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ANALYSIS AND DESIGN OF A CANTEEN CUM GUEST HOUSE BUILDING FOR JIT CAMPUS, DAVANGERE

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Abstract - *Structural analysis is a branch which involves the determining the behavior of structure in order to predict the responses of real structure such as buildings, bridges, trusses, etc. under the improvement of expected loading and external environmental conditions during the service life of structure Computer software's are being used for the calculation of forces are like, bending moment, stress strain and deformation or deflection for a structural system. The software used in the present mark is ETABS which means Extended Three dimensional Analysis of Building Systems which is commonly used to analyze and design skyscrapers, parking garages, steel & concrete structures, low and high rise buildings, and portal framed structures. And it is also leading design software in present days used by many structural designers.The principles and objective of this project is to analyze and design the Canteen with guesthouse building by using ETABS software.*

Key Words: **Etabs, Stress, Strain, Shear Force, Bending Moment.**

1. INTRODUCTION

Due to concentration and increase of population in urban cities there, is a need to accommodate the influx in urban cities. Due to rapid increase of land cost and limited availability of land, construction of high rise buildings are taking part in our daily life.

The continuing economic prosperity and population increase in the urban areas point towards a future with increased activity in high rise construction of residential and office buildings. However, construction of high rise building can be economically attractive only if the structural engineers can have comprehensive understanding of the structural behaviors of various systems on one hand and the practical sense of the construction problems on the other.

1.1 ETABS

ETABS it means, **"Extended Three Dimensional Analysis of Building System".** Special purpose analysis and design program developed specially for building system. ETABS features an inventive and powerful graphical interface coupled with unmatched modeling. It works on the principle of finite element approach. Although quick and easy for simple structures, ETABS can also handle the largest and most complex building models, including a wide range of nonlinear behaviors necessary for performance based design.

1.2 OBJECTIVES

- To carry out a complete analysis and design of main structural elements of a canteen and guest house including slabs, beams, columns and foundations.
- To study the architectural problems in different geometrical structures and the solutions by ETABS using analysis and design results like ultimate load, ultimate moments etc.
- To design the building as per code IS 456-2000 and SP-16.
- Designing the components of the building by manual methods and compared with the software results.
- To design the economical section of the structure of G+2 building.

2. METHODOLOGY

STEPS OF MODELING IN ETABS

1. Units
2. Grids
3. Material property:
   a. Concrete
   b. Steel
4. Frame sections:
   a. Column
   b. Beam
   c. slab
   d. wall
5. Loadings:
   a. Dead load
   b. live load
   c. floor finishing
   d. wall load
6. Load combination:
   a. factored
   b. unfactored
7. Support condition:
   a. fixed } RCC
   b. hinged }
   c. pinned }
   d. Rolled } Steel8. Assigning load
9. Analysis
10. Designing

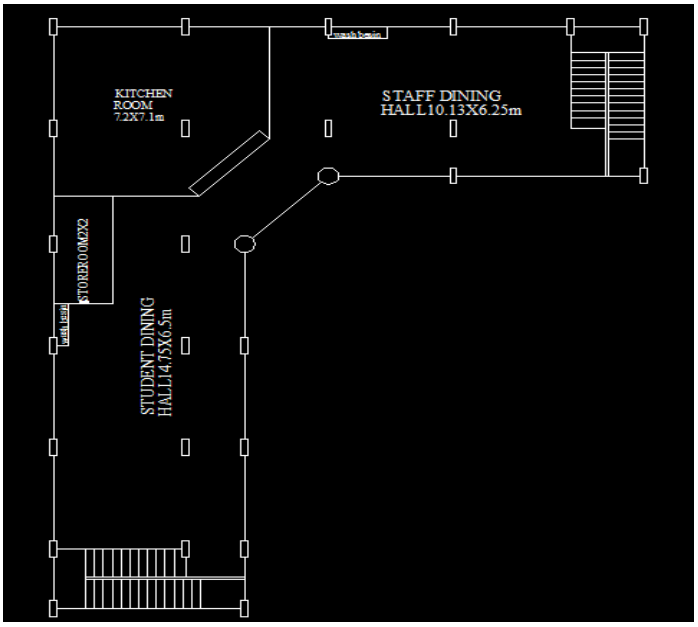

Fig -1: Plan of Ground Floor

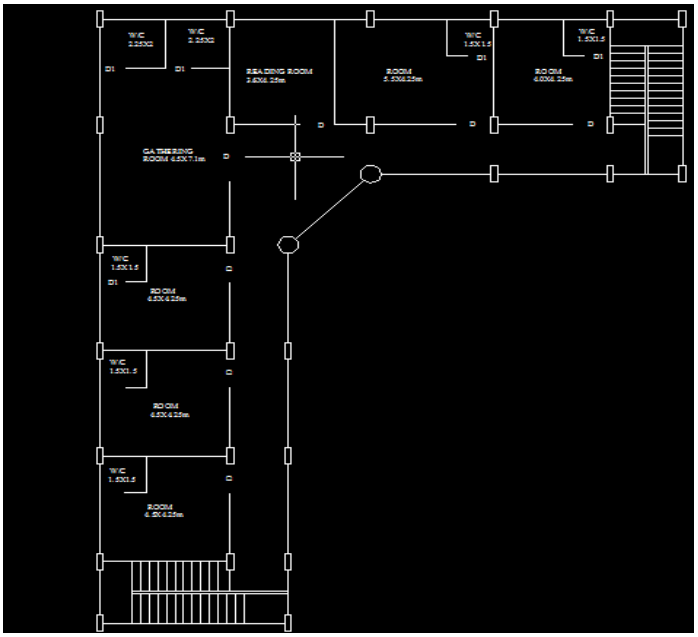

Fig -2: Plan of First and Second Floor

Table -1: Ground Floor Details

ROOM	SIZES (m)	No.
Staff dining hall	10.13x6.25	1
Student dining hall	14.75x6.5	1
Kitchen room	7.2x7.1	1
Store room	2x2	1

Table -2: First and Second Floor Details

Sl. No.	ROOMS	SIZES (m)	No.
1	Room 1	5.5x4.25	2
2	Room 2	4.0x4.25	2
3	Rooms	4.5x4.25	6
4	Gathering Room	9.1x9.5	1
5	Reading Room	3.6x4.5	2
6	Dining Hall	9.1x9.5	1
7	w/c	1.5x1.5	14

Statement of the project:

Silent feature: The design data shall be as fallows

1. Utility of building:
2. No.of story: (G+2)
3. Shape of the building: L-shape
4. No.of staircase: 2
5. Type of walls: Brick wall
6. Geometric details
   a) Ground floor: 3.6m
   b) Floor To Floor height (G1andG2): 3.1m
   c) Height of the plinth:
   d) Depth of the foundation: 1.5m
7. Materail details:
   a) Concrete grade: M_{30}
   b) Grade of steel: F_e415
   c) Bearing capacity of soil: 140Kn/m^2

The loads on the building are as follows:

- Dead Load:-

Dead load of the floor = 3.75 KN/m2

Dead load of walls on beam = 14.72 and 12.42KN/m2

- Live load:-

Live load on all the floors = 5KN/m2

3. RESULTS AND ANALYSIS

Shear force for the analysis part

Shear force and **bending moment** diagrams analytical tools used in conjunction with structural analysis to help perform structural design by determining the value of **shear force** and **bending moment** at a given of structural element such as a beam.

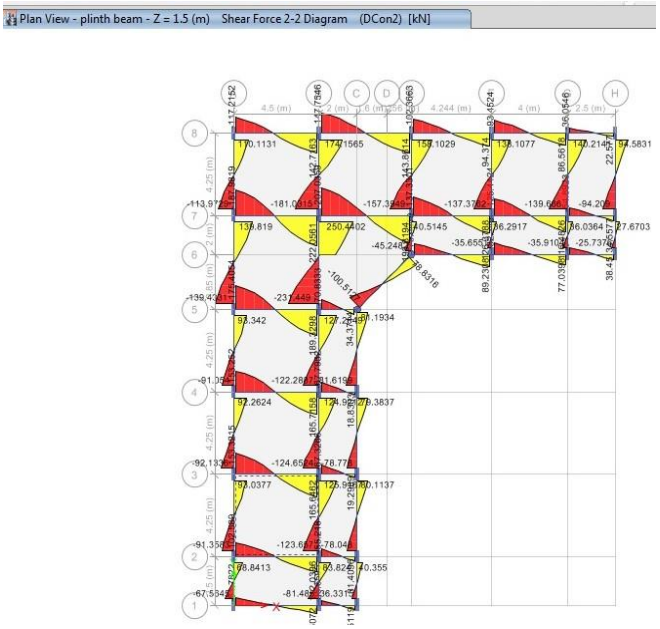

Fig -3: Shear force diagram for structure

The bending moment diagram for the indicates the bending moment resisted by the beam.

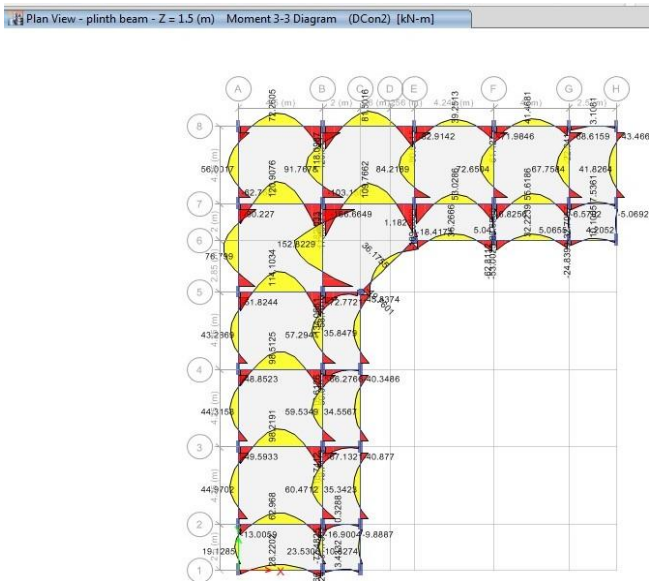

Fig -4: Bending moment diagram for structure

For area of longitudinal reinforcement, go to design menu in ETABS, concrete frame design and start design check

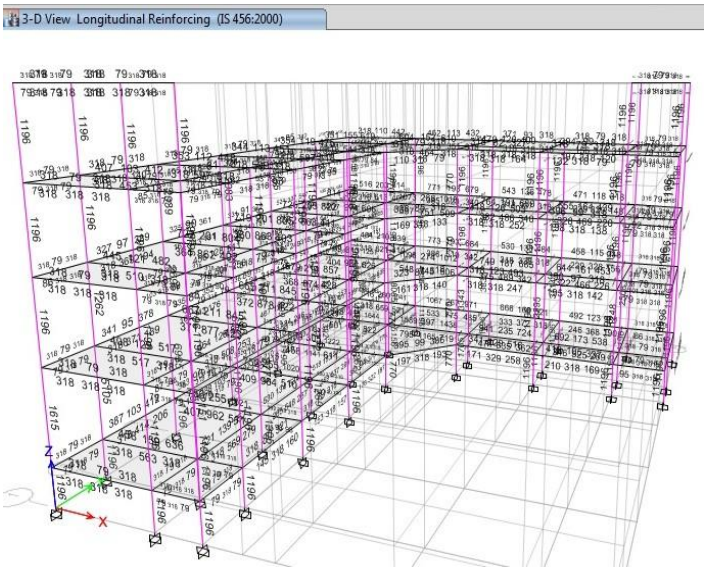

Fig -5: Longitudinal reinforcement of structure

4. DESIGNING DETAILS

Sl. No	Name of the component	Dimension in mm	Area of the steel (mm^2)	Reinforcement details
1	slab	Depth=150 Lx=4250 Ly=4500	Ast_x =391.69 Ast_y =392.29	10mm dia at 300mm c/c and 450mm c/c
2	Circular column	dia=350 Length=3100	Ast=5890.48	12 no. of 25mm dia bars
3	footing	Lx=3000 Ly=6000	Ast_x =514.90 Ast_y =1920.18	12mm dia at 140mm c/c 16mm dia at 100mm c/c
4	beam	B=300 D=500	Ast=2024.42	4 no. of 25mm dia bars
5	staircase	H=3100 Rise=150 Tread=300 Width=1250	Main ast=1569.2 Distrubution =336	16mm dia bars at 150 mm c/c 10mm dia bars at 230mm c/c

5. CONCLUSIONS

- By designing a new building for the JIT campus our group was able to accommodate the future growth of the college.
- The dead load, live load and floor finish loads obtained by ETABS are similar to the manually calculated values.

- The live load, dead load, and floor finish loads are referred from the IS 875-1987
- The various results like bending moment, shear force and deflection results are safe from manual calculation as well as software results.

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