Effect Of shear wall locations on the natural time period of a multi storey building in seismic zone V

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Abstract - *In the accompanying examination, investigation of 25 storey building in seismic zone V is given sure examinations which have been broke down by changing locations of shear wall for determining parameters like storey drift, base shear, torsion, displacement, storey stiffness and drift index in order to reduce the effect of earthquakes, reinforced concrete shear walls are being used in the building to provide lateral stiffness and stability for the purpose of improving seismic response of buildings. The provision of shear wall in building is to achieve rigidity and had been found effective and economical. Shear walls can be constructed easily and are structural element, efficient both in terms of construction cost and effectiveness in minimizing damages caused by earthquake in structural and non-structural elements (like glass windows and building contents).They are mainly flexural members and usually provided in multi storey buildings to avoid the total collapse of the buildings under seismic forces.*

***Key Words*: storey drift, base shear, torsion, displacement, storey stiffness, drift index, shear wall.**

1. INTRODUCTION

An earthquake is a sudden shaking of the earth's crust, caused by the abrupt release of slowly accumulated strain stored in the rocks beneath the surface. It is an oscillatory movement produced due to release of strain energy below the crust of earth surface. It generates elastic vibration or waves which moves in all direction from the point of origin and cause earthquake. No building can remain altogether free of harm amid seismic tremor, still, all structure, huge or little; can be made to withstand earthquake of a specific extent by playing it safe amid outline and development stages building crumples because of inertia force. During an earthquake the lower portion of a building tends to vibrate, as it is in direct contact with ground. The inertial force however keep the upper position in static position.

1.1 WORK METHODOLOGY

Response spectra are curves plotted between maximum response of Single degree of freedom **(SDOF)** system subjected to specified earthquake ground motion and its time period (or frequency). Response spectrum can be interpreted as the locus of maximum response of a SDOF system for given damping ratio. Response spectra thus helps in obtaining the peak structural responses under linear range, which can be used for obtaining lateral forces developed in structure due to earthquake thus facilitates in earthquake-resistant design of structures.

1.2 NATURAL TIME PERIOD

Modular mass of a structure subjected to flat or vertical ground movement, by and large, ground movement is separated of the aggregate seismic mass of the structure that is powerful in mode k of vibration. The modal mass for a given mode has a unique value irrespective of scaling of the mode shape. All the objects or structures have a tendency to vibrate. The rate at which it wants to vibrate is its fundamental time period.

2. Time Period variation with respect to different positions of shear wall

Following is the maximum natural period of one complete cycle of oscillation of multi-storey building models in seismic zones V

Table -1: Maximum Time Period Variation

Model	Maximum Time Period
RC Frame without Shear Wall	5.384 sec
RC Frame with shear wall at core	3.781 sec
RC Frame with shear wall at corner	2.618 sec
RC Frame with shear wall at side center	2.49 sec

With references to above outputs natural time period reduces after the addition of shear wall, proving the importance of shear wall in the building. Greater the time period more flexible is the structure or lesser the time period more **stiffed (rigid**) the structure. There is **60% to 70%** reduction in time period for multi storey with shear wall compare to G+24 multi-storey building without shear wall which indicates that shear wall structure has higher stiffness compare to without shear wall structure.

Among all models the minimum time period is observed when shear wall is installed at side center of the building, which signifies that the best possible position of shear wall in reducing the cycle of oscillation of building is side centre.

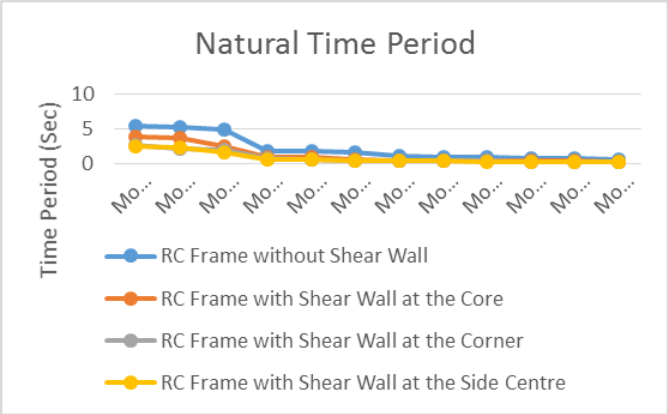

Fig -1: Natural time period variation

3. CONCLUSIONS

Based upon the research carried as above, Lateral load resisting capacity of moment resisting frame increases significantly after the addition of shear wall, as clear from the seismic parameter result and following conclusions have been drawn.

The Fundamental natural time period of building decreases when shear wall is provided at different location. In Modal 1 (without shear wall):5.384**>** Model 2(Shear at core):3.781 **>**Model 3(shear wall at corner):2.618 > Model 4(shear wall at side center):2.49, so it clear that the minimum fundamental natural time period is in **Model 4** (Shear wall at side center) is **60%** of the **Model 1** (without Shear wall).

RC frame building without shear wall shows poor performance during earthquake excitation when compared to RC frame building with shear wall due less **lateral stiffness.**

To increase the performance of the RC frame structure under horizontal loads, particularly when speaking about seismically prone areas modifications of such system can be done by adding structural elements such as RC shear wall.

If time period of oscillation of the structure is less than more is mass of the structure and more is the stiffness of structure. There is 60% to 70 % reduction in time period of oscillation of RC frame structure with shear wall compared to RC frame G+24 multi-storey building without shear wall indicates that with shear wall structure has higher stiffness compare to without shear wall structure.

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