

**A
Major Project Report
On
“DESIGN OF
STUDENT ACTIVITY CENTER
FOR
RTU CAMPUS KOTA”**

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ABSTRACT

Student Activity Center is one of supporting facility to embody the student and non-academic activity. To shape learners to be a part of the society, which expected will not only have academic and professional capabilities, but also can applying and developing science, technology, and arts.

The college, University Departments, RTU, Kota, is 38 years old. Since the college is being expanding at a great rate, vast genre of activities are being held in the college lately apart from the academics. The college is having a strength of 2400+ students. And keeping in mind the overall personality development of the students, there's an urgent need of a Student Activity center in the college.

This project deals with the design of a Student Activity center for the college. The report comprises of the various sections namely planning, structural design and costing and estimation of the building.

The planning of the building was carried out using the AUTOCAD software and the Structural Analysis and Design was carried out using Bentley Staad.Pro as well as STAAD RCDC softwares. The costing and estimation was carried out with the help of MicrosoftExcel.

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1. INTRODUCTION

1.1 GENERAL

Any construction project to begin with starts with the Layout of the building or structure followed by Design and Analysis of the structure which is succeeded by cost estimation and planning for the said project. This project involves the layout, design, analysis and cost estimation of a G+4 student activity center (assembly building) located in Rajasthan Technical University campus, Kota. For completing the project very popular civil engineering software's such as AutoCAD, STAAD Pro V8i, STAAD RCDC and Microsoft Excel for Cost Estimation have been used.

Together with academic knowledge, involvement of students in extracurricular activities is necessary for the development of a balanced personality of the students. To encourage the students to actively participate in various activities appropriate facilities are needed to be provided and thus there is a need to build a proper planned student activity center. The main aim of SAC is to complement the academic experience of students with extra-curricular programs that promote social and personal development. Providing a separate space to student groups is a must for them to carry out planning of various programs. This adds an additional set of valuable learning experiences for students & faculty.

1.2 REQUIREMENT OF THE SAC BUILDING

A Student activities center has been chosen as the topic for our project.

1. The first is the acute need for such a facility on the campus. The students and the faculty have expressed their need for such a facility for a long time. At the present moment, no such comprehensive facility exists on campus to house the student needs of recreation and socializing; only make-shift spaces serve these needs right now, with the result that the present activities are scattered all over the campus grounds.
2. Secondly, a student activities center would enhance the aim of the University by providing an atmosphere for a common life and cultivated social program for the many and varied ethnic population of the students, faculty and Alumni of the University. The facility will serve as an informal educational medium for supplementing the academic and non-academic factors of education by centralizing and integrating the University Community effort and activities. It would definitely contribute to the students awareness of self-government and social and civic responsibility.

3. Thirdly, the University will strive to gather the teachers and students into a closer relationship and make the University a better place to help this inter-relation to formulate intelligent and practical programs for action in realizing the track of creating a better society.

Student activities make a positive impact on the environment of any Institution as these are dedicated to helping students in developing their personality, perception, learning and attitude. There are many ways for students to get involved on campus so, we have planned and designed Student Activity Centre (SAC) which serve as a connection point for the students in finding the niche that is right for them.

1.3 OBJECTIVES OF THE PROJECT

The objectives of the project are mentioned below:

1. Draft the Layout of the proposed building using AutoCAD
2. Analyse and Design the building on STAAD Pro V8i
3. Calculate the approximate cost of the building

1.4 STATEMENT OF PROJECT

Salient features:

Utility of building : Assembly/recreational building.

No of stories : G+4

Shape of the building : Rectangle

No of staircases : 2

No. of rooms

Conference halls: 2

Presentation rooms: 3

Activity rooms : 30

Office rooms: 5

Pantry and storage rooms: 15

No of lifts : 2

Type of construction : R.C.C framed structure

Types of walls : brick wall , shear wall for lift.

Geometric details:

Floor to floor height : 3900 mm

Area of each Floor :

Height of plinth : 900 mm

Depth of foundation: 1800mm

Materials:

Concrete grade : M30

All steel grades: Fe500 grade

Bearing capacity of soil: 600 KN/M2

1.5 SOFTWARES USED

1. AutoCAD is a commercial software application for 2D and 3D computer aided design and drafting for various fields in engineering like civil, mechanical, electrical, automation, architecture etc. It was first launched in 1982 by Autodesk, Inc.

AutoCAD Architecture allows designers to draw 3D objects such as walls, doors and windows, with more intelligent data associated with them rather than simple objects. The data can be programmed to represent products sold in the building industry, or it can be extracted into a file for pricing material estimation etc.

In this project AutoCAD has been used extensively for drafting. Also the various detailing for the different components of structure has also been completed using AutoCAD.

2. STAAD Pro (V8i) and STAAD RCDC: We used this software for analysis of different types of truss with multiple load combinations and selected the most economical truss in designing. “STAAD Pro” is a structural analysis and design computer program originally developed and marketed by research engineers international in 1997. In late 2005, research engineer’s international

was brought by Bentley Systems. The commercial version, STAAD Pro is most widely used structural analysis and design software used all over the world. It supports several steel concrete and timber design codes.

3. Microsoft Excel: Excel is a typical spreadsheet which is nowadays widely used in cost estimation and also sometimes for planning purposes. Excel has various inbuilt calculation tools which can be used for complex calculation. Apart from that one can also input one's own formula for special calculations. The user interface is very friendly and easy to use. There are around Rows: 1,048,576 Columns: 16,384, which makes it easier for the user to enter a large amount of data into a single spreadsheet. The key objective of cost estimation is to arrive at an accurate cost and schedules so as to avoid schedule slips and cost overruns. Cost estimation goes beyond preparing approx. Costs and helps in preparing schedules, manage human resource, support assessment and decisionmaking. The wide range of topics in cost estimation represents the crossing of various fields such as project management, business management and engineering. Cost estimation recognises and pays attention to the relationship between cost and physical dimension of what is being built. Microsoft excel was also used for the design of the staircase after manual calculations.

2. PLANNING

Any building project starts with the preparation of the layout of the structure. The layout of the structure was drafted using the autocad software.

2.1 SITE PLAN

The choice of site for a student activity centre is governed by several factors which may be mutually conflicting, but a compromise has to be struck between the various considerations involved. Student activity centre building is located just to the left of the T- point, behind the dispensary .

- A) The site location of Student activity centre is such that it is placed away from the academic blocks so that the studies and cultural activities do not intervene together.
- B) Also the cafeteria, stationary shops and dispensary is located nearby and easily accessible.
- C) The outdoor sports activities such as football ground, volleyball ground and tennis ground are located nearby.
- D) The building is facing towards the west direction .

2.2 GENERAL REQUIREMENTS

	Requirements as per code (minimum)	Considered requirements
Set-Backdistance	7 m	
Plinth height	450mm	900mm
Floor Height	3.6m	3.9m
Staircase	Width –1.5m	1.83m
Tread	300mm (max)	275mm
Riser	150mm (max)	150mm
Doors	0.95m(width)	1.2m(width)

Table 2.1 : General Requirements as per National Building Code .

2.3 PLAN OF DIFFERENT FLOORS

The building consists of five floors including ground floor whose details are as follows:

Ground Floor Plan

Each floor consists of an office for the faculty in charge of the student activity centre and for the student in charges of different activities.

It consists of rooms as follows :

- Flying Mustang Club (Aeromodelling Club) works to cultivate and develop aerodynamic skills among students by building various aircrafts. It aims at providing fine details involved in the construction and testing of aero models to students so that they can develop air-mindedness and motivate themselves to participate in national level tech-fests. Various competitions like Water-Rocket Competition, Craft Control etc. are held regularly in this club.
- Marketing club: The club deals with marketing and management systems. The main area of focus of the club is to increase awareness of students towards marketing and advertisement. It helps in working for the college events promotion and sponsorship.
- Conference Hall : The conference hall is for the round table meeting of the faculties and the guests.
- Presentation Hall : The clubs can use this presentation room to present the activity onto the screen to the interested students.
- NCC Room: The National Cadet Corps is the youth wing of the Indian Armed Forces, so this room is for the NCC students to carry out there classes and store there material .
- NSS Room :The National Service Scheme is an Indian government-sponsored flagship for public service program conducted by the Ministry of Youth Affairs and Sports of the Government of India.Purpose of this room is to indulge more and more students in social service and to deliver the social qualities to them.
- Fest Preparation room : This room is for the preparation for the fests such as Thar, Anukriti ,Uttaradh and many more college fests.
- Also one pantry room is provided on each floor for the purpose of refreshments.

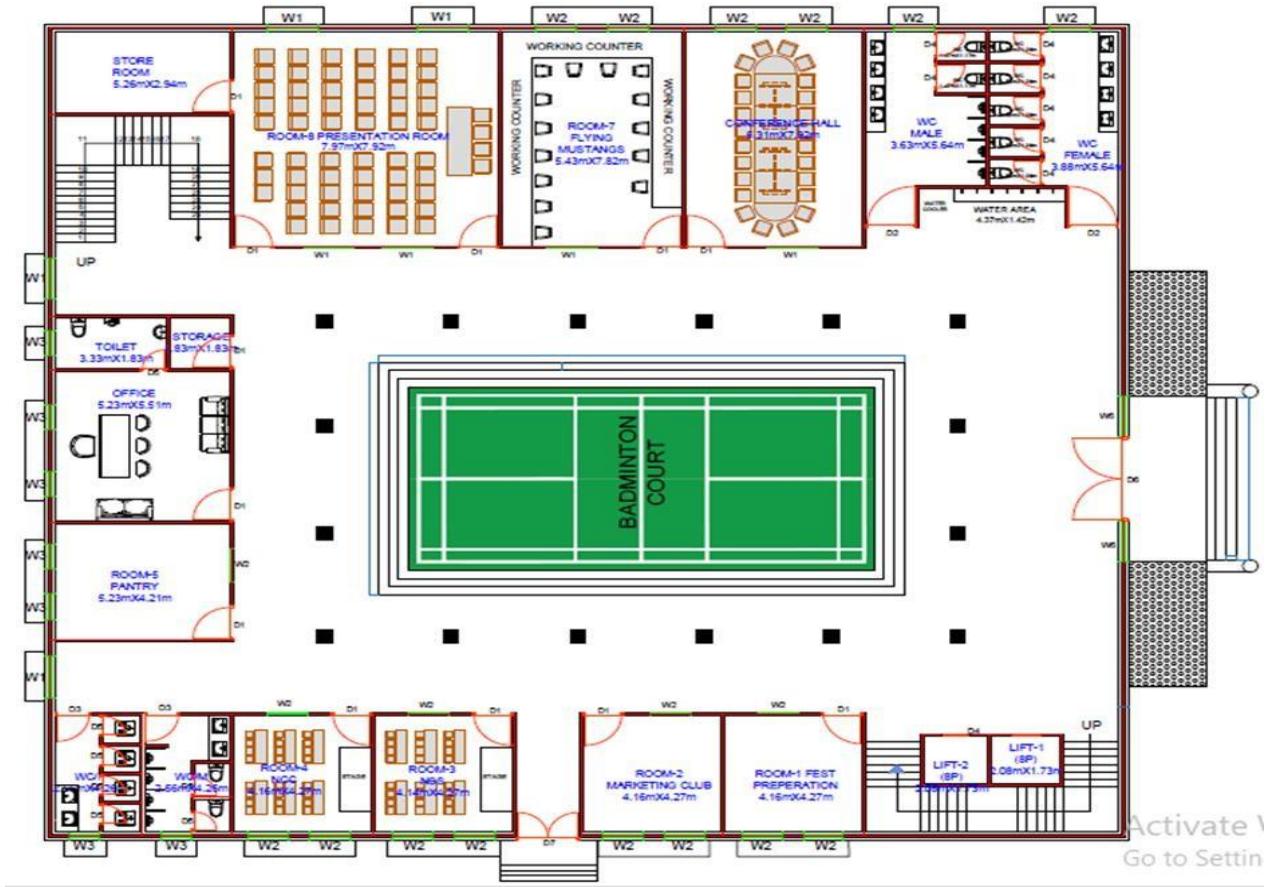


Fig.2.1: Ground floor plan

a) First Floor

1. **Master Builders :**The objective of club is to learn the advanced technology and their implementation in practical life, to discover new construction projects, learn more about modern infrastructural development. Various workshops on technical and structural softwares like AutoCAD, Staad.Pro, Revit Architecture, etc. are actively organized.
2. **Robotics Club :**The Robotics Club is the oldest technical club of the college. This Club is an association of students where the all discuss and share their expertise on robotics to create the best of robots with added features. Competitions like robowar, roborate etc are regularly organized to boost the interest of students in the emerging field. This club gives them a technology driven environment.
3. **Techknights :**Tech Knights (Programming Designing & Gaming Club) works to cultivate and develop programming, development and gaming skills among the students by organizing live Programming & Development sessions and LAN Gaming sessions. It aims at providing

a head start to all programmers. Night Out Coding Challenges (NOCCs) and various workshops are conducted on a regular basis.

4. Technocryptics :Techno Cryptics, aims to bring out the hidden technical talent in students as well as to make them familiar with updated technical and non-technical knowledge. It organizes technical and logical based quizzes which nurtures the inquisitive nature of the students.
5. Wordsworth :True to their motto “Enroll, Enhance and Enlighten” Words-Worth provides a platform for self improvement, linguistic creativity and personality development by practicing communication and leadership skills in friendly and supportive environment. The club organizes meetings on a regular basis to promote literary activities.
6. SAE club room :Society of Automotive Engineers (SAE) RTU is a group of students enthusiastic about design, manufacture and operation of motorcycles, automobiles and trucks and their respective engineering sub-systems. The club is run by the students under the guidance of the teachers. The students of this club made an eco-cart and participated in SAE eco-cart series.
7. Presentation Room

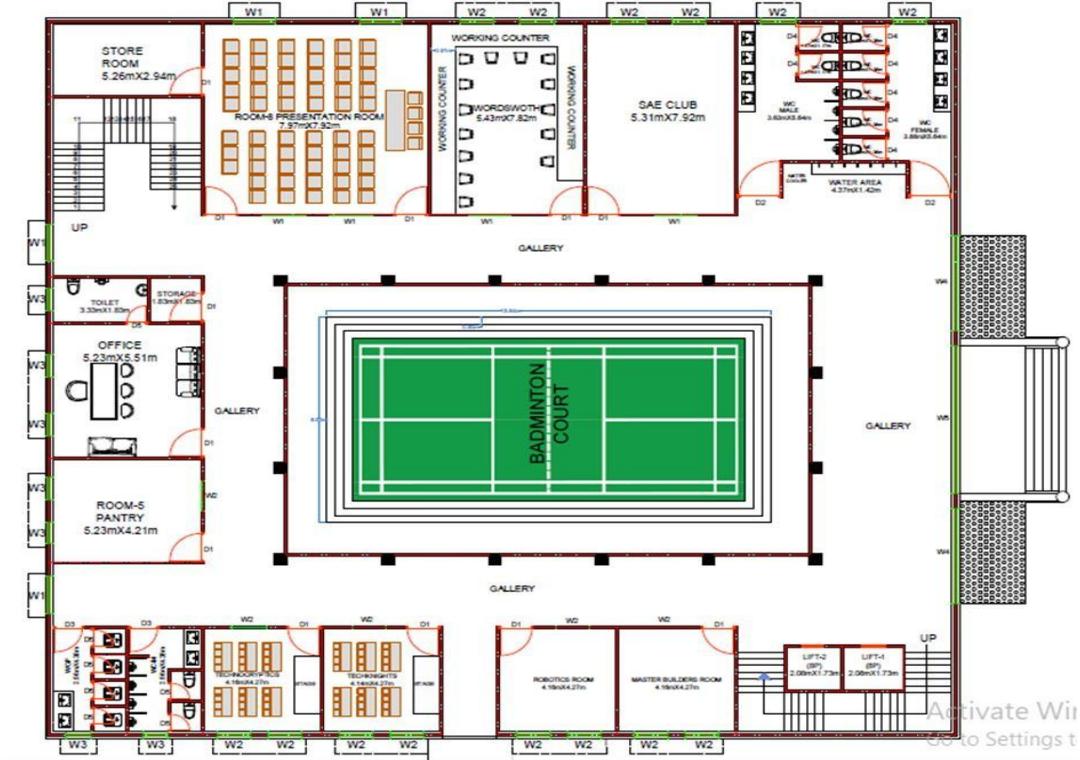


Fig.2.2: First floor plan

b) Second Floor :

1. Art and craft room : The creative club brings out the creative side of the student through the art and craft.
2. Interview Room : In this room interview of the students selected by the companies will be held .
3. Group Discussion Room : The group discussion will be held in this room helping the students to prepare them for the placements.
4. Reading Room : The student can visit this room if they want a peaceful place to read something:
5. Book Store : This floor also includes a book store .
6. Presentation Hall
7. Conference Hall

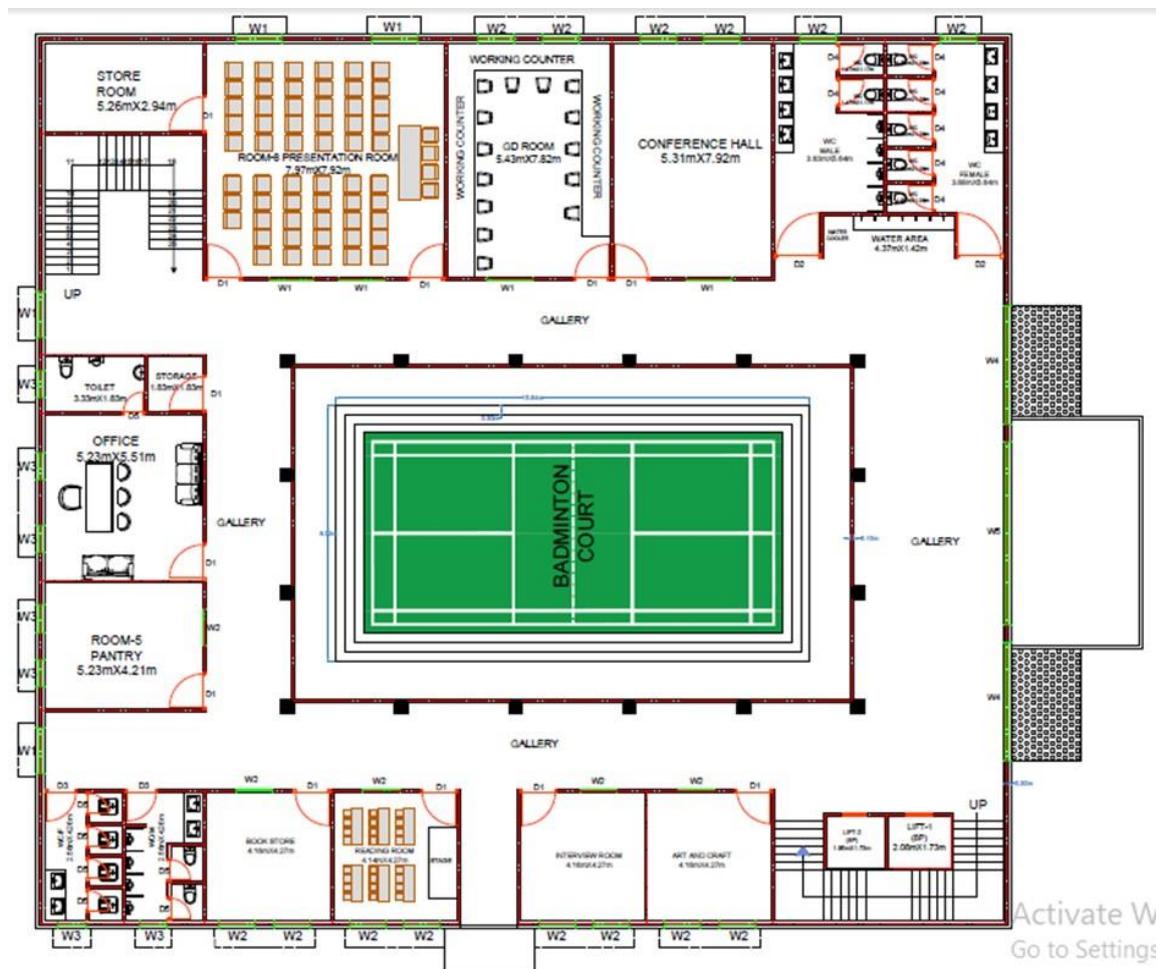


Fig.2.3: Second floor plan

c) Third Floor

1. Vivekanand study circle :Vivekananda study circle RTU Kota is working for enhancement of moral and ethical values among engineering students. The study circle also provides free tuitions to needy students of nearby economically backward colony and motivates parents to send their wards to school.
2. Drama club :Objective of the club – To enhance the characters within ourselves
3. Editorial board
4. Eateries
5. 2 rooms for future extension
6. Quiz room



Fig.2.4: Third floor plan

d) Fourth floor

1. Dance club :Objective of the club – To teach dance to the newcomer students and prepare them for dance competition.

2. Music Club :Objective of the club – The club aims to nurture the talent in every member and enhance their own individual love of music. We provide a conductive environment for mutual learning. Learn vocals & various instruments as well as how to perform on stage.
3. Indoor games :



2.4 SECTIONAL ELEVATION

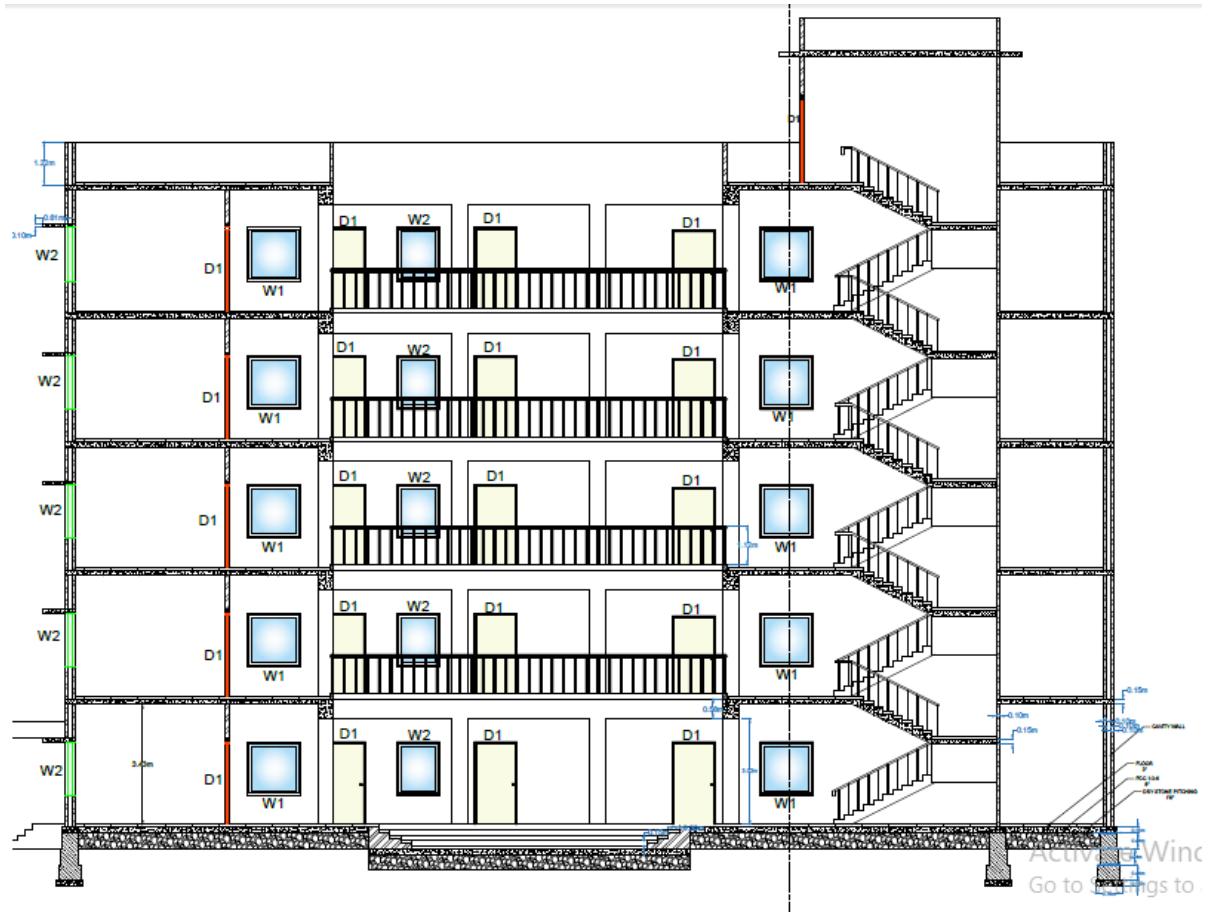


Fig.2.6: Sectional elevation

3. STRUCTURAL ANALYSIS AND DESIGN

3.1 SAC BUILDING MODEL GENERATION

Student activity centre building model was generated using software STAAD.Pro V8i SS6. General design and analysis of beams and columns was done with the help of the above mentioned software.

Staad-Pro Over View:

STAAD.Pro is a general purpose program for performing the analysis and design of a wide variety of types of structures. The basic three activities which are to be carried out to achieve that goal –

- a) Model generation
- b) The calculations to obtain the analytical results
- c) Result verification – are all facilitated by tools contained in the program's graphical environment application for design and detailing.

Step 1: Creation of nodes.

Based on the column positioning of plan we entered the grid line using Snap Node/Beam command. Open Staad.Pro → New Project → {Enter Name of project} → Add Beam → Create → {Enter data as per plan}

Node	X m	Y m	Z m
1	0.000	0.000	0.000
2	2.768	0.000	0.000
3	5.537	0.000	0.000
4	9.728	0.000	0.000
5	13.894	0.000	0.000
6	16.027	0.000	0.000
7	20.244	0.000	0.000
8	24.409	0.000	0.000
9	28.346	0.000	0.000
10	32.309	0.000	0.000
11	26.289	0.000	-1.777
12	28.346	0.000	-1.777
13	30.404	0.000	-1.777
14	26.289	0.000	-3.404
15	28.346	0.000	-3.404
16	30.404	0.000	-3.404
17	Activ...0.000	Wind...0.000	-4.191

Fig.3.1: Joint coordinates

Step 2: Representation of beams

By using Snap Node/Beam button in Snap Node/Beam window we had drawn the beams and between the corresponding node points.

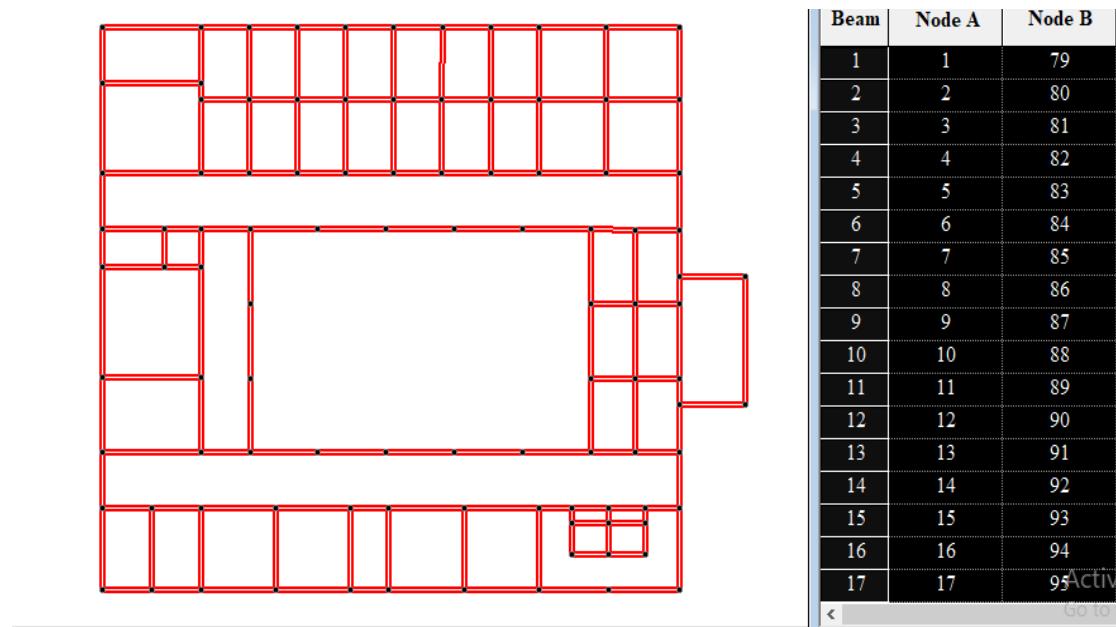


Fig.3.2: Creating beams by connecting nodes

Step 3: Creating 3D skeleton view with the help of translational repeat.

To create 3D View of structure transitional repeat command was used in Y direction. Geometry → Transitional repeat → {Enter data as per requirement}

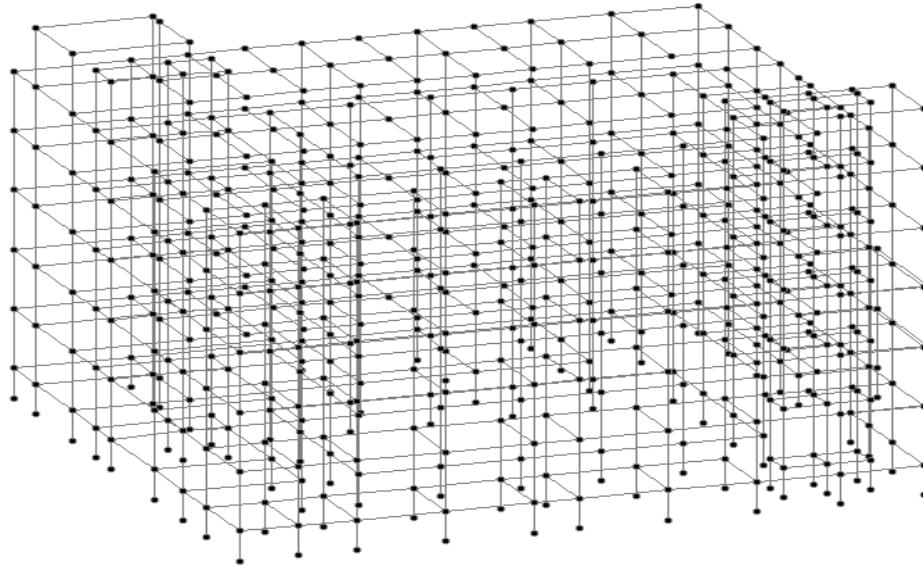


Fig.3.3: Structure of SAC model

Step 4 : Assigning supports

After the creation of structure, the supports at the base of structure are specified as fixed.

Commands → Support specification → Fixed → Add

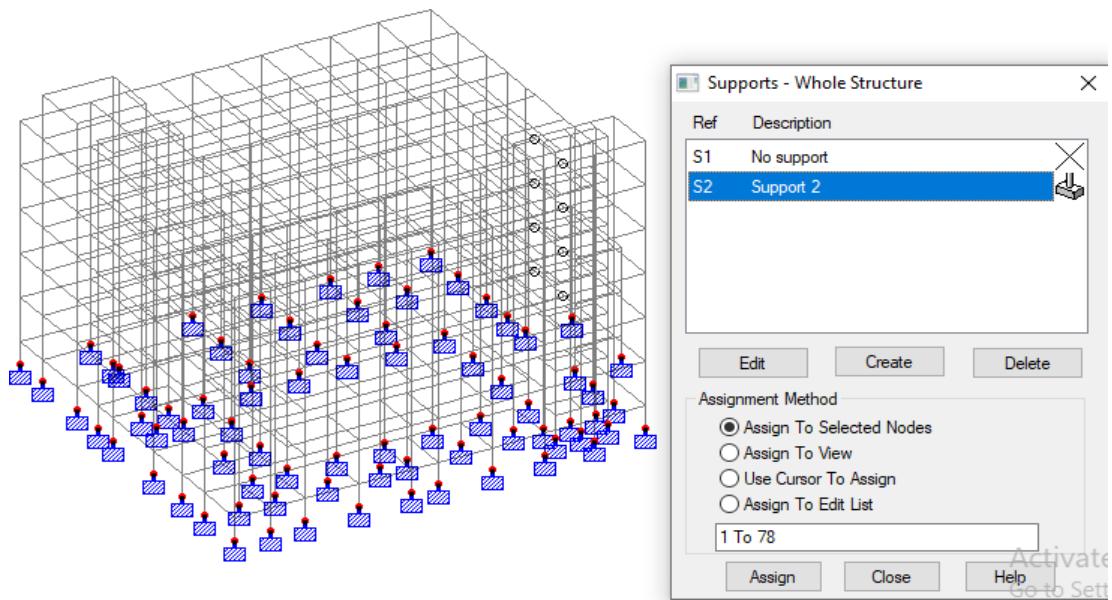


Fig.3.4:Supports assigned

Step 5 : Creating element incidences shell for shear wall

This is done with the help of 4noded plate cursor.

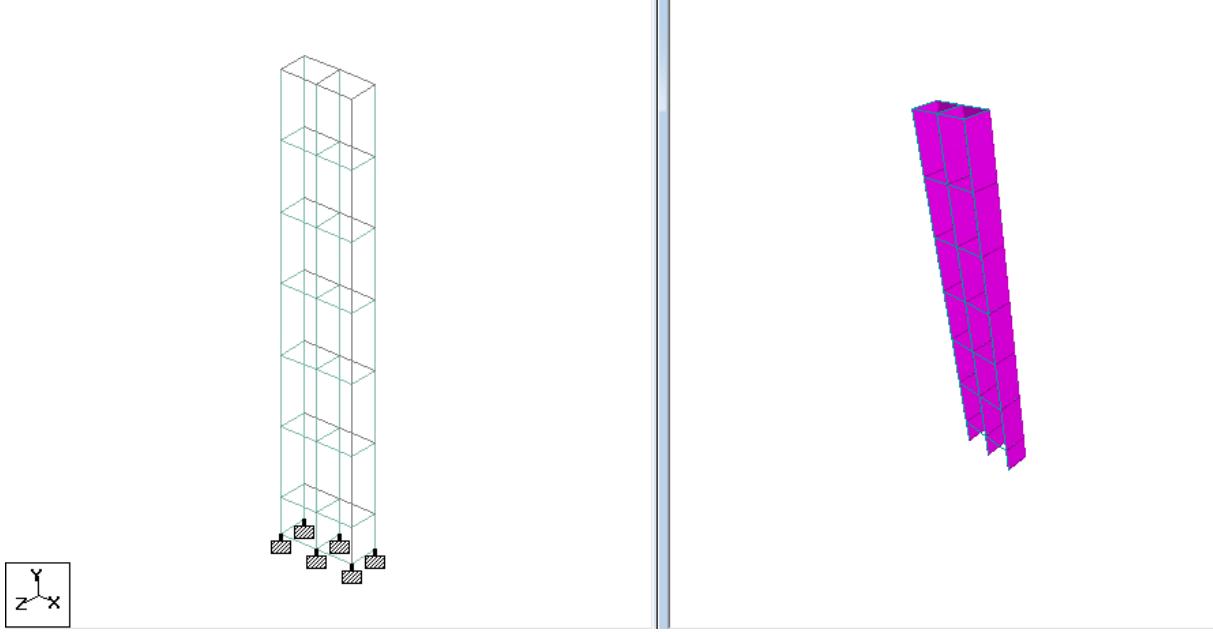


Fig.3.5: Outline of shear walls using 4 noded plate cursor

Step6: Surface incidences

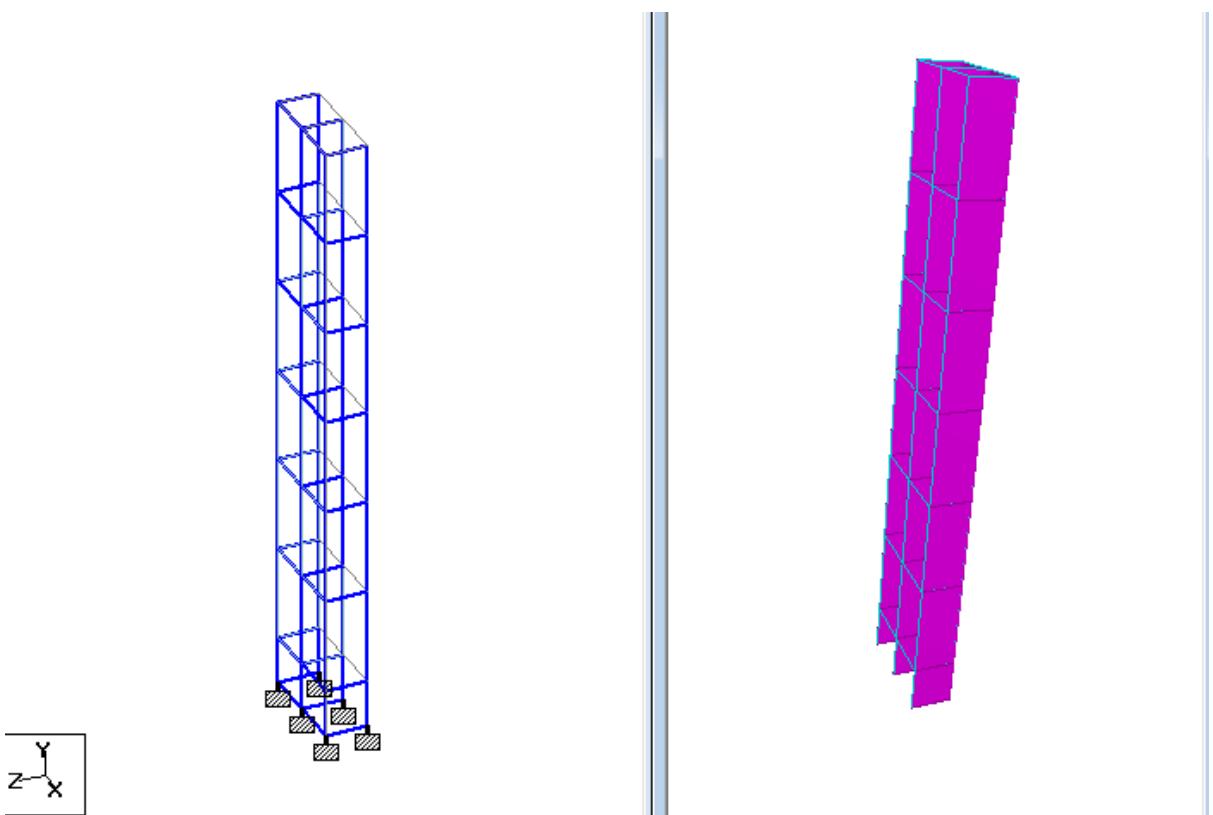


Fig.3.6 Inserting surface between the elements

Step 7 : Assigning properties to members

The materials were specified and cross section of beams and columns members was assigned as shown figure. Commands → Members Property → Prismatic → {Enter data as per requirement}

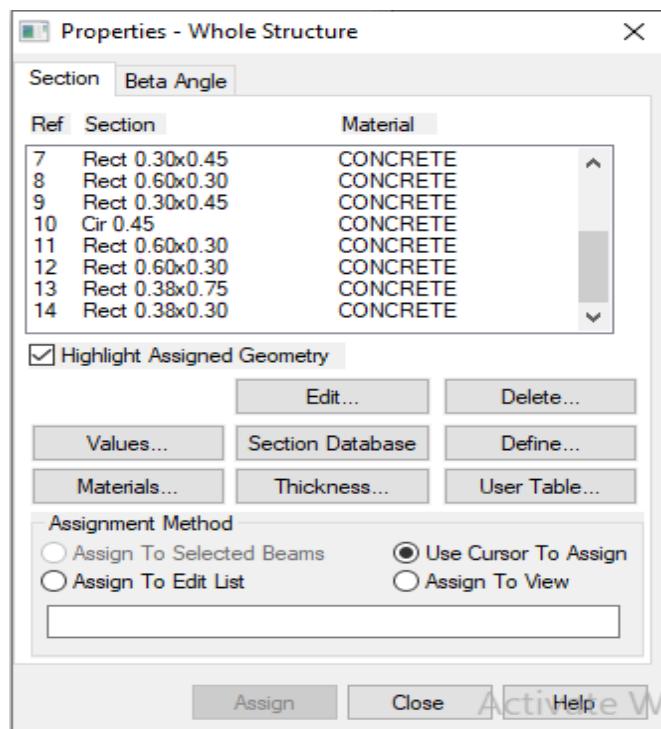
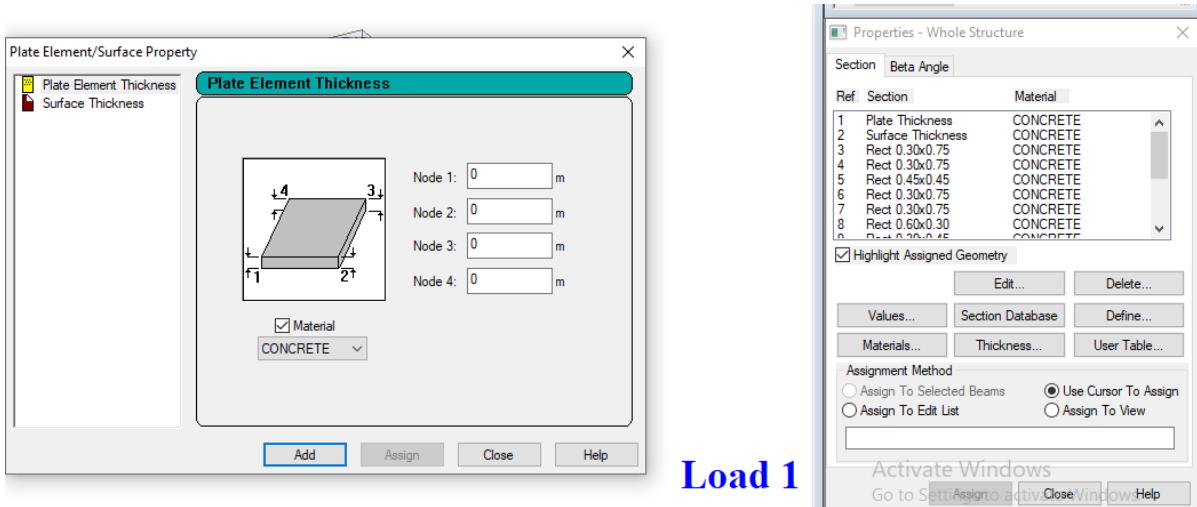


Fig.3.7 Property window

Step 8 : Assigning properties to surface

Once the properties are assigned to beams and columns then the surface properties are assigned as shown below. The thickness of the surface was adopted as 300mm.



Load 1

Fig.3.8 Surface property

Step 9: Loads and definitions

(i) Assigning of dead loads

Dead loads are calculated as per IS 875 PART 1 for external walls, internal walls, parapet wall including self-weight of structure. Commands → Loading → Primary Load

(a) Self Weight of Structure

The self-weight of the structure can be generated by STAAD.Pro itself with the self-weight command in the load case column. Density of RCC Material is 25 kN/cum.

(b) Weight of Masonry Wall

- For outer wall 300mm thick

Masonry Flyash Brick wall Thickness is 300mm, height & the density of Flyash brick wall is 20 kN/cum then it can be calculated as: Thickness x Height x Density

$$DL = \text{height} \times \text{thickness} \times \text{length} \times \text{unit weight of brick} = 3.2 \times 0.3 \times 1.0 \times 20 = 19.20 \text{ kN}$$

- For inner wall 230mm thick

Masonry Flyash Brick wall Thickness is 230mm, height & the density of Flyash brick wall is 20 kN/cum then it can be calculated as: Thickness x Height x Density

$$DL = \text{height} \times \text{thickness} \times \text{length} \times \text{unit weight of brick} = 3.2 \times 0.15 \times 1.0 \times 20 = 9.6 \text{ kN}$$

(c) Self Wt. of Slab

If we know thickness of slabs then it can be calculated as: Thickness x RCC Density

It will be applied as Floor load. $0.15 \times 25 = 3.75 \text{ kN/m}$

(d) Floor Finish Load

$$0.075 \times 20 = 1.5 \text{ kN/m}$$

(e) False ceiling load

It is taken as 0.5 kN/m^2

(ii) Assigning of live load

The Imposed Loads for Residential Buildings are considered as per IS:875-2002 (Part-2) as follows:

Assemble area	5.00 kN/sqm
Roof	1.50 kN/sqm

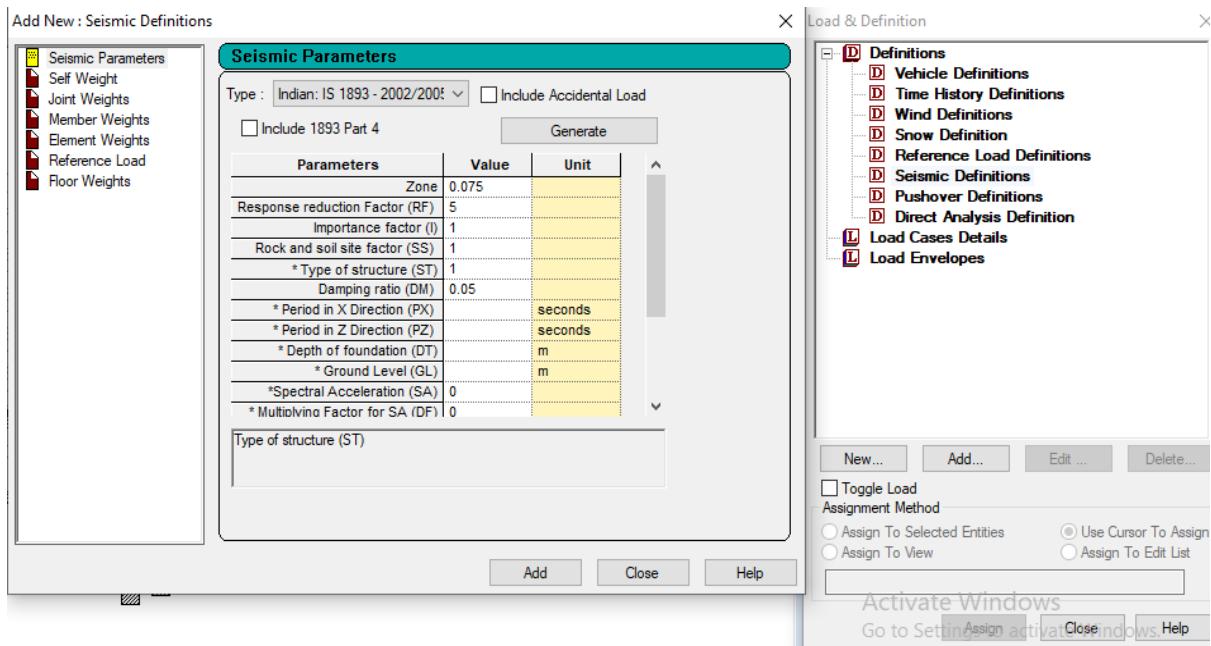


Fig.3.9 Seismic parameters

Step 10 :Load Combinations

After assigning all the loads, the load combinations are given with suitable factor of safety as per IS 875 part 5. Commands → Loading → Load Combination

The structure shall be designed for the following load combinations:

LOAD NO.	TYPE OF LOAD	NOTATION
LOAD 1	Earthquake load in positive X direction	EQ +X
LOAD 2	Earthquake load in negative X direction	EQ -X
LOAD 3	Earthquake load in positive Z direction	EQ +Z
LOAD 4	Earthquake load in negative Z direction	EQ -Z
LOAD 5	Dead load	DL
LOAD 6	Live load	LL

Table 3.1 : Type of Loads

S.NO.	DL	LL	EQ +X	EQ -X	EQ +Z	EQ -Z
1	1.5	1.5				
2	1.2	1.2				
3	1.2	1.2	1.2			
4	1.2	1.2		1.2		
5	1.2	1.2			1.2	
6	1.2	1.2				1.2
7	1.2	1.2	-1.2			
8	1.2	1.2		-1.2		
9	1.2	1.2			-1.2	
10	1.2	1.2				-1.2
11	1.5					
12	1.5		1.5			
13	1.5			1.5		
14	1.5				1.5	
15	1.5					1.5
16	1.5		-1.5			
17	1.5			-1.5		
18	1.5				-1.5	
19	1.5					-1.5
20	0.9		1.5			
21	0.9			1.5		
22	0.9				1.5	
23	0.9					1.5
24	0.9		-1.5			
25	0.9			-1.5		
26	0.9				-1.5	
27	0.9					-1.5
28	1	1				

Table 3.2 : Load Combinations

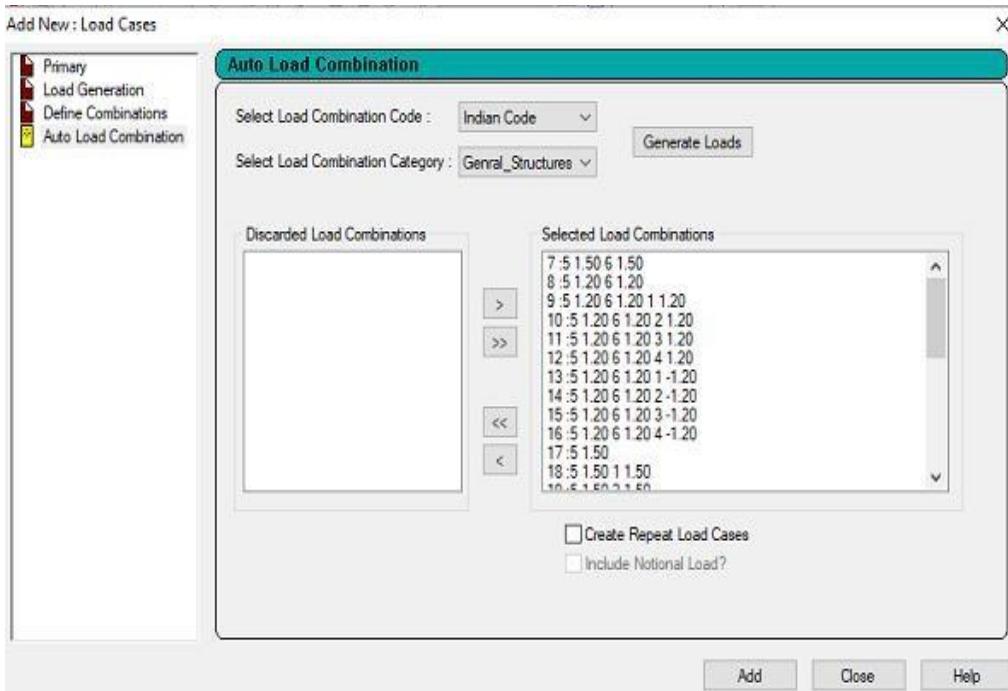


Fig. 3.10 Generating auto load combinations

Step 11 : Analysis of whole structure

After the completion of all the above steps we have performed the analysis and checked for errors. Analyze → Run Analysis

```

Input File: SAC Design[2081] without column[2153].std

++ Processing Joint Coordinates.          0:42:44
++ Processing Member Information.        0:42:44
++ Processing Element Information.       0:42:44
++ Surface Element Generation ...      0:42:44
++ Begin Surface   49     49 of    49      0:42:44
++ Surface Element Property ...        0:42:50
++ Begin Surface   49 of    49      0:42:50
++ Surface Element Constants ...       0:42:50
++ Reading Member Properties ...       0:42:50
++ Finished Reading Member Properties ... 360 ms
++ Reading Member Properties ...       0:42:50
++ Finished Reading Member Properties ... 0 ms
++ Reading Member Properties ...       0:42:50
++ Finished Reading Member Properties ... 10 ms
++ Processing Support Condition.       0:42:51
++ Read/Check Data in Load Cases ...   0:42:51
++ Process Loads for Case=      6 Seq. No.   6
++ Using Out-of-Core Basic Solver      0:42:52
++ Processing and setting up Load Vector. 0:42:52
++ Processing Element Stiffness Matrix. 0:42:54
++ Processing Global Stiffness Matrix. 0:42:55
++ Finished Processing Global Stiffness Matrix. 1.470 sec
++ Processing Triangular Factorization. 0:42:57

```

0 Error(s), 2 Warning(s), 0 Note(s)

0:42:59

Abort

Fig.3.11 Analysis of whole structure

Step 11 : concrete design

Finally, concrete design is performed as per IS 456: 2000 by defining suitable design commands for different structural components. After the assigning of commands again we performed analysis for any errors.

1. Commands → Design → Concrete Design

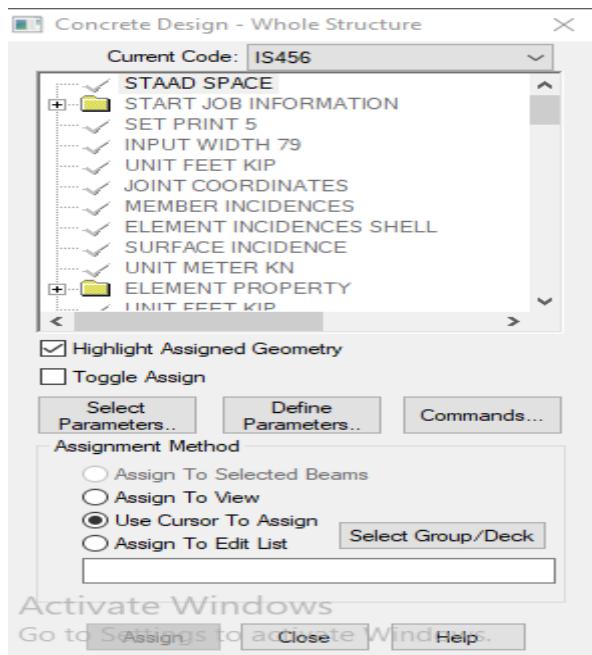


Fig.3.12 Concrete design window

As the concrete design window opens after clicking on design tab parameter selection for concrete design is done .thereafter the selected parameters are defined by clicking on the define parameters tab. Finally, design commands for concrete design are given through the design commands window.

2. During the analysis (and design, if specified), an output file is generated.
3. Select an option for what action occurs when the dialog is closed: Open the output file, go to the post-processing mode.
4. Click the Done button.
5. Output File > STAAD Output to review the output file is this option was not selected in the STAAD Analysis and Design dialog.

From here we can see the concrete design given by Staad by right clicking the individual

Member And selecting the Concrete Design Tab.

3.2 GENERAL DESIGN IN STAAD.Pro

Detailing of beam and column as per IS-456 and SP34

By following basic detailing rule of beam and column design which has been given in IS-456 and SP-34

3.2.1 COLUMN DESIGN

Longitudinal Reinforcement

- a) The cross-sectional area of longitudinal reinforcement, shall be not less than 0.8 percent nor more than 6 percent (usually not exceed 4 percent) of the gross cross- sectional area of the column.
- b) The minimum number of longitudinal bars provided in a column shall be 4 in rectangular columns and 6 in circular columns. The bars shall not be less than 12 mm in diameter.
- c) A reinforced concrete column having helical reinforcement shall have at least six bars of longitudinal reinforcement within the helical reinforcement. Spacing of longitudinal bars measured along the periphery of the column shall not exceed 300 mm.

The bar generally used in column and beam detailings are:

BAR DIAMETER(mm)	AREA (mm ²)
8	50.24
10	78.5
12	113.04
16	200.96
20	314
25	490.625
32	803.84

Pitch and Diameter of Lateral Ties

1) Pitch-The pitch of transverse reinforcement shall be not more than the least of the following

distances:

- i) The least lateral dimension of the compression members;
- ii) Sixteen times the smallest diameter of the longitudinal reinforcement bar to be tied; and
- iii) 300 mm.

2) Diameter- The diameter of the polygonal links or lateral ties shall be not less than one fourth

of the diameter of the largest longitudinal bar, and in no case less than 16 mm.

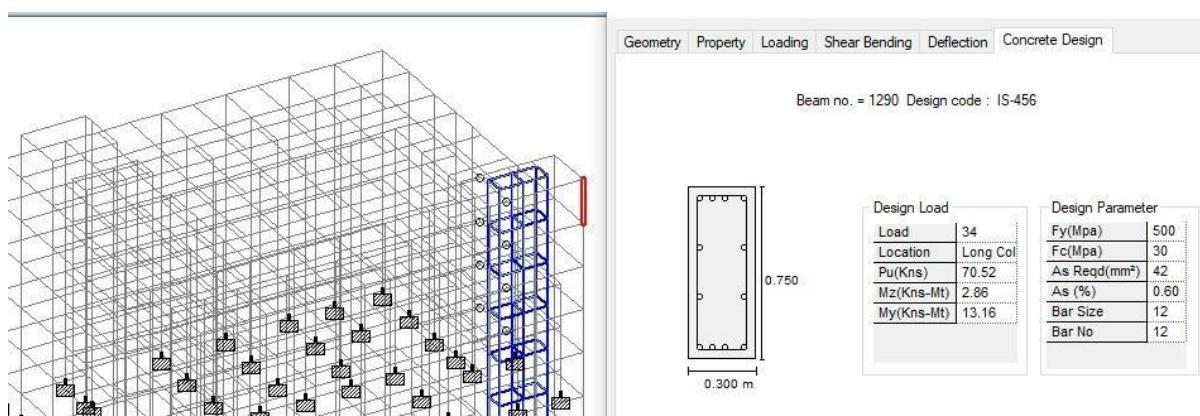


Fig.3.13 Sample of concrete design output of a column



Fig.3.14 Reinforcement detail drawing of columns (1)



Fig.3.15 Reinforcement detail drawing of columns (2)

3.2.2 BEAM DESIGN

a) Minimum reinforcement-The minimum area of tension reinforcement shall be notless than that

$$A_s / b d = 0.85 / f_y$$

A_s = minimum area of tension reinforcement,

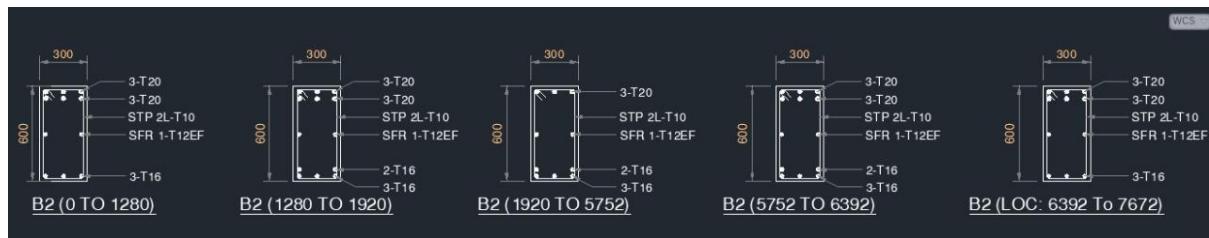
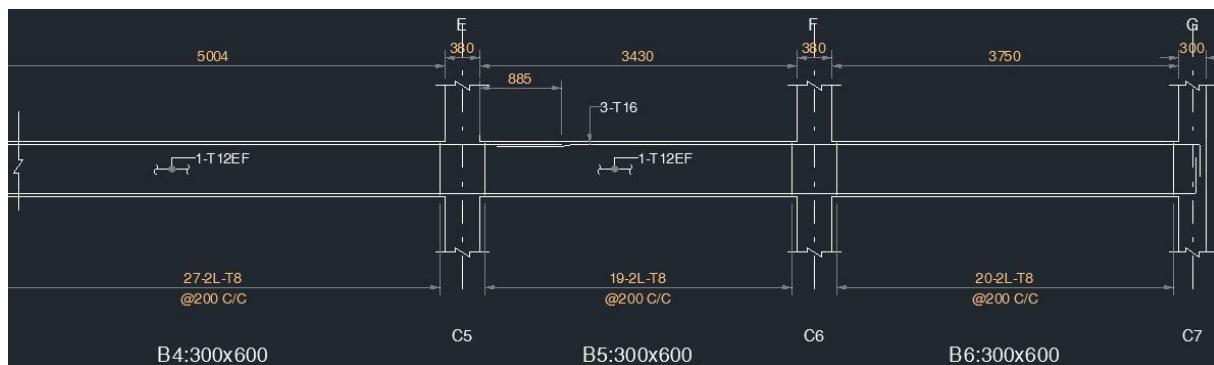
b=breadth of beam

d= depth of beam

f_y = characteristic strength of reinforcement in N/mm².

b) Maximum reinforcement- the maximum area of tension & compression reinforcements shall not exceed 0.04 bD.

c) Maximum spacing of shear reinforcement measured along the axis of the member shall not exceed 0.75d for vertical stirrups and d for inclined stirrups at 45 degree where d is the effective depth of the section under consideration. In no case shall the spacing exceed 300 mm.



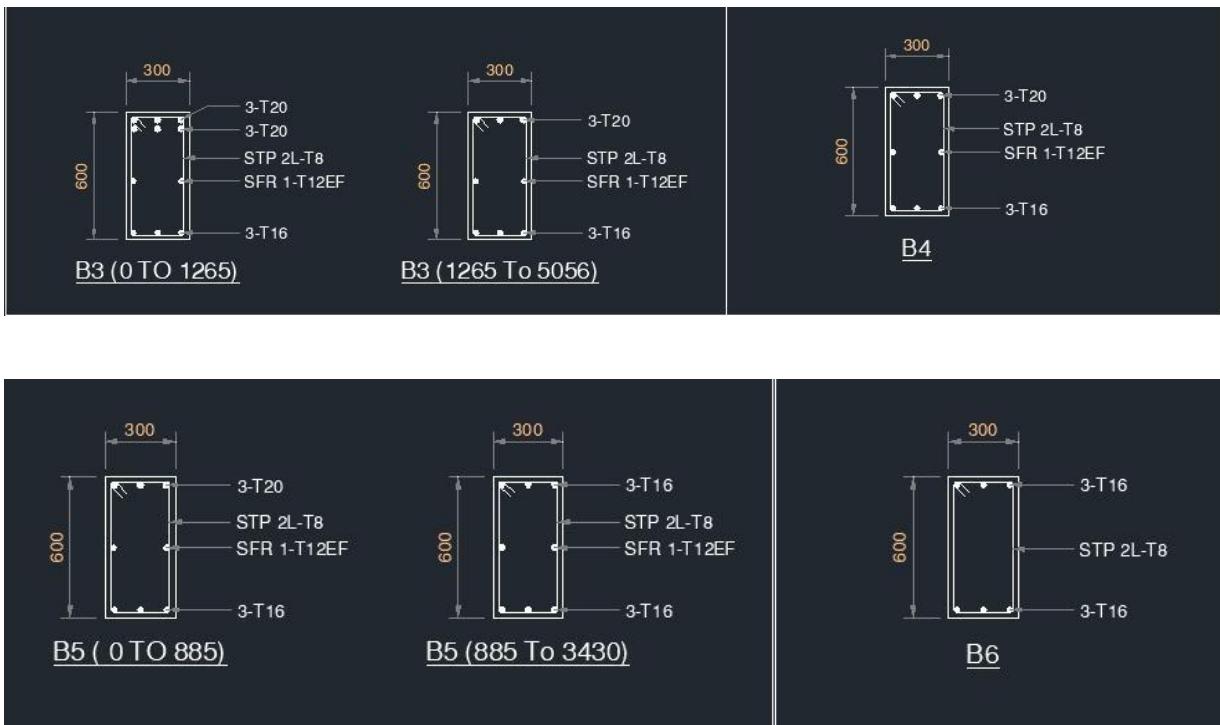


Fig.3.16 BEAM DESIGN

3.3 GENERAL DESIGN IN STAAD RCDC

Analysis and design of slab and footing was done using the software STAAD RCDC.

The procedure carried out is as follows:

1.2.1 Slab Design

Step 1 : Data input for slab design

The long span, short span , span type, panel type and loads definitions are given as the input in a table format in STAAD RCDC as shown below.

Design Input								
Design Data								
No	Slab Mark	Lx (m)	Ly (m)	Span Type	Panel Type	Imposed Load (kN/sqm)	Live Load (kN/sqm)	Thickness (mm)
1	S1	2.97	5.54	Two Way	Three Edges Discontinuous (Short)	2	5	150
2	S2	2.60	3.81	Two Way	One Short Edge Discontinuous	2	5	150
3	S3	2.68	3.81	Two Way	One Short Edge Discontinuous	2	5	150
4	S4	2.68	3.81	Two Way	One Short Edge Discontinuous	2	5	150
5	S5	2.72	3.81	Two Way	One Short Edge Discontinuous	2	5	150
6	S6	2.69	3.81	Two Way	One Short Edge Discontinuous	2	5	150
7	S7	3.81	3.81	Two Way	One Short Edge Discontinuous	2	5	150
8	S8	3.81	4.09	Two Way	Two Adjacent Edges Discontinuous	2	5	150
9	S9	2.68	3.81	Two Way	Four Edges Discontinuous	2	5	150
10	S10	2.60	3.81	Two Way	One Short Edge Discontinuous	2	5	150
11	S11	4.65	5.51	Two Way	Four Edges Discontinuous	0	0	0
12	S12	2.59	3.82	Two Way	One Long Edge Discontinuous	2	5	150
13	S13	2.72	3.81	Two Way	Interior Panel	2	5	150
14	S14	2.69	3.81	Two Way	Interior Panel	2	5	150
15	S15	2.72	3.81	Two Way	Interior Panel	2	5	150
16	S16	2.69	3.81	Two Way	Interior Panel	2	5	150
17	S17	3.81	3.81	Two Way	Interior Panel	2	5	150
18	S18	3.81	4.09	Two Way	One Short Edge Discontinuous	2	5	150
19	S19	2.58	3.81	Two Way	Interior Panel	2	5	150
20	S20	2.46	3.82	Two Way	Interior Panel	2	5	150
21	S21	2.92	32.31	One Way	Span Next to End Span	2	5	150
22	S22	1.83	3.45	Two Way	Two Short Edges Discontinuous	2	5	150
23	S23	1.91	1.97	Two Way	Interior Panel	0	0	0
24	S24	2.50	3.75	Two Way	One Long Edge Discontinuous	2	5	150
25	S25	2.54	3.72	Two Way	One Long Edge Discontinuous	2	5	150
26	S26	5.42	5.60	Two Way	Four Edges Discontinuous	2	5	200
27	S27	2.63	11.49	One Way	Span Next to End Span	2	5	150
28	S28	11.58	19.05	Two Way	Interior Panel	0	0	0

Fig.3.17 Data input for slab design

Step 2 : Design setting for slab

Design Settings

Detailing Style <input type="radio"/> Curtailed Rebars <input checked="" type="radio"/> Bent Up Rebars		Detailing Options <input checked="" type="radio"/> Rebar <input type="radio"/> Spacing													
Preferred Span/d Cantilever 7 Simply supported 20 Continuous 26 Two-way Slab Simply supported 28 Continuous 32		Preferred Rebar 10													
BentUp Location Bottom End Support L/ 6 Bottom Cont. Support L/ 4 Top Cont. Support L/ 4															
Rebar Diameter <table border="1"> <tbody> <tr> <td><input type="checkbox"/> 6</td> <td><input type="checkbox"/> 13</td> <td><input checked="" type="checkbox"/> 20</td> </tr> <tr> <td><input type="checkbox"/> 8</td> <td><input type="checkbox"/> 14</td> <td><input type="checkbox"/> 22</td> </tr> <tr> <td><input checked="" type="checkbox"/> 10</td> <td><input checked="" type="checkbox"/> 16</td> <td><input checked="" type="checkbox"/> 25</td> </tr> <tr> <td><input checked="" type="checkbox"/> 12</td> <td><input type="checkbox"/> 18</td> <td><input type="checkbox"/> 28</td> </tr> </tbody> </table>				<input type="checkbox"/> 6	<input type="checkbox"/> 13	<input checked="" type="checkbox"/> 20	<input type="checkbox"/> 8	<input type="checkbox"/> 14	<input type="checkbox"/> 22	<input checked="" type="checkbox"/> 10	<input checked="" type="checkbox"/> 16	<input checked="" type="checkbox"/> 25	<input checked="" type="checkbox"/> 12	<input type="checkbox"/> 18	<input type="checkbox"/> 28
<input type="checkbox"/> 6	<input type="checkbox"/> 13	<input checked="" type="checkbox"/> 20													
<input type="checkbox"/> 8	<input type="checkbox"/> 14	<input type="checkbox"/> 22													
<input checked="" type="checkbox"/> 10	<input checked="" type="checkbox"/> 16	<input checked="" type="checkbox"/> 25													
<input checked="" type="checkbox"/> 12	<input type="checkbox"/> 18	<input type="checkbox"/> 28													
Rebar Spacing Minimum Spacing 100 mm Maximum Spacing 200 mm Round off 10 mm															
Material Property Concrete Grade M30 Add Steel Grade Fe500 Add Cover (Main Reinf) 20 mm Minimum Thickness 100 mm <input type="checkbox"/> Use material properties from analysis		Rebar Mark Manager OK Cancel													

Fig.3.18 Design setting for slab

STAAD RCDC CONNECT Edition (Advanced Concrete Design) - [SAC Design-Slab-1-5.486 m.R1.rcdx]

No	Slab	Thickness (mm)	Conc Grade	Steel Grade	Bottom @ Lx	Bottom @ Ly	Top @ Lx (Cor ^)
1	S1	150	M30	Fe500	T10 @ 200	T10 @ 200	—
2	S2	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
3	S3	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
4	S4	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
5	S5	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
6	S6	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
7	S7	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
8	S8	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
9	S9	150	M30	Fe500	T10 @ 200	T10 @ 200	—
10	S10	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
11	S12	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
12	S13	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
13	S14	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
14	S15	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
15	S16	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
16	S17	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
17	S18	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
18	S19	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
19	S20	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
20	S21	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
21	S22	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
22	S24	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
23	S25	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
24	S26	200	M30	Fe500	T10 @ 140	T10 @ 140	—
25	S27	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200
26	S29	150	M30	Fe500	T10 @ 200	T10 @ 200	T10 @ 200

Fig.3.19 Design output of slab design

FOOTING DESIGN

Step 1. Data input for footing

STAAD RCDC CONNECT Edition (Advanced Concrete Design) - [Untitled]

Sl.No.	Analysis No	Column Mark	Footing Mark	Footing Type	Cal Offset (mm)	Eff Thr (kN)
1	10	C1	FC1	Step	0	0
2	11	C2	FC2	Step	0	0
3	12	C3	FC3	Step	0	0
4	13	C4	FC4	Step	0	0
5	14	C5	FC5	Step	0	0
6	15	C6	FC6	Step	0	0
7	16	C7	FC7	Step	0	0
8	17	C8	FC8	Step	0	0
9	18	C9	FC9	Step	0	0
10	19	C10	FC10	Step	0	0
11	20	C11	FC11	Step	0	0
12	21	C12	FC12	Step	0	0
13	22	C13	FC13	Step	0	0
14	23	C14	FC14	Step	0	0
15	24	C15	FC15	Step	0	0
16	25	C16	FC16	Step	0	0
17	26	C17	FC17	Step	0	0
18	27	C18	FC18	Step	0	0
19	28	C19	FC19	Step	0	0
20	29	C20	FC20	Step	0	0
21	30	C21	FC21	Step	0	0
22	31	C22	FC22	Step	0	0
23	32	C23	FC23	Step	0	0
24	33	C24	FC24	Step	0	0
25	34	C25	FC25	Step	0	0
26	35	C26	FC26	Step	0	0
27	36	C27	FC27	Step	0	0
28	37	C28	FC28	Step	0	0
29	38	C29	FC29	Step	0	0

Fig.3.20 Data input for footing

Step 2. General settings for footing

General Settings

Design Settings	Soil Contact
<input type="checkbox"/> Use Gross SBC	Permissible loss of contact <input type="text" value="0"/> %
<input type="checkbox"/> Consider Overburden	
<input type="checkbox"/> Surcharge Load <input type="text" value="0"/> kN/sqm	
<input type="checkbox"/> Check for Buoyancy	
<input type="checkbox"/> Check for Sliding	
<input type="checkbox"/> Check for Overturning	
<input type="checkbox"/> Provide Top Steel	
<input checked="" type="radio"/> All Footings	
<input type="radio"/> Footing Depth >= <input type="text" value="600"/> mm	
<input type="checkbox"/> Provide Face Reinforcement	
Soil Data	
<input checked="" type="radio"/> Net SBC <input type="text" value="600"/> kN/sqm	Design Parameters
<input type="radio"/> Varying SBC <input type="button" value="Set"/>	Concrete Grade <input type="text" value="M30"/> Add
<input type="radio"/> Bearing Capacity (BSEN 1997-1 : 2004)	Steel Grade <input type="text" value="Fe500"/> Add
Soil Density <input type="text" value="18"/> kN/cum	Clear Cover <input type="text" value="50"/> mm
Founding Depth <input type="text" value="1.5"/> m	Live Load Reduction <input type="text" value="50"/> %
Water Table <input type="text" value="6"/> m	Type of Soil <input type="text" value="Medium"/> Add
Friction Coefficient <input type="text" value="0.4"/>	SBC Increase - Earthquake <input type="text" value="25"/> %
FOS For Sliding <input type="text" value="1.2"/>	SBC Increase - Wind <input type="text" value="25"/> %
FOS For Uplift <input type="text" value="1.4"/>	PCC Thickness <input type="text" value="100"/> mm
Cross Section design	
<input checked="" type="radio"/> Average Pressure	Dimensional Settings
<input type="radio"/> Maximum Pressure	Plan Round - Off <input type="text" value="50"/> mm
<input type="radio"/> Factored SBC <input type="text" value="1.5"/> x SBC	Depth Round - Off <input type="text" value="25"/> mm
	Maximum Steps <input type="text" value="5"/>
	Maximum Depth <input type="text" value="0"/> mm
	Minimum Depth <input type="text" value="300"/> mm
	Plan Limits <input type="button" value="Set"/> <input type="button" value="Help"/>
OK Cancel	

Fig.3.21 General settings for footing

Step 3. Reinforcement settings for footing

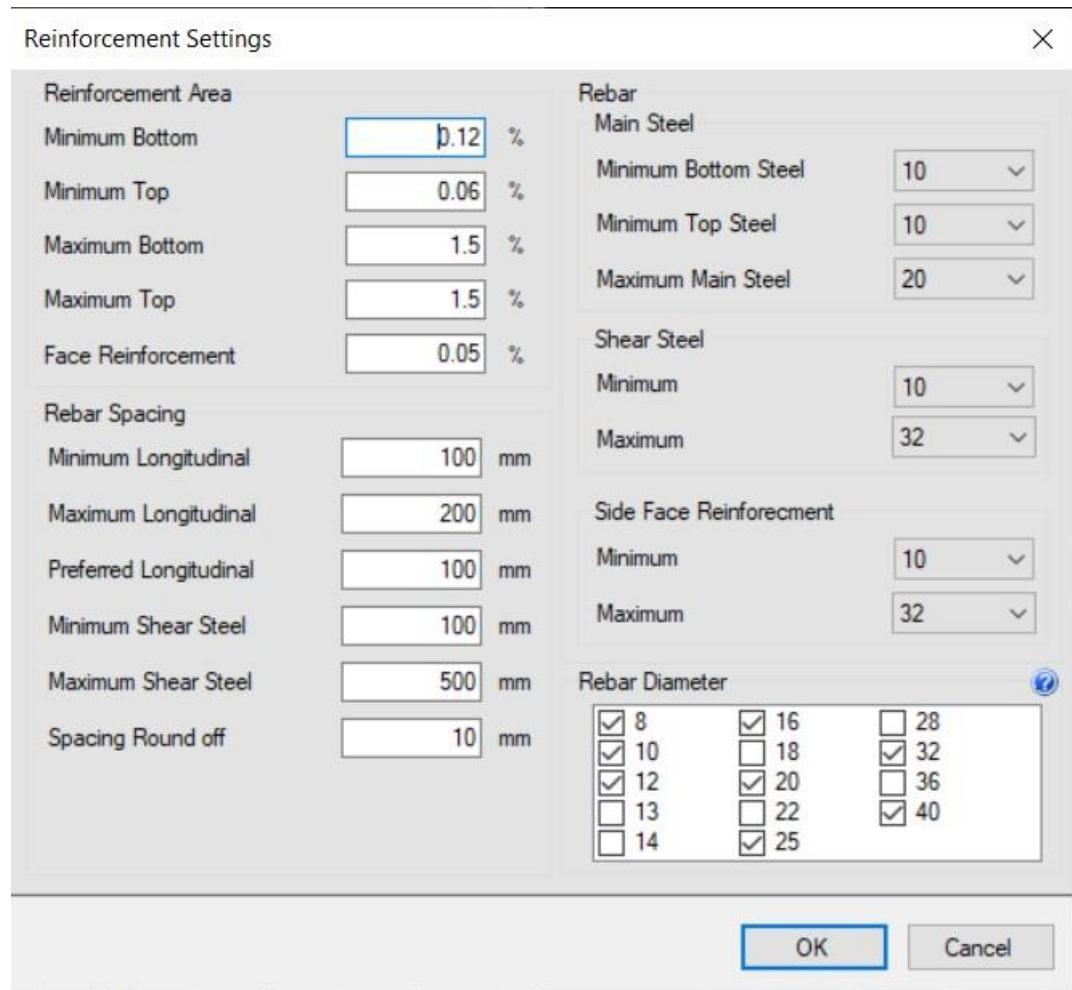


Fig.3.22 Reinforcement settings for footing

Step 4. Load case details of footing

Basic Load Cases	
Analysis Load Cases	Load Type
LOAD 1: EQ+X	Earthquake X
LOAD 2: EQ-X	Earthquake X
LOAD 3: EQ+Z	Earthquake Z
LOAD 4: EQ-Z	Earthquake Z
LOAD 5: DEAD LOAD	Dead Load
LOAD 6: LIVE LOAD	Live Load

Type	Primary Load Cases
EQ-X	LOAD 1: EQ+X
EQ-X	LOAD 2: EQ-X
EQ-Z	LOAD 3: EQ+Z
EQ-Z	LOAD 4: EQ-Z
DL	LOAD 5: DEAD LOAD
LL	LOAD 6: LIVE LOAD

Fig.3.23 Load case details of footing

Step 5. Load combinations

Load combinations are generated automatically by the STAAD RCDC and are given as follows.

Load Combinations

Design		Sizing					
		Linear Combination					
Analysis No		LOAD 5: DEAD LOAD	LOAD 6: LIVE LOAD	LOAD 1: EQ+X	LOAD 2: EQ-X	LOAD 3: EQ+Z	LOAD 4: EQ-Z
7	<input checked="" type="checkbox"/>	1.5	1.5				
8	<input checked="" type="checkbox"/>	1.2	1.2				
9	<input checked="" type="checkbox"/>	1.2	1.2	1.2			
10	<input checked="" type="checkbox"/>	1.2	1.2		1.2		
11	<input checked="" type="checkbox"/>	1.2	1.2			1.2	
12	<input checked="" type="checkbox"/>	1.2	1.2				1.2
13	<input checked="" type="checkbox"/>	1.2	1.2	-1.2			
14	<input checked="" type="checkbox"/>	1.2	1.2		-1.2		
15	<input checked="" type="checkbox"/>	1.2	1.2			-1.2	
16	<input checked="" type="checkbox"/>	1.2	1.2				-1.2
17	<input checked="" type="checkbox"/>	1.5					
18	<input type="checkbox"/>	1.5					

7 : 1.5(LOAD 5: DEAD LOAD) +1.5(LOAD 6: LIVE LOAD)

Repeat / Non-Linear Combination

View / Edit Template Add from Template Add from Analysis

Export Load Cases & Combinations OK Cancel

Fig.3.24 Load combinations

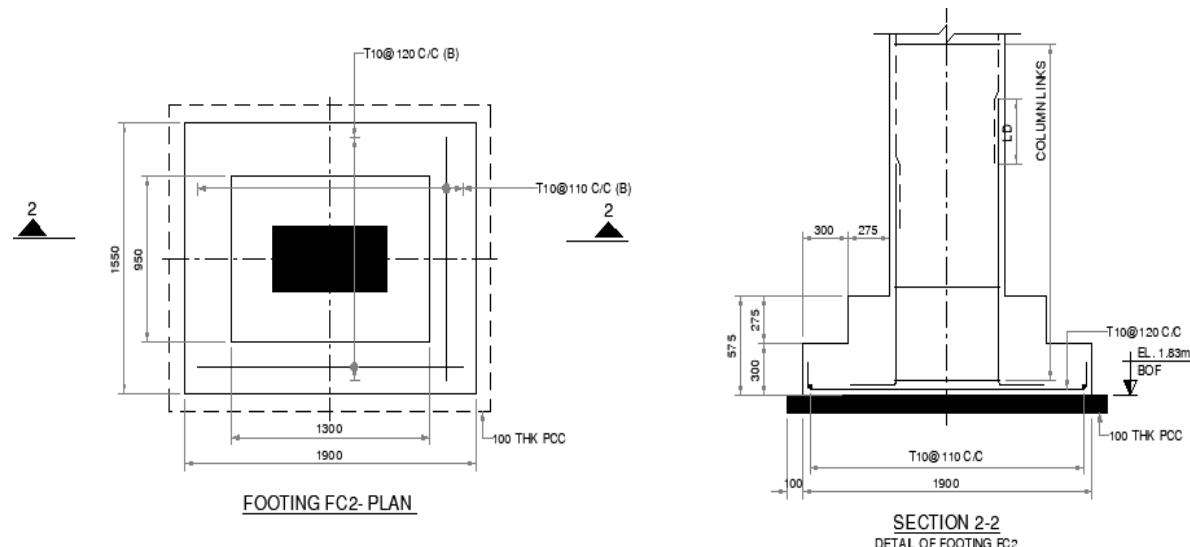


Fig.3.25 Footing plan

Fig.3.26 Detail of footing

3.4 SHEAR WALL DESIGN

The walls, in a building, which resist lateral loads originating from wind or earthquakes are known as shear walls. A large portion of the lateral load on a building, if not the whole amount, as well as the horizontal shear force resulting from the load, are often assigned to such structural elements made of RCC. These shear walls, may be added solely to resist horizontal force, or concrete walls enclosing stairways, elevated shafts, and utility cores may serve as shear walls. Shear walls not only have a very large in-plane stiffness and therefore resist lateral load and control deflection very efficiently, but may also help to ensure development of all available plastic hinge locations throughout the structure prior to failure. The other way to resist such loads may be to have the rigid frame augmented by the combination of masonry walls.

The use of shear walls or their equivalent becomes imperative in certain high-rise buildings, if inter-storey deflections caused by lateral loadings are to be controlled. Well-designed shear walls not only provide adequate safety but also give a great measure of protection against costly non-structural damage during moderate seismic disturbances.

The term shear wall is actually a misnomer as far as high-rise buildings are concerned, since a slender shear wall when subjected to lateral force has predominantly moment deflections and only very insignificant shear distortions. High-rise structures have become taller and more slender, and with this trend the analysis of shear walls may emerge as a critical design element. More often than not, shear walls are pierced by numerous openings. Such shear walls are called coupled shear walls. The walls on both sides of the openings are interconnected by short, often deep, beams forming part of the wall, or floor slab, or both of these.

Figure 3.27(a) shows a building with the lateral force represented by arrows acting on the edge of each floor or roof. The horizontal surfaces act as deep beams to transmit loads to vertical-resisting elements—the shear walls A and B

[Fig. 3.27(b)]. These walls, in turn, act as cantilever beams fixed at their base and transfer loads to the foundation. For the building plan shown in Fig. 3.27(a), additional shear walls

C and D are provided to resist the lateral loads that may act in the orthogonal direction [Fig. 3.27(c)].

The shear walls are subjected to the following loads:

- (a) A variable shear which reaches a maximum at the base.
- (b) A bending moment which tends to cause vertical tension near the loaded edge and compression at the far edge.
- (c) A vertical compression due to ordinary gravity loading from the structure.

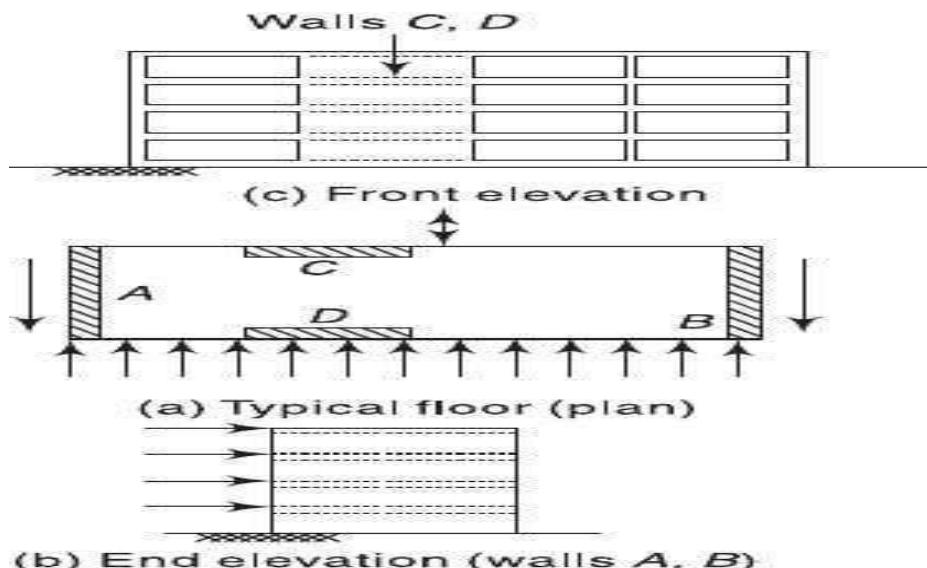


Fig 3.27 (a,b,c)

Behaviour of Shear Walls

The behaviour of shear walls, with particular reference to their typical mode of failure is, as in the case of beams, influenced by their proportions as well as their support conditions. Low shear walls also known as squat walls , characterized by relatively small height-to-length ratios, may be expected to fail in shear just like deep beams. Shear walls occurring in high-rise buildings, on the other hand, generally behave as vertical cantilever beams (Fig. 8.28) with their strength controlled

by flexure rather than by shear. Such walls are subjected to bending moments and shears originating from lateral loads, and to axial compression caused by gravity. These may, therefore, be designed in the same manner as regular flexural elements.

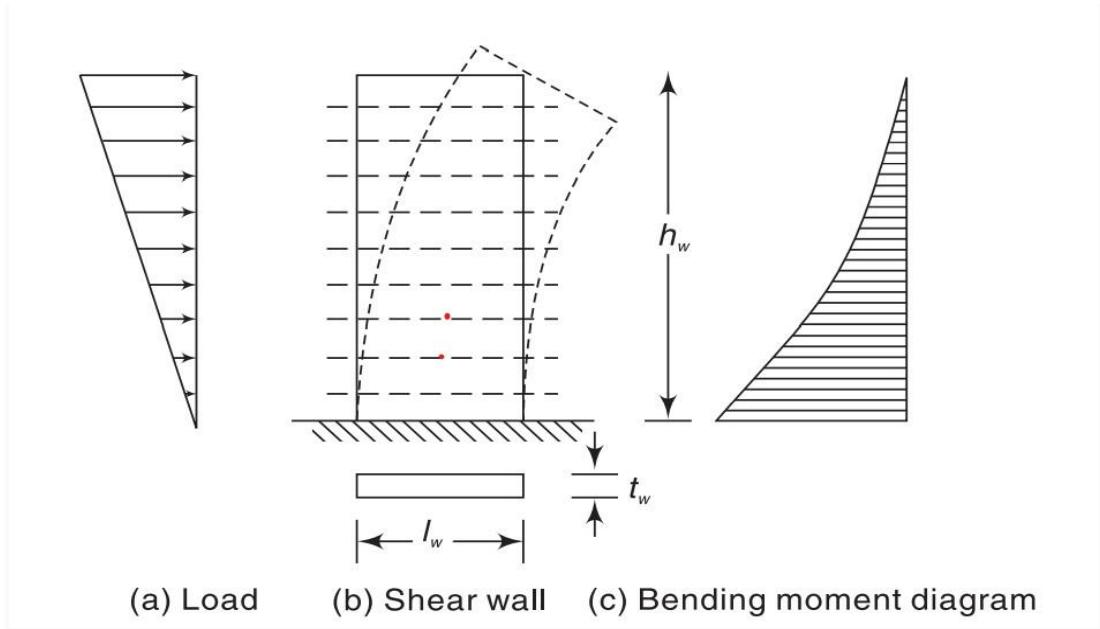


Fig 3.28 Behaviour of shear walls

When acting as a vertical cantilever beam, the behaviour of a shear wall which is properly reinforced for shear (i.e., diagonal tension) will be governed by the yielding of the tension reinforcement located near the vertical edge of the wall and, to some degree, by the vertical reinforcement distributed along the central portion of the wall. It is thus evident that shear is critical for walls with relatively low height-to-length ratios and tall shear walls are controlled mainly by flexural requirements particularly if only uniformly distributed reinforcement is used.

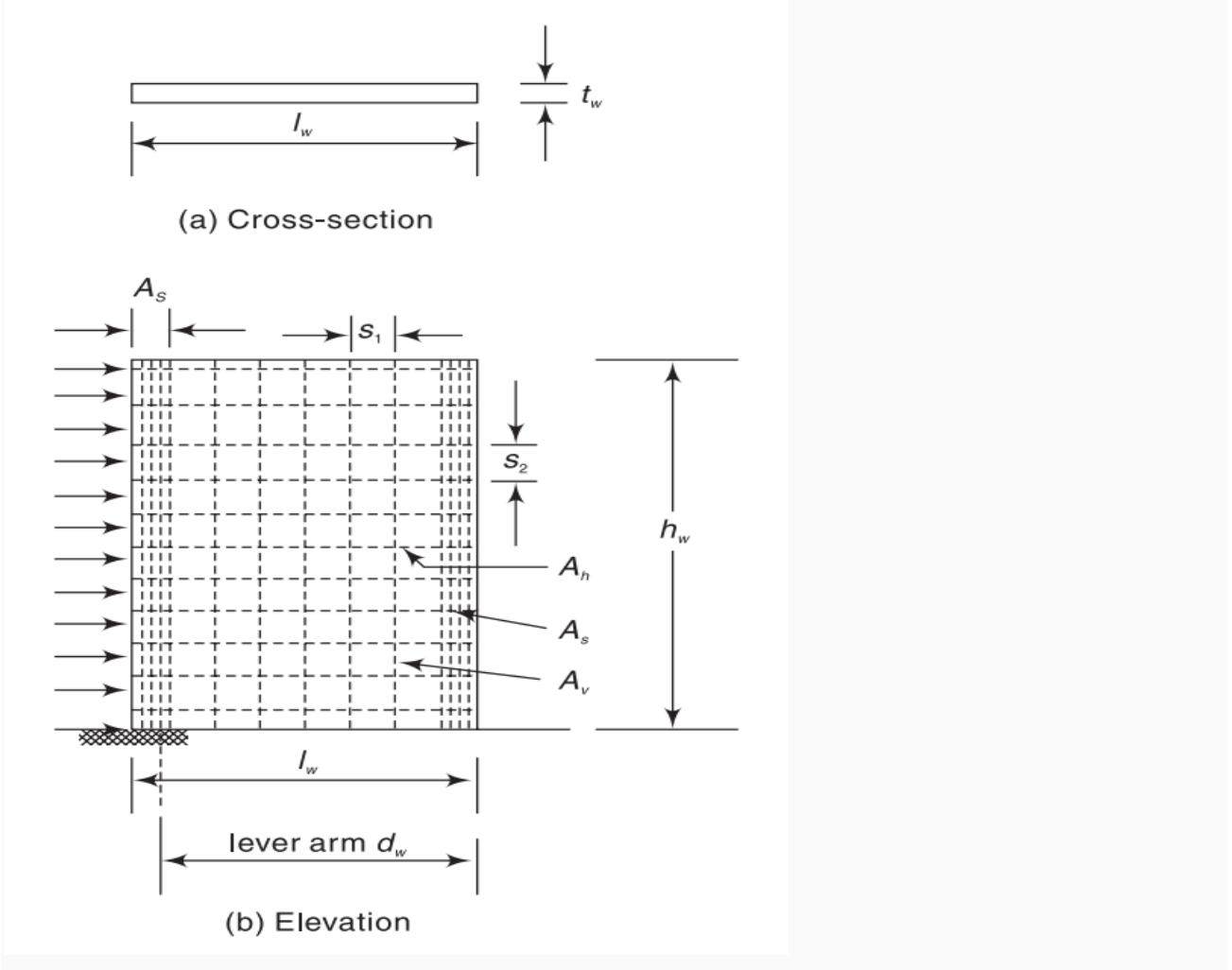


Fig 3.29 Shear wall Cross-section & Elevation

Figure 8.29 shows a typical shear wall of height h_w , length l_w , and thickness t_w . It is assumed to be fixed at its base and loaded horizontally along its left edge. Vertical flexural reinforcement of area A_s is provided at the left edge, with its centroid at a distance d_w from the extreme compression face. To allow for reversal of load, identical reinforcement is provided along the right edge. Horizontal reinforcement of area A_h at spacing S_2 as well as vertical reinforcement of area

A_v at spacing S_1 is provided as shear reinforcement. Distribution of a minimum reinforcement vertically and horizontally helps to control the width of inclined cracks. Such distributed steel normally is placed in two layers, parallel to both faces of the wall. Since the ductility of a flexural member such as a tall shear wall can be significantly affected by the maximum usable strain in the compression zone concrete, confinement of concrete at the ends of the shear wall section would improve the performance of such shear walls. Such confinement can take the form of enlarged boundary elements with adequate confining reinforcement. In the flanged wall sections, the adjacent

parts of the wall will provide lateral support to each other. Confinement may also be obtained from the presence of other walls running at right angles to the shear wall at its ends. In both cases, the additional compression flanges contribute to the increase in ductility.

Design of Shear Walls

Shear wall construction is an economical method of bracing buildings to limit damage. For good performance of well designed shear walls, the shear wall structures should be designed for greater strength against lateral loads than ductile reinforced concrete frames with similar characteristics; shear walls are inherently less ductile and perhaps the dominant mode of failure is shear. With low design stress limits in shear walls, deflection due to shear forces is small. However, exceptions to the excellent performance of shear walls occur when the height to-length ratio becomes great enough to make overturning a problem and when there are excessive openings in shear walls. Also, if the soil beneath its footing is relatively soft, the entire shear wall may rotate, causing localized damage around the wall. Following are the design steps of cantilever shear walls.

3.4.1 General Requirements

- (a) The thickness of the shear wall should not be less than 150 mm to avoid unusually thin sections. Very thin sections are susceptible to lateral instability in zones where inelastic cyclic loading may have to be sustained.
- (b) The effective flange width for the flanged wall section from the face of web (wall) should be taken as least of z half the distance to an adjacent shear wall web, and z one-tenth of total wall height.
- (c) The minimum reinforcement in the longitudinal and transverse directions in the plan of the wall should be taken as 0.0025 times the gross area in each direction and distributed uniformly across the cross-section of wall. This helps in controlling the width of inclined cracks that are caused due to shear.
- (d) If the factored shear stress in the wall exceeds 0.25 fck or if the wall thickness exceeds 200 mm, the reinforcement should be provided in two curtains, each having bars running in both the longitudinal and transverse directions in the plane of the wall. The use of reinforcement in two curtains reduces fragmentation and premature deterioration of the concrete under cyclic loading

(e) The maximum spacing of reinforcement in either direction should be lesser than $l_w/5$, $3t_w$, and 450 mm, where l_w is the horizontal length and t_w is the thickness of the wall web.

(f) The diameter of the bars should not exceed one-tenth of the thickness of that part. This puts a check on the use of very large diameter bars in thin wall sections.

3.4.2 Shear Strength

The provisions for shear strength are almost the same as those of RC beams. The increase in shear strength may also be considered. However, for this, only 80 per cent of the factored axial force is considered as effective. This reduction of 20 per cent is made to account for possible effect of vertical acceleration.

(a) The nominal shear stress is

$$\tau_v = \frac{V_u}{t_w d_w}$$

where V_u is the factored shear force,

t_w is the thickness of web, and

d_w is the effective depth of the wall section (may be taken as $0.8l_w$).

(b) The design shear strength of concrete (T_c) should be as per IS 456: 2000.

(c) The nominal shear stress, τ_v , should not be greater than $T_c, \text{ max}$. The value of $T_{c,\text{max}}$ can be found from IS 456: 2000. If $\tau_v < T_c$, minimum shear reinforcement of 0.25 per cent should be provided in the horizontal direction. If $\tau_v > T_c$, the area of horizontal shear reinforcement A_h at a vertical spacing S_v can be determined from the expression

$$V_{us} = \frac{0.87 f_y A_h d_w}{S_v}$$

where V_{us} is the shear force to be resisted by the horizontal reinforcement and is given by

$$V_{us} = V_u - T_c t_w d_w \quad (8.16)$$

(e) Uniformly distributed vertical reinforcement not less than the horizontal reinforcement should be provided. This is particularly important for squat walls. When the height-to-width ratio is about 1.0, both the vertical and horizontal reinforcement are equally effective in resisting the shear force.

3.4.3 Flexural Strength

The moment of resistance of short shear walls is calculated as for columns subjected to combined bending and axial load. The procedure for the calculation of moment of resistance, M_{uv} of tall rectangular shear walls is as described. For walls without boundary elements, the vertical reinforcement is concentrated at the ends of the walls. A minimum of four bars, 12mm ϕ , arranged in two layers, are provided at each end.

3.4.4 Boundary Elements

These are the portions along the wall edges and may have the same or greater thickness than the wall web. These are provided throughout the height with special confining reinforcement. Wall sections having stiff and well confined boundary elements develop substantial flexural strength, are less susceptible to lateral buckling and have better shear strength and ductility in comparison to plane rectangular walls not having stiff and well-confined boundary elements.

(a) During a severe earthquake, the ends of a wall are subjected to high Compressive and tensile stresses. Hence, the concrete needs to be well confined so as to sustain the load reversals without a large deterioration in strength. Thus, the boundary elements are provided along the vertical boundaries of walls, when the extreme fibre compressive stress in the wall due to factored Gravity load plus factor earthquake force exceeds 0.2fck. The boundary element may be discontinued where the calculated compressive stress becomes less than 0.15fck.

(b) The boundary element is assumed to be effective in resisting the design moment due to earthquake-induced forces, along with the web of the wall. The boundary element should have an adequate axial load carrying capacity (assuming short-column action) so as to carry an axial compression equal to the sum of the factored gravity load plus compressive load due to seismic load. The latter may be calculated as

$$P_c = \frac{M_u - M_{uv}}{C_w},$$

where M_u is the factored design moment on the entire wall section, M_{uv} is the moment of resistance provided by the distributed reinforcement across the wall section, and C_w is the c/c distance between the boundary elements along the two vertical edges of the wall.

- (c) Moderate axial compression results in higher moment capacity of the wall. Hence, the beneficial effect of axial compression by gravity loads should not be fully relied upon in a design, due to the possible reduction in its magnitude by vertical acceleration. When gravity loads add to the strength of the wall, a load factor of 0.8 may be taken.
- (d) The percentage of vertical reinforcement in boundary elements should range between 0.8 and 6 per cent (the practical upper limit is four per cent).
- (e) During a severe earthquake, boundary elements may be subjected to stress reversals. Hence, they have to be confined adequately to sustain the cyclic loading without a large degradation in strength. Therefore, these should be provided throughout their height.
- (f) Boundary elements need not be provided if the entire wall section is provided with special confining reinforcement,

Design of Shear wall of the lift using the STAAD software

The steps to be taken to create the surface and assign the properties are already covered above as the properties are assigned at the beginning.

STEP 1: CREATING SHEAR WALL PANEL

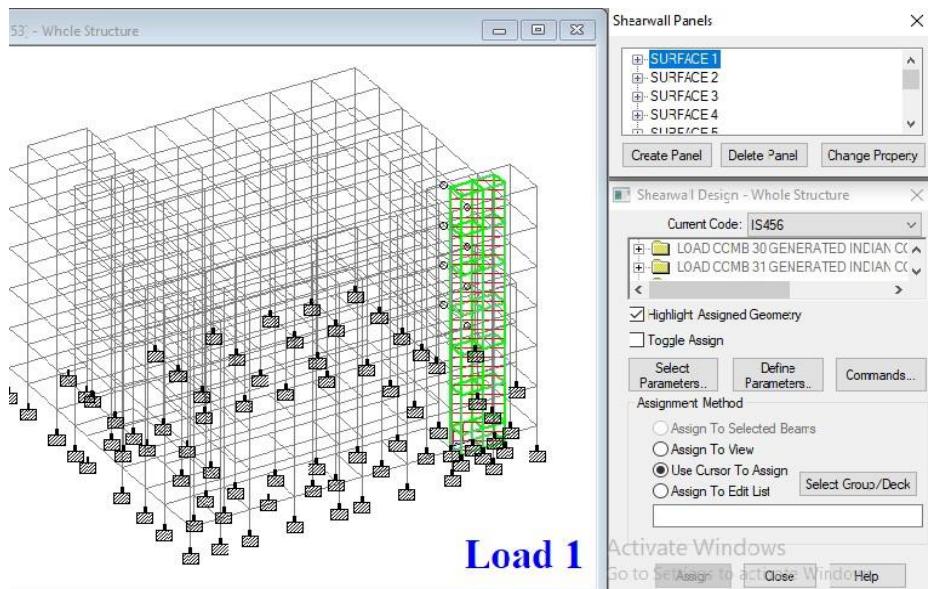


Fig.3.30 CREATING SHEAR WALL PANEL

Step 2: Parameter selection

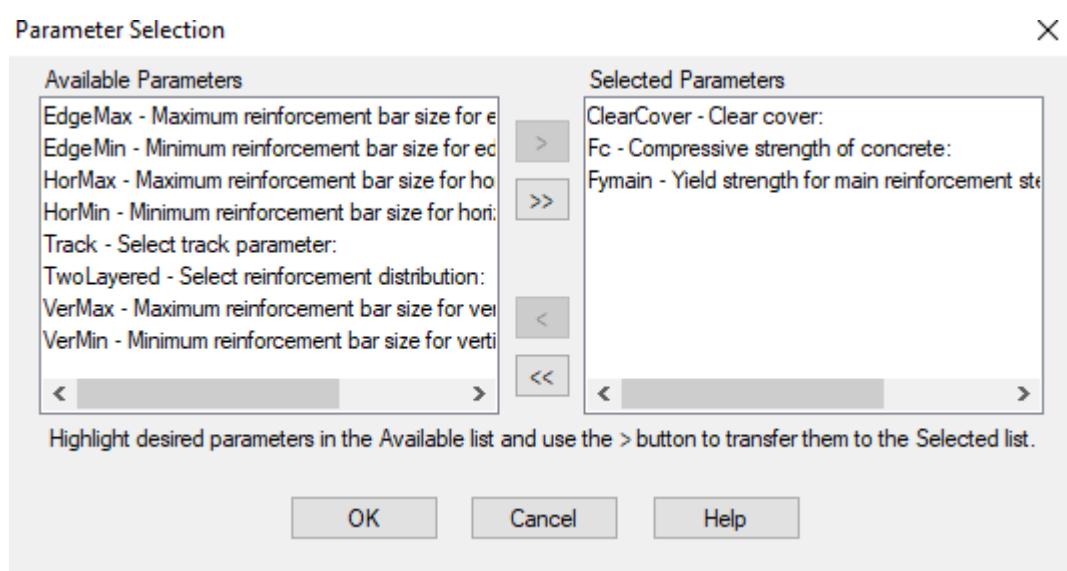


Fig.3.31 Parameter selection

Step 3: Design parameters for shear wall

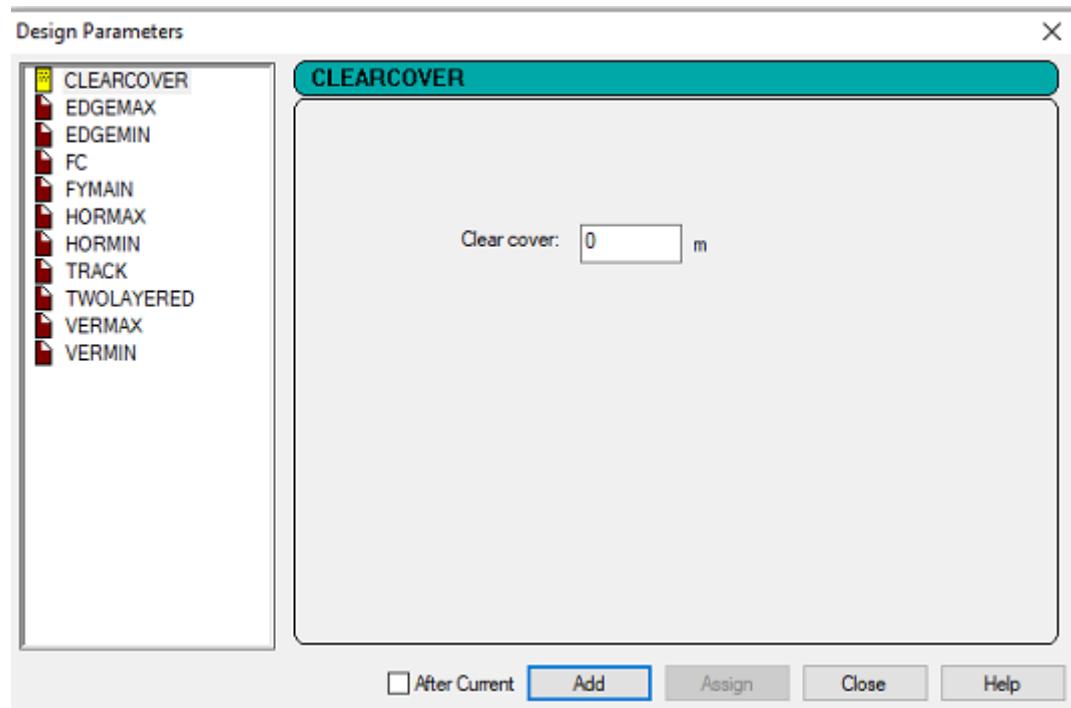


Fig.3.32 Design parameters for shear wall

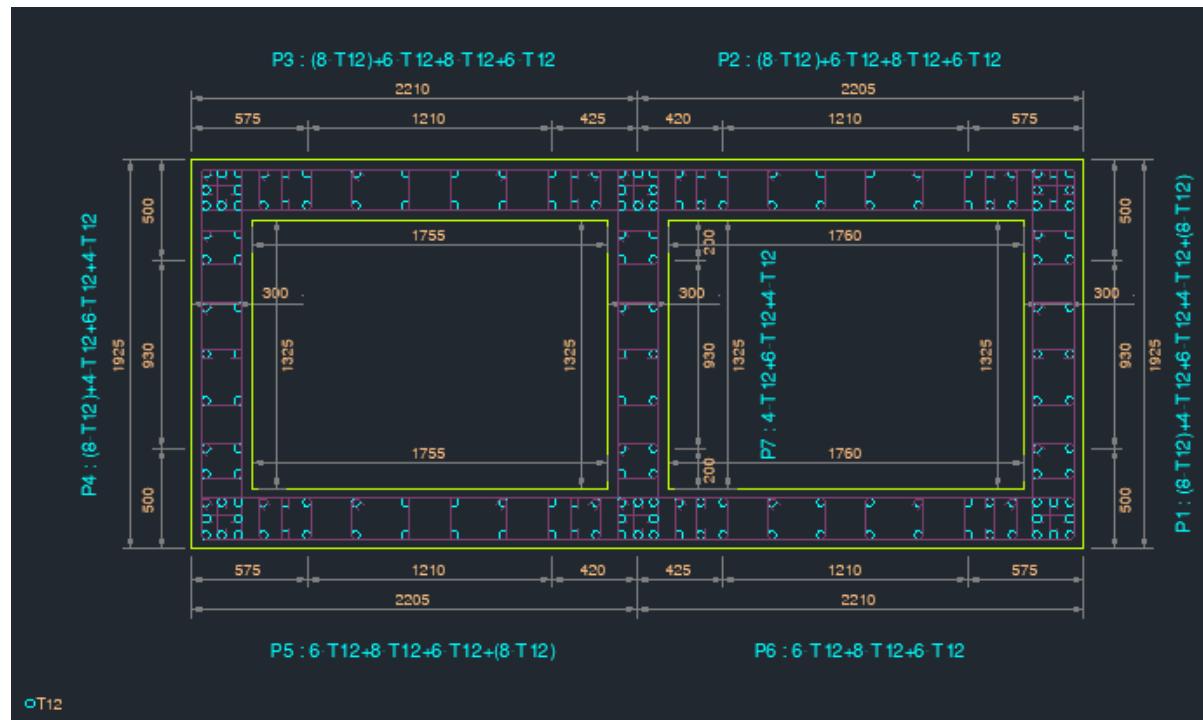
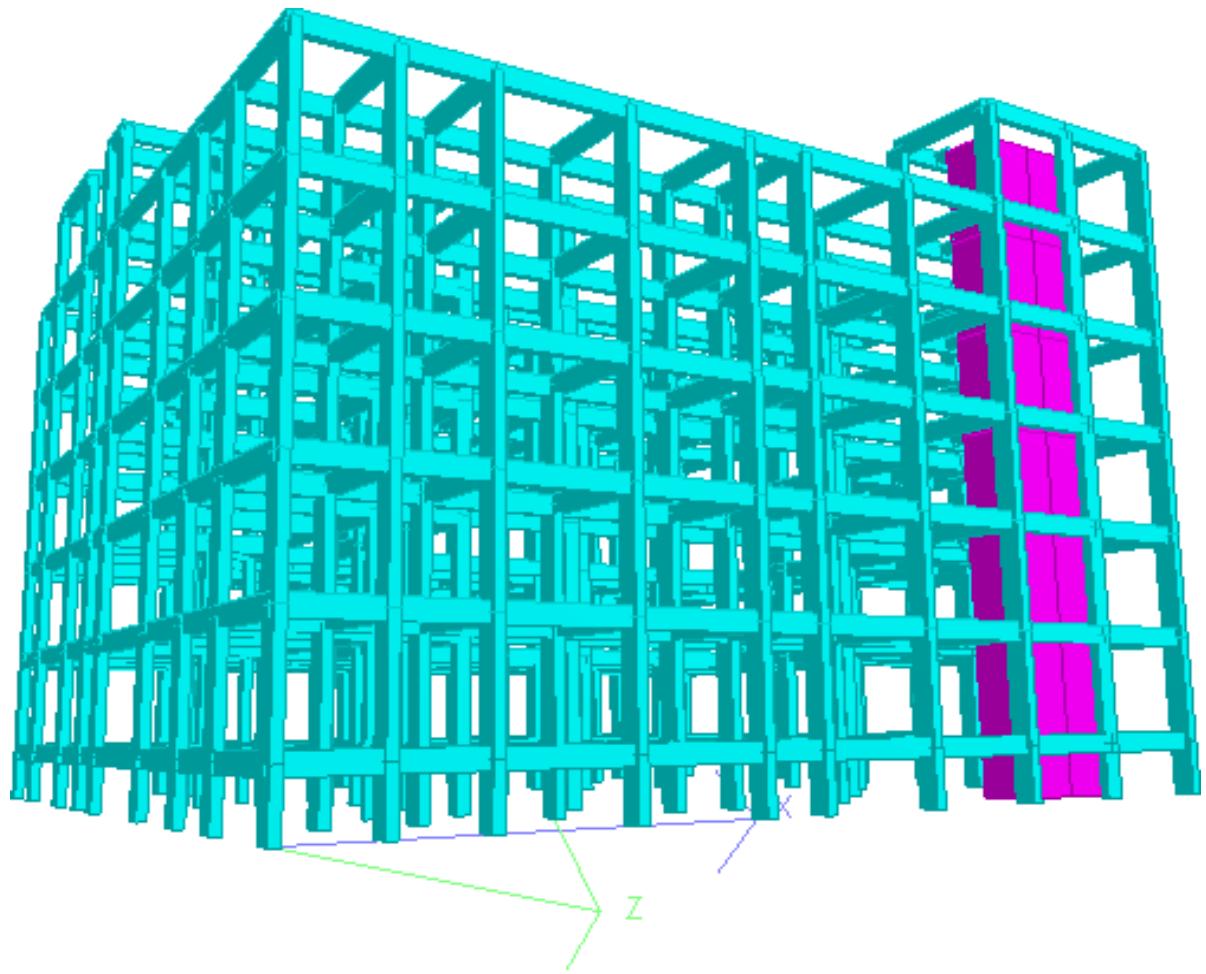


Fig.3.33 Reinforcement details of shear wall

Fig.3.34 3d rendered view



4. STAIRCASE DESIGN

4.1 DESIGN OF WAIST SLAB FOR STAIRCASE

CALCULATION FOR FLIGHT 1 OF STAIRCASE 1

Step 1: Selection of preliminary depth of slab

The depth of the slab shall be assumed from the span to effective depth ratios as given in section 3.6.2.2 of Lesson 6 IS456

For both edge discontinuous $L/d = 35*0.8 = 28$

Clear Span = 1650 mm = L

$d = 1650/28 = 59\text{mm}$, let us assume $d = 126\text{mm}$

Taking clear cover of 20mm and main reinforcement bars of 8mm.

Total depth(assumed) = 150mm

Step 2 : Effective span calculation

Since both the edges are discontinuous

$L_{eff} = \text{Min of (C/C of support or clear span +depth)}$

Effective span obtained = $L_{eff} = 1800\text{mm}$

Step 3: Load calculations

a) Dead load calculation for stair slab

Area of one step = $0.5 \times \text{Rise} \times \text{Tread} = 0.5 \times 0.15 \times 0.275 = 0.0206 \text{ m}^2$

Area of inclined slab = thickness of slab x inclined length = 0.0470 m^2

Total Area = $0.0206 + 0.0470 = 0.0676 \text{ m}^2$

dead load (slab+ step) = Total area x Density = $0.0676 \times 25 = 1.690 \text{ kN/m}$

Floor finish load = (rise + tread) x floor finishing thickness x Density = 0.638 kN/m

Factored Total dead load = $1.5 \times \text{total dead load} = 10.176 \text{ kN/m}$

b) Live load calculation

Live load is taken as 5 kN/m²

Factored live load = 1.5 x 5 x 1 = 7.5 kN/m

Total factored Load = $W_u = LL + DL = 17.676 \text{ kN/m}$

Step 4 : Determination of bending moment and check for depth of slab

$$\text{Bending moment } M_u = \frac{W_u X L^2}{8} = 7.159 \text{ kN-m}$$

Design constant = $R_u = 0.36 \times f_{ck} \times X_{umax}/d(1 - 0.416 \times X_{umax}/d) = 3.991$

$X_{umax}/d = 0.456$

$$\text{Minimum depth required from bending moment consideration} = \sqrt{\frac{M_u}{R_u X b}} = 42.35 \text{ mm}$$

$d_{\text{required}} < d_{\text{adopted}}$ Hence O.K.

Step 5 : Calculation of reinforcement details

LONGITUDINAL REINFORCEMENT

Area of Steel required = A_{st}

$$A_{st} = 0.5 \times \frac{f_{ck}}{f_y} [1 - \sqrt{1 - \frac{4.6 X M_u}{f_{ck} b d^2}}] b d = 133 \text{ mm}^2$$

Providing bars of diameter 8 mm , $a_{st} = \frac{\pi X d^2}{4} = 50.26 \text{ mm}^2$

Spacing = $\frac{a_{st}}{A_{st}} \times 1000 = 378 \text{ mm}$

Maximum allowable spacing = Min of (300 or 3d) = 300mm

Provided Spacing = 200mm

Provided Area of steel for 200 mm spacing = 251.3 mm²

Percentage reinforcement = $P_t = (A_{st}/bd) \times 100 = 0.199\%$

DISTRIBUTION REINFORCEMENT

0.12% of the gross area = $(0.12 \times 1000 \times 150)/100 = 180 \text{ mm}^2$

Providing bars of diameter 8 mm , $a_{st} = \frac{\pi \times 8^2}{4} = 50.26 \text{ mm}^2$

$$\text{Spacing} = \frac{a_{st}}{A_{st}} \times 1000 = 279\text{mm}$$

Provided spacing = 200mm .

Step 6: Check for shear

$$\text{Design shear force} = V_u = (W_u \times L)/2 = 15.9 \text{ kN}$$

$$\text{Nominal shear stress} = \tau_v = V_u/bd = 0.126 \text{ N/mm}^2$$

$$\tau_{cmax} = 3.5 \text{ N/mm}^2$$

$$\tau_v < \tau_{cmax} \text{ O.K.}$$

$$\tau_c = 0.33 \text{ N/mm}^2$$

$$\text{however for solid slab design shear strength} = \tau_c = k \times \bar{c} = 0.429 \text{ N/mm}^2$$

So for overall depth = 150mm, k = 1.3

$$\tau_c > \tau_v \quad \text{O.K.}$$

Step 7 : Check for deflection

$$\left(\frac{l}{d}\right)_{actual} < \left(\frac{l}{d}\right)_{allowable}$$

$$\left(\frac{l}{d}\right)_{allowable} = \left(\frac{l}{d}\right)_{basic} k_1 k_2 k_3 k_4$$

k_1 - Modification factor for tension steel = 1.7, (for $P_t = 0.199\%$)

k_2 – Modification factor for compression steel

k_3 – Modification factor for T-sections

k_4 -Only if span exceeds 10 m (10/span)

$$\left(\frac{l}{d}\right)_{allowable} = 28 \times 1.7 = 47.6$$

$$\left(\frac{l}{d}\right)_{actual} = \frac{1800}{126} = 14.28$$

$$\left(\frac{l}{d}\right)_{actual} < \left(\frac{l}{d}\right)_{allowable} \quad \text{Hence O.K.}$$

STAIRCASE 1

Design of staircase performed in excel

STAIRCASE1 FLIGHT 2

Design Constants & Slab Parameters

Grade of Steel		500	N/mm ²
Grade of Concrete		30	N/mm ²
Density of Concrete		25	kN/m ³
Riser		150	mm
Tread		275	mm
Span (Flight)		1.375	m
Bottom Landing		1.650	m
Top Landing		0.605	m
Stair Width		1.650	m
Width of Support		0.300	m
Floor to Floor Height		0.900	m
Support condition	One Edge Continuous		1
Size of Bar Main Bar adopted		8	mm
Spacing of Main bars required	623	Provided	200 mm
Size of Bar Distribution Bar			8 mm
Spacing of Distribution bars required	141372	Provided	200 mm
Clear Cover		20	mm
Depth	Required	OK	60.7 mm
Floor Finishing Thickness			150 mm
Live Load			75 mm
For Discontinuity Edge L/d =	28	For continuous Edge L/d =	5.0 kN/m ²
			32 mm

$$x_{umax}/d = 0.456$$

$$R_u = 0.36 * f_{ck} * x_{umax}/d (1 - 0.416 * x_{umax}/d) = 3.991$$

Effective Span For end span L = min of C/C of support or clear span + depth

				1.525	mm
Number of Risers				6	Nos.
Number of Trades				5	Nos.
Total Length (flight+ Landing)				3.630	m
Effective Span				3.930	m
Inclined length of one step				313	mm
Area of Step				0.0206	m ²
Area of Inclined Slab				0.0470	m ²
Total Area				0.0676	m ²
Dead load of Step				1.690	kN/m
Floor finishing load				0.638	kN/m
Total Dead Load				6.784	kN/m
Live Load				5.0	kN/m ²
Factored Live Load				7.500	kN/m
Factored Total Dead Load				10.176	kN/m
Bending Moment	Near Support			4.374	kN-m
				3.820	kN-m
Design Moment				4.374	kN-m
Factored Design Moment				4.374	kN-m
Depth				33.1	mm
Overall depth provided				150	mm
Actual effective depth available				126	mm
Area of Steel required				80.7	mm ²
Spacing of bars required				623	mm
Maximum Allowable spacing	300	OR	378	623	mm
Provided spacing				300	mm
Area of Steel provided				251.3	mm ²
SAFE					
Percentage of steel required				0.199	%
Modication factor				1.387	
L/d ratio				30	
Depth required for servicability criteria				37	mm
Distribution Steel required				180	mm ²
Dia of bar provided				180	mm
Spacing required				141372	mm
Check for deflection					
Service Stress				290	N/mm ²
Actual Span/Eff. Depth				12.10	
Allowable Span /def.	Mod. Factor		1.387	41.60	

5. ESTIMATION AND COSTING

5.1 DEFINITION OF ESTIMATING AND COSTING

Estimating is the technique of calculating or Computing the various quantities and the expected Expenditure to be incurred on a particular work or project.

In case the funds available are less than the estimated cost the work is done in part or by reducing it or specifications are altered, the following requirement are necessary for preparing an estimate. a) Drawings like plan, elevation and sections of important points.

- b) Detailed specifications about workmanship & properties of materials etc.
- c) Standard schedule of rates of the current year.

5.2 NEED FOR ESTIMATION AND COSTING

1. Estimate give an idea of the cost of the work and hence its feasibility can be determined i.e whether the project could be taken up with in the funds available or not.
2. Estimate gives an idea of time required for the completion of the work.
3. Estimate is required to invite the tenders and Quotations and to arrange contract.
4. Estimate is also required to control the expenditure during the execution of work.
5. Estimate decides whether the proposed plan matches the funds available or not.

5.3 PROCEDURE OF ESTIMATING OR METHOD OF ESTIMATING.

Estimating involves the following operations

1. Preparing detailed Estimate.
2. Calculating the rate of each unit of work
3. Preparing abstract of estimate

5.4 DATA REQUIRED TO PREPARE AN ESTIMATE

1. Drawings i.e. plans, elevations, sections etc.
2. Specifications.
3. Rates.

5.4.1 DRAWINGS

If the drawings are not clear and without complete dimensions the preparation of estimation become very difficult. So, It is very essential before preparing an estimate.

5.4.2. SPECIFICATIONS

- a) General Specifications: This gives the nature, quality, class and work and materials in general terms to be used in various parts of work. It helps to form a general idea of building.
- b) Detailed Specifications: These give the detailed description of the various items of work laying down the quantities and qualities of materials, their proportions, the method of preparation workmanship and execution of work.

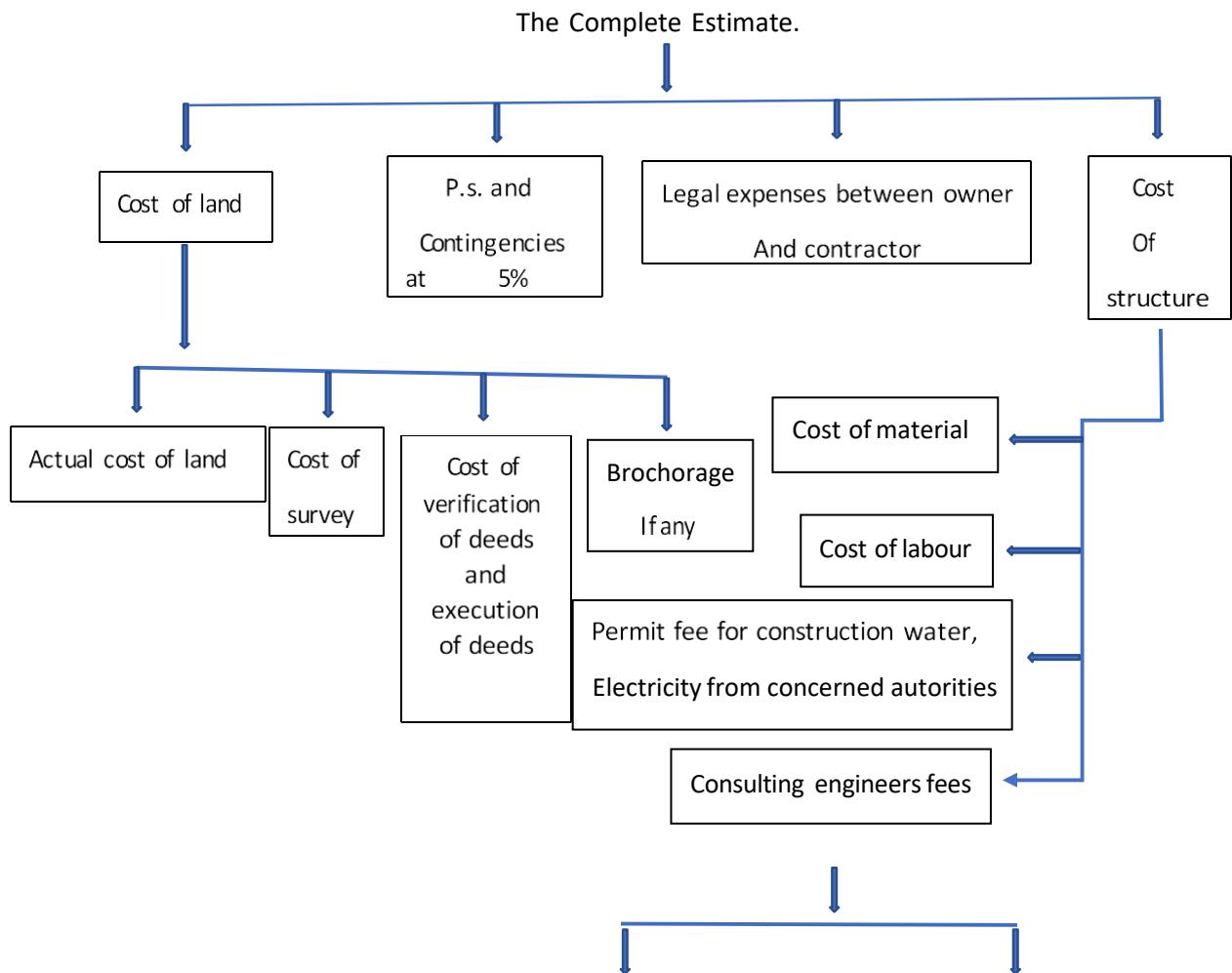
5.4.3. RATES:

For preparing the estimate the unit rates of each item of work are required.

1. For arriving at the unit rates of each item.
2. The rates of various materials to be used in the construction.
3. The cost of transport materials.
4. The wages of labour, skilled or unskilled of masons, carpenters, Mazdoor, etc.,

5.5 COMPLETE ESTIMATE:

Most of people think that the estimate of a structure includes cost of land, cost of materials and labour, But many other direct and indirect costs included and is shown below



Cost of preparation
of plan, Estimate
and design

Cost of supervision

5.6 LUMPSUM:

While preparing an estimate, it is not possible to workout in detail in case of petty items. Items other than civil engineering such items are called lumpsum items or simply L.S. Items.

The following are some of L.S. Items in the estimate.

1. Water supply and sanitary arrangements.
2. Electrical installations like meter, motor, etc.,
3. Architectural features.
4. Contingencies and unforeseen items.

In general, certain percentage on the cost of estimation is allotted for the above L.S. Items.

Even if subestimates prepared or at the end of execution of work, the actual cost should not exceed the L.S. amounts provided in the main estimate.

5.7 WORK CHARGED ESTABLISHMENT:

During the construction of a project considerable number of skilled supervisors, work assistance, watch men etc., are employed on temporary basis. The salaries of these persons are drawn from the L.S. amount allotted towards the work charged establishment. that is, establishment which is charged directly to work. an L.S. amount of 1½ to 2% of the estimated cost is provided towards the work charged establishment.

5.8 UNITS OF MEASUREMENTS:

The units of measurements are mainly categorised for their nature, shape and size and for making payments to the contractor and also. The principle of units of measurements normally consists the following:

- a) Single units work like doors, windows, trusses etc., are expressed in numbers.
- b) Works consists linear measurements involve length like cornice, fencing, hand rail, bands of specified width etc., are expressed in running metres (RM).

- c) Works consists areal surface measurements involve area like plastering, white washing, partitions of specified thickness etc., are expressed in square meters (m²) d) Works consists cubical contents which involve volume like earth work, cement concrete

Sr.No.	Particulars of item	Unit of measurement	Unit of payment
1	Earth work: 1. Earth work in Excavation 2. Earthwork in filling in foundation trenches 3. Earth work in filling in plinth	cum cum cum	Per%cum Per%cum Per%cum
2	Concrete: 1. Lime concrete in foundation 2. Cement concrete in Lintels 3. R.C.C.in slab 4. C.C. or R.C.C. Chujja, Sunshade 5. L.C. in roof terracing (thickness specified)	cum cum cum cum sqm	percum percum percum percum persqm
3	6. Cement concrete bed 7. R.C. Sunshade (Specified Width & Height) Damp Proof Course (D.P.C) (Thickness should be mentioned)	cum cum sqm	per cum 1rm persqm percum
4	Brick work: 1. Brickwork in foundation 2. Brick work in plinth 3. Brick work in super structure 4. Thin partition walls 5. Brick work in arches 6. Reinforced brick work (R.B. Work)	cum cum cum sqm cum cum	percum percum percum percum percum

5	<p>Stone Work: Stone masonry</p> <p>Wood work:</p> <ol style="list-style-type: none"> 1. Door sand windows frames or chowkhats, rafters beams 2. Shutters of doors and windows (thickness specified) 3. Doors and windows fittings (like hinges, tower bolts, sliding bolts, handles) <p>Steel work</p>	<p>cum</p> <p>cum</p> <p>Number</p> <p>Quintal</p>	<p>per cum</p> <p>per cum</p> <p>persqm</p> <p>per number</p> <p>per quintal</p>
---	--	--	--

<p>1. Steel reinforcement bars etc in R.C.C. and R.B.work. quintal</p> <p>2. Bending, binding of steel Reinforcement</p> <p>3. Rivets, bolts, & nuts, Anchor bolts, Lewis bolts, Holding down bolts.</p> <p>4. Iron hold fasts</p> <p>5. Iron railing (height and types specified) 6. Iron grills</p> <p>Roofing</p> <ol style="list-style-type: none"> 1. R.C.C. and R.B. Slab roof (excluding steel) 2. L.C. roof over and inclusive of tiles or brick or stone slab etc (thickness specified) 3. Centering and shuttering form work 4. A.C. Sheet roofing <p>Plastering, points & finishing</p> <ol style="list-style-type: none"> 1. Plastering-Cement or Lime Mortar (thickness and proportion specified) 2. Pointing 	<p>Quintal</p> <p>Quintal</p> <p>Quintal Quintal</p> <p>sqm</p> <p>cum</p> <p>sqm</p> <p>sqm</p> <p>sqm</p> <p>sqm</p>	<p>per quintal per quintal per quintal</p> <p>per quintal per sqm</p> <p>per cum</p> <p>per sqm</p> <p>per sqm</p> <p>per sqm</p> <p>per sqm</p> <p>per sqm</p> <p>per sqm</p>

	3. White washing, colour washing, cement wash (number of coats specified) 4. Distempering (number of coats specified) 5. Painting, varnishing (number of coats specified) Flooring 1. 25mm cement concrete over 75mm lime concrete floor (including L.C.) 2. 25mm or 40mm C.C. floor 3. Doors and window sills (C.C. or cement mortar plain) Rain water pipe /Plain pipe Steel wooden trusses Glass panels (supply)	sqm sqm sqm sqm 1RM 1No sqm No	per sqm per sqm per sqm per RM per 1No per sqm per no.
	Fixing of glass panels or cleaning		

5.8.2 RULES FOR MEASUREMENT :

The rules for measurement of each item are invariably described in IS1200. However some of the general rules are listed below.

1. Measurement shall be made for finished item of work and description of each item shall include materials, transport, labour, fabrication tools and plant and all types of overheads for finishing the work in required shape, size and specification.
2. In booking, the order shall be in sequence of length, breadth and height or thickness.
3. All works shall be measured subject to the following tolerances.
 - i) Linear measurement shall be measured to the nearest 0.01m.
 - ii) Areas shall be measured to the nearest 0.01 sq.m
 - iii) Cubic contents shall be worked-out to the nearest 0.01 cum
4. Same type of work under different conditions and nature shall be measured separately under separate items.
5. The bill of quantities shall fully describe the materials, proportions, workmanships and accurately represent the work to be executed.

6. In case of masonry (stone or brick) or structural concrete, the categories shall be measured separately and the heights shall be described:

- a) from foundation to plinth level
- b) from plinth level to First floor level
- c) from Fist floor to Second floor level and so on.

5.8.3 METHODS OF TAKING OUT QUANTITIES:

The quantities like earth work, foundation concrete, brickwork in plinth and super structure etc., can be workout by any of following two methods:

- a) Long wall - short wall method
- b) Centre line method.
- c) Partly centre line and short wall method.

a) Long wall-short wall method:

In this method, the wall along the length of room is considered to be long wall while the wall perpendicular to long wall is said to be short wall. To get the length of long wall or short wall, calculate first the center line lengths of individual walls. Then the length of long wall, (out to out) may be calculated after adding half breadth at each end to its center line length. Thus the length of short wall measured into in and may be found by deducting half breadth from its center line length at each end. The length of long wall usually decreases from earth work to brick work in super structure while the short wall increases. These lengths are multiplied by breadth and depth to get quantities.

b) Centre line method:

This method is suitable for walls of similar cross sections. Here the total center line length is multiplied by breadth and depth of respective item to get the total quantity at a time. When cross walls or partitions or verandah walls join with main all, the center line length gets reduced by half of breadth for each junction. such junction or joints are studied carefully while calculating total center line length. The estimates prepared by this method are most accurate and quick.

c) Partly center line and partly cross wall method:

method is adopted when external (i.e., all round the building) wall is of one thickness This and the internal walls having different thicknesses. In such cases, center line method is applied to external walls and long wall-short wall method is used to internal walls. This method suits for different thicknesses walls and different level of foundations. Because of this reason, all Engineering departments are practicing this method.

5.9 DETAILED ESTIMATE:

The preparation of detailed estimate consists of working out quantities of various items of work and then determine the cost of each item. This is prepared in two stages.

- i) Details of measurements and calculation of quantities:

The complete work is divided into various items of work such as earth work concreting, brick work, R.C.C. Plastering etc., The details of measurements are taken from drawings and entered in respective columns of prescribed proforma. the quantities are calculated by multiplying the values that are in numbers column to Depth column as shown below:

Details of measurements form:-

S. No.	Description Of Item	No	Length (m)	Breadth (B)	Depth / Height (m)	Quantity	Explanatory Notes

- ii) Abstract of Estimated Cost :

The cost of each item of work is worked out from the quantities that already computed in the details measurement form at workable rate. But the total cost is worked out in the prescribed form is known as abstract of estimated form. 4% of estimated Cost is allowed for Petty Supervision, contingencies and Unforeseen items.

ABSTRACT OF ESTIMATE FORM

Item Nos	Description	Quantity	Unit	Rate	Per(Unit)	AMOUNT

--	--	--	--	--	--	--

The detailed estimate should accompanied with

- i) Report
- ii) Specification
- iii) Drawings (plans, elevation, sections)
- iv) Design charts and calculations
- iv) Standard schedule of rates.

5.9.1.1 Factors to be considered While Preparing Detailed Estimate:

- i) Quantity and transportation of materials:
For bigger project, the requirement of materials is more. such bulk volume of materials will be purchased and transported definitely at cheaper rate.
- ii) Location of site:
The site of work is selected, such that it should reduce damage or in transit during loading, unloading, stocking of materials.
- iii) Local labour charges:
The skill, suitability and wages of local laboures are considered while preparing the detailed estimate.

5.9.2 DATA:

The process of working out the cost or rate per unit of each item is called as Data. In preparation of Data, the rates of materials and labour are obtained from current standard scheduled of rates and while the quantities of materials and labour required for one unit of item are taken from Standard Data Book (S.D.B).

5.9.2.1 Fixing of Rate per Unit of an Item:

The rate per unit of an item includes the following:

- 1) Quantity of materials & cost: The requirement of materials are taken strictly in accordance with standard data book (S.D.B). The cost of these includes first cost, freight, insurance and transportation charges.
- 2) Cost of labour: The exact number of labours required for unit of work and the multiplied by the wages/ day to get of labour for unit item work.
- 3) Cost of equipment (T&P): Some works need special type of equipment, tools and plant. In such case, an amount of 1 to 2% of estimated cost is provided.
- 4) Overhead charges: To meet expenses of office rent, depreciation of equipment salaries of staff postage, lighting an amount of 4% of estimate cost is allocated.

5.9.3 METHODS OF PREPARATION OF APPROXIMATE ESTIMATE:

Preliminary or approximate estimate is required for studies of various aspects of work of project and for its administrative approval. It can decide, in case of commercial projects, whether the net income earned justifies the amount invested or not. The approximate estimate is prepared from the practical knowledge and cost of similar works. The estimate is accompanied by a report duly explaining necessity and utility of the project and with a site or layout plan. A percentage 5 to 10% is allowed for contingencies. The following are the methods used for preparation of approximate estimates.

- a) Plinth area method
- b) Cubical contents methods
- c) Unit base method.

a) Plinth area method: The cost of construction is determined by multiplying plinth area with plinth area rate. The area is obtained by multiplying length and breadth (outer dimensions of building). In fixing the plinth area rate, carefull observation and necessary enquiries are made in respect of quality and quantity aspect of materials and labour, type of foundation, hight of building, roof, wood work, fixtures, number of storeys etc.,

As per IS 3861-1966, the following areas include while calculating the plinth area of building.

Types Of estimates

- a) Area of walls at floor level.
- b) Internal shafts of sanitary installations not exceeding 2.0m², lifts, air conditionings ducts etc.,
- c) Area of barsati at terrace level:

Barsati means any covered space open on one side constructed on one side constructed on terraced roof which is used as shelter during rainy season.

- d) Porches of non cantilever type.

Areas which are not to include

- a) Area of lofts.
- b) Unenclosed balconies.
- c) Architectural bands, cornices etc.,
- d) Domes, towers projecting above terrace level.
- e) Box louvers and vertical sunbreakers.

b) Cubical Contents Method: This method is generally used for multistoreyed buildings. It is more accurate than the other two methods viz., plinth area method and unit base method. The cost of a structure is calculated approximately as the total cubical contents (Volume of buildings) multiplied by Local Cubic Rate. The volume of building is obtained by Length x breadth x depth or height. The length and breadth are measured out to out of walls excluding the plinth off set.

The cost of string course, cornice, carbelling etc., is neglected.

The cost of building= volume of buildings x rate/ unit volume.

c) Unit Base Method: According to this method the cost of structure is determined by multiplying the total number of units with unit rate of each item. In case schools and colleges, the unit considered to be as 'one student' and in case of hospital, the unit is 'one bed'. The unit rate is calculated by dividing the actual expenditure incurred or cost of similar building in the nearby locality by the number of units

5.10 ANALYSIS OF RATES:-

Definition : In order to determine the rate of a particular item, the factors affecting the rate of that item are studied carefully and then finally a rate is decided for that item. This process of determining the rates of an item is termed as analysis of rates or rate analysis.

The rates of particular item of work depends on the following.

1. Specifications of works and material about their quality, proportion and constructional operation method.
2. Quantity of materials and their costs.
3. Cost of labours and their wages.
4. Location of site of work and the distances from source and conveyance charges.
5. Overhead and establishment charges

6. Profit

Cost of materials at source and at site of construction:-

The costs of materials are taken as delivered at site inclusive of the transport local taxes and other charges.

Purpose of Analysis of rates:

1. To work out the actual cost of per unit of the items.
2. To work out the economical use of materials and processes in completing the particulars item.
3. To work out the cost of extra items which are not provided in the contract bond, but are to be done as per the directions of the department.
4. To revise the schedule of rates due to increase in the cost of material and labour or due to change in technique.

Cost of labour -types of labour, standard schedule of rates

The labour can be classified in to

- 1) Skilled 1st class
- 2) Skilled IIInd Class
- 3) un skilled

The labour charges can be obtained from the standard schedule of rates 30% of the skilled labour provided in the data may be taken as 1st class, remaining 70% as II class. The rates of materials for Government works are fixed by ANALYSIS OF RATES Chapter 5 57 Estimation and Costing the superintendent Engineer for his circle every year and approved by the Board of Chief Engineers. These rates are incorporated in the standard schedule of rates.

Lead statement: The distance between the source of availability of material and construction site is known as "Lead " and is expected in Km. The cost of convenayce of material depends on lead.

This statement will give the total cost of materials per unit item. It includes first cost, convenayce loading, unloading stacking, charges etc.

The rate shown in the lead statement are for mettalled road and include loading and staking charges . The environment lead on the mettalled roads are arrived by multiplying by a factor

- a) for metal tracks - lead x 1.0
- b) For cartze tracks - Lead x 1.1
- c) For Sandy tracks - lead x 1.4

Note: For 1m³ wet concrete = 1.52m³ dry concrete approximately

SP.Wt of concrete= 1440 kg/m³ (or) 1.44 t/m³

1 bag of cement= 50 Kg

Estimation for Stair case :-

Total cutting length for bar No.1:-

=a + b + c+ d + Development length - 45 degree Bend - 90 degree bend

For 90 degree bend = 2d

For 45 degree bend = d Cover for beam

=30mm

Cover for waist slab= 25mm

Development length = (Breadth-cc)+(Depth-cc) = (300-30)+(600-30) =840mm

Cutting length = 706 + 260.14 + 3504 + 597+ 840 =5767mm =5.767m

No of bars calculations:-

No. of bars = [(width of flight-clear cover)/spacing] + 1

= [(1200-(2*30))/100] +1 = 13 Nos No of crank

bars = 7nos = Bars shape No 1

No of Nominal bars = 6 NOS = bars shape No 2

Total length of Bar shape No 1= 7 * 5.676 = 40.37m

Calculation of bar shape No 2:-

Cutting length = e + f + g + Development length + LS Extra length – 45 degree bend – 90 degree bend

= 903 + 3504 + 597 + 390 + 220 - (2*10)-(1*2*10)

= 5.57m

Total length of bar shape No 2:-

$$= 6 * 5.57 = 33.44\text{m}$$

Calculation of bar shape No 3:-

Cutting length = $h + l + \text{Development length} - 45 \text{ degree bend}$

$$= 450 + 993.0 + 220 - 10$$

$$= 1.65\text{m}$$

$$\text{Nos of bars} : = [((1200)-(30*2))/200] + 1$$

$$= 7 \text{ Nos}$$

Total length of shape Nos 3:-

$$= 1.65 * 7 = 11.16\text{m}$$

Calculation of binder bar in waist slab:-

Cutting length of binder bar = $1200 - 2 * 30 = 1140\text{mm}$

Nos of binder bars in waist slab = (length of waist slab / spacing) + 1

$$= (3504/150) + 1 = 24 \text{ Nos}$$

$$\text{Total length of binder bar} = 1.15 * 24 = 27.60\text{m}$$

Calculation of Binder bars in landing no 1:-

Bottom binder bars:-

Cutting length = $2500 - (2 * 30) = 2440\text{mm} = 2.44\text{m}$

Nos of bottom Binder bars in landing = (width of landing / spacing) + 1

$$= (903/150) + 1 = 7 \text{ Nos}$$

$$\text{Total length of bottom binder bars} = 2.45 * 7 = 17.15 \text{ m}$$

Top binder bars:-

Cutting length of top binder bars = $2500 - (2 * 30) = 2440\text{mm} = 2.44\text{m}$

Nos of top binder bars in landing Nos 1:- = (width of B/U bar in landing (L/7)/Spacing) + 1

$$= (643/150) + 1 = 5 \text{ Nos}$$

$$\text{Total length} = 2.45 * 5 = 12.25\text{m}$$

Calculation of binder bars in landing no 2: - Binder for extra bottom bars in landing Nos. 2 :-

$$\text{Cutting length} = 2500 - 2*30 = 2440\text{mm} = 2.44\text{m}$$

$$\text{Nos of binder (extra) bars in landing no. 2} : - (847/150) + 1 = 7 \text{ Nos}$$

$$\text{Total length} = 2.45 * 7 = 17.15\text{m}$$

Binder for extra top bars in waist slab :-

$$\text{Cutting length} = \text{width of waist} - (2*30) = 1200 - (2*30) = 1140\text{mm} = 1.14\text{m}$$

No. of extra bottom binder bars in waist slab : -

$$\begin{aligned} &= (\text{length of extra bar in waist slab / spacing}) + 1 \\ &= (450/200) + 1 = 4 \text{ Nos.} \end{aligned}$$

Total length of extra bottom binder bars in landing :-

$$= 1.15 * 4 = 4.60\text{m}$$

Footing estimation and costing

Table 1

DETAILED BAR BENDING SCHEDULE FOR FOOTING											Total CUTTING Lenth		
SR. NO	GROUP	DESCRIPTION	DIRECTION	BAR SHAPE	SPAN OF Member	Straigth length	Extra Length for L	NO of footin	No of bars	6 8 10			
										Wt. Kg/m	0.2	0.4	0.617
		FC27,FC28,FC 42,	X		1.50	1.20	0.13	3	16				63.84
A	G-9		Y		1.50	1.20	0.13	3	14.64				58.40
B	G-10	FC32,	X		1.10	1.00	0.13	1	6.5				7.35
			Y		0.85	0.70	0.13	1	5.25				4.36
C	G-11	FC23,FC44,FC 63,FC64,FC66	X		1.05	1.00	0.13	7	6.25				49.44
			Y		0.85	0.70	0.13	7	5.25				30.50
D	G-12	FC15,FC58,FC 59,FC71,	X		1.55	1.30	0.13	6	8.75				75.08
			Y		1.10	1.00	0.13	6	7				47.46
E	G-13	FC37,FC41,FC 51	X		1.25	1.10	0.13	3	5				18.45
			Y		1.25	1.10	0.13	3	5				18.45
F	G-14	FC70,FC72,	X		1.45	1.30	0.13	2	4				11.44
G	G-15		Y		1.00	0.80	0.13	2	5				9.30
										TOTAL WEIGHT(Kg)			394.06
										NET TOTAL WEIGHT(Kg)			85922.46

Table 2

Columns estimation and costing

DETAILED BAR BENDING SCHEDULE FOR COLUMN											25		
S	N	Wt. Kg/m	member	for Overlap	for L bend	Embedded in footing	mns	bar s	Total CUTTING Lenth				
2			UP to 1.829 m height										
A			DETAILED BAR BEN IN SC										
1	C1,C7,C8,C10,C 12, C13,C14,C15,C 16, C17,C18,C19,C 20C21 C30,C31,C33,C 34 C39,C40,C45,C 53 C54,C55,C56,C 57 C58,C59,C60,C 61 C62,C69,C70	1.829	0.6	0.3	0.53	33			737	235	215		
	stirrups	0.768				33	19	479					
	C2,C3,C4,C5,C6 ,C11, C35,C43,	1.829	0.6	0.3	0.53				332				
	Stirrups	0.768					19	116					
2	C9,C22,C23,C3 2,C63 C64,C65,C66,C 67	1.829	0.6	0.3	0.53	8			196				
3		0.768				10	19	145					
4	C68, 27 Stirrups C24,C25,C26,C 42 ,	1.829	0.6	0.3	0.53	14			548				
	C47,C48,C4 9,C50,C51	0.768				14	19	203					
	C52,	1.829	0.6	0.3	0.53				45.6				
	Stirrups	0.768				2	19	29					
5	C37,C41,	1.829	0.6	0.3	0.53	2			46				
	Stirrups	0.768					19	29					
						TOTAL WEIGHT	105	126	41	2935	580	830	
						SUM (Kg)	4616.98	Kg					

Table 1

DETAILED BAR BENDING SCHEDULE FOR COLUMN											Total CUTTING Length				
SR. NO	DESCRIPTION	Length of member	Extra length for Overlap	Extra length for L bend	Extra Length Embedded in footing	NO of Columns	No of bars	Total CUTTING Length							
								6	8	10	12	16	20	25	
	Wt. Kg/m ²							0.2	0.4	0.6	0.89	1.58	2.5	3.86	
2 FOR GROUND FLOOR COLUMNS															
A 1	C1,C7,C8,C10,C12, C13,C14,C15,C16, C17,C18,C19,C20,C21 C30,C31,C33,C34, C39,C40,C45,C53, C54,C55,C56,C57, C58,C59,C60,C61, C62,C69,C70	3.657	0.6	0.3	0.53	33									
	stirrups	0.768				33	36	912							
2	C2,C3,C4,C5,C6 ,C11, C35,C43,	3.657	0.6	0.3	0.53	8									519
	Stirrups	0.768				8	36	221							
3	C9,C22,C23,C32,C63 C64,C65,C66,C67,C68,	3.657	0.6	0.3	0.53	10									305
	Stirrups	0.768				10	36	276							
4	C24,C25,C26,C27, C28,C29,C38,C42,C47,C48,C49,C50,C51, C52,	3.657	0.6	0.3	0.53	14									855
	Stirrups	0.768				14	36	387							
5	C36,C44,	3.657	0.6	0.3	0.53	2									71.2
	Stirrups	0.768				2	36	55							
6	C37,C41,	3.657	0.6	0.3	0.53	2									71
	Stirrups	0.768				2	36	55							
	SUM	7439.18 Kg				TOTAL Weight (kg)	201	393							1296

Table 2

DETAILED BAR BENDING SCHEDULE FOR COLUMN														
SR. NO	DESCRIPTION	Length of member			Extra Length Embedded in footing	NO of Colu mns	No of bar s	Total CUTTING Lenth						
			Extra length for Overlap	Extra length for L bend				6	8	10	12	16	20	25
	Wt. Kg/m ²							0.2	0.4	0.6	0.89	1.58	2.5	3.86
2	FOR SECOND FLOOR COLUMNS													
A														
1	C1,C7,C8,C10,C 12, C13,C14,C15,C 16, C17,C18,C19,C 20,C21 C30,C31,C33,C 34, C39,C40,C45,C 53, C54,C55,C56,C 57, C58,C59,C60,C 61, C62,C69,C70	3.687	0.6	0.3	0.53	33					1566	61	102	
	stirrups	0.768				33	36	912						
2	C2,C3,C4,C5,C6 ,C11, C35,C43,	3.657	0.6	0.3	0.53	8						488		
	Stirrups	0.768				8	36	221						
3	C9,C22,C23,C3 2,C63 C64,C65,C66,C 67,C68,	3.657	0.6	0.3	0.53	10						305		
	Stirrups	0.768				10	36	276						
4	C24,C25,C26,C 27, C28,C29,C38,C 42,C47,C48,C4 9,C50,C51, C52,	3.657	0.6	0.3	0.53	14						855		
	Stirrups	0.768				14	36	387						
5	C36,C44,	3.657	0.6	0.3	0.53	2						71.2		
	Stirrups	0.768				2	36	55						
6	C37,C41,	3.657	0.6	0.3	0.53	2						71		
	Stirrups	0.768				2	36	55						
7	C46	3.657	0.6	0.3	0.53	1						30.5		
	Stirrups	0.768				1	36	28						
	SUM	6300.77	Kg		TOTAL Weight		201	251			63	5239	152	395

Table 3

DETAILED BAR BENDING SCHEDULE FOR COLUMN														
SR. NO	DESCRIPTION	Length of member	Total CUTTING Lenth											
			Extra length for Overlap	Extra length for L bend	Extra Length Embedded in footing	NO of Colu mns	No of bar s	6	8	10	12	16	20	25
			Wt. Kg/m ²					0.2	0.4	0.6	0.89	1.58	2.5	3.86
FOR THIRD FLOOR COLUMNS														
A														
1	C1,C7,C8,C10,C 12, C13,C14,C15,C 16, C17,C18,C19,C 20,C21 C30,C31,C33,C 34, C39,C40,C45,C 53, C54,C55,C56,C 57, C58,C59,C60,C 61, C62,C69,C70	3.657	0.6	0.3	0.53	33						1577	112	50.9
	stirrups		0.768				33	36	912					
2	C2,C3,C4,C5,C6 ,C11, C35,C43,	3.657	0.6	0.3	0.53	8						488		
	Stirrups		0.768				8	36	221					
3	C9,C22,C23,C3 2,C63 C64,C65,C66,C 67,C68,	3.657	0.6	0.3	0.53	10						305		
	Stirrups		0.768				10	36	276					
4	C24,C25,C26,C 27, C28,C29,C38,C 42,C47,C48,C4 9,C50,C51, C52,	3.657	0.6	0.3	0.53	14						855		
	Stirrups		0.768				14	36	387					
5	C36,C44,	3.657	0.6	0.3	0.53	2						122		
	Stirrups	0.768				2	36	55						
6	C37,C41,	3.657	0.6	0.3	0.53	2					71			
	Stirrups	0.768				2	36	55						
	SUM	6418.63	Kg	TOTAL Weight(kg)		201	393		63	5289	276	196		

Table 5

DETAILED BAR BENDING SCHEDULE FOR COLUMN												
SR. NO	DESCRIPTION	Length of member	Extra length for Overlap	Extra length for L bend	Extra Length Embedded in footing	NO of Colu mns	No of bar s	Total CUTTING Lenth				
								6	8	10	12	16
	Wt. Kg/m ²							0.2	0.4	0.6	0.89	1.58
2 FOR THIRD FLOOR COLUMNS												
A												
1	C1,C7,C8,C10,C 12, C13,C14,C15,C 16, C17,C18,C19,C 20,C21 C30,C31,C33,C 34, C39,C40,C45,C 53, C54,C55,C56,C 57, C58,C59,C60,C 61, C62,C69,C70	3.657	0.6	0.3	0.53	33						
2	stirrups	0.768				33	36	912				
	C2,C3,C4,C5,C6 ,C11, C35,C43,		3.657	0.6	0.3	0.53	8					488
3	Stirrups	0.768				8	36	221				41
	C9,C22,C23,C3 2,C63 C64,C65,C66,C 67,C68,		3.657	0.6	0.3	0.53	10					
4	Stirrups	0.768				10	36	276				305
	C24,C25,C26,C 27, C28,C29,C38,C 42,C47,C48,C4 9,C50,C51, C52,		3.657	0.6	0.3	0.53	14					
6	Stirrups	0.768				14	36	387				855
	C37,C41,		3.657	0.6	0.3	0.53	2					
7	Stirrups	0.768				2	36	55				71
	C46		3.657	0.6	0.3	0.53	1					
	Stirrups	0.768				1	36	28				30.5
	SUM		6363.55	Kg	TOTAL Weight (Kg)	201	382	63	5144	377	196	

Table 6

DETAILED BAR BENDING SCHEDULE FOR COLUMN

												Total CUTTING Lenth					
SR. NO	DESCRIPTION	Length of member	Extra length for Overlap	Extra length for L bend	Extra Length Embedded in footing	NO of Colu mns	No of bar s										
								6	8	10	12	16	20				
	Wt. Kg/m⇒							0.2	0.4	0.6	0.89	1.58	2.5				
2 FOR TOP FLOOR TO TERRIES FLOOR																	
A																	
1		C8,C10,C16,C1 7,C61 C62,C76,C78	3.657	0.6	0.3		8										365
2		stirrups	0.768				8	36	221								
2		C2,C3,C4,C5,C6 ,C11, C35,C43,	3.657	0.6	0.3	0	8									437	36
3		Stirrups	0.768				8	36		221							
3		C9,C63,C64,C6 5,C66 C67,C68	3.657	0.6	0.3	0	7									191	
4		Stirrups	0.768				7	36		194							
4		NO	3.657	0.6	0.3	0	0									0	
5		Stirrups	0.768				0	0		0						0	
5		NO	0	0	0	0	0									0	
		Stirrups	0				0	0		0							
								TOTAL WEIGHT(Kg)		49		164				1570	
								Sum		1872.13428		Kg					
								NET WEIGHT (Kg)		33020.71		Kg		33		MT	

Table 7

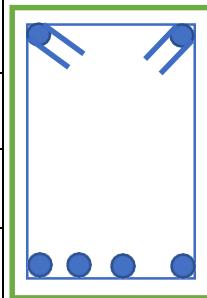
Beams estimation and costing :

DETAILED BAR BENDING SCHEDULE FOR BEAMS				
Designed beam given data				.
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Width of beam(b)	300	mm	
2	Depth of beam(D)	650	mm	
3	Cover(d')	25	mm	
4	Effective depth (d)	600	mm	
5	Span of beam(L)	5.512	m	
6	Width of support(bs)	300	mm	
7	Diameter of main straight bar	16	mm	
8	Number of Main straight bar	6	Numbers	
9	Diameter of bentup bar	16	mm	
10	Number of Bentup bar	2	Numbers	
11	Diameter of Anchor bars	16	mm	
12	Number of Anchor bars	2	Numbers	
13	Diameter of stirrups	8	mm	
14	Spacing of stirrups	200	mm	
	Length of Bars and Number of stirrups			

Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	6112.00	mm				
2	Length of main straight bar	6.06	m				
3	Length of bentup bar	6.85	m				
4	Length of anchor bar	6.35	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	45.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	6	16	6.062	36.372	1.58	57.48
2	Main bentup Bars	2	16	6.854	13.708	1.58	21.66
3	Anchor Bars	2	16	6.35	12.7	1.58	20.07
4	Stirrups	45	8	1.892	85.14	0.4	33.64
				TOTAL WEIGHT(Kg)			132.84
	Bars	No of Bars		Weight per bar			
	B7,B13,B22,B25	4		94.53	378.12	kg	

Table 1

Designed beam given data				.
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Width of beam(b)	300	mm	
2	Depth of beam(D)	650	mm	
3	Cover(d')	25	mm	
4	Effective depth (d)	600	mm	
5	Span of beam(L)	5.512	m	
6	Width of support(bs)	300	mm	
7	Diameter of main straight bar	16	mm	
8	Number of Main straight bar	5	Numbers	
9	Diameter of bentup bar	16	mm	
10	Number of Bentup bar	3	Numbers	
11	Diameter of Anchor bars	16	mm	
12	Number of Anchor bars	2	Numbers	
13	Diameter of stirrups	8	mm	
14	Spacing of stirrups	200	mm	
	Length of Bars and Number of stirrups			
Sr. No.	Description	Value	Unit	Cross- Section of beam



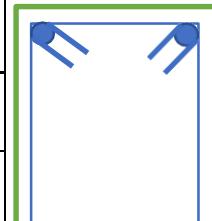
1	Total length of Beam (TL)	6112.00	mm				
2	Length of main straight bar	6.06	m				
3	Length of bentup bar	6.85	m				
4	Length of anchor bar	6.35	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	45.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	79eigh t (Kg/m)	Total weight (Kg)
1	Main Straight Bars	5	16	6.062	30.31	1.58	47.90
2	Main bentup Bars	3	16	6.854	20.562	1.58	32.49
3	Anchor Bars	2	16	6.35	12.7	1.58	20.07
4	Stirrups	45	8	1.892	85.14	0.4	33.64
				TOTAL WEIGHT(Kg)			134.10
	Bars	No of Bars		Weight per bar			
	B1	1		114.94	114.94	kg	

Table 2

Designed beam given data				.
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Width of beam(b)	300	mm	
2	Depth of beam(D)	650	mm	
3	Cover(d')	25	mm	
4	Effective depth (d)	600	mm	
5	Span of beam(L)	8.267	m	
6	Width of support(bs)	300	mm	
7	Diameter of main straight bar	16	mm	
8	Number of Main straight bar	6	Numbers	
9	Diameter of bentup bar	16	mm	
10	Number of Bentup bar	3	Numbers	
11	Diameter of Anchor bars	16	mm	
12	Number of Anchor bars	2	Numbers	
13	Diameter of stirrups	8	mm	
14	Spacing of stirrups	200	mm	
	Length of Bars and Number of stirrups			
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Total length of Beam (TL)	8867.00	mm	
2	Length of main straight bar	8.82	m	

3	Length of bentup bar	9.61	m				
4	Length of anchor bar	9.11	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	45.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight(Kg)
1	Main Straight Bars	6	16	8.817	52.902	1.58	83.60
2	Main bentup Bars	3	16	9.609	28.827	1.58	45.55
3	Anchor Bars	2	16	9.105	18.21	1.58	28.78
4	Stirrups	45	8	1.892	85.14	0.4	33.64
				TOTAL WEIGHT(Kg)			191.56
	Bars	No of Bars		Weight per bar			
B	B2,B8,B14	3		114.94	344.82	kg	

Table 3

Designed beam given data				.					
Sr. No.	Description	Value	Unit	Cross- Section of beam					
1	Width of beam(b)	300	mm						
2	Depth of beam(D)	650	mm						
3	Cover(d')	25	mm						

4	Effective depth (d)	600	mm		
5	Span of beam(L)	5.409	m		
6	Width of support(bs)	300	mm		
7	Diameter of main straight bar	16	mm		
8	Number of Main straight bar	6	Numbers		
9	Diameter of bentup bar	16	mm		
10	Number of Bentup bar	3	Numbers		
11	Diameter of Anchor bars	16	mm		
12	Number of Anchor bars	2	Numbers		
13	Diameter of stirrups	8	mm		
14	Spacing of stirrups	200	mm		
	Length of Bars and Number of stirrups				
Sr. No.	Description	Value	Unit	Cross- Section of beam	
1	Total length of Beam (TL)	6009.00	mm		
2	Length of main straight bar	5.96	m		
3	Length of bentup bar	6.75	m		
4	Length of anchor bar	6.25	m		
5	Length of stirrups	1.89	m		
6	Number of stirrups	45.00	Numbers		

Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight(Kg)
1	Main Straight Bars	6	16	5.959	35.754	1.58	56.50
2	Main bentup Bars	3	16	6.751	20.253	1.58	32.00
3	Anchor Bars	2	16	6.247	12.494	1.58	19.74
4	Stirrups	45	8	1.892	85.14	0.4	33.64
				TOTAL WEIGHT(Kg)			141.88
	Bars	No of Bars		Weight per bar			
C	B3,B9,B15,B4,B10,B16	6		141.88	851.3	kg	

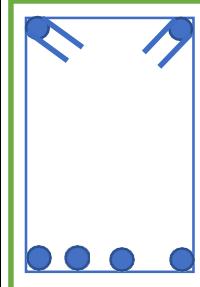
Table 4

Designed beam given data				.			
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Width of beam(b)	300	mm				
2	Depth of beam(D)	650	mm				
3	Cover(d')	25	mm				
4	Effective depth (d)	600	mm				
5	Span of beam(L)	3.925	m				
6	Width of support(bs)	300	mm				
7	Diameter of main straight	16	mm				

	bar						
8	Number of Main straight bar	6	Numbers				
9	Diameter of bentup bar	16	mm				
10	Number of Bentup bar	3	Numbers				
11	Diameter of Anchor bars	16	mm				
12	Number of Anchor bars	2	Numbers				
13	Diameter of stirrups	8	mm				
14	Spacing of stirrups	200	mm				
	Length of Bars and Number of stirrups						
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	4525.00	mm				
2	Length of main straight bar	4.48	m				
3	Length of bentup bar	5.27	m				
4	Length of anchor bar	4.76	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	45.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	6	16	4.475	26.85	1.58	42.43

2	Main bentup Bars	3	16	5.267	15.801	1.58	24.97
3	Anchor Bars	2	16	4.763	9.526	1.58	15.05
4	Stirrups	45	8	1.892	85.14	0.4	33.64
				TOTAL WEIGHT(Kg)			116.09
	Bars	No of Bars		Weight per bar			
D	B5,B6,B11,B12,B20,B24,	34	116.09	3947	kg		
	B61,B69,B72,B78,B80, B84,B86,B92,B99,B114						
	B67,B71,B77,B79,B83, B85,B88,B91,B98,B113						
	B79,B74,B75,B96,B103, B104,B110						

Table 5

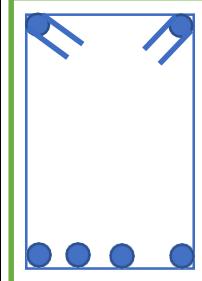
Designed beam given data				.	Cross- Section of beam
Sr. No.	Description	Value	Unit		
1	Width of beam(b)	300	mm		
2	Depth of beam(D)	650	mm		
3	Cover(d')	25	mm		
4	Effective depth (d)	600	mm		
5	Span of beam(L)	7.6	m		
6	Width of support(bs)	300	mm		
7	Diameter of main straight bar	16	mm		

8	Number of Main straight bar	6	Numbers				
9	Diameter of bentup bar	16	mm				
10	Number of Bentup bar	4	Numbers				
11	Diameter of Anchor bars	16	mm				
12	Number of Anchor bars	2	Numbers				
13	Diameter of stirrups	8	mm				
14	Spacing of stirrups	200	mm				
	Length of Bars and Number of stirrups						
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	8200.00	mm				
2	Length of main straight bar	8.15	m				
3	Length of bentup bar	8.94	m				
4	Length of anchor bar	8.44	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	45.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	6	16	8.15	48.9	1.58	77.27
2	Main bentup Bars	4	16	8.942	35.768	1.58	56.52

3	Anchor Bars	2	16	8.438	16.876	1.58	26.67
4	Stirrups	45	8	1.892	85.14	0.4	33.64
				TOTAL WEIGHT(Kg)			194.10
	Bars	No of Bars		Weight per bar			
D	B17	1		194.10	194.1	kg	

Table 6

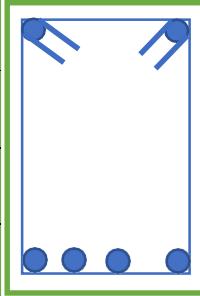
Designed beam given data				.
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Width of beam(b)	300	mm	
2	Depth of beam(D)	650	mm	
3	Cover(d')	25	mm	
4	Effective depth (d)	600	mm	
5	Span of beam(L)	1.853	m	
6	Width of support(bs)	300	mm	
7	Diameter of main straight bar	16	mm	
8	Number of Main straight bar	5	Numbers	
9	Diameter of bentup bar	16	mm	
10	Number of Bentup bar	2	Numbers	
11	Diameter of Anchor bars	16	mm	



12	Number of Anchor bars	2	Numbers				
13	Diameter of stirrups	8	mm				
14	Spacing of stirrups	180	mm				
	Length of Bars and Number of stirrups						
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	2453.00	mm				
2	Length of main straight bar	2.40	m				
3	Length of bentup bar	3.20	m				
4	Length of anchor bar	2.69	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	45.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	5	16	2.403	12.015	1.58	18.99
2	Main bentup Bars	2	16	3.195	6.39	1.58	10.10
3	Anchor Bars	2	16	2.691	5.382	1.58	8.50
4	Stirrups	45	8	1.892	85.14	0.4	33.64
				TOTAL WEIGHT(Kg)			71.22
	Bars	No of Bars		Weight per bar			

D	B19,B117	2	71.22	142.45	kg	
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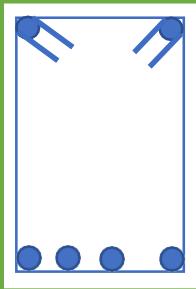
Table 7

Designed beam given data				.		
Sr. No.	Description	Value	Unit	Cross- Section of beam		
1	Width of beam(b)	300	mm			
2	Depth of beam(D)	650	mm			
3	Cover(d')	25	mm			
4	Effective depth (d)	600	mm			
5	Span of beam(L)	5.004	m			
6	Width of support(bs)	300	mm			
7	Diameter of main straight bar	16	mm			
8	Number of Main straight bar	8	Numbers			
9	Diameter of bentup bar	16	mm			
10	Number of Bentup bar	2	Numbers			
11	Diameter of Anchor bars	16	mm			
12	Number of Anchor bars	2	Numbers			
13	Diameter of stirrups	8	mm			
14	Spacing of stirrups	180	mm			

	Length of Bars and Number of stirrups						
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	5604.00	mm				
2	Length of main straight bar	5.55	m				
3	Length of bentup bar	6.35	m				
4	Length of anchor bar	5.84	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	15.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	8	16	5.554	44.432	1.58	70.21
2	Main bentup Bars	2	16	6.346	12.692	1.58	20.06
3	Anchor Bars	2	16	5.842	11.684	1.58	18.46
4	Stirrups	15	8	1.892	28.38	0.4	11.21
				TOTAL WEIGHT(Kg)			119.95
	Bars	No of Bars		Weight per bar			
D	B21,B24,B32	3		119.95	359.84	kg	

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Table 8

Designed beam given data				.			
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Width of beam(b)	300	mm				
2	Depth of beam(D)	650	mm				
3	Cover(d')	25	mm				
4	Effective depth (d)	600	mm				
5	Span of beam(L)	2.768	m				
6	Width of support(bs)	300	mm				
7	Diameter of main straight bar	16	mm				
8	Number of Main straight bar	8	Numbers				
9	Diameter of bentup bar	16	mm				
10	Number of Bentup bar	2	Numbers				
11	Diameter of Anchor bars	16	mm				
12	Number of Anchor bars	2	Numbers				
13	Diameter of stirrups	8	mm				
14	Spacing of stirrups	180	mm				
	Length of Bars and Number of stirrups						
Sr. No.	Description	Value	Unit	Cross- Section of beam			

1	Total length of Beam (TL)	3368.00	mm				
2	Length of main straight bar	3.32	m				
3	Length of bentup bar	4.11	m				
4	Length of anchor bar	3.61	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	15.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	8	16	3.318	26.544	1.58	41.95
2	Main bentup Bars	2	16	4.11	8.22	1.58	12.99
3	Anchor Bars	2	16	3.606	7.212	1.58	11.40
4	Stirrups	15	8	1.892	28.38	0.4	11.21
				TOTAL WEIGHT(Kg)			77.54
	Bars	No of Bars		Weight per bar			
D	B26,B118,B33,B34,B37,B45, B46,B47	8		77.54	620.35	kg	

Table 9

Designed beam given data				.
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Width of beam(b)	300	mm	

2	Depth of beam(D)	650	mm		
3	Cover(d')	25	mm		
4	Effective depth (d)	600	mm		
5	Span of beam(L)	2.768	m		
6	Width of support(bs)	300	mm		
7	Diameter of main straight bar	16	mm		
8	Number of Main straight bar	8	Numbers		
9	Diameter of bentup bar	16	mm		
10	Number of Bentup bar	2	Numbers		
11	Diameter of Anchor bars	16	mm		
12	Number of Anchor bars	2	Numbers		
13	Diameter of stirrups	8	mm		
14	Spacing of stirrups	180	mm		
	Length of Bars and Number of stirrups				
Sr. No.	Description	Value	Unit	Cross- Section of beam	
1	Total length of Beam (TL)	3368.00	mm		
2	Length of main straight bar	3.32	m		
3	Length of bentup bar	4.11	m		
4	Length of anchor bar	3.61	m		
5	Length of stirrups	1.89	m		
6	Number of stirrups	15.00	Numbers		

Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight(Kg)
1	Main Straight Bars	8	16	3.318	26.544	1.58	41.95
2	Main bentup Bars	2	16	4.11	8.22	1.58	12.99
3	Anchor Bars	2	16	3.606	7.212	1.58	11.40
4	Stirrups	15	8	1.892	28.38	0.4	11.21
				TOTAL WEIGHT(Kg)			77.54
	Bars	No of Bars		Weight per bar			
D	B26,B118,B33,B34,B37,B45, B46,B47	8		77.54	620.35	kg	

Table 10

Designed beam given data				.
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Width of beam(b)	300	mm	
2	Depth of beam(D)	650	mm	
3	Cover(d')	25	mm	
4	Effective depth (d)	600	mm	
5	Span of beam(L)	5.1	m	
6	Width of support(bs)	300	mm	
7	Diameter of main straight	20	mm	

	bar						
8	Number of Main straight bar	6	Numbers				
9	Diameter of bentup bar	16	mm				
10	Number of Bentup bar	3	Numbers				
11	Diameter of Anchor bars	16	mm				
12	Number of Anchor bars	2	Numbers				
13	Diameter of stirrups	8	mm				
14	Spacing of stirrups	180	mm				
	Length of Bars and Number of stirrups						
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	5700.00	mm				
2	Length of main straight bar	5.65	m				
3	Length of bentup bar	6.44	m				
4	Length of anchor bar	5.94	m				
5	Length of stirrups	1.89	m				
6	Number of stirrups	15.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	6	20	5.65	33.9	2.47	83.70

2	Main bentup Bars	3	16	6.442	19.326	1.58	30.54
3	Anchor Bars	2	16	5.938	11.876	1.58	18.77
4	Stirrups	15	8	1.892	28.38	0.4	11.21
				TOTAL WEIGHT(Kg)			144.22
	Bars	No of Bars		Weight per bar			
N	B35,B36,B38,B39,B47, B48,B50,B51,B52,B53,	10		144.22	1442.2	kg	

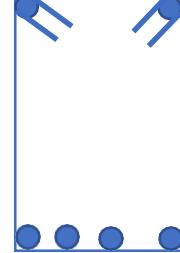
Table 11

Designed beam given data				Cross- Section of beam	
Sr. No.	Description	Value	Unit		
1	Width of beam(b)	300	mm		
2	Depth of beam(D)	600	mm		
3	Cover(d')	25	mm		
4	Effective depth (d)	550	mm		
5	Span of beam(L)	9	m		
6	Width of support(bs)	300	mm		
7	Diameter of main straight bar	20	mm		
8	Number of Main straight bar	4	Numbers		
9	Diameter of bentup bar	16	mm		

10	Number of Bentup bar	2	Numbers				
11	Diameter of Anchor bars	16	mm				
12	Number of Anchor bars	2	Numbers				
13	Diameter of stirrups	8	mm				
14	Spacing of stirrups	180	mm				
	Length of Bars and Number of stirrups						
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	9600.00	mm				
2	Length of main straight bar	9.55	m				
3	Length of bentup bar	10.30	m				
4	Length of anchor bar	9.84	m				
5	Length of stirrups	1.79	m				
6	Number of stirrups	46.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	4	20	9.55	38.2	2.47	94.32
2	Main bentup Bars	2	16	10.3	20.6	1.58	32.55

3	Anchor Bars	2	16	9.838	19.676	1.58	31.09
4	Stirrups	46	8	1.792	82.432	0.4	32.57
				TOTAL WEIGHT(Kg)			190.53
	Bars	No of Bars		Weight per bar			
N	B40	1		190.53	190.53	kg	

Table 12

Designed beam given data				Cross- Section of beam	
Sr. No.	Description	Value	Unit		
1	Width of beam(b)	300	mm		
2	Depth of beam(D)	750	mm		
3	Cover(d')	25	mm		
4	Effective depth (d)	700	mm		
5	Span of beam(L)	2.35	m		
6	Width of support(bs)	300	mm		
7	Diameter of main straight bar	20	mm		
8	Number of Main straight bar	4	Numbers		
9	Diameter of bentup bar	16	mm		
10	Number of Bentup bar	3	Numbers		

11	Diameter of Anchor bars	16	mm				
12	Number of Anchor bars	2	Numbers				
13	Diameter of stirrups	8	mm				
14	Spacing of stirrups	180	mm				
Length of Bars and Number of stirrups							
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	2950.00	mm				
2	Length of main straight bar	2.90	m				
3	Length of bentup bar	3.78	m				
4	Length of anchor bar	3.19	m				
5	Length of stirrups	2.09	m				
6	Number of stirrups	15.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	4	20	2.9	11.6	2.47	28.64
2	Main bentup Bars	3	16	3.776	11.328	1.58	17.90
3	Anchor Bars	2	16	3.188	6.376	1.58	10.08
4	Stirrups	15	8	2.092	31.38	0.4	12.40
				TOTAL WEIGHT(Kg)			69.02

	Bars	No of Bars	Weight per bar			
N 1	B44,B43,B58,B63,B66,B109,B11	7	69.02	483.11	kg	

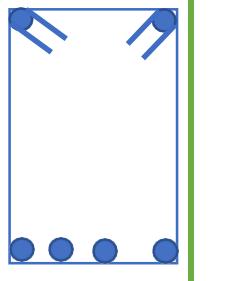
Table 13

Designed beam given data				.
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Width of beam(b)	300	mm	
2	Depth of beam(D)	380	mm	
3	Cover(d')	25	mm	
4	Effective depth (d)	330	mm	
5	Span of beam(L)	1.67	m	
6	Width of support(bs)	300	mm	
7	Diameter of main straight bar	20	mm	
8	Number of Main straight bar	4	Numbers	
9	Diameter of bentup bar	16	mm	
10	Number of Bentup bar	3	Numbers	
11	Diameter of Anchor bars	16	mm	
12	Number of Anchor bars	2	Numbers	

13	Diameter of stirrups	8	mm				
14	Spacing of stirrups	180	mm				
Length of Bars and Number of stirrups							
Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	2270.00	mm				
2	Length of main straight bar	2.22	m				
3	Length of bentup bar	2.79	m				
4	Length of anchor bar	2.51	m				
5	Length of stirrups	1.35	m				
6	Number of stirrups	10.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	4	20	2.22	8.88	2.47	21.93
2	Main bentup Bars	3	16	2.7852	8.3556	1.58	13.20
3	Anchor Bars	2	16	2.508	5.016	1.58	7.93
4	Stirrups	10	8	1.352	13.52	0.4	5.34
				TOTAL WEIGHT(Kg)			48.40
	Bars	No of Bars		Weight per bar			
N	B93,B100,B105	3		48.40	145.19	kg	



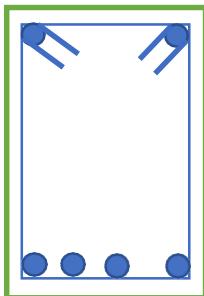
Table 14

Designed beam given data				.
Sr. No.	Description	Value	Unit	Cross- Section of beam
1	Width of beam(b)	300	mm	
2	Depth of beam(D)	600	mm	
3	Cover(d')	25	mm	
4	Effective depth (d)	550	mm	
5	Span of beam(L)	4.5	m	
6	Width of support(bs)	300	mm	
7	Diameter of main straight bar	20	mm	
8	Number of Main straight bar	4	Numbers	
9	Diameter of bentup bar	16	mm	
10	Number of Bentup bar	3	Numbers	
11	Diameter of Anchor bars	16	mm	
12	Number of Anchor bars	2	Numbers	
13	Diameter of stirrups	8	mm	
14	Spacing of stirrups	180	mm	
	Length of Bars and Number of stirrups			

Sr. No.	Description	Value	Unit	Cross- Section of beam			
1	Total length of Beam (TL)	5100.00	mm				
2	Length of main straight bar	5.05	m				
3	Length of bentup bar	5.80	m				
4	Length of anchor bar	5.34	m				
5	Length of stirrups	1.79	m				
6	Number of stirrups	26.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	4	20	5.05	20.2	2.47	49.88
2	Main bentup Bars	3	16	5.8	17.4	1.58	27.50
3	Anchor Bars	2	16	5.338	10.676	1.58	16.87
4	Stirrups	26	8	1.792	46.592	0.4	18.41
				TOTAL WEIGHT(Kg)			112.65
	Bars	No of Bars		Weight per bar			
N	B54,B62,B70,B76,B81, B82,B87,B90,B107	22	112.65	2478.3	kg		
	B55,B56,B64,B73,B95, B102,B108,B116						
	B57,B65						
	B59,B112						

	B60					
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Table 15

Designed beam given data				.		
Sr. No.	Description	Value	Unit	Cross- Section of beam		
1	Width of beam(b)	300	mm			
2	Depth of beam(D)	380	mm			
3	Cover(d')	25	mm			
4	Effective depth (d)	330	mm			
5	Span of beam(L)	6.67	m			
6	Width of support(bs)	300	mm			
7	Diameter of main straight bar	20	mm			
8	Number of Main straight bar	4	Numbers			
9	Diameter of bentup bar	16	mm			
10	Number of Bentup bar	3	Numbers			
11	Diameter of Anchor bars	16	mm			
12	Number of Anchor bars	2	Numbers			
13	Diameter of stirrups	8	mm			
14	Spacing of stirrups	200	mm			
	Length of Bars and Number of stirrups					
Sr. No.	Description	Value	Unit	Cross- Section of beam		

1	Total length of Beam (TL)	7270.00	mm				
2	Length of main straight bar	7.22	m				
3	Length of bentup bar	7.79	m				
4	Length of anchor bar	7.51	m				
5	Length of stirrups	1.35	m				
6	Number of stirrups	35.00	Numbers				
Sr. No.	Description of bar	No	Diameter	Length(m)	Total length of bar(m)	Weight (Kg/m)	Total weight (Kg)
1	Main Straight Bars	4	20	7.22	28.88	2.47	71.31
2	Main bentup Bars	3	16	7.7852	23.356	1.58	36.91
3	Anchor Bars	2	16	7.508	15.016	1.58	23.73
4	Stirrups	35	8	1.352	47.32	0.4	18.69
				TOTAL WEIGHT(Kg)			150.64
	Bars	No of Bars		Weight per bar			
N	B110,B115	2		150.64	301.28	kg	
				TOTAL WEIGHT(Kg)	11994	kg	
	FOR GROUND FLOOR BEAM				11994	kg	
	FOR FIRST FLOOR BEAM				11994	kg	
	FOR SECOND FLOOR BEAM				11994	kg	

	FOR THIRD FLOOR BEAM				11994	kg	
	FOR FOURTH FLOOR				11994	kg	
				NET TOTAL WEIGHT (Kg)	71961	kg	

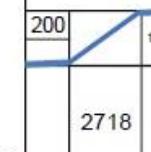
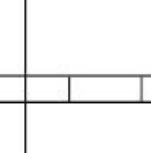
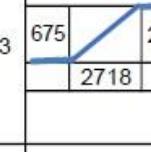
Table 16

Slab estimation and costing tables

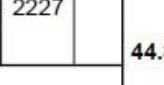
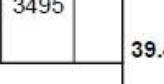
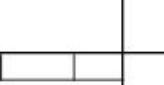
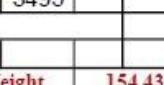
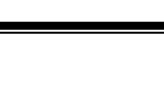
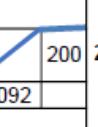
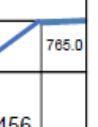
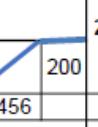
										no. of bars			Shape of bars	
	S24,S2 5,S28, S29,S3 0,S32, S33,S3 4,S39, S40	Shorter Length	2660	Short span Steel Alternate 1St Bar										
		Longer Length	3911											
		Shorter Bar spacing	200		10	10.7	10	106.5	3923.0	417.90				257.96
		Longer side Bar Spacing c/c	200											
		Depth	150											
	Next Slab Distance	Left side	2613	Short span Steel Alternate 2nd Bar										
		Right side	2613		10	10.7	10	106.5	3575	380.78				235.05
	S24,S2 5,S28, S29,S3 0,S32, S33,S3 4,S39, S40	Shorter Length	2660	Long span Steel Alternate 1St Bar										
		Longer Length	3911											
		Shorter Bar spacing	200		10	7.5	10	75.3	5174.0	389.34				240.34
		Longer side Bar Spacing c/c	200											
		Depth	150											
	Next Slab Distance	Left side	2613	Long span Steel Alternate 2nd Bar										
		Right side	2613		10	7.5	10	75.3	4826	363.13				224.15
													TOTAL Weight	957.50
													kg	

BAR BENDING SCHEDULE (BBS)-SLAB												
Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10mm
	S41,S42,S43, S44,S45	Shorter Length	4191	Short span Steel Alternate 1St Bar	10	11.4	5	56.8	5753.7	326.59		201.60
		Longer Length	4191									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
	Next Slab Distance			Short span Steel Alternate 2nd Bar	10	11.4	5	56.8	5137	291.58		179.99
		Left side	2769									
		Right side	3512									
	S41,S42,S43, S44,S45	Shorter Length	4191	Long span Steel Alternate 1St Bar	10	11.4	5	56.8	5454.0	309.58		191.10
		Longer Length	4191									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
	Next Slab Distance			Long span Steel Alternate 2nd Bar	10	11.4	5	56.8	5106	289.81		178.89
		Left side	2613									
		Right side	2613									
											TOTAL Weight	751.58

BAR BENDING SCHEDULE (BBS)-SLAB													
Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10mm	
1	Top Reinforcement	Long Bentu p steel lift side	10	1.20	5	6.00	4591	27.55				17.004	
									200	4191	200		
		Long Bentu p steel Right side	10	1.20	5	6.00	4591	27.55				17.004	
2	Top Reinforcement	Long Bentu p steel Front side	10	1.20	5	6.00	4591	27.55				17.004	
									200	4191	200		
		Long Bentu p steel Back side	10	1.20	5	6.00	4591	27.55				17.004	
									200	4191	200		
	Shorter Length	4191	Shorter Bar spacing	200	Longer side Bar Spacing c/c	200	Left side	1500	Front side	1500	Total Weight (Kg)		68.015
	Longer Length	4191					Right side	2000	Back side	2000	NET TOTAL WEIGHT (Kg)		818.30

BAR BENDING SCHEDULE (BBS)-SLAB																					
Sr. No.	Slab Description	Measurement		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10mm									
	S9,S10 ,S11	Shorter Length	2676	Short span Steel Alternate 1st Bar	10	8.4	3	25.1	3943.7	99.03	 200 / \ 1025.7	61.13									
		Longer Length	2998																		
		Shorter Bar spacing	200																		
		Longer side Bar Spacing c/c	200																		
		Depth	150																		
	Next Slab Distance	Left side	2627	Short span Steel Alternate 2nd Bar	10	8.4	3	25.1	3593	90.23	 675 / \ 200	55.70									
		Right side	2627																		
	S9,S10 ,S11	Shorter Length	2676	Long span Steel Alternate 1st Bar	10	7.6	3	22.7	4265.7	96.81	 200 / \ 1025.7	59.76									
		Longer Length	2998																		
		Shorter Bar spacing	200																		
		Longer side Bar Spacing c/c	200																		
		Depth	150																		
	Next Slab Distance	Left side	2627	Long span Steel Alternate 2nd Bar	10	7.6	3	22.7	3915	88.86	 675 / \ 200	54.85									
		Right side	2627																		
TOTAL Weight											231.44										
											kg										

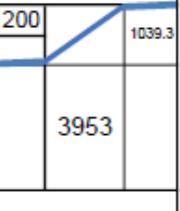
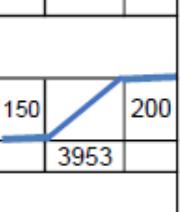
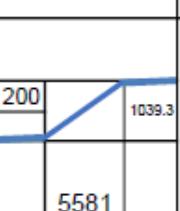
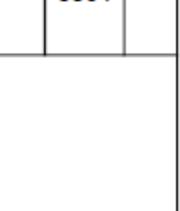
BAR BENDING SCHEDULE (BBS)-SLAB													
Sr. No.	Slab Description	Measurement	Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars		Dia 10mm	
1	Top Reinforcement	Long Bentu p steel lift side	10	1.20	3	3.60	3398	12.23					7.551
									200	2998	200		
		Long Bentu p steel Right side	10	1.20	3	3.60	3398	12.23					7.551
									200	2998	200		
2	Top Reinforcement	Long Bentu p steel Front side	10	1.20	3	3.60	3076	11.07					6.836
									200	2676	200		
		Long Bentu p steel Back side	10	1.20	3	3.60	3076	11.07					6.836
									200	2676	200		
	Shorter Length	2676	Shorter Bar spacing	200	Longer side Bar Spacing c/c	200	Left side	2676	Front side	1500		Total Weight (Kg)	28.773
	Longer Length	2998				Right side	2676	Back side	2000		NET TOTAL WEIGHT (Kg)		260.21

BAR BENDING SCHEDULE (BBS)-SLAB												
Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10mm
	S22, S23	Shorter Length	2185	Short span Steel Alternate 1St Bar	10	9.5	2	19.0	3778.0	71.84	 	44.34
		Longer Length	3453									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side									
	S22, S23	Left side	2627	Short span Steel Alternate 2nd Bar	10	9.5	2	19.0	3102	58.99	 	36.41
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
	S22, S23	Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 1St Bar	10	6.3	2	12.7	5046.0	63.96	 	39.48
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
		Shorter Bar spacing	200									
	S22, S23	Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 2nd Bar	10	6.3	2	12.7	4370	55.39	 	34.19
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
	S22, S23	Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side									
		Right side	3603									
		Shorter Length	2185									
	S22, S23	Longer Length	3453									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 2nd Bar	10	6.3	2	12.7	4370	55.39	 	34.19
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
	S22, S23	Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 1St Bar	10	6.3	2	12.7	4370	55.39	 	34.19
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
	S22, S23	Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 2nd Bar	10	6.3	2	12.7	4370	55.39	 	34.19
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
	S22, S23	Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 1St Bar	10	6.3	2	12.7	4370	55.39	 	34.19
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
	S22, S23	Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 2nd Bar	10	6.3	2	12.7	4370	55.39	 	34.19
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
	S22, S23	Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 1St Bar	10	6.3	2	12.7	4370	55.39	 	34.19
		Right side	3603									
		Shorter Length	2185									
		Longer Length	3453									
	S22, S23	Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
		Next Slab Distance	Left side	Long span Steel Alternate 2nd Bar	10	6.3	2	12.7	4370	55.39	 	26.08
		Longer Length	2414									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
	Next Slab Distance	Left side	1845	Short span Steel Alternate 2nd Bar	10	6.9	2	13.8	2811	38.85		23.98
		Right side	1845									
	S35,S3 6	Shorter Length	2050	Long span Steel Alternate 1St Bar	10	6.0	2	12.0	3421.0	41.05		25.34
		Longer Length	2414									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
	Next Slab Distance	Left side	1845	Long span Steel Alternate 2nd Bar	10	6.0	2	12.0	3175	38.10		23.52
		Right side	1845									
											TOTAL Weight	98.92
											kg	

BAR BENDING SCHEDULE (BBS)-SLAB												
Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10mm
1	Top Reinforcement	Long Bentu p steel lift side	10	1.20	2	2.40	2814	6.75				4.169
									200	2414	200	
		Long Bentu p steel Right side	10	1.20	2	2.40	2814	6.75				4.169
									200	2414	200	
2	Top Reinforcement	Long Bentu p steel Front side	10	1.20	2	2.40	2450	5.88				3.630
									200	2050	200	
		Long Bentu p steel Back side	10	1.20	2	2.40	2450	5.88				3.630
									200	2050	200	
	Shorter Length	2050	Shorter Bar spacing	200	Longer side Bar Spacing c/c	200	Left side	1845	Front side	1777		Total Weight (Kg) 15.597
	Longer Length	2414				Right side	1845	Back side	1777		NET TOTAL WEIGHT (Kg)	114.52

BAR BENDING SCHEDULE (BBS)-SLAB												
Sr. No.	Slab Description	Measurement		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10mm
	S37,S38	Shorter Length	2050	Short span Steel Alternate 1St Bar	10	6.0	2	12.0	3057.0	36.68	<p>Diagram illustrating the bending schedule for S37,S38 slab. It shows two main sections: one for the shorter span (left side) and one for the longer span (right side). Each section contains four bars, each with a length of 2050 mm and a diameter of 12 mm. The bars are bent at an angle of 765.0 degrees. The total number of bars is 12, and the total cutting length is 3057.0 mm. The net length is 36.68 m.</p>	22.64
		Longer Length	2050									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
	Next Slab Distance	Left side	1845	Short span Steel Alternate 2nd Bar	10	6.0	2	12.0	2811	33.73	<p>Diagram illustrating the bending schedule for the next slab distance. It shows two main sections: one for the left side and one for the right side. Each section contains four bars, each with a length of 1845 mm and a diameter of 12 mm. The bars are bent at an angle of 200 degrees. The total number of bars is 12, and the total cutting length is 2811 mm. The net length is 33.73 m.</p>	20.82
		Right side	1845									
	S37,S38	Shorter Length	2050	Long span Steel Alternate 1St Bar	10	6.0	2	12.0	3057.0	36.68	<p>Diagram illustrating the bending schedule for S37,S38 slab. It shows two main sections: one for the shorter span (left side) and one for the longer span (right side). Each section contains four bars, each with a length of 2050 mm and a diameter of 12 mm. The bars are bent at an angle of 765.0 degrees. The total number of bars is 12, and the total cutting length is 3057.0 mm. The net length is 36.68 m.</p>	22.64
		Longer Length	2050									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
	Next Slab Distance	Left side	1845	Long span Steel Alternate 2nd Bar	10	6.0	2	12.0	2811	33.73	<p>Diagram illustrating the bending schedule for the next slab distance. It shows two main sections: one for the left side and one for the right side. Each section contains four bars, each with a length of 1845 mm and a diameter of 12 mm. The bars are bent at an angle of 200 degrees. The total number of bars is 12, and the total cutting length is 2811 mm. The net length is 33.73 m.</p>	20.82
		Right side	1845									
											TOTAL Weight	86.93
											kg	

BAR BENDING SCHEDULE (BBS)-SLAB													
Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars		Dia 10mm
1	Top Reinforcement	Long Bentu p steel lift side		10	1.20	2		2.40	2450	5.88			3.630
										200	2050	200	
		Long Bentu p steel Right side		10	1.20	2		2.40	2450	5.88			3.630
										200	2050	200	
2	Top Reinforcement	Long Bentu p steel Front side		10	1.20	2		2.40	2450	5.88			3.630
										200	2050	200	
		Long Bentu p steel Back side		10	1.20	2		2.40	2450	5.88			3.630
										200	2050	200	
	Shorter Length	2050	Shorter Bar spacing	200	Longer side Bar Spacing c/c	200	Left side	1845	Front side	1777		Total Weight (Kg)	14.519
	Longer Length	2050					Right side	1845	Back side	1777		NET TOTAL WEIGHT (Kg)	101.45

BAR BENDING SCHEDULE (BBS)-SLAB													
Sr. No.	Slab Description	Measureme nt		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10m m	
	S31	Shorter Length	3911	Short span Steel Alternate 1St Bar	10	14.7	1	14.7	5192.3	76.44		47.19	
		Longer Length	5539										
		Shorter Bar spacing	200										
		Longer side Bar Spacing c/c	200										
		Depth	150										
	S31	Next Slab Distance	Left side	0	Short span Steel Alternate 2nd Bar	10	14.7	1	14.7	4303	63.35		39.11
			Right side	2668									
	S31	Shorter Length	3911	Long span Steel Alternate 1St Bar	10	10.7	1	10.7	6820.3	72.65		44.85	
		Longer Length	5539										
		Shorter Bar spacing	200										
		Longer side Bar Spacing c/c	200										
		Depth	150										
	S31	Next Slab Distance	Left side	0	Long span Steel Alternate 2nd Bar	10	10.7	1	10.7	5931	63.18		39.00
			Right side	2668									
											TOTAL Weight	170.14	
											kg		

BAR BENDING SCHEDULE (BBS)-SLAB																					
Sr. No.	Slab Description	Measureme nt		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10m m									
	middle S1 Slab	Shorter Length	2500	Short span Steel Alternate 1St Bar	10	20.9	5	104.4	3558.7	371.44	<p>The diagram shows a bending schedule for a middle slab. It includes a top row for 'Left side' with a bar length of 1500 mm, a bottom row for 'Right side' with a bar length of 2000 mm, and a middle row for '2nd Bar'. Each row contains two bars, each with a 450 mm horizontal segment and a 200 mm vertical segment, with a total length of 2542 mm. The total net length for the slab is 229.28 m.</p>	229.28									
		Longer Length	8000																		
		Shorter Bar spacing	200																		
		Longer side Bar Spacing c/c	200																		
		Depth	150																		
	Next Slab Distance			Short span Steel Alternate 2nd Bar	10	20.9	5	104.4	3192	333.17	<p>The diagram shows a bending schedule for the next slab distance. It includes a top row for 'Left side' with a bar length of 1500 mm, a bottom row for 'Right side' with a bar length of 2000 mm, and a middle row for '2nd Bar'. Each row contains two bars, each with a 450 mm horizontal segment and a 200 mm vertical segment, with a total length of 2542 mm. The total net length for the slab is 205.66 m.</p>	205.66									
		Left side	1500																		
		Right side	2000																		
				Long span steel	10	13.25	5	66.25	8400	556.50	<p>The diagram shows a bending schedule for long span steel. It includes a top row for 'Left side' with a bar length of 1500 mm, a bottom row for 'Right side' with a bar length of 2000 mm, and a middle row for '2nd Bar'. Each row contains two bars, each with a 200 mm horizontal segment and a 8000 mm vertical segment, with a total length of 343.52 m.</p>	343.52									
				Long Bentu p steel lift side	10	3.50	5	17.50	8400	147.00	<p>The diagram shows a bending schedule for long bentu p steel lift side. It includes a top row for 'Left side' with a bar length of 1500 mm, a bottom row for 'Right side' with a bar length of 2000 mm, and a middle row for '2nd Bar'. Each row contains two bars, each with a 200 mm horizontal segment and a 8000 mm vertical segment, with a total length of 90.741 m.</p>	90.741									
				Long Bentu p steel Right side	10	3.50	5	17.50	8400	147.00	<p>The diagram shows a bending schedule for long bentu p steel right side. It includes a top row for 'Left side' with a bar length of 1500 mm, a bottom row for 'Right side' with a bar length of 2000 mm, and a middle row for '2nd Bar'. Each row contains two bars, each with a 200 mm horizontal segment and a 8000 mm vertical segment, with a total length of 90.741 m.</p>	90.741									

BAR BENDING SCHEDULE (BBS)-SLAB

Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10mm				
	S1	Shorter Length	2972	Short span Steel Alternate 1St Bar	10	14.7	1	14.7	4278.3	62.97		38.87				
		Longer Length	5537													
		Shorter Bar spacing	200													
		Longer side Bar Spacing c/c	200													
		Depth	150													
	Next Slab Distance			Short span Steel Alternate 2nd Bar	10	14.7	1	14.7	3364	49.51		30.56				
		Left side	0													
		Right side	2743													
	S1	Shorter Length	2972	Long span Steel Alternate 1St Bar	10	8.3	1	8.3	6843.3	56.83		35.08				
		Longer Length	5537													
		Shorter Bar spacing	200													
		Longer side Bar Spacing c/c	200													
		Depth	150													
	Next Slab Distance			Long span Steel Alternate 2nd Bar	10	8.3	1	8.3	5929	49.24		30.40				
		Left side	0													
		Right side	2743													
											TOTAL Weight	134.91				
											kg					

BAR BENDING SCHEDULE (BBS)-SLAB													
Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars		Dia 10mm
1	Top Reinforcement	Long Bent up steel lift side	10	1.20	1	1.20	5937	7.12	200	5537	200		4.398
		Long Bent up steel Right side	10	1.20	1	1.20	5937	7.12	200	5537	200		4.398
2	Top Reinforcement	Long Bent up steel Front side	10	1.20	1	1.20	3372	4.05	200	2972	200		2.498
		Long Bent up steel Back side	10	1.20	1	1.20	3372	4.05	200	2972	200		2.498
	Shorter Length	2972	Shorter Bar spacing	200	Longer side Bar Spacing c/c	200	Left side	0	Front side	0		Total Weight (Kg)	13.791
	Longer Length	5537				Right side	2676	Back side	2638			NET TOTAL WEIGHT (Kg)	148.79

BAR BENDING SCHEDULE (BBS)-SLAB												
Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars	Dia 10mm
	S12,S13 ,S14,S15,S16, S17,S18,S19, S20,S8 ,S3,S4, S2,S5, S6,S7, S8,S32 ,S33,	Shorter Length	2743	Short span Steel Alternate 1St Bar	10	10.4	19	197.6	4049.3	800.15		493.92
		Longer Length	3810									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
	Next Slab Distance	Left side	2743	Short span Steel Alternate 2nd Bar	10	10.4	19	197.6	3684	727.88		449.31
		Right side	2743									
	S12,S13 ,S14,S15,S16, S17,S18,S19, S20,S8 ,S3,S4, S2,S5, S6,S7, S8,S32 ,S33,	Shorter Length	2743	Long span Steel Alternate 1St Bar	10	7.7	19	146.9	5116.3	751.68		464.00
		Longer Length	3810									
		Shorter Bar spacing	200									
		Longer side Bar Spacing c/c	200									
		Depth	150									
	Next Slab Distance	Left side	2743	Long span Steel Alternate 2nd Bar	10	7.7	19	146.9	4751	697.95		430.83
		Right side	2743									
											TOTAL Weight	1838.06
											kg	

BAR BENDING SCHEDULE (BBS)-SLAB														
Sr. No.	Slab Description	Measurements		Bar No.	Dia. Of Bar	No. Of Bar per slab	No. of slabs	Total no. of bars	Cutting Length (mm)	Net Length (m)	Shape of bars		Dia 10mm	
1	Top Reinforcement	Long Bent	p steel	lift side	10	1.20	19	22.80	4210	95.99	200	3810	200	59.252
		Long Bent	p steel	Right side	10	1.20	19	22.80	4210	95.99	200	3810	200	59.252
											200	3810	200	
2	Top Reinforcement	Long Bent	p steel	Front side	10	1.20	19	22.80	2960	67.49	200	2560	200	41.659
		Long Bent	p steel	Back side	10	1.20	19	22.80	2960	67.49	200	2560	200	41.659
											200	2560	200	
	Shorter Length	2560	Shorter Bar spacing	200	Longer side Bar Spacing c/c	200	Left side	2743	Front side	1500		Total Weight (Kg)	201.82	
	Longer Length	3810					Right side	2743	Back side	2000		NET TOTAL WEIGHT (Kg)	2039.9	

BAR BENDING SCHEDULE (BBS)-SLAB

SLAB SCHEDULE(M30:Fe500)									
Sr. No.	Groups	Slabs	Nos	Type	Thickness	Bottom Reinforcement	Top Reinforcement	Distribution	
					MM	Short Span (Bentup)	Long Span (Bentup)	SS CONT.	LS CONT.
1	A	S1,S2,S3 ,S4,S5,S 6,S7,S8, S9,S10, S12,S13, S14,S15, S16,S17, S18,S19, S20,S22, S23,S24, S25,S29, S30,S31, S32,S33, S37,S39, S40, S42,S43, S44,S45	35	2-Way	150	T10@ 200	T10@ 200 (NAS1,S9)	T10@ 20 0 (NAS9,S22)	T10@ 200
2	B	S21,S27, S34, S35,S36	5	1-Way	150	T10@ 200	T10@ 200 (NAS1,S9)	T10@ 20 0 (NAS9,S22)	T10@ 200
3	C	S26	1	2-Way	200	T10@ 200	T10@ 200 (NA-S27,S34,S3 5 ,S36)	T10@ 200 (NAS21,S27, S34,S35, S36)	T10@ 200

Shear wall estimation and costing tables :

BBS FOR SHEAR WALL							
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Base To level 1		1.829				
1		Vertical Bars 1 (Column Bars)	12	48	2.429	0.888889	103.6373333
2		Vertical Bars 2	12	122	2.429	0.888889	263.4115556
3		Master Links	8	204.848	2.71	0.405	224.8309224
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(KG)	770.8141735
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 1 To Level 2		3.687				
1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total (Kg)	1279.974383
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 2 To Level 3		3.687				
1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(kg)	1279.974383
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 3 To Level 4		3.687				

n and

1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(Kg)	1279.974383
<hr/>							
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 4 To Level 5		3.687				
1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(Kg)	1279.974383
<hr/>							
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 5 To Level 6		3.687				
1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(Kg)	1279.974383
						NET TOTAL (Kg)	8450.66047

BBS FOR SHEAR WALL							
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Base To level 1		1.829				
1		Vertical Bars 1 (Column Bars)	12	48	2.429	0.888889	103.6373333
2		Vertical Bars 2	12	122	2.429	0.888889	263.4115556
3		Master Links	8	204.848	2.71	0.405	224.8309224
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(KG)	770.8141735
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 1 To Level 2		3.687				
1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total (Kg)	1279.974383
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 2 To Level 3		3.687				
1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(kg)	1279.974383
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 3 To Level 4		3.687				

Quantity sheet 1										R
Sr. No.	Description	Nos	L	B	H	Qty.	Un	Rate	Amount	Remarks
1	Excavation work of footing									
	Excavation for foundation in earth, soil of all types sand, gravel and soft murum including removing the excavated material upto a distance of 50m beyond the building area stacking and spreading as directed, dewatering, preparing the bed for the foundation and necessary back filling, ramming, watering(including shoring and strutting) etc. complete.					250.3	cum	175.0	43801.4	
A	F+B5:J5C1,FC7,FC56,	3	1.5	1.05	2	9.45				
B	FC2,FC3,FC11,FC18,	4	1.9	1.55	2	23.56				
C	FC38	1	1.55	1.55	2	4.805				
D	FC4,FC8,FC10,FC12, FC19,FC20,FC30,FC35, FC39,FC40,FC45,FC61, FC76,FC78	14	1.7	1.35	2	64.26				
E	FC5,FC6,FC13,FC14, FC16,FC31,FC33,FC43, FC53,FC54,FC60,FC75	12	1.65	1.3	2	51.48				
F	FC9,FC22,	2	1.15	0.95	2	4.37				
G	FC24,FC47,	2	1.15	1.15	2	5.29				
H	FC25,FC29,FC28,FC48,	4	1.3	1.3	2	13.52				
I	FC27,FC28,FC42,	3	1.5	1.5	2	13.5				
J	FC32,	1	1.1	0.85	2	1.87				
K	FC23,FC44,FC63,FC64,FC66,FC67 ,FC68,	7	1.05	0.85	2	12.5				
L	FC15,FC58,FC59,FC71, FC73,FC74,	6	1.55	1.1	2	20.46				
M	FC37,FC41,FC51	3	1.125	1.13	2	7.594				
N	FC46,FC55,FC57	3	1.35	1	2	8.1				

O	FC70,FC72,	2	1.45	1	2	5.8				
	1:4:8 PCC For foundation				6.72	cum	4000	26880.0		
	F-1, F-2, F-3, F-4, F-5, F-6, F-7,	7	1.6	1.5	0	1.68				
	F-8, F-9, F-10, F-11, F-12, F-13 ,F-14,F-15,F-16	9	1.65	1.6	0	2.376				
	F-17, F-18,F-19, F-20,F-21,F-22, F-23, F-24	8	1.85	1.8	0	2.664				
3	Concrete for column footing									
A1										
1	F-1, F-2, F-3, F-4, F-5, F-6, F-7,	7	1.3	1.2	0	1.638				
A2										
1	F-8, F-9, F-10, F-11, F-12, F-13, F-14,F-15,F-16	6	9	0.389		3.501				
	F-17, F-18,F-19, F-20,F-21,F-22, F-23, F-24	8		0.386		3.088				
A3	Lift raft slab	1	2.072	0.5		0.622				
					Tot	8.849	cum	5000	44243.0	

Quantity sheet 1.1								R
Sr. No.	Description	Nos	L	B	H	Qty.	Un	Remarks
	1:4:8 PCC For foundation Laying plain cement concrete machine mix for foundation of columns, walls, etc. with 40mm coarse aggregate including ramming, consolidating and curing etc. complete.					18.738	cum	
A	FC1,FC7,FC56,	3	1.5	1.05	0.1	0.4725	cum	
B	FC2,FC3,FC11,FC18,	4	1.9	1.55	0.1	1.178	cum	
						0	cum	
C	FC38	1	1.55	1.55	0.1	0.2403	cum	
I							cum	
D	FC4,FC8,FC10,FC12, FC19,FC20,FC30,FC35, FC39,FC40,FC45,FC61, FC76,FC78	14	1.7	1.35	0.15	4.8195	cum	
E	FC5,FC6,FC13,FC14, FC16,FC31,FC33,FC43, FC53,FC54,FC60,FC75	12	1.65	1.3	0.1	2.574	cum	75mm offset
F	FC9,FC22,	2	0.389			0.778	cum	
G	FC24,FC47,	2	1.15	0.95	0.1	2.3	cum	
H	FC25,FC29,FC28,FC48,	4	1.3	1.3	0.1	5.2	cum	
I	FC27,FC28,FC42,	3	1.5	1.5	0.15	0.3375	cum	
J	FC32,	1	1.1	0.85	0.15	0.1403	cum	
K	FC23,FC44,FC63,FC64,FC66,FC67 ,FC68,	7	1.05	0.85	0.1	0.0893	cum	
L	FC15,FC58,FC59,FC71, FC73,FC74,	6	1.5	1.15	0.1	0.1725	cum	
M	FC37,FC41,FC51	3	1.25	1.25	0.1	0.1563	cum	

Quantity sheet 1.2

Sr. No.	Description	.	Nos	L	B	H	Qty.	Un
3	Concrete for column footing							Cum
	FOOTINGS	TYPE						Cum
A	FC1,FC7,FC56,	Pad	3	1.5	1.05	0.35	1.654	Cum
B	FC2,FC3,FC11,FC18,	Step	4	1.9	1.55	0.3	3.534	Cum
				1.3	0.95	0.275	1.359	Cum
C	FC38	Step	1	1.55	1.55	0.325	0.781	Cum
				0.95	0.95	0.2	0.181	Cum
D	FC4,FC8,FC10,FC12, FC19,FC20,FC30,FC35, FC39,FC40,FC45,FC61, FC76,FC78	Pad	12	1.65	1.35	0.45	12.029	Cum

E	FC5,FC6,FC13,FC14, FC16,FC31,FC33,FC43, FC53,FC54,FC60,FC75	Pad	12	1.65	1.3	0.45	11.583	Cum
F	FC9,FC22,	Pad	2	1.15	0.95	0.35	0.765	Cum
G	FC24,FC47,	Pad	2	1.15	1.15	0.35	0.926	Cum
H	FC25,FC29,FC28,FC48	Pad	4	1.3	1.3	0.4	2.704	Cum
I	FC27,FC28,FC42,	Pad	3	1.5	1.5	0.45	3.038	Cum
J	FC32,	Pad	1	1.1	0.85	0.375	0.351	Cum
K	FC23,FC44,FC63,FC64, FC66,FC67 ,FC68,	Pad	7	1.05	0.85	0.3	1.874	Cum
L	FC15,FC58,FC59,FC71 FC73,FC74,	Pad	6	1.55	1.1	0.375	3.836	Cum
M	FC37,FC41,FC51	Pad	3	1.25	1.25	0.375	1.758	Cum
N	FC46,FC55,FC57	Pad	3	1.35	1	0.375	1.519	Cum
O	FC70,FC72,	Pad	2	1.45	1	0.35	1.015	Cum
				TOTAL Qty.(m3)			48.904	Cum

Quantity sheet 3								
Sr.No.4	CONCRETE FOR COLUMN							
A	Level- From Ground slab Top to First Stlit floor slab Top							
	PERTICULERS	Nos	B	L	H	Qty.	Un	Remark
1	C1,C7,C8,C10,C12, C13,C14,C15,C16, C17,C18,C19,C20,C21 C30,C31,C33,C34, C39,C40,C45,C53, C54,C55,C56,C57, C58,C59,C60,C61, C62,C69,C70	33	0.3	0.75	3.658	27.16065	cum	

2	C2,C3,C4,C5,C6,C11, C35,C43,	8	0.23	0.45	3.658	3.028824	cum	
3	C24,C25,C26,C27, C28,C29,C38,C42,C47,C 48,C49,C50,C51, C52,	14	0.45	0.45	3.658	10.37043	cum	
4	C36,C44,	2	Dia .45		3.658	0.290742	cum	
5	C37,C41,	2	0.45	0.6	3.658	1.97532	cum	
6	C46	1	0.23	0.6	3.658	0.504804	cum	
B	FROM LEVEL First floor slab Top TO STILT SECOND FLOOR TOP							
1	C1,C7,C8,C10,C12, C13,C14,C15,C16, C17,C18,C19,C20,C21 C30,C31,C33,C34, C39,C40,C45,C53, C54,C55,C56,C57, C58,C59,C60,C61, C62,C69,C70	33	0.3	0.75	3.658	27.16065	cum	
2	C2,C3,C4,C5,C6,C11,C4 3,	8	0.23	0.45	3.658	3.028824	cum	
3	C24,C25,C26,C27, C28,C29,C38,C42,C47,C 48,C4,C50,C51,C52,	14	0.45	0.45	3.658	10.37043	cum	
4	C36,C44,	2	Dia .45		3.658	1.162652	cum	
5	C37,C41,	2	0.45	0.6	3.658	1.97532	cum	
6	C46	1	0.23	0.6	3.658	0.504804	cum	

Quantity sheet 5								
Sr.No.4	CONCRETE FOR COLUMN							
A	Level- From Four floor slab Top to slab Top							
	PERTICULERS	Nos	B	L	H	Qty.	Un	Remark
1	C8,C10,C16,C17,C61	8	0.3	0.75	3.658	6.5844	cum	

2	C62,C76,C78 C2,C3,C4,C5,C6,C11, C35,C43, C9,C63,C64,C65,C66	7	0.38	0.75	3.658	7.29771	cum	
3	C67,C68 NO NO C77	7	0.23	0.45	3.658	2.650221	cum	
4		0	0.45	0.45	3.658	0	cum	
5		0	0.45	0.6	3.658	0	cum	
6		1	0.23	0.6	3.658	0.504804	cum	
					Total	17.03714	cum	
B	FROM LEVEL Thirdfloor slab Top TO STILT FOURTH FLOOR TOP							
G	HEADROOM SLAB TOP TO WATER TANK TOP							
1	C21, C22, C23, C31	4	0.23	0.3	2.6	0.7176	cum	
					TOTAL	26.8904	cum	
5	LIFT WALL- FromFooting Top to M/c Floor Slab Bottom							
	SW1	2	1.8	0.15	22.3	12.042		2.6+3+(3* 4) +4.7= 22.3
	SW2	2	2	0.15	22.3	13.38		
	Deduct					0		
	Door	-6	1.2	0.15	2.3	-2.484		
					Total	22.938	cum	

Quantity sheet 3								
Sr.No.4	CONCRETE FOR COLUMN							
A	Level- From Ground slab Top to First Stilt floor slab Top							
	PERTICULERS	Nos	B	L	H	Qty.	Un	Remark
1	C1,C7,C8,C10,C12, C13,C14,C15,C16, C17,C18,C19,C20,C21 C30,C31,C33,C34, C39,C40,C45,C53, C54,C55,C56,C57, C58,C59,C60,C61, C62,C69,C70	33	0.3	0.75	3.658	27.16065	cum	
2	C2,C3,C4,C5,C6,C11, C35,C43,	8	0.23	0.45	3.658	3.028824	cum	
3	C24,C25,C26,C27, C28,C29,C38,C42,C47, C48,C49,C50,C51, C52,	14	0.45	0.45	3.658	10.37043	cum	
4	C36,C44,	2	Dia .45		3.658	0.290742	cum	
5	C37,C41,	2	0.45	0.6	3.658	1.97532	cum	
6	C46	1	0.23	0.6	3.658	0.504804	cum	
B	FROM LEVEL First floor slab Top TO STILT SECOND FLOOR TOP							
1	C1,C7,C8,C10,C12, C13,C14,C15,C16, C17,C18,C19,C20,C21 C30,C31,C33,C34, C39,C40,C45,C53, C54,C55,C56,C57, C58,C59,C60,C61, C62,C69,C70	33	0.3	0.75	3.658	27.16065	cum	
2	C2,C3,C4,C5,C6,C11,C43,	8	0.23	0.45	3.658	3.028824	cum	

3	C24,C25,C26,C27, C28,C29,C38,C42,C47, C48,C4,C50,C51,C52,	14	0.45	0.45	3.658	10.37043	cum	
4	C36,C44,	2	Dia .45		3.658	1.162652	cum	
5	C37,C41,	2	0.45	0.6	3.658	1.97532	cum	
6	C46	1	0.23	0.6	3.658	0.504804	cum	

Quantity sheet 4

Sr.No.4	CONCRETE FOR COLUMN							
A	Level- From Second floor slab Top to Third Stilt floor slab Top							
	PERTICULERS	Nos	B	L	H	Qty.	Un	Remark
1	C1,C7,C8,C10,C12, C13,C14,C15,C16, C17,C18,C19,C20,C21 C30,C31,C33,C34, C39,C40,C45,C53, C54,C55,C56,C57, C58,C59,C60,C61, C62,C69,C70	33	0.3	0.75	3.658	27.16065	cum	
2	C2,C3,C4,C5,C6,C11, C35,C43,	8	0.38	0.75	3.658	8.34024	cum	
3	C9,C22,C23,C32,C63 C64,C65,C66,C67,C68	10	0.23	0.45	3.658	3.78603	cum	
4	C24,C25,C26,C27, C28,C29,C38,C42,C47, C48,C49,C50,C51,C52,	14	0.45	0.45	3.658	0.290742	cum	
5	C37,C41, C46	2	0.45	0.6	3.658	0.290742	cum	
6		1	0.23	0.6	3.658	0.290742	cum	
B	FROM LEVEL Thirdfloor slab Top TO STILT FOURTH FLOOR TOP							
1	C1,C7,C8,C10,C12, C13,C14,C15,C16, C17,C18,C19,C20,C21 C30,C31,C33,C34, C39,C40,C45,C53, C54,C55,C56,C57, C58,C59,C60,C61,	33	0.3	0.75	3.658	27.16065	cum	

2	C62,C69,C70 C2,C3,C4,C5,C6,C11, C35,C43,	7	0.38	0.75	3.658	7.29771	cum	
3	C9,C22,C23,C32,C63 C64,C65,C66,C67,C68	10	0.23	0.45	3.658	3.78603	cum	
4	C24,C25,C26,C27, C28,C29,C38,C42,C47, C48,C49,C50,C51,C52,	2	0.45	0.45	3.658	1.162652	cum	
5	C37,C41,	2	0.45	0.6	3.658	1.97532	cum	
6	C46	1	0.23	0.6	3.658	0.504804	cum	

Quantity sheet 5

Sr.No.4	CONCRETE FOR COLUMN							
A	Level- From Four floor slab Top to slab Top							
	PERTICULERS	Nos	B	L	H	Qty.	Un	Remark
1	C8,C10,C16,C17,C61 C62,C76,C78	8	0.3	0.75	3.658	6.5844	cum	
2	C2,C3,C4,C5,C6,C11, C35,C43,	7	0.38	0.75	3.658	7.29771	cum	
3	C9,C63,C64,C65,C66 C67,C68	7	0.23	0.45	3.658	2.650221	cum	
4	NO	0	0.45	0.45	3.658	0	cum	
5	NO	0	0.45	0.6	3.658	0	cum	
6	C77	1	0.23	0.6	3.658	0.504804	cum	
					Total	17.03714	cum	
B	FROM LEVEL Thirdfloor slab Top TO STILT FOURTH FLOOR TOP							
G	HEADROOM SLAB TOP TO WATER TANK TOP							
1	C21, C22, C23, C31	4	0.23	0.3	2.6	0.7176	cum	
					TOTAL	26.8904	cum	

5	LIFT WALL- FromFooting Top to M/c Floor Slab Bottom							
	SW1	2	1.8	0.15	22.3	12.042		2.6+3+(3* 4) +4.7= 22.3
	SW2	2	2	0.15	22.3	13.38		
	Deduct					0		
	Door	-6	1.2	0.15	2.3	-2.484		
					Total	22.938	cum	

Quantity sheet 6								
Sr.No.4	CONCRETE FOR COLUMN							
A	Level- From Four floor slab Top to slab Top							
	PERTICULERS	Nos	B	L	H	Qty.	Un	Remark
1	C8,C10,C16,C17,C61 C62,C76,C78 C2,C3,C4,C5,C6,C11, C35,C43, C9,C63,C64,C65,C66 C67,C68 NO NO C77	8	0.3	0.75	3.658	6.5844	cum	
2		7	0.38	0.75	3.658	7.29771	cum	
3		7	0.23	0.45	3.658	2.650221	cum	
4		0	0.45	0.45	3.658	0	cum	
5		0	0.45	0.6	3.658	0	cum	
6		1	0.23	0.6	3.658	0.504804	cum	
					Total	17.03714	cum	
B	FROM LEVEL Thirdfloor slab Top TO STILT FOURTH FLOOR TOP							
G	HEADROOM SLAB TOP TO WATER TANK TOP							
1	C21, C22, C23, C31	4	0.23	0.3	2.6	0.7176	cum	
					TOTAL	26.8904	cum	

5	LIFT WALL- FromFooting Top to M/c Floor Slab Bottom							
	SW1	2	1.8	0.15	22.3	12.042		2.6+3+(3* 4) +4.7= 22.3
	SW2	2	2	0.15	22.3	13.38		
	Deduct					0		
	Door	-6	1.2	0.15	2.3	-2.484		
					Total	22.938	cum	
					Net Total For Columns	285.368	cum	

QUANTITY SHEET 4								
Sr.No.								
6	CONCRETE FOR RCC BEAMS							
	Perticulars	Nos	L	B	H	Qty.	Un	Remarks
A	Plinth beams							
1	B1,B7,B13,B22, B25	5	5.512	0.3	0.6	4.96	cum	
2	B2,B8, B14	3	8.267	0.3	0.6	4.46	cum	
3	B3,B9, B15	3	5.409	0.3	0.6	2.92	cum	
4	B4,B10, B16	3	5.384	0.48	0.48	3.72	cum	
5	B5,B11	2	3.925	0.3	0.6	1.41	cum	
6	B6,B12	2	4.09	0.3	0.6	1.47	cum	

7	B17	1	7.6	0.3	0.6	1.37	cum	
8	B19,B117	2	1.853	0.3	0.6	0.67	cum	
9	B20,B24	2	3.807	0.3	0.6	1.37	cum	
10	B21,B23, B32	3	5.004	0.3	0.6	2.70	cum	
11	B26,B118	2	2.603	0.3	0.6	0.94	cum	
12	B27,B28,B29,B3 0,B31,B120,B12 1,B122,B123	9	3.81	0.3	0.48	4.94	cum	
13	B33,B34,B37,B4 5,B46, B47	6	2.768	0.3	0.6	2.99	cum	
14	B35,B36,B38,B3 9,B47, B48,B50,B51,B5 2,B53,	10	4.901	0.3	0.6	8.82	cum	
15	B40	1	9	0.3	0.6	1.62	cum	
16	B44,B43	2	2.185	0.3	0.38	0.50	cum	
17	B54,B62,B70,B7 6,B81, B82,B87,B90,B1 07	9	4.191	0.3	0.75	8.49	cum	
18	B55,B56,B64,B7 3,B95, B102,B108,B11 6	8	3.633	0.3	0.6	5.23	cum	
19	B57,B65	2	5.587	0.3	0.6	2.01	cum	
20	B59,B112	2	3.048	0.45	0.45	1.23	cum	
21	B60	1	4.648	0.3	0.75	1.05	cum	
22	B61,B69,B72,B7 8,B80, B84,B86,B92,B9 9,B114	20	3.81	0.3	0.6	13.72	cum	

23	B67,B71,B77,B79,B83, B85,B88,B91,B98,B113	20	3.81	0.3	0.6	13.72	cum	
24	B79,B74,B75,B96,B103, B104,B110	7	3.886	0.3	0.38	3.10	cum	
25	B93,B100,B105	3	1.692	0.3	0.6	0.91	cum	
26	B58,B63,B66,B109,B111	5	2.414	0.3	0.6	2.17	cum	
27	B110,B115	2	6.679	0.3	0.75	3.01	cum	
					TOTAL	99.50	cum	
B	Ground Floor Beab							
1	B1,B7,B13,B22, B25	5	5.512	0.3	0.6	4.96	cum	
2	B2,B8, B14	3	8.267	0.3	0.6	4.46	cum	
3	B3,B9, B15	3	5.409	0.3	0.6	2.92	cum	
4	B4,B10, B16	3	5.384	0.48	0.48	3.72	cum	
5	B5,B11	2	3.925	0.3	0.6	1.41	cum	
6	B6,B12	2	4.09	0.3	0.6	1.47	cum	
7	B17	1	7.6	0.3	0.6	1.37	cum	
8	B19,B117	2	1.853	0.3	0.6	0.67	cum	
9	B20,B24	2	3.807	0.3	0.6	1.37	cum	
10	B21,B23, B32	3	5.004	0.3	0.6	2.70	cum	
11	B26,B118	2	2.603	0.3	0.6	0.94	cum	
12	B27,B28,B29,B30,B31,B120,B121,B122,B123	9	3.81	0.3	0.48	4.94	cum	
13	B33,B34,B37,B45,B46, B47	6	2.768	0.3	0.6	2.99	cum	

14	B35,B36,B38,B3 9,B47, B48,B50,B51,B5 2,B53,	10	4.901	0.3	0.6	8.82	cum	
15	B40	1	9	0.3	0.6	1.62	cum	
16	B44,B43	2	2.185	0.3	0.38	0.50	cum	
17	B54,B62,B70,B7 6,B81, B82,B87,B90,B1 07	9	4.191	0.3	0.75	8.49	cum	
18	B55,B56,B64,B7 3,B95, B102,B108,B11 6	8	3.633	0.3	0.6	5.23	cum	
19	B57,B65	2	5.587	0.3	0.6	2.01	cum	

20	B59,B112	2	3.048	0.45	0.45	1.23	cum	
21	B60	1	4.648	0.3	0.75	1.05	cum	
22	B61,B69,B72,B7 8,B80, B84,B86,B92,B9 9,B114							
23	B67,B71,B77,B7 9,B83, B85,B88,B91,B9 8,B113	20	3.81	0.3	0.6	13.72	cum	
24	B79,B74,B75,B9 6,B103, B104,B110	7	3.886	0.3	0.38	3.10	cum	
25	B93,B100,B105	3	1.692	0.3	0.6	0.91	cum	
26	B58,B63,B66,B1 09,B111	5	2.414	0.3	0.6	2.17	cum	
27	B110,B115	2	6.679	0.3	0.75	3.01	cum	
				TOTAL	85.78	cum		
	FOR FIRST FLOOR					85.78	cum	
	FOR SECOND FLOOR					85.78	cum	

	FOR THIRD FLOOR					85.78	cum	
	FOR FOURTH FLOOR					85.78	cum	
					TOTAL	528.42	cum	
	HEADROOM BEAM AND WATER TANK BEAM							
		HB-1	1	4.77	0.3	0.38	0.54	cum
		HB-2	1	4.77	0.3	0.38	0.54	cum
		HB-3	1	2.14	0.3	0.38	0.24	cum
		HB-4	1	2.14	0.3	0.38	0.24	cum
		WTB1	1	5.6	0.3	0.6	1.01	cum
		WTB2	1	5.6	0.3	0.6	1.01	cum
		WTB3	1	4.2	0.3	0.6	0.76	cum
		WTB4	1	4.2	0.3	0.6	0.76	cum
						Total	5.10	cum
					NET TOTAL		533.52	cum

Qunty Sheet 8							
Sr.No.	Particulars	Nos	L	B	H	Qty.	Un
11	SHEAR WALL						
A	BASE SLAB						
	S-2	1	2	1.5	0.1	0.30	cum
B	TOP SLAB						
	S-3	1	2	1.5	0.1	0.30	cum
C	Side Wall parking floor						
	SW-1	1	2.3	0.15	2.7	0.93	cum
	SW-2,SW-3	2	1.8	0.15	2.7	1.46	cum
D	side Wall First floor						
	SW-1	1	2.3	0.15	3	1.04	cum
	SW-2,SW-3	2	1.8	0.15	3	1.62	cum
E	Side wall Second Floor						
	SW-1	1	2.3	0.15	3	1.04	cum
	SW-2,SW-3	2	1.8	0.15	3	1.62	cum
F	Side wall third floor						
	SW-1	1	2.3	0.15	3	1.04	cum
	SW-2,SW-3	2	1.8	0.15	3	1.62	cum
G	Side wall fourth floor						
	SW-1	1	2.3	0.15	3	1.04	cum
	SW-2,SW-3	2	1.8	0.15	3	1.62	cum
H	Bottom beam						
	LB-1,LB-2	2	2.3	0.23	0.3	0.32	cum
	LB-3,LB-4	2	1.5	0.23	0.3	0.21	cum
I	TOP BEAM						
	LB-5, LB-6	2	2.3	0.23	0.3	0.32	cum
	LB-7, LB-8	2	1.5	0.23	0.3	0.21	cum
					TOTAL	16.28	cum

1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(Kg)	1279.974383
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 4 To Level 5		3.687				
1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(Kg)	1279.974383
Sr. No.	Level	Description	Diameter	Nos.	L(m)	Wt./m	Qty.
	Level 5To Level 6		3.687				
1		Vertical Bars 1 (Column Bars)	12	48	4.287	0.888889	182.912
2		Vertical Bars 2	12	122	4.287	0.888889	464.9013333
3		Master Links	8	412.944	2.71	0.405	453.2266872
4		Other links	8	892.552	0.495	0.405	178.9343622
						Total(Kg)	1279.974383
					NET TOTAL (Kg)		8450.66047

BRICKWORK ESTIMATION SHEETS :

Sr. No.	Item Description	No.	Length (m)	Width (m)	Height (m)	Quantity	Unit
1	Brickwork masonry in superstructure						
	For 305 mm thick cavity wall brick masonry C.L. =61.86	1	61.87	0.20	3.5	44.17	cu m
	Deduction						
	column	-31	0.38	0.75	3.5	-30.92	cu m
	window W 1	-4	1.52	0.20	1.52	-1.89	cu m
	window W 2	-14	1.21	0.20	1.52	-5.25	cu m
	window W 3	-7	0.91	0.20	1.52	-1.98	cu m
	window W 6	-2	1.52	0.20	1.82	-1.13	cu m
	Door D6	-1	3.04	0.20	2.74	-1.70	cu m
	Door D7	-1	1.89	0.20	2.43	-0.94	cu m
		Total quantity 305 mm thick wall				0.37	cu m
	For 102 mm thick wall brick masonry						
	long wall 1	5	5.37	0.10	3.5	9.59	cu m
	long wall 2	1	26.45	0.10	3.5	9.44	cu m
	long wall 3	1	22.48	0.10	3.5	8.02	cu m
	short wall 1	7	4.26	0.10	3.5	10.65	cu m
	short wall 2	1	3.99	0.10	3.5	1.42	cu m
	short wall 3	1	5.51	0.10	3.5	1.97	cu m
	short wall 4	2	1.82	0.10	3.5	1.30	cu m
	short wall 5	4	7.92	0.10	3.5	11.31	cu m
	short wall 6	2	1.46	0.10	3.5	1.04	cu m

	short wall 7	1	5.66	0.10	3.5	2.02	cu m
	washroom wall 1	2	3.31	0.10	2.43	1.64	cu m
	washroom wall 2	2	1.72	0.10	2.43	0.85	cu m
	washroom wall 3	3	1.21	0.10	2.43	0.90	cu m
	washroom wall 4	2	1.15	0.10	2.43	0.57	cu m
	washroom wall 5	1	0.71	0.10	2.43	0.18	cu m
	washroom wall 6	1	2.39	0.10	2.43	0.59	cu m
	washroom wall 7	4	0.97	0.10	2.43	0.96	cu m
	washroom wall 8	7	1.39	0.10	2.43	2.41	cu m
	Deduction						
	column	-23	0.30	0.75	3.5	-18.11	cu m
	window W1	-4	1.52	0.10	1.524	-0.95	cu m
	window W2	-5	1.22	0.10	1.524	-0.95	cu m
	Door D1	-12	1.22	0.10	2.438	-3.64	cu m
	Door D2	-2	1.52	0.10	2.438	-0.76	cu m
	Door D3	-2	1.07	0.10	2.438	-0.53	cu m
	Door D4	-7	0.91	0.10	1.828	-1.19	cu m
	Door D5	-7	0.76	0.10	1.828	-0.99	cu m
		Total quantity 102 mm thick wall				71.96	cu m

2	Inside plaster						
	Inside rooms (100mm skirting reduction)						
	long wall 1	2	31.60		3.4	214.85	sq m

	long wall 2	4	5.27		3.4	71.67	sq m
	long wall 3	2	24.81		3.4	168.73	sq m
	short wall 1	1	56.40		3.4	191.76	sq m
	short wall 2	1	19.00		3.4	64.60	sq m
	short wall 3	8	4.26		3.4	115.87	sq m
	washroom 1	1	64.06		3.4	217.80	sq m
	washroom 2	1	39.57		3.4	134.54	sq m
	washroom 3	1	9.80		3.4	33.32	sq m
	service room	1	7.28		3.4	24.75	sq m
	open space	1	131.24		3.4	446.22	sq m
	Deduction						
	window W 1	-4	1.52		1.524	-9.29	sq m
	window W 2	-9.5	1.22		1.524	-17.65	sq m
	window W 3	-3.5	0.91		1.524	-4.88	sq m
	window W 6	-1	1.52		1.828	-2.79	sq m
	Door D1	-12	1.22		2.438	-35.66	sq m
	Door D2	-2	1.52		2.438	-7.43	sq m
	Door D3	-1	1.07		2.438	-2.60	sq m
	Door D4	-1	0.91		1.828	-1.67	sq m
	Door D5	-6.5	0.76		1.828	-9.04	sq m
	Door D6	-1	3.05		2.743	-8.36	sq m
	Door D7	-1	1.90		2.438	-4.64	sq m
	Addition						
	D2 soffit	2	1.52	0.10		0.31	sq m

	D2 jamb	4		0.10	2.438	0.99	sq m
	D6 soffit	1	3.05	0.10		0.31	sq m
	D6 jamb	2		0.10	2.743	0.56	sq m
	D7 soofit	1	1.90	0.10		0.19	sq m
	D7 jamb	2		0.10	2.438	0.50	sq m
			Total quantity inside plaster		1582.97	sq m	
3	Outside plaster						
	Front side	1	29.87		3.5	104.55	sq m
	Deduction						
	Door D6	-1	3.05		2.743	-8.36	sq m
	window W 6	-1	1.52		1.828	-2.79	sq m
	Addition						
	Door D6 soffit	1	3.05	0.31		0.93	sq m
	Door D6 jamb	2		0.31	2.743	1.67	sq m
	Back side	1	29.87		3.5	104.55	sq m
	Deduction						

	window W 1	-1	1.52		1.524	-2.32	sq m
	window W 3	-2.5	0.91		1.524	-3.48	sq m
	Left side	1	32.61		3.5	114.14	sq m
	Deduction						
	Door D7	1	1.90		2.438	4.64	sq m

	Addition						
	Door D7 soffit	1	1.90	0.31		0.58	sq m
	Door D7 jamb	2		0.31	2.438	1.49	sq m
	window W2	-4	1.22		1.524	-7.43	sq m
	window W3	-1	0.91		1.524	-1.39	sq m
	Right side	1	32.61		3.5	114.14	sq m
	Deduction						
	Window W1	-1	1.52		1.524	-2.32	sq m
	Window W2	-3	1.22		1.524	-5.57	sq m
			Total quantity outside plaster			413.00	sq m
4	Ceiling plaster						
	Inside rooms						
	type 1	1	5.27	2.98		15.70	sq m
	type 2	1	7.98	7.92		63.20	sq m
	type 3	1	5.21	7.86		40.95	sq m
	type 4	1	5.33	7.92		42.21	sq m
	type 5	1	5.27	5.51		29.04	sq m
	type 6	1	5.27	3.99		21.03	sq m
	type 7	1	4.20	4.26		17.89	sq m
	type 8	3	4.15	4.26		53.04	sq m
	washroom 1	2	3.38	5.66		38.26	sq m
	washroom 2	2	2.56	4.26		21.81	sq m
	washroom 3	1	3.08	1.82		5.61	sq m
	service room	1	1.82	1.82		3.31	sq m

	corridor space 1	1	26.64	4.15		110.64	sq m
	corridor spce 2	1	26.64	4.28		114.02	sq m
	corridor space 3	1	4.36	8.53		37.17	sq m
	corridor space 4	1	6.44	8.53		54.99	sq m
	corridor space 5	1	1.91	4.36		8.31	sq m
	stair case area	1	2.44	5.37		13.10	sq m
	Total quantity ceiling plaster					690.28	sq m
		Total plaster quantity					2735.78 sq m
5	In side paint					0.00	
	Inside rooms						
	long wall 1	2	31.60		3.4	214.85	sq m
	long wall 2	4	5.27		3.4	71.67	sq m
	long wall 3	2	24.81		3.4	168.73	sq m
	short wall 1	1	56.40		3.4	191.76	sq m
	short wall 2	1	19.00		3.4	64.60	sq m
	short wall 3	8	4.26		3.4	115.87	sq m

	washroom 1	1	64.06		3.4	217.80	sq m
	washroom 2	1	39.57		3.4	134.54	sq m
	washroom 3	1	9.80		3.4	33.32	sq m
	service room	1	7.28		3.4	24.75	sq m
	open space	1	131.24		3.4	446.22	sq m
	Deduction						
	window W1	-4	1.52		1.524	-9.29	sq m

	window W 2	-9.5	1.22		1.524	-17.65	sq m
	window W 3	-3.5	0.91		1.524	-4.88	sq m
	window W 6	-1	1.52		1.828	-2.79	sq m
	Door D1	-12	1.22		2.438	-35.66	sq m
	Door D2	-2	1.52		2.438	-7.43	sq m
	Door D3	-1	1.07		2.438	-2.60	sq m
	Door D4	-1	0.91		1.828	-1.67	sq m
	Door D5	-6.5	0.76		1.828	-9.04	sq m
	Door D6	-1	3.05		2.743	-8.36	sq m
	Door D7	-1	1.90		2.438	-4.64	sq m
6	Outside paint						
	Front side	1	29.87		3.5	104.55	sq m
	Deduction						
	Door D6	-1	3.05		2.743	-8.36	sq m
	window W 6	-1	1.52		1.828	-2.79	sq m
	Addition						
	Door D6 soffit	1	3.05	0.31		0.93	sq m
	Door D6 jamb	2		0.31	2.743	1.67	sq m
	Back side	1	29.87		3.5	104.55	sq m
	Deduction						
	window W 1	-1	1.52		1.524	-2.32	sq m
	window W 3	-2.5	0.91		1.524	-3.48	sq m
	Left side	1	32.61		3.5	114.14	sq m

	Deduction						
	Door D7	1	1.90		2.438	4.64	sq m
	Addition						
	Door D7 soffit	1	1.90	0.31		0.58	sq m
	Door D7 jamb	2		0.31	2.438	1.49	sq m
	window W2	-4	1.22		1.524	-7.43	sq m
	window W3	-1	0.91		1.524	-1.39	sq m
	Right side	1	32.61		3.5	114.14	sq m
	Deduction						
	Window W1	-1	1.52		1.524	-2.32	sq m
	Window W2	-3	1.22		1.524	-5.57	sq m
7	ceiling paint						
	Inside rooms						
	type 1	1	5.27	2.98		15.70	sq m
	type 2	1	7.98	7.92		63.20	sq m

	type 3	1	5.21	7.86		40.95	sq m
	type 4	1	5.33	7.92		42.21	sq m
	type 5	1	5.27	5.51		29.04	sq m
	type 6	1	5.27	3.99		21.03	sq m
	type 7	1	4.20	4.26		17.89	sq m
	type 8	3	4.15	4.26		53.04	sq m
	washroom 1	2	3.38	5.66		38.26	sq m
	washroom 2	2	2.56	4.26		21.81	sq m

	washroom 3	1	3.08	1.82		5.61	sq m
	service room	1	1.82	1.82		3.31	sq m
	corridor space 1	1	26.64	4.15		110.64	sq m
	corridor spce 2	1	26.64	4.28		114.02	sq m
	corridor space 3	1	4.36	8.53		37.17	sq m
	corridor space 4	1	6.44	8.53		54.99	sq m
	corridor space 5	1	1.91	4.36		8.31	sq m
	stair case area	1	2.44	5.37		13.10	sq m
			Total paint quantity			2683.39	sq m
8	Flooring						
	Inside rooms						
	type 1	1	5.27	2.98		15.70	sq m
	type 2	1	7.98	7.92		63.20	sq m
	type 3	1	5.21	7.86		40.95	sq m
	type 4	1	5.33	7.92		42.21	sq m
	type 5	1	5.27	5.51		29.04	sq m
	type 6	1	5.27	3.99		21.03	sq m
	type 7	1	4.20	4.26		17.89	sq m
	type 8	3	4.15	4.26		53.04	sq m
	washroom 1	2	3.38	5.66		38.26	sq m
	washroom 2	2	2.56	4.26		21.81	sq m
	washroom 3	1	3.08	1.82		5.61	sq m
	service room	1	1.82	1.82		3.31	sq m
	corridor space 1	1	26.64	4.15		110.64	sq m
	corridor spce 2	1	26.64	4.28		114.02	sq m

	corridor space 3	1	4.36	8.53		37.17	sq m
	corridor space 4	1	6.44	8.53		54.99	sq m
	corridor space 5	1	1.91	4.36		8.31	sq m
	stair case area	1	2.44	5.37		13.10	sq m
	skirting addition						
	Inside rooms						
	long wall 1	2	31.60		0.15	9.48	sq m
	long wall 2	4	5.27		0.15	3.16	sq m
	long wall 3	2	24.81		0.15	7.44	sq m
	short wall 1	1	56.40		0.15	8.46	sq m
	short wall 2	1	19.00		0.15	2.85	sq m
	short wall 3	8	4.26		0.15	5.11	sq m
	washroom 1	1	64.06		0.15	9.61	sq m
	washroom 2	1	39.57		0.15	5.94	sq m
	washroom 3	1	9.80		0.15	1.47	sq m
	service room	1	7.28		0.15	1.09	sq m

	open space	1	131.24		0.15	19.69	sq m
			Total flooring quantity			764.58	sq m
	FOR SECOND FLOOR						
	BRICK WORK FOR 305MM WALL					0.37	sq m
	102mm WALL					79.96	sq m
	Inside plaster					1582.97	sq m
	out side Plaster					413	sq m
	Ceiling Plaster					690.18	sq m

	Total plaster				2735.78	sq m
	Total paint				2683.39	sq m
	Total flooring				764.58	sq m
	FOR THIRD FLOOR					
	BRICK WORK FOR 305MM WALL				0.37	sq m
	102mm WALL				79.96	sq m
	Inside plaster				1582.97	sq m
	out side Plaster				413	sq m
	Ceiling Plaster				690.18	sq m
	Total plaster				2735.78	sq m
	Total paint				2683.39	sq m
	Total flooring				764.58	sq m
	FOR FOURTH FLOOR				0	
	BRICK WORK FOR 305MM WALL				0.37	sq m
	102mm WALL				79.96	sq m
	Inside plaster				1582.97	sq m
	out side Plaster				413	sq m
	Ceiling Plaster				690.18	sq m
	Total plaster				2735.78	sq m
	Total paint				2683.39	sq m
	Total flooring				764.58	sq m
	FOR TOP FLOOR				0	
	BRICK WORK FOR 305MM WALL				0.37	sq m
	102mm WALL				79.96	sq m
	Inside plaster				1582.97	sq m

	out side Plaster					413	sq m
	Ceiling Plaster					690.18	sq m
	Total plaster					2735.78	sq m
	Total paint					2683.39	sq m
	Total flooring					764.58	sq m

6 CONCLUSION

The rapid development of information technology has brought several innovations to the field of Civil Engineering. In this project advanced concrete design software STAAD RCDC was used for the design of footing and slab which is otherwise not possible in STAAD.Pro V8i SS6. STAAD RCDC also provides the reinforcement detail diagrams as well as schedules which makes the work very simpler and efficient.

In this project, the walls of the lift are designed as shear walls. The creating of the panels or surface for shear wall and assigning of the surface properties was done in STAAD.Pro whereas the design of shear wall and reinforcement drawings was done in STAAD RCDC.

This project consists of analysis and design of student activity center building with all possible cases of the loadings using STAAD.Pro. Deflection of various members can be checked under the given loading combinations. Further in case of rectification it is simple to change the values at the place where errors occurred and the obtained results are generated in the output. STAAD.Pro software provides us a fast, efficient, easy to use and accurate platform for analyzing and designing structures.

AutoCAD is a computer-aided software drafting program. It is used for a number of applications like creating architectural drawing , structural drawing for building. AutoCAD made the drafting process easy, fast and efficient.

7 REFERENCES

- 1.) IS 456:2000
- 2.) IS 13920:1993 is considered very important as the ductile detailing gives the amount of reinforcement required and the alignment of bars. It gives the ductile detailing of shear walls as per clause 9,where
 - 9.1: gives general requirement
 - 9.2: shear strength
 - 9.3: gives flexural strength
 - 9.6: gives opening in shear walls
- 3.) IS 1893: criteria of earthquake resistant buildings part 3 page 23,clause 4.2 gives the estimation of earthquake loads .
- 4.) [\(1\) \(PDF\) Earthquake-Resistant Design of Structures, Second Edition \[Shashikant K. Duggal\] |](#)
[ওর্কস:লাইব্রেরি - Academia.edu](#) Earthquake-Resistant Design of Structures Second Edition
Shashikant K. Duggal
- 5.) RCC design by B.C. Punmia
- 6.) Estimation and costing in civil engineering by B.N. Dutta