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Comparison between RCC and Steel Structure Using Software

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Abstract - *As India is a fast developing country among the world so it has large demand of construction of high-rise building . Mainly the material used for the construction of building concrete , steel, bricks, concrete blocks, wood, etc . The major product used in the construction in RCC and Steel is concrete, reinforcement and steel sections . For the design of building we consider different accepts such as cost , duration of construction , durability, etc. For the construction of building every material has pros and corns, so we need to choose perfect solution according to that problem . Nowadays for the design purpose we used different software like AutoCad , Revit , Staad-Pro , Etab , RCDC , etc . Use of software reduces time of design . For the comparison purpose we used Staad-Pro software .*

Key Words: RCC, Steel, Staad-Pro, Cost, Axial Force, Displacement, etc.

1.INTRODUCTION

For this project we design a multi-story building of G+10 , G+20 , G+30 . Mainly we compare the cost , axial force and displacement of building for RCC and Steel frame structure . As we use Staad-Pro for design because it provides fast , efficient and accurate result of analysis of complex structures . We used IS codes for design purpose of RCC and Steel Framed Structure .

1.1 PROBLEM STATEMENT

We generate a simple model of 12m*12m area for each floor and analyse with respect to that .

1.2 OBJECTIVE

1. Compare the RCC frame structure with steel structure frame .
2. Getting familiar with design software .
3. To fulfill the future requirement of the building construction .
4. Design and construct a economical building .
5. Design the building according to IS codes .

1.3 SCOPE OF PROJECT WORK

1. By the use of Staad-Pro software we get to know the quantity of the material and it is easy to compare the cost for respective building design .

2. During the design pf building we exactly get to know the use of Staad-Pro software .

1.4 EXPECTED OUTCOMES

After going through the journals papers we get know that the cost for RCC frame structure is much less than Steel frame structure . The displacement in RCC structure is less than in Steel structure. Where the axial force in RCC structure is more than the Steel structure .

2.PROCEDURE

For design purpose we consider a simple plan as shown in figure . The same plan is used for G+10 , G+20 and G+30 story building for both RCC and Steel structure .

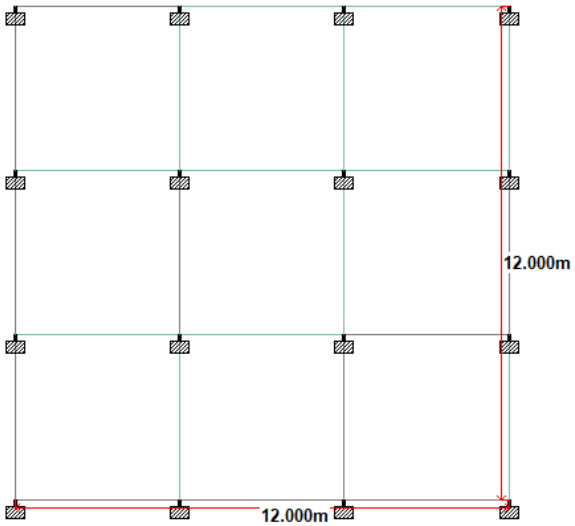

Fig-1: Plan

2.1 DATA

For design and analysis purpose we consider some data from IS codes and other references as follow for both RCC and Steel structures .

1. Loads :

1) Self weight of structure = 1KN/M
2) Wall Load = 12KN/M
3) Floor Load = 3KN/M
4) Live Load = 3KN/M<
5) Wind Load = As per IS 875:1987(Part-4) for Pune location

6) Earthquake Load = As per IS 1893:1993 for Pune location

2. Slab Thickness = 150MM

3. Sizes of Column and Beam for RCC Structure

Table 1-Sizes of Column and Beam for RCC Structure

STRUCTURE	COLUMN	BEAM
G+10	400*500MM 300*400MM	400*300MM 350*350MM
G+20	800*450MM 600*400MM	600*400MM 500*400MM
G+30	700*950MM 600*800MM 400*600MM	300*650MM 300*800MM 300*400MM

4. Sizes Of Column and Beam for Steel Structure

Table 2- Sizes of Column and Beam for Steel Structure

STRUCTURE	COLUMN	BEAM
G+10	IW350300012	ISMB200
G+20	IW400300012 IW350300012	ISMB200 ISMB150
G+30	IW450300012 IW400350010 IW350300012	ISMB200 ISMB175 ISMB150

5. Properties for RCC Structure :

Clear Cover For Column = 40MM

Clear Cover For Beam = 25MM

Grade Of Concrete = M20,M25

Yield Strength of Bars = Fe450

6.Properties for Steel Structure :

Yield Strength of Bars = Fe450

2.2 DESIDN :

We flow the steps and complete the design for G+10 , G+20 and G+30 story structure for both RCC and Steel Structure .

STAAD-PRO MODELS-

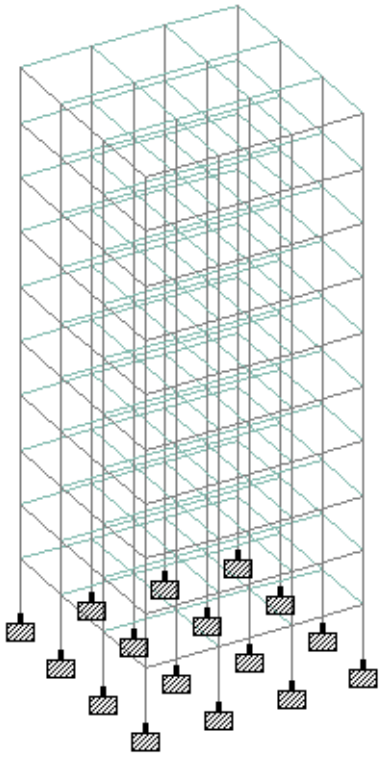

Fig-2: G+10 Model for RCC and Steel Structure

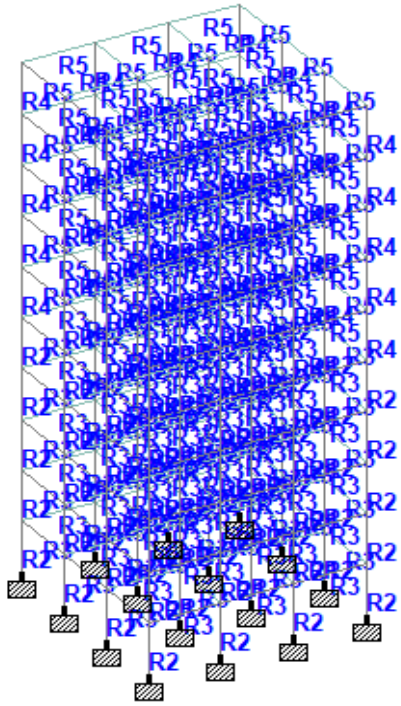

Fig-3: Property Assign to Elements of Building

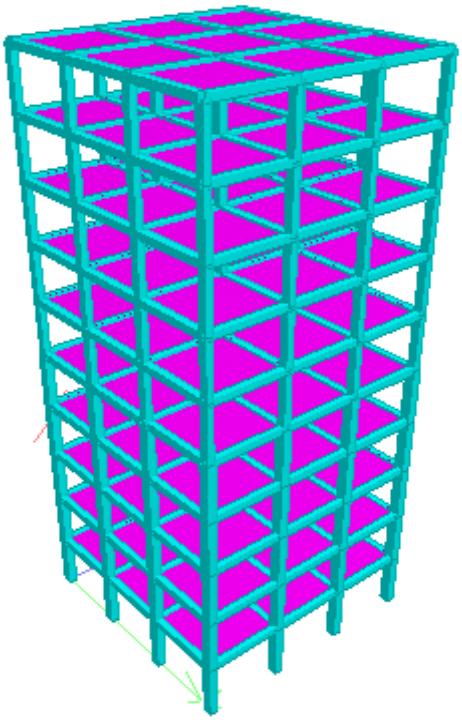

Fig-5: Render View of RCC Structure

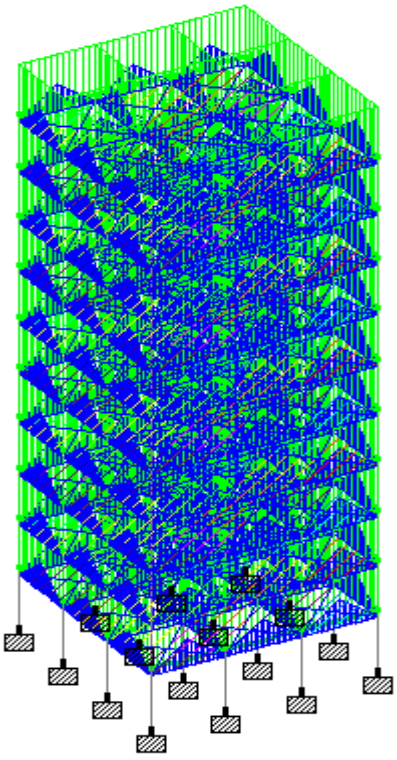

Fig-4:Loading

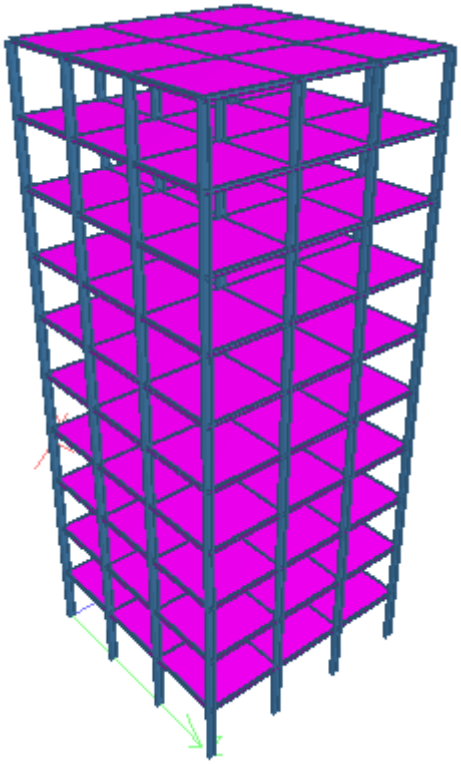

Fig-6:Render View of Steel Structure

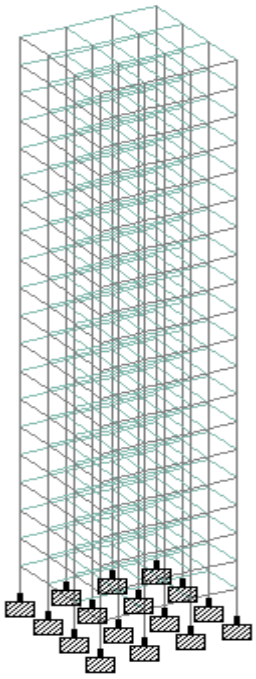

Fig-7:G+20 Model

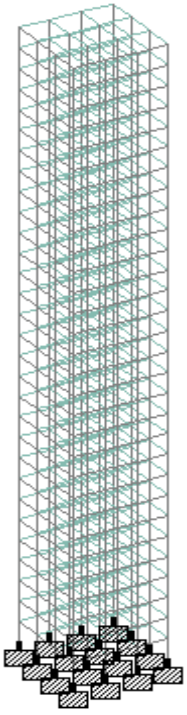

Fig-8:G+30 Model

3. RESULT

After doing design for the different story building we got results such as ,

1. Quantity material we get as follow

Table 2- Quantity of Material for RCC and Steel Structure

STRUCTURE	RCC	STEEL
G+10	Concrete = 193.2 m3 R/F = 15568 kg	76952 kg
G+20	Concrete = 662.4 m3 R/F = 46240 kg	153788 kg
G+30	Concrete = 1511 m3 R/F = 18395 kg	242845 kg

2. Cost Comparison Between RCC and Steel Structure

Table 3-Cost Comparison

STRUCTURE	RCC	STEEL
G+10	18 lakh	33 lakh
G+20	57 lakh	65 lakh
G+30	114 lakh	102 lakh

3. Axial Force Comparison Between RCC and Steel Structure

Table 4-Axial Force Comparison

STRUCTURE	RCC	STEEL
G+10	3897.475 KN	3511.604 KN

G+20	7355.547 KN	6277.946 KN
G+30	13222.803 KN	8821.687 KN

4. Maximum Displacement in Building of RCC and Steel Structure

Table 5- Maximum Displacement

STRUTURE	RCC	STEEL
G+10	17.145 mm	19.380 mm
G+20	31.629 mm	58.576 mm
G+30	52.133 mm	110.421 mm

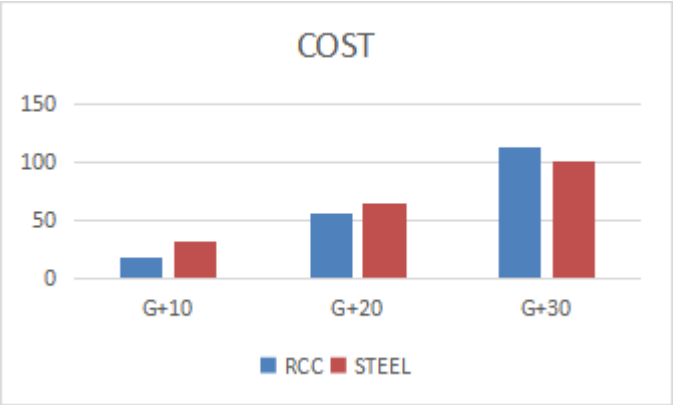

Chart 1-Story of Building vs Cost in Lakh

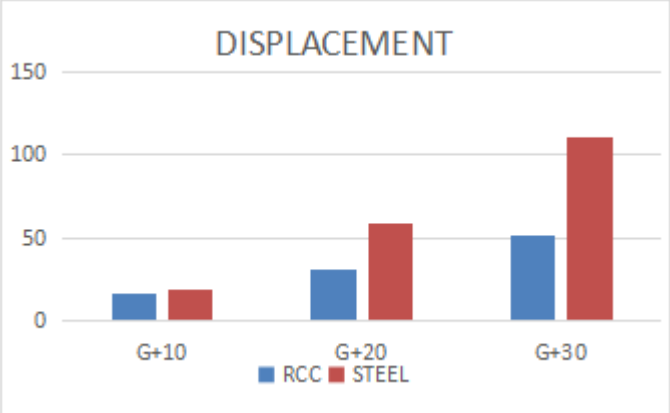

Chart 2-Story of Building vs Displacement in MM

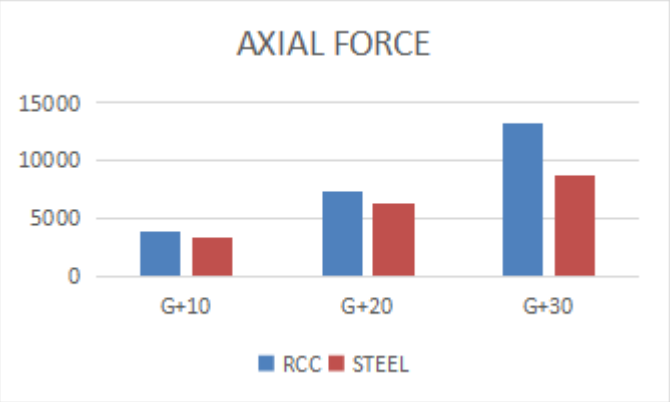

Chart 3-Story of Building vs Axial Force in KN

4. CONCLUSIONS

1.Axial forces are lower in Steel structures due to the lower Weight of Steel structure compared to RCC structure.

2.Steel structures are resulting in lighter construction than traditional concrete construction as well as speedy construction. So the completion period of composite building is less than RCC building.

3.Steel structures are more economical than that of R.C.C. structure as shown in literature for commercial buildings having large spans.

4.Steel structure is a better option than RCC for high rise buildings.

5.Steel has excellent resistance to tensile loading and is also used to induce ductility which provides flexibility to structure.

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