

Analysis & Designing of Five Star Hotel building by using E-Tabs

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Abstract— Structural Analysis is a branch which involves in the determination of behaviour of structures in order to predict the responses of different structural components due to effect of loads. Each and every structure will be subjected to either one or the groups of loads, the various kinds of loads normally considered are dead load, live load, earth quake load and wind load. ETABS (Extended Three Dimensional Analysis of Building Systems) is a software which is incorporated with all the major analysis engines that is static, dynamic, Linear and non-linear, etc. and especially this Software is used to analyze and design the buildings. Our project “Analysis and Design of Commercial building using ETABS software” is an attempt to analyze and design a commercial building using ETABS. A G+10 storey building is considered for this study. Analysis is carried out by static method and design is done as per IS 456:2000 guidelines. Also an attempt has been made to design the structural elements manually. Drawing and detailing are done using Auto CAD as per SP 34.

Keywords: Building design, Analysis, E-tab

I. INTRODUCTION

The term building in Civil Engineering is used to mean a structure having various components like foundation, walls, columns, floors, roofs, doors, windows, ventilators, stairs lifts, various types of surface finishes etc. Structural analysis and design is used to produce a structure capable of resisting all applied loads without failure during its intended life. Prior to the analysis and design of any structure, necessary information regarding supporting soil has to be collected by means of geotechnical investigation. A geotechnical site investigation is the process of collecting information and evaluating the conditions of the site for the purpose of designing and constructing the foundation for a structure. Structural engineers are facing the challenges of striving for most efficient and economical design with accuracy in solution while ensuring that the final design of a building and the building must be serviceable for its intended function over its design life time. Now a day’s various software packages are available in market for analyzing and designing practically all types of structures viz. RISA, STAADPRO, ETABS, STRUDL, MIDAS, SAP and RAM etc.

II. BRIEF DESCRIPTION OF SOFTWARE – ETABS2015

ETABS is an engineering software product that caters to multi-story building analysis and design. Modeling tools and templates, code-based load prescriptions, analysis methods and solution techniques, all coordinate with the grid-like geometry unique to this class of structure. Basic or advanced systems under static or dynamic conditions may be evaluated using ETABS. For a sophisticated assessment of seismic performance, modal and direct-integration time-

history analyses may couple with P-Delta and Large Displacement effects. Nonlinear links and concentrated PMM or fiber hinges may capture material nonlinearity under monotonic or hysteric behavior. Intuitive and integrated features make applications of any complexity practical to implement. Interoperability with a series of design and documentation platforms makes ETABS a coordinated and productive tool for designs which range from simple 2D frames to elaborate modern high-rises.

III. LITERATURE REVIEW

VaralakshmiV et.al (2014) analyzed a G+10 storey Commercial building and designed the various components like beam, slab, column and foundation. The loads namely dead load and live load were calculated as per IS 875(Part I & II)-1987 and HYSD bars i.e. Fe 415 are used as per IS 1986- 1985. They concluded that the safety of the reinforced concrete building depends upon the initial architectural and structural configuration of the total building, the quality of the structural analysis, design and reinforcement detailing of the building frame to achieve stability of elements and their ductile performance.

IV. DESIGNING OF MODEL

A. Framing of Model



Fig. 1: 3D model in ETABS

B. Load Cases

Name	Type	Self-weight	Auto-Load
Dead	Dead	1	
Live	Live	0	
Superimposed Dead	Superimposed Dead	0	
E _{qx}	Seismic	0	IS1893 200
E _{qy}	Seismic	0	IS1893 200

Table. 1: Load Cases

C. Axial Force:

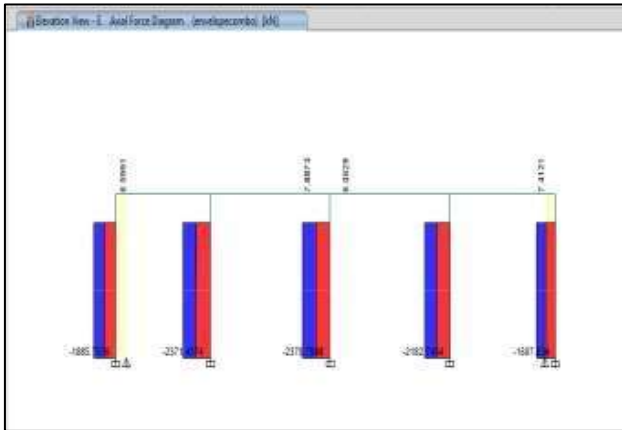


Fig. 2: Axis Force Diagram

D. Load Combinations

Design of the structures would have become highly expensive in order to maintain either serviceability and safety if all types of forces would have acted on all structures at all times. Accordingly the concept of characteristics loads has been accepted to ensure at least 95 percent of the cases, the characteristic loads are to be calculated on the basis of average/mean load of some logical combinations of all loads mentioned above. IS 456:2000, IS 875:1987 (Part-V) and IS 1893(part-1):2002 stipulates the combination of the loads to be considered in the design of the structures. The different combinations used are:

Name	Load Case/ Combo	Scale Factor	Type	Auto
UDCon1	Dead	1.5	Linear Add	No
UDCon1	Superimposed Dead	1.5		No
UDCon2	Dead	1.5	Linear Add	No
UDCon2	Live	1.5		No
UDCon2	Superimposed Dead	1.5		No
UDCon3	Dead	1.2	Linear Add	No
UDCon3	Live	1.2		No
UDCon3	Superimposed Dead	1.2		No

Table. 2: Load Combinations

E. Material constants

Use M25 grade concrete and HYSD steel bars of grade Fe500

Concrete, $f_{ck} = 25 \text{ N/mm}^2$

Steel, $f_y = 415 \text{ N/mm}^2$

Column size = 230 mm x 450 mm

Depth of column, $a = 450 \text{ mm}$

Breadth of column, $b = 230 \text{ mm}$

Factored axial Load, $P_u = 2505 \text{ kN}$

Safe Bearing Capacity of soil = 200 kN/m

F. Design of Isolated Footing

Establishment is that piece of the construction which is in direct contact with soil. The R.C. structures comprise of different underlying parts which act together to oppose the applied loads and move them securely to soil. Overall the loads applied on pieces in structures are moved to soil through pillars, sections and footings. Footings are that piece of the design which are for the most part situated subterranean Level.

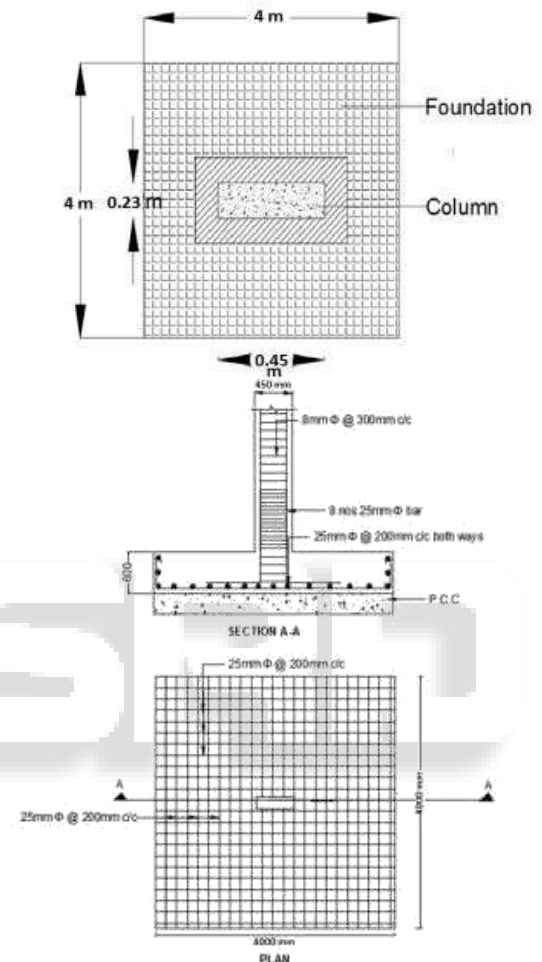


Fig. 3: Plan and detailing of a footing

G. Reinforcement detailing of staircase

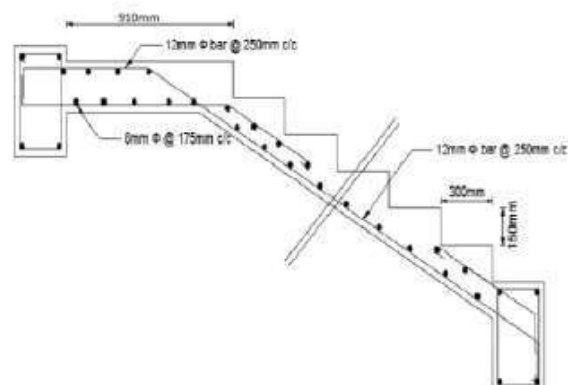


Fig. 4: Section details of a stair case

V. CONCLUSION

Examination and plan of a high rise having G+10 stories is finished. Examination is finished by utilizing the product ETABS V15.2, which end up being premium of incredible potential in investigation and plan of different segments. The primary components like RCC outline, shear divider and holding dividers are likewise given. According to the dirt examination report, a segregated balance is given. The plan of RCC outline individuals like bar and segment was finished utilizing ETABS. The investigation and configuration was finished by standard details to the conceivable expand. The different troubles experienced in the plan interaction and the different requirements looked by the primary specialist in planning up to the structural drawing were additionally perceived.

REFERENCES

- [1] Reinforced Concrete Design- N. Krishna Raju and R.N. Pranesh
- [2] Limit State Theory And Design Of Reinforced Concrete- Dr. V. L. Shah and Dr. S. R.Karve
- [3] Theory Of Structures- S Ramamrutham.
- [4] Limit State Design- Dr. Ramchandra
- [5] IS. 456: 2000, Indian Standard Plain and Reinforced Concrete - Code of Practice, Bureau of Indian Standards
- [6] IS: 875 (Part I) - 1987, Indian Standard Code of Practice for Design Loads (Other than Earthquake) (Dead Loads) for Buildings and Structures, Bureau of Indian Standards.
- [7] IS: 875 (Part 2) - 1987, Indian Standard Code of Practice for Design Loads (Other than Earthquake) (Imposed Loads) for Buildings and Structures, Bureau of Indian Standards.
- [8] SP 16 (1980): Design Aids for Reinforced Concrete to IS 456:1978, Bureau of Indian Standards, New Delhi.
- [9] Analysis And Design Of Apartment Building, IJSET - International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 3, March 2016 , ISSN 2348 – 7968.
- [10] Analysis And Design Of A Multi Storied Residential Building Of (Ung-2+G+10) By Using Most Economical Column Method, IJSEAT International Journal of Science Engineering and Advance, Technology, IJSEAT, Vol. 4, Issue 2, ISSN 2321- 6905.
- [11] Structural Analysis of a Multi-Storied Building using ETABS for different Plan Configurations, International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 3 Issue 5, May – 2014.
- [12] Comparative Study of Static and Dynamic Seismic Analysis of Multi-storied RCC Building by ETAB: A Review, International Journal of Emerging Research in Management & Technology ISSN: 2278-9359 (Volume-5, Issue-12).