iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** V **Month of publication:** May 2022

DOI: https://doi.org/10.22214/ijraset.2022.43490

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue V May 2022- Available at www.ijraset.com

Analysis and Design of G+12 Storey Reinforced Concrete Building Using ETABS

P. Vinoth[1], Irfan Alam[2], Abdul Rehman[3], Mohammad Raiyan[4], Gauhar Imam[5], Mohd Ashar Zubair[6]
[1, 2, 3, 4, 5, 6]*Department of Civil Engineering, Galgotias College Of Engineering & Technology, K.P.-II, Guatam Budh Nagar, U.P., India*

Abstract: ***Extended Three Dimensional Analysis of Building Systems is abbreviated as ETABS. The significant objective of this program is to make multi-story structures in a purposeful way. The productive plan and development of quake safe designs is significant everywhere. ETABS was used to analyse and design a multi-story residential structure with the lateral loading effect of an earthquake. IS 1893-part2:2002 and IS 456:2000 were used to design this project. This analysis takes into account harsh earthquake zones, and reactions are evaluated using soil type-II conditions.***
Important phrases: Etabs programme , Seismic Analysis of G+12 storey RC frame structure.

I. INTRODUCTION

ETABS is perhaps the most popular design and analysis programme these days. This programme is mainly used by many organisations and firms to create project designs and analyse. As a result, the main focus of this article is on a comparison of the results produced from conventional and ETABS software analyses of a G+12 storied building structure.

The powerful elements of the designs, as well as the force, span, and recurrence content of existing ground movement, impact primary response to quakes. Primary investigation utilizing ETABS is the method involved with deciding the shape, size, coming about aspect and responses and specifying of the sturucture. The subsequent results of a construction so it can satisfy the reason for which it was planned and support the powers that will follow up on it for the entire of its lifetime.

The efficient design and construction of seismic events structures is crucial all over the world. According to India's geological data, tremors threaten around 54 percent of the country's area. This project uses ETABS programme software to design and analyze a multi-story G+12 structure with lateral seismic and wind load effects. IS 1893-part2:2002 and IS 456:2000 were used to design this project. This analysis takes into account various seismic zones based on its location, and reactions result is evaluated using type-II soil conditions. In this project, we're taking a zone-III plan. At Agra, the eathquake intensity is harsh, and the Zone Factor is 0.16. Ordinary RC moment-resisting frame is recommended for the structure, with a Response Reduction Factor(R) of 1.0.

In this research, the columns sizes vary from the ground to a particular upper stories, with the lower columns being larger than the upper column in order to minimize structural failure. The diaphragm is inflexible. To avoid possible eccentricity, the major beams lie on the columns. ETABS software is being used to compare the design and analysis of irregular and regular multi-story building configurations in diverse seismic zones. The special point at the focal point of a mass dissemination in space is known as the focal point of mass. The mean area of a mass dispersion in space is the focal point of mass

We planned the design in an affordable manner by limiting the size of the areas since this task manages its most financial sections strategy. Since the heap is more prominent at the base than at the top, there is little requirement for gigantic sizes at the top. By streamlining the segments by situating it in a more noteworthy ranges, longer course, how much bowing is brought down, and how much steel utilized is trimmed down.

II. THE WORK MODEL'S DESCRIPTION

A. Project Specifications

1) The structure's motivation: private/residential
2) The construction's shape is regular & rectangular
3) Total number of storey: (G+12)
4) Wall type: Brick Wall
5) Story height: 3 metres (Similar stories)
6) Plot size: 620 m2
7) Plinth surface area: 600 m2

©IJRASET: All Rights are Reserved

B. Conditions on a Typical Construction Site

Area of construction: Agra
Zone: III
Zone factor: 0.16
RRF (Response Reduction Factor), : 1.0 (Ordinary RC moment-resisting frame)
A Twelve-story Private structure of balanced plan.
Type of soil: Medium stiff

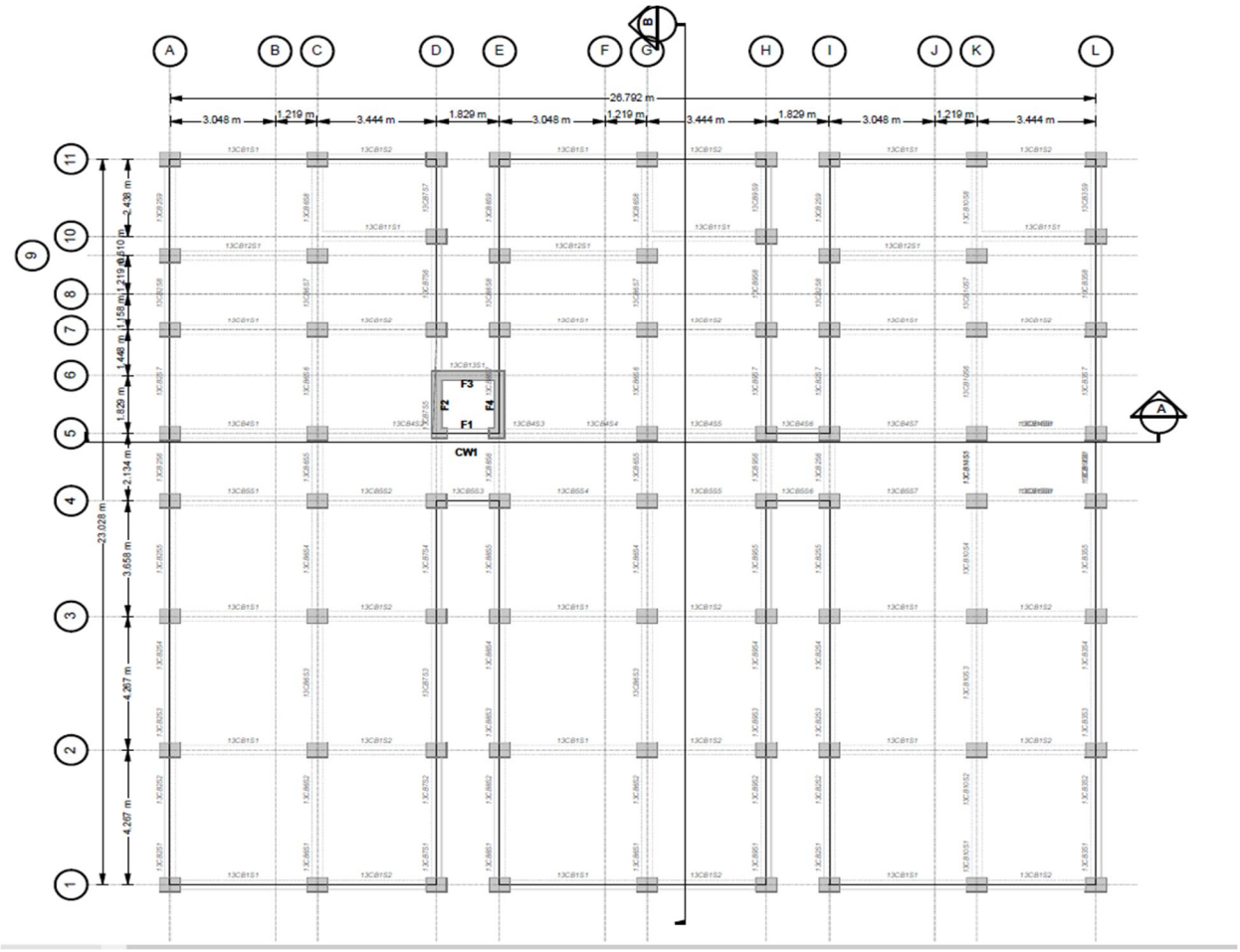


Fig.1. Etabs Plan Of Structure

C. Properties of Materials

In order to finish the task in ETABS programme, firstly we defines the material properties of concrete(in our case its M40) and material properties of rebars(i.e. HYSD500), sizes of beams and columns, thickness of slab, loads like live and super dead loads should also be defined, and seismic as well as wind factor will also be considered.

As like:

Concrete properties: M40
Properties of steel: HYSD500
Live load: 2kN/m^2
Beam size: 300mm x 600mm
Column size: 450mm x 600mm

D. Load's Description

- Live loads include all moving loads.
  Live load (on floor): 2kN/m^2, (IS 875:1987 - Part -II)
  Live load (on roof): 1kN/m^2, (IS 875:1987 - Part -II)
- Floor completes are the very forced dead loads
  Floor Completions (on floor): 1.5kN/m^2
  Floor Completions (on roof): 2kN/m^2
- Seismic loads specified in the manner that structure becomes seismic resistant.
  Zone: 3 (As indicated by the current drafting survey, seismic Zone 5 anticipates the most significant level of seismic effect. Although seismic Zone 2 is related to least degree of seismic effect.)
  Zone factor: 0.16
  Kind of soil: II (medium solid/stiff soil)
  Significance factor I: 1.0 (as private structure)
  Ordinary moment resisting frame is proposed for the structure.

III. RESULTS AND ANALYSIS

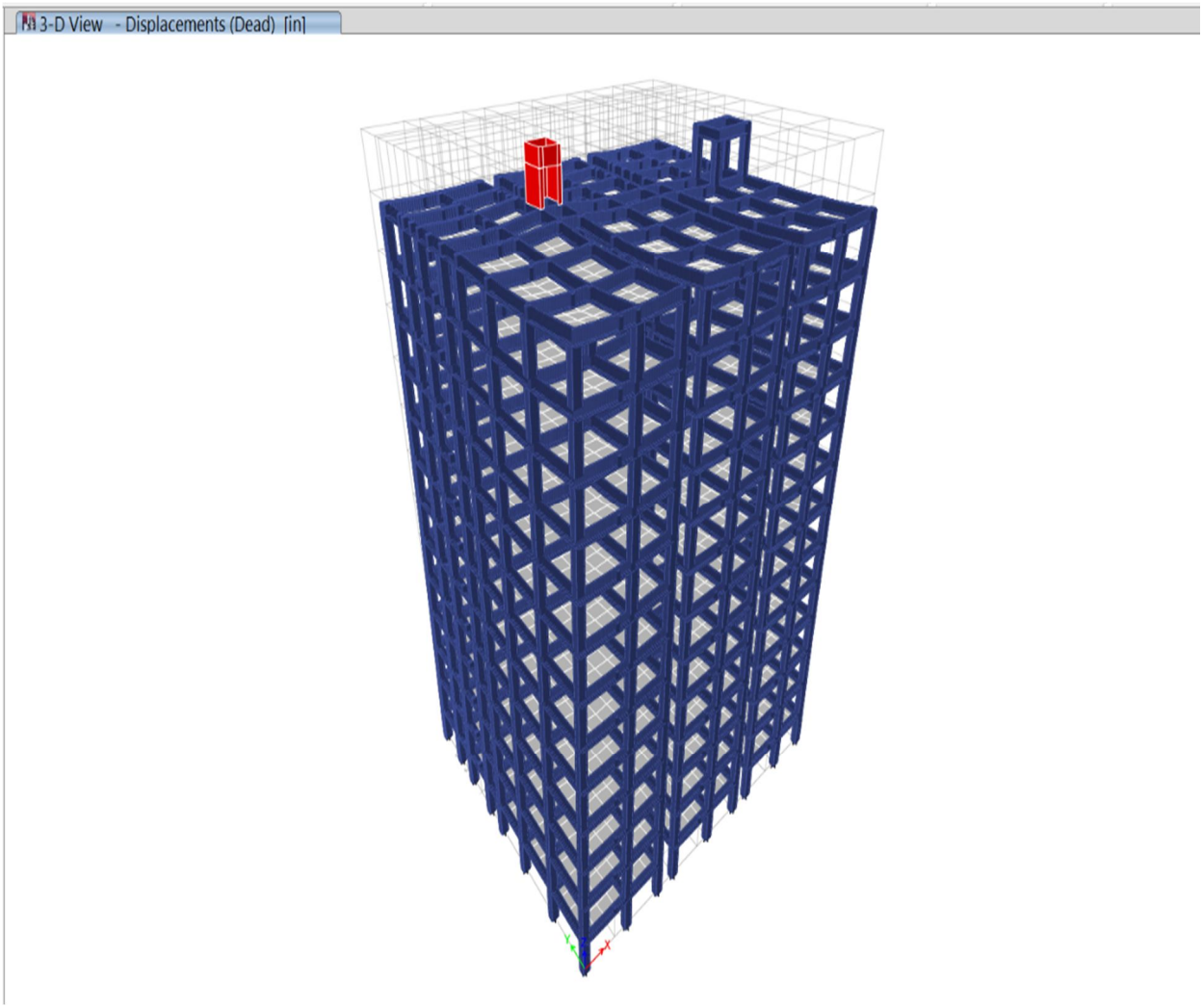
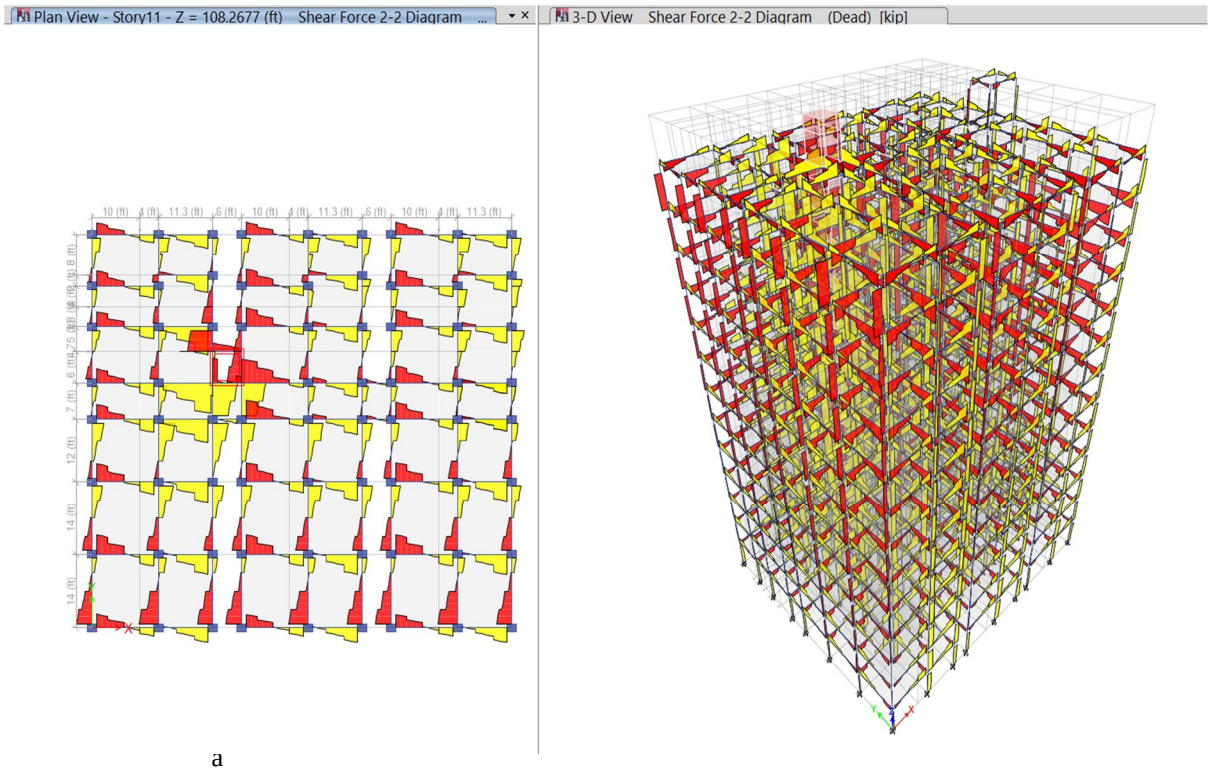


Fig. 2 3D Detail Deflection Of Structure

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue V May 2022- Available at www.ijraset.com



a

r Force

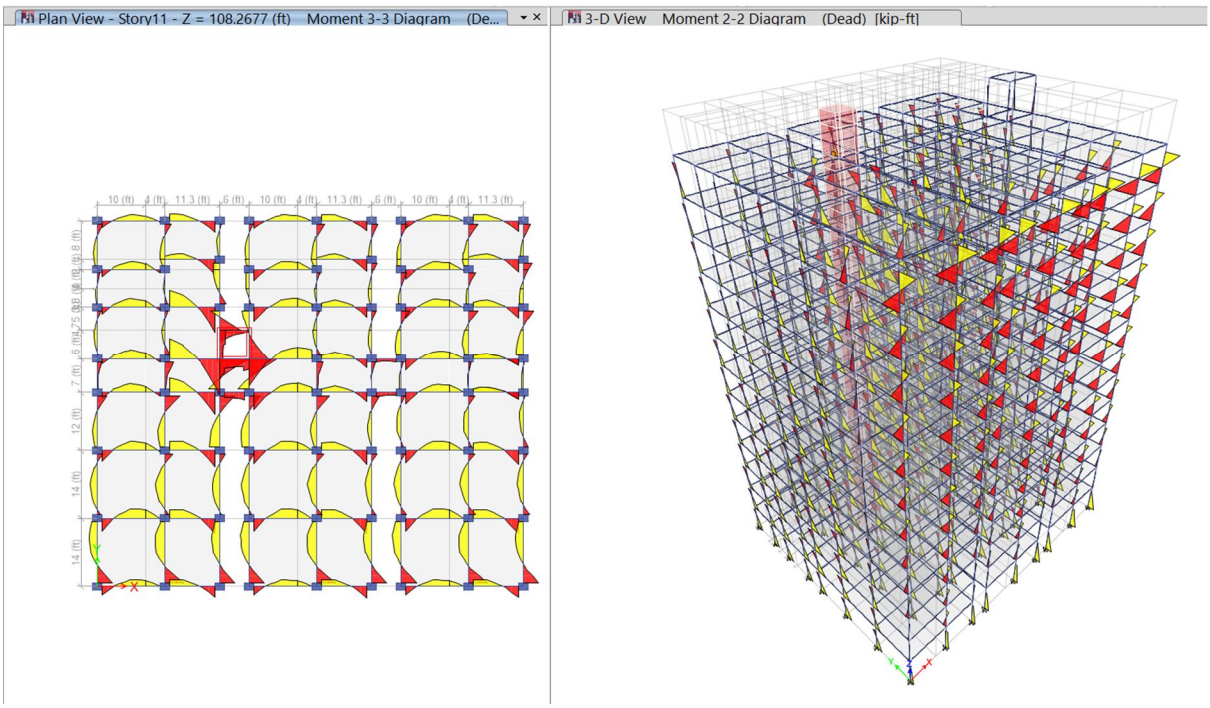


Fig. 4 Details Of Bending Moment

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

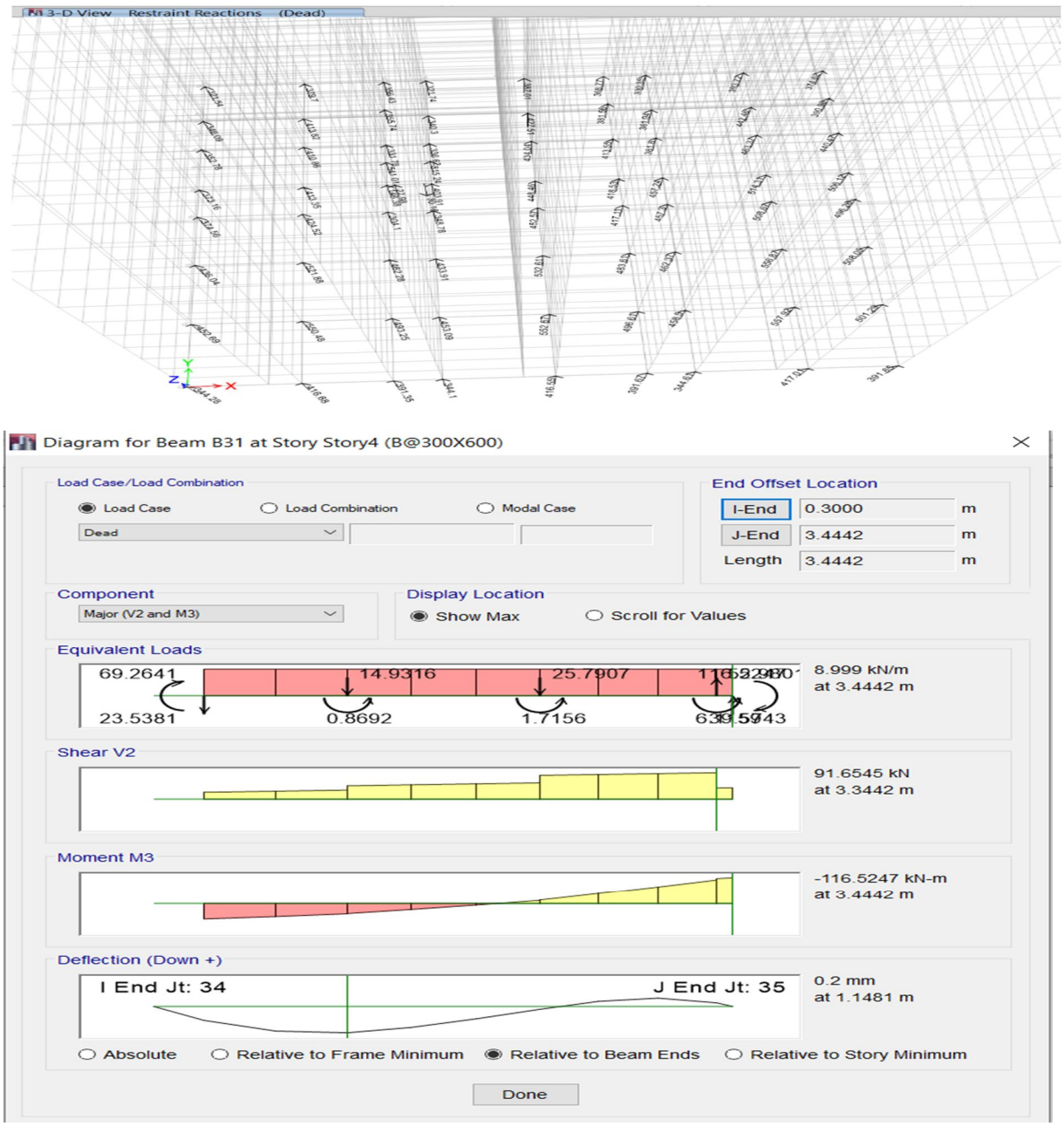


Fig. All The Loads Acting on Footing of Structure

IV. CONCLUSIONS

The following findings are drawn from the analysis and design of G+12 story buildings:

1) Our project entails the construction of an earthquake-resistant structure that is also cost-effective.

2) The previous dimensions of the beam and columns were B@300mmX600mm and C@300mmX600mm, respectively; however, after analysis, only the column fails. Thus the dimensions of column were altered to C@450mmX600mm, which is also more cost effective.

3) The seismic study was performed using ETABS software and personally confirmed according to IS 1893-2002.

4) In software analysis, the value of reaction force and loads increases gradually from to the roof top floor to the ground floor if we come down .

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

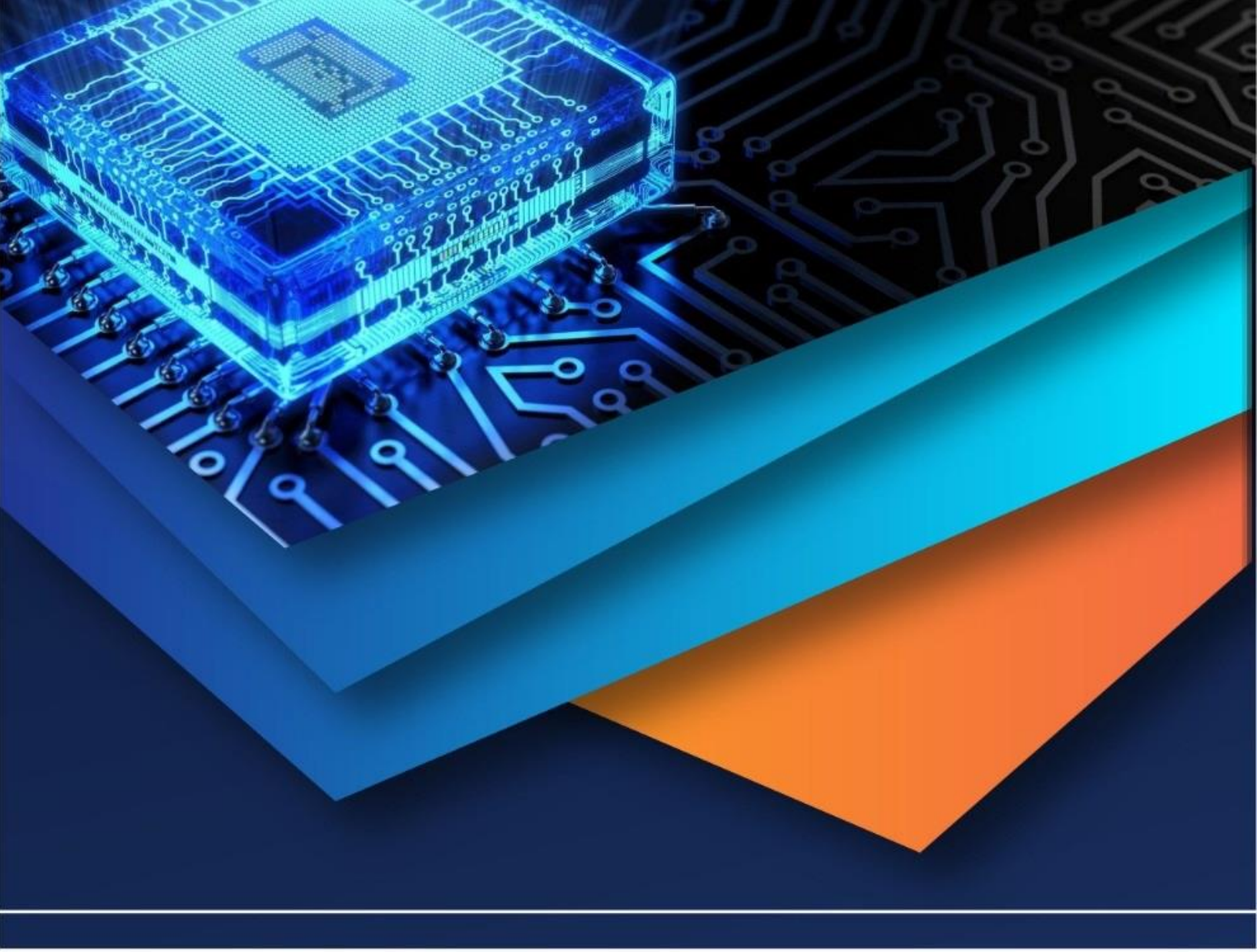
V. ACKNOWLEDGEMENT

We are highly thankful to Department of Civil Engineering, Galgotias College Of Engineering & Technology for providing the help for this work.

REFERENCES

[1] Mahesh N. Patil, Yogesh N. Sonawane, Seismic Analysis of Multi-storied Building, International Journal of Engineering and Innovative Technology, ISSN: 2277-3754, Volume 4, Issue 9, March 2015, PP 123-129
[2] Balaji.U, "Design and ANALYSIS OF Multi-storied Building under static and dynamic loading conditions using ETABS, International Journal of Technical Research and Applications ,ISSN: 2320-8163, Volume 4, Issue 4 (July-Aug, 2016), PP. 1-5.
[3] R. Garg and R. Garg, "Performance evaluation of polypropylene fiber waste reinforced concrete in presence of silica fume," Mater. Today Proc., vol. 43, no. xxxx, pp. 809–816, 2020, doi: 10.1016/j.matpr.2020.06.482.
[4] R. Garg, R. Garg, B. Chaudhary, and S. Mohd. Arif, "Strength and microstructural analysis of nano-silica based cement composites in presence of silica fume," Mater. Today Proc., vol. 46, no. xxxx, pp. 6753–6756, 2020, doi: 10.1016/j.matpr.2021.04.291.
[5] Piyush Tiwari, P.J.Salunke, Earthquake Resistant Design of Open Ground Storey Building, International Research Journal of Engineering and Technology, ISSN: 2395 -0056, Volume: 02 Issue: 07 |Oct-2015,PP 63-71
[6] R. Garg, R. Garg, and N. O. Eddy, "Microbial induced calcite precipitation for self-healing of concrete: a review," J. Sustain. Cem. Mater., vol. 0, no. 0, pp. 1–14, 2022, doi: 10.1080/21650373.2022.2054477.
[7] V. Kumar, S. Singla, and R. Garg, "Strength and microstructure correlation of binary cement blends in presence of waste marble powder," Mater. Today Proc., vol. 43, Part 2, pp. 857–862, 2020, doi: 10.1016/j.matpr.2020.07.073.
[8] R. Garg, R. Garg, and S. Singla, "Experimental Investigation of Electrochemical Corrosion and Chloride Penetration of Concrete Incorporating Colloidal Nanosilica and Silica Fume," J. Electrochem. Sci. Technol., vol. 12, no. 4, pp. 440–452, 2021, doi: 10.33961/JECST.2020.01788.
[9] S. Dhiman, R. Garg, R. Garg, and S. Singla, "Experimental investigation on the strength of chipped rubber-based concrete," IOP Conf. Ser. Mater. Sci. Eng., vol. 961, no. 1, 2020, doi: 10.1088/1757-899X/961/1/012002.
[10] R. Garg, M. Bansal, and Y. Aggarwal, "Split Tensile Strength of Cement Mortar Incorporating Micro and Nano Silica at Early Ages," Int. J. Eng. Res., vol. V5, no. 04, pp. 16–19, 2016, doi: 10.17577/ijertv5is040078.
[11] M. N. Khan, S. Singla, R. Garg, and R. Garg, "Effect of Microsilica on Strength and Microstructure of the GGBS-based Cement composites," IOP Conf. Ser. Mater. Sci. Eng., vol. 961, no. 1, 2020, doi: 10.1088/1757-899X/961/1/012007.
[12] R. Garg, P. Rani, R. Garg, and N. O. Eddy, "Study on potential applications and toxicity analysis of green synthesized nanoparticles," Turkish J. Chem., vol. 45, no. 6, pp. 1690–1706, 2021, doi: 10.3906/kim-2106-59.
[13] M. Kumar, M. Bansal, and R. Garg, "An overview of beneficiary aspects of zinc oxide nanoparticles on performance of cement composites," Mater. Today Proc., vol. 43, part 2, pp. 892–898, 2020, doi: 10.1016/j.matpr.2020.07.215.
[14] C. M. Kansal, S. Singla, and R. Garg, "Effect of Silica Fume & Steel Slag on Nano-silica based High-Performance Concrete," IOP Conf. Ser. Mater. Sci. Eng., vol. 961, no. 1, 2020, doi: 10.1088/1757-899X/961/1/012012.
[15] M. S. Amin, M. A. S. Bhuiyan, M. B. I. Reaz, and S. S. Nasir, "GPS and Map matching based vehicle accident detection system," in Proc. SCOReD'13, IEEE, 2013, pp 520-523.
[16] R. Garg, M. Kumari, M. Kumar, S. Dhiman, and R. Garg, "Green synthesis of calcium carbonate nanoparticles using waste fruit peel extract," Mater. Today Proc., vol. 46, part 15, pp. 6665–6668, 2020, doi: 10.1016/j.matpr.2021.04.124.
[17] N. O. Eddy, R. Garg, R. Garg, A. O. Aikoye, and B. I. Ita, "Waste to resource recovery: mesoporous adsorbent from orange peel for the removal of trypan blue dye from aqueous solution," Biomass Convers. Biorefinery, 2022, doi: 10.1007/s13399-022-02571-5.
[18] R. Garg, R. Garg, A. Thakur, and S. M. Arif, "Water remediation using biosorbent obtained from agricultural and fruit waste," Mater. Today Proc., vol. 46, no. xxxx, pp. 6669–6672, 2020, doi: 10.1016/j.matpr.2021.04.132.
[19] D. Prasad Bhatta, S. Singla, and R. Garg, "Microstructural and strength parameters of Nano-SiO2based cement composites," Mater. Today Proc., vol. 46, no. xxxx, pp. 6743–6747, 2020, doi: 10.1016/j.matpr.2021.04.276.
[20] Pardeshi sameer, "Study of seismic analysis and design of multi storey symmetrical and asymmetrical building, International Research Journal of Engineering and Technology, ISSN: 2395 -0056, Volume: 03 Issue: 01 | Jan-2016, PP 732-737.
[21] Priya Sera Varkey, N. Ganapathy Ramasamy, S. Prakash Chandar and Dhanya R, A Review on LCEA of Infrastructure Buildings. International Journal of Civil Engineering and Technology, 8(3), 2017, pp. 1112–1122.
[22] Mounika.Pallapolu, Aquila Angel. Pilli and K. Prasanthi, Analysis and Design of Commercial Building. International Journal of Civil Engineering and Technology, 8(4), 2017, pp. 1445–1451.
[23] IS: 1893:2000, Part 1, Criteria for Earthquake Resistant Design of Structures - General Provisions for Buildings, Bureau of Indian Standards, New Delhi, 2002.
[24] 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.
[25] Structural Analysis of a Multi-Storeyed Building using ETABS for different Plan Configurations, International Journal of Engineering Research & Technology (IJERT), ISSN: 2278- 0181, Vol. 3 Issue 5, May – 2014.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)