International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 5, Issue 04, April-2019

COMPARATIVE STUDY OF SHEAR WALL AND PORTAL BRACING BUILDING

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Abstract : ***A large proportion of world's population lives under higher seismic risk region so there is a need of construction technologies which resist higher seismic forces and Shear wall is such type of technology. Shear wall are used as an efficient way to resist lateral load in RC building. Shear wall stabilize the whole structure against the effect of strong horizontal seismic loading and impart stiffness to the building. The main goal of this research is to find out of Displacement of the building. The present study is an attempt to understand the effectiveness of story displacement on different storey height of building. Four different height of building G+5 to G+20 every five incremental story has been taken. The response spectrum analysis of building of portal bracing in place of shear wall was carried out using STAAD PRO software. At the end, building response parameter Story Displacement was compared.***

Index Terms –Shear Wall, Portal Bracing, Building aspect ratio, Different Storey Height, Response spectrum analysis, Story Displacement.

I. INTRODUCTION

Shear wall is a structural member in a reinforced concrete framed structure to resist lateral forces such as wind forces. Shear walls are generally used in high-rise buildings subject to lateral wind and seismic forces. In reinforced concrete framed structures the effects of wind forces increase in significance as the structure increases in height. Codes of practice impose limits on horizontal movement or sway.

In this paper we will study about seismic behavior of different Building with Displacement, in this paper the measuring parameters for different height of building story drift is taken, the models are prepared and analyzed in Matrix based analytic software. To performed seismic analysis on model response spectrum method used.

To Study the different height of Building with Displacement, we used the shear wall building and portal bracing in place of shear wall in building and total 8 models into this parametric study using into the 4 with shear wall building model and 4 with metal bracing in place of shear wall building model with same aspect ratio.

II. PRESENT STUDY

To effectiveness of displacement building is checked from G+5 to G+20 storey with every incremental five storey. As the tendency (purpose) of base shear is to reduce the drift of the building, so the storey drift of Shear Wall and Portal Bracing building for varying storey height is compared. Building data are same as mentioned in Building data except column sizes. Beam and Column sizes are decided by analyzing and designing the model in STAAD PRO by using response spectrum analysis.

Building Data

Grade of concrete = M 25
Beam size (m×m) = 0.4×0.5
Thickness of slab = 0.15m
Thickness of shear wall = 0.25 m
Storey Height = 3.1 m each
Live load = 2 kn/m2
Dead load on slab = 1 kn/m2
External glass panel load = 7 kn/m
Internal wall load = 6.4 kn/m
Parapet wall load = 2.3 kn/m
Shear wall thickness = 230 mm

Table 1 Geometrical data of Buildings

No. of Storey	Height of Building (H_B)(m)	Length of Building (L_B)(m)	Width of Building (B_B)(m)	H_B/B_B Ratio
G+5	20.5	20.5	32	0.64
G+10	36	36	32	1.13
G+15	51.5	51.5	32	1.61
G+20	67	67	32	2.09
G+25	73.2	73.2	32	2.29
G+30	82.5	82.5	32	2.58

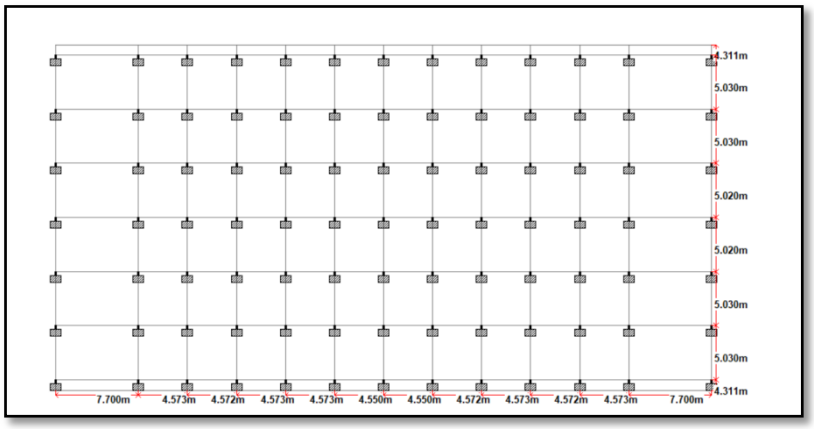


Figure 1 Plan of G+5 Storey Building

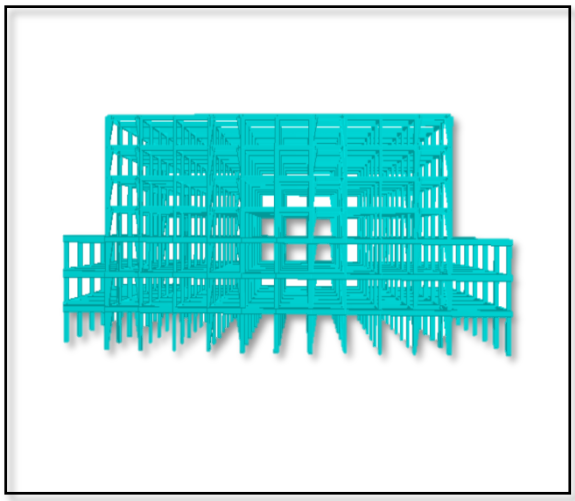


Figure 2 G+5 Storey Metal Bracing Building

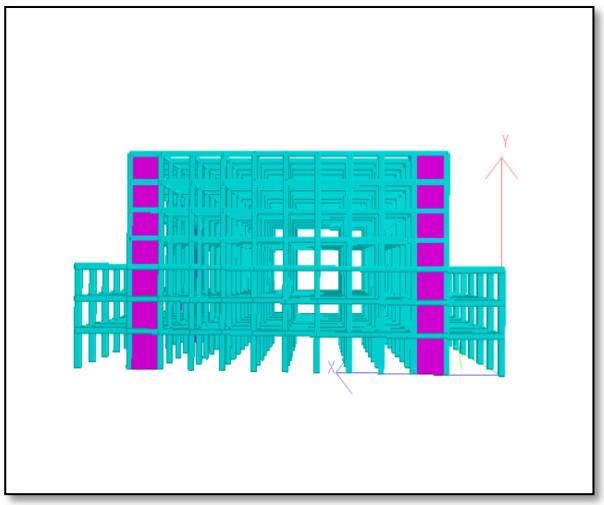


Figure 3 G+5 Storey Shear Wall Building

III. RESULT

After the analysis of all models all are compared to below parameters

Table 2 Storey Drift of G+5 building

Storey	Storey Drift			
	Shear wall X direction	Portal bracing X direction	Shear wall Z direction	Portal Bracing Z direction
G.F	0.9489	1.4262	0.1928	0.3069
1st Floor	0.6785	1.1046	0.1419	0.2238
2nd Floor	0.6372	1.0022	0.1370	0.2094
3rd Floor	0.6346	0.9471	0.1389	0.2115
4th Floor	0.6024	0.8500	0.1348	0.1999
5th Floor	0.5423	0.7536	0.1261	0.1827

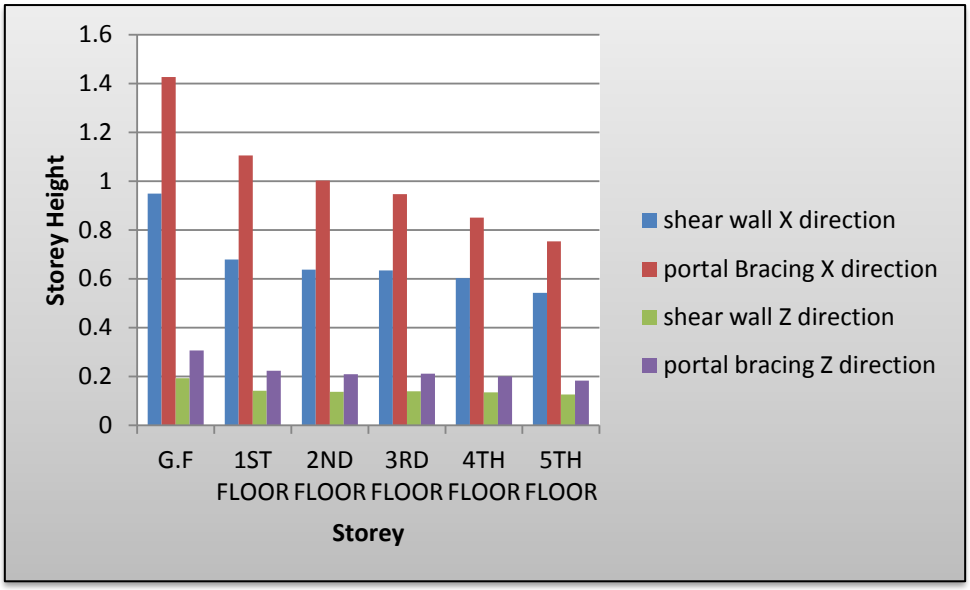


Table 3 Storey Drift of G+10 building

Storey	Storey Drift			
	Shear wall X direction	Portal bracing X direction	Shear wall Z direction	Portal Bracing Z direction
G.F	1.0921	1.5986	0.2256	0.3742
1st Floor	0.8302	1.2380	0.1756	0.2913
2nd Floor	0.8287	1.1698	0.1792	0.2778
3rd Floor	0.8856	1.1591	0.1942	0.2768
4th Floor	0.9127	1.1669	0.2092	0.2795
5th Floor	0.9171	1.1982	0.2095	0.2895
6th Floor	0.9016	1.1679	0.2102	0.2843
7th Floor	0.8701	1.1149	0.2078	0.2736
8th Floor	0.8258	1.0514	0.2022	0.2605
9th Floor	0.7745	0.9892	0.1946	0.2464
10th Floor	0.7045	0.9045	0.1841	0.2278

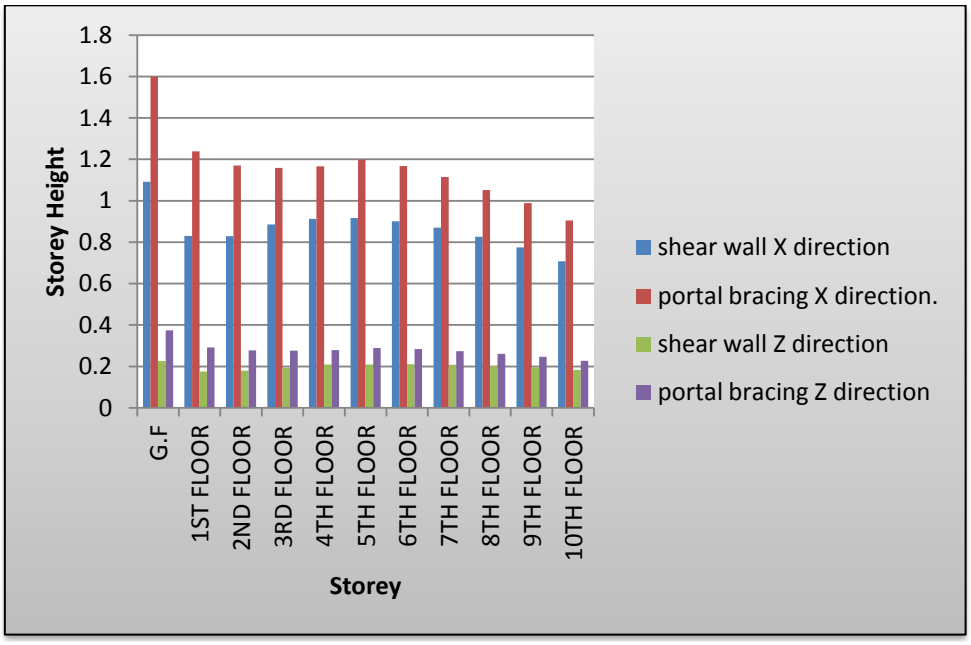


Table 4 Storey Drift of G+15 building

Storey	Storey Drift			
	Shear wall X direction	Portal bracing X direction	Shear wall Z direction	Portal Bracing Z direction
G.F	1.1505	1.7285	0.2423	0.5150
1st Floor	0.8427	1.3142	0.1753	0.3939
2nd Floor	0.7981	1.2309	0.1665	0.3730
3rd Floor	0.8327	1.2402	0.1753	0.3780
4th Floor	0.8481	1.2172	0.1846	0.3733
5th Floor	0.8279	1.1258	0.1760	0.3467
6th Floor	0.8447	1.1765	0.1804	0.3620
7th Floor	0.9022	1.2164	0.1945	0.3752
8th Floor	0.9344	1.2311	0.2033	0.3807
9th Floor	0.9413	1.1950	0.2069	0.3697
10th Floor	0.9378	1.1538	0.2094	0.3578
11th Floor	0.9546	1.1331	0.2155	0.3527
12th Floor	0.9487	1.0554	0.2168	0.3302
13th Floor	0.9202	0.9501	0.2132	0.3030
14th Floor	0.8735	0.8320	0.2057	0.2676
15th Floor	0.8057	0.6925	0.1936	0.2269

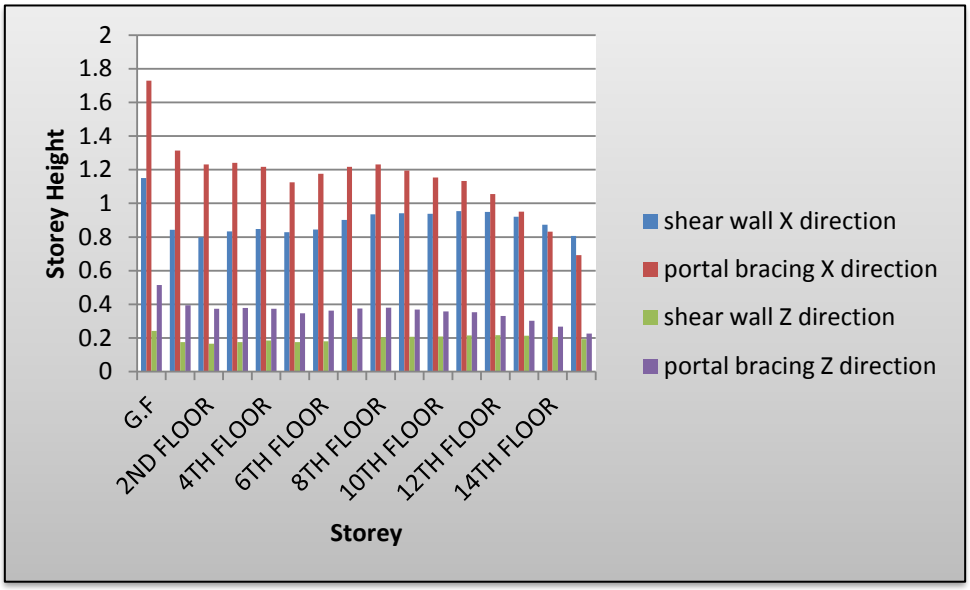
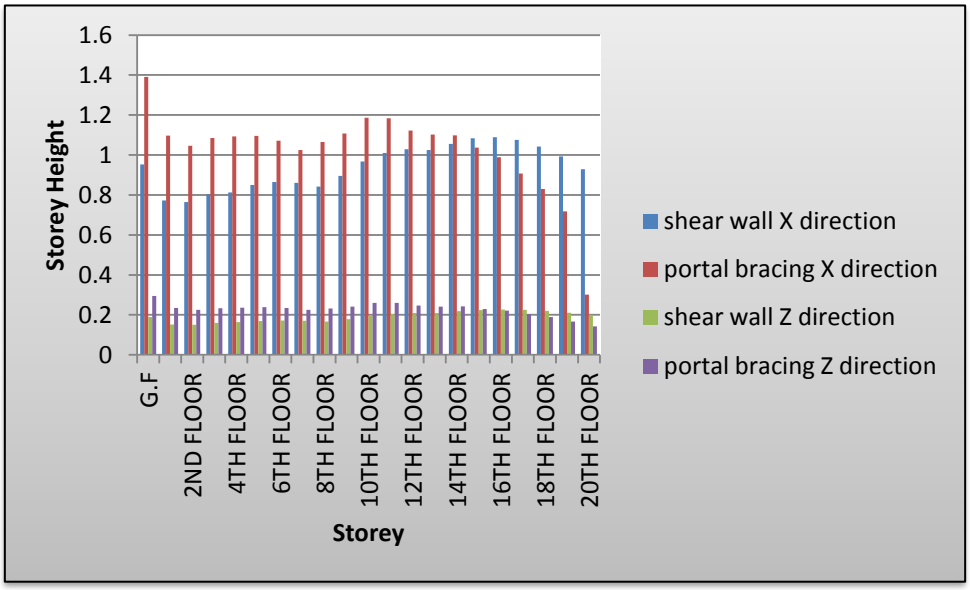


Table 5 Storey Drift of G+20 building

Storey	Storey Drift			
	Shear wall X direction	Portal bracing X direction	Shear wall Z direction	Portal Bracing Z direction
G.F	0.9527	1.3908	0.1889	0.2949
1st Floor	0.7726	1.0966	0.1524	0.2344
2nd Floor	0.7643	1.0460	0.1508	0.2246
3rd Floor	0.8034	1.0848	0.1592	0.2335
4th Floor	0.8126	1.0923	0.1634	0.236
5th Floor	0.8499	1.0954	0.1693	0.2384
6th Floor	0.8652	1.0708	0.1715	0.2346
7th Floor	0.8611	1.0250	0.1705	0.2258
8th Floor	0.8413	1.0642	0.1666	0.2324
9th Floor	0.8955	1.1071	0.1789	0.2417
10th Floor	0.9674	1.1866	0.1943	0.2601
11th Floor	1.0100	1.1837	0.2040	0.2599
12th Floor	1.0281	1.1220	0.2090	0.2465

13th Floor	1.0245	1.1020	0.2090	0.2418
14th Floor	1.0560	1.0985	0.2180	0.2421
15th Floor	1.0829	1.0369	0.2244	0.2296
16th Floor	1.0894	0.9888	0.2268	0.2207
17th Floor	1.0751	0.9076	0.2252	0.2044
18th Floor	1.0416	0.8300	0.2197	0.1892
19th Floor	0.9930	0.7181	0.2112	0.1665
20th Floor	0.9291	0.3010	0.1994	0.1424



IV. CONCLUSION

1) In G+5 and G+10 storey building storey drift is increased at higher rate 20 to 40%.
2) The increment of drift in G+15 storey building is about 4 to 30%.
3) In G+20 Storey building storey drift decreased at 10 to 70%.
4) By replacing shear wall by portal bracing there is increase in storey drift and however that is brought in permissible limit by increasing depth of beam.
5) Thus Portal bracing can be used as an effective replacement to shear wall.

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