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Comparative Analysis of Multi-story RCC Structure under Sloping Ground using Shear wall and FVD by ETABS

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ABSTRACT: Structures built on bumpy zones are unique in relation to the structures developed on level grounds on account of their inconsistency and unsymmetrical structure in vertical and even plane. Additionally, these structures on uneven zones are considerably more inclined to quake powers. The fundamental goal of the present work is to contemplate the conduct of the structures on an inclined surface and level ground. The structures lying on slope regions must be designed uniquely in contrast to level ground. They are exceptionally unpredictable and unsymmetrical in even and vertical planes, and torsion ally coupled and consequently helpless to disjoin harm when influenced by seismic tremor.

I. INTRODUCTION

Seismic load is the most deplorable and flighty marvel of nature. At present when a structure is subjected to seismic powers it doesn't make misfortune human lives specifically however because of the harm cause to the structures that prompts the fall of building & henceforth to the inhabitants and the property. Structure subjected to seismic/quake powers are constantly helpless against harm and on the off chance that it happens on a slanted working as on slopes which is at some tendency to the ground the odds of harm build substantially more because of expanded horizontal powers on short section on tough side and along these lines prompts the arrangement of plastic pivots. Structures on inclines contrast from those on fields since they are unpredictable on a level plane and additionally vertically.

The physical landscape is an assemblage of slopes. Geomorphologists for long been intrigued by the evolution of genesis and form of slopes, it posed a major challenge to know the landforms. Various theories and models were formulated to provide rational explanation while each had defects unique to its origin and shape. Despite the fact that slope constitutes the core of landform study, has not gotten the proper attention and largely remained neglected.

II. FLUID VISCOUS DAMPERS

There is not only single damper used but various other dampers are used to control the earthquake effects. These dampers classified depending on performance of structure. These dampers are used because of highly energy absorption, also very easily replaceable, clear and easy mounting process as well as it can co-ordinate with different structure member also.

Fluid viscous damper is velocity dependent system, fluid viscous damper devices are originally developed for military applications. The fluid viscous damper consists of an orifice through which some fluid is flowing and this is which the phenomenon is used for the operation of fluid viscous damper. There are various chambers through silicone oil is flowing steadily. This oil is used for the reason that it is steady for long time, it is unwatery and inert. Also, it is non-toxic unharmed and does not catch fire easily. The potential difference is created between the two chambers. This difference applies the pressure so that oil flows through the given path. In this process the earthquake energy is converted to heat energy, and this heat is shrinks to the atmosphere.

FVDs are often used as an energy dissipation device on structures built in seismic hotspots. A structure that utilizes fluid viscous dampers will increase its critical damping ratio and reduce the dynamic magnification factor. This

reduction will reduce the dynamic response of a structural system in the event of an earthquake or other external excitation.

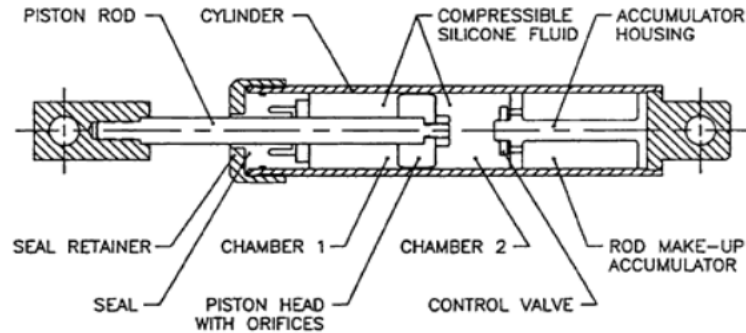


Fig. 1: Longitudinal section of viscous damper

III. OBJECTIVES

The objectives of the present study to compare the seismic response of building with and without fluid viscous dampers are as follows

1. To determine displacements variations in the structure with and without fluid viscous damper and also providing shear wall.
2. To determine base shear variations in the structure by using fluid viscous damper in RC building.
3. To compare other parameters such as story drift auto lateral load and story displacement.
4. Comparing the results along and concluding the effect of viscous damper over the building in slope.

IV. METHODOLOGY

The modelling and design of the models were carried out in ETABS software. Model description and parameters were tabulated below.

Table 1: Parameters consider for the model

SL. NO	PARTICULARS	VALUES
1	No. of Story	G+10
2	Story height	3m
3	Plan area	24m x 28m
4	Thickness of slab	0.2m
5	Thickness of Shear wall	0.23m
6	Column size	0.6mmx0.6mm
7	Bean size	0.6mmx0.45mm
8	Wall thickness	230mm
9	Grade of concrete	M35
10	Grade of Steel	Fe550
11	Seismic Zone	V
12	Density of concrete	25KN/m ³
13	Density of motor	20.4KN/m ³
14	Density of solid Brick	20KN/m ³
15	Code book consideration	1) IS: 1893 (part-1)-2002, 2) IS 456- 2000,

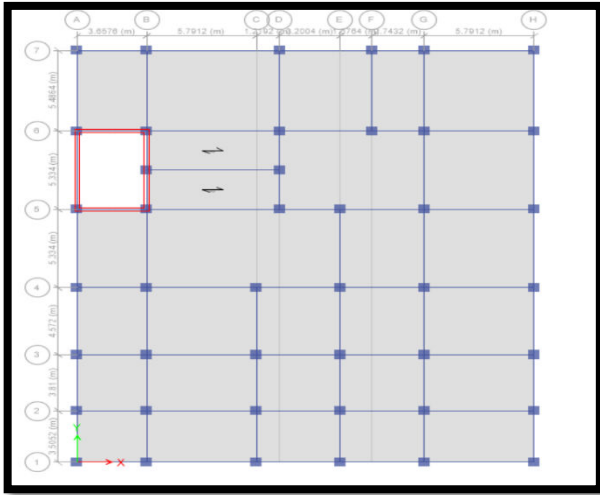


Fig. 2: 2D Plan of Model

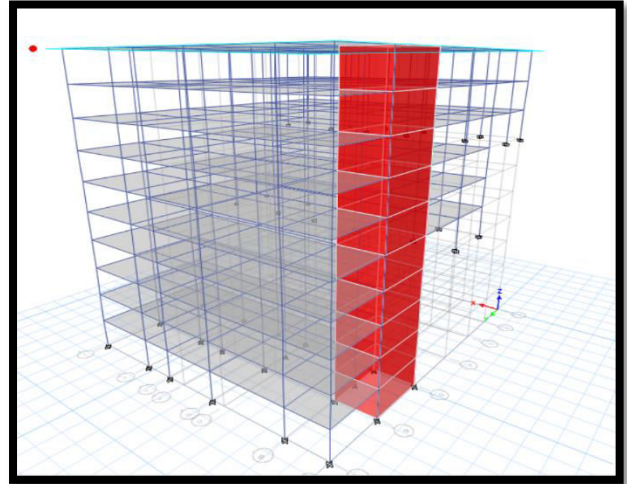


Fig. 2: 3D Wire frame of structure on slope

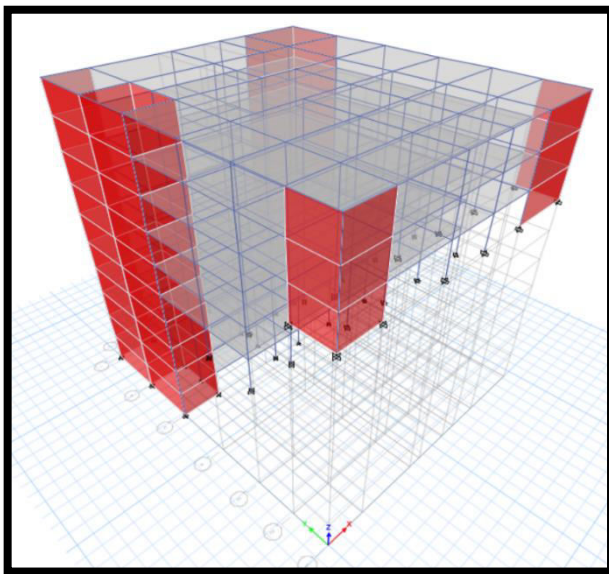


Fig. 5.13: 3D wire frame of model with shear wall

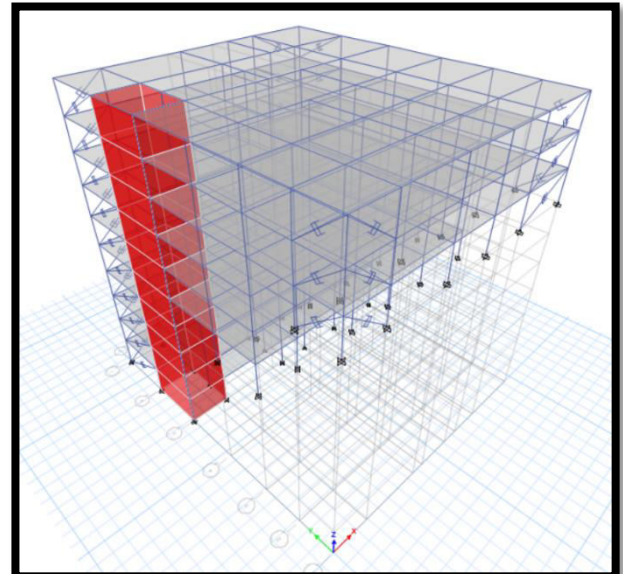


Fig. 5.8: 3D wire frame of model with FVD



V. RESULT AND DISCUSSION

Maximum Value of Story displacement, Story shear and auto lateral load are tabulated and graphs were plotted below.

Story Displacement

Table 2: Comparison of story displacement

Story displacement in (mm)		
Model	X direction	Y direction
Slope	7.915	5.374
FVD	3.697	2.22
Shear wall	3.326	2.186

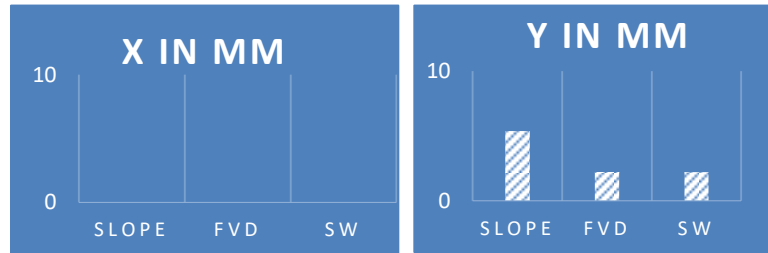


Chart1: Comparison of Story Displacement in X and Y direction of all Model

Story Shear

Table 3: Comparison of story shear

Story Shear in (KN)		
Model	X direction	Y direction
Slope	772.073	772.073
FVD	685.852	520.047
Shear wall	812.899	812.899

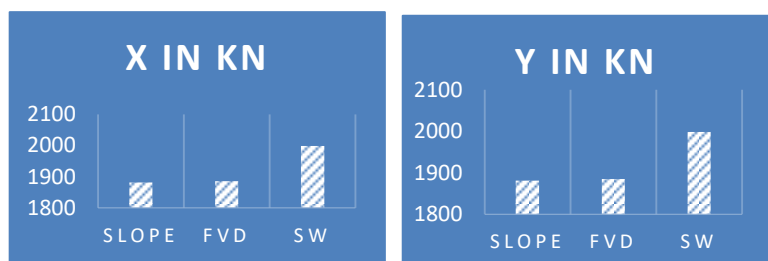


Chart 2: Comparison of Story Drift in X and Y direction of all Models

Auto lateral Load

Table 4: Comparison of auto lateral load

Auto lateral load in (KN)		
Model	X direction	Y direction
Slope	1881.388	1881.39
FVD	1884.826	1884.83
Shear wall	1998.082	1998.08



Chat 3: Comparison of Auto lateral Load in X and Y direction of all Models

VI. CONCLUSION

The final values obtained for all three reserves holds well for the dampers model while the displacement, drift, and shear comparisons are checked.

The slope building with SW is determined being the better-performing model in terms of displacement. The inclusion of shear walls in the model increases the overall stiffness and resistance to lateral forces, resulting in lower displacements. This indicates improved structural stability and reduced risk of excessive deformations or damage.

FVD model exhibits better performance in terms of story shear. The incorporation of viscous dampers in the model helps dissipate energy and control the response to lateral forces. This leads to reduced story shear values, indicating effective mitigation of vibrations and better distribution of forces within the structure.

FVD also functions well in terms of auto-lateral loads. By including's the FVD, the model effectively reduces internal forces and deformations of building beneath the static loading conditions. This results in improved load-carrying capacity and enhanced overall stability.

The final conclusion considers the outcomes attained from analysis of displacement, story shear, and auto-lateral loads. Although, it is essential to mention the selection of most appropriate model should be considered other factors, such as cost, constructability, and specific project requirements. Additionally, a comprehensive analysis using appropriate software, such as ETABS, should be conducted to validate and compare the results accurately, considering all relevant design parameters and loading conditions specific to the project.

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