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Comparision Between R.C.C. & Steel in High Rise Building by Dynamic Analysis

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Abstract

The current trend in the construction industry demands taller and lighter structures which are also more flexible and having a quite low damping value. These increase failure possibilities and also a problem from a serviceability point of view. For the structural engineer, a tall building can be defined as one whose skeletal system must be modified to make it sufficiently economical to resist the lateral force due to earthquake within the prescribed criteria for strength drift and comfort of the occupants. The behavior of structures and structural components under earthquake loading. Analytical studies of the dynamic response of idealized models of structures to earthquake excitation have provided much valuable information which has helped explain the observed behavior of actual structures subjected to an earthquake. During an earthquake, directly from the earthquake response (or design) spectrum without the need for response history analysis of the structure know as response spectrum analysis. This procedure is not an exact predictor of peak response, but it provides an estimate that is sufficiently accurate for structural design application. The method is first presented for an arbitrary structural configuration and then specialized for the multi-storey building. From this study, it has been found that in high rise building the Steel is better.

Keywords:*Comparative Study, Composite, Comparison Aspects, Storey Drift, Lateral Acceleration, Base shear, Mass irregularity, Overturning Moment.*

1. INTRODUCTION

Congestion has a strong grip on the metropolitan city. Excess upon excess of People and building are heaped upon the land. Size is an accretion of ever-increasing population; people are piled in a pyramid expanding at the base in proportion to the accumulation at the centre. The heavy burden of building bulk has created a monster of land values, and the result is a paradox. The value of land is a product of its use. Presumably the use in designed as a service to people, and the value of land is measured by the income derived from performing that's service. When by increasing the intensity of land use the income from it can be increased, the value of the land is likewise increased.

Following this logic with enthusiasm, city building proceeded according to the "highest and best use" to which urban land could be put. Absorbed in the pursuit of this theory, focus to the fundamental idea of land value as arisen from service to people transformed to the idea of land as a speculative commodity, and this is the status of urban land "economics" today. It is not a new situation. Exploitation of land has been common throughout history. This paradox is at the root of the urban problem, but it is being resolved. Decentralization is gnawing at the values in congested areas, even though the unplanned and disorderly process has the effect of shifting the disease about the urban anatomy rather than curing the malady. Congestion is a habit hard to break. Struggling to escape from congestion, the smooth freeways loosen themselves from one complicated intersection only to find themselves.

2. LITERATURE REVIEW

2.1 Marcelo Gaita~S~ & John F. Abels (3)

This research emphases on analysis of buildings on the level of 3 dimensions. It produces analysis via 32 bit minicomputer having virtual memory. For computational efficiency several stiffness, geometry, inertial, floor and displacement models of 3 dimensional constructions are examined with respect to implications. From this research a model for such 3 dimensional constructions is chosen for use with virtual-memory minicomputers. This work also discusses the utilizations of dynamic allocation of memory, symbolic manipulation, and matrix storage and manipulation to achieve compu~tiona1 efficiency. Instances with computational statistics exemplify the ideas exhibited.

2.2 M.S. Medhekar, & D.J.L.Kennedy (2)

For a construction of an eight-stories or two-stories having concentrically braced steel frames as the lateral load resisting system the approach of displacement-based seismic design is useful. This marks the first utilization of this approach to the seismic design of (steel) construction. Appropriate earthquake accelerograms numerically generated displacement spectra for design. Constructions are planned to have inelastic and elastic responses both in the earthquake considered proposals. The impact of torsion because of column shortening, an asymmetric construction layout, and higher vibration modes, is focused. Dynamic and static time history of nonlinear form analysis are employed to measure the seismic response.

2.3 C.W. Roeder G.A. MacRae , K. Scott (5)

Construction based on steel frame were planned and built differently in 1900s from the way they are today, and there was very little or no consideration of seismic design was essential. Severalof these constructions persist in service as part of critical lifeline facilities, but engineers are incompetent to measure their seismic performance by modern assessment techniques. This research work put on several tactics for seismic assessment of present constructions to one of these erections. It is revealed that modern assessment techniques do not precisely simulate the seismic performance of the subject constructions. These modern tactics propose the existence of difficulties that are not perceived in practice, while they avoid issues that may be unfavorable to the seismic performance of some earlier constructions. Consequently, dynamic response of the constructions is depicted, and the series of destruction and yielding are noticed. The aspects that may restrict the inelastic performance of the constructions are explained. Conclusively, a streamlined architecture of design, that seizes the dynamic response of such constructions, issummarized.

3. Comparison of high rise structural Systems

Different type of high rise framing concept are suitable for different building height or rather for certain building height to width ratios. Professor Fazlur Khan compared most of these structural concepts. Steel & R.C.C system were presented separately. The structural system proposed for certain height should not be considered an absolute rule. In face the 10 storey Empire state building. New York is characterized by a rigid frame shear wall interaction system. Indicated as applying to building less than 40 storey"s high. **Table 2.1** is prepared according to structural efficiency (i.e. optimization) as measured by the weight per square meter that is the weight of the total building structure divided by the total square meter of gross floor area. **Table 2.1** shows the ratios of weight to area for some typical tall constructions for the empire state building.

Table 3.1 Weight to area ratio for some typical high rise building

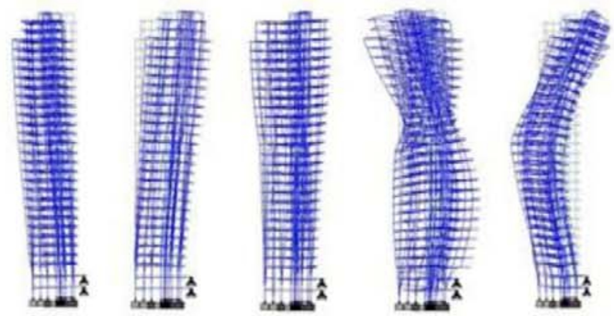
Sr. no	High Rise building	Place	Year	Storey's	Height width Ratio	High Rise building weight (kg/m^2)
1	Empire state building	New York	1930	102	9.3	206.187
2	Seagram building	New York	1957	42	5.1	136.807
3	Chase Manhatten	New York	1963	60	7.3	269.705
4	Civi Centre	Chicago	1965	30	5.7	185.666
5	First National Bank	Chicago	1969	60	5.7	185.666
6	John Hancock Center	Chicago	1968	100	7.9	145.113
7	Alco building	Sanfrancisco	1969	26	4.0	127.034
8	Boston co. building	Boston	1970	41	4.1	102.605
9	U.S steel building	Pittsburgh	1971	57	6.1	146.578
10	I.D.S Centre	Minneapolis	1971	57	6.1	87.459
11	Low income housing	Brockton mass	1971	10	5.1	30.782
12	World trade certre	New York	1972	110	6.9	180.780
13	Sears & Roebuck	Chicago	1974	109	6.4	161.237

4. STRUCTURE MODELING AND ANALYSIS

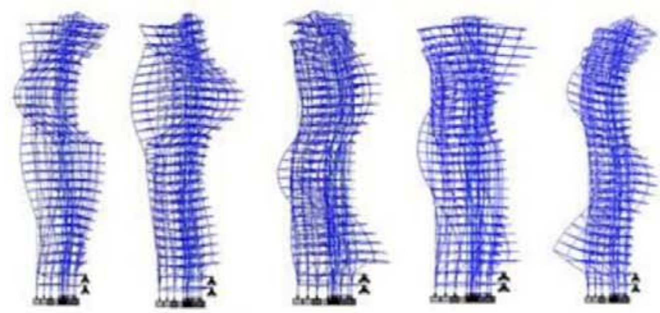
Table 4.1 Data for Analysis ofthe Structure

1	Type of Structure	Multistory building
2	Location	Mumbai
3	Zone of Seismic imp.	III [2002, IS 1893 (Part 1): Table 2] Zone factor 0.16
4	Number storey	91 meter above ground 6.4 meter below ground
5	Total height of building	3856 sqft
6	Slab area	On residential 2 KN/m^2 On stair case 3 KN/m^2 Parking 5KN/m^2 Balconies 3 KN/m^2
7	Imposedload	R.C.C & Steel
8	Material	100, 130,150,170,200,250
9	Slab thickness (mm)	25. $K.N. / m^3$
10	Specific weight of R.C.C	Hard soil
11	Category of soil	2002 [IS 1893 (part 1)] spectra at medium soil
12	Spectra for reaction	R.C.C 5% Steel 3%

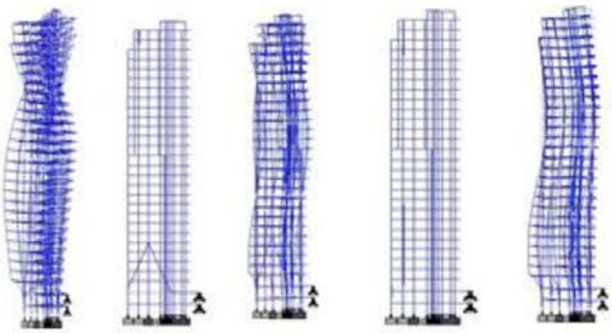
5. RESULTS



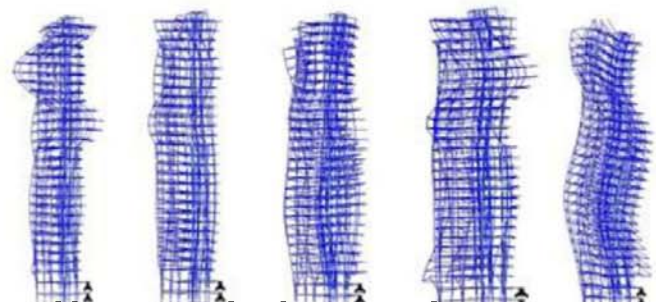
MODE 1 MODE 2 MODE 3 MODE 4 MODE 5



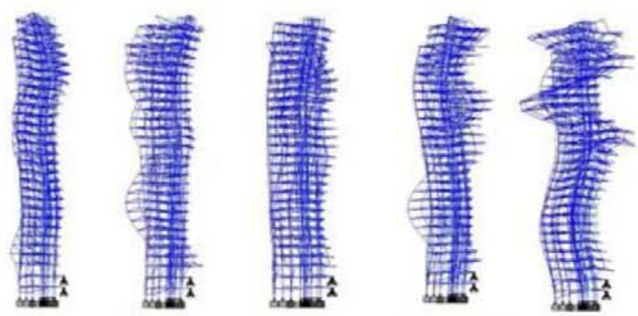
MODE 11 MODE 12 MODE 13 MODE 14 MODES 15



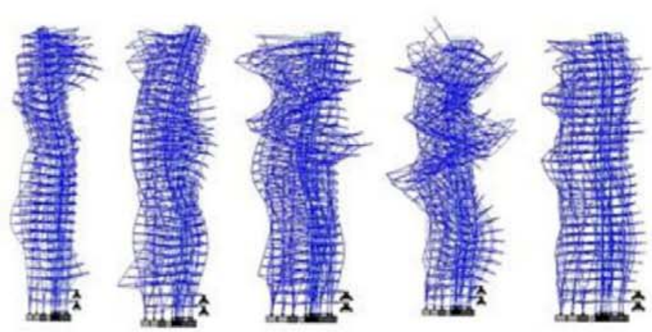
MODE 6 MODE 7 MODE 8 MODE 9 MODE 10



MODE 16 MODE 17 MODE 19 MODES 20



MODE 21 MODE 22 MODE 23 MODE 24 MODES 25



MODE 26 MODE 27 MODE 28 MODE 29 MODES 30

Table no. 5.1 on hard strata mode no Vs frequency & time

	STEEL		R.C.C	
MODE SHAPE NO.	FREQUENCY (HZ)	PERIOD (SECOND	FREQUENCY (HZ)	PERIOD (SECOND
1	0.55	1.817	0.306	3.27
2	0.741	1.35	0.373	2.679
3	0.986	1.014	0.549	1.821
4	1.292	0.774	1.092	0.915
5	1.735	0.576	1.311	0.763
6	1.801	0.555	1.655	0.604
7	2.381	0.42	1.94	0.515
8	2.585	0.387	1.975	0.506
9	2.619	0.382	2.215	0.452
10	2.633	0.38	2.298	0.435
11	2.711	0.369	2.453	0.408
12	2.784	0.359	2.616	0.382
13	2.874	0.348	2.828	0.354
14	3.081	0.325	2.902	0.345
15	3.14	0.318	3.121	0.32
16	3.233	0.309	3.414	0.293

	STEEL		R.C.C	
MODE SHAPE NO.	FREQUENCY (HZ)	PERIOD (SECONDS)	FREQUENCY (HZ)	PERIOD (SECONDS)
17	3.28	0.305	3.514	0.285
18	3.346	0.299	3.552	0.282
19	3.394	0.295	3.667	0.273
20	3.428	0.292	3.707	0.27
21	3.446	0.29	3.805	0.263
22	3.551	0.282	3.974	0.252
23	3.6	0.278	4.1	0.244
24	3.61	0.277	4.144	0.241
25	3.662	0.273	4.206	0.238
26	3.733	0.268	4.268	0.234
27	3.765	0.266	4.4	0.227
28	3.846	0.26	4.574	0.219
29	3.898	0.257	4.612	0.217
30	3.899	0.256	4.761	0.21

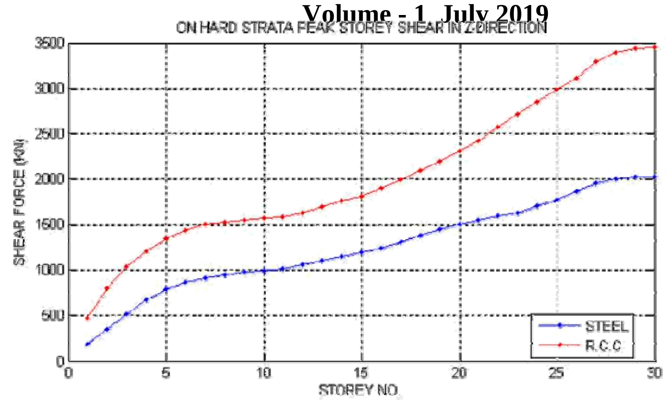


Fig no. 5.2 Floor no. vs. shear force (on hard strata in x- direction)

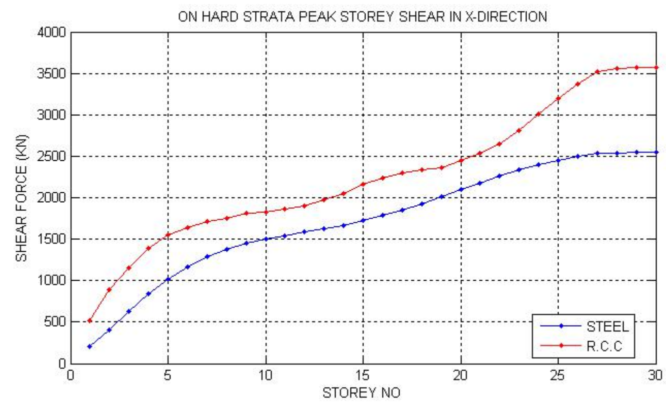
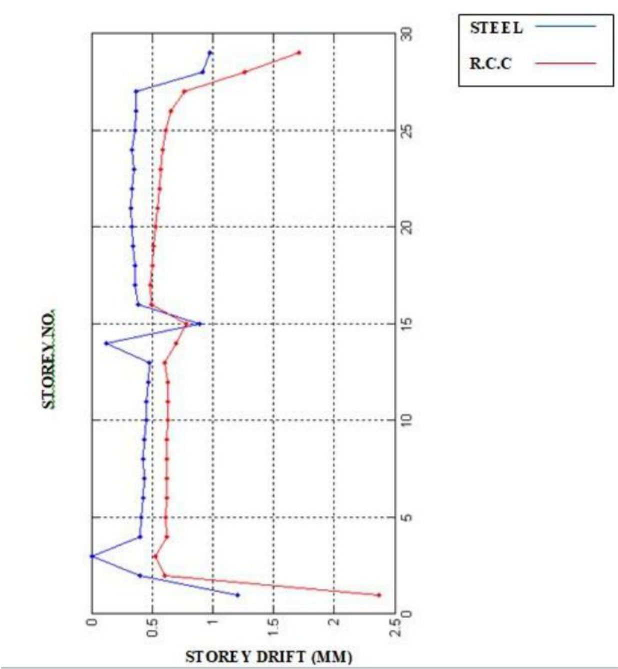


Fig no. 5.3 Floor no. vs. shear force (on hard strata in z-direction)



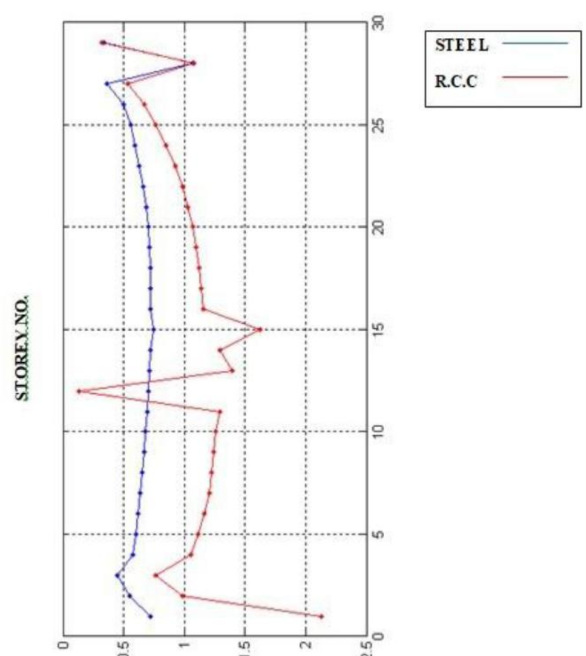


Fig no. 5.4 on hard strata drift in z-direction Fig no. 5.5on hard strata drift in x-direction

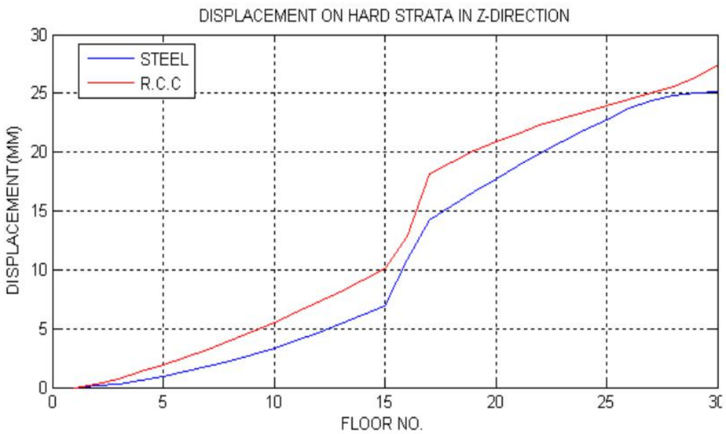


Fig no. 5.6 On hard strata displacement in x-direction

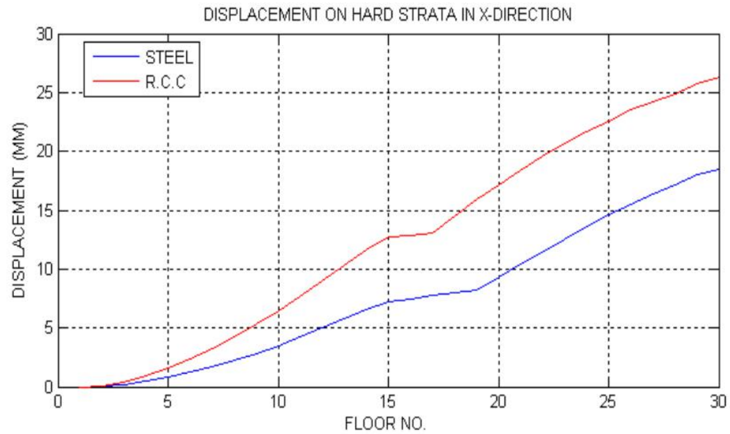


Fig. no. 5.7 On hard strata displacement in z- direction

6. CONCLUSION

Recent trends in construction i.e. civil engineering commands constructions or structures of lowered weight and raised height that are also extra acquiescent flexible and of pretty little damping value. This escalates failure vulnerabilities and also difficulties from the direction of providing facilities. Behavior of structures and structural components under earthquake loading. Rational investigations of the active response of idealized models of constructions to earthquake excitation have provided much valuable information which has helped explain the observed behavior of actual structures subjected to earthquake. At the time of an earthquake, response (or design) spectrum of earthquake straight from itself without the prerequisite for history analysis of response of the construction is called as response spectrum analysis. The variation of the fundamental period with „ρ‟(stiffness) which indicate thecolumn stiffness EIc and floor mass, the fundamental period is more in R.C.C its mean it stiffness is weak as compare tosteel.

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