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TO STUDY THE BEHAVIOUR OF RC BUILDING WITH AND WITHOUT INFILL AND SHEAR WALL

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Abstract - *India at current situation, the extension or widening of the population that leads to the call for the basic facilities (infrastructure facilities). This kind of improvements brings the dare to impede extra lateral loads from various parameters like seismic or earthquake and wind.* In this project, a trial is made to know the way of action of multi-story building when subjected to different system of lateral loading system i.e., shear wall and infill frame systems. *The detail explore is conducted for zone (V) of India as according to IS 1893 (part 1):2002, along with basic reflection of live, dead and seismic loads and their respective combination approximate factor of safety. The method used in this project for analysis is response spectrum method (dynamic analysis) using etabs software and different parameters were compared (i.e, displacement, drift and time period).*

Key Words: Earthquake, R C frame building, response spectrum function, shear wall, masonry infill wall, etabs

1. INTRODUCTION

Generally when we hear a word Earthquake, the first think it comes to mind is the most dangerous and more hazard that effect the loss of economy and human life. Earthquake is due to the sudden release of enormous amount of energy in lithosphere. Anyway earthquake is not only because of the vibration effect but also from floods, fire, landslides, etc. As a structural engineer u must design a building by taking seismic under consideration of its intensity, location and also considering modern magnitude of that occurs in the location. Many structural engineers are collecting the previous earthquake data's and based on that data they are providing or assisting the best load carrying systems are to be placed for the better performance of the structures. Commonly the continuous and redundant lateral forcing system are preformed and they are functioning well for the building not allowing any damage to the building.

1.2 Shear wall

It is a vertical component which is mainly to designed or casted to resist or withstand in plane lateral loadings mainly from the wind and seismic loads. There are many types of the shear walls namely reinforced concrete, light framed or braced wooden walls with shear panels, steel plates or reinforced masonry walls. The main factor of the shear wall is that the location of it where to provide for effectively or efficiently functioning to resist the lateral loading. When the building requires to withstand both direction at that time if the shear wall systems are not provided, the beam-column system with higher dimensions are required which inter leads to the congesting to place the beam-column and also difficulty to vibrate the poured concrete between beam-column joints or connections.

1.3 Infill wall

Normally it is defined as the supporting wall constructed with a three-dimensional framework structure which covers the perimeter of the structure. Usually they are casted with either steel or reinforced concrete. Infill wall serves to divide outer and inner space and fills up the outer frames. It as an idiosyncratic functioning to bear its own weight. It is an external vertical misty type of closure or winding up system. It also separates non load bearing from load bearing wall. They are quite commonly preferring now a days, especially in frame structures with reinforced concrete. It provides an economical and durable solution when they are used as frame structures. No such risk are there to build these kind of frame structures and are more gorgeous in architeural view and when it comes to economy it is quite efficient cost-performance.

2. Methodology and Design data

Under this project the modelling is carried out using etabs. Dynamic analysis are only criteria is carried out in this project. Response spectrum method is initiated to study the performance of the structure along with infill and shear wall as a parameter of lateral loading resisting system and also comparison is made between the walls (shear wall and infill wall). The displacement, stiffness, time period and story drift also take in consideration to know the reduction of different stories.

Table -1: Design data

sl no	Kind of structure	Structure assets
1	Stories of building	G+20
2	Zone factor	V(0.36)
3	Soil type	II
4	Floor spacing	3
5	Materials description	Concrete M25 and Steel HYSD415

6	Beam size	200mm*450mm
7	Column size	400*400mm
8	Slab size	125mm thick 100mm sunken slab
9	Shear wall	200mm thick wall
10	Masonry infill wall	200mm thick wall
11	Function	Response spectrum method as per IS 1893:2002
12	Live load	3 kN/m^2
13	Super dead load	1.5 kN/m^2
14	Restrain	Fixed

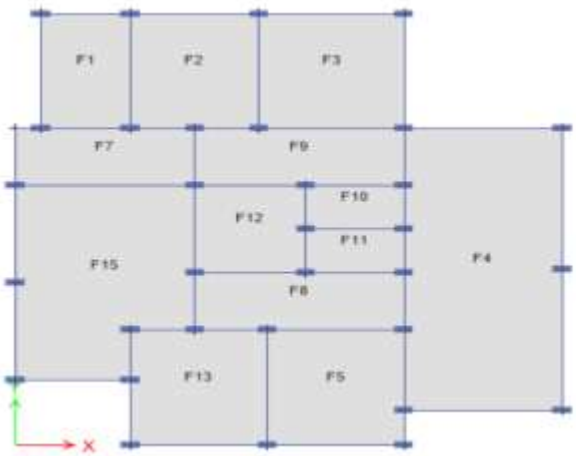

Fig -1: Structural plan of building

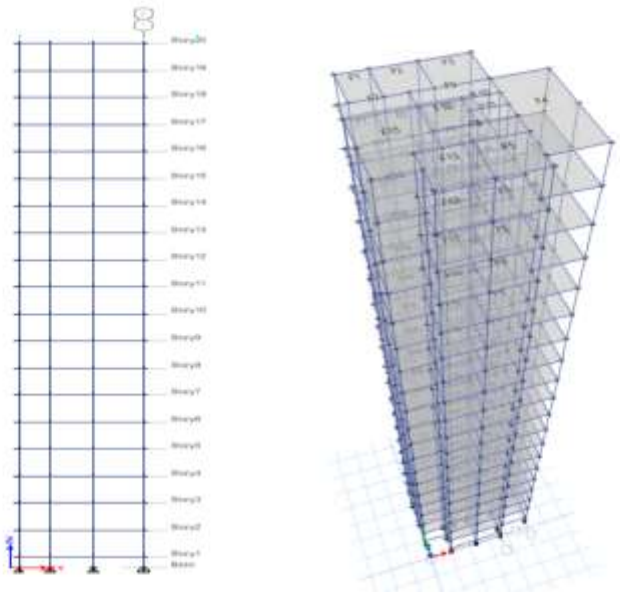

Fig -2: Elevation and 3d model

3. Results and discussions

The way of action of different structures along with combination shear wall and masonry infill walls are analysed and for different parameters their results were compared under the course of action of seismic analysis as per codal provisions (IS 1893:2002).

The discrepancy of the parameters like drift, displacement and time period is tabulated below

Table 1-Scrutinized outcome of displacement in EQX

No	Bare	s-outer	s-inner	m-outer	m-inner
20	244.277	55.941	25.022	70.528	34.726
19	237.079	52.316	23.513	66.115	32.684
18	228.513	48.649	21.975	61.627	30.595
17	218.647	44.951	20.409	57.081	28.459
16	207.616	41.231	18.819	52.488	26.284
15	195.567	37.505	17.211	47.87	24.08
14	182.651	33.792	15.596	43.25	21.858
13	169.018	30.116	13.982	38.657	19.634
12	154.813	26.502	12.383	34.125	17.425
11	140.182	22.977	10.81	29.69	15.248
10	125.263	19.573	9.278	25.389	13.122
09	110.192	16.321	7.802	21.264	11.069
08	95.101	13.255	6.398	17.358	9.11
07	80.115	10.41	5.081	13.715	7.268
06	65.359	7.822	3.869	10.383	5.565
05	50.952	5.529	2.78	7.41	4.027
04	37.018	3.57	1.833	4.847	2.68
03	23.704	1.985	1.048	2.746	1.554
02	11.302	0.817	0.45	1.165	0.682
01	1.55	0	0	0	0

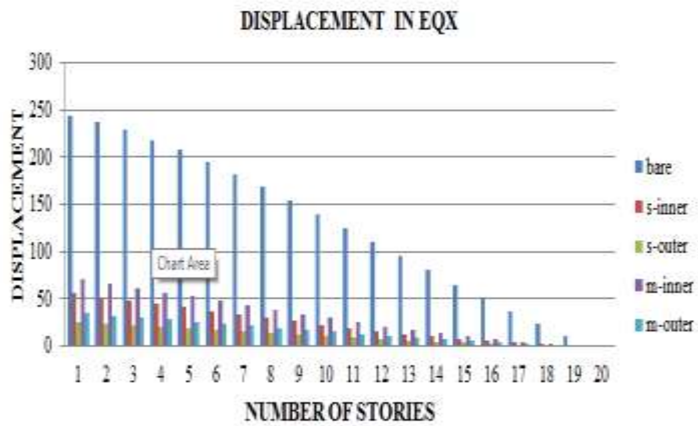

Chart -1: variation of displacements in EQX

Table 2- Scrutinized outcome of displacement in EQY

No	Bare	s-outer	s-inner	m-outer	m-inner
20	216.903	78.693	20.773	88.512	29.861
19	210.517	74.426	19.507	83.87	28.089
18	202.925	70.048	18.216	79.077	26.274
17	194.183	65.546	16.902	74.125	24.421
16	184.407	60.907	15.57	69.002	22.536
15	173.725	56.137	14.227	63.714	20.629
14	162.266	51.255	12.881	58.283	18.712
13	150.163	46.286	11.54	52.74	16.799
12	137.546	41.267	10.215	47.125	14.904
11	124.541	36.241	8.916	41.489	13.042
10	111.273	31.258	7.655	35.887	11.229
9	97.865	26.375	6.443	30.382	9.483
8	84.432	21.656	5.292	25.043	7.82
7	71.091	17.168	4.215	19.947	6.258
6	57.955	12.989	3.225	15.181	4.816
5	45.139	9.204	2.335	10.839	3.513
4	32.761	5.909	1.559	7.03	2.369
3	20.961	3.212	0.912	3.881	1.403
2	9.984	1.239	0.408	1.54	0.64
1	1.358	0	0	0	0

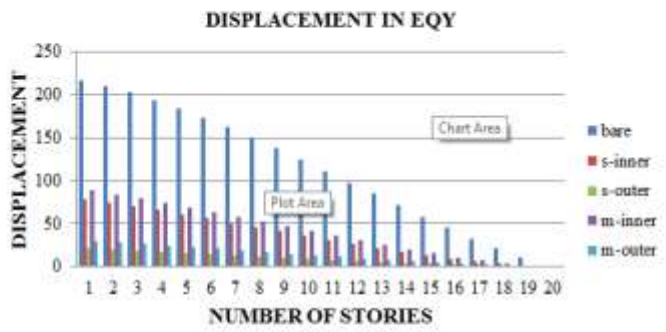

Chart -2: variation of displacements in EQY

Table 3- Scrutinized outcome of time period for modes

No	Bare	s-outer	s-inner	m-outer	m-inner
1	3.013	1.541	0.855	1.645	1.018
2	2.868	1.295	0.784	1.462	0.958
3	2.545	0.767	0.269	0.916	0.33
4	0.956	0.393	0.2	0.434	0.246
5	0.909	0.268	0.181	0.321	0.229
6	0.839	0.201	0.092	0.248	0.115
7	0.526	0.178	0.085	0.208	0.109
8	0.501	0.117	0.085	0.143	0.106
9	0.491	0.109	0.058	0.131	0.074
10	0.364	0.094	0.056	0.118	0.072
11	0.347	0.076	0.046	0.093	0.059
12	0.343	0.071	0.042	0.089	0.054

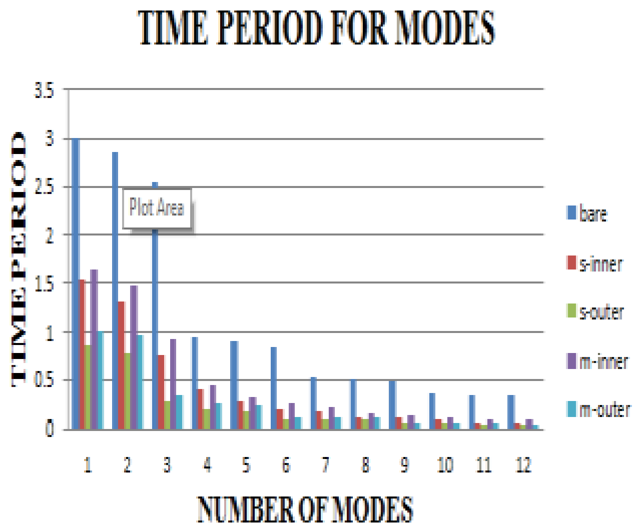

Chart -3 time period for modes

Table 4- Scrutinized outcome of drift in EQX

No	Bare	s-outer	s-inner	m-outer	m-inner
20	7.325	3.624	1.508	4.413	2.042
19	8.585	3.667	1.538	4.488	2.09
18	9.866	3.699	1.566	4.546	2.135
17	11.031	3.72	1.59	4.592	2.175
16	12.049	3.726	1.607	4.619	2.205
15	12.916	3.712	1.616	4.62	2.222
14	13.634	3.676	1.613	4.592	2.224
13	14.204	3.614	1.6	4.532	2.21
12	14.632	3.524	1.573	4.436	2.177
11	14.919	3.404	1.532	4.301	2.125
10	15.071	3.252	1.476	4.125	2.053
09	15.091	3.066	1.405	3.906	1.959
08	14.985	2.845	1.317	3.642	1.843
07	14.756	2.588	1.212	3.332	1.703
06	14.406	2.293	1.089	2.973	1.538
05	13.934	1.959	0.947	2.563	1.347
04	13.314	1.585	0.785	2.101	1.126
03	12.402	1.168	0.598	1.582	0.872
02	10.105	0.74	0.388	1.052	0.594
01	1.55	0.159	0.111	0.215	0.156

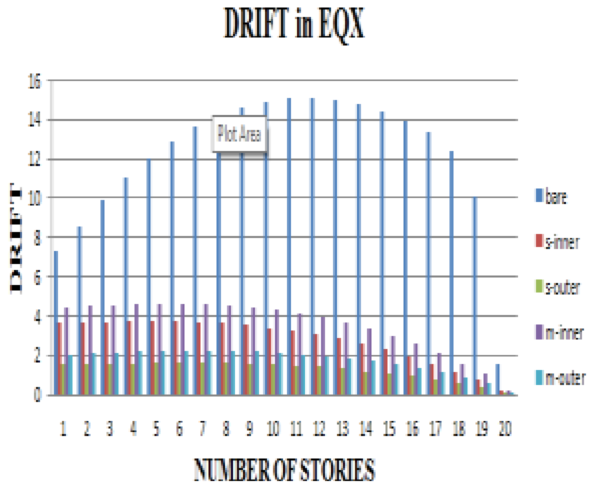

Chart -4 drift in EQX

Table 4- Scrutinized outcome of drift in EQY

No	Bare	s-outer	s-inner	m-outer	m-inner
20	6.493	4.266	1.266	4.643	1.772
19	7.673	4.378	1.291	4.792	1.815
18	8.806	4.503	1.314	4.952	1.854
17	9.825	4.639	1.332	5.123	1.885
16	10.72	4.769	1.343	5.288	1.907
15	11.486	4.883	1.346	5.431	1.917
14	12.122	4.969	1.341	5.543	1.913
13	12.628	5.019	1.325	5.614	1.895
12	13.007	5.026	1.299	5.636	1.862
11	13.267	4.983	1.261	5.602	1.813
10	13.409	4.883	1.212	5.505	1.747
09	13.433	4.72	1.151	5.339	1.663
08	13.341	4.488	1.077	5.095	1.562
07	13.136	4.179	0.99	4.767	1.442
06	12.816	3.785	0.89	4.342	1.303
05	12.378	3.295	0.776	3.809	1.145
04	11.8	2.697	0.648	3.149	0.965
03	10.977	1.972	0.504	2.341	0.763
02	8.993	1.121	0.359	1.391	0.565
01	1.358	0.164	0.101	0.215	0.15

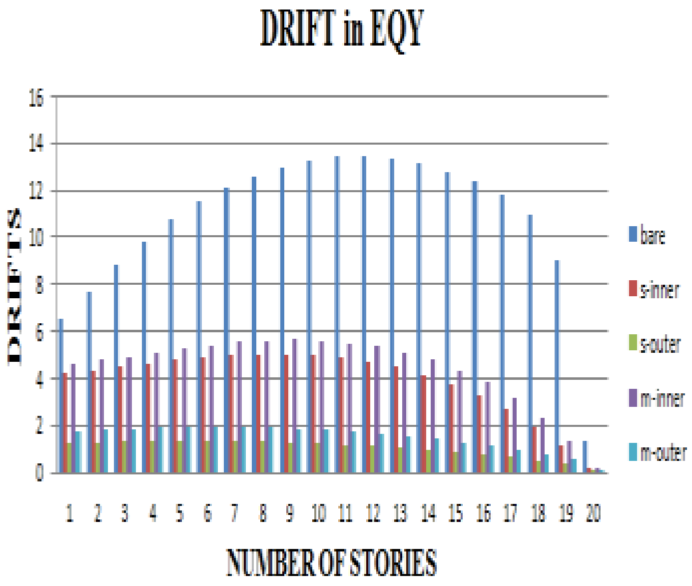

Chart -5 drift in EQY

4 Conclusions

This thesis undergoes the study of behaviour of the multi storied building of G+20 in etabs along the consideration of the two parameters (infill wall and shear wall) as LLRS. For the placement of infill and shear wall along the building are studied and the drift, displacements and the time period are noted down. Some conclusions are as indicated below:

The behaviour of building when subjected to infill and shear wall are analysed and results are taken in order to minimise the drift and moments in the structure.
The displacements will be minimum for shear wall when it is subjected as LLRS as compared to the infill walls and bare frame arrangements.
As compared to inner periphery of the wall these LLRS are more stable around the outer periphery of the wall of this type of arrangements.

If u increase the section of shear wall then obviously there will be reduction in the parameters like drift and bending moments will be decreased.
The thesis shows the better performance of LLRS for reduction or minimise of the displacements, drift and bending moments as compared to the normal bare frame system.
In this thesis we can see the reduction of the displacement when shear wall is placed around the outer periphery is around 85-90% and in inner periphery is around 75-80% as compared to bare frame.
Where as in case for masonry infill walls we can see the reduction of displacement in inner periphery is around 65-70% and in outer periphery is around 75-80% as compared to bare frame.

Where as in case for the drift parameters for shear wall as LLRS we can see that 75-80% for outer and is around 40-50% for inner periphery as compared to bare frame.

In case for the masonry infill as LLRS for outer it is around 70-75% and for inner periphery it is 30-40% as compared to bare frame.

Hence shear walls are more suitable when compared to masonry infill as LLRS and position of shear wall is better for the outer periphery of this modelling.

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