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Er. V.SABARISH, B.E(Civil),
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REGISTEREDENGINEER CORPORATION
CONSULTING ENGINEER

No:154, South West Boag Road,
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Mobile : 9566225285
8778951791

STABILITY CERTIFICATE

(To be furnished while filing application for registration of building)

It is certified that the proposed construction at (Chiron villa)of Stilt + 2 and 3rd Part Floor Residential Building at Plot No: 9, Kanathur Reddikuppam. Comprised in Old S.No: 87/3A1D Patta No: 180, V. No : 11 Kanathur Redikuupam Village & Panchayat, Thiruporur Taluk, Chengalpattu District. Thiruporur Panchayat Union is designed to resist earthquake. Check has been made and found safe and I hereby certify that :

1. The minimum grade of concrete is M25

2. The design and analysis using the code of practice for plain and reinforced concrete as per IS 456, Design Loads as per IS 875:1987 (Part I, II & IV) – Code of Practice for Design Loads and Design of Earthquake resistant Structure as per IS 1983:2016-Criteria for Earthquake Resistant Design of Structures are carried out.

The building will be safe and sound when used for the purpose for which it is designated

Stamp and Signature

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Email Id: Sabarijohn229@gmail.com

Encl.: Structural Design Calculation

Date: 20.07.2024

STRUCTURAL STABILITY CERTIFICATE

STRUCTURAL STABILITY CERTIFICATE AND DRAWING FOR THE PROPOSED CONSTRUCTION (CHIRON VILLA)OF STILT + 2 and 3rd PART FLOOR RESIDENTIAL BUILDING AT PLOT NO: 9, KANATHUR REDDIKUPPAM. COMPRISEDIN OLD S.NO: 87/3A1D PATTA NO: 180, V. NO : 11 KANATHUR REDIKUUPAM VILLAGE & PANCHAYAT, THIRUPORUR TALUK, CHENGALPATTU DISTRICT. THIRUPORUR PANCHAYAT UNION.

The Proposed Building referred to above is a framed structure with Stilt and 2 Upper Floors and 3rd Part Floor . The Structural Design and Drawing for the building are being prepared by me conforming to the relevant Bureau of Indian Standard viz. IS 456:2000 for Plain and Reinforced Concrete, IS 875(Part II) – 1987 for Imposed Loads and IS 1893:2002(part 1) for Seismic Force. We certify that the building when constructed according to our Structural Designs and Drawings will be structurally safe and sound and fit for occupation.

1. The minimum grade of concrete is M25

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Annexure – XIV

[See rule 51 (3)]

Form 1

Structural Design Basis Report

(1) This report to accompany the application for Building Developments

Part1	General Data		
S.No.	Description	Information	Notes
1.	Site Address	At plot no: 9, Kanathur, Reddikuppam Village, Chengalpattu.	
2	Name of Owner	M/s . ARIMA BUILDERS & TECHNOLOGIES PVT LTD Mr. NARAYANA SAMY MARIMUTHU	
3	Name of Registered Developer along with the Registration Number		
4	Name of Registered Architect/Engineer along with the Registration Number	Mr. ATHI BAHAVATHI CGLDIST RE/GR-I/2023/10/011	
5	Name of Registered Structural engineer along with the Registration Number	Mr.V.SABARISH SE/GR-II/005/2021	
6	Use of the building	Residential	
7	Number of stories above ground level (including storeys to be added later, if any)	Ground + 2 Floors & 3rd floor part	
8	Number of basements below ground level	Nil	
9	Type of structure Load bearing walls R.C.C. frame R.C.C. frame and Shear Walls Steel frame	R.C.C Frame	
10	Soil data Type of soil Design safe bearing capacity	Silty Sand 150 KN/ M^2	IS:1893 C1.6.3.5.2 IS: 1904 IS: 1892 IS: 2131
11	Dead loads (unit weight adopted) • Earth • Water • Brick masonry • Plain cement concrete • Reinforced cement concrete • Floor finish • Other fill materials	18KN/M^3 20KN/ M^3 23KN/ M3 24KN/ M3 20KN/ M3	IS: 875 Part 1
12	Imposed (live) loads		

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	Floor loads Roof loads	2.5KN/ M^3	IS: 875 Part 2
13	Cyclone/Wind • Speed • Design pressure intensity	40 M/Sec 120Kg/M^2	IS: 875 Part 3
14	Seismic zone	III	IS: 1893 (2002)
15	Importance factor	1.2	IS:1893(2002) Table 6
16	Seismic zone factor (Z)	0.16	IS:1893 Table 2
17	Response reduction factor	4	IS:1893 Table 7
18	Fundamental natural period – approx.		IS:1893 C1.7.6
19	Design horizontal acceleration spectrum value (A_h)		IS: 1893 C1.6.4.2
20	♠ Expansion/Separation Joints		
21	Building is regular/irregular	Regular	IS 1893

♥ Enclose detailed drawings drawn to scale for each floor

♦ In case terrace garden is provided, indicate additional fill load and live load along with the detailed drawings drawn to scale

Part 2	Load bearing masonry buildings		
Sl.No.	Description	Information	Note
1	Building category		IS: 4326 C1.7 Read with IS:1893 Zone / Bldg. | II III IV V Ordinary | B C D E Important | C D E E
2	Basement Provided		
3	Number of floors including Ground Floor (all floors including stepped floors in hill slopes)		
4	Type of wall masonry	Brick Masonry	
5	Type and mix of Mortar	R.C.C-1:2:4	IS: 4326 C1.8.1.2
6	Re: size and position of openings (See note No.[i]) • Minimum distance (b5) • Ratio $(b_1+b_2+b_3)/l_1$ or $(b_6+b_7)/l_2$ • Minimum pier width between consequent opening (b_4) • Vertical distance (h_3) • Ratio of wall height to thickness 4 Ratio of wall length between cross wall to thickness		IS: 4326 Table 4, Fig.7

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7	Horizontal seismic band • at plinth level • at window sill level • at lintel level • at ceiling level • at eave level of sloping roof • at top of gable walls	P IP NA G.L 1.0M 7.0M 10.0M	(see note No.2) IS:4326 C1 8.4.6 IS: 4326 C1 8.3 IS: 4326 C1 8.4.2 IS: 4326 C1 8.4.3 IS: 4326 C1 8.4.3 IS: 4326 C1 8.4.4
	• at top of ridge walls		
8	Vertical reinforcing bar at corners and T junction of walls at jambs of doors and window openings		IS: 4326 C1 8.4.8. IS: 4326 C1 8.4.9
9	Integration of prefab roofing/flooring elements through reinforced concrete screed.		IS:4326 C1 9.1.4
10	Horizontal bracings in pitched truss in horizontal plane at the level of ties in the slopes of pitched roofs		

Notes: (i) Information in Item 6 should be given on separate A4 sheets for all walls with large number of openings

(ii) IP indicated "Information Provided"

IP indicates "Information to be provided"

NA indicates "Not Applicable"

Tick mark one box

Part 3	Reinforced concrete framed buildings		
Sl. No.	Description	Information	Notes
1	Type of building • Regular frames • Regular frames with Shear Walls • Irregular frames • Irregular frames with Shear Walls • Soft storey	Regular	IS: 1893 C1 7.1
2	Number of basements	--	
3	Number of floors including ground floor	04	
4	Horizontal floor system • Beams and slabs • Waffles • Ribbed floor • Flat slab with drops • Flat plate without drops	Yes	

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5	Soil data • Type of soil • Recommended type of foundation -Independent footings -Raft -Piles • Recommended bearing capacity of soil • Recommended type, length, diameter and load capacity of piles • Depth of water table • Chemical analysis of ground water • Chemical analysis of soil	Silty Sand Isolated Yes 150KN/m^2 - 2.5m - -	IS: 1498
6	Foundations Depth below ground level Type Independent Interconnected Raft Piles	1.2 M Isolated	
7	System of interconnecting foundations Plinth beams Foundation beams	Plinth	IS: 1893 C1 7.12.1
8	Grades if concrete used in different parts of building	M20	
9	Method of analysis used	Yes	
10	Computer software used	Yes	
11	Torsion included	Yes	IS: 1893 C1 7.9
12	Base shear a. Based on approximate fundamental period b. Based on dynamic analysis c. Ratio of a/b		IS: 1893 Cl. 7.5.3
13	Distribution of seismic forces along the height of the building.	Nil	IS:1893 Cl.7.7 (Provide sketch)
14	The Column of soft ground storey specially designed.	Nil	IS: 1893 Cl.7.10
15	Clear minimum cover provided in • Footing • Column • Beams • Slabs • Walls	 60 40 40 25 25	IS: 456 Cl. 26.4

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16	Ductile detailing of RC frame		
	• Type of reinforcement used	FE450	IS: 456 Cl. 5.6
	• Minimum dimension of beams	12mm	IS: 13920 Cl.6.1
	• Minimum dimension of columns	230x230	IS: 13920 Cl.7.1.2
	• Minimum percentage of reinforcement of beams at any cross section	2% 4%	IS: 456 Cl.26.5.1(a)
	• Maximum percentage of reinforcement at any section of beam	Nil	IS: 13920 Cl.6.2.1
	• Spacing of transverse reinforcement in 2-d length of beams near the ends	Nil	IS: 456 Cl.26.5.1.1(b)
	• Ratio of capacity of beams in shear to capacity of beams in flexure	-	IS: 13920 Cl.6.2.2
	• Maximum percentage of reinforcement in column	4%	IS: 13920 Cl.6.3.5
	• Confining stirrups near ends of columns and in beam-column joints Diameter Spacing	8mm 150mm	IS: 456 Cl.26.5.3.1
	• Ratio of shear capacity of columns to maximum seismic shear in the	Nil	IS: 13920 Cl. 7.4

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	storey.		
17	Does the features require clearance by SDRP Example: High rise building Prefab building Building in hazard prone areas	**N/A**	

Foundation

i. In case raft foundation has been adopted, indicate K value used for analysis of the raft.

ii. In case pile foundations have been used, give full particulars of the piles, type, dia, length, capacity

iii. In case of high water table, indicate system of countering water pressure, and indicate the existing water table, and that assumed to design foundations.

Idealization for Earthquake analysis

i. In case of composite system of shear walls and rigid frames, give distribution of base shear

in the two systems on the basis of analysis, and that used for design of each system

ii. Indicate the idealization of frames and shear walls adopted in the analysis with the help of sketches.

iii. Submit framing plans of each floor

iv. In case of basements, indicate the system used to contain earth pressures.

Part 4	Buildings in structural steel		
1	Adopted method of design	o Simple o Semi-rigid o Rigid	IS:800 Cl 3.4.4 IS:800 Cl.3.4.5 IS:800 Cl.3.5.6
2	Design based on	o Elastic analysis o Plastic analysis	IS: 800 Section-9 SP;6 (6)
3	Floor construction	o Composite o Non composite o Boarded	
4	Roof construction	o Composite o Non composite o Metal o Any other	
5	Horizontal force resisting system adopted	Frames Braced frames Frames & shear walls	Note: Seismic force As per IS:1893 Would depend on system
6	Slenderness ratios maintained	Members defined in Table 3.1, IS:800	IS 800; Cl.3.7
7	Member deflection limited to	Beams, Rafters Crane Girders, Purlins Top of columns	IS:800 Cl.3.13
8	Structural members	o Encased in concrete Not encased	IS: 800 Section-10
9	Proposed material	o General weld-able o High strength **N/A** o Cold formed o Tubular	IS: 2062 IS: 8500 IS: 801, 811 IS: 806
10.	Minimum metal	o Hot rolled sections **N/A**	IS: 800, Cl.3.8

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	thickness Specified for corrosion protection	○ Cold formed sections ○ Tubes	Cl.3.8.1 to Cl.3.8.4 Cl.3.8.5
11	Structural connections	○ Rivets ○ CT Bolts ○ S H F G Bolts ○ Black Bolts ○ Welding field Shop (Specify welding type proposed) Composite Not Able	IS: 800, Section-8 IS: 1929, 2155, 1149 IS 6639, 1367 IS 3757, 4000 IS: 1363, 1367 IS: 816, 814,1395, 7280, 3613, 6419, 6560, 813, 9595
12	Minimum Fire rating proposed, with method	○ Rating One hours ○ Method proposed. -In tumescent painting -Spraying -Quilting -Fire retardant boarding	IS: 1641, 1642, 1643

Part-5

Any special weakness in the building making it vulnerable for stability related failure and the precaution to be taken during execution/completion and finishing to be indicated.

Part-6

Recommendations of structural Engineer with respect to special requirements needed with respect to structural safety and stability to be taken note of by competent authority feature like incorporation of swimming pool, heavy load on roof, prefabricated structure or any other hazardous features should be included.

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1.0 INTRODUCTION

1.1 General Project Information

Project Title
RESIDENTIAL BUILDING CONSISIT OF STILT AND 2 UPPER FLOORS AND THIRD PART LFOOR

Location of Project
CHIRONVILLA PLOT NO: 9, KANATHUR REDDIKUPPAM

Project Description
RCC Framed Building consisting of Stilt and two Upper floors and Third Part Floor

1.2 Purpose of Basis of Design Document

This document details the input data, principles, methods and performance criteria to be used in the structural engineering design of the Project.

The document serves as a plan for the basis of justification and calculations associated with the design and are a repository for all relevant structural information, including references and computer programs pertaining to the project.

The contents of this brief is based on the drawings available at time of design and actual structural working drawings may change to suit latest architectural design at time of construction.

1.3. Structural Design

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.

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2.0 STRUCTURAL SYSTEM

This section provides an overview of the selected structural system and the structural concept employed for the Project. The stability of each building against imposed lateral loads, namely seismic loads /wind load is provided by RCC columns.

RCC BUILDING – REINFORCED CONCRETE STRUCTURE

2.1.1 Foundations

The design options for Foundation shall be worked out based on the Soil test report shared by client. The foundations are to comprise of Individual Footing.

2.1.2 Superstructure – Gravity System

The load resisting system is to be framed utilising RCC slabs and beams with columns. Frames are classified as Ordinary Moment–Resisting Frames (OMRF).

2.1.3 Expansion joint

As the total length of the building is found to be not more than normal condition it is found that expansion joint is not necessary.

2.1.4

Seismic loads and earthquake resistant design shall be as per IS 1893(Part-1). Earthquake forces shall not be considered to act at the same time as wind forces. Direction of earthquake loading and combination thereof shall be as per clause 6.3.2 of IS 1893(Part-1).

Zone	: III (For Chennai)
Zone factor	: 0.16
Importance factor (I)	: 1.5
Response reduction factor (R)	: 5.0

Avg. response acceleration coefficients (Sa/g) : As per soil condition
The building is designed by static analysis

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3.0 DESIGN CODES, STANDARDS AND REFERENCE DOCUMENT

3.1 Codes, Standards and Commentaries

a) IS 456 – 2000 Plain and Reinforced Concrete structures
b) IS 875 – 1987 Design Loads
c) IS 3370 Part I, Part II and Part IV Concrete Structures for storage of liquids
d) SP 16 Design aids for Reinforced Concrete structures
e) SP 34 Concrete Reinforced & Detailing
f) IS 1786 Specification for high strength deformed bars
g) National Building Code of India 1983
h) IS 13920 -2016 for Seismic detailing

3.2 Design References and Guides

a) Reinforced Concrete Design –SP 16 BIS handbook
b) Reinforced Concrete Designers Handbook

3.3 Specification used

All the buildings have been designed as framed structures in accordance with the relevant Indian Codes of Practice for civil works i.e. IS: 456-2000. Seismic detailing is followed for the entire building wherever found to be necessary.

4.0 LOADSCRITERIA

The structure is analyzed for all possible combinations of loads i.e. gravity loads(dead and live loads). It should be noted that no extra provision has been made in the design of foundation and vertical structural elements for additional floors.

4.1 MATERIAL DEAD LOADS

Item	Density (kN/m^3)
Dense Concrete	25
Steelwork	78.5
Soil	18.0
Water	10.0
225 thk Clay Brick with 8 mm plaster internal walls	20.0

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4.2 MINIMUM IMPOSED LOADS

RESIDENTIAL BUILDINGS (KN)

a) All rooms and Kitchen	2.0
b) Toilets and bathrooms	2.0
c) Corridors, passages, lobbies and staircases including fire escapes - as per the floor serviced but not less than	3.0

IMPOSED LOADS ON ROOFS

Roofs of buildings used for promenade or incidental to assembly purposes shall be designed for the appropriate imposed floor loads given in Table for the occupancy.

4.3 WIND LOADING

The building structure is of normal high so wind load does not dominate the result of the analysis.

4.4 FIRE RESISTANCE:

Cover to main rebars will be provided as per Table 16 in BIS 456 for fire rating of 1.0 hours.

4.5 EXPOSURE:

The Building will be exposed to Moderate environment as per Table 5 in BIS456.

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5.0 REINFORCED CONCRETE STRENGTHS.

5.1 Concrete design grades are specified cube strengths to BIS

Elements	Concrete Grade Fck (N/sqmm)
Columns/Shear Walls	25
Foundations	25
Beams / Slabs	25
Lean Concrete	10

5.2 REINFORCEMENT

Reinforcement Yield Strengths used in the design of concrete elements:

Deformed Bars	500 MPa (D)

6.0 GEOTECHNICAL

Geotechnical Model and recommendations are based on report shared by the Client

The recommendations for the proposed structure (Residential building .comprising of an Stilt and two upper floors) are given below:

a) Type of Foundations : Individual footing

b) Depth of foundations : 1.2mt from the existing ground level

c) Allowable bearing pressure : 15t/m^2

d) Settlement considered for calculations: <50mm

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Design of Footing

Characteristic comp stress of concrete	f_{ck}	:	25.0 **N/mm²**
Characteristic tensile stress of steel	f_y	:	500.0 **N/mm²**
Density of the soil	γ	:	18.0 kN/m³
Gross or Safe Bearing Capacity	G. Sbc	:	150.0 kN/m²
Basement Height from NGL	h1	:	0.5 m
Founding depth from the GL	h2	:	1.2 m
Total Depth	H	:	1.7 **m**
Additional depth below the recommended level	D_S		0.3 m
Angle of internal friction	ϕ	:	30 deg
Working Load from the column	P	:	600 kN
Working Horizontal Load	H_z	:	15 **kN**
Working Horizontal Load	Hy	:	35 **kN**
Working Moment	M_{zz}	:	10 **kNm**
Working Moment	M_{xx}	:	50 **kNm**
Size of pedestal width	B		0.23 **m**
Size of pedestal depth	d		0.45 **m**
Grade beam span	l	:	**m**
Wall height	hw	:	**m**
width of wall	w	:	**m**
Load from Grade beam	Pw	:	0.0 **kN**
Assume Footing size			
Breadth	B	:	2.00 **m**
Length	L	:	2.00 **m**
Depth of footing	D	:	0.53 **m**
Self weight of footing	Psf	:	53 **kN**
Self weight of soil above the footing	P_S		47 **kN**
Total Axial Load	P	:	700 **kN**
Check against sliding			
Coefficient of friction	μ	:	0.5
coefficient of active earth pressure	ca	:	0.33
coefficient of passive earth pressure	cp	:	3.00
Soil weight considered above the footing with frictional dispersion	Psoil	:	71 kN
Total Load		:	100 kN
Horizontal Resisting Load	Hr=(P+Pw+Psf+Ps)* μ + cp	:	461 kN
			safe
Check against Uplift			
Total Resisting Load	Pa = Psf+Psoil+Pw	:	123.5 kN
			No uplift

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Description				
Net Load	**P+Psf+Ps**	:	700 kN	
Total Moment	Mzz	:	10 kNm	
Total Moment	Mxx	:	50 kNm	
Area of the footing	A	:	4 m^2	
Section Modulus	Zzz	:	1.33 m^3	
	Zyy	:	1.33 m^3	
	P/A	:	175.0	
	Mzz/Zzz	:	7.5	
	Mxx/Zxx	:	37.5	
Maximum Pressure	**P/A+Mzz/Zzz+Mxx/Zxx**	:	220.0 kN/m^2	
Minimum Pressure	**P/A-Mzz/Zzz-Mxx/Zxx**	:	130.0 kN/m^2	
Eccentricity	**ezz=Mzz/P**	:	0.0143	<
Eccentricity	**eyy=Myy/P**	;	0.0714	<
	Soil is subjected to Compression			
	Resultant acts within the length		*and breadth of the footing*	
Effective length	**L'**	:	2.000 m	
Effective breadth	**B'**		2.000 m	
Area of the footing in contact with the soil	**A**	:	4.00 m^2	
Section Modulus	**Zz1**	:	1.33 m^3	
	Zy1		1.33 m^3	
	P/A	:	175.0 kN/m^2	
	Mzz/Zzz	:	7.5 kN/m^2	
	Mxx/Zxx	:	37.5 kN/m^2	
Pressure after distribution	**$P/A+(M_{zz}/Z)+(M_{xx}/Z)$**	:	220.0 kN/m^2	
Therefore design pressure				
Maximum Pressure	**Pmax**	:	220.0 kN/m^2	
	Pmin	:	130.0 kN/m^2	
Pressure in Case of Uplift	**Pmax**	: No uplift	kN/m^2	
	Pmin	: No uplift	kN/m^2	
Limit state of strength				
Factored Max Pressure	$Q_{ult\ (max)}$	:	312.4 kN/m^2	
Factored Min Pressure	$Q_{ult\ (min)}$	:	177.4 kN/m^2	
Factored Pressure @ Centreline of Column	$Q_{ult\ at\ Column\ Center}$	:	244.9 kN/m^2	
Factored Pressure @ Face of Column depth	$Q_{ult\ at\ Column\ depth\ face}$	:	260.1 kN/m^2	
Factored Pressure @ Face of Column Width	$Q_{ult\ at\ Column\ width\ face}$	:	252.6 kN/m^2	
Bending Moment @ Center of the Column maximum in width and depth	Mzz	:	237.7 kNm	
Depth required for Bending	d	:	189 mm	
Hence Provided Depth	d	:	475 mm	
			safe	

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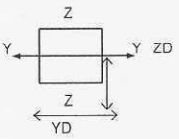
Reinforcement parallel to depth of the column				
Percentage of Ast	pt	:	0.12	%
Area of steel required	Ast	:	1140	mm^2
Dia of the reinforcement	ϕ	:	10	mm
Number of Bars	N	:	10	nos
Spacing	sp	:	200	mm
Check for Oneway shear				
Factored Pressure @ d distance from face of c	Q_{ult} at d Column depth face	:	295.16	kN/m^2
Factored Pressure @ d distance from face of c	Q_{ult} at d Column width face	:	287.74	kN/m^2
Shear at distance d from the face column parc	V	:	154.9	kN
Allowable Shear Stress	τ_c	:	0.28	N/mm^2
Depth Required	dreq		274	mm
			safe	
Bending Moment	Mxx	:	238	kNm
Depth required for Bending	d	:	189.1	mm
Hence Provide Depth	d	:	475	mm
			safe	
Reinforcement parallel to width of the column		:		
Percentage of Ast	pt	:	0.12	%
Area of steel required	Ast	:	1140	mm^2
Dia of the reinforcement	ϕ	:	10	mm
Number of Bars	N	:	10	nos
Spacing	sp	:	200	mm
shear at distance d from the face column para	V	:	219	kN
Allowable Shear Stress	τ_c	:	0.28	N/mm^2
Depth Required	dreq	:	387.91	mm
			safe	
Check for Two way Shear				
Shear	V	:	900	kN
Effective width	b	:	3.48	m
coefficient	k	:	1.00	
Maximum shear stress	τ_c	:	1.25	N/mm^2
Depth required	drq		206.9	mm
			safe	

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COLUMN DESIGN

Input

1.Grade of Concrete	=	M25		
2.Fck (Ch. Strength of Concrete)	=	25	N/mm^2	
3.Grade of Steel	=	Fe500		
4.Fy (Ch Strength of Steel)	=	500	N/mm^2	
5.Unsupported Length of Columns about X	=	3000	mm	
6.Unsupported Length of Columns about Z	=	3000	mm	
7.Width of Column Section (YD)	=	230	mm	
8.Depth of Column Section (ZD)	=	450	mm	
9.Clear Cover To Reinforcement	=	40	mm	>= 30 mm
10.Effective Cover	=	48	mm	
11.Bar Dia (Ties)	=	8	mm	>= 6 mm
12.Bar Dia (Main Steel)	=	16	mm	=12 mm



Slenderness ratio

Slenderness ratio	=	6.7	<12, Short Column
Check for column or pedestal	=	690	The section is Column

Load Calculations

Self weight of column	=	7.763	kN		
(DL + LL) acting on Column	=	44	kN		
Total load of column	=	51.76	kN		
Factored load Pu	=	77.64	kN		
Moment about (Mx)	=	3	kN-m		
Moment about (Mz)	=	70	kN-m		

Eccentricity

$e_x = (l / 500) + (b / 30)$	=	13.67	mm	< 20 mm	20.00
$e_z = (l / 500) + (d / 30)$	=	21.00	mm	< 20 mm	21.00

Whichever is greater

Calculation Of Total Design Moments (kN-m) :

Factored load Pu	=	77.64	kN	
Moments Due To Min Eccentricity about X	=	$P_u \times e_z$		
	=	1.553	kN-m	
Moments Due To Min Eccentricity about Z	=	$P_u \times e_x$		
	=	1.631	kN-m	
Total design Moment about (Mx)	=	3	kN-m	
Total design Moment about (Mz)	=	70	kN-m	

Axial load Calculations:

Percentage of Steel (Assume)

p	=	1.5	%	>= 0.8
p / fck	=	0.06		

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Check For Adequacy Of Section :

Uniaxial moment capacity about xx axis

	d'/b	=	0.21	
Chart for d'/D will be used				
Pu / fck b D		=	0.030	
Referening to chart				
M_{uz1} / f_{ck} b D^2		=	**0.08**	

Using the value of M_{uz1} / fck b D^2

	M_{uz1}	=	93.15	kN-m

Uniaxial moment capacity about zz axis

	d'/D	=	0.11	
Chart for d'/D will be used				
Pu / fck b D		=	0.030	
Referening to chart				
M_{uy1} / f_{ck} D b^2		=	**1**	

Using the value of M_{uy1} / fck b D^2

	M_{uy1}	=	595.1	kN-m

Calculation for P_{uz}	P_{uz}	=	0.45 x fck x Ac + 0.75 x fy x Asc		
	Ac	=	1E+05	mm^2	Ac = 1- (1/100) x b x D
	Asc	=	1553	mm^2	Asc = (1/100) x b x D
	P_{uz}	=	1729	kN	
	Pu / Puz	=	0.045		
	α_n	=	1.00		
$(M_{ux}/M_{ux1})^{an}$		=	0.0322		
$(M_{uy}/M_{uy1})^{an}$		=	0.1176		
$(Muz/Muz1)^{an}+(Muy/Muy1)^{an}$		=	0.150		
			SAFE		

Area of Steel Required :

Ast(required)	=	1553	mm^2	
Provide	=	8	Nos	
	Y	=	16	mm dia bar
Ast(provided)	=	1608	mm^2	
Percentage of Reinforcement provided	=	1.55	%	

Provide 8 Nos of 16 mm dia bar

Area of Steel Required :

M20
M25
M30

Direct stress method

Direct load	=	44	kN		
Permissible Stress in concrete	=	6	N/mm^2	for M25	
Area of cross section	=	direct load / stress			
Area of cross section	=	7333	mm^2		
Column reinforcement percentage	=	1% b D			
Ast	=	73.33	mm^2	< Ast Required	
73.33	<	1553			

Lateral Ties:

Diameter shall be not less than,

i)1/4 x dia of longitudinal bars	=	4	mm	
ii)5mm	=	5	mm	
Provide	=	8	mm dia ties	

Spacing of ties shall not exceed,

i)Least lat dimension of column	=	230	mm	
ii)16 x dia of longitudinal bar	=	256	mm	
iii)48 x diameter of ties	=	384	mm	
iv)300mm	=	300	mm	

Provide 8 mm dia @ 150 mm c/c

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DESIGN OF BEAM

Beam 230 x 375 mm

General Data

1	Breadth of the beam,	B	=	230	mm
2	Depth of the beam,	D	=	375	mm
3	Clear cover,	Cc	=	25	mm
4	Dia. of bar used,	ϕ	=	16	mm
5	Stirrup dia.,	sd	=	8	mm
6	Effective cover,	Cc'	=	41	mm
7	Effective depth,	d	=	334	mm
8	Characteric compressive strength od concrete,	fck	=	25	N/mm^2
9	Yield strength of steel	fy	=	500	N/mm^2

10 **Determination of Ast.**

11 Bending moment — **Mu** = 85 kNm (from STAAD out put)

12 Moment of reistance — **Mu lim** = 0.138 fck bd^2
= 88.52 kNm *(0.138x25x230x334^2)/(10^6)*

13 Effective depth required — **d'** = SQRT(Mu/0.138 fck b)
= 327.29 SAFE

14 $R=Mu/bd^2$ (from reinforcement tables SP 16) = 3.31 N/mm^2 *(85x10^6/(230x334^2))*

15 pt. required = 0.78 *(((1/2x100x25)/500)x(1-SQRT(1-(4.598x3.31)/25)))*

16 Ast reqiured = 599.20 mm^2 *(0.78x230x334)/100*

17 Ast for 1 bar = 201.22 mm^2 *(0.786x16^2)*

18 No. of bars required = 3 *599.2/201.22*

19 Min.Ast = 130.59 *(0.85x230x334)/500*

20 No. of bars provided = 2

21 Ast provided = 100.61 mm^2 *(201.22/2)*

22 pt. Provided = 0.13 % *100.61x100/(230x327.29)*

23 Min. pt required = 0.170 % *(0.85x230x334)/(500x230x334)x100*

24 **Check for shear**

25 Shear from Analysis — **Vu** = 100

26 Nominal shear stress, — τ_v = 1.3 N/mm^2 *(100x1000/(230x327.29))*

27 Maximum Shear stress, — τ_c **max** = 3.15 SAFE

28 Shear strength of M25 concrete, — τ_c = 0.29 N/mm^2 Nominal

29 Design shear force, — **Vus** = 78 kN

30 Spacing, — **Sv** = 183 mm *(0.87x500x327.29x(2x0.785x8^2))/(78.169757x1000)*

31 Mini. Spacing = 245.47 *0.75x327.29* SAFE

32 Spacing provided = 150 mm

Provide Top Bar= 3no of 16 dia
Provide Bottom Bar= 3no of 16 dia

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DESIGN OF SLAB

INPUT DATA

Slab				Loads			
Shorter Span	Lx =	4.650	m	Dead Load	DL =	4.08	kN/m²
Longer Span	Ly =	5.150	m	Live load	LL =	2.00	kN/m²
Thickness of Slab	D =	163	mm	Floor Finishes	FF =	1.00	kN/m²
Clear Cover	d' =	25	mm	False Ceilling Load	=	0.25	kN/m²
Ly/Lx ratio	k =	1.11	Two-Way Slab	Total Load	w =	7.33	kN/m²

Panel Type			Materials			
Basic L/d ratio	=	26	Grade of Concrete	=	25	N/mm²
Edge Condition:	=	4	Grade of Reinf. Steel	=	500	N/mm²
Two Adjacent Edges Discontinuous			Young's Modulus E		2.50E+04	N/mm²

DESIGN

Direction	BM Coefficients (IS:456-2000)		Flexural Design			dia & Required Spacing				Provided Reinforcement	
			Mu	Ast_{req}	Ast_{pro}	8	10	12	16		
			kNm	mm²	mm²	mm	mm	mm	mm		
Shorter Span	αx (-) =	0.0535	12.717	228	864	221	300	300	300	10 @ 100	Safe
	αx (+) =	0.0404	29.697	561	864	90	140	202	300	10 @ 100	Safe
Longer Span	αy (-) =	0.0470	29.697	561	864	90	140	202	300	10 @ 100	Safe
	αy (+) =	0.0350	29.697	561	864	90	140	202	300	10 @ 100	Safe

CHECK FOR DEFLECTION

13

Area of Steel required = 561 mm²

Area of Steel Provided = 864 mm²

Steel stress of service load = 188.24 N/mm²

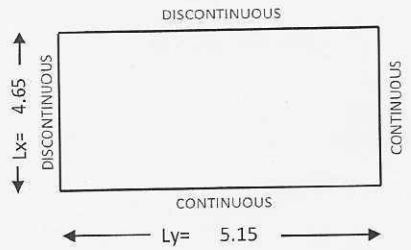
Provided reinforcement (%) = 0.65%

Modification ratio MF = 1.400

Effective depth required for deflection point of view

d_{req} = 127.7083 mm

Eff. depth provided d = 133 mm Safe



SLAB SUMMARY

Shorter Span: Provide T 10 @ 100 mm c/c + 1 T 10 Extra between the two cranked bars

Longer Span : Provide T 10 @ 100 mm c/c + 1 T 10 Extra between the two cranked bars

CHECK FOR SHEAR

Max Shear Force = 26 KN

Actual Shear stress τv = 0.192 N/mm2

P_t of A_{st} = 0.65%

Design Shear Stress τc = 0.54 N/mm²

Shear is less than Design Shear Stress, Hence Safe against shear

NOTES

1. Crank alternate bars at 0.3 times the respective span.
2. Provide 12mm dia chairs at 1000mm c/c in both directions.
3. Provide 5 mm thick cover blocks at 600mm c/c in both directions.

Reinforcement Summary:

Along Shorter Span

Provided T10@ 100mm c/c

Along Longer Span

Provided T10@ 100mm c/c

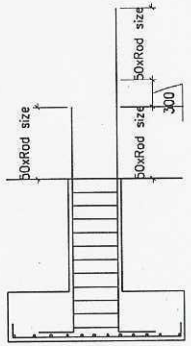
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DESIGN OF STAIRCASE

Height of the floor		=	3 m
Width of the staircase d		=	1.14 m
Tread		=	0.25 m
Rise		=	0.15 m
Effective span		=	4.72 m
Concrete grade	M 25		
Design of the section			
Assume thickness		=	150 mm
For the purpose of computing selfweight of the slab, thickness is			0.15 m
tan 0 = rise/thread =	0.6	0 =	30.96 degree
Weight of the slab =	1 x 0.15 x 25 / cos x 30.96	=	4.37 kN/m^2
Weight of the step =	0.25 x 0.15 x 1.0 x 24 / 2 x 0.25	=	1.8 kN/m^2
Live load =	4 x 1.0	=	4 kN/m^2
Finishes =	1 x 1.0	=	1 kN/m^2
		Total load =	11.17 kN/m^2
Maximum bending moment			
M = wl^2/8 =	11.17 x 4.72 ^ 2 / 8	=	31.11 kNm
Calculation of steel			
Mu/bd^2 =	31.11 x 1.5 x 10^6/(1000 x 150 ^ 2)	=	2.074 kN/m^2
pt =	0.667%		
Minimum % of steel required shall not be less than			0.12
Min Ast =	180 mm^2		
i.e	12 dia bars @	628	mm c/c
Effective depth	150 mm		
Ast required =	180 mm^2		
Required	12 dia bars @	628	mm
Provide	**12 dia bars @**	**100**	**mm centres at the bottom**
ie	1131 mm^2		
Distribution steel shall be	10 dia bars @	150	mm centres
Provide	**10 dia bars @**	**150**	**centres at bottom as main reinf**
CHECK FOR DEFLECTION			
Span of the beam		=	4.72 m
According to IS:456, Clause 22.2.1			
Span to effective depth ratio shall be			26 for continuous slab
The ratio shall be reduced by dividing by the modification factor			1.5 obtained
from Fig.3, page 57 of IS:456 based on reinf percentage of			0.667%
L/(26 x Mod factor)		=	121 mm
Effective depth provided		=	130 mm
			Deflection check okay

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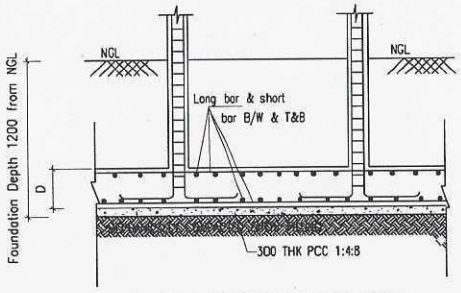
FOUNDATION DETAILS (M30-Fe500)					
TYPE	LENGTH	BREADTH	D	LONG BAR	SHORT BAR
F1	2500	2500	500	10# @ 100 c/c	10# @ 100 c/c
F2	2000	2000	500	10# @ 125 c/c	10# @ 125 c/c
F3	1750	1750	500	10# @ 125 c/c	10# @ 125 c/c
SF	1000	1000	300	10# @ 200 c/c	10# @ 200 c/c
CF1	3500	3000	500	10# @ 100 c/c(T&B)	10# @ 100 c/c(T&B)
CF2	3500	2000	500	10# @ 100 c/c(T&B)	10# @ 150 c/c(T&B)
CF3	3500	1750	500	10# @ 100 c/c(T&B)	10# @ 150 c/c(T&B)



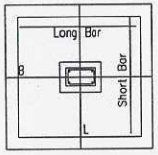
SECTION OF COLUMN FOR LAP

CA DRAWING NTS

COLUMN DETAILS (M30-Fe500)					
C1 230x450	C2 230x450	C3 230x450	C4 150x450	SC 230x230	
230 / 450	230 / 450	230 / 450	150 / 450	230 / 230	
• 8-16# 8#@150c/c	• 6-16# 8#@150c/c	• 6-12# 8#@150c/c	• 8-12# 8#@150c/c	• 4-12# 8#@150c/c	

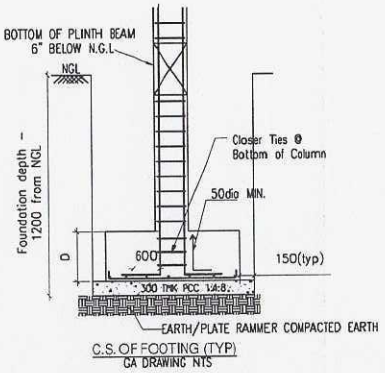


C.S. OF COMBINED FOOTING (TYP)



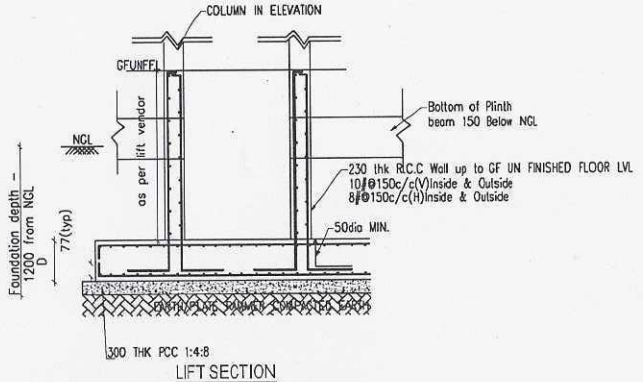
PLAN OF FOOTING DETAIL(TYP)

CA DRAWING NTS



C.S. OF FOOTING (TYP)

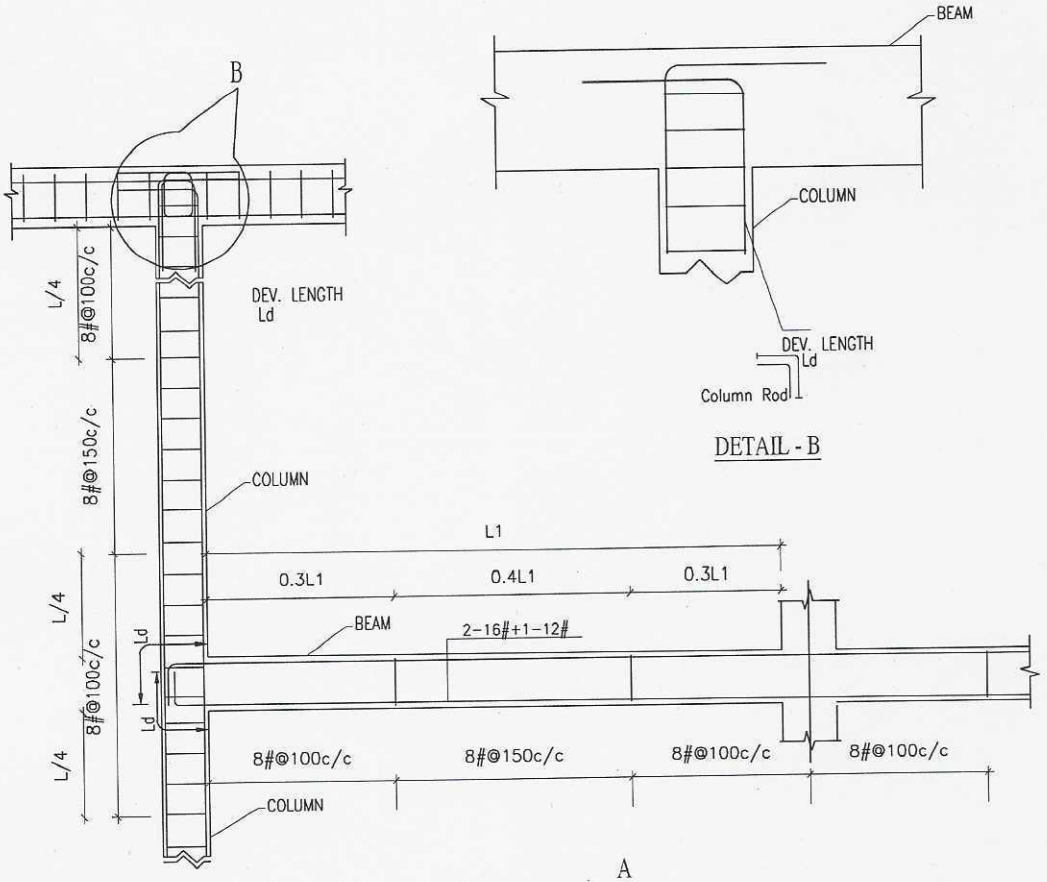
CA DRAWING NTS



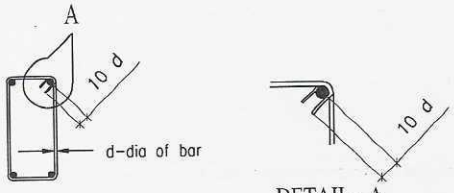
LIFT SECTION

WATER PROOFING TO BE DONE AS PER MANUFACTURE SPECIFICATION

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DETAIL - B



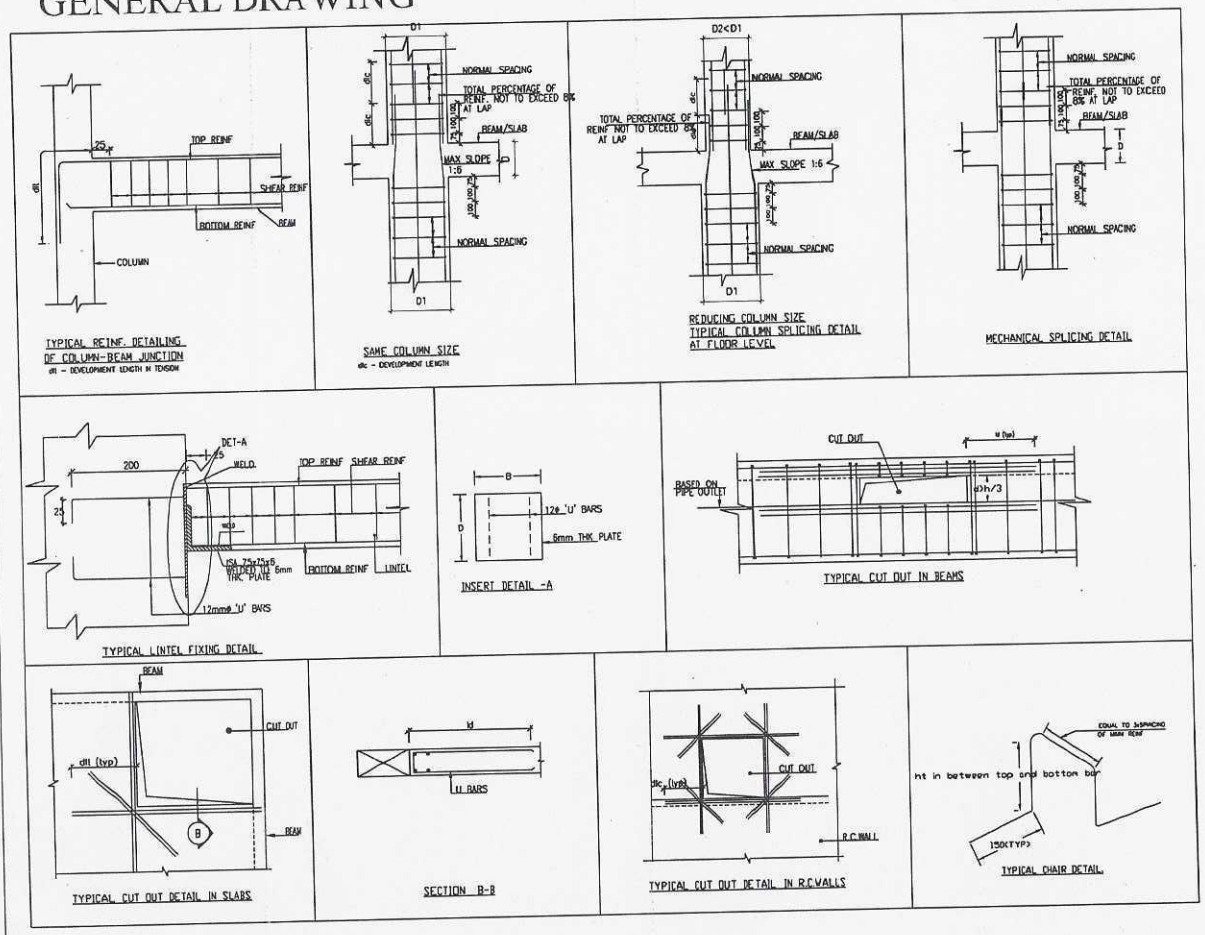
CLOSED STIRRUPS / TIES
FOR BEAM & COLUMN

DETAIL - A

SEISMIC DETAILING

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GENERAL DRAWING



GENERAL DETAILS

GENERAL NOTES

1. GENERAL

1.1 ALL DIMENSIONS ARE IN MM.

1.2 WORK TO FIGURED DIMENSIONS AND DO NOT SCALE THE DRAWING.

1.3 ALL STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH RELEVANT ARCHITECTURAL AND SERVICE DRAWINGS.

1.4 ANY DISCREPANCY IN THE DRAWING SHALL BE BROUGHT TO THE NOTICE OF CONSULTANTS BEFORE COMMENCING THE WORK.

1.5 THE STRUCTURE IS DESIGNED FOR :
AS PER PLAN

2. DESIGN CRITERIA

2.0 STANDARDS AND LOADS.

2.1 THE CONCRETE DESIGN IS BASED ON IS: 456–2000.

2.2 LIVE LOADS ARE BASED ON IS:875 PART II:

a) GENERATORS

b) LIVE,ELECTRICAL PANNEL, EQIPMENT : 300 Kg/Sq.m
AS PER ACTUALS

c) STAIRS

d) TERRACES : 400Kg/Sq.m

2.3 SHUTTERING FOR FOOTING ARE BY STEEL/PLYWOOD SHEETING.
SHUTTERING FOR COLUMN AND PEDESTAL ARE BY STEEL/ PLYWOOD SHEETING.
SHUTTERING FOR SLABS BY STEEL/PLYWOOD SHEETING.

3. CONCRETE

3.1 ALL CONCRETE SHALL BE OF DESIGN MIX AND ARE TO BE OBTAINED FROM REPUTEDTESTING LABORATORIES AND APPROVED BY CONSULTANTS, THE MATERIALS THAT ARE PROPOSED TO BE USED IN THE PROJECT SHALL BE TESTED AND TEST CERTIFICATE TO BE FURNISHED BEFORE USE OF MATERIAL AT SITE.

3.2 IRRESPECTIVE OF WHAT MENTIONED ON DRAWING THE PCC MIX SHALL BE AS FOLLOWS.

I). PCC FOR PILE CAP / PLINTH BEAM / RAFT SLAB MIX 1:4:8

3.3 CANTILEVERED SLAB/BEAMS SHALL BE PROPPED TILL COUNTER BALANCING WEIGHT BECOMES EFFECTIVE.

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4. REINFORCING STEEL/DEVELOPMENT AND ANCHORAGE LENGTHS

4.1 ALL REINFORCEMENT STEEL SHALL CONFORM TO IS:1786 –1985 HIGH STRENGTH DEFORMED STEEL BARS,PRODUCED BY THE THERMO–MECHANICAL TREATMENT PROCESS, OF GRADE Fe500, HAVING ELONGATION MORE THAN 14.5% CAN BE USED

4.4 COUPLER CAN BE PROVIDED INSTEAD OF LAPPING.

Developed Length & Anchorage length

FOR Fe500 in mm	BAR IN TENSION M25	BAR IN COMPRESSION M25
10	485	388
12	583	466
16	777	621
20	971	777
25	1214	971

5. SOIL DATA & WATER TABLE

5.1 FOOTING CARRYING CAPACITY IS BASED ON SOIL REPORT.
5.2 MINIMUM DEPTH OF EXCAVATION SHALL BE AS INDICATED IN DRAWINGS.
5.3 FOR LIME SAND COMPACTION FILLING REFER ARCH DWG.
5.4 GROUND WATER LVL AS PER SOIL REPORT.

6. CONCRETE CLEAR COVER TO MAIN REINFORCEMENT

6.1 CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH 75MM.

6.2 PILE --- 50MM (BOTTOM), 50MM (SIDES)
PILE CAP 75MM (BOTTOM), 75MM (TOP)
FOOTING 50MM (BOTTOM & SIDES)
LINTELS 20MM
BEAMS 30MM
COLUMNS 40MM >12#Rod & 25MM≤12#Rod
SLABS 20MM
RCC WALLS 40MM ON EARTH SIDE/WATER SIDE
20MM ON ATMOSPHERE SIDE

6.3 COVER BLOCKS SHALL BE USED TO GIVE CORRECT COVER TO REINFORCEMENT.

7. WATER PROOFING

7.1 WATER PROOFING SHALL BE DONE FOR : SUMP TANKS, OVERHEAD TANK, TOILET SLABS, TERRACE, LIFT RCC WALL, AS PER STANDARD SPECIFICATIONS.

8. CURING

8.1 CURING BY WATER SHALL BE DONE FOR ALL RCC STRUCTURE FOR A MINIMUM PERIOD OF 10 DAYS FOR OPC AND 12 DAYS FOR PPC CONCRETE.

9. DESHUTTERING TIME

9.1 TYPE OF FORM WORK FOR :

	MINIMUM PERIOD BEFORE STRIKING (EXCLUDING THE DAY OF CASTING)
a. SLABS	14 DAYS
b. BEAMS UPTO 6.0M	14 DAYS
OVER 6.0M	21 DAYS
c. WALL/COLUMN VERTICAL FACES	1 DAY

9.2 SHUTTERING CAN BE RELEASED EARLIER THAN SPECIFIED ABOVE PROVIDED THE PROPS ARE RETAINED AT REASONABLE SPACINGS AND CONCRETE ATTAINS THE FULL STRENGTH AT THE TIME OF DESHUTTERING AS PER IS 456 – 2000. DESHUTTERING SHALL BE DONE BY PROVIDING DAMPENING MATERIAL BELOW IN ORDER TO REDUCE THE IMPACT AT THE LOWER LEVEL.

9.3 SIMPLY SUPPORTED AND CONTINUOUS SPANS SHALL BE DESHUTTERED FROM MID SPAN TOWARDS SUPPORTS.

CANTILEVERS SHALL BE DESHUTTERED FROM FREE END TOWARDS SUPPORTS

9.4 SLAB/BEAMS SHALL BE REPROPPED UNTIL THE NEXT LEVEL SLAB IS CAST AND DESHUTTERED.

10. CONSTRUCTION JOINTS

10.1 SLABS : AT MIDDLE ONE THIRD OF THE SPAN.

10.2 BEAMS : AT MIDDLE ONE THIRD OF THE SPAN. IF ANY CROSS BEAMS ARE LOCATED IN THIS REGION THE JOINT SHALL BE LOCATED TWO TIMES THE WIDTH OF THE BEAM AWAY FROM THE BEAM.

10.3 RETAINING WALL : AT THE JUNCTION OF THE WALL AND FOOTING WITH A KEY JOINT AND AT MIDDLE OF VERTICAL SPAN, VERTICAL JOINTS TO BE AVOIDED.

10.4 RAFT SLAB : AT MIDDLE ONE THIRD OF THE SPAN.

10.5 CANTILEVERS : CONSTRUCTION JOINT SHALL NOT BE PROVIDED IN CANTILEVERS.

10.6 AT CONSTRUCTION JOINTS OF WATER RETAINING STRUCTURES AND BASEMENTS: PRE FORMED PLASTIC WATER STOP (SYNKOFLEX OR EQUIVALENT) SHALL BE PROVIDED.

11. SLUMP OF CONCRETE

11.1 SLUMP OF CONCRETE SHALL RANGE BETWEEN 100 TO 180MM DEPENDING ON THE MANNER OF CONCRETING.

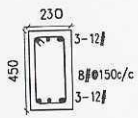
THE TABLE BELOW GIVE THE GENERAL GUIDANCE:

PILING	SLUMP(in mm) Min.	Max.	
A	100	180	POURING IN TO WATER–FREE UNLINED BORE HAVING WIDELY SPACED REINFORCEMENT. WHERE REINFORCEMENT IS NOT SPACED WIDELY ENOUGH, CUT–OFF LVL OF PILE IS WITHIN THE CASTING AND DIAMETER OF PILE IS LESS THAN OR EQUAL TO 600MM, HIGHER ORDER OF SLUMP WITH IN THIS RANGE MAY BE USED.
B	Min. 150	Max. 180	WHERE CONCRETE IS TO BE PLACED UNDER WATER OR DRILLING MUD BY TREMIE OR BY PLACER.

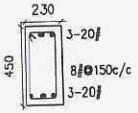
12. MISCELLANEOUS

12.1 ROD EQUAL AND ABOVE 20mm DOUBLE BINDING TO BE DONE.
12.2 CHAIR ROD TO BE PROVIDED AT PROPER SPACING NOT MORE THAN 3'0".
12.3 AT CONSTRUCTION JOINTS A COAT OF SBR–LATEX TO BE APPLIED BEFORE CONCRETING
12.4 COLUMN CAN BE RAISED AFTER 1 COMPLETE DAY FOR CONCRETING.

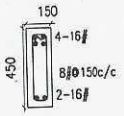
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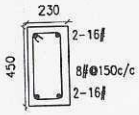
C.S OF RB1
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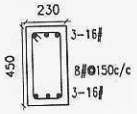
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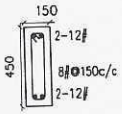
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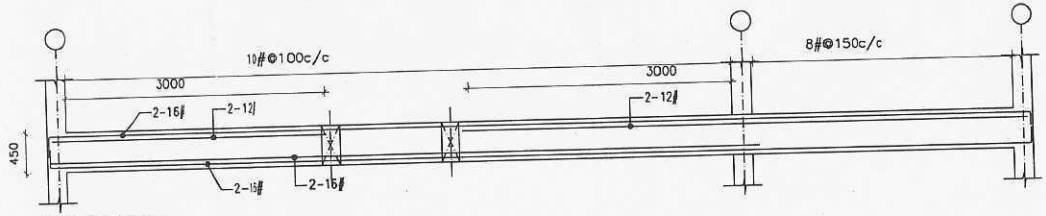
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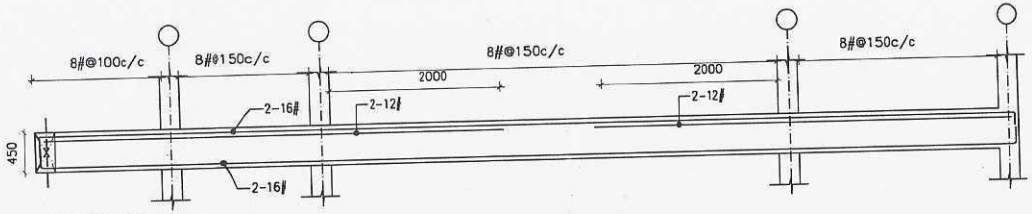
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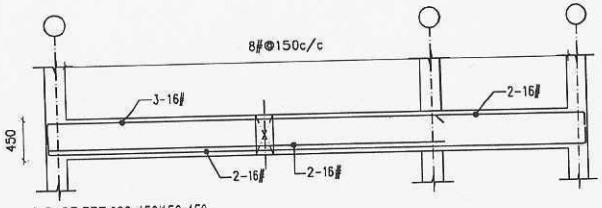
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150x450



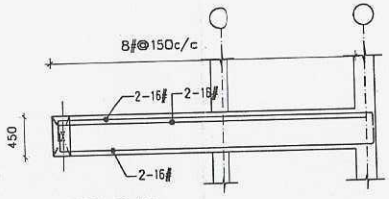
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L.S. OF RB5a-230x450

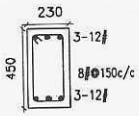


L.S. OF RB7-230x450/150x450

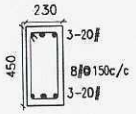


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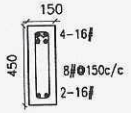
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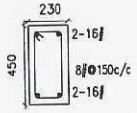
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230x450



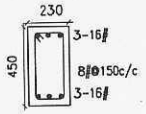
C.S OF RB2
230x450



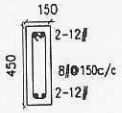
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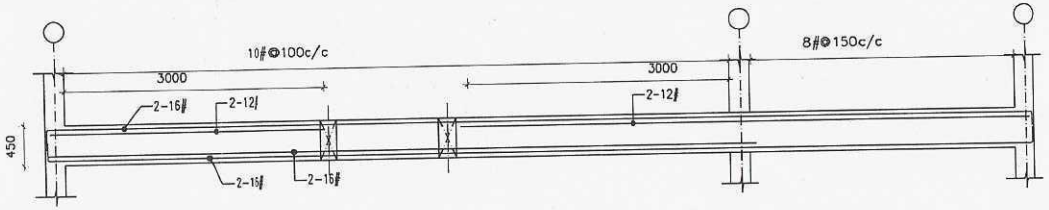
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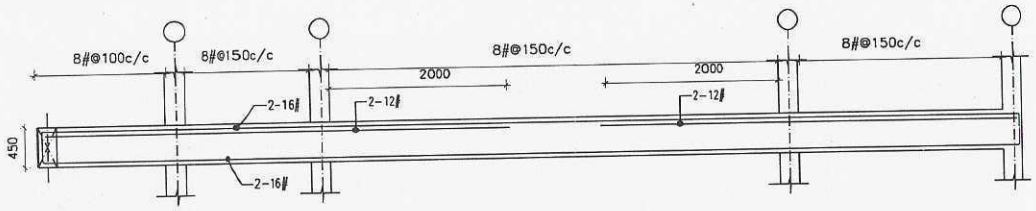
C.S OF RB5
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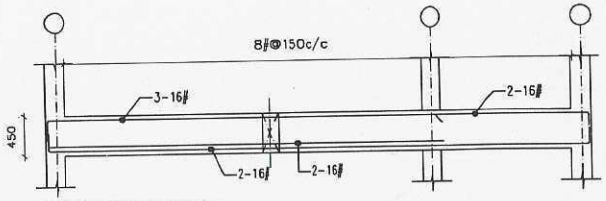
C.S OF RB6
150x450



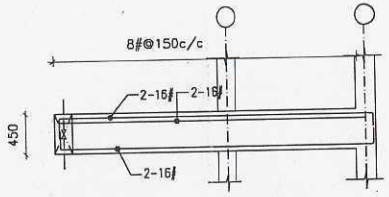
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L.S. OF RB5a-230x450

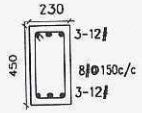


L.S. OF RB7-230x450/150x450

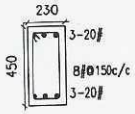


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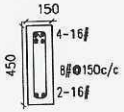
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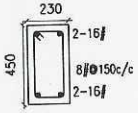
C.S OF RB1
230x450



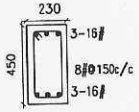
C.S OF RB2
230x450



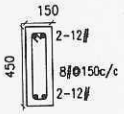
C.S OF RB3
150x450



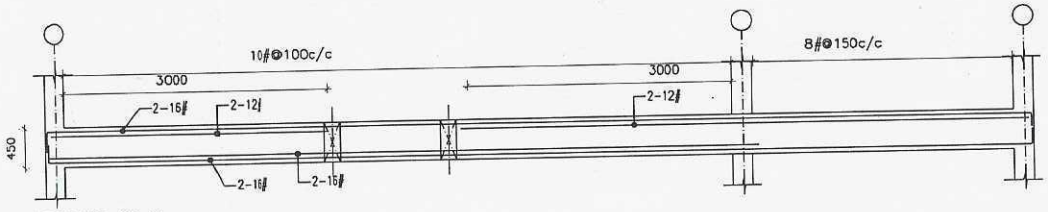
C.S OF RB4
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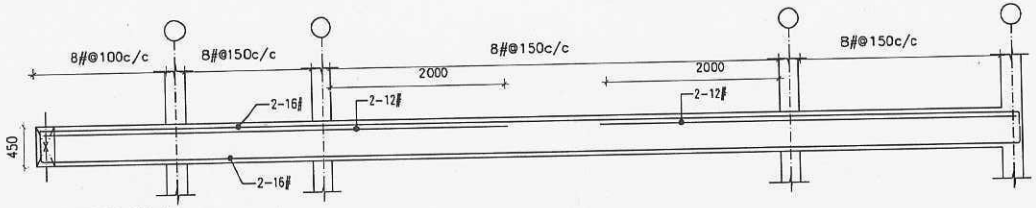
C.S OF RB5
230x450



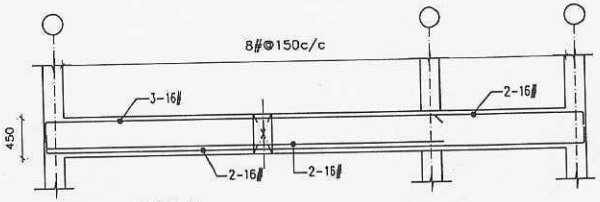
C.S OF RB6
150x450



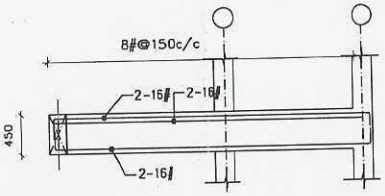
L.S. OF RB2a-230x450



L.S. OF RB5a-230x450

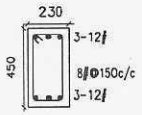


L.S. OF RB7-230x450/150x450

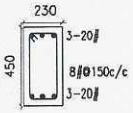


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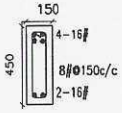
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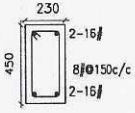
C.S OF RB1
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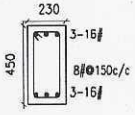
C.S OF RB2
230x450



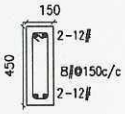
C.S OF RB3
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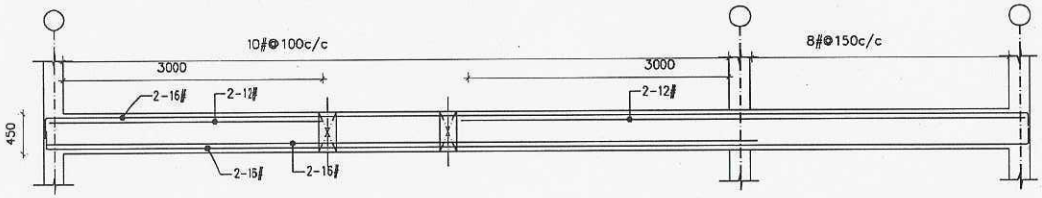
C.S OF RB4
230x450



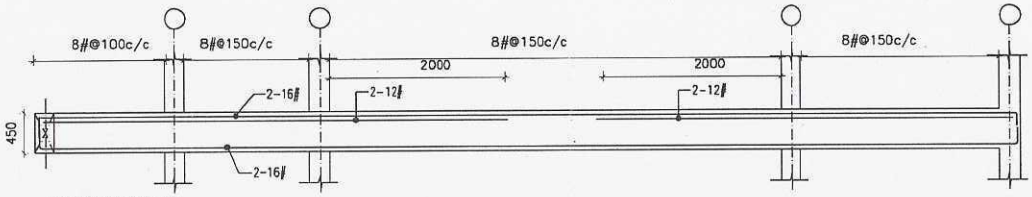
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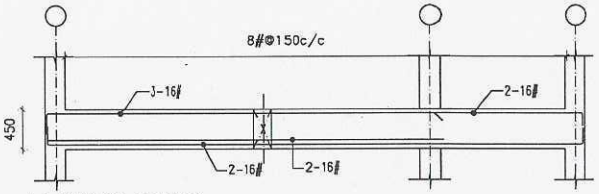
C.S OF RB6
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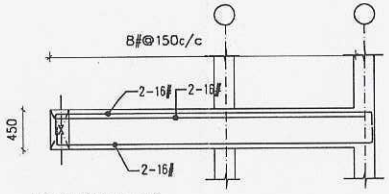
L.S. OF RB2a-230x450



L.S. OF RB5a-230x450



L.S. OF RB7-230x450/150x450

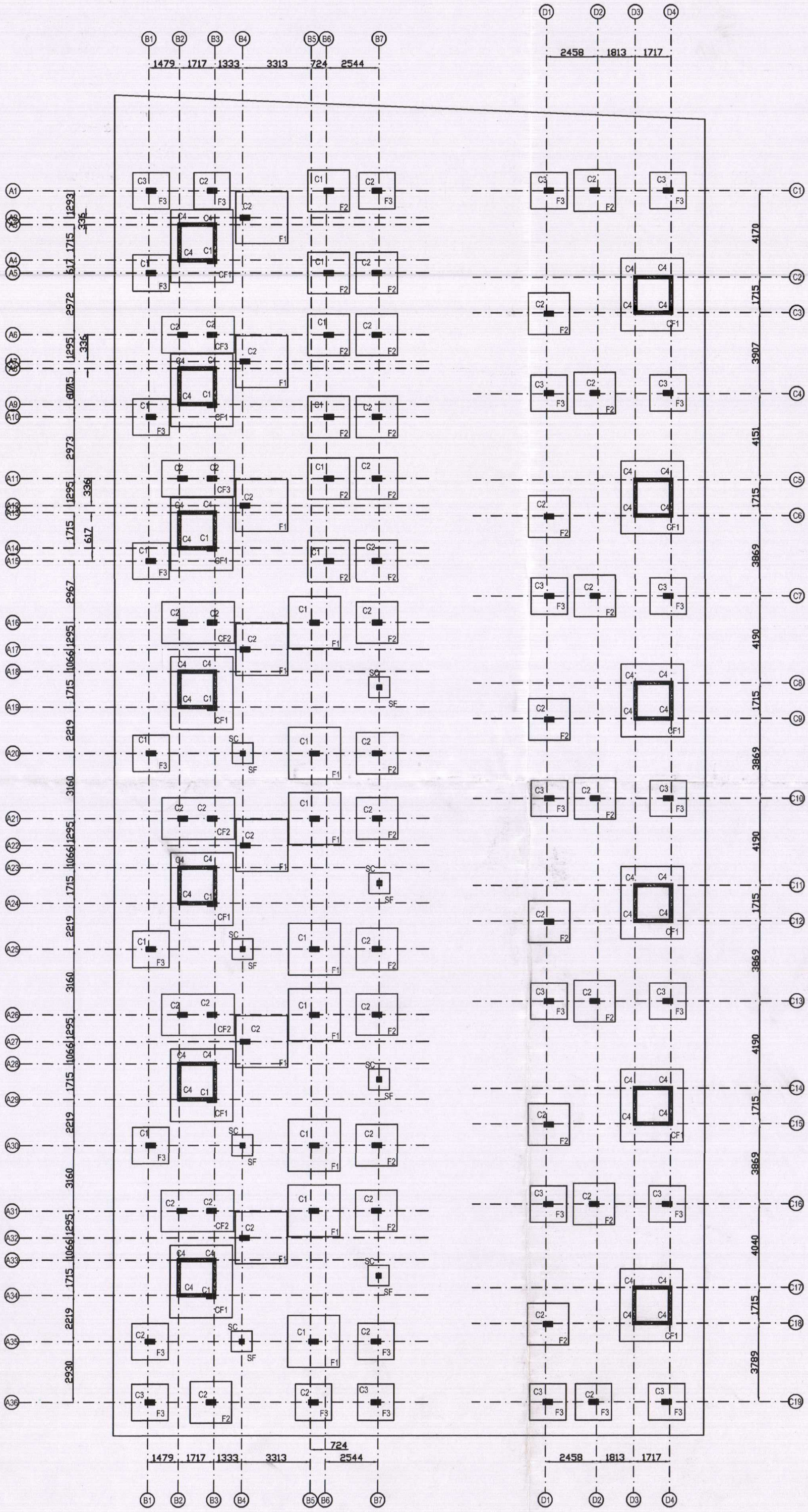


L.S. OF RB8-150x450

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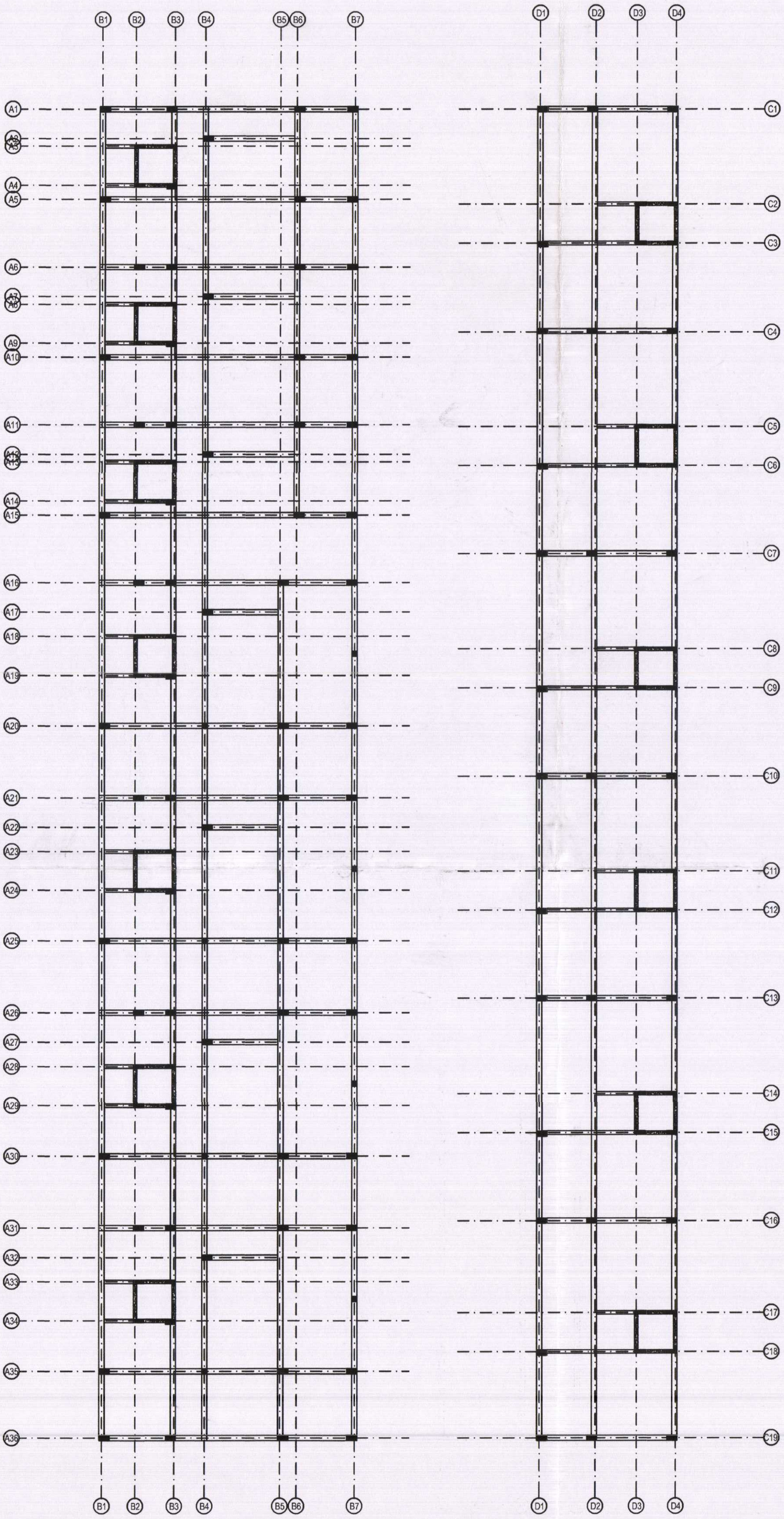
NOTES

1. All dimensions are in mm.
2. Dimensions to be read, not scaled, and to be Checked with arch. dwg only.
3. Clear cover to the main reinf. as follows
   a) Col 25mm for 12mm bars & 40mm for >12mm
   b) Footings 50mm
4. Use M30 Conc & Fe500 Steel.
5. SBC– taken as 15 T/sqm as per soil test report.
6. Foundation depth –1200mm as per soil test report.
7. Foundation designed for S+3 Flrs. only.
8. Leave dowels wherever necessary.



FOOTING LAYOUT

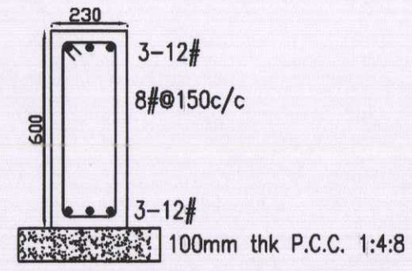
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PLINTH BEAM LAYOUT

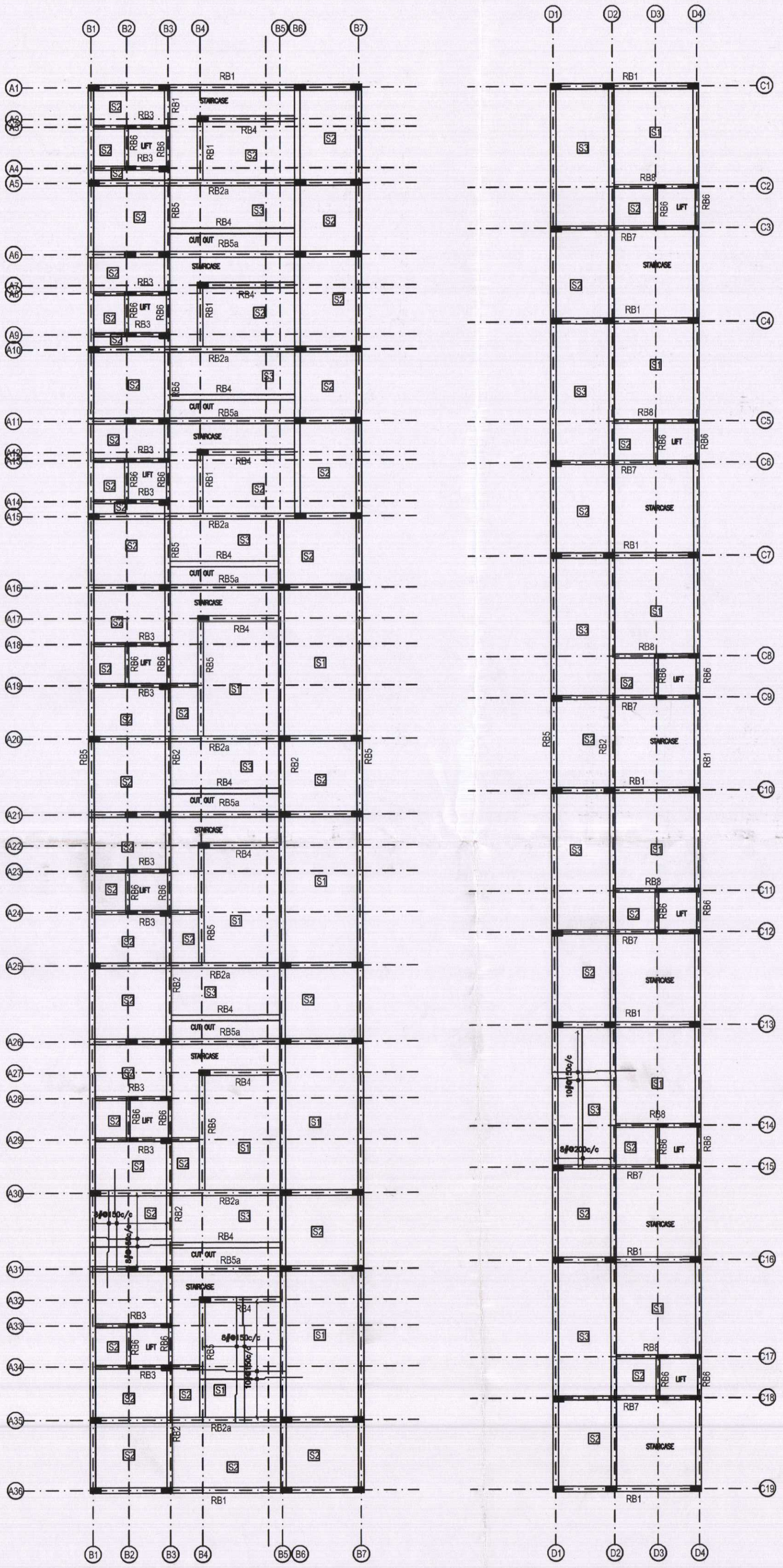
NOTES

1. All dimensions are in mm.
2. Dimensions to be read, not scaled, and to be Checked with arch. dwg only.
3. Clear cover to the main reinf. as follows
   a) Col 25mm for 12mm bars & 40mm for >12mm
   b) Plinth beam 30mm
4. Use M30 Conc & Fe500 Steel.
5. Leave dowels wherever necessary.



C.S OF PLINTH BEAM
230x600
(USE M30-Fe500)

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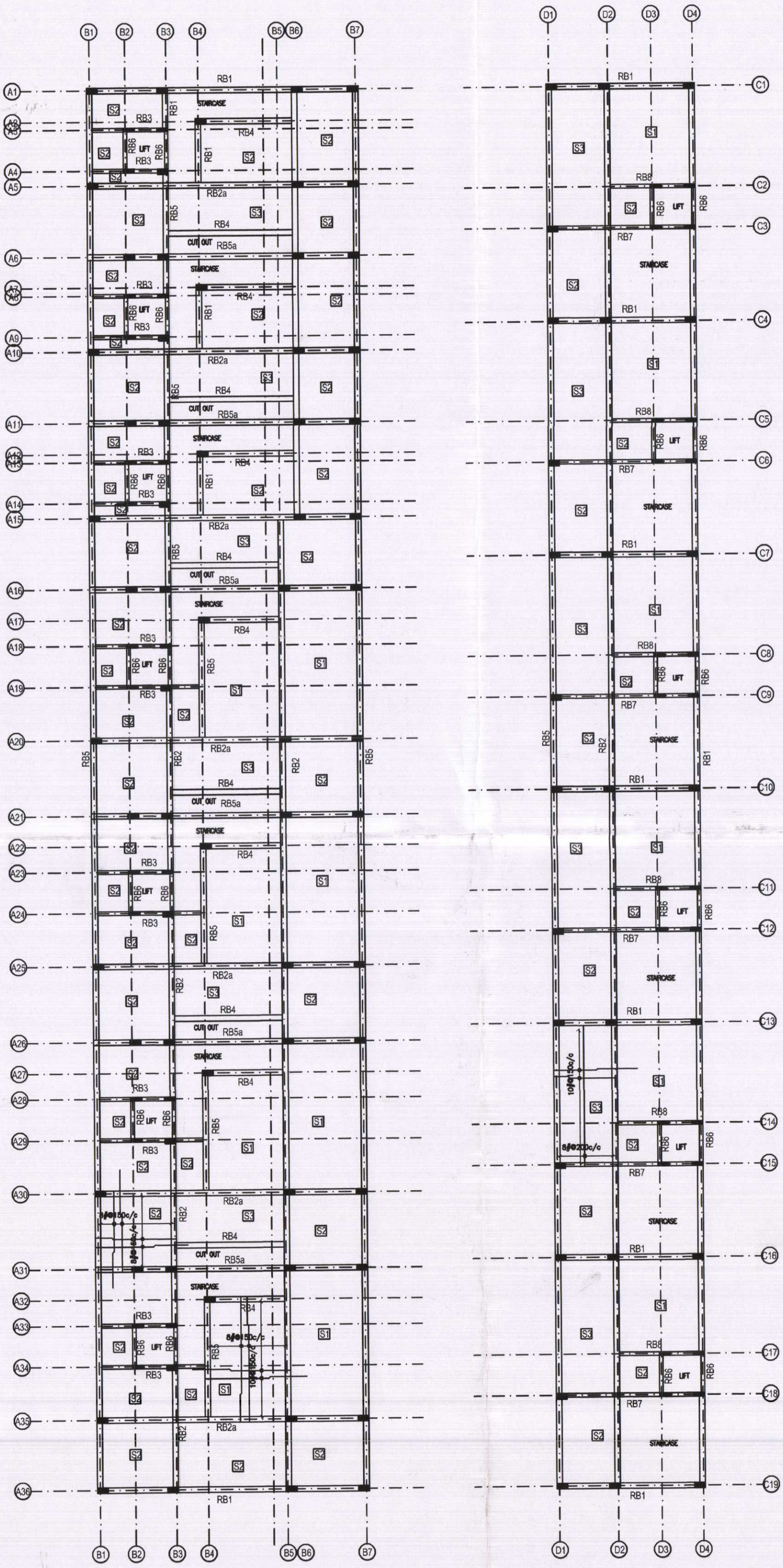


GF ROOF LAYOUT

NOTES

1. All dimensions are in mt.
2. Dimensions to be read, not scaled, Check in arch. dwg
3. Clear cover to the main reinf. as follows
   a) Col 25mm for 12mm bars & 40mm for >12mm
   b) Slab 20mm
   c) Beams 30mm
4. Use M30 Conc & Fe500 unless specified otherwise.
5. Slab thickness 125mm unless specified otherwise.
6. Crank length 0.2L of span.
7. Top rod extn. 0.3L of span.
8. Sunk the slab as per arch dwg.
9. Roof Levels refer to Arch. Drg.
10. Leave dowels/Sleeves wherever necessary.

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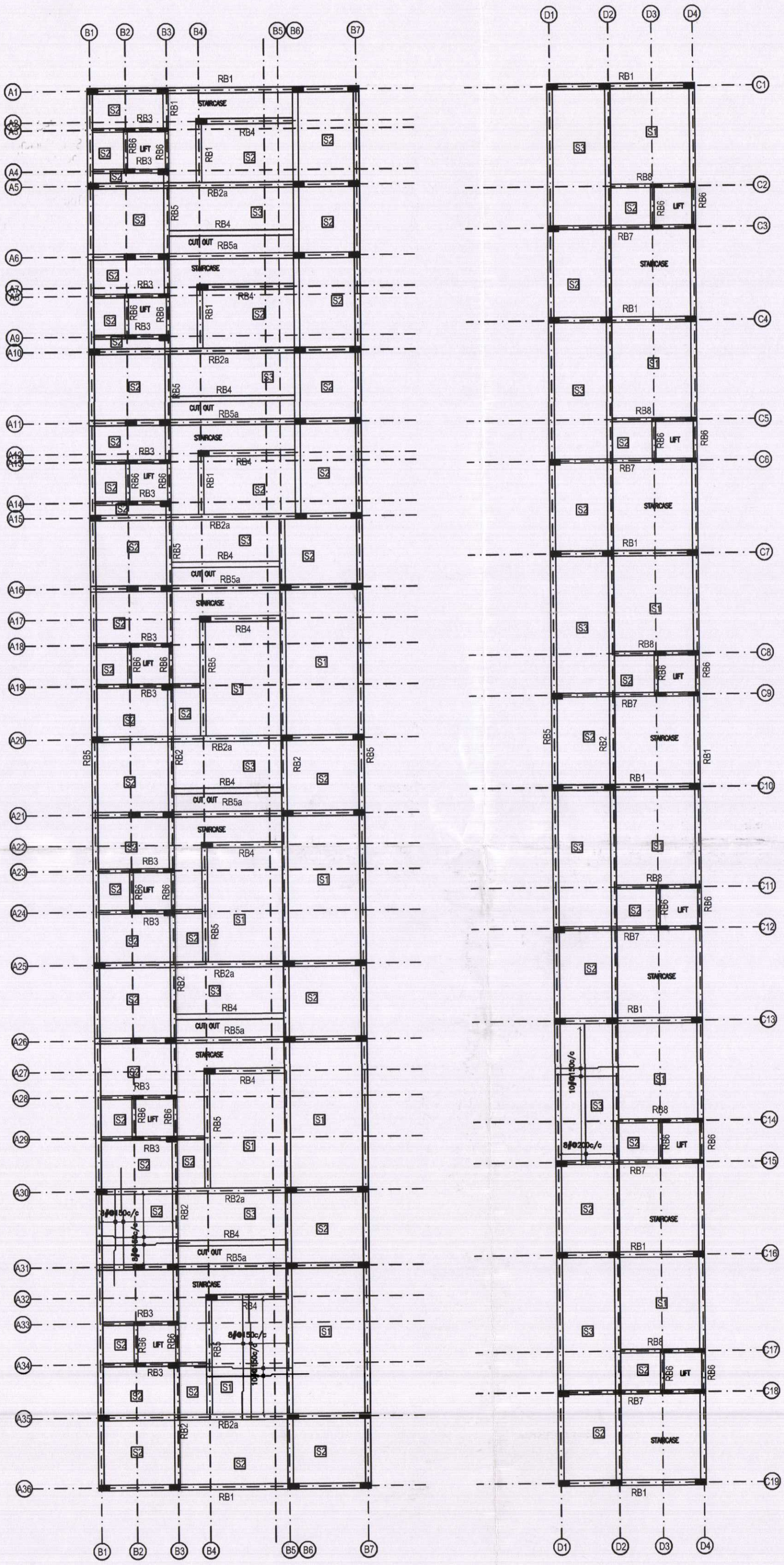


FF ROOF LAYOUT

NOTES

1. All dimensions are in mt.
2. Dimensions to be read, not scaled, Check in arch. dwg
3. Clear cover to the main reinf. as follows
   a) Col 25mm for 12mm bars & 40mm for >12mm
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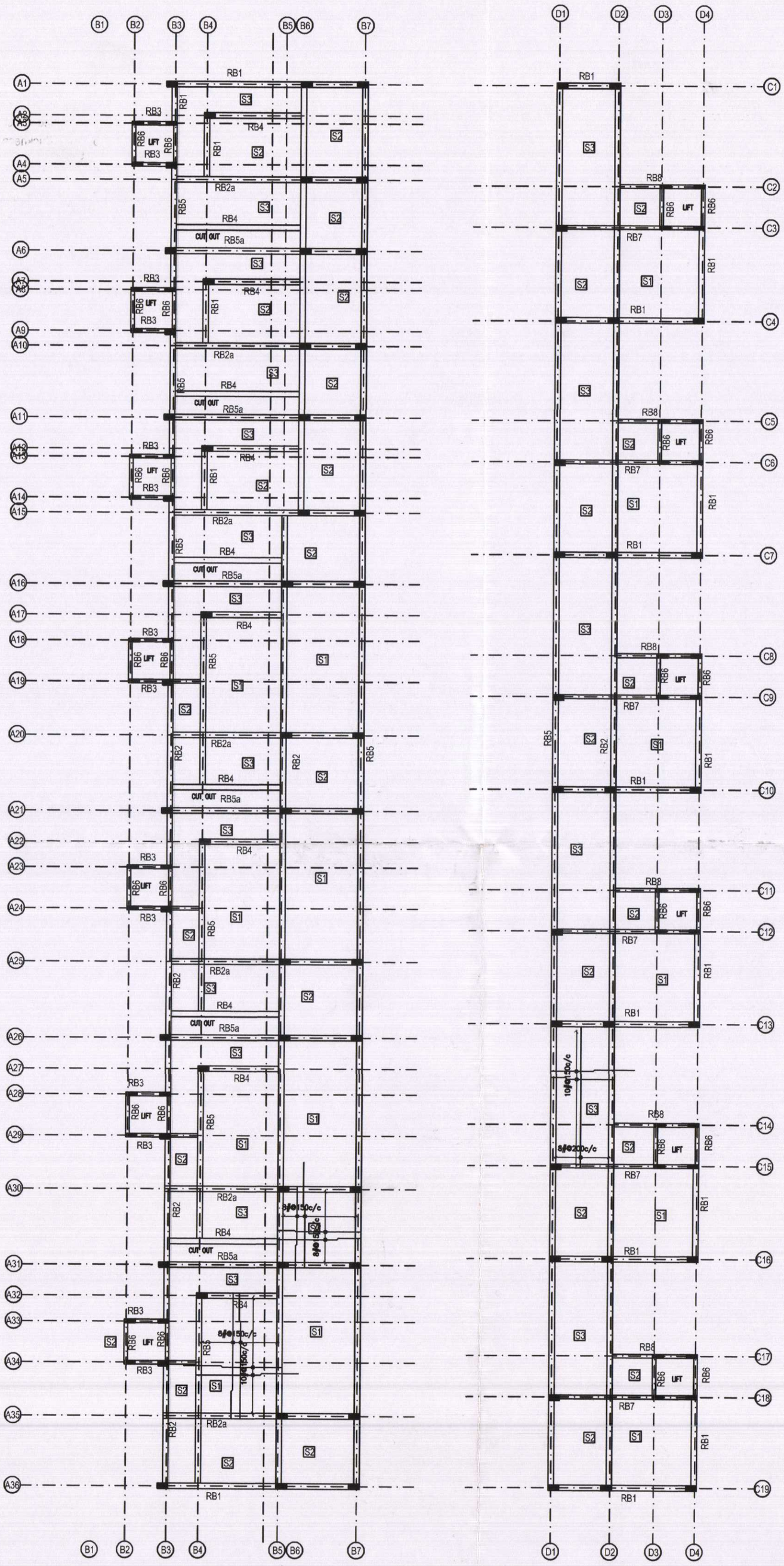


SF ROOF LAYOUT

NOTES

1. All dimensions are in mt.
2. Dimensions to be read, not scaled, Check in arch. dwg
3. Clear cover to the main reinf. as follows
   a) Col 25mm for 12mm bars & 40mm for >12mm
   b) Slab 20mm
   c) Beams 30mm
4. Use M30 Conc & Fe500 unless specified otherwise.
5. Slab thickness 125mm unless specified otherwise.
6. Crank length 0.2L of span.
7. Top rod extn. 0.3L of span.
8. Sunk the slab as per arch dwg.
9. Roof Levels refer to Arch. Drg.
10. Leave dowels/Sleeves wherever necessary.

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TF ROOF LAYOUT

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