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STRUCTURAL STUDY ON COMMERCIAL BUILDING DESIGNING AND IMPLEMENTATION USING E-TABS

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ABSTRACT
Structural analysis is a discipline of engineering that focuses on figuring out how structures behave in order to forecast how various structural components will react to loads. Every structure will be susceptible to one or more of the groups of loads, which typically include dead load, live load, wind load (under IS875-1987), and earthquake load (IS1893-2016). Software called ETABS (Extended Three Dimensional Analysis of Building System) integrates all of the main analysis engines, including static, dynamic, linear, and non-linear. This computer software is used to evaluate and design buildings as well as to calculate forces, bending moments, stress, strain, and deformation or deflection for a complicated structural system. Our project "Structural study on commercial Building Designing and Implementation Using E-tabs" is an attempt to analyze and design a commercial building using ETABS. A G+5storey building is considered for this study. The Analysis is carried out by static method and design is done as per IS 456:2000 guidelines. Also, an attempt has been made to design the structural elements manually. Drawing is done using AUTOCAD. The primary objective of this project is to gain sufficient knowledge in planning, analysis and design of the building. Our project deals with the Analysis and design of a commercial building by TABS(2016). It is a reinforced concrete framed structure consisting of G+5.IS 456:2000 codes are 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 commercial building has proper ventilation; it is provided with sufficient Exits are also provided.

INTRODUCTION

In civil engineering, a structure with several parts, such as a foundation, walls, columns, floors, roofs, doors, windows, ventilators, stair lifts, various types of surface coatings, etc., is referred to as a "building." A structure is created using structural analysis and design such that it can withstand all applied loads without failing for the duration of its planned life. RISA, STAADPRO, ETABS, STRUD, MIDAS, SAP, and RAM, among others, are some of the software programmers that are now on the market for evaluating and designing almost all sorts of structures. In general, the primary goal of our project is to become familiar with the many design elements, such as planning, analysis, and design. We have planned to design a Hostel Building structure consisting of G+5 Floors.

1) The elements of the building should be strong and capable to withstand the likely adversely effects of natural agency
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.

LIVE LOAD ON SLABS	
ASSIGNED ON	KN/m²
LIVING ROOM	2
KITCHEN	6
CORRIDOR	3
DINING	5
TOILETS	2
STAIRCASE	3

1.1.1Practical considerations: Besides all the fundamentals of planning discussed, The following practical points should be additionally considered:

2. LOADS

2.1. DEAD LOAD: (IS 875:1987) PART-1

The dead load comprises of the weight of the walls, partition floors finishes, false ceiling, false floors and the other permanent constructions in the building. The dead loads may be calculated from the dimensions of various members and their unit weight

2.2. IMPOSED LOADS: (IS 875:1987) PART-2

The Imposed load is produced by the intended use or occupancy of a building including the weight of movable partitions, distribution and concentrated load..

2.3. WIND LOAD: (IS 875:2015) PART-3

Wind is air in motion relative to the surface of the earth. The primary cause of wind is traced to the earth's rotation and differences in terrestrial radiation

2.4 SEISMIC LOAD :(IS1893:2002)PART1

3 Load Calculations

3.1. Assigning of Dead loads

BEAM-300X450MM

Total load =(length*breadth*height)*unit weight

Total load/length = 0.3x0.45x25

=3.375 kn/m

SLAB-200MM THICK

Total load = unit weight*area*thickness

Total load/area = 0.2x25

= 5kN/sq.m

Walls

Outer wall-0.23m

Total load =(length*breadth*height)*unit weight of brick

Total load/length = (0.23x2.1)x20

=9.66kN/sq.m

Inner wall – 0.115m

Total load =(length*breadth*height)*unit weight of brick

Total load/length = (0.115x2.1)x20

=4.83kN/sq.m

3.2. Assigning of Live loads

Live loads are assigned for the entire structure as per IS 875-1987 (PART 2)

4 Model Analysis

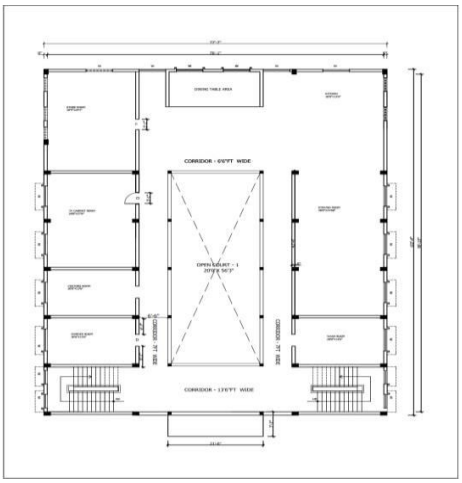


Fig 1: typical ground plan

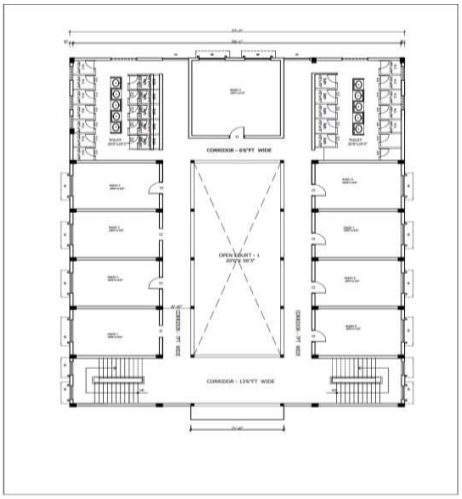


Fig 2 : Typical Floor Plan(First Floor To Fifth Floor)

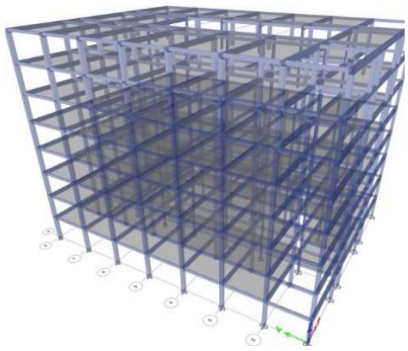


Fig 3: 3-D VIEW MODEL

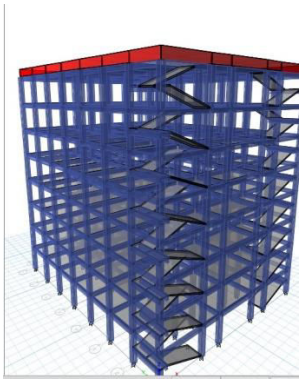


Fig.4 : 3-D View Along With section properties

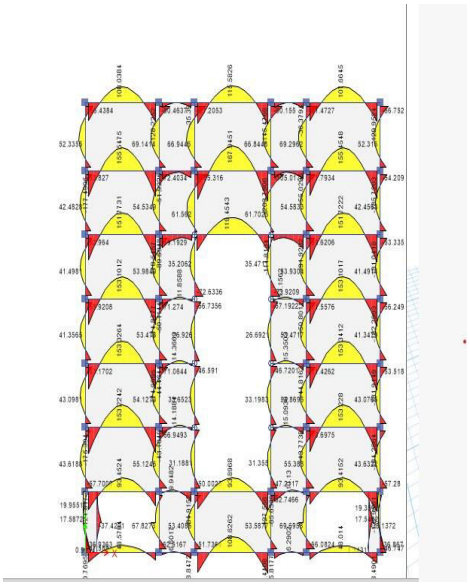
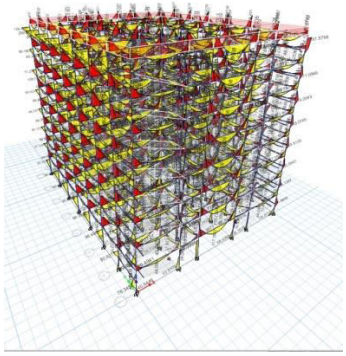


FIG.5 : Moment Diagrams For Frames(Single Floor)



5.0 Design

5.1. Defining Section Property

After Defining Material property, we define section size by selecting frame sections as shown below & added the required section for beams, columns, Slabs etc.

SECTION PROPERTIES:

COLUMN DIMENSIONS:

C1- 500X550 MM

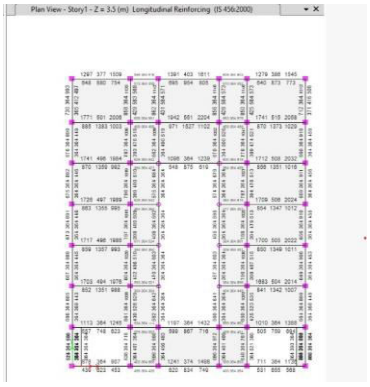
C2 400mm

BEAM DIMENSIONS:

B1-300X450MM

SLAB DIMENSIONS:

TWO WAY SLAB-200 MM Thick



RESULT:

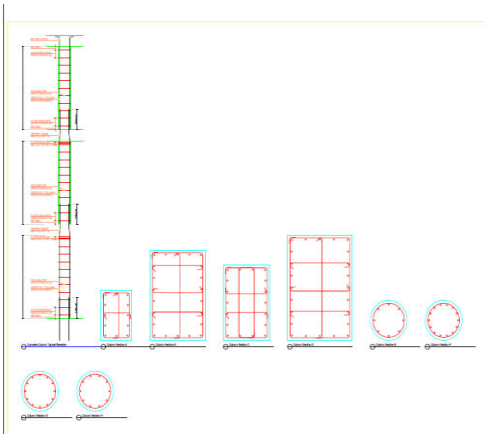


Fig:column sections

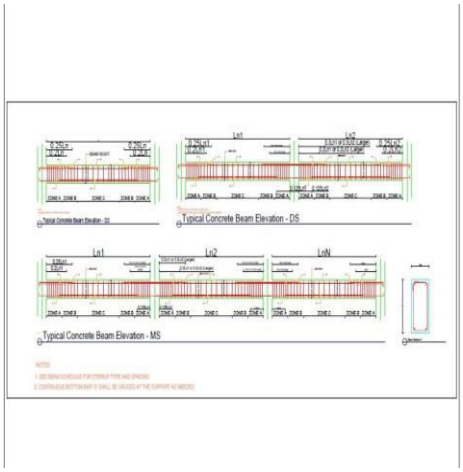
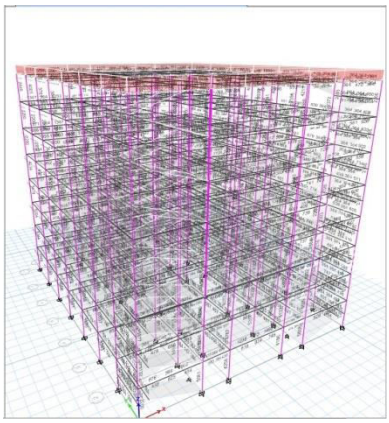


Fig:Beam section



CONCLUSION

The structure's design is based on the idea of LIMIT STATE METHOD and the ETABS, which together offer sufficient strength, serviceability, and durability in addition to being cost-effective.

In the planning and design of the G+5GIRLS HOSTEL BUILDING, the project preparation has given us a fantastic opportunity to establish ourselves. If any beam or column fails, its measurements should be adjusted, and reinforcement detailing can be created.

The ETABS Software reduces work time and aids in precise structural design.

The G+5 Hostel Building Plan was created using the AutoCAD programme, and it includes designs for the stairs, slabs, footings, beams, and columns. Using IS 875-1987 Part I and Part II, the Dead load and Live load are evaluated.

According to IS 456.2000, the Loads are designed, and SP-16 by considering the concrete grade of M25 and Fe415 steel are used.

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