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Analysis and Design of G+21 Building using ETABS: A Review

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Abstract: ***Civil engineering is a very vast field in which planning and designing of buildings are done according to the need. As we can see that many development and changes happening in the sector of construction and everyday new commercial and residential buildings projects are initiated. So, it needs proper planning before starting the construction so that the work can be done in a cost effective way and also complete the structures as per users requirements. The ETABS is a engineering software that helps in modeling, designing and calculating loads while making a structure. It is a very useful software in civil engineering field and provide a vast methods to ease out the work of engineers. It analysis the structure in terms of static and dynamic loads. Today there is a huge scope in this field and it also gives the opportunity to many people to work it the respective field.***
Keyword: Definition, Objective, Design Parameters, Load and wind calculations.

I. INTRODUCTION

It is not an easy task to build a beautiful and strong building which can withstand against harshad conditions. We all know that today technology has achieved milestones in every field, and that's why even civil engineering needs to be upgraded. This has led to several changes in how civil engineers work and perform. Not just the use of technology has made lives way easier but has also because of the development of some really helpful software, encouraged civil engineers to give their best. "ETABS-Extended 3D analysis of Building Systems", is a engineering software . It is an engineering software that is used in construction and planning and designing of buildings . It has provided a very different options and opportunities to make structures efficiently and in less time with full safety. It is loaded with an integrated system consisting of modeling tools, code-based load analysis , solution to the problems techniques. It can handle the complex and big building models and associated requirements. ETABS software is widely in use nowadays for construction of buildings. .

A. Design Philosophies

There are basically three philosophies for the design -

1) Working stress method
2) Ultimate load method
3) Limit state method

B. Assumption Regarding Design

1) We tend to assume that block is continuous over interior supports, and part mounted over the perimeters, thanks to construction in style of monolithic and construction of wall over it.
2) Beams also are assumed to be continuous over the inside support and framing takes place into the ends of columns.
3) The internal forces, such as bending moments, and normal and shear stresses, at any section of a member are in equilibrium. with the effects of the external laods at that corresponding section.

II. OBJECTIVE

To perform analysis and style of the structure with none kind of failures.

1) To grasp the essential principles of structures with the help of Indian standard Codes.
2) To realise the parameters for beams, columns, slabs and alternative structural parts.
3) To organize the 3D model of the structure by with the help of E-TABS code for careful analysis and style.

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III. LITERATURE REVIEW

S Abhishek, Manoj S K, Roopa B D, Bhagyashree M S, Guruprasad C H M(2018), They took into thought of the residential buildings (G+1) style and did the analysis using ETABS, whereby they got productive results through that they got a great industrial exposure and saved their coming up with time in addition as analysis. They took load thought for the worst scenarios for the loading in their structures. They designed structural components on the software as well as manually and after they did comparison.

K. Naga Sai Gopal(2017), He took into thought of the designing of (G+5) residential buildings using ETABS, his structure was based on theory of LIMIT STATE METHOD which provide adequate strength, serviceability and durability besides economy. He took the necessary steps in the modelling process after correctly defining material in ETABS. He prepared the 3D model of the structure using Etabs software for detailed analysis and design.

Sayyed A.Ahad, Hashmi S Afzal, Pathan Tabrej, Shaikh Ammar, Shaikh Vikhar, Shivaji Bidve(2017), This paper deals with the analysis and design of (G+10) residential buildings.Analysis was done with the help ETABS software Version 15.2. It proved to be good enough in the design for construction including the analysis of all the sections. All the elements of structure like concrete wall, are provided. They provided isolated footing as per soil investigation reports. . The sectional and design analysis was done with the help of STAAD-PRO and result was compared. .

V.L.S Banu, Second AMDShafiuddin Siddiqui, Sheikh Mohd Salar, MA Ghouse, Sohel Jawad ,Md Afak , Shaik Mohd Sadeq(2021), They took into thought of the analysis and designing of the residential building (G+5) using ETABS. Their scope of the study was to produce good and strong structural work for analysis and designing of the building. They took the load consideration as per theory of LIMIT STATE METHOD. They assigned the wind loads, seismic loads, and live loads to the model. They showed the displacement, shear force, bending moment variation.

K. KIRAN MAI, MOHD AMER, MD. SHAIBAZ ALI, MOHAMMED FAZAL AHMED, Mohammed, OMAIR, AFTAB TANVEER,This paper mainly deals with the analysis done by the members by comparison of the results which they have obtained from the analysis of a multi storied building structure through manual method as well as by using ETABS software. They considered a plan under zone–IV and Zone Factor is 0.24.

C.V.S. Lavanya, Emily.P.Pailey, Md. Mansha Sabreen(2017), This paper deals with the analysis and design of (G+4) residential buildings using ETABS software. They have taken the area of Panaji with medium stiff soil type. They considered the plan under zone-IV with zone factor 0.24.They defined the properties of material such as concrete and steel in ETABS software.The building proposed to have ordinary moment resistinZ frame.

Mr.Ramesh Baragan, Mr.Bharat Konar, KiranBabu S V (2020), This paper deals with the analysis and design of residential building using ETABS software. They took into consideration of functional and structural aspects while designing the building. This project consists of only ground floor. In the structure the masonry wall was used as filler wall and in packages slab loads were applied as floor loads. Their process of structural design consisted of 5 units. They took all slabs as continuous slabs.

Sayyed Feroz Sikandar, Shaikh Zameeroddin. S, Prof. Agrawal. A. S3BE Student, Gudie(2019), This paper deals with the analysis and design of multistory building using Etabs software. They took into consideration of dead loads, live loads, wall loads, earthquake forced, earthquake loading etc. They took the load consideration as per IS 456:2000, IS 875:1987 (Part-V) and IS 1893(part-I):2002. They checked for one way shear, two way shear, development length, bearing stress. According to soil investigation report they provided an isolated footing. They also provided structural elements like RCC frame, shear walls and retaining walls.

Ayush Chandrakar, Manas Rathore (2021),This paper deals with the analysis and design of multistoried residential building (G+5) using ETABS software. They assumed continuous slabs over interior supports and beams were also assumed to be continuous. They considered dead load, live load, wind load, imposed load, earthquake load. The shape of building was regularly (rectangular). Grade of the concrete used is M25 and Unit weight of concrete is 25KN)/m3. They considered the load combination for seismic and wind load analysis of the building.

Kunal Wailkar, Pranay Chide, Manthan Shende, Jinendra Ralekar, Dhanashree Walke, Dhanashree Tayde, Atul Kurzekar(2021),This paper deals with the analysis and design of residential building. Their objective was to generate structural framing plan and to apply various load combinations on member. They analysed the structure using STAAD PRO. They concluded that the elements of the building are safe in flexure and shear, also quantity of steel provided for steel is economical and adequate.

Shaikh Ibrahim, Md Arifuzzaman, Jisan Ali Mondal, Md Taukir Alam, Sanuwar Biswas, Sagar Biswas (2019),This paper deals with the design and analysis of residential building. The type of structure is mutli storey rigid jointed frame with number of storey as 5.After analysis of the G+4 storey building structure, they concluded that their structure is safe in loading in terms of dead load, live

load, wind load and seismic load. Dimensional members(beams, columns and slabs) were assigned by calculating the load type and quantity applied on it.

P.P. Chandurkar et. al. (2013), He had presented the study of G+9 building with three metres height for each and every storey.The whole building design was done according to IS code for seismic resistant design and the building at base was considered as fixed. The structural element had assumed as square or rectangular in section. They had done modelling and analysis of building with the help of ETABS software and in that four different models were studied. .

Mohit Sharma et.al. (2015),This paper deals with the analysis and design of (G+30) storied regular reinforced concrete framed building. The building have the plan area of 22m x 40m with a storey height of 3.4m each and foundation depth of 2.2m. The total height of the building including depth of foundation is 114m.. The static and dynamic analysis was done with the help of STAAD-Pro software using the parameters for the design according to the IS:1893-2002 codes including Part-1 for the zones- II and III. He concluded that there was not much difference in the values of Axial Forces which was obtained by static and dynamic analysis.

M. S. Aainawala et. al. (2014), In this project he did the study of multi-storeyed R.C.C.Buildings with and without Shear Walls. They applied the earthquake load to a building for different cases of shear wall position. They applied load to G+12,G+25,G+38 located in zone II, zone III, zone IV and zone V. They calculated the lateral displacement as well as story drift in all the cases. It was observed that Multi-storeyed R.C.C. Buildings with shear wall is economical and stable as compared to without shear wall. After the analysis, it was concluded that the displacement at different level in multi-storeyed building with shear wall is lesser as compared to R.C.C. building without shear wall which is important for building designing and use of shear walls.

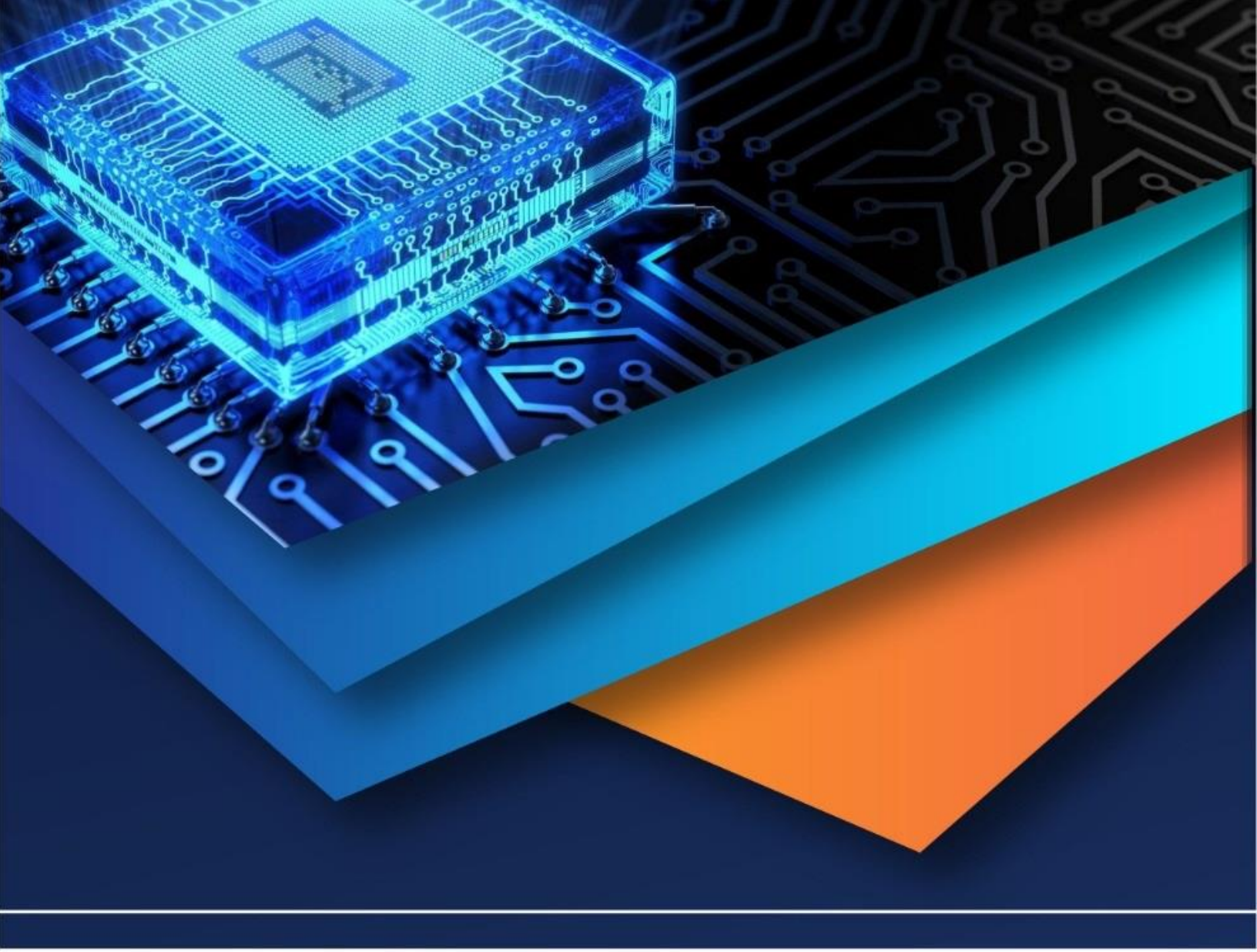
M. Mallikarjun et. al. (2016), He carried the study on analysis and design of a multi-storied residential building (G+10) by using most economical column method. The dead load and live load was applied on the different structural component like slabs, beams. and this was achieved by reducing the size of columns at top floors as load at the bottom floor was more. The economizing was done by doing column orientation in longer span in longer direction because it can scale back the quantity of bending and therefore the the space of steel was also reduced.

IV. CONCLUSION

1) The structure is a design based on the E-Tabs, which provides adequate serviceability, strength and also the work is economical.
2) With the usage of ETABS software working time is saved and it also helps us in the designing of structure accurately.
3) The structural components were designed manually in as well as with the help of software.
4) There is not much land available in urban areas so buildings are constructed in storeys to utilise the vertical space.
5) Rather than destroying forests and swamps to build houses, shopping centers, and factories, they can be placed in a vertical tower, serving to preserve the environment.

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