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Study of Framed Building with and without Shear Wall, Flat Slab for Tall Building

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***Abstract*— In the present world of construction the study of different structural analysis of building plays a major role in the construction work, Here the study of compative analysis of performance of RC conventional structure is done with structure having flat slab with and without drop this analysis is carried out for base shear , wind load , storey displacement , Natural time period, Best location of shear wall ,storey stiffness, bending moment, for G+7 storey building having both RC conventional frame and flat slab structure, this is studied under zone III also under the soft soil condition ,the structural is analysed for equivalent static force , linear dynamic response spectrum analysis as per IS code, this study aim for the getting best performance results for different model conditions using Etabs.**

***Keywords*— Flat slab, Base shear, wind load, storey displacement, Natural time period, shear wall, Equivalent static force**

I. INTRODUCTION

A flat slab is typical type of construction in which a reinforced slab is built monolithically with the supporting columns and is reinforced in two or more directions, without any provision of beams. The flat slab thus transfers the load directly to the supporting columns suitably spaced below the slab, Because of exclusion of beam system in this type of construction, a plain ceiling is obtained, thus giving attractive appearance from architectural point of view. The plain ceiling diffuses the light better and is considered less vulnerable in the case of fire than the usual beam slab construction. The flat slab is easier to construct and requires cheaper form work. concrete is more logically used in these types of construction, and hence in the case of large spans and heavy load, the total cost is considerably less compared to the normal slab.

II. MODEL INPUTS

A. Analytical Analysis

The main objective of the analysis is to study the different forces acting on a building. The analysis is carried out in ETAB software. Results of conventional structure i.e., slab, beam and column, shear wall and R.C flat slab structure for different heights are modelled for the different combinations of static loading, time history analysis. The comparison is made between the conventional structure with flat slab and shear wall**.**

B. Assumptions

The following are the assumptions made:

The heights of the building are kept as 25.2 m from ground these building is of 7-storey. The height of one floor is of 3.6m each. In this way 10 numbers of total models are analysed.

C. Group Properties

The different components of conventional R.C.C structure, flat slab and shear wall are as follows:

Grade of concrete M25

Columns of the building is of 230mm x 600mm,

Beam size of the building is of 230mm x 450mm,

Slab thickness of the building is of 150mm,

Flat slab thickness 250mm, shear wall thickness 250mm,

Size of drop 5000mm x 50000mm x 300mm

D. Description of Loading

The loading of the buildings is considered as per following calculations

1. Dead Loads

i. Wall load with 150mm thickness = 24 x (3.6-0.45) x 0.15 = 11.34kN

ii. Wall load with 230mm thickness = 20 x 3.15 x 0.23 = 15.73kN

iii. Weight of the slab having thickness 150mm = 25 x 0.150 = 3.75kN/m

iv. Weight of the slab having thickness 300mm = 25 x 0.3 = 4.05kN/m

v. Self-weight of building is automatically considered by the ETAB software.

2. Live Loads

The live load of 4kN/m2 is considered on the buildings.

E. Types of cases used for analysis of structures

There are different cases considered for analysis of 7 storey structures.

I. PERFORMANCE OF CONVENTIONAL STRUCTURE.

II. PERFORMANCE OF CONVENTIONAL STRUCTURE WITH VARIOUS SHEAR WALL LOCATION.

III. PERFORMANCE OF FLAT SLAB WITH VARIOUS SHEAR WALL LOCATION.

F. Load combinations considered are 1.5(DL+LL), According to is 1893:2002, for equivalent static Analysis, response spectrum and pushover analysis. The loads: gravity load, (DL+LL) the percentage of Imposed load was selected is 1893:2002. It is 25% of imposed load less than 3kn/m2.lateral load in X direction. Lateral load in Y direction. The beam and column sizes are selected and modelled in Etabs software then its material. Properties and section properties are assigned. Then the various loads are assigned which includes dead Load,

live load and earthquake load. Then 4 models Are modelled as RCC conventional building on the Sloping and plane ground, and also flat slab Building on the sloping and plane ground, these Models are analysed for equivalent static method & time history method.

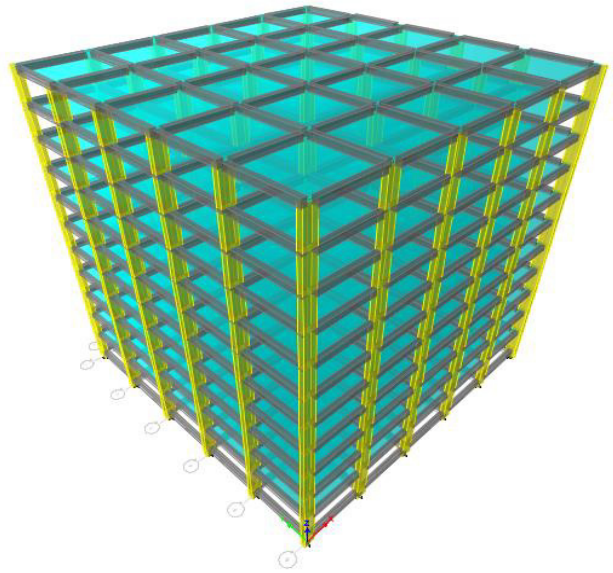

FIG 1 SHOWS 3D MODEL OF RC BUILDING ON PLAIN GROUND

III. RESULTS AND DISCUSSIONS

Results from the analysis are storey stiffness, storey displacement, base shear and time period are known from both static and response spectrum analysis for both.

Base Shear: Base shear is an estimation of the maximum expected lateral force that will occur due to seismic ground motion at the base of a structure.

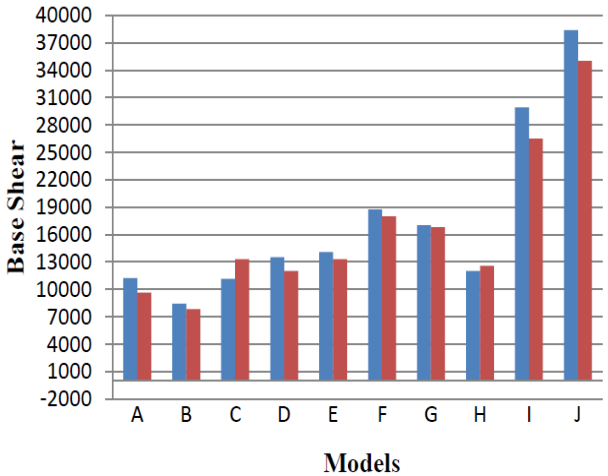

FIG 2 SHOWS BASE SHEAR FOR VARIOUS G + 7 MODELS

Displacement: Displacement of all models i.e., conventional structure, shear wall and flat slab using static equivalent static analysis.

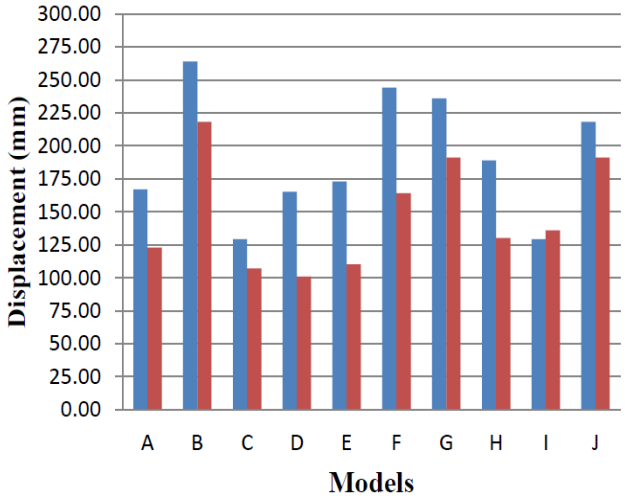

FIG 3 SHOWS DISPLACEMENT FOR VARIOUS G + 7 MODELS

Acceleration Acceleration for all models i.e., conventional structure, shear wall and flat slab is obtained from various structures are shown in figure

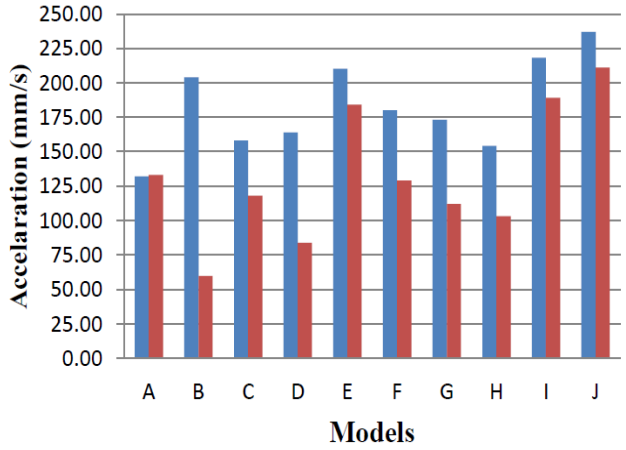

FIG 4 SHOWS ACCELERATION FOR VARIOUS G + 7 MODELS

Time Period: Time period for all models i.e., conventional structure, shear wall and flat slab is obtained from various twelve mode shapes are shown in figure

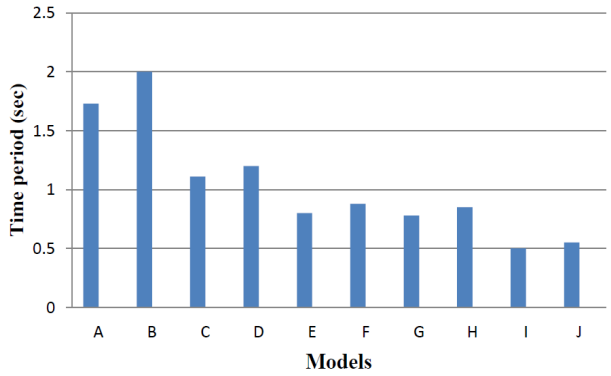

FIG 5 SHOWS TIME PERIOD FOR VARIOUS G + 7 MODELS

IV. CONCLUSIONS

1. From the results it is evident that natural time period is more for RC conventional than for flat slab (irrespective of the building located in plain ground or sloping ground).
2. From the results we can say that, base shear for RC conventional is more than flat slab.
3. Storey stiffness at the bottom storey is more compared with top storey, thus as the storey height increases stiffness value decreases gradually.
4. Storey displacement increases as there is an increase in storey height for all the models irrespective of all the conditions.
5. With comparisons of both methods Response spectrum analysis has given more accuracy than equivalent static method.
6. Performance point of RC conventional and flat slab were observed before the collapse of building, and it's concluded that building is safe.

V. REFERENCES

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