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Analysis and comparison of the Flat and Traditional Slab System in Multistory building

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***ABSTRACT**: In today's activity of the construction use of flat slab is common it gives the reduction in the weight, increases the speed of construction and economical also. Similarly, the use of traditional slabs also got a place in providing better features. This work presents the comparative analysis of flat slab and traditional slab system under seismic loading by using ETABS software, for this purpose for various multi-story buildings of G+14 storey having plan area 1225 sq. m. the entire 4 models are modeled on the software. The result obtained from the seismic analysis compared for the various slab system. It's important to note that the study is conducted for seismic properties. The buildings are located in Seismic Zone 5. The worth obtain for max shear force, maximum story drift, maximum bending moment.*

In the last some years it's been observed that in construction systems flat slabs are adopting majorly over traditional slabs. In a comparative study between flat slab and traditional slab, it's found that traditional slab carries more load than flat slab but there are some drawbacks of traditional slab like more loading, increases in story height, less economical whereas flat slab are more efficient. Also if we compare both slabs on the premise of appearance flat slabs system looks better than the normal slab.

***KEYWORDS**: G+14 storey, ETABS, seismic zone5, Storey drift*

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I. INTRODUCTION

1.1 FLAT SLABS and TRADITIONAL SLABS

A slab can be with flat surface form, two-dimensional in dimensions also could be a planar structural element and it having a thickness small compared to its other two dimensions. It provides a flat surface for working or a shelter for covering the buildings. Flat slabs can supports mainly transverse loads, and it transfers them to support primarily by bending elements a bit like a flat plate. In traditional slabs can be a slab of design and construction is to supports the slabs by beams and supports the beams by columns. These slabs can be called Traditional -slab construction. A traditional slab has two- directional reinforcement on the skin of the fabric, giving it the form of pockets or a waffle. These slabs also have a great holding of a greater amount of load as we compared them with conventional concrete slabs. The net clear height available of the ceiling is always reduced by beams. Hence, the slab is directly laid or supported on the column in some offices, warehouses, and public halls or celebration halls. These types of construction are always aesthetically appealing. In building floors, water tanks, and bridges the interconnected grid systems are commonly used. A grid might be a planar structural system composed of continuous members like beams and columns that either intersect each other or cross one another in specific forms. Grids are not for covering large column-free areas and also are constructed in several areas in India n abroad too. Grids are always subjected to loads,and they can be applied normally to their plane, and this type of structure is refered to as Grid. Grids additionally having there aesthetically pleasing appearance also, so it is preferred and provides a variety of advantages over the opposite styles of roofing systems.

1.2 **OBJECTIVE**

The primary objectives of this plan are often shortening as follows:

1. To gauge the response of Flat slab and Traditional Slab subjected to seismic loads.
2. Analysis done by ETABs Software
3. To test the difference between lateral displacement of Flat slab and Traditional slab.

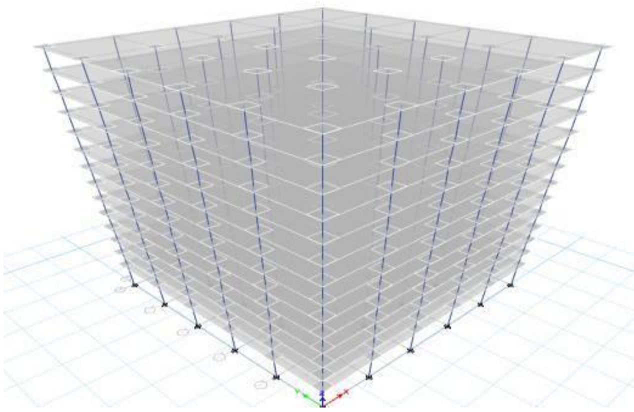
II. METHODOLOGY

Proposed Methodology during the tenure of research work. This project work presents the comparative analysis of flat slab and traditional slab system under seismic loading by using ETABS software, for this purpose four different multi- storey buildings having plan area 1225sq.m had analyzed using ETABS Selecting an exhaustive set of R.C.C. flat slab building models with the same aspect ratio and having same slenderness ratio are considered in the plan, and also we have considered constant plan area. We are performing an Equivalent Static Analysis method for both models which are to be analyzed. And Analyzing and comparing the result which is obtained from this Equivalent Static Analysis of models are Shear forces, Bending Moments, storey drift of earthquake.To test the difference between Lateral displacement of Flat Slab and Traditional Slab.

III. MODELING AND ANALYSIS

3.1 COMPUTATIONAL MODEL

Modeling a building involves the assembling and Modeling of its various load-carrying elements. The model which is considered must preferably represent the deformability mass distribution, strength, stiffness, and deformability. The Modeling of the structural elements and material properties which are utilized in this present study that we have done is discussed below. Material Properties are: grade of concrete M-30 is used and grade of reinforcing steel Fe-415 is utilized for all the frame models used in this study. These materials having elastic material properties are taken as per Indian Standard code IS 456 (2000). Ec=√5000fckMPa the value of modulus of elasticity (Ec) of the concrete is taken Where, fck is the characteristic compressive strength of concrete cube which is in MPa at 28-day. For the steel bar, modulus of elasticity (Es) and yield stress (fy) are taken as per IS code 456 (2000).



3D View of G+14 storey building

3.2 METHODS OF ANALYSIS

The analysis will be performed on the premise of external action, the behavior of structure or structural materials, and therefore the sort of structural model selected. Supported the behavior of structure and kind of external action, the analysis is further classified as. 3.2.1 For the building design of Earthquake Lateral Force Analysis the lateral force shall first be computed as a whole in the design. This design of the lateral force shall be then distributed to the assorted floor levels which are taken into consideration.

The methods which are commonly used for seismic design lateral forces are of two types:

1. Equivalent static force analysis

The method which is used for the seismic design of lateral force is Equivalent static force analysis. This method is used to substitute the major and minor effects of loading which are of a dynamic type and which occur due to expected earthquakes. And it is substitute by the static forces which are laterally distributed on a structure for design purposes. It is one of the simplified methods. This concept of analysis may be a dynamic analysis done into partly dynamic analysis and partly static analyses for locating the highest displacement. It's restricted only to one mode of vibration of the structure.

2. Dynamic analysis

The method used for seismic design lateral forces i.e Dynamic analysis can be classified into two types: First one is the Time history method and the second one is the Response spectrum method.

Time History Method:
The time history method of study is one type of dynamic analysis, when it is used, it shall be supported by a proper ground motion it shall be performed using accepted principles of dynamics.
Response Spectrum Method: Response spectrum method of study which is one of the types of dynamic analysis, when it is used it shall be performed using the planning spectrum which is specified in Clause 6.4.2 of is code or also by a site specific design ,spectrum is mentioned in clause 6.4.6 of IS1893 (2000).

3.3 BUILDING GEOMETRY

The study is predicated on a three-dimensional R.C.C. building with varying Flat slab and grid slab and same plan ratio, but with a continuing plan area. Same building geometries were taken for the study. These building geometries represent the same

L/C	TYPE	NAME
1	Primary	DL
2	Primary	LL
3	Primary	EQXA
4	Primary	EQXB
5	Primary	EQYA
6	Primary	EQYB
7	Combinations	1.5 (DL+LL)
8	Combinations	1.2 (DL+LL+EQXA)
9	Combinations	1.2 (DL+LL+EQXB)
10	Combinations	1.2 (DL+LL+EQYA)
11	Combinations	1.2 (DL+LL+EQYB)
12	Combinations	1.5 (DL+EQXA)
13	Combinations	1.5 (DL+EQXB)
14	Combinations	1.5 (DL+EQYA)
15	Combinations	1.5 (DL+EQYB)

3.1 Table shows primary and cargo combinations assigned to structure

Plan ratio (Dimensions in Meter)

A total 25 number of building models are selected supported varying ratio and slenderness ratio. The detail description of model taken during this study is presented in tabulated form in table 3.2

Main Group	Aspect Ratio	Length	Width	Column Spacing		Number Of Column
	L:B	L	B	X	Z	
		M	M	M	M	
M_1	1	35	35	6.5	6	
M_2	2	35	35	5.85	5.5	
M_3	3	35	35	5	6	
M_4	4	35	35	6	5	

Table 3.2 shows that in each aspect ratio there are 4 models.

ASSUMED DATA

- Material properties and geometric parameters
- Load considered for designing building
- Seismic design data

IV. CONCLUSION

1. Fundamental mode of frequencies of a flat slab structure rise 20% while drops panels are present, as in additiongrowingof stiffness by providing Grid slab those values upturns to 96%.
2. Base Shear values rises from model 1 to model 4. As the load of the structure rises from model 1 to 4.
3. Flat drawsextrashear value while flat slab suppliedinstead of Grid slab building.
4. Providing column drops to flat slab, storey displacements lessenbarely, as stiffness will risesbarely. Weather Grid Slab rises the overall lateral stiffness of the structure.
5. For internal columns, punching shear stresses are growing linearly from top most stories to bottom most

stories.

6. As earthquake moments are growing from top most stories to bottom most stories. But the changes on the punching shear and variation due to the gravity loads is not more from story to storey.
7. This indicates that earthquake moments are more effective and extra powerful in generating punching shear at bottom most stories.

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