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A STRUCTURAL BEHAVIOUR AND SEISMIC PERFORMANCE OF FLOATING COLUMN BUILDING BY STAAD PRO

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ABSTRACT

The rapid increase in population and scarcity of land tends to the development of construction technology and high rise commercial structures. Building plays a vital role for improving the various activities. In the late world, prompt to action of peoples from one place to another is of great extent mainly for earnings. In building more facilities like financing section, computer section, administration section, design section and drawing section are provided. The supporting condition of structural members determines their stability during their lifetime. A structure is said to be stable when it satisfies all stability requirements. Structures will be more stable when all the sides proportionally to balance the static and dynamic loads support it; the structure has supposed to be supported. For aesthetic appearance we create our building supported by a single column. Satisfying the requirement of stability conditions for a single column structure will be a complicated one, compare with the structures supporting in all the sides depends upon their configuration; single column structure is a critical one when it is being to an symmetrical and eccentric loading condition. Eccentric loading will cause the structure to twist in any direction and may cause failure of structure is very critical condition. Since single column is supporting whole structure, all other members will act as cantilevers. To reduce the cantilever span for the structural beams converting two-third of the length as simply supported by providing the two ring beams and inclined beams. The structure is analyzed and designed using Staad pro (structural analysis package), which is based on stiffness matrix method. The above structure has been analyzed for various possible loading conditions and the critical has been selected for design purpose.

Keywords: Stadd pro, FLOATING COLUMN, High raise building.

I INTRODUCTION

This project describes planning, structural analysis, design and drawings with various components and approximate cost of the whole building. The proposed site is located at Hyderabad. This building consists. single column is special mono column structure (the whole block is supported by single rectangular column at the center). single column 4 floors in addition to the ground floor. It is provided for vertical and horizontal movement between the floors. It consists of staircase (Dog-legged), lift, dining room, rest room, verandah and toilet. Concrete grade used in single column is M30. High strength deformed bars are used for both the single column for reinforcement. Design of all structural members conforms to IS: 456- 2000.

The primary aim of all structural design is to ensure that the structure will perform satisfactorily During its design life. Specifically, the designer must check that the structure is capable of carrying the loads safely and that it will not deform excessively due to the applied loads. This requires the designer to make realistic estimates of the strengths of the materials composing the structure and the loading to which it may be subject during its design life. Furthermore, the designer will need a basic understanding of structural behaviour.

The work that follows has two objectives:

1. to describe the philosophy of structural design;

2. to introduce various aspects of structural and material behaviour.

Design is a word that means different things to different people. In dictionaries the word is described as a mental plan, preliminary sketch, pattern, construction, plot or invention. Even among those closely involved with the built environment there are considerable differences in interpretation. Architects, for example, may interpret design as being the production of drawings and models to show what a new building will actually look like. To civil and structural engineers, however, design is taken to mean the entire planning process for a new building structure, bridge, tunnel, road, etc., from outline concepts and feasibility studies through mathematical calculations to working drawings which could show every last nut and bolt in the project. Together with the drawings there will be bills of quantities, a specification and a contract, which will form the necessary legal and organizational framework within which a contractor, under the supervision of engineers and architects, can construct the scheme.

II SURVEY OF RESEARCH

Chen and Constantinou (1998) studied that the practical system deliberately introduces flexibility to the sloping ground storey of structures was described. The system utilizes Teflon sliders to carry a portion of the superstructure. Energy dissipation is provided by the ground story ductile column s and by the Teflon sliders. Utilizing this concept the seismic response characteristics of a multistory frame are analyzed an discussed. The results show that it is possible to provide safely to the superstructure while maintaining the stability of the ground storey.

Chandrasekaran and Rao (2002) investigated analysis and the design of multi- storied RCC buildings for seismicity. Reinforced concrete multi-storied buildings re very complex to model as structural systems for analysis. Usually, they are modeled as two-dimensional or three-dimensional frame ,systems are in to plane and slope with different angles 5 10 , and 15 .Analyze multistoried buildings in the country for seismic forces and comparing the axial force, shear force, moment, nodal displacement, stress in beam and support reaction compared t o current version of th e IS: 1893 – 2002 to the last version IS: 1893- 1984. Birajdar B.G. (2004) presented the results from seismic analyses performed on 24 RC buildings with three different co figurations like, Step back building; Step back Set back building and Set back building are presented. 3 –D analysis including tensional effect has been carried out by using response spectrum method. The dynamic response properties i.e. fundamental time period, to p storey displacement and, the base shear action induced in columns have been studied with reference to the suitability of a building configuration on sloping ground. It is observed that Step back Set back buildings are found to be more suitable on sloping ground.

OBJECTIVE OF THE STUDY

To design and analysis of mono column building by using Staad. Pro software to with stands the gravity loads.

Analysis using Staad pro on of mono column building.

Design using Staad. Pro on of mono column building.

III WORKING WITH STAAD.Pro

The STAAD input file can be created through a text editor or the GUI Modeling facility. In general, any text editor may be utilized or edit/created the STD input file. The GUI Modeling facility creates the input file through an interactive menu-driven graphics oriented procedure. The input file is a text consisting of series of command which are executed sequentially.

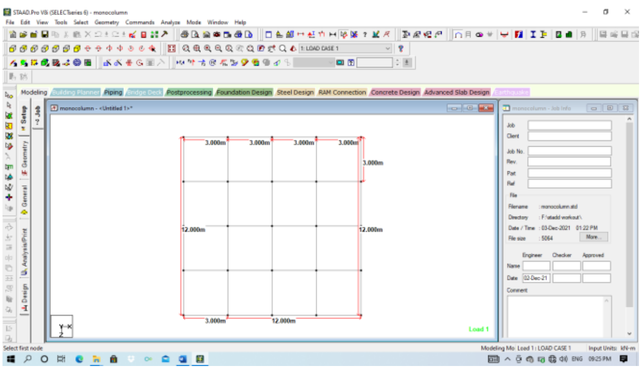

Fig.1 staad input file

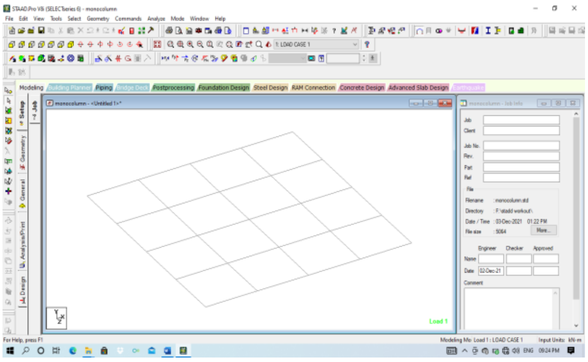

Fig.2 Base plan

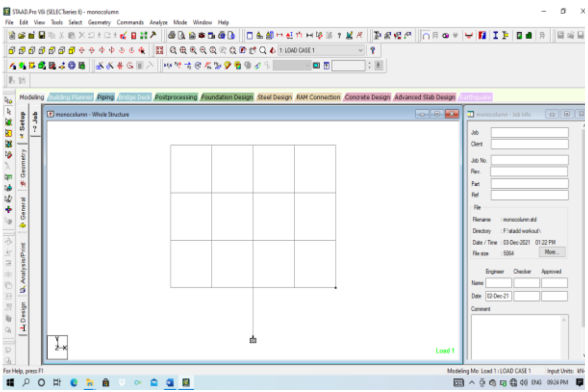

Fig.3 Isometric view with fixed support

POST PROCESSING FACILITIES

All output from the STAAD run may be utilized for further processing by the STAAD.Pro GUI.

Stability Requirements: Slenderness ratios are calculated for all members and checked against the appropriate maximum values. IS: 800 summarize the maximum slenderness ratios for different types of members. In STAAD implementation of IS: S00, appropriate maximum slenderness ratio can be provided for each member. If no maximum slenderness ratio is provided, compression members will be checked against a maximumvalue of 180 and tension members will be checked against a maximum value of 400.

Deflection Check: This facility allows the user to consider deflection as criteria in the CODE CHECK and MEMBER SELECTION processes. The deflection check may be controlled using three parameters. Deflection is used in addition to other strength and stability related criteria. The local deflection calculation is based on the latest analysis results.

Code Checking: The purpose of code checking is to verify whether the specified section is capable of satisfying applicable design code requirements. The code checking is based on the IS 800(1984) requirements. Forces and moments at specified sections of the members are utilized for the code checking calculations Sections may be specified using the BEAM parameter or the SECTION command. If no sections are specified, the code checking is based on forces and moments at the member ends.

SELF-WEIGHT

The self weight of the structure can be generated by STAAD.Pro itself with the self weight command in the load case column.

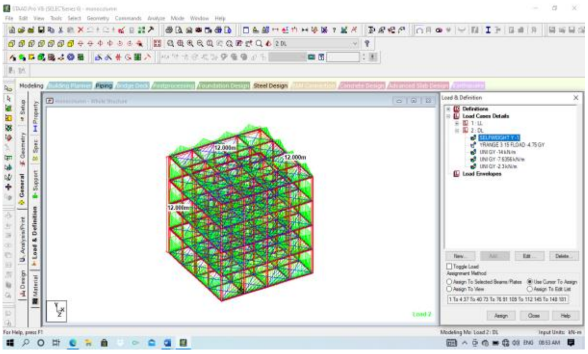

Fig.4. Self weight

DEAD LOAD Slab weight

Slab weight = depth of slab x unit weight = 0.150 x 25 = 3.75 KN/m2

Floor finish load = = depth of floor finish x unit weight = 0.050 x 20 = 1

Total weight = slab weight + floor finish load = 3.75 + 1 = 4.75 KN/m2

Wall Height

External wall thickness of brick=230mm (9")

Internal wall thickness of brick = 115mm(4'')

Wall Height=3m-0.3m=2.7m

Praphet wall height= 1m

Plaster external = 15mm

Plaster internal = 12mm

Total plaster = 27mm

Wall weight=wall height x wall thickness x unit weight

Ext. Wall weight=(2.7x.23x20) + (0.027 x 22 x 2.7) =14 KN/m Int.

Internal Wall weight=(0.115 x 2.7 x 20) + (0.024 x 2.7 x 22) =7.63 KN/m

Praphet wall weight=0.115 x 1 x 20 = 2.3 KN/m

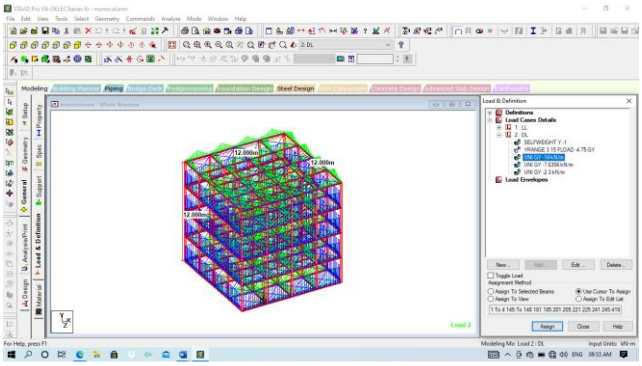

Fig 5. External Wall load

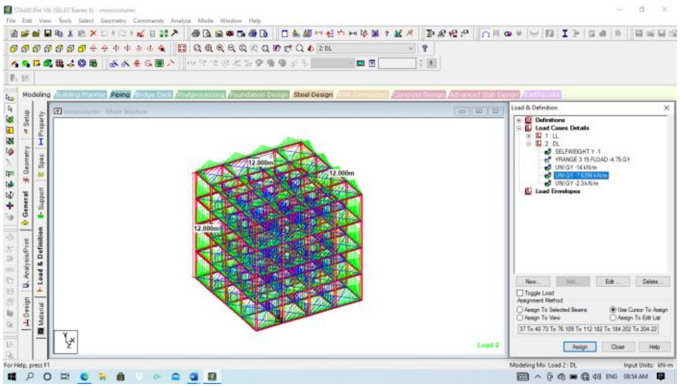

Fig.6 Internal Wall load

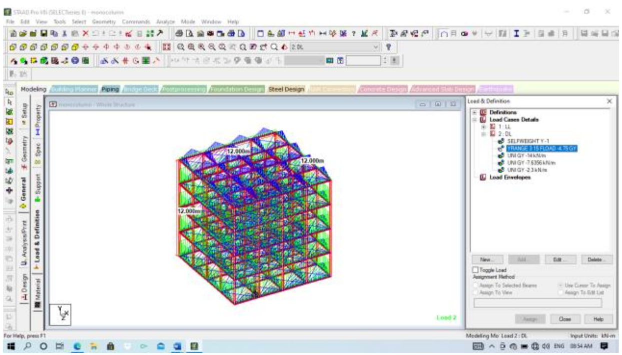

Fig 5.4: Slab + floor finish load

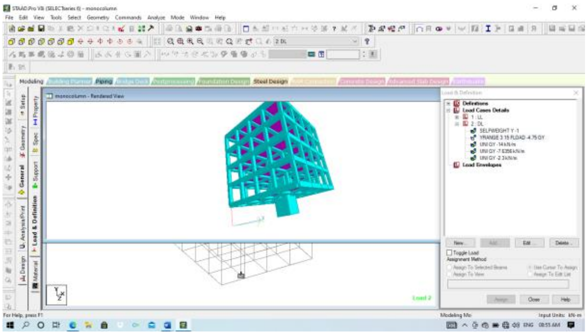

Fig.7. 3d view

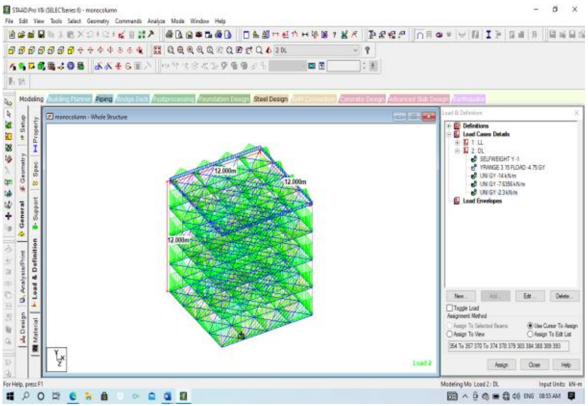

Fig.8. paraphet wall load

LIVE LOAD

The live load considered in each floor & terace was 3 KN/sq m. The live loads were generated in similar manners as done in the ealier case dead load in floor. This may be done from the member load button from the load case column.

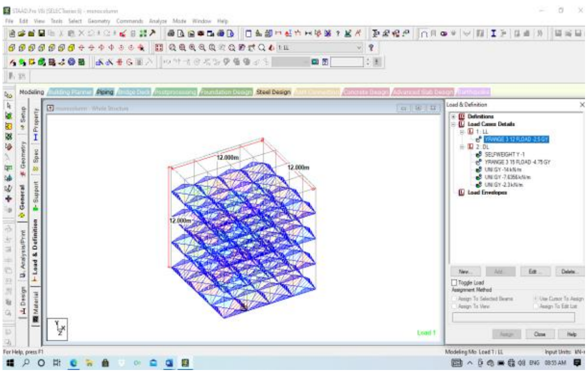

Fig.9. The structure under live load

1. DESIGN OF FOOTING

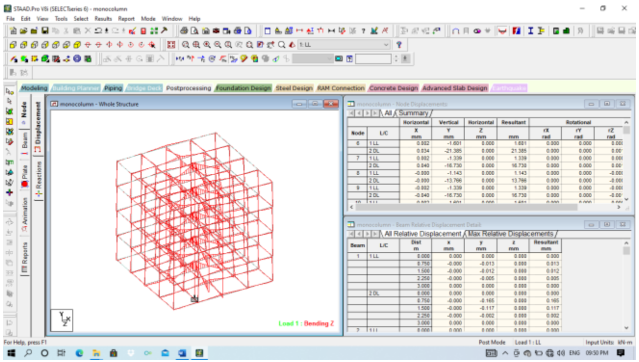

Fig.10. BMD for all members

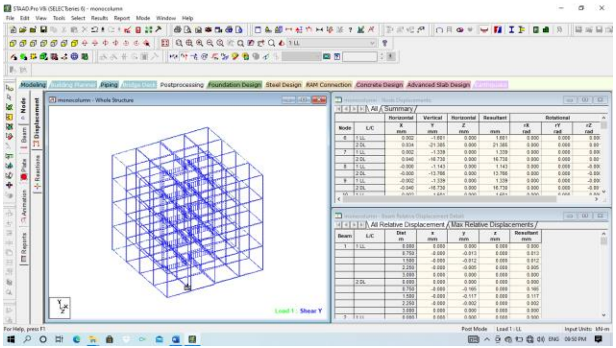

Fig.11. SFD for all members

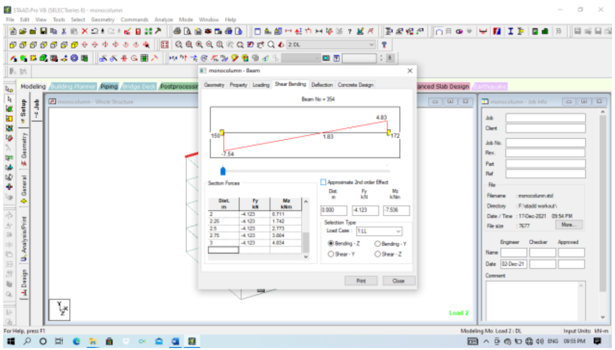

Fig.12. Shear bending

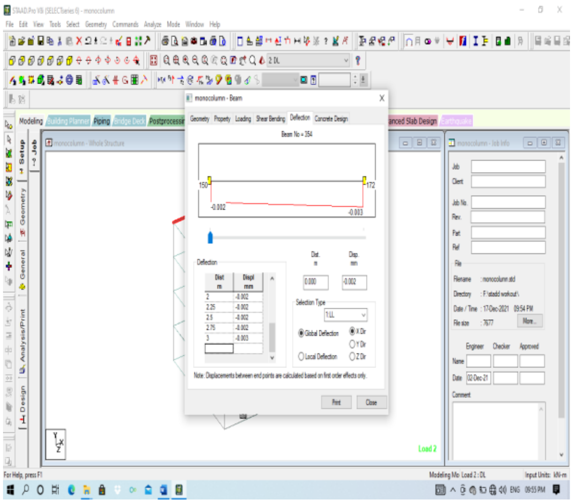

Fig.13. Deflection

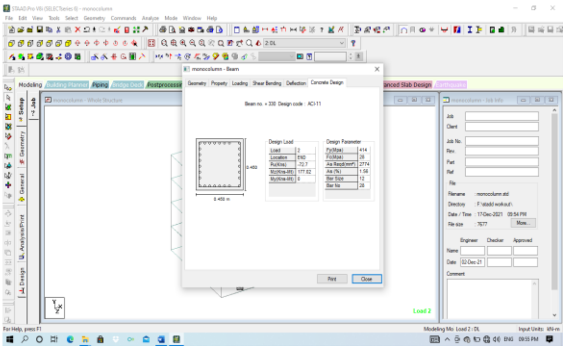

Fig.14. Concrete design

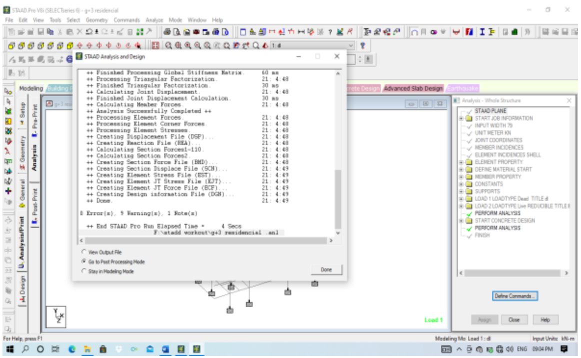

Fig.15. Design and analysis

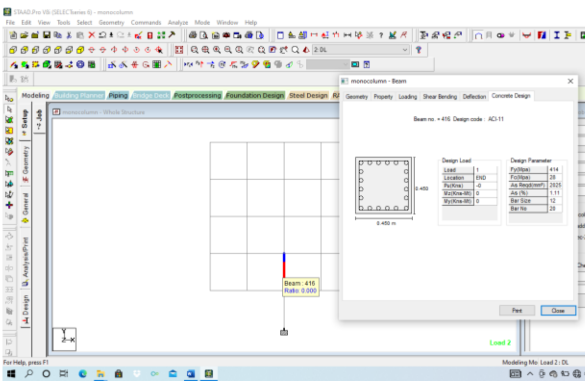

Fig.16. Mono column concrete Design

CONCLUSION

This project has been selected with utmost enthusiasm and keen interest by us and has been successfully completed with our knowledge to our satisfaction. The project Building with Mono Column (single supported building) is analyzed and designed with special attention and it is completed. Maximum space utilization is considered while planning and designing and we assure it will serve its maximum serviceability.

FUTURE SCOPE

1. This present study considered to only LIVE LOAD & DEAD LOAD. The same may be extended to wind & seismic analysis.
2. This analysis is done for 2D frame structures. This may extended to 3D-structures.

REFERENCES

1. IS: 456-2000, Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.

2. B.N.Dutta, Estimating and Costing in Civil Engineering, UBS Publishers & Distributors, New Delhi, 2000.

3. N.Krishnaraju, Structural Design and Drawing, UBS Publishers & Distributors, New Delhi.

4. Staad pro User's Manual, SAI INFRASTRUCTURES., SR Nagar,Hydrabad-500038,jan-june

2016

5. MEHMET INEL, HAYRI BAYTAN OZMEN"Nonlinear analysis of reinforced concrete buildings", Engineering Structures 28 (2006)Pg No .1494–1502.
6. EROL KALKAN and SASHI K. KUNNATH "Method of modal combinations for wind analysis of buildings", 13th World Conference on Earthquake Engineering, August 1-6, 2004 Paper No. 2713.
7. RAHUL RANA, LIMIN JIN and ATILA ZEKIOGLU "wind analysis of a 19 story concrete shear wall building", 13th World Conference on Earthquake Engineering, August 1-6, 2004 Paper No. 113.
8. PETER FAJFAR"Capacity spectrum method based on inelastic demand spectra", Earthquake engineering and structural dynamics 28(1999) Pg No. 979-993.
9. CINITHA A, UMESHA P.K."Evaluation of Seismic Performance of an ExistingSteel Building- wind Analysis Approach", ISET Journal of Earthquake Technology, Vol.41, Pg No.159-181
10. YU-YUAN LIN, KUO-CHUN CHANG and YUAN-LI WANG"Comparison of displacement coefficient method and capacity spectrum method with experimental results of RC columns",earthquake engineering and structural dynamics, 2004; Vol.33Pg No. 35–48.