IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Behavior of RC Frame Structure with Lateral Load Resisting Systems Subjected to Earthquake forces

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Abstract— Of many natural disasters, most destructive is earthquake. It may be defined as the vibration of the earth's surface as a result of a release of energy in the earth's crust. Destruction and damage caused to constructed and natural environment and loss of human life is of prime importance. Various types of lateral load resisting systems can be adopted for a structure to prevent the damage caused due to earthquakes. Analysis is carried out for G+4 RC structure with & without lateral load resisting system to evaluate the performance of structure subjected to earthquake forces

***Keywords*—Earthquake; Lateral load Resting system; Storey Shear, Lateral displacement.**

I. Introduction

An earthquake may be as the vibration, sometimes vibrant, of the earth's surface as a result of a release of energy in the earth's crust. Enormous amount of energy will be released during an earthquake. The size and severity of an earthquake is estimated by two important parameters-. Two important parameters of an earthquake are magnitude and intensity. It is not possible to determine the damage or devastation caused due to earthquake. An important aspect of loss of life, failure of infrastructure and psychological fear of the region being earthquake-prone results in decline in economic growth of the area.

An attempt to weaken the effects of an earthquake, a unique approach is required. Due to earthquakes, loss of life is always associated with collapse of man-made structures, e.g., collapse of buildings, bridges, dams, etc. It is well understood that earthquakes cannot be predicted accurately. Therefore, it is necessary to construct earthquake-resistant structures, structures that may be susceptible to damage, but are essentially collapse-proof even in the event of the greatest possible earthquake.

II. Literature Survey

Raveesh R. M and Sahana T. S analyzed a multistoried RC framed structure with Tune Mass Damper to evaluate the structural response subjected to implemental dynamic analysis. It was observed that the effect of tuned mass dampers plays a significant role to decrease the natural frequency, base shear, roof displacement, lateral displacement, storey drift, and bending moment and shear force in a multistory RC framed structure.

Yamada et al. analyzed a framed shear wall (Height/Width =0.44) by monotonic loading. Displacement model was proposed and parameters such as wall thickness and steel ratio was studied.

III. METHODOLOGY

The application of lateral loads and evaluation of performance of building are based on the Indian standards. To develop 3D model and to carry out the analysis, E-TABS software is used

TABLE 3.1 MODEL DESCRIPTION

Structure	OMRF
Storey height	3m
Bay width	6 m along X-direction; 5 m along Y-direction
No. of storeys	G+4
Soil type	Soft, Medium, Hard
Seismic Zones	II

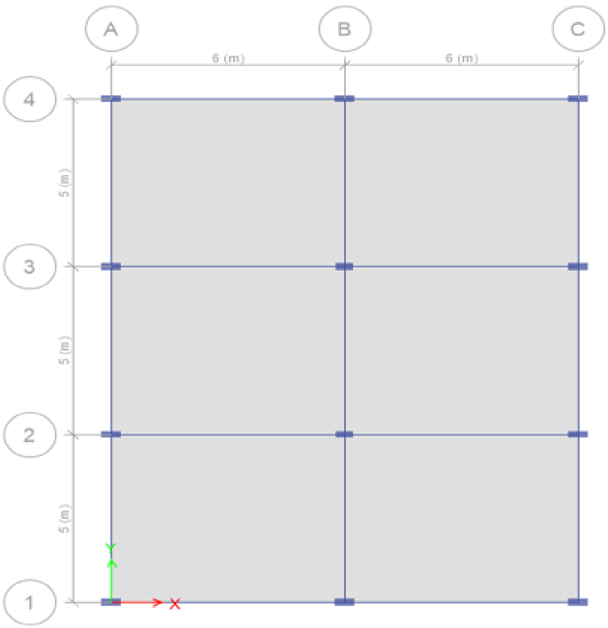

Fig 3.1: Plan of CS

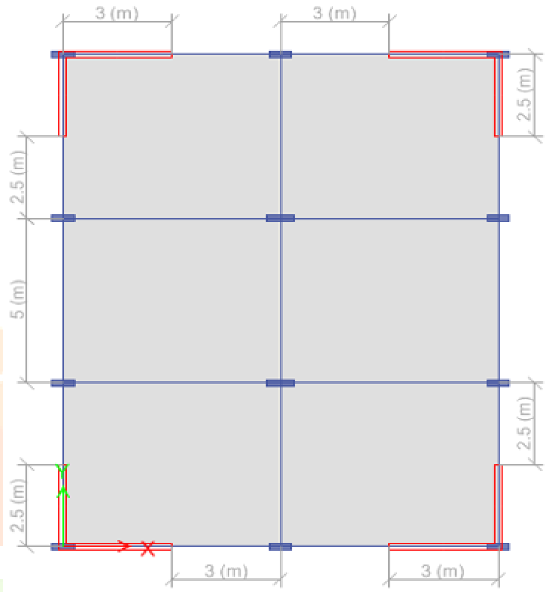

Fig 3.2: Plan of CSW

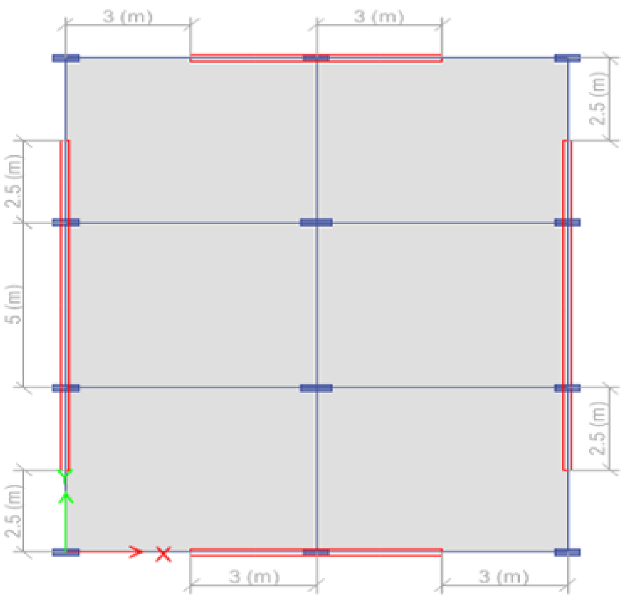

Fig 3.3: Plan with PSW

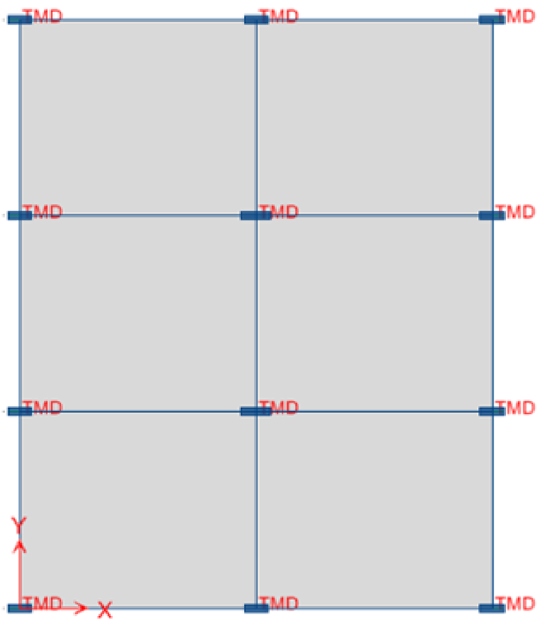

Fig 3.4: Plan with TMD

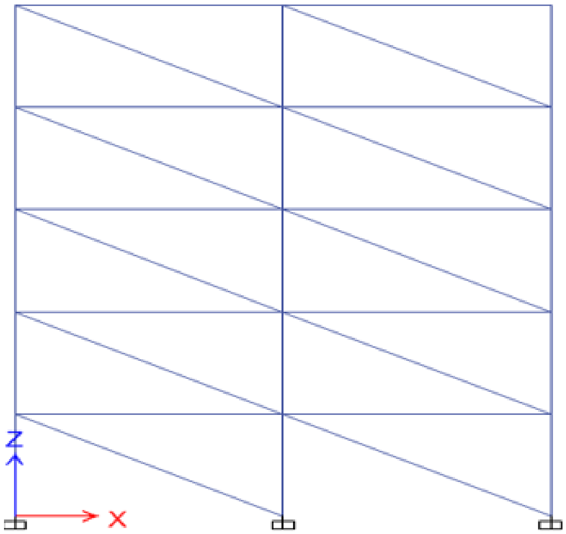

Fig. 3.5 Elevation of Structure with Diagonal Strut

IV RESULTS & DISCUSSION

The nomenclature of the legend in the graphs plotted below are as follows

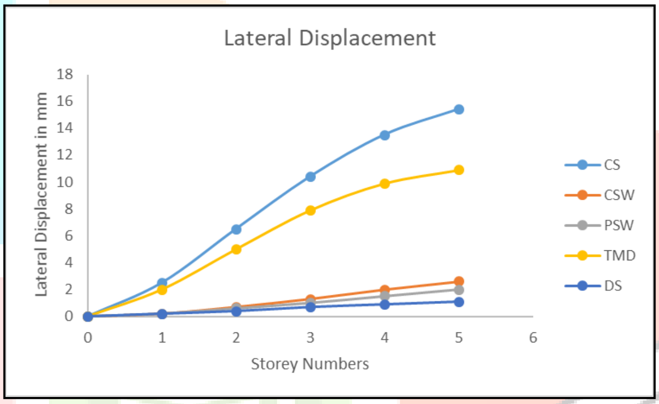

Fig 4.1: Variation of lateral displacement at different storeys for with and without lateral resisting systems

The above graph shows that; diagonal strut can be an optimal solution in reducing the lateral displacement of structure with medium soil located in zone 2

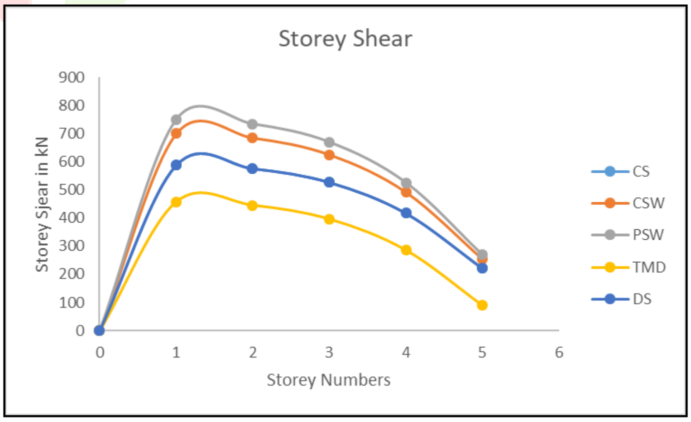

Fig 4.2: Variation of storey shear at different storeys for with and without lateral resisting systems

The above graph shows that; TMD can be an optimal solution in reducing the storey shear of structure with medium soil located in zone 2

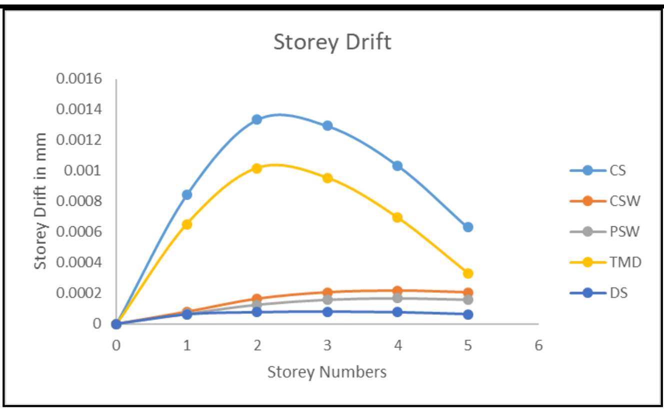

Fig 4.3: Variation of storey drift at different storeys for with and without lateral resisting systems

The above graph shows that; diagonal strut can be an optimal solution in reducing the storey drift of structure with medium soil located in zone 2

CONCLUSIONS

A 15m high RC frame structure having 5 storeys with a floor to floor height of 3m built on medium soil and located in seismic zone II is modelled in ETABS software to evaluate the performance of structure such as lateral displacement, storey drift and storey shear.

Seismic waves cause more lateral displacement, storey and storey shear for a controlled structure. It was observed that structure with diagonal strut can reduce storey displacement & storey drift and structure with TMD has performed better among the lateral load resisting systems in reduce the base shear of the structure which provides a desired level of human comfort, safety and economy of the structure.

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