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COST COMPARATIVE STUDY OF STEEL CONCRETE COMPOSITE AND RCC STRUCTURE

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Abstract - *The project entails the analysis, planning, and design of a steel-concrete composite building. The planned building is a G+4 structure with floors that are each 3.75 metres high. The building's total plan is 39.6 m by 12.3 m. The structural planning, load calculations, analysis by 2D modelling using STAAD-Pro V8i, design of composite floors and columns, design of steel beams, design of RCC beam, design of RCC column, and design of RCC slab are all included in the analysis and design process. According to the Indian Standard Code of Practice, analysis has been performed for a variety of load combinations. In this project, a comparable RCC structure is also created so that the costs of both the steel composite and the RCC structure has been compared.*

Key Words: steel concrete composite, cost, STAAD Pro V8i

1. INTRODUCTION

1.1 OBJECTIVE

The use of Steel in construction industry is very low in India compared to many developing countries. Experiences 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 in the current development needs in India. Not exploring Steel as an alternative construction material and not using it where it is economical is a heavy loss for the country. Also, it is evident that now-a-days, the composite sections using Steel encased with Concrete are economic, cost and time effective solution in major civil structures such as bridges and high-rise buildings.

In due consideration of the above fact, this project has been envisaged which consists of analysis and design of a high-rise building using Steel-Concrete composites. The project also involves analysis and design of an equivalent R.C.C structure so that a cost comparison can be made between a Steel-Concrete composite structure and an equivalent R.C.C. structure.

1.2 ADVANTAGE OF COMPOSITE CONSTRUCTION

Concrete slabs are supported by steel beams in conventional composite construction by keeping them on top of the latter. These two parts do not behave as monolithic structures when under load, and if they are not connected, there is a potential that slide will happen at the interface. The possibility of slip happening between the beam and slab can be minimized with the use of a purposeful and suitable connection created between them. The steel beam and slab in this situation function as a "composite beam," acting similarly to a monolithic Tee beam. Due to the fact that steel is more prone to buckling in compression and concrete is stronger in compression than tension, we can fully take advantage of each material's benefits by combining the two. The use of steel-concrete composite construction has various benefits.

2. METHODOLOGY

Step 1: The plan is drawn using AutoCad.

Step 2: The proposed plan is then modelled and analysed in STAAD.Pro.V8i.

Step 3: Both R.C.C and Steel Concrete Composite is then designed manually.

Step 4: Cost is then estimated for both R.C.C and Steel Concrete Composite.

Step 5: Result was compared and its economic feasibility was found out.

3. ANALYSIS

The explained 3 D model is analyzed by the software STAAD Pro. Different parameters such as deflection, shear force, and bending moment are studied for the models.

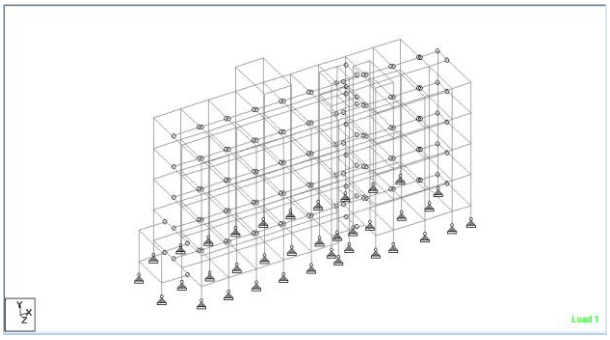

Fig 1: Building model.

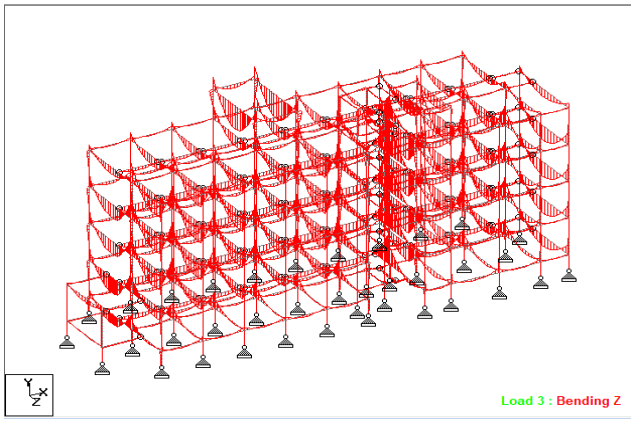

Fig 2: Bending moment in z direction.

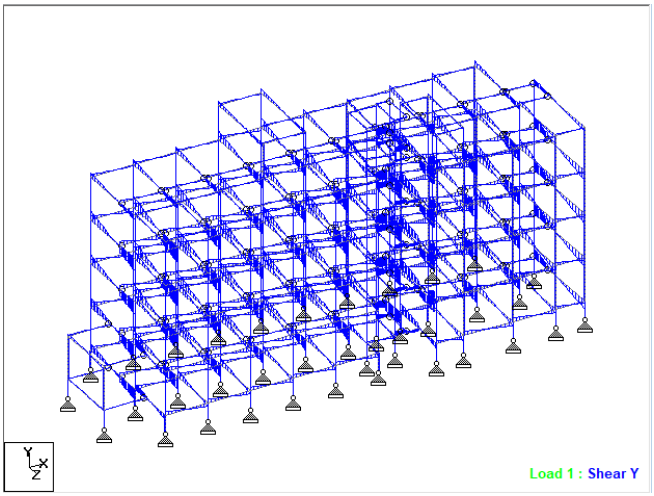

Fig 3: Shear in Y direction

5. COST COMPARISON OF COMPOSITE ELEMENTS WITH CONVENTIONAL RCC TYPE

5.1 BEAM

MATERIAL	RATE	COMPOSITE DESIGN	AMOUNT	RCC	AMOUNT
CONCRETE	15000	0.76545	11481.75	0.666	9990
STEEL	78			70.487	5497.986
STRUCTURAL STEEL	90	235.8	21222		
		TOTAL	32703	TOTAL	15488

Table 1: Cost comparison of beam

5.2 COLUMN

MATERIAL	RATE	COMPOSITE DESIGN	AMOUNT	RCC	AMOUNT
CONCRETE	15000	0.0847	1270.5	0.3339	5008.5
STEEL	78	13.3172	1038.741	27.918	2177.607
STRUCTURAL STEEL	90	139.875	125888.75		
		TOTAL	14898	TOTAL	7186

Table 2: Cost comparison of column

5.3 SLAB

MATERIAL	RATE	COMPOSITE DESIGN	AMOUNT	RCC	AMOUNT
CONCRETE	15000	0.75	11250	2.478	37170
STEEL	78	2.68	209.04	89.9	7016.88
STRUCTURAL STEEL	90	36.9	3321		
		TOTAL	14780	TOTAL	44186.88

Table 3: Cost comparison of slab

6. CONCLUSION

A comparative study between steel concrete composite and conventional R.C.C was carried out. From this study we get to the conclusion that RCC construction with regards to beam, column and slab is more expensive than steel concrete composite construction by about 6%. Due to decrease in direct cost of steel concrete composite structure resulting from faster construction further makes steel more economically feasible.

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