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Seismic Behaviour of Multi-Storeyed Building with Floating Column

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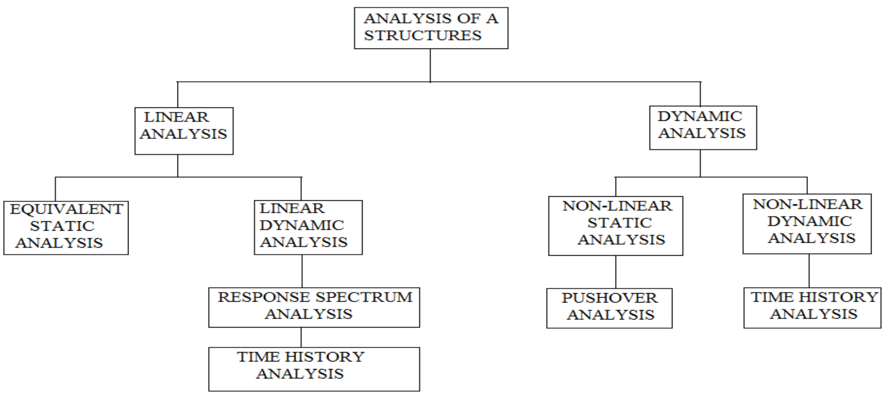
ABSTRACT: The earthquake pressure generated at distinctive ground level of the constructing want to be done to the foundation by means of the shortest viable manner which won't be the case when floating columns are supplied. Providing floating columns can also fulfil a number of the practical necessities however structural behaviour modifications all at once due provisions of floating columns. The flexural and shear demand of the beams which helps floating columns are tons better than surrounding beams, this ends in stiffness irregularities at a selected joint. Columns are fundamental lateral load resisting elements in moment resisting frame and play a critical role in seismic performance of constructing. The stiffness of the storey below the floating column is generally lower than the storey above and beneath it. In this thesis the seismic performance of building with floating columns are offered in terms of numerous parameters such as displacement, storey waft, maximum column forces, time period of vibration, storey shear etc. The buildings having diverse places of floating columns i.e. floating columns starting from special stories are taken into consideration for the study. The building is modelled through using finite element software ETABS. Linear dynamic time history analysis is executed on the various structures and their seismic overall performance is evaluated.

1. INTRODUCTION

A column is meant to be a vertical member beginning from basis stage and shifting the burden to the floor. The term floating column is likewise a vertical detail which (due to architectural design/ web page state of affairs) at its decrease level (termination Level) rests on a beam that is a horizontal member. The beams in flip switch the load to different columns under it.

ETABS can be used to do the evaluation of this sort of structure. Floating columns are capable sufficient to hold gravity loading but transfer girder ought to be of adequate dimensions (Stiffness) with very minimal deflection.



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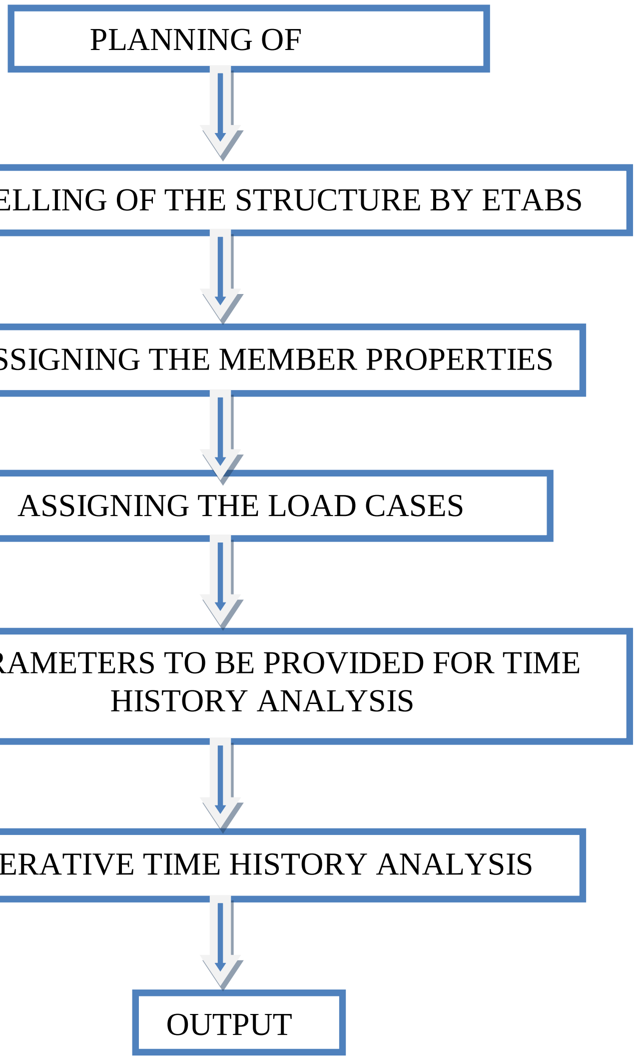
A. Time history methodology:

In this analysis dynamic response of the constructing will be calculated at whenever intervals. This evaluation may be achieved by way of taking recorded ground movement records from past earthquake database. This analysis overcomes all disadvantages of response spectrum analysis if there is no involvement of nonlinear behaviour. Hence this method calls for more efforts in calculating response of buildings in discrete time durations. In these assignment paintings BHUJ earthquake of significance 7.7 with floor acceleration zero.106g is taken for the time records evaluation. The usage of this method shall be on an appropriate ground motion and shall be performed using accepted principles of dynamics. In this method, the mathematical model of the building is subjected to accelerations from earthquake records that represent the expected earthquake at the base of the structure.



II. STRUCTURAL MODELLING

The study in this thesis is based on linear dynamic analysis of different structures on different conditions are modelled in ETABS.

Structures considered as

1. Building without floating column
2. Building with floating column situated at 1st storey
3. Building with floating column situated at 2nd storey

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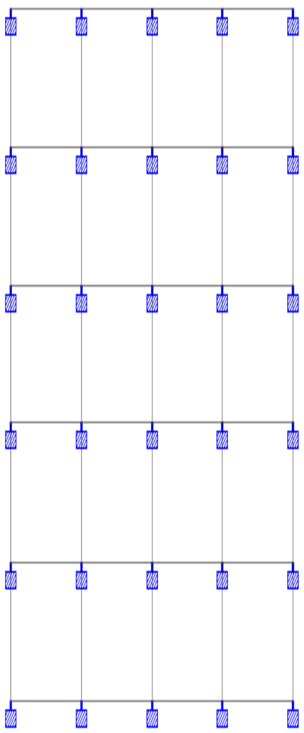
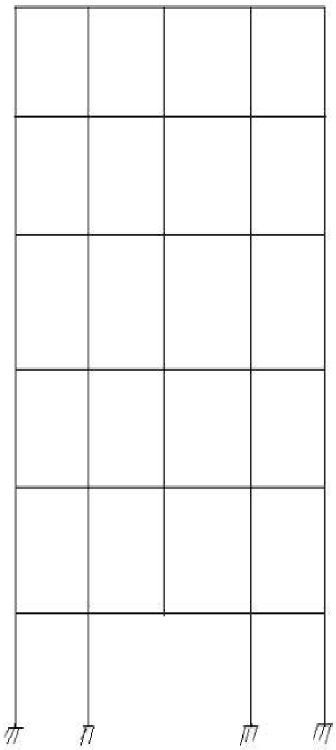
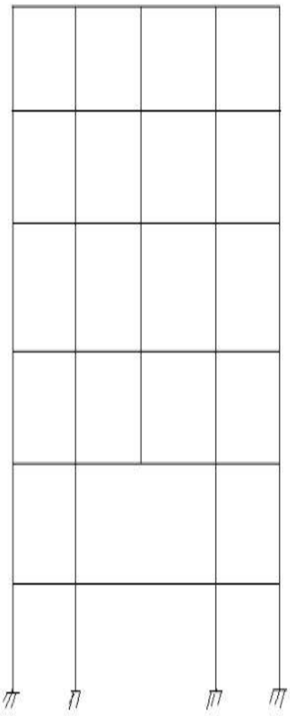


Normal building



floating column situated at 1st storey



floating column situated at 2nd storey

III. RESULTS AND DISCUSSIONS

Time period for the three structures

MODE	TIME PERIOD, T(sec)		
	STRUCTURE 1	STRUCTURE 2	STRUCTURE 3
1	0.69044	0.718067	0.748805
2	0.666643	0.688549	0.716476
3	0.639103	0.676532	0.679217
4	0.22853	0.237397	0.248726
5	0.218368	0.223912	0.237629
6	0.210714	0.221413	0.223729
7	0.148216	0.148392	0.148121
8	0.135224	0.139794	0.14167
9	0.128545	0.133734	0.130832
10	0.12807	0.133115	0.107666
11	0.111673	0.111762	0.102209
12	0.110348	0.11094	0.093573

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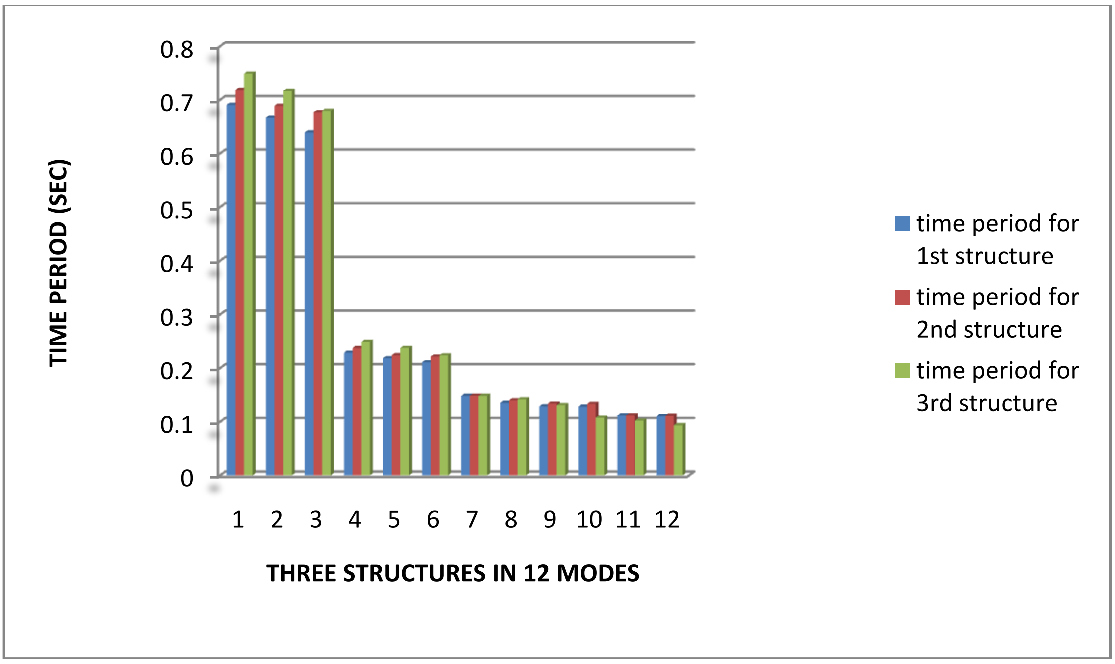

Point displacements for the three structures.

STOREY	POINT DISPLACEMENT, m		
	STRUCTURE 1	STRUCTURE 2	STRUCTURE 3
STOREY 6	0.0015	0.0017	0.0018
STOREY 5	0.00145	0.00181	0.0016
STOREY 4	0.0011	0.00156	0.0015
STOREY 3	0.00095	0.0015	0.0012
STOREY 2	0.00084	0.00144	0.0011
STOREY 1	0.00053	0.00097	0.001

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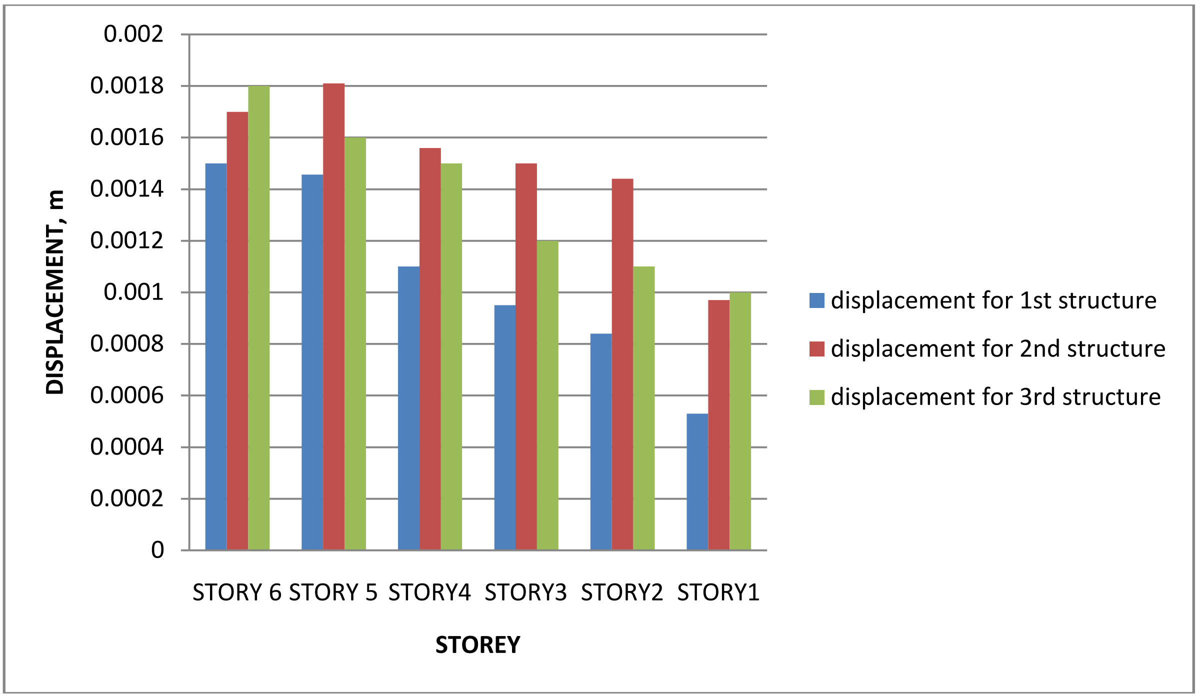

Storey drift for the three structure

STOREY	STOREY DRIFT, m		
	STRUCTURE 1	STRUCTURE 2	STRUCTURE 3
STOREY 6	0.00045	0.000449	0.000455
STOREY 5	0.000563	0.000568	0.000626
STOREY 4	0.000642	0.000652	0.000709
STOREY 3	0.000669	0.000679	0.000718
STOREY 2	0.000658	0.000697	0.000692
STOREY 1	0.000585	0.000535	0.000664

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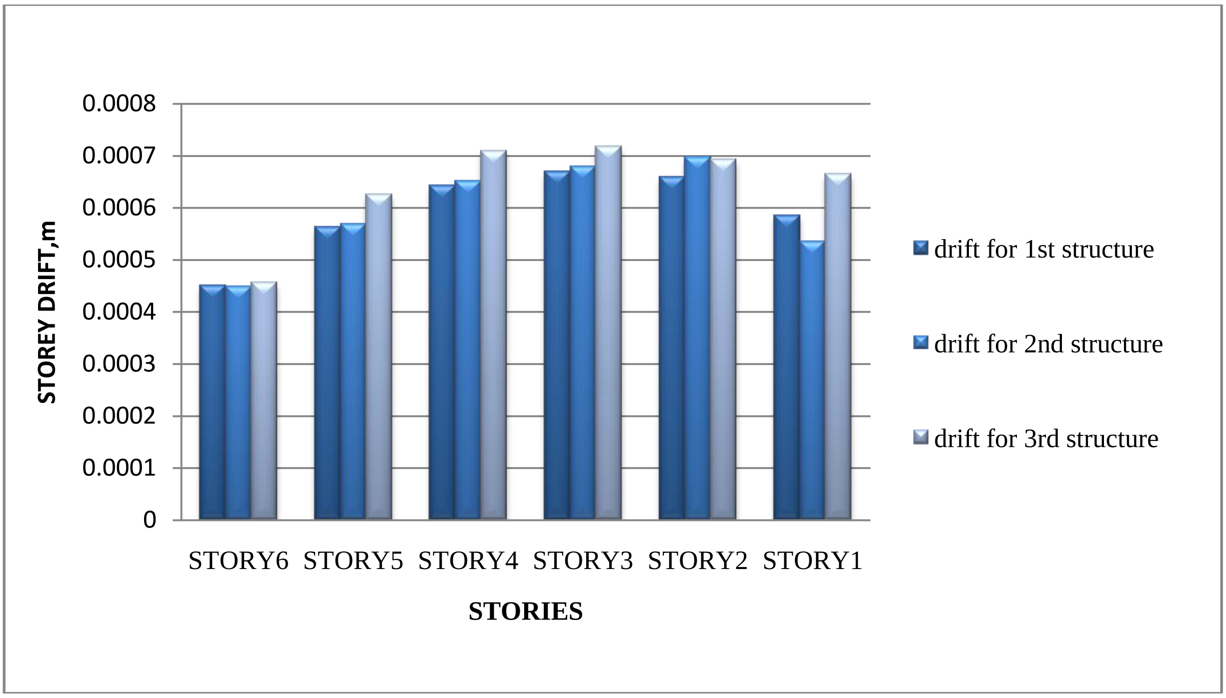

Axial force for the three structures

STOREY	AXIAL FORE, KN		
	STRUCTURE 1	STRUCTURE 2	STRUCTURE 3
STOREY 6	5865.6	7549.37	8087.93
STOREY 5	8811.2	9610.11	9622.77
STOREY 4	11752.6	15722	16157.99
STOREY 3	20302.4	20305.47	28326.13
STOREY 2	3448	2538	4120
STOREY 1	4253	5604	5880

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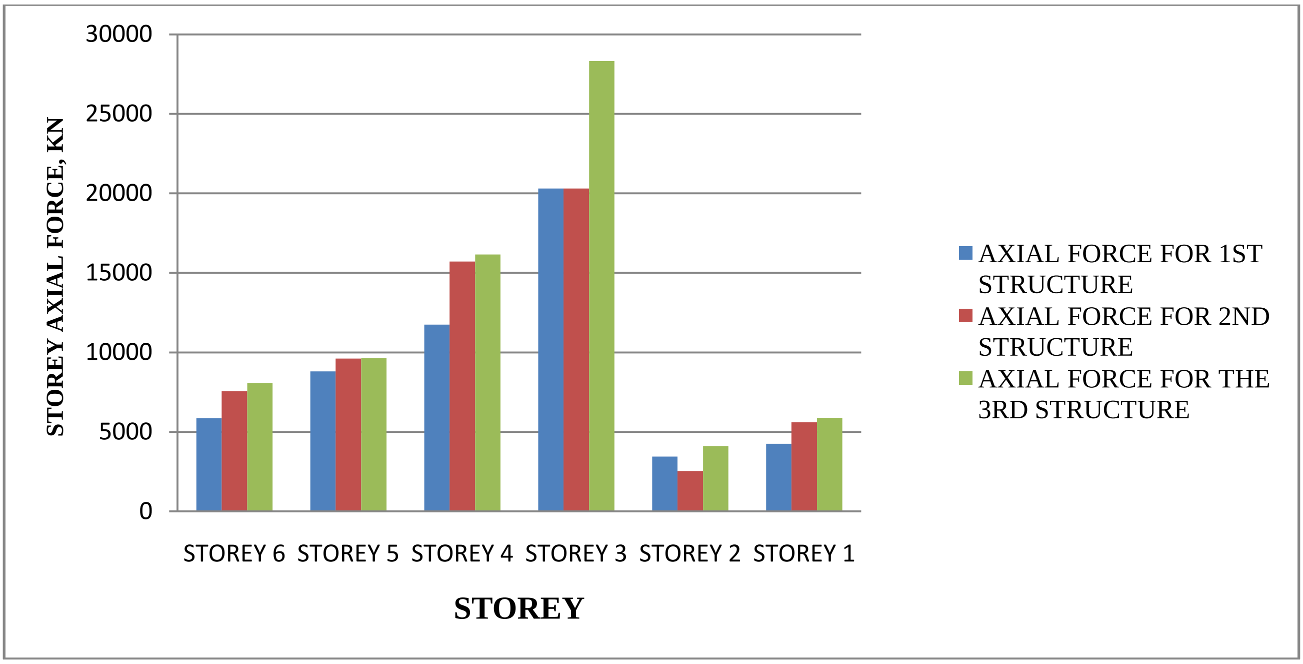

IV CONCLUSION

The study presented in the behavior of the building between the normal building, floating column from the 2nd storey and a building with floating column from the 1st storey. The following conclusions were drawn based on the investigation

1) It was observed that building with floating columns has more time period than that of building without floating column because of the decreasing of the stiffness.

2) The displacement of building increases from lower zones to higher zones, because the magnitude of intensity will be more for higher zones, similarly for drift, because it is correlated with the displacement.

3) By the calculation of storey drift at each floor for the three buildings it is observed that floating column from 2nd storey will suffer extreme storey drift than that of floating column from the 1st storey and the normal building

4) The building with floating columns from 2nd storey experienced more storey shear than that of the floating column from the 1st storey and the normal building.

5) By the application of lateral loads in X and Y direction at each floor, the lateral displacements of floating column building in X and Y directions are more in floating column from the 2nd storey compared to that of a floating column is situated from the 1st storey.

6) It was observed that shifting of floating column from 1st storey towards top storey of the building results in increase of base shear.

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