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DIGITALLY VERIFIED RECORD

Structural Design Details

Of

THE PROPOSED CONSTRUCTION OF AFFORDABLE RESIDENTIAL APARTMENT BUILDING (STILT + 5 FLOOR) IN TS NO - 75/4, WARD -AG, BLOCK -33, PONMALAI ZONE (ZONE -IV) TRICHY CITY CORPORATION.

Structural Details Design by

TRICHY RG ENGINEERING EXCELLENCE
PRIVATE LIMITED

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TRICHY RG ENGINEERING EXCELLENCE PRIVATE LIMITED

(Structural Design Consultants)

Date :

STRUCTURAL DESIGN STABILITY CERTIFICATE

I hereby certify that the proposed construction of **Affordable residential apartment building (stilt +5 floors) in TS no - 75/4, ward -ag, block -33, Ponmalai zone (zone -iv) Trichy city corporation.**The building will withstand against the Earthquake, (Seismic Zone II as per IS1893 (Part I) 2002) loading stress parameters are within limits of National Building Code and Bureau of Indian Standards code of practice for concrete and loading. The building consists of **Stilt Floor +FiveFloors.**

For external and internal partition walls 200/100mm thick AAC block work walls are used.

The R.C.C building frame of the structure is designed as per the Indian standard code of practice for concrete and loading as follows:

1. IS:456-2000 Code of Practice for Plain and Reinforced Concrete
2. IS:875-1987 Code of Practice for Design loads for Buildings and Structures
3. IS:1893-2002 Criteria for Earthquakes resistant design of structures Part -1 General Provisions and Buildings
4. IS4326-1993 Code of Practice for Earthquake resistant design & Construction of Buildings
5. IS:13920-1993 Code of Practice for Ductile detailing of concrete structures subjected to seismic forces and
6. National Building code of India -2005

It is further certified that the above structure will be constructed from foundation to roof, as per structural design and detailing of reinforcements furnished in our drawings. The building will be **SAFE and SOUND** as per the design.

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DESIGN BASIS REPORT

For

The proposed construction of affordable residential apartment building (stilt +5 floor) in ts no – 75/4, ward -ag, block -33, ponmalai zone (zone -iv) trichy city corporation.

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1.0 OBJECTIVE

the proposed construction of affordable residential apartment building (stilt +5 floor) in Ts no - 75/4, ward -ag, block -33, ponmalai zone (zone -iv) trichy city corporation.The structure is supported on column in turn resting on column footing Foundation. The Structural System comprises columns, beams, slabs and wall structure.

3-D Analysis of all the building structures will be carried out using STAAD PRO Software package and analysis results shall be used for designing the various elements.

2.0 DESIGN LOADS

2.1 Dead Loads

The Deadloads that are envisaged to act permanently are considered as per **IS:875 (Part 1) – 1987 – Dead loads.** Indian standard**"Code of Practice for Design Loads (other than earthquakes) for Buildings and Structures".**

1. Slab is assumed to be 125mm thick – 3.125 KN/m2 and 200mm thick for PT Slab (5KN/mm2).
2. Floor finish (Super Imposed Dead Load) – 1.5KN/m2
3. AAC block masonry walls 200 & 100 mm thick are proposed to be used (location of walls per Architectural drawings) Unit weight is taken as 8 KN/m^3
4. Weathering course in Terrace finish –2 KN/m^2

2.2 Imposed Loads

The imposed loads that are envisaged to get permanently are considered as per **IS: 875 (part – 2) – 1987.** Indian standard **"Code of Practice for Design loads (other than earthquake) for Buildings and structures".**

1. Residential area = 2 KN/m2
2. Staircase = 4 KN/m^2
3. Toilets = 2 KN/m^2
4. Terrace floors = 1.5 KN/m^2

P.T.O

2.3 Load combinations

The various loads shall be combined in accordance with the stipulations in IS:875 (Part 5) – 1987. Whichever combinations produced the most unfavorable effect in the building, foundation or structural member concerned shall be adopted. The various load combinations considered in the analysis are as follows:

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

The above load combination will be considered and effect of worst combinations will be taken for design of various building elements.

3.0 ANALYSIS METHODS

The analysis of the structures is carried out using the STAAD PRO. The entire super structure is modeled using frame elements as appropriate. Beams and columns are modeled as frame elements. Appropriate loads and its combinations as per relevant IS code clauses, for most unfavorable effects are chosen for design. Various load cases considered in the analysis are briefed above.

4.0 DESIGN ASSUMPTION

4.1.1 The Base of the Foundation is assumed to be FIXED& PINNED.

4.1.2 All concrete elements shall be designed in accordance with IS 456:2000 Limit state design.

4.1.3 Appropriate loads and its combination as per relevant clauses, for the most unfavorable effects are chosen for design. (Refer Load Combination below).

5.0 FOUNDATION DESIGN

Type of foundation	: Isolated, Combined and Raft foundation.
Depth of foundation	: 3.6 m below natural ground level

6.0 MATERIALS

The self-weight of the various elements is computed based on the unit weight of materials as given below:

S. no	Materials	Unit weight KN / m^3
1	Reinforced Cement Concrete	25
2	Brick Work(for lift well& parapet)	20
3	Steel	78.50
4	AAC block work	8

Structural concrete shall be of grade M25 for all R.C.C work.

Steel reinforcement shall be of grade Fe 550 confirming to IS: 1786-2008.

7.0 NOMINAL COVER TO REINFORCEMENT

From Durability requirement, exposure condition is assumed as mild for structural elements above ground level and moderate for structural elements below ground level.

The clear cover to reinforcement to meet durability requirement shall be as follows:

Footing - 50mm

Column - 40mm

Beam - 32mm

Slab -20mm

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FOOTING DESIGN CALCULATIONS FOOTING DESIGN CALCULATIONS

Analysis File : D:\wip\1 trichy based projects\khajamalaiappartment\r11 for footing\Structure8-R11.std

Code References:

IS 456

Parameter Reference

1. Ptmax : Cl. 26.5.2.1
2. Ptmin : Cl. 26.5.2.1
3. Pt : Cl. 38
4. Tc : Cl. 40.2.1
5. Tcmax : Cl. 40.2.3
6. Asv : Cl. 40.4
7. Min Shear Reinf : Cl. 26.5.1.6
8. Max Stirrup Spacing : Cl. 26.5.1.5
9. Punching Shear design : Cl. 31.6.3
10. Load transfer : Cl. 34.4
11. Ptnominal : Cl. 34.5.2
12. Crack width calculation : Annex-F
13. Cracking : Cl. 35.3.2

BS 8007 (For Early / Initial Thermal Cracking)

1. Surface Zone for suspended slab : Figure A.1
2. Surface Zone for ground slab : Figure A.2
3. Factors for the calculation of minimum reinforcement : Table A.1

Design Code : IS 456 : 2000 + IS 13920 : 2016

Footing No : FC20

Column No : C20 (530 mm X 530 mm)

Analysis No : 8342

Concrete Grade : M30 N/sqmm

Steel Grade : Fe550 N/sqmm

Clear Cover : 40 mm

Df : 3.6 M

Dw : 5 M

Density of Soil = 18 kN/cum

Soil Bearing Capacity =190 kN/sqm

Gross Bearing Capacity = 254.8 kN/sqm

Permissible SBC Increase for EQ = 25 %

Permissible SBC Increase for Wind = 25 %

Live Load Reduction = 50 %

Permissible area of loss of contact = 0 %

Design cross section by : Factored SBC Factor = 1.5

Thus factored SBC = 285 kN/sqm

Consider overburden pressure

Footing Type : Pad

Footing Size (L x B x D) : 3250mm X 3250mm X 875mm

Without considering Effect of Water Table

Footing Self Wt., F1 = 231.05 kN

Soil Weight, S1 = 504.31 kN

Total Weight, W1 = F1 + S1 = 735.37 kN

Offset Along L (Loff) = 1360 mm

Offset Along B (Boff) = 1360 mm

Check For Maximum Soil Pressure:

Critical Load Combination = [1] : (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +(LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +(LOAD 3: LOAD CASE 3WALL LOAD) +(LOAD 5: LOAD CASE 5SUNKEN LOAD) +(LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB)

Pcomb = 1941.89 kN

P = Pcomb + W1

P = 2677.26 kN

Mx = 0 kNm

My = 0 kNm

P/A = 253.47 kN/sqm

Mx/Zx = 0 kN/sqm

My/Zy = 0 kN/sqm

Maximum Soil Pressure = 253.47 kN/sqm

Allowable Soil Pressure = (1 X 190) + 64.8 kN/sqm = 254.8 kN/sqm

Check For Minimum Soil Pressure:

Critical Load Combination = [1] : (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +(LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +(LOAD 3: LOAD CASE 3WALL LOAD) +(LOAD 5: LOAD CASE 5SUNKEN LOAD) +(LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB)

Pcomb = 1941.89 kN

P =Pcomb + W1

P = 2677.26 kN

Mx = 0 kNm

My = 0 kNm

P/A = 253.47 kN/sqm

Mx/Zx = 0 kN/sqm

My/Zy = 0 kN/sqm

Minimum Soil Pressure = 253.47 kN/sqm > 0

Check For Sliding:

Critical Load Combination = [1] : (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +(LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +(LOAD 3: LOAD CASE 3WALL LOAD) +(LOAD 5: LOAD CASE 5SUNKEN LOAD) +(LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB)

Coefficient Of Friction = 0.4

Factor of safety = 1.2

Pcomb = 1941.89

Shear Vx = 0.27 kN

shear Vy = 8.59 kN

Resultant sliding force = 8.59 kN

Downward force =Pcomb + (F1 + S1) = 2677.26 kN

Upward water pressure = 0.00 kN

Net downward force = 2677.26 kN

Force resisting sliding = Friction Coeff X Net Downward Force = 1070.90 kN

Factor of safety available = Resisting Force / Sliding Force = 124.63 > 1.2

Check For Overturning:

Along Width:

Critical Load Combination = (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +(LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +(LOAD 3: LOAD CASE 3WALL LOAD) +(LOAD 5: LOAD CASE 5SUNKEN LOAD) +(LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB)

Factor of safety = 1.50

Pcomb = 1941.89 kN

Moment Mx = 0 kNm

P = Pcomb + (F1 + S1) = 2677.26 kN

Stabilizing Moment for P = 4350.54 kNm

DeStabilizingMoment = 0 kNm = Hence, Not required

Along Length:

Critical Load Combination = (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +(LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +(LOAD 3: LOAD CASE 3WALL LOAD) +(LOAD 5: LOAD CASE 5SUNKEN LOAD) +(LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB)

Factor of safety = 1.50

Pcomb = 1941.89 kN

Moment My = 0 kNm

P = Pcomb + (F1 + S1) = 2677.26 kN

Stabilizing Moment for P = 4350.54 kNm

DeStabilizingMoment = 0 kNm = Hence, Not required

Design For Bending:

Bottom Reinforcement Along L:

Deff =827 mm

Beff =3250 mm

SPu =382.2 kN/sqm

Mu =SPu X B X Loff X Loff / 2 =1148.74 kNm

Pt = 0.12 %

Ast Rqd (BM) = 3225 sqmm

Ast Prv (Distributed Across Total Width) = 29 - T12 @ 120 = 3280 sqmm

Top Reinforcement Along L:

D = 875 mm <= 1000 mm, Hence

Ast = Min Pt For Top Reinforcement X D X B

= 0.06% X 875 X 3250 = 1706sqmm

Ast Prv (Distributed Across Total Width) = 22 - T10 @ 160 c/c =1728 sqmm

Bottom Reinforcement Along B:

Deff =811 mm

Leff =3250 mm

SPu =382.2 kN/sqm

Mu =SPu X L X Boff X Boff / 2 = 1148.74 kNm

Pt =0.12 %

Ast Rqd (BM) = 3163 sqmm

Ast Prv (Distributed Across Total Length) = 29 - T12 @ 120 = 3280 sqmm

Top Reinforcement Along B:

D = 875 mm <= 1000 mm, Hence

Ast = Min Pt For Top Reinforcement X D X L

= 0.06% X 875 X 3250 = 1706sqmm

Ast Prv (Distributed Across Total Length) = 22 - T10 @ 160 c/c = 1728 sqmm

Design For Shear:

One Way Shear Along L:

Critical Section @ d from Column Face =827 mm

Deff =827 mm

Beff =3250 mm

SPu =382.2 kN/sqm

Vu =SPu X (Loff - d) X B =662.07 kN

Tv = Vu / (Beff X Deff) =0.25 N/sqmm

Tc = 0.27 N/sqmm

Tv < Tc

One Way Shear Along B:

Critical Section @ d from Column Face = 811 mm

Deff = 811 mm

Leff =3250 mm

SPu =382.2 kN/sqm

Vu =SPu X (Boff - d) X L = 681.94 kN

Tv = Vu / (Leff X Deff) = 0.26 N/sqmm

Tc = 0.27 N/sqmm

Tv < Tc

Design For Punching Shear:

Critical Section @ d/2 from Column Face= 410 mm

Deff = 819 mm

Leff =1349 mm

Beff =1349 mm

Punching Perimeter =5396 mm

Punching Area =4419324 sqmm

SPu = Factored SBC = 382.2 kN/sqm

Vu =SPu X ((L X B)-(Leff X Beff)) = 3341.46 kN

Tv = Vu / Punching Area = 0.756 N/sqmm

Tc = 1.369 N/sqmm

Tv < Tc

Load Transfer Check For Load Transfer From Column To Footing

Critical Load Combination = [2] : 1.5 (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +1.5 (LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +1.5 (LOAD 3: LOAD CASE 3WALL LOAD) +1.5 (LOAD 5: LOAD CASE 5SUNKEN LOAD) +1.5 (LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB)

Pu = 2912.83 kN

A2 = 0.28 sqm

A1 = 16.24 sqm

Base Area = 10.56 sqm

A1 > Base Area

Thus, A1 = 10.56

Modification Factor = SquareRoot(A1/A2) < = 2

SquareRoot(A1/A2) = 6.1412

Thus, Modification Factor = 2

Concrete Bearing Capacity = 0.45 X Fck X Modification Factor X Column Area = 7584.3kN

Concrete Bearing Capacity > Pu, Hence Safe.

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COLUMN DESIGN CALCULATIONS

Analysis File : D:\wip\1 trichy based projects\khajamalaiappartment\Structure8-R4.std

Analysis Last Modified : 03-04-2025 19:21:30

Code References:

IS 456

ELEMENT CLAUSE / table

1 Max area of reinforcement : 26.5.3.1-a & b

2 Min area of reinforcement : 26.5.3.1-a & b

3 Min number of bars : 26.5.3.1-c

4 Minimum Eccentricity Calc : 25.4 & 39.2

5 Effective Length : 25.2

6 Slenderness Moments : 25.3 & 39.7

7 Design for axial loads : 39.3

8 Design for axial loads And uniaxial bending : 39.5

9 Design for axial loads And Biaxial bending : 39.6

10 Design of horizontal links : 26.5.3.2

11 Design shear strength : 40.2

12 Stiffness Proportion Factor, β : E-1

13 Stability(Index, Q) : E -2

14 Crack width calculation : 3.8

15 Multiplying factor to Beam Stiffness for effective length calculation : SP 24 1983 APPENDIX D

IS 13920 - 2016

ELEMENT CLAUSE / table

1 Spacing of special confining reinforcement : 10.4 and 7.6

2 C/s area of special confining reinforcement : 7.6.1

3 Applicability of boundary element : 10.4.1

4 Muv-Moment Capacity of Web : Annex

5 Additional Compressive Force in BE : 10.4.2

6 Check for BE in tension and compression : 10.4.2.1 and 10.4.3

7 Shear include due to Beam : 7.5

8 Minimum Flexural Strength of Column : 7.2

9 Shear Check at Column Joint : 9.1

10 Length of wall to thickness ratio : 10.1.3

11 Type of wall & Minimum reinforcement : 10.1.4

12 Largest diameter of longitudinal steel bar : 10.1.8

13 Shear reinforcement in RC wall : 10.2.3

14 Special confinement reinforcement in Boundary Element : 10.4.4

15 Minimum vertical reinforcement across horizontal construction joint : 10.7

General Data

Column No. : C16

Level : 1 m To 3 m

Frame Type = Non-Ductile

Response Reduction Factor = 3

Design Code = IS 456 : 2000 + IS 13920 : 2016

Grade Of Concrete = M30 N/sqmm

Grade Of Steel (Main) = Fe550 N/sqmm

Grade Of Steel (Shear) = Fe550 N/sqmm

Grade Of Steel - Flexural Design = Fe550 N/sqmm

Column B = 450 mm

Column D = 450 mm

Clear Cover = 32 mm

Live Load Reduction = 40 %

Clear Floor Height @ B = 2620 mm

Clear Floor Height @ D = 2620 mm

No Of Floors = 1

No Of Columns In Group = 1

Column Type :UnBraced

Minimum eccentricity check : One Axis at a Time

Code defined D/B ratio : 4

D/B Ratio : 1 <= 4 Hence, Design as Column

Flexural Design (Analysis Forces)

Analysis Reference No. = 1846

Load Combination = [1] : 1.5 (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +1.5 (LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +1.5 (LOAD 3: LOAD CASE 3WALL LOAD) +1.5 (LOAD 5: LOAD CASE 5SUNKEN LOAD) +1.5 (LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB)

Critical Location = Top Joint

Pu = 2100.32 kN

Mux = -7.52 kNm

Muy = 14.07 kNm

Vux = 4.69 kN

Vuy = 2.51 kN

Minimum Eccentricity Check

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

Most critical case is with Min. Eccentricity check in X-direction

Minimum Eccentricity Along D:

Minimum Eccentricity = Unsupported Length / 500 + D / 30 = 20.24 mm

Minimum Eccentricity > 20 mm

Mminx = Pu x Minimum Eccentricity = 42.51 kNm

Slenderness Check

Max Slenderness Ratio(L/B) = 5.82 < 60 (Hence Ok)

Column Is Unbraced Along D

Slenderness Check Along D:

Effective Length Factor = 1

Slenderness Ratio = Effective Length / D = 5.82, Column not Slender Along D

Column Is Unbraced Along B

Slenderness Check Along B:

Effective Length Factor = 1

Slenderness Ratio = Effective Length / B = 5.82, Column Not Slender Along B

Calculation of Design Moment

Direction ManalysisMmin (Abs) MdesignMslndx (Abs) Mdesign-final

A B C E F

Major Axis - Mux -7.52 42.51 -42.51 0 -42.51

Minor Axis - Muy 14.07 --- 14.07 0 14.07

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

Pu = 2100.32 kN

Mux = -42.51 kNm

Muy = 14.07 kNm

Resultant Moment (Combined Action)

Moment Capacity Check

Pt Calculated = 0.45

Reinforcement Provided = 8-T12

Load Angle = Tan-1(Muy/Mux) = 18.32 deg

MRes = 44.78 kNm

MCap = 143.04 kNm

Capacity Ratio = MRes/ MCap = 0.31 <= 1

Shear Calculation Along D Along B

Critical Load Combination [1] : 1.5 (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +1.5 (LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +1.5 (LOAD 3: LOAD CASE 3WALL LOAD) +1.5 (LOAD 5: LOAD CASE 5SUNKEN LOAD) +1.5 (LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB) [1] : 1.5 (LOAD 1: LOAD CASE 1SELF WEIGHT OF BEAM AND COLUMN) +1.5 (LOAD 2: LOAD CASE 2SELF WEIGHT OF SLAB) +1.5 (LOAD 3: LOAD CASE 3WALL LOAD) +1.5 (LOAD 5: LOAD CASE 5SUNKEN LOAD) +1.5 (LOAD 4: LOAD CASE 4LIVE LOAD ON SLAB)

Design shear force, Vu (kN) 2.508 4.6918

Pu (kN) 2100.32 2100.32

Deff ,Beff (mm) 412 412

Aeff (sqmm) 185400 185400

Design shear stress, Tv Vu / (B x Deff) Vu / (D x Beff)

Tv (N/sqmm) 0.0135 0.0253

Pt (%) 0.223 0.223

Design shear strength, Tc (N/sqmm) 0.351 0.351

Shear Strength Enhancement Factor (Compressive Force) 1 + 3 x Pu / (B x D x Fck)

2.1329 2.1329

Shear Strength Enhancement Factor (Tensile Force) - -

Shear Strength Enhancement Factor (max) 1.5 1.5

Shear Strength Enhancement Factor 1.5 1.5

Enhanced shear strength, Tc-e (N/sqmm) 0.5265 0.5265

Design shear check Tv < Tc x Enhancement factor Tv < Tc x Enhancement factor

Shear Links Design Shear Links Not Required Shear Links 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 = 3 mm

Criterion for spacing of normal links

Min. Longitudinal Bar dia X 16 = 192 mm

Min. dimension of column = 450 mm

Max. 300 mm = 300 mm

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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BEAM DESIGN CALCULATION

Analysis File : D:\wip\1 trichy based projects\khajamalai appartment\Structure8-R4.std
Analysis Last Modified : 03-04-2025 19:21:30
Level Designed : 6.6 m

Code References
IS 456
Sr.No. Item Clause / Table
1. Ptmax : 26.5.1.1
2. Ptmin : 26.5.1.1
3. MTu : 41.4.2
4. VTu : 41.3.1
5. Ptclc : 38
6. Tc : 40.2.1
7. Tcmax : 40.2.3
8. Asv : 40.4
9. Min Shear Reinf : 26.5.1.6
10. Max Stirrup Spacing : 26.5.1.5
11. Shear Reinf - Torsion : 26.5.1.7
12. Side Face Reinforcement : 26.5.1.3
13. crack width calculation : Annex-F
14. cracking : Clause 35.3.2

IS 13920 - 2016
Sr.No. Item Clause / Table
1. Ptmax : 6.2.2
2. Ptmin : 6.2.1
3. Astmin : 6.2.3 & 6.2.4
4. Svclc : 6.3.5
5. Shear Capacity : 6.3.4
6. Coupling Beams : 10.5

Group : G23
Beam No : B28
Analysis Reference (Member) : 2172,2173,2280 (6.6 m)
Beam Length : 5000 mm
Breadth (B) : 450 mm
Depth (D) : 750 mm
Effective Depth (d) : 695 mm
Design Code : IS 456
Beam Type : Regular Beam
Grade Of Concrete (Fck) : M30 N/sqmm
Grade Of Steel (Main) : Fe550 N/sqmm
Grade Of Steel (Shear) : Fe550 N/sqmm

Grade Of Steel (Shear) : Fe550 N/sqmm
Top/Bottom Clear Cover (Cmin) : 25 mm
Side Clear Cover : 25 mm
Es : 2x10^5 N/sqmm
Ptnominal (%) (Bn) : 0.2 %

Flexure Design

	Beam Bottom			Beam Top		
	Left	Mid	Right	Left	Mid	Right
Critical L/C - RCDC	1	1	1	1	-	
Mu (kNm)	74.47	526.38	446.92	588.03	-	-
Tu (kNm)	10.52	0	0	10.52	10.52	0
MTu (kNm)	16.5	0	0	16.5	16.5	0
Mud (kNm)	90.97	526.38	446.92	604.53	16.5	0
MuLim (kNm)	849	849	849	849	849	849
R	0.419	2.422	2.056	2.781	0.076	0
Ptmin (%) (A)	0.2	0.2	0.2	0.2	0.2	0.2
Ptclc (%) (B')	0.2	0.565	0.47	0.662	0.2	0.2
Pcclc (%) (C)	0	0	0	0	0.016	0
PtPrv (%)	0.321	0.579	0.514	1.029	0.257	0.257
AstCalc (sqmm)	625.5	1766.7	1471.46	2070.34	625.5	625.5
AstPrv (sqmm)	1005.3	1809.54	1608.48	3217	804.24	804.24
Reinforcement Provided	5-T16			5-T16		
	4-T16			5-T16		
	3-T16	4-T32		4-T16	4-T16	

Note: Calculation of Ast
AstCalc = Max {B',C} x B X d (for Mu > 0)
AstCalc = Bn x B X d (for Mu = 0)
Where,
A = Ptmin = Min % area of flexural reinforcement
B' = Ptclc = Maximum of % reinforcement required for Bending Moment and Min % area of flexural reinforcement (A)
Bn = Ptnominal = Nominal % area of reinforcement
C = Pcclc = % area of compression reinforcement required
D = AstCrack = Area of reinforcement required for Crackwidth

Shear Design

	Left	Mid	Right
Critical L/C - RCDC	1	1	1
PtPrv (%)	1.029	0.579	0.514
Vu (kN)	703.95	135.54	452.1
Tu (kNm)	10.52	0	0
VTu (kN)	37.4	0	0
Vut (kN)	741.36	135.54	452.1

Tv (N/sqmm) 2.37 0.43 1.45
Tc (N/sqmm) 0.66 0.53 0.5
Vc (kN) 207.33 165.01 157.18
Vus=Vut-Vc (kN) 534.03 0 294.92
Legs 4 4 4
Stirrup Rebar 8 8 8
Asv Torsion (sqmm) 1286.03 - -
Asv Torsion Prv (sqmm) 1340.53 - -
Asv Reqd (sqmm/m) 2441.29 498.55 1175.31
SvCalc (mm) 75 300 170
SvPrv (mm) 75 300 170
Asv Total Prv (sqmm) 2681.07 670.27 1182.82

Maximum Spacing Criteria

Basic

Spc1 =0.75d = 521 mm

Spc2 = 300 mm

For Torsion

(X1 = 410, Y1 = 710)

Spc3 = X1 = 410 mm

Spc4=(X1+Y1)/4 = 280 mm

SFR Design

Beam Width = 450 mm
Beam Depth = 750 mm
Torsion = 10.52 > 0 kNm
Beam Depth >750 Or Torsion > 0,
Hence SFR Provided

Asr = 337.5 sqmm
SFR Provided = 2-T12EF
ASFR Provided = 452.4 sqmm

Spacing Criteria

Provided Spacing = 206.4 mm
1.<= beam Width = 450 mm
2. Not Greater Than = 300 mm

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Design of slab

Two Long Edges Discontinuous

Fck	30	N/mm^2
Fy	500	N/mm^2
Dia of bar (Lx Direction)	12	mm
Dia of bar (Ly Direction)	10	mm
Clear cover	15	mm
Clear span Lx	5240	mm
Clear span Ly	6300	mm
Width of Beam	300	mm
Slab tk	150	mm
Floor Finish	70	mm
Weathering Coarse	5	mm
LIVE LOAD	3	KN/m2
Length of slab (lx)	5369	mm
Length of slab (ly)	6424	mm
Dead Load	5.18	KN/m2
LIVE LOAD	3	KN/m2
FD D.L	7.77	KN/m2
FD L.L	4.5	KN/m2
ly/lx	1.202290076	IT IS TWO WAY SLAB

Bending Moment Coeffecient for Rectangular Panels Supported on Four Sides with Provision for Torsion at Corners (IS 456-2000 Table 26)

	short span		long span	
	(-ve Mx)	(+ve Mx	(-ve My)	(+ve My)
	0	0.0845	0.0453	0.05848

support moment	Mx	0	KN.m
	My	16.03426379	KN.m
span moment	Mx	29.90155926	KN.m
	My	20.68594239	KN.m

Xu max/d	0.46	
Q	4.0081824	
d rquired	86.37204046	The depth provide is suffcient
Effective depth shorter span	129	
Effective depth longer span	118	
Ast (+ ve Shorter span)	575.9925892	mm^2
Ast (+ ve Longerer span)	429.2219703	mm^2
Ast (- ve Shorter span)	0	mm^2
Ast (- ve Longerer span)	327.6999523	mm^2
Min Ast	180	mm^2

SPAN REINFORCEMENT

TO PROVIDE 12 mm DIA OF BAR @196 mm SPACING IN 5240 mm DIRECTION

TO PROVIDE 10 mm DIA OF BAR @183 mm SPACING IN 6300 mm DIRECTION

SUPPORT REINFORCEMENT

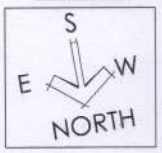
.

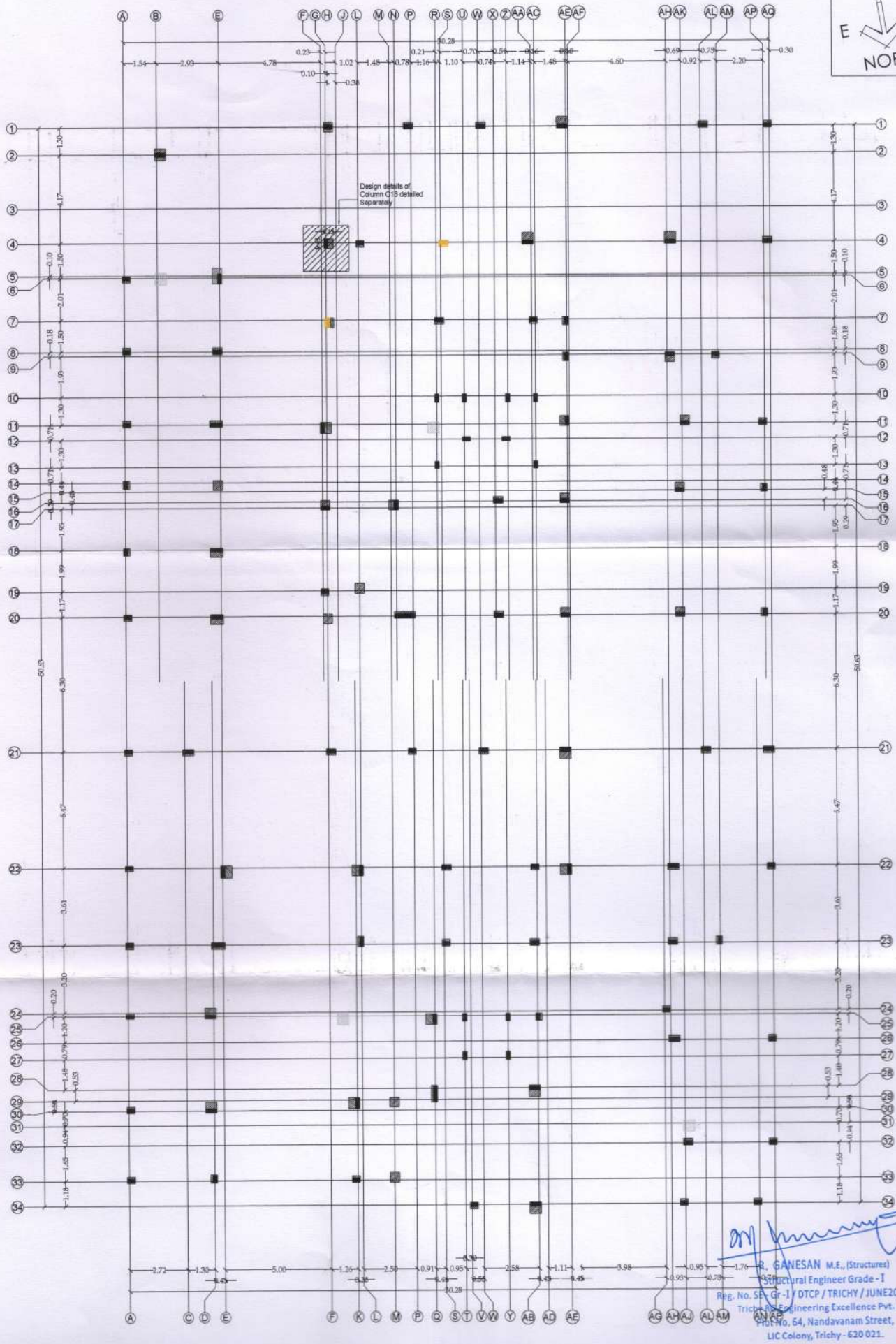
TO PROVIDE 10 mm DIA OF BAR @240 mm SPACING IN 6300 mm DIRECTION

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Column & Grid Layout

ORIENTATION



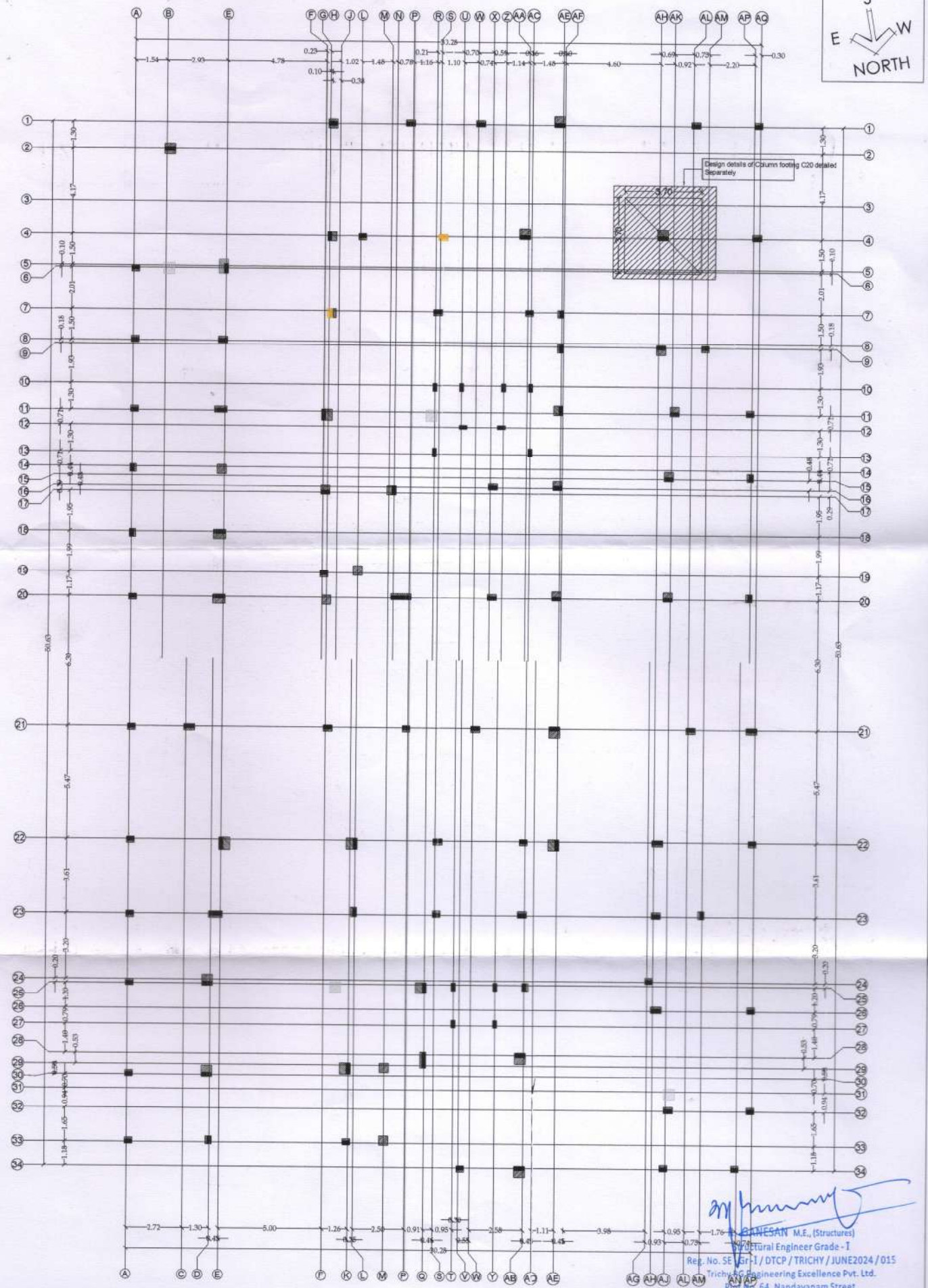


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Column & Grid Layout

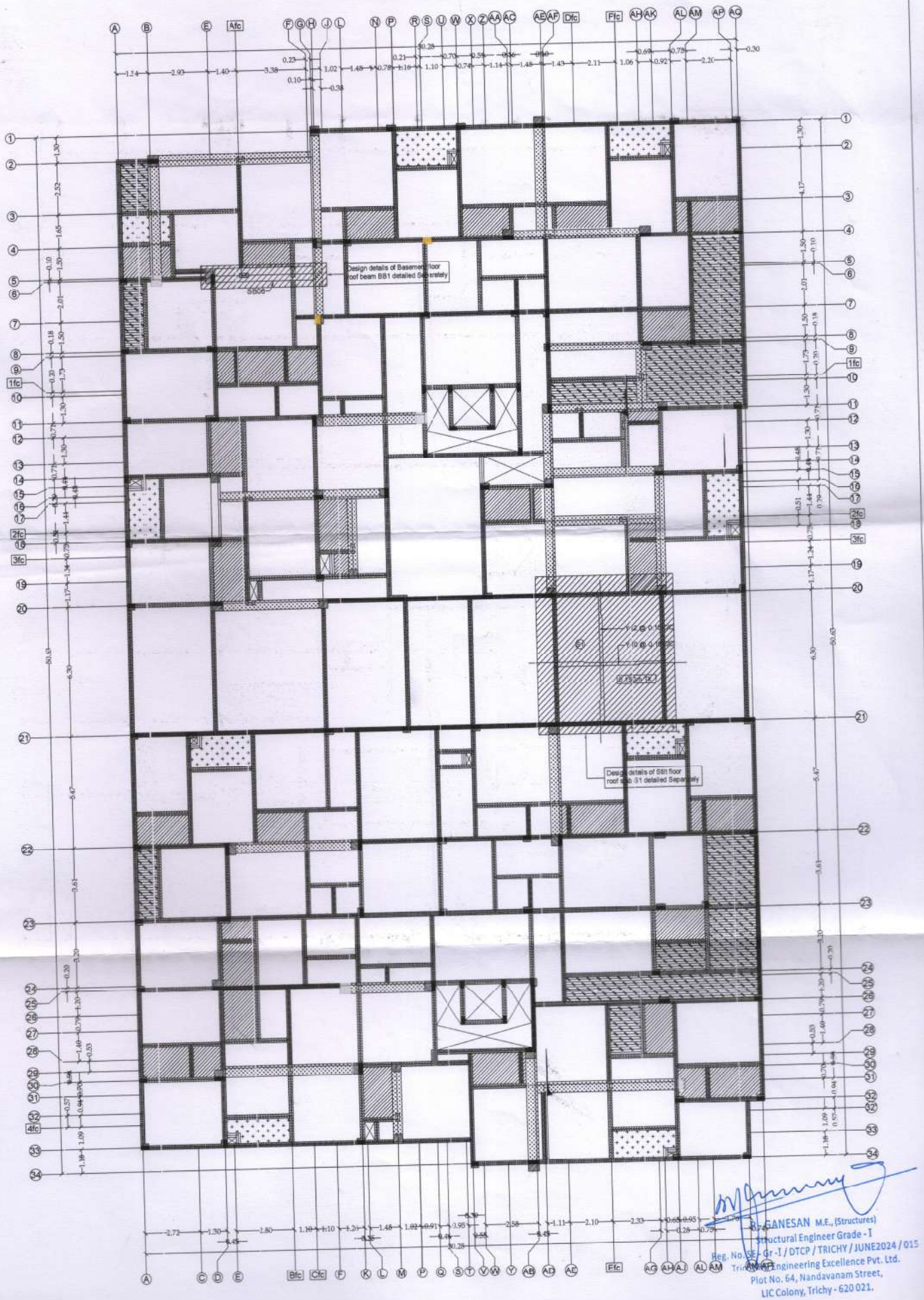
ORIENTATION

S
E W
NORTH



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Stilt Floor Roof Beam Layout



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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

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.