

## Analysis and Design of a Commercial Building

Harsitha M N<sup>1</sup>, Binod Kumar Das<sup>2</sup>, Rajiv Kumar Chaudhary<sup>3</sup>, Saurabh Singh<sup>4</sup>, Shivam Shivhare<sup>5</sup>

<sup>1</sup>Assistant Professor, Department of Civil engineering, JSS Academy of technical education, Bangalore, Karnataka, India

<sup>2</sup>student, final year B E Civil engineering, JSS Academy of technical education, Bangalore, Karnataka, India

<sup>3</sup>student, final year B E Civil engineering, JSS Academy of technical education, Bangalore, Karnataka, India

<sup>4</sup>student, final year B E Civil engineering, JSS Academy of technical education, Bangalore, Karnataka, India

<sup>5</sup>student, final year B E Civil engineering, JSS Academy of technical education, Bangalore, Karnataka, India

\*\*\*

**Abstract** -The primary objective of this project is to gain sufficient knowledge in planning, analysis, and design of building. Our project deals with the **Analysis and design of a commercial building was done in ETABS(2016)**. It is a reinforced concrete framed structure consisting of G+4. And also we provide a two wheeler & car parking facility in the ground floor. IS 456:2000 codes is the basic code for general construction in concrete structures, hence all the structural members are designed using limit state method in accordance with the IS 456:2000 code and design aids. The planning of any building in India will be recognized by National Building Code (NBC), hence the building is planned in accordance with the National Building Code of India. The commercial building has proper ventilation, it is provided with sufficient Exits, Water supply and electrification are also provided. The ceiling height is provided as 1m, for assembly buildings as mentioned Building Code (NBC). This project also enables in establishing in sufficient water supply, electric power supply, proper sanitary system, and rain water harvesting facility are given.

**Key Words:** Analysis, design, shear wall

### 1. INTRODUCTION

#### 1.1 General

The main objective of our project is to know the various design aspects like planning, analysis and design etc. We have planned to design a Commercial Building structure consisting of G+4 Floors. The planning is done as per the requirements and regulations given by the National Building Code (NBC).

#### 1.1.1 Practical considerations

Besides all the fundamentals of planning discussed, following practical points should be additionally considered:

- 1) The elements of the building should be strong and capable to withstand the likely adverse effects of natural agencies.
- 2) Strength, stability, convenience and comfort of the occupants should be the first consideration in planning.

- 3) Elevation should be simple but attractive. The number of doors and windows provided should be less for a commercial building.
- 4) The provisions of built in furniture at proper places are useful from the point of view of utility.
- 5) Since the plan is for a commercial building, the car parking must be secured with required space than usual.

#### 1.1.2 Planning considerations

The plan and detailing was drawn using Auto CAD. The proposed area of the car parking is 893 Sq.m. The shape of the building is rectangular in plan. The building consists of G+4. The parking space is provided around the building. The floor height of the building is 3 m. The height of the parapet wall is 1m. The staircase is provided including lift with enough safe.

#### 1.2 Plan of the building

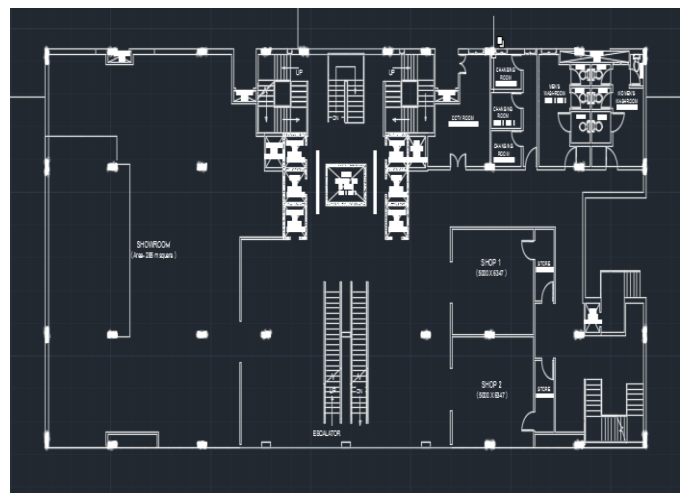


Fig 1. Plan of the Building

## 2.ETABS MODELLING AND ANALYSIS

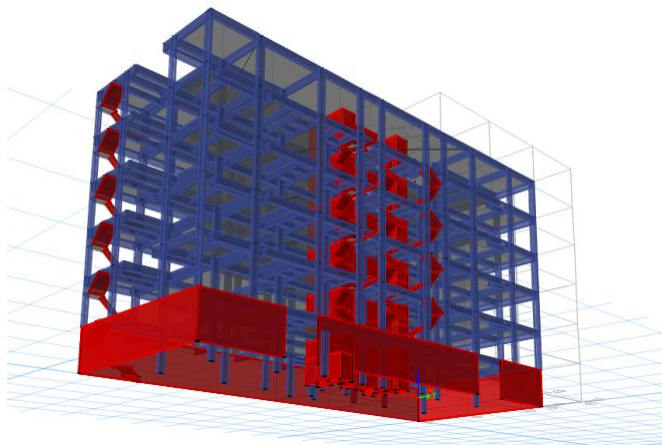


Fig 2. ETABS model of building

### 2.1 ANALYSIS

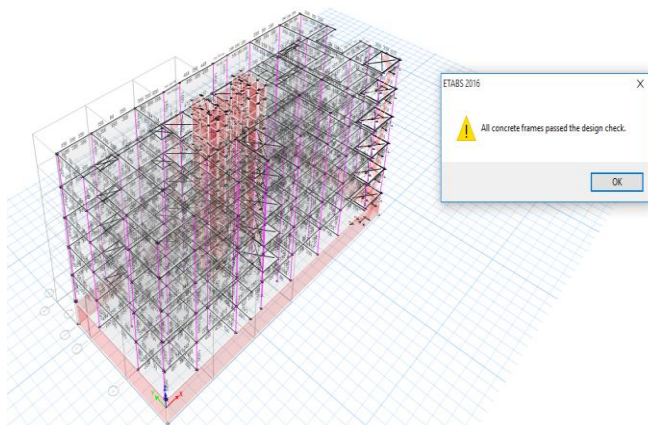


Fig 3. Shows all Members are Safe

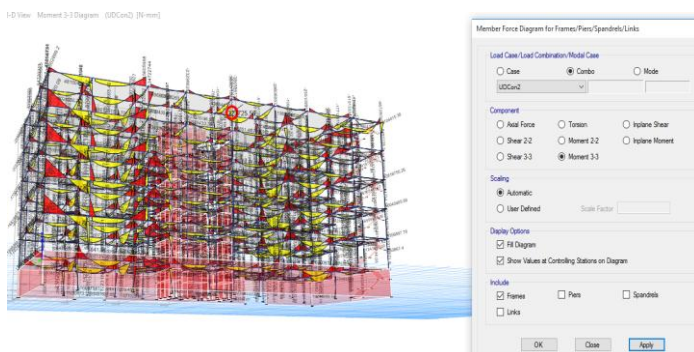


Fig 4. Moment 3-3 Diagram

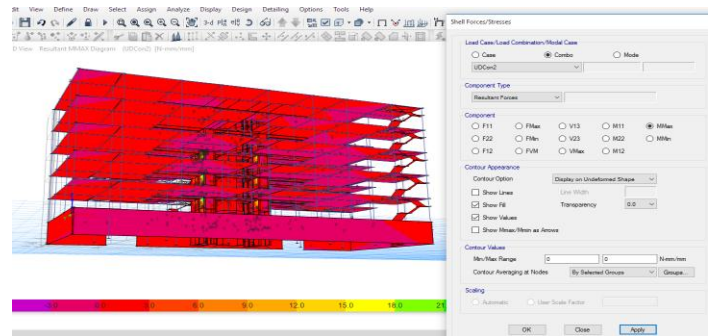


Fig5. MAX Stress Diagram

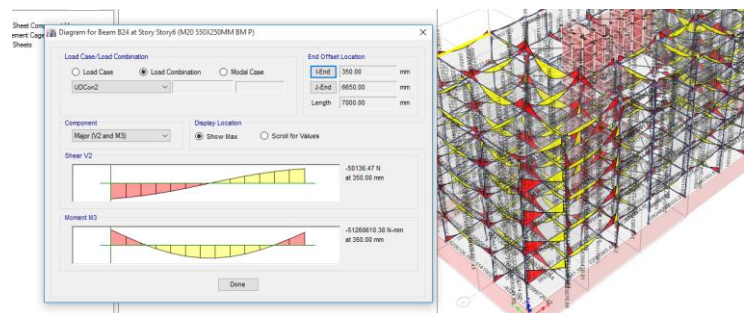


Fig6. Shear force and Bending Moment Diagram

## 3. DESIGN OF SLABS, BEAMS, COLUMN, FOOTING AND STAIRCASE

### 3.1 DESIGN OF SLAB

Slab dimension: 5.55m x 5.0m

Concrete grade: M30

Steel used: Fe415

Edge condition: Interior panel

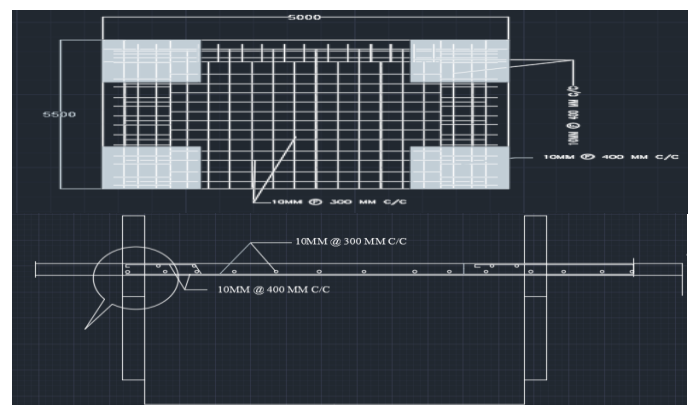


Fig7. Reinforcement details of two way lab

### 3.2 DESIGN OF BEAM

Sectional area: 250mm x 750mm  
 Concrete grade: M20  
 Steel used: Fe415

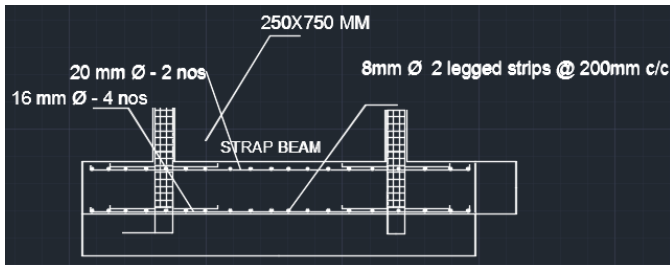


Fig 8. Reinforcement details of beam

### 3.3 DESIGN OF COLUMN

Dimension: 250mm x 750mm  
 Concrete grade: M25  
 Steel used: Fe415

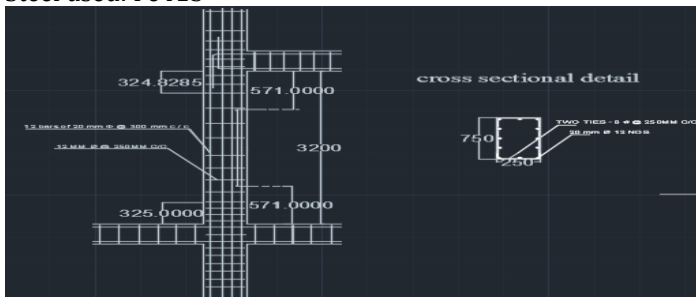


Fig 9. Reinforcement details of column

### 3.4 DESIGN OF FOOTING

Axial service load  $P = 1660$  KN  
 Size of the column = 750 mm x 250 mm  
 Safe bearing capacity of soil = 140 N/mm<sup>2</sup>  
 $f_{ck} = 20$  N/mm<sup>2</sup> and  $f_y = 415$  N/mm<sup>2</sup>

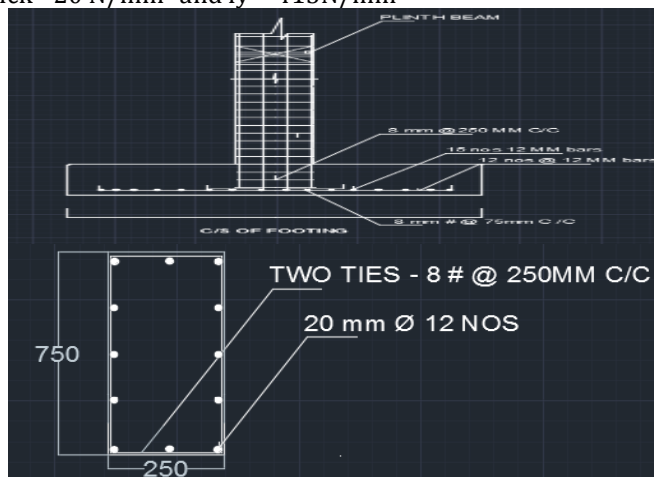


Fig 10 . Reinforcement details of Footing

### 3.5 DESIGN OF STAIRCASE

STAIRCASE TYPE= DOG LEGGED  
 Height of floor= 3.6m  
 Height of each flight= 1.8m  
 Flight width=1.85m  
 Rise=150mm  
 thread=300mm  
 No. of risers required= $1.8/0.15=12$  in each flight No. of thread in each flight= $12-1=11$   
 Width of landing= 1.85m

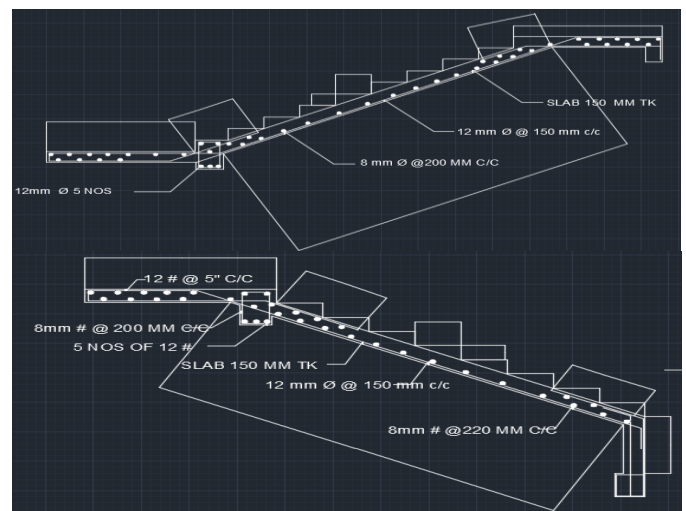


Fig 11 . Reinforcement details of stair case

### 4. CONCLUSION

In this project, PLANNING DESIGNING AND ANALYSING OF A COMMERCIAL BUILDING. We all the members of our team has learned to plan a building with referring to National Building Code of India -2005.

This bank building project has made us to learn Drawing and drafting the building plans using Auto cad software.

In this bank building project we learnt to create the models by giving nodes and property to the structural elements using analysis and also we learnt to the same structure with corresponding loads as given IS 875 part 1&2 using analysis.

This project is very useful in making us learn the design by referring to the IS 456:2000 for each slab and beam. SP: 16 codes alone are used for easier design of columns yet we learned to design the columns.

The important thing that we done was referring to a lot of books for designing and we are very much satisfied with exposing to field of design.

## 5. REFERENCES

- 1.Arul Manickam A.P (2004) 'Structural Engineering Pratheeba publishers.
- 2.Is 456: 2000 'Plain and Reinforced concrete – code of practice (Fifth revision).
- 3.SP 16 ' Design for reinforced concrete' to 456 1978
- 4.Krishna raju (2002) 'Design of reinforced concrete structures'
- 5.Murugan.M (2007) 'Structural Analysis' Samuthira Publications.
- 6.Varghese P.C (2002) 'Limit state Design of Reinforced concrete second Edition.
- 7.Vaidyanthan. R. Perumal. P (2005) 'Structural Analysis – Volume I' Laxmi Publications.
- 8.NBC –National building of India , Bureau of Indian Standards ,New Delhi.

## BIOGRAPHIES



**Harshitha M N**  
Assistant Professor  
Dept. of civil engineering  
JSS Academy of technical education  
Bangalore-60



**Rajiv Kumar Chaudhary**  
4<sup>th</sup> year student, civil engineering  
JSS Academy of technical education  
Bangalore-60



**Binod Kumar Das**  
4<sup>th</sup> year student, civil engineering  
JSS Academy of technical education  
Bangalore-60



**Saurabh Singh**  
4<sup>th</sup> year student, civil engineering  
JSS Academy of technical education  
Bangalore-60



**Shivam Shivhare**  
4<sup>th</sup> year student, civil engineering  
JSS Academy of technical education  
Bangalore-60