A Review on Seismic Performances of Flat Slab Through Composite Columns

Mr. Ranjeet Singh[1], Prof. G.V.Joshi[2]
[1]Dept of Civil Engg
[2]Assistant professor, Dept of Civil Engg
[1, 2] G.H. Raisoni college of Engineering and Management Wagholi,Pune

Abstract- *The structures that are built as flat slab building structures are reasonably more elastic than usual conventional concrete frame structures, so it becomes more susceptible towards seismic loading. In composite column structure, reinforced Concrete and Steel are incorporated in that behavior that the compensation of the materials is made in competent way. The flat slab structures give more advantage as compared to conventional slab beam column structure due to better purposeful and lucrative aspects. The main purpose is only to learn the seismic act of type of flat slabs by composite column in dissimilar seismic zones. Seismic parameter is follow by IS-1893-2016. And there are various different kinds of mixed column and from those concrete encase 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 in earlier studies, might be flat slab by means of perimeter beams gives relatively superior results. Composite column design parameters are taken up by European code 4 and flat slab design parameter are taken up by Indian Standard code (IS)-456-2000.*

Keywords- Flat slabs, composite column, structural analysis software Etabs, seismic response, seismic zones.

I. INTRODUCTION

Reinforced concrete (RCC) flat slab, also known as beam-less slab, is basically a slab that is straight supported on the column with no beam. A flat slab can have a drop panel and a column capital both and it can be of standardized depth without drop-panel and column capital. Slabs in general of similar thickness that do not have column capital or drop panels are referred as flat plates. The strength of the flat plate structure is a lot restricted due to action of high punching shear near the columns, and as a result they are used for light loads and for comparatively small spans.

A concrete-steel column is basically a compression column member. In a composite structure, columns are typically referred as load-carrying members. A steel column made-up from build-up and rolled steel shape and enclosed in structural concrete or made-up from steel pipe or tubing and filled with structural concrete where the structural steel portion account for minimum 4 percentage of the gross area of column. A composite column is basically a member which is under compression, comprising of either a concrete enclosed hot-rolled steel or a hollow section which is filled with concrete of hot-rolled steel. Generally, it is looked as a load-bearing structure in composite structure.

1.1 Problem Statements

In this study the focus is on the performance of flat slab RCC structure with all types likes flat slab without drop, flat slab with drop and flat slabs with perimeter beams which engage its actions to earthquake situation with composite column. As it is very much obvious from earlier literature so as to the flat slab arrangement is not stable in seismic force, so we are going to analytically investigate the outcome of flat slab normally with concrete encased composite columns and in different earthquake zones. The method considering for the analysis are Response spectrum analysis method, linear static analysis method as per the Indian Standard codal provisions and by using ETABS software.

II. LITERATURE REVIEW

Nanditha vinod kumar, et al 2018 [1] described in this type of studies, and efforts are made for studying and comparing the procedure and performances of the conventional RC frame slab,grid slab and flat slab. G+14 storey structure is well thought-out for design and investigation for the evaluation of traditional, flat slab and grid slab structure. The design and analysis is don for both gravity and lateral loads. Models are designed and analyzed in software 'Etabs 2015' with Indian Standard-456-2000 parameters. The corresponding static method is thought of for analysis and designs the structures as designated by Indian Standard -1893-2002. After perception of results comes about, conclusion were pointed which are, seismic behavior of grid slab structure is comparatively superior than flat slab and traditional slab, story drift of flat slab and grid slab is 10 percent less than traditional slab. Additionally, base shear of flat slab is lower

by 44 percent less than traditional slab and grid slab is 37 percent less than traditional slab.

B. S. Sureshchandra, et al 2018 [2] worked on the "Comparative analysis of merged and standard columns building under seismic load". For examination and plan, G+6 story multi-storey normal building modeling is done by SAP-2000 which offer assistance of seismic tremor parameters zone-3 as depicted in IS-1893-2002.Conclusion was said that the composite columns execution is superior than customary concrete column building too with least cross sectional zone of the column. composite columns designs are reasonable for all sorts of buildings.

Jitendra Sharma, et al 2017 [3] worked on "Seismic presentation of flat slabs shear wall, core building". In this study, it is considered that actions of eight, twelve and sixteen floor flat slabs structure arrangements without and with two and four shear wall cores had been considered at diverse levels of seismic surroundings which are classified in Indian Standard(IS)-1893-2002 by means of typical examination in SAP 2000. Inference of this learning is that the flat slab structure arrangements acts entirely dissimilar as related to systematic framed structure, due to its excessive cross flexibility. And due to addition of shear wall core, its cross toughness is immovable pointed lythatrises seismic performance of this double system. In models of flat slab structure on shearwall core, non-linearity first advances in shear wall core which more progress to slab-column association.

Linda N Mathew, et al 2017 [4] in this study, told the main aim of this study evaluated the seismic evaluation. Seismic activity of structure is analyse by responce spectram analyses by Etab software. Three models were examined, first one with traditional concrete framed building, and remaining two by means of two sorts of fused columns, completely concrete covered steel segment and partly concrete enclosed segment. Inferences are drawn and stated that the traditional structure can be shown best in relations of base shear than the composite structure. Storey drifts are 40 percent more in event of composite structure, the drift is not observed in conventional building as compared to composite structure and if compared between composite buildings, the completely concrete enclosed structural steel sections column has better performance.

Archana sukumaran, et al 2017 [5] The study focus on the key purpose of this research paper stays to compare merged posts through concrete occupied composite and steel tube enclosed I-section post. Likewise the structural performance of G+15 multi-storied structures is used for diverse design forms like, C-shapes, rectangular shapes, H-shapes, L-shapes, with two diverse column properties is supported out in Etabs design and analysis software. It similarly compare and identify which structure through composite columns is extra active compared to cross loads. Inferences stay that concrete occupied steel tube columns achieved improved results in systematic structures and concrete enclosed I-section columns performed fine in asymmetrical form structures.

Anuj K. Chandiwala, et al 2017 [6]. In this research study, diverse storey level structures having flat slabs with drop and with-out drop and traditional slab structure has been examined. There are 9 models examined in Etabs software such as G+5, G+8 and G+11 with traditional RCC, flat slabs with having drop, flat slab without drop. The parameters considered are storey displacement, storey drift, storey shear, baser shear and time period. The main objective compares seismic evaluation of high rised buildings having traditional Reinforced Concrete frame, flat slabs with drop and also without drop in zone III medium soil, and also to learn the result of altitude of structure on top of performance under seismic forces. After considering the results, inferences were made which are, storey displacement is high at top and least at base of structure, traditional structure has greater performance in earthquake against above mentioned case. Base shear is maximum at ground level and keeps on increasing, time period is maximum at mode 1,2 and 3, column head and flat slab with drop is decrease great shear strength and bending moment which is negative in nature.

Dr. S. P. Raut, et al 2017 [7] worked on this research, of examination of G+9 multi-storey commercial structure having flat slab with shear wall and without shear wall is scrutinized and completed. There are three models analyzed, that are traditional enclosed structure, flat slab building structure and flat slab through shear walls which are situated at angles and cores. This structure examines, built under parameter like base shear, base period, store id drift and story displacement. Following proper studying of results it was determined that the essential natural period of flat slab by shear wall is fewer than the flat slabs with drops column structure, storey shear in flat slabs with shear wall are comparatively much less, storey displacement is less than flab slab with drop, storey drift in flat slabs with shear wall are reasonably considerable fewer due to shear walls provided near the bends and cores of the building.

Dr. H. Eramma, et al 2015 [8] worked on the assessment of merged and traditional structure is done by keeping all the additional structural members similar for both the structures. They are model in EABS design and analysis software. The

merged columns designs are done by Eurocode-4 and conventional column design by IS-456-2000. The concrete encased composite columns are to be used for analysis. The G+10 building structure are preferred to analyze the seismic behavior. After doing the assessment of parameters, base shear for composite structure is 8 times more than conventional structure. The low overturning moment nearly Eight to Nine times variance is detected. Relatively storied drift and storied displacement is fewer in traditional post. Conclusion of study, they concluded that composite column design is unsuitable for short rise structural buildings.

Mahesh Prabhu K., et al 2014 [9] study the Flat slab building structures under earthquake loading conditions. The flat slabs are extra stretchy than traditional frame structures and to progress the performances of building which is having flat slab in seismic condition, facility of flat slabs with and without drops is performed in this research. The principle reason of this research is to compare of the performance of high rise structure which is having flat slabs with and without drops on the performance under the seismic forces. 2 models are analyze, flat slab without drops and flat slabs with drops. The G + five structure having floor to floor distance of 3.5 m is model in Etabs software. It is decided that drift tails a parabolic curvature laterally with storied altitude by supreme rate up to 4^{th}floor. The essential natural period rate is advanced in flat slab with drop structure as compared with no drop. In all structures, design base shear rises as numeral of floors rises.

III. RESULTS AND DISCUSSIONS

A many of research stated that researchers paper's ponders approximately the examination of diverse sort s of flat slabs and composite columns structures with different conditions such as building shapes, building statures etc. It is seen that, flat slabs building with shear walls appears way better and results comes about in terms of storey shear, base shear, story drifts as compared to other sorts of flat slabs frameworks. A few studies are related to the comparison between sorts of composite columns. The result appears that, the steel tube filled with concrete columns can gives comparatively superior results. A few ponders concluded that shear wall at the centers and corners appears way better results as compared to other positions. A few thinks about deal with the comparison of diverse sorts of slabs suchas conventional, flat and grid slab s. Thus it concluded that seismic behavior of grid slab structure is comparatively better and it is comparatively superior than flat slab and customary slab

IV. CONCLUSION

Many researchers have done numerous experiments, analytical act and proportional work related with flat slab as well as composite columns in their research and findings. Theianalysisiofidifferentitypesiofiflatislabsiwithiconventionali columnsihaveibeenistudiediinipreviousiresearches,ialsoitheipe rformanceibasedistudiesionicompositeicolumnsiwithitheiridiff erentitypesihasibeendone. The limited works are done on combination of flat-slabs and composite columns.

REFERENCES

[1] Nanditha Vinod Kumar, Dr.Ramakrishna Hegde, Chethana,; "Comparative study on seismic analysis of conventional slab, flat slab and grid slab system for a RC framed structures;" International Research Journal of Engineering and Technology (IRJET), ISSN: 2395-0056, Vol.5 Issue 9, Sept 2018, PP: 394-401.

[2] B. S. Sureshchandra, Siddalingaprasad Y. B,; "Comparative analysis of composite and regular column buildings under seismic loads;" International Research Journal of Engineering and Technology (IRJET), ISSN: 2395-0056, Vol.5 Issue 8, Aug 2018, PP: 79-83.

[3] Jitendra Sharma, Kamlesh Parihar,; "Seismic performance of flat slab shear-wall-core building;" International Journal of Advanced Research and Development, ISSN: 2455-4030, Vol.2 Issue 6, Nov 2017, PP: 189-195.

[4] Linda Ann Mathew, Athira K.B; "Contrast of seismic behavior of R.C.C. and composite columns in G+15 storied buildings with GFRG infill"; International Journal of Engineering Research & Technology, ISSN: 2278-0181, Vol.6 Issue 6, June 2017, PP: 610-613.

[5] Archana Sukumaran, Vidhya Purushothaman; "Comparative study on seismic analysis of multi storied buildings with composite columns"; International Journal of Engineering Research & Technology, ISSN: 2278-0181, Vol.6 Issue 6, June 2017, PP: 555-561.

[6] Anuj K. Chandiwala, Vishesh P. Thakkar, , Unnati D. Bhagat; "Comparative study of seismic behavior of flat slab and conventional RC framed structure"; International Journal of Engineering Research & Technology, ISSN: 2278-0181, Vol.6 Issue 4, April 2017, PP: 923-929.

[7] Dr. S. P. Raut, Niharika M. Keskar; "Comparative study of multi-storey RC building having flat slab with and without shear wall with conventional frame structure subjected to earthquake"; International Journal of Advances in Scientific Research and Engineering, ISSN: 2454-8006, Vol.3 Issue 3, April 2017, PP: 16-23.

[8] Dr.H.Eramma, Hajira Nausheen; "Comparison of seismic behavior of a structure with composite and conventional columns"; International Research Journal of Engineering

and Technology (IRJET), ISSN: 2395-0056, Vol.2 Issue 8, Nov 2015, PP: 1556-1562.

[9] Mahesh Prabhu K., Sanjay P.N, Umesh S.S.; "Behaviour of flat slab RCC structure under earthquake loading;" International journal of engineering research and technology, ISSN: 2278-0181, Vol.3 Issue 5, May 2014, PP: 1386-1395.

[10] Suman Adhikary, Mahbuba begum; "Comparative study on different types of composite column sections"; International Conference on Recent Innovation in Civil Engineering for Sustainable Development(IICSD-2015),paper ID: SE-022.

[11] B.Anjaneyulu, K. Jaya Prakash; "Analysis and Design of Flat Slab by Using Etabs Software"; International journal of Science Engineering and Advance Technology (IJSEAT), ISSN: 2321-6905, Vol.4 Issue 2, Feb 2016.

[12] Arpitha Gowda S L,Dr. GopiSiddappa, Sindhoora C; "A Comparative study of RC Column and Composite column with flat slab system using linear static analysis and constructional sequential analysis"; International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395-0056, Vol.4 Issue 6, June 2017, p-ISSN: 2395-0072.

[13] Namrata DR,Raghupathi M, Priyadharshini M; "An Analytical and Experimental Study of Concrete encased column"; International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395-0056, Vol.4 Issue 6, June 2017, p-ISSN: 2395-0072.

[14] RasnaP,Safvana P, Jisha P; "Comparative study of analysis of flat slab Using Etabs software"; IJSRSET, ISSN:2395-1990,Vol. 3 issue 2,2017,online ISSN:2394-4099.

[15] Raunaq Singh Suri, D.r. A.K. Jain; "A comparative study of Flat slab with Perimeter beams and conventional slab structures under seismic conditions"; American Journal of Engineering Research(AJER) E-ISSN: 2320-0847, p-ISSN: 2320-0936Vol.7 Issue12, PP: 251-258.