

Comparison of STEEL Structure and RCC Structure

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ABSTRACT

In a modern world time and economy are very important factor for building structures. So we should try to minimize cost and time as much as possible. By selection of proper material for frame of building with considering strength and atmospheric condition. We know that both RCC and structural steel in frame of building have own advantages and disadvantages as per loading and atmospheric condition. Based on study of real-life structure we conclude that as when time is consult structural steel is batter but as economy it is not effective vice versa.

I. INTRODUCTION

The use of steel in construction industry is very low in India compared to many developing countries. Experiences of other countries of other countries indicate that this is not due to the lack of economy of steel as a construction material. There is a great potential for increasing the volume of steel in construction, especially the current development needs in India. Exploring Steel as an alternative construction material and not using it where it is economical is a heavy loss for the country. But in case of the high rise frame structure it may be economical in this project we will see merits and demerits, and the conclusion we will be on the basis of R.C.C. and Steel Structural material's comparison of cost and load carrying characteristic. We have taken a plan G+5 on rigid frame structure.

This project based on simply comparison of cost as per load carrying characteristics between same buildings with different material. But we can't estimate without safely designing a frame of this building. So, in this project we involved design part with using of software STAAD.PRO. For input file of software geometry created from transferring cad file to stand. We enter the earthquake detail as per original location of a building. After designing we get material quantity in terms of cubic meter from this data, we easily calculate the cost with knowing material property. We could not get overall cost of frame because of form work cost and erection cost also need to be include which is vary with size & location of the project. In case of cost calculation experiment of volume change of cement after curing which need to study load combination was also different in case of both material as individual IS code. Literature review about both materials said structural steel is much better for saving a time but in case of economy RCC. Steel structure is also a good solution to select material. But in the process of selecting material functional requirement, aesthetic view and atmospheric condition should be kept in mind.

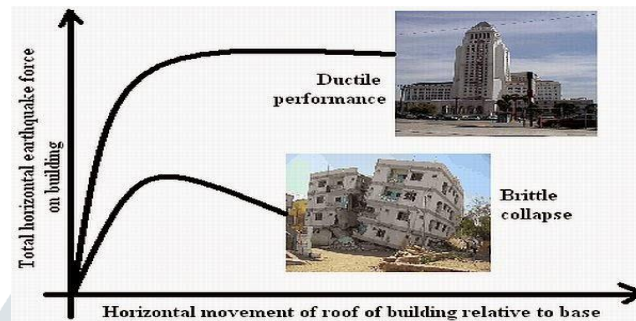
In India, we know that steel and composite structure not more popular. But after complete this project we can conclude that before selection of materials possibilities of use other material also should be check. It may help in get better result.

II. MATERIAL AND METHODS

1.COMPARISON OF COST BETWEEN COMPOSITTE & R.C.C. STRUCTURE

1)Fire safety

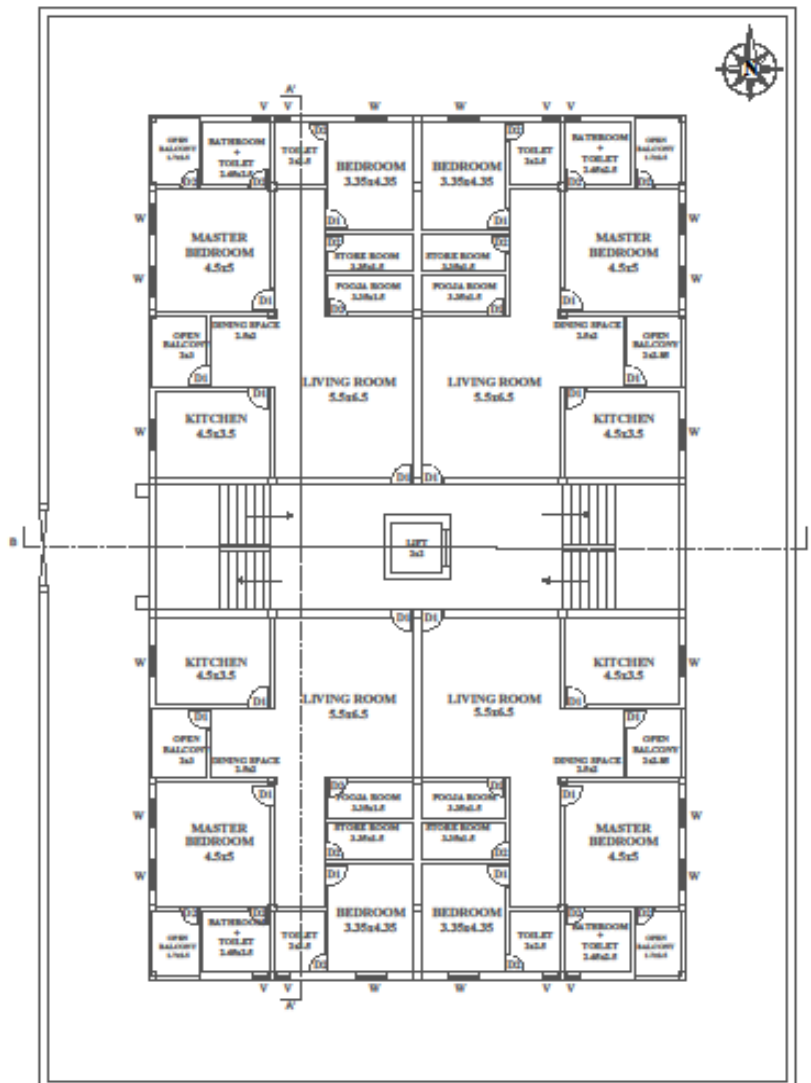
R.C.C.: - Concrete requires no additional fireproofing treatments to meet stringent fire codes, and Above 400 °C concrete becomes weaker. **Steel:** - For buildings, steel should be fabricated already against fire, but in situations where temperature is scaled up till 500 °C, the yield stress drops by two-thirds and the load-carrying capacity is lost.



2.BUILDING DETAILS

1. Type of Building: - Multi-Storey Rigid Joined Frame Structure
2. Number of Storey's: - 6(G+5)
3. Floor to Floor height: - 3.05m
4. Height of Plinth: - .6 m above G.L.
5. External Wall: - 230mm Thick Including Plaster
6. Internal Wall: - 115mm Thick Including Plaster
7. Bearing Capacity of Soil: - 200 kN/m²
8. Imposed Load: Roof: Roof Finish: - 1.5 kN/m² , Live Load: - 4 kN/m² ,Floor: Floor Finish: - 1.0 kN/m²
9. Materials: -Concrete Grade: - M30, Steel Grade: - Fe415
10. Unit Weight of Concrete: -25 kN/m³ , Unit Weight of Masonry: -20 kN/m³

Method Based on Is 456-2000 Limit State Method.



TYPICAL FLOOR PLAN (5 FLOOR)



3.ESTIMATE

➤ Abstract of R.C.C. Building

Abstract					
Sir No.	Description	Quantity	Per	Rate Rs.	Amount(Rs.)

1	EXCAVATION FOR FOUNDATION	1652.774	CUM	1200	1983329
2	P.C.C. (1:3:6)	29.04	CUM	3200	92928
3	Reinforcement in Footing Column, Beam, Slab, Stairs	182	TONE	50000	9084847
4	R.C.C. FOOTING M30	96.8	CUM	210	20328
	Plinth Beam	61.11	CUM	210	12833
	R.C.C. in columns upto slab	100.431	CUM	210	21091
	Main Beams	274.995	CUM	210	57749
	R.C.C. for Slab	774.648	CUM	210	162676
		1307.984	CUM		274677
5	Brick Masonry upto slab	1789.602	CUM	170	304232
6	Plastering				
	Inside Plastering	9924.05	SqM	190	1885570
	Outside Plastering	1027	SqM	190	195130
		10951.05			2080700
7	Flooring	5164.32	SqM	140	723005
8	Coloring	10951.05	SqM	150	1642658
		Grand Total of all works			16186374
9	Labour Cost				
	Mason	1696	Per Men	300	508800
	Blenders	3060	Per Men	200	612000
	Bhishti	1189	Per Men	200	237800
	Women	2010	Per Women	180	361800
	Men	3817	Per Men	200	763400
	Fitter	2	Per Men	300	600
	Mistry	137	Per Men	400	54800
	Carpenters	257	Per Men	300	77100
		Total Labour Cost			2616300
		Total Labour Cost + GT			18802674
10	Water Charges	1.5% of G.T.			242796
11	Contractor's Profit	10% of all Over Project G.T.			1880267
12	Other Charges	5% of G.T.			809319
13	Electricity Charge	5% of G.T.			809319
		All Over Project Cost			22544375

➤ **Abstract of Steel Building**

Abstract					
Sir No.	Description	Quantity	Per	Rate Rs.	Amount(Rs.)
1	EXCAVATION FOR FOUNDATION	1652.774	CUM	1200	1983329
2	P.C.C. (1:3:6)	29.04	CUM	3200	92928
3	R.C.C. FOOTING M30	96.8	CUM	210	20328
	Plinth Beam	61.11	CUM	210	12833
		157.91			33161
4	Steel Columns ISMC-300	52.4112	TONE	33500	1755775
	Steel Beams ISMB-200	41.6941	TONE	31000	1292517
	Steel Beams ISMB-300	72.5543	TONE	36000	2611955
	Angles 50x50x6	1.9404	TONE	15000	29106
	Angles 70x70x6	9.832788	TONE	18000	176990
					5660247
5	WALL	2982.498	SqM	150	447375
6	Stairs	767.03413	CUM	250	191759
7	Mezzanine Floor	3356.22775	CUM	350	1174680
8	Coloring				
	Zinc Coating	10.7256	SqM	50	536
	Painting	10.7256	SqM	50	536
9	Labour Cost				
	Bleders	593	Per Men	300	177900
	Bhishti	77	Per Men	200	15400
	Mason	16	Per Men	200	3200
	Men Labours	268	Per Men	200	53600
	Women Labours	268	Per Men	180	48240
	Skilled Labours	900	Per Men	500	450000
					748340
10	Welding				2830124
					Grand Total
					13163014
11	Electricity Charge		5% of G.T.		6581507
12	Contractor's Profit		10% of G.T.		1316301

13	Other Charges	Lump Sum	98723
14	Fire Safety Coat In Steel Sections	Lump Sum	65815
		Total	21225360

4. Conclusion

- I. A G+5 structure of plan dimensions 21.2 m x 34.8 m has been analyzed, and cost per unit quantities are worked out.
- II. Though the cost comparison reveals that steel structure design is more costly, reduction in direct cost of steel structure resulting from speedy erection will make steel structure economically viable. Further, under earthquake consideration because of the inherent ductility characteristics, steel-concrete structure will perform than conventional R.C.C. structure.
- III. The axial forces, bending moment and deflections in R.C.C. are somewhat more as compared to the Steel structure.
- IV. The seismic forces are also not very harmful to the Steel structure as compared to the R.C.C. structure, due to low dead weight.
- V. There is the reduction in cost of steel structure as compared to R.C.C. structure due to reduction in dimensions of elements.
- VI. As the result shows Steel structure option is better than R.C.C. Because Steel structure option for high rise building is best suited. Weight of steel structure is low as compared to R.C.C. structure which helps in reducing the foundation cost.
- VII. As the dead weight of the steel structure is less as compared to R.C.C. structure, it is subjected to fewer amounts of forces induced due to the earthquake.
- VIII. It is clear that the nodal displacements in steel structure, by both the method of seismic analysis, compared to R.C.C. structure in all the three global directions are less which is due to the higher stiffness of member in a steel structure to R.C.C. structure.
- IX. Steel structure is more economical than that of R.C.C. structure. Steel structures are the best solution for high rise structure as compared to R.C.C. structure. Speedy construction facilitates quicker return on the invested capital and benefits in terms of rent.

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