e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:07/July-2024 Impact Factor- 7.868 www.irjmets.com

COMPARATIVE ANALYSIS OF A HIGH RISE STRUCTURE CONSIDERING DIFFERENT SLABS: A REVIEW

Satyendra Choukiker*1, Hitesh Kodwani*2

[1]Research Scholar, Civil Engineering Dept., Sam Global University, Raisen-464551, Madhya Pradesh, India.

*[2]Assistant Professor, Civil Engineering Dept., Sam Global University, Raisen-464551, Madhya Pradesh, India.

DOI : https://www.doi.org/10.56726/IRJMETS60140

ABSTRACT

Civil Engineers are facing a great challenge in structural designing. The design must fulfill various parameters which include economical structure, durability and serviceability. But taking these points in mind it becomes very difficult for an Engineer to fulfill all these requirements at a time when a design is performed manually. This digital tool used in civil engineering and comparing their results by taking in mind the requirements of the above points. In this paper we have reviewed articles related to high rise structures considering different slabs.

Keywords: Staad.Pro, Axial Force, Storey Displacement, Shear Force, Bending Moment

I. INTRODUCTION

The building codes permit performance-based style, but there isn't a lot of particular guidance. Numerous necessary guiding principles for the shaky design of tall buildings have recently been published in distinct styles. These focuses advance the usage of various kind of burden refusal embracement which was not out there for the plan in the plan local area. Parallel burdens as a result of wind and quake supervises the design rather than the upward loads.

The developments made to help vertical burdens probably won't have the option to help side burdens. The justification for why sidelong loads are more huge and increment rapidly with level than vertical loads that would be supposed to increment straightforwardly with height is on the grounds that they are flat. The disrupting second at the foundation of a design so tall is huge and changes comparable to the square under a consistent breeze and tremor stacks. A structure will normally work as a cantilever on the grounds that the level burdens are excessively weighty at the popular narrative contrasted with the establishment story. These equal powers will in everyday impact the packaging. Neither in an extensive part of the seismic slanted regions there are a couple of instances of dissatisfaction of designs which are nor been planned f0r quake loads. This all reaction has examination of effect of the sidelong burden huge.

II. TYPES OF RCC SLAB SYSTEM

One Way Slab on Beam

One-way slabs on beams are built using the cast in situ process, which entails attaching forms, installing reinforcements, and then pouring brand-new concrete.

One-way joist slab (Ribbed slab)

It comprises of a floor slab supported by reinforced concrete ribs that range in thickness from 50 to 100mm (or joists). The ribs are regularly placed at intervals of no more than 750mm and are typically tapered. On girders that rest on columns, the ribs are supported.

Waffle Slab (Grid Slab)

It is a type of reinforced concrete slab that contains square grids with deep sides. Waffle slab construction process includes fixing forms, placement of pods on shuttering, installation of reinforcement between pods, installation of steel mesh on top of pods, and pouring of concrete. For spans of 9–15 meters and live loads of 4–7 KN/m2, grid slabs are appropriate. The cost of formwork, including the usage of pans, is high.

Flat Plates

Flat plates are directly supported by columns or walls and can be built as one-way or two-way slabs. It is simple to build and only needs basic formwork.

Flat Slabs

Typically, there are no beams involved; instead, the reinforced slab is supported directly by columns or caps. This kind of slab can usually be built quickly and with minimum formwork. The columns receive the loads right away.

Two Way Slab on Beam

Due to the fact that two-way slabs are supported on all sides, the construction of this type of slab is similar to that of a one-way slab on beams, but additional formwork may be required. For spans between 6 and 9 metres and live loads of 3-6 KN/m2, slabs on beams are appropriate. The beams make the slabs stiffer, resulting in comparatively little deflection. The beams require additional formwork.

Hollow Core Slab

This kind of precast slab allows for the running of cores. These cores serve as service ducts in addition to reducing slab self-weight and improving structural efficiency. It is appropriate in situations where quick builds are sought.

Precast Slab

Precast concrete slabs are cast and cured in manufacturing plants, and then delivered to the construction site to be erected. The improvement in efficiency and improved quality control that can't be obtained on site are the most notable benefits of slab preparation in manufacturing plants.

Composite Slab

Regularly, it is developed from built up substantial cast on top of profiled steel decking. The decking goes about as formwork and working region during the development stage, and it likewise goes about as outer support during administration life of the piece.

III. LITERATURE REVIEW

Denis K, Mateng'e and Manu SE (2022) In a study, the seismic behaviour of multistory buildings for flat slab constructions with variously shaped drop panels was examined. Using the dynamic analytical method, slabs with rectangular and square drop panels were examined under earthquake stresses. Using ETAB's software, square flat slab buildings with plan areas of 28m x 28m were modelled and assessed for earthquake zones III and IV. Storey drift, displacement, and base shear were the parameters employed to assess the seismic behaviour.

Results stated that displacement in the flat slab with a rectangular drop panel structure was more than that of the structure with square shaped drop panel by 69.61% at the top story and 28.78% at the bottom story for seismic zone III. In seismic zone IV the displacement of the structure with rectangular drop panel was more than that of the structure with square drop panel with the same percentage however the values for this zone were higher. The story drift for the structure with rectangular drop panels was more than that of the structure with square drop panels by 88.40% at the top story and 28.78% at the bottom story. The base shear and story shears was more for the building with square drop panels than that with rectangular drop panels.

Manish Kumar Pandey and Dr. Raghvendra Singh (2021) objective of the research paper was to investigate the behavior of different types of slab and secondary beam in a structure considering a G+10 multistory building taking different variations on slabs and introducing a secondary beam in the structure. RSA (Response Spectrum Analysis) was used for the analysis of model on parameters of Storey displacement, base shear, overturning moments and storey shears. Results stated that most preferable long span slab was building with waffle or ribbed slab.

Nitish A. Mohite et.al (2021) in the research paper, Using CSI ETABS software version 2016, three-dimensional analytical models of G+20 storey buildings were created and examined. A G+20 story structure with a flat slab (with drops) and conventional slab system was analysed and designed while taking seismic zone III into consideration. The structures were designed and analysed using the equivalent static method in accordance with the Indian Standard Code for earthquake-resistant structures, and comparisons were made based on factors such story drift, story displacement, story stiffness, and time period.

Results stated that that story drift was 10% more in conventional slab as compared to flat slab; story displacements was observed linearly increasing with height of the building and was 11% more in conventional slab as compared to flat slab.

Shital Borkar et.al (2021) The primary motive of research was to analyze the seismic behaviour of different types of slab structures i.e. Flat slab structure, conventional slab structure, flat slab structure with drop under different earthquake zones considering G+5 storey building using ETAB software. Author also analyzed a comparison of behavior of flat bit of material building with old common 2 way bit of material system for different bands, parts like band, part zone-II, part zone-III, part zone-IV, part zone-V in respect with the greatest point making bent moment.

According to the findings, for both regular and irregular structures, the storey displacement was greatest in flat systems and lowest in typical slab systems throughout the seismic zone. For both regular and irregular structures, story shear was greatest in the flat slab system and lowest in the flat slab with drop system across the seismic zone.

Ved Prakash Parihar et.al (2021) the research paper proposed work was twenty by thirty m plan area in which size of panels is 5x5 m. The cantilever beam and column select by Span to depth ratio as per IS Code criteria for the given loads for a ten, twenty and thirty storied model. And linear dynamic analysis was done using Staad pro software. Total 27 model taken and observed with regular and 200% and 300% vertical geometric irregularities and result obtained in terms of Node displacement, Peak Storey shear, Stresses on flat slab, storey Drift etc. Results stated that in G+10 Storied building the natural period of building increases as compared with G+20 & the G+30 Storied building because Natural periods of buildings increase with an increase in mass. Node displacement in the X direction will be more restricted in a regular building when compared with a 200% & 300% irregular structure, but it will be more increased with the height of the Building. Natural periods of buildings reduce in flat slab G+30 & G20 Storied building as compared with flat slab G+10 because the natural period of the building reduces with an increase in stiffness.

Abhijit Salunkhe and S.B.Mohite (2020) the primary objective of the research was to compare the seismic behavior of flat slab structure with conventional R.C.C. Structure.

Results stated that flat slab structure design base shear was less as compare with conventional structure which is due to the flexibility of flat slab structure. In case of flat slab storey drift is more as compare with conventional RC framed structure. This storey drift found to be maximum at middle storey and minimum at top and bottom storey. The presence of opening in flat slab structure does not make appreciable difference in results (maximum displacement and drift) when compared with flat slab structure without opening.

IV. CONCLUSION

Past researches suggested the use of different types of slab systems depending upon the suitability of the condition. Implementation of softwares is found beneficial in order to develop a relation between software and practical condition.

V. REFERENCES

[1] Denis K, Mateng'e and Manu SE, [AN ANALYTICAL STUDY OF THE SEISMIC PERFORMANCE OF FLAT SLAB STRUCTURES WITH DIFFERENT SHAPES OF DROP PANELS], International Research Journal of Modernization in Engineering Technology and Science, Volume:04/Issue:07/July-2022.

[2] Manish Kumar Pandey and Dr. Raghvendra Singh, [Seismic Response of Large span slab in Horizontal Setback Building], International Journal for Research in Applied Science & Engineering Technology (IJRASET), ISSN: 2321-9653, Volume 9 Issue XI Nov 2021.

[3] Nitish A. Mohite, Mayur M.More, Vidyanand S.Kadam, Satish S. Kotwal and Vinayak B. Patil, [Comparative seismic analysis study of G+ 20 story building with flat slab and conventional slab using ETABS], International Journal for Research in Applied Science & Engineering Technology (IJRASET), ISSN: 2321-9653, Volume 9 Issue XI Nov 2021.

[4] Shital Borkar, Kuldeep Dabhekar, Isha Khedikar and Santosh Jaju, [Analysis of Flat Slab Structures in Comparison with Conventional Slab Structures], IOP Conf. Series: Earth and Environmental Science 822 (2021) 012049.

[5] Ved Prakash Parihar, Priyanka Dubey and Ashwin Hardiya, [Earthquake Analysis of Irregular Flat Slab High Rise structure in Diverse Earthquake Zone], International Journal of Research Publication and Reviews, Vol 2, no 11, pp 1033-1050, November 2021.

[6] Abhijit Salunkhe and S.B.Mohite, [A Comparative Study of Seismic Behavior of Flat Slab Structure and Conventional Framed Structure], Journal of Emerging Technologies and Innovative Research (JETIR), July 2020, Volume 7, Issue 7.