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STRUCTURAL ANALYSIS & DESIGN REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO: 66,67,70 & 71 AT INAM KARUR VILLAGE , KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT.

ATM
ASSOCIATES

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Gowripuram East,
Karur - 2.

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PROJECT: **STRUCTURAL ANALYSIS & DESIGN REPORT FOR THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO: 66, 67, 70 & 71 AT INAM KARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT.**

CLIENT: **M/s AADHAVAN CONSTRUCTIONS,**
K.SUNDARAMOORTHY (MANAGING PARTNER)

STRUCTURAL CONSULTANT: ATM ASSOCIATES
KARUR – 639002

PROJECT NO: ATM-2023/ST-32

DATE OF SUBMISSION: 03.07.2023

A. T. Mohan

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District Panel Eng-Class-1A ப.க.எ.1/2957/2018,
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ATM
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INTRODUCTION

INDRODUCTION:

The work of structural analysis, designing & detailing for the PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO: 66, 67, 70 & 71 AT INAM KARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT.It was designed to meet both strength and serviceability requirements when subjected to gravity loads. The dimension of building is 18 M x 31 M Approximately.

The Construction Of RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO: 66, 67, 70 & 71 AT INAM KARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT.has a Ground + Five Floor only (G+5). The structure is designed as RCC framed structure. RCC beam-slab system & steel truss is adopted for the proposed building (Please refer the Beam/Slab layout drawing as produced ATM ASSOCIATES Karur).

The structural frame comprises of Six storey braced in-situ reinforced concrete frame comprises one and two-way spanning slabs, supported on beams, columns and walls. Internal beams are supported on beams or columns. The Beam / slab system is provided all over floors except at the areas viz. stairs, shafts, voids etc. The slabs shall be supported by beams and transfer the loads to column.Isolated footing distribute the loads to soil under the safe bearing capacity.

The allowable safe bearing capacity for foundation design is taken as **250 Kn/m2** by referring soil report submitted by **KARPAGAM ACADEMY OF HIGHER EDUCATION, CBE-21.**

General

- At ground floor, slabs are not provided and the floor will directly rest on ground. Therefore, only ground beams passing through columns are provided as tie beams. The floor slabs are thus absent in the ground floor.
- The main beams rest centrally on columns to avoid local eccentricity.
- Centre-line dimensions are followed for analysis and design. In practice, it is advisable to consider finite size joint width.
- The floor diaphragms are assumed to be rigid.

DESIGN BRIEF:

Design of the RCC beam-slab system layout is based on IS: 456 for the proposed building with a design life of 60 years & a fire rating of two (02) hours.

The lateral stability of the building is provided through the frame action of the main frames.

The longitudinal stability of the building is provided through truss action of cross braced bays of the building at roof and Portal action at walls.

Both End wall columns are Post and Beam Frame with by-pass girt.

The roof purlins are discontinuous beams supported at rigid frame locations and span the bay spacing of the building.

Side wall girts are discontinuous beams supported at rigid frame locations and span the bay spacing of the building.

The roof and wall sheeting provide lateral support for purlins & girts.

The main considerations followed for the design of structure are:

(a) Structural safety and stability.

(b) Demands of aesthetics conceived by the architect.

(c) Availability of material, equipment and expertise.

(d) Constructability and ease of maintenance.

(e) Durability

(f) Economy.

(g) Recyclability

The design responsibilities shall be shared as follows:

- Design of Columns, Beams, Slabs, Foundations & Staircases.

LOADINGS :

MATERIALS

Grade of Concrete	:	M 20
Yield strength of steel	:	500 N/mm^2
Design Code	:	Indian Standards.

DEAD LOAD

The dead load on the structure includes all the permanent loads such as those of the structural components. The dead load thus comprises of the weight of all walls, partitions, floors, roofs and also includes the weight of all other permanent constructions in the building sand shall conform to IS: 1911-Schedule of unit weights of buildings materials.

UNIT WEIGHT

Self weight of 230 mm wall	=	19.2 kN/m^3 (Elevation area load)
Self weight of 115 mm wall	=	9.5 kN/m^3 (Elevation area load)
Unit weight of concrete	=	25 kN/m^3

FLOOR LOADS

Floor finish	=	1.25 kN/m^2
Wall load	=	As per Architectural plans
Partitions wall load (Demountable)	=	0.5 kN/m^2
Live load	=	2 kN/m^2
Live load (Corridors, stairs and landings)	=	3 kN/m^2

ROOF LOADS

Water proofing & Floor finish	=	1.25 kN/m^2
Live load	=	1.5 kN/m^2

STRURCUTAL ANALYSIS & DESIGN :

The structure is analyzed & designed for all possible combinations of gravity loads. A 3-dimensional model of structure is generated using STAAD PRO. For the design of concrete sections, which are designed with the limit state method, the following load combinations are taken:

1.1.5 (D.L. + L.L.)

2. 1.2 (D.L + L.L + W.L)

3. 1.5 (D.L + W.L)

4. D.L. + L.L

5.D.L + W.L

The building has been analysed as Six storied (G+5) RCC framed structure structure using STAAD PRO and designed as per the provisions in the relevant IS codes.

RCC elements are design as per limit state of Strength & check for Limit state of serviceability.

Necessary admixtures to be added while concreting to avoid corrosions of structural elements.

DESIGN STANDARDS

All the relevant IS codes are followed. The main codes are as follows:

a) IS:875-1987(Part-I, II),
b) IS: 456-2000, Code of practice for Plain and Reinforced Concrete.
c) IS800-2000 LSD, Code of practice for steel strucutres.
d) SP:16 Design aids to IS:456)
e) SP: 34 Concrete Reinforcement & Detailing.

The Pre-Engineered Building described in these calculations was designed according to the latest Buildings and Design Codes that have been referred to in the design:

1. Loads on all buildings are applied in accordance with:

a. Dead, Live and Wind load applied as per **IS 875 Latest Edition Part I, II & III.**

b. Seismic load applied as per **IS 1893 (Part 4) – Latest Edition.**

2. Manufacturing and Erection tolerances are applied as per:

2002 edition of the **Low Rise Building Systems Manual**

Metal Building Manufacturers Association, Inc **(MBMA)**

3. Built up and hot rolled sections have been designed in accordance with :

AISC-360-16 "American Institute of Steel Construction" Manual of Steel Construction – Load & Resistance Factor Design", 2010 Edition

4. Fabrication & erection tollerances **(MBMA-2002)**

5. "American Institute of Steel Structure" - Allowable Stress Design,

6. Cold formed components have been designed in accordance with:

"American Iron and Steel Institute" Cold Formed Steel Design Manual, 2001 **(AISI)**.

7. Welding has been applied in accordance with:

AWS D1.1M:2007 "American Welding Society" Structural Welding Code - Steel Manual, 2007 Edition

CLEAR COVER TO ANY REINFORCEMENT

a)	Suspended slabs	=	20 mm
b)	Beams	=	30 mm
c)	Columns	=	40 mm
d)	Footings	=	50 mm
e)	Staircase waist slabs	=	25 mm

DESIGN MOVEMENTS & LIMITATIONS :

SETTLEMENT

- Overall settlement of the building is not expected to exceed 25mm.

VERTICAL DEFLECTION LIMITS

Concrete Slabs/Beams – generally: Span/250

Concrete Edge Beams – supporting masonry or glazing: Span/500

Concrete Slabs/Beams – supporting brittle finishes: Span/360

Structural Steel Elements – generally: Span/200

Structural Steel Elements – supporting brittle finishes: Span/360

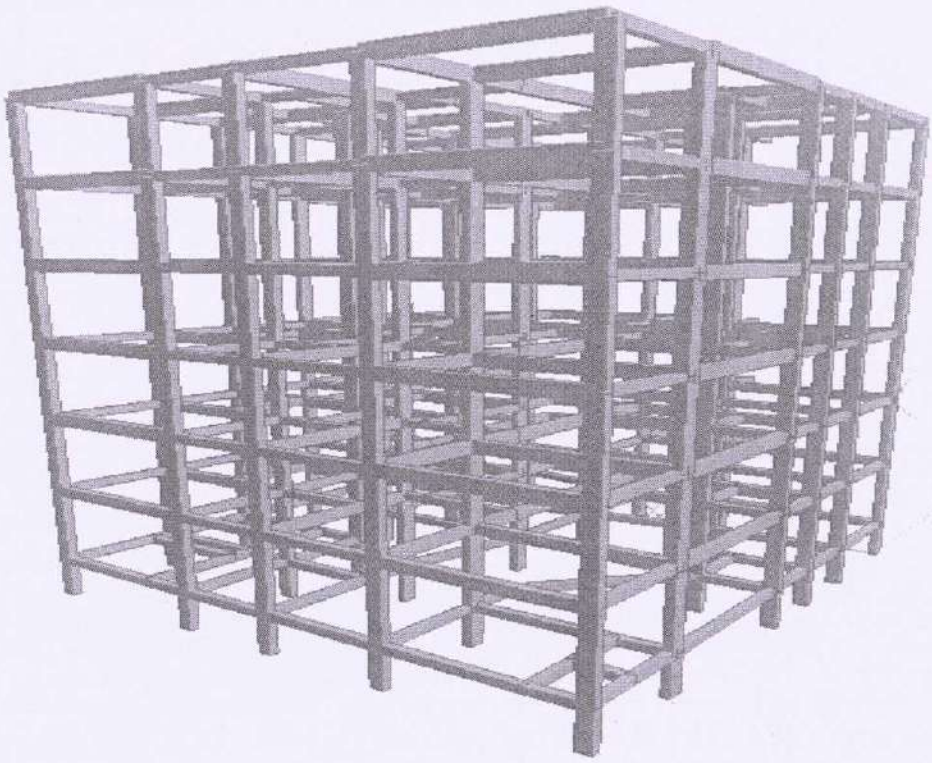
Horizontal Deflection Limits

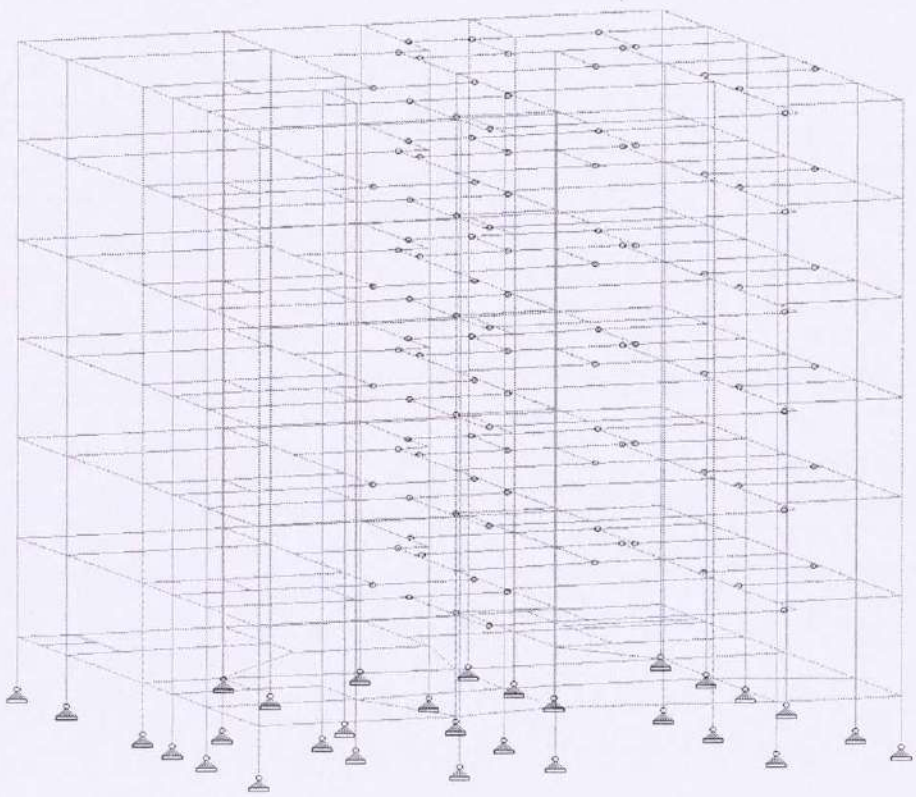
Structural Elements supporting masonry or glazing: Span/500

Relative Floor to Floor movement generally: Height/300

ANALYSIS

STAAD IMAGES





ATM ASSOCIATES

STAAD SPACE
START JOB INFORMATION
ENGINEER DATE 02.07.2023
JOB NAME RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE
JOB CLIENT M/s AADHAVAN CONSTRUCTIONS,
JOB NO ATM-2023/32
JOB REV 0
ENGINEER NAME RB
CHECKER NAME RB
APPROVED NAME ATM
JOB PART 0
JOB REF G+5
END JOB INFORMATION
INPUT WIDTH 79
UNIT METER KN
JOINT COORDINATES
1 0 0 0; 2 5.03 0 0; 3 7.66 0 -0.61; 4 12.8 0 0.27; 5 15.89 0 0.27;
6 15.89 0 -2.82; 7 0 0 -3.51; 8 3.73 0 -3.51; 9 7.66 0 -4.08; 10 12.8 0 -4.08;
11 0 0 -5.87; 12 3.73 0 -5.87; 13 7.66 0 -7.51; 14 12.8 0 -7.51; 15 0 0 -7.93;
16 1.98 0 -7.93; 17 15.89 0 -7.51; 18 15.89 0 -10.37; 19 11.17 0 -10.37;
20 15.89 0 -13.04; 21 11.17 0 -13.04; 22 8.43 0 -11.47; 24 0 0 -13.04;
25 0 0 -16.2; 26 5.03 0 -16.2; 27 8.43 0 -16.2; 28 11.17 0 -16.2;
29 15.89 0 -16.2; 30 0 1.5 0; 31 5.03 1.5 0; 32 7.66 1.5 -0.61;
33 12.8 1.5 0.27; 34 15.89 1.5 0.27; 35 15.89 1.5 -2.82; 36 0 1.5 -3.51;
37 3.73 1.5 -3.51; 38 7.66 1.5 -4.08; 39 12.8 1.5 -4.08; 40 0 1.5 -5.87;
41 3.73 1.5 -5.87; 42 7.66 1.5 -7.51; 43 12.8 1.5 -7.51; 44 0 1.5 -7.93;
45 1.98 1.5 -7.93; 46 15.89 1.5 -7.51; 47 15.89 1.5 -10.37;
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78 3.73 4.5 -3.51; 79 7.66 4.5 -4.08; 80 12.8 4.5 -4.08; 81 0 4.5 -5.87;
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86 1.98 4.5 -7.93; 87 15.89 4.5 -7.51; 88 15.89 4.5 -10.37;
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MEMBER INCIDENCES

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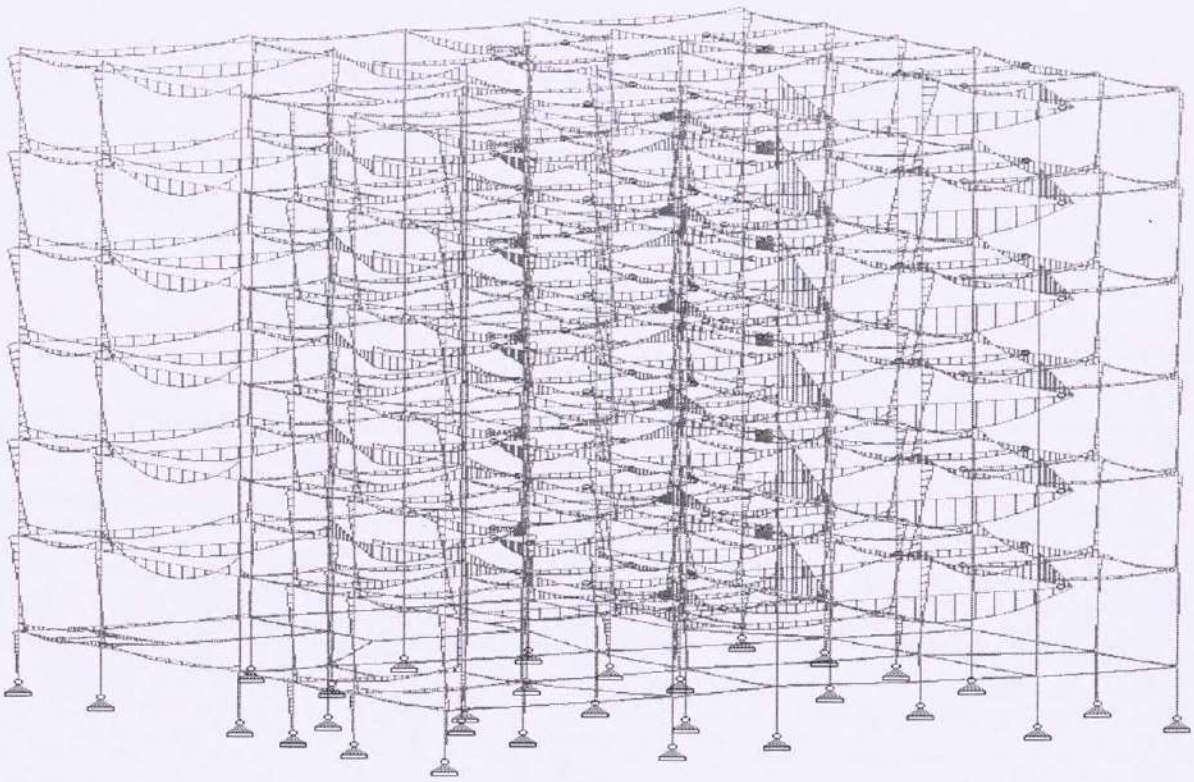
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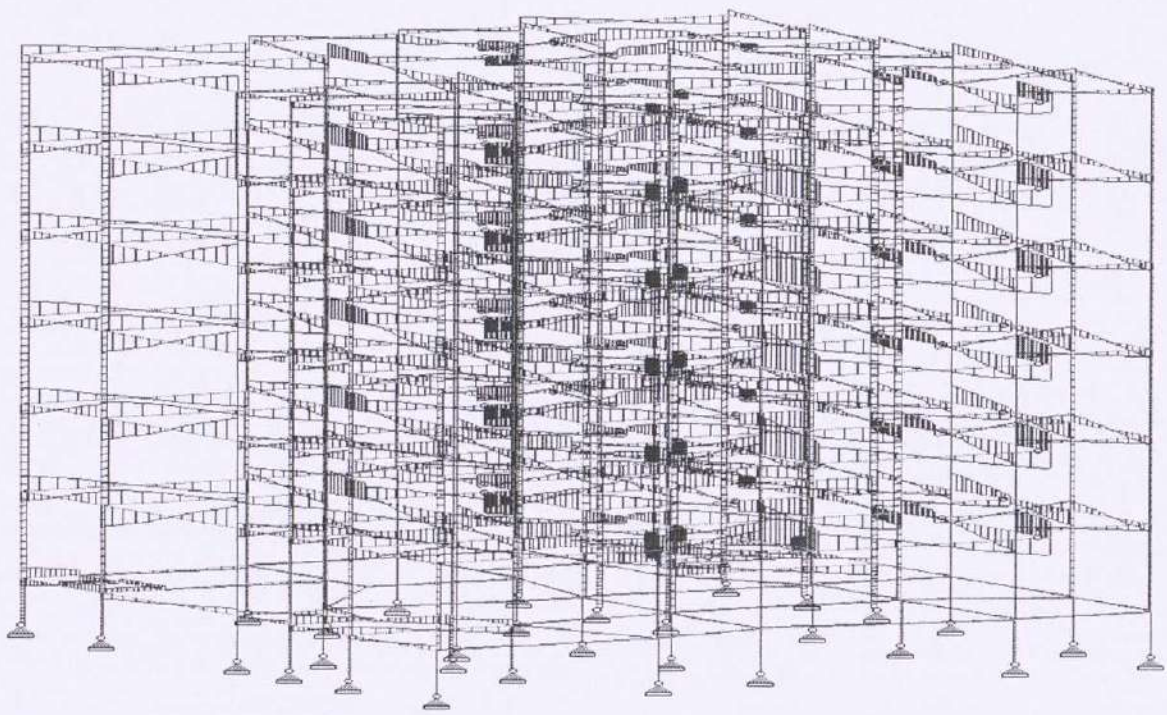
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CONSTANTS
MATERIAL CONCRETE ALL
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SELFWEIGHT Y -1
MEMBER LOAD
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YRANGE 19.5 19.5 FLOAD -5.75 GY
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FLOOR LOAD
YRANGE 4.5 16.5 FLOAD -2 GY
YRANGE 19.5 19.5 FLOAD -1.5 GY
LOAD COMB 3 DL + LL
1 1.0 2 1.0
LOAD COMB 4 1.5 DL + 1.5 LL
1 1.5 2 1.5
PERFORM ANALYSIS
FINISH
```

STAAD OUTPUT



BMD DIAGRAM



SHEAR FORCE DIAGRAM

ATM ASSOCIATES

STAAD ANALYSIS REPORT

Job Information

	Engineer	Checked	Approved
Name:	RB	RB	ATM
Date:	02.07.2023		

Structure Type	SPACE FRAME

Number of Nodes	382	Highest Node	383
Number of Elements	721	Highest Beam	732

Number of Basic Load Cases	2
Number of Combination Load Cases	2

Included in this printout are data for:

All	The Whole Structure

Included in this printout are results for load cases:

Type	L/C	Name
Primary	1	DL
Primary	2	LL
Combination	3	DL + LL
Combination	4	1.5 DL + 1.5 LL

Basic Load Cases

Number	Name
1	DL
2	LL

Combination Load Cases

Comb.	Combination L/C Name	Primary	Primary L/C Name	Factor
3	DL + LL	1	DL	1.00
		2	LL	1.00
4	1.5 DL + 1.5 LL	1	DL	1.50
		2	LL	1.50

Node Displacement Summary

	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)	rX (rad)	rY (rad)	rZ (rad)
Max X	92	4:1.5 DL + 1.5 I	**0.710**	-3.290	0.696	3.437	-0.001	-0.000	0.003
Min X	292	4:1.5 DL + 1.5 I	**-6.542**	-8.304	15.207	18.520	-0.000	0.000	0.002
Max Y	1	1:DL	0.000	**0.000**	0.000	0.000	0.000	0.000	-0.000
Min Y	379	4:1.5 DL + 1.5 I	-2.098	**-33.421**	12.229	35.650	0.013	-0.000	-0.003
Max Z	273	4:1.5 DL + 1.5 I	-1.797	-11.151	**16.014**	19.597	0.003	-0.001	-0.000
Min Z	32	4:1.5 DL + 1.5 I	0.119	-1.480	**-0.542**	1.580	-0.001	0.000	-0.000
Max rX	118	4:1.5 DL + 1.5 I	0.123	-27.315	0.291	27.317	**0.013**	0.000	-0.003
Min rX	120	4:1.5 DL + 1.5 I	-0.202	-3.851	1.277	4.062	**-0.002**	0.000	0.002
Max rY	313	4:1.5 DL + 1.5 I	-6.405	-9.283	11.309	15.972	-0.000	**0.001**	-0.000
Min rY	304	4:1.5 DL + 1.5 I	-1.731	-9.508	13.888	16.919	0.001	**-0.001**	-0.001
Max rZ	375	4:1.5 DL + 1.5 I	-4.387	-12.113	11.127	17.023	0.001	0.001	**0.004**
Min rZ	379	4:1.5 DL + 1.5 I	-2.098	-33.421	12.229	35.650	0.013	-0.000	**-0.003**
Max Rst	379	4:1.5 DL + 1.5 I	-2.098	-33.421	12.229	**35.650**	0.013	-0.000	-0.003

Beam Displacement Detail Summary

Displacements shown in italic indicate the presence of an offset

	Beam	L/C	d (m)	X (mm)	Y (mm)	Z (mm)	Resultant (mm)
Max X	114	4:1.5 DL + 1.5 I	2.100	**1.979**	-2.635	0.817	3.396
Min X	550	4:1.5 DL + 1.5 I	0.471	**-6.623**	-8.661	15.208	18.712
Max Y	1	1:DL	0.000	0.000	**0.000**	0.000	0.000
Min Y	713	4:1.5 DL + 1.5 I	1.542	-2.098	**-35.989**	11.943	37.977
Max Z	600	4:1.5 DL + 1.5 I	0.514	-3.001	-27.302	**16.084**	31.829
Min Z	95	4:1.5 DL + 1.5 I	1.500	0.133	-2.948	**-1.543**	3.330
Max Rst	713	4:1.5 DL + 1.5 I	1.542	-2.098	-35.989	11.943	**37.977**

Beam End Displacement Summary

Displacements shown in italic indicate the presence of an offset

	Beam	Node	L/C	X (mm)	Y (mm)	Z (mm)	Resultant (mm)
Max X	114	92	4:1.5 DL + 1.5 I	**0.710**	-3.290	0.696	3.437
Min X	550	292	4:1.5 DL + 1.5 I	**-6.542**	-8.303	15.207	18.520
Max Y	1	1	1:DL	0.000	**0.000**	0.000	0.000
Min Y	710	379	4:1.5 DL + 1.5 I	-2.098	**-33.421**	12.229	35.650
Max Z	534	273	4:1.5 DL + 1.5 I	-1.798	-11.151	**16.014**	19.597
Min Z	3	32	4:1.5 DL + 1.5 I	0.119	-1.480	**-0.542**	1.581
Max Rst	710	379	4:1.5 DL + 1.5 I	-2.098	-33.421	12.229	**35.650**

Beam End Force Summary

The signs of the forces at end B of each beam have been reversed. For example: this means that the Min Fx entry gives the largest tension value for an beam.

	Beam	Node	L/C	Axial	Shear		Torsion	Bending	
				Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
Max Fx	3	3	4:1.5 DL + 1.5 l	**2.22E+3**	-0.217	-10.317	-0.000	0.000	-0.000
Min Fx	558	303	4:1.5 DL + 1.5 l	**-86.092**	-46.453	21.572	-2.821	-4.161	-4.970
Max Fy	291	123	4:1.5 DL + 1.5 l	-0.352	**217.191**	0.496	16.641	-0.474	372.206
Min Fy	148	92	4:1.5 DL + 1.5 l	-7.574	**-140.150**	-15.262	3.285	-4.785	72.491
Max Fz	197	73	4:1.5 DL + 1.5 l	1.81E+3	2.136	**99.632**	0.148	-154.131	3.527
Min Fz	732	372	4:1.5 DL + 1.5 l	173.032	1.903	**-36.583**	-0.978	49.651	3.372
Max Mx	662	360	4:1.5 DL + 1.5 l	-3.481	132.118	-1.637	**22.302**	-0.043	90.532
Min Mx	157	93	4:1.5 DL + 1.5 l	-19.383	17.641	-3.873	**-7.170**	8.679	-74.473
Max My	197	123	4:1.5 DL + 1.5 l	1.79E+3	2.136	99.632	0.148	**144.764**	-2.882
Min My	197	73	4:1.5 DL + 1.5 l	1.81E+3	2.136	99.632	0.148	**-154.131**	3.527
Max Mz	291	123	4:1.5 DL + 1.5 l	-0.352	217.191	0.496	16.641	-0.474	**372.206**
Min Mz	662	363	4:1.5 DL + 1.5 l	-3.481	84.008	-1.637	22.302	-2.613	**-79.127**

Beam Force Detail Summary

Sign convention as diagrams:- positive above line, negative below line except Fx where positive is compression. Distance d is given from beam end A.

	Beam	L/C	d	Axial	Shear		Torsion	Bending	
			(m)	Fx (kN)	Fy (kN)	Fz (kN)	Mx (kNm)	My (kNm)	Mz (kNm)
Max Fx	3	4:1.5 DL + 1.5 l	0.000	**2.22E+3**	-0.217	-10.317	-0.000	0.000	-0.000
Min Fx	558	4:1.5 DL + 1.5 l	0.000	**-86.092**	-46.453	21.572	-2.821	-4.161	-4.970
Max Fy	291	4:1.5 DL + 1.5 l	0.000	-0.352	**217.191**	0.496	16.641	-0.474	372.206
Min Fy	148	4:1.5 DL + 1.5 l	0.770	-7.574	**-140.150**	-15.262	3.285	-4.785	72.491
Max Fz	197	4:1.5 DL + 1.5 l	0.000	1.81E+3	2.136	**99.632**	0.148	-154.131	3.527
Min Fz	732	4:1.5 DL + 1.5 l	0.000	173.032	1.903	**-36.583**	-0.978	49.651	3.372
Max Mx	662	4:1.5 DL + 1.5 l	0.000	-3.481	132.118	-1.637	**22.302**	-0.043	90.532
Min Mx	157	4:1.5 DL + 1.5 l	0.000	-19.383	17.641	-3.873	**-7.170**	8.679	-74.473
Max My	197	4:1.5 DL + 1.5 l	3.000	1.79E+3	2.136	99.632	0.148	**144.764**	-2.882
Min My	197	4:1.5 DL + 1.5 l	0.000	1.81E+3	2.136	99.632	0.148	**-154.131**	3.527
Max Mz	291	4:1.5 DL + 1.5 l	0.000	-0.352	217.191	0.496	16.641	-0.474	**372.206**
Min Mz	713	4:1.5 DL + 1.5 l	2.570	-0.616	-3.703	0.596	0.000	-1.531	**-149.369**

Reaction Summary

	Node	L/C	Horizontal FX (kN)	Vertical FY (kN)	Horizontal FZ (kN)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
Max FX	21	4:1.5 DL + 1.5 I	**16.540**	1.43E+3	0.690	0.000	0.000	0.000
Min FX	20	4:1.5 DL + 1.5 I	**-19.356**	1.12E+3	-6.132	0.000	0.000	0.000
Max FY	3	4:1.5 DL + 1.5 I	0.217	**2.22E+3**	-10.317	0.000	0.000	0.000
Min FY	5	2:LL	-0.001	**35.315**	0.079	0.000	0.000	0.000
Max FZ	9	4:1.5 DL + 1.5 I	-1.536	1.69E+3	**10.974**	0.000	0.000	0.000
Min FZ	3	4:1.5 DL + 1.5 I	0.217	2.22E+3	**-10.317**	0.000	0.000	0.000
Max MX	1	1:DL	-1.846	660.193	-1.826	**0.000**	0.000	0.000
Min MX	1	1:DL	-1.846	660.193	-1.826	**0.000**	0.000	0.000
Max MY	1	1:DL	-1.846	660.193	-1.826	0.000	**0.000**	0.000
Min MY	1	1:DL	-1.846	660.193	-1.826	0.000	**0.000**	0.000
Max MZ	1	1:DL	-1.846	660.193	-1.826	0.000	0.000	**0.000**
Min MZ	1	1:DL	-1.846	660.193	-1.826	0.000	0.000	**0.000**

Reaction Envelope

Node	Env	Horizontal FX (kN)	Vertical FY (kN)	Horizontal FZ (kN)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
1	+ve	0.000	1.07E+3	0.158	0.000	0.000	0.000
1	+ve	-	Load: 4	Load: 2	-	-	-
1	-ve	-3.319	0.000	-2.502	0.000	0.000	0.000
1	-ve	Load: 4	-	Load: 4	-	-	-
2	+ve	0.476	1.66E+3	1.191	0.000	0.000	0.000
2	+ve	Load: 4	Load: 4	Load: 4	-	-	-
2	-ve	0.000	0.000	0.000	0.000	0.000	0.000
2	-ve	-	-	-	-	-	-
3	+ve	0.217	2.22E+3	0.000	0.000	0.000	0.000
3	+ve	Load: 4	Load: 4	-	-	-	-
3	-ve	-0.046	0.000	-10.317	0.000	0.000	0.000
3	-ve	Load: 2	-	Load: 4	-	-	-
4	+ve	0.000	1.67E+3	0.000	0.000	0.000	0.000
4	+ve	-	Load: 4	-	-	-	-
4	-ve	-2.402	0.000	-3.468	0.000	0.000	0.000
4	-ve	Load: 4	-	Load: 4	-	-	-
5	+ve	0.000	603.901	0.079	0.000	0.000	0.000
5	+ve	-	Load: 4	Load: 2	-	-	-
5	-ve	-0.320	0.000	-0.756	0.000	0.000	0.000
5	-ve	Load: 4	-	Load: 4	-	-	-
6	+ve	2.600	1.14E+3	0.000	0.000	0.000	0.000
6	+ve	Load: 4	Load: 4	-	-	-	-
6	-ve	0.000	0.000	-1.525	0.000	0.000	0.000
6	-ve	-	-	Load: 4	-	-	-
7	+ve	7.036	1.28E+3	0.000	0.000	0.000	0.000

Reaction Envelope Cont...

Node	Env	Horizontal FX (kN)	Vertical FY (kN)	Horizontal FZ (kN)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
7	+ve	Load: 4	Load: 4	-	-	-	-
7	-ve	-0.254	0.000	-3.401	0.000	0.000	0.000
7	-ve	Load: 2	-	Load: 4	-	-	-
8	+ve	0.010	1.48E+3	0.000	0.000	0.000	0.000
8	+ve	Load: 2	Load: 4	-	-	-	-
8	-ve	-7.265	0.000	-1.221	0.000	0.000	0.000
8	-ve	Load: 4	-	Load: 4	-	-	-
9	+ve	0.000	1.69E+3	10.974	0.000	0.000	0.000
9	+ve	-	Load: 4	Load: 4	-	-	-
9	-ve	-1.536	0.000	0.000	0.000	0.000	0.000
9	-ve	Load: 4	-	-	-	-	-
10	+ve	5.156	1.65E+3	0.000	0.000	0.000	0.000
10	+ve	Load: 4	Load: 4	-	-	-	-
10	-ve	0.000	0.000	-0.326	0.000	0.000	0.000
10	-ve	-	-	Load: 4	-	-	-
11	+ve	12.029	1.05E+3	0.120	0.000	0.000	0.000
11	+ve	Load: 4	Load: 4	Load: 1	-	-	-
11	-ve	0.000	0.000	-0.124	0.000	0.000	0.000
11	-ve	-	-	Load: 2	-	-	-
12	+ve	0.312	1.35E+3	4.058	0.000	0.000	0.000
12	+ve	Load: 2	Load: 4	Load: 4	-	-	-
12	-ve	-9.927	0.000	-0.042	0.000	0.000	0.000
12	-ve	Load: 4	-	Load: 2	-	-	-
13	+ve	0.000	1.73E+3	10.827	0.000	0.000	0.000
13	+ve	-	Load: 4	Load: 4	-	-	-
13	-ve	-2.600	0.000	0.000	0.000	0.000	0.000
13	-ve	Load: 4	-	-	-	-	-
14	+ve	0.939	1.62E+3	0.000	0.000	0.000	0.000
14	+ve	Load: 4	Load: 4	-	-	-	-
14	-ve	0.000	0.000	-0.910	0.000	0.000	0.000
14	-ve	-	-	Load: 4	-	-	-
15	+ve	2.331	1.21E+3	0.003	0.000	0.000	0.000
15	+ve	Load: 4	Load: 4	Load: 2	-	-	-
15	-ve	0.000	0.000	-5.280	0.000	0.000	0.000
15	-ve	-	-	Load: 4	-	-	-
16	+ve	1.686	1.14E+3	4.944	0.000	0.000	0.000
16	+ve	Load: 4	Load: 4	Load: 4	-	-	-
16	-ve	0.000	0.000	0.000	0.000	0.000	0.000
16	-ve	-	-	-	-	-	-
17	+ve	0.068	1.09E+3	0.000	0.000	0.000	0.000
17	+ve	Load: 2	Load: 4	-	-	-	-
17	-ve	-0.194	0.000	-2.097	0.000	0.000	0.000
17	-ve	Load: 1	-	Load: 4	-	-	-
18	+ve	0.055	1.09E+3	0.000	0.000	0.000	0.000

Reaction Envelope Cont...

Node	Env	Horizontal FX (kN)	Vertical FY (kN)	Horizontal FZ (kN)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
18	+ve	Load: 2	Load: 4	-	-	-	-
18	-ve	-15.979	0.000	-3.431	0.000	0.000	0.000
18	-ve	Load: 4	-	Load: 4	-	-	-
19	+ve	11.155	1.75E+3	0.050	0.000	0.000	0.000
19	+ve	Load: 4	Load: 4	Load: 2	-	-	-
19	-ve	-0.620	0.000	-0.836	0.000	0.000	0.000
19	-ve	Load: 2	-	Load: 4	-	-	-
20	+ve	0.151	1.12E+3	0.027	0.000	0.000	0.000
20	+ve	Load: 2	Load: 4	Load: 2	-	-	-
20	-ve	-19.356	0.000	-6.132	0.000	0.000	0.000
20	-ve	Load: 4	-	Load: 4	-	-	-
21	+ve	16.540	1.43E+3	0.690	0.000	0.000	0.000
21	+ve	Load: 4	Load: 4	Load: 4	-	-	-
21	-ve	-0.620	0.000	0.000	0.000	0.000	0.000
21	-ve	Load: 2	-	-	-	-	-
22	+ve	0.194	1.41E+3	8.489	0.000	0.000	0.000
22	+ve	Load: 2	Load: 4	Load: 4	-	-	-
22	-ve	-0.530	0.000	0.000	0.000	0.000	0.000
22	-ve	Load: 1	-	-	-	-	-
24	+ve	2.000	1.83E+3	0.000	0.000	0.000	0.000
24	+ve	Load: 4	Load: 4	-	-	-	-
24	-ve	-0.519	0.000	-4.663	0.000	0.000	0.000
24	-ve	Load: 2	-	Load: 4	-	-	-
25	+ve	10.107	1.01E+3	5.738	0.000	0.000	0.000
25	+ve	Load: 4	Load: 4	Load: 4	-	-	-
25	-ve	-0.376	0.000	-0.017	0.000	0.000	0.000
25	-ve	Load: 2	-	Load: 2	-	-	-
26	+ve	0.290	1.1E+3	0.000	0.000	0.000	0.000
26	+ve	Load: 2	Load: 4	-	-	-	-
26	-ve	-2.856	0.000	-0.897	0.000	0.000	0.000
26	-ve	Load: 4	-	Load: 4	-	-	-
27	+ve	0.103	1.02E+3	0.254	0.000	0.000	0.000
27	+ve	Load: 2	Load: 4	Load: 1	-	-	-
27	-ve	-1.182	0.000	-0.268	0.000	0.000	0.000
27	-ve	Load: 4	-	Load: 2	-	-	-
28	+ve	13.984	1.08E+3	2.389	0.000	0.000	0.000
28	+ve	Load: 4	Load: 4	Load: 4	-	-	-
28	-ve	-0.185	0.000	0.000	0.000	0.000	0.000
28	-ve	Load: 2	-	-	-	-	-
29	+ve	0.252	868.995	6.406	0.000	0.000	0.000
29	+ve	Load: 2	Load: 4	Load: 4	-	-	-
29	-ve	-17.506	0.000	-0.023	0.000	0.000	0.000
29	-ve	Load: 4	-	Load: 2	-	-	-
381	+ve	0.550	1.84E+3	0.000	0.000	0.000	0.000

Reaction Envelope Cont...

Node	Env	Horizontal FX (kN)	Vertical FY (kN)	Horizontal FZ (kN)	Moment MX (kNm)	MY (kNm)	MZ (kNm)
381	+ve	Load: 2	Load: 4	-	-	-	-
381	-ve	-0.987	0.000	-3.620	0.000	0.000	0.000
381	-ve	Load: 1	-	Load: 4	-	-	-
382	+ve	0.000	1.43E+3	0.000	0.000	0.000	0.000
382	+ve	-	Load: 4	-	-	-	-
382	-ve	-0.662	0.000	-4.298	0.000	0.000	0.000
382	-ve	Load: 4	-	Load: 4	-	-	-

Failed Members

There is no data of this type.

DESIGN OF SLAB

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH CTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST,	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE .			
		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM/2023/32	Date:	02.07.2023
Page Type:	Calculation Sheet	Prepared By:	BOOPATHY	Revision:	R0
Section:	Design of Beam as per IS 456	Checked By:	MOHAN	Date Revised:	-

Slab Number : FS1 Floor level : First Floor

SPANS :

Shorter span c/c w.r.to beam	B	=	4.88	m
Longer span c/c w.r.to beam	L	=	5.18	m
Width of support - shorter span - Left	bxl	=	230	mm
Width of support - shorter span - Right	bxr	=	230	mm
Width of support - longer span - Left	byl	=	230	mm
Width of support - longer span - Right	byr	=	230	mm
Clear Cover of slab	cv	=	20	mm
Ratio Ly / Lx	ly/lx	=	1.07	< 2

LOAD CALCULATION :

Assume the thickness of the slab	=	150.0	mm
Effective Depth of the of the slab	=	125.0	mm
Self Weight of slab	=	3.750	KN / m^2
Weathering course / Floor finishing	=	2.000	KN / m^2
Wall load	=	1.000	KN / m^2
Live Load	=	2.000	KN / m^2
D.L+L.L	=	8.75	KN / m^2
1.4D.L+1.6L.L	=	12.65	KN / m^2

DESIGN AS TWO WAY SLAB

Support Condition INTERIOR PANELS

EFFECTIVE SPANS :

Shorter span: (Lx)

Clear span + effective depth	=	4.77	m
Center to centre of supports	=	4.88	m
Effective span	=	4.88	m

Longer span: (Ly)

Clear span + effective depth	=	5.08	m
Center to centre of supports	=	5.18	m
Effective span	=	5.18	m
Aspect Ratio Ly / Lx	=	1.06	< 2

As per BS 8110 (Table 3.14)

+ ve Alpha - x	=	0.027
- ve Alpha - x	=	0.036
+ ve Alpha - y	=	0.024
- ve Alpha - y	=	0.032

Compressive Stength of Concrete	=	20.00	N/mm^2
Grade of steel	=	500.0	N/mm^2

BENDING MOMENTS:

EFFECTIVE DEPTH OF SLAB

Positive moment along Shorter dir.	Mx +ve =	8.13	KNm / m	dx-	=	125.00	mm	Kx+	=	0.026	Zx+	=	118.750 mm
Negative moment along Shorter dir.	Mx -ve =	10.84	KNm / m	dx-	=	125.00	mm	Kx-	=	0.035	Zx-	=	118.750 mm
Positive moment along Longer dir.	My +ve =	7.22	KNm / m	dy-	=	115.00	mm	Ky+	=	0.027	Zy+	=	109.250 mm
Negative moment along Longer dir.	My -ve =	9.63	KNm / m	dy-	=	125.00	mm	Ky-	=	0.031	Zy-	=	118.750 mm

REQUIRED AREA OF STEEL :

Ast req. at midspan along x- dir.	ast +ve x =	144.09	mm^2
Ast req. at midspan along y- dir.	ast +ve y =	139.21	mm^2
Ast req. at support along x- dir.	ast -ve x =	192.11	mm^2
Ast req. at support along y- dir.	ast -ve y =	170.77	mm^2
Minimum Ast required	ast min =	195.00	mm^2
Ast req. at top of mid span	ast comp. =	195	mm^2

REQUIRED SPACING OF STEEL:

10	mm dia at midspan along x- dir	=	403	mm c/c
10	mm dia at midspan along y- dir.	=	403	mm c/c
10	mm dia at support along x- dir.	=	403	mm c/c
10	mm dia at support along y- dir.	=	403	mm c/c
8	mm dia for distribution steel	=	258	mm c/c
0	mm dia for top of mid span	=	200	mm c/c

PROVIDED SPACING OF STEEL

Bottom reinforcement along x- dir.	Y	10	150	mm c/c
Bottom reinforcement along y- dir.	Y	10	200	mm c/c
Top reinforcement along x- dir.	Y	10	150	mm c/c
Top reinforcement along y- dir.	Y	10	200	mm c/c
Distribution Steel	Y	8	200	mm c/c

CHECK FOR DEFLECTION :

Provided area of reinforcement	=	524	mm^2
Mu/bd^2	=	0.52	
Actual Span / Effective depth Ratio	=	39.02	
Design service stress	=	91.7	
Modification factor - Tension reinf.	=	2.00	
Modification factor - Comp. reinf.	=	1.00	
Allowable Span /Effective depth Rati	=	52.00	

===<< Hence SAFE in Deflection >>===

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH UCTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST,	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE ,			
		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM/2023/32	Date:	02.07.2023
Page Type:	Calculation Sheet	Prepared By:	BOOPATHY	Revision:	R0
Section:	Design of Beam as per IS 456	Checked By:	MOHAN	Date Revised:	-

Slab Number : FS2 Floor level : First Floor

SPANS :

Shorter span c/c w.r.to beam	B	=	4.88	m
Longer span c/c w.r.to beam	L	=	5.18	m
Width of support - shorter span - Left	bxl	=	230	mm
Width of support - shorter span - Right	bxr	=	230	mm
Width of support - longer span - Left	byl	=	230	mm
Width of support - longer span - Right	byr	=	230	mm
Clear Cover of slab	cv	=	20	mm
Ratio Ly / Lx	ly/lx	=	1.07	< 2

LOAD CALCULATION :

Assume the thickness of the slab	=	150.0	mm
Effective Depth of the of the slab	=	125.0	mm
Self Weight of slab	=	3.750	KN / m^2
Weathering course / Floor finishing	=	2.000	KN / m^2
Wall load	=	1.000	KN / m^2
Live Load	=	2.000	KN / m^2
D.L+L.L	=	8.75	KN / m^2
1.4D.L+1.6L.L	=	12.65	KN / m^2

DESIGN AS TWO WAY SLAB

Support Condition TWO ADJACENT EDGES DISCONTINUOUS

EFFECTIVE SPANS :

Shorter span: (Lx)

Clear span + effective depth	=	4.77	m
Center to centre of supports	=	4.88	m
Effective span	=	4.88	m

Longer span: (Ly)

Clear span + effective depth	=	5.08	m
Center to centre of supports	=	5.18	m
Effective span	=	5.18	m
Aspect Ratio Ly / Lx	=	1.06	< 2

As per BS 8110 (Table 3.14)

+ ve Alpha - x	=	0.040
- ve Alpha - x	=	0.054
+ ve Alpha - y	=	0.034
- ve Alpha - y	=	0.046

Compressive Stength of Concrete	= 20.00	N/mm^2
Grade of steel	= 500.0	N/mm^2

BENDING MOMENTS:

EFFECTIVE DEPTH OF SLAB

Positive moment along Shorter dir.	Mx +ve =	12.04	KNm / m	dx-	=	125.00	mm	Kx+ =	0.039	Zx+ =	118.750	mm
Negative moment along Shorter dir.	Mx -ve =	16.25	KNm / m	dx-	=	125.00	mm	Kx- =	0.052	Zx- =	117.302	mm
Positive moment along Longer dir.	My +ve =	10.23	KNm / m	dy-	=	115.00	mm	Ky+ =	0.039	Zy+ =	109.250	mm
Negative moment along Longer dir.	My -ve =	13.85	KNm / m	dy-	=	125.00	mm	Ky- =	0.044	Zy- =	118.509	mm

REQUIRED AREA OF STEEL :

Ast req. at midspan along x- dir.	ast +ve x =	213.46	mm^2
Ast req. at midspan along y- dir.	ast +ve y =	197.22	mm^2
Ast req. at support along x- dir.	ast -ve x =	291.73	mm^2
Ast req. at support along y- dir.	ast -ve y =	245.98	mm^2
Minimum Ast required	ast min =	195.00	mm^2
Ast req. at top of mid span	ast comp. =	195	mm^2

REQUIRED SPACING OF STEEL:

10	mm dia at midspan along x- dir	=	368	mm c/c
10	mm dia at midspan along y- dir.	=	398	mm c/c
10	mm dia at support along x- dir.	=	269	mm c/c
10	mm dia at support along y- dir.	=	319	mm c/c
8	mm dia for distribution steel	=	258	mm c/c
0	mm dia for top of mid span	=	200	mm c/c

PROVIDED SPACING OF STEEL

Bottom reinforcement along x- dir.	Y	10	150	mm c/c
Bottom reinforcement along y- dir.	Y	10	200	mm c/c
Top reinforcement along x- dir.	Y	10	150	mm c/c
Top reinforcement along y- dir.	Y	10	200	mm c/c
Distribution Steel	Y	8	200	mm c/c

CHECK FOR DEFLECTION :

Provided area of reinforcement	=	524	mm^2
Mu/bd^2	=	0.77	
Actual Span / Effective depth Ratio	=	39.02	
Design service stress	=	135.9	
Modification factor - Tension reinf.	=	2.00	
Modification factor - Comp. reinf.	=	1.00	
Allowable Span /Effective depth Rati	=	46.00	

===<<< Hence SAFE in Deflection >>>===

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH CTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST,	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE ,			
		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM/2023/32	Date:	02.07.2023
Page Type:	Calculation Sheet	Prepared By:	BOOPATHY	Revision:	R0
Section:	Design of Beam as per IS 456	Checked By:	MOHAN	Date Revised:	-

Slab Number : FS3 Floor level : First Floor

SPANS :

Shorter span c/c w.r.to beam	B	=	3.05	m
Longer span c/c w.r.to beam	L	=	5.18	m
Width of support - shorter span - Left	bxl	=	230	mm
Width of support - shorter span - Right	bxr	=	230	mm
Width of support - longer span - Left	byl	=	230	mm
Width of support - longer span - Right	byr	=	230	mm
Clear Cover of slab	cv	=	20	mm
Ratio Ly / Lx	ly/lx	=	1.70	< 2

LOAD CALCULATION :

Assume the thickness of the slab	=	125.0	mm
Effective Depth of the of the slab	=	100.0	mm
Self Weight of slab	=	3.125	KN / m^2
Weathering course / Floor finishing	=	2.000	KN / m^2
Wall load	=	1.000	KN / m^2
Live Load	=	2.000	KN / m^2
D.L+L.L	=	8.13	KN / m^2
1.4D.L+1.6L.L	=	11.78	KN / m^2

DESIGN AS TWO WAY SLAB

Support Condition IREE EDGES DICONTINUOUS (ONE LONG. EDGE CON

EFFECTIVE SPANS :

Shorter span: (Lx)

Clear span + effective depth	=	2.92	m
Center to centre of supports	=	3.05	m
Effective span	=	3.05	m

Longer span: (Ly)

Clear span + effective depth	=	5.05	m
Center to centre of supports	=	5.18	m
Effective span	=	5.05	m
Aspect Ratio Ly / Lx	=	1.66	< 2

As per BS 8110 (Table 3.14)

+ ve Alpha - x	=	0.068
- ve Alpha - x	=	0.091
+ ve Alpha - y	=	0.044
- ve Alpha - y	=	0.000

Compressive Stength of Concrete	=	20.00	N/mm^2
Grade of steel	=	500.0	N/mm^2

BENDING MOMENTS:

EFFECTIVE DEPTH OF SLAB

Positive moment along Shorter dir.	Mx +ve =	7.44	KNm / m	dx-	=	100.00	mm	Kx+ =	0.037	Zx+ =	95.000	mm
Negative moment along Shorter dir.	Mx -ve =	9.96	KNm / m	dx-	=	100.00	mm	Kx- =	0.050	Zx- =	94.121	mm
Positive moment along Longer dir.	My +ve =	4.82	KNm / m	dy-	=	90.00	mm	Ky+ =	0.030	Zy+ =	85.500	mm
Negative moment along Longer dir.	My -ve =	0.00	KNm / m	dy-	=	100.00	mm	Ky- =	0.000	Zy- =	95.000	mm

REQUIRED AREA OF STEEL :

Ast req. at midspan along x- dir.	ast +ve x =	164.93	mm^2
Ast req. at midspan along y- dir.	ast +ve y =	118.58	mm^2
Ast req. at support along x- dir.	ast -ve x =	222.78	mm^2
Ast req. at support along y- dir.	ast -ve y =	0.00	mm^2
Minimum Ast required	ast min =	162.50	mm^2
Ast req. at top of mid span	ast comp. =	162.5	mm^2

REQUIRED SPACING OF STEEL:

10	mm dia at midspan along x- dir	=	476	mm c/c
10	mm dia at midspan along y- dir.	=	483	mm c/c
10	mm dia at support along x- dir.	=	353	mm c/c
10	mm dia at support along y- dir.	=	483	mm c/c
8	mm dia for distribution steel	=	309	mm c/c
0	mm dia for top of mid span	=	200	mm c/c

PROVIDED SPACING OF STEEL

Bottom reinforcement along x- dir.	Y	10	175	mm c/c
Bottom reinforcement along y- dir.	Y	10	200	mm c/c
Top reinforcement along x- dir.	Y	10	150	mm c/c
Top reinforcement along y- dir.	Y	10	200	mm c/c
Distribution Steel	Y	8	200	mm c/c

CHECK FOR DEFLECTION :

Provided area of reinforcement	=	449	mm^2
Mu/bd^2	=	0.74	
Actual Span / Effective depth Ratio	=	30.49	
Design service stress	=	122.5	
Modification factor - Tension reinf.	=	2.00	
Modification factor - Comp. reinf.	=	1.00	
Allowable Span /Effective depth Rati	=	46.00	

===<<< Hence SAFE in Deflection >>>===

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH CTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST,	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE ,			
		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM/2023/32	Date:	02.07.2023
Page Type: Calculation Sheet		Prepared By:	BOOPATHY	Revision:	R0
Section: Design of Beam as per IS 456		Checked By:	MOHAN	Date Revised:	-

Slab Number : FS4 Floor level : First Floor

SPANS :

Shorter span c/c w.r.to beam	B	=	3.05	m
Longer span c/c w.r.to beam	L	=	5.18	m
Width of support - shorter span - Left	bxl	=	230	mm
Width of support - shorter span - Right	bxr	=	230	mm
Width of support - longer span - Left	byl	=	230	mm
Width of support - longer span - Right	byr	=	230	mm
Clear Cover of slab	cv	=	20	mm
Ratio Ly / Lx	ly/lx	=	1.70	< 2

LOAD CALCULATION :

Assume the thickness of the slab	=	125.0	mm
Effective Depth of the of the slab	=	100.0	mm
Self Weight of slab	=	3.125	KN / m^2
Weathering course / Floor finishing	=	2.000	KN / m^2
Wall load	=	1.000	KN / m^2
Live Load	=	2.000	KN / m^2
D.L+L.L	=	8.13	KN / m^2
1.4D.L+1.6L.L	=	11.78	KN / m^2

DESIGN AS TWO WAY SLAB

Support Condition **INTERIOR PANELS**

EFFECTIVE SPANS :

Shorter span: (Lx)

Clear span + effective depth	=	2.92	m
Center to centre of supports	=	3.05	m
Effective span	=	3.05	m

Longer span: (Ly)

Clear span + effective depth	=	5.05	m
Center to centre of supports	=	5.18	m
Effective span	=	5.18	m
Aspect Ratio Ly / Lx	=	1.70	< 2

As per BS 8110 (Table 3.14)

+ ve Alpha - x	=	0.044
- ve Alpha - x	=	0.059
+ ve Alpha - y	=	0.024
- ve Alpha - y	=	0.032

Compressive Stength of Concrete	=	20.00	N/mm^2
Grade of steel	=	500.0	N/mm^2

BENDING MOMENTS:

EFFECTIVE DEPTH OF SLAB

Positive moment along Shorter dir.	Mx +ve =	4.82	KNm / m	dx-	=	100.00	mm	Kx+ =	0.024	Zx+ =	95.000	mm
Negative moment along Shorter dir.	Mx -ve =	6.46	KNm / m	dx-	=	100.00	mm	Kx- =	0.032	Zx- =	95.000	mm
Positive moment along Longer dir.	My +ve =	2.63	KNm / m	dy-	=	90.00	mm	Ky+ =	0.016	Zy+ =	85.500	mm
Negative moment along Longer dir.	My -ve =	3.50	KNm / m	dy-	=	100.00	mm	Ky- =	0.018	Zy- =	95.000	mm

REQUIRED AREA OF STEEL :

Ast req. at midspan along x- dir.	ast +ve x =	106.72	mm^2
Ast req. at midspan along y- dir.	ast +ve y =	64.68	mm^2
Ast req. at support along x- dir.	ast -ve x =	143.10	mm^2
Ast req. at support along y- dir.	ast -ve y =	77.62	mm^2
Minimum Ast required	ast min =	162.50	mm^2
Ast req. at top of mid span	ast comp. =	162.5	mm^2

REQUIRED SPACING OF STEEL:

10	mm dia at midspan along x- dir	=	483	mm c/c
10	mm dia at midspan along y- dir.	=	483	mm c/c
10	mm dia at support along x- dir.	=	483	mm c/c
10	mm dia at support along y- dir.	=	483	mm c/c
8	mm dia for distribution steel	=	309	mm c/c
0	mm dia for top of mid span	=	200	mm c/c

PROVIDED SPACING OF STEEL

Bottom reinforcement along x- dir.	Y	10	200	mm c/c
Bottom reinforcement along y- dir.	Y	10	200	mm c/c
Top reinforcement along x- dir.	Y	10	150	mm c/c
Top reinforcement along y- dir.	Y	10	200	mm c/c
Distribution Steel	Y	8	200	mm c/c

CHECK FOR DEFLECTION :

Provided area of reinforcement	=	393	mm^2
Mu/bd^2	=	0.48	
Actual Span / Effective depth Ratio	=	30.49	
Design service stress	=	90.6	
Modification factor - Tension reinf.	=	2.00	
Modification factor - Comp. reinf.	=	1.00	
Allowable Span /Effective depth Rati	=	52.00	

===<<< Hence SAFE in Deflection >>>===

Project	11. PLOT NO:66,67,70&71 AT INAM KARUR VILL	Design by	Date	Page
Client	M/s AADHAVAN CONSTRUCTIONS, K.SUNDA	ATM	07.02.2023	-
Design	CANTILEVER SLAB	Checked	Revision	Job No
Consultant	ATM ASSOCIATES	ATM	0	ATM/2023/32

SLAB REF. BALCONY SLAB

GIVEN DATA:

Span	L	=	1.22	m
Width of support	b	=	230.00	mm
Compressive Stength of Concrete	fck	=	20.00	N/mm^2
Grade of steel	fy	=	500.00	N/mm^2
Clear cover of slab	d'	=	25.00	mm

LOAD CALCULATION :

Assume the thickness of the slab	thick	=	150.00	mm
Self Weight of slab	sl.wt	=	3.750	kN/m^2
Weathering course / Floor finishing	finish	=	1.500	kN/m^2
if any Wall Load	wall load	=	1.000	kN/m^2
Live Load (Access provided)	l.l	=	2.000	kN/m^2
Total Load	T.L	=	8.250	kN/m^2
Factored Load	Fact.T.L	=	11.750	kN/m^2

EFFECTIVE SPANS :

Effective span: (Lx)

Clear span + effective depth		=	1.339512195 mm
Effective span		=	1.34 mm

BENDING MOMENTS:

Bending Moment at Support	M x +ve	=	10.54 kNm/m

DEPTH OF SLAB :

Moment of Resistance Constant	q	=	2.76
Provided Overall Depth	D	=	150 mm
Provided Effective Depth	dx	=	117 mm

AREA OF STEEL REINFORCEMENT:

Area of Steel Required	Ast	=	259 mm^2
16.00 mm dia as main reinforcement		=	775 mm c/c
Minimum Ast required	Dist steel	=	180 Sq.mm
10.00 mm dia as Dist. reinforcement		=	436 mm c/c

TOP	**Steel Provided**	**In Lx**	Y	12	150	
		In Ly	Y	10	200	Distri Steel
BOTTOM	**Steel Provided**	**In Lx**	Y	10	200	
		In Ly	Y	10	200	

CHECK FOR DEFLECTION :

	Ast Prov	=	754
	M/bd2	=	0.77
Actual Span / Effective depth Ratio		=	10
As per BS 8110 (Table 3.10)			
Design service stress	fs	=	115
Modification factor		=	2.00
Allowable Span /Effective depth Ratio		=	14.00

======<<< Hence SAFE in Deflection >>>===

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		Client::	M/s AADHAVAN CONSTRUCTIONS,		
		Job No::	ATM/2023/32	Date::	02.07.2023
Page Type:: **Calculation Sheet**		Prepared By::	BOOPATHY	Revision::	R0
Section:: **Design of Beam as per IS 456**		Checked By::	MOHAN	Date Revised::	-

Slab Number : RS1 Floor level : Roof Level

SPANS :

Shorter span c/c w.r.to beam	B	=	4.88	m
Longer span c/c w.r.to beam	L	=	5.18	m
Width of support - shorter span - Left	bxl	=	230	mm
Width of support - shorter span - Right	bxr	=	230	mm
Width of support - longer span - Left	byl	=	230	mm
Width of support - longer span - Right	byr	=	230	mm
Clear Cover of slab	cv	=	20	mm
Ratio Ly / Lx	ly/lx	=	1.07	< 2

LOAD CALCULATION :

Assume the thickness of the slab	=	150.0	mm
Effective Depth of the of the slab	=	125.0	mm
Self Weight of slab	=	3.750	KN / m^2
Weathering course / Floor finishing	=	2.000	KN / m^2
Wall load	=	0.000	KN / m^2
Live Load	=	2.000	KN / m^2
D.L+L.L	=	7.75	KN / m^2
1.4D.L+1.6L.L	=	11.25	KN / m^2

DESIGN AS TWO WAY SLAB

Support Condition **INTERIOR PANELS**

EFFECTIVE SPANS :

Shorter span: (Lx)

Clear span + effective depth	=	4.77	m
Center to centre of supports	=	4.88	m
Effective span	=	4.88	m

Longer span: (Ly)

Clear span + effective depth	=	5.08	m
Center to centre of supports	=	5.18	m
Effective span	=	5.18	m
Aspect Ratio Ly / Lx	=	1.06	< 2

As per BS 8110 (Table 3.14)

+ ve Alpha - x	=	0.027
- ve Alpha - x	=	0.036
+ ve Alpha - y	=	0.024
- ve Alpha - y	=	0.032

Compressive Stength of Concrete	=	20.00	N/mm^2
Grade of steel	=	500.0	N/mm^2

BENDING MOMENTS:

EFFECTIVE DEPTH OF SLAB

Positive moment along Shorter dir.	Mx +ve =	7.23	KNm / m	dx-	=	125.00	mm	Kx+ =	0.023	Zx+ =	118.750	mm
Negative moment along Shorter dir.	Mx -ve =	9.64	KNm / m	dx-	=	125.00	mm	Kx- =	0.031	Zx- =	118.750	mm
Positive moment along Longer dir.	My +ve =	6.42	KNm / m	dy-	=	115.00	mm	Ky+ =	0.024	Zy+ =	109.250	mm
Negative moment along Longer dir.	My -ve =	8.57	KNm / m	dy-	=	125.00	mm	Ky- =	0.027	Zy- =	118.750	mm

REQUIRED AREA OF STEEL :

Ast req. at midspan along x- dir.	ast +ve x =	128.14	mm^2
Ast req. at midspan along y- dir.	ast +ve y =	123.81	mm^2
Ast req. at support along x- dir.	ast -ve x =	170.85	mm^2
Ast req. at support along y- dir.	ast -ve y =	151.87	mm^2
Minimum Ast required	ast min =	195.00	mm^2
Ast req. at top of mid span	ast comp. =	195	mm^2

REQUIRED SPACING OF STEEL:

10	mm dia at midspan along x- dir.	=	403	mm c/c
10	mm dia at midspan along y- dir.	=	403	mm c/c
10	mm dia at support along x- dir.	=	403	mm c/c
10	mm dia at support along y- dir.	=	403	mm c/c
8	mm dia for distribution steel	=	258	mm c/c
0	mm dia for top of mid span	=	200	mm c/c

PROVIDED SPACING OF STEEL

Bottom reinforcement along x- dir.	Y	10	175	mm c/c
Bottom reinforcment along y- dir.	Y	10	200	mm c/c
Top reinforcement along x- dir.	Y	10	150	mm c/c
Top reinforcement along y- dir.	Y	10	200	mm c/c
Distribution Steel	Y	8	200	mm c/c

CHECK FOR DEFLECTION :

Provided area of reinforcement	=	449	mm^2
Mu/bd^2	=	0.46	
Actual Span / Effective depth Ratio	=	39.02	
Design service stress	=	95.2	
Modification factor - Tension reinf.	=	2.00	
Modification factor - Comp. reinf.	=	1.00	
Allowable Span /Effective depth Rati	=	52.00	

===<<< Hence SAFE in Deflection >>>===

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH CTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST,	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE ,			
		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM/2023/32	Date:	02.07.2023
Page Type:	Calculation Sheet	Prepared By:	BOOPATHY	Revision:	R0
Section:	Design of Beam as per IS 456	Checked By:	MOHAN	Date Revised:	-

Slab Number : RS2. Floor level : Roof Level

SPANS :

Shorter span c/c w.r.to beam	B	=	4.88	m
Longer span c/c w.r.to beam	L	=	5.18	m
Width of support - shorter span - Left	bxl	=	230	mm
Width of support - shorter span - Right	bxr	=	230	mm
Width of support - longer span - Left	byl	=	230	mm
Width of support - longer span - Right	byr	=	230	mm
Clear Cover of slab	cv	=	20	mm
Ratio Ly / Lx	ly/lx	=	1.07	< 2

LOAD CALCULATION :

Assume the thickness of the slab	=	150.0	mm
Effective Depth of the of the slab	=	125.0	mm
Self Weight of slab	=	3.750	KN / m^2
Weathering course / Floor finishing	=	2.000	KN / m^2
Wall load	=	1.000	KN / m^2
Live Load	=	2.000	KN / m^2
D.L+L.L	=	8.75	KN / m^2
1.4D.L+1.6L.L	=	12.65	KN / m^2

DESIGN AS TWO WAY SLAB

Support Condition TWO ADJACENT EDGES DISCONTINUOUS

EFFECTIVE SPANS :

Shorter span: (Lx)

Clear span + effective depth	=	4.77	m
Center to centre of supports	=	4.88	m
Effective span	=	4.88	m

Longer span: (Ly)

Clear span + effective depth	=	5.08	m
Center to centre of supports	=	5.18	m
Effective span	=	5.18	m
Aspect Ratio Ly / Lx	=	1.06	< 2

As per BS 8110 (Table 3.14)

+ ve Alpha - x	=	0.040
- ve Alpha - x	=	0.054
+ ve Alpha - y	=	0.034
- ve Alpha - y	=	0.046

Compressive Stength of Concrete	=	20.00	N/mm^2
Grade of steel	=	500.0	N/mm^2

BENDING MOMENTS:

EFFECTIVE DEPTH OF SLAB

Positive moment along Shorter dir.	Mx +ve =	12.04	KNm / m	dx-	=	125.00	mm	Kx+ =	0.039	Zx+ =	118.750 mm
Negative moment along Shorter dir.	Mx -ve =	16.25	KNm / m	dx-	=	125.00	mm	Kx- =	0.052	Zx- =	117.302 mm
Positive moment along Longer dir.	My +ve =	10.23	KNm / m	dy-	=	115.00	mm	Ky+ =	0.039	Zy+ =	109.250 mm
Negative moment along Longer dir.	My -ve =	13.85	KNm / m	dy-	=	125.00	mm	Ky- =	0.044	Zy- =	118.509 mm

REQUIRED AREA OF STEEL :

Ast req. at midspan along x- dir.	ast +ve x =	213.46	mm^2
Ast req. at midspan along y- dir.	ast +ve y =	197.22	mm^2
Ast req. at support along x- dir.	ast -ve x =	291.73	mm^2
Ast req. at support along y- dir.	ast -ve y =	245.98	mm^2
Minimum Ast required	ast min =	195.00	mm^2
Ast req. at top of mid span	ast comp. =	195	mm^2

REQUIRED SPACING OF STEEL:

10	mm dia at midspan along x- dir	=	368	mm c/c
10	mm dia at midspan along y- dir.	=	398	mm c/c
10	mm dia at support along x- dir.	=	269	mm c/c
10	mm dia at support along y- dir.	=	319	mm c/c
8	mm dia for distribution steel	=	258	mm c/c
0	mm dia for top of mid span	=	200	mm c/c

PROVIDED SPACING OF STEEL

Bottom reinforcement along x- dir.	Y	10	200	mm c/c
Bottom reinforcement along y- dir.	Y	10	200	mm c/c
Top reinforcement along x- dir.	Y	10	150	mm c/c
Top reinforcement along y- dir.	Y	10	200	mm c/c
Distribution Steel	Y	8	200	mm c/c

CHECK FOR DEFLECTION :

Provided area of reinforcement	=	393	mm^2
Mu/bd^2	=	0.77	
Actual Span / Effective depth Ratio	=	39.02	
Design service stress	=	181.2	
Modification factor - Tension reinf.	=	2.00	
Modification factor - Comp. reinf.	=	1.00	
Allowable Span /Effective depth Rati	=	46.00	

===<<< Hence SAFE in Deflection >>>===

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH CTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST,	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE ,			
		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM/2023/32	Date:	02.07.2023
Page Type:	Calculation Sheet	Prepared By:	BOOPATHY	Revision:	R0
Section:	Design of Beam as per IS 456	Checked By:	MOHAN	Date Revised:	-

Slab Number : RS3 Floor level : Roof Level

SPANS :

Shorter span c/c w.r.to beam	B	=	3.05	m
Longer span c/c w.r.to beam	L	=	5.18	m
Width of support - shorter span - Left	bxl	=	230	mm
Width of support - shorter span - Right	bxr	=	230	mm
Width of support - longer span - Left	byl	=	230	mm
Width of support - longer span - Right	byr	=	230	mm
Clear Cover of slab	cv	=	20	mm
Ratio Ly / Lx	ly/lx	=	1.70	< 2

LOAD CALCULATION :

Assume the thickness of the slab	=	125.0	mm
Effective Depth of the of the slab	=	100.0	mm
Self Weight of slab	=	3.125	KN / m^2
Weathering course / Floor finishing	=	2.000	KN / m^2
Wall load	=	0.000	KN / m^2
Live Load	=	2.000	KN / m^2
D.L+L.L	=	7.13	KN / m^2
1.4D.L+1.6L.L	=	10.38	KN / m^2

DESIGN AS TWO WAY SLAB

Support Condition IREE EDGES DICONTINUOUS (ONE LONG. EDGE CON

EFFECTIVE SPANS :

Shorter span: (Lx)

Clear span + effective depth	=	2.92	m
Center to centre of supports	=	3.05	m
Effective span	=	3.05	m

Longer span: (Ly)

Clear span + effective depth	=	5.05	m
Center to centre of supports	=	5.18	m
Effective span	=	5.05	m
Aspect Ratio Ly / Lx	=	1.66	< 2

As per BS 8110 (Table 3.14)

+ ve Alpha - x	=	0.068
- ve Alpha - x	=	0.091
+ ve Alpha - y	=	0.044
- ve Alpha - y	=	0.000

Compressive Stength of Concrete	=	20.00	N/mm^2
Grade of steel	=	500.0	N/mm^2

BENDING MOMENTS:

EFFECTIVE DEPTH OF SLAB

Positive moment along Shorter dir.	Mx +ve =	6.56	KNm / m	dx-	=	100.00	mm	Kx+ =	0.033	Zx+ =	95.000	mm
Negative moment along Shorter dir.	Mx -ve =	8.78	KNm / m	dx-	=	100.00	mm	Kx- =	0.044	Zx- =	94.860	mm
Positive moment along Longer dir.	My +ve =	4.24	KNm / m	dy-	=	90.00	mm	Ky+ =	0.026	Zy+ =	85.500	mm
Negative moment along Longer dir.	My -ve =	0.00	KNm / m	dy-	=	100.00	mm	Ky- =	0.000	Zy- =	95.000	mm

REQUIRED AREA OF STEEL :

Ast req. at midspan along x- dir.	ast +ve x =	145.32	mm^2
Ast req. at midspan along y- dir.	ast +ve y =	104.48	mm^2
Ast req. at support along x- dir.	ast -ve x =	194.76	mm^2
Ast req. at support along y- dir.	ast -ve y =	0.00	mm^2
Minimum Ast required	ast min =	162.50	mm^2
Ast req. at top of mid span	ast comp. =	162.5	mm^2

REQUIRED SPACING OF STEEL:

10	mm dia at midspan along x- dir	=	483 mm c/c
10	mm dia at midspan along y- dir.	=	483 mm c/c
10	mm dia at support along x- dir.	=	403 mm c/c
10	mm dia at support along y- dir.	=	483 mm c/c
8	mm dia for distribution steel	=	309 mm c/c
0	mm dia for top of mid span	=	200 mm c/c

PROVIDED SPACING OF STEEL

Bottom reinforcement along x- dir.	Y	10	175	mm c/c
Bottom reinforcement along y- dir.	Y	10	200	mm c/c
Top reinforcement along x- dir.	Y	10	150	mm c/c
Top reinforcement along y- dir.	Y	10	200	mm c/c
Distribution Steel	Y	8	200	mm c/c

CHECK FOR DEFLECTION :

Provided area of reinforcement	=	449	mm^2
Mu/bd^2	=	0.66	
Actual Span / Effective depth Ratio	=	30.49	
Design service stress	=	107.9	
Modification factor - Tension reinf.	=	2.00	
Modification factor - Comp. reinf.	=	1.00	
Allowable Span /Effective depth Rati	=	46.00	

===<<< Hence SAFE in Deflection >>>===

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH CTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST,	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE,			
		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM/2023/32	Date:	02.07.2023
Page Type: Calculation Sheet		Prepared By:	BOOPATHY	Revision:	R0
Section: Design of Beam as per IS 456		Checked By:	MOHAN	Date Revised:	-

Slab Number : RS4 Floor level : Roof Level

SPANS :

Shorter span c/c w.r.to beam	B	=	3.05	m
Longer span c/c w.r.to beam	L	=	5.18	m
Width of support - shorter span - Left	bxl	=	230	mm
Width of support - shorter span - Right	bxr	=	230	mm
Width of support - longer span - Left	byl	=	230	mm
Width of support - longer span - Right	byr	=	230	mm
Clear Cover of slab	cv	=	20	mm
Ratio Ly / Lx	ly/lx	=	1.70	< 2

LOAD CALCULATION :

Assume the thickness of the slab	=	125.0	mm
Effective Depth of the of the slab	=	100.0	mm
Self Weight of slab	=	3.125	KN / m^2
Weathering course / Floor finishing	=	2.000	KN / m^2
Wall load	=	0.000	KN / m^2
Live Load	=	2.000	KN / m^2
D.L+L.L	=	7.13	KN / m^2
1.4D.L+1.6L.L	=	10.38	KN / m^2

DESIGN AS TWO WAY SLAB

Support Condition INTERIOR PANELS

EFFECTIVE SPANS :

Shorter span: (Lx)

Clear span + effective depth	=	2.92	m
Center to centre of supports	=	3.05	m
Effective span	=	3.05	m

Longer span: (Ly)

Clear span + effective depth	=	5.05	m
Center to centre of supports	=	5.18	m
Effective span	=	5.18	m
Aspect Ratio Ly / Lx	=	1.70	< 2

As per BS 8110 (Table 3.14)

+ ve Alpha - x	=	0.044
- ve Alpha - x	=	0.059
+ ve Alpha - y	=	0.024
- ve Alpha - y	=	0.032

Compressive Stength of Concrete	=	20.00	N/mm^2
Grade of steel	=	500.0	N/mm^2

BENDING MOMENTS:

EFFECTIVE DEPTH OF SLAB

Positive moment along Shorter dir.	Mx +ve =	4.24	KNm / m	dx-	=	100.00	mm	Kx+ =	0.021	Zx+ =	95.000	mm
Negative moment along Shorter dir.	Mx -ve =	5.69	KNm / m	dx-	=	100.00	mm	Kx- =	0.028	Zx- =	95.000	mm
Positive moment along Longer dir.	My +ve =	2.31	KNm / m	dy-	=	90.00	mm	Ky+ =	0.014	Zy+ =	85.500	mm
Negative moment along Longer dir.	My -ve =	3.09	KNm / m	dy-	=	100.00	mm	Ky- =	0.015	Zy- =	95.000	mm

REQUIRED AREA OF STEEL :

Ast req. at midspan along x- dir.	ast +ve x =	94.03	mm^2
Ast req. at midspan along y- dir.	ast +ve y =	56.99	mm^2
Ast req. at support along x- dir.	ast -ve x =	126.09	mm^2
Ast req. at support along y- dir.	ast -ve y =	68.39	mm^2
Minimum Ast required	ast min =	162.50	mm^2
Ast req. at top of mid span	ast comp. =	162.5	mm^2

REQUIRED SPACING OF STEEL:

10	mm dia at midspan along x- dir	=	483	mm c/c
10	mm dia at midspan along y- dir.	=	483	mm c/c
10	mm dia at support along x- dir.	=	483	mm c/c
10	mm dia at support along y- dir.	=	483	mm c/c
8	mm dia for distribution steel	=	309	mm c/c
0	mm dia for top of mid span	=	200	mm c/c

PROVIDED SPACING OF STEEL

Bottom reinforcement along x- dir.	Y	10	200	mm c/c
Bottom reinforcement along y- dir.	Y	10	200	mm c/c
Top reinforcement along x- dir.	Y	10	150	mm c/c
Top reinforcement along y- dir.	Y	10	200	mm c/c
Distribution Steel	Y	8	200	mm c/c

CHECK FOR DEFLECTION :

Provided area of reinforcement	=	393	mm^2
Mu/bd^2	=	0.42	
Actual Span / Effective depth Ratio	=	30.49	
Design service stress	=	79.8	
Modification factor - Tension reinf.	=	2.00	
Modification factor - Comp. reinf.	=	1.00	
Allowable Span /Effective depth Rati	=	52.00	

===<<< Hence SAFE in Deflection >>>===

DESIGN OF BEAM

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH CONSULTING STRUCTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST, KARUR - 2.		RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE , KARUR CITY		
			Client:	M/s AADHAVAN CONSTRUCTIONS,	
			Job No:	ATM-2023/ST-32	Date: 02.07.2023
Page Type:	Calculation Sheet		Prepared By:	BOOPATHY	Revision: RO
Section:	Design of Beam as per IS 456 & 189	Beam No: PB1	Checked By:	MOHAN	Date Revised: -

SECTION DETAILS

Breath of the beam	B	=	230.00	mm
Depth of the beam	D	=	380.00	mm
Clear cover of the beam	C	=	30	mm
Grade of concrete	Fck	=	20	N/mm^2
Grade of steel	Fy	=	500	N/mm^2
Effective length of the beam	L	=	5.0	m

FORCE DETAILS FROM STAAD :

Max. sagging moment of the beam	=	25.00	kN m
LHS Support moment of the beam	=	40.00	kN m
RHS Support moment of the beam	=	40.00	kN m
Torsional Moment	=	0.00	kN m
Shear force at LHS of the beam	=	52.00	kN
Shear force at RHS of the beam	=	45.00	kN

Design of beam at LHS section

Tension Reinf.

Bending Moment (Mu)L	=	40.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')L	=	62.4	mm
Effective depth (d)L	=	317.65	mm
KL= Mu/(bd^2fck)	=	0.087	(1.8)
K'L	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZL	=	0.892	d
ZL	=	283.34	mm
XL = (dL-ZL)/0.45	=	76.24	mm
d'L/XL	=	0.82	
Ast reqd = Mu/(0.87fyZ)	=	325	mm^2

Layer	1st	2nd	3rd
Dia of reinf	12	16	16
Reqd No.	2.9	0.49	0
Provided	2	1	0
Ast prov.	226	201	0

Ast provided	=	427	mm^2

Compression Reinf.

Ast required	=	61	mm^2
Ast min	=	162	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.34	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force Vus	=	52.00	kN
ζv = Vus/bd + Vt	=	0.71	N/mm^2
% of reinf provided	=	0.58	< 3
Design Stress	=	0.56	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Minimum Shear reinf. Reqd

Reqd. stirrup spac.	=	475.34	mm
Proived stirrup spac.	=	150	mm

Design of beam at Max sagging section

Tension Reinf.

Bending moment (Mu)M	=	25.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')L	=	62.6	mm
Effective depth (d)M	=	317.38	mm
KM= Mu/(bd^2fck)	=	0.054	(1.1)
K'M	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZM	=	0.94	d
ZM	=	297.06	mm
XM = (dM-ZM)/0.45	=	45.14	mm
d'M/XM	=	1.39	
Ast reqd = Mu/(0.87fyZ)	=	193	mm^2

Layer	1st	2nd	3rd
Dia of reinf	12	20	16
Reqd No.	1.8	0	0
Provided	3	2	0
Ast prov.	339	0	0

Ast provided	=	339	mm^2

Compression Reinf.

Ast required	=	38	mm^2
Ast min	=	48	mm^2
Diameter of reinf	=	12	mm
No of bars required	=	0.43	Nos
Provide No of reinf	=	2	Nos
Ast provided	=	227	mm^2

Torsional Reinforcement

Torsional Moment	=	0.00	kN m
Vt	=	0.00	N/mm^2

Vtmin = 0.3 Mpa Vtmax = 3.6 Mpa

No torsion reiforcement required

Designed stress	=	0	N/mm^2
Stirrup area reqd	=	0.00	mm^2
Long. Reinf reqd	=	0.00	mm^2

Provide 0 Nos of 10 mm on EVF

Ast prov.	=	0.0	mm^2

Design of beam at RHS section

Tension Reinf.

Bending moment (Mu)R	=	40.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')R	=	62.4	mm
Effective depth (d)R	=	317.65	mm
KR= Mu/(bd^2fck)	=	0.087	(1.8)
K'R	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZR	=	0.89	d
ZR	=	283.34	mm
XR = (dR-ZR)/0.45	=	76.24	mm
d'R/XR	=	0.82	
Ast reqd = Mu/(0.87fyZ)	=	325	mm^2

Layer	1st	2nd	3rd
Dia of reinf	12	16	16
Reqd No.	2.9	0.49	0
Provided	2	1	0
Ast prov.	226	201	0

Ast provided	=	427	mm^2

Compression Reinf.

Ast required	=	61	mm^2
Ast min		108	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.23	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force Vus	=	45.00	kN
ζv = Vus/bd+Vt	=	0.62	N/mm^2
% of reinf provided	=	0.58	< 3
Design Stress	=	0.56	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Minimum Shear reinf. Reqd

Reqd. stirrup spac.	=	475.34	mm
Proived stirrup spac.	=	150	mm

CHECK FOR DEFLECTION : As per BS 8110 (Table 3.10)

Provided area of reinforcement	=	339	Design service stress	=	190.06
Mu/bd^2	=	1.10	Modification factor - Tension reinf.	=	1.75
Actual Span / Effective depth Ratio	=	15.75	Modification factor - Comp. reinf.	=	1.09
Support Condition	=	Continuous	Allowable Span /Effective depth Ratio	=	49.63

==<<< Hence SAFE in Deflection >>>==

Beam No	Size	Bottom steel		Top steel			Stirrups		Side Face Reinf.
		Straight	Curtail	Middle	LHS	RHS	Ends	Mid	
PB1	230 x 380	3Y12	---	2Y12	2Y12+1Y16	2Y12+1Y16	2L Y8/150	2L Y8/200	----

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				Client:	M/s AADHAVAN CONSTRUCTIONS,
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Page Type: Calculation Sheet				Prepared By: BOOPATHY	Revision: RO
Section: Design of Beam as per IS 456 & 189		Beam No:	FB3	Checked By: MOHAN	Date Revised: -

SECTION DETAILS

Breath of the beam	B	=	230.00	mm
Depth of the beam	D	=	450.00	mm
Clear cover of the beam	C	=	30	mm
Grade of concrete	Fck	=	20	N/mm^2
Grade of steel	Fy	=	500	N/mm^2
Effective length of the beam	L	=	6.0	m

FORCE DETAILS FROM STAAD :

Max. sagging moment of the beam	=	75.00	kN m
LHS Support moment of the beam	=	98.00	kN m
RHS Support moment of the beam	=	104.00	KN m
Torsional Moment	=	0.00	KN m
Shear force at LHS of the beam	=	124.00	KN
Shear force at RHS of the beam	=	118.00	KN

Design of beam at LHS section

Tension Reinf.

Bending Moment (Mu)L	=	98.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')L	=	46.0	mm
Effective depth (d)L	=	404.00	mm
KL= Mu/(bd^2fck)	=	0.131	(2.7)
K'L	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZL	=	0.824	d
ZL	=	332.90	mm
XL = (dL-ZL)/0.45	=	158.01	mm
d'L/XL	=	0.29	
Ast reqd = Mu/(0.87fyZ)	=	677	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	3.4	0	0
Provided	4		0
Ast prov.	804	0	0

Ast provided	=	804	mm^2

Compression Reinf.

Ast required	=	117	mm^2
Ast min	=	338	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.69	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force VuR	=	124.00	kN
ζv = VuL/bd + Vt	=	1.33	N/mm^2
% of reinf provided	=	0.87	< 3
Design Stress	=	0.60	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	259.68	mm
Proived stirrup spac.	=	150	mm

Design of beam at Max sagging section

Tension Reinf

Bending moment (Mu)M	=	75.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')L	=	52.0	mm
Effective depth (d)M	=	397.96	mm
KM= Mu/(bd^2fck)	=	0.103	(2.1)
K'M	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZM	=	0.87	d
ZM	=	345.83	mm
XM = (dM-ZM)/0.45	=	115.85	mm
d'M/XM	=	0.45	
Ast reqd = Mu/(0.87fyZ)	=	499	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	12	16
Reqd No.	2.5	0.86	0
Provided	2	2	0
Ast prov.	402	226	0

Ast provided	=	628	mm^2

Compression Reinf.

Ast required	=	91	mm^2
Ast min	=	125	mm^2
Diameter of reinf	=	16	mm
No of bars required	=	0.62	Nos
Provide No of reinf	=	2	Nos
Ast provided	=	403	mm^2

Torsional Reinforcement

Torsional Moment	=	0.00	kN m
Vt	=	0.00	N/mm^2

Vtmin = 0.3 Mpa Vtmax = 3.6 Mpa

No torsion reiforcement required

Designed stress	=	0	N/mm^2
Stirrup area reqd	=	0.00	mm^2
Long. Reinf reqd	=	0.00	mm^2

Provide 0 Nos of 10 mm on EVF

Ast prov.	=	0.0	mm^2

Design of beam at RHS section

Tension Reinf.

Bending moment (Mu)R	=	104.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')R	=	46.0	mm
Effective depth (d)R	=	404.00	mm
KR= Mu/(bd^2fck)	=	0.139	(2.8)
K'R	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZR	=	0.81	d
ZR	=	327.24	mm
XR = (dR-ZR)/0.45	=	170.58	mm
d'R/XR	=	0.27	
Ast reqd = Mu/(0.87fyZ)	=	731	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	3.7	0	0
Provided	4	0	0
Ast prov.	804	0	0

Ast provided	=	804	mm^2

Compression Reinf.

Ast required	=	125	mm^2
Ast min		244	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.50	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force VuL	=	118.00	kN
ζv = VuL/bd+Vt	=	1.27	N/mm^2
% of reinf provided	=	0.87	< 3
Design Stress	=	0.60	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	284.80	mm
Proived stirrup spac.	=	150	mm

CHECK FOR DEFLECTION : As per BS 8110 (Table 3.10)

Provided area of reinforcement	=	628	
Mu/bd^2	=	2.10	
Actual Span / Effective depth Ratio	=	15.08	
Support Condition	=	Continuous	
Design service stress	=	264.49	
Modification factor - Tension reinf.	=	1.14	
Modification factor - Comp. reinf.	=	1.13	
Allowable Span /Effective depth Ratio	=	33.44	

===<<< Hence SAFE in Deflection >>>===

Beam No	Size	Bottom steel		Top steel			Stirrups		Side Face Reinf.
		Straight	Curtail	Middle	LHS	RHS	Ends	Mid	
FB3	230 x 450	2Y16+2Y12	---	2Y16	4Y16	4Y16	2L Y8/150	2L Y8/200	----

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				Client:	M/s AADHAVAN CONSTRUCTIONS,	
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Page Type:	Calculation Sheet			Prepared By:	BOOPATHY	Revision: RO
Section:	Design of Beam as per IS 456 & 189	Beam No:	FB5	Checked By:	MOHAN	Date Revised: -

SECTION DETAILS

Breath of the beam	B	=	230.00	mm
Depth of the beam	D	=	530.00	mm
Clear cover of the beam	C_v	=	30	mm
Grade of concrete	F_{ck}	=	20	N/mm^2
Grade of steel	F_y	=	500	N/mm^2
Effective length of the beam	L	=	8.0	m

FORCE DETAILS FROM STAAD :

Max. sagging moment of the beam	=	115.00	kN m
LHS Support moment of the beam	=	145.00	kN m
RHS Support moment of the beam	=	152.00	kN m
Torsional Moment	=	0.00	kN m
Shear force at LHS of the beam	=	145.00	KN
Shear force at RHS of the beam	=	152.00	KN

Design of beam at LHS section

Tension Reinf.

Bending Moment $(Mu)_L$	=	145.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover $(d')_L$	=	46.0	mm
Effective depth $(d)_L$	=	484.00	mm
$K_L = Mu/(bd^2fck)$	=	0.135	(2.7)
K'_L	=	0.156	

Hence comp. reinf. NOT reqd.

$Z = d\{0.5+sqrt(0.25-K/0.9)\} < 0.95d$

Z_L	=	0.817	d
Z_L	=	395.43	mm
$X_L = (d_L - Z_L)/0.45$	=	196.83	mm
d'_L/X_L	=	0.23	
$A_{st\,reqd} = M_u/(0.87fyZ)$	=	843	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	4.2	0	0
Provided	6		0
Ast prov.	1206	0	0

$A_{st\,provided}$	=	1206	mm^2

Compression Reinf.

$A_{st\,required}$	=	145	mm^2
$A_{st\,min}$	=	421	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.86	Nos
Provide No of reinf	=	4	Nos
$A_{st\,provided}$	=	1964	mm^2

Shear Check

Shear force V_{uL}	=	145.00	kN
$\zeta v = V_{uL}/bd + Vt$	=	1.30	N/mm^2
% of reinf provided	=	1.08	< 3
Design Stress	=	0.65	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	291.00	mm
Proived stirrup spac.	=	150	mm

Design of beam at Max sagging section

Tension Reinf.

Bending moment $(Mu)_M$	=	115.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover $(d')_M$	=	54.4	mm
Effective depth $(d)_M$	=	475.60	mm
$K_M = Mu/(bd^2fck)$	=	0.111	(2.3)
K'_M	=	0.156	

Hence comp. reinf. NOT reqd.

$Z = d\{0.5+sqrt(0.25-K/0.9)\} < 0.95d$

Z_M	=	0.86	d
Z_M	=	407.11	mm
$X_M = (d_M - Z_M)/0.45$	=	152.19	mm
d'_M/X_M	=	0.36	
$A_{st\,reqd} = M_u/(0.87fyZ)$	=	649	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	3.3	0.23	0
Provided	3	2	0
Ast prov.	603	402	0

$A_{st\,provided}$	=	1005	mm^2

Compression Reinf.

$A_{st\,required}$	=	117	mm^2
$A_{st\,min}$	=	162	mm^2
Diameter of reinf	=	16	mm
No of bars required	=	0.81	Nos
Provide No of reinf	=	3	Nos
$A_{st\,provided}$	=	604	mm^2

Torsional Reinforcement

Torsional Moment	=	0.00	kN m
Vt	=	0.00	N/mm^2

Vtmin = 0.3 Mpa Vtmax = 3.6 Mpa

No torsion reiforcement required

Designed stress	=	0	N/mm^2
Stirrup area reqd	=	0.00	mm^2
Long. Reinf reqd	=	0.00	mm^2

Provide 2 Nos of 12 mm on EVF

Ast prov.	=	226.2	mm^2

Design of beam at RHS section

Tension Reinf.

Bending moment $(Mu)_R$	=	152.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover $(d')_R$	=	46.0	mm
Effective depth $(d)_R$	=	484.00	mm
$K_R = Mu/(bd^2fck)$	=	0.142	(2.9)
K'_R	=	0.156	

Hence comp. reinf. NOT reqd.

$Z = d\{0.5+sqrt(0.25-K/0.9)\} < 0.95d$

Z_R	=	0.80	d
Z_R	=	389.14	mm
$X_R = (d_R - Z_R)/0.45$	=	210.81	mm
d'_R/X_R	=	0.22	
$A_{st\,reqd} = M_u/(0.87fyZ)$	=	898	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	4.5	0	0
Provided	6	0	0
Ast prov.	1206	0	0

$A_{st\,provided}$	=	1206	mm^2

Compression Reinf.

$A_{st\,required}$	=	152	mm^2
$A_{st\,min}$		299	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.61	Nos
Provide No of reinf	=	4	Nos
$A_{st\,provided}$	=	1964	mm^2

Shear Check

Shear force V_{uL}	=	152.00	kN
$\zeta v = V_{uL}/bd + Vt$	=	1.37	N/mm^2
% of reinf provided	=	1.08	< 3
Design Stress	=	0.65	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	265.45	mm
Proived stirrup spac.	=	150	mm

CHECK FOR DEFLECTION : As per BS 8110 (Table 3.10)

Provided area of reinforcement	=	1005	
Mu/bd^2	=	2.30	
Actual Span / Effective depth Ratio	=	16.82	
Support Condition	=	Continuous	
Design service stress	=	215.31	
Modification factor - Tension reinf.	=	1.23	
Modification factor - Comp. reinf.	=	1.16	
Allowable Span /Effective depth Ratio	=	36.99	

==<<< Hence SAFE in Deflection >>>==

Beam No	Size	Bottom steel		Top steel			Stirrups		Side Face Reinf.
		Straight	Curtail	Middle	LHS	RHS	Ends	Mid	
FB5	230 x 530	3Y16+2Y16	---	3Y16	6Y16	6Y16	2L Y8/150	2L Y8/200	2T12 EVF

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				Client:	M/s AADHAVAN CONSTRUCTIONS,
				Job No:	ATM-2023/ST-32
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Revision:	RO				
Section:	Design of Beam as per IS 456 & 189	Beam No:	FB7	Checked By:	MOHAN
Date Revised:	-				

SECTION DETAILS

Breath of the beam	B	=	230.00	mm
Depth of the beam	D	=	300.00	mm
Clear cover of the beam	C_v	=	30	mm
Grade of concrete	Fck	=	20	N/mm^2
Grade of steel	Fy	=	500	N/mm^2
Effective length of the beam	L	=	3.0	m

FORCE DETAILS FROM STAAD :

Max. sagging moment of the beam	=	35.00	kN m
LHS Support moment of the beam	=	44.00	kN m
RHS Support moment of the beam	=	40.00	KN m
Torsional Moment	=	0.00	KN m
Shear force at LHS of the beam	=	55.00	KN
Shear force at RHS of the beam	=	50.00	KN

Design of beam at LHS section

Tension Reinf.

Bending Moment (Mu)L	=	44.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')L	=	46.0	mm
Effective depth (d)L	=	254.00	mm
KL= Mu/(bd^2fck)	=	0.149	(3)
K'L	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZL	=	0.791	d
ZL	=	200.91	mm
XL = (dL-ZL)/0.45	=	117.97	mm
d'L/XL	=	0.39	
Ast reqd = Mu/(0.87fyZ)	=	503	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	2.6	0	0
Provided	3		0
Ast prov.	603	0	0

Ast provided	=	603	mm^2

Compression Reinf.

Ast required	=	84	mm^2
Ast min	=	252	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.52	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force Vu	=	55.00	kN
ζv = Vu/bd + Vt	=	0.94	N/mm^2
% of reinf provided	=	1.03	< 3
Design Stress	=	0.72	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Minimum Shear reinf. Reqd

Reqd. stirrup spac.	=	475.34	mm
Proived stirrup spac.	=	150	mm

Design of beam at Max sagging section

Tension Reinf.

Bending moment (Mu)M	=	35.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')M	=	38.0	mm
Effective depth (d)M	=	262.00	mm
KM= Mu/(bd^2fck)	=	0.111	(2.3)
K'M	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZM	=	0.86	d
ZM	=	224.27	mm
XM = (dM-ZM)/0.45	=	83.84	mm
d'M/XM	=	0.45	
Ast reqd = Mu/(0.87fyZ)	=	359	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	1.8	0	0
Provided	2	0	0
Ast prov.	402	0	0

Ast provided	=	402	mm^2

Compression Reinf.

Ast required	=	65	mm^2
Ast min	=	90	mm^2
Diameter of reinf	=	16	mm
No of bars required	=	0.45	Nos
Provide No of reinf	=	2	Nos
Ast provided	=	403	mm^2

Torsional Reinforcement

Torsional Moment	=	0.00	kN m
Vt	=	0.00	N/mm^2

Vtmin = 0.3 Mpa Vtmax = 3.6 Mpa

No torsion reiforcement required

Designed stress	=	0	N/mm^2
Stirrup area reqd	=	0.00	mm^2
Long. Reinf reqd	=	0.00	mm^2

Provide 0 Nos of 12 mm on EVF

Ast prov.	=	0.0	mm^2

Design of beam at RHS section

Tension Reinf.

Bending moment (Mu)R	=	40.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')R	=	46.0	mm
Effective depth (d)R	=	254.00	mm
KR= Mu/(bd^2fck)	=	0.135	(2.7)
K'R	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZR	=	0.82	d
ZR	=	207.52	mm
XR = (dR-ZR)/0.45	=	103.29	mm
d'R/XR	=	0.45	
Ast reqd = Mu/(0.87fyZ)	=	443	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	2.3	0	0
Provided	3	0	0
Ast prov.	603	0	0

Ast provided	=	603	mm^2

Compression Reinf.

Ast required	=	76	mm^2
Ast min	=	148	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.31	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force Vu	=	50.00	kN
ζv = Vu/bd+Vt	=	0.86	N/mm^2
% of reinf provided	=	1.03	< 3
Design Stress	=	0.72	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Minimum Shear reinf. Reqd

Reqd. stirrup spac.	=	475.34	mm
Proived stirrup spac.	=	150	mm

CHECK FOR DEFLECTION : As per BS 8110 (Table 3.10)

Provided area of reinforcement	=	402	
Mu/bd^2	=	2.30	
Actual Span / Effective depth Ratio	=	11.45	
Support Condition	=	Continuous	
Design service stress	=	297.38	
Modification factor - Tension reinf.	=	1.02	
Modification factor - Comp. reinf.	=	1.18	
Allowable Span /Effective depth Ratio	=	31.28	

===<<< Hence SAFE in Deflection >>>===

Beam No	Size	Bottom steel		Top steel			Stirrups		Side Face Reinf.
		Straight	Curtail	Middle	LHS	RHS	Ends	Mid	
FB7	230 x 300	2Y16	---	2Y16	3Y16	3Y16	2L Y8/150	2L Y8/200	----

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		Client: M/s AADHAVAN CONSTRUCTIONS,	
		Job No: ATM-2023/ST-32	Date: 02.07.2023
Page Type: Calculation Sheet		Prepared By: BOOPATHY	Revision: RO
Section: Design of Beam as per IS 456 & 189	Beam No: TB1	Checked By: MOHAN	Date Revised: -

SECTION DETAILS

Breath of the beam	B	=	230.00	mm
Depth of the beam	D	=	380.00	mm
Clear cover of the beam	C	=	30	mm
Grade of concrete	Fck	=	20	N/mm^2
Grade of steel	Fy	=	500	N/mm^2
Effective length of the beam	L	=	4.0	m

FORCE DETAILS FROM STAAD :

Max. sagging moment of the beam	=	45.00	kN m
LHS Support moment of the beam	=	70.00	kN m
RHS Support moment of the beam	=	70.00	kN m
Torsional Moment	=	0.00	kN m
Shear force at LHS of the beam	=	88.00	kN
Shear force at RHS of the beam	=	80.00	kN

Design of beam at LHS section

Tension Reinf.

Bending Moment (Mu)L	=	70.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')	=	46.0	mm
Effective depth (d)L	=	334.00	mm
KL= Mu/(bd^2fck)	=	0.137	(2.8)
K'L	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZL	=	0.813	d
ZL	=	271.54	mm
XL = (dL-ZL)/0.45	=	138.80	mm
d'L/XL	=	0.33	
Ast reqd = Mu/(0.87fyZ)	=	593	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	3	0	0
Provided	3		0
Ast prov.	603	0	0

Ast provided	=	603	mm^2

Compression Reinf.

Ast required	=	101	mm^2
Ast min	=	296	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.61	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force VuL	=	88.00	kN
ζv = VuL/bd + Vt	=	1.15	N/mm^2
% of reinf provided	=	0.79	< 3
Design Stress	=	0.61	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	355.00	mm
Proived stirrup spac.	=	150	mm

Design of beam at Max sagging section

Tension Reinf.

Bending moment (Mu)M	=	45.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')M	=	58.5	mm
Effective depth (d)M	=	321.50	mm
KM= Mu/(bd^2fck)	=	0.095	(1.9)
K'M	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZM	=	0.88	d
ZM	=	283.24	mm
XM = (dM-ZM)/0.45	=	85.02	mm
d'M/XM	=	0.69	
Ast reqd = Mu/(0.87fyZ)	=	365	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	1.9	0	0
Provided	2	2	0
Ast prov.	402	0	0

Ast provided	=	402	mm^2

Compression Reinf.

Ast required	=	68	mm^2
Ast min	=	91	mm^2
Diameter of reinf	=	16	mm
No of bars required	=	0.46	Nos
Provide No of reinf	=	2	Nos
Ast provided	=	403	mm^2

Torsional Reinforcement

Torsional Moment	=	0.00	kN m
Vt	=	0.00	N/mm^2
Vtmin = 0.3 Mpa		Vtmax = 3.6 Mpa	

No torsion reiforcement required

Designed stress	=	0	N/mm^2
Stirrup area reqd	=	0.00	mm^2
Long. Reinf reqd	=	0.00	mm^2
Provide 0 Nos of 12 mm on EVF			
Ast prov.	=	0.0	mm^2

Design of beam at RHS section

Tension Reinf.

Bending moment (Mu)R	=	70.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')R	=	46.0	mm
Effective depth (d)R	=	334.00	mm
KR= Mu/(bd^2fck)	=	0.137	(2.8)
K'R	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZR	=	0.81	d
ZR	=	271.54	mm
XR = (dR-ZR)/0.45	=	138.80	mm
d'R/XR	=	0.33	
Ast reqd = Mu/(0.87fyZ)	=	593	mm^2

Layer	1st	2nd	3rd
Dia of reinf	16	16	16
Reqd No.	3	0	0
Provided	3	0	0
Ast prov.	603	0	0

Ast provided	=	603	mm^2

Compression Reinf.

Ast required	=	101	mm^2
Ast min		198	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.41	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force VuR	=	80.00	kN
ζv = VuR/bd+Vt	=	1.04	N/mm^2
% of reinf provided	=	0.79	< 3
Design Stress	=	0.61	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	440.68	mm
Proived stirrup spac.	=	150	mm

CHECK FOR DEFLECTION : As per BS 8110 (Table 3.10)

Provided area of reinforcement	=	402	
Mu/bd^2	=	1.90	
Actual Span / Effective depth Ratio	=	12.44	
Support Condition	=	Continuous	
Design service stress	=	302.75	
Modification factor - Tension reinf.	=	1.07	
Modification factor - Comp. reinf.	=	1.15	
Allowable Span /Effective depth Ratio	=	32.05	

===<<< Hence SAFE in Deflection >>>===

Beam No	Size	Bottom steel		Top steel			Stirrups		Side Face Reinf.
		Straight	Curtail	Middle	LHS	RHS	Ends	Mid	
TB1	230 x 380	2Y16	---	2Y16	3Y16	3Y16	2L Y8/150	2L Y8/200	----

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		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM-2023/ST-32	Date:	02.07.2023
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Section:	Design of Beam as per IS 456 & 189 / Beam No: TB2	Checked By:	MOHAN	Date Revised:	-

SECTION DETAILS

Breath of the beam	B	=	230.00	mm
Depth of the beam	D	=	530.00	mm
Clear cover of the beam	C_c	=	30	mm
Grade of concrete	F_{ck}	=	20	N/mm^2
Grade of steel	F_y	=	500	N/mm^2
Effective length of the beam	L	=	7.0	m

FORCE DETAILS FROM STAAD :

Max. sagging moment of the beam	=	255.00	kN m
LHS Support moment of the beam	=	170.00	kN m
RHS Support moment of the beam	=	170.00	KN m
Torsional Moment	=	0.00	KN m
Shear force at LHS of the beam	=	177.00	KN
Shear force at RHS of the beam	=	180.00	KN

Design of beam at LHS section

Tension Reinf.

Bending Moment $(Mu)_L$	=	170.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover $(d')_L$	=	72.1	mm
Effective depth $(d)_L$	=	457.86	mm
$K_L = Mu/(bd^2fck)$	=	0.177	(3.6)
K'L	=	0.156	

Hence Comp. reinf. Reqd.

$Z = d\{0.5+sqrt(0.25-K'/0.9)\} < 0.95d$

Z_L	=	0.777	d
Z_L	=	355.76	mm
$X_L = (d_L-Z_L)/0.45$	=	226.89	mm
d'_L/X_L	=	0.32	
$A_{st\ reqd} = M_u/(0.87fyZ)$	=	1216	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	3.9	2.93	0
Provided	2	4	0
Ast prov.	628	804	0

$A_{st\ provided}$	=	1433	mm^2

Compression Reinf.

$A_{st\ required}$	=	244	mm^2
$A_{st\ min}$	=	608	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	1.24	Nos
Provide No of reinf	=	4	Nos
$A_{st\ provided}$	=	1964	mm^2

Shear Check

Shear force V_{uR}	=	177.00	kN
$\zeta v = V_u/bd + Vt$	=	1.68	N/mm^2
% of reinf provided	=	1.36	< 3
Design Stress	=	0.70	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	193.91	mm
Proived stirrup spac.	=	150	mm

Design of beam at Max sagging section

Tension Reinf.

Bending moment $(Mu)_M$	=	255.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover $(d')_M$	=	50.4	mm
Effective depth $(d)_M$	=	479.58	mm
$K_M = Mu/(bd^2fck)$	=	0.242	(4.9)
K'M	=	0.156	

Hence Comp. reinf. Reqd.

$Z = d\{0.5+sqrt(0.25-K'/0.9)\} < 0.95d$

Z_M	=	0.78	d
Z_M	=	372.63	mm
$X_M = (d_M-Z_M)/0.45$	=	237.66	mm
d'_M/X_M	=	0.21	
$A_{st\ reqd} = M_u/(0.87fyZ)$	=	1506	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	4.8	1.24	0
Provided	4	2	0
Ast prov.	1257	402	0

$A_{st\ provided}$	=	1659	mm^2

Compression Reinf.

$A_{st\ required}$	=	487	mm^2
$A_{st\ min}$	=	376	mm^2
Diameter of reinf	=	20	mm
No of bars required	=	1.56	Nos
Provide No of reinf	=	2	Nos
$A_{st\ provided}$	=	629	mm^2

Torsional Reinforcement

Torsional Moment	=	0.00	kN m
Vt	=	0.00	N/mm^2

Vtmin = 0.3 Mpa Vtmax = 3.6 Mpa

No torsion reiforcement required

Designed stress	=	0	N/mm^2
Stirrup area reqd	=	0.00	mm^2
Long. Reinf reqd	=	0.00	mm^2
Provide 0 Nos of	12	mm on EVF	
Ast prov.	=	0.0	mm^2

Design of beam at RHS section

Tension Reinf.

Bending moment $(Mu)_R$	=	170.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover $(d')_R$	=	72.1	mm
Effective depth $(d)_R$	=	457.86	mm
$K_R = Mu/(bd^2fck)$	=	0.177	(3.6)
K'R	=	0.156	

Hence Comp. reinf. Reqd.

$Z = d\{0.5+sqrt(0.25-K'/0.9)\} < 0.95d$

Z_R	=	0.78	d
Z_R	=	355.76	mm
$X_R = (d_R-Z_R)/0.45$	=	226.89	mm
d'_R/X_R	=	0.32	
$A_{st\ reqd} = M_u/(0.87fyZ)$	=	1216	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	3.9	2.93	0
Provided	2	4	0
Ast prov.	628	804	0

$A_{st\ provided}$	=	1433	mm^2

Compression Reinf.

$A_{st\ required}$	=	244	mm^2
$A_{st\ min}$		405	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.83	Nos
Provide No of reinf	=	4	Nos
$A_{st\ provided}$	=	1964	mm^2

Shear Check

Shear force V_{uL}	=	180.00	kN
$\zeta v = V_{uL}/bd+Vt$	=	1.71	N/mm^2
% of reinf provided	=	1.36	< 3
Design Stress	=	0.70	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	188.44	mm
Proived stirrup spac.	=	150	mm

CHECK FOR DEFLECTION : As per BS 8110 (Table 3.10)

Provided area of reinforcement	=	1659	
Mu/bd^2	=	4.90	
Actual Span / Effective depth Ratio	=	14.60	
Support Condition	=	Continuous	
Design service stress	=	302.55	
Modification factor - Tension reinf.	=	0.80	
Modification factor - Comp. reinf.	=	1.16	
Allowable Span /Effective depth Ratio	=	24.14	

===<<< Hence SAFE in Deflection >>>===

Beam No	Size	Bottom steel		Top steel			Stirrups		Side Face Reinf.
		Straight	Curtail	Middle	LHS	RHS	Ends	Mid	
TB2	230 x 530	4Y20+2Y16	---	2Y20	2Y20+4Y16	2Y20+4Y16	2L Y8/150	2L Y8/200	----

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			Client:	M/s AADHAVAN CONSTRUCTIONS,	
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Section:	Design of Beam as per IS 456 & 189	Beam No: TB8	Checked By:	MOHAN	Date Revised: -

SECTION DETAILS

Breath of the beam	B	=	380.00	mm
Depth of the beam	D	=	750.00	mm
Clear cover of the beam	C_1	=	30	mm
Grade of concrete	F_{ck}	=	20	N/mm^2
Grade of steel	F_y	=	500	N/mm^2
Effective length of the beam	L	=	14.0	m

FORCE DETAILS FROM STAAD :

Max. sagging moment of the beam	=	750.00	kN m
LHS Support moment of the beam	=	800.00	kN m
RHS Support moment of the beam	=	795.00	KN m
Torsional Moment	=	0.00	KN m
Shear force at LHS of the beam	=	360.00	KN
Shear force at RHS of the beam	=	384.00	KN

Design of beam at LHS section

Tension Reinf.

Bending Moment $(Mu)_L$	=	800.00	kN m
Breath of the beam (B)	=	380	mm
Effective cover $(d')_L$	=	63.9	mm
Effective depth $(d)_L$	=	686.05	mm
K_L= Mu/(bd^2fck)	=	0.224	(4.5)
K'L	=	0.156	

Hence Comp. reinf. Reqd.

Z= d{0.5+sqrt(0.25-K'/0.9)} < 0.95d

Z_L	=	0.777	d
Z_L	=	533.06	mm
$X_L = (d_L - Z_L)/0.45$	=	339.98	mm
d'_L/X_L	=	0.19	
$A_{st\ reqd} = M_u/(0.87 f_y Z)$ =		3305	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	10.6	3.94	0
Provided	8	6	0
Ast prov.	2513	1206	0

$A_{st\ provided}$	=	3720	mm^2

Compression Reinf.

$A_{st\ required}$	=	899	mm^2
$A_{st\ min}$	=	1653	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	3.37	Nos
Provide No of reinf	=	4	Nos
$A_{st\ provided}$	=	1964	mm^2

Shear Check

Shear force V_{uR}	=	360.00	kN
$\zeta v = V_{uL}/bd + Vt$	=	1.38	N/mm^2
% of reinf provided	=	1.43	< 3
Design Stress	=	0.71	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 10 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	268.62	mm
Proived stirrup spac.	=	150	mm

Design of beam at Max sagging section

Tension Reinf.

Bending moment $(Mu)_M$	=	750.00	kN m
Breath of the beam (B)	=	380	mm
Effective cover $(d')_L$	=	53.9	mm
Effective depth $(d)_M$	=	696.05	mm
K_M= Mu/(bd^2fck)	=	0.204	(4.1)
K'M	=	0.156	

Hence Comp. reinf. Reqd.

Z= d{0.5+sqrt(0.25-K'/0.9)} < 0.95d

Z_M	=	0.78	d
Z_M	=	540.83	mm
$X_M = (d_M - Z_M)/0.45$	=	344.93	mm
d'_M/X_M	=	0.16	
$A_{st\ reqd} = M_u/(0.87 f_y Z)$ =		3074	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	9.8	2.8	0
Provided	8	6	0
Ast prov.	2513	1206	0

$A_{st\ provided}$	=	3720	mm^2

Compression Reinf.

$A_{st\ required}$	=	633	mm^2
$A_{st\ min}$	=	769	mm^2
Diameter of reinf	=	20	mm
No of bars required	=	2.45	Nos
Provide No of reinf	=	4	Nos
$A_{st\ provided}$	=	1257	mm^2

Torsional Reinforcement

Torsional Moment	=	0.00	kN m
Vt	=	0.00	N/mm^2

Vtmin = 0.3 Mpa Vtmax = 3.6 Mpa

No torsion reiforcement required

Designed stress	=	0	N/mm^2
Stirrup area reqd	=	0.00	mm^2
Long. Reinf reqd	=	0.00	mm^2

Provide 2 Nos of 16 mm on EVF

Ast prov.	=	402.1	mm^2

Design of beam at RHS section

Tension Reinf.

Bending moment $(Mu)_R$	=	795.00	kN m
Breath of the beam (B)	=	380	mm
Effective cover $(d')_R$	=	61.9	mm
Effective depth $(d)_R$	=	688.05	mm
K_R= Mu/(bd^2fck)	=	0.221	(4.5)
K'R	=	0.156	

Hence Comp. reinf. Reqd.

Z= d{0.5+sqrt(0.25-K'/0.9)} < 0.95d

Z_R	=	0.78	d
Z_R	=	534.62	mm
$X_R = (d_R - Z_R)/0.45$	=	340.97	mm
d'_R/X_R	=	0.18	
$A_{st\ reqd} = M_u/(0.87 f_y Z)$ =		3272	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	10.5	3.78	0
Provided	8	6	0
Ast prov.	2513	1206	0

$A_{st\ provided}$	=	3720	mm^2

Compression Reinf.

$A_{st\ required}$	=	859	mm^2
$A_{st\ min}$	=	1091	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	2.23	Nos
Provide No of reinf	=	4	Nos
$A_{st\ provided}$	=	1964	mm^2

Shear Check

Shear force V_{uL}	=	384.00	kN
$\zeta v = V_{uL}/bd + Vt$	=	1.47	N/mm^2
% of reinf provided	=	1.42	< 3
Design Stress	=	0.71	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	151.85	mm
Proived stirrup spac.	=	150	mm

CHECK FOR DEFLECTION : As per BS 8110 (Table 3.10)

Provided area of reinforcement	=	3720	
Mu/bd^2	=	4.10	
Actual Span / Effective depth Ratio	=	20.11	
Support Condition	=	Continuous	
Design service stress	=	275.50	
Modification factor - Tension reinf.	=	0.89	
Modification factor - Comp. reinf.	=	1.14	
Allowable Span /Effective depth Ratio	=	26.18	

===<<< Hence SAFE in Deflection >>>===

Beam No	Size	Bottom steel		Top steel			Stirrups		Side Face Reinf.
		Straight	Curtail	Middle	LHS	RHS	Ends	Mid	
TB8	380 x 750	8Y20+6Y16	—	4Y20	8Y20+6Y16	8Y20+6Y16	2L Y10/150	2L Y10/200	2T16 EVF

ATM ASSOCIATES	ER. A.T.MOHAN M.TECH CONSULTING STRUCTURAL & CIVIL ENGINEER NO.35/50, ATM TOWER, GOWRIPURAM EAST, KARUR - 2.	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE , KARUR CITY			
		Client:	M/s AADHAVAN CONSTRUCTIONS,		
		Job No:	ATM-2023/ST-32	Date:	02.07.2023
Page Type:	Calculation Sheet	Prepared By:	BOOPATHY	Revision:	RO
Section:	Design of Beam as per IS 456 & 189 — Beam No: TB12	Checked By:	MOHAN	Date Revised:	-

SECTION DETAILS

Breath of the beam	B	=	230.00	mm
Depth of the beam	D	=	600.00	mm
Clear cover of the beam	C	=	30	mm
Grade of concrete	Fck	=	20	N/mm^2
Grade of steel	Fy	=	500	N/mm^2
Effective length of the beam	L	=	8.0	m

FORCE DETAILS FROM STAAD :

Max. sagging moment of the beam	=	200.00	kN m
LHS Support moment of the beam	=	250.00	kN m
RHS Support moment of the beam	=	250.00	KN m
Torsional Moment	=	0.00	KN m
Shear force at LHS of the beam	=	175.00	KN
Shear force at RHS of the beam	=	210.00	KN

Design of beam at LHS section

Tension Reinf.

Bending Moment (Mu)L	=	250.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')L	=	58.4	mm
Effective depth (d)L	=	541.58	mm
KL= Mu/(bd^2fck)	=	0.186	(3.8)
K'L	=	0.156	

Hence Comp. reinf. Reqd.

Z= d{0.5+sqrt(0.25-K'/0.9)} < 0.95d

ZL	=	0.777	d
ZL	=	420.80	mm
XL = (dL-ZL)/0.45	=	268.38	mm
d'L/XL	=	0.22	
Ast reqd = Mu/(0.87fyZ)	=	1426	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	4.6	0.85	0
Provided	4	2	0
Ast prov.	1257	402	0

Ast provided	=	1659	mm^2

Compression Reinf.

Ast required	=	276	mm^2
Ast min	=	713	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	1.46	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force VuL	=	175.00	kN
ζv = VuL/bd + Vt	=	1.40	N/mm^2
% of reinf provided	=	1.33	< 3
Design Stress	=	0.70	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	267.95	mm
Proived stirrup spac.	=	150	mm

Design of beam at Max sagging section

Tension Reinf.

Bending moment (Mu)M	=	200.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')M	=	50.4	mm
Effective depth (d)M	=	549.58	mm
KM= Mu/(bd^2fck)	=	0.144	(2.9)
K'M	=	0.156	

Hence comp. reinf. NOT reqd.

Z= d{0.5+sqrt(0.25-K/0.9)} < 0.95d

ZM	=	0.80	d
ZM	=	439.66	mm
XM = (dM-ZM)/0.45	=	244.26	mm
d'M/XM	=	0.21	
Ast reqd = Mu/(0.87fyZ)	=	1046	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	3.4	0	0
Provided	4	2	0
Ast prov.	1257	0	0

Ast provided	=	1257	mm^2

Compression Reinf.

Ast required	=	176	mm^2
Ast min	=	261	mm^2
Diameter of reinf	=	20	mm
No of bars required	=	0.84	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1257	mm^2

Torsional Reinforcement

Torsional Moment	=	0.00	kN m
Vt	=	0.00	N/mm^2

Vtmin = 0.3 Mpa Vtmax = 3.6 Mpa

No torsion reiforcement required

Designed stress	=	0	N/mm^2
Stirrup area reqd	=	0.00	mm^2
Long. Reinf reqd	=	0.00	mm^2

Provide 0 Nos of 16 mm on EVF

Ast prov.	=	0.0	mm^2

Design of beam at RHS section

Tension Reinf.

Bending moment (Mu)R	=	250.00	kN m
Breath of the beam (B)	=	230	mm
Effective cover (d')R	=	58.4	mm
Effective depth (d)R	=	541.58	mm
KR= Mu/(bd^2fck)	=	0.186	(3.8)
K'R	=	0.156	

Hence Comp. reinf. Reqd.

Z= d{0.5+sqrt(0.25-K'/0.9)} < 0.95d

ZR	=	0.78	d
ZR	=	420.80	mm
XR = (dR-ZR)/0.45	=	268.38	mm
d'R/XR	=	0.22	
Ast reqd = Mu/(0.87fyZ)	=	1426	mm^2

Layer	1st	2nd	3rd
Dia of reinf	20	16	16
Reqd No.	4.6	0.85	0
Provided	4	2	0
Ast prov.	1257	402	0

Ast provided	=	1659	mm^2

Compression Reinf.

Ast required	=	276	mm^2
Ast min		475	mm^2
Diameter of reinf	=	25	mm
No of bars required	=	0.97	Nos
Provide No of reinf	=	4	Nos
Ast provided	=	1964	mm^2

Shear Check

Shear force VuL	=	210.00	kN
ζv = VuL/bd+Vt	=	1.69	N/mm^2
% of reinf provided	=	1.33	< 3
Design Stress	=	0.70	N/mm^2
ζc max	=	3.58	N/mm^2

2 Legged 8 mm Dia stirrups

Design Shear reinf.

Reqd. stirrup spac.	=	191.94	mm
Proived stirrup spac.	=	150	mm

CHECK FOR DEFLECTION : As per BS 8110 (Table 3.10)

Provided area of reinforcement	=	1257	
Mu/bd^2	=	2.90	
Actual Span / Effective depth Ratio	=	14.56	
Support Condition	=	Continuous	
Design service stress	=	277.39	
Modification factor - Tension reinf.	=	0.99	
Modification factor - Comp. reinf.	=	1.25	
Allowable Span /Effective depth Ratio	=	32.07	

===<<< Hence SAFE in Deflection >>>===

Beam No	Size	Bottom steel		Top steel			Stirrups		Side Face Reinf.
		Straight	Curtail	Middle	LHS	RHS	Ends	Mid	
TB12	230 x 600	4Y20	---	4Y20	4Y20+2Y16	4Y20+2Y16	2L Y8/150	2L Y8/200	----

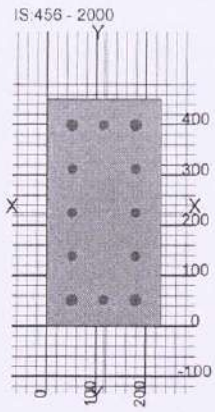
DESIGN OF COLUMN

COLUMN C1 - LEVEL 1

C13

General column design by *PROKON*. (GenCol Ver W2.6.11 - 24 Apr 2014)

Design code : IS:456 - 2000



General design parameters:

Given:
- Lo = 3.300 m
- fck = 20 MPa
- fy = 500 MPa
- Ac = 99023 mm²

Assumptions:
(1) The general conditions of clause 25.1.1 are applicable.
(2) The specified design axial loads include the self-weight of the column.
(3) The design axial loads are taken constant over the height of the column.

Design approach:

The column is designed using the following procedure:
(1) The column design charts are constructed.
(2) The design axis and design ultimate moment are determined .
(3) The design axial force and moment capacity is checked on the relevant design chart.
(4) The procedure is repeated for each load case.
(5) The critical load case is identified as the case yielding the lowest safety factor about the design axis

Through inspection:
Load case 1 (95) is critical.

Check column slenderness:

End fixity and bracing for bending about the Design axis:
At the top end: Condition 1 (fully fixed).
At the bottom end: Condition 1 (fully fixed).
The column is unbraced.

Effective length factor ß = 1.20 *ANNEX E*

Effective column height:

$$l_e = \beta \cdot L_o$$
$$= 1.2 \times 3.3$$
$$= 3.960 \text{ m}$$

Column slenderness about weakest axis:

$$m_{cx_s140l} = \frac{l_e}{h}$$
$$= \frac{3.96}{.23101}$$
$$= 17.142$$

Where h is an equivalent column depth derived from the radius of gyration*square root of 12

Minimum Moments for Design:

Check for mininum eccentricity: *25.4*

Check that the eccentricity exceeds the minimum in the plane of bending:

$$M_{min} = e_{min} \cdot N$$
$$= .02112 \times 2\ 218.3$$
$$= 46.850 \text{ kNm}$$

Check if the column is slender: *25.1.2*

le/h = 17.1 > 12

∴ The column is short.

Initial moments:

The column is bent in double curvature about the X-X axis:

M1 = Smaller initial end moment = -26.3 kNm

M2 = Larger initial end moment = 74.3 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times -26.347 + 0.6 \times 74.253$$
$$= 34.013 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times 74.253$$
$$= 29.701 \text{ kNm}$$

∴ Mi ≥ 0.4M2 = 34.0 kNm

The column is bent in double curvature about the Y-Y axis:

M1 = Smaller initial end moment = -1.5 kNm

M2 = Larger initial end moment = 3.9 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times 1.495 + 0.6 \times -3.925$$
$$= -1.7570 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times -3.925$$
$$= -1.5700 \text{ kNm}$$

∴ Mi ≥ 0.4M2 = -1.8 kNm

Design ultimate load and moment:

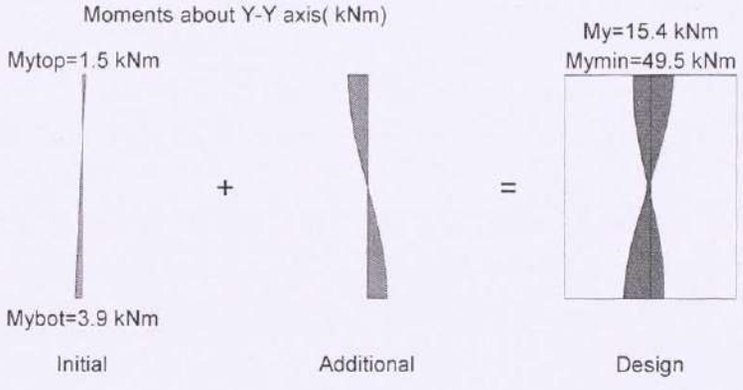
Design axial load:

P_u = 2218.3 kN

Moments as a result of imperfections added about Design axis *5.8.9 2)*



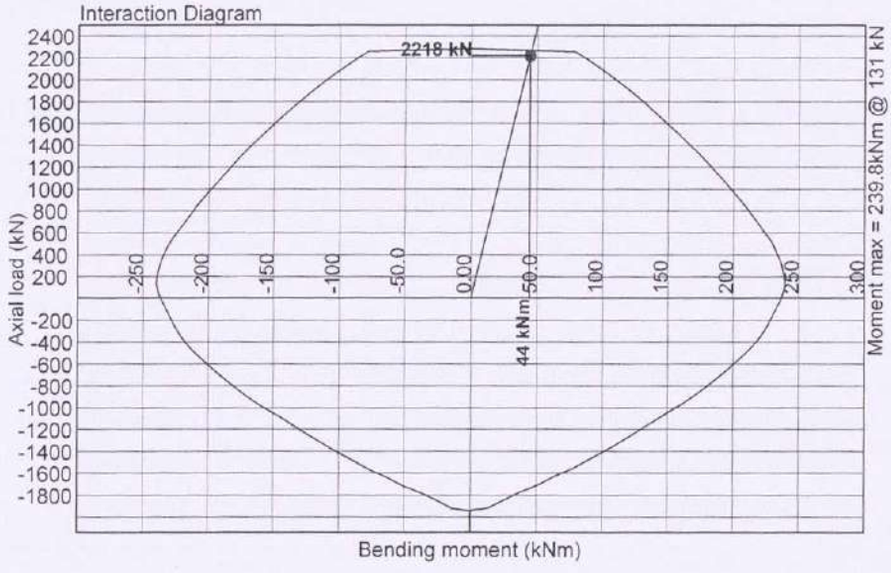
Moments as a result of imperfections added about Design axis *5.8.9 2)*



Design of column section for ULS:

The column is checked for applied moment about the design axis.
Through inspection: the critical section lies at the top end of the column.
The design axis for the critical load case 1 lies at an angle of 153.78° to the X-axis
The safety factor for the critical load case 1 is 1.03

For bending about the design axis:

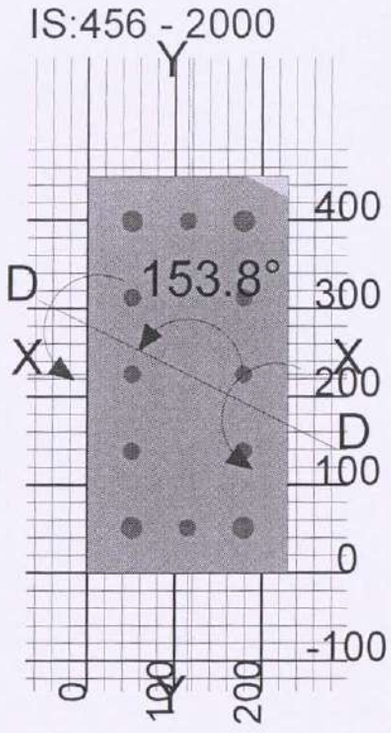


Moment distribution along the height of the column for bending about the design axis:

The final design moments were calculated as the vector sum of the X- and Y- moments of the critical load case. This also determined the design axis direction

At the top, Mx = 44.4 kNm
Near mid-height, Mx = 44.4 kNm
At the bottom, Mx = 75.8 kNm

Stresses at the top end of the column for the critical load case 1



Summary of design calculations:

Design table for critical load case:

Moments and Reinforcement for LC 1:95			
	Top	Middle	Bottom
Madd-x (kNm)	0.0	0.0	0.0
Madd-y (kNm)	-11.5	0.0	11.5
Mx (kNm)	-26.3	34.0	-74.3
My (kNm)	13.0	-1.8	15.4
Mmin (kNm)	42.7	0.0	42.7
M-design (kNm)	44.4	44.4	75.8
Design axis (°)	153.78	357.04	348.28
Safety factor	1.03	1.03	1.03
Asc (mm^2)	4477	4477	4477
Percentage	4.33 %	4.33 %	4.33 %
AsNom (mm^2)	792	792	792
Critical load case: LC 1			

Design results for all load cases:

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 1 95	X-X Y-Y	2218.3	-26.3 1.5	74.3 -3.9	34.0 -1.8	0.0 -11.5	Top	74.3 15.4	44.4	1.033
Load case 2 115	X-X Y-Y	2133.1	4.7 -2.4	16.0 13.8	11.5 7.3	0.0 0.0	Middle	16.0 27.5	42.7	1.074

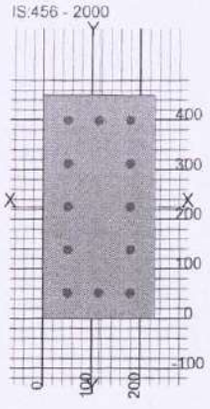
Load case 1 (95) is critical.

COLUMN C1 - LEVEL 2

C13

General column design by *PROKON*. (GenCol Ver W2.6.11 - 24 Apr 2014)

Design code : IS:456 - 2000



General design parameters:

Given:
- Lo = 3.200 m
- fck = 20 MPa
- fy = 500 MPa
- Ac = 99730 mm²

Assumptions:
(1) The general conditions of clause 25.1.1 are applicable.
(2) The specified design axial loads include the self-weight of the column.
(3) The design axial loads are taken constant over the height of the column.

Design approach:

The column is designed using an iterative procedure:
(1) An area of reinforcement is chosen.
(2) The column design charts are constructed.
(3) The corresponding slenderness moments are calculated.
(4) The design axis and design ultimate moment are determined .
(5) The design axial force and moment capacity is checked on the relevant design chart.
(6) The safety factor is calculated for this load case.
(7) The procedure is repeated for each load case.
(8) The critical load case is identified as the case yielding the lowest safety factor about the design axis

Through inspection:
Load case 3 (299) is critical.

Check column slenderness:

End fixity and bracing for bending about the Design axis:
At the top end: Condition 1 (fully fixed).
At the bottom end: Condition 1 (fully fixed).
The column is unbraced.

Effective length factor ß = 1.20 *ANNEX E*

Effective column height:

$$l_e = \beta \cdot L_o$$
$$= 1.2 \times 3.2$$
$$= 3.840 \text{ m}$$

Column slenderness about weakest axis:

$$max_slnd = \frac{l_e}{h}$$
$$= \frac{3.84}{.23095}$$
$$= 16.627$$

Where h is an equivalent column depth derived from the radius of gyration*square root of 12

Minimum Moments for Design:

Check for mininum eccentricity: *25.4*

Check that the eccentricity exceeds the minimum in the plane of bending:

$$M_{min} = e_{min} \cdot N$$
$$= .02269 \times 1\ 417.4$$
$$= 32.161 \text{ kNm}$$

Check if the column is slender: *25.1.2*

le/h = 16.6 > 12

∴ The column is slender.

Initial moments:

The column is bent in double curvature about the X-X axis:

M1 = Smaller initial end moment = -135.7 kNm

M2 = Larger initial end moment = 139.1 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times - 135.75 + 0.6 \times 139.09$$
$$= 29.154 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times 139.09$$
$$= 55.636 \text{ kNm}$$

∴ Mi ≥ 0.4M2 = 55.6 kNm

The column is bent in double curvature about the Y-Y axis:

M1 = Smaller initial end moment = -4.3 kNm

M2 = Larger initial end moment = 4.6 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times -4.298 + 0.6 \times 4.629$$
$$= 1.058 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times 4.629$$
$$= 1.852 \text{ kNm}$$

∴ Mi ≥ 0.4M2 = 1.9 kNm

Deflection induced moments: *39.7.1*

Design ultimate capacity of section under axial load only:

$$P_{uc} = 0.45 \cdot f_{cu} \cdot A_c + 0.75 \cdot f_y \cdot A_{sc}$$
$$= 0.45 \times 20 \times 99.73 + 0.75 \times 500 \times 3.7699$$
$$= 2\,311.282 \text{ kN}$$

Maximum allowable stress and strain:

Allowable compression stress in steel

$$f_{sc} = 0.87 \cdot f_y$$
$$= 0.87 \times 500$$
$$= 435.000 \text{ MPa}$$

Allowable tensile stress in steel

$$f_{st} = 0.87 \cdot f_y$$
$$= 0.87 \times 500$$
$$= 435.000 \text{ MPa}$$

Allowable tensile strain in steel

$$e_y = \frac{f_{st}}{E_s}$$
$$= \frac{434.78}{210000}$$
$$= 0.0021$$

Allowable compressive strain in concrete

$$e_c = 0.0035$$

For bending about the weakest axis:

Weakest axis lies at an angle of -90.00° to the X-X axis
Overall dimension perpendicular to weakest axis h = 231mm

$$K = \frac{P_{uc} - P_u}{P_{uc} - P_b}$$
$$= \frac{2311 \times 10^3 - 1417 \times 10^3}{2311 \times 10^3 - 288099}$$
$$= 0.4419$$

Therefore:

$$M_{add} = \frac{P_u \cdot D}{2000} \cdot m_{ex_sl}^2 \cdot K$$

$$= \frac{1\,417.4 \times .23095}{2000} \times 16.627^2 \times .44183$$

$$= 19.992 \text{ kNm}$$

Where max_sl is the maximum slenderness ratio of the column as an equivalent rectangular column.

∴ Maddx = Madd*cos(-90.00°) = 0.0 kNm
∴ Maddy = Madd*sin(-90.00°) = 19.9 kNm

Design ultimate load and moment:

Design axial load:
P_u = 1417.4 kN

Moments as a result of imperfections added about Design axis *5.8.9.2)*

For bending about the X-X axis, the maximum design moment is the greatest of:
(a) 39.7.1

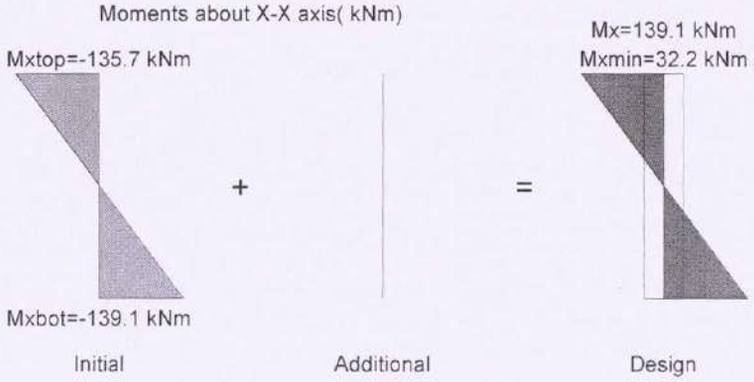
$$M = M_2 + M_{add}$$
$$= 139.09 + 0$$
$$= 139.090 \text{ kNm}$$

(d) 39.7.1

$$M = e_{minx} \cdot N$$
$$= .02269 \times 1\,417.4$$
$$= 32.161 \text{ kNm}$$

Thus 39.7.1

$$M = 139.1 \text{ kNm}$$



Moments as a result of imperfections added about Design axis *5.8.9.2)*

For bending about the Y-Y axis, the maximum design moment is the greatest of:

(a) 39.7.1

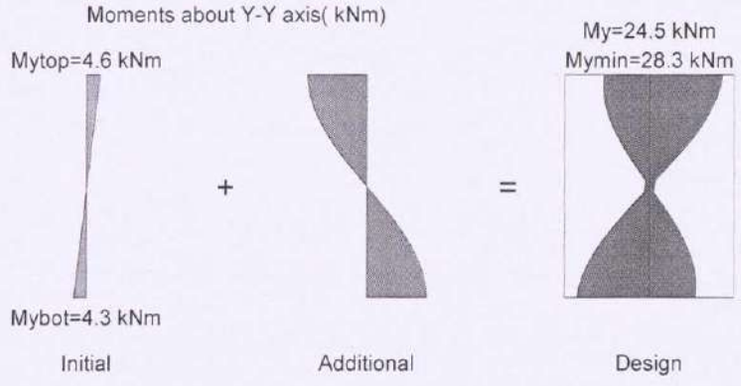
$$M = M_2 + M_{eadd}$$
$$= 4.629 + -19.909$$
$$= -15.2800 \text{ kNm}$$

(d) 39.7.1

$$M = e_{miny} \cdot N$$
$$= .02 \times 1\,417.4$$
$$= 28.348 \text{ kNm}$$

Thus 39.7.1

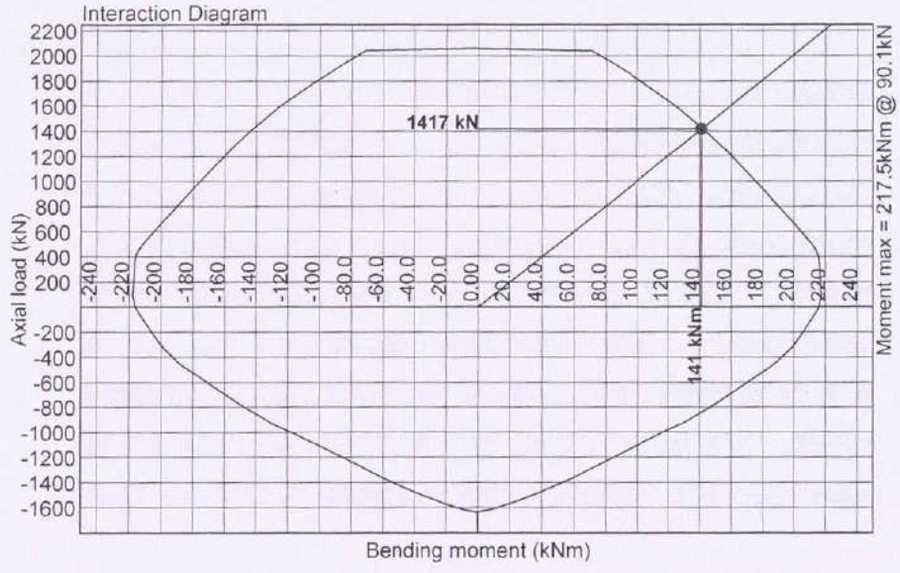
$$M = 28.3 \text{ kNm}$$



Design of column section for ULS:

The column is checked for applied moment about the design axis.
Through inspection: the critical section lies at the bottom end of the column.
The design axis for the critical load case 3 lies at an angle of 350.13° to the X-axis
The safety factor for the critical load case 3 is 1.01

For bending about the design axis:

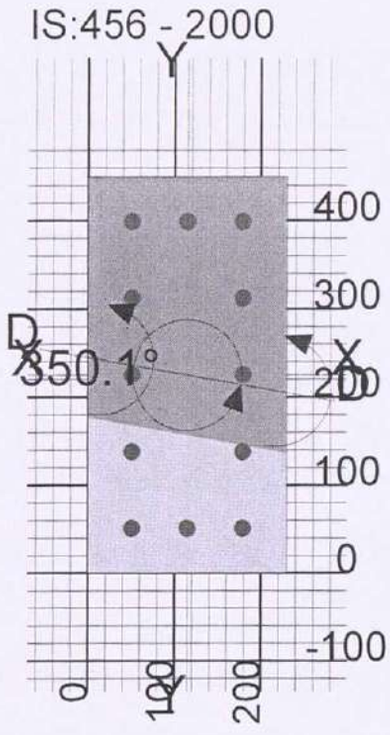


Moment distribution along the height of the column for bending about the design axis:

The final design moments were calculated as the vector sum of the X- and Y- moments of the critical load case. This also determined the design axis direction

At the top, Mx = 137.9 kNm
Near mid-height, Mx = 55.7 kNm
At the bottom, Mx = 141.2 kNm

Stresses at the bottom end of the column for the critical load case 3



Summary of design calculations:

Design table for critical load case:

Moments and Reinforcement for LC 3:299			
	Top	Middle	Bottom
Madd-x (kNm)	0.0	0.0	0.0
Madd-y (kNm)	-19.9	0.0	19.9
Mx (kNm)	-135.7	55.6	-139.1
My (kNm)	24.5	1.9	24.2
Mmin (kNm)	28.9	0.0	28.9
M-design (kNm)	137.9	55.7	141.2
Design axis (°)	169.75	1.91	350.13
Safety factor	1.02	1.42	1.01
Asc (mm^2)	3770	3770	3770
Percentage	3.64 %	3.64 %	3.64 %
AsNom (mm^2)	798	798	798
Critical load case: LC 3			

Design results for all load cases:

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 1 197	X-X Y-Y	1817.2	84.5 -4.8	-87.4 5.5	-35.0 2.2	0.0 -14.1	Top	87.4 19.6	89.6	1.037
Load case 2 217	X-X Y-Y	1640.1	-1.1 18.0	3.5 -21.1	1.6 -8.4	0.0 0.0	Middle	3.5 34.7	36.8	1.079
Load case 3 299	X-X Y-Y	1417.4	-135.7 -4.3	139.1 4.6	55.6 1.9	0.0 -19.9	Bottom	139.1 24.5	141.2	1.010

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 4 319	X-X Y-Y	1445.7	-1.9 16.8	3.7 -17.0	1.5 -6.8	0.0 0.0	Middle	3.7 36.7	28.9	1.376

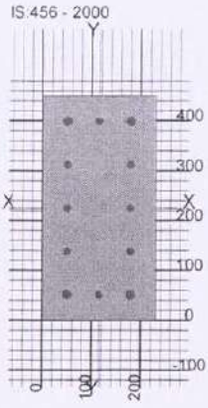
Load case 3 (299) is critical.

COLUMN C1 - LEVEL 3

C13

General column design by *PROKON*. (GenCol Ver W2.6.11 - 24 Apr 2014)

Design code : IS:456 - 2000



General design parameters:

Given:
- Lo = 3.200 m
- fck = 20 MPa
- fy = 500 MPa
- Ac = 100635 mm²

Assumptions:
(1) The general conditions of clause 25.1.1 are applicable.
(2) The specified design axial loads include the self-weight of the column.
(3) The design axial loads are taken constant over the height of the column.

Design approach:

The column is designed using the following procedure:
(1) The column design charts are constructed.
(2) The design axis and design ultimate moment are determined .
(3) The design axial force and moment capacity is checked on the relevant design chart.
(4) The procedure is repeated for each load case.
(5) The critical load case is identified as the case yielding the lowest safety factor about the design axis

Through inspection:
Load case 1 (401) is critical.

Check column slenderness:

End fixity and bracing for bending about the Design axis:
At the top end: Condition 1 (fully fixed).
At the bottom end: Condition 1 (fully fixed).
The column is unbraced.

Effective length factor ß = 1.20 *ANNEX E*

Effective column height:

$$l_e = \beta \cdot L_o$$
$$= 1.2 \times 3.2$$
$$= 3.840 \text{ m}$$

Column slenderness about weakest axis:

$$m_{ax_s140l} = \frac{l_e}{h}$$
$$= \frac{3.84}{.23064}$$
$$= 16.649$$

Where h is an equivalent column depth derived from the radius of gyration*square root of 12

Minimum Moments for Design:

Check for mininum eccentricity: *25.4*

Check that the eccentricity exceeds the minimum in the plane of bending:

$$M_{min} = e_{min} \cdot N$$
$$= .02318 \times 1\ 020.1$$
$$= 23.646 \text{ kNm}$$

Check if the column is slender: *25.1.2*

le/h = 16.6 > 12

∴ The column is short.

Initial moments:

The column is bent in double curvature about the X-X axis:

M1 = Smaller initial end moment = -124.6 kNm

M2 = Larger initial end moment = 124.8 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times 124.6 + 0.6 \times - 124.75$$
$$= -25.0100 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times - 124.75$$
$$= -49.9000 \text{ kNm}$$

∴ Mi ≥ 0.4M2 = -49.9 kNm

The column is bent in double curvature about the Y-Y axis:

M1 = Smaller initial end moment = -3.5 kNm

M2 = Larger initial end moment = 3.5 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times -3.519 + 0.6 \times 3.526$$
$$= 0.7080 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times 3.526$$
$$= 1.410 \text{ kNm}$$

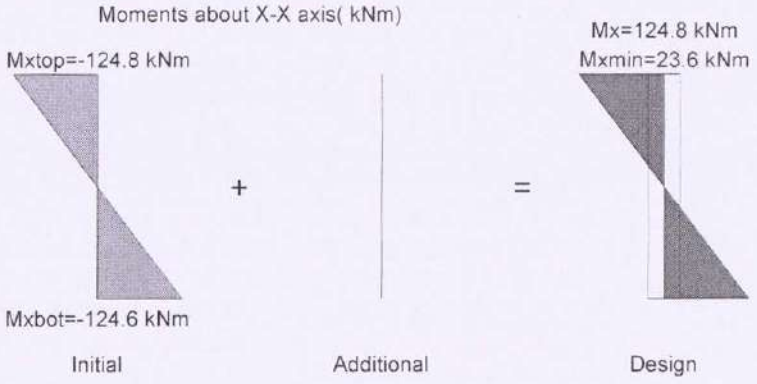
∴ Mi ≥ 0.4M2 = 1.4 kNm

Design ultimate load and moment:

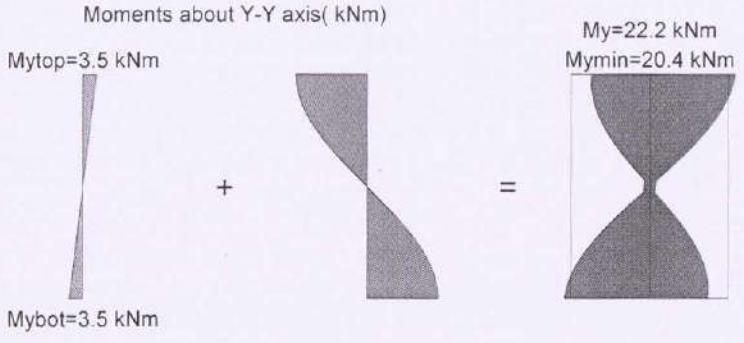
Design axial load:

P_u = 1020.1 kN

Moments as a result of imperfections added about Design axis *5.8.9 2)*



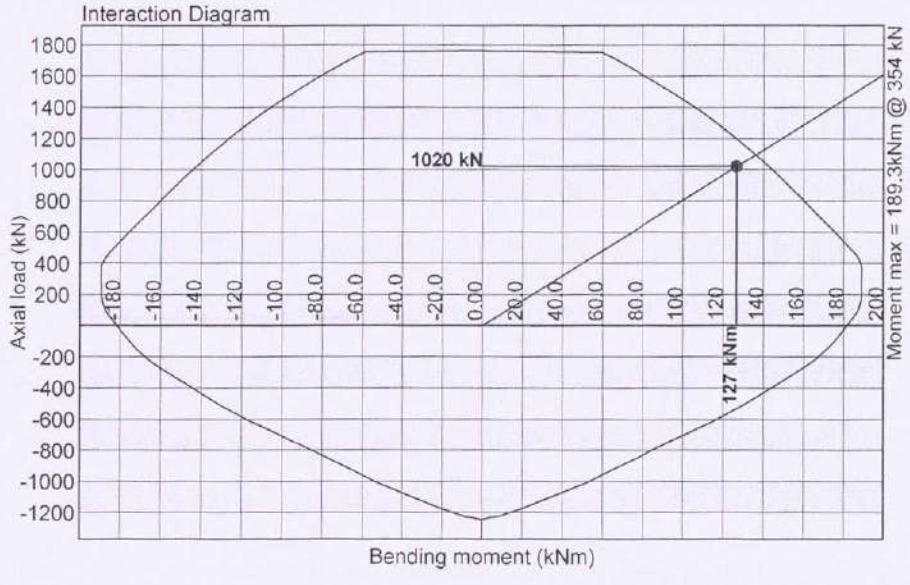
Moments as a result of imperfections added about Design axis *5.8.9 2)*



Design of column section for ULS:

The column is checked for applied moment about the design axis.
Through inspection: the critical section lies at the top end of the column.
The design axis for the critical load case 1 lies at an angle of 169.92° to the X-axis
The safety factor for the critical load case 1 is 1.08

For bending about the design axis:

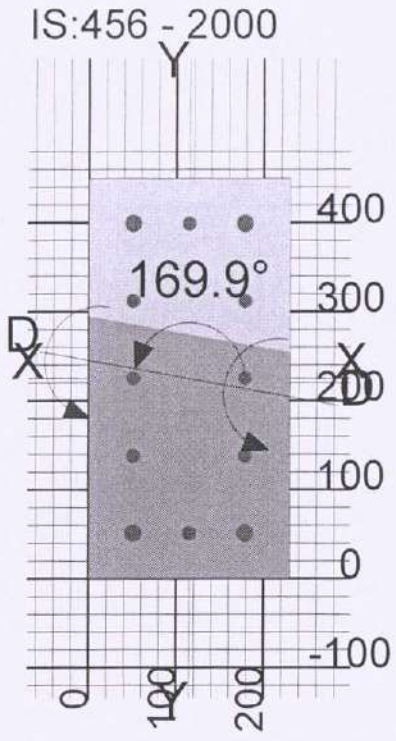


Moment distribution along the height of the column for bending about the design axis:

The final design moments were calculated as the vector sum of the X- and Y- moments of the critical load case. This also determined the design axis direction

At the top, Mx = 126.7 kNm
Near mid-height, Mx = 49.9 kNm
At the bottom, Mx = 126.6 kNm

Stresses at the top end of the column for the critical load case 1



Summary of design calculations:

Design table for critical load case:

Moments and Reinforcement for LC 1:401			
	Top	Middle	Bottom
Madd-x (kNm)	0.0	0.0	0.0
Madd-y (kNm)	-18.6	0.0	18.6
Mx (kNm)	-124.8	-49.9	-124.6
My (kNm)	22.2	1.4	22.2
Mmin (kNm)	13.3	0.0	13.3
M-design (kNm)	126.7	49.9	126.6
Design axis (°)	169.92	178.38	349.91
Safety factor	1.08	1.60	1.08
Asc (mm^2)	2865	2865	2865
Percentage	2.77 %	2.77 %	2.77 %
AsNom (mm^2)	805	805	805
Critical load case: LC 1			

Design results for all load cases:

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 1 401	X-X Y-Y	1020.1	124.6 -3.5	-124.8 3.5	-49.9 1.4	0.0 -18.6	Top	124.8 22.2	126.7	1.083
Load case 2 421	X-X Y-Y	1053.3	-3.5 16.2	5.7 -16.6	2.3 -6.6	0.0 0.0	Middle	5.7 35.2	21.1	1.637
Load case 3 503	X-X Y-Y	624.3	-134.8 2.7	138.7 -2.8	55.5 -1.1	0.0 0.0	Middle	138.7 19.0	55.5	2.127

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 4 523	X-X Y-Y	662.7	-5.0 -15.9	6.6 16.4	2.7 6.6	0.0 0.0	Middle	6.6 33.0	13.3	2.623

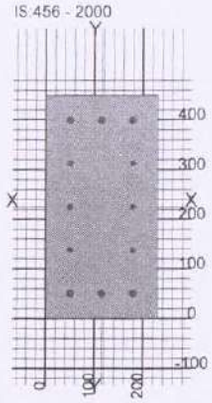
Load case 1 (401) is critical.

COLUMN C1 - LEVEL 4

C13

General column design by *PROKON*. (GenCol Ver W2.6.11 - 24 Apr 2014)

Design code : IS:456 - 2000



General design parameters:

Given:
- Lo = 3.200 m
- fck = 20 MPa
- fy = 500 MPa
- Ac = 101615 mm²

Assumptions:
(1) The general conditions of clause 25.1.1 are applicable.
(2) The specified design axial loads include the self-weight of the column.
(3) The design axial loads are taken constant over the height of the column.

Design approach:

The column is designed using the following procedure:
(1) The column design charts are constructed.
(2) The design axis and design ultimate moment are determined .
(3) The design axial force and moment capacity is checked on the relevant design chart.
(4) The procedure is repeated for each load case.
(5) The critical load case is identified as the case yielding the lowest safety factor about the design axis

Through inspection:
Load case 1 (627) is critical.

Check column slenderness:

End fixity and bracing for bending about the Design axis:
At the top end: Condition 1 (fully fixed).
At the bottom end: Condition 1 (fully fixed).
The column is unbraced.

Effective length factor ß = 1.20 *ANNEX E*

Effective column height:

$$l_e = \beta \cdot L_o$$
$$= 1.2 \times 3.2$$
$$= 3.840 \text{ m}$$

Column slenderness about weakest axis:

$$m_{cx_s140} = \frac{l_e}{h}$$
$$= \frac{3.84}{.23057}$$
$$= 16.654$$

Where h is an equivalent column depth derived from the radius of gyration*square root of 12

Minimum Moments for Design:

Check for mininum eccentricity: *25.4*

Check that the eccentricity exceeds the minimum in the plane of bending:

$$M_{min} = e_{min} \cdot N$$
$$= .02164 \times 228.82$$
$$= 4.952 \text{ kNm}$$

Check if the column is slender: *25.1.2*

le/h = 16.7 > 12

∴ The column is short.

Initial moments:

The column is bent in double curvature about the X-X axis:

M1 = Smaller initial end moment = -128.0 kNm

M2 = Larger initial end moment = 131.9 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times 127.98 + 0.6 \times - 131.85$$
$$= -27.9180 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times - 131.85$$
$$= -52.7400 \text{ kNm}$$

∴ Mi ≥ 0.4M2 = -52.7 kNm

The column is bent in single curvature about the Y-Y axis:

M1 = Smaller initial end moment = 1.1 kNm

M2 = Larger initial end moment = 2.0 kNm

The initial moment near mid-height of the column :

$$M_i = - 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= - 0.4 \times 1.082 + 0.6 \times 1.965$$
$$= 0.7462 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times 1.965$$
$$= 0.7860 \text{ kNm}$$

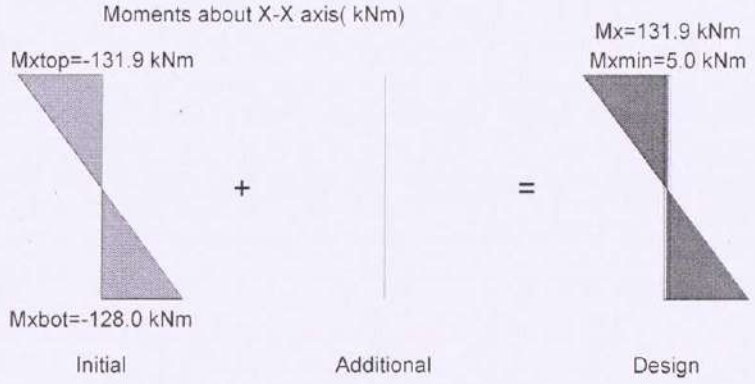
∴ Mi ≥ 0.4M2 = 1.6 kNm

Design ultimate load and moment:

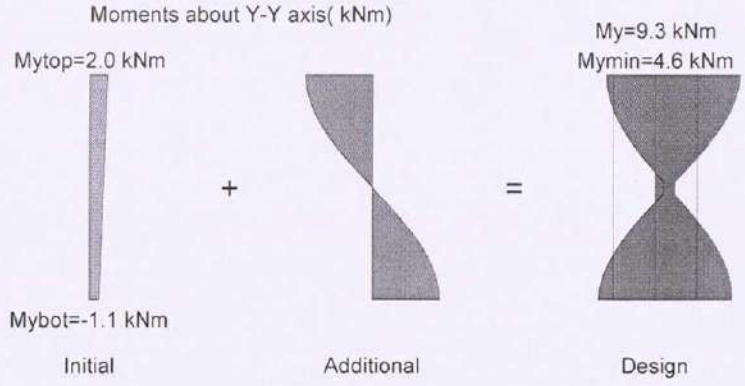
Design axial load:

P_u = 228.8 kN

Moments as a result of imperfections added about Design axis *5.8.9 2)*



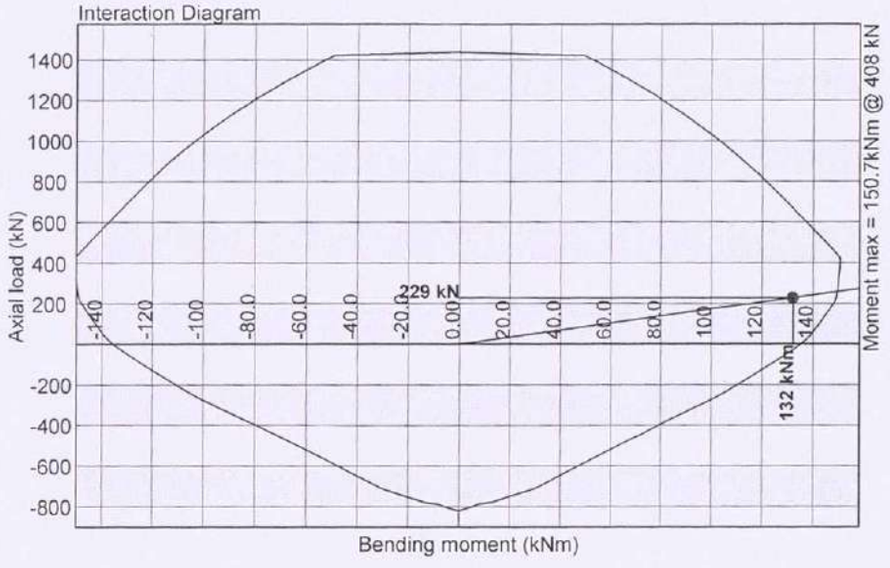
Moments as a result of imperfections added about Design axis *5.8.9 2)*



Design of column section for ULS:

The column is checked for applied moment about the design axis.
Through inspection: the critical section lies at the top end of the column.
The design axis for the critical load case 1 lies at an angle of 175.98° to the X-axis
The safety factor for the critical load case 1 is 1.14

For bending about the design axis:

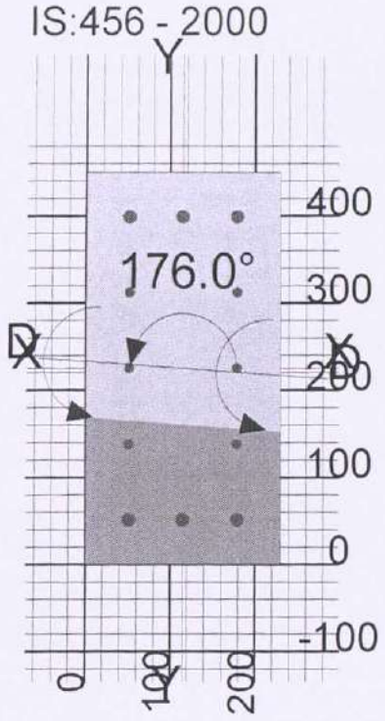


Moment distribution along the height of the column for bending about the design axis:

The final design moments were calculated as the vector sum of the X- and Y- moments of the critical load case. This also determined the design axis direction

At the top, Mx = 132.2 kNm
Near mid-height, Mx = 52.8 kNm
At the bottom, Mx = 128.3 kNm

Stresses at the top end of the column for the critical load case 1



Summary of design calculations:

Design table for critical load case:

Moments and Reinforcement for LC 1:627			
	Top	Middle	Bottom
Madd-x (kNm)	0.0	0.0	0.0
Madd-y (kNm)	-7.3	0.0	7.3
Mx (kNm)	-131.9	-52.7	-128.0
My (kNm)	9.3	1.6	-8.4
Mmin (kNm)	5.5	0.0	5.5
M-design (kNm)	132.2	52.8	128.3
Design axis (°)	175.98	178.25	3.75
Safety factor	1.14	2.64	1.18
Asc (mm^2)	1885	1885	1885
Percentage	1.82 %	1.82 %	1.82 %
AsNom (mm^2)	813	813	813
Critical load case: LC 1			

Design results for all load cases:

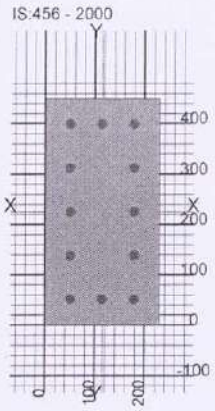
Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 1 627	X-X Y-Y	228.8	128.0 1.1	-131.9 2.0	-52.7 1.6	0.0 -7.3	Top	131.9 9.3	132.2	1.139
Load case 2 660	X-X Y-Y	272.6	6.3 10.2	-16.0 -13.7	-7.1 -5.5	0.0 0.0	Middle	16.0 22.4	9.0	5.108

Load case 1 (627) is critical.

COLUMN C2 - LEVEL 1

General column design by *PROKON*. (GenCol Ver W2 6.11 - 24 Apr 2014)

Design code : IS:456 - 2000



General design parameters:

Given:
- Lo = 3.200 m
- fck = 20 MPa
- fy = 500 MPa
- Ac = 99730 mm²

Assumptions:
(1) The general conditions of clause 25.1.1 are applicable.
(2) The specified design axial loads include the self-weight of the column.
(3) The design axial loads are taken constant over the height of the column.

Design approach:

The column is designed using an iterative procedure:
(1) An area of reinforcement is chosen.
(2) The column design charts are constructed.
(3) The corresponding slenderness moments are calculated.
(4) The design axis and design ultimate moment are determined .
(5) The design axial force and moment capacity is checked on the relevant design chart.
(6) The safety factor is calculated for this load case.
(7) The procedure is repeated for each load case.
(8) The critical load case is identified as the case yielding the lowest safety factor about the design axis

Through inspection:
Load case 4 (102) is critical.

Check column slenderness:

End fixity and bracing for bending about the Design axis:
At the top end: Condition 1 (fully fixed).
At the bottom end: Condition 1 (fully fixed).
The column is unbraced.

Effective length factor ß = 1.20

ANNEX E

Effective column height:

$$l_e = \beta \cdot L_o$$
$$= 1.2 \times 3.2$$
$$= 3.840 \text{ m}$$

Column slenderness about weakest axis:

$$m_{ax_s140l} = \frac{l_e}{h}$$
$$= \frac{3.84}{.23095}$$
$$= 16.627$$

Where h is an equivalent column depth derived from the radius of gyration*square root of 12

Minimum Moments for Design:

Check for mininum eccentricity: *25.4*

Check that the eccentricity exceeds the minimum in the plane of bending:

$$M_{min} = e_{min} \cdot N$$
$$= .02311 \times 1\ 642.7$$
$$= 37.963 \text{ kNm}$$

Check if the column is slender: *25.1.2*

le/h = 16.6 > 12

∴ The column is slender.

Initial moments:

The column is bent in double curvature about the X-X axis:

M1 = Smaller initial end moment = -2.6 kNm

M2 = Larger initial end moment = 3.5 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times -2.635 + 0.6 \times 3.458$$
$$= 1.021 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times 3.458$$
$$= 1.383 \text{ kNm}$$

∴ Mi ≥ 0.4M2 = 1.4 kNm

The column is bent in double curvature about the Y-Y axis:

M1 = Smaller initial end moment = -15.9 kNm

M2 = Larger initial end moment = 35.4 kNm

The initial moment near mid-height of the column :

$$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$$
$$= 0.4 \times 15.909 + 0.6 \times -35.45$$
$$= -14.9064 \text{ kNm}$$

$$M_{i2} = 0.4 \cdot M_2$$
$$= 0.4 \times -35.45$$
$$= -14.1800 \text{ kNm}$$

∴ Mi ≥ 0.4M2 = -14.9 kNm

Deflection induced moments: 39.7.1

Design ultimate capacity of section under axial load only:

$$P_{uc} = 0.45 \cdot f_{cu} \cdot A_c + 0.75 \cdot f_y \cdot A_{sc}$$
$$= 0.45 \times 20 \times 99.73 + 0.75 \times 500 \times 3.7699$$
$$= 2\,311.282 \text{ kN}$$

Maximum allowable stress and strain:

Allowable compression stress in steel

$$f_{sc} = 0.87 \cdot f_y$$
$$= 0.87 \times 500$$
$$= 435.000 \text{ MPa}$$

Allowable tensile stress in steel

$$f_{st} = 0.87 \cdot f_y$$
$$= 0.87 \times 500$$
$$= 435.000 \text{ MPa}$$

Allowable tensile strain in steel

$$e_y = \frac{f_{st}}{E_s}$$
$$= \frac{434.78}{210000}$$
$$= 0.0021$$

Allowable compressive strain in concrete

$$e_c = 0.0035$$

For bending about the weakest axis:

Weakest axis lies at an angle of -90.00° to the X-X axis

Overall dimension perpendicular to weakest axis h = 231mm

$$K = \frac{P_{uc} - P_u}{P_{uc} - P_b}$$
$$= \frac{2311 \times 10^3 - 1643 \times 10^3}{2311 \times 10^3 - 288099}$$
$$= 0.3302$$

Therefore:

$$M_{add} = \frac{P_u \cdot D}{2000} \cdot m_{ax_sl}^2 \cdot K$$

$$= \frac{1\,642.7 \times .23095}{2000} \times 16.627^2 \times .33047$$

$$= 17.330 \text{ kNm}$$

Where max_sl is the maximum slenderness ratio of the column as an equivalent rectangular column.

∴ Maddx = Madd*cos(-90.00°) = 0.0 kNm
∴ Maddy = Madd*sin(-90.00°) = 17.3 kNm

Design ultimate load and moment:

Design axial load:
P_u = 1642.7 kN

Moments as a result of imperfections added about Design axis 5.8.9 2)

For bending about the X-X axis, the maximum design moment is the greatest of:
(a) 39.7.1

$$M = M_2 + M_{add}$$

$$= 3.458 + 0$$

$$= 3.458 \text{ kNm}$$

(d) 39.7.1

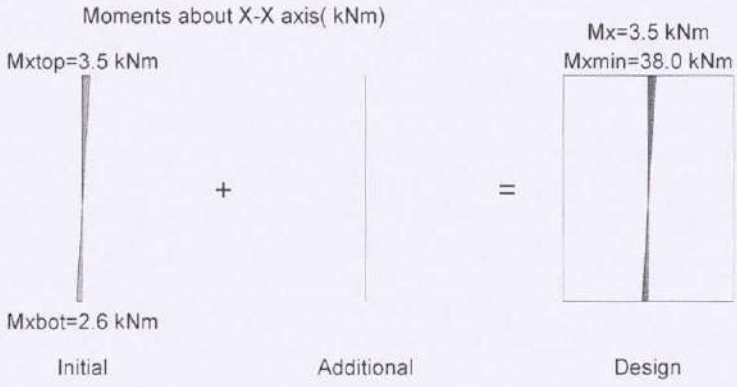
$$M = e_{minx} \cdot N$$

$$= .02311 \times 1\,642.7$$

$$= 37.963 \text{ kNm}$$

Thus 39.7.1

$$M = 38.0 \text{ kNm}$$



Moments as a result of imperfections added about Design axis 5.8.9 2)

For bending about the Y-Y axis, the maximum design moment is the greatest of:

(a) 39.7.1

$M = M_2 + M_{add}$

$= -35.45 + -17.258$

$= -52.7080$ kNm

(d) 39.7.1

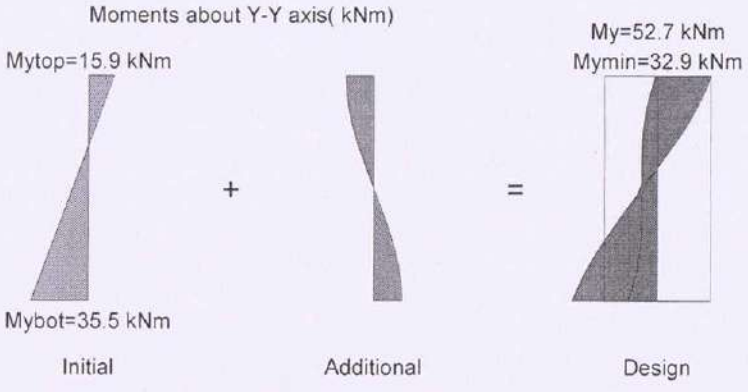
$M = e_{miny} \cdot N$

$= .02 \times 1\ 642.7$

$= 32.854$ kNm

Thus 39.7.1

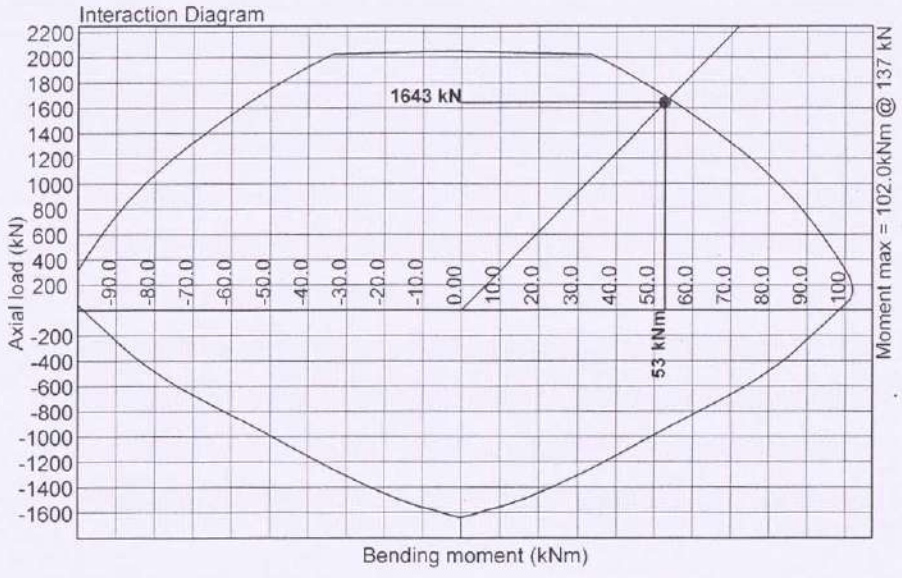
$M = 52.7$ kNm



Design of column section for ULS:

The column is checked for applied moment about the design axis.
Through inspection: the critical section lies at the bottom end of the column.
The design axis for the critical load case 4 lies at an angle of 267.14° to the X-axis
The safety factor for the critical load case 4 is 1.03

For bending about the design axis:

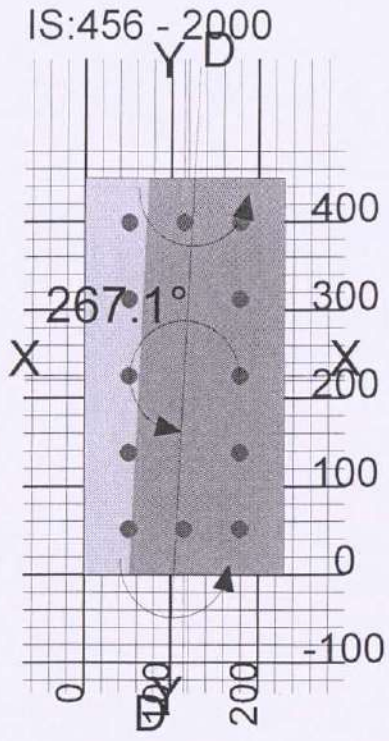


Moment distribution along the height of the column for bending about the design axis:

The final design moments were calculated as the vector sum of the X- and Y- moments of the critical load case. This also determined the design axis direction

At the top, Mx = 33.3 kNm
Near mid-height, Mx = 32.9 kNm
At the bottom, Mx = 52.8 kNm

Stresses at the bottom end of the column for the critical load case 4



Summary of design calculations:

Design table for critical load case:

Moments and Reinforcement for LC 4:102			
	Top	Middle	Bottom
Madd-x (kNm)	0.0	0.0	0.0
Madd-y (kNm)	-17.3	0.0	17.3
Mx (kNm)	3.5	1.4	2.6
My (kNm)	33.2	-14.9	52.7
Mmin (kNm)	33.4	0.0	33.4
M-design (kNm)	33.3	32.9	52.8
Design axis (°)	84.05	275.30	267.14
Safety factor	1.19	1.19	1.03
Asc (mm^2)	3770	3770	3770
Percentage	3.64 %	3.64 %	3.64 %
AsNom (mm^2)	798	798	798
Critical load case: LC 4			

Design results for all load cases:

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 1 94	X-X Y-Y	1650.2	6.5 11.3	18.8 -25.9	13.9 -11.0	0.0 -17.1	Bottom	18.8 43.1	47.0	1.129
Load case 2 96	X-X Y-Y	1638.2	-0.4 -1.8	9.6 6.9	5.6 3.5	0.0 0.0	Middle	9.6 24.3	32.8	1.258
Load case 3 101	X-X Y-Y	1688.6	3.2 -10.0	10.4 26.1	7.5 11.6	0.0 -16.5	Bottom	10.4 42.6	42.7	1.086

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 4 102	X-X Y-Y	1642.7	-2.6 15.9	3.5 -35.4	1.4 -14.9	0.0 -17.3	Bottom	3.5 52.7	52.8	1.026
Load case 5 105	X-X Y-Y	1721.9	-12.3 -5.8	16.3 20.5	6.5 10.0	0.0 0.0	Middle	16.3 36.5	34.4	1.197
Load case 6 111	X-X Y-Y	1671.7	0.7 8.6	4.7 -19.9	3.1 -8.5	0.0 0.0	Middle	4.7 36.7	33.4	1.207

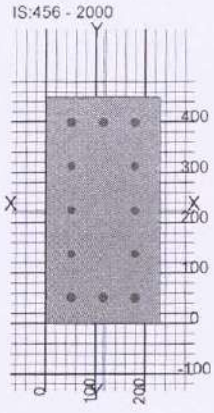
Load case 4 (102) is critical.

COLUMN C2 - LEVEL 2

C13

General column design by *PROKON*. (GenCol Ver W2.6.11 - 24 Apr 2014)

Design code : IS:456 - 2000



General design parameters:

Given:
- Lo = 3.200 m
- fck = 20 MPa
- fy = 500 MPa
- Ac = 100409 mm²

Assumptions:
(1) The general conditions of clause 25.1.1 are applicable.
(2) The specified design axial loads include the self-weight of the column.
(3) The design axial loads are taken constant over the height of the column.

Design approach:

The column is designed using the following procedure:
(1) The column design charts are constructed.
(2) The design axis and design ultimate moment are determined .
(3) The design axial force and moment capacity is checked on the relevant design chart.
(4) The procedure is repeated for each load case.
(5) The critical load case is identified as the case yielding the lowest safety factor about the design axis

Through inspection:
Load case 1 (196) is critical.

Check column slenderness:

End fixity and bracing for bending about the Design axis:
At the top end: Condition 1 (fully fixed).
At the bottom end: Condition 1 (fully fixed).
The column is unbraced.

Effective length factor ß = 1.20 *ANNEX E*

Effective column height:

$$l_e = \beta \cdot L_o$$
$$= 1.2 \times 3.2$$
$$= 3.840 \text{ m}$$

Column slenderness about weakest axis:

$$m_{ax_s140l} = \frac{l_e}{h}$$
$$= \frac{3.84}{.2309}$$
$$= 16.631$$

Where h is an equivalent column depth derived from the radius of gyration*square root of 12

Minimum Moments for Design:

Check for mininum eccentricity: *25.4*

Check that the eccentricity exceeds the minimum in the plane of bending:

$M_{min} = e_{min} \cdot N$

$= .02 \times 1\ 359.2$

$= 27.184$ kNm

Check if the column is slender: *25.1.2*

le/h = 16.6 > 12

∴ The column is short.

Initial moments:

The column is bent in double curvature about the X-X axis:

M1 = Smaller initial end moment = -7.5 kNm

M2 = Larger initial end moment = 13.0 kNm

The initial moment near mid-height of the column :

$M_i = 0.4 \cdot M1 + 0.6 \cdot M2$

$= 0.4 \times -7.525 + 0.6 \times 13.015$

$= 4.799$ kNm

$M_{i2} = 0.4 \cdot M2$

$= 0.4 \times 13.015$

$= 5.206$ kNm

∴ Mi ≥ 0.4M2 = 5.2 kNm

The column is bent in double curvature about the Y-Y axis:

M1 = Smaller initial end moment = -33.7 kNm

M2 = Larger initial end moment = 35.8 kNm

The initial moment near mid-height of the column :

$M_i = 0.4 \cdot M1 + 0.6 \cdot M2$

$= 0.4 \times -33.681 + 0.6 \times 35.845$

$= 8.035$ kNm

$M_{i2} = 0.4 \cdot M2$

$= 0.4 \times 35.845$

$= 14.338$ kNm

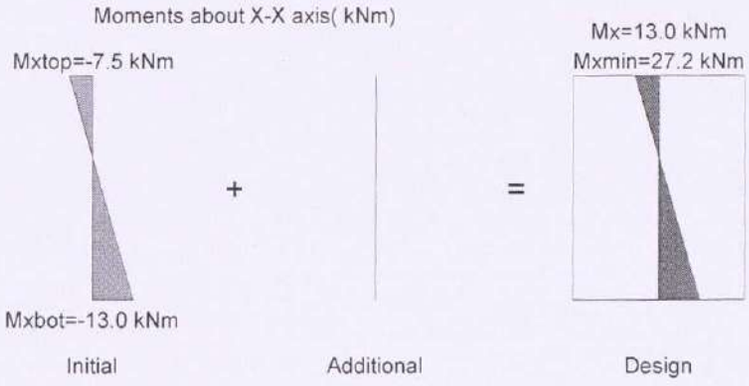
∴ Mi ≥ 0.4M2 = 14.3 kNm

Design ultimate load and moment:

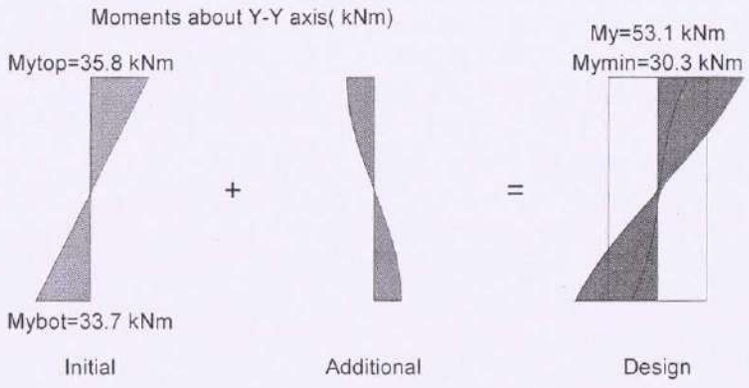
Design axial load:

P_u = 1359.2 kN

Moments as a result of imperfections added about Design axis *5.8.9 2)*



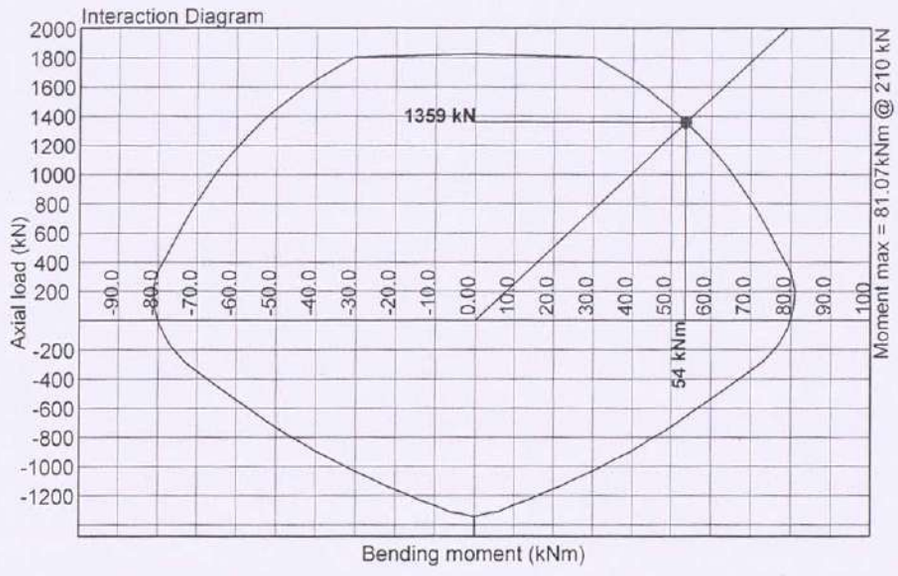
Moments as a result of imperfections added about Design axis *5.8.9 2)*



Design of column section for ULS:

The column is checked for applied moment about the design axis.
Through inspection: the critical section lies at the top end of the column.
The design axis for the critical load case 1 lies at an angle of 98.06° to the X-axis
The safety factor for the critical load case 1 is 1.01

For bending about the design axis:

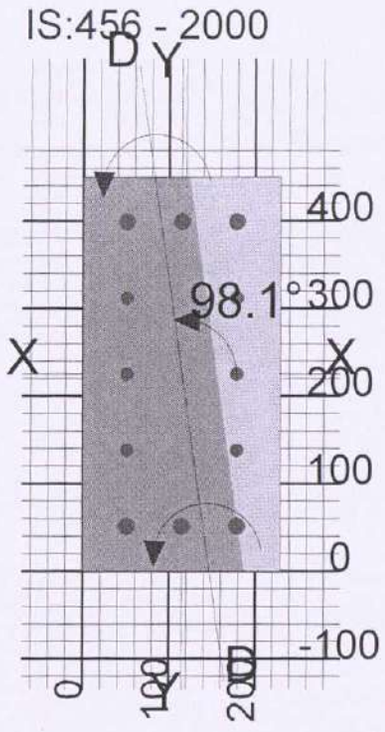


Moment distribution along the height of the column for bending about the design axis:

The final design moments were calculated as the vector sum of the X- and Y- moments of the critical load case. This also determined the design axis direction

At the top, Mx = 53.7 kNm
Near mid-height, Mx = 27.2 kNm
At the bottom, Mx = 52.6 kNm

Stresses at the top end of the column for the critical load case 1



Summary of design calculations:

Design table for critical load case:

Moments and Reinforcement for LC 1:196			
	Top	Middle	Bottom
Madd-x (kNm)	0.0	0.0	0.0
Madd-y (kNm)	-17.3	0.0	17.3
Mx (kNm)	-7.5	5.2	-13.0
My (kNm)	53.1	14.3	51.0
Mmin (kNm)	21.1	0.0	21.1
M-design (kNm)	53.7	27.2	52.6
Design axis (°)	98.06	70.04	284.33
Safety factor	1.01	1.33	1.04
Asc (mm²)	3091	3091	3091
Percentage	2.99 %	2.99 %	2.99 %
AsNom (mm²)	803	803	803
Critical load case: LC 1			

Design results for all load cases:

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 1 196	X-X Y-Y	1359.2	-7.5 -33.7	13.0 35.8	5.2 14.3	0.0 -17.3	Top	13.0 53.1	53.7	1.010
Load case 2 198	X-X Y-Y	1350.8	11.7 -0.5	-12.0 -3.2	-4.8 -2.2	0.0 0.0	Middle	12.0 20.6	27.0	1.361
Load case 3 203	X-X Y-Y	1394.3	-17.8 30.5	28.1 -34.8	11.2 -13.9	0.0 0.0	Middle	28.1 51.7	27.9	1.319

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 4 204	X-X Y-Y	1358.9	-56.0 7.0	65.0 -7.0	26.0 -2.8	0.0 0.0	Middle	65.0 24.3	27.2	1.353
Load case 5 207	X-X Y-Y	1413.2	-38.6 29.8	50.0 -31.6	20.0 -12.6	0.0 0.0	Middle	50.0 48.2	28.3	1.301
Load case 6 213	X-X Y-Y	1349.1	-4.4 5.7	10.1 -7.7	4.3 -3.1	0.0 0.0	Middle	10.1 25.1	27.0	1.363
Load case 7 298	X-X Y-Y	1068.2	-11.7 31.5	13.1 -31.7	5.3 -12.7	0.0 0.0	Middle	13.1 50.9	21.4	1.698
Load case 8 300	X-X Y-Y	1065.9	-10.1 1.0	10.4 -2.8	4.1 -1.3	0.0 0.0	Middle	10.4 22.0	21.3	1.725
Load case 9 305	X-X Y-Y	1094.5	-14.8 -25.6	15.4 26.3	6.2 10.5	0.0 0.0	Middle	15.4 45.4	21.9	1.680
Load case 10 306	X-X Y-Y	1071.3	55.0 8.0	-55.0 -8.0	-22.0 -3.2	0.0 0.0	Middle	55.0 27.2	22.2	1.716
Load case 11 309	X-X Y-Y	1106.9	-36.9 -28.1	37.5 28.3	15.0 11.3	0.0 0.0	Middle	37.5 47.4	22.1	1.661
Load case 12 315	X-X Y-Y	1054.7	12.0 -1.9	-12.5 2.6	-5.0 1.0	0.0 0.0	Middle	12.5 21.8	21.1	1.744

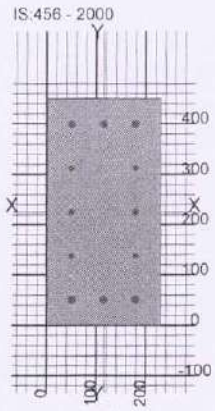
Load case 1 (196) is critical.

COLUMN C2 - LEVEL 3

C13

General column design by *PROKON*. (GenCol Ver W2.6.11 - 24 Apr 2014)

Design code : IS:456 - 2000



General design parameters:

Given:
- Lo = 3.200 m
- fck = 20 MPa
- fy = 500 MPa
- Ac = 101615 mm²

Assumptions:
(1) The general conditions of clause 25.1.1 are applicable.
(2) The specified design axial loads include the self-weight of the column.
(3) The design axial loads are taken constant over the height of the column.

Design approach:

The column is designed using the following procedure:
(1) The column design charts are constructed.
(2) The design axis and design ultimate moment are determined .
(3) The design axial force and moment capacity is checked on the relevant design chart.
(4) The procedure is repeated for each load case.
(5) The critical load case is identified as the case yielding the lowest safety factor about the design axis

Through inspection:
Load case 1 (400) is critical.

Check column slenderness:

End fixity and bracing for bending about the Design axis:
At the top end: Condition 1 (fully fixed).
At the bottom end: Condition 1 (fully fixed).
The column is unbraced.

Effective length factor ß = 1.20 *ANNEX E*

Effective column height:

$$l_e = \beta \cdot L_o$$
$$= 1.2 \times 3.2$$
$$= 3.840 \text{ m}$$

Column slenderness about weakest axis:

$$m_{ax_s140t} = \frac{l_e}{h}$$
$$= \frac{3.84}{.23057}$$
$$= 16.654$$

Where h is an equivalent column depth derived from the radius of gyration*square root of 12

Minimum Moments for Design:

Check for mininum eccentricity: *25.4*

Check that the eccentricity exceeds the minimum in the plane of bending:

$M_{min} = e_{min} \cdot N$

$= .02 \times 776.17$

$= 15.523$ kNm

Check if the column is slender: *25.1.2*

le/h = 16.7 > 12

∴ The column is short.

Initial moments:

The column is bent in double curvature about the X-X axis:

M1 = Smaller initial end moment = -11.9 kNm

M2 = Larger initial end moment = 13.5 kNm

The initial moment near mid-height of the column :

$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$

$= 0.4 \times -11.921 + 0.6 \times 13.466$

$= 3.311$ kNm

$M_{i2} = 0.4 \cdot M_2$

$= 0.4 \times 13.466$

$= 5.386$ kNm

∴ Mi ≥ 0.4M2 = 5.4 kNm

The column is bent in double curvature about the Y-Y axis:

M1 = Smaller initial end moment = -31.1 kNm

M2 = Larger initial end moment = 31.2 kNm

The initial moment near mid-height of the column :

$M_i = 0.4 \cdot M_1 + 0.6 \cdot M_2$

$= 0.4 \times -31.087 + 0.6 \times 31.187$

$= 6.277$ kNm

$M_{i2} = 0.4 \cdot M_2$

$= 0.4 \times 31.187$

$= 12.475$ kNm

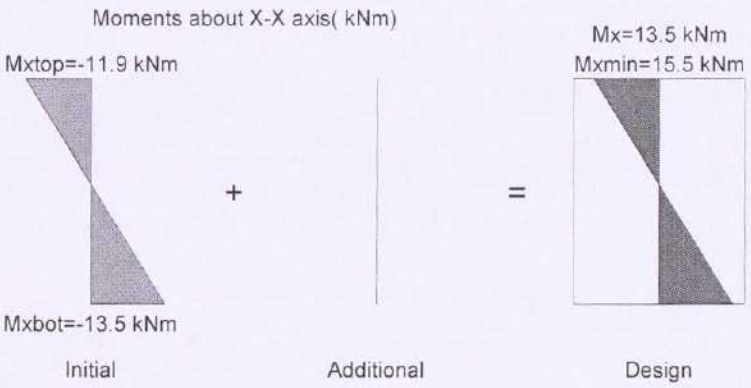
∴ Mi ≥ 0.4M2 = 12.5 kNm

Design ultimate load and moment:

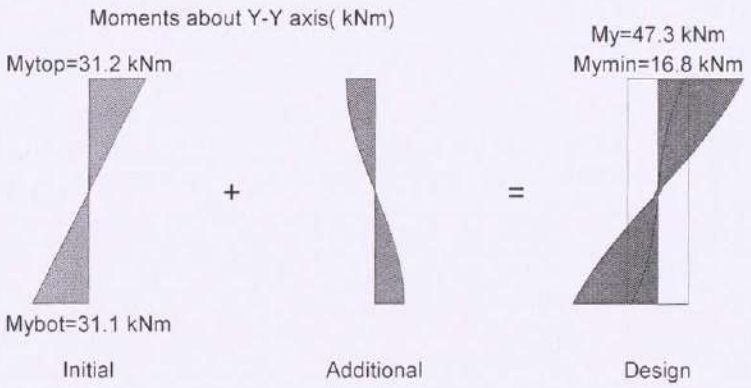
Design axial load:

P_u = 776.2 kN

Moments as a result of imperfections added about Design axis *5.8.9.2)*



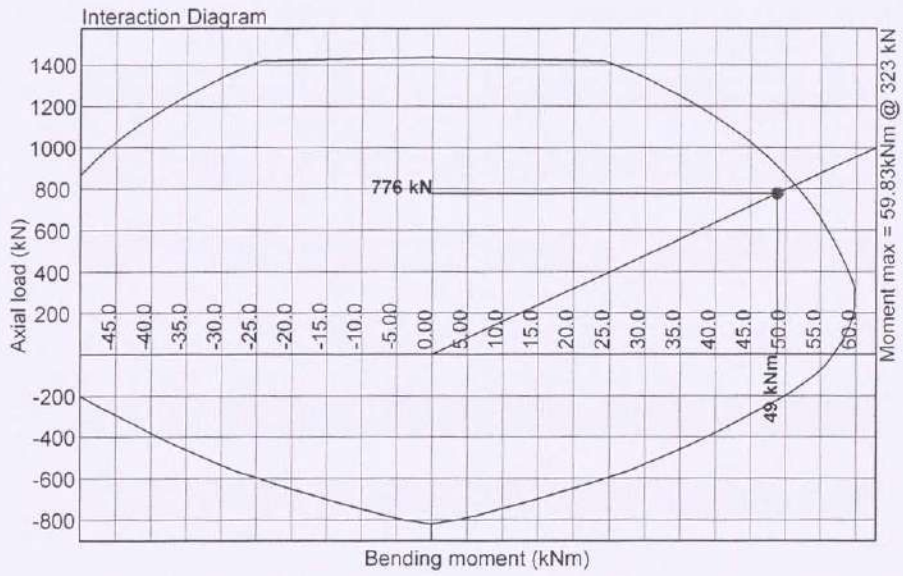
Moments as a result of imperfections added about Design axis *5.8.9.2)*



Design of column section for ULS:

The column is checked for applied moment about the design axis.
Through inspection: the critical section lies at the top end of the column.
The design axis for the critical load case 1 lies at an angle of 104.13° to the X-axis
The safety factor for the critical load case 1 is 1.06

For bending about the design axis:

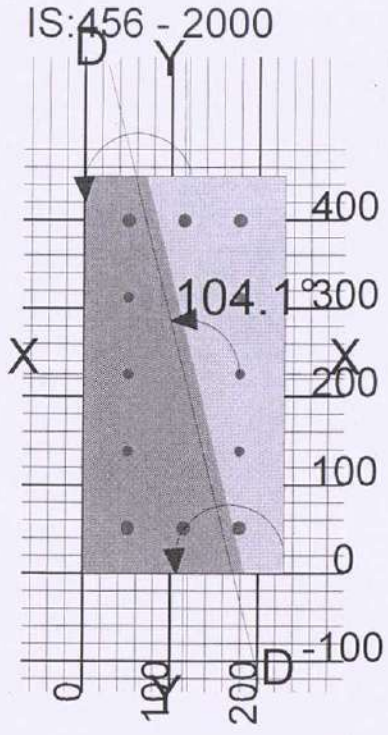


Moment distribution along the height of the column for bending about the design axis:

The final design moments were calculated as the vector sum of the X- and Y- moments of the critical load case. This also determined the design axis direction

At the top, Mx = 48.8 kNm
Near mid-height, Mx = 15.5 kNm
At the bottom, Mx = 49.1 kNm

Stresses at the top end of the column for the critical load case 1



Summary of design calculations:

Design table for critical load case:

Moments and Reinforcement for LC 1:400			
	Top	Middle	Bottom
Madd-x (kNm)	0.0	0.0	0.0
Madd-y (kNm)	-16.2	0.0	16.2
Mx (kNm)	-11.9	5.4	-13.5
My (kNm)	47.3	12.5	47.2
Mmin (kNm)	9.3	0.0	9.3
M-design (kNm)	48.8	15.5	49.1
Design axis (°)	104.13	66.65	285.91
Safety factor	1.06	1.83	1.07
Asc (mm²)	1885	1885	1885
Percentage	1.82 %	1.82 %	1.82 %
AsNom (mm²)	813	813	813
Critical load case: LC 1			

Design results for all load cases:

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 1 400	X-X Y-Y	776.2	-11.9 -31.1	13.5 31.2	5.4 12.5	0.0 -16.2	Top	13.5 47.3	48.8	1.064
Load case 2 402	X-X Y-Y	782.0	10.4 1.9	-10.4 -5.0	-4.2 -2.2	0.0 0.0	Middle	10.4 21.1	15.6	1.847
Load case 3 407	X-X Y-Y	794.5	-15.2 -26.3	17.8 26.4	7.1 10.6	0.0 0.0	Middle	17.8 42.6	15.9	1.818

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 4 408	X-X Y-Y	783.6	58.0 8.0	-58.0 -8.0	-23.2 -3.2	0.0 0.0	Middle	58.0 24.2	23.4	1.843
Load case 5 411	X-X Y-Y	801.2	-37.2 -28.1	39.9 28.1	16.0 11.3	0.0 0.0	Middle	39.9 44.3	19.5	1.803
Load case 6 417	X-X Y-Y	760.9	-11.7 0.4	11.8 -1.8	4.7 -0.9	0.0 0.0	Middle	11.8 17.9	15.2	1.898
Load case 7 502	X-X Y-Y	483.5	-11.4 30.0	12.7 -30.4	5.1 -12.1	0.0 0.0	Middle	12.7 43.9	13.2	2.724
Load case 8 504	X-X Y-Y	498.6	-10.9 0.5	11.1 -7.5	4.4 -4.3	0.0 0.0	Middle	11.1 21.3	10.0	2.897
Load case 9 509	X-X Y-Y	493.6	-16.4 24.7	19.9 -25.3	8.0 -10.1	0.0 0.0	Middle	19.9 39.0	12.9	2.863
Load case 10 510	X-X Y-Y	495.8	58.0 8.0	-58.0 -8.0	-23.2 -3.2	0.0 0.0	Middle	58.0 21.7	23.4	2.698
Load case 11 513	X-X Y-Y	496.4	-40.9 27.7	42.8 -28.0	17.1 -11.2	0.0 0.0	Middle	42.8 41.8	20.5	2.691
Load case 12 519	X-X Y-Y	467.4	11.6 0.7	-11.7 -4.4	-4.7 -2.3	0.0 0.0	Middle	11.7 17.6	9.3	3.091

Load case 1 (400) is critical.

Load case	Axis	Pu (kN)	M1 (kNm)	M2 (kNm)	Mi (kNm)	Ma (kNm)	Design	M (kNm)	M' (kNm)	Safety factor
Load case 4 631	X-X Y-Y	208.7	60.0 7.0	-78.0 -7.0	-31.2 -2.8	0.0 -6.7	Bottom	78.0 13.7	79.2	1.367
Load case 5 646	X-X Y-Y	172.2	11.8 4.3	-12.1 -9.1	-4.8 -3.8	0.0 0.0	Middle	12.1 14.6	6.1	6.874
Load case 6 652	X-X Y-Y	191.7	42.0 -29.8	-45.3 30.9	-18.1 12.4	0.0 0.0	Middle	45.3 37.0	21.9	3.651

Load case 4 (631) is critical.

DESIGN OF STAIRCASE

Project	RESIDENTIAL BUILDING (STILT + FIVE)	Design by	Date	Job No
Client	K.SUNDARAMOORTHY (MANAGING	MOHAN	02.07.2023	ATM ST-32
Design	DESIGN OF STAIRCASE -S.C.1			

Input Data r case No : S.C. 1

Enter the support condition		=	ONE END CONTINIC	
Width of stair	B	=	1500	mm
Riser	R	=	150	mm
Tread	T	=	300	mm
Effective span of stair	l	=	5500	mm
Depth of waist slab	D	=	225	mm
Clear Cover	d'	=	20	mm
Effective depth	d	=	199	mm
	F_{cu}	=	20	N/mm^2
	Fy	=	500	N/mm^2
	φ of bar	=	12	mm

LOADING

self-wt of waist		=	6.04	kN/m^2
self-wt of steps		=	1.50	kN/m^2
Floor finishes		=	1.00	kN/m^2
Live load		=	3.00	kN/m^2
Total load		=	11.54	kN/m^2
Factored load		=	**16.15**	kN/m^2
	Mu	=	40.72	kN.m
	$K= Mu/bd^2$	=	0.69	Mpa
	A_{st} Req	=	491	mm^2
	Pt	=	0.0016	%
	No. of Bars	=	4.3	Nos.
	spacing	=	345.8	mm c/c
provided steel		12	Y	125
	A_{st} Prov	=	904.8	mm^2
	pt	=	0.0027	%

Distribution steel

ProvideY10/240 as Distribution Steel Reinforcement

CHECK FOR DEFLECTION :

Actual Span / Effective depth Ratio		=	27.64
M/bd2		=	1.03
As per BS 8110 (Table 3.10)			
Design service stress	fs	=	181
Modification factor		=	1.83
Allowable Span /Effective depth Ratio		=	47.59

=====<<< Hence SAFE in Deflection >>>===

Project	RESIDENTIAL BUILDING (STILT + FIVE)	Design by	Date	Job No
Client	K.SUNDARAMOORTHY (MANAGING	MOHAN	02.07.2023	ATM ST-32
Design	DESIGN OF STAIRCASE -S.C.2			

Input Data r case No : S.C.2

Enter the support condition		=	ONE END CONTINIC	
Width of stair	B	=	1500	mm
Riser	R	=	150	mm
Tread	T	=	300	mm
Effective span of stair	l	=	6500	mm
Depth of waist slab	D	=	250	mm
Clear Cover	d'	=	20	mm
Effective depth	d	=	224	mm
	F_{cu}	=	20	N/mm^2
	Fy	=	500	N/mm^2
	φ of bar	=	12	mm

LOADING

self-wt of waist		=	6.71	kN/m^2
self-wt of steps		=	1.50	kN/m^2
Floor finishes		=	1.00	kN/m^2
Live load		=	3.00	kN/m^2
Total load		=	12.21	kN/m^2
Factored load		=	**17.09**	kN/m^2
	Mu	=	60.18	kN.m
	$K= Mu/bd^2$	=	0.80	Mpa
	A_{st} Req	=	649	mm^2
	Pt	=	0.0019	%
	No. of Bars	=	5.7	Nos.
	spacing	=	261.4	mm c/c
provided steel		12	Y	125
	A_{st} Prov	=	904.8	mm^2
	pt	=	0.0024	%

Distribution steel

ProvideY10/210 as Distribution Steel Reinforcement

CHECK FOR DEFLECTION :

Actual Span / Effective depth Ratio		=	29.02
M/bd2		=	1.20
As per BS 8110 (Table 3.10)			
Design service stress	fs	=	239
Modification factor		=	1.49
Allowable Span /Effective depth Ratio		=	38.86

=====<<< Hence SAFE in Deflection >>>===

Project	RESIDENTIAL BUILDING (STILT + FIVE)	Design by	Date	Job No
Client	K.SUNDARAMOORTHY (MANAGING	MOHAN	02.07.2023	ATM ST-32
Design	DESIGN OF STAIRCASE -S.C.3			

Input Data r case No : S.C. 3

Enter the support condition		=	CONTINIOUS	
Width of stair	B	=	1500	mm
Riser	R	=	150	mm
Tread	T	=	300	mm
Effective span of stair	l	=	7000	mm
Depth of waist slab	D	=	250	mm
Clear Cover	d'	=	20	mm
Effective depth	d	=	224	mm
	F_{cu}	=	20	N/mm^2
	Fy	=	500	N/mm^2
	φ of bar	=	12	mm

LOADING

self-wt of waist		=	6.71	kN/m^2
self-wt of steps		=	1.50	kN/m^2
Floor finishes		=	1.00	kN/m^2
Live load		=	3.00	kN/m^2
Total load		=	12.21	kN/m^2
Factored load		=	**17.09**	kN/m^2
	Mu	=	69.79	kN.m
	$K= Mu/bd^2$	=	0.93	Mpa
	A_{st} Req	=	759	mm^2
	Pt	=	0.0023	%
	No. of Bars	=	6.7	Nos.
	spacing	=	223.5	mm c/c
provided steel		12	Y	125
	A_{st} Prov	=	904.8	mm^2
	pt	=	0.0024	%

Distribution steel

ProvideY10/210 as Distribution Steel Reinforcement

CHECK FOR DEFLECTION :

Actual Span / Effective depth Ratio		=	31.25
M/bd2		=	1.39
As per BS 8110 (Table 3.10)			
Design service stress	fs	=	280
Modification factor		=	1.27
Allowable Span /Effective depth Ratio		=	32.96

=====<<< Hence SAFE in Deflection >>>===

DESIGN OF FOOTING

Project	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 4	Design by	Page
Client	M/s AADHAVAN CONSTRUCTIONS, K.SUNDARAMO	BOOPATHY	-
Design	DESIGN OF FOOTING OF G+5 BUILDING	Checked	Job No
Consultant	ATM ASSOCIATES	MOHAN	ATM/2023/32

Given Data: Footing ID = **F1**

Breadth of column/pedestal w.r.to footing	B	=	**230**	mm
Depth of column/pedestal w.r.to footing	D	=	**600**	mm
Height of column from foundation top to plinth beam	H	=	**1.5**	m
Compressive strength of concrete,	Fck	=	**20**	N/mm^2
Grade of steel	Fy	=	**500**	N/mm^2
Clear cover provided		=	**50**	mm
Safe bearing Capacity of Soil	SBC	=	**250**	kN/m^2

Loading Details.: - SERVICE LOAD

Axial Load (Support reaction - service load)	Px	=	**1240**	kN
Moment abt Mx (Service load)	Mx	=	**0**	kN/m^2
Moment abt My (Service load)	My	=	**0**	kN/m^2
Horizontal force from X direction (Service load)	Hx	=	**0**	kN
Horizontal force from Y direction (Service load)	Hy	=	**0**	kN

Step 1:

Calculations:

Self weight of the footing	Self wt	=	**79**	kN
Total load (Axial + SW)	**P**	=	**1319.35**	kN

Step 2:

Area of the footing required

Total load / SBC	A	=	**5.28**	m^2
Equal spacing in both direction as 'x'	x req	=	945	mm
	X pro	=	985	mm

Size of Footing	Required	L	=	2.57 m	
		B	=	2.20 m	
	Provided	**B**	=	**2.30** m	7.544
		L	=	**2.30** m	7.544

Net upward pressure **p** **249.4** kN/m^2

< SBC Hence safe

Step 3:

Bending Moment calculation:

Moment along per m strip **Mu**(Long) = 181.48 kN.m

Depth required

d reqd	=	512.85	mm
D prov	=	600	mm
d eff	=	542	mm
Mu/Bd2	=	0.618	

Step 4:

Steel Ast calculation:

Ast required	=	799	mm^2
Select bar dia	=	16	mm
Spacing Required	=	252	mm c/c
Spacing Provided	=	**125**	mm c/c
Ast provided	=	1608	mm^2

Provide Y16/125 as BOTTOM reinforcement in Both X & Y directions

Step 5:

Check For Shear:

1. One way shear :

From Critical Xn for One Way Shear	Vu	=	165.73	KN
	ζv	=	0.31	N/mm^2
	pt	=	0.297	%
	ζc	=	0.386	N/mm^2
	ζc max	=	3.578	N/mm^2

ζv < ζc

Hence footing is safe in one way shear

2. Two way shear :

Critical distance - 1.5d from the face of the column		=	813	mm
From Critical Xn for Two Way Shear	Vu	=	1262.96	KN
	ζv	=	0.61	N/mm^2
ζc= k*0.28*sqrt (fck)	ζc	=	1	N/mm^2
	ζc max	=	3.578	N/mm^2

ζv < ζc

Hence footing is safe in Two-way shear

Project	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 4	Design by	Page
Client	M/s AADHAVAN CONSTRUCTIONS, K.SUNDARAMO	BOOPATHY	-
Design	DESIGN OF FOOTING OF G+5 BUILDING	Checked	Job No
Consultant	ATM ASSOCIATES	MOHAN	ATM/2023/32

Given Data: Footing ID = **F2**

Breadth of column/pedestal w.r.to footing	B	=	**230**	mm
Depth of column/pedestal w.r.to footing	D	=	**530**	mm
Height of column from foundation top to plinth beam	H	=	**1.5**	m
Compressive strength of concrete,	Fck	=	**20**	N/mm^2
Grade of steel	Fy	=	**500**	N/mm^2
Clear cover provided		=	**50**	mm
Safe bearing Capacity of Soil	SBC	=	**250**	kN/m^2

Loading Details.: - SERVICE LOAD

Axial Load (Support reaction - service load)	Px	=	**980**	kN
Moment abt Mx (Service load)	Mx	=	**0**	kN/m^2
Moment abt My (Service load)	My	=	**0**	kN/m^2
Horizontal force from X direction (Service load)	Hx	=	**0**	kN
Horizontal force from Y direction (Service load)	Hy	=	**0**	kN

Step 1:

Calculations:

Self weight of the footing	Self wt	=	**56**	kN
Total load (Axial + SW)	**P**	=	**1035.683**	kN

Step 2:

Area of the footing required

Total load / SBC	A	=	**4.14**	m^2
Equal spacing in both direction as 'x'	x req	=	830	mm
	X pro	=	840	mm

Size of Footing	Required	L	=	2.21 m	
		B	=	1.91 m	
	Provided	**B**	=	**2.05** m	6.724
		L	=	**2.05** m	6.724

Net upward pressure **p** **246.44** kN/m^2

< SBC Hence safe

Step 3:

Bending Moment calculation:

Moment along per m strip **Mu**(Long) = 130.42 kN.m

Depth required

	d reqd	=	434.75 mm
	D prov	=	530 mm
	d eff	=	472 mm
	Mu/Bd2	=	0.585

Step 4:

Steel Ast calculation:

	Ast required	=	658 mm^2
	Select bar dia	=	16 mm
	Spacing Required	=	305 mm c/c
	Spacing Provided	=	**150** mm c/c
	Ast provided	=	1340 mm^2

Provide Y16/150 as BOTTOM reinforcement in Both X & Y directions

Step 5:

Check For Shear:

1. One way shear :

From Critical Xn for One Way Shear	Vu	=	136.03 KN
	ζv	=	0.29 N/mm^2
	pt	=	0.284 %
	ζc	=	0.379 N/mm^2
	ζc max	=	3.578 N/mm^2
		ζv < ζc	

Hence footing is safe in one way shear

2. Two way shear :

Critical distance - 1.5d from the face of the column		=	708 mm
From Critical Xn for Two Way Shear	Vu	=	923.60 KN
	ζv	=	0.57 N/mm^2
ζc= k*0.28*sqrt (fck)	ζc	=	1 N/mm^2
	ζc max	=	3.578 N/mm^2
	ζv	< **ζc**	

Hence footing is safe in Two-way shear

Project	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 4	Design by	Page
Client	M/s AADHAVAN CONSTRUCTIONS, K.SUNDARAMO	BOOPATHY	-
Design	DESIGN OF FOOTING OF G+5 BUILDING	Checked	Job No
Consultant	ATM ASSOCIATES	MOHAN	ATM/2023/32

Given Data: Footing ID = **F3**

Breadth of column/pedestal w.r.to footing	B	=	**230**	mm
Depth of column/pedestal w.r.to footing	D	=	**530**	mm
Height of column from foundation top to plinth beam	H	=	**1.5**	m
Compressive strength of concrete,	Fck	=	**20**	N/mm^2
Grade of steel	Fy	=	**500**	N/mm^2
Clear cover provided		=	**50**	mm
Safe bearing Capacity of Soil	SBC	=	**250**	kN/m^2

Loading Details.: - SERVICE LOAD

Axial Load (Support reaction - service load)	Px	=	**875**	kN
Moment abt Mx (Service load)	Mx	=	**0**	kN/m^2
Moment abt My (Service load)	My	=	**0**	kN/m^2
Horizontal force from X direction (Service load)	Hx	=	**0**	kN
Horizontal force from Y direction (Service load)	Hy	=	**0**	kN

Step 1:

Calculations:

Self weight of the footing	Self wt	=	**51**	kN
Total load (Axial + SW)	**P**	=	**926.4219**	kN

Step 2:

Area of the footing required

Total load / SBC	A	=	**3.71**	m^2
Equal spacing in both direction as ' x'	x req	=	775	mm
	X pro	=	800	mm

Size of Footing	Required	L	=	2.13 m	
		B	=	1.83 m	
	Provided	**B**	=	**1.97** m	6.4616
		L	=	**1.97** m	6.4616

Net upward pressure **p** **238.71** **kN/m^2**

< SBC Hence safe

Step 3:

Bending Moment calculation:

Moment along per m strip **Mu**(Long) = 114.58 kN.m

Depth required

d reqd	=	407.50	mm
D prov	=	530	mm
d eff	=	474	mm
Mu/Bd2	=	0.510	

Step 4:

Steel Ast calculation:

Ast required	=	573	mm^2
Select bar dia	=	12	mm
Spacing Required	=	197	mm c/c
Spacing Provided	=	**125**	mm c/c
Ast provided	=	904	mm^2

Provide Y12/125 as BOTTOM reinforcement in Both X & Y directions

Step 5:

Check For Shear:

1. One way shear :

From Critical Xn for One Way Shear Vu	=	116.73	KN
ζv	=	0.25	N/mm^2
pt	=	0.191	%
ζc	=	0.320	N/mm^2
ζc max	=	3.578	N/mm^2
	ζv < ζc		

Hence footing is safe in one way shear

2. Two way shear :

Critical distance - 1.5d from the face of the column	=	711	mm
From Critical Xn for Two Way Shear Vu	=	778.04	KN
ζv	=	0.48	N/mm^2
ζc= k*0.28*sqrt (fck) ζc	=	1	N/mm^2
ζc max	=	3.578	N/mm^2
ζv	**< ζc**		

Hence footing is safe in Two-way shear

Project	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 4	Design by	Page
Client	M/s AADHAVAN CONSTRUCTIONS, K.SUNDARAMO	BOOPATHY	-
Design	DESIGN OF FOOTING OF G+5 BUILDING	Checked	Job No
Consultant	ATM ASSOCIATES	MOHAN	ATM/2023/32

Given Data: Footing ID = **F4**

Breadth of column/pedestal w.r.to footing	B	=	**230**	mm
Depth of column/pedestal w.r.to footing	D	=	**450**	mm
Height of column from foundation top to plinth beam	H	=	**1.5**	m
Compressive strength of concrete,	Fck	=	**20**	N/mm^2
Grade of steel	Fy	=	**500**	N/mm^2
Clear cover provided		=	**50**	mm
Safe bearing Capacity of Soil	SBC	=	**250**	kN/m^2

Loading Details.: - SERVICE LOAD

Axial Load (Support reaction - service load)	Px	=	**650**	kN
Moment abt Mx (Service load)	Mx	=	**0**	kN/m^2
Moment abt My (Service load)	My	=	**0**	kN/m^2
Horizontal force from X direction (Service load)	Hx	=	**0**	kN
Horizontal force from Y direction (Service load)	Hy	=	**0**	kN

Step 1:

Calculations:

Self weight of the footing	Self wt	=	**37**	kN
Total load (Axial + SW)	**P**	=	**686.8561**	kN

Step 2:

Area of the footing required

Total load / SBC	A	=	**2.75**	m^2
Equal spacing in both direction as 'x'	x req	=	661	mm
	X pro	=	675	mm

Size of Footing	Required	L	=	1.80 m	
		B	=	1.58 m	
	Provided	**B**	=	**1.81** m	5.9368
		L	=	**1.81** m	5.9368

Net upward pressure **p** **209.66** kN/m^2

< SBC Hence safe

Step 3:

Bending Moment calculation:

Moment along per m strip **Mu**(Long) = 71.64 kN.m

Depth required

d reqd	=	322.23	mm
D prov	=	**450**	mm
d eff	=	394	mm
Mu/Bd2	=	0.462	

Step 4:

Steel Ast calculation:

Ast required	=	430	mm^2
Select bar dia	=	12	mm
Spacing Required	=	263	mm c/c
Spacing Provided	=	**150**	mm c/c
Ast provided	=	754	mm^2

Provide Y12/150 as BOTTOM reinforcement in Both X & Y directions

Step 5:

Check For Shear:

1. One way shear :

From Critical Xn for One Way Shear	Vu	=	88.37	KN
	ζv	=	0.22	N/mm^2
	pt	=	0.191	%
	ζc	=	0.320	N/mm^2
	ζc max	=	3.578	N/mm^2
		ζv < ζc		

Hence footing is safe in one way shear

2. Two way shear :

Critical distance - 1.5d from the face of the column		=	591	mm
From Critical Xn for Two Way Shear	Vu	=	568.63	KN
	ζv	=	0.49	N/mm^2
ζc= k*0.28*sqrt (fck)	ζc	=	1	N/mm^2
	ζc max	=	3.578	N/mm^2
	ζv	< **ζc**		

Hence footing is safe in Two-way shear

Project	RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 4	Design by	Page
Client	M/s AADHAVAN CONSTRUCTIONS. K.SUNDARAMO	BOOPATHY	-
Design	DESIGN OF FOOTING OF G+5 BUILDING	Checked	Job No
Consultant	ATM ASSOCIATES	MOHAN	ATM/2023/32

Given Data: Footing ID = **F6**

Breadth of column/pedestal w.r.to footing	B	=	**230**	mm
Depth of column/pedestal w.r.to footing	D	=	**380**	mm
Height of column from foundation top to plinth beam	H	=	**1.5**	m
Compressive strength of concrete,	Fck	=	**20**	N/mm^2
Grade of steel	Fy	=	**500**	N/mm^2
Clear cover provided		=	**50**	mm
Safe bearing Capacity of Soil	SBC	=	**250**	kN/m^2

Loading Details.: - SERVICE LOAD

Axial Load (Support reaction - service load)	Px	=	**610**	kN
Moment abt Mx (Service load)	Mx	=	**0**	kN/m^2
Moment abt My (Service load)	My	=	**0**	kN/m^2
Horizontal force from X direction (Service load)	Hx	=	**0**	kN
Horizontal force from Y direction (Service load)	Hy	=	**0**	kN

Step 1:

Calculations:

Self weight of the footing	Self wt	=	**30**	kN
Total load (Axial + SW)	**P**	=	**639.5245**	kN

Step 2:

Area of the footing required

Total load / SBC	A	=	**2.56**	m^2
Equal spacing in both direction as 'x'	x req	=	648	mm
	X pro	=	675	mm

Size of Footing	Required	L	=	1.73 m	
		B	=	1.58 m	
	Provided	**B**	=	**1.62** m	5.3136
		L	=	**1.62** m	5.3136

Net upward pressure **p** **243.68** **kN/m^2**

< SBC Hence safe

Step 3:

Bending Moment calculation:

Moment along per m strip **Mu**(Long) = 83.27 kN.m

Depth required

d reqd	=	347.39	mm
D prov	=	**450**	mm
d eff	=	394	mm
Mu/Bd2	=	0.536	

Step 4:

Steel Ast calculation:

Ast required	=	502	mm^2
Select bar dia	=	12	mm
Spacing Required	=	225	mm c/c
Spacing Provided	=	**150**	mm c/c
Ast provided	=	754	mm^2

Provide Y12/150 as BOTTOM reinforcement in Both X & Y directions

Step 5:

Check For Shear:

1. One way shear :

From Critical Xn for One Way Shear	Vu	=	102.71	KN
	ζv	=	0.26	N/mm^2
	pt	=	0.191	%
	ζc	=	0.320	N/mm^2
	ζc max	=	3.578	N/mm^2
		ζv < ζc		

Hence footing is safe in one way shear

2. Two way shear :

Critical distance - 1.5d from the face of the column		=	591	mm
From Critical Xn for Two Way Shear	Vu	=	448.27	KN
	ζv	=	0.41	N/mm^2
ζc= k*0.28*sqrt (fck)	ζc	=	1	N/mm^2
	ζc max	=	3.578	N/mm^2
	ζv	< **ζc**		

Hence footing is safe in Two-way shear

SOIL REPORT

KARPAGAM
ACADEMY OF HIGHER EDUCATION
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(Established Under Section 3 of UGC Act, 1956)

KARPAGAM ACADEMY OF HIGHER EDUCATION

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(Accredited with A+ Grade by NAAC in the Second Cycle)
Pollachi Main Road, Eachanari Post, Coimbatore - 641 021, Tamil Nadu, India.
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SOIL INVESTIGATION REPORT

Client : Aadhavan Construction

Place : S.F. No. 415/11, Kothai Nagar, Plot No. 66,67,70,71, Erode road, Karur.

Date : 23.06.2023

DEPARTMENT OF CIVIL ENGINEERING
KARPAGAM ACADEMY OF HIGHER EDUCATION
Coimbatore - 641021

SOIL INVESTIGATION REPORT

1. GENERAL

This report presents the results of the Geotechnical investigation for proposed Construction of Residential building in S.F.No.415/11, kothai nagar, Plot No 66, 67, 70, 71, in Karur District. A team of experts from the Department of Civil Engineering, Karpagam Academy of Higher Education visited the site on 20.06.2023 and conducted the detailed site investigation and exploration at the site.

2. FIELD INVESTIGATION

After examining the test pit, it was decided to conduct standard Penetration Test (SPT) to assess the bearing capacity in the location. The ultimate bearing capacity of footing on granular soils can be determined with the help of standard penetration resistance value, 'N'. These tests were carried out manually by dropping the hammer of 63.5kg from 750mm height and observed the number of blows for the penetration of 15cm, 30cm and 45cm, the samples collected through the SPT sampler were packed in polythene bags to retain the natural moisture content. The allowable bearing pressure (q_{all} or q_{safe}) of the foundation system is generally determined based on the shear failure and settlement criteria. The SPT N Value is observed.

2.1 Stratification

The trail pits were advanced to a depth of 2m at three locations at the site. Soil Samples were collected for conducting laboratory test. The location of the trail pits and the layout of the site Shown in **Annexure-A**

Location 1, 2 & 3

It can be seen that almost typical soil stratum in three pit for a depth of about 1.2-1.4m of clay soil, followed by 0.5-0.6m with Soft disintegrated rock and 1.4-1.5m of Random rubble masonry of existing structure were observed in Pit 1 only.

3. BEARING CAPACITY ANALYSIS

The allowable bearing capacity is worked out based on the corrected N value, taking into consideration shear failure criterion and settlement criterion.

3.1 Bearing pressure corresponding to shear failure

The net allowable bearing capacity Q_{ns}(kN/m^2), can be obtained by applying a factor of safety of 3.0.

Pit 1

For Square footing,

$$Qns = 0.11.N^2B.R_{w1} + 0.33\,(100 + N^2).D_f.R_{w2}$$

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Where,

N= SPT Value

D_f = Depth of footing

B=Minimum size of the foundation (taken as 2.0m)

R_{w1}&R_{w2}= Water table correction factor

3.2 Bearing pressure corresponding to Settlement Criteria

The net allowable bearing capacity Q_{ns} (kN/m²), corresponding to a settlement of 25mm is given by,

Pit 1

$$Q = 1.4\,(N-3).\left(\frac{B+0.3}{2\times B}\right)^2 S.R_d.Rw1$$

Where,

N= SPT Value

B= Width of footing (m)

S= Settlement (mm)

R_d = Depth Correction factor, $\left(1+\frac{D_f}{B}\right) \le 2$

Representative soil samples collected from the test pit at the test level were analyzed in the geotechnical Engineering laboratory for its particle size distribution, Plasticity characteristics and soil classification.

Table 1: Test Results

Description	Pit 1	Pit 2	Pit 3
Specific Gravity	2.72	2.56	2.67
Gravel	14%	16%	12%
Sand	78%	77%	83%
Silt & Clay	8%	7%	5%
Plastic/Non-Plastic	Non – Plastic		
Soil Classification	SM		
Angle of internal friction	27		
SBC	250kN/m²		

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* This certificate is issued for test conducted on samples tendered only.
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Mail.id: civil.hod@kahedu.edu.in Phone No: 9442130186

5. REFERENCES

1. Bowles, J. E. (1996), Foundation Analysis and Design (5th Edition), McGraw Hill, New York.
2. IS: 1489 – 1970 (Reaffirmed 2002) *Classification and Identification of Soils for General Engineering Purpose.*
3. IS: 6403 – 1981 (Reaffirmed 2002), *Indian Standard* Code of Practice for Determination of Breaking Capacity of Shallow Foundations.
4. IS: 2131 – 1981 (Reaffirmed 1997), *Indian Standard* Method for Standard Penetration Test for soils.
5. IS 1904 – 1948 Code of practice for design and construction of soil in foundation: General requirements
6. GopalRanjan and A. S. R. Rao (2007), Basic and Applied Soil Mechanics, New Age International.

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4. CONCLUSIONS AND RECOMMENDATIONS

Based on analysis of subsoil conditions, field test and computation of bearing capacity as above, following conclusion are drawn and recommendation made:

- Analysis of the subsoil data and calculation of safe bearing capacity has been done based on the obtained soil profile by SPT test.
- The scope of the soil investigation is to locate the depth where refusal stratum is encountered (N- Value >50)
- Refusal stratum found at a depth of 2m from the existing ground level in Pit.
- The soil is course and cohesive in nature.
- The depth of foundation shall be taken as 2m from ground level so as to rest the foundation.
- The allowable bearing capacity shall be taken as 250kN/m^2(or) 25ton/m^{2}in the foundation design.
- Any deviation if observed during execution other than that available in this report may be brought to the notice for further suggestions.

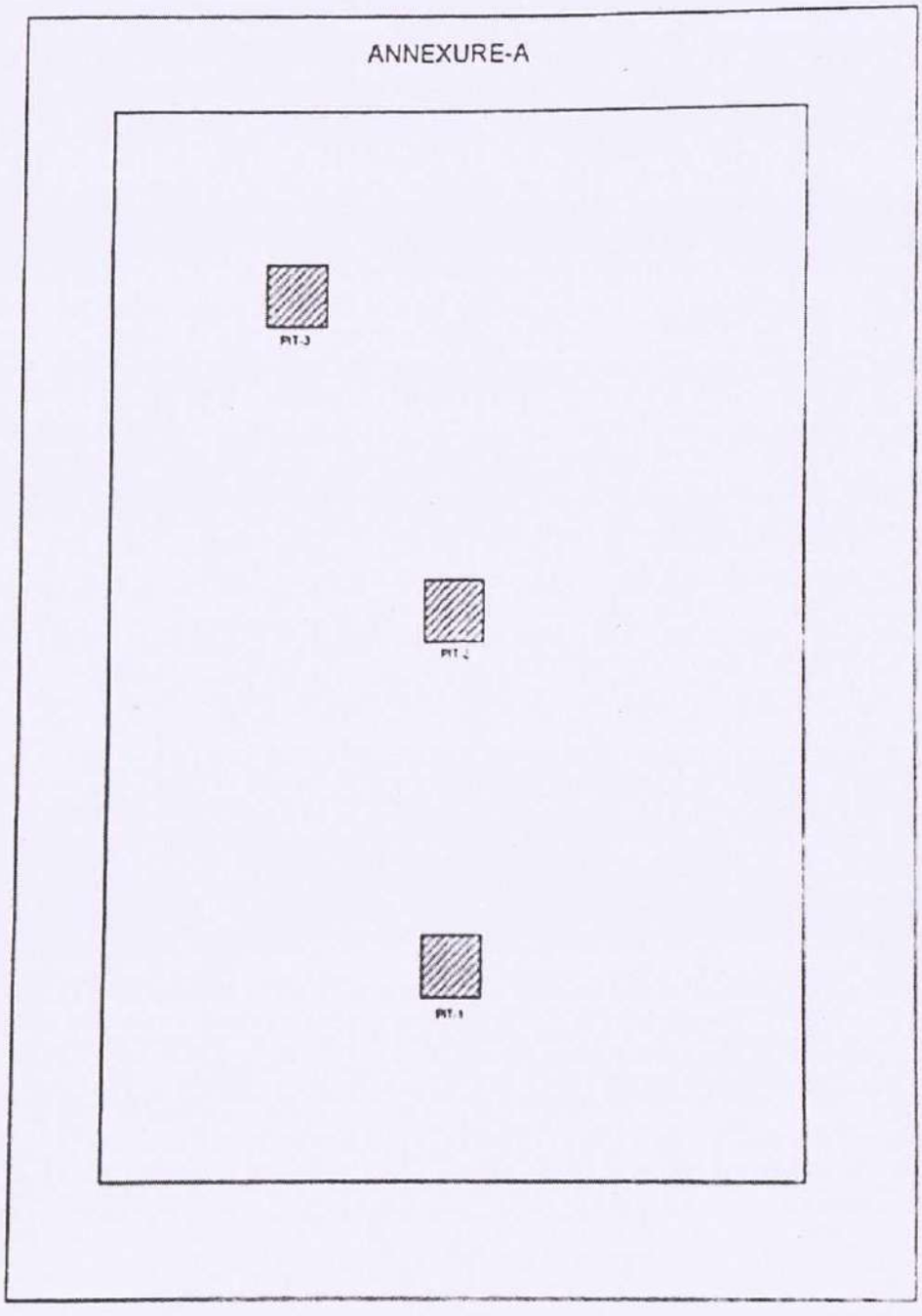
Technician

Staff In-Charge
Assistant Professor
Department of Civil Engineering
Faculty of Engineering
Karpagam Academy of Higher Education
Coimbatore – 641 021, Tamil Nadu, India.

Geotechnical Engineer
Dr.M. NATARAJAN, M.Sc, Ph.D,
Geo Technical Engineer
Reg.No.LPA/GTE/19/06/005
No.51 Sivaji Colony (East Extn)
Velandipalayam(PO),
CBE - 25 Ph. 98430 18763

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ANNEXURE-A



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COIMBATORE LOCAL PLANNING AUTHORITY

Corporation Complex, Sivanandha Colony, Coimbatore-641012
Phone : 0422-2492700, E-mail: clpams@gmail.com

PROFESSIONAL REGISTRATION CERTIFICATE

This is to Certify that the Thiru. **N.BALASUNDARAM** has enrolled as **Construction Engineer (CE)** with Coimbatore Local Planning Authority (CLPA) who has the qualification of **Ph.D (Civil Engineering)** and experience in the relevant field for **30 Years**.

He has been given the Registration No. **Coimbatore LPA/CE/19/06/052** on **24.06.2019**. He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. Dated. 04.02.2019.

This Registration is valid upto **23.06.2024**.



Member Secretary, (I/C).,
Coimbatore Local Planning Authority
Coimbatore - 641012.

COIMBATORE LOCAL PLANNING AUTHORITY

Corporation Complex, Sivanandha Colony, Coimbatore-641012

Phone : 0422-2492700, E-mail: clpams@gmail.com

PROFESSIONAL REGISTRATION CERTIFICATE

This is to Certify that the Thiru. **M.NATARAJAN** has enrolled as **Geo-Technical Engineer (GTE)** with Coimbatore Local Planning Authority (CLPA) who has the qualification of **M.Sc(Geology).,Ph.D.,** and experience in the relevant field for **20 Years**.

He has been given the Registration No. **Coimbatore LPA/GTE/19/06/005** on **24.06.2019**. He shall be required to comply with the duties and responsibilities prescribed by the Government of Tamil Nadu in Part V, "Registration of Professionals", Tamil Nadu Combined Development and Building Rules, 2019 approved vide G.O.(Ms) No.18 MAWS (MA1) Dept. Dated. 04.02.2019.

This Registration is valid upto **23.06.2024**.



Member Secretary, (I/C).,
Coimbatore Local Planning Authority
Coimbatore - 641012.

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
(Accredited with A+ Grade by NAAC in the Second Cycle)
Pollachi Main Road, Eachanari Post, Coimbatore - 641 021, Tamil Nadu, India.
Phone: 0422 - 2980011- 14 | Email : info@ kahedu.edu.in

DEPARTMENT OF CIVIL ENGINEERING

Soil Investigation Report

Date: 23.06.2023

From
Head of the Department
Department of Civil Engineering,
Karpagam Academy of Higher Education,
Coimbatore-21

To
Aadhavan Constructions
Near Annai Apartment,
Gayathri Nagar West,
Erode Road, Karur -2.

Respected Sir,

Sub: Dept. of Civil Engg. - Karpagam Academy of Higher Education –Proposed Construction of Residential Building– Soil test – Investigation report – Reg.
Ref. Ltr. Dt: 19-06-2023.

The Geotechnical investigation report for proposed Construction of Residential Building in S.F.No.415/11, kothai nagar, Plot No.66, 67, 70, 71, in Karur District enclosed herewith in duplicate. The receipt of the report may please be acknowledged.

Yours truly

HoD/CIVIL
Dr. N. BALASUNDARAM, ME., Ph.D
PROFESSOR & HOD
DEPARTMENT OF CIVIL ENGINEERING
KARPAGAM ACADEMY OF HIGHER EDUCATION
Pollachi Main Road, Eachanari Post,
Coimbatore 641 021

Encl:

Soil Investigation report.

Page 1

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Mail.id: civil.hod@kahedu.edu.in Phone No: 9442130186
Web:www.kahedu.edu.in

STRUCTURAL DRAWINGS

THE PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO:66,67,70&71 AT INAM KARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT.

APPLICANT :- Ms AADHAVAN CONSTRUCTIONS,
K.SUNDARAMOORTHY (MANAGING PARTNER)

SCALE 1 : 100 — ALL DIMENSIONS ARE IN "METRE"

AREA STATEMENT

SITE AREA DETAILS (In Sq.m)

AS PER DOCUMENT	892.00
AS PER PATTA	891.87
SUPERIMPOSED PLOT AREA	891.87

BUILDING AREA DETAILS (In Sq.m)

FLOOR NAME	BUILTUP AREA	FSI AREA
FLOOR - STILT	468.92	------
FLOOR - 01	492.87	492.87
FLOOR - 02	492.87	492.87
FLOOR - 03	492.87	492.87
FLOOR - 04	492.87	492.87
FLOOR - 05	358.64	358.64
FLOOR - TERRACE (Head Room)	15.82	------
TOTAL AREA	2814.86	2330.12

FLOOR SPACE INDEX (FSI) = 2.61 : 2.80

PLOT COVERAGE = 55.25 %

PARKING DETAILS

PARKING TYPE	REQUIRED	PROVIDED
CAR PARKING	31 Nos.	31 Nos.

NOTES:-

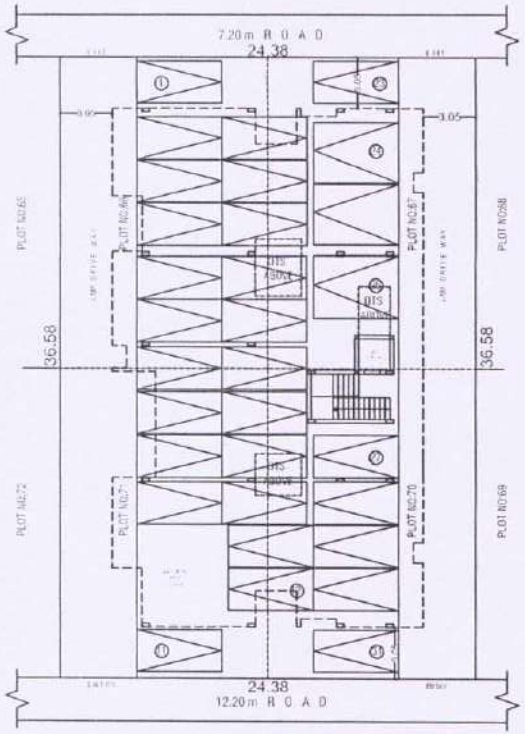
1. ALL DIMENSIONS ARE IN METER
2. FIRE FIGHTING ARRANGEMENTS WILL BE PROVIDED
3. SOLAR WATER HEATING SYSTEM PROVIDED
4. RAINWATER HARVESTING FACILITIES PROVIDED
5. WATER FACILITIES PROVIDED
6. DRAINAGE TO BE CONNECTED WITH PUBLIC SEWER WITH NECESSARY PERMISSION
7. F.E. - FIRE SAFETY MEASURES PROVIDED
8. E.S.F - EXHAUST FAN

COLOUR INDEX

- SITE BOUNDRY SHOWN
- PROPOSED BUILDING SHOWN
- EXISTING ROAD
- DRIVEWAY SHOWN

APPLICANT :

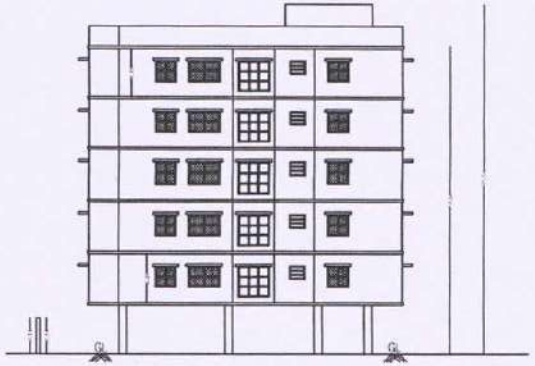
REGISTERED ENGINEER :



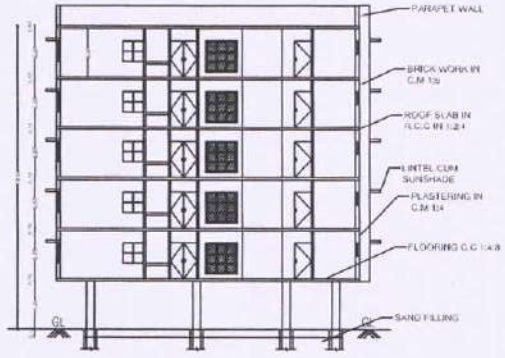
SITE CUM STILT FLOOR



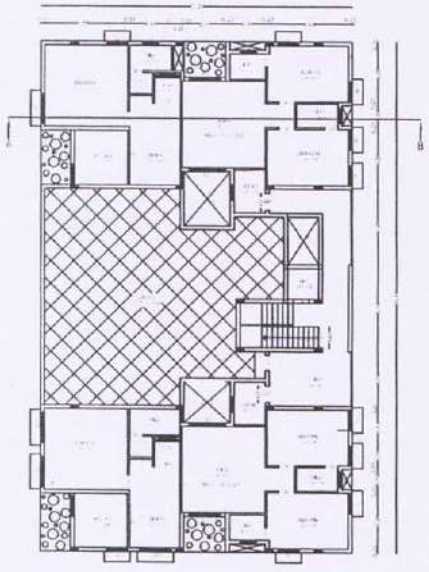
TYPICAL FLOOR



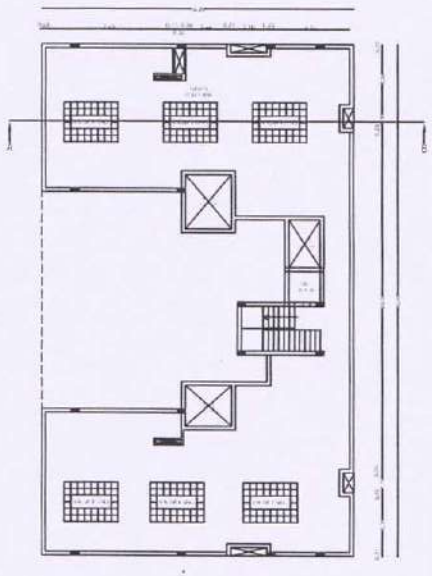
ELEVATION



SECTION "A-B"



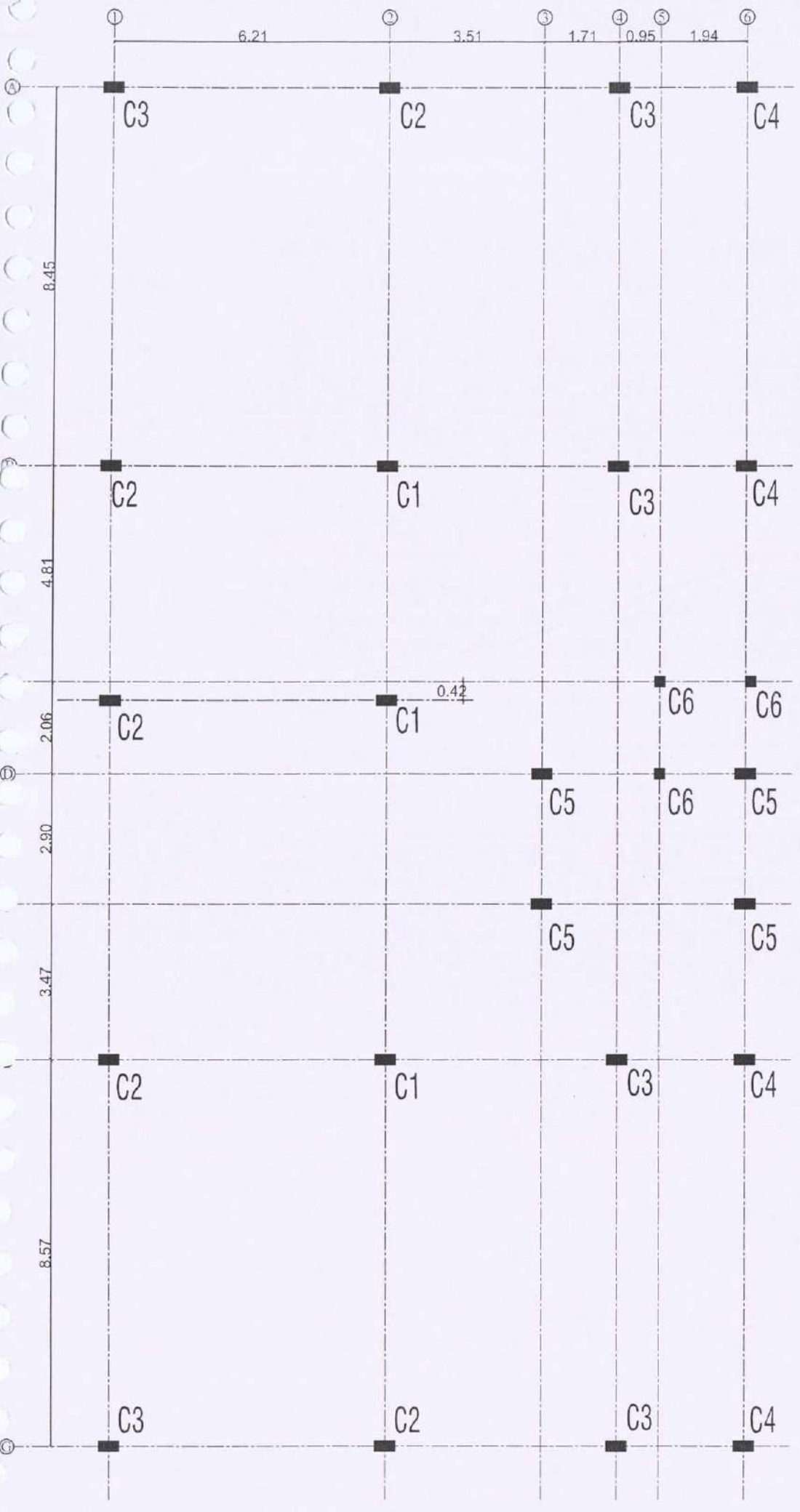
FIFTH FLOOR



TERRACE FLOOR

SCHEDULE OF JOINERY

S.No.	Type	Description	WIDTH	HEIGHT	SILL
1	MD	Main door- Wooden	1.00	2.13	-
2	D	Door	0.91	2.13	-
3	D1	Toilet Door	0.76	2.13	-
4	D2	Door	1.22	2.13	-
5	O	Open	1.00	2.13	-
6	O1	Open	1.83	2.13	-
7	W	Window	1.22	1.22	0.91
8	W1	Window	1.83	1.22	0.91
9	W2	Window	2.13	1.22	0.91
9	V	Ventilator	0.91	0.76	1.37
10	V1	Ventilator	0.80	0.76	1.37
11	FW	French Window	1.83	1.83	0.30



COLUMN AXES LAYOUT

NOTES:-

1. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE
2. DO NOT SCALE ANY DRG. FOLLOW FIGURED DIMENSIONS.
3. ALL DIMENSIONS ARE TO BE VERIFIED PROPERLY AT SITE.
4. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
5. ALL R.C. WORKS SHALL BE CARRIED OUT CONFIRMING TO IS:456--2000. SPECIFICATIONS AND OTHER RELEVANT INDIAN STANDARDS.
6. UNLESS OTHERWISE NOTED, DETAILS SHOWN ON ANY STRUCTURAL DRAWINGS ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITION.
7. CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE SITE AND SHALL CONSULT RELEVANT ARCHITECTURAL DRG'S IN CONJUNCTION WITH THESE STRUCTURAL DRG'S.
8. ANY DISCREPANCY IN THE DRG.SHALL BE BROUGHT TO CONSULTANTS NOTICE BEFORE EXECUTION.

SPECIFICATION

1.FOUNDATIONS.
ALL ISOLATED FOOTINGS SHALL BE CONCENTRIC WITH COLUMN / PEDESTAL UNLESS OTHERWISE SPECIFIED.

2.TYPE OF CEMENT.
OPC = ORDINARY PORTLAND CEMENT FOR SUB STRUCTURE
PPC = PORTLAND POZZOLANA CEMENT FOR SUPER STRUCTURE.

3.CONCRETE.
ALL REINFORCED CONCRETE SHALL BE OF GRADE M 20 (1:1.5:3)
MAXIMUM WATER CEMENT RATIO = 0.45 LR/Kg
MAXIMUM CEMENT CONTENT =300 Kg/cu.m
MAXIMUM SIZE OF AGGREGATE = 20mm
ALL BINDING CONCRETE SHALL BE OF GRADE M10

4.STEEL.
'Y' DENOTES HIGH YIELD STRENGTH DEFORMED BARS OF CHARACTERISTIC STRENGTH fy = 500 N/Sq.mm CONFORMING TO IS STANDARD (AS PER IS 1786--1985)

5.COVERS.
FOR BEAMS - 1½" (30 MM)
FOR SUSPENDED SLABS - 1" (20 MM)
FOR COLUMN ABOVE G.L. - 1½" (40 MM)
COVER BLOCKS TO BE MADE OF SAME STRENGTH AS THE CONCRETE IN WHICH IT IS EMBEDDED.

6.LAP LENGTH.
FOR ALL BARS SHALL BE 50 x DIA.
NO LAPPING SHALL BE ALLOWED IN FOOTING.

7.CONCRETE BLOCK WORK.
BLOCK WORK AT SUB STRUCTURE (BELOW PLINTH LEVEL) SHALL BE PERCANT WITH CEMENT TYPE SULPHATE RESISTANT PORTLAND CEMENT (SRC) AND CONSTRUCTED BY USING MORTAR HAVING SRC CEMENT.
BLOCK WORK AT SUPER STRUCTURE (ABOVE PLINTH LEVEL) SHALL BE PERCANT WITH CEMENT TYPE OPC (OR) PPC AND CONSTRUCTED BY USING MORTAR HAVING OPC (OR) PPC.
SOLID BRICK WORK SHALL BE USED BEHIND ALL STONE CLADDING FINISH WORKS.

8.ROUGH CEMENT PLASTERING WORK SHOULD BE DONE FOR BOTH FOOTINGS & COLUMNS UP TO GROUND FLOOR LEVEL.

9. PROVIDE ST12 AT 4" c/c -ADDITIONAL STIRRUPS FOR MAIN BEAMS AT LOCATIONS WHERE IT SUPPORTS OTHER BEAMS.

10.LATERAL TIES SHALL BE PROVIDED AT BEAM JUNCTIONS FOR COLUMNS AS SECTIONS PROVIDED.

11.MINIMUM REMOVAL OF FORM WORKS
FOR FOOTINGS - 24 Hrs (MINIMUM) AFTER CAST.
FOR COLUMNS - 48 Hrs (MINIMUM) AFTER CAST.

12.SAFE BEARING CAPACITY OF SOIL ASSUMED = 200 KN/ m²

13.FOUNDATION IS DESIGNED FOR GROUND + 5 FLOORS ONLY. (NO FUTURE FLOORS)

TITE PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 915/1E, PLOT NO:66,67,68&71 AT IN A.M. KARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT

INDICATES COLUMN FLOATS AT THIS LEVEL
INDICATES COLUMN STOPS AT THIS LEVEL
INDICATES COLUMN CONTINUOUS AT THIS LEVEL

o - SMALLER DIA
● - BIGGER DIA

ISSUED FOR CONSTRUCTION

CLIENT :- M/s ADHAVAN CONSTRUCTIONS, SUNDARAM MOORTHY (MANAGING PARTNER)

ARCHITECT :- ARCHITECTS & PLANNERS, IN & OUT SPACES, COIMBATORE

DWG. TITLE: COLUMN AXES LAYOUT

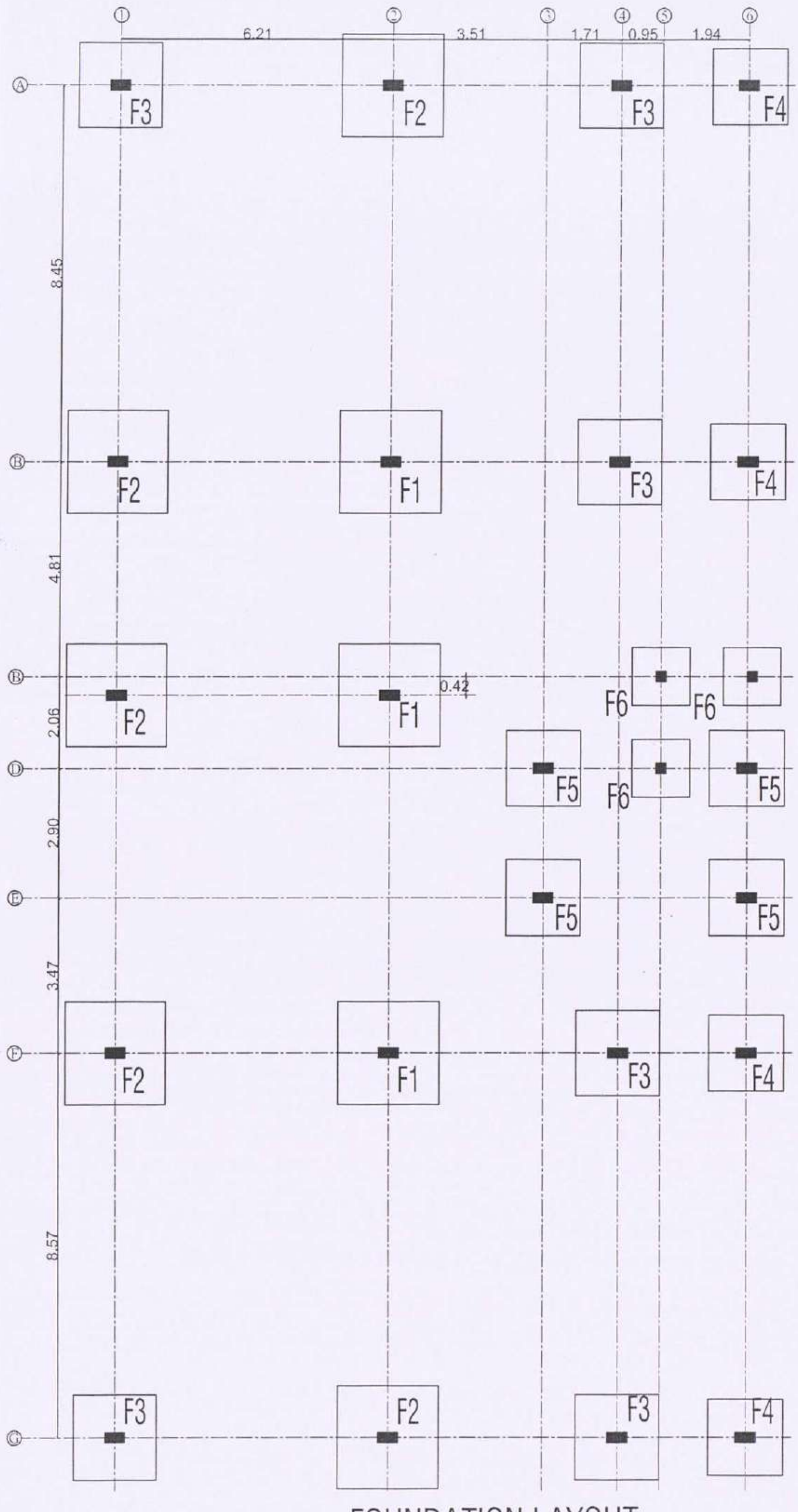
DWG. NO.: ATM/2023/2240

DESIGNED BY :-	DRAWN BY :-	CHECKED BY :-
MOHAN	BOOPATHY	MOHAN

DATE :-	SCALE :-	REV :-
07.02.2025	1:100 A2	R0

PROJECT :- PROPOSED RESIDENTIAL APARTMENT FOR M/s ADHAVAN CONSTRUCTIONS.

STRUCTURAL CONSULTANT :-
ATM ASSOCIATES
CIVIL & STRUCTURAL CONSULTANTS
NO.136/92 ATM Tower, Karur-01. Phone:8940036758, Email:atmassc@gmail.com



FOUNDATION LAYOUT

NOTES:-

1. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE
2. DO NOT SCALE ANY DRG. FOLLOW FIGURED DIMENSIONS.
3. ALL DIMENSIONS ARE TO BE VERIFIED PROPERLY AT SITE.
4. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
5. ALL R.C. WORKS SHALL BE CARRIED OUT CONFIRMING TO IS:456-2000, SPECIFICATIONS AND OTHER RELEVANT INDIAN STANDARDS.
6. UNLESS OTHERWISE NOTED, DETAILS SHOWN ON ANY STRUCTURAL DRAWINGS ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITION.
7. CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE SITE AND SHALL CONSULT RELEVANT ARCHITECTURAL DRG'S IN CONJUNCTION WITH THESE STRUCTURAL DRG'S.
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PPC = PORTLAND POZZOLANA CEMENT FOR SUPER STRUCTURE.

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ALL REINFORCED CONCRETE SHALL BE OF GRADE M 20 (1:1.5:3)
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MAXIMUM CEMENT CONTENT =300 Kg/cu.m
MAXIMUM SIZE OF AGGREGATE = 20mm
ALL BINDING CONCRETE SHALL BE OF GRADE M10

4.STEEL.
'Y' DENOTES HIGH YIELD STRENGTH DEFORMED BARS OF CHARACTERISTIC STRENGTH fy = 500 N/Sq.mm CONFORMING TO IS STANDARD (AS PER IS 1786-1985)

5.COVERS.
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FOR COLUMN ABOVE G.L - 1½" (40 MM)
COVER BLOCKS TO BE MADE OF SAME STRENGTH AS THE CONCRETE IN WHICH IT IS EMBEDDED.

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7.CONCRETE BLOCK WORK.
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BLOCK WORK AT SUPER STRUCTURE (ABOVE PLINTH LEVEL) SHALL BE PRECAST WITH CEMENT TYPE OPC (OR) PPC AND CONSTRUCTED BY USING MORTAR HAVING OPC (OR) PPC.
SOLID BRICK WORK SHALL BE USED BEHIND ALL STONE CLADDING FINISH WORKS.

8.ROUGH CEMENT PLASTERING WORK SHOULD BE DONE FOR BOTH FOOTINGS & COLUMNS UP TO GROUND FLOOR LEVEL.

9. PROVIDE STLS AT 4" c/c -ADDITIONAL STIRRUPS FOR MAIN BEAMS AT LOCATIONS WHERE IT SUPPORTS OTHER BEAMS.

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FOR COLUMNS - 48 Hrs (MINIMUM) AFTER CAST.

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THE PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/11, PLOT NO 66,67,70&71 AT INAM KARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT

INDICATES COLUMN FLOATS AT THIS LEVEL
INDICATES COLUMN STOPS AT THIS LEVEL
INDICATES COLUMN CONTINUOUS AT THIS LEVEL

o - SMALLER DIA
• - BIGGER DIA

ISSUED FOR CONSTRUCTION

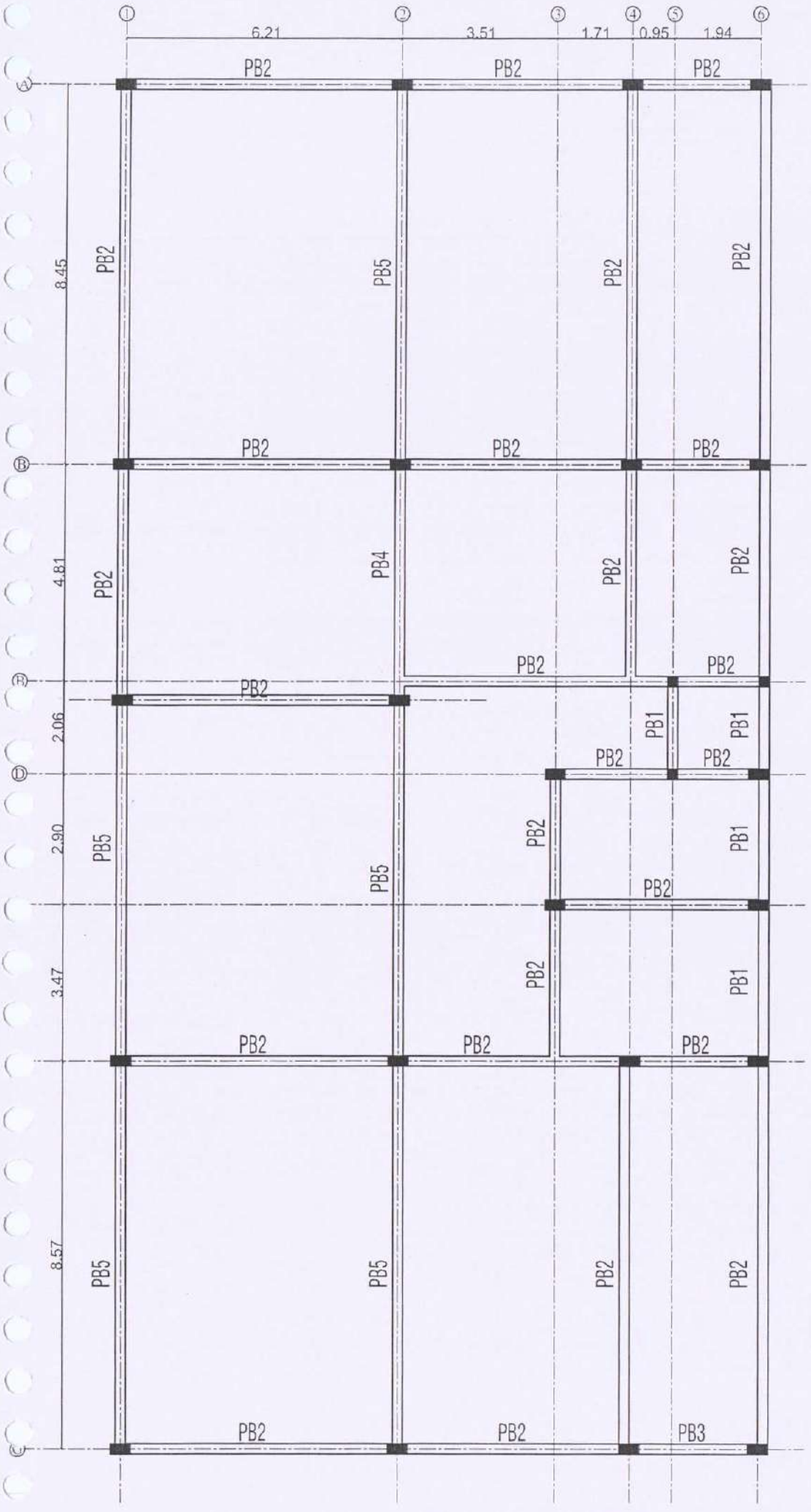
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ARCHITECT:- ARCHITECTS & PLANNERS IN & OUT SPACES COIMBATORE		
DWG. TITLE: FOUNDATION LAYOUT		DWG. NO: ATM/2021/[illegible]
DESIGNED BY:- MOHAN	DRAWN BY:- BOOPATHY	CHECKED BY:- MOHAN
DATE:- [illegible]	SCALE:- [illegible]	REV:- [illegible]
PROJECT:- PROPOSED RESIDENTIAL APARTMENT FOR [illegible] CONSTRUCTIONS		

STRUCTURAL CONSULTANT:-

ATM ASSOCIATES

CIVIL & STRUCTURAL CONSULTANT

NO: 35 B ATM Tower
Karur
Phone: 9842335788
Email: [illegible]



PLINTH BEAM LAYOUT

NOTES:-

1. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE
2. DO NOT SCALE ANY DRG. FOLLOW FIGURED DIMENSIONS.
3. ALL DIMENSIONS ARE TO BE VERIFIED PROPERLY AT SITE.
4. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
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MINIMUM CEMENT CONTENT =300 Kg/cu.m
MAXIMUM SIZE OF AGGREGATE = 20mm
ALL BINDING CONCRETE SHALL BE OF GRADE M10

4.STEEL,
'Y' DENOTES HIGH YIELD STRENGTH DEFORMED BARS OF CHARACTERISTIC STRENGTH fy = 500 N/Sq.mm CONFORMING TO IS STANDARD (AS PER IS 1786-1985)

5.COVERS,
FOR BEAMS - 1½" (50 MM)
FOR SUSPENDED SLABS - ¾" (20 MM)
FOR COLUMN ABOVE G.L - 1½" (40 MM)
COVER BLOCKS TO BE MADE OF SAME STRENGTH AS THE CONCRETE IN WHICH IT IS EMBEDDED.

6.LAP LENGTH,
FOR ALL BARS SHALL BE 50 x DIA.
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7.CONCRETE BLOCK WORK,
BLOCK WORK AT SUB STRUCTURE (BELOW PLINTH LEVEL) SHALL BE PRECAST WITH CEMENT TYPE SULPHATE RESISTANT PORTLAND CEMENT (SRC) AND CONSTRUCTED BY USING MORTAR HAVING SRC CEMENT.
BLOCK WORK AT SUPER STRUCTURE (ABOVE PLINTH LEVEL) SHALL BE PRECAST WITH CEMENT TYPE OPC (OR) PPC AND CONSTRUCTED BY USING MORTAR HAVING OPC (OR) PPC.
SOLID BLOCK WORK SHALL BE USED BEHIND ALL STONE CLADDING FINISH WORKS.

8.ROUGH CEMENT PLASTERING WORK SHOULD BE DONE FOR BOTH FOOTINGS & COLUMNS UP TO GROUND FLOOR LEVEL.

9. PROVIDE ST12 AT 4" c/c -ADDITIONAL STIRRUPS FOR MAIN BEAMS AT LOCATIONS WHERE IT SUPPORTS OTHER BEAMS.

10.LATERAL TIES SHALL BE PROVIDED AT BEAM JUNCTIONS FOR COLUMNS AS SECTIONS PROVIDED.

11.MINIMUM REMOVAL OF FORM WORKS
FOR FOOTINGS - 24 Hrs (MINIMUM) AFTER CAST.
FOR COLUMNS - 48 Hrs (MINIMUM) AFTER CAST.

12.SAFE BEARING CAPACITY OF SOIL ASSUMED = 200 KN/ m²

13.FOUNDATION IS DESIGNED FOR GROUND + 5 FLOORS ONLY. (NO FUTURE FLOORS)

THE PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO.415/1, PLOT NO.66,67,70&71 AT INAM KARUR VILLAGE, KARUR CITY, MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT.

INDICATES COLUMN FLOATS AT THIS LEVEL.
INDICATES COLUMN STOPS AT THIS LEVEL.
INDICATES COLUMN CONTINUOUS AT THIS LEVEL.

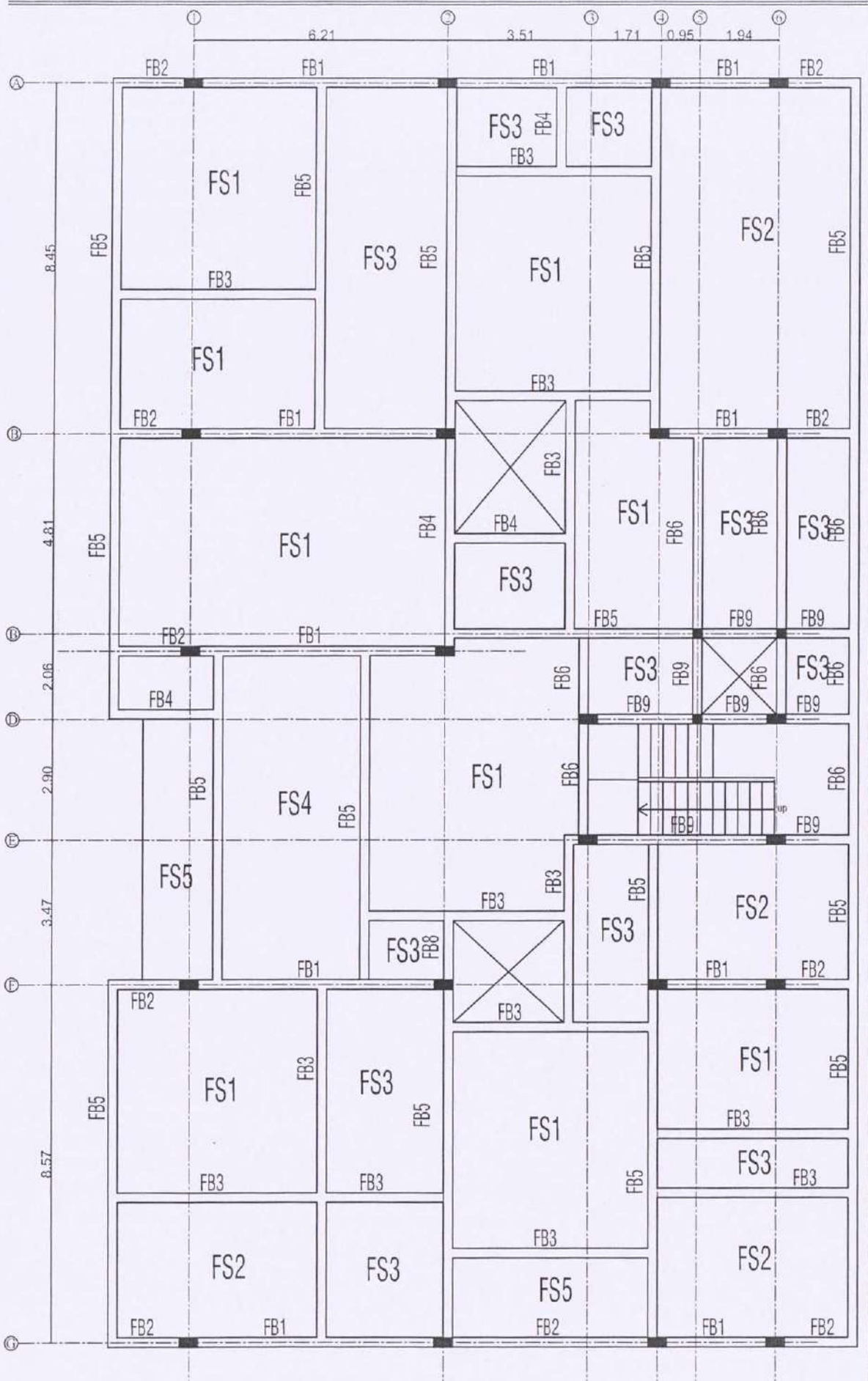
○ - SMALLER DIA
● - BIGGER DIA

ISSUED FOR CONSTRUCTION

CLIENT :- M/s.AADHAVAN CONSTRUCTIONS, SUNDAR AGRO(P)LTD.,(MANAGING PARTNER)	
ARCHITECT :- ARCHITECTS & PLANNERS, IN & OUT SPACES, COIMBATORE	N
DWG. TITLE :- PLINTH BEAM LAYOUT	DWG. NO :- ATM/2023/2703
DESIGNED BY :- MOHAN	DRAWN BY :- BOOPATHY / CHECKED BY :- MOHAN
DATE :- 07.02.2023	SCALE :- 1:100@A2 / REV :- 00
PROJECT :- PROPOSED RESIDENTIAL APARTMENT FOR M/s.AADHAVAN CONSTRUCTIONS.	

STRUCTURAL CONSULTANT :-
ATM ASSOCIATES
CIVIL & STRUCTURAL CONSULTANTS

NO.35/50 ATM Tower, Karur-01
Phone:9842338758
Email : atmassc@gmail.com



TYPICAL FLOOR BEAM SLAB LAYOUT

NOTES:-

1. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE
2. DO NOT SCALE ANY DRG. FOLLOW FIGURED DIMENSIONS.
3. ALL DIMENSIONS ARE TO BE VERIFIED PROPERLY AT SITE.
4. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
5. ALL R.C. WORKS SHALL BE CARRIED OUT CONFIRMING TO IS:456-2000, SPECIFICATIONS AND OTHER RELEVANT INDIAN STANDARDS.
6. UNLESS OTHERWISE NOTED, DETAILS SHOWN ON ANY STRUCTURAL DRAWINGS ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITION.
7. CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE SITE AND SHALL CONSULT RELEVANT ARCHITECTURAL DRG'S IN CONJUNCTION WITH THESE STRUCTURAL DRG'S.
8. ANY DISCREPANCY IN THIS DRG.SHALL BE BROUGHT TO CONSULTANTS NOTICE BEFORE EXECUTION.

SPECIFICATION

1.FOUNDATIONS.
ALL ISOLATED FOOTINGS SHALL BE CONCRETED WITH COLUMN / PEDESTAL UNLESS OTHERWISE SPECIFIED.

2.TYPE OF CEMENT.
OPC = ORDINARY PORTLAND CEMENT FOR SUB STRUCTURE
PPC = PORTLAND POZZOLANA CEMENT FOR SUPER STRUCTURE.

3.CONCRETE.
ALL REINFORCED CONCRETE SHALL BE OF GRADE M 30 (1:1.5:3)
MAXIMUM WATER CEMENT RATIO = 0.45 LIt/Kg
MINIMUM CEMENT CONTENT =300 Kg/cu.m
MAXIMUM SIZE OF AGGREGATE = 20mm
ALL ROOFING CONCRETE SHALL BE OF GRADE M20

4.STEEL.
'Y' GRADE HIGH YIELD STRENGTH DEFORMED BARS OF CHARACTERISTIC STRENGTH fy = 500 N/Sq.mm CONFORMING TO IS STANDARD (AS PER IS 1786-1985)

5.COVERS.
FOR BEAMS - 1½" (30 MM)
FOR SUSPENDED SLABS - 1" (20 MM)
FOR COLUMN ABOVE G.L - 1½" (40 MM)
COVER BLOCKS TO BE MADE OF SAME STRENGTH AS THE CONCRETE IN WHICH IT IS EMBEDDED.

6.LAP LENGTH.
FOR ALL BARS SHALL BE 50 x DIA.
NO LAPPING SHALL BE ALLOWED IN FOOTING.

7.CONCRETE BLOCK WORK.
BLOCK WORK AT SUB STRUCTURE (BELOW PLINTH LEVEL) SHALL BE PRECAST WITH CEMENT TYPE SULPHATE RESISTANT PORTLAND CEMENT (SRC) AND CONSTRUCTED BY USING MORTAR HAVING SRC CEMENT.
BLOCK WORK AT SUPER STRUCTURE (ABOVE PLINTH LEVEL) SHALL BE PRECAST WITH CEMENT TYPE OPC (OR) PPC AND CONSTRUCTED BY USING MORTAR HAVING OPC (OR) PPC.
SOLID BRICK WORK SHALL BE USED BEHIND ALL STONE CLADDING WORKS.

8.ROUGH CEMENT PLASTERING WORK SHOULD BE DONE FOR BOTH FOOTINGS & COLUMNS UP TO GROUND FLOOR LEVEL.

9. PROVIDE STIR AT 4" c/c --ADDITIONAL STIRRUPS FOR MAIN BEAMS AT LOCATIONS WHERE IT SUPPORTS OTHER BEAMS.

10.LATERAL TIES SHALL BE PROVIDED AT BEAM JUNCTIONS FOR COLUMNS AS SECTIONS PROVIDED.

11.MINIMUM REMOVAL OF FORM WORKS
FOR FOOTINGS - 24 Hrs (MINIMUM) AFTER CAST.
FOR COLUMNS - 48 Hrs (MINIMUM) AFTER CAST.

12.SAFE BEARING CAPACITY OF SOIL ASSUMED = 300 KN/ m²

13.FOUNDATION IS DESIGNED FOR GROUND + 5 FLOORS ONLY. (NO FUTURE FLOORS)

THE PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL /BUILDING (STILT + FIVE) IN S.F.NO.447/1C PLOT NO.9&10 SOUTH AT VASAM KARUVELAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK,KARUR DISTRICT.

INDICATES COLUMN PLANTS AT THIS LEVEL
INDICATES COLUMN STOPS AT THIS LEVEL
INDICATES COLUMN CONTINUOUS AT THIS LEVEL

o - SMALLER DIA
● - BIGGER DIA

ISSUED FOR CONSTRUCTION

CLIENT :-

ARCHITECTS :-
ARCHITECTS & PLANNERS
IN & OUT SPACES
COIMBATORE

DRAG. TITLE :-
TYPICAL FLOOR BEAM SLAB LAYOUT

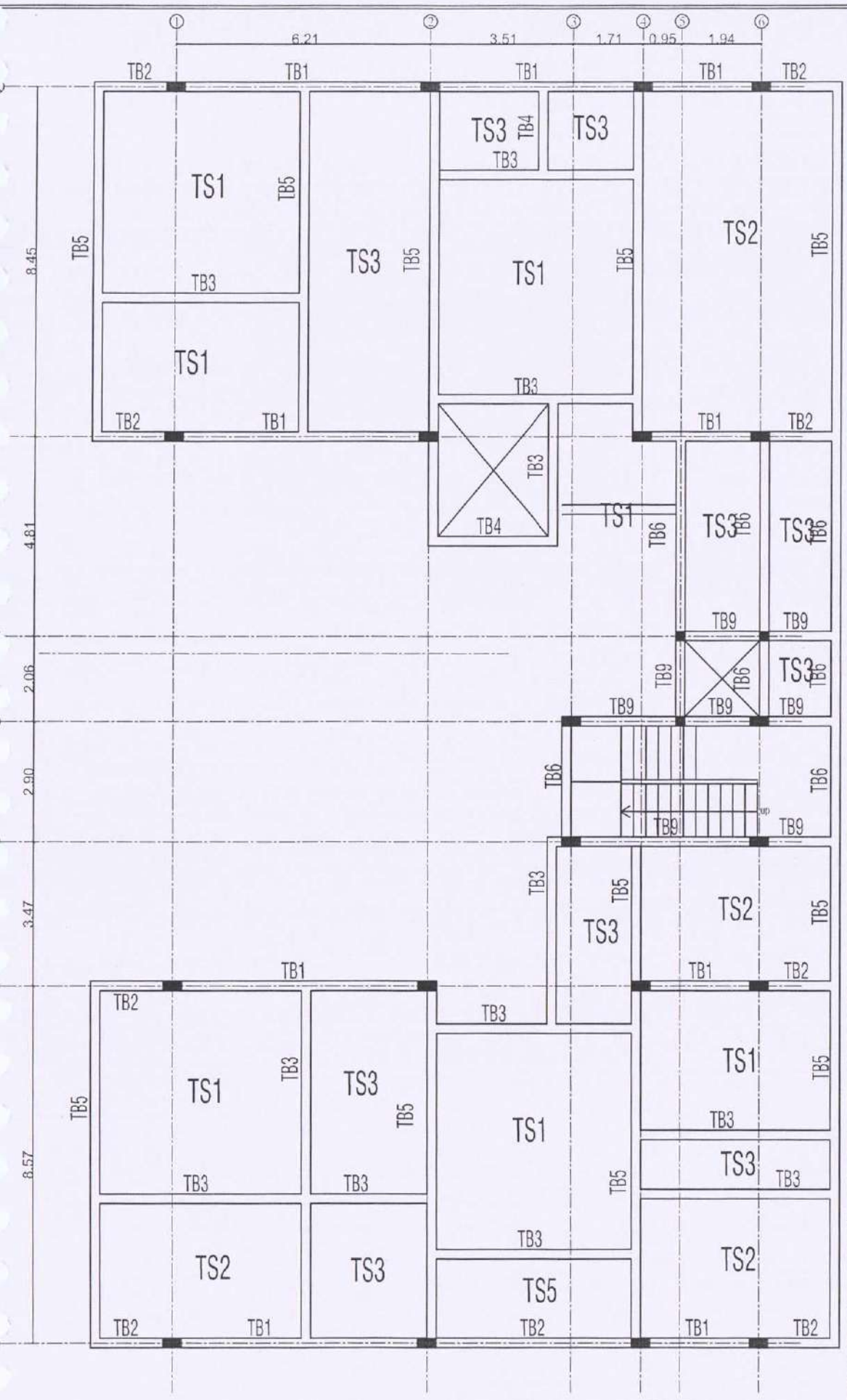
DRG. NO :-
ATM/2021/324

DESIGNED BY :- MURUGAN
DRAWN BY :- BOOPATHY
CHECKED BY :- MURUGAN

DATE :- 07.02.2021
SCALE :- 1:100 @ A2
REV :-

PROJECT :- PROPOSED RESIDENTIAL APARTMENT FOR M/s.ADHAVAN CONSTRUCTIONS

STRUCTURAL CONSULTANT :-
ATM ASSOCIATES
NO.35/56 ATM Tower, Karur(DT)
Phone:9865355756,
Email: atmassociates@gmail.com



TERRACE FLOOR BEAM SLAB LAYOUT

NOTES:-

1. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE
2. DO NOT SCALE ANY DRG. FOLLOW FIGURED DIMENSIONS.
3. ALL DIMENSIONS ARE TO BE VERIFIED PROPERLY AT SITE.
4. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
5. ALL R.C. WORKS SHALL BE CARRIED OUT CONFIRMING TO IS:456-2000, SPECIFICATIONS AND OTHER RELEVANT INDIAN STANDARDS.
6. UNLESS OTHERWISE NOTED, DETAILS SHOWN ON ANY STRUCTURAL DRAWINGS ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITION.
7. CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE SITE AND SHALL CONSULT RELEVANT ARCHITECTURAL DRG'S IN CONJUNCTION WITH THESE STRUCTURAL DRG'S.
8. ANY DISCREPANCY IN THE DRG.SHALL BE BROUGHT TO CONSULTANTS NOTICE BEFORE EXECUTION.

SPECIFICATION

1.FOUNDATIONS.
ALL ISOLATED FOOTINGS SHALL BE CONCENTRIC WITH COLUMN / PEDESTAL UNLESS OTHERWISE SPECIFIED.

2.TYPE OF CEMENT.
OPC = ORDINARY PORTLAND CEMENT FOR SUB STRUCTURE
PPC = PORTLAND POZZOLANA CEMENT FOR SUPER STRUCTURE.

3.CONCRETE.
ALL REINFORCED CONCRETE SHALL BE OF GRADE M 20 (1:1.5:3)
MAXIMUM WATER CEMENT RATIO = 0.45 Lit/Kg
MAXIMUM CEMENT CONTENT =500 Kg/cu.m
MAXIMUM SIZE OF AGGREGATE = 20mm
ALL ROOFING CONCRETE SHALL BE OF GRADE M10

4.STEEL.
'Y' DEFORMED HIGH YIELD STRENGTH DEFORMED BARS OF CHARACTERISTIC STRENGTH fy = 500 N/mm^2 CONFORMING TO IS STANDARD (AS PER IS 1786-1985)

5.COVERS.
FOR BEAMS - 1½" (30 MM)
FOR SUSPENDED SLABS - 1" (20 MM)
FOR COLUMNS ABOVE G.L - ½" (40 MM)
COVER BLOCKS TO BE MADE OF SAME STRENGTH AS THE CONCRETE IN WHICH IT IS EMBEDDED.

6.LAP LENGTH.
FOR ALL BARS SHALL BE 50 x DIA.
NO LAPPING SHALL BE ALLOWED IN FOOTING.

7.CONCRETE BLOCK WORK.
BLOCK WORK AT SUB STRUCTURE (BELOW PLINTH LEVEL) SHALL BE PERCANT WITH CEMENT TYPE SULPHATE RESISTANT PORTLAND CEMENT (SRC) AND CONSTRUCTED BY USING MORTAR RATIO 1SRC CEMENT.
BLOCK WORK AT SUPER STRUCTURE (ABOVE PLINTH LEVEL) SHALL BE PERCANT WITH CEMENT TYPE OPC (OR) PPC AND CONSTRUCTED BY USING MORTAR HAVING OPC (OR) PPC.
SOLID BRICK WORK SHALL BE USED BEHIND ALL STONE CLADDING STONE WORKS.

8.DOUBLE CEMENT PLASTERING WORK SHOULD BE DONE FOR BOTH FOOTINGS & COLUMNS UP TO GROUND FLOOR LEVEL.

9. PROVIDE STIR AT 4" c/c -ADDITIONAL STIRRUPS FOR MAIN BEAMS AT LOCATIONS WHERE IT SUPPORTS OTHER BEAMS.

10.LATERAL TIES SHALL BE PROVIDED AT BEAM JUNCTIONS FOR COLUMNS AS SECTIONS PROVIDED.

11.MINIMUM REMOVAL OF FORM WORKS
FOR FOOTINGS - 24 Hrs (MINIMUM) AFTER CAST.
FOR COLUMNS - 48 Hrs (MINIMUM) AFTER CAST.

12.SAFE BEARING CAPACITY OF SOIL ASSUMED = 200 KN/ m²

13.FOUNDATION IS DESIGNED FOR GROUND + 2 FLOORS ONLY. (NO FUTURE FLOORS)

THE PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVES IN S.F.NO.91/1D, PLOT NO.96,97,106/1Y AT NAMAKARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT

INDICATES COLUMN FLOATS AT THIS LEVEL
INDICATES COLUMN STOPS AT THIS LEVEL.
INDICATES COLUMN CONTINUOUS AT THIS LEVEL

◇ - SMALLER DIA
◆ - BIGGER DIA

ISSUED FOR CONSTRUCTION

CLIENT:- M/S.SARAVANA CONSTRUCTIONS
SUNDARAMOORTHY,SARAVANA PARTNERS

ARCHITECT:-
ARCHITECTS & PLANNERS
IN & OUT SPACES
COIMBATORE

DRWG. TITLE: TERRACE FLOOR BEAM SLAB LAYOUT
DRG. NO: ATM/2023-12-01

DESIGNED BY:-	DRAWN BY:-	CHECKED BY:-
SUBHAN	ROOPA/DEV	SUBHAN
DATE:- 07.02.2023	SCALE:- 1:100 A2	REV:- 00

PROJECT:- PROPOSED RESIDENTIAL APARTMENT FOR M/s.SARAVANA CONSTRUCTIONS.

STRUCTURAL CONSULTANT:-
ATM ASSOCIATES
CIVIL & STRUCTURAL CONSULTANT

NO.35/50 ATM Tower, Karur-01
Phone:9842335756
Email: amasts@gmail.com

COLUMN SCHEDULE:

COLUMN NO	SIZE	REINFORCMENT DETAILS						
		GROUND FLOOR	FIRST FLOOR	SECOND FLOOR	THIRD FLOOR	FOURTH FLOOR	TERRACE FLOOR	RINGS
C1	300 X 600	4Y25+14Y20	18Y20	8Y20+10Y16	4Y20+14Y16	18Y16	4Y16+14Y12	Y8/150
C2	300 X 600	18Y20	8Y20+10Y16	4Y20+14Y16	18Y16	4Y16+14Y12	18Y12	Y8/150
C3	300 X 530	4Y25+12Y20	16Y20	10Y20+6Y16	4Y20+12Y16	8Y16+6Y12	4Y16+12Y12	Y8/150
C4	300 X 530	16Y20	10Y20+6Y16	4Y20+12Y16	8Y16+6Y12	4Y16+12Y12	16Y12	Y8/150
C5	230 x 530	12Y20	6Y20+6Y16	12Y16	8Y16+4Y12	4Y16+8Y12	12Y12	Y8/150
C6	230 X 380	4Y20+6Y16	10Y16	6Y16+4Y12	4Y16+6Y12	10Y12	10Y12	Y8/150

FOOTING SCHEDULE:

FOOTING NO	SIZE	DEPTH	BOTTOM REINFORCEMENT
F1	2.3 X 2.3	600.00	Y16/125 BOTH WAYS
F2	2.1 X 2.1	530.00	Y16/150 BOTH WAYS
F3	2 X 2	530.00	Y12/125 BOTH WAYS
F4	1.8 X 1.8	450.00	Y12/150 BOTH WAYS
F5	1.7 X 1.7	450.00	Y12/150 BOTH WAYS
F6	1.6 X 1.6	450.00	Y12/150 BOTH WAYS

PLINTH BEAM SCHEDULE:

BEAM NO	SIZE	BOTTOM STEEL		TOP STEEL			STIRRUPS	
		STRAIGHT	CURTAIL	MIDDLE	LHS	RHS	ENDS	MIDDLE
PB1	230 x 300	3Y12	2Y12	2Y16	2Y16+2Y12	2Y16+2Y12	2L Y8/150	2L Y8/200
PB2	230 x 450	2Y16	---	2Y16	3Y16	3Y16	2L Y8/150	2L Y8/200
PB3	230 x 450	3Y20	---	2Y20	2Y20+2Y16	2Y20+2Y16	2L Y8/150	2L Y8/200
PB4	230 x 450	3Y20	---	4Y20	2Y20+4Y16	4Y20+2Y16	2L Y8/150	2L Y8/200
PB5	230 x 450	4Y20	---	4Y20	4Y20+2Y16	2Y20+2Y16	2L Y8/150	2L Y8/200
PB6	230 x 450	2Y12	----	2Y12	2Y12	3Y20	2L Y8/150	2L Y8/200
PB7	230 x 450	3Y16	----	2Y12	3Y20	3Y20	2L Y8/150	2L Y8/200
PB8	230 x 450	3Y20	----	3Y16	3Y16	3Y16	2L Y8/150	2L Y8/200

TYPICAL FLOOR BEAM SCHEDULE:

BEAM NO	SIZE	BOTTOM STEEL		TOP STEEL			STIRRUPS	
		STRAIGHT	CURTAIL	MIDDLE	LHS	RHS	ENDS	MIDDLE
FB1	230 x 600	3Y20	3Y20	2Y20	6Y20	6Y20	2L Y10/150	2L Y10/200
FB2	230 x 600	3Y20	---	6Y20	6Y20	6Y20	2L Y10/150	2L Y10/150
FB3	230 x 450	2Y16+2Y12	---	2Y16	4Y16	4Y16	2L Y8/150	2L Y8/200
FB4	230 x 450	2Y20	---	2Y16	2Y16	2Y16	2L Y8/150	2L Y8/200
FB5	230 x 530	6Y16	2Y16	2Y16	6Y16	6Y16	2L Y8/150	2L Y8/200
FB6	230 x 530	5Y16	2Y20	2Y16	3Y20+3Y16	3Y20+3Y16	2L Y10/150	2L Y10/150
FB7	230 x 300	3Y16	----	2Y12	3Y20	3Y20	2L Y8/150	2L Y8/200
FB8	230 x 450	3Y20	----	3Y16	3Y16	3Y16	2L Y8/150	2L Y8/200
FB9	230 x 450	2Y16+2Y12	2Y12	2Y16	4Y16+2Y12	3Y16+4Y12	2L Y8/150	2L Y8/200
FB10	230 x 530	4Y16	2Y12	2Y16	5Y16	5Y16	2L Y8/150	2L Y8/200

NOTES:-

1. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE
2. DO NOT SCALE ANY DRG. FOLLOW FIGURED DIMENSIONS.
3. ALL DIMENSIONS ARE TO BE VERIFIED PROPERLY AT SITE.
4. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
5. ALL R.C. WORKS SHALL BE CARRIED OUT CONFIRMING TO IS:456-2000, SPECIFICATIONS AND OTHER RELEVANT INDIAN STANDARDS.
6. UNLESS OTHERWISE NOTED, DETAILS SHOWN ON ANY STRUCTURAL DRAWINGS ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITION.
7. CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE SITE AND SHALL CONSULT RELEVANT ARCHITECTURAL DRG'S IN CONJUNCTION WITH THESE STRUCTURAL DRG'S.
8. ANY DISCREPANCY IN THE DRG.SHALL BE BROUGHT TO CONSULTANTS NOTICE BEFORE EXECUTION.

SPECIFICATION

1.FOUNDATIONS.
ALL ISOLATED FOOTINGS SHALL BE CONCENTRIC WITH COLUMN / PEDESTAL UNLESS OTHERWISE SPECIFIED.

2.TYPE OF CEMENT.
OPC = ORDINARY PORTLAND CEMENT FOR SUB STRUCTURE
PPC = PORTLAND POZZOLANA CEMENT FOR SUPER STRUCTURE.

3.CONCRETE.
ALL REINFORCED CONCRETE SHALL BE OF GRADE M 20 (1:1.5:3)
MAXIMUM WATER CEMENT RATIO = 0.45 lit./Kg
MAXIMUM CEMENT CONTENT =300 Kg/cu.m
MAXIMUM SIZE OF AGGREGATE = 20mm
ALL BENDING CONCRETE SHALL BE OF GRADE M30

4.STEEL.
'Y' DENOTES HIGH YIELD STRENGTH DEFORMED BARS OF CHARACTERISTIC STRENGTH fy = 500 N/Sq.mm CONFORMING TO IS STANDARD (AS PER IS 1786-1985)

5.COVERS.
FOR BEAMS – 1½" (50 MM)
FOR SUSPENDED SLABS – 1" (20 MM)
FOR COLUMS ABOVE G.L. – 1½" (40 MM)
COVER BLOCKS TO BE MADE OF SAME STRENGTH AS THE CONCRETE IN WHICH IT IS EMBEDDED.

6.LAP LENGTH.
FOR ALL BARS SHALL BE 50 x DIA.
NO LAPPING SHALL BE ALLOWED IN FOOTING.

7.CONCRETE BLOCK WORK.
BLOCK WORK AT SUB STRUCTURE (BELOW PLINTH LEVEL) SHALL BE PRECAST WITH CEMENT TYPE SULPHATE RESISTANT PORTLAND CEMENT (SRC) AND CONSTRUCTED BY USING MORTAR HAVING SRC CEMENT.
BLOCK WORK AT SUPER STRUCTURE (ABOVE PLINTH LEVEL) SHALL BE PRECAST WITH CEMENT TYPE OPC (OR) PPC AND CONSTRUCTED BY USING MORTAR HAVING OPC (OR) PPC.
SOLID BRICK WORK SHALL BE USED BEHIND ALL STONE CLADDING FOR ALL WORKS.

8.ROUGH CEMENT PLASTERING WORK SHOULD BE DONE FOR BOTH FOOTINGS & COLUMNS UP TO GROUND FLOOR LEVEL.

9. PROVIDE STIR AT 4" c/c –ADDITIONAL STIRRUPS FOR MAIN BEAMS AT LOCATIONS WHERE IT SUPPORTS OTHER BEAMS.

10.LATERAL TIES SHALL BE PROVIDED AT BEAM JUNCTIONS FOR COLUMNS AS SECTIONS PROVIDED.

11.MINIMUM REMOVAL OF FORM WORKS
FOR FOOTINGS – 24 Hrs (MINIMUM) AFTER CAST.
FOR COLUMNS – 48 Hrs (MINIMUM) AFTER CAST.

12.SAFE BEARING CAPACITY OF SOIL ASSUMED = 300 KN/ m²

13.FOUNDATION IS DESIGNED FOR GROUND + 6 FLOORS ONLY. (NO FUTURE FLOORS)

THE PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN S.F.NO. 415/1, PLOT NO 66,67,70&71 AT PSAM KARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION KARUR TALUK, KARUR DISTRICT

INDICATES COLUMN FLOATS AT THIS LEVEL

INDICATES COLUMN STOPS AT THIS LEVEL

INDICATES COLUMN CONTINUOUS AT THIS LEVEL

o - SMALLER DIA

• - BIGGER DIA

ISSUED FOR CONSTRUCTION

CLIENT :-

ARCHITECT :-
ARCHITECTS & PLANNERS
IN & OUT SPACES
COIMBATORE

DWG. TITLE
ALL LEVEL STEEL DETAILS-1

DWG. NO.

DESIGNED BY :-
MOHAN

DRAWN BY :-
BOOPATHY

CHECKED BY :-
MOHAN

DATE :-

SCALE :-

REV :-

PROJECT :-

STRUCTURAL CONSULTANTS
ATM ASSOCIATES
CIVIL & STRUCTURAL CONSULTANTS

NO. 25/52, ATM Tower, Karur-01
Phone:+9623235758,
Email: atmassc@gmail.com

TYPICAL FLOOR SLAB DETAILS

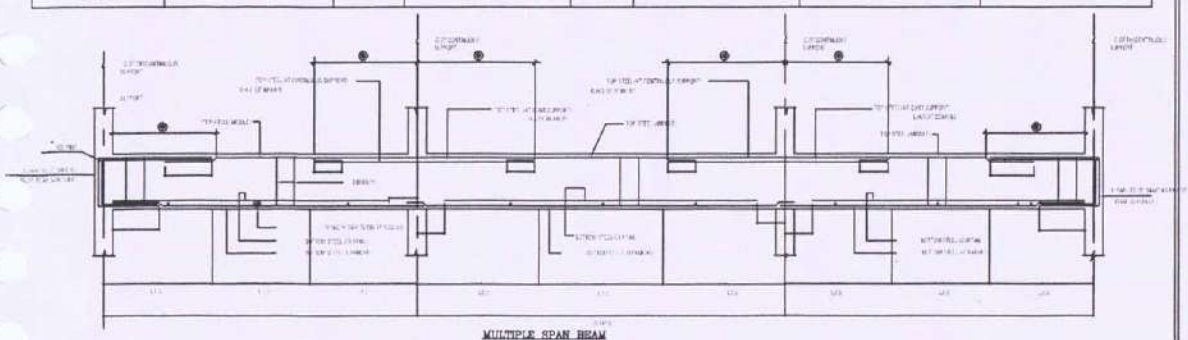
SLAB MARK	BOUNDRY CONDITION	SHORTER SPAN		LONGER SPAN		SLAB THICKNESS	REMARKS
		DIA	SPACING c/c	DIA	SPACING c/c		
FS1	TWO WAY	10#	150	10#	200	6"	
FS2	TWO WAY	10#	150	10#	200	6"	
FS3	TWO WAY	10#	175	10#	200	5"	
FS4	TWO WAY	10#	150	10#	200	6"	
FS5	CANTILEVER	12#	150	10#	200	6"	

TERRACE FLOOR BEAM SCHEDULE:

BEAM NO	SIZE	BOTTOM STEEL		TOP STEEL			STIRRUPS	
		STRAIGHT	CURTAIL	MIDDLE	LHS	RHS	ENDS	MIDDLE
TB1	230 X 530	3Y20	3Y16	2Y20	6Y20	6Y20	2L Y10/150	2L Y10/200
TB2	230 X 530	3Y20	---	6Y20	6Y20	6Y20	2L Y10/150	2L Y10/150
TB3	230 x 380	2Y16+2Y12	---	2Y16	4Y16	4Y16	2L Y8/150	2L Y8/200
TB4	230 x 380	2Y20	---	2Y16	2Y16	2Y16	2L Y8/150	2L Y8/200
TB5	230 x 450	6Y16	2Y16	2Y16	6Y16	6Y16	2L Y8/150	2L Y8/200
TB6	230 x 450	5Y16	2Y20	2Y16	3Y20+3Y16	3Y20+3Y16	2L Y10/150	2L Y10/150
TB7	230 x 300	3Y16	----	2Y12	3Y20	3Y20	2L Y8/150	2L Y8/200
TB8	230 x 450	3Y20	----	3Y16	3Y16	3Y16	2L Y8/150	2L Y8/200
TB9	230 x 450	2Y16+2Y12	2Y12	2Y16	4Y16+2Y12	3Y16+4Y12	2L Y8/150	2L Y8/200
TB10	230 x 450	4Y16	2Y12	2Y16	5Y16	5Y16	2L Y8/150	2L Y8/200

TERRACE FLOOR SLAB DETAILS

SLAB MARK	BOUNDRY CONDITION	SHORTER SPAN		LONGER SPAN		SLAB THICKNESS	REMARKS
		DIA	SPACING c/c	DIA	SPACING c/c		
RS1	TWO WAY	10#	150	10#	200	6"	
RS2	TWO WAY	10#	150	10#	200	6"	
RS3	TWO WAY	10#	175	10#	200	5"	
RS4	TWO WAY	10#	150	10#	200	6"	



MULTIPLE SPAN BEAM

NOTES:-

1. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE
2. DO NOT SCALE ANY DRG. FOLLOW FIGURED DIMENSIONS.
3. ALL DIMENSIONS ARE TO BE VERIFIED PROPERLY AT SITE.
4. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS.
5. ALL R.C. WORKS SHALL BE CARRIED OUT CONFORMING TO IS:456-2000, SPECIFICATIONS AND OTHER RELEVANT INDIAN STANDARDS.
6. UNLESS OTHERWISE NOTED, DETAILS SHOWN ON ANY STRUCTURAL DRAWINGS ARE TO BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITION.
7. CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE SITE AND SHALL CONSULT RELEVANT ARCHITECTURAL DRG'S IN CONJUNCTION WITH THESE STRUCTURAL DRG'S.
8. ANY DISCREPANCY IN THE DRG.SHALL BE BROUGHT TO CONSULTANTS NOTICE BEFORE EXECUTION.

SPECIFICATION

1.FOUNDATIONS.
ALL ISOLATED FOOTINGS SHALL BE CONCENTRIC WITH COLUMN / PEDESTAL UNLESS OTHERWISE SPECIFIED.

2.TYPE OF CEMENT.
OPC = ORDINARY PORTLAND CEMENT FOR SUB STRUCTURE
PPC = PORTLAND POZZOLANA CEMENT FOR SUPER STRUCTURE.

3.CONCRETE.
ALL REINFORCED CONCRETE SHALL BE OF GRADE M 20 (1:1.5:3)
MAXIMUM WATER CEMENT RATIO = 0.45 LR/Kg
MAXIMUM CEMENT CONTENT =300 Kg/cu.m
MAXIMUM SIZE OF AGGREGATE = 20mm
ALL BEDDING CONCRETE SHALL BE OF GRADE M10

4.STEEL.
'Y' DENOTES HIGH YIELD STRENGTH DEFORMED BARS OF CHARACTERISTIC STRENGTH fy = 500 N/Sq.mm CONFORMING TO IS STANDARD (AS PER IS 1786-1985)

5.COVERS.
FOR BEAMS - 1½" (30 MM)
FOR SUSPENDED SLABS - 1" (20 MM)
FOR COLUMN ABOVE G.L - 1½" (40 MM)
COVER BLOCKS TO BE MADE OF SAME STRENGTH AS THE CONCRETE IN WHICH IT IS EMBEDDED.

6.LAP LENGTH.
FOR ALL BARS SHALL BE 50 x DIA.
NO LAPPING SHALL BE ALLOWED IN FOOTING.

7.CONCRETE BLOCK WORK.
BLOCK WORK AT SUB STRUCTURE (BELOW PLINTH LEVEL) SHALL BE PERCAST WITH CEMENT TYPE SULPHATE RESISTANT PORTLAND CEMENT (SRC) AND CONSTRUCTED BY USING MORTAR HAVING SRC CEMENT.
BLOCK WORK AT SUPER STRUCTURE (ABOVE PLINTH LEVEL) SHALL BE PERCAST WITH CEMENT TYPE OPC (OR) PPC AND CONSTRUCTED BY USING MORTAR HAVING OPC (OR) PPC.
SOLID BRICK WORK SHALL BE USED BEHIND ALL STONE CLADDING FINISH WORKS.

8.ROUGH CEMENT PLASTERING WORK SHOULD BE DONE FOR BOTH FOOTINGS & COLUMNS UP TO GROUND FLOOR LEVEL.

9. PROVIDE ST12 AT 4" c/c -ADDITIONAL STIRRUPS FOR MAIN BEAMS AT LOCATIONS WHERE IT SUPPORTS OTHER BEAMS.

10.LATERAL TIES SHALL BE PROVIDED AT BEAM JUNCTIONS FOR COLUMNS AS SECTIONS PROVIDED.

11.MINIMUM REMOVAL OF FORM WORKS
FOR FOOTINGS - 24 Hrs (MINIMUM) AFTER CAST.
FOR COLUMNS - 48 Hrs (MINIMUM) AFTER CAST.

12.SAFE BEARING CAPACITY OF SOIL ASSUMED = 200 KN/ m²

13.FOUNDATION IS DESIGNED FOR GROUND + 6 FLOORS ONLY. (No FUTURE FLOORS)

THE PLAN SHOWING THE PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING (STILT + FIVE) IN SITU.NO.415/1, PLOT NO.56 A/2B/2A1 AT PLAN KARUR VILLAGE, KARUR CITY MUNICIPAL CORPORATION, KARUR TALUK, KARUR DISTRICT.

INDICATES COLUMN FLOATS AT THIS LEVEL
INDICATES COLUMN STOPS AT THIS LEVEL
INDICATES COLUMN CONTINUOUS AT THIS LEVEL

o - SMALLER DIA
● - BIGGER DIA

ISSUED FOR CONSTRUCTION

CLIENT :-

ARCHITECT :-
ARCHITECTS & PLANNERS
IN & OUT SPACES
COIMBATORE

N

DRAWING TITLE :-
ALL LEVEL STEEL DETAILS

DRG.NO :-
ATM/2021/154

DESIGNED BY :-
MURUGAN

DRAWN BY :-
MURUGAN

CHECKED BY :-
MURUGAN

DATE :-
07.12.2021

SCALE :-
1:100

REV :-
00

PROJECT :-
PROPOSED RESIDENTIAL APARTMENT FOR
M/S.ARIHANT ESTATES, KARUR

STRUCTURAL CONSULTANTS :-
ATM ASSOCIATES
CIVIL & STRUCTURAL CONSULTANTS

NO.35,SI ATM Towers, KARUR.
Phone:9962335763
Email: atmassoc@gmail.com

DIRECTORATE OF TOWN AND COUNTRY PLANNING
(Government of Tamil Nadu)
(807 Anna Salai, Chennai 600 002)

TIRUCHIRAPPALLI REGIONAL OFFICE
(Kajamalai Main Road, Kajamalai, Tiruchy 620 023)

PROFESSIONAL REGISTRATION CERTIFICATE

This is to certify that Thiru.A.T.MOHAN has enrolled as STRUCTURAL ENGINEER GRADE – I (SE) with this office who has the qualification of M.TECH in STRUCTURAL ENGINEERING and experience in the relevant field for 9 years.

He has been given the Registration No.SE/Gr-I/TR/ May 2019/ 005 on 18.05.2019.

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) Department dated.04.02.2019.

This Registration is valid up to 17.05.2024

Assistant Director
Town and Country Planning
Tiruchirappalli Region



Attested by

A. T. Mohan



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

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