Seismic Analysis of RC Framed Building under the Effect of Lateral Load

Abhishek Kumar[1] G.B.Bhaskar[2]
[1]M.Tech. Student [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]G.H. Raisoni Academy of Engineering & Technology, Nagpur

Abstract— A large area of India is susceptible to damage due to the impact of earthquake. Hence, it is essential to consider the seismic load for the design of multi-storied building. For that, program in STAAD Pro v8i software with different conditions of lateral load resisting system is used. Some models of brace frame & unbarred frame and shear wall & without shear wall are prepared and carried out through seismic analysis. A regular reinforced concrete frame structure having 11 floors i.e. (G+10) is designed using different types of bracing & shear wall like single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and different position of shear wall are used to compare the results of different patterns of braced & shear wall structure with unbraced & without shear wall structure . Zone-IV is considered for the analysis of different models. Seismic analysis is performed by using response spectrum method for the design of high-rise building. The analysis has produced the effect of actual distribution of forces and higher modes of vibration in a better way. For the purpose of seismic analysis IS: 1893 (part 1): 2002 is used. And test results including time period, bending moment, joint displacement, storey drift, base shear and axial forces are presented to get an effective lateral load resisting system.

Key words: Hospital Bed Management, Hospital Capacity Planning, Decision Support Systems, Decision Support Models

I. Introduction

Earthquakes are one of the most destructive of natural hazards. Earthquake occurs due to sudden transient motion of the ground as a result of release of elastic energy in a matter of few seconds. The impact of the event is most traumatic because it affects large area, occurs all on a sudden and unpredictable.

In the RC structure, reinforced concrete frames are used as part of seismic force-resisting systems in buildings that are designed to resist earthquakes. Beams, columns, and beam-column joints in moment frames are proportioned and detailed to resist flexural, axial, and shearing actions that result as a building sways through multiple displacement cycles during strong earthquake ground shaking. Special proportioning and detailing requirements result in a frame capable of resisting strong earthquake shaking without significant loss of stiffness or strength.

During earthquake bracing and shear wall is reduce the deflection in the structure. It works like a Retrofitting of the structure. A bracing system can be defined as a structural system capable of resisting horizontal actions and limiting horizontal deformations. a shear wall is a structural system composed of braced panels (also known as shear panels) to counter the effects of lateral load acting on a structure. On the basis of this definition, all the systems shown in following figure can be considered bracing systems & shear wall. Within one building more than one of these systems can be present. In that case some systems are more effective than others in resisting horizontal loads, the others are neglected.

II. Objectives of the Project

The Main objective of the project is to analyze the RC Framed Building for Zone –IV using (STAAD Pro. V8i) software approach. The multistory building will be considered to check effectiveness of lateral load in high rise building on different types of bracing system and different position of shear wall. The comparison of results between without bracing & without shear wall and different position of shear wall & different bracing system will be done by observing the different parameters such as joint displacement, bending moment, storey drift, axial force, and base shear.

III. Modelling and Analysis of Building

Models description of building in table 1:

Serial Number	Building Description	
1	Zone	IV
2	Zone Factor	0.24
3	Response Reduction Factor	5
4	Importance Factor	1
5	Height of Building	35.2 m
6	Column Details	0.3m x0.6m
7	Beam Details	0.23m x 0.5m
8	Bracing Details	ISMC 350
9	Shear wall thickness	0.23 m
10	Thickness of wall	0.23 m
11	Thickness of parapet wall	0.15 m
12	Thickness of Slab	0.125 m
13	Floor to Floor Height	3.2 m
14	Grade of Steel Section	Fe - 415
15	Grade of Concrete	M 30
16	Soil Type	Hard Strata
17	Damping Ratio	5%

Table 1: Building Description

Centre line plan of RC frame building which is used for the study is shown in figure in below.

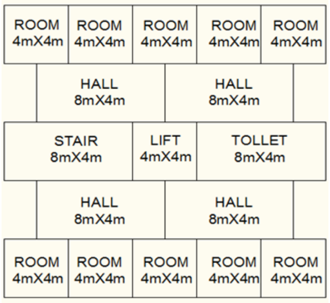

Fig. 1: Centre line Plan of RC Building

Different Types of Bracing Patterns and shear wall used in building to study are shown in figures below:-

A. *For Corner Position*

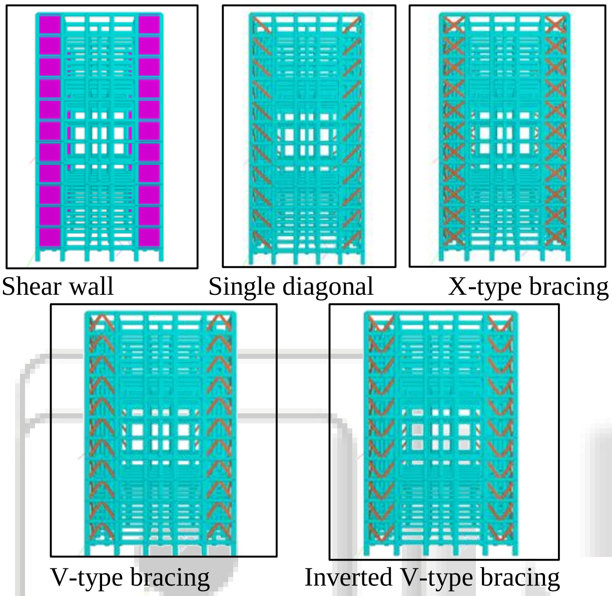

Fig. 2: Elevation of G+10 storey building using different types of bracing pattern & shear wall used in corner position.

B. *For Middle Position*

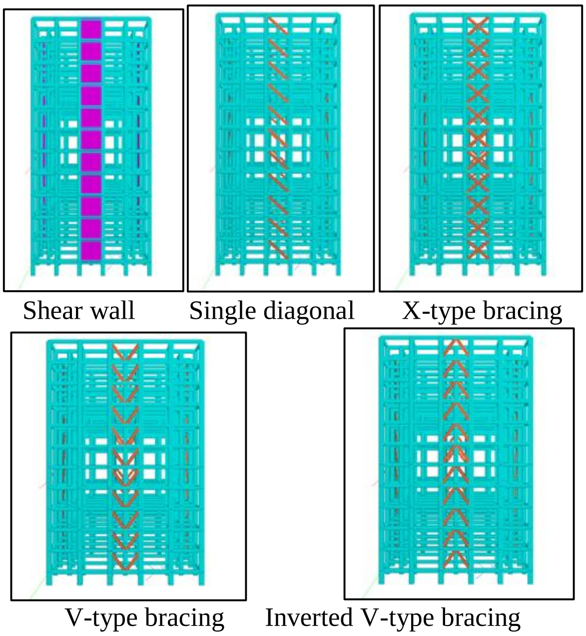

Fig. 3: Elevation of G+10 storey building using different types of bracing pattern & shear wall used in middle position.

C. *For Corner & Middle Position*

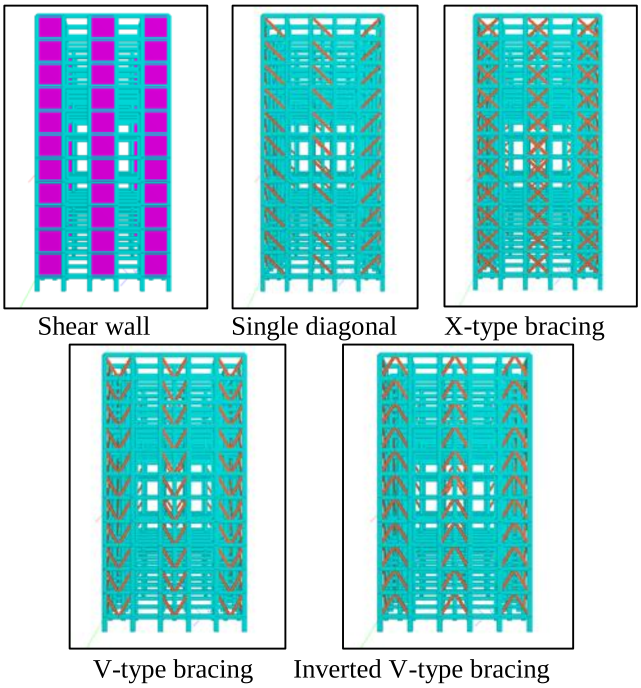

Fig. 4: Elevation of G+10 storey building using different types of bracing pattern & shear wall used in corner & middle position.

D. *Unbraced and without Shear Wall Building*

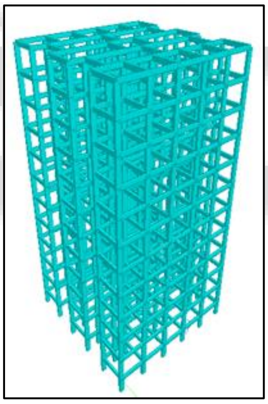

Fig. 5: Elevation of G+10 storey building using unbraced and without shear wall

IV. RESULTS & DISCUSSION

A. *General*

Seismic performance evaluation is a complex phenomenon as there are several factors which are affecting the behavior of the building. In this study there is a comparison of the analytical results between without shear wall, unbraced and braced RC framed structure with various parameters such as Joint Displacement, base shear, storey drift, bending moment & axial force. The Response Spectrum Analysis on static approach is carried out on all the models. The results obtained from the analysis are discussed in this chapter.

B. *For G+10 Story Building*

1) *Joint Displacement*

a) Maximum Joint Displacement in X-Direction

Graphs are plotted below for without shear wall & with shear wall and unbraced and braced buildings, Joint

Displacement is indicated on X-axis & floor levels are indicated on Y-axis.

– For corner position using different bracing types & shear wall

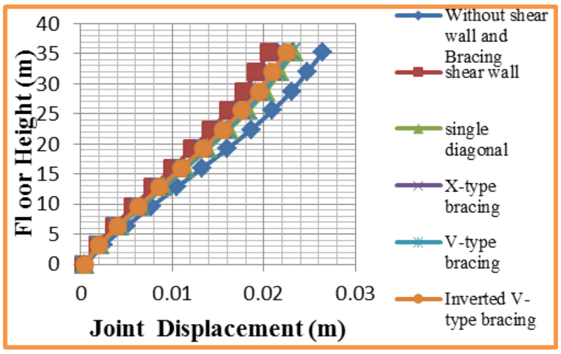

Fig. 6: Joint Displacement for corner position using different bracing types & shear wall in X-Direction for G+10 Storey Building.

From the Fig. 6, we know that the maximum values of Joint Displacement are reduced on comparison with shear wall & without shear wall and unbraced & braced building for corner position using different bracing types & shear wall i.e. single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall position. The Joint Displacement in RC frames building for corner position in X-direction is reduced by 11.84% using single diagonal, 15.26% using X-type bracing, 16.49% using V-type bracing, 15.07% using inverted V-type bracing & 22.23% using shear wall.

Due to the different bracing systems and shear wall provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Joint Displacement takes place.

– For middle position using different bracing types & shear wall

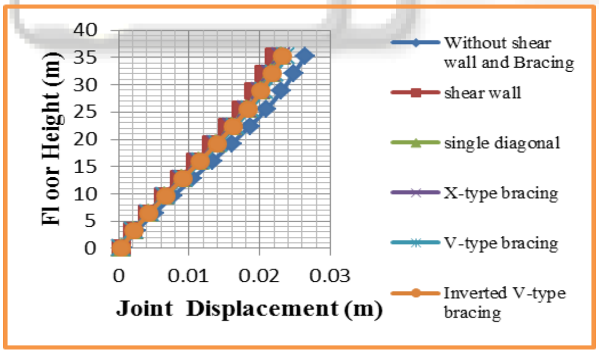

Fig. 7: Joint Displacement for middle position using different bracing types & shear wall in X-Direction for G+10 Storey Building.

From the Fig. 7, we know that the maximum values of Joint Displacement are reduced on comparison with shear wall & without shear wall and unbraced & braced building for corner position using different bracing types & shear wall i.e. single diagonal, X-type bracing ,V-type bracing, Inverted V-type bracing and shear wall. The Joint Displacement in RC frames building for corner position in X-direction is reduced by 12.99% using single diagonal, 12.70% using X-type bracing, 10.58% using V-type bracing, 12.09% using inverted V-type bracing & 16.37% using shear wall.

Due to the different bracing systems and shear wall provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Joint Displacement takes place.

– For corner and middle position using different bracing types & shear wall

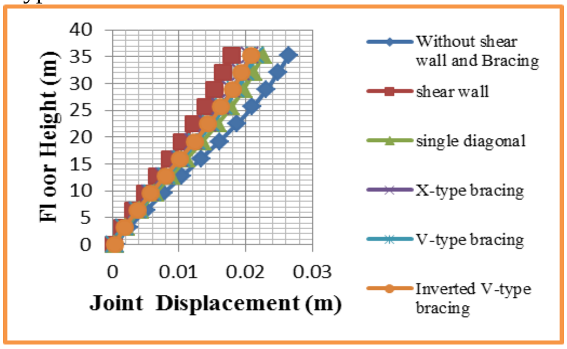

Fig. 8: Joint Displacement for corner and middle position using different bracing types & shear wall in X-Direction for G+10 Storey Building.

From the Fig. 8, we know that the maximum values of Joint Displacement are reduced on comparison with shear wall & without shear wall and unbraced & braced building for corner position using different bracing types & shear wall i.e. single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall. The Joint Displacement in RC frames building for corner position in X-direction is reduced by 14.69% using single diagonal, 21.85% using X-type bracing, 19.13% using V-type bracing, 21.41% using inverted V-type bracing & 32.31% using shear wall.

Due to the different bracing systems and shear wall provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Joint Displacement takes place.

b) Maximum Joint Displacement in X- Direction

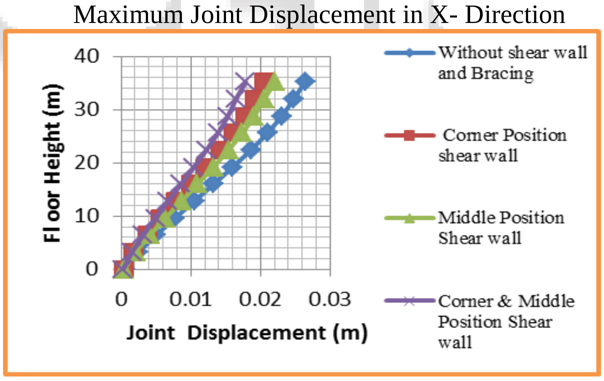

Fig. 9: Maximum Joint Displacement In X -Direction for G+10 Storey Building

From the Fig. 9, we know that the maximum values of Joint Displacement are reduced on comparison with shear wall & without shear wall and unbraced & braced building for using different bracing types & shear wall such as without shear wall and bracing, corner position of shear wall , middle position of shear wall and corner and middle position of shear wall. The percentage difference decreases i.e. maximum reduction for corner position of shear wall is 22.23%, for middle position of shear wall is 16.37% and for corner and middle position of shear wall is 32.31%.

The overall Percentage Difference Decreases i.e. reduction in the shear wall building occurs due to the stiffness provided to the shear wall building in the form of shear wall system using different position. The maximum Percentage Difference Decreases i.e. reduction is 32.31%

which can be seen for corner and middle position of shear wall. Due to this result it is concluded that corner and middle position of shear wall offers maximum resistance to deflection which increases the stiffness of the building in X-direction.

c) Maximum Joint Displacement in Z-Direction

Graphs are plotted below for without shear wall & with shear wall and unbraced and braced buildings, Joint Displacement is indicated on X-axis & floor levels are indicated on Y-axis.

– For corner position using different bracing types & shear wall

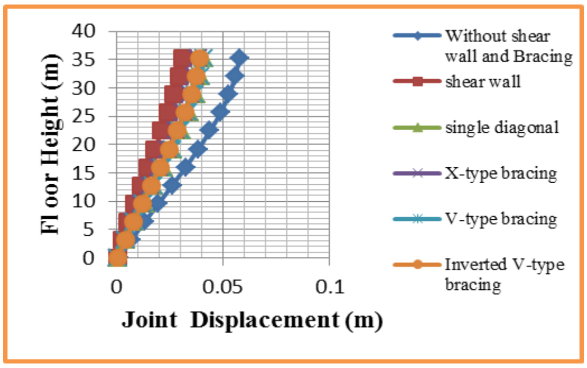

Fig. 10: Joint Displacement for corner position using different bracing types & shear wall in Z-Direction for G+10 Storey Building.

From the Fig. 10, we know that the maximum values of Joint Displacement are reduced on comparison with shear wall & without shear wall and unbraced & braced building for corner position using different bracing types & shear wall i.e. single diagonal, X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall. The Joint Displacement in RC frames building for corner position in X-direction is reduced by 28.49% using single diagonal, 33.12% using X-type bracing, 28.89% using V-type bracing, 32.63% using inverted V-type bracing & 45.93% using shear wall.

Due to the different bracing systems and shear wall provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Joint Displacement takes place.

– For middle position using different bracing types & shear wall

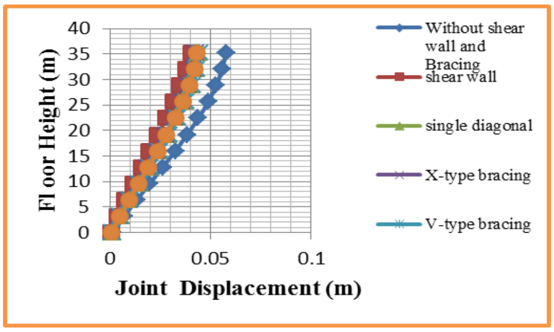

Fig. 11: Joint Displacement for middle position using different bracing types & shear wall in Z-Direction for G+10 Storey Building.

From the Fig. 11, we know that the maximum values of Joint Displacement are reduced on comparison with shear wall & without shear wall and unbraced & braced building for corner position using different bracing types & shear wall i.e. single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall. The Joint Displacement in RC frames building for corner position in X-direction is reduced by 23.72% using single diagonal, 25.56% using X-type bracing, 22.30% using V-type bracing, 24.75% using inverted V-type bracing & 29.50% using shear wall. Due to the different bracing systems and shear wall provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Joint Displacement takes place.

– For corner and middle position using different bracing types & shear wall

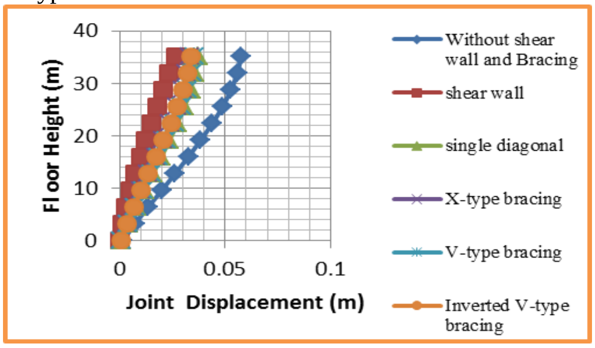

Fig. 12: Joint Displacement for corner and middle position using different bracing types & shear wall in Z-Direction for G+10 Storey Building.

From the Fig. 12, we know that the maximum values of Joint Displacement are reduced on comparison with shear wall & without shear wall and unbraced & braced building for corner position using different bracing types & shear wall i.e. single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall. The Joint Displacement in RC frames building for corner position in X-direction is reduced by 35.80% using single diagonal, 42.45% using X-type bracing, 38.41% using V-type bracing, 41.57% using inverted V-type bracing & 53.88% using shear wall. Due to the different bracing systems and shear wall provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Joint Displacement takes place.

d) Maximum Joint Displacement in Z- Direction

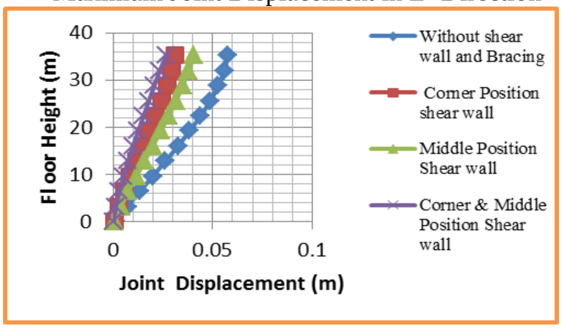

Fig. 13: Maximum Joint Displacement In Z -Direction for G+10 Storey Building

From the Fig. 13, we know that the maximum values of Joint Displacement are reduced on comparison with shear wall & without shear wall and unbraced & braced building for using different bracing types & shear wall such as without shear wall and bracing, corner position of shear wall, middle position of shear wall and corner and middle position of shear wall. The percentage difference decreases i.e. maximum reduction for corner position of shear wall is 45.93%, for middle position of shear wall is 29.50% and for corner and middle position of shear wall is 53.88% .

The overall Percentage Difference Decreases i.e. reduction in the shear wall building occurs due to the stiffness provided to the shear wall building in the form of shear wall system using different position. The maximum Percentage Difference Decreases i.e. reduction is 53.88% which can be seen for corner and middle position of shear wall. Due to this result it is concluded that corner and middle position of shear wall offers maximum resistance to deflection which increases the stiffness of the building in X-direction.

2) Storey Drift

a) Maximum Storey Drift in X-Direction

Graphs are plotted below for without shear wall & with shear wall and unbraced and braced buildings, Storey Drift is indicated on X-axis & floor height is indicated on Y-axis.

– For corner position using different bracing types & shear wall

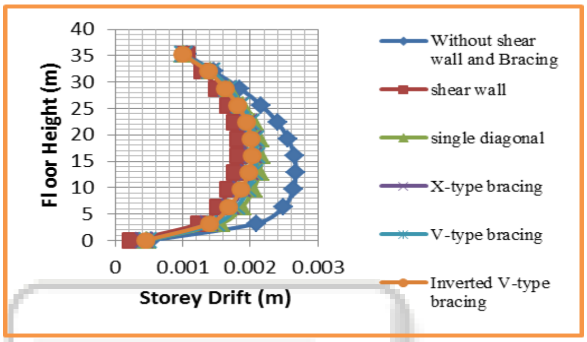

Fig. 14: Storey Drift for corner position using different bracing types & shear wall in X-Direction for G+10 Storey Building.

From the Fig. 14, we know that the maximum values of Storey Drift are reduced on comparison with unbraced building & braced and shear wall & without shear wall building for using different bracing types and shear wall position. i. e. single diagonal, X-type bracing, V-type bracing, Inverted V-type bracing and shear wall position. The maximum Storey Drift in RC frames building for corner position in X-direction is reduced by 19.00% using single diagonal, 23.56% using X-type bracing, 21.58% using V-type bracing, 24.35% using inverted V-type bracing & 31.38% using shear wall.

Due to the different bracing systems shear wall positions provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Storey Drift takes place.

– For middle position using different bracing types & shear wall

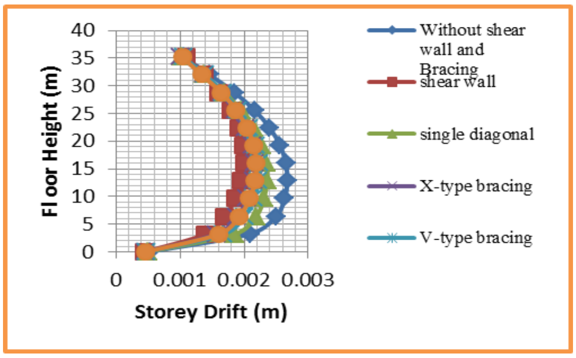

Fig. 15: Storey Drift for middle position using different bracing types & shear wall in X-Direction for G+10 Storey Building.

From the Fig. 15, we know that the maximum values of Storey Drift are reduced on comparison with unbraced building & braced and shear wall & without shear wall building for using different bracing types and shear wall position. i.e. single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall position. The maximum Storey Drift in RC frames building for corner position in X-direction is reduced by 11.85% using single diagonal, 18.89% using X-type bracing, 16.23% using V-type bracing, 17.99% using inverted V-type bracing & 24.99% using shear wall.

Due to the different bracing systems shear wall positions provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Storey Drift takes place.

– For corner and middle position using different bracing types & shear wall

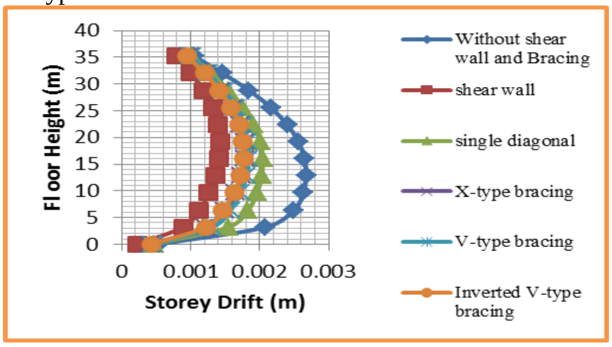

Fig. 16: Storey Drift for corner and middle position using different bracing types & shear wall in X-Direction for G+10 Storey Building.

From the Fig. 16, we know that the maximum values of Storey Drift are reduced on comparison with unbraced building & braced and shear wall & without shear wall building for using different bracing types and shear wall position. i.e. single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall position. The maximum Storey Drift in RC frames building for corner position in X-direction is reduced by 23.56% using single diagonal, 32.99% using X-type bracing, 31.08% using V-type bracing, 33.85% using inverted V-type bracing & 46.61% using shear wall.

Due to the different bracing systems shear wall positions provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Storey Drift takes place.

b) Maximum Storey Drift in X-Direction

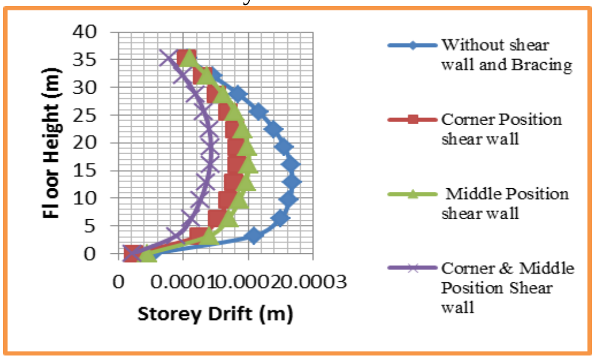

Fig. 17: Maximum Storey Drift in X-Direction for G+10 Storey Building

From the graph No. 17, we know that the maximum values of Storey Drift is are reduced on comparison with shear wall

& without shear wall and unbraced & braced building for using different bracing types & shear wall positions such as without shear wall and bracing, corner position of shear wall, middle position of shear wall and corner and middle position of shear wall. The percentage difference decreases i.e. maximum reduction for corner position of shear wall is 31.38%, for middle position of shear wall is 24.99% and for corner and middle position of shear wall is 46.61% .

The overall Percentage Difference Decreases i.e. reduction in the shear wall building occurs due to the stiffness provided to the shear wall building in the form of shear wall system using different position. The maximum Percentage Difference Decreases i.e. reduction is 46.61% which can be seen for corner and middle position of shear wall. Due to this result it is concluded that corner and middle position of shear wall offers maximum resistance to deflection which increases the stiffness of the building in X-direction.

c) Maximum Storey Drift in Z-Direction

Graphs are plotted below for without shear wall & with shear wall and unbraced and braced buildings, Storey Drift is indicated on X-axis & floor height is indicated on Y-axis.

– For corner position using different bracing types & shear wall

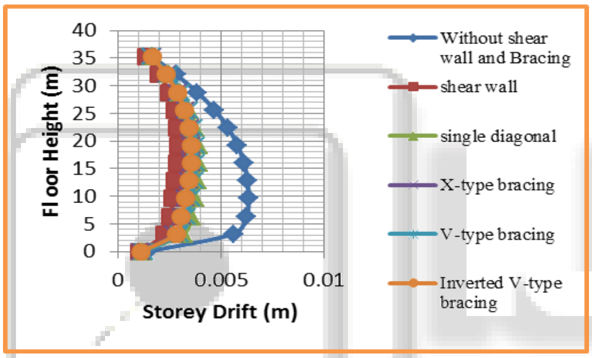

Fig. 18: Storey Drift for corner position using different bracing types & shear wall in Z-Direction for G+10 Storey Building.

From the Fig. 18, we know that the maximum values of Storey Drift are reduced on comparison with unbraced building & braced and shear wall & without shear wall building for using different bracing types and shear wall position. i.e. single diagonal, X-type bracing, V-type bracing, Inverted V-type bracing and shear wall position. The maximum Storey Drift in RC frames building for corner position in X-direction is reduced by 38.23% using single diagonal, 43.65% using X-type bracing, 40.14% using V-type bracing, 43.94% using inverted V-type bracing & 53.42% using shear wall.

Due to the different bracing systems shear wall positions provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Storey Drift takes place.

– For middle position using different bracing types & shear wall

From the Fig. 19, we know that the maximum values of Storey Drift are reduced on comparison with unbraced building & braced and shear wall & without shear wall building for using different bracing types and shear wall position. i.e. single diagonal, X-type bracing, V-type bracing, Inverted V-type bracing and shear wall position. The maximum Storey Drift in RC frames building for corner position in X-direction is reduced by 26.21% using single diagonal, 33.58% using X-type bracing, 29.82% using V-type bracing, 32.82% using inverted V-type bracing & 42.93% using shear wall.

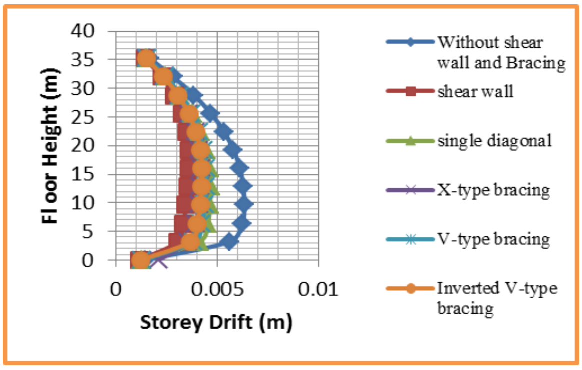

Fig. 19: Storey Drift for middle position using different bracing types & shear wall in Z-Direction for G+10 Storey Building.

Due to the different bracing systems shear wall positions provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Storey Drift takes place.

– For corner and middle position using different bracing types & shear wall

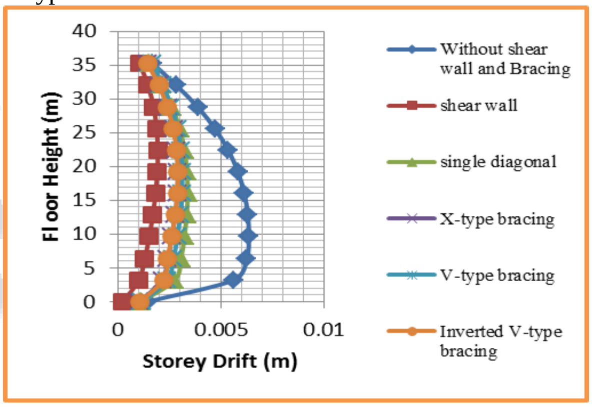

Fig. 20: Storey Drift for corner and middle position using different bracing types & shear wall in Z-Direction for G+10 Storey Building.

From the Fig. 20, we know that the maximum values of Storey Drift are reduced on comparison with unbraced building & braced and shear wall & without shear wall building for using different bracing types and shear wall position. i.e. single diagonal, X-type bracing, V-type bracing, Inverted V-type bracing and shear wall position. The maximum Storey Drift in RC frames building for corner position in X-direction is reduced by 46.67% using single diagonal, 53.97% using X-type bracing, 50.66% using V-type bracing, 54.11% using inverted V-type bracing & 69.44% using shear wall. Due to the different bracing systems shear wall positions provided, the building offers resistance to the displacement & percentage difference decreases i.e. reduction of Storey Drift takes place.

d) Maximum Storey Drift in X-Direction

From the Fig. 21, we know that the maximum values of Storey Drift is are reduced on comparison with shear wall & without shear wall and unbraced & braced building for using different bracing types & shear wall positions such as without shear wall and bracing , corner position of shear wall , middle position of shear wall and corner and middle position of shear wall. The percentage difference decreases i.e. maximum reduction for corner position of shear wall is 53.42%, for middle position of shear wall is 42.93% and for corner and middle position of shear wall is 69.44%.

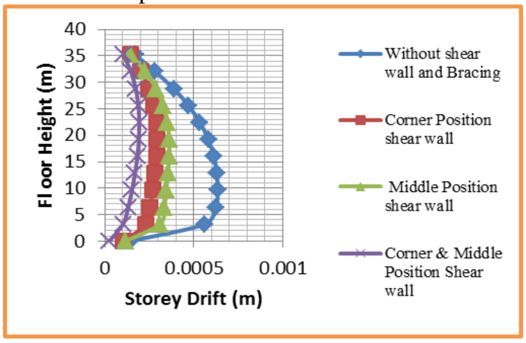

Fig. 21: Maximum Storey Drift in Z-Direction for G+10 Storeys Building

The overall Percentage Difference Decreases i.e. reduction in the shear wall building occurs due to the stiffness provided to the shear wall building in the form of shear wall system using different position. The maximum Percentage Difference Decreases i.e. reduction is 69.44% which can be seen for corner and middle position of shear wall. Due to this result it is concluded that corner and middle position of shear wall offers maximum resistance to deflection which increases the stiffness of the building in X-direction.

3) *Maximum Base shear*

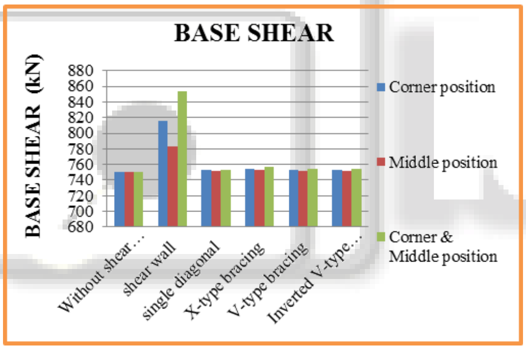

Fig. 22: Base Shear for G+10 Storey Building for Different Position of shear wall and Bracing Systems.

From the Fig. 22, it is clear that the maximum values of base shear in bottom of a column increases for shear wall and braced building for using different bracing types & shear wall positions. When compared to single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall position such as corner ,middle, corner & middle positions. The maximum percentage difference increases i.e. Increment for corner position is increased by 0.26% using single diagonal, 0.52% using X-type bracing, 0.38% using V-type bracing, 0.38% using inverted V-type bracing & 8.62% using shear wall.

Increment for middle position is increased by 0.13% using single diagonal, 0.26% using X-type bracing, 0.19% using V-type bracing, 0.19% using inverted V-type bracing & 4.31% using shear wall.

Increment for corner & middle position is increased by 0.39% using single diagonal, 0.78% using X-type bracing, 0.57% using V-type bracing, 0.57% using inverted V-type bracing & 13.66% using shear wall.

On comparison of base shear it increases in shear wall & without shear wall and unbraced & braced building. From the above graph it can be clearly seen that the difference in values of Base shear in case of unbraced & braced building is very less and in case of without shear wall & with shear wall building is more than in case of unbraced & braced building, so the base shear is almost same.

From Fig. 23 the maximum base shear for different position with shear wall, bracing system, unbraced & without shear wall RC frame building is plotted & compared as below.

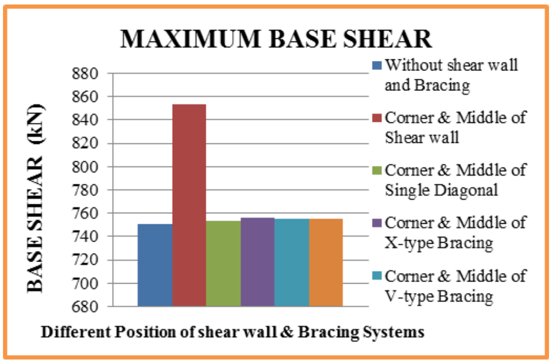

Fig. 23: Maximum Base Shear for G+10 Storey Building for Different Position of shear wall and Bracing Systems

Fig. 23, shows that the base shear in Corner & Middle position for shear wall is more as compared to single diagonal bracing, X-type bracing, V-type bracing, Inverted V-type bracing system. The base shear produce in X and Z direction is same because stiffness of building is same in both direction. As the stiffness of bracing system and shear wall system increases, the base shear in building also increases in both directions.

4) *Maximum Bending Moment*

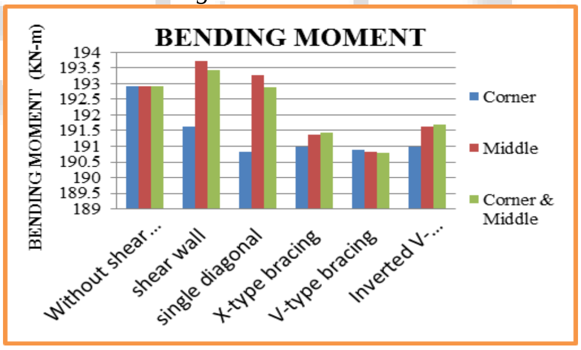

Fig. 24: Bending Moment for G+10 Storey Building for Different Position of shear wall and Bracing Systems.

From the Fig. 24, it is observed that the maximum values of bending moment in the members are reduced for shear wall and braced building for using different bracing types & shear wall positions respectively corner ,middle, corner & middle positions when compared to single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall position. The maximum percentage difference increase i.e. Reduction for corner position is reduced by 1.08% using single diagonal, 1.00% using X-type bracing, 1.04% using V-type bracing, 1.00% using inverted V-type bracing & 0.66% using shear wall.

Reduction for middle position is increased by 0.17% using single diagonal, and reduced by 0.79% using X-type bracing, 1.09% using V-type bracing, 0.66% using inverted V-type bracing and increased by 0.41% using shear wall.

Reduction for corner & middle position is reduced by 0.01% using single diagonal, 0.76% using X-type bracing, 1.10% using V-type bracing, 0.63% using inverted V-type bracing and increased by 0.27% using shear wall.

On comparison of bending moment the reduction takes place in braced and shear wall building as compared to unbraced and without shear wall building but in middle position of shear wall & single diagonal bracing and in corner & middle position of shear wall of bending moment the increases takes place is very less.

From Fig. 24 the maximum bending moment for different position with shear wall, bracing system, unbraced & without shear wall RC frame building is plotted & compared as below.

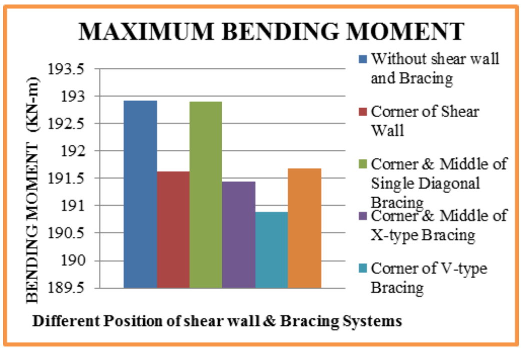

Fig. 25: Maximum Bending Moment for G+10 Storey Building for Different Position of shear wall and Bracing Systems.

From the Fig. 25, it is shows that the maximum values of bending moment in columns, it is observed that on comparison of bending moment of unbraced building with braced building. The reduction for corner position is 0.66% using shear wall, for corner & middle position is 0.01% using single diagonal bracing, for corner & middle position is 0.76% using X-type bracing, for corner & middle position is 1.10% using V-type bracing, for corner & middle position is 0.63% using inverted V-type bracing. On comparison of bending moment the reduction takes place in braced and shear wall building as compared to unbraced and without shear wall building.

From the above graph it can be clearly seen that the bending moment is comparatively reduced, it is due to the load being distributed equally in frame and the braces and shear wall provided. Bending moment in building with coner of V-type bracing system is less among of others bracing and shear wall but other bracings and shear wall also gives suitable result as compare to unbraced & without shear wall building.

5) Maximum Axial Force

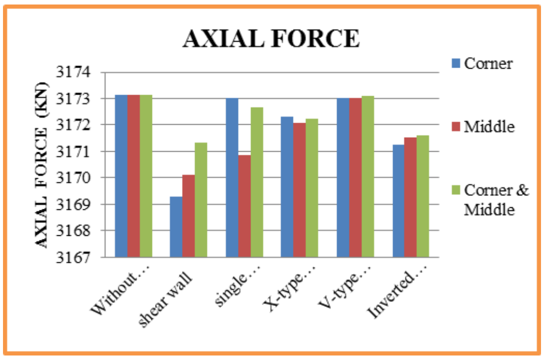

Fig. 26: Axial Force for G+10 Storey Building for Different Position of shear wall and Bracing Systems.

From the Fig. 26 it is clear that the maximum values of axial force in the column reduced for shear wall and braced building for using different bracing types & shear wall positions respectively corner ,middle and corner & middle positions when compared to single diagonal , X-type bracing ,V-type bracing , Inverted V-type bracing and shear wall position. The maximum percentage difference increase i.e. Reduction for corner position is reduced by 0.004% using single diagonal, 0.02% using X-type bracing, 0.004% using V-type bracing, 0.06% using inverted V-type bracing & 0.12% using shear wall.

Reduction for middle position is reduced by 0.07% using single diagonal, 0.03% using X-type bracing, 0.004% using V-type bracing, 0.05% using inverted V-type bracing & 0.09% using shear wall.

Reduction for corner & middle position is reduced by 0.01% using single diagonal, 0.02% using X-type bracing, 0.001% using V-type bracing, 0.04% using inverted V-type bracing & 0.05% using shear wall.

On comparison of axial force the reduction takes place in braced & shear wall building as compared to unbraced & without shear wall building.

From Fig. 27 the maximum axial force of different sections & unbraced RCC frame building is plotted & compared as below.

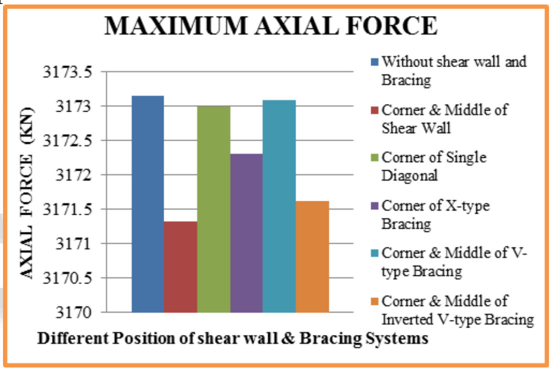

Fig. 27: Maximum Axial force for G+10 Storey Building for Different Position of shear wall and Bracing Systems.

From the Fig. 27, it is observed that on comparison of axial force of unbraced & without shear wall building with braced & shear wall building. The reduction for corner & middle position is 0.05% using shear wall, for corner position is 0.004% using single diagonal bracing, for corner position is 0.02% using X-type bracing, corner & middle position is 0.001% using V-type bracing and corner & middle position is 0.04% using inverted V-type bracing. On comparison of Axial Force the reduction takes place in braced & shear wall building as compared to unbraced & without shear wall building. Axial force in building with corner & middle position of shear wall is less among of other bracing with different position and other bracings also gives suitable result as compare to unbraced & without shear wall building.

V. CONCLUSIONS

A. General

Here the analysis was performed for braced and unbraced type of buildings using STAAD pro. v8i. The comparison of output i.e. results for braced and unbraced building has been carried out to get the most suitable type of bracing system.

B. Conclusions

1) The concept of using steel bracing system and shear wall position is one of the advantageous concepts.
2) The stiffness of the building increases using steel bracing system and shear wall position .
3) The value of maximum base shear increases in braced structure as compared to unbraced structure.
4) The value of maximum base shear increases in with shear wall structure as compared to without shear wall structure.
5) The value of maximum joint displacement in X-direction for G+10 storey building gives better result in corner and middle position of shear wall is 32.31%.
6) The value of maximum joint displacement in Z-direction for G+10 storey building gives better result in corner and middle position of shear wall is 53.88%.
7) The value of maximum storey drift in X-direction for G+10 storey building gives better result in corner and middle position of shear wall is 46.61%.
8) The value of maximum storey drift in Z-direction for G+10 storey building gives better result in corner and middle position of shear wall is 69.44%.
9) The value of maximum base shear for G+10 storey building gives better result in corner and middle position of shear wall.
10) The value of maximum bending moment for G+10 storey building gives better result in corner position of V-type bracing.
11) The value of maximum axial force for G+10 storey building gives better result in corner and middle position of shear wall.

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