



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 6, June 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

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Analysis and Design of B+G+6 Residential Building Using Staad Pro

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ABSTRACT: Structural Analysis is a branch which involves the determination of behaviour of structures in order to predict the responses of real structures buildings, bridges, trusses etc. Under the improvement of expected loading and external environment during the service life of structures. The results of analysis are used to verify the structure fitness for use. Computer software's are also being used for the calculation of the forces, bending moment, stress, strain and deformation are deflection for a complex structural system. The Principle objective of this project is the comparative study on design and analysis of Multi-storeyed residential building by using STAAD Pro software. STAAD Pro is one of the leading software's for the designs of structures. In this project we had analysed the residential building for finding the shear forces, bending moment, deflections and reinforcement details for the structural components of the building (such as Beams, Columns and Slabs) to develop the economic design. Finally, we will make an attempt to define the economical section of multi-storied residential building using STAAD Pro software tool.

KEYWORDS: Planning, Analysis, Design, Multistoried Building, STAAD PRO, Auto CAD, Etc.

I. INTRODUCTION

In every aspect of human civilization, we needed structures to live. The structures should be built in an efficient manner so that it can serve people and save money. Structural Analysis is a branch which involves in the determination of behaviour of structures in order to predict the responses of real structures such as buildings, bridges, trusses etc. Computer Software's are also being used for the calculation of Forces, Bending Moment, Stress, Strain and Deformation or Deflection for a complex Structural System.

The full form of STAAD is "STRUCTURAL AIDED ANALYSIS AND DESIGN". To perform an accurate analysis we must determine such information as structural loads, geometry, support conditions, and materials properties. The results of such an analysis typically include support reactions, stresses and displacements. This information is then compared to criteria that indicate the conditions of failure.

II. LITERATURE REVIEW

•A.D. Bhosale, Archit Pradip Hatkhambkar, Rupesh Vinayak katkar, Shubham Balasaheb Babar, Sunny Pramod Gorivale: - Design and Analysis of Multistory Building by using STAAD Pro. In the STAAD Pro limit state method is used as per Indian Standard Code and Practices. In this project G+3 Structure was considered and Dead load, Live load, Combinations, Wind are applied. Then results are studied and compared by manual calculations.

•Shruthi Dixit, Vasudha Patil, Mayuri Tanpure, Dr. Basavaraj Balapgol: Analysis and Design of G+10 Residential Building using STAAD Pro considered the Earthquake load and Wind load. In this project they are analyzed the

building for finding Shear force, bending moment, Deflection and Design of Columns and Beams is being done IS 456-2000.

•S.K. Salmaan, V. Rajkumar, N. Phaniteja: - Design and Analysis of Multistory Building by using STAAD Pro. In this project they had analyzed the Residential Building for finding the Shear force, Bending Moment, Deflection and Reinforcement Details for the Structural Components of Building (such as beams, columns, and slabs) to develop the economic design. Finally, they will make an attempt to define the economic section of multistory residential building using STAAD Pro, software tool.

•Dhanvath Seva, Bhukya Chandrashekar, Faria Aseem: - Design of Residential Building using STAAD Pro. In this project deals with the Multistory Residential building of G+6 consisting of 5 Apartments in each floor. The Dead load and live loads are applied and the design for beams, columns, footings is obtained STAAD Pro with its new surpassed its predecessors and compactors with its data sharing capabilities with the other major software's like Auto Cad and MS Excel.

•Arjun Sahu, Anurag Varma, Ankit Singh, Aryan Pal, Mohd. Shariq: Design and Analysis of Multistory G+3 Residential Building by using STAAD Pro. In this project deals with the Design and Analysis of a Multistoried Residential Building of G+3 consisting of two Apartments in each floor. The Dead load and live loads are applied and the design for beams, columns and footings are obtained.

III. METHODOLOGY

Step – 1: Creation of nodal points. Based on the column positioning of plan we entered the node points into the STAAD PRO.

Step-2: Representation of beams and columns. By using add beam command we had drawn the beams and columns between the corresponding node points.

Step-3: 3D view of structure Here we have used the Transitional repeat command in Y direction to get the 3D view of structure.

Step-4: Supports and property assigning. After the creation of structure the supports at the base of structure are specified as fixed. Also the Materials were specified and cross section of beams and columns members was assigned.

Step-5: Assigning of dead loads. Dead loads are calculated as per **IS 875 PART-1** for external walls, internal walls, parapet wall including self -weight of structure.

Step-6: Assigning of live loads. Live loads are assigned for every floor as per **IS 875 PART-2**

Step-7: Assigning of earthquake loads, earthquake loads are defined as per **IS 1893 Part 1** based on intensity calculated and damping ratio. Then loads are added in load case details in +X, -X, +Z, -Z directions.

Step-8: Analysis after the completion of all the above steps we have performed the analysis and checked for errors.

LOAD CALCULATION

Dead load:

Dead of each section will get assigned by itself, if the section dimensions are properly defined.

- For columns and beams use self weight command
- Slab (assuming 125mm thick 0.12X25) = 3.125KN/m²
- Floor finish (On floor slab) = 1KN/m²
- Main wall load 0.23X3X18=12.42KN/m²
- Partition wall 0.23X3X18=12.42KN/m²
- Staircase load = 3KN/m²

Live load:

- Residential units (Living/dining/bedroom) = 2KN/m²
- Kitchen/Store/ = 2KN/m²
- Utility / Balcony/Ramp = 3KN/m²
- Toilet = 2KN/m²

IV. MODELLING AND ANALYSIS

FIG 1: ASSIGNING OF SUPPORTS

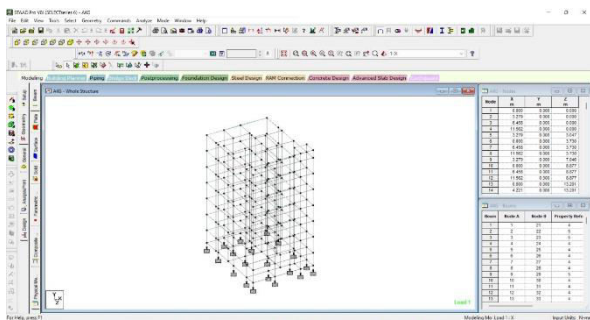


FIG 3: ASSIGNED VIEWS OF BEAMS AND COLUMN

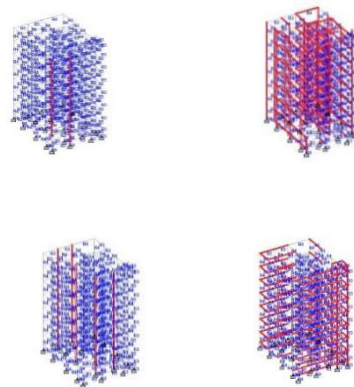


FIG 2: ASSIGNING OF BEAM AND COLUMN DIMENSIONS

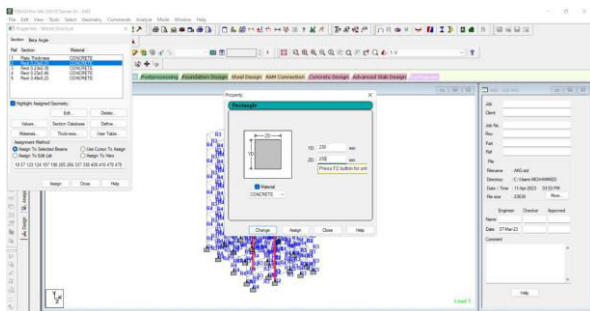


FIG 4: DEAD LOAD

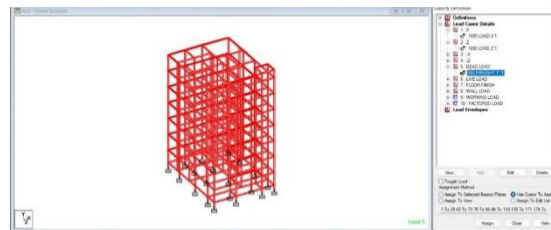


FIG 5: LIVE LOAD

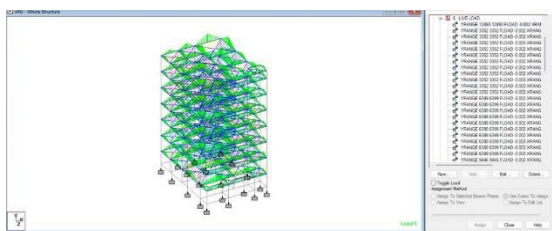
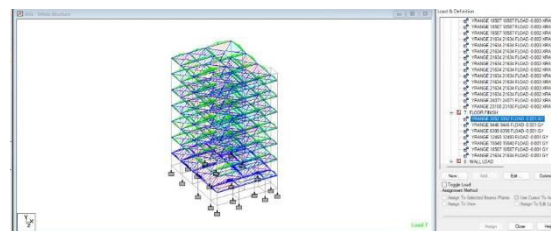


FIG 6: FLOOR FINISH



V. DESIGN USING EXCEL SPREADSHEET

Design of structure is done as per IS 456:2000 recommendation.

VI. RESULTS AND DISCUSSION

FOOTING:

- For the actual load of 1341.352KN of C1 Group and the size of footing is 230X460mm.

Reinforcement details:

- Along longer span: 12mm dia @70mm C/C
- Along shorter span: 10mm dia @340mm C/C

- For the actual load of 938.587KN of C2 and the size of footing is 460X230mm.

Reinforcement details:

- Along longer span: 12mm dia @110mm C/C
- Along shorter span: 10mm dia @260mm C/C

- For the actual load of 316.315KN of C3 and the size of footing is 230X230mm.

Reinforcement details:

- Along longer span: 12mm dia @300mm C/C
- Along shorter span: 10mm dia @60mm C/C

- For the actual load of 479.213KN of C3 and the size of footing is 230X380mm.

Reinforcement details:

- Along longer span: 12mm dia @210mm C/C
- Along shorter span: 10mm dia @120mm C/C

COLUMN:

- For the column area of 230X460mm, the actual load is 2012.028KN

Reinforcement details:

- Longitudinal reinforcement: 10 no's 20mm dia
- Lateral ties: 8mm dia @ 120mm

BEAM:

- For Beam no1, the area is 230X380mm, moment is 63.341KN-m and shear force is 80.585KN

Reinforcement details:

- Main reinforcement: 3no's 16mm dia
- Vertical stirrups: 2L 8mm dia @ 300mm C/C

- For Beam no1, the area is 230X460mm, moment is 65.571KN-m and shear force is 69.599KN

Reinforcement details:

- Main reinforcement: 2no's 16mm dia
- Vertical stirrups: 2L 8mm dia @ 300mm C/C

SLAB (TWO WAY SLAB):

- For Lx and Ly values 6959 and 4322mm, the overall depth is 200mm.

Reinforcement details:

- Main reinforcement: 12mm dia bars @200mm C/C
- Distribution bars: 8mm dia bars @200mm C/C

- For Lx and Ly values 4876 and 3708mm, the overall depth is 150mm.

Reinforcement details:

- Main reinforcement: 12mm dia bars @350mm C/C
- Distribution bars: 8mm dia bars @250mm C/C

STAIRCASE:

- For 150mm Riser and 300mm Tread, maximum moment @ mid span 27.028KN/m²

Reinforcement details:

- Main reinforcement: 12mm dia bars @290mm C/C
- Distribution bars: 8mm dia bars @220mm C/C

VII. CONCLUSION

The STAAD.Pro program is used to model, and the performance generated by STAAD.Pro consists of accurate numerical results for analysis and design. Details of each and every member can be obtained using STAAD.Pro. In this project B+G+6 storied building is considered and applied various loads like dead load, live load, floor finish and wall load and results are studied and compared by EXCEL calculations. All the necessities are drawn using AutoCAD software.

REFERENCES

- 1) A.D. Bhosale, Archit Pradip Hatkhambkar, Rupesh Vinayak katkar, Shubham Balasaheb Babar, Sunny Pramod Gorivale. "To Study Analysis and Design of Multi-Storey Building by using STAAD-Pro V8i," Apr 2018.
- 2) Shruthi Dixit, Vasudha Patil, Mayuri Tanpure, Dr. Basavaraj Balapgol. "To Study Analysis and Design of G+10 Residential Building by using STAAD-Pro," May 2021.
- 3) Dhanvath Seva, Bhukya Chandrashekar, Faria Asem. "To Study Design of Residential Building using STAAD-Pro," Nov 2017.
- 4) S.K. Salmaan, V. Rajkumar, N. Phaniteja. "To Study Analysis and Design of Multistoried Residential Building using STAAD-Pro," May 2017.
- 5) Arjun Sahu, Anurag Varma, Ankit Singh, Aryan Pal, Mohd. Shariq. "To Study Design and Analysis of Multi-Storey (G+3) Residential Building by using STAAD-Pro and AUTOCAD."
- 6) Vaghasiya N, Pachchigar Forum N, Patel Falguni R and Patel Minal H "Development of RCC Building Model with Soft Storey in STADD-PRO", "Global Research and Development Journal for Engineering", March 2016, 95-102.
- 7) Annap.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, Issue 4 , April-2016.
- 8) 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 03 Issue:06, June 2016,888-891.
- 9) 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" , " International Journal of Engineering Research and Application" ,Vol 06,Issue 7 ,(part 1) July 2016,17-19.



INDIAN STANDARD CODES:

- Assigning of dead loads. Dead loads are calculated as per IS 875 (Part 1)1987 for external walls, internal walls, parapet wall including self-weight of structure.
- Assigning of live loads. Live loads are assigned for every floor based on IS 875 (Part 2) 1987 (TABLE NO 1 CLAUSE 3.1)
- Adding of load combinations. After assigning all the loads, the load combinations are given with suitable factor of safety as per IS 875 (Part 5) 1987 (clause 8.1).
- Assigning of earthquake loads, earthquake loads are defined as per IS 1893 (Part 1)2002 (TABLE-2 Clause 6.4.2) based on intensity calculated and damping ratio. Then loads are added in load case details in +X, -X, +Z, -Z directions.
- Finally concrete design is performed as per IS 456:2000 by defining suitable design commands for different structural components. (TABLE NO-19, ANNEX-G CLAUSE 38.1)



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