Analysis & Designing G+10 Storied Building by Struds & STAAD Pro Software & Comparing the Design Results

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Abstract—In designing and analyzing the performance of high-rise buildings, it is especially important that an effective modeling technique be involved because of the complexity of the real structural behavior and the difficulties of full scale measurement. The lateral performance of multi-storey buildings under different loading conditions is greatly influenced by various parameters such as structural stiffness and base to height ratio of the building. Optimization and refinement of such performance has become the focus as well as the constraint for structural engineers in their design practice.

Key words: Analysis & Designing G+10 Storied Building, STAAD.Pro, Strud

I. INTRODUCTION

In every aspect of human civilization needed structures to live in. Due to rapid growth of population the area is decreasing, so for human needs it is require build multistoried building. Complicated and high-rise structures need very time taking and cumbersome calculations using conventional manual methods. Here in this project work based on software named STAAD pro and Strud has been used. STAAD Pro: STAAD.Pro is a general purpose structural analysis and design program with applications primarily in the building industry-commercial buildings, bridges and highway structures, industrial structures, chemical plant structures, dams, retaining walls, turbine foundations, culverts and other embedded structures, etc. Strud is the user friendly and has exceptional features like it designs the structural components individually along with their Analysis and Results. Additional useful feature of this software is that we can view the Shear force, Bending moment, Torsion diagrams at each level of the building. We prepared the drawing plans along with its specifications for the construction area. After preparing the Plan and its criteria we have commenced our project by designing the structural components of building namely slabs, beams, columns and footings. The design of slab was designed by us as mentioned in the plan after which we have placed the columns in their desired locations. Then we have given the material properties along with their grades to beams and columns.

II. LITERATURE REVIEW

Mr. A. P. Patil et.al. (2017) the principle objectives of this project are comparison between staad-pro software and manually calculations and design a multi-storied building using STAAD Pro. The design involves load calculations and analyzing the whole structure by STAAD Pro. The design methods used in STAAD Pro analysis are Limit State Design conforming to Indian Standard Code of Practice. These involve Staad Modeling, Analysis the members due to the effect of Wind & Seismic load & Compare them for a 33 meter height Building with Concrete & Steel construction. The proposal structure is a G+10 storied building with 3.00 m as the height of each floor. The overall plan dimension of the building is 21.30 m x 14.0m.

Yeruvakota Sanjeeva Reddy et. al. (2017) the columns which are supported on a beam instead of rigid foundation are called as floating columns. Many of the buildings in India are constructed with floating columns. This is primarily beam adopted to accommodate parking or reception lobbies in the first story. The earthquake force generated at different floor level of the building need to be carried out to the foundation by the shortest possible way which may not be the case when floating columns are provided. Providing floating columns may satisfy some of the functional requirements but structural behavior changes abruptly due provisions of floating columns.

Satish Danget et. al. (2017) the aim of our work is to design the given DUPLEX HOUSE according to Indian Standard codes. The design of a building can be done manually or with the help of Software. We have selected to do our project with Software because designing manually consumes a lot of time, effort and can contain mistakes whereas by using software we can save time and obtain results without errors. Now a days there are several software's are available in market for analysis and design of „Civil Engineering structures” like ETABS, STAAD Pro and STRUDS etc., At present work we used software named “STRUDS”” abbreviated as “Structural Analysis Design and Detailing Software”. By using the software is that it is user friendly and has exceptional features like it designs the structural components individually along with their Analysis and Results.

K. Naga Sai Gopal et. al. (2017) Structures are design to resist earthquake, wind load and stable the structure in the structure causes loss of peoples and the high raise buildings stiffness and resists the displacement of the building by proper designs and detail ductile of the building and is able to design the proper gravi building, the paper deals the analysis E-TABS. ETABS is 3D structural software Analysis of Building System. Hence revisions are done depend upon the the result given by the analysis.

Siluveri Shivaji et. al. (2017) this research discusses the analysis procedure adopted for the evaluation of symmetric high rise multi-storey building (G+15) under the effect of Earthquake (EQ) forces. Earthquake occurred in multistoried building shows that if the structures are not well designed and constructed with and adequate strength it leads to the complete collapse of the structures. To ensure safety against seismic forces of multistoried building hence, there is need to study of seismic analysis to design earthquake resistance structures. In seismic analysis the response reduction was considered for two cases both ordinary moment resisting frame and special moment resisting frame.
The main objective of this report is to study the seismic analysis of structures for static and dynamic analysis in ordinary moment resisting frame and special moment resisting frame. Equivalent static analysis and response spectrum analysis are the methods used in structural seismic analysis. We considered the residential building of G+15 storied structures for the seismic analysis and it is located in zone II. The total structure was analyzed by computer with using STAAD.PRO software. We observed the response reduction of cases ordinary moment resisting frame and special moment resisting frame values with deflection diagrams in static and dynamic analysis. The special moment of resisting frame structure is good in resisting the seismic loads.

Mohd. Muzaffar Hussain et.al. (2016) Objective of this research involves the design of high rise buildings primarily involves an abstract design, approximate analysis, preliminary designing and optimization, to securely carry gravity and lateral loads. The planning criteria are strength, serviceability and human comfort. The aim of the structural engineer is to attain appropriate structural schemes, to satisfy these criteria. Within the present study, the limit state methodology of research and style of a G+21 structure ferroconcrete high rise building beneath wind and seismic loads as per IS codes of observe is represented. Safety of the structure is checked against allowable limits prescribed for accelerations prescribed in codes of observe and different relevant references in literature on effects of earthquake and wind loads on buildings.

Conclusion was that a G+21-storey RCC high rise building as per IS 1893(2002) and IS 875(1987)codes severally.

M.Mallikarjun et. al. (2016) Hyderabad is the fifth largest city in our country. As it is rapidly developing in the field of construction in the city is very costly. The design process of structural planning and design requires not only imaginations and conceptual thinking but also a sound full knowledge on how a structural engineer can economies the structure besides the knowledge of practical aspects, such as recent design codes, bye laws, experience, intuition and judgment. The main purpose of the project is to ensure and enhance the safety, keeping careful balance between economy and safety (i.e. most economical column method).

Ashok Kankunta(2016) In high rise building shear wall is used to resisting the lateral loads that may be induced by the effect of wind and earthquakes. In high rise building increases sizes of structural element. As a result consumption of conventional construction materials like concrete and steel goes on increasing day by day in the structures. On the other hand time delay is the key factor that will affect overall growth of such projects. Hence in order to overcome these constraints economical construction methodology and optimization techniques should be used. Finite Element modeling now days is an essential approach in analyzing and simulating civil engineering problem numerically. In this paper at attempt is made to apply the finite element modeling in analyzing and exploring the behavior of shear wall with opening under seismic load action on member forces. Hence the aim of present study is to compare seismic performance of 13-Storey with openings in shear wall situated in earthquake zone V. Seismic coefficient method and Response spectrum method are used for seismic analysis. SAP software is used and the results are compared. Position of shear wall by changing the sizes and shape of openings in shear wall for all buildings models is determined.

D.R. Deshmukh et. al.(2016) High-rise structures need much time for its time consuming and cumbersome calculations using conventional manual methods. STAAD-Pro provides a fast, efficient, easy to use and accurate platform for analyzing and designing structures. The principle objective of this project is to analysis and design a multi-storied building G+19 (3 dimensional frame) using STAAD Pro software. The design involves analyzing the whole structure by STAAD Pro. The design methods used in STAAD-Pro analysis are Limit State Design conforming to Indian Standard Code of Practice.

Mohammed Mohsin1 (2016), RC frame building with open ground storey, and similar soft storey effect can be observed when soft storey at different levels of structure are constructed. The building with discontinuity in the stiffness and mass subjected to concentration of forces and deformations at the point of discontinuity which may leads to failures of members at the junction and collapse of building. The method used for stability analysis of columns, shears walls, coupled and coupled components, cores, single storey and multi storey structures are studying. Buildings and structures are considered stable with lateral supports by using either bracing systems or shear system or both such as wall to ensure the stability of the building. There have been so many cases in which the structures failed due to instability which require P-Delta analysis. One of the problems is affected from wind load.

Madhurivasavai et. al. (2016) One of the major project that the country facing is the rapidly growing population, which necessities more facilities in the restricted availability of land this can be solved to a certain extent with the construction of multistoried building, which can serve many people in a available limited area. Hence it is the necessary requirement of multistoried building with all facilities. Hence an attempt is made in the project and designing of multistoried building with ground floor+ EIGHT (G+8 framed structure). In the multistoried building spacious corridors, staircases, rooms etc are provided. This proposed structure consists of the features like Plot Area of 35,000 sft, Ground floors for Car parking, First Floor for Commercial usage and Remaining Floors are RESIDENTIAL, whereas Building Zone is Zone-2. The above Project Consists of 35,000 sft Plot area in this 15,000 sft is built up area for Residential houses and Office rooms for commercial use. Efficient modeling is performed using Staad Pro,

Tejashree Kulkarni (2016) with the immense increase in population, demand of land keeps on mounting which in turn leads the responsibility of civil engineer to greater extent. Earlier Horizontal system of construction was in use but now a day’s vertical system of construction is preferred more due to a lesser amount of ground existing. In multistoried buildings one should apprehension about all the forces acting on a structure, its self-weight as well as the SBC. Good quality of beam column reinforcement should be used to counter react the external forces satisfactorily acting on a structure. The soil beneath the structure should be hard enough to distribute the load uniformly to the foundation.
Deep foundation is preferred for loose soil. As number of floors keeps on increasing, manual calculations process becomes tedious, consumes more time and there are chances of human errors as well.

Aman et. al. (2016) The main aim of structural engineer is to design the structures for a safe technology in the computing field; the structural engineer can dare to tackle much more large and complex structure subjected to various type of loading condition. Earlier the loads acting on the structure are considered as static, but strictly speaking, with the exception of the self-weight (dead load) no structure load is static one now a day large number of application software’s are available in the civil engineering field. All these software’s are developed as the basis of advanced. Finite element analysis which include the effect of dynamic load such as wind effect, earth quake effect etc in the present work, an attempt has been made to study the efficiency of certain civil engineering application software’s.

Conclusion of thesis was that Short term deflection of all horizontal members is within 20mm. The structural components of the building are safe in shear and flexure. Amount of steel provided for the structure is economic. There is no such large difference in analysis results of STAAD Pro and Kanis method. Proposed sizes of the elements can be used in the structure.

Anoop a. et.al. (2016) The aim of the project is to design a multi storied building of G+ 5 floors, at kalakode about 4 km from paravoor. The design is done by taking in to account the requirements and standards recommended by IS code. Kerala building rules and national building rules. Planning is done using the 3D modeling software Revit 2011 with the help of Auto CAD 2014. The structure analysis and design is done using STAAD.PRO.V8i and a cross check is done for selected members using limit state method of design as per IS 456-2000. STAAD. Pro uses a command language based input format, which can be created through an editor called the editor file, the powerful STAAD.Pro graphics input generator or through CAD based input generators like AutoCAD. Output generated by staad.pro consists of detailed numerical results for analysis and design

S. P. Sharma et. al. (2015) as per the previous records of earthquakes, there is an increase in the demand of use of earthquake resisting structures. So it is necessary to design and analyse the structures by considering seismic effect. The present paper gives an overview of different research works to be done regarding the study of multi-storey RC frame structure with lateral load resisting systems such as shear wall and diagrid system. The present work concerned with the comparative study of seismic analysis of multi-storied building with shear wall and bracing, analysis of multi-storey structure of different shear wall locations and heights and proper location of shear wall in the multi-storey building etc. The present paper gives the knowledge about the seismic behavior of structures by using shear wall & diagrid and comparison between them.

This paper reports on research development on seismic behavior of structure by using shear wall or diagrid. Some researchers have concluded that the shear wall, diagrid and hexagrid system do not interfere in the vertical load resisting system for RC structure but they affects the lateral load resisting system of the same due to its stiffness and mass.

The storey shear is linearly varying to each other but the steel bracing frame system gives the good results than shear wall system. It is observed that the deflection at the different level in multi-storey building with shear wall is comparatively lesser as compare to RC building without shear wall. Some authors have concluded that by providing shear wall to the high rise building, seismic behavior will be affected to greater extent and also the stiffness and strength of building will be increased.

D.Ramya et. al. (2015) Structural Analysis is a branch which involves in the determination of behavior of structures in order to predict the responses of real structures such as buildings, bridges, trusses etc. Under the improvement of expected loading & external environment during the service life of structure. The results of analysis are used to verify the structure fitness for use. Computer software’s are also being used for the calculation of forces, bending moment, stress, strain &deformation or deflection for a complex structural system. The principle objective of this project is the comparative study on design and analysis of multi-storied building (G+10) by STAAD.Pro and ETABS software’s STAAD.Pro is one of the leading software for the design of structures. In this project we had analyzed the G+10 building for finding the shear forces, bending moments, deflections & reinforcement details for the structural components of building (such as Beams, columns & slabs) to develop the economic design. ETABS is also a leading design software in present days used by many structural designers. Here we had also analyzed the same structure using ETABS software for the design.

III. CONCLUSION

1) It is concluded that the shear wall should be placed at a point by coinciding center of gravity and centroid of the building.
2) If any component fails the Struds gives you warning messages and suggests you the possible alternative for design. Struds prepares graphical outputs in the form of drawings and diagrams.
3) STAAD.Pro provides us a fast, efficient, easy to use and accurate platform for analysing and designing structures.

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