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DIGITALLY VERIFIED RECORD

STRUCTURAL DESIGN BASIS REPORT

PROPOSED CONSTRUCTION OF NEW STILT + 3 FLOORS BUILDING WITH 15 DWELLING UNITS IN, NEW NO.36, OLD NO: 19, VELU STREET, WEST MAMBALAM, CHENNAI -600033. COMPROMISED IN PAIMASH NO: 1728, AS PER TOWN SURVEY NO:32, BLOCK NO:1, ZAMIN MAMBALAM VILLAGE, MAMBALAM GUINDY TALUK, CHENNAI DISTRICT.

CLIENTS:

MS BEAVERS VEENA GARDEN

STRUCTURAL ENGINEER:

R. RAVIKUMAR **M.E** (Structural Engg)

REGISTER STRUCTURAL ENGINEER (**REG.NO SE/GR-1/19/12/231-CMDA)**

REV	DATE	DESCRIPTION	DESIGN	CHKD.	APP.
00	07.01.2025	PROPOSED RESIDENTIAL BUILDING AT STILT + 3 FLOORS BUILDING WITH 15 DWELLING UNITS IN, NEW NO.36, OLD NO: 19, VELU STREET, WEST MAMBALAM, CHENNAI.	AP	RK	RK

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1.0 DESIGN CRITERIA

1.1 INTRODUCTION

The "Proposed Residential Building With 15 Dwelling Units In, New No.36, Old No: 19, Velu Street, West Mambalam, Chennai-600 033.Having Stilt + 3. It is designed as a Reinforced Concrete Framed Structure Supported on R.C.C. Isolated Foundation.

1.2 DESIGN PHILOSOPHY

This document presents the structural design calculation of Proposed Residential Building.

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 and SP-34.

The columns, beams are analyzed using ETABS. Footing, Columns, Beams Designed using RCDC.

1.3 GENERAL DATA:

Use of Building	= Residential
Type of structure	= R.C.C frame
The height of floors	= 3 m for each floor
Total height of building	= 13.2 m from above ground level

1.4 DEAD LOAD:

Unit weight of brick masonry	=10 kN/m^3
Density of Concrete	= 25 kN/m^3
Floor finish	= 1.5 kN/m2
Main Wall load	= 3.0m-0m (first floor level –Stilt Floor Level)
	= 3.0m -0.38m (assumed beam depth 0.38m)
	= 2.62m x0.20m x 20 kN/m3 (unit weight of brick-10kN/m3)
	≈ 5.3 kN/m
Partition Wall load	= 60% main wall load
	= 5.3 x 60/100
	≈ 3.2 kN/m
Parapet Load	= 1.0x0.20x10 (parapet wall height considered-1.0m)

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= 2.3 kN/m

1.5 LIVE LOAD:

Live Load in lobby & corridors	=3.00 kN/m2
Live Load in stairs	=3.00 kN/m2
Live Load in Toilets & Bathrooms	=2.00 kN/m2
Live Load in Bed Room, Kitchen,HALL	=2.00 kN/m2
Water tank load	= 12KN/m2

1.6 SEISMIC ZONE:

For the Proposed Residential Building -Seismic zone is considered as Zone III. Response spectrum Method for seismic analysis of R.C.C. Frames as recommended by **IS: 1893** shall be used.

Seismic Zone	= III
Zone Factor 'Z'	=0.16
Response Reduction Factor 'R' (for OMRF)	=5
Importance Factor 'I'	=1.0
Building type	= Regular

1.7 SOIL DATA:

Type of Soil	= Blackish Medium Stiff silty clay
Type of Foundation	= Isolated Footing
Safe Bearing Capacity of Soil	= 150 kN/m^2 (AS PER SOIL TEST REPORT)
Depth of Water Table	= 3.0m From Existing Ground Level
Chemical Analysis of Soil	= Reference Attached

1.8 REINFORCED CONCRETE BUILDINGS:

Type of building	= Regular Frames
No. of story	= Stilt + 3
Horizontal Floor System	= Beams & Slabs
Foundation Depth below ground level	= 2.0m
System of interconnecting foundations	= grade beams
Concrete grade	= M25 for All RCC Members
Steel grade	= FE500
Method of analysis	= static analysis
Computer Software used	= AUTOCAD, ETABS

1.9 **CLEAR COVER**

Cover for reinforcement is considered as per table 16A of NBC, for a fire resistance of **2 hrs.**

1. Foundation = 60mm
2. Columns = 40mm
3. Beams = 25mm
4. Slabs = 20mm
5. Stair Waist Slab = 20mm

CODES

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

1. IS: 456 – 2000 Code of practice for Plain and Reinforced concrete
2. SP: 16 Design Aids for Reinforced concrete
3. IS: 875 (part 1) – 1987 Dead Load
4. IS: 875 (part 2) – 1987 Live Load
5. IS 1893 (part 1)- 2016 Earthquake Load

2.0 ANALYSIS OF STRUCTURE:

The Structure is analyzed using ETABs software. All beams & slabs are designed as conventional beam & slabs.

LOAD CASES:

Primary Load:

1. Dead Load (DL)
2. Live Load (LL)
3. Earthquake Load (EL)

Load Combinations:

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

STRENGTH CONDITION

1. 1.5(DL +LL)
2. 1.2(DL +LL ± EL)
3. 1.5(DL ± EL)
4. 0.9DL ± 1.5EL
5. 1.2DL+1.2LL
6. 1.5DL

SERVICE CONDITION

1. 1.0DL + 1.0LL
2. 1.0DL+1.0LL±1.0EL
3. 1.0DL±1.0EL
4. 0.9DL±1.0EL

3.0 DESIGN OF STRUCTURE

SLAB

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Slab marked : **S1**

Design data

Length of shorter span	L_x	=	**3600**	mm
Length of longer span	L_Y	=	**4600**	mm
Thickness of Slab	D	=	**125**	mm
Concrete grade	f_{ck}	=	**20**	N/mm²
Reinforcement grade	f_y	=	**500**	N/mm²
Nominal cover to reinf.		=	**20**	mm
Finishes Load		=	**1.5**	kN/m²
False ceiling, ducts etc		=	**0.0**	kN/m²
Equipment Load		=	**0**	kN/m²
Thickness of fill		=	**0**	mm
Unit weight of fill		=	**0**	kN/m³
Unit weight of concrete		=	**25**	kN/m³
Live load on the slab		=	**2.0**	kN/m²
Dia of reinforcement bar		=	**8**	mm
Ratio	l_y / l_x	=	1.28	< 2, Hence Two way slab design procedure is followed

Type of slab Panel = Four edges discontinuous

Bending moment coefficient For the above ratio as per *IS456:2000, Annexure-D, Table 26*

Bending Moment coefficient		+ ve moment	- ve moment
Short span coefficient	α_x	0.077	0.000
Long span coefficient	α_y	0.056	0.000

Loadings

Self weight of slab	=	0.13	x	25	=	3.13	kN/m²
Finishes load on slab	=					1.50	kN/m²
False ceiling, ducts etc	=					0.00	kN/m²
Equipment Load	=					0.00	kN/m²
Fill Load	=	0.00	x	0	=	0.00	kN/m²
Live Load	=					2.00	kN/m²
	Total Load				=	6.63	kN/m²

Factored Load on slab w = 6.63 x 1.5 = **9.94** kN/m²

Moment and reinforcement Moments per unit width are given by the following equation:

Bending Moment $M_x = \alpha_x w L_x^2 = \alpha_x \times 9.94 \times 3.60^2 = 129\ \alpha_x$

Bending Moment $M_y = \alpha_y w L_x^2 = \alpha_y \times 9.94 \times 3.60^2 = 129\ \alpha_y$

Depth Required = $\sqrt{}$ M / (0.1338xfckxb)
Ast Required = ((fck/(2xfy))x(1-($\sqrt{}$(1-((4.6xR)/fck)))))xbxd
where, R = M/(bd²)

	Moment kN.m/m	Depth Reqd mm	Eff. Depth mm	Reinf Reqd A_{st} mm²	Provided Reinf. Bar dia	Spacing	Summary A_{st} mm²	check
M_x(-ve)	0.00	0.00	101	150	T 8	150 mm	335	OK
M_x(+ve)	9.97	61.05	101	242	T 8	150 mm	335	OK
M_y(-ve)	0.00	0.00	93	150	T 8	150 mm	335	OK
M_y(+ve)	7.21	51.91	93	188	T 8	150 mm	335	OK

Check for deflection *IS456:2000, 23.2.1*

Span to depth ratio (L / d) should not exceed the values as calculated below.

Actual Span to depth ratio, L/d = 3600 / 101
= 35.6

Allowable span to depth ratio = $\alpha\ \beta\ \gamma\ \delta$

where α = **26** *20 for simply supported, 26 for continuous span*

β = 1.00 *For Span < 10m, β = 1 & for span > 10m, β = 10 / span*

Short span reinf. % = 0.33 % *at mid span*

Steel stress at service load f_s = 0.58 x f_y x area of steel required / area of steel provided
= 0.58 x 500 x 242 / 335
f_s = 209 N/mm²

Modification factor for tension reinforcement *as per IS456:2000, Fig. 4, page-38*

γ = **1.67** *For the above caculated steel stress*

Modification factor for compression reinforcement *as per IS456:2000, Fig. 5, Page no 39*

δ = **1.0** *No compression reinf. is provided*

Allowable L / d ratio = **43**

Actual L/d ratio < Allowable L/d ratio, Hence OK

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Check for Crack Width

Permissible Compressive stress, σcbc	=	7	N/mm²
Modular ratio, m	=	13.33	
Modulus of Elasiticity of steel, Es	=	200000	N/mm²
Area of steel provided, Ast	=	523.33	mm²/m
Tension Steel percentage provided, Pt	=	0.523	%
Neutral axis depth factor, k	=	√((2x((Pt/100)xm))+(((Pt/100)xm)²)) - ((Pt/100)xm)	
	=	0.310	
Neutral axis depth, x	=	31.02	mm
Cracked Moment of Inertia, I_{cr}	=	((bx(x^3))/3)+((mxAst)x((d-x)²))	
	=	((1000x(31.02^3))/3)+((13.33x523.33)x((100-31.02)^2))	
	=	43143209	mm^4
Service load Moment, M	=	6.74	kNm/m
Tensile stress in steel, fst	=	((mxMx(d-x))/I_{cr}	
	=	(13.33x6.74x10^6x(100-31.02))/(43143209.18)	
	=	143.55	N/mm²
Strain in concrete, ε1	=	(f_{st} x (D - x)) / (E_s x (d - x))	
	=	0.0009779	
Mean tensile Strain in concrete, εm	=	ε1 - ((b x ((D - x)²)) / (3 x E_s x Ast x (d - x)))	
	=	0.0005702	**OK**
Status of Section	=	CRACKED	
Spacing of reinforcement, S	=	150	mm
Distance of point from surface of reinforcing bar, a_{cr}	=	√(((S/2)²) + (d_c²)) - (d_b/2)	*[d_c = Effective cover*
	=	74.06	mm *d_b = Bar diameter]*
Crack width, Wcr	=	(3 x a_{cr} x εm) / [1 + 2(a_{cr} - c) / (D - x)]	
	=	0.06	mm

< 0.2mm, Crack width is with in the Limit, Hence OK

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BEAM

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Design Of Beam

DESIGN OF B10 AT AXIS

MOMENT AT SUPPORT

Fcu	=	200	kg/cm2	
Fy	=	5000	kg/cm2	
Depth H	=	60	cm	
Width B	=	20	cm	
Max. B.M.	=	15.00	t.m	
Shear force V	=	15.00	t.m	
d act.	=	53.70	cm	
$K = M/bd^2fcu$	=	0.13		
&	=	0.82		
z	=	44.29	cm	
A's required	=	0.00	cm2	
no. of bars	=	**2**	**2**	
Dia. of bars	=	**20**	**16**	
A's provided	=	10.30	cm2	TRUE
As required	=	9.27	cm2	
no. of bars	=	**2**	**2**	
Dia. of bars	=	**20**	**16**	
As provided	=	10.30	cm2	TRUE
CLEAR COVER		2.50	CM	

MOMENT AT MID SPAN

Fcu	=	200	kg/cm2	
Fy	=	5000	kg/cm2	
Depth H	=	60	cm	
Width B	=	20	cm	
Max. B.M.	=	16.00	t.m	
d act.	=	53.70	cm	
$K = M/bd^2fcu$	=	0.14		
&	=	0.81		
z	=	43.48	cm	
A's required	=	0.00	cm2	
no. of bars	=	**2**	**2**	
Dia. of bars	=	**20**	**16**	
A's provided	=	10.30	cm2	TRUE
As required	=	10.07	cm2	
no. of bars	=	**2**	**2**	
Dia. of bars	=	**20**	**16**	
As provided	=	10.30	cm2	TRUE
CLEAR COVER		2.50	CM	

CHECK DEFLECTION

Fcu =	25	N/mm2		
Fy =	500	N/mm		
M =	16.00	t.m		
L =	5.2	m		
b =	200	mm		
d =	537	mm		
Sup. Con.				
Effective	20			
Asr =	10.071	cm2	Asp= 10.30	cm2
As´r =	0.000	cm2	As´p= 10.30	cm2
M/bd2=	2.774			
fs1 =	305.430			
mf1 =	0.939	0.939		
mf2 =	1.000	1.000		
L/d act. =	9.683			
L/d lim. =	18.783	**deflection ok**		

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COLUMN

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General Data

Column No.	:	C3	
Level	:	STILT FLOOR To 1ST FLOOR	
Design Code	=	IS Code	
Grade Of Concrete	=	M20	N/Sqmm
Grade Of Steel	=	Fe500	N/Sqmm
Column B	=	300	MM
Column D	=	450	MM
Clear Cover	=	40	MM
Clear Floor Height @ B	=	3750	MM
Clear Floor Height @ D	=	4050	MM
No Of Floors	=	1	
No Of Columns In Group	=	1	
Column Type	:	UnBraced	
Minimum eccentricity check	:	Simultaneously (Both Axis)	

Load Data

Analysis Reference No.	=	C3	
Critical Analysis Load Combination	:	STR	
Load Combination	=	[2] : 1.5 (Dead) +1.5 (Live)	
Critical Location	=	Bottom Joint	
Pu	=	1125.75	KN
Mux	=	-35.81	KNM
Muy	=	-10.73	KNM
Vux	=	-6.99	KN
Vuy	=	-17.46	KN

Minimum Eccentricity Check

Since Axial Force is compressive, Min. Eccentricity check to be performed

Minimum Eccentricity Along D :

Minimum Eccentricity	=	Unsupported Length / 500 + D / 30	
	=	23.1	MM
Minimum Eccentricity	>	20	MM
Mminx	=	Pu x Minimum Eccentricity	
	=	26	KNM

Minimum Eccentricity Along B :

Minimum Eccentricity	=	Unsupported Length / 500 + B / 30	
	=	17.5	MM
Mminy	=	Pu x Minimum Eccentricity	
	=	22.51	KNM

Slenderness Check

Max Slenderness Ratio(L/B)	=	12.5	
	<	60	(Hence Ok)

Column Is Unbraced Along D

Slenderness Check Along D:

Effective Length Factor	=	1
Slenderness Ratio	=	Effective Length / D
	=	9, Column not Slender Along D

Column Is Unbraced Along B

Slenderness Check Along B:

Effective Length Factor	=	1
Slenderness Ratio	=	Effective Length / B
	=	12.5, Column Slender Along B
Slenderness moment along B	=	(Pu B/ 2000) (Ley/B)^2
	=	26.38 KNM

Reduction factor 'k' for slenderness moment

Puz	=	1886.49	kN
Pb	=	510.92	kN
k	=	(Puz - Pu) / (Puz - Pb) < = 1	
	=	0.5955 < = 1	
Design slenderness moment along B	=	k x 26.38	
Mslndy	=	14.59	KNM

Calculation of Design Moment

Direction	Manalysis	Mmin	Mdesign	Mslndx	Mdesign-final
	A	B	C	E	F
Major Axis - Mux	35.81	26	35.81	0	35.81
Minor Axis - Muy	10.73	22.51	22.51	14.59	37.11

Where

A = Moments directly from analysis

B = Moments due to minimum eccentricity

C = Maximum of analysis moment and min. eccentricity = Max (A,B)

E = Moment due to slenderness effect

F = Final design Moment = Max(C- Top Bottom , D- Top Bottom) + E

Final Critical Design Forces

Critical Case - Axial Load & BiAxial Bending

Pu	=	1125.75	KN
Mux	=	35.81	KNM
Muy	=	37.11	KNM

Biaxial Bending Check

Pt Calculated	=	1.36	
Steel Provided	=	8-T16 + 2-T12	
Mux1	=	110.77	KNM
Muy1	=	75.58	KNM
Puz	=	0.45 x Fck x Ac + 0.75 x Fy x Asc	
	=	1886.49	KN
Pu/Puz	=	0.6	
Alpha	=	1.66	
Interaction Ratio	=	(Mux / Mux1)^Alpha + (Muy / Muy1)^Alpha)	
	=	0.46 < 1	

Design Of Shear

Design for shear along D

Critical Analysis Load Combination	:	STR	
Critical Load Combination	=	[2] : 1.5 (Dead) +1.5 (Live)	KN
Design shear force, Vuy	=	-17.456	KN
Pu	=	1111.19	
Design shear stress, Tvy	=	Vuy / (B x Deff)	N/Sqmm
	=	0.1447	N/Sqmm
Design shear strength, Tc	=	0.5394	N/Sqmm
Shear Strength Enhancement Factor	=	1 + 3 x Pu / (B x D x Fck)	
	=	2.2347	
Shear Strength Enhancement Factor (max)	=	1.5	
Shear Strength Enhancement Factor	=	1.5	
Enhanced shear strength, Tc-e	=	0.8091	N/Sqmm
Design shear check	=	Tvy < Tc x Enhancement factor	

Link for Shear Design along D are not required

Design for shear along B

Critical Analysis Load Combination	:	STR	
Critical Load Combination	=	[2] : 1.5 (Dead) +1.5 (Live)	KN
Design shear force, Vux	=	-6.9867	kN
Pu	=	1111.19	
Design shear stress, Tvx	=	Vux / (D x Beff)	kN
	=	0.0616	N/Sqmm
Design shear strength, Tc	=	0.5394	N/Sqmm
Shear Strength Enhancement Factor	=	1 + 3 x Pu / (B x D x Fck)	
	=	2.2347	
Shear Strength Enhancement Factor (max)	=	1.5	
Shear Strength Enhancement Factor	=	1.5	
Enhanced shear strength, Tc-e	=	0.8091	N/Sqmm
Design shear check	=	Tvx < Tc x Enhancement factor	

Link for Shear Design along B are not required

Design Of Links

Links in the zone where special confining links are not required

Normal Links

Diameter of link	=	8	mm
	>	Max. longitudinal bar dia / 4	
	=	4	mm

Criterion for spacing of normal links

Min. Longitudinal Bar dia X 16	=	192	mm
Min. dimension of column	=	300	mm
Max. 300 mm	=	300	mm
Maximum B/2	=	150	
Provided spacing	=	175	mm

Table For Links

	Required			Provided	
	Normal Design	Shear Design	Ductile Design	Normal Zone	Ductile Zone
Link Dia.	8	---	---	8	---
Spacing	175	---	---	175	---

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FOUNDATION DESIGN

								S.B.C =	15.00										
								Fdn. Lvl.	0.500										
S.B.C	=	15.000	T/M^2				Gross	S.B.C =	15.90										etabs input
								ALLOW.=	1.50	1.330	FOR WIND								
c38							Check	INCREASE for EQ.											manual input
					1 WAY SHEAR		okay	Dftg =	0.5	Ftg	Ftg								
					1 WAY SHEAR		okay	Col L	Col B	CANTX	CANTY								
					2 WAY SHEAR		SAFE	0.60	0.20	0.95	0.95								

Pu (L)	Mx (L)	My (L)						L	B		PU	Pmax	Pmin	RESULT
Ton	Ton-cm	Ton-cm	self wt.	soil wt.	P+ws+wf	ex	ey	m	m		design (L)	Ton/m2	Ton/m2	
manual	in dir. of L	in dir. of B				m	m							
110	0	0	6.5625	0	119.84375	0	0	2.50	2.10	0	119.84375	22.83	22.83	O.K.

FOUNDATION DESIGN

c38

Design F 22.827 T/M2

	B (m)	D (m)			
	0.600	0.200			
FOOTING	2.500	2.100	0.500	0.415	d=(D-d') d'=0.085
M	**L (m)**	**B (m)**	**D (m)**	**d (m)**	

Upward pressure = w= 228.274 KN/M2

LIMIT STATE METHOD

	LONG DIR			SHORT DIR		
PROJECT	0.950	m			0.950	m
BM	216.32	KNm		B.M.	257.521	KNm
Shear	256.47	KN		Shear	305.316	KN
Pt % assumed =0.15	Tc = 0.29	N/mm2				
Shear str	0.294	okay		shear stre	0.294	okay
fck	30.000	N/mm2		fck	30.000	N/mm2
fy	500.000	N/mm2		fy	500.000	N/mm2
Ast=	1227.70	mm2		Ast=	1578.5	mm2
Pt %	0.141			Pt %	0.156	
Pt to be p	0.141			Pt to be pr.	0.156	
Shear str	0.320	okay		shear stre	0.318	okay
Ast to be	1227.7	mm2		Ast to be p	1617.4	mm2

CHK FOR TWO WAY SHEAR				
	Mix	30.000		
	d/2 =	0.208	0.62	1.02
Perimeter atd/2		3.260	m	
Vu at d/2		1055.9	kn	
Tv	=	0.78	mpa	
Tc allow		1.141		0.83
		SAFE		Ks

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L	2500	mm		LENGTH // TO DEPTH OF COLUMN				
B	2100	mm		WIDTH // TO WIDTH OF COLUMN				
D	500	mm						
			DIA	SPACING	AREA PROV	AREA REQD.		Pt Provided
As // L	14	NOS DIA	12	150.000	15.840	12.277	O.K.	0.182
As // B	16	NOS DIA	12	156.667	18.103	16.17	O.K.	0.179

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4. CONCLUSION

As a result of our analysis, all the structural elements are found safe for service and ultimate condition.

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R. RAVIKUMAR
STRUCTURAL ENGINEER GRADE - 1 (SE)
M.E (Structural Engg)
Reg. No - SE/GR-1/19/12/231 (CMDA)

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

Every free tool
/tools

Services we run for you
/services

The LandLens suite
/landlens/one

Verified RealEstate™

Every claim in this document traces back to a government record.

- 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.