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"Comparative Analysis and Design of Floors System"

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Abstract:- *In this fastly growing world, multistoried tall buildings construction is use. Many types of slabs used to construct floors of building structure. Flat slab conventional slab and grid slab mostly use in construction as it has many advantages over other types of slab system in terms of easier formwork, flexibility, space, less duration of time of construction. In present work conventional slab system, flat slab, grid slab has been analyzed by using Etabs, staadPro software to study the parameters like displacement, shear force, bending moment and effect of vertical and horizontal forces. The purpose of this study is to compare the analysis results of conventional slab, flat slab, grid slab, flat plate and to study the effect of vertical and horizontal force, flexibility, and behavior of slab in different earthquake zones.*

Key Words: Flat slab, conventional slab, grid slab, vertical and horizontal loading, Etabs, staadPro.

1. INTRODUCTION

In this modern developing industrial era we can see the huge construction activities taking place in all over the world. Due to increase in population development of buildings and structures is necessity. . So the construction of tall building structures is the solution to overcome this problem. The multistoried building is constructed by using frame structure. They are subjected under vertical and horizontal loadings. The effect of these loads makes the study of lateral and gravity loads very important.

In building structures the floors slab system is the most important component like other components of the building. To design slab various types of slabs used. Some of them are very important and mostly use for construction because of easy way of construction and to overcome the cost of construction. Mostly conventional, flat and grid slabs are used. Manual calculation of these floors slab system for multistoried building makes work hard and time consuming hence there are various software used to design slabs and other components of building structures. Software like Etabs, staadPro, SAP-2000 mostly used. The results of manual calculation and results of software make study important.

2. LITERATURE

Lan N Robertson 'Analysis of the flat slab structures subjected to combined lateral and gravity loads' ACI Structure Journal, November- december1997 done analysis of flat slab structures subjected to combined lateral and gravity loads using a three dimensional model, analysis of flat slab building can have done when it subjected to vertical and lateral loads which . Both slab column frame elements and the lateral framing system (shear wall) if present. In this study two structural analysis models were compared to experimental test results. A two beam analytical model give exact results of test with respect to lateral drift and slab moment distribution. Analysis of Three dimensional model done by using Etabs software. Models assumed as constant cracking factor for an entire span and uniform slab effective width coefficient. The analytical models were unable to reproduce the slab flexural moment distribution observed in test specimen at either 0.5 or 1.5% drift levels. By replacing the single element with two beam elements connected at the point of contra flexure. The difference between positive and negative moment in cracking regions was incorporated into the mode.

Phyoe Hnin Thu Htum, Nyan Phone, Kyaw Zeyar Win ' Comparative Study on Analysis and Design between Flat Slab and Flat plate System for RC Building' they made study on flat slab and flat plate slab the analysis done by using Etabs software. The flat slab and flat plate are designed by SAFE software. Comparison results shows that flat plate building structure is more beneficial than flat slab building structure. Flat plate structure is more economical so steel area of flat plate building is less than flat slab building.

Mohan H.S, Kavan M.R, 'Comparative Study of Flat Slab and Conventional Slab Structure Using ETabs for Different Earthquake Zones of India' In this paper they have said that storey shear of flat slab more than conventional slab by 6% and at base storey shear is maximum and least at top storey. Design axial load is more on flat slab as compared to conventional slab structure. The storey displacement of flat slab structure is greater than conventional structure.

Ms. Priyanka Chandanshive, Prof. Sandeep Gaikwad, 'Comparative Analysis and Design of Flat Slab and Grid Slab in Multistoried Building under Seismic Condition'. In this

paper they said that, the quantity of concrete is increase with increase in span / grid size of the structure for the same slab system. The maximum displacement is found to be most for grid slab system for same plan area of the structure and it is followed by flat slab system in all direction of the system. The quantity of concrete is least for smaller span of the structure and it is most for large span of the structure. From analysis they concluded that the flat slab is most economical for all span consider in the analysis.

Sumit Pahwa, Vivek Tiwari, Madhavi Prajapati, Ms. 'Comparative Analysis and Design of Flat Slab with Old Traditional Two way Slab' they said that for all cases considered drift values follow a parabolic path along storey height with maximum value has been shown somewhere near to the middle storey. Use of flat slabs with drop results in increase in drift values in shorter plans and decrease in larger plans, marginally in a range 0.5 to 3mm. In Zone III and IV where flat slab used with drop, the maximum displacement values and drift values are well within permissible limits, even without shear walls. Provision of the part shear wall in zone V is not enough to keep maximum displacement within permissible limits, whether it is a beam slab framed structure or framed structure or framed structure with flat slab with drop.

Ulfat Saboree Paramveer Singh 'Comparative Study Of Flat Slab And Grid Slab In Reinforced Concrete Structures' In this study analysis and design of Flat, Grid and their different combinations for particular parameters have been carried out such as seismic behavior, , dead loads, base shear, storey drift, displacement, addition of total moment. The analysis results show that G+F (5+5) is the best combination with smallest storey drift and displacement; base shear in G (10) is the highest than any other types of the structures, and it decreases in F (10), F+G (3+7), G+F (3+7), F+G (5+5), G+F (5+5) respectively.

Amit A. Sathwane studied Most Economical Slab between Flat Slab with Drop, Flat Slab without Drop and Grid Slab. studied that the among flat slab , flat slab with drop and grid slab which is economical for the nexus point opposite to vidhan bhavan and beside NMC office. The analysis of flat slab, flat slab without drop and grid slab done both manually by IS 456-2000 and by STAAD PRO V8i. In this study they said that flat slab with drop is economical than other considered slab. Also stated that concrete requirement for grid slab is more. And steel requirement for the flat slab without drop is maximum as compare to flat slab with drop.

K.N.Mate 'Study of flat slab' in this study author analyzed the flat slab .Flat slab system is simple structure of RCC which provide long clear space, a good height, simple formwork and no delay time in construction. It is has been shown that flat slab is more feasible and flexible as compare to other slab. Complete analysis and design of flat slab is obtained as per Indian code of practices IS456:2000. After analysis they concluded that Flat slab is more economical and flexible in comparison to conventional slab. In this paper author explained how to select thickness of slab, drop, panel width, and reinforcement detailing.

Sudhir Singh Bhaduria1, Nitin Chhugani 'Comparative Analysis and Design of Flat and Grid Slab System with Conventional Slab System' in this paper they design and analyzed G+10 building for seismic zone III. For medium soil condition by using STAAD Pro V8i and these slab system analyzed for different plan area or grid size. The design of slab system is done as per IS 456-2000 and IS 1983-2002. Design of the slab system made for various spacing, grid size of column to carried out which grid size of the column and which slab is economical. After getting results they concluded that the flat slab is most economical for all span considered in the analysis. In flat slab system maximum displacement, maximum force and maximum bending moment in x, y and z direction is minimum but in case of grid slab system maximum displacement, maximum force and maximum bending moment is found to be maximum. The quantity of steel and concrete required for flat slab system is minimum but for the grid slab system is maximum

Syed Abdul Qavi, Syed Khaleelullah Shah Quadri, Syed Farrukh Anwar 'Comparative Analysis and Design of Flat and Grid Slab System with Conventional Slab System' Study made on different parameters like bending moment, shear force, displacement of flat slab and grid slab with conventional slab. After analysis they concluded that grid slab is most economical for all span considered in analysis. The maximum displacement, maximum bending moment, maximum force is minimum in grid slab and maximum displacement, maximum bending moment, maximum force is maximum in flat slab.

3. CONCLUSIONS

The above research paper gives the following conclusion.

- Flat plate building structure is more beneficial than flat slab building structure. Flat plate structure is more economical so steel area of flat plate building is less than flat slab building.
- Story shear is maximum at base and least at top story and design axial load on flat slab are more compared to conventional structure. The storey displacement of flat slab structure is greater than conventional structure.
- Requirement of concrete for grid slab is more as compare to flat slab with and without drop and steel requirement for flat slab without drop is more than flat slab with drop and grid slab.
- The quantity of concrete is increase with increase in span / grid size of the structure for the same slab system.
- Flat slab system is more economical as compare to conventional slab system.

- The maximum displacement, maximum bending moment, maximum force is minimum in grid slab and maximum displacement, maximum bending moment, maximum force is maximum in flat slab.

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