PLANNING,ANALYSIS AND DESIGN OF DEPARTMENTAL STORE BUILDING

A PROJECT REPORT

Submitted by

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In partial fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

INDUS COLLEGE OF ENGINEERING

COIMBATORE- 646 101

ANNA UNIVERSITY, CHENNAI

OCTOBER 2012

ANNA UNIVERSITY,CHENNAI

BONAFIDE CERTIFICATE

Certified that this project report **"PLANNING, ANALYSIS AND DESIGN OF A DEPARTMENTAL STORE BUILDING. "** is the bonafide work of "**K.ANAND, S.SENTHIL KUMAR, B.ABINESH, A.UMMAR KHAN"** who carried out the project work under my supervision.

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ACKNOWLEDGEMENT

We are very grand to expose our sincere and lovable memorial thanks to our management for having on hand the facilities for the triumphant completion of the project.

We have glad to express our subterranean gratitude to **Dr.R.RANGARAJAN,** Principal, for his invaluable motivation and encouragement in every tread of our course.

We cordially thanks to **Prof.Mrs.PREMSUDHA** Head of the Department, Civil engineering, intended for giving valuable guidance, steady support and encouragement to inclusive our project lucratively. Also we are vastly obliged to her as our project guide, for her breed and valuable support to make our project a successful one.

We are very much thankful to our department staff for giving unsurpassed suggestions towards successful completion of this new project.

ABSTRACT

This project consist of "PLANING, ANALYSIS AND DESIGN OF A DEPARTMENTAL STORE BUILDING". The design is given special importance to satisfy the various functional and structural requirements. Functional design can promote skill, economy, conveniences, and comforts and can compete needs and priorities. A good front elevation is also given to enhance the appearance of the building. The building is proposed to be located at COIMBATORE TO POLLACHI NATIONAL HIGHWAY, POLLACHI.

The plan of "DEPARTMENTAL STORE BUILDING "as per building Bye law. The analysis and design of the various building components are as per IS codal provisions and recommendations. The ultimate aim of the project is to get an economical section for the structural system. Our project deals with the planning of the departmental store building by using Auto cad. The building frame is to be analyzed by using the software 'STAADPro' and THREE DIMENSIONAL VIEW of the building using the 'REVIT ARCHITECTURE'. The structural components are to be designed by limit state method as per the IS code.

SITE DETAILS:

LOCATION	: Behind hotel amuthasurabhi, NH-209, pollachi
AREA	: 6536 Sq.m
BUILTUP AREA PLANNED	: 2400 Sq.m
SAFE BEARING CAPACITY OF SOIL	: 150KN/Sq.M
FACING OF SITE	: WEST FACING

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LIST OF FIGURES

LIST OF SYMBOLS:

A	=	Area
B	=	Breath
D	=	Depth
d	=	Effective depth
d’	=	Effective cover
DL	=	Dead Load
fck	=	Characteristics compressive strength
qs	=	Characteristics strength of Steel
Ld	=	Development length
LL	=	Live Load
L	=	Length
le	=	Effective Span
lxx	=	Effective length about xx-axis
lx	=	Length of Longer Span in x-axis
ly	=	Length of longer span in y-axis
Sv	=	Spacing of Stirrups
S.F	=	Shear force
W	=	Total Load
Wd	=	Design Load
WL	=	Distributed Imposed Load per unit length
□	=	Shear Stress in concrete
$\square_v$	=	Nominal Shear in Stress
Ø	=	Diameter of Bar
P	=	Axial Load on the Cross Section

Ac = Area of concrete

Ag = Gross Area of the Cross Section

Al = Area of longitudinal Reinforcement

$\square_{max}$ = Maximum shear stress in Concrete

S.F = factored Shear Force

M.R = Moment of Resistance

$\square_{bd}$ = Design of Bond Stress

INTRODUCTION

A **departmental store** is a retail establishment which satisfies a wide range of durable goods and products to the consumer's personal and residential needs; and at the same time offering the consumer a choice of multiple merchandise lines, at variable price points, in all product categories. Department stores usually sell products including clothing, furniture, home appliances, toys, cosmetics, gardening, toiletries, sporting goods, do it yourself, paint and hardware and additionally select other lines of products such as food, books, jewelry, electronics, stationery, photographic equipment and baby and pet needs. Certain department stores are further classified as discount stores. Discount department stores commonly have central customer checkout areas, generally in the front area of the store. Department stores are usually part of a retail chain of many stores situated around a country or several countries.

1.1 NEED OF THE PROJECT

Due to urbanization and migration of people from villages to cities population in cities is increasing day by day. Our project location pollachi is having increasing population, institutions and industries. Hence the basic needs of the people increases day by day. People also need royalty in everything, to cater the need and requirements of the people day by day and making their time effectively to fulfill their needs.

Even though many stores are there in pollachi, they are not enough to meet the requirements of people.

Construction of a departmental store in this area provides easy and fast purchasing of goods.

1.2 STORE LAYOUT AND DESIGN

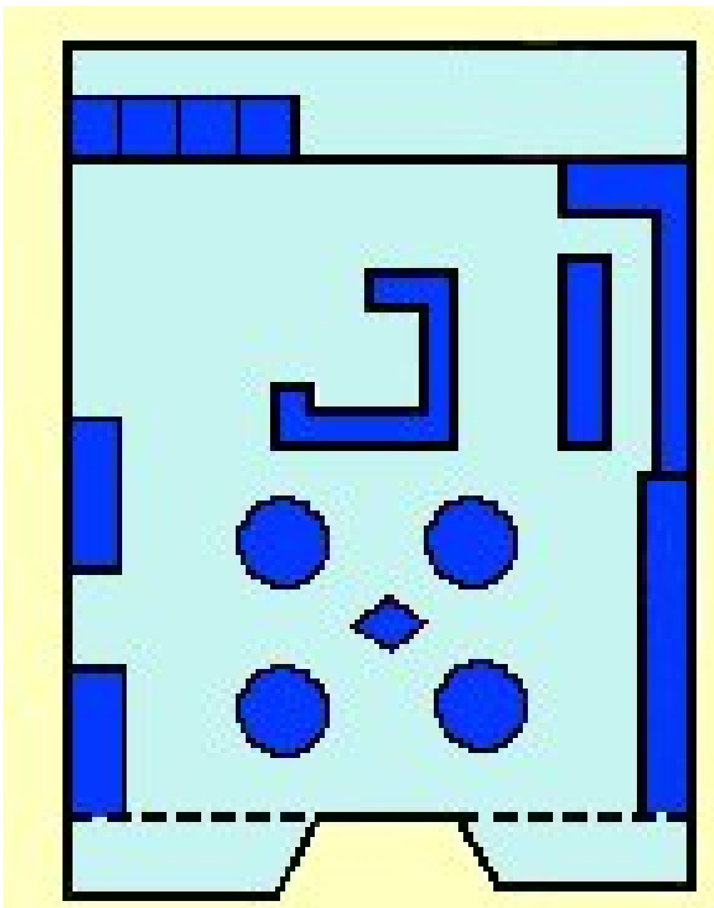
It is the overall perception to the consumer has of the store's environment.
STORE LAYOUT:

There are two different types of layout,

a. Free flow layout
b. Grid layout

A.FREE FLOW LAYOUT:

The layout of the store placed freely and requires more space to maintain the racks and circulation allowed freely is known as free flow layout.



Advantages and Disadvantages of Free Flow Layout:

Advantages:

1. Allowance for browsing and wandering freely
2. Increased impulse purchases
3. Visual appeal
4. Flexibility Retailing,

Disadvantages:

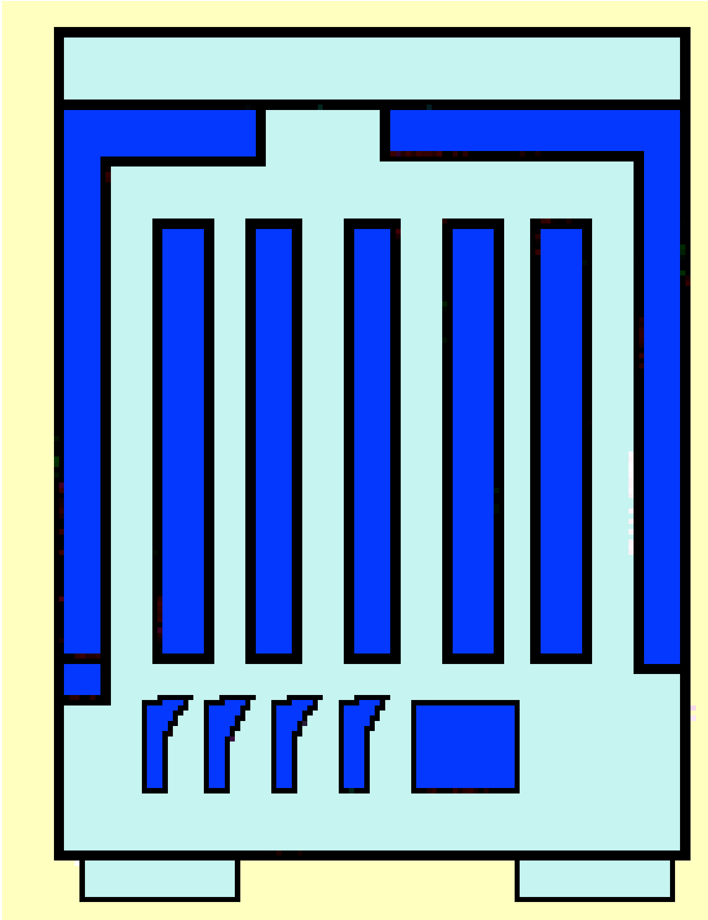
1. Loitering encouraged
2. Possibility of confusion
3. Waste of floor space
4. Cost
5. Difficulty of cleaning

B.GRID LAYOUTS*:*

The arrangements of racks and goods are in grid manner having following advantages and disadvantages,

Advantages:

1. Low cost
2. Customer familiarity
3. Merchandise exposure
4. Ease of cleaning
5. Simplified security
6. Possibility of self-service



Disadvantages

1. Plain and uninteresting
2. Limited browsing
3. Stimulation of rushed shopping behavior
4. Limited creativity in decor

From comparisons of layouts, we preferred the free flow layout.

SPECIFICATION

Following is the specification that is planned to be provided in this project consisting of G+4 floors and having RCC roof

1. FOUNDATION:

The foundation for all the main columns in cement concrete 1:4:8,3500x3500mm wide, 600 mm thick and column size of 500x500mm.

2. BASEMENT:

RCC column size 500mmx500mm, 600mm thick and basement will be in first class B.W in C.M 1:5, 600mm height, above the ground level for all the walls and is filled with earth filling, 500mm thick. A DPC, in cement mortar 1:3,20mm thick will be provided for all the walls at basement level.

3. SUPER STRUCTURE:

All the main walls will be in brick work in C.M 1:5, 230mm thick. All the walls will be raised up to the roof. The height of the main wall will be 4000mm above floor level. Parapet walls is 230mm thick and 800mm height

4. ROOFING:

The roofing will be in RCC 1:2:4 mix, 230mm thick flat slab, plastered with cement mortar 1:3 and 20mm thick, the weathering coarse will be of brick jelly with lime mortar of thickness 75mm will be provided over the slab.

5. DOORS AND WINDOWS:

The doors of fully glazed and of size 3000mmx2500mm and 1800x2500mm and flush door of 1000x 2500 mm, glazed window of size 1800x1500 and fully glazed ventilator of 1800x600mm size.

6. LINTEL:

All the opening will be provided with 150mm thick RCC 1:2:4 mix lintels.

7. FLOORING:

The floor will be in cement concrete 1:4:8 mix,130mm thick, top finished smoothly with 1:3, 20mm thick plaster for all the rooms.

8. STEPS:

Steps will be in cement concrete 1:2:4 mix having rise of 150mm, thread 250mm.

DESIGN PROCEDURE:

1. Basic Codes for Design.
2. General Design Consideration of IS: 456-2000.
3. Calculation of horizontal loads and vertical load on buildings.
4. Vertical load analysis.
5. Horizontal load analysis.

LOAD BEARING MASONRY BUILDINGS:

•Low rise buildings with small spans generally constructed as load bearing brick walls with RCC slab &beams.

•Suitable for building upto four or less stories.

•Adequate for vertical loads &also serves to resists horizontal loads like wind& earth quake by box action.

•Provisions of IS:4326 e.g.providing horizontal RCCBands & Vertical reinforcement in brick wall etc. need to be followed to ensure safety against earthquake

•Design to bed one asper BIScode IS:1905

RCC FRAMED STRUCTURES:

•RCC frames are provided in both principal directions and

•Loads are transmitted to ground through vertical framing system i.e Beams, Columns and Foundations.

•Effective in resisting both vertical & horizontal loads.

•Brick walls are non load bearing filler walls only.

•Suitable for multi-storied building as it is very effective in resisting horizontal loads due to earthquake/wind.

BASIC CODES OF DESIGN:

Useful Codes/Hand Books For Structural Design of RCC Structures:

(i) IS 456 : 2000 –Plain and reinforced concrete –code of practice

(ii) Loading Standards:

IS 875 (Part 1-5) –Code of practice for design loads (other than earthquake) for buildings and structures

Part 1 : Dead loads

Part 2 : Imposed (live) loads

Part 3 : Wind loads

Part 4 : Snow loads

Design Handbooks (Bureau of Indian standards) -

•SP 16 : 1980 –Design Aids to IS 456 : 1978 (Based on previous version of code but still useful)

•SP 34 : 1987 –Handbooks on Reinforced Concrete Detailing

BASIS OF DESIGN:

AIM OF DESIGN:

•To design structures with appropriate degree of safety to–Perform satisfactorily during its intended life.

•Sustainably loads/deformations of normal construction & use

Have adequate durability & resistance to fire.

METHOD OF DESIGN:

•Structure and structural elements to be normally designed by Limit State Method.

•Working Stress Method may be used where Limit State Method cannot be conveniently adopted

MEMBER SPECIFICATIONS:

COLUMN	- 500mmX500mm
BEAM	-400mmX600mm
THICKNESS OF SLAB	-200mm
HEIGHT OF COLUMN	-4.0m
THICKNESS OF WALL	-230mm
SPAN OF BEAM 1	-8.0m
SPAN OF BEAM2	-10.0m

LOAD CALCULATIONS:

CALCULATION OF DEAD LOADS:

Dead load of slab/m width = 25x1x0.2x25x1

= 5 KN\M

Dead load of beam/m width = 25x0.3x0.5x1

= 3.75 KN\M

Dead load of Column/m width = 4 KN\M

CALCULATION OF WIND LOADS (IS 875 PART-III) :

Height of building above ground level = 19m

Design wind speed Vz = Vbxk1xk2xk3xk4

where,

Vb= basic wind speed, (50m/s)

K1=risk factor,(1.0)

K2=terrain roughness and height factor,(1.01)

K3=topographic factor,(1.0)

K4=importance factor,(1.0)

Vz =50x1x1.01x1x1

=50.5 kN/m

Design wind pressure, Pz = $0.6Vz^2$

= 0.6x50.5

= 1530.15 N/m^2

wind force F = (Cpe-Cpi)AxVz

= (0.7-0.2)x1.6x1530.15

= 1.224kN

SELF WEIGHT CALCULATIONS :

SELF WEIGHT OF MEMBERS:

Total No of Columns = 42 (in each floor)

Length of Building = 40+0.5

=40.5

Width of Building = 60+0.5

=60.5m

Thickness of floor finish = 50mm

Factored dead load from slab & floor plinth:

W = 1.5x[(0.125x25)+(0.05x20)]x(40.5x60.5)

= 15160.92 KN

Length of primary & secondary beams in transverse direction in each floor:

For 7 primary beams,

L = 7 x [40.5-(8x0.5)]

= 255.5 m

For 12 nos of secondary beams,

L = 12 x[40.5-(8x0.4)]

=447.6 m

At Floor Level, in addition to weight of floor slab & beam, half of the weights of walls and columns below and above it are lumped.

Factored Dead Load OF Columns at different floor levels:

Ground Floor:

$$W = 42 * \frac{1.5*0.50.5*0.25*(4+3.6)}{2} = 1496.25\ KN$$

From Floor I to Floor IV :

$$W = 42 * \frac{1.5*0.50.5*0.25*(3.6+3.6)}{2} = 1417\ KN$$

For Roof Level :

$$W = 42 * \frac{1.5*0.50.5*0.25*(3.6)}{2} = 708.75\ KN$$

FACTORED DEAD LOAD OF BEAMS :

W_{beam} = 1.5x[0.4x(0.6-0.125)x25x(333+255.5) +

1.5x[0.3x(0.4- 0.125)x25x(447.6)

= 4193.06+1384.6

=5578 KN

LIVE LOAD CALCULATIONS : (IS 875-PART-II)

Live Load on Roof for access not provided = 0.75 $KN\backslash M^2$

Live Load on Floor = 1.5$KN\backslash M^2$

Roof Slab = 0.75x1.5x60.5x40.5 = 2756.53 KN

Floor Slab = 5.0x1.5x60.5x40.5 = 18376.8 KN

TOTAL FACTORED GRAVITY LOAD OF BUILDING :

W = Dead Loads + Reduced Live Loads

= 5x(5578+15160.9) + 708.75 +(3x1417)+1496 + [2756.5+18376.8x(1.0+0.9+0.8+0.7)]

$=1177\text{x}10^3$ KN

LOAD FOR SINGLE COLUMN IN GROUND FLOOR:

Total load on roof level of ground floor= $1177\text{x}10^3$ KN

Load per one panel = $1177\text{x}10^3/30$

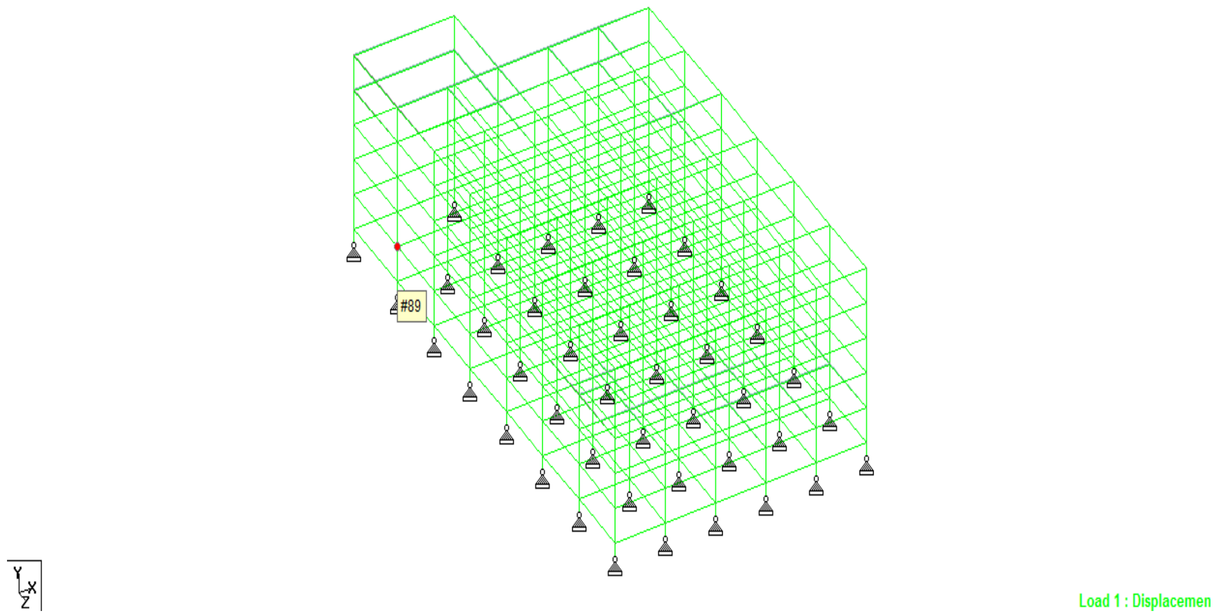
= 39249.32 KN

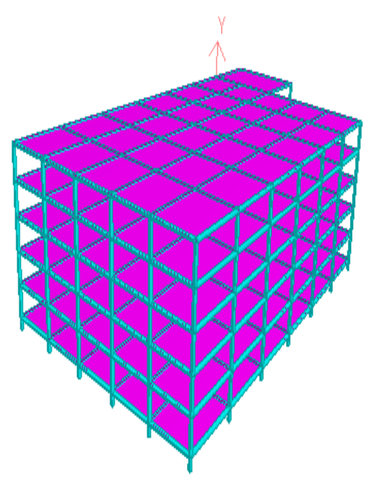
Load per individual column = $1.1\text{x}39249.32 \text{ x } \frac{8*10}{60.5*40.5}$

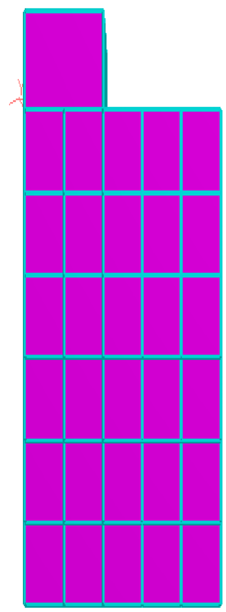
= 1409.62 KN

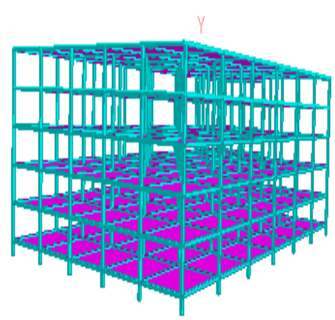
<u>**ANALYSIS USING STAADPRO:**</u>

FRAMED STRUCTURES:

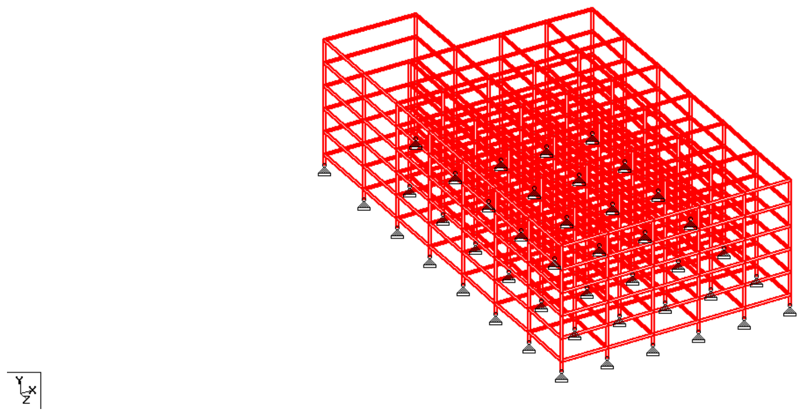


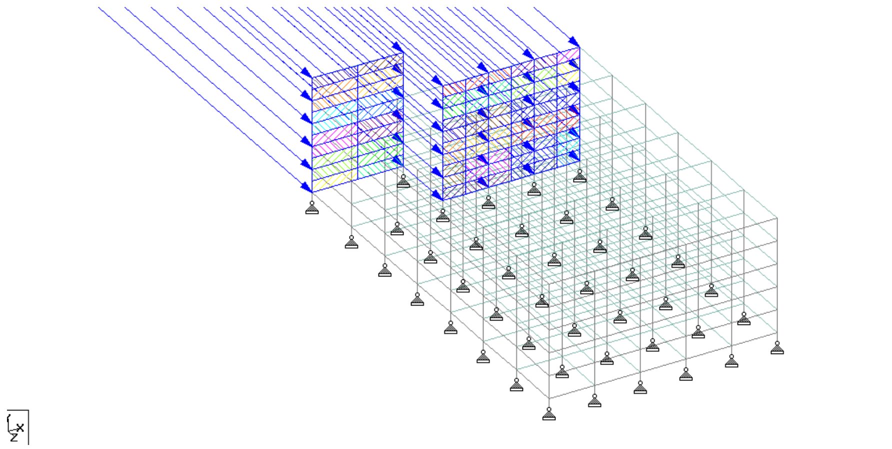


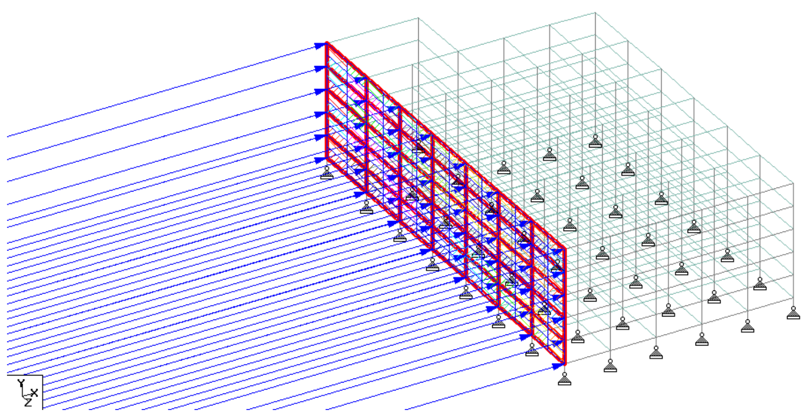




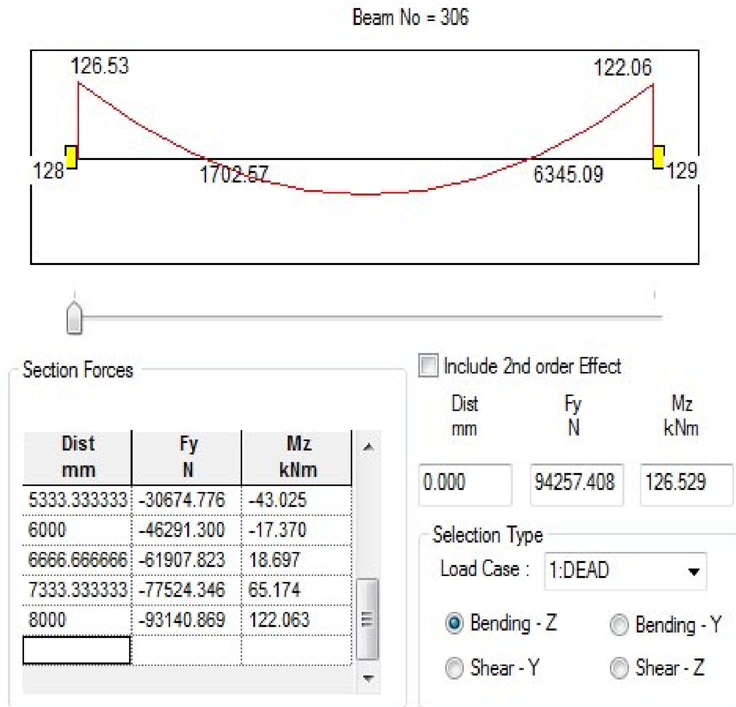
LOADING DIAGRAM:

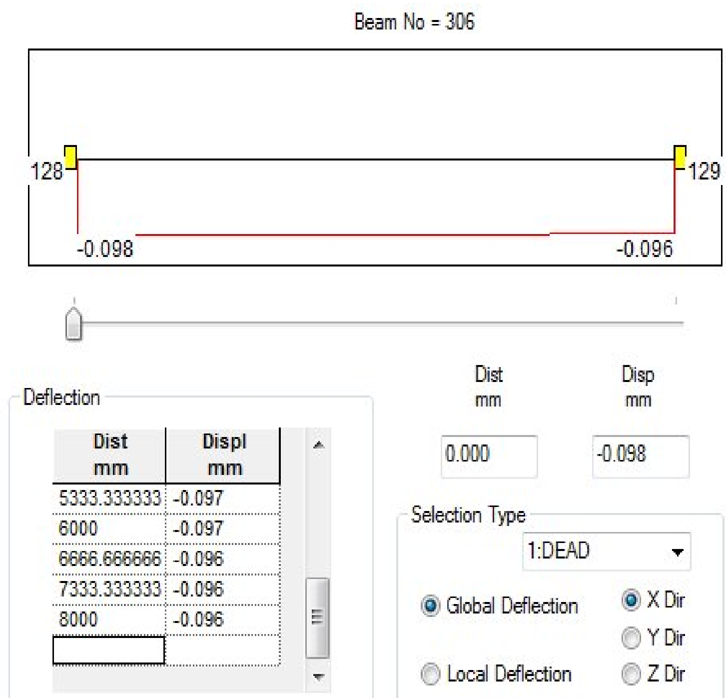






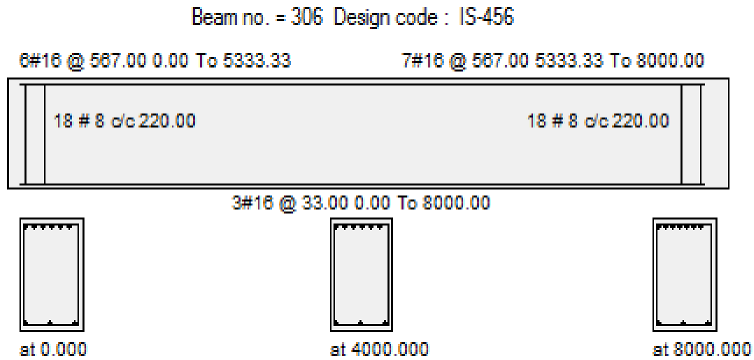
ANALYSIS OF BEAM:





DISTANCE	FX	FY	FZ	MX	MY	MZ
0.000	-1160.606	165.22739E3	2.915	-0.501	-0.017	205.084
2000.000	-1160.606	79953.033	2.915	-0.501	-0.011	-40.097
4000.000	-1160.606	-5321.332	2.915	-0.501	-0.006	-114.729
6000.000	-1160.606	-90595.703	2.915	-0.501	0.000	-18.811
8000.000	-1160.606	-175.87007E3	2.915	-0.501	0.006	247.654

DESIGN OF BEAM:



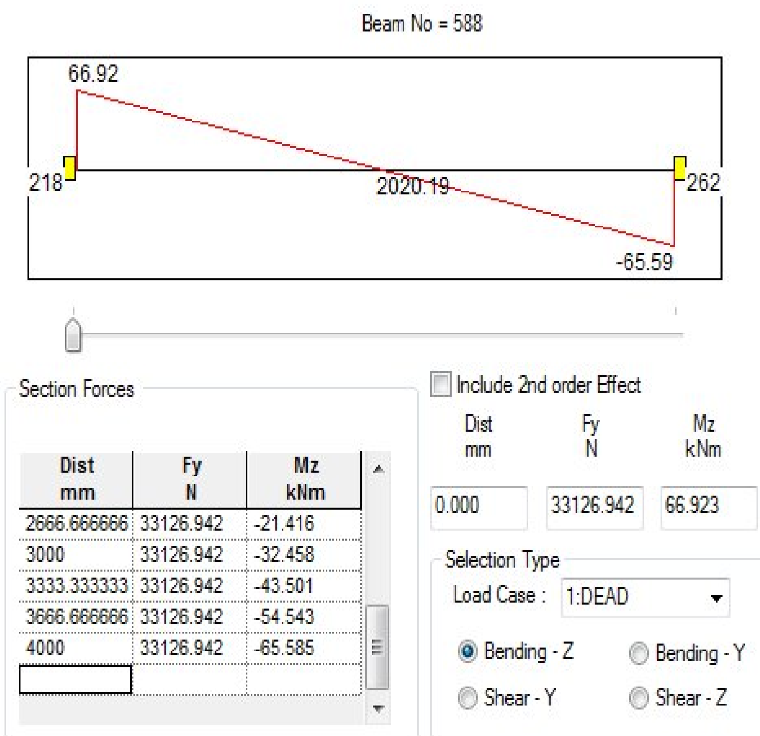
Design Load

Mz Kn Met	Dist Met	Load
114.73	4	6
-205.08	0	6
-247.65	8	6

Design Parameter

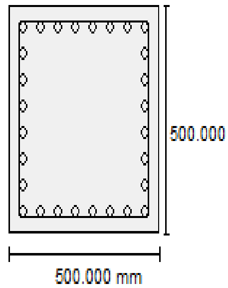
Fy(Mpa)	415
Fc(Mpa)	20
Depth(mm)	600.0000238
Width(mm)	400.0000059
Length(mm)	8000

ANALYSIS OF COLUMN:



DISTANCE	FX	FY	FZ	MX	MY	MZ
0.000	1.66813E6	63066.315	-131.91756E3	0.376	267.983	125.333
1000.000	1.62514E6	63066.315	-131.91756E3	0.376	136.065	62.267
2000.000	1.58215E6	63066.315	-131.91756E3	0.376	4.148	-0.799
3000.000	1.53916E6	63066.315	-131.91756E3	0.376	-127.770	-63.866
4000.000	1.49617E6	63066.315	-131.91756E3	0.376	-295.687	-126.932

DESIGN OF COLUMN:



Design Load

Load	6
Location	End 1
Pu(Kns)	1668.13
Mz(Kns-Mt)	125.33
My(Kns-Mt)	267.98

Design Parameter

Fy(Mpa)	415
Fc(Mpa)	20
As Reqd(mm²)	5087
As (%)	2.25
Bar Size	16
Bar No	28

DESIGNS:

DESIGN OF ONE WAY CONTINUOUS SLAB:

1.Assume depth of slab is = 200mm

Clear span = 3.2 m

a) Depth Required:

Minimum depth $= \frac{\text{span}}{\text{B.V}*\text{MF}}$

$= \frac{3200}{26*1.08}$

=113.96 mm

Use 12mm bars & cover of 15 mm.

D_{eff} =113.96+6+15 =135 mm

Provide d =150mm

Effective length for Intermediate span:

Effective length = width of primary beam (or) $^1/_{12}$ of clear span

$^1/_{12}$ of clear span = 233.33 mm

Hence effective span = 400 mm (width of beam)

2.EFFECTIVE SPAN:

For intermediate span L =2800+400= 3200 mm

For End span L =3200mm

3.LOAD CALCULATIONS:

DEAD LOAD:

Floor finish = 0.6 $KN\backslash m^2$

Self weight = 1x1x0.15x25 = 3.75 $KN\backslash M^2$

Total Dead Load = 4.35 $KN\backslash M^2$

Factored Dead Load = 4.35x1.5

=6.525 $KN\backslash M^2$

Factored Live Load = 1.5 x 5.0

=7.5 $KN\backslash M^2$

Total Load = 14.02 $KN\backslash m^2$

4.BENDING MOMENT:

@ middle of end span $= \frac{Fd(D)}{12} l^2 + \frac{Fd(L)}{10} l^2$

$= \frac{6.53X3.2^2}{12} + \frac{7.5X3.2^2}{10}$

= 13.01 KN\m

@ middle of interior span $= \frac{Fd(D)}{24} l^2 + \frac{Fd(L)}{12} l^2$

$= \frac{6.25X3.2^2}{24} + \frac{7.5X3.2^2}{12}$

= 9.186 KN\m

@ support next to end span $= \frac{Fd(D)}{12} l^2 - \frac{Fd(L)}{10} l^2$

$= \frac{6.25X3.2^2}{12} - \frac{7.5X3.2^2}{10}$

= -15.22 KN\m

Check for Depth:

M_u=Qbd^2

15.22x10^6 =0.138 x 2. X1000 x d^2

D = 74 mm< 150 mm

Hence Safe.

Reinforcement:

a) A_{st} min = $\frac{0.12}{100}$ x 1000 x50

= 180 mm^2

Use 8mm bars @ 300 mm c/c

b) A_{st} @ middle of End panel:

Mu_{lim} = QubD^2

= 0.138 X 20 X1000 X 129^2

=45.92KN/M

Effective depth, d =129mm

Effective span Le =3200mm

5.AREA OF STEEL:

1. @ middle of end span =293.15mm^2

provide 12mm#@300mmc/c spacing.

2. @ supports =346.04mm^2

Provide 12mm#@300mmc/c spacing

□$_c$>□$_v$, hence safe in shear.

D_{pro}>d_{req} ,hence safe in deflection.

$M_u < M_{u\,lim}$

Hence the section is Under Reinforced section.

$13.01 \times 10^6 = 0.87 \times 415 \times A_{st} \times 129 \times (1-\frac{415 \, X \, Ast}{20 \, x \, 1000 \, x \, 129})$

$= 293.155 \text{ mm}^2$

Use 12 mm Diameter Rods @ 300 mm c/c.

6.CHECK FOR SPACING:

3xd =3 x 129 =387 >300 mm

Hence Safe.

50% of steel is curtailed @ 0.15*L from centre of end support & @ 0.25*L from the centre of intermediate support.

CURTAILMENT:

0.15*L = 0.15 x 3200 = 480 mm

0.25*L = 0.25 x 3200 = 800 mm

DEVELOPMENT LENGTH:

0.1*L = 0.1 x 3200 = 320 mm.

A_{st} Over Support:

$115.22 \times 10^6 = 0.87 \times 415 \times A_{st} \times 129 \times (1-\frac{415 \, X \, Ast}{20 \, x \, 1000 \, x \, 129})$

$= 346.04 \text{ mm}^2$

Use 12 mm diameter Rods @ 300 mm c /c.

300<387 mm

Hence Safe.

7.CHECK FOR SHEAR:

S.F = 0.6 Fd(D)l + 0.6 Fd(D)l

= (0.6 x 6.53 x 3.2)+(0.6 x 7.5 x 3.2)

Shear Force = V_u =26.9 KN

Nominal Shear Force:

$T_v = \frac{Vu}{bd}$

$= \frac{26.96 \ x \ 10^3}{1000 \ x \ 129}$

$= 0.21 \ N\backslash mm^2$

A_{st} available @ support :

$= \frac{113.06 \ x \ 10^3}{300}$

$= 376.8 \ mm^2$

$\% \ A_{st} = \frac{Ast \ x \ 100}{bd}$

$= \frac{376.8 \ x \ 100}{1000 \ x129}$

$= 0.29 \ \%$

$T_c = 0.38 \ N/mm^2$

$T_v < T_c$

Hence Safe.

8.CHECK FOR DEFLECTION :

A_{st} @ midspan $= \frac{Ast \ x \ 1000}{spacing}$

$= \frac{113.06 \ x \ 1000}{300}$

$= 376.8 \ mm^2$

% steel = 0.29 %

Modification Factor = 1.5

$D_{required}$ for stiffness = span\ B.V x M.F

= 3200/26 X 1.5

= 82.05 mm < 129 mm

Hence Safe in Deflection.

DESIGN OF TWO WAY SLAB:

1. DESIGN DATA:

L_x= 5.33m

L_y= 6m

L_y / L_x =1.18 <2

Hence the Slab is designed as 2 Way Slab with provisions for Torsion Reinforcement.

2. DEPTH OF SLAB:

Assume l/d =25

Then d $= \frac{5300}{25}$

= 200mm

3. EFFECTIVE SPAN:

L_{eff} = 5.3 + 0.25

= 5.5 m.

4. LOADS :

Self Weight = (0.2 x 25) = 5 KN/m^2

Live Load = 4 KN/m^2

Floor Finish = 0.6 KN/m^2

Total Load = 9.6 KN/m^2

$W_u \quad = (1.5 \text{ x } 9.6)$

$= 14.4 \text{ KN/m}^2$

DESIGN FOR TWO WAY SLABS S1,S3,S4,S6 :

Edge Condition : Two Adjacent Edges Discontinuous.

$L_y / L_x = 1.18$

$\alpha_x \quad = 0.06$ (@ end span)

$\alpha_y \quad = 0.047$

1.MOMENTS:

$M_{ux} = (\alpha_x W_u L_x)^2$

$= (0.06 \text{ x } 14.4 \text{ x } 5.5)^2$

$= 22.58 \text{ KN}$

$M_{uy} = (\alpha_y W_u L_x)^2$

$= (0.047 \text{ x } 14.4 \text{ x } 5.5)^2$

$= 13.85 \text{ KN}$

2. DEPTH REQUIRED:

$M \quad = 0.138 f_{ck} b d^2$

$$d = \sqrt{\frac{22.58 \, x \, 10^6}{0.138 \, x \, 20 \, x \, 1000}}$$

$d \quad = 90.44 \text{ mm} < 200 \text{ mm}$

3.REINFORCEMENT FOR SHORTER SPAN :

$$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } d \text{ X } (1 - \frac{415 \, X \, Ast}{fck \, x \, bd})$$

$$22.58 \text{X } 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 200 \text{ X } (1 - \frac{415 \, X \, Ast}{20 \, x \, 1000 \, x \, 200})$$

A_{st} = 1158mm^2

Use 12 mm diameter Bars @ 100 mm c/c.

4.REINFORCEMENT FOR LONGER SPAN :

M_u = 0.87 X 415 X A_{st} X d X $(1-\frac{415\ X\ Ast}{fck\ x\ bd})$

13.85 X 10^6 = 0.87 X 415 X A_{st} X 200 X $(1-\frac{415\ X\ Ast}{20\ x\ 1000\ x\ 200})$

A_{st} = 710mm^2

Use 12 mm diameter Bars @ 160 mm c/c.

5.CHECK FOR SHEAR:

S.F = 0.5 W_uL

Shear Force = V_u =39.6 KN

Nominal Shear Force:

T_v = $\frac{Vu}{bd}$

$= \frac{39.6\ x\ 10^3}{1000x\ 200}$

= 0.19 N\mm^2

% A_{st} = 0.58 %

T_c = 0.40 N/mm^2 (from IS -456)

$T_v < T_c$

Hence Safe in Shear.

6.CHECK FOR DEFLECTION:

$(L/d)_{basic}$ = 20

% A_{st} = 0.58

K_t = 1.6

$(L/d)_{max}$ = (20 x 1.6) = 32

$(L/d)_{actual}$ = (5300/200)

= 26.5 < 32

Hence the Deflection control is satisfied.

7.TORSION REINFORCEMENT @ CORNERS :

Area of Torsion Steel at each of the corners in 4 layer is computed as (0.75 x 315) = 236 mm^2

Length Over which Torsion Steel is provided = (1/5)x short span

= (1/5)x 5300

= 1060mm.

Provide 6mm Diameter bars @ 120 mm centres for a length of 1060mm at all four corners in four layers.

8.REINFORCEMENT IN EDGE STRIPS :

A_{st} = 0.12 % of bd

= 0.12/100 x 1000 x200

= 240 mm^2/m

Provide 10 mm diameter bars @ 300 mm c/c.

DESIGN FOR SLABS S2,S5 :

Edge Condition : One Edge Discontinous.

$L_y / L_x = 1.18$

$\alpha_x = 0.052$ (@ end span)

$\alpha_y = 0.037$ (@ end span)

1.MOMENTS:

$M_{ux} = (\alpha_x W_u L_x)^2$

$= (0.052 \times 14.4 \times 5.5)^2$

$= 16.97$ KN

$M_{uy} = (\alpha_y W_u L_x)^2$

$= (0.037 \text{ x } 14.4 \text{ x } 5.5)^2$

$= 8.58$KN

2.DEPTH REQUIRED:

$M = 0.138 f_{ck} b d^2$

$d = \sqrt{\frac{22.58 \; x \; 10^6}{0.138 \; x \; 20 \; x \; 1000}}$

$d = 78.38 \text{ mm} < 200 \text{ mm}$

3.REINFORCEMENT FOR SHORTER SPAN :

$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1 - \frac{415 \; X \; Ast}{fck \; x \; bd})$

$16.96 \text{X } 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 200 \text{ X } (1 - \frac{415 \; X \; Ast}{20 \; x \; 1000 \; x \; 200})$

$A_{st} = 864 mm^2$

Use 10 mm diameter Bars @ 90 mm c/c.

4.REINFORCEMENT FOR LONGER SPAN :

$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1 - \frac{415 \; X \; Ast}{fck \; x \; bd})$

$8.58 \text{ X } 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 200 \text{ X } (1 - \frac{415 \; X \; Ast}{20 \; x \; 1000 \; x \; 200})$

$A_{st} = 440 mm^2$

Use 12 mm diameter Bars @ 180 mm c/c.

5.CHECK FOR SHEAR:

$S.F = 0.5 W_u L$

Shear Force = V_u =39.6 KN

Nominal Shear Force**:**

$T_v = \frac{Vu}{bd}$

$= \frac{39.6 \ x \ 10^3}{1000x \ 200}$

= 0.19 N\mm^2

% A_{st} = 0.58 %

T_c = 0.40 N/mm^2 (from IS -456)

$T_v < T_c$

Hence Safe in Shear.

6.CHECK FOR DEFLECTION:

$(L/d)_{basic}$ = 20

% A_{st} = 0.58

K_t = 1.6

$(L/d)_{max}$ = (20 x 1.6) = 32

$(L/d)_{actual}$ = (5300/200)

= 26.5< 32

Hence the Deflection control is satisfied.

7.TORSION REINFORCEMENT @ CORNERS :

Area of Torsion Steel at each of the corners in 4 layer is computed as (0.75 x 315) = 236 mm^2

Length Over which Torsion Steel is provided = (1/5)x short span

= (1/5)x 5300

= 1060mm.

Provide 6mm Diameter bars @ 120 mm centres for a length of 1060mm at all four corners in four layers.

8.REINFORCEMENT IN EDGE STRIPS :

A_{st} = 0.12 % of bd

= 0.12/100 x 1000 x200

= 240 mm^2/m

Provide 10 mm diameter bars @ 300 mm c/c.

DESIGN OF CONTINUOUS BEAM:

Span = 5.3m

Load on Beam = 1403 KN

Self Weight of Beam = (0.6 x 0.4 x 1 x 25) x1.5

= 9 KN/m

Total Load = 23.03 KN/m

Effective Span = 5.3 + 0.4

= 5.7 m

1.FACTORED MOMENTS:

B.M @ middle of end span $=\left(\frac{15.53\ x\ 5.7^2}{12}+\frac{7.5^2 x\ 8.5^2}{10}\right)$ x 1.5

= 103.15 KN-m

B.M @ interior supports $= -\frac{15.53\ x 5.7^2}{12} - \frac{7.5^2 x\ 8.5^2}{9}$

= -107.15 KN-m

Max Shear Force @ Support Section :

V_u= 1.5 x 0.6 (15.33 + 7.5) X 5.7

$= 20.547 \times 5.7$

$= 119$ KN

2.LIMITING MOMENT :

$M_{u\,lim} = Q_u .b.D^2$

$M_{u\,lim} = 0.138 \times 20 \times 400 \times 600^2 \times 10^{-6}$

$M_{u\,lim} = 397$ KN-m

$M_u < M_{u\,lim}$

Hence the section is under Reinforced Section.

3.REINFORCEMENT:

AT End Spans:

$$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1-\frac{415 \ X \ Ast}{fck \ x \ bd})$$

$$107 \times 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 600 \text{ X } (1-\frac{415 \ X \ Ast}{400 \ x \ 600 \ x \ 20})$$

$A_{st} = 517 \text{ mm}^2$

Use 16mm diameter Bars @ 400 mm c/c at the top of tension face.

AT Mid Span:

$$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1-\frac{415 \ X \ Ast}{fck \ x \ bd})$$

$$103 \times 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 600 \text{ X } (1-\frac{415 \ X \ Ast}{400 \ x \ 600 \ x \ 20})$$

$A_{st} = 517 \text{ mm}^2$

Use 16mm diameter Bars @ 400 mm c/c @ bottom of tension face.

4.CHECK FOR SHEAR:

S.F $= 0.5\ f_{DL} \times L + 0.6\ f_{LL} \times L$

$= [(0.5 \text{ X } 15.53 \text{ X } 5.7) + (0.6 \text{ X } 7.5 \text{ X } 5.7)] \times 1.5$

$= 107.37$KN

Shear Force = V_u =107.37 KN

Nominal Shear Force:

$$T_v = \frac{Vu}{bd}$$

$$= \frac{107..37 \ x \ 10^3}{400x \ 600}$$

$$= 0.44 \ N\backslash mm^2$$

$$\% \ A_{st} = 0.21 \ \%$$

$$T_c = 0.28 \ N/mm^2 \ \text{(from IS -456)}$$

$$T_v > T_c$$

Hence Safe this is not Safe in Shear.

$$V_{US} = V_U - T_C \ x \ b \ d$$

$$= 107.37 - 0.28 \ x \ 400x \ 600$$

$$= 40.17 \ KN$$

Use 8 mm Diameter 2 Legged Stirrups.

Spacing:

$$S_v = \frac{0.87 \ X \ fy \ x \ Ast \ d}{Vus}$$

$$= \frac{0.87 \ X \ 415 \ x \ 50.27 \ x \ 2x \ 600}{40.17}$$

= 170 mm c/c.

5.CHECK FOR DEFLECTION:

$(L/D)_{actual}$ = 5700/600 =9.6

$(L/D)_{max}$ = 26x k_t =26 x 1.5 = 31.2

$(L/D)_{actual} < (L/D)_{max}$

Hence Safe in Deflection.

DESIGN OF TEE- BEAM:

Flange width = 3200 mm

Slab Thickness = 200 mm

Rib Width = 400 mm

Depth = 500 mm

Use 4 Nos Of 20 mm Diameter Rods.

A_{st} = 1256.63 mm

1.LIMITING NEUTRAL AXIS:

$$\frac{Xu\ max}{d} = 0.49$$

Xu_{max} = 0.49 x 610 = 299 mm

2.ACTUAL NEUTRAL AXIS:

$$\frac{Xu}{d} = \frac{0.87\ x\ 415\ x\ 1256.65}{0.36\ x\ 20\ x\ 3200\ x\ 610}$$

= 0.032 x 610

=19.69 mm

Actual Neutral Axis lies with in the Flange.

$X_u < D_f$

Hence Safe.

3.TYPE OF REINFORCEMENT:

X_u =19.69 < 299 mm($X_{u\ max}$)

Hence the section is Under Reinforced Section.

4.MOMENT OF RESISTANCE:

M_u = 0.87 X 415 X 1256.60 X 610 X $(1-\frac{415\ X\ 1256.60}{20\ x\ 3200\ x\ 610})$

M_u = 273 KN/m

5.CHECK FOR SHEAR:

S.F = WxLx1.5

= (0.4 x 0.5 x 1 x 25) x 1.5 + 14.02

= 14.02 + 7.5

=21.52 KN/m

W = 21.52 x 8= 173 KN

Shear Force = V_u =173 KN

Shear Force @ Support = V_u = 173/2 = 86.5 KN

Nominal Shear Force:

$T_v = \frac{Vu}{bd}$

$= \frac{86.5\ x\ 10^3}{400x\ 610}$

= 0.35 N\mm^2

$\%\ A_{st} = \frac{Ast\ x\ 100}{bd}$

$= \frac{1256.6\ x\ 100}{400\ x610}$

= 0.52 %

T_c = 0.49 N/mm^2 (from IS -456)

$T_v < T_c$

Hence Safe in Shear.

6.DESIGN OF SHEAR REINFORCEMENT:

$$T_v < T_c$$

Hence $A_{st\ min}$ is provided as Shear Reinforcement.

$$A_{st\ min} = \frac{0.12}{100} \text{ x } 0.4 \text{ x } 610$$

$$= 293 \text{ mm}^2$$

Use 2 Legged stirrups of 8mm bars @260 mm c/c

$$S_v = \frac{2\ x\ 50.26\ x\ 415}{0.4\ x\ 400}$$

$$= 260 \text{ mm}$$

DESIGN OF RECTANGULAR CONTINUOUS BEAM(1):

Load on Beam = 1403 KN

Self Weight of Beam = (0.6 x 0.4 x 1 x 25) x1.5

= 9 KN/m

Total Load = 23.03 KN/m

Effective Span = 8 + 0.5

= 8.5 m

1. FACTORED MOMENTS:

B.M @ middle of end span $= \frac{15.53\ x\ 8.5^2}{12} + \frac{7.5^2 x\ 8.5^2}{10}$

= 146.69 KN-m

B.M @ middle of interior span $= \frac{15.53\ x\ 8.5^2}{24} + \frac{7.5^2 x\ 8.5^2}{12}$

= 88.43 KN-m

B.M @ support next to end support $= \frac{-15.53\ x\ 8.5^2}{12} - \frac{7.5^2 x\ 8.5^2}{10}$

= -172.41 KN-m

B.M @ interior supports $= -\frac{15.53\ x\ 8.5^2}{12} - \frac{7.5^2 x\ 8.5^2}{9}$

= -153.711 KN-m

2. DEPTH REQUIRED:

$M_u = Q_u .b.D^2$

$153.7 \times 10^6 = 0.138 \times 20 \times 1000 \times d^2$

d = 235.99 mm < 600 mm

Hence Safe.

3. REINFORCEMENT:

A_{st} @ F :

$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1-\frac{415 \ X \ Ast}{fck \ x \ bd})$

$88.43 \text{X } 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 560 \text{ X } (1-\frac{415 \ X \ Ast}{20 \ x \ 1000 \ x \ 560})$

$A_{st} = 445 \text{ mm}^2$

Use 12mm diameter Bars @ 250 mm c/c.

A_{st} @ E & G :

$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1-\frac{415 \ X \ Ast}{fck \ x \ bd})$

$153 \text{X } 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 560 \text{ X } (1-\frac{415 \ X \ Ast}{20 \ x \ 1000 \ x \ 560})$

$A_{st} = 445 \text{ mm}^2$

Use 20mm diameter Bars @ 350 mm c/c.

4. CHECK FOR SHEAR:

S.F $= 0.5 f_{DL} \text{ x L } + 0.6 f_{LL} \text{ x L}$

= (0.5 X 15.53 X 8.5) + (0.6 X 7.5 X 8.5)

= 104.25 KN

Shear Force = V_u =104.25 KN

Nominal Shear Force:

$T_v = \frac{Vu}{bd}$

$= \frac{104.25 \ x \ 10^3}{400x \ 600}$

$= 0.43 \text{ N\textbackslash mm}^2$

% A_{st} = 0.32 %

$T_c = 0.40 \text{ N/mm}^2$ (from IS -456)

$T_v > T_c$

Hence Safe this is not Safe in Shear.

$V_{US} = V_U - T_C \times b\ d$

$= 104.25 – 0.40 \times 1000 \times 560$

$= 119.75$ KN

Use 8 mm Diameter 2 Legged Stirrups.

Spacing:

$S_v = \frac{0.87 \text{ X fy x Ast d}}{\text{Vus}}$

$= \frac{0.87 \text{ X } 415 \text{ x } 50.27 \text{ x } 2\text{x } 560}{119.75}$

$=170$ mm c/c.

5. CHECK FOR DEFLECTION:

$\% A_{st} = 0.32$

$F_s = 0.58 \text{ x } \frac{783.78}{783.78} \textbf{ x } 415$

$= 230.5$ say 240 curve

Min depth Required :

$\frac{8500}{26\ x\ 1.5} = 217$ mm <510 mm

Hence Safe.

DESIGN OF RECTANGULAR CONTINUOUS BEAM(2):

Load on Beam = 1403 KN

Self Weight of Beam = (0.6 x 0.4 x 1 x 25) x1.5

= 9 KN/m

Total Load = 23.03 KN/m

Effective Span = 10 + 0.5

= 10.5 m

1. FACTORED MOMENTS:

B.M @ middle of end span $= \frac{15.53\ x\ 10.5^2}{12} + \frac{7.5^2 x\ 10.5^2}{10}$

= 225.36 KN-m

B.M @ middle of interior span $= \frac{15.53\ x\ 10.5^2}{24} + \frac{7.5^2 x\ 10.5^2}{12}$

= 140 KN-m

B.M @ support next to end support $= \frac{-15.53\ x\ 10.5^2}{12} - \frac{7.5^2 x\ 10.5^2}{10}$

= -263.09 KN-m

B.M @ interior supports $= -\frac{15.53\ x\ 10.5^2}{12} - \frac{7.5^2 x\ 10.5^2}{9}$

= -234.55 KN-m

2. DEPTH REQUIRED :

$M_u = Q_u .b.D^2$

$264 \times 10^6 = 0.138 \times 20 \times 1000 \times d^2$

d = 310 mm < 560mm.

Hence Safe.

3. REINFORCEMENT:

A_{st} @ F :

$$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1-\frac{415\ X\ Ast}{fck\ x\ bd})$$

$$140\text{X } 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 560 \text{ X } (1-\frac{415\ X\ Ast}{20\ x\ 1000\ x\ 560})$$

$A_{st} = 711.16\ mm^2$

Use 12mm diameter Bars @ 250 mm c/c.

A_{st} @ E & G :

$$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1-\frac{415\ X\ Ast}{fck\ x\ bd})$$

$$264\text{X } 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 560 \text{ X } (1-\frac{415\ X\ Ast}{20\ x\ 1000\ x\ 560})$$

$A_{st} = 1408.94\ mm^2$

Use 20mm diameter Bars @ 350 mm c/c.

4. CHECK FOR SHEAR:

S.F = $(0.5\ f_{DL}\ x\ L) + (0.6\ f_{LL}\ x\ L)$

= (0.5 X 15.53 X 10.5) + (0.6 X 7.5 X 10.5)

= 130.35 KN

Shear Force = V_u =130.35 KN

Nominal Shear Force:

$$T_v = \frac{Vu}{bd}$$

$$= \frac{130.35\ x\ 10^3}{400x\ 600}$$

= 0.54 N\mm²

% A_{st} = 0.58 %

T_c = 0.60 N/mm^2 (from IS -456)

$T_v < T_c$

Hence Safe this is Safe in Shear.

Use 8 mm Diameter 2 Legged Stirrups.

5. CHECK FOR DEFLECTION:

% A_{st} = 0.582

$F_s = 0.58 \times \frac{1408.94}{1408.94} \mathbf{x}\ 415$

=220.3 say 240 curve

Min depth Required :

$\frac{10500}{26 \times 1.5}$ = 269 mm <560 mm

Hence Safe.

DESIGN OF COLUMN:

Load = 1409.62 KN

P_u = 1.5 x 1409.62

= 2115 KN

B = 500 mm

D = 500 mm

Length of the column =4m

d =300mm

(l/d) =10<12

So the column is short column

e_{min} = l/500+b/30

=400/500+500/30

=16<20mm

e_{min} <20mm is assumed in the formula. hence short column formula for axial load can be used

1. LONGITUDINAL REINFORCEMENT :

$P_u = 0.4\, f_{ck}A_g + (0.67 \times f_y - f_{ck})\, A_{sc}$

$2115 \times 10^3 = (0.4 \times 20 \times 500 \times 500) + (0.67 \times 415) - (0.4 \times 20)A_{sc}$

$A_{sc} = 2112\ mm^2$

Provide 6 no 22 mm diameter bars with 3 bars distributed on each face.

2. LATERAL TIES :

Provide 8 mm ties @ 300 mm c/c.

DESIGN OF RECTANGULAR FOOTING:

1. DESIGN DATA:

Load From Column	= 1435 KN
Safe Bearing Capacity Of soil	=150
Size Of Column	=500x500mm
Grade Of Concrete:	M20
Grade Of steel:	Fe 415

2. SIZE OF FOOTING:

Factored Load	= 1.5x1435
	=2200 KN
Self weight of footing	= 220 KN (10% of column load)
Footing Area	= Load/S.B.C
	=2420/(1.5x150)
	=10.75 Sq.M
Size Of The Footing	= 3.5x3.5 M
Factored Soil Pressure	= 2420/12.5
	= 193.6 KN/m^2

which is less than Factored SBC Of Soil (225)

HENCE SAFE

3. FACTORED MOMENTS :

Cantilever Projection from the Face of the Column = 1.55 m

B.M @ the face of the column = $\frac{Pu \ x \ L^2}{2}$

$$= \frac{193.6 \ x \ 1.55^2}{2}$$

= 232.562 KN-m

4. DEPTH OF FOOTING :

$M = 0.138 f_{ck} b d^2$

$d = \sqrt{\frac{232.5 \, x \, 10^6}{0.138 \, x \, 20 \, x \, 1000}}$

d = 290 mm

From Shear Stress Considerations , the Depth is increased to 600 mm.

5. REINFORCEMENT FOR FOOTING :

$M_u = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X d X } (1 - \frac{415 \, X \, Ast}{fck \, x \, bd})$

$232.52 \text{X } 10^6 = 0.87 \text{ X } 415 \text{ X } A_{st} \text{ X } 600 \text{ X } (1 - \frac{415 \, X \, Ast}{20 \, x \, 600 \, x \, 20})$

$A_{st} = 1227.67 mm^2$

Use 16 mm diameter Bars @ 160 mm c/c.

6. CHECK FOR SHEAR:

S.F = 193.6 (1550 -600)

Shear Force $= V_u = 183 \text{ x } 10^3$ KN

Nominal Shear Force:

$T_v = \frac{Vu}{bd}$

$= \frac{183 \, x \, 10^3}{1000 x \, 600}$

= 0.32 N\mm^2

% A_{st} = 0.58 %

T_c = 0.33 N/mm^2 (from IS -456)

$T_v < T_c$

Hence Safe in Shear.

$A_{st\ min} = 0.12\ \%$ of bd $= \frac{0.12}{100}$ x (1000 x 600) = 660 mm^2

Hence Provide 12 mm Diameter Bars @ 250c/c .

7.CHECK FOR DEFLECTION:

$(L/d)_{basic}$ = 20

$\%\ A_{st}$ = 0.58

K_t = 1.6

$(L/d)_{max}$ = (20 x 1.6) = 32

$(L/d)_{actual}$ = (5300/200)

= 26.5< 32

Hence the Deflection control is satisfied.

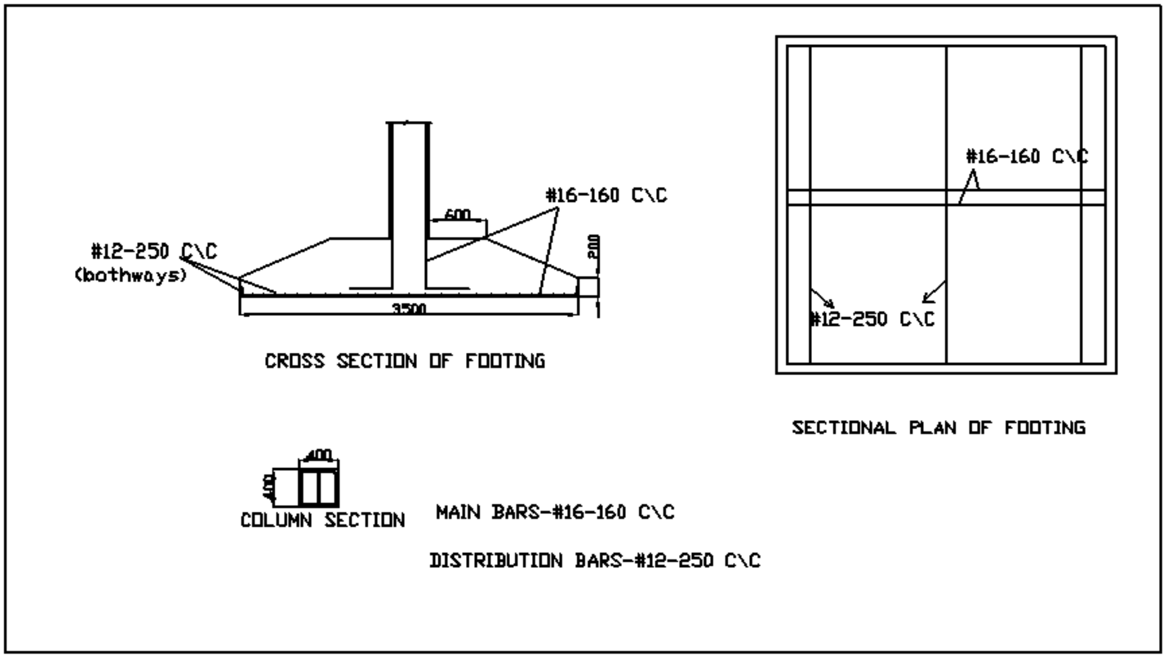


FIG.15

DESIGN OF STAIR CASE :

TYPE OF STAIRCASE : DOG LEGGED

Height Of One Rise = 150 mm

Height Of One Tread = 250 mm

Height Of One Flight = 2 m

Height Of One Floor = 4 m

1. LOAD CALCULATIONS :

Self Weight Of Waist Slab = 0.2 x 1.2 x 25

= 6 KN/m

Self Weight Of Steps =(0.5 x 0.15 x 0.25 x 25 x 1.2 x 11)/2.75

= 2.25 KN/m

2. MOMENT PRODUCED :

M_u= 35 KN/m

M= $0.138 f_{ck} b d^2$

$$d = \sqrt{\frac{35 x\ 10^6}{0.138\ x\ 20\ x\ 1200}}$$

d = 99.86 mm

3. REINFORCEMENT FOR STAIR CASE :

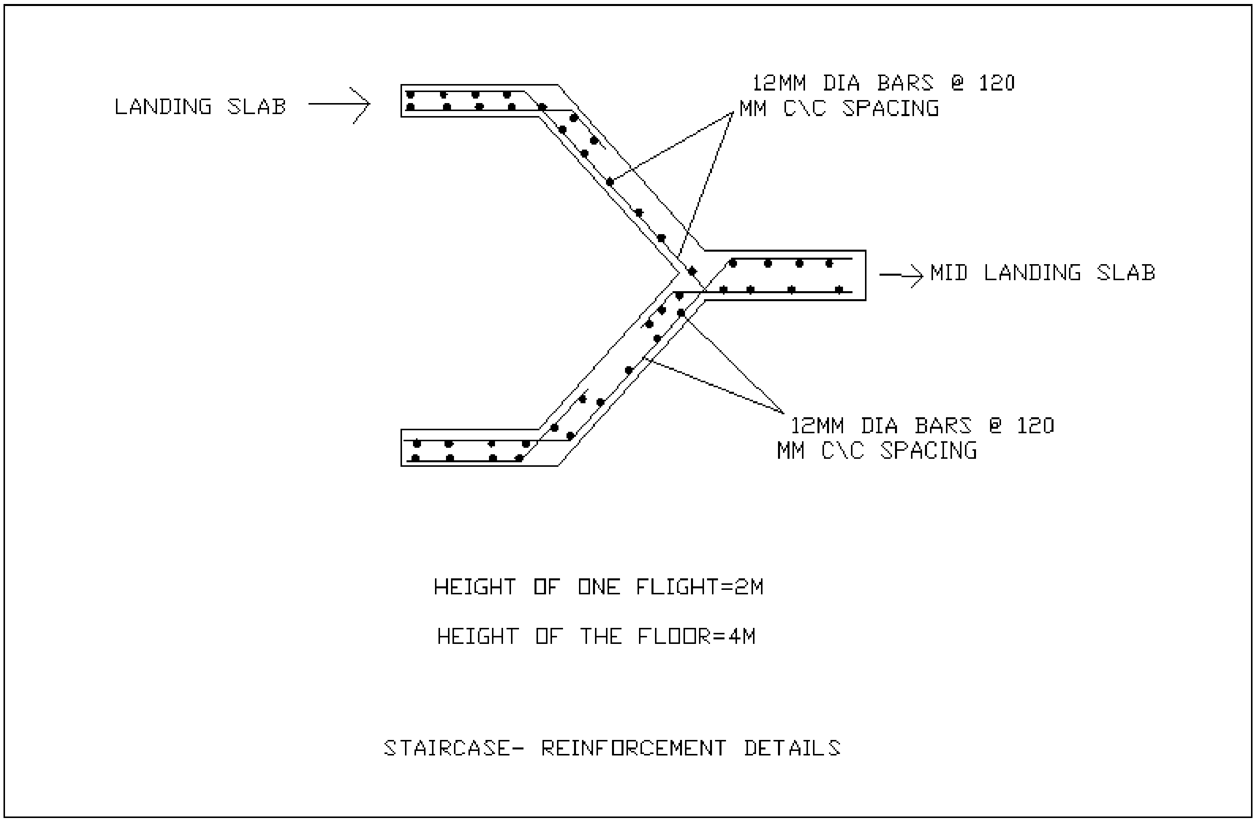
$$M_u = 0.87\ X\ 415\ X\ A_{st}\ X\ d\ X\ (1-\frac{415\ X\ Ast}{fck\ x\ bd})$$

$$35\ x\ 10^6 = 0.87\ X\ 415\ X\ A_{st}\ X\ 200X\ (1-\frac{415\ X\ Ast}{1200\ x\ 200\ x\ 20})$$

A_{ST} = 740 mm^2

Provide 12 mm Diameter Bars @120 mm c/c for both Main & Distribution Bars.

FIG.16



DESIGN OF LINTEL:

1. EFFECTIVE SPAN :

c/c of bearing =2000+150+150

=2300mm

Clear span + d =2000+231

=2231mm

2. LOADINGS:

a. loading due to masonry

height of equilateral triangle=0.886 x l
= 1932mm

Weight of masonry = 0.5x2.231x1.932x0.23x19
=9.418 KN

Factored load = 1.5x 9.418 =14.127 KN.

b. load from floor slab:

length of floor slab =1365mm

load transmitted =20 KN/m

factored load =1.5 x 20 =30 KN/m

c. self weight of lintel =1x0.23x0.25x25x1.5

= 2.157 KN/m

3. FACTORED MOMENT:

Moment due to

Masonry = 5.235 KN.m

Floor slab = 15.84KN.m

Slab weight =1.342 KN.m

Total M_{UD} = 22.417 KN.m

4. DEPTH FOR MOMENT:

$M_{UD} = Q_{U}.b.d^2$

$22.417x10^6 = 0.138x20x230xd^2$

d = 188 mm

D = 188+4+15 = 207 say 210mm.

5. REINFORCEMENT:

$$\frac{Xu\,max}{d} = \frac{0.87XFyXAst}{0.36.Fck.b.d}$$

$0.479 = \frac{0.87X415XAst}{0.36X20X230X191}$

Ast = 419.6 mm^2 say 420 mm^2

Steel for hanger is 20% of main steel = 0.2 x 452 =90.42mm^2

Use 2.nos of 8mm Φ bars

6. CHECK FOR SHEAR:

shear force due to

a. masonry = 14.72/2 =7.164 KN

b. floor slab = 0.5x30x1.365 = 20.475 KN

c. slab wt =2.175x2.2/2 = 2.406 KN

total shear force = 30.045 KN

nominal shear stress $\square_v$ $= \frac{Vu}{bd}$

$= \frac{30.045X10^6}{230X191}$

= 0.68 N/mm^2

% of Ast at support = 0.51%

$\square_c$ = 0.47 mm^2

since $\square_v > \square_c$ shear design is necessary

$V_{us}=V_u- \square_c$ =30.045 – (0.45x230x191) =9397.9 N

Using 6mm Φ bar 2 legged stirrups

a. spacing to resist design shear = $0.87xf_yxAsvxd/ V_{us}$
= 0.87x 415x2x28.27x191/9397.9
=737 mm

b. spacing for minimum shear steel = f_yx2x28.27x0.87/ 0.4x230

= 395 mm

c. spacing should not exceed = 0.75d

= 0.75 x 191 =144mm

d. spacing should also not exceed = 300mm
adopt a spacing of 140mm c/c

7. CHECK FOR DEFLECTION:

% Ast @ mid span = 1.02%

Minimum d required for stiffness = span / B.V x M.F

= 2231 / 20 X 0.96

=116 mm

d required for stiffness < d provided

hence DESIGN IS SAFE

DRAWINGS:

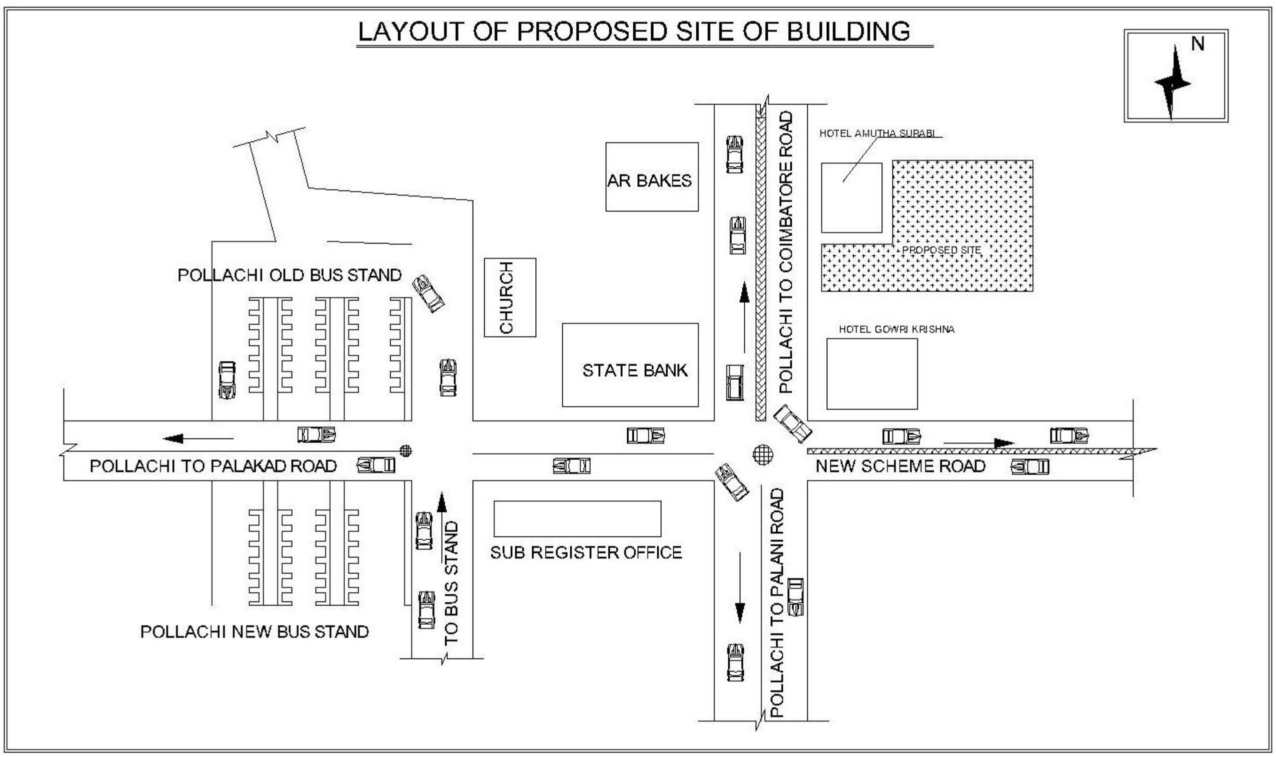


FIG.1


The Dhanalakshmi Bank
Signal
Imagery ©2012 GeoEye, Map data ©2012 Google -

FIG.2

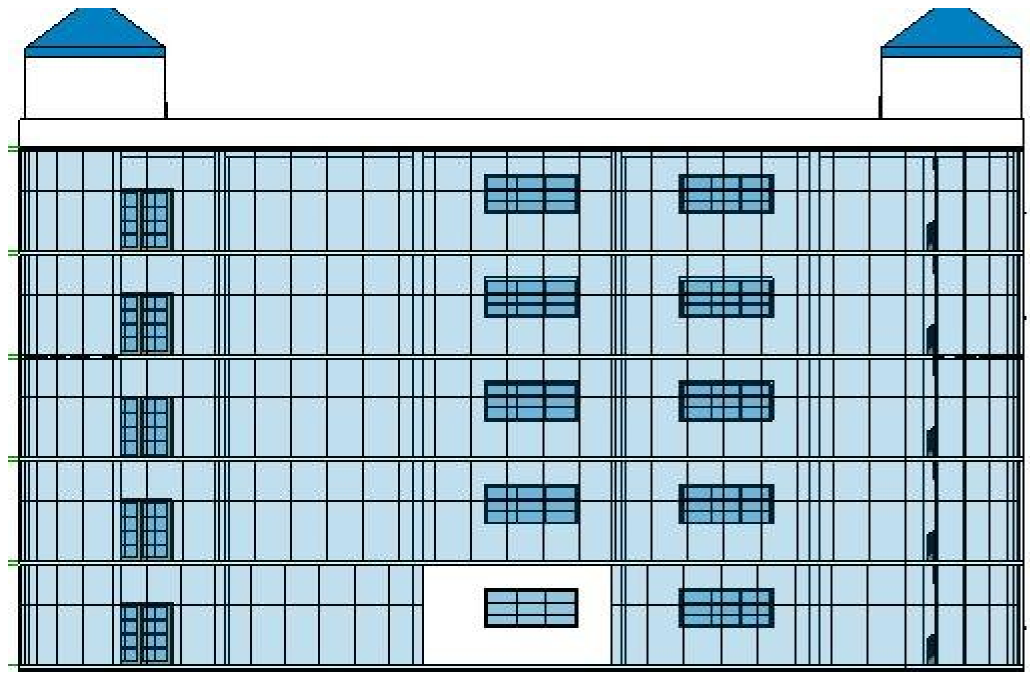


FIG.3

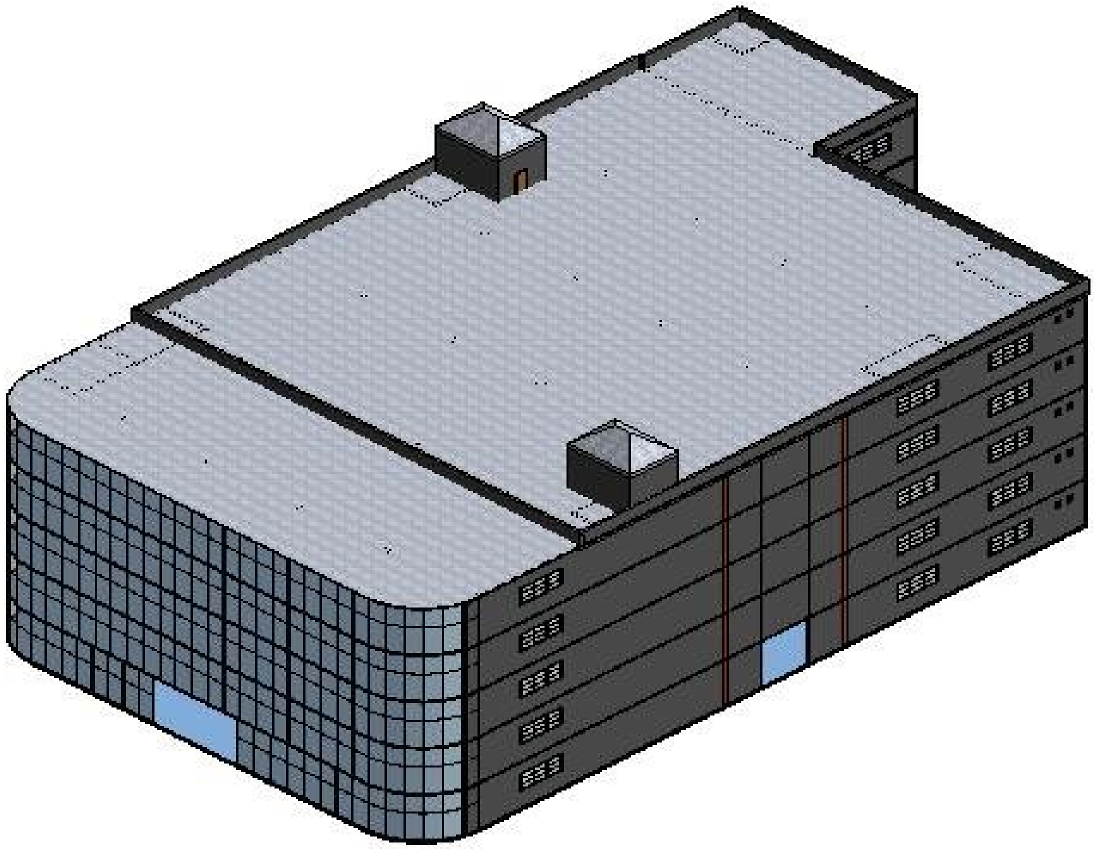


FIG.4

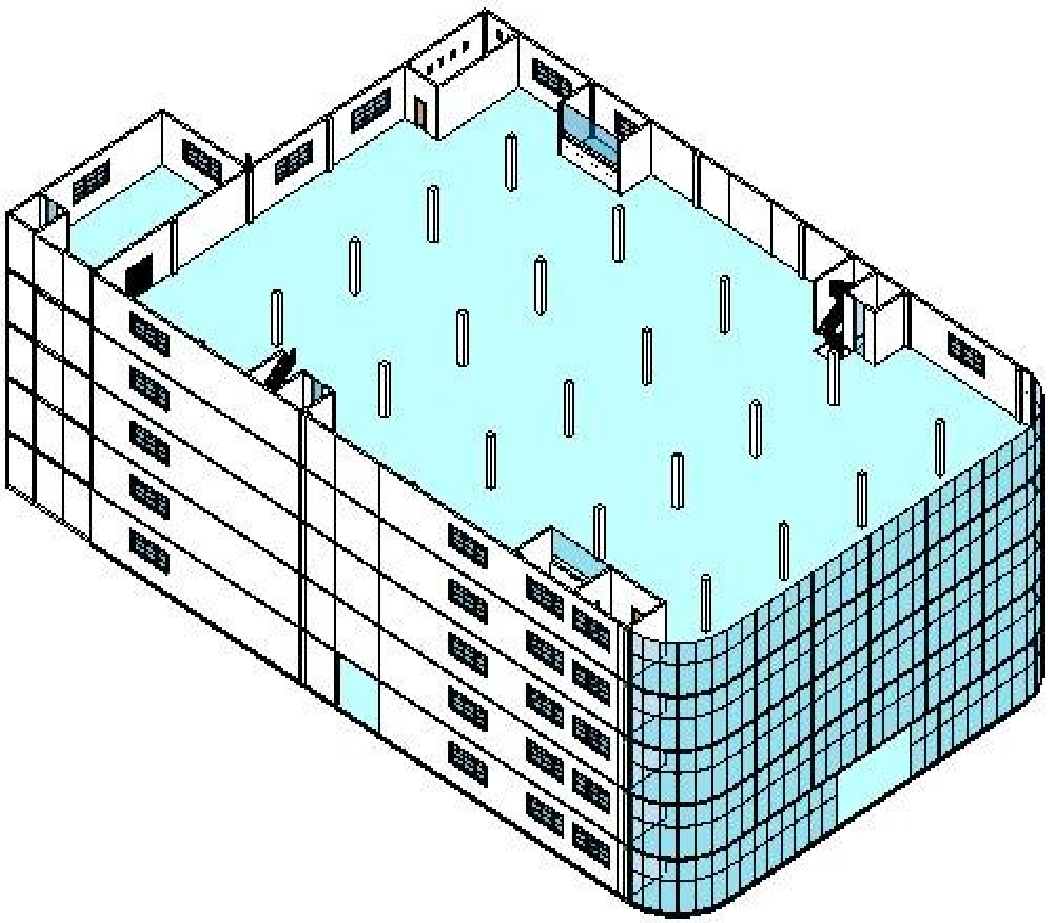


FIG.5

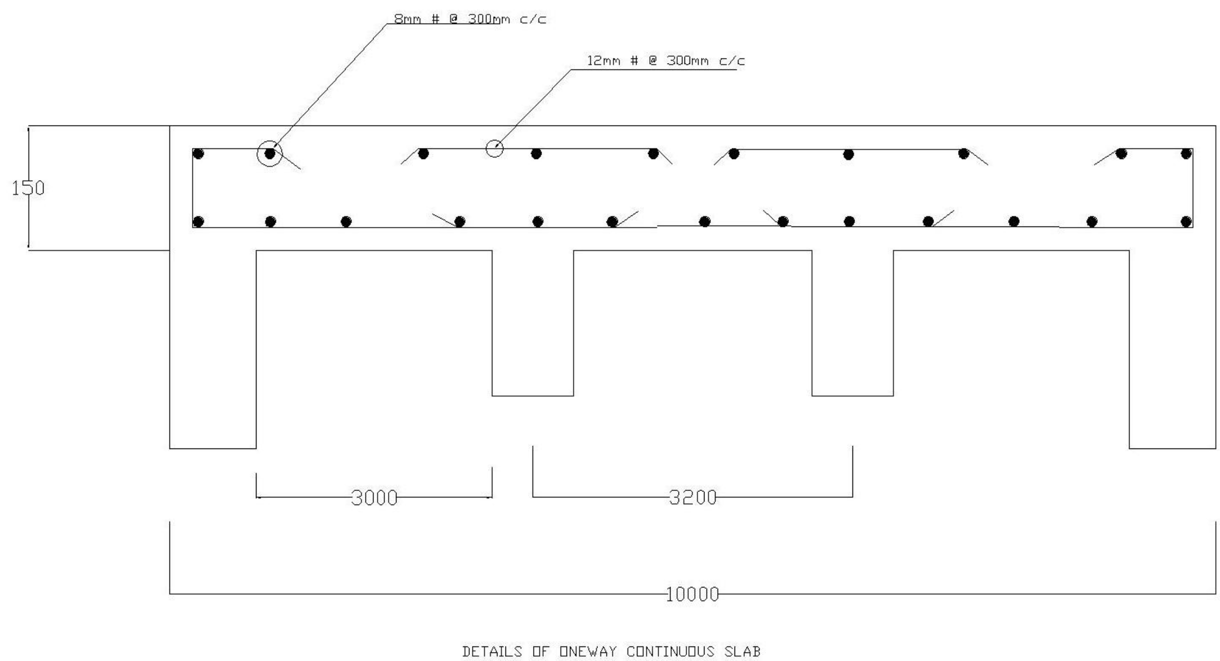

8mm # @ 300mm c/c
12mm # @ 300mm c/c
150
3000
3200
10000
DETAILS OF ONEWAY CONTINUOUS SLAB

FIG.6

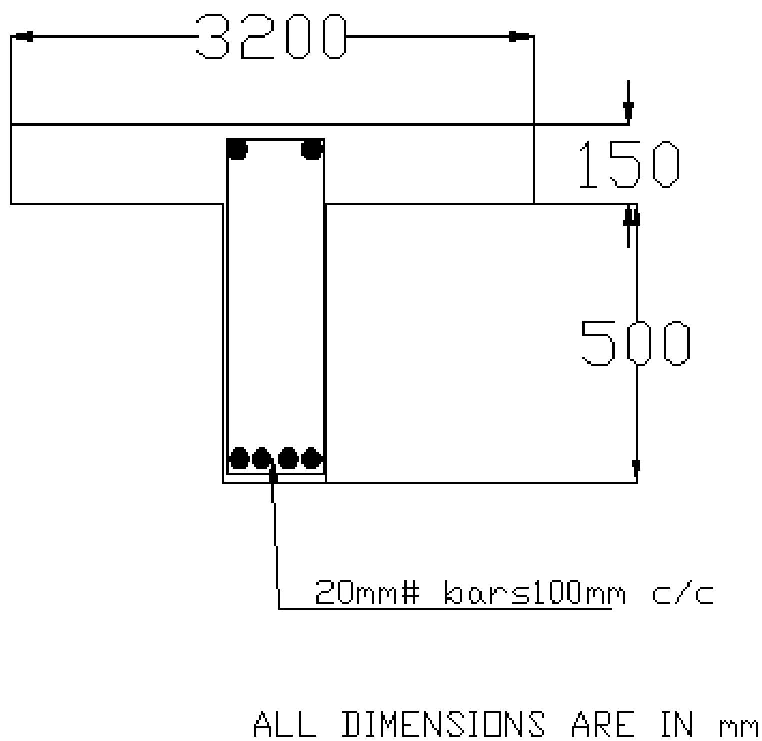
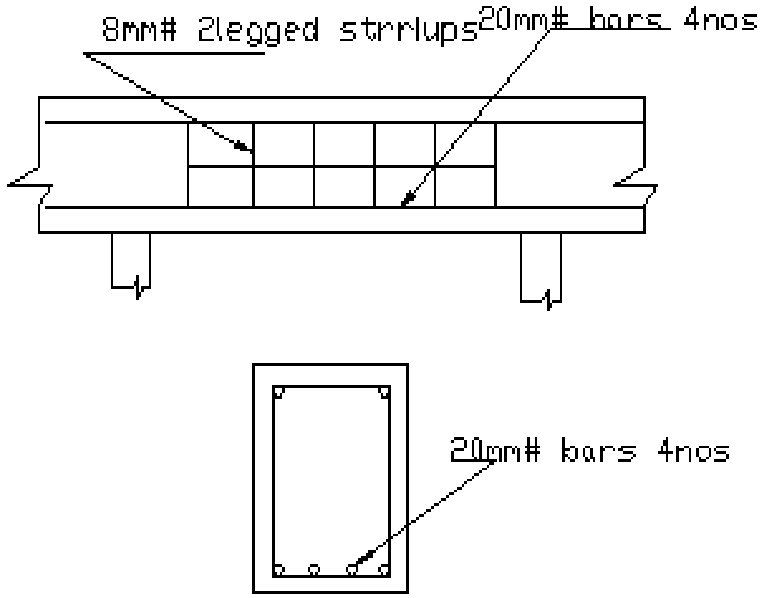


FIG.7



REINFORCEMENT DETAILS OF CONTINUOUS BEAM

ALL DIMENSIONS ARE IN mm

FIG-8

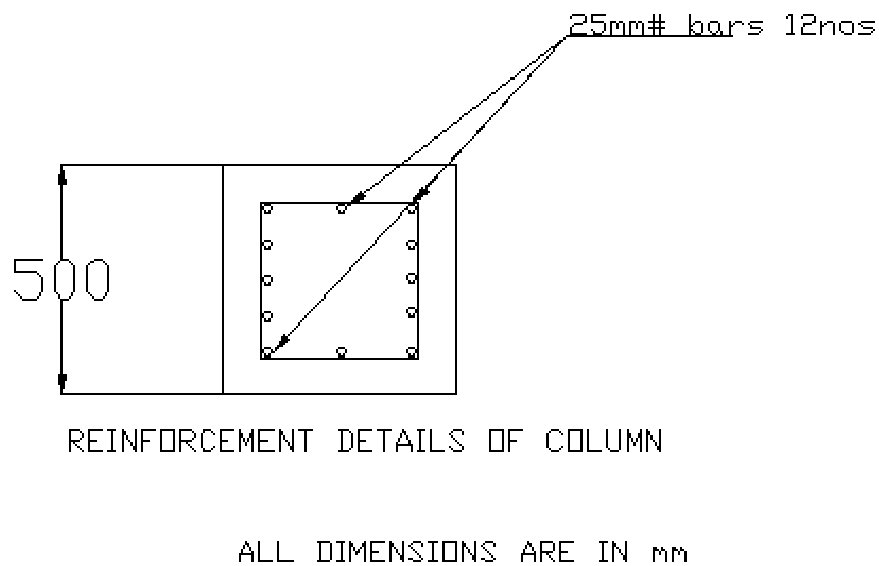
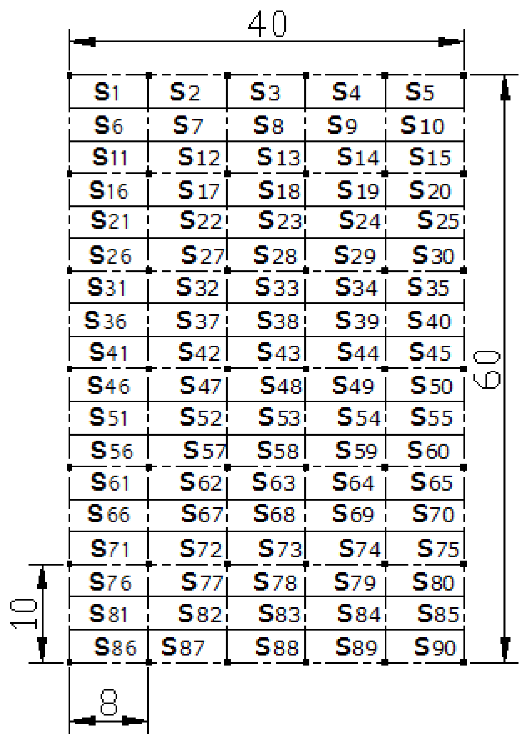

25mm# bars 12nos
500
REINFORCEMENT DETAILS OF COLUMN
ALL DIMENSIONS ARE IN mm

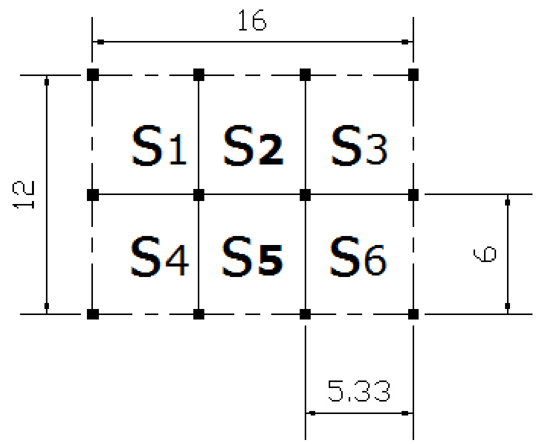
FIG.9



SLAB PLAN

ALL DIMENSIONS ARE IN M

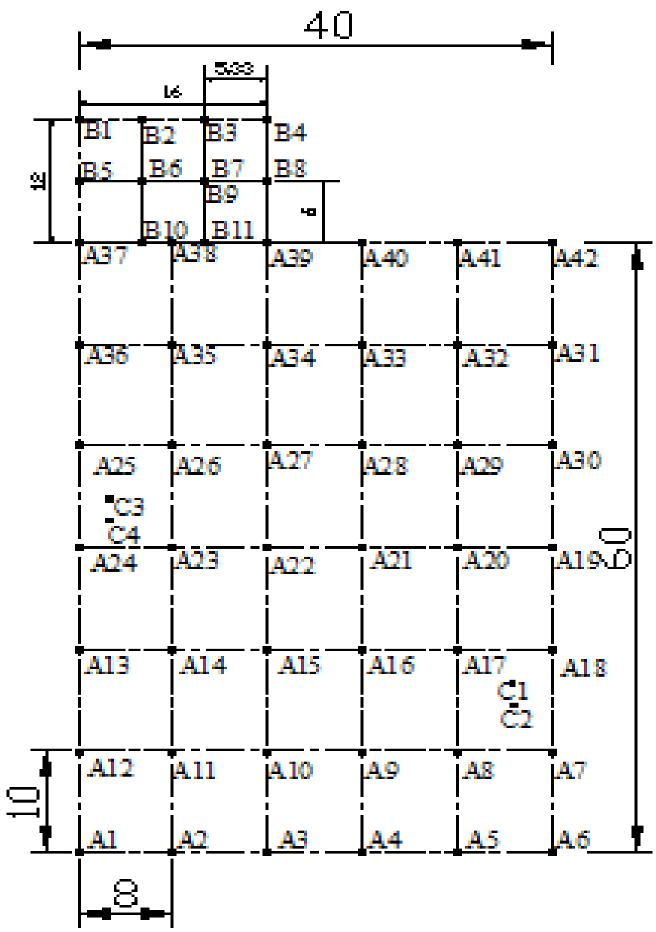
FIG-10



SLAB PLAN FOR GODOWN

ALL DIMENSIONS ARE IN M

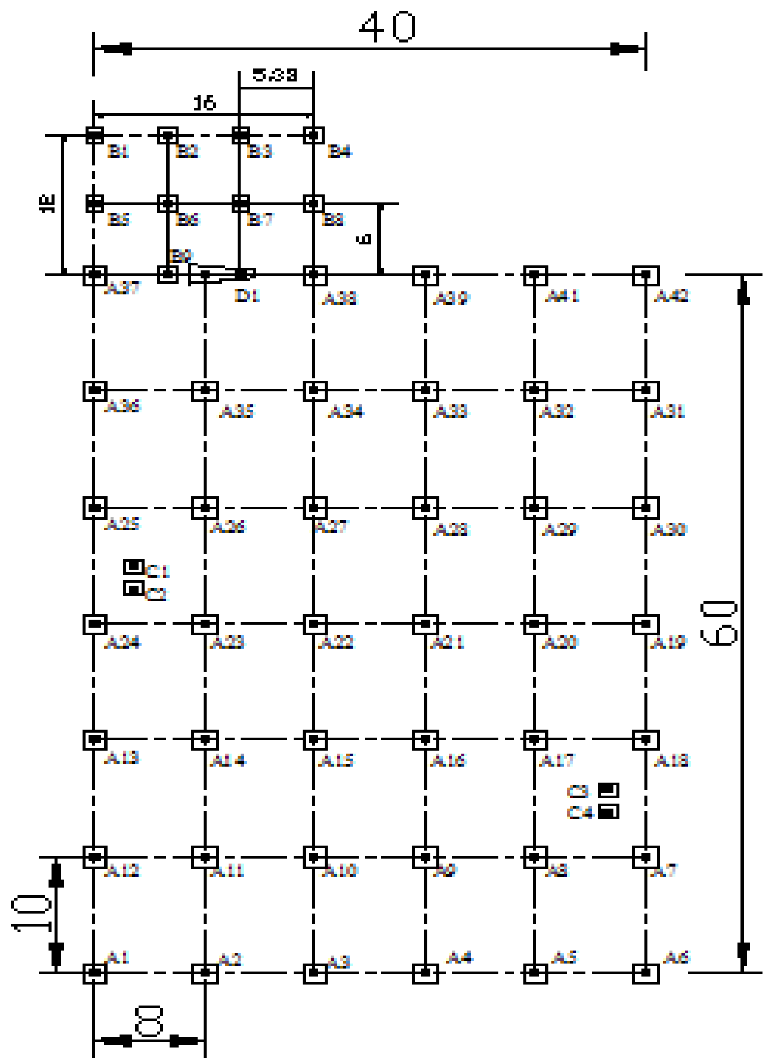
FIG-11



COLUMN GRID-PLAN

A1-A42
COLUMN SIZE- 500X500
B1-B11
COLUMN SIZE- 400X400
C1-C4
COLUMN SIZE- 300X300

FIG-12



FOOTING -PLAN

A1-A42

FOOTING SIZE- 3500X3500

B1-B11

FOOTING SIZE- 2600X2600

C1-C4

FOOTING SIZE- 2600X2600

D1

COMBINED FOOTING

FIG-13

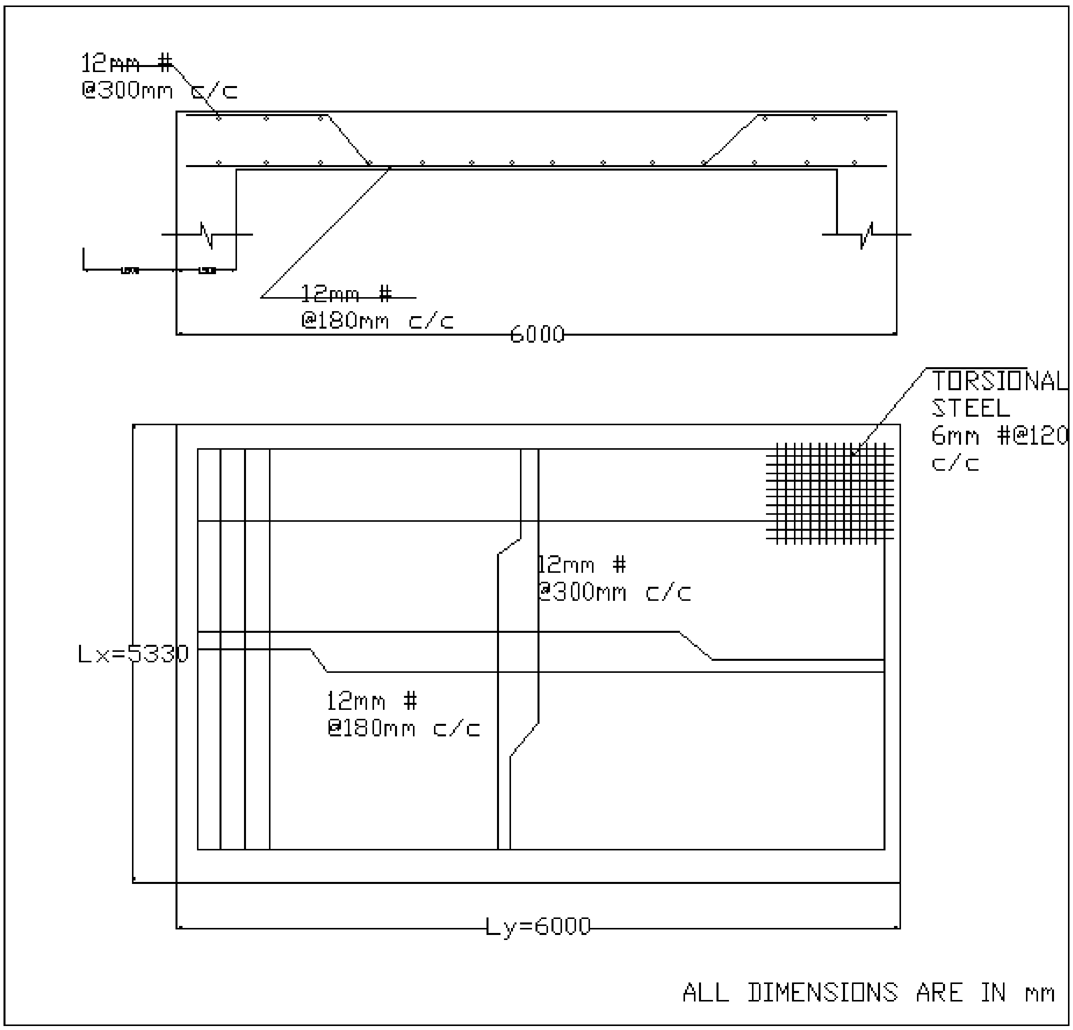

12mm #
@300mm c/c
12mm #
@180mm c/c
6000
TORSIONAL
STEEL
6mm #@120
c/c
12mm #
@300mm c/c
Lx=5330
12mm #
@180mm c/c
Ly=6000
ALL DIMENSIONS ARE IN mm

FIG-14

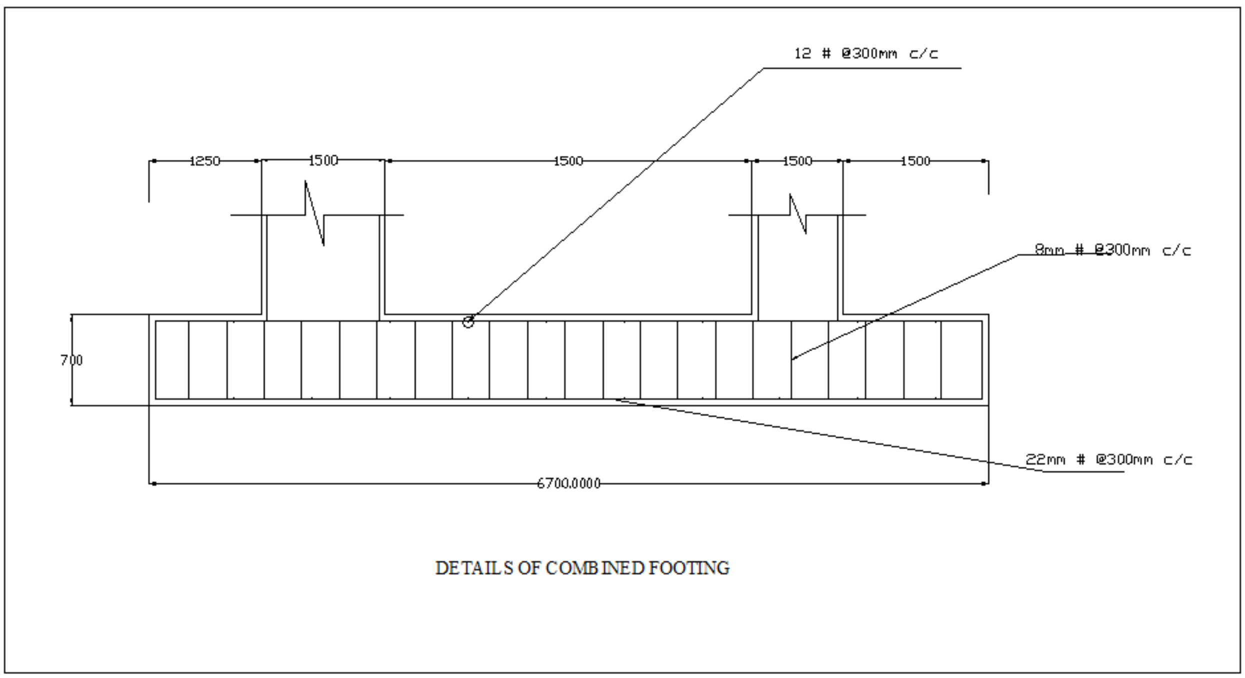
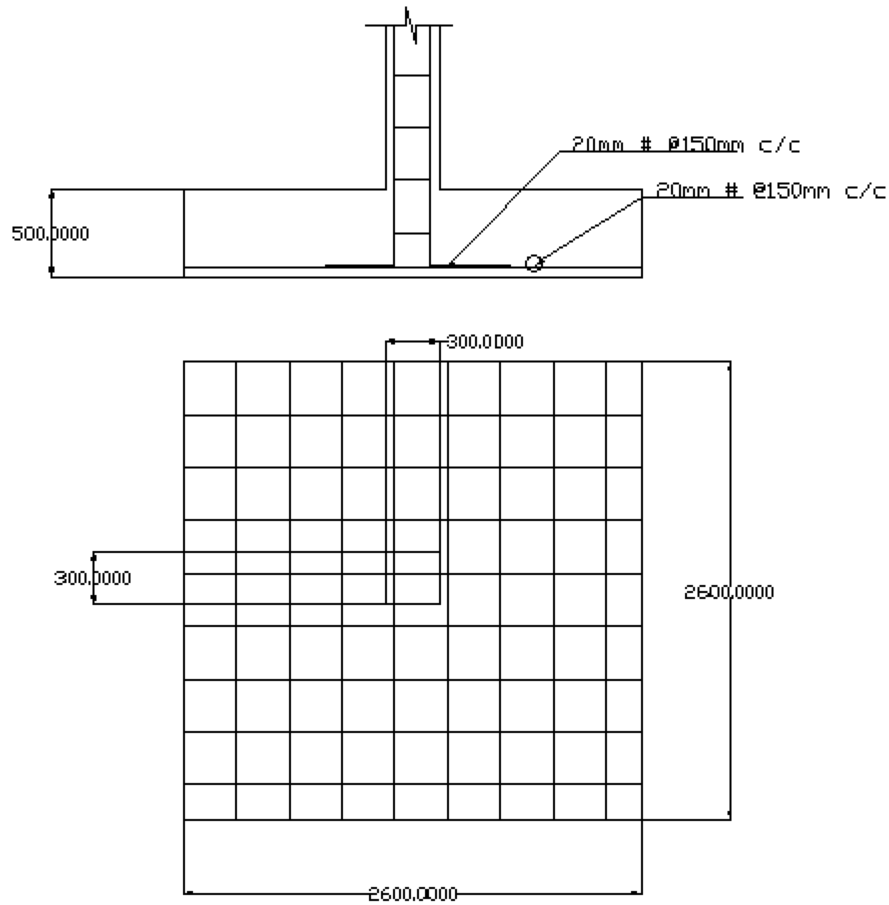

12 # @300mm c/c
1250
1500
1500
1500
1500
8mm # @300mm c/c
700
22mm # @300mm c/c
6700.0000
DETAILS OF COMBINED FOOTING

FIG-17



DETAILS OF FOOTING 2

All Dimensions are in mm

FIG-18

CONCLUSION

Our project is "PLANNING, ANALYSIS AND DESIGNING OF DEPARTMENTAL STORE BUILDING" is planned and designed with spacious and easy way of making their purchase. The entire functional requirements such as lighting, ventilation, emergency exit, etc., were considered in planning.

The structural elements such as foundation, lintel, column, footing, beam and slab were designed as per IS 456-2000 in limit state method using M20 Grade concrete and HYSD bars of Grade Fe 415.

By performing this project we learned about the steps involved in planning and designing of a building. We learned about designing both manually by limit state method and by using software STAAD pro. By finishing this project we got confidence for designing a framed structure.

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