Seismic Performance of RC & Composite Frames with Plan Irregular Configurations

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Abstract - *Steel-Concrete composite structures are very popular & have their advantages over Concrete constructions. Concrete structures are bulky and have more seismic weight and more deflection as compare to Composite Construction, & it combines the better properties of both steel and concrete along with lesser cost, speedy construction, fire protection etc. The aim of the present study is to compare seismic performance of plan irregular configurations of RC, and Composite building frame which is situated in earthquake zone IV. Total number of 12 models been modeled(6 RC & 6 Composite) all models are of G+10 storey buildings. All frames are designed for same gravity loadings. Beam and column sections are made of Either RCC and Structural Steel-concrete composite sections. Response Spectrum method are used for seismic analysis. Effect of each building is studied with respect to time period, base shear, storey shear, displacements, drift & axial force. ETABS-2015 Software is used for analysis and results are compared.*

Key Words: **Composite Beam, Composite Column, Response spectrum method, ETABS**

1.INTRODUCTION

At the present time, many of multi-storey (residential & commercial) buildings have open storeys as salient feature. The composite materials were commonly used for multi-storey, industrial buildings or in bridges. The composite structures are made of different materials and they are compatible and complementary to each other, the composite structures have same extension both for thermal & applied loads. The combination of the steel and RCC will have higher strength as steel will take tension forces and the concrete will take compression forces. The concrete also gives corrosion protection and thermal insulation to the steel at elevated temperatures and additionally can restrain slender steel sections from local or lateral-torsional buckling.

1.1 OBJECTIVES

The present work done for both RC & Composite structure the total number of model considered is 12 (6 RCC & 6 Steel Composite) with the number of storey as 11, which was in zone 4, & the soil type taken is medium soil.

I. To analysis the multi storeyed frame of irregular plan of both R.C and Composite frames.

II. To perform Equivalent analysis & Response Spectrum Analysis.

III. To study the performance of both R.C and composite frame w.r.t. different parameters such as story displacement, story drift, base shear, story shear, time period & axial force.

2 STRUCTURAL MODELLING

On the analysis a building has been Modeled for G+10 storey building and analysed in ETABS software. Two kinds of the structures were considered one is RCC structure with column of 0.4x0.5m from 1 -5th floor & 0.3x0.4m from 6-11th floor and beam of 300x350mm kept constant for all the floors and slab of 175mm. And another one is steel composite structure with column of 0.4x0.5m at 1st floor & 0.3x0.4m encased ISHB250 from 2nd -11th floor and beam of 250x350mm and slab of 175mm.

3. DESCRIPTION OF ANALYTICAL MODEL

Various parameters such as a number of storeys, the dimension of structural members, storey height, load intensities are mentioned below.

Table -1: Description of model

Number of Storeys	G+10	Reduction Factor	5
Building Frame system	SMRF	Importance Factor	1.5
Storey Height	3m	Grade of Concrete	M25
Seismic Zone	Zone 4	Grade of Steel	Fe500
Type of Soil	Medium	Live load	3 kN/m^2

4. TYPES OF MODELS

Model 1- Re- entrant Corner (C- shaped RCC & Steel Composite)
Model 2- Re- entrant Corner (U- shaped RCC & Steel Composite)
Model 3- Re- entrant Corner (L- shaped RCC & Steel Composite)

Model 4- Re- entrant Corner (T- shaped RCC & Steel Composite)
Model 5- Re- entrant Corner (Plus- shaped RCC & Steel Composite)
Model 6- Diaphragm Discontinuity (Hollow- shaped RCC & Steel Composite)

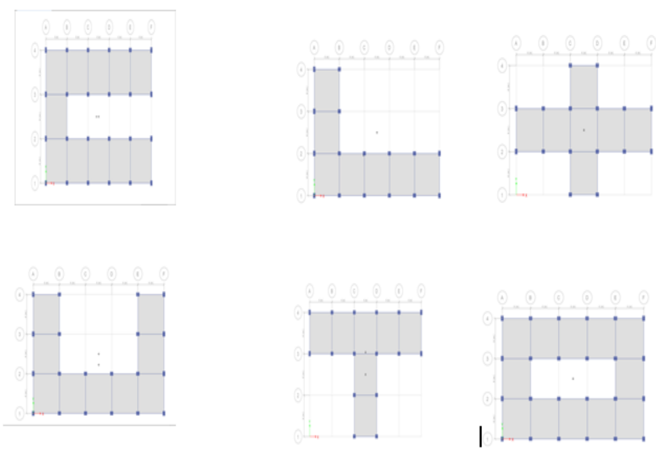

Fig-1: Different types of Models

5. RESULTS AND DISCUSSION

5.1 TIME PERIOD

Table-2: Time period of both RC & Composite

No. of Modes	Model 1		Model 2		Model 3	
	RC	Composite	RC	Composite	RC	Composite
1	2.088	1.695	1.93	1.524	2.041	1.651
2	1.768	1.37	1.904	1.509	1.845	1.453
3	1.753	1.369	1.725	1.34	1.739	1.353

Model 4		Model 5		Model 6	
RC	Composite	RC	Composite	RC	Composite
2.027	1.621	2.023	1.617	2.031	1.624
1.838	1.459	1.804	1.407	1.815	1.414
1.756	1.375	1.767	1.402	1.734	1.349

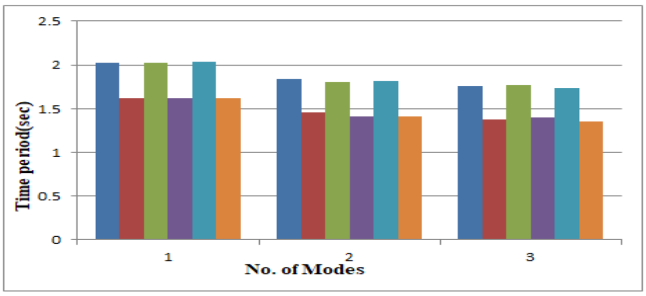

Fig-2: Time period of both RC & Composite

Its observed that mode 1, 2 & 3 of all models of RC building shows slightly higher frequency, than the mode 1, 2 & 3 of all models of Steel composite building.

5.2 BASE SHEAR

Table-3: Base Shear of both RC & Composite

	Force (kN)	
No. of Models	RC	Composite
Model 1	510.1272	1153.36
Model 2	419.8836	934.9655
Model 3	329.4255	716.9278
Model 4	329.1591	724.5134
Model 5	328.7514	733.3976
Model 6	542.3382	1225.4358

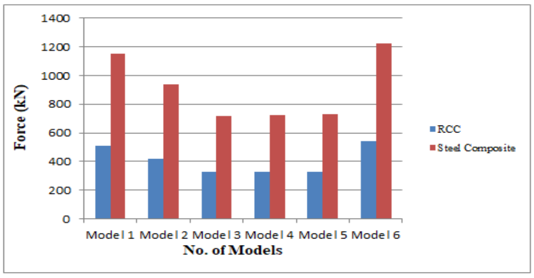

Fig-3: Base Shear of both RC & Composite

The results show that the response obtain in the form of base shear may be due to various earthquakes is more in case of the RC building when compare to the composite building.

5.3 STOREY DISPLACEMENT

Table-4: Displacements in X directions of both RC & Composite

	Model 1				Model 2			
No. Story	RC		Composite		RC		Composite	
	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)
Base	0	0	0	0	0	0	0	0
Story1	0.4	0.4	0.6	1.6	0.5	0.5	0.8	1.9
Story2	2.6	2.6	2.3	5.8	3	3.5	2.8	6.8
Story3	5.4	5.1	4	9.7	6.2	7.1	4.8	11.6
Story4	8.2	7.5	5.7	13.4	9.6	10.6	6.9	16.1
Story5	11	9.8	7.3	16.9	13	13.9	8.9	20.3
Story6	14.4	12.3	8.8	19.9	17	17.5	11	24.1
Story7	17.5	14.6	10.3	22.6	20.7	20.8	12.9	27.4
Story8	20.1	16.4	11.5	24.8	24	23.6	14.6	30.3
Story9	22.3	17.9	12.5	26.5	26.8	25.9	16	32.7
Story10	23.8	18.9	13.2	27.7	28.7	27.5	17.1	34.4
Story11	24.5	19.4	13.6	28.3	29.9	28.5	17.8	35.5

Model 3				Model 4			
RC		Composite		RC		Composite	
EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)
0	0	0	0	0	0	0	0
0.4	0.6	0.7	2.6	0.4	0.6	0.7	2.7
2.8	3.9	2.6	9	2.8	4.2	2.6	9.2
5.9	7.8	4.5	15.2	5.8	8.7	4.4	15.6
9.1	11.7	6.4	21.1	8.9	13.1	6.3	21.6
12.3	15.4	8.3	26.6	12.1	17.3	8.2	27.2
16.1	19.4	10.2	31.6	15.8	21.8	10	32.4
19.6	23	11.9	36.1	19.2	25.8	11.7	37.1
22.7	26	13.5	40	22.3	29.3	13.3	41.2
25.2	28.5	14.8	43.2	24.7	32.2	14.5	44.6
27	30.3	15.8	45.6	26.5	34.2	15.5	47.1
28	31.3	16.4	47.1	27.5	35.5	16.1	48.9

Model 5				Model 6			
RC		Composite		RC		Composite	
EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)
0	0	0	0	0	0	0	0
0.4	0.4	0.7	1.7	0.4	0.4	0.7	1.7
2.7	2.6	2.4	5.9	2.8	2.7	2.5	6.1
5.5	5.2	4.2	10	5.7	5.4	4.2	10.3
8.5	7.8	5.9	13.9	8.6	7.9	6	14.2
11.5	10.2	7.7	17.4	11.5	10.3	7.8	17.8
15	12.8	9.3	20.6	15.1	13	9.4	21
18.2	15.1	10.9	23.4	18.4	15.3	10.9	23.9
21	17.1	12.2	25.8	21.2	17.2	12.3	26.2
23.3	18.6	13.3	27.7	23.5	18.8	13.3	28
24.9	19.7	14.1	29	25	19.8	14.1	29.3
25.7	20.3	14.6	29.8	25.8	20.4	14.5	29.9

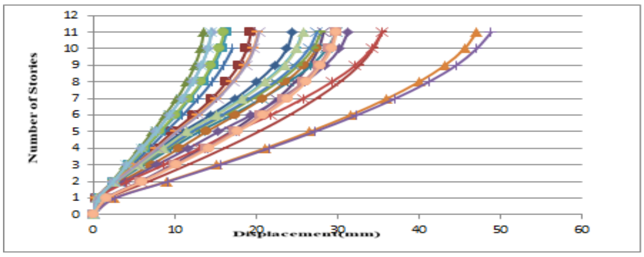

Fig-4: Displacements in X directions of both RC & Composite

The displacements of all models in X directions. From the results its observed that the model 3 model 1 & model 4 of composite building shows the higher displacements. The maximum deflection is occurred in the upper most floor & its less than 40mm(the deflections were within limits as prescribed by IS codes)

Table-5: Displacements in Y directions of both RC & Composite

	Model 1				Model 2			
No. Story	RC		Composite		RC		Composite	
	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)
Base	0	0	0	0	0	0	0	0
Story1	0.5	0.6	1	2.6	0.5	0.5	0.8	1.9
Story2	3.5	3.8	3.4	9	3	2.9	2.8	6.8
Story3	7.4	7.8	5.9	15.3	6.2	5.9	4.8	11.6
Story4	11.5	11.7	8.6	21.4	9.6	8.7	6.9	16.1
Story5	15.6	15.5	11.4	27.1	12.9	11.3	8.9	20.3
Story6	20.6	19.7	14.1	32.5	17	14.4	10.9	24.1
Story7	25.3	23.5	16.7	37.6	20.7	17.1	12.7	27.4
Story8	29.5	26.8	19.1	42.1	24.1	19.4	14.3	30.3
Story9	33.1	29.6	21.2	46.1	26.8	21.2	15.7	32.7
Story10	35.8	31.7	22.9	49.3	28.7	22.5	16.7	34.4
Story11	37.5	33	24.2	51.7	29.7	23.3	17.3	35.5

Model 3				Model 4			
RC		Composite		RC		Composite	
EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)
0	0	0	0	0	0	0	0
0.5	0.8	1	3.6	0.5	0.5	0.8	2
3.6	5	3.4	12.2	3.3	3.2	3	7.2
7.4	10.3	6	20.6	6.8	6.3	5.3	12.2
11.5	15.5	8.7	28.6	10.4	9.4	7.6	16.9
15.7	20.4	11.4	36.3	14.1	12.3	10	21.4
20.7	25.9	14.1	43.5	18.6	15.6	12.2	25.5
25.5	30.9	16.7	50.1	22.8	18.6	14.4	29.2
29.7	35.2	19.1	56.1	26.6	21.2	16.3	32.4
33.3	38.9	21.2	61.2	29.7	23.4	17.9	35.2
36	41.6	22.9	65.3	31.9	24.9	19.1	37.2
37.7	43.3	24.2	68.4	33.2	25.8	20	38.6

Model 5				Model 6			
RC		Composite		RC		Composite	
EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)
0	0	0	0	0	0	0	0
0.5	0.5	0.9	2.1	0.5	0.5	0.9	2.1
3.3	3.2	3	7.2	3.4	3.2	3.1	7.4
6.8	6.3	5.3	12.2	6.9	6.4	5.4	12.5
10.4	9.4	7.6	17	10.5	9.6	7.7	17.3
14	12.3	9.9	21.4	14.2	12.5	10	21.7
18.6	15.6	12.2	25.5	18.7	15.8	12.3	25.8
22.8	18.6	14.3	29.2	22.9	18.8	14.4	29.4
26.6	21.2	16.2	32.4	26.6	21.3	16.2	32.5
29.6	23.3	17.8	35.1	29.6	23.4	17.8	35.1
31.8	24.8	19	37.1	31.8	24.9	19	37.1
33.1	25.7	19.8	38.5	33	25.7	19.7	38.3

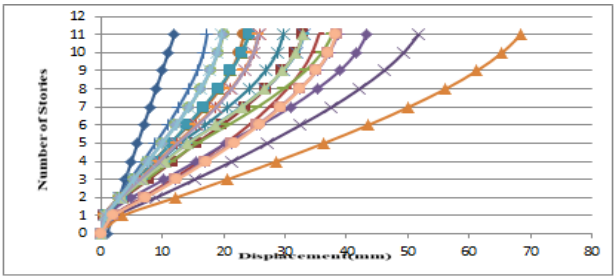

Fig-5: Displacements in Y directions of both RC & Composite

The displacements of all models in Y directions. From the results its observed that the model 3 model 1 & model 4of composite building shows the higher displacements. The maximum deflection is occurred in the upper most floor & its less than 40mm(the deflections were within limits as prescribed by IS codes)

5.4 STOREY DRIFTS

Table-6: Drifts in X directions of both RC & Composite

	Model 1				Model 2			
No. Story	RC		Composite		RC		Composite	
	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)
Base	0	0	0	0	0	0	0	0
Story1	0.000268	0.000264	0.000415	0.001044	0.000302	0.000357	0.000522	0.001633
Story2	0.000744	0.00072	0.000561	0.001395	0.000846	0.000985	0.000658	0.002019
Story3	0.000914	0.000848	0.000559	0.00133	0.00107	0.001193	0.000678	0.001973
Story4	0.000943	0.000827	0.000556	0.001255	0.001126	0.001187	0.000691	0.001898
Story5	0.000928	0.000776	0.000543	0.00117	0.001126	0.001134	0.000691	0.001811
Story6	0.001127	0.000916	0.000518	0.001075	0.001341	0.001315	0.000672	0.001713
Story7	0.001031	0.000841	0.000477	0.000968	0.001249	0.00123	0.000633	0.001594
Story8	0.000896	0.000751	0.000417	0.000837	0.001105	0.001117	0.00057	0.001433
Story9	0.000717	0.000624	0.000337	0.000672	0.000907	0.000949	0.000482	0.001209
Story10	0.000489	0.000442	0.000235	0.000465	0.000653	0.000701	0.000367	0.000911
Story11	0.00024	0.000216	0.000124	0.000237	0.00038	0.000395	0.000244	0.000585

Model 3				Model 4			
RC		Composite		RC		Composite	
EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)
0	0	0	0	0	0	0	0
0.000287	0.000396	0.00049	0.001734	0.000277	0.000429	0.00048	0.001794
0.000806	0.001094	0.000618	0.002137	0.000783	0.001199	0.000613	0.002187
0.001014	0.001324	0.000634	0.00208	0.001	0.001486	0.000624	0.002117
0.001063	0.001315	0.000643	0.001995	0.001056	0.001494	0.000632	0.00204
0.001059	0.001254	0.000639	0.001897	0.001056	0.001434	0.000628	0.001953
0.001265	0.001454	0.000619	0.001785	0.001234	0.001621	0.000608	0.001853
0.001174	0.001362	0.00058	0.001651	0.001145	0.001532	0.000569	0.001727
0.001034	0.001238	0.000519	0.001475	0.001009	0.001402	0.000509	0.001557
0.000843	0.001052	0.000434	0.001237	0.000822	0.001193	0.000425	0.001322
0.000599	0.000774	0.000325	0.000922	0.000586	0.000878	0.000318	0.001004
0.000337	0.000428	0.000207	0.000576	0.000335	0.000504	0.000204	0.000661

Model 5				Model 6			
RC		Composite		RC		Composite	
EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)	EQ-X Dir(mm)	RS-X Dir(mm)
0	0	0	0	0	0	0	0
0.000272	0.000267	0.000469	0.001164	0.000284	0.000279	0.000445	0.001113
0.000761	0.000733	0.000588	0.00144	0.000784	0.000759	0.000599	0.001481
0.000952	0.000879	0.000586	0.00137	0.000959	0.00089	0.000595	0.001407
0.000992	0.000866	0.000587	0.001301	0.000989	0.000867	0.000591	0.001327
0.000984	0.000819	0.000577	0.001221	0.000973	0.000813	0.000578	0.001237
0.001171	0.000948	0.000553	0.001132	0.001186	0.000964	0.000551	0.001138
0.001078	0.000877	0.000512	0.001029	0.001085	0.000885	0.000508	0.001028
0.000941	0.000787	0.000451	0.0009	0.000945	0.000791	0.000445	0.000892
0.000756	0.000657	0.000368	0.000732	0.000756	0.000659	0.00036	0.000719
0.000522	0.000471	0.000263	0.000519	0.000517	0.000469	0.000251	0.000499
0.000272	0.000242	0.000151	0.000289	0.000255	0.00023	0.000133	0.000255

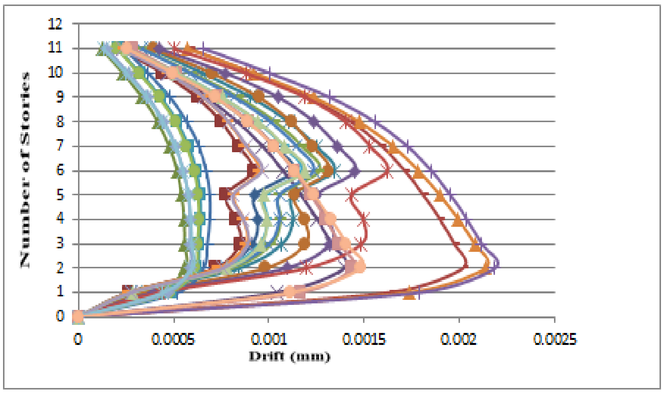

Fig-6: Driftss in X directions of both RC & Composite

The drifts of all models in X directions. From the results its observed that the model 4, model 2 & model 3 of composite building shows the higher drifts. The maximum deflection is occurred in the upper most floor & its less than 40mm(the deflections were within limits as prescribed by IS codes)

Table-7: Drifts in Y directions of both RC & Composite

No. Story	Model 1				Model 2			
	RC		Composite		RC		Composite	
	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)
Base	0	0	0	0	0	0	0	0
Story1	0.000354	0.000389	0.000634	0.001718	0.000308	0.000302	0.000513	0.001286
Story2	0.000998	0.001078	0.000812	0.002151	0.000859	0.000827	0.000682	0.001686
Story3	0.001281	0.001322	0.000853	0.002109	0.001065	0.000979	0.00068	0.001598
Story4	0.001369	0.001334	0.000891	0.002062	0.001108	0.000961	0.000686	0.001524
Story5	0.001387	0.001291	0.000911	0.002009	0.001103	0.000912	0.000679	0.001441
Story6	0.001655	0.001499	0.000905	0.001952	0.001361	0.001096	0.000655	0.001351
Story7	0.001567	0.001418	0.000871	0.001872	0.001265	0.001024	0.000611	0.001247
Story8	0.001409	0.001302	0.000805	0.00174	0.001111	0.000927	0.000544	0.001111
Story9	0.001184	0.001124	0.000706	0.001528	0.000902	0.000784	0.000451	0.000926
Story10	0.000891	0.000858	0.000574	0.001224	0.000636	0.000573	0.000332	0.000678
Story11	0.000575	0.000531	0.000432	0.000884	0.000346	0.000307	0.000204	0.000403

Model 3				Model 4			
RC		Composite		RC		Composite	
EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)
0	0	0	0	0	0	0	0
0.000357	0.000513	0.00066	0.002387	0.000333	0.000324	0.000549	0.001313
0.001006	0.001422	0.00081	0.002859	0.00093	0.00089	0.000736	0.00173
0.001289	0.001746	0.000857	0.002818	0.001159	0.001058	0.000759	0.001684
0.001375	0.001758	0.000895	0.002749	0.001214	0.001044	0.000775	0.001619
0.001393	0.0017	0.000912	0.002671	0.001217	0.000998	0.000775	0.001549
0.00167	0.001973	0.000905	0.002582	0.001511	0.001209	0.000755	0.001475
0.001581	0.001871	0.000869	0.002464	0.001419	0.001141	0.000711	0.001386
0.00142	0.001719	0.000802	0.002277	0.001256	0.001042	0.000641	0.00126
0.001191	0.001484	0.000701	0.001988	0.001032	0.000892	0.000542	0.001075
0.000894	0.001129	0.000567	0.001578	0.000743	0.000666	0.000413	0.000817
0.000573	0.000689	0.000423	0.001122	0.000432	0.000377	0.000276	0.000529

Model 5				Model 6			
RC		Composite		RC		Composite	
EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)	EQ-Y Dir(mm)	RS-Y Dir(mm)
0	0	0	0	0	0	0	0
0.000332	0.000324	0.000587	0.001407	0.000343	0.000335	0.000578	0.001382
0.000929	0.00089	0.000752	0.001771	0.000949	0.000912	0.000767	0.001808
0.001158	0.001058	0.000757	0.001683	0.00117	0.001073	0.000766	0.001709
0.001212	0.001043	0.000772	0.001618	0.001219	0.001053	0.000775	0.001631
0.001214	0.000996	0.000771	0.001546	0.001214	0.001001	0.00077	0.001548
0.001508	0.001207	0.00075	0.00147	0.001507	0.001211	0.000745	0.001462
0.001414	0.001139	0.000706	0.001379	0.001404	0.001134	0.000698	0.001363
0.001249	0.001037	0.000635	0.00125	0.001238	0.001029	0.000624	0.001227
0.001022	0.000885	0.000535	0.001063	0.00101	0.000876	0.000521	0.001035
0.00073	0.000656	0.000406	0.000803	0.000719	0.000648	0.000389	0.00077
0.000417	0.000365	0.000268	0.000513	0.000401	0.000354	0.000245	0.00047

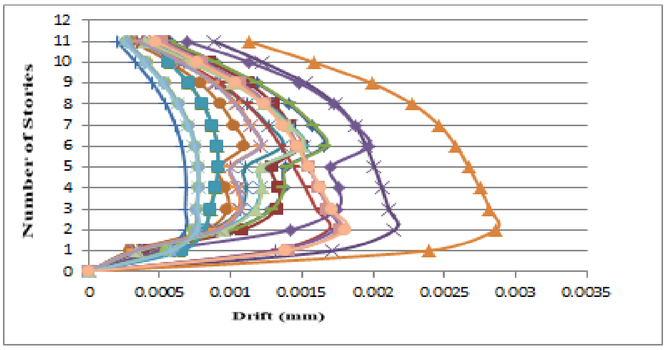

Fig-7: Drifts in Y directions of both RC & Composite

The drifts of all models in Y directions. From the results its observed that the model 3 model 1 & model 4 of composite building shows the higher drifts. The maximum deflection is occurred in the upper most floor & its less than 40mm(the deflections were within limits as prescribed by IS codes)

5.5 AXIAL FORCE

The axial force of RC building has got high value when it was compared with Composite building.

Table-8: Axial Force of both RC & Composite

		Axial Force (kN)			
		EQx	EQy	RSx	RSy
Model1	RC	920.4373	678.8374	920.3219	724.667
	Composite	737.9918	510.3828	732.8183	294.7571
Model2	RC	927.8696	723.7228	910.441	765.9133
	Composite	757.8001	572.8591	708.5616	378.19
Model3	RC	926.9534	688.6148	897.5883	705.649
	Composite	747.0732	524.0146	684.8113	248.2327
Model4	RC	758.0885	379.9294	367.2066	422.635
	Composite	613.9124	241.0651	33.9711	49.5474
Model5	RC	762.4309	404.4255	474.9426	404.4255
	Composite	364.0455	285.3347	186.1226	90.6565
Model6	RC	922.6017	699.1658	922.5195	746.5128
	Composite	749.5866	542.9336	744.329	344.0039

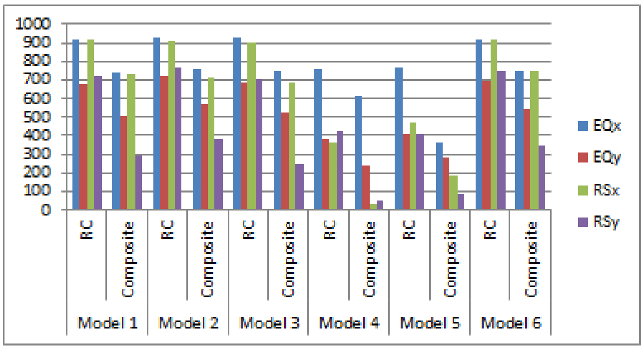

Fig-8: Axial Force of both RC & Composite

6. CONCLUSIONS

1. There are slight changes in time period of both RC & composite buildings, RC buildings has more frequency when compared with composite buildings.
2. Base shear values are more for composite buildings when compared with RC buildings. Because seismic weight of Composite materials, when compared with RC buildings.
3. Base shear and storey shear of composite buildings is high, due to more seismic weight of the building.
4. In the displacements of both RC & Composite structures of all models, it is observed that in few models of the structure has discontinuity in X direction & has less number of bays than in Y direction. Therefore, structure in Y direction is stiffer than X direction. Similarly in the remaining models, Y direction has got discontinuity, so X direction is stiffer than Y direction.
5. The displacements of all plan irregular models is found to be within the limits as per IS 1893-2002.
6. The storey drift of the RC building is less as compared to composite building, and all frames are within permissible limit of 0.004 times the storey height, as prescribed in IS 1893-2002.
7. Drift variations are observed for both RC and composite buildings which may be due to differential size of columns.
8. It is observed that the RC buildings have more axial force than the composite buildings.

REFERENCES

[1] J.M. Castro, A.Y. Elghazouli and B.A. Izzuddin, "Performance Assessment Of Composite Moment-Resisting Frames". 29th the 14th world conference on earthquake engineering, Beijing, China october 12-17, 2008

[2] D. R. Panchal and P. M. Marathe, "Comparative Study of R.C.C, Steel and Composite (G+30 Storey) Building ", Institute of Technology, Nirma University, Ahmedabad – 382 481, December, 2011.

[3] Anish N. Shah, Dr. P.S. Pajgade "Comparision of R.C.C. And Composite Multistoried Buildings" International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 Vol. 3, Issue 2, March -April 2013, pp.534-539

[4] Nitin m. Warade, P. J. Salunke; "Comparative Study On Analysis And Design Of Composite Structure" International Journal Of Advance Research In Science And Engineering Vol. No.2, Issue No.12, December, 2013 ISSN-2319-8354(E).

[5] Shashikala. Koppad, Dr. S.V.Itti "Comparative Study of RCC and Composite Multistoreyed Buildings" International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 5, November 2013

[6] Prof. Prakarsh Sangave, Mr. Nikhil Madur, Mr. Sagar Waghmare, Mr. Rakesh Shete, Mr. Vinayak Mankondi, Mr. Vinayak Gundla "Comparative Study of Analysis and Design of R.C. and Steel Structures" International Journal of Scientific & Engineering Research, Volume 6, Issue 2, February-2015 ISSN 2229-5518

[7] Prof. Swapnil B. Cholekar1, Basavalingappa S. M. "Comparative Analysis Of Multistoried Rcc And Composite Building Due To Mass Irregularity" Volume: 02 Issue: 04 | July-2015

[8] Tabassum G Shirhatti, Dr. S. B. Vanakudre "The Effects Of P-Delta And Construction Sequential Analysis Of Rcc And Steel Building With Respect To Linear Static Analysis" Volume: 02 Issue: 04 | July-2015

[9] S.R.Sutar, P.M.Kulkarni Civil Engg. "Comparative inelastic analysis of RCC and steel-concrete composite frame" e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 13, Issue 4 Ver. IV (Jul. - Aug. 2016), PP 22-32.

[10] Ankur Tailora Sejal P. Dalalb* Atul K.Desai Sardar Vallabhbhai "Comparative Performance Evaluation of Steel Column Building & Concrete Filled Tube Column Building under Static and Dynamic Loading" Procedia Engineering 173(2017) 1847 – 1853.

[11] Deepak M Jirage, Prof. V.G. Sayagavi, Prof. N.G. Gore, Prof.P.J.Salunke "Comparison of R.C.C. And Composite Multistoried Buildings" Deepak M Jirage.et.al. Int. Journal of Engineering Research and Application. ISSN : 2248-9622, Vol. 7, Issue 7, (Part -2) July 2017, pp.42-45.

[12] Mohd Amir Khan "Comparative Study of R.C.C & Structural Steel -Concrete Composite Frame for Linear and Non-Linear Analysis" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 07 | July -2017

[13] IS:456, Code of practice for plain and reinforced concrete code of practice, Bureau of Indian Standards, New Delhi, 2000.

[14] IS:1893, Criteria for earthquake resistant design of structures - general provisions for buildings, Part 1, Bureau of Indian Standards, New Delhi, 2002.

[15] IS:875, "code of practice for design load (other than earthquake) for buildings and structures" Bureau of Indian Standards, New Delhi, 2002.

[16] IS:800, Code of practice for general construction in steel, Bureau of Indian Standards, New Delhi, 2007.