

# Analysis, Design, Estimation and Comparison of Commercial RC Building with Prefabricated Building

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## Abstract

This study presents the analysis, structural design, detailed estimation and comparative evaluation of a commercial reinforced concrete (RC) building and a prefabricated building. The structural analysis was carried out considering dead loads, live loads and other applicable loads as per standard practice. Design of structural elements such as slabs, beams and columns was performed using limit state method. A detailed quantity take-off and cost estimation were prepared for both systems. The results indicate significant differences in cost, construction time and material utilization. The prefabricated system shows advantages in speed and controlled quality, while the RC structure demonstrates robustness and conventional adaptability.

**Keywords:** Commercial Building, Reinforced Concrete, Prefabricated Structure, Structural Design, Cost Estimation

## 1. Introduction

Rapid urbanization has increased the demand for commercial buildings with improved structural efficiency and reduced construction time. Conventional reinforced concrete construction is widely adopted due to its durability and structural integrity. However, prefabricated construction techniques are gaining importance because of reduced on-site labour and faster execution. This study focuses on comparing a multi-storey commercial RC building with a prefabricated building in terms of structural design and economic feasibility.

## 2. Methodology

The methodology adopted includes structural analysis, design of components, quantity estimation and cost comparison. The building plan and loading details were considered for analysis. Design calculations were carried out using limit state method. Detailed estimates were prepared based on quantities derived from drawings. Separate cost analysis was performed for RC and prefabricated systems.

### 3. Structural Design of RC Building

The RC building consists of slabs, beams and columns designed using M30 grade concrete and Fe415 steel. Two-way slab reinforcement was calculated based on bending moments and shear forces. Columns were designed considering axial load and bending interaction. Reinforcement detailing was prepared according to standard practice.

### 4. Detailed Estimation

The total quantity of concrete required for the RC building was approximately 750 cubic metre. Steel reinforcement required was approximately 3910 kilogram. Plastering, painting, and services such as plumbing and electrical works were included in the estimate. The approximate total cost of the RC building was calculated as Rs. 14,127,900.

For the prefabricated building, structural steel sections including ISMB and ISMC were considered. Total steel quantity was approximately 121,650 kilogram. Prefabricated wall panels, roofing systems and protective coatings were included. The approximate total cost of the prefabricated building was calculated as Rs. 9,669,500.

### 5. Comparative Analysis

The prefabricated building was found to be more economical compared to the RC building in terms of initial construction cost. It also reduces construction time significantly. However, RC construction provides better fire resistance and long-term durability. The choice of system depends on project requirements, budget and time constraints.

### 6. Conclusion

The comparative study concludes that prefabricated construction is suitable for projects requiring fast completion and cost efficiency. Conventional RC construction remains preferable for structures requiring higher mass, rigidity and long-term performance. Proper planning and design optimization can further enhance the benefits of both systems.

### References

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