **One Long edge Discontinuous**	
1.0.2	**Load Data**	
	Self Weight of Slab = 0.125 x 25 = 3.125 KN/m^2	
	Floor finish = **1.500** KN/m^2	
	Partition Load = **1.500** KN/m^2	
	Sunken Filling = **0.000** KN/m^2	
	Imposed Load = **2.000** KN/m^2	IS 875 (Part 2) -1987
	Extra Load, (if Any) = **0.000** KN/m^2	
	Total load = 8.125 KN/m^2	
	Design load (Wu) = 1.5 x 8.125 = **12.188** KN/m^2	Table 18 Cl 36.4.1 IS 456 -2000
1.0.3	**Moment and Shear Calculations**	
	Short Span Direction	
	α_x for positive moment 1.5 → 0.051	Table 26 Cl D-1.1, IS 456 -2000
	1.75 → 0.059	
	for 1.57 α_x = 0.053	
	Positive moment M_x 0.053 x 12.19 x 4.2 ^2 = **11.46** KN-m	
	α_x for negative moment 1.5 → 0.067	Table 26 Cl D-1.1, IS 456 -2000
	1.75 → 0.077	
	for 1.57 α_x = 0.070	
	Negative moment M_x 0.070 x 12.19 x 4.2 ^2 = **15.02** KN-m	

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PROJECT	PLOT NO.3 & 6, BAZAAR ROAD (MADIPAKKAM - VELACHERY MAIN ROAD) AND VALLALPARI STREET, RAM NAGAR, MADIPAKKAM, CHENNAI 600091	DOCUMENT.NO	DATE	DESIGNED	DATE
TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Long Span Direction	
	For positive moment α_y = 0.028	Table 26 Cl D-1.1, IS 456 -2000
	Positive moment M_y : 0.028 x 12.19 x 4.2 ^2 = **6.02** KN-m	
	For negative moment α_y = 0.037	Table 26 Cl D-1.1, IS 456 -2000
	Negative moment M_y 0.037 x 12.19 x 4.2 ^2 = **7.95** KN-m	
	Shear force V_u = 12.19 x 4 x 1 = **25.59** KN	
1.0.4	**Check Effective Depth for Max.Bending Moment**	
	Depth required = $(M_x / (0.13 \times fck \times b))^{1/2}$ = 67.21 mm	Table C,SP 16 :1980 Cl 2.3
	Depth provided = 125 - 25 - 8 /2 = 96 mm > 67.21 mm	
	Hence the section is Safe against Bending	
1.0.5	**Check Depth for Shear**	
	Nominal Shear Stress : $\tau_v = V_u / b\,d$ = 0.27 N/mm²	Cl.40.1, IS 456:2000
	Design shear strength (τ_c) = 0.42 N/mm²	Table 19 , IS 456:2000
	k = 1.30	Cl.40.2.1.1, IS 456:2000
	$k * \tau_c$ = 0.55 N/mm²	
	τ_v < $k * \tau_c$ **Hence the section is Safe against Shear**	
1.0.6	**Check for Maximum Shear Stress:**	
	Nominal Shear Stress : $\tau_v = V_u / b\,d$ = 0.27 N/mm²	Cl.40.1, IS 456:2000
	Maximum Shear Stress ($\tau_{c,max}$) = 3.1 N/mm²	Table 20 , IS 456:2000
	0.5 $\tau_{c,max}$ = 1.55 N/mm²	
	$\tau_v < 1\ \tau_{c,max}$ **Hence the section is Safe against Max.Shear Stres**	Cl.40.2.3.1, IS 456:20
1.0.7	**Reinforcement calculations**	
	Short Span Direction @ Support	
	Mu/bd^2 = 15.02 x 10 ^ 6 / (1000 x 96 x 96) = **1.630**	
	Pt = **0.41** %	Table 2-4, SP16 :1980

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TITLE	TWO WAY SLAB DESIGN	REVISION	DATE	CHECKED	DATE

CL. NO.	DESIGN CALCULATIONS	REFERENCES
	Area of steel Ast = 0.0041 x 1000 x 96 = 391.8 mm^2	
	Minimum area of stee 0.0012 x 1000 x 125 = 150.00 mm^2	Cl:26.5.2.1
	Spacing of Y **8** bars 50.27 x 1000 / 391.80 = 128.23 mm	IS 456 -2000
	Check for Spacing	
	Minimum of 1) 3d = 288 mm	
	2) = 300 mm	Cl:26.3.3.(b).1
	3) = 128.23 mm	IS 456 -2000
	Therefore provide Y **8** @ **120** mm C/C	
	Short Span Direction @ Mid Span	
	Mu/bd^2 = 11.46 x 10 ^ 6 / 1000 x 96 x 96 = 1.243	
	Pt = 0.304 %	SP16 :1980 Table 2-4
	Area of steel Ast = 0.0030 x 1000 x 96 = 292.26 mm^2	IS 456:2000
	Minimum area of stee 0.0012 x 1000 x 125 = 150.00 mm^2	Cl:26.5.2.1
	Spacing of Y **8** bars 50.27 x 1000 / 292.26 = 171.9 mm	
	Check for Spacing	
	Minimum of 1) 3d = 288 mm	IS 456:2000
	2) = 300 mm	Cl:26.3.3.(b).1
	3) = 171.90 mm	
	Therefore provide Y **8** @ **150** mm C/C 150	
	Provided % of Tension Reinforcement (pt) = **0.349** %	
	Long Span Direction @ Support	
	Mu/bd^2 = 7.95 x 10 ^ 6 / 1000 x 96 x 96 = 0.863	
	Pt = 0.207 %	SP16 :1980 Table 2-4
	Area of steel Ast = 0.0021 x 1000 x 96 = 198.81 mm^2	IS 456:2000
	Minimum area of stee 0.0012 x 1000 x 125 = 150.00 mm^2	Cl:26.5.2.1
	Spacing of Y **8** bars 50.27 x 1000 / 198.81 = 252.7 mm	

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THE LANDLENS SUITE

Eight ways to know a piece of land before you pay for it.

This report covers one part of the picture. These cover the rest, drawn from the same government records, for any property in Tamil Nadu.

LandLens One
Ask anything about a property and get an answer grounded in live government records, with the sources shown.
/landlens/one

Verify My Land
Every record check run on one property and returned as a single report.
/landlens/verify-my-land

Legal Opinion
An advocate's written opinion on the title, built on the records we pull for it.
/landlens

One Map
Every layer on one map: the parcel, its boundary, zoning, water bodies and what sits around it.
/landlens/one/map

PriceMap
What land actually changed hands for around this plot, taken from the registered deeds.
/landlens/pricemap

Build Scope
What you are allowed to build here: floor space, height, coverage and setbacks.
/landlens/build-scope

Property Tracker
Watch a property and hear about it when something new is registered against it.
/landlens/property-tracker

Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
/landlens/deal-room

FREE TOOLS · NO ACCOUNT NEEDED

Twenty-four checks you can run yourself, at no cost.

Records and verification

The registers themselves, read for you.

- Encumbrance Certificate
- Patta and Chitta
- Field Measurement Sketch
- EC Analyzer
- Bank charge check
- Court case search
- Seller background check
- Approval check by survey

Value and duty

What it is worth and what it costs to register.

- Guideline value by street
- Guideline value by survey
- Stamp duty and registration fees
- Capital gains
- Floor space index
- Area unit converter

Zoning and land use

What the plan says can happen on this land.

- Land use zone finder
- CMDA land use check
- Coastal regulation zone
- Master plan check
- Water bodies finder
- Airport height clearance

Registers and directories

Who holds it, and which office keeps the record.

- Find your registering office
- Temple property check
- Waqf property check
- RERA register

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- Legal opinions, due diligence and title verification
- Building plan, layout and sub-division approvals
- Completion and occupancy certificates, regularisation
- Escrow, negotiation and NRI property management
- Land survey, soil testing, architecture and construction

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Prepared from the registers named on the page each finding sits on. Where a register could not be read, this document says so in its place rather than leaving the gap to be read as a clean result.