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ANALYSIS AND DESIGN OF HOSTEL BUILDING (G+4) USING ETABS

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Abstract: Due to the increase in population, there is a problem in we are facing problems in constructing houses individually as large areas is required per person. So, Adaption of high rise buildings has increased. It is important for the civil engineers to analyze and design any structure before it is constructed. To get accurate values of loads, stresses and bending moments of a member, software is needed. ETABS is the software which can design complex building models. It has been used by the structural engineers because of its accuracy.

Our building model has been analyzed by ETABS software with a capacity of 120 students. It consists of around 60 rooms which has been allotted as per standards. The material properties of steel and concrete has assigned as per IS standards. Using this software, we have analyzed and designed the beams, columns, slabs and staircase. The results are downloaded from the software and compared with manual calculations which are designed as per IS:456-2000. The structure is safe under loads.

Keywords: IS:456-2000, Design, Analysis

I. INTRODUCTION

We are aware of the problem and challenges posed by housing in the present age of shrinking space, shrinking time and rising expectation. It has become common for any institution, providing hostel facility nearby for students. To accommodate 120 students, we have designed G+4 building with staircase and lift as well. The model is prepared in ETABS software. It is the great software which can handle high rise building and most complex structures. It can analyze all the members like beam, column, slab, shear walls etc. The results can be downloaded after it is analyzed without any errors with ETABS, we can easily analyze different materials like concrete, steel, reinforced concrete etc., It has the facility of generating gravity loads, lateral loads, self-weights automatically. (varalakshmi V et al-2014)

Structural design is art and science of designing with economy and elegance, a safe serviceable and a durable structure, primarily to meet the functional requirements and economy of the structure for its intended use over the life span of the

structure are looked by the structural designer.

The design of the structure must satisfy three basic requirements: (S. Brahma naidu et al -2018)

Stability: To prevent overturning, sliding or buckling of the structure or parts of it under the action loads.

Strength: To resist safely the stress induced by the load in the various structural members.

Serviceability: To ensure satisfactory performance under service load condition which implies providing adequate stiffness to contain deflection, crack width, vibrations within acceptable limit and providing in permeability, durability ect.,

A). OBJECTIVES:

- To provide accommodation for the students of
- St. Martin's Engineering College.
- To reduce the current accommodation crisis at the college.

II. METHODOLOGY

To achieve the objectives of the study that is to analyze and design commercial building using ETABS and by manual method, which meets the basic requirements such as safety, durability, It has been proposed to follow the following methodology.

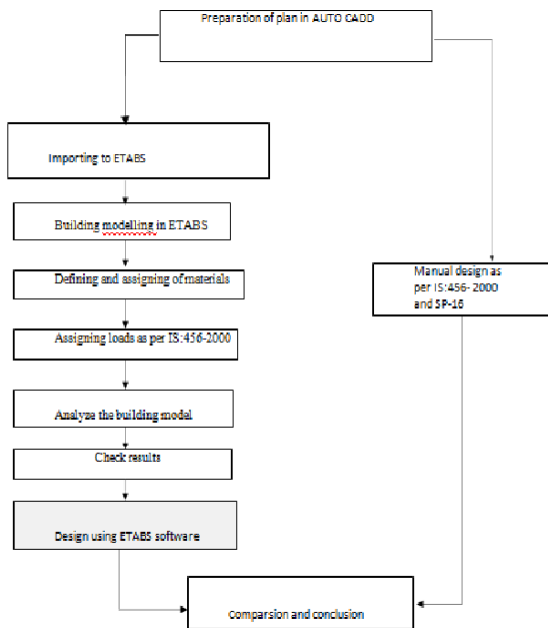
- Site survey
- Soil investigation
- Structural planning
- Analysis and design in ETABS
- Verification by manual method
- Detailing

Surveying is a basic tool for a Civil engineering science. Before any civil engineering work has to start, surveying has to be done and then we must prepare a plan or map of the area showing topographical details related. Good planning and management of a geotechnical site investigation is the key to obtaining



sufficient site information for designing a structure in a timely manner and with minimum cost. The engineering properties of soil like water content, density and SBC are calculated by conducting tests in laboratory. The structural plan is prepared using autocad. The center line diagram is prepared and imported to ETAB model, and the following step by step procedures are followed:

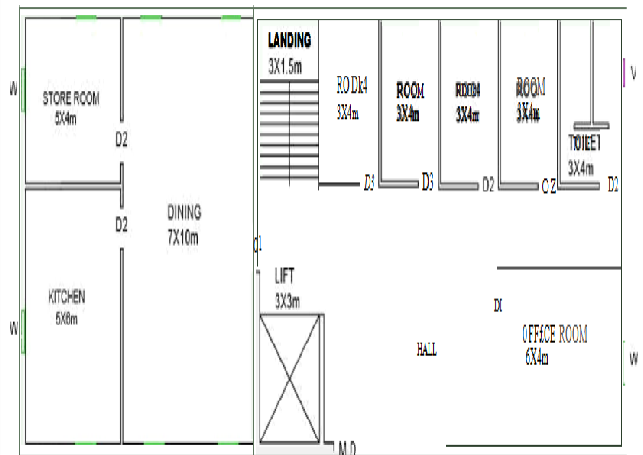
Flow Chart:



analysis was performed and checked for errors.

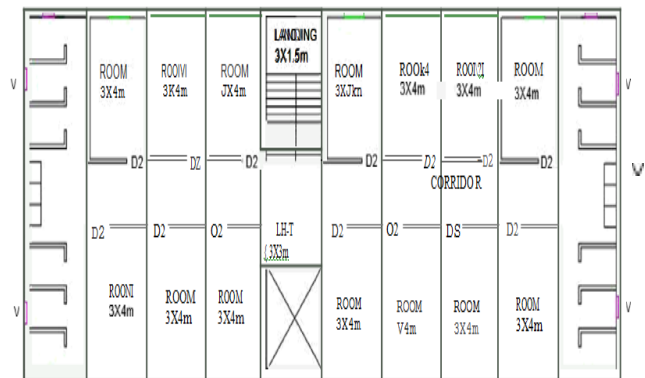
Step - 6: Design- Once after the analysis is over design of the structural elements was done as per IS 456:2000 guidelines. For this go to Design menu >concrete design >select design combo. After this again go to design menu >concrete frame design >start design check of structure then ETABS performs the design for every structural element.

PLAN DETAILS:



GROUND FLOOR

Plan with doors, windows, ventilators



1 to 4 FLOORS PLAN

Step - 1: Defining of property

Beam:

Size of beam =250mm*300mm

Column:

Size of column =300mm*400mm

Slab:

Slab Thickness =200mm

Staircase:

Staircase slab thickness 120mm

Step - 2: Assigning of Property

Step - 3: Assigning of Supports

Step - 4: Defining of loads

Load considered:

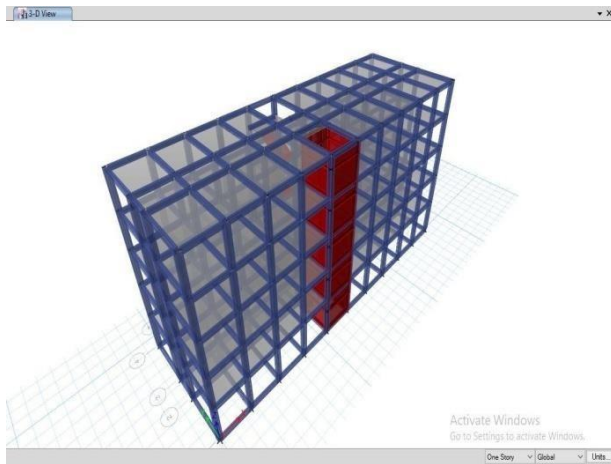
Deadload = 2.0 KN/m²

Live load = 4.0 KN/m²

Floor finishers = 1.0KN/m²

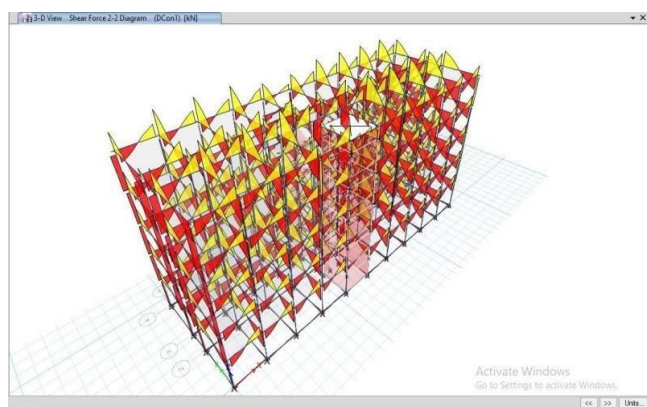
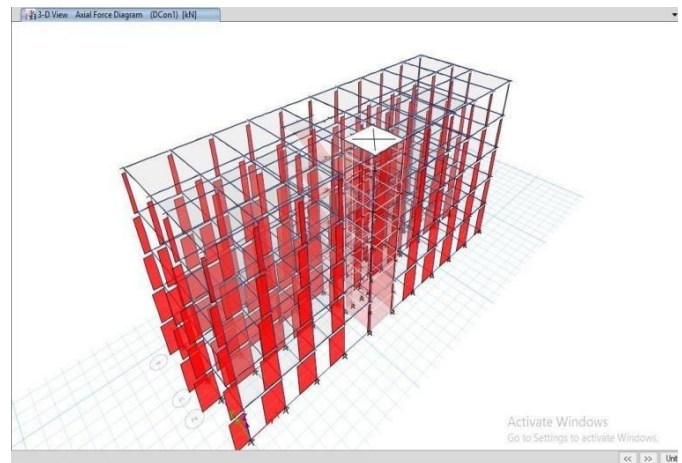
Step - 5: Analysis-After the completion of all the above steps

SOFTWARE RESULT
 3D BUILDING MODEL

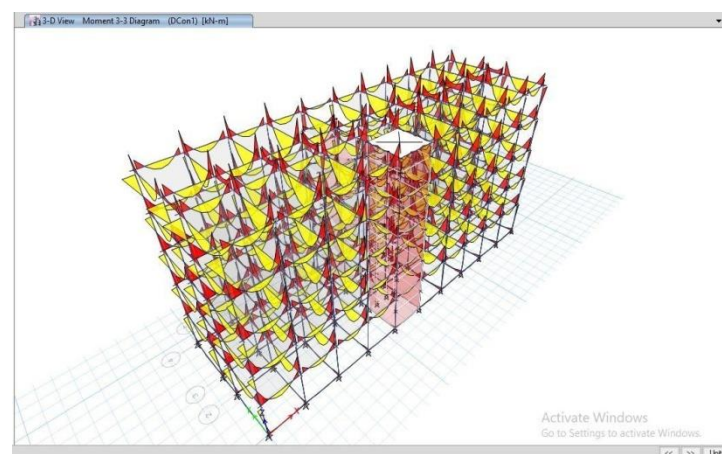


SHEAR DIAGRAM

AXIAL FORCES



BENDING MOMENT DIAGRAM



III. CONCLUSION

- G+4 Hostel building plans has been drawn in AUTOCAD software and designed for Beams, Columns, Footings, Staircase, Slabs. The dead load, live load, are referred using IS:875-1987 part I part II and designed according to the IS:456-2000 by considering concrete grade of M25 and Fe 415 are used.
- The results obtained are safe from manual calculations and software results.
- By using ETABS, the analysis and design work can be completed within the stipulated time.

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