iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** IX **Month of publication:** September 2022

DOI: https://doi.org/10.22214/ijraset.2022.46932

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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 IX Sep 2022- Available at www.ijraset.com

Seismic Analysis and Modelling of Grid Slab and Flat Slab of G+14 R.C. Framed Structure using ETABS

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Abstract: ***These days, choosing the right kind of structure for a given function is crucial for design engineers. In some cases, grid structures and slab structures demonstrates to be more advantageous than the traditional RC Framed Buildings. Architectural features, as well as the adaptability of the use of space inside the buildings, the ease of formwork, etc. plays a significant impact in choosing the design criteria even despite the fact that the traditional method naturally offers the improved resistance against earthquakes. An attempt is made in this Present research to designed and evaluate the processes and results of the Flat Slab and Grid Slab RC frame slab, under earthquake zone V. The E-Tabs 2016 and IS Code 456-2000 is used for modes. G+14 Buildings with multiple stories are selected, designed, and analysed for earth quake zone V and D.L. and L.L.)***
Keywords: Structure, RC Framed, Buildings, demonstrates, resistance, Flat Slab, Grid Slab.

I. INTRODUCTION

Design needs to have good hand on numerical problem, to counter different challenges while getting twisted in a design. After complete knowledge of analysis and design one can design any structure but it is not possible for a single person to go through all fields. It is necessary to get a full knowledge in a particular field. Building analysis and design needs complete knowledge of IS Codes and numerical analysis. One must be well versed about loading which are considered in a building. Building can be of various types and can be residential, commercial, industrial and institutional. So, while performing a design we need to go through different design codes. Some of the codes are given below with their description of loading. IS- 875 (Part 1) – Design Code for Dead Loads. IS- 875 (Part 2) – Design Code for Live Loads. IS- 875 (Part 3) – Wind Load Design Code. IS- 1893 – Earthquake Design Code. In addition to above codes we have other codes too to take proper loading and to follow the steps as per standard code recommendation. Engineers which are dealing with Analysis and Design of Structures are known as Structural Design Engineers. They are professional in design both by manual process and by software means. But there is a question that which method we must choose while designing nowadays. It is not as easy as it looks to design a problem it needs mathematical calculation and practice in that field. With this specialization one must have good hand on numerical calculation and must have good experience as well.

II. LITERATURE REVIEW

Ahmed (2018) analysed that the Quantity of Concrete required for grid slab is more than conventional slab followed by flat slab for shorter spans. The Quantity of Steel required for grid slab is more than conventional slab followed by flat slab for shorter spans. As Span increases the Quantity of steel required for a slab system increases. The Maximum Joint Displacement (lateral sway) was found to be more for grid slab system followed by conventional slab system and least for flat slab system. The Maximum Joint Displacement (downward deflection) was found to be more for flat slab system followed by grid slab system and least for conventional slab system. The Maximum Storey Drift was found to be least for flat slab followed by conventional slab and more for grid slab system. The Maximum Column forces was found to be more for grid slab followed by conventional slab and least for flat slab system. The Maximum Column Moments was found to be more for grid slab followed by conventional slab and least for flat slab system.

Mahamuni and Halkude (2018) has done the analysis of the various methods by which grid floor system can be analysed. He has done the analysis of grid slab manually by using Plate theory, Rankine-Grashoff method, Stiffness method. Used various approaches for analyzing the grid slab system. For carrying out study, ratio of hall dimensions (L/B) from 1 to 1.5, halls having constant width 10.00m are considered. After applying the theoretical formulas, he observed that by using stiffness method, bending moment in x direction is increasing linearly by increasing L/B ratio.

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By using Rankine-Grashoff method it will give the lowest values of bending moment in x direction, which the lowest value among all the methods that is used in the analysis.

Sharma et al. (2018) observed that thickness of the building having flat slab with shear wall changes with the storey height. Flat slab provides more flexibility to the building as compare to conventional slab. Flat slab also provides more stability and aesthetic view to the building. In case of industrial structures constructed in a square and rectangular layout the displacement is more in case of flat slab as compare to waffle system and displacement is increases with the increases in the height of the building.

Deshmukh et al. (2018) as flat slab building structures are comparatively more flexible than conventional concrete framed structure, so it becomes more vulnerable to seismic loading. In composite column construction, steel and concrete are integrated in that manner that the advantages of the materials are recruited in efficient manner. The main objective of this study is only to study the seismic behavior of different types of flat slab building system with composite column at different soil conditions. Seismic parameters are followed by IS-1893-2016. And also there are many types of composite columns and from those concrete encased composite column are taken for the analysis. G+15 storied Model analyses preferred from previous studies by using Etabs-2017 (Structural Analysis Software). The results expected as in the previous studies, may be flat slabs with perimeter beams gives comparatively better results. Composite column design parameters are followed by Eurocode-4 and flat slab design parameters are followed by IS- 456-2000.

Imran B K et al. (2019) analyzed the office towers of G+ 5 with unappetizing slab and conventional slab for Bangalore, India by using ETABS software. They terminated that the unappetizing slab is not economical at all. Due to slab thickness and size of waif panel, the quantity of touchable will be increasingly and thus increases the construction forfeits to some extent.

III. STRUCTURAL DESIGNING

Whatever be the mode of analysis done, the structural engineer must have the ability to understand and interpret the results from the software to know the validity of the values provided as output. Some organization won't completely rely on the computer results, they conduct a separate man- made calculation for assurance. Even though structural engineers are the ones that bring and develop the design ideas and detail, he can only see it happen on the site only if the structure is constructed as desired. The structural engineer has to make coordination and consult other members like the site engineers, other design engineers, geotechnical engineers, landscape architects, architects, project manageress. Proper knowledge helps in spreading correct information among the group avoiding confusion and errors.

IV. STORY DATA

Table1. - Story Data

Name	Height mm	Elevation mm	Master Story	Similar To	Splice Story
Story15	3000	45000	Yes	None	No
Story14	3000	42000	No	Story15	No
Story13	3000	39000	No	Story15	No
Story12	3000	36000	No	Story15	No
Story11	3000	33000	No	Story15	No
Story10	3000	30000	No	Story15	No
Story9	3000	27000	No	Story15	No
Story8	3000	24000	No	Story15	No
Story7	3000	21000	No	Story15	No
Story6	3000	18000	No	Story15	No
Story5	3000	15000	No	Story15	No
Story4	3000	12000	No	Story15	No
Story3	3000	9000	No	Story15	No
Story2	3000	6000	No	Story15	No
Story1	3000	3000	No	Story15	No
Base	0	0	No	None	No

V. CONCLUSIONS

Flat slab makes it best for design purpose instead of grid slab if we take economic point of view.It is also found that bending moment will be greater at grid slabs and lesser at flat slabs as there are no beams. So, in this case reinforcement provided will be greater in the region of grid slabs as compared to flat slabs. Reinforcement provided for flat slabs is minimum as compared to grid slabs.Grid slabs help to minimize provision of number of columns as they are rigid and can be used for longer spans. But flat slabs cannot resist that much amount of load as they are not supported by beams.It is found that max displacement in slabs reach up to 240X10-3 mm shown in red zone. It can be clearly depicted that flat slabs experience maximum displacement as compared to grid slabs.

VI. ACKNOWLEDGMENT

This work was completed with the grants and facilities of Lakshmi Narain College Of Technology, Bhopal (M.P.). Authors are thankful to this institute and faculties for extending this cooperation.

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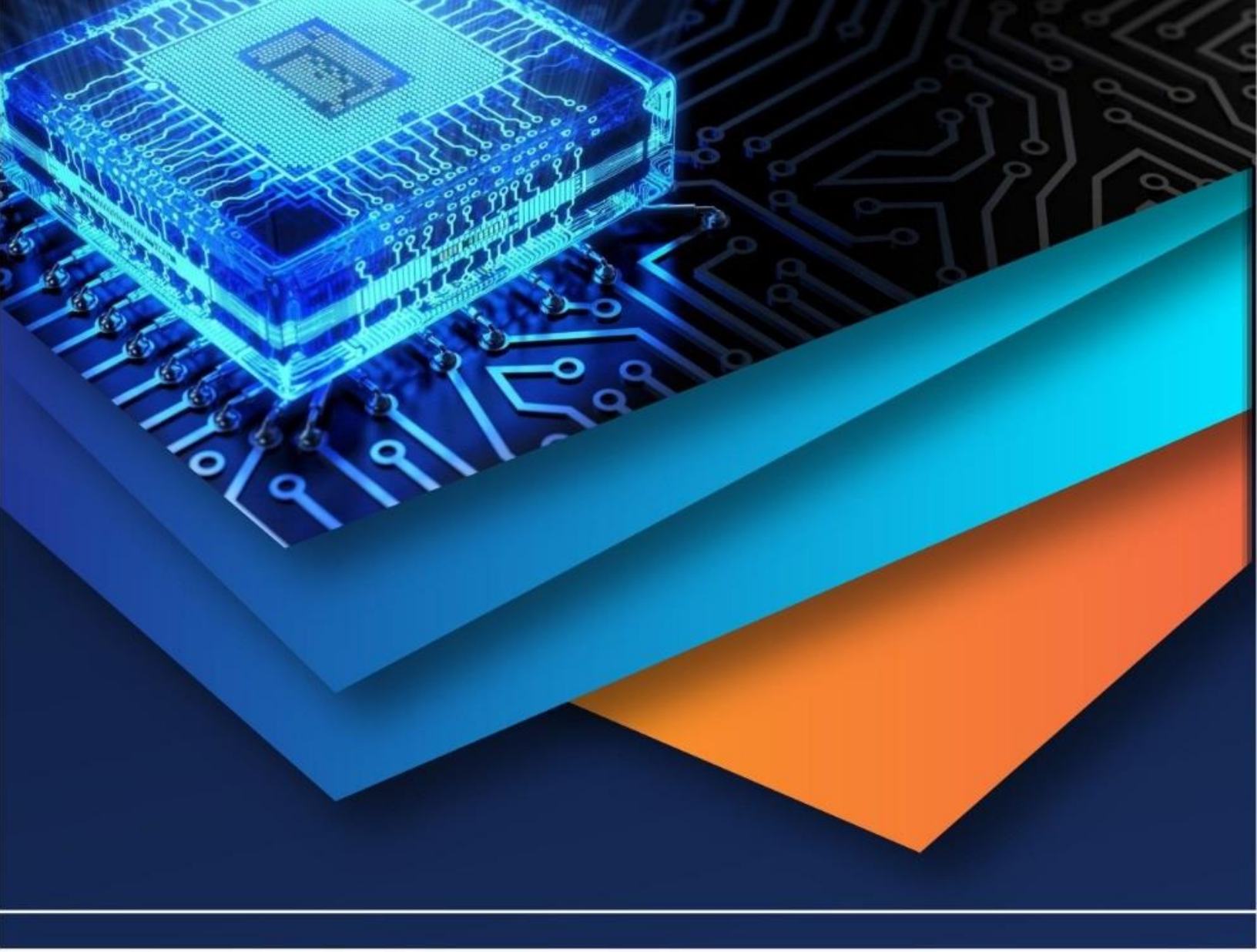
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