

Design & Analysis of Multistoried Residential Building (G+5) using ETABS Software

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Abstract- ETABS is software which has its full form “Extended Three Dimensional Analysis of Building Systems”. This software helps us in the design of multi-storied building in a systematic manner. With the need of making the work of construction effective and less time consuming in design, software is made into use. This help us in the design of multi-storied building, here used for design of a residential building (G+5). The plan of building has been drafted using AutoCAD software using required conditions of land and available built-up area and all the necessity of beams and column placing as well as the room dimensions are taken care of before construction and according to the dimensions the plans are made. The placement of beam and column also play a major role in the design aspect.

The superstructure i.e. building frame has been designed and analyses using ETABS software. In our project which is “(G+5) Residential building”, we are considering the design as well as analysis for both gravity and lateral loads as stated by Indian Standards. With the help of this software building can be analyzed before the construction, and we can check the failure in the analysis and redesign them, so that failure can be prevented. Once we get the results construction can be done according to design. This project is designed as per INDIAN CODES – IS 1893 part II: 2002, IS 456:2000.

Keywords- AutoCAD, ETABS, Design Software, Residential building, Indian Codes

I. INTRODUCTION

ETABS is the presently leading design software for designers working on big projects which require high accuracy. Design company’s use this software in their project for design purpose. The comparative analysis of results obtained from analysis of a multistoried building when analysed manually and using ETABS software.

Structural analysis means determination of the shape and all the specific and required dimensions of a particular structure so that it will perform the function for which it was

created and will safely withstand the external forces which will act on it throughout its useful life. Since quick and easy for simple structures, ETABS can also be used for the largest and most complex building structures, including a wide range of editing options, making it first choice for structural engineers working in the building industry. ETABS also adds in itself complex analytical options such as dynamic nonlinear behavior, and AutoCAD-like drawing software in a graphical and object based interface.

ETABS also provide input, output and numerical solution techniques that also clearly satisfy design and characteristics unique for building and type of structure, providing an instrument that offers huge amount of savings in time and increasing the accuracy, over general programs.

As in this project we are dealing with the economical column method, so for this project we have to design the structure in an economical way by reducing the sizes in the sections. As the load is more at the bottom when compared to the top floors, there is no need of providing large sizes at the top. Economizing the column by means of orienting the column in such a way that “longer span in longer direction will reduce the amount of bending in structure and as a result the requirement of steel is reduced.

Due to monolithic construction and construction of brick walls over it slab is assumed to be continuous over all the interior supports, and partially fixed for edges. There is assumption that Beams are continuous at interior supports and into frame at column ends.

Following are the objectives of the project-

1. The main objective of the study is to analyze and design G+5 residential building using ETABS.
2. Designing of structural components such as footing, foundation, column, slab, beam by manual method.
3. To design and give reinforcement bar details of the component of structure by using AutoCAD.

Loads acting on building are generated either by force or nature or are manmade. The various natural force which act on it are temperature, air, earth quake, gravitational force etc. Artificial forces can be generated by the live load, people moving, impact loads etc.

Sayed A.Ahad1, Hashmi S Afzal2, Pathan Tabrej3, Shaikh Ammar4, Shaikh Vikhar5, Shivaji Bidve6, Design and Analysis of the residential building which has (G+10) stories has been done. Analysis was done using ETABS software Version 15.2 which proved to be good enough in the design for construction and the structural analysis of all the sections. All the elements of structure like concrete wall, which retains weight of soil are provided. As per soil investigation reports they provided isolated footing. The designing and analysis of RCC frame members such as Beams and Columns were done using ETABS software. The analysis and design were done using standard specifications to the possible extent. The sectional and design analysis were done using STAAD-PRO and result can be compared. The design of a structure must satisfy three basic requirements: Stability - To prevent the overturning due to loads, sliding or buckling in the structure, by the action of loads. Strength - To resist safety due to stresses induced due to loads by various structural elements. Serviceability – so as to get desired performance for service load conditions which implies providing desired stiffness and reinforcement for resisting the deflections crack in structure and resisting vibrations within acceptable limits, and also providing stability and life to structure .

K. KIRAN MAI1, MOHD AMER2, MD. SHAIBAZ ALI3, MOHAMMED FAZAL AHMED4, MOHAMMED OMAIR5, AFTAB TANVEER6, This paper mainly deals with the analysis done by comparing the results which we have obtained from the analysis of a multi storied building structure through manual method as well as by using ETABS software. Structural analysis implies designing of the structural shape and all the standard dimensions of a particular structure so that it will perform the necessary function for which it was created and will safely withstand the natural and artificial influences which will be acting on it throughout its useful life. In their analysis, they carried out by considering all the necessary seismic zones data and their behavior is assessed by considering type-II Soil condition. In their construction site they considered a plan under zone –IV. Seismic Intensity came out to be Severe and Zone Factor is 0.24

C.V.S. Lavanya, Emily.P.Pailey, Md. Mansha Sabreen, their project deals with the economical designing method of column so they design the structure in economical way by reducing the section size. Since load is more at bottom in comparison to top floors, less chances occurs of providing

large size in top. Column arrangement needs to be economized by arranging its orientation such that span in the longer direction will result in reduction in the amount of bending and as a result the requirement of steel is reduced.. In the building frame, from plinth to terrace the column size may differ i.e. it would be more in upper column so as to reduce the failure in the structure

S Abhishek1, Manoj S K2, Roopa B D3, Bhagyashree M S4, Guruprasad C H M5, they considered analysis of commercial building (G+1) located at Hyderabad which was under the effect of seismic forces. They observed shear force and bending moment of beams and column and concluded that larger span will have more shear force and bending moment. ETABS can handle largest and most complex buildings which include various types of structures. This software also saves the time and increases the efficiency of person. This provide compatibility and scalable solution that meets demand of project every time. And will help in the development of building with utmost care.

Ragy Jose1, Restina Mathew2, Sandra Devan3, Sankeerthana Venu4, Mohith Y S5, their commercial building of 3441.87 sqft. Surveying is the basic tool before any engineering work has to start. Survey shows all the topography details related to the structure which needs to be designed. They collected engineering properties like water content, SBC, by conducting tests in laboratories. They conducted soil survey reports and found out water content and other factors.

Varikuppala Krishna, Rajashekar this project comprises of (parking floor +5) upper stories RCC frame building to be analysed and earthquake and wind loads are also considered. He took into consideration light weight materials for the structural elements so that dead load on the building is reduced. Connecting beams were to be provided in between so as to withstand loading over it. They planned silt +5 floors and followed all the vastu norms and municipal guidelines. Basic height of floor is 3m, considering Dead load with self weight, live load, wall as dead load. **Lenkala Krishna,** in her project she considered analysis of multistoried residential building (G+6) consisting of 5 apartment in each floor. They considered various specifications like M20 grade of concrete, for main reinforcement Fe415 steel, for distribution reinforcement Fe415 steel, for shear reinforcement Fe230 steel. All the floors were connected within internally and stand within the beams of the building.

II. CONCLUSION

As our project is based on most economical column method so we will do it by reducing the size of section. As load is more at bottom as compared to top there is no need of providing big size column at top.

We can economize the column by providing it in the required amount as specified by IS Codes.

Usage of ETABS software saves the working time and helps us in the design aspect.

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