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# Seismic Performance of Floating Column with FVD

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***Abstract: -Open spaces in building are highly desirable features are floating columns are used for that to provide more internal space and to make better looking building. These floating columns come with big risk since it can't stand any seismic load. In this study we tried to reduce the chances of failure of floating column in multistory building by using fluid viscous damper (FVD) and achieve higher safety. We have found that FVD can decrease the drift of the building and help it to resist seismic vibration. This shows that there are ways to improve the performance of floating column and make it possible to be used in high seismic zones.***

***Keywords: - Floating column, Dampers, Fluid Viscous Damper, FVD Damper, Structure***

## I. INTRODUCTION

In the now days the need for open spaces in the commercial building has increased a lot which forced the engineers to come up with new ways and methods to satisfy the demand of the clients. One the most used methods is by adding floating column. These floating column comes with a lot of disadvantages when it is used in a building built in area of high seismic zone. The earthquake forces that are developed at different floor levels in building need to be carried down along the height to ground by shortest path. But, due to floating column there is discontinuity in the load transfer path which results in poor performance of building. So, for that we need to find the optimum way to reduce the chances of the failure of the floating column in the building to ensure higher safety and durability.

## II. FLOATING COLUMNS

A column is a vertical compressive member. It transfers superstructure load to the foundation then to the ground. The floating column also a vertical member but its lower end is not connected to the foundation. Its lower end rest on beam which is a horizontal member, this beam transfer the load of floating column to other columns below it.
This means that the beam which supports the column acts as a foundation and it is called as a transfer beam. The transfer beam which supports the floating column transfers the loads up to foundation as shown in fig.1. Hence, it has to be designed with more reinforcement.

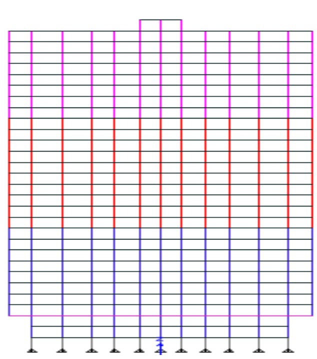

Fig.1 Location of Floating Column

## III. OBJECTIVES

1. To study the behavior of multi-story floating column building under earthquake load.
2. To increase the safety and durability of the building using Fluid Viscous Damper (FVD).

## IV. LITERATURE REVIEW

**Kishalay Maitra et al.** according to the study "It can be concluded that as far as possible, the floating columns are to be avoided especially in the seismic prone areas and if not possible then floating column should be provided symmetrically to avoid torsional irregularity as well as column size should be increased to get rid of from soft story effect". Hence, by using FVD and LRB isolator we are trying to reduce the chances of failure of floating column. [1]

**V. Umachagi, K. et al.** in "Applications of Dampers for Vibration Control of Structures: An overview" has briefly explained that Viscous dampers works based on fluid flow through orifices. Viscous damper is consist of viscous wall, piston with a number of small orifices, cover filled with a silicon or some liquid material like oil, through which the fluid pass from one side of the piston to the other[2]. Stefano et al., 2010 have manufactured the viscous damper and it was implemented in 3 story building structure for seismic control of structure with additional viscous damper [3]. Attar et al., 2007 have proposed optimal viscous damper to reduce the interstory displacement of steel building. [4]

## V. METHODOLOGY

By using ETABS 2017 we have designed a multi-story building with floating columns in the story above the ground floor as shown in fig.2 in seismic zone 5, by default the result would be unpleasant. We are going to add braces, FVD and LRB isolator to see the behavior of the structure and compare the results to check if it has improved or not.

Design Standards which are used:

1. IS 456: 2000 (RCC Design) [5]
2. IS 875: 2015 (Wind Load) [6]
3. IS 1893: 2016 (Earthquake load) [7]
4. IS 800: 2007 (Steel Structure Design) [8]

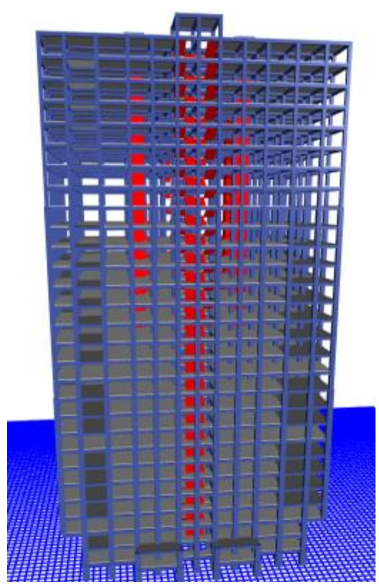

Fig.2 View of the Design in Etabs

## VI. RESULTS

After the model was designed and subjected to the loads according the Indian Standard we came to the result that by using fluid viscous damper (FVD) of force 750 KN the story displacement has decreased as shown in table I and drift in each story of the building has decreased by 14% as shown in fig.3. This result shows that by using various types of dampers we can achieve higher safety in building having floating column. Fig.4 and Fig.5 shows the displacement of different structure under different load combination.

TABLE I MAXIMUM STORY DISPLACEMENT

| Structure Type | Maximum Story Displacement (mm) |
|---|---|
| Normal Building | 260.709 |
| Building with FVD | 257.082 |

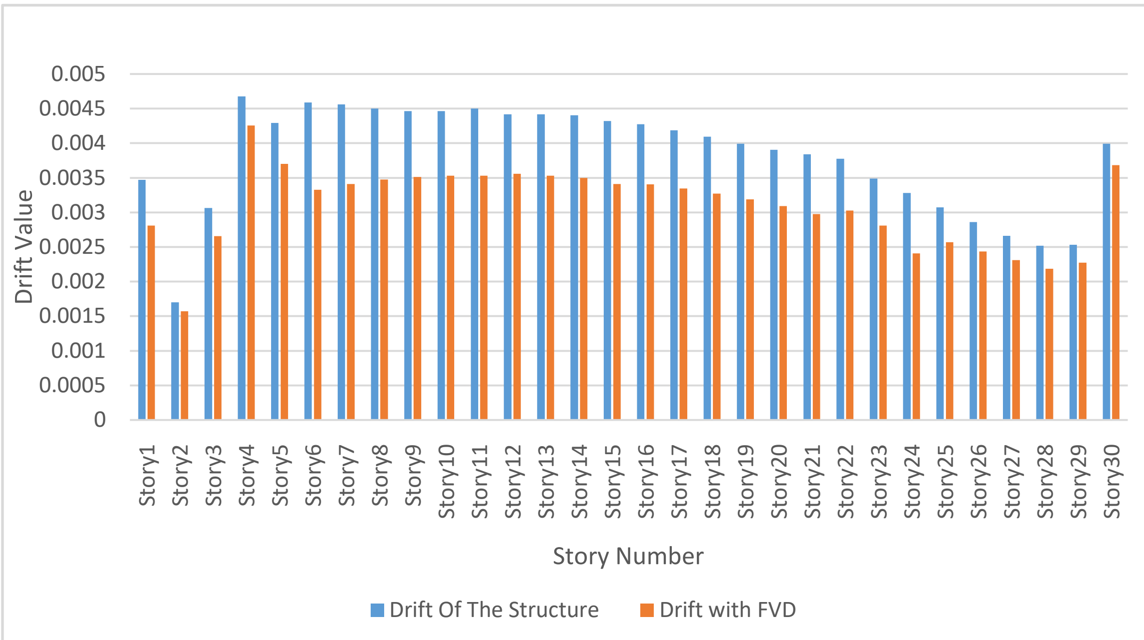


Fig.3 Story Drift with respect to Story Number

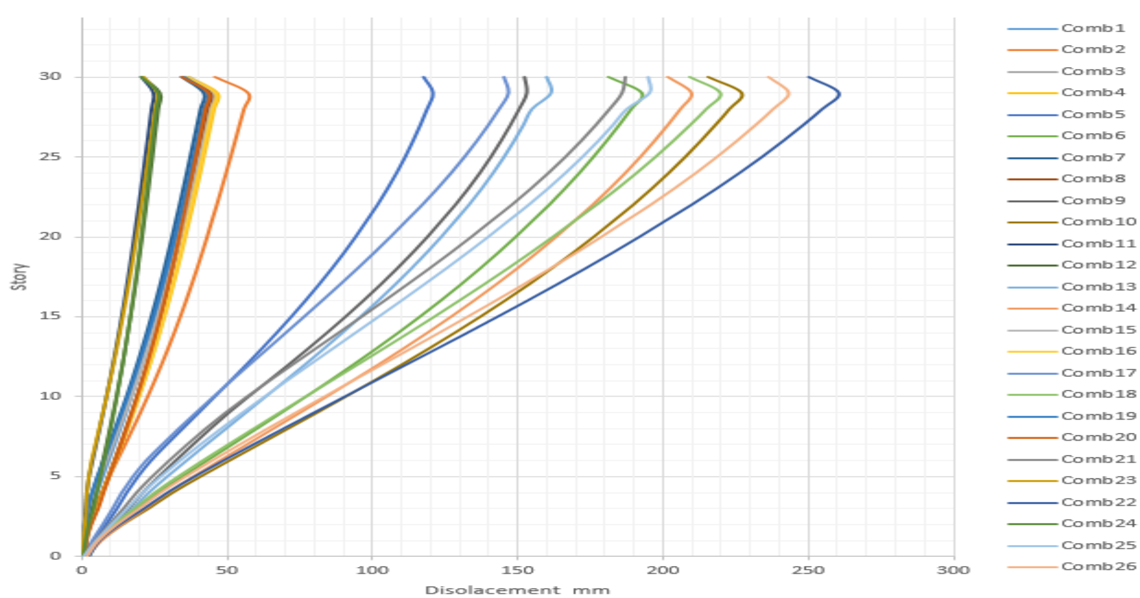


Fig.4 Displacement with respect to Story Number of the Normal Building

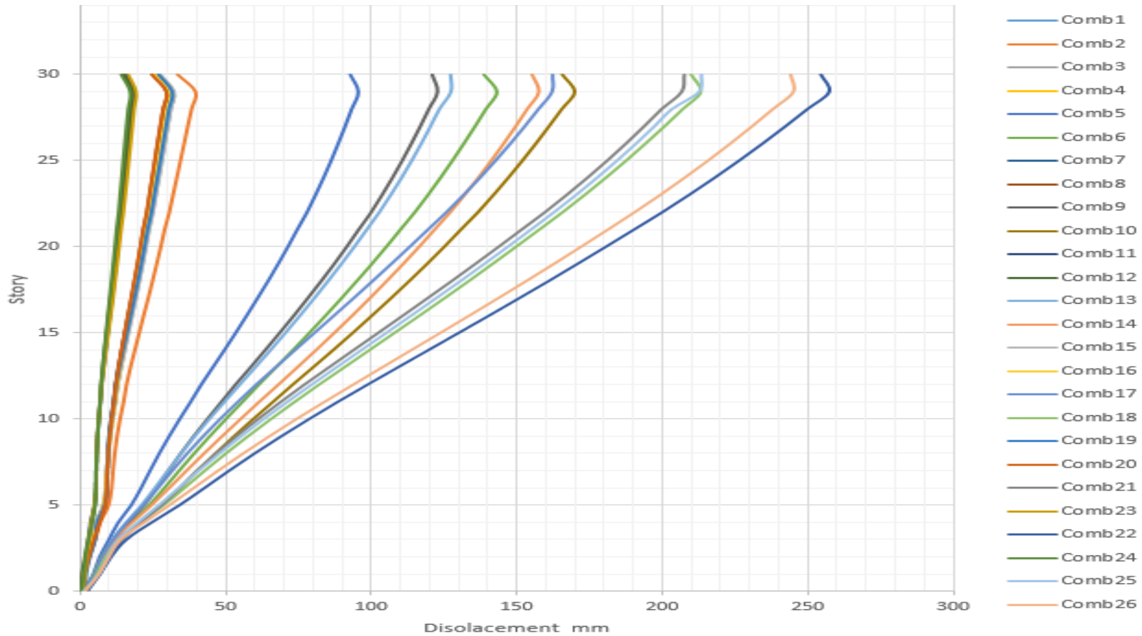


Fig.5 Displacement with respect to Story Number of the FVD Building

## VII. CONCLUSION

As it was clear that building having floating columns cannot be built in high seismic zone but, from our study we found that if dampers are used there can be less drift of the story which makes the building safer. Different types of dampers can be used in different combination to achieve better results. Different construction standards have different maximum value of drift and for designing earthquake resisting buildings which can show if the building has become safe or not. For our study we used Indian Standards which specifies in IS 1893 (Part I): 2016 clause 7.11.1.1 that story drift in any story shall not exceed 0.004 times the story height.

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