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Survey Paper on Analysis of Flat Slab Resting on shear walls

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Abstract - *In this project, study of G+8 storey hospital building in Zone III is presented with some investigation which is analyzed by replacing complete columns by shear walls for determining parameters like storey drift, storey shear and displacement and is done by using Etabs software.*

Due to high seismic zone the column sizes of structure increases which decreases carpet area and also the aesthetic look from inside.

Shear Walls are specially designed structural walls included in the buildings to resist horizontal forces that are induced in the plane of the wall due to wind, earthquake and other forces. They are mainly flexural members and usually provided in high rise buildings to avoid the total collapse of the high rise buildings under seismic forces.

The aim of project is to analyze the flat slab structure which is completely resting on shear wall.

Key Words*: *Response spectrum analysis, flat slab completely resting on shear wall.

1. INTRODUCTION

RCC tall buildings are adequate for resisting both the vertical and horizontal load. When such building is designed without shear wall, beam and column sizes are quite heavy and there is problem arises at these joint and it is congested to place and vibrate concrete at these places and displacement is quite heavy which induces heavy forces in building member. Shear wall may become essential from the point of view of economy and control of horizontal displacement.

Frame action provided by a flat slab–beam and column interaction is generally insufficient to provide the required strength and stiffness for buildings taller than about 10 stories. A system consisting of shear walls, R.C. Infill Walls and flat Plate-frames may provide an appropriate lateral bracing system. Walls can be designed as plain concrete walls when there is only compression with no tension in the section. Otherwise they should be designed as reinforced concrete walls. Shear walls are specially designed structural walls incorporated in building to resist lateral forces that are produced in the plane of the wall due to wind, earthquake forces. In an earthquake, heavy wind affected prone zones these masonry infill wall panels attract large lateral forces and are damaged, or the perimeter columns, beams, and their connections fails. It is always advisable to incorporate them in buildings built in regions likely to experience earthquake of large intensity or high winds. They are usually provided between columns, in stairwells left wells, toilets, utility shafts, etc. Their thickness can as low as 150mm, or as high as 400mm in high rise buildings

This study includes the structural behaviour of hospital building which is completely resting on shear wall under static and lateral loading. The main aim of study has been to identify which system the column or shear wall causes minimum displacement such contributes to greater lateral stiffness to the structure.

1.1 Scope and objectives

Following are the main objective of the present study:

- The main objective of the study is to analyze the behavior of flat slab supported on shear walls instead of columns for existing structure.
- To study the vulnerability of flat-slab resting on shear wall models under different factors which are Storey drift, lateral displacement, time period and base shear have been obtained for SPECX (EX) and SPECY (EY) in zone 3,4 & 5.

1.2 Review of literature

Sumit Pawah, Vivek Tiwari, Madhavi Prajapati et.al [1] focuses to compare behavior of flat slab with old traditional two way slab along with effect of shear walls on their performance. The parametric studies comprise of maximum lateral displacement, storey drift and axial forces generated in the column. For these case studies they have created models for two way slabs with shear wall and flat slab with

shear wall, for each plan size of 16X24 m and 15X25 m, analyzed with Staad Pro. 2006 for seismic zones III, IV and V with varying height 21m, 27 m, 33 m and 39 m. This investigation also tells us about seismic behavior of heavy slab without end restrained. For stabilization of variable parameter shear wall are provided at corner from bottom to top for calculation. Results comprises of study of 36 models, for each plan size, 18 models are analyzed for varying seismic zone. From conclusion it is seen that part shear wall are not enough to keep displacement in limits. In case of larger plans increase in column reinforcement is 0.6 to 1 % without shear walls and 0.2 to 0.6 % with shear walls

Fayazuddin Ahmed Syed, B. Dean Kumar, Y. Chandrasekhar, B.L.P. et.al [2] studied analysis of Flat Plate Multistoried Frames With and Without Shear Walls under Wind Loads. It is seen that the column moments for flat plate floor system building with Shear walls has decreased by 69.17 % & 58.2 % when compared with flat floor system, conventional beam supported slab system. The Shear walls with flat plates contribute towards reducing the column axial force even in the middle frame region also. In the case of other building frames there is similar reduction in column axial force when wind is acting. The flat plate floor system can be further strengthened against the lateral loads by providing Shear walls also. The drift becomes minimum, so that there is 65.77% reduction in the drift in this case.

R. S. Surum · K. P. Jaya · S. Greeshm et.al [7] This paper explains the investigation carried out to study the seismic behavior of shear wall–flat slab connections with various reinforcement detailing at the joint region. The modelling and assessment of scaled down exterior wall–slab connection sub-assemblages subjected to static reverse cyclic loading is presented. Three-dimensional nonlinear finite element models with different reinforcement detailing at the joint region were developed using ABAQUS/CAE software. The concrete damage plasticity model was used to model. It concludes that The provision of shear reinforcement in the joint core region can be an effective option for detailing exterior wall—flat slab connection in seismic risk regions.

P. V. Sumanth Chowdary et.al [8] we are study the solution for shear wall location and type of shear wall in seismic prone areas. The effectiveness of RCC shear wall building is studied with help of four different models. Model one is bare frame system and remaining three types are different shear wall buildings. An earthquake load is applied to 8 storey building located in different zones. The performance of building is evaluated in terms of lateral displacements of each storey. The analysis is done by using structural finite element analysis (SAP2000) software.

P. Srinivasulu*, A. Dattatreya Kumar et.al [10] The objective of this paper is to investigate the behaviour of flat slab in 4 different cases as I).flat slab structure without drop, II). Flat slab structure with column drop, III). Flat slab structure with shear wall, IV). Flat slab structure with column drop and shear wall together, through response spectrum method, by using ETABS software. The behaviour of the flat slab is investigated in terms of story displacements, frequency, base shear, story level accelerations. And also most severe problem in flat slabs is punching shear failure. During the earthquake, unbalanced moments can produce significant shear stresses that causes slab column connections to brittle punching shear failure. This paper also investigates on which type of combination produces less punching shear at slab column joint.

2. METHODOLOGY

The Finite Element analysis software ETABS 2013 is used to create the 3-D model and run the linear static and dynamic analyses

a) A thorough literature reviews to understand the basic concept of the topic like seismic evaluation of building structures, Response Spectrum analysis, by referring books, technical papers or research papers.
b) Data collection.
c) An actual hospital building with Flat slab resting on column is analyzed using software's and then for the same building columns will be replaced by shear walls according to plan and analyzed for different earthquake zones.
d) Both the models are compared for shear, bending moments, mode shapes, Drift, punching etc.
a) Interpretation of results & conclusion

3. CONCLUSIONS

The proposed conclusions of the project may be

1. The variation of storey displacement can be plotted against storey height. It is expected that the horizontal storey drift reduces due to use of shear walls.

2. The variation of shear wall location might also effect on structure.

3. It is expected that the flat slab with shear wall would increase the carpet area and would be cost effective as compared to flat slab with columns.

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