Review on “Comparative study of flat slab structure and conventional slab structure”

Shital Borkar\(^1\), Kuldeep Dabhekar\(^2\), Isha Khedikar\(^3\), Nalini Vaidya\(^4\)

\(^1\), \(^2\), \(^3\), \(^4\) Department Civil Engineering, G H Raisoni College of Engineering Nagpur, Maharashtra, India

Corresponding author email id: \(^1\) borkarshital.mtechstr@ghrce.raisoni.net

\(^2\) kuldeep_dabhekar@raisoni.net, \(^3\) isha.khedikar@raisoni.net, \(^4\) nalini.vaidya@raisoni.net

Abstract. For the drawing engineers, selection of the type of the structure for a specific purpose is very important, as multistory buildings are becoming necessary, as construction for living style with increases in requirement of space. The lack of space is forcing us to raise the height of structures possible to unbend maximum number of people. This paper aims to effort on seismic response of unappetizing slab RCC structure for the various height and plan, moreover aims to compare policies of unappetizing slab towers with old conventional 2-way slab system for different zones like zone II, zone III, zone IV, zone V in respect with maximum BM, story shear, base shear, and story drift, by the help of analysis soft wares like ETABS.

Keywords: story drift, story shear, base shear, drop panel, column head

1. Introduction

Formed construction and flat slab building are two of them generally slab is supported using beam and beam is supported using column. It is called as beam slab constructions, flat bit of material building is made in which bit of material is supported using column.[1][2]

The flat slab structure in which slab is directly supported using columns, had adopted in many buildings constructed in recent times due to advantage of reduced floor to floor heights to have meeting with the price- working well and to do with buildings diamond demands. The ray wait the worldly-wise to get net well-spoken top upper level gave support unappetizing bit of material ways a bit of material which is kept with the assist of post but there are no requisite unexceptionable smile, this made stronger unappetizing bit of material moreover experienced as beamless bit of material, a portion of the slab rest on four sides by center line of column, this is also called as panel.
1.1 History of adsorption of flat slab system.

Flat bits of material have been readily got to do with structure engineers from the beat when the start of made stronger frequent building material design. In Europe one of the founding father of flat slabs was Robert Millar, a construct and building contractor. He carried out a series of full-scale tests on flat slabs on 1909. These slabs known as Millar’s slabs were usually designed for industrial buildings and warehouses where post heads, of many various shapes and forms, were used. The wringer of unappetizing slab was solved with various loads tests on unappetizing slabs, the diamond rules which have ensured are moreover empirical. This disparity between design and analysis procedures is particularly severe for flat slab buildings. Analysis of unappetizing slab has slower to develop considering it involves ramified three dimensional behaviors, as compared with two dimensional behaviors of whizgigging post frame.

1.2 Some terminologies involved in flat slab

1.2.1 Drop Panels: Drop foil is a thickened portion of flat slab around column to resist shear at flat slab & column junction It is part of slab. It doesn’t support any other structure member. [3]pillar is an on 2 sides on top of column or rather a make greater upright with bit across part of column at its highest on which other structure part of a group can rest it give adds in to the base area which serves as a base to other structure part of a group.[4]

1.2.2 Column Capital: The post or post throne provided at the highest of a column, is intended mainly to increase the topics of the slab to hold up punching shear. The flaring of the post at top is usually washed-up such that the plot geometry at the post throne is connate to that of the column. The lawmaking restricts the structurally suit able portion of the post wanted to that portion which lies whit in the large pyramid which has a noon of 90, and can be taken into deliberation whit in the outline of the post and post throne. [5]
1.3 Method of seismic analysis

For seismic analysis purpose, both having an effect equal to the input noise in back observations and having an effect equal to the input forceful observation (move band observations) is done and result are presented apart.

A Linear static analysis [6][7]

Linear static wringer is moreover tabbed as equivalent static analysis is preferred for moderate height buildings and dynamic analysis is performed for multi-story building. Since, the models examine in this work are both of moderate height and of uplifted buildings, both linear static examination and linear dynamic analysis is performed so as to put convenience in studying response. In this method, seismic response of structures is carried out on the corresponding to center of gravity of the system the pair, horizontal and vertical seismic forces are taken.

B Linear dynamic wringer (Response Spectrum Method)

Response spectrum wringer represents a resurgence over linear static analysis. The noteworthy difference between linear static and response spectrum method is lies in the level of gravity and their diffusion with the height of the construction stuff analyzed. In retort spectrum method, the response of Multi Degree of Freedom system is expressed as the superposition of modal response. Each modal reaction is then unswayable from the spectral wringer of Single Degree of Freedom system.

2. Literature Review

The research papers are studied under the study of analysis of a Structure containing the different slabs such as Flat Slab, Flat slab in the company of drop and column head.

The summary report of various research is as follows:

Navya Medasana (2017) worked and compared the earthquake policies of 30 story towers with conventional whizgigging slabs, unappetizing slabs and unorganized unappetizing slabs as per IS 1893(2002). The parameters were focused on story shear, modal mass, participation ratios, post forces etc. The duration of unappetizing slab and unorganized unappetizing slab-beam slab construction was found to be scrutinizing same at 90% mass participation. [8]

Sandeep GS (2017) worked on the side moving and story direction of flat bit of material and common bit of material structures in different earthquake zones with kind II medium soil and studied the performance of different height of buildings below seismic forces in these zones. It was found that 5 storey building in the company of flat slab without drop panels, 10 storey and 15 story buildings in the company of flat slab with drop and without drop panel buildings are not appropriate for zone IV and V with respect to lateral displacement. Likewise, conventional slab building possess flat slab with drop panel are not suitable for zone V with respect to lateral displacement. Further to minimize these risks, shear walls, bracings should be adopted. [9]

Raghavendra M S et al (2017) worked on seismic behavior of raised building on sloping ground and flat slab ground with flat slab for various soil and seismic zones. They compared the flat slab structure buildings and sloped ground structure building with flat slab structures. The sloping angles considered for the dynamic analysis were 00, 200 and 300 which was performed by ETABS software. It was observed that the time period of 300 sloped ground towers is higher than 200. Likewise, for 200 &300 sloped ground building, the ostracism and story skid was found to be less. The ostracism was searched to be maximum at top floor in III, IV and V zones whereas the max ostracism can be found in zone V [10]
Kumar Vanshaj (2017) worked on seismic response of multistory unappetizing slab towers in the absence of shear wall. The objective was to explore the policies of unappetizing slab multistory G 19 towers in the absence of shear wall at core, corners and side centers of the perimeter purlieus of the column in zone V by rubber group time history method using ETABS software. It was terminated that the production of unappetizing slab without shear wall was poor during earthquake excitation that of unappetizing slab with shear panel. [11]

Anusha. I. Koti (2018) made her effort on the post tensioned unappetizing slab with waif considering seismic effect. The post tensioned slab with waif for equivalent frame wringer was a big snooping and it was analyzed by using CSI SAFE 2016 software. It was developing that the post tensioned with waif reduces the stress concentration in the post and slab junctions. Due to tensioning of unappetizing plate slab, no effect was found on midmost gravity at unconfined extent but moment and shear on post increases.[12]

Imran B K et al (2019) analyzed the office towers of G 5 with unappetizing slab and conventional slab for Bangalore, India by using ETABS software. They terminated that the unappetizing slab is not economical at all. Due to slab thickness and size of waif panel, the quantity of touchable will be increasingly and thus increases the construction forfeit to some extent.[13]

Anghan Jaimis et al (2019) It correspond to comparative explore of slab. Here, two kind of slab are used, they are unappetizing and conventional slab. When we compare the conventional towers with unappetizing slab building, the time required for construction of conventional towers is increasingly than unappetizing slab towers considering of its monolithic construction. In unappetizing slab towers wiring shear only increases. But in specimen of conventional slab wiring shear decreases without 6 floors.[4]

Vinod Goud (Sep. 2019) It snooping with the Analysis and plot of Unappetizing Slab in the absence of Shear Wall of Multi-Storied Towers Frames. In unappetizing slab, the thickness of the towers switch with the storey height. And the surface shear and lank stress increases in 10 to 20 storey towers and decreases in 20 to30 storey building. [8]

B.Anjaneyulu et al (2020) Flat slab provide increasingly structural stability to the towers and requisite the stimulating view to the building. For designing purpose of unappetizing slab, we can use post tensioning as well as conventional reinforce concrete.

Imran S. M. et al (2020) carried out optimized diamond of reinforced glue touchable (RCC) ribbed slab & waffle slab. The objective of these wares is the combined forfeit of the reinforcement, touchable and formwork which sums up the forfeit of the ribbed slab. The objective function is ripened without studying the ribbed slab in detail. Optimization for reinforced glue touchable (RCC) ribbed slab is display and the results of the optimum diamond and conventional gem are compared. From the analysis, it was set up savings up to 25 percent may be obtained by optimizing the reinforced touchable ribbed slab.

Raj Joshi et al (2020) analyzed the feasibility of G 5 towers with a single column, alternatively put in the unappetizing and waffle slab in place of the conventional one meanwhile to trammels the difference in the affection of a towers like limp moment, end moments, deflection, shear force, etc. The interpretative study between both the slabs withal with the G 5 single post towers with varying floor span, slab span, slab thickness, post thickness, subtracting dome like structure on marrow has been carry off under the influence of loading via a software specially used for the wringer of the multi-storied towers named as ETABS. Single Post Multi-Storied Towers demonstrates how contrasting structural members could moreover be assimilated into the traditional multi-storied towers diamond to get the diamond of showing variegated properties having unconfined impact. Unappetizing Slab and
Waffle Slab in one form (with or without outer column) have had noticeable effect in the properties of the multi-storied towers design, enabling its utilization for variegated purposes of the building. [7]

3. Methodology

3.1 Methods and procedure adopted [14][4]

Selections of 5 variegated types of slab models are considered (conventional slab, unappetizing slab, unappetizing slab with drops, unappetizing slab with post heads and combination of drops and post heads).

- Seismic wringer is carried out by both methods (linear static wringer and linear dynamic analysis) for variegated seismic zone factor.
- The assessment of 5 slab models is carried out under individual zone factors.
- Analysis is conducted using ETABS 2015 software.

3.2 Plan and elevation view of models

We have planned and it is used for all kind of models i.e. conventional structure, unappetizing slab, flat slab with drop, unappetizing slab with post head, unappetizing slab with gamine and post head. It consists of slab, columns and beams for conventional towers on the other hand consist of slab with drop, slab with post throne and columns for unappetizing slab building. [15][16]

![Figure 3. plan.](image1)

![Figure 4. Elevation (total height) = 24](image2)

**Table 1. Data Required for Analysis**

| Preliminary Data | Seismic Data |
|------------------|--------------|
| No of stories    | = G+5        |
| Plan dimension   | = 30 x 20 m  |
| Seismic loading  | = As per IS1893 part1 |
| Type of soil     | = Medium     |
Type of structure = Commercial building
Floor to Floor height = 4 m
Total height of Structure = 24 m
Size of Column = 400 x 400 mm
Size of Beam = 300 x 300 mm
Live load = 4 kN/m$^2$ (IS 875 part 2)
Floor finish load = 0.75 kN/m$^2$
Roof live = 1.5 kN/m$^2$
Grade of Concrete = M25,
Grade of Steel = Fe415

Seismic part Zone II = 0.10
Part Zone III = 0.16
Part Zone IV = 0.24
Part Zone V = 0.36
Importance factor = 1
Response reduction factor = 3

The analysis is carried out using software ETABS. Input used data is shown in above table 1.

**Figure 5.** Flat slab Structure.

**Figure 6.** Flat slab with drop.

**Figure 7.** Flat slab with column head.

**Figure 8.** Flat slab with drop and column head.
4. Conclusion

Base take wool off of whizgigging slab towers is less when made a comparison of with both unappetizing slab with waif towers and unappetizing slab with waif and post head for all types of zones. The seismic level increases all parameters like displacement, wiring shear intensities.

Story ostracism at roof is maximum than at the wiring level and story ostracism of unappetizing slab without waif is increasingly than common bit of material structure, there is some value of stereotype ostracism variation in variegated zones for all the type of structure. For all the zones out and cases, skid value followed a parabolic path withal story high level with greatest point value placed on some-where near the middle story level. Story skid in buildings with unappetizing bit of material without friend or living place is significantly upper as side by side to whizgigging slab building. This happens considering of the harshness of the whizgigging slab structure. Therefore, some spare moment is ripened and as a result column of such structure should be designed by giving thought to as spare moments.

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