A Review Paper on – Design and Analysis of Multistorey Building (G+4) with Different Grade of Concrete (STAAD. Pro)

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Abstract: **The study incorporates structural design and analysis of a multi-storey (residential) building having 5 storeys with ground floor complete car parking and residential spaces on other floors, including lift with access to all floors (including terrace) by using STAAD.Pro V8i. It also includes a comparison of different grade of concretes to be use on similar type of structure and similar type of loading. Design of the structure will be done using the STAAD.Pro V8i software for both grade of concrete. Analysis part will also be done using the software which in result provide us the graphs for deflection, stress and strain curve, stress areas, etc. in each section individually and wholly. By doing the comparison we can understand the structural behaviour of the similar structure and loading for different grades. Also the analysis will provide us the details as with grade of concrete will be better in structural and economic strength.**

Keywords: **Structural design & analysis, STAAD. Pro, grade of concrete, layout plan, dead load, impose load.**

1. Introduction

Structural engineering is the science and art of designing and making, with economy and elegance, buildings, bridges, frameworks and other similar structures so that they can safely resist the forces to which they may be subjected.

Structural engineers carry out strength calculations and prepare drawings of structures to ensure they are strong enough to avoid collapse when loaded. The most common structures dealt with are buildings and bridges, but tunnels, walls to hold back earth embankments, large tanks and silos as well as mining structures, also form part of a structural engineer's work. Specialist areas include oil drilling platforms and associated infrastructure, shipbuilding and aircraft design. Some structural engineers work in the design of structures (carrying out the strength calculations and supervising drawings), others specialise in the building of structures and some work in research. Structural engineers commonly work with architects, builders, mechanical, electrical and chemical engineers to ensure that all parts of the structure are safe and capable of fulfilling their intended function. They also make sure

structures use appropriate materials efficiently.

Accordingly, the study includes the structural design and Analysis of a multi-storey building using STAAD.Pro V8i software, using different grade of concrete to determine which structure is economic with equal strength. Layout plan for the structure to be designed and analysis is finalized and is given on the next page of the introduction. The layout includes 6 units of flats to be constructed on a single floor (as 1-3bhk, 3-2bhk and 2-1bhk), having extra spaces for lift, stair case and lobby for every flats.

2. Literature Review

[P. Leela Krishna (2020)] this study was related to the design and analysis of a multi-storey building by using staad.pro software. This frame analysis includes;
- Kani's method
- Cantilever method
- Portal method
- Matrix method

This analysis passed the checks carried out on them including the deflection, shear forces and bending moment. The use of software staad.pro and cad in structure analysis and design has be proven to be effective from the results output.

[Nirmal s mehta, urmi d modi, parth r patel, rutvik m prajapati, (november 2018)] this study was realted to the design and analysis of a multi-storey bulding with basement using etabs 2013 software.

In this analysis building model is generated by etabs software and the various paraemeters like;
- Center of mass
- Center of stiffness
- Displacement of building
- Storey drift
- Rotational displacements

are considered for analysis of columns, according to this design report provided by etabs all the values of stresses and

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storey drift are under limit as mentioned in is 456 2000 and is 1893 2000. According to the above analysis we can say that the building is asymmetric about x and y axis and interstorey drift is under limit prescribed by is 1893 2000.

[K. Prabin kumar, R. sanjaynath, (2018)] this study is related to the design of a multi-storey building using staad.pro software. In this report the building is designed using limit state method and carried out using staad.pro software. The whole procedure is done according to software wise listings and the parameters are defined and designed according to is codes and norms. The building is planned as per is 456 2000. The checks performed are accoring to the procedured defined by the indian standards. In the project with the help of software different figures are taken into account from the software graphs and designs. Complete details are shown here related to stress and strain chats, etc.

[Harshita m n, vinod kumar das, rajiv kumar chaudhary, sourabh singh, shivam shivhare, (2017)] this study is related to design and analysis of commercial building was done in etabs 2016. This project includes reinforced concrete frame structure (g+4) with parking facilities and the structure members are designed using limit state method as per is 456 2000. The whole procedure is done according to software wise listings and the parameters are defined and designed according to is codes and norms. The building is planned as per is 456 2000.

The checks performed are accoring to the procedured defined by the indian standards. In the project with the help of software different figures are taken into account from the software graphs and designs. Complete details are shown here related to stress and strain chats, etc.

[Rashmi Agashe, Marshal Baghele, Vaishnavi Deshmukh, Sharad Khomane, Gaurav Patle, Kushal Yadav, (April 2020)] From the work carried out in STAAD.Pro we can conclude that:

Comparison between manual calculation and STADD.Pro Software analysis and design, conclude that the analysis is same but design is some different. Using STADD Pro., analysis and design of multi-storey building has completed much quickly and easier than the manual calculation.

Building plan was develop and draft in Auto- CAD with required dimension. During designing G+ 4 storeys residential building structure is capable to sustain all loads acting on building. The design of slab, beam, column, rectangular footing and staircase is done with IS 456-2000 as limit state method.

[Arjun Sahu, Anurag Verma, Ankit Singh, Aryan Pal, Mohd. Shariq] Planning, analysis and design of G+3 multi-storey residential building was done. It's a G+3 storied building with parking in the basement and the rest of the floors are occupied with apartments. All the structural components were designed manually and detailed using AutoCAD. The analysis and design were done according to standard 8 specifications using STAAD. Pro for static and dynamic loads. The dimensions of structural members are specified and the loads such as dead load, live load, floor load and earthquake load are applied. Deflection and shear tests are checked for beams, columns and slabs. The tests proved to be safe. Theoretical work has been done. Hence, I conclude that we can gain more knowledge in practical work when compared to theoretical work.

[Falak Vats] Staad. Pro gives hardly any variation in results compared to the results computed manually, STAAD. Pro allows you to follow the criteria of several design codes for eg The Indian standards relating to loads, designs, analysis, etc. STAAD. Pro is a much easier and faster way of analyzing and designing a structure when compared to manual computation. The variation of seismic load, wind load, shear force and bending moment with the height is showing a direct relationship. STAAD. Pro is a user-friendly way to analyses the structure as its GUI is very easy to work with and the software is quite versatile.

3. Conclusion

This study is completely focusing on the structural design and analysis of the building and comparing the grades of concrete to find out which of them is better economically with same structural strength. This study includes the similar type of design, loading and procedure for both the grades. This study will help us to compare in between two or more of the grade for which is better in case of economy and strength. This can be helpful for further study as we can have the behaviour chat for the span (like for M20 & M25 grades) so that we can understand what if we increase or decrease the grade it will be economical or not.

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