

COMPARISON STUDY OF FLAT SLAB AND CONVENTIONAL SLAB

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Abstract: – The flat slab system has been adopted in many building construction taking advantage of the reduced floor height to meet the profitable and architectural trade. Buildings are overall geometry, structural system, and load part. Those parameters are behaving a different way in flat slab structures and conventional slab structures. In case the client plans to change the interior and wants to use the conventionality to suit the need. Research on the design of the structure has started not only in India but in other developed countries also. The building still damages due to some or other reasons due to the earthquake. Despite all the weakness in the structure either code imperfection or error in analysis and design, the structure configuration system has played a vital role in calamity. In general normal frame construction utilizes column, slab, and beam. However, it may be possible to undertake construction without providing beams, in such a case the frame system would consist of a slab and column without beam. In our study, it has been planned to analyze a building having a flat slab and conventional slab under the effect of various loading conditions.

The focus of our project is to compare the performance of buildings having flat slabs and having conventional slabs using software aid.

Key Words: - Keyword- Building, flat-slab, Conventional slab, Period Time, STAAD PRO

1. INTRODUCTION:-

The current work is converging on the Comparison Study of the flat slab and conventional slab. The configuration involves the conventional slab structures which act on different loading positions. The conventional R.C. slab and flat slab having different conditions in a framework so, they are performing different ways on different loading positions. The mass of flat slab structure is less compared to conventional slab structure. Components of the flat

slab and conventional slab are dissimilar so the performance was studied in terms of, lateral displacement, period time, base shear, story drift, base shear, the complete modelling, analysis, and design is done with STAAD PRO V8i software.

The advantages of flat-slab reinforced concrete structures are widely known but there are also known disadvantages concerning their earthquake resistance. Remarkably, both Greek codes, Reinforced Concrete Code and Seismic Code do not forbid the use of such structural systems however both Codes provide specific compliance criteria in order for such structures to be acceptable.

The advantages of these systems are:

- 1) The ease of the construction of formwork.
- 2) The ease of placing of flexural reinforcement.
- 3) The ease of casting concrete.
- 4) The free space for water, air pipes, etc. Between slab and a possible ceiling.
- 5) The clear placing of walls in the ground plan.
- 7) The minimization of building height in multi-story structures by saving one story height.

Methodology: - The buildings are modelled in STAAD PRO V8i software the buildings consist of stories G+3 is unique moment resisting frame assumed subjected to gravity and dynamic loads are analyzed by equivalent static analysis, response spectrum analysis, time history analysis is carried out taking data. Beams and column members have been defined as concrete area elements. Conventional Slabs are defined as area elements having the properties of concrete area elements and plate elements, Flat slabs having the properties of plate element, Buildings having grade of concrete for beam, column, and slab is M25 with unit weight of concrete being 25kN/m³. Column size for building up to 4th floor is 0.3 mx0.3m, while the beam size is 0.30mx0.175m. The Building models having each storey height of 3m.

2. Details of parameter for Design

Description for Loading:-

The loading on the buildings is considered as per following calculations

- 1) Dead Loads
 - a) Wall load of 200mm thickness on all beams = $20 \times 2.85 \times 0.20 = 11.40$ KN/m
 - b) Load of 100mm thickness on all beams = $20 \times 2.85 \times 0.10 = 5.70$ KN/m
 - c) Dead load of Floor finish on slab = 1 KN/m²
 - d) Slab Dead load = $0.150 \times 25 \times 1 = 3.75$ KN/m²
 - e) Slab Dead load = $0.125 \times 25 \times 1 = 3.125$ KN/m²
 - d) Self-weight of building is automatically considered by the STAAD PRO V8i software.
- 3) Live load on slab = 2 KN/m²
- c) Earthquake zone and soil type has been changed as per requirement.
- 4) Loading Combinations

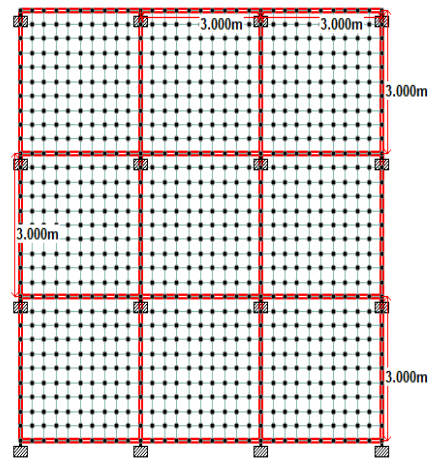
The different loading combinations for the analysis of the building have been taken by STAAD PRO V8i software

BUILDING DESCRIPTION:-

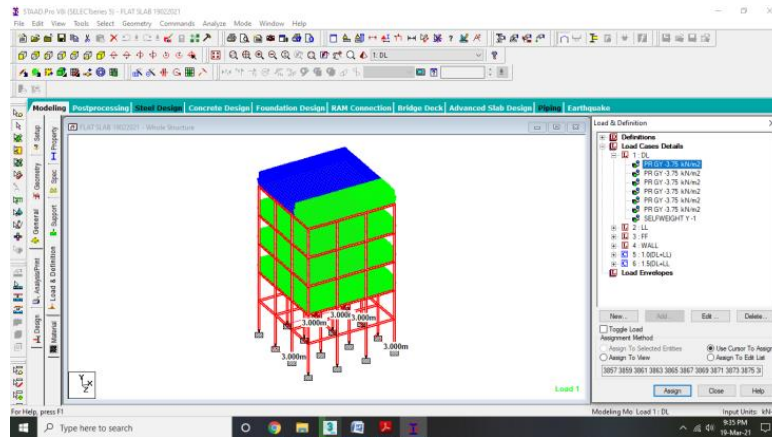
Building Details		
	Flat Slab	Conventional Slab
Column Size	300 mm X 300 mm	300 mm X 300 mm
Beam Size	300 mm X 175 mm (Hidden beam)	200 mm X 400 mm
Slab Size	150 mm thick	125 mm thick
No. of Bays	3No.	3No.

C/c Span length	3.0 mt	3.0 mt
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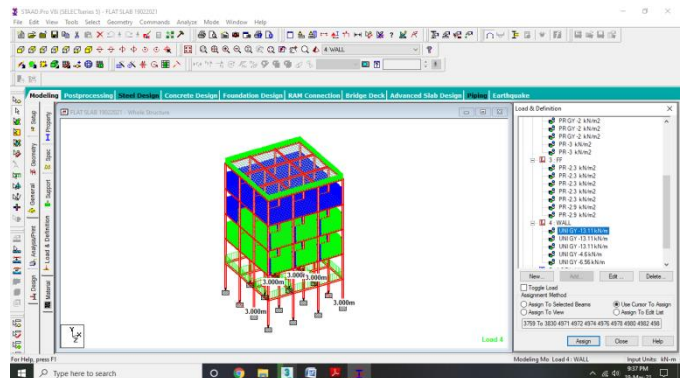
3. Section Details:



Plan of a Slab Structure



Load apply on Structure

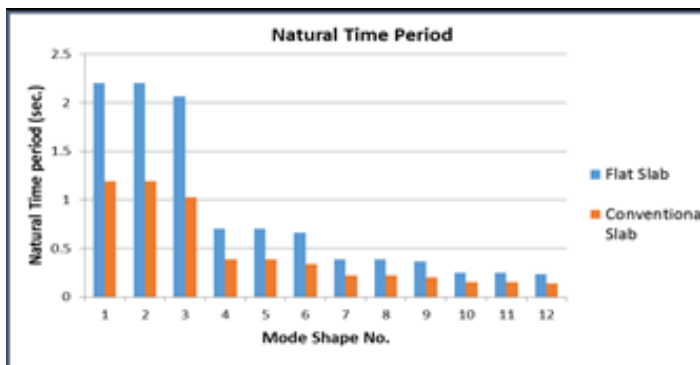


Plan of wall load on Structure

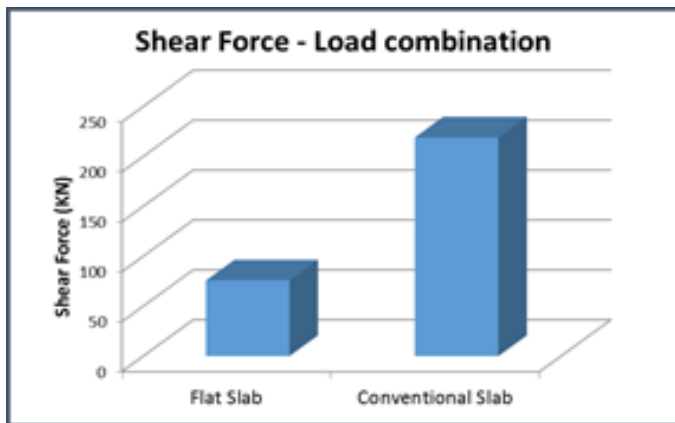
4. RESULTS AND DISCUSSIONS

The study of results has been divided into the following points:

1. Comparison of Natural period time of Flat slab building and Conventional slab building of 4 floors for various mode shapes.



2. Comparison of Shear forces, bending moments, Axial forces in columns at ground level due to all load combination forces for Flat slab building and Conventional slab building of 4 floors.



5. CONCLUSIONS

Based on comparison study of flat slab and conventional slab the following conclusions are drawn:

1. In comparison of the conventional R.C. building to flat slab building, the time period is more for conventional building than flat slab building. The time period will be maximum at mode 1, 2 and 3. After mode 3, time period will lower highly.

2. The natural period time is rise as the numbers of floors rise.
3. Story drift (Sway) in buildings with flat slab construction is significantly more as compared to conventional R.C.C building. As a result of this, additional moments are developed. Therefore, the columns of such buildings should be designed by considering increased moment caused by the drift.
4. Axial force on column due to all load combination is almost same in both building but shear force and bending moment is similarly more in conventional slab building.
5. The column enforcement changes as building height increases.
6. The column moments are more in conventional R.C. building compared to flat slab building.

6. FUTURE SCOPE

- 1) This study was done between flat slab and conventional slab in future flat slab with Perimeter beams comparison with drop and without drop can also be studied for all seismic zones.
- 2) This analysis was done using STAAD PRO V8i software.
- 3) In future, analysis of flat slab structure with perimeter beams can be done while considering different load condition
- 4) In this study, fixed supports are considered for the analysis of the structure. In the future, it can be extended for different support conditions.

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2. **Prof. P. S. Lande [2015]** discussed about flat slab structure is most vulnerable to the seismic excitation therefore the careful analysis of flat slab is important. In this paper the seismic analysis on flat slab is performed and compared it with the conventional RC building. To improve the performance of flat slab system shear wall and beam at periphery is applied and the seismic response of the same is determined and compared it with the flat slab building.
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