



Your trusted partner for buying, selling, and managing property,
ensuring hassle-free service with 100% transparency.

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate

+91 9996 12 9996

Official Property Record

Digitally Verified Record - Powered by Verified  RealEstate™





Dr.A.Ramakrishnan, M.E., Ph.D., M.I.E.,D.F.S

Structural & Geo Tech Consultant

☎ +91 99444 05248

☎ 04561 299639

✉ idhalgroups@gmail.com

📍 2089, Idhal Complex, Mullikundu,
Ramnager, Devakottai 630 302.

STRUCTURAL DESIGN BASIS REPORT

REPORT NO : SR / OCT/ 24 / 01	DATE : 30.10.2024	REV : 00
-------------------------------	-------------------	----------

**LOCATION : ALAGU FLATS RESIDENTIAL APARTMENT PROJECT
DEVAKOTTAI**

**CLIENT : MR.A.RATHINAM
RATHAN ABUILDERS,
NO:4A, AL.VR. VALAVU,
DEVAKOTTAI**

**PREPARED BY : IDHAL INFRASTRUCTURE,
No.2089, Idhal Complex, Mullikundu,
Ram Nagar, Devakottai - 630 303,
email : idhalgroups@gmail.com
Mob No : 9944405248.**



**DISTRICT TOWN AND COUNTRY PLANNING
COLLECTORATE CAMPUS, SIVAGANGAI
SIVAGANGAI DISTRICT.**

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that **Thiru.A.RAMAKRISHNAN** has enrolled as
Structural Engineers Grade-I (SE) with DISTRICT TOWN AND
COUNTRY PLANNING (D.T&CP) who has the qualification of M.E.
Structural Engineering and experience in the relevant filed for 15 years.

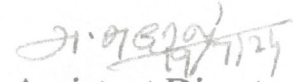
He has been given the Registration. No.SE. I / SVG .33/24 on .19 .07.2024,

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 up to . 18 .07.2029


Assistant Director

Town and Country Planning
Sivagangai District.

To
Dr.A.RAMAKRISHNAN,M.E. Ph.D,
No.13A, Senthil Nagar, Ramnagar,
Devakottai, Sivagangai. District.- 630302

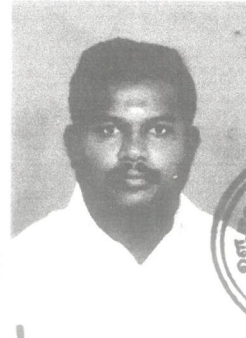


TABLE OF CONTENTS

1.1 FOREWORD

- 1.1.1 Description
- 1.1.2 Objective

1.2 CODES, STANDARDS AND REFERENCES

1.3 DESCRIPTION OF STRUCTURE

- 1.3.1 -Location
- 1.3.2 -Building Description
- 1.3.3 -Structural Arrangement

1.4 DESIGN APPROACH

- 1.4.1 -Design Life
- 1.4.2 -Material Properties
- 1.4.3 -Design loads
- 1.4.4 -Durability Consideration
- 1.4.5 -Fire Rating

1.5 ANALYSIS METHODOLOGY

- 1.5.1 -Assumptions
- 1.5.2 -Static Analysis

1.6 LOAD COMBINATIONS

1.7 DESIGN METHODOLOGY

1.8 ACCEPTANCE CRITERIA

1.9 DETAILING REQUIREMENTS



Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
DEVAKOTTAI - 630 303, SIVAGANGA
Mob:9344405248, Ph:0455

1.1 FOREWORD

1.1.1 –Description

Mr. A. Rathinam, Rathna Builders, No. 4A, AL. VR. Valavu, Devakottai – 630 302, intend to develop a residential building, at Devakottai.

1.1.2 –Objective

The objective is to provide design assumptions and philosophy adopted to analyze the structure. It covers complete structural elements design considerations for analysis of structure subjected to only gravity loads.

1.2 CODES, STANDARDS AND REFERENCES

DESIGN STANDARDS:

Specific applicable clauses of the codes and standards will be identified and adopted in the design philosophies as appropriate to the structural elements. The latest editions of the Codes and Standards will be used in designs. All design work shall be based on Indian Standards and codes with latest revision, with amendments if any, as on date.

Structural Requirements:

The design of structural and other building services will comply with the following requirements:

- National Building Code
- The Building Regulations
- The Environmental Protection Act in liaison with the Environmental Agency.
- Fire prevention and detection in compliance with the local Fire Regulation.

For Loads & RCC Design:

IS:456 -2000(2016)	Code of Practice for plain and reinforced concrete
IS:3370-2021	Code of Practice for concrete structures for the storage of liquids: (All parts)
IS:875 -2015	Code of Practice for design loads (other than earthquake) for Buildings and structure (All parts)
IS:5525-1969(2013)	Recommendation for detailing of reinforced concrete works
IS:1786-2008	Specification for high strength deformed steel bars and wires for concrete reinforcement
IS:10262-2009	Recommended guidelines for concrete mix design

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
Mob: 9944405248 Ph: 01561-299639

Foundations:

IS:1080-1985(2016)	Code of Practice for design and construction of shallow foundations on soils (other than raft, ring, and shell)
IS:1904-1986(2015)	Code of Practice for design and construction of foundations in soils general requirement
IS:2950-1981(2013)	Code of Practice for design and construction of raft foundations
IS:8009-1976/1980 (2013/2015)	Code of Practice for calculation of settlement of foundations (All parts)

Miscellaneous:

SP:34-1987	Handbook of concrete reinforcement and detailing (SCIP)
SP:16-1999	Design Aids for reinforced concrete to IS:456-1978
IS: 432(part 2)-1995	Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement
IS:3067-1995	Code of Practice for general design details and preparatory works for damp proofing and water proofing of buildings
SP:7 -2005	National Building Code of India
SP:24-1983	Explanatory handbook on Indian Standard code of Practice for plain and reinforced concrete

Materials:

IS:516- 1999	Method of test for strength of concrete.
IS:269-2015	Specification for Ordinary, rapid hardening and low heat Portland cement.
IS:1489-1991	Specification for portland pozzolana cement
IS:4031-1991	Method of physical tests for Portland cement.
IS:383-2016	Specification for coarse and fine aggregates from natural sources for concrete.
IS:1199-1999	Method of sampling and analysis of concrete.
IS:1566-2000	Specification for plain hard drawn steel wire fabric for concrete reinforcement.
IS:4990-1998	Specification for plywood for concrete shuttering works.
IS:2645-1999	Specification for integral cement water proofing compounds.



Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
Registered Structural Engineer Grade-I, SVG/33/2024

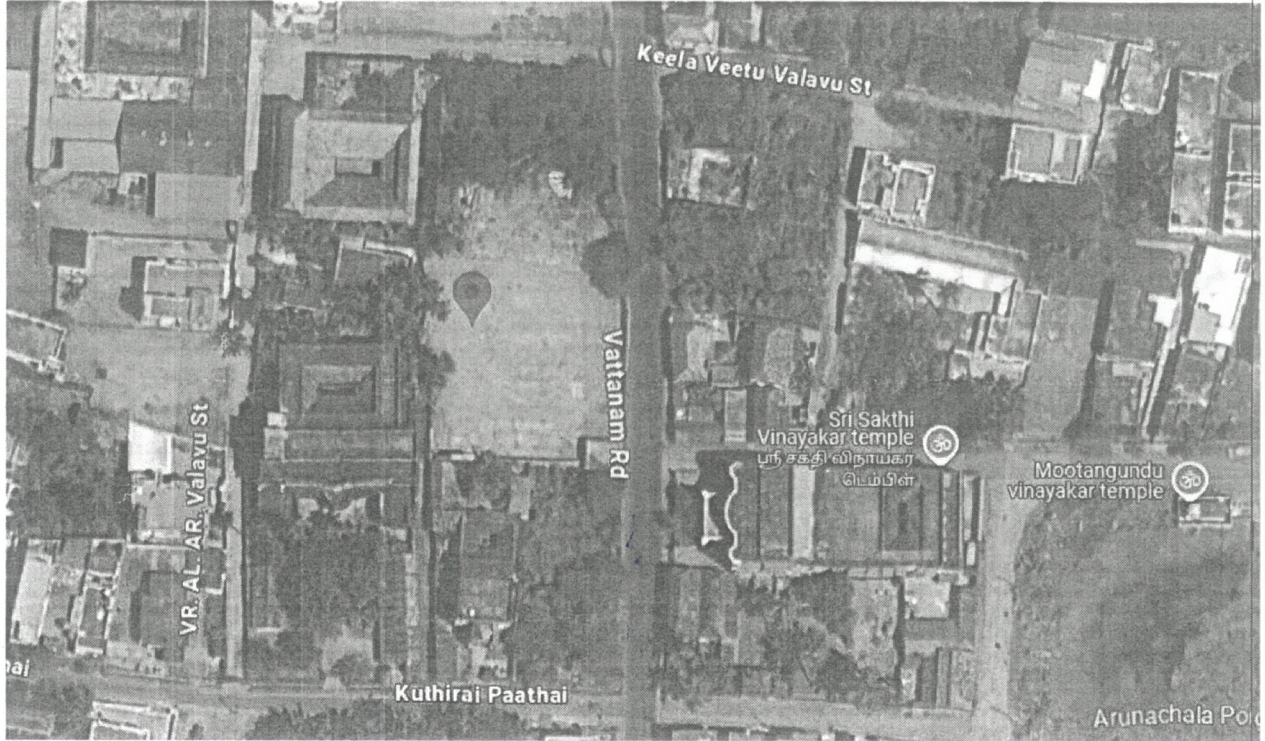
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR

DEVAKOTTAI - 630 303, SIVAGANGA DISTRICT
Mob:9944405249, Ph:0437-2551111

1.3 DESCRIPTION OF STRUCTURE

1.3.1 -Location

DEVAKOTTAI, TAMILNADU



1.3.2 -Building Description.

The proposed residential building consists of a single Basement, Ground plus 4 upper floors. The usage of individual floors of tower is given below:

Floors	Details
Ground floor	Parking
1 st Floor and above	Residential units

The height of the building is 12.20m from Ground floor to Terrace level.

Total number of slabs=4 no's of slabs.

Proposed Floor Heights:

Floor	Proposed floor to floor height
Ground floor	3.05m
Upper typical floors	3.05m
Total height of tower	12.20m (Ground level to terrace level)


Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., R.E.,
 Registered Structural Engineer Grade-I, SVG/33/2024
IDEAL INFRASTRUCTURE
 No.2089, IDHAL COMPLEX
 MULLIKUNDU, RAM NAGAR
 DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
 Mob:9944405248, Ph:04561-299639

1.3.3 –Structural Arrangement:

- The Structural System of building comprises of Columns, RC Beams and RC Slabs construction. Floor slabs and column are considered to act as a rigid diaphragm.

Sl. No.	Description	Tower area
1	Beam grids	Varies as per plan
2	Slab thickness	Varies and as needed by design
3	Column size	As per design
4	Beam size	As per design

1.4 DESIGN APPROACH

Architectural drawing was provided by the architect.

1.4.1 – Design Life.

The design life of the building is assumed to be 50 years. This requirement is applicable only for concrete works and not applicable to replaceable finishing materials, water proofing membrane and thermal insulations (if any). Hence periodic maintenance / refurbishment is required for all replaceable material for longer life.

1.4.2 –Material Properties.

Materials specified will confirm to the latest edition of the relevant Indian Standard or other accepted standard. Specifications for materials will include sampling and testing as stipulated in the design standards. Detailed material specifications will be included in the technical specification.

Concrete:

- All structural concrete shall have cube crushing strength of 25N/mm^2 at 28 days.
- Plain cement concrete shall have cube crushing strength of 7.5N/mm^2 at 28 days.

Concrete Mix:

Schedule of concrete grade for Sub-structure			
Floor Name	RC Footings	RC Columns	
Foundation	M25	M25	
Schedule of concrete grade for Super structure			
Floor name	RC Columns	RC Beams	RC Slabs
Ground floor to LMR roof	M25	M25	M25

Reinforcing steel:

- All reinforcement shall Confirm to IS:1786-2008 having minimum yield strength of 500N/mm^2 . Corrosion resistant steel is not required.

1.4.3 –Design Loads.

Loads:

Dead Loads:

Dead load shall include weight of all structural and Architectural components. Self-weight of the materials shall be calculated on the basis of unit weights given in IS:875.

Density of loads considered:

- Self-weight of plain concrete

2400kg/cum(24kN/cum)


Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
 Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
 No.2089, IDHAL COMPLEX
 KILLIKUNDU, RAM NAGAR
 DENKOTTAI - 630 303, SIVAGANGAI DIST.
 Mob:9944405248, Ph:04561-299639

DVK Apartment

• Self-weight of RCC	:	2500kg/cum(25kN/cum)
• AAC block masonry	:	650kg/cum(6.5kN/cum)
• Soil(Dry)	:	1800kg/cum(18kN/cum)
• Soil(Wet)	:	2000kg/cum(20kN/cum)
• Water	:	1000kg/cum(10kN/cum)
• Glass	:	2800kg/cum(28kN/cum)
• Stainless steel	:	7850kg/cum(78.50kN/cum)
• Masonry with plastering	:	2200kg/cum(22kN/cum)
• Cinder Filling for toilets	:	1000kg/cum(10kN/cum)

Super Dead Loads:

Load intensity considered:

• For all Rooms, Staircase	:	150kg/sqm(1.5kN/sqm)
• For terrace	:	200kg/sqm(2.0kN/sqm)
• Floor finish of 50mm thick for Residential floors	:	120kg/sqm(1.2kN/sqm)
• False ceiling	:	50 kg/sqm (0.5 kN/sqm) [on all floor slabs]
• Partition walls	:	As per actual
• Wall loads	:	As per actual
• External finishes	:	No additional finishes load
• Water proofing(membrane)	:	15kg/sqm(0.15kN/sqm)

Live Loads:

The super imposed loads shall be calculated in accordance with IS:875 (Part-2) based on Occupancy Classification. For multiple occupancies of use in the building shall be referred with the other appropriate comparable occupancy classification as per Table.1 of IS:875(Part-2)-1987.

Following live loads are considered while designing the structural elements apart from the dead loads as per codes.

Residential Floors

▪ Residential areas	:	200 kg/sqm(2.0 kN/sqm)
▪ Stairs	:	300 kg/sqm(3.0 kN/sqm)
▪ Corridors/Balcony/Utility	:	300 kg/sqm(3.0 kN/sqm)
▪ Toilets	:	200 kg/sqm(2.0 kN/sqm)
▪ Lift machine room	:	2500 kg/sqm or as per actual(25.0kN/sqm)
▪ Terrace	:	150 kg/sqm(1.5 kN/sqm)

Actual loading due to lifts loads shall be ascertained and design live loads are suitably modified (if required) considered.


Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
BEVAKOTTAI - 630 303, SIVAGANGAI DIST.
Mob: 9944405248, Ph: 04561-205048

1.4.4 –Durability Considerations:

Environmental conditions, Corrosion and Fire protection for concrete and structural steel.

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 and 9.1.2)

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m ³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m ³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	–	300	0.55	M 20
iii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

NOTES

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.

- Environment : Mild/Moderate
- Exposure conditions : Mild for super structure (concrete surfaces protected against weather or aggressive conditions) and Moderate for substructure (Concrete surfaces sheltered from severe rain or freezing whilst wet Environment)

Minimum grade of concrete : Moderate exposure–M25

- Nominal cover to reinforcement : For Moderate exposure condition, nominal cover should not be less than 30mm.

1.4.5 –Fire Rating:

Fire Resistance <i>h</i>	Minimum Beam Width <i>b</i>	Rib Width of Slabs <i>b_s</i>	Minimum Thickness of Floors <i>D</i>	Column Dimension (<i>b</i> or <i>D</i>)			Minimum Wall Thickness		
				Fully Exposed	50% Exposed	One Face Exposed	$p < 0.4\%$	$0.4\% \leq p \leq 1\%$	$p > 1\%$
	mm	mm	mm	mm	mm	mm	mm	mm	mm
0.5	200	125	75	150	125	100	150	100	100
1	200	125	95	200	160	120	150	120	100
1.5	200	125	110	250	200	140	175	140	100
2	200	125	125	300	200	160	–	160	100
3	240	150	150	400	300	200	–	200	150
4	280	175	170	450	350	240	–	240	180

NOTES

1 These minimum dimensions relate specifically to the covers given in Table 16A.

2 p is the percentage of steel reinforcement.

FIG. 1 MINIMUM DIMENSIONS OF REINFORCED CONCRETE MEMBERS FOR FIRE RESISTANCE

- Thickness of the structural elements as per Fig.1, clause 21.2 of IS 456-2000.
- Nominal covers for 2hr. fire resistance as per table-15, 16 & 16A clause 26.4 of IS 456-2000:

RC Beams		RC Slabs		RC Columns
Simply supported	Continuous	Simply supported	Continuous	
mm	mm	mm	mm	mm
40	30	35	25	40

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
Mob:9944405248, Ph:04561-299639

1.5 ANALYSIS METHODOLOGY:

This structure has a physical interface with almost all the disciplines like geotechnical works, MEP services, landscape etc.

The structure proposed is of cast in-situ concrete construction with columns suitably placed.

As per codal requirement, one analysis model would be prepared which is as detailed below:

Analysis model – Analysis model with serviceability limit state condition and to be used for the design of all structural elements.

The Vertical Loads including the dead and super imposed loads are transferred to the soil through columns, core walls and footings. Footings are sized with consideration to the safe bearing capacity of soil at the level of transfer of load recommended by specialist soil investigation consultants.

Assumptions:

- The structure is idealized as 3D space frame and analyzed using Etabs software package for vertical loads.
- The structure is analyzed for specific loads like dead load, live load and for the load combinations as given in the relevant codes.
- The foundation is represented in analysis model using fixed end conditions.

1.5.2 Static Analysis:

The following Static loads cases are considered in the analysis.

DL -Dead Load which includes self-weight of the structure.

SDL-Super Imposed Dead Load, including load due to finishes, wall loads, Soil filling loads etc.

LL -Live Load.

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
BEVAKOTTAI - 620 303, SIVAKASI
Mob: 9944405248, Ph: 04522 11000

1.6 LOAD COMBINATIONS:

Load combinations used for Strength and Serviceability are tabulated below:

Load Combination	Limit State of Collapse		Limit State of Serviceability	
	<i>DL+SDL</i>	<i>LL</i>	<i>DL+SDL</i>	<i>LL</i>
DL+LL	1.5	1.5	1	1

The various loads are combined in accordance with the stipulations in IS: 875 (Part 5)-1987; whichever combination produces the most unfavorable effect in the building foundation or structural member concerned may be adopted.

*This value is to be considered when stability against overturning and stress reversal is critical

Where,

DL-Dead Load.

LL-Live Load.

1.7 DESIGN METHODOLOGY:

- All R.C.C structures shall be designed according to the Limit State Method as specified in IS:456-2000.
- Forces and moments from the 3D analysis output for the worst combinations are used for the design of the structure.
- The foundations are designed for critical load combination.
- The structure is analyzed for specific loads like dead load, live load, and for the load combinations as given in the relevant codes.
- The slab is analyzed as two-way and one-way slabs.
- The design of special members like water tanks will be done in accordance with the relevant IS Codes.
- Design of structural steel members are done using elastic method as per IS: 800 with relevant allowable stresses.

1.8 ACCEPTANCE CRITERIA:

1.8.1 Deflection Limits:

For Reinforced concrete works:

Limiting values of deflection (Short and Long term) as per clause 35.3 of IS: 456-2000 is followed in the design.

- Limiting value for long term deflection is considered as span/250 and for the long-term deflection after erection of partitions & finishes is considered as span/350 or 20mm whichever less as per IS456-2000.

1.8.2 Cracking Limits:

Limiting values of crack width as per clause 35.3 of IS:456-2000 is followed in the design.

- In general, for slabs and beams, the crack width is limited to 0.3mm.
- For basement retaining wall and water retaining structures, crack width is limited to 0.2mm.
- For STP, the crack width is limited to 0.1mm.

1.8.3 Permissible Drift Limits:

- Short term deflection for RC elements=Span/250
- Long term deflection for RC elements =Span/350

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
 Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
 No.2089, IDHAL COMPLEX
 MULLIKUNDU, RAM NAGAR
 DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
 Mob:9944405248, Ph:04561-299539

1.8.4 Soil Data:

Foundations are designed based on Geo Technical investigation report and will dissipate all the vertical and horizontal loads safely to the soil below. In case of lateral forces increase in allowable bearing pressure for footing proportioning shall be done in accordance with the relevant IS codes.

Safe Bearing Capacity of the soil is 250kN/m^2 from Natural Ground level considered as per the report.

1.9 DETAILING REQUIREMENTS:

- All columns including beams are detailed as per normal detailing requirement.
- Detailing for all structural members shall be in accordance with IS: 456&SP: 34.



Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
MOB.9344405248, Ph:04561-290631

MATERIALS OF CONSTRUCTION

Grade of concrete f_{ck} =

25	N/mm ²
500	N/mm ²
18	KN/m ³

Grade of steel f_y =

Unit wt of soil =

CHECK FOR GROSS BEARING PRESSURE

Safe NET bearing pressure =

250 KN/m²

Safe gross bearing pr. =

312.10 KN/m²

(net pr. + depth of foot * soil unit wt)

Axial load from output (P1) =

560 KN

Moment about Z axis (M_z) =

5 KN-m

Moment about X axis (M_x) =

0 KN-m

Depth of top of foot, from ground =

3 m

Unit wt of soil =

18 KN/m³

Weight of soil retained above foot =

138.51 KN

P = (P1+soil+foot self wt) =

728.89 KN

Maximum bearing pressure =

276.13 KN/m²

Minimum bearing pressure =

263.78 KN/m²

Hence footing is safe against max gross bearing pr.

DESIGN FORCES

Axial load: (P_u) =

840 KN

Moment about Z axis (M_{uz}) =

7.5 KN-m

Moment about X axis (M_{ux}) =

0 KN-m

Maximum effective soil pressure $p_{e \max}$

($P_u/\text{Area} + M_{uz}/Z_z + M_{ux}/Z_x$) =

320.37 KN/m²

Minimum effective soil pressure $p_{e \min}$

($P_u/\text{Area} - M_{uz}/Z_z - M_{ux}/Z_x$) =

301.85 KN/m²

Design of footing is done using above maximum effective soil pressure

MOMENT AT FACE OF THE PEDESTAL

M_u about X1 X1 = ($p_{e \max} \times \text{length}^2/2$) =

44.15 KN-m per meter

Mulimit = 518.88 KN-m per meter

The section is singly reinforced

Hence, Ast =

260.518 mm²

Min Ast =

540.000 mm²

(0.12 % for slab, cl 26.5.2.1)

Spacing required =

145.44 mm

(considering max of above two calculated values of Ast)

Spacing provided =

125 mm

pt provided =

0.16 %

pt required =

0.14 %

provide a maximum ϵ

0.16 %

Hence provide 10 mm dia bar @ 125 mm c/c parallel to length of footing (|| to Z)

M_u about N1 N1 = ($p_{e \max} \times \text{length}^2/2$) =

90.10 KN-m per meter

Calc. Ast =

539.388 mm²

The section is singly reinforced

Min Ast =

540 mm²

(0.12 % for slab, cl 26.5.2.1)

Spacing =

145.44 mm

(considering max of above two calculated values of Ast)

Spacing provided =

125 mm

pt provided =

0.16 %

pt required =

0.14 %

provide a maximum ϵ

0.16 %

Hence provide 10 mm dia bar @ 125 mm c/c parallel to breadth of footing (|| to X)


Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
DEVAKOTTAI - 630 303, SIVAGANGA DIST.
Mob: 9944405248, Ph: 04561 220622

DESIGN OF BI-AXIAL ISOLATED RCC FOOTING (IS 456, 2000)

Building Name
Footing Number:
Node number

DVK APARTMENTS
F2
167

COLUMN

WIDTH (Breadth) =
DEPTH (Length) =
Axial load from output (P1) =
Moment about Z axis (M_z) =
Moment about X axis (M_x) =
Safe bearing pressure =
AREA=

300	mm
450	mm
560	KN
5	KN-m
0	KN-m
250	KN/m ²

2.464 mm²

Required length of the footing
Required width of the footing
Depth required
Over All Depth

1 x2	-0.15 x	-2.464	L	1.646504
			w	-1.4965

PEDASTAL

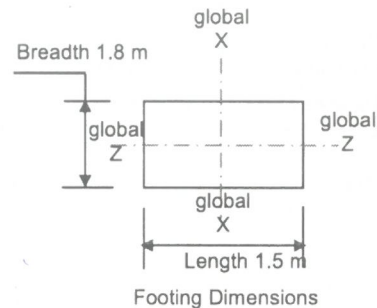
Offset to be provided in each side (breadth) =
Offset to be provided in each side (length) =
Depth of Pedestal (d) =
Breath =
Length =

0	mm
0	mm
0	mm
300	mm
450	mm

FOOTING

Revised Footing length (L, dim.) =
Revised Footing Breadth (W,) =
Depth of footing (D) =
Clear cover of footing =
Main bar dia of footing =
Effective depth of footing at Face of The Column=
Effective depth of footing at Edge =
Selfweight of the footing =
Area of Footing(A) =
Sect mod of foot about Z axis (Z_z) =
Sec mod of foot about X axis (Z_x) =

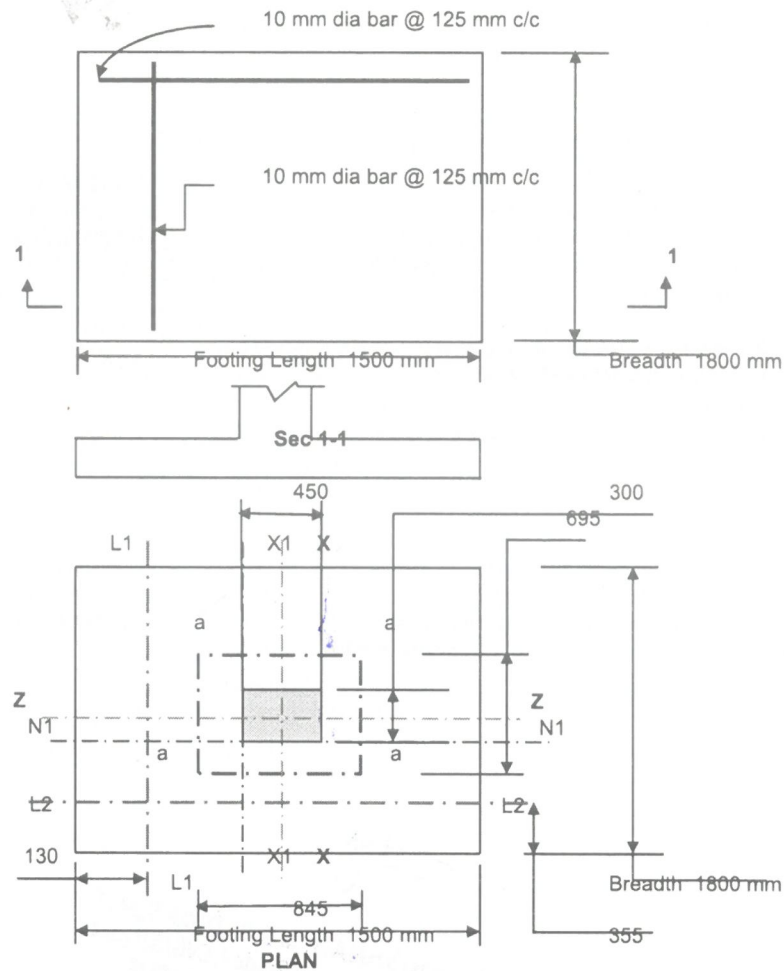
1.5	m
1.8	m
450	mm
50	mm
10	mm
395	mm
395	mm
30.38	KN
2.70	m ²
0.81	m ³
0.68	m ³



[Handwritten signature]

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
Mob:9944405248, Ph:04161-299639

Arrangement of bottom reinforcement as per above design is shown below



CHECK FOR ONE WAY SHEAR AT FACE OF PEDESTAL :

One way shear at critical section L1- L1

Distance of critical sec. from edge of footing =

Shear force $V_s = p_e \text{ max} \times 0.13 \times 1 \text{ m width of footing} =$

Shear stress $\tau_v = V_s / bd =$ **0.105 N/mm²**

$\tau_c =$ **0.30 N/mm²**

$\tau_v < \tau_c$ hence O.K.

0.13 m

41.648 KN

One way shear at critical section L2- L2

Distance of critical sec. from edge of footing =

Shear force $V_s = p_e \text{ max} \times 0.355 \times 1 \text{ m width of footing} =$

Shear stress $\tau_v = V_s / bd$ **0.288 N/mm²**

$\tau_c =$ **0.30 N/mm²**

$\tau_v < \tau_c$ hence O.K.

0.355 m

113.731 KN

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
 Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
 No.2089, IDHAL COMPLEX
 MULLIKUNDU, RAM NAGAR
 DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
 Mob:9944405248, Ph:04561-299639

CHECK FOR TWO WAY SHEAR

Ref. cl 34.2.4 and cl.31.6.3 of IS 456 : 2000

$$\text{Allowable shear stress } \tau_{v \text{ allowable}} = k_s \tau_c$$
$$k_s = (0.5 + bc) = 1.166666667 > 1$$

Hence, $k_s = 1$

$$\tau_c = 0.25 (f_{ck})^{0.5} = 1.25 \text{ N/mm}^2$$

$$\tau_{v \text{ allowable}} = k_s \times \tau_c = 1.25 \text{ N/mm}^2$$

$$\text{Shear force } V_s = 320.37 (1.5 \times 1.8 - 0.845 \times 0.695) =$$

$$\text{Length of critical section} = 2 \times (845 + 695) =$$

$$\text{Area of the critical section (length of critical sec x eff. d)} =$$

$$\text{Hence shear stress } \tau_v = 0.556 \text{ N/mm}^2$$

676.85 KN

3080 mm

1216600 mm²

$\tau_v < \text{allowable}$ hence O.K.

CHECK FOR TWO WAY SHEAR FROM FACE OF THE COLUMN

Ref. cl 34.2.4 and cl.31.6.3 of IS 456 : 2000

$$\text{Allowable shear stress } \tau_{v \text{ allowable}} = k_s \tau_c$$
$$k_s = (0.5 + bc) = 1.166666667 > 1$$

Hence, $k_s = 1$

$$\tau_c = 0.25 (f_{ck})^{0.5} = 1.25 \text{ N/mm}^2$$

$$\tau_{v \text{ allowable}} = k_s \times \tau_c = 1.25 \text{ N/mm}^2$$

$$\text{Shear force } V_s = 320.37 (1.5 \times 1.8 - 0.695 \times 0.845) =$$

$$\text{Length of critical section} = 2 \times (695 + 845) =$$

$$\text{Area of the critical section (length of critical sec x eff. d)} =$$

$$\text{Hence shear stress } \tau_v = 0.556 \text{ N/mm}^2$$

676.85 KN

3080 mm

1216600 mm²

$\tau_v < \text{allowable}$ hence O.K.

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
No.2089, IDHAL COMPLEX
MULLIKUNDU, RAM NAGAR
DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
Mob:9944405248, Ph:0456120000

DESIGN OF TYPICAL SLAB

PROJECT: DVK APARTMENTS

DESIGN OF TWO WAY SLAB

PANEL INSIDE GRID G,K & 1,2

Short span	S=	3.15	mts
Long span	L=	4.80	mts
Assumed slab thickness	t=	0.125	mts
Grade of concrete	fck=	25	N/mm ²
Grade of reinforcement	fy=	550	N/mm ²

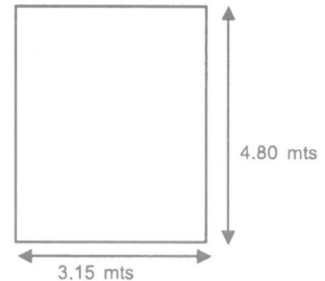
greater than 'min. eff depth reqd'.
Hence ok

Type of panel

Two long edges discontinuous

Loads

Self weight of slab	w1=	3.13	kN/m ²
Floor finish	w2=	1.50	kN/m ²
Live load	w3=	2.00	kN/m ²
Miscellaneous	w4=	0.00	kN/m ²
			TOTAL
			6.63
			kN/m ²



Ratio of long span to short span	R=	1.55
Design Load with load factor of 1.5	Wu=	9.94 kN/m ²

Design

	Coeff	BM	k	pt	Ast	Dia	Spacing	d
<u>Short span direction</u>								
Negative moment at continuous edge	0	0.00	0.00	0.00	150.00	8	335	96
Positive moment at midspan	0.071	7.00	0.76	0.16	158.17	8	318	96
<u>Long span direction</u>								
Negative moment at continuous edge	0.045	4.44	0.57	0.12	150.00	8	335	88
Positive moment at midspan	0.035	3.45	0.45	0.10	150.00	8	335	88

Minimum effective depth reqd	dre=	45.05 mm
Clear cover to any reinforcement	c=	25 mm
Minimum effective depth provided	dpr=	88 mm
Minimum reinforcement	Amin=	150 mm ²

greater than 'min. eff depth reqd'. Hence ok

Deflection check

Reinf provided at midspan along short direction	251.33 mm ²	Dia	8	at	200 mm
Stress in reinforcement	fs=	200.76 N/mm ²			
Percentage of reinforcement provided	pt=	0.2618 %			
Modification factor as per fig 4 of IS:456-2000	MF=	1.9698			

Type of slab for deflection check

Simply supported

Basic span to effective depth ratio	20
Minimum effective depth reqd from deflection criteria	79.96 mm
Effective depth provided	96 mm

greater than 'min. eff depth reqd'. Hence ok

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
 Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
 No.2089, IDHAL COMPLEX
 MULLIKUNDU, RAM NAGAR
 DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
 Mob:9944405248, Ph:04561-299639

BEAM ALONG GRID 2 BETWEEN GRIDS A TO G(AT FIRST FLOOR)

ETABS Concrete Frame Design

IS 456:2000 Beam Section Design (Envelope)

Beam Element Details

Level	Element	Unique Name	Section ID	Length (mm)	LLRF
FIRST FLOOR SLAB	B212	20	B-200X450-M25	6400.8	1

Section Properties

b (mm)	h (mm)	b _r (mm)	d _s (mm)	d _{ct} (mm)	d _{cb} (mm)
200	450	200	0	40	40

Material Properties

E _c (MPa)	f _{ck} (MPa)	Lt.Wt Factor (Unitless)	f _y (MPa)	f _{ys} (MPa)
25000	25	1	500	415

Design Code Parameters

Y _c	Y _s
1.5	1.15

Flexural Reinforcement for Major Axis Moment, M_{u3}

	End-I Rebar Area mm ²	End-I Rebar %	Middle Rebar Area mm ²	Middle Rebar %	End-J Rebar Area mm ²	End-J Rebar %
Top (+2 Axis)	427	0.47	0	0	426	0.47
Bot (-2 Axis)	175	0.19	636	0.71	237	0.26

Flexural Design Moment, M_{u3} and Axial Force, P_u

	Station Loc mm	Design M _u kN-m	Design P _u kN	Combo Name
Top (+2 Axis) End-I	115	-68.1137	0	1.5(DL+SDL+LL)
Top (+2 Axis) Middle	4622.8	0	0	1.5(DL+SDL+LL)
Top (+2 Axis) End-J	6285.8	-67.9391	0	1.5(DL+SDL+LL)
Bot (-2 Axis) End-I	1422.4	29.8535	0	1.5(DL+SDL+LL)
Bot (-2 Axis) Middle	3200.4	95.5368	0	1.5(DL+SDL+LL)
Bot (-2 Axis) End-J	4978.4	39.8364	0	1.5(DL+SDL+LL)

Shear Reinforcement for Major Shear, V_{u2}

End-I Rebar A _{sv} /s mm ² /m	Middle Rebar A _{sv} /s mm ² /m	End-J Rebar A _{sv} /s mm ² /m
271.85	221.69	381.29

COLUMN AT GRID G-2 (STILT TO FIRST FLOOR)

ETABS Concrete Frame Design

IS 456:2000 Column Section Design (Envelope)

Column Element Details (Envelope)

Level	Element	Unique Name	Section ID	Length (mm)	LLRF	Type
FIRST FLOOR SLAB	C19	550	C-230X450-M25	3050	0.9	Ordinary Frame

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
230	450	56	30

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
25000	25	1	500	415

Design Code Parameters

γ_c	γ_s
1.5	1.15

Longitudinal Reinforcement Design for $P_u - M_{u2} - M_{u3}$ Interaction

Column End	Rebar Area mm ²	Rebar %
Top	828	0.8
Bottom	828	0.8

Design Axial Force & Biaxial Moment for $P_u - M_{u2} - M_{u3}$ Interaction

Column End	Design P_u kN	Design M_{u2} kN-m	Design M_{u3} kN-m	Station Loc mm	Controlling Combo
Top	987.2314	20.898	-33.7855	2600	1.5(DL+SDL+LL)
Bottom	997.3226	-19.9465	23.2747	0	1.5(DL+SDL+LL)

Shear Reinforcement for Major Shear, V_{u2}

Column End	Rebar A_{sv}/s mm ² /m	Design V_{u2} kN	Station Loc mm	Controlling Combo
Top	254.94	21.823	2600	1.5(DL+SDL+LL)
Bottom	254.94	21.823	0	1.5(DL+SDL+LL)

Shear Reinforcement for Minor Shear, V_{u3}

Column End	Rebar A_{sv}/s mm ² /m	Design V_{u3} kN	Station Loc mm	Controlling Combo
Top	498.8	12.4722	2600	1.5(DL+SDL+LL)
Bottom	498.8	12.4722	0	1.5(DL+SDL+LL)

COLUMN AT GRID G-2 (STILT TO FIRST FLOOR)

ETABS Concrete Frame Design

IS 456:2000 Column Section Design (Envelope)

Column Element Details (Envelope)

Level	Element	Unique Name	Section ID	Length (mm)	LLRF	Type
FIRST FLOOR SLAB	C20	552	C-450X230-M25	3050	0.7	Ordinary Frame

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
450	230	56	30

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
25000	25	1	500	415

Design Code Parameters

γ_c	γ_s
1.5	1.15

Longitudinal Reinforcement Design for $P_u - M_{u2} - M_{u3}$ Interaction

Column End	Rebar Area mm ²	Rebar %
Top	1371	1.33
Bottom	1443	1.39

Design Axial Force & Biaxial Moment for $P_u - M_{u2} - M_{u3}$ Interaction

Column End	Design P_u kN	Design M_{u2} kN-m	Design M_{u3} kN-m	Station Loc mm	Controlling Combo
Top	1313.2361	2.8164	-26.2647	2600	1.5(DL+SDL+LL)
Bottom	1323.3274	-8.2176	26.4665	0	1.5(DL+SDL+LL)

Shear Reinforcement for Major Shear, V_{u2}

Column End	Rebar A_{sv}/s mm ² /m	Design V_{u2} kN	Station Loc mm	Controlling Combo
Top	498.8	7.0284	2600	1.5(DL+SDL+LL)
Bottom	498.8	7.0284	0	1.5(DL+SDL+LL)

Shear Reinforcement for Minor Shear, V_{u3}

Column End	Rebar A_{sv}/s mm ² /m	Design V_{u3} kN	Station Loc mm	Controlling Combo
Top	254.94	4.3641	2600	1.5(DL+SDL+LL)
Bottom	254.94	4.3641	0	1.5(DL+SDL+LL)

BEAM ALONG GRID 2 BETWEEN GRIDS A TO G(AT FIRST FLOOR)

Design Shear Force for Major Shear, V_{u2}

End-I Design V_u kN	End-I Station Loc mm	Middle Design V_u kN	Middle Station Loc mm	End-J Design V_u kN	End-J Station Loc mm
69.4199	590.9	44.052	4622.8	82.2257	5809.9
1.5(DL+SDL+LL)		1.5(DL+SDL+LL)		1.5(DL+SDL+LL)	

Torsion Reinforcement

Shear
Rebar A_{svl}/s
mm²/m

0

Design Torsion Force

Design T_u kN-m	Station Loc mm	Design T_u kN-m	Station Loc mm
0.0888	6285.8	0.0888	6285.8
1.5(DL+SDL+LL)		1.5(DL+SDL+LL)	

Dr. A. RAMAKRISHNAN, M.E., Ph.D., D.F.S., M.I.E.,
 Registered Structural Engineer Grade-I, SVG/33/2024
IDHAL INFRASTRUCTURE
 No.2089, IDHAL COMPLEX
 MULLIKUNDU, RAM NAGAR
 DEVAKOTTAI - 630 303, SIVAGANGAI DIST.
 Mob:9944405248, Ph:04561-299639

SCALF = 1 - 1000

REFERENCE

[illegible][illegible]

Area of the Second Floor	310 Sq. ft.	100
Area of the Third Floor	440 Sq. ft.	100
Area of the Fourth Floor	290 Sq. ft.	100
Area of the Fifth Floor	349 Sq. ft.	100
Area of the Sixth Floor	1467 Sq. ft.	100
Area of the Seventh Floor	715 Sq. ft.	100

[illegible][illegible]

PLRANI
P. 2.

STRUCTURAL ENGINEER

E. T. BABU, a R
 PLAINFIELD
 My wife and I are 54 and 52
 We have a 1964 Ford Mustang
 We have a 1964 Ford Mustang
 We have a 1964 Ford Mustang

This architectural drawing shows the second floor of a building. The plan is rectangular with a central corridor running horizontally. On the left side of the corridor, there are several rooms, including a large one labeled 'Salle à manger' and a smaller one labeled 'Cuisine'. On the right side, there are more rooms, including a large one labeled 'Salle à manger' and a smaller one labeled 'Cuisine'. The drawing includes various architectural details such as doors, windows, and furniture like tables and chairs. The overall style is that of a technical architectural drawing from the early 20th century.

Floor plan of the first floor of the Federal Reserve Bank of New York. The plan shows a large central area with several rooms and corridors. The rooms are labeled with their names and dimensions in feet and inches.

- Top Left:** A large rectangular room, likely a main hall or auditorium.
- Top Center:** A room labeled "RECEIVING ROOM" with dimensions "10' 0" x 12' 0"".
- Top Right:** A room labeled "OFFICE OF THE PRESIDENT OF THE BOARD" with dimensions "10' 0" x 12' 0"".
- Middle Left:** A room labeled "OFFICE OF THE VICE PRESIDENT OF THE BOARD" with dimensions "10' 0" x 12' 0"".
- Middle Center:** A room labeled "OFFICE OF THE SECRETARY OF THE BOARD" with dimensions "10' 0" x 12' 0"".
- Middle Right:** A room labeled "OFFICE OF THE TREASURER OF THE BOARD" with dimensions "10' 0" x 12' 0"".
- Bottom Left:** A room labeled "OFFICE OF THE COMPTROLLER OF THE CURRENCY" with dimensions "10' 0" x 12' 0"".
- Bottom Center:** A room labeled "OFFICE OF THE ASSISTANT SECRETARY OF THE BOARD" with dimensions "10' 0" x 12' 0"".
- Bottom Right:** A room labeled "OFFICE OF THE ASSISTANT SECRETARY OF THE BOARD" with dimensions "10' 0" x 12' 0"".

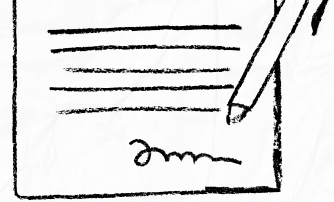
The plan also shows various corridors, stairwells, and service areas. The overall layout is symmetrical and formal, reflecting the building's role as a major financial institution.

[illegible]

Architectural floor plan of the 1st floor of the 'Hauptgebäude' (Main Building) of the 'Königliche Technische Hochschule' in Berlin. The plan shows a large central hall (Hauptsaal) with a stage and orchestra pit, surrounded by lecture halls (Vorlesungssäle), seminar rooms (Seminarräume), and administrative offices. The building is labeled 'Hauptgebäude' and 'Königliche Technische Hochschule'.

The diagram illustrates a proposed building footprint on a rectangular lot. The lot is bounded by T.S. NO. 16 to the north, T.S. NO. 17 to the south, T.S. NO. 18 to the east, and T.S. NO. 19 to the west. The building is oriented horizontally, with its long side facing the eastern boundary. The plan includes various annotations such as "PROPOSED BUILDING", "EXIST'G BENCH MARK", and "EXIST'G UTILITY". Dimensions are provided for the lot and the building footprint. A note at the bottom left states "As Per LMB Boundary".





our services doesn't just end there



Buying & Selling Services

Property Buying Assistance, Property Selling Support, Market Price Analysis, Owner Outreach and Negotiation.



Legal & Documentation Services

Certified EC, Patta, legal opinions, property verification, due diligence, litigation solutions, and legal heir certificates.



Property Development & Approvals

Building plan approvals, construction, layout and sub-division approvals, zone conversion, and occupancy certification.



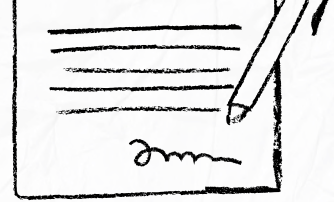
NRI & Investment Services

Escrow Services, Rentals, Litigation Solutions, Property Valuation and Property Management



Compliance & Special Services

Demolition, Vaasthu checks, regularization of unauthorized buildings, and office space solutions.



 **empowering your real estate decisions**
with smart tools



Property Valuation & Cost Estimation

Guideline Value, Apartment Composite Value, Stamp Duty & Registration Fees Calculator, Building Value Calculator, Capital Gains Calculator, Area Unit Converter, Length Unit Converter



Ownership, Compliance & Legal Verification

Encumbrance Certificate (EC) Search, Find Your SRO, Temple Property Check, WAQF Property Check, View Patta/Chitta, View FMB, Patta Analyzer, EC Analyzer



Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator



Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary



Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management



We're honored to be part of your
real estate journey

3/350/2 Mettukuppam,
OMR Thoraipakkam,
Chennai, India

hello@verified.realestate
[+91 9996 12 9996](tel:+919996129996)
www.verified.realestate