Comparative Study of RC Building By Using Various Types of Dampers

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Abstract- *Dampers are used to resist lateral force coming on the structure. Dampers are the energy dissipating devices which also resist displacement of RC building during earthquake these dampers help the structure to reduce the buckling of columns and beams and the stiffness of the structure is increased. At the time of earthquake multi storey building is damaged and large deformation occurred in multi storied building. Dampers reduced vibration and deformation of RC building during earthquake. There is lot of various types are used in RC building. This study deals with selection of suitable type of damper which will be more resistant to earthquake for the selected building. The dissertation work is concern with comparative study of various types of dampers used for multi storied R.C.C. building. Response Spectrum method is used to analyse seismic behaviour of G+3 and G+9 story building with and without dampers. In response Spectrum method, earthquake load is applied in both X and Y direction. For the analysis purpose ETABS 2015 software is used by considering seismic zone V as per IS 1893:2002 (Part 1) code. Results of these analyses are discussed in terms of various parameters such as maximum absolute displacement, story shear, story drift, and time period. The comparison of these various parameters is done. From this comparison it is concluded that maximum, story shear, time period values are more in case of RC building without damper as compared to RC building with dampers.*

Keywords- Dampers, Conventional Building, High rise building, Seismic behaviour.

I. INTRODUCTION

Buildings around the world are subject to various loading conditions. During the design of a building, the designer must estimate the loads related to the building itself, for example the static forces due to connections. However, the building would also possibly be affected by external excitations, such as earthquakes. These disturbances induce undesired vibrations in the building, make people uncomfortable, cause damage to the structure and the equipment, and reduce the life of the building. Because the disturbances are dynamic in nature and highly uncertain with respect to magnitude and arrival times, the uncertainties make the design challenging at times.

Design of conventional structures specified by the codes is based on the philosophy that the structure should withstand seismic loads while sustaining an acceptable level of damage. Structures are designed to prevent collapse but their serviceability and functionality in the aftermath of strong earthquake ground motion are not taken into consideration. This is accomplished by planning structures to be pliable and giving them a chance to yield when subjected to solid seismic tremor ground movements. Yielding prompts solidness and quality corruption, expanded inter story floats, and harm with perpetual floats, which render the structure non-useful.

II. OBJECTIVES OF THE WORK

The objectives of present work are:-

1) To compare response of the RC structure for single Dampers:-
   a) Static Linear case as per IS 1893- 2002 (Part 1) for Zone V.
   b) Time History Non-linear Dynamic analysis for specified ground motion.
2) To study of Dynamic analysis results in terms of story displacements, Storey drift, Base shear, mode participation etc.
3) To study the effect of Dampers on structure.

III. MODELLING AND ANALYSIS

It involves modelling and analysis of G+3 and G+9 conventional building (without damper), building with single damper. The plan and loading is kept same for all the structures.

Building Configuration

i. Plan Dimensions – 20 m X 15 m
ii. Story Height – 3.5 m
iii. Column Size – 230 mm X 700 mm

iv. Beam Size – 230 mm X 600 mm
v. Slab Thickness – 125 mm
vi. Wall Thickness – 230 mm
vii. Parapet Height – 1.2 m
viii. Damper type – FVD
ix. Damper Mass – 45 Kg
x. Damper weight – 250 kN

Earthquake force data:

i. Earthquake load for the building has been calculated as per IS 1893(par 1) : 2005
ii. Zone factor – 0.36
iii. Seismic zone – V
iv. Importance factor (I) – 1
v. Reduction factor (R) – 5

Etab Models

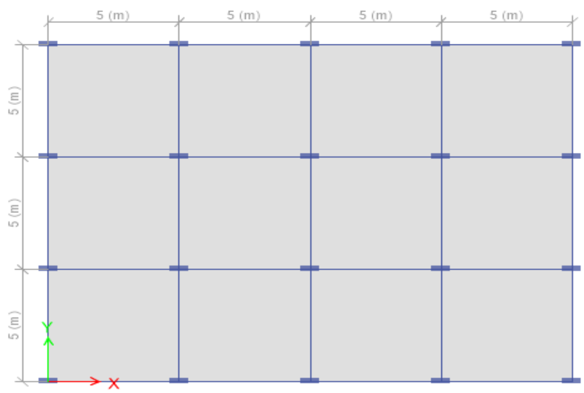

Fig.1 Plan of Building

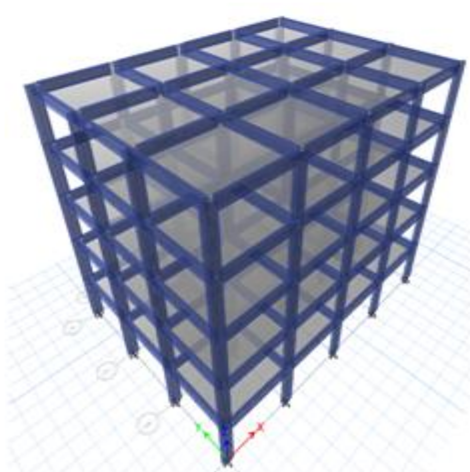

Fig. 2 3D of G+3 Conventional

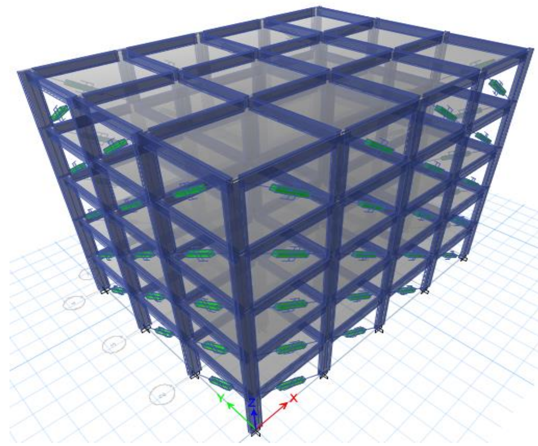

Fig. 3 3D of G+ 3 single Dampers

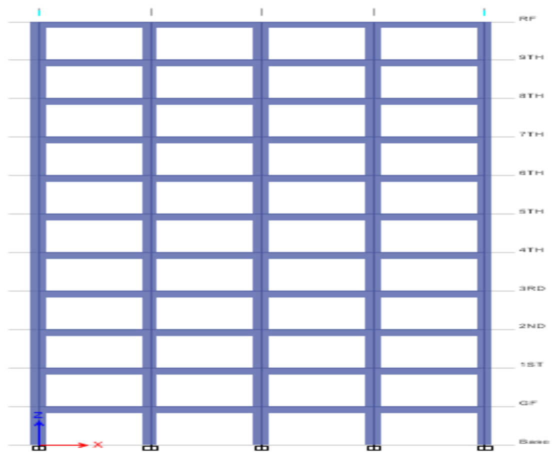

Fig. 4 3D of G+9 Conventional

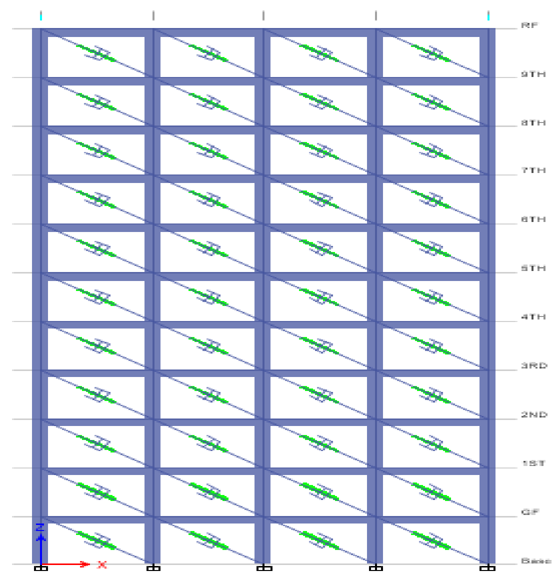

Fig. 5 Elevation of G+ 9 Single Dampers

IV. RESULT AND DISCUSSION

Comparative dynamic analysis results are
TIME PERIOD (Second) G+3

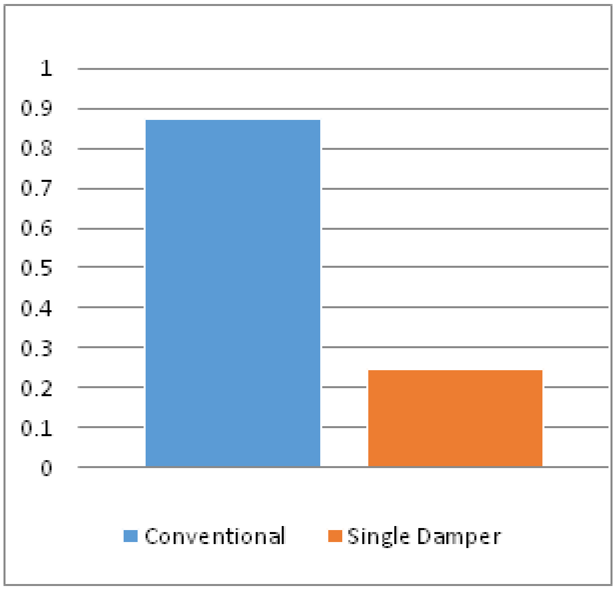

Fig. 6 TIME PERIOD G+3

MAXIMUM STORY DISPLACEMENT (mm) G+3

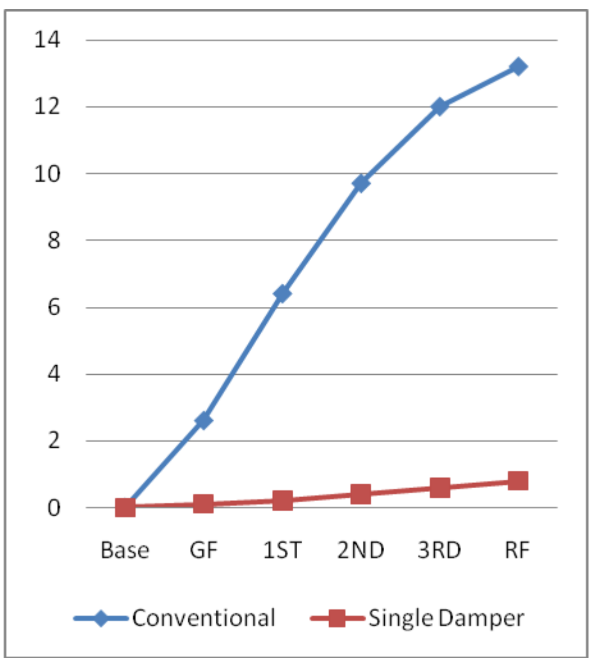

Fig. 7 MAXIMUM STORY DISPLACEMENTS G+3

STORY SHEARS (kN) G+3

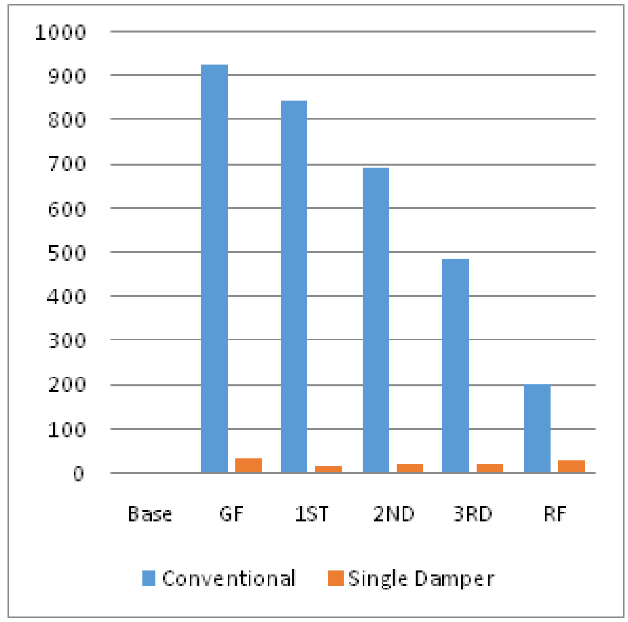

Fig. 8 STORY SHEARS G+3

TIME PERIOD (Second) G+9

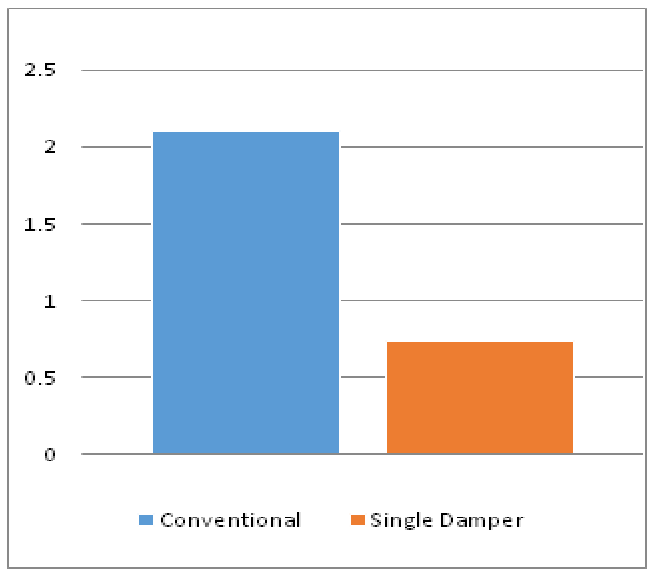

Fig. 9 TIME PERIOD G+9

MAXIMUM STORY DISPLACEMENT (mm) G+9

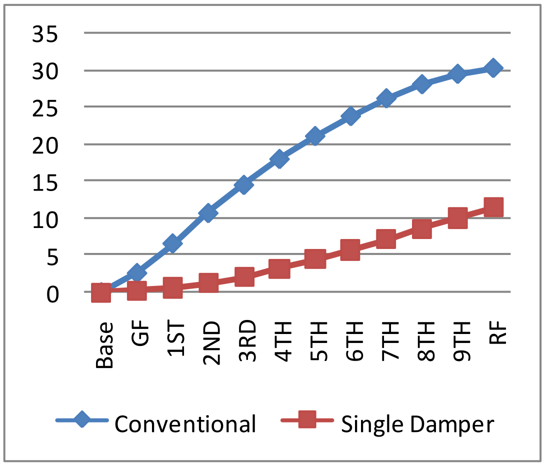

Fig. 10 MAXIMUM STORY DISPLACEMENTS G+9

STORY SHEARS (kN) G+9

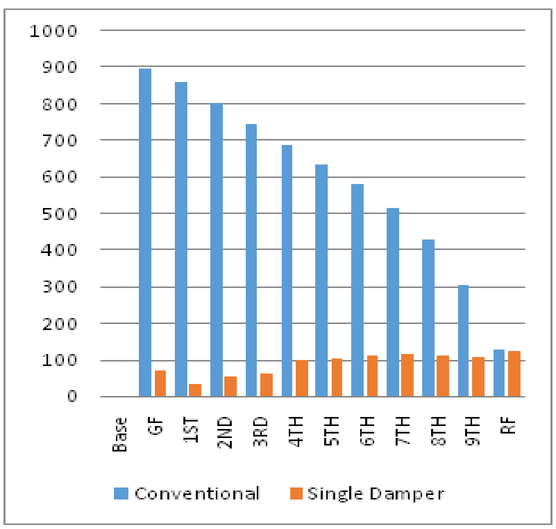

Fig. 11 STORY SHEARS G+9

V. CONCLUSION

It is found that all the damper arrangements are effective in reducing seismic response of the structure.

In the comparison of results of structure with damper and without damper it is concluded:

- The reduction in time period ranges 69 % to 97 % for damper structures less than that of uncontrolled structure.
- The reduction in maximum story displacement ranges 60 % to 90 % for structures with damper.
- Story shears for structures with damper about 30 % to 85 % less than that of uncontrolled structure.

The response can further reduced by different arrangement of damper. From above it can be conclude that the fluid viscous damper devices' with different arrangements perform a vital role in reducing and controlling the seismic response of the structure as compared to conventional structure.

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