Performance of High Rise Structure with Dampers at Different Location

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***Abstract*— In day to day life, it is needed to study the behavior of every multi-storyed building structure subjected to ground motion which is the common problem for construction. The earthquake creates the vibrating forces at the base of structure. These vibrations create the oscillations in building which may damage the structure tremendously. These vibrations created at the ground level gets transferred up to the top of building and because of mass of structure which produces the lateral forces on the frame which finally reduces the moment resistance capacity of building parameters such as columns beams etc. Paper gives the idea about different researches carried out on multistoried building considering various parameters. All previous studies, observations, and conclusions show that response spectrum method is useful for determination of structural response in particular cases of ground motions. This study describes the results of a study on the seismic behavior of a structure (G+7) with and without damper.**

The result from a previous experiment expressed that with the use of dampers, the stiffness and strength of the structure increase considerably. The scope of present work is to analyze behavior of multi storied building for the efficient location of damper in structural system. Analysis can be carried out by using any type of finite element software like ETABS software. These models will then examine for different parameters like lateral story displacement, base shear, time period and modal shapes.

Key Words: Response Spectra Analysis, Damper, Storey Deflection, Multi-Storey.

I. INTRODUCTION

There is several base isolation system that have been proposed which reduces the vibration at the base level of the building and restrict them to transfer up to the top floor of structure. But in case of existing multi-storey building it is difficult to apply base isolation in such case for the dissipation of energy and to increase the life of structure for earthquake forces we must have to adopt the he diagonally braced damping system in between the frame elements in the present study the response of structure is analyzed with the different location of dampers to reduce the excessive cost of dampers for economical considerations.

From the previous literature it shows that, for complex structures, the response spectrum method can be use by considering motions in a number of modes of vibration. So that the actual seismic coefficients or lateral forces can be obtained by response spectrum method. Also from this method the value of total base shear force can be obtained directly hence it is useful for determination of structural response in particular cases of ground motions. As well as the general character of the earthquake ground motions the structure present in seismic zone must have to resist the vibration due to ground motions.

II. TERMINOLOGY

A. Earthquake loads: -Earthquake loads are causes more damage than wind loads. It is occurs frequently in certain regions. It is a sudden lateral movement in ground under a structure that may shift in any direction and the horizontal components of this movement generates a wave action which usually transferred vertically to a structural. The variations in earthquake load are almost consistence than the wind load. The magnitude earthquake load changes with change in the stiffness, mass of the structure, and the motion of the earth surface because of seismic forces. These lateral forces can be resisting by any structure by modifying location of building, importance factor, type of soil, and achieving good construction practices.

B. Story Displacement:-The floor displacement profile is maximum with the maximum story drift ratio depending upon the height, the time period, and the column-to-beam strength ratio. It is measured in terms of mean coefficient of variation. The parameters under which displacement is study are sections and variations in of reinforcement. This term is proportional with the mechanism of formation of plastic hinges in structural members.

C. Response Spectrum Method:-The analysis is useful for determine the peak value of ground acceleration in case of seismic analysis of structure. The curve is plotted between ground motion and frequency. For which different damping ratios were considered and the mean peak response of displacement, velocity, acceleration of structure with time period is then calculated from different curves (i.e. spectrums). Different factors that will affects the response spectrum analysis are energy release mechanism, soil condition, Richter magnitude, damping in the system, time period of the system.

III. METHODOLOGY

In the present paper Following types of structures are analyse as lateral load resisting frame. Column sections of size 230mm×700 mm (depth parallel to y- axis), beam sections of size 230mm×600 mm, 150 mm thick RCC slab on all floors and shear wall having 200 mm thickness are taken for proposed work. The column height throughout the structure is 3 m. These frames are subjected to dead load, floors finished load 1 KN/m^2, live load 2 KN/m^2 on all floors earthquake loads as per IS 1893:2002.

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The damped and undamped frames with different geometrical configurations viz. are taken for the study.
Model-1 building without dampers
Model-2 building with dampers at plinth
Model-3 building with dampers at storey-1
Model-4 building with dampers at storey-2
Model-5 building with dampers at storey-3
Model-6 building with dampers at storey-4
Model-7 building with dampers at storey-5
Model-8 building with dampers at storey-6
Model-9 building with dampers at storey-7
For the seismic analysis of building, the zone factor 'Z' is taken as 0.16 for seismic zone III, Importance Factor 'I' equal to 1.

IV. MODELLING AND ANALYSIS

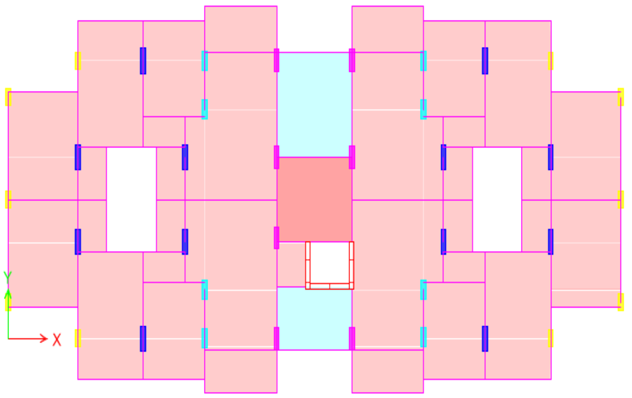
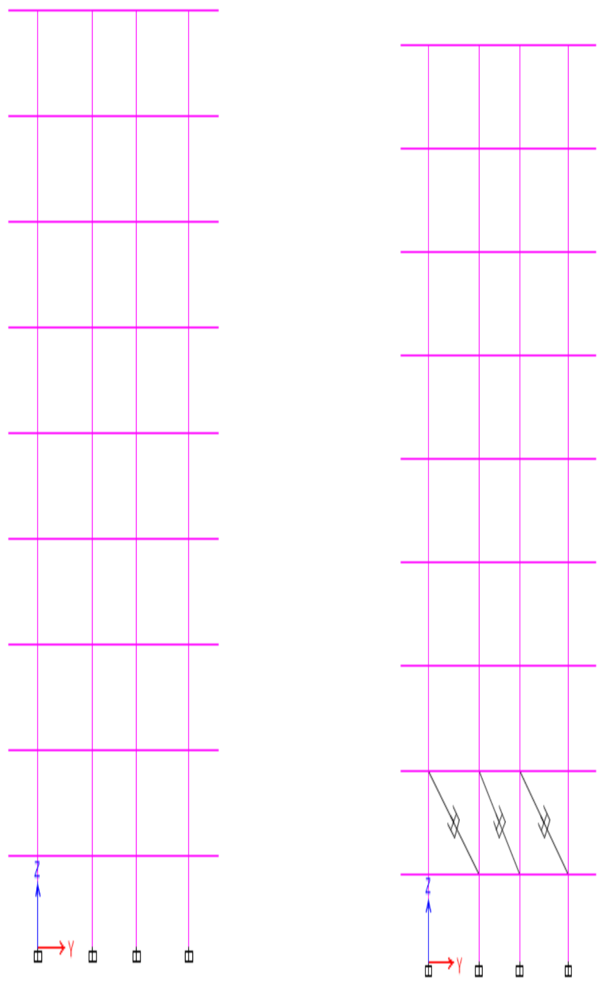


Fig. 1 General building plan showing

The G+7 story reinforced concrete building is assumed to be located in seismic zone-III on medium soil type 3 (as per IS 1893:2002). The frame has six degrees of freedom. Floor diaphragms are considered as semi-rigid for all. As stated earlier the main objective of this dissertation is focused on the behavior of RC frame building with and without damper under non linear response spectra analysis in ETABS – 2013 software.

The Visco-elastic dampers are modeled as link element having six degree of freedoms. The dampers are placed in between frame elements diagonally.

The elevation view of undamped and damped model is as shown Follows:



(a) Model-1 (b) Model-2

Fig. 2 Mathematical Model

V. GRAPHS

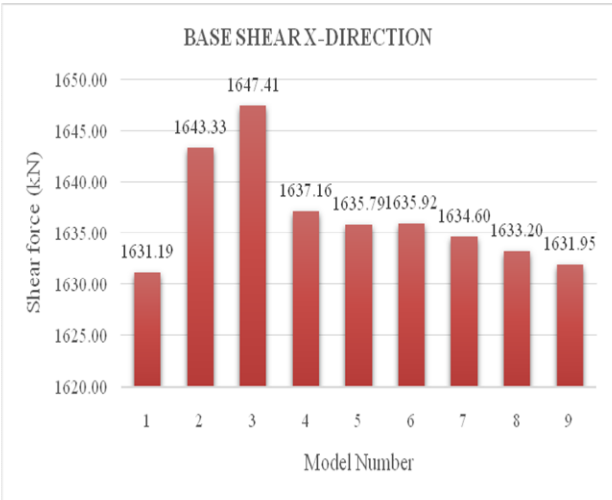


Fig. 3 Base shear variation along-x

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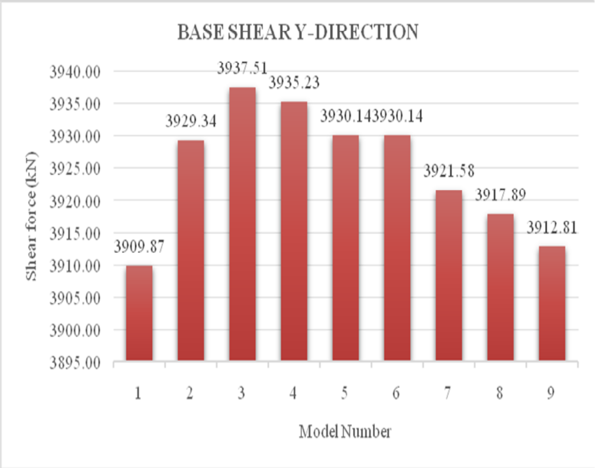

Fig. 4 Base shear variation along-y

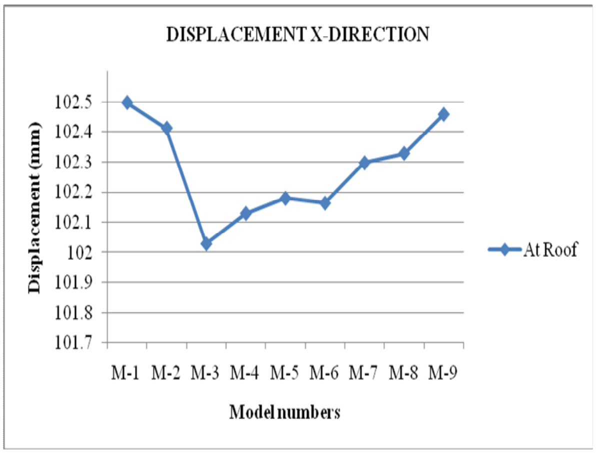

Fig. 5 Storey displacement-x variation

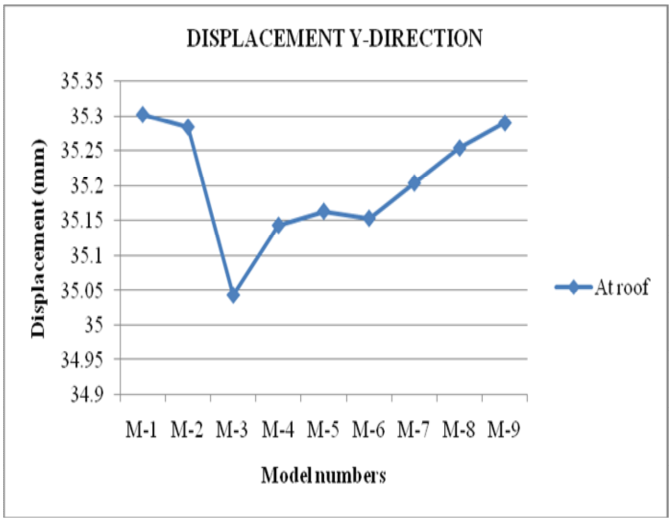

Fig. 6 Storey displacement-y variation

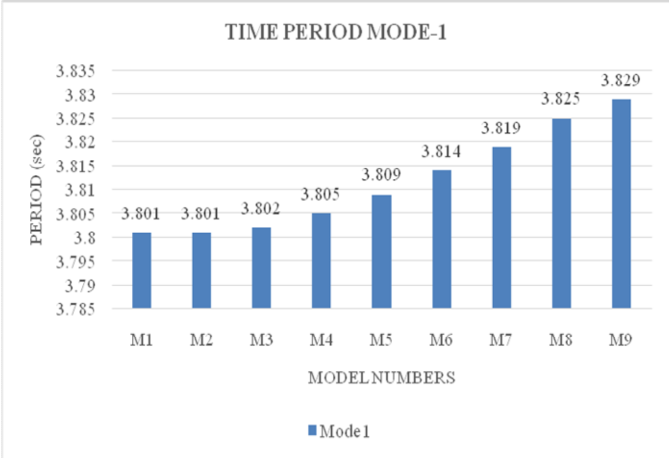

Fig. 7 Time period Mode-1

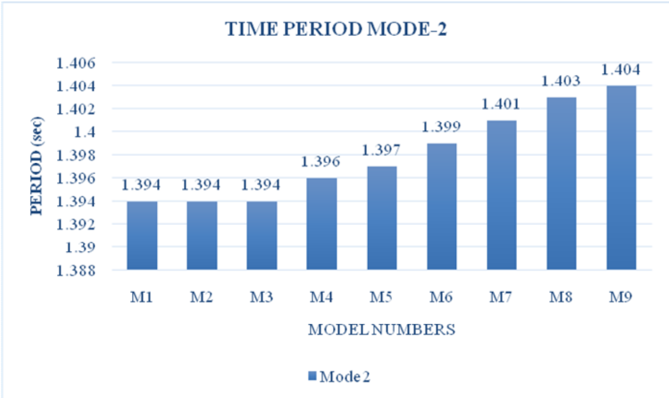

Fig. 8 Time period Mode-2

CONCLUSION

In these Paper Following consideration are concluded in between structure with damper up to 7th floor and structure without provision of damper.

The Computational modeling of the damper and structural analysis has indicated a rather efficient damping system and has also indicated its limitation.

The device is easy to manufactures and implements its structure and above economical due to easy availability of material and easy replaced.

On the basis of present study and retained literature the following conclusion can be drawn.

1. Seismic Performance of building can be improved by providing energy dissipating device (damper), which absorb input energy during earthquake.
2. After application of damper is much better when we provide same number of damper to bottom 7th stories.
3. Frame is safer when damper is provided up to Floor from base as compare with other arrangement.
4. With deployment of damper in the structures, base shear effectively reduce.
5. Due to shear reduction one can make the structure cost effective.
6. By graph, response spectrum method have been found to be useful not only for determination structural response in a particular cases of ground motion but also as a means of investigating the general character of earthquake ground motion.

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