REVIEW PAPER ON ANALYSIS AND DESIGN OF A COMMERCIAL G+3 COMMERCIAL BUILDINGS USING ETABS FOR GRAVITY LOADS, SEISMIC LOADS AND WIND LOADS

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ABSTRACT

Structural Engineering field is facing lot of challenges off late in Civil Engineering domain in developing required infrastructure for the needs of mankind. In the present project based learning, a Hospital Building under construction is selected to evaluate demands on a reinforced concrete structure using Structural analysis software E-TABS. Gravity loads, Wind loads as per IS 875 and Earthquake loads as per IS1893-2016 are considered acting on the structure and the design is carried out in accordance with IS456-2000.The design of foundations will be done using SAFE software and detailing of reinforcement is carried out in accordance with SP34 and SP13920 using Csi detailing software. Manual design calculations will be done for representative structural elements slab, beam, column and footing to validate software results. The analysis design and detailing results will be compared with professional respective outcomes and drawings. Behaviour of the structure when acted upon by static and dynamic loads is presented with the help of stress resultants namely axial forces, bending moments and shear force in all structural elements for safety in accordance with IS456-2000. Displacements will be checked for serviceability limit states to control cracks and vibrations in the structure. Results and discussions will be presented with the help of tables and charts.

Keywords: Hospital, Structure, earthquake loads, wind loads, E-TABS, SAFE, CSi detailing, axial forces, bending moment, shear force.

1. INTRODUCTION

Structural Engineering is a Sub-Discipline of Civil Engineering that involves the application of the laws of Physics, Mathematics and Empirical Knowledge to safely design the load bearing elements of Man Made Structures. Role – Structural engineers are primarily concerned with designing and constructing building and structures that are safe and capable of withstanding the demands to which they are exposed as well as improving the structural integrity of existing building. Structural design is important in Civil Engineering because it helps to check that the structure is safe. Structural design gives all the vital information regards foundations, floors, walls, beams, roof and the quality of material to ensure that any of the structure built meet all the safety requirements.

2. OBJECTIVES

➢ The Main Objective of this study is to Analyse and Design a Proposed Hospital Building using E-TABS.

➢ To Grasp the essential principles of structures by using Indian Standard Codes.

➢ To Design Structural Components like Beam, Slab, Column and Footing manually.

➢ To Draw and give Reinforcement details of Structural components by using AutoCAD.

➢ Comparison of Results obtained from ETABS software with a manual method.

3. LITERATURE REVIEW

Agepathi Venkata Ganesh, Mujahid Ahmed 2016– In this Project the, author says that The Fundamental principles of earthquake-Resistant design applicable to RCC members are outlines. Shear walls, which form an important lateral load-resisting element, have been discussed.

Comparing the frame with shear wall & shear core to only frame model the volume of RCC obtained for only frame is 100% where frame with shear wall & shear core is 33.4% By providing a ductile shear walls and shear core for s.m.r.f. (special moment resisting frame) the cross sectional properties are reduced and also axial forces, tensile forces, storey lateral loads and base shear are also reduced. Hence the design ijf building with shear wall & shear core is more economical and optimistic.

Regi Jose, Restina Mathew 2017 – In This project, Analysis was done by using ETABS and successfully verifies manually as per the IS codes, calculations was done both manual work as well as software and almost gives same results. Authors extended the work for 4-Storey building and found that the results are matching & concludes that as

4-Storey building had similar floors ETABS is the Perfect software to perform analysis and design and it minimizes the times required for Analysis and design.

P Venu Madhav, E Sai Teja 2022 - In this Project, Author Analyses and design's a G+9 Commercial structure, they assumed that the material property to be linear, static and dynamic analysis was performed.

Author concludes that the results of the computerized and manual analysis are identical, & ETABS is an excellent software for high-rise buildings.

Gurudath C, Arun Kumar sah – 2019 - Author and team analyzed G+2 storey building, analysis is carried out by static method and design is done as per IS 456:2000. Design & Analysis is done by both manually and using ETABS.

Analysis was done by using ETABS software and successfully verified as per IS 456:2000 and gives results within the permissible limit according to IS code. The work was extended to G+4 storey building and found out that the results match. ETABS minimizes the time required for analysis and design.

Sophia A. Pechorskaya, Vera V. Galishnikova – 2021 - Author Considered 3-by-3 bay of thirty storied high rise building, 3D Model was prepared in Revit Structures then exported to Revit Structural analysis to understand the integration process between Revit and Structural Analysis software Loads and boundary conditions are adopted in Revit easily then exported to RSA. After Analysis and Design author concludes that the results from RSA is bigger than the results from ETABS software although the analysis is generated based on the same inputs and with the same design codes.

Maruthi T, Pruthvi Raj SR, - 2019 - Considering G+4 Commercial building for the analysis and design in ETABS and Manually They considered loads for worst scenarios on the structures. In Conclusion, the structure designed based on the ETABS which provides adequate serviceability and considered economical.

Abhishek Kumar Ranjan, Aditya Pratap Singh 2022 - Author considered G+21 building to perform analysis and style of the structure with none kind of failures to grasp the essential principles of structural with the help of Indian standard codes, Structures was based on theory of limit state method which provide adequate strength, serviceability and durability.

The Calculations done by manual work and anlaysis gives almost same result and usage of ETABS software minimizes the time required for analysis and design.

Aim

To Analyse, Design & detailing of a Proposed Hospital Building under Construction using E-TABS CSi Software.

4. CONCLUSION

From the study of above literature papers:

➢ Reinforced concrete is the most widely used Construction material in the building industry, orthodox criteria for design of RCC Members are almost exclusively concerned with strength while ductility and energy absorption receive little consideration.

➢ The Analysis and design done both manually and in ETABS, Results were almost same / identical, results are verified and are within the permissible limit and according to Indian Standard Code.

➢ There is no much land available in urban areas, so building are constructed in storey to utilize the vertical space, rather than destroying forest and swamps to build houses, shopping centres and factories they can be placed in a vertical tower, serving to preserve the Environment.

➢ For Multi-Storied buildings with similar floors ETABS is the perfect software which can be adoptable for analysis and design, Compared to other software's ETABS software minimizes the time required for analysis and design and superior in terms of efficiency and functionality.

➢ Even when the work is broadened for the multiple-stories during the work, and that is determined that the outcomes are consistent.

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