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ANALYTICAL STUDY OF PUNCHING SHEAR IN FLAT SLAB - REVIEW PAPER

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Abstract - *Flat slab buildings are becoming popular from architectural and aesthetic point of view and gaining importance as they have many advantages like reduced building height, shorter construction time, easier formwork, large clear ceiling height, easier reinforcement placement. Modern trends towards high rise buildings increase recently due to the high increase in the number of tall buildings, both residential and commercial. In every parts of the world flat slab construction are widely used in reinforced concrete structures because; this system reduces the costs of form work and construction time and easy installation. Without beams floor slab system directly supports columns. In general while designing a flat slab the major problem caused is due to punching shear failure. In my study i have given different types of drop pattern in a Multi-storied building along with cut-outs near to the drops on the slab to analyze the punching shear in all different types of models using software.*

Key Words: Flat slab, easier formwork, drop pattern, punching shear.

1.INTRODUCTION

Flat slab is defined as a doubly reinforced concrete slab only with or without drops panel or column head and without beams support . Flat slab is mostly used system to avoid the beam-column clogging, and it is very economical. In Flat slabs, the loads are directly transfer to columns without beams. But flat slabs are not efficient in transfer the lateral loads. Punching shear strength around the column-slab connections always possess a problem. Punching shear is a type of failure of reinforced concrete slabs subjected to high localized forces. In flat slab structures this occurs at column support points. The failure is due to shear.

2.LITERATURE REVIEW

Pradip S. Lande, Aniket B. Raut

Because of its reduced floor height, flat slabs are adopted. However, the flat-slab construction is hindered by its worse behaviour under earthquake loading. Flat slabs are mostly preferred in severe earthquake regions of the world. Unfortunately, behaviour of flat slab during earthquake has proved that this form of construction results in severe damage, when not designed and detailed properly. This paper carried out the parametric investigation in order to identify the seismic response of flat slab. Building is analysed using ETABS. Linear dynamic analysis i.e. response spectrum analysis is performed on the system to get the seismic behaviour.

Miguel Fernández Ruiz, Aurelio Muttoni, and Jakob Kunz

Large number of existing flat slabs requires strengthening against punching shear for safety reasons to comply with standard code requirements. Predefined strengthening methods are not completely satisfactory or they are restricted in some areas of application. This paper provided an innovative system of overcoming most of the previous difficulties in flat slabs. Inclined shear reinforcement installed within existing slabs done by drilling holes from the bottom. After analysis, it has been finalized that such reinforcement is an efficient way to increase both the strength and deformation capacity of flat slabs. Finally, the design of the reinforcement based on the critical shear-crack theory (CSCT) is presented.

Renuka Gurusiddappa Madiwalar and Vinayak Vijapur

Now days, flat slab are using quite common, widely in commercial buldings. Flat slab are normally used because of various advantages over conventional slab system because of its reduced height of the storey, minimizes the construction period, most economical and good aesthetic appearance. Under seismic loading, flat slab reveal poor performance, so it is necessary analyse the seismic behaviour of structure with flat slab over conventional slab. This paper involves structures having conventional slab and flat slab has been analysed under the earthquake loading using ETABS version 13.1.2. Comparative analysis of conventional slab, flat slab without drop, flat with drop, flat slab with column head and flat with both drop and column head using equivalent static method. Different plan configurations involved (G+4) storey, 10 (G+9) storey, 15 (G+14) storey and buildings were also studied for different seismic zone which are located in zone II, zone III, zone IV, and zone V and taking soil type II. Response spectra

parameters like Lateral Displacement, Storey Drifts, Storey Shear, Design Base Shear, and Axial Forces are studied.

Renuka Ramteke

Advantages of flat slabs over traditional structures because of the less design space, less construction time and economical aspects. Than traditional RC frame system, flat-slab structural system is more flexible in the absence of deep beams and shear walls, for lateral loads. The critical part of flat slab design is the slab-column connection, i.e., the shear force in the slab at the connection, which should retain its bearing capacity even at maximal displacements. The behaviour of flat slab building during earthquake depends mainly on 'Building Configuration'. Safety is predominant during earthquake. Hence, there is need to determine seismic responses of such building for designing earthquake resistant structures. Seismic analysis includes response spectrum analysis is most preferable. This paper carried out the dynamic analysis of 15 models of multi-storied RCC Flat slab structure.

Athira M. V, Sruthi K Chandran

Now days high rise buildings are increasing predominantly due to the increase in the number of tall buildings including both residential and commercial purpose. Rapid growing construction industry, flat slab construction is widely used in reinforced concrete structures because of its reduced cost of form work, construction time and easy installation. Absence of beams, floor slab system directly supports columns. In comparison with earlier high rise buildings, today tall buildings are becoming more slender and resulting in the possibility of more sway. Lateral loads such as wind, seismic loads shear walls provide more stability to the structure. Inclusion of shear walls is mainly to transfer the lateral loads to the foundation by their shearing resistance and resistance to overturning. After seismic analysis it has been concluded the importance of flat slab construction and revealed the relevance of shear wall in a flat slab multi-storied building.

Ravindra B N, Mallikarjun S. Bhandiwad

In this paper, analysis carried out as per IS code 1893:2002 by considering regular and irregular buildings with brick infill and modified building with strong column and shear wall at the corner of the soft storey. For linear and nonlinear analysis 5, 10, and 15 storey buildings modeled by using ETABS software considering Response reduction factor, Importance factor, Zone factor, damping ratio, loads as per code Lateral displacement, base shear and hinge reactions were obtained according to code provision

Mohana H.S, Kavan M.R

The use of flat slab in today's construction activity is quite common which results in weight reduction, speed up construction and economical. Advancement in new technology makes flat slab quite common. This paper studied the G+5 commercial multi storied building having flat slab and conventional slab has been analysed. Parameters like base shear, storey drift, axial force, and displacement are verified. The performance and behaviour of both the conventional and flat slab structures in all seismic zones of India has been studied. From the analysis results it has been concluded that the storey shear of flat slab is 5% more than conventional slab structure and the axial forces on flat slab building is nearly 6% more than conventional building. So the difference in storey displacement of flat and conventional building is approximately 4mm in each floor.

Thimmayapally Dileep Kumar , A.Mownika Vardhan

Construction industry is being revolutionised with growing technology and innovation. Man started to reach sky not in any aeroplane but with the height of building. Tall structures have considerably reduced the problem of shelter but are considered highly susceptible to seismic loads and uneconomical. Both the problems are aroused due to high weight of the building. Of all the structural members in a building slabs are considered to be occupying high area and the load of the building is mostly contributed due to slab. For commercial buildings, conventional slab model is not designed because spans between the supports are high which leads to increasing in deflection and ultimately provision of huge depth and percentage of steel is increased beyond the codal provision, once such solution to reduce the slab depth and provide economical design is flat slabs technology.

3. CONCLUSIONS

From the above literatures, as different drop patterns are provided in middle column and outer columns, the columns with drop at corners are safe in punching shear, while the middle columns need shear reinforcement. Hence it is economical to provide drops at the corners. If the cut-outs are provided near the drops, the slab is safe in shear hence shear reinforcement is not required. This is due to increased depth of the slab which resists the one way shear. Further study involves the use different types of drop pattern in a Multi-storied building along with cut-outs near to the drops on the slab to analyze the punching shear in all different types of models using software.

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