Analysis and Design of Regular Building Using STAAD Pro without Earthquake Load

K. Venkatesh[1], Abhishek Mahagaonkar[2*]

[1]*Associate Professor, Department of Civil Engineering, Sharnbasva University (co-ed), Kalaburgi, India*
[2]*Student, Department of Civil Structural Engineering, Sharnbasva University (co-ed), Kalaburgi, India*

Abstract: **This paper presents an overview of Analysis and design of regular building using STAAD pro without earthquake load.**

Keywords: **Earthquake, STAAD pro.**

1. Introduction

Buildings are structures formed by combing roofs, walls with different sizes and shapes. They are constructed from tiny scale to large. Buildings serve quite a lot of needs primarily as a haven from the weather, living space, security, privacy, and are comfortable for living and also to work. Buildings can be classified as different types as residential and commercial. Residential buildings are those most commonly known as homes or houses for families to live. Residential buildings have various names depending upon their use. Commercial buildings are those known as offices etc., where the public will do their professional works.

Regular residential building : Residential building means a building in which sleeping accommodation is provided for normal residential purpose with or without cooking, or dining facilities and includes one or more families dwelling, lodging houses, apartments, flats etc.

The construction in the 21st century is becoming challenging day by day as in order to achieve more economy and efficiency. As in order to bring down these challenges and save time, computer based programs are used by engineers. In this Project after having the theoretical knowledge about the analysis and design of building we have attempted to G+4 residential building using the software STAAD PRO. Our project involves Auto cad and Staad pro.

1. Auto Cad: - One of the main benefits of AutoCAD is that it allows you to draw to scale and accurately, Easy Layout and Viewing, we can make changes easily and reduce risk of error, Identify design problems, calculate material quantities for production store and transfer data safely save time and money.
2. The STAAD Pro: - It is used to generate the model, which can then be analyzed using the STAAD engine. Design, including design for durability, construction and use in service should be considered as a whole.

3. The design of the building is dependent upon the minimum requirements as prescribed in the Indian Standard Codes.

2. Literature Review

Aradhanna Chavan et.al (1): Analysis, Design and Estimation of G+4 Residential building. The study includes G+4 building with parking at ground floor and rest of floors occupied with 2BHK flats. The design and analysis is done by using STAAD PRO, estimation by MS-EXCEL.

Deshmukh D.R et.al (2): Analysis and Design of G+19Multistoried Building .The study includes designing of multistory building by well-known civil engineering software named as STAAD-PRO and it also includes wind and Seismic load. They also compare the results of earthquake load applied on structure by STAAD-Pro and manual calculations both by seismic coefficient method.

Preeti Singh et.al (3): This work consist each regular and irregular geometric shapes. Every shape with G+ 10 storied models was created by exploitation STAAD-Pro code with earthquake and wind load conditions. In regular form building static analysis was dole out within the unstable zones II and particularly in irregular form building T form was choosened and also the dynamic analysis was in dire straits the unstable zones IV and V. Finally calculated base shear, volume of concrete, weight of steel and also the value comparison analysis area unit compared for all unstable zones.

Aman et.al (4): Analysis and Design of multi-storey building at Gulbarga city, Karnataka, India. The study includes design of columns, beams, footings and slabs by well known civil engineering software named as STAAD-PRO.

Annop .A et.al (5): Design a multistoried building of G+5 floors, at kalakode, Keral, India. The design is done by taking into account standards recommended by IS code, Kerala building and national building rules. And also includes requirements for seismic and wind load.

3. Objectives

Generation of structural framing plan (Regular)
1. Creation of model of Regular building structure in

STAAD PRO

2. Application of various load combinations on the member
3. Design of the structure
4. Analysis of the structure.

4. Methodology

1. Importing of centre-line plan from Auto-cad in dxf format.
2. Representation of beams and columns. By using add beam command we had drawn the beams and columns between the corresponding node points.
3. 3D view of structure here we have used the Transitional repeat command in Y direction to get the 3D view of structure.
4. Supports, material and property assigning.
5. Assigning of dead and live loads.
6. Adding of load combinations.
7. Analysis After the completion of all the above steps we have performed the analysis and checked for errors.
8. Finally concrete design is performed as per IS 456: 2000 by defining suitable design commands for different structural components.
9. After the assigning of commands again we performed analysis for any errors.
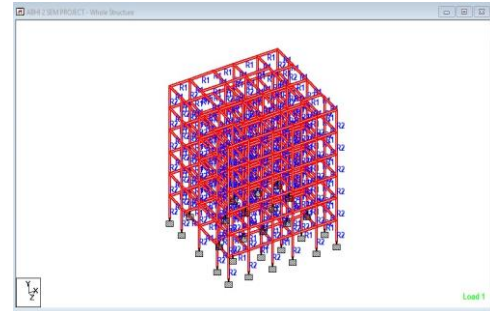10. Generation of Report.

5. Figures

Fig. 1. Plan of Regular Building

Fig. 2. G+4 Regular Building 3D Modeling in STAAD PRO
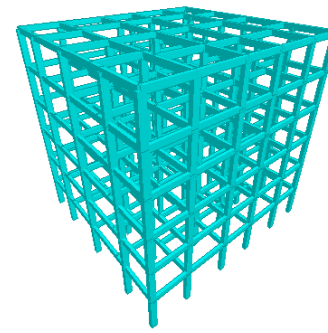
Fig. 3. 3D Rendering view of model

Fig. 4. Properties of Beam and Column
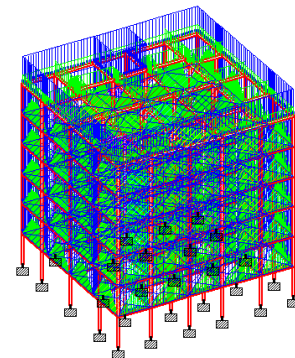
Fig. 5. Structure under Dead Load
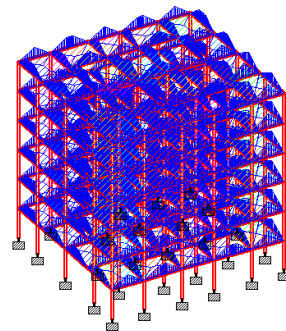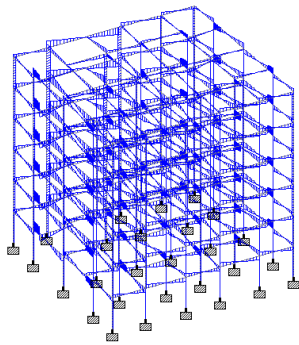

Fig. 6. Structure under Live Load
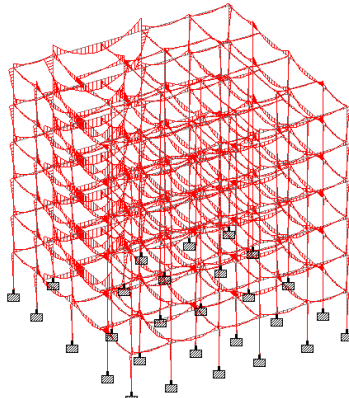
Fig. 7. Shear Force Diagram
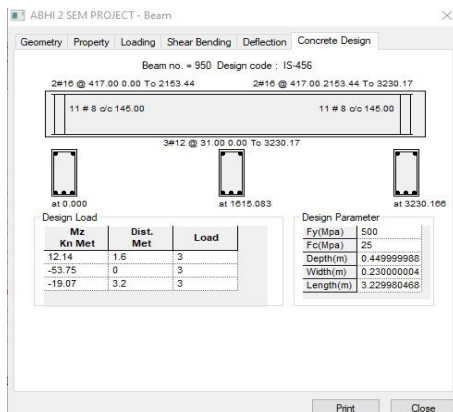

Fig. 8. Bending Moment Diagram
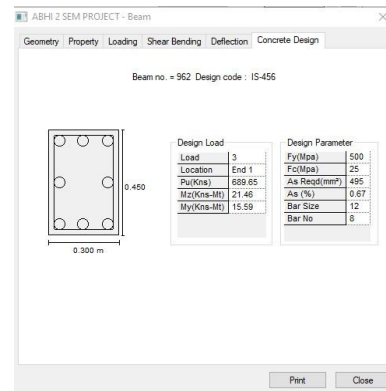

Fig. 9. Concrete Design of Beam

Fig. 10. Concrete Design of Column

6. Conclusion

1. The project is mainly performed with analysis and design of multi-storied residential building with all details using Staad Pro.
2. We may also check the deflection of various members under the given loading combinations.
3. The structural components of the building are safe in shear and bending.
4. Amount of steel provided for the structure is economic.
5. Very less space is required for the storage of the data.
6. STAAD Pro is a advanced software which provides us a fast, efficient, easy to use and accurate platform for analysis and designing structures.

References

[1] Aradhanna Chavan "Analysis, Design and Estimation of G+4 Residential building", "International Journal of Engineering Research and Technology", vol. 10, no. 6, June 2021.
[2] 2.Deshmukh D.R, Yadav.A.K , Supekar S.N , Thakur A.B, Sonawane H.P and Jain I.M "Analysis and Design of G+19 Storied Building using Staad-Pro" ,
[3] "International Journal of Engineering Research and Application", vol. 6, no. 7, July 2016, pp. 17-19.
[4] Preeti Singh, "Design and Comparison of Multi-Storied Building in all Seismic Zones", International Journal for Scientific Research & Development (IJSRD), vol. 5, pp. 538-539, 2017.
[5] Aman, Nalwadgi M, Vishal T and Gajendra "Analysis and Design of multi-storey building by using Stadd-pro", "International Research Journal of Engineering and Technology" vol. 3, no. 06, June 2016, 888-891.
[6] Annop .A, Hussian F, Neeraja R, Chandran Rahul , S Shabina and S Varsha "Planning analysis and Design of multi-storey Building By Staad.Pro.V8i" , "International Journal of Scientific and Engineering Research", vol 7, no. 4 , April-2016.
[7] IS Code 456-2000 (Design of RC structural elements)
[8] IS Code SP-16 (Depth & percentage of Reinforcement)