Study on Design and Construction of Building Using Prefabricated and Conventional Component

Sunil Prajapati[1], Nitesh Kushwaha[2]

[1]M. Tech. Scholar, [2]Professor

Department of Civil Engineering, Millennium Institute of Technology, Bhopal India

Abstract - The development and application of onsite and precast building is very different in the various countries. Traditionally, cast-in-place construction has been primary method for buildings. Prefabricated systems are a growing technology to aid in rapid building construction to minimize delays. Prefabrication also improves the quality of product because elements are manufactured under controlled conditions in the plant and high-performance materials may be used during casting. Prefabrication also improves safety in the work zone by reducing the amount of activity that is required over traffic or at high elevations to construct the high-rise buildings.

I. INTRODUCTION

- Prefabricated construction is defined as prior to installation on site of manufacture of main components in a building or complete modular houses, in an offsite factory.
- To reduce the environmental impact of construction, prefabrication can be considerable as efficient solution. The role of prefabrication in construction has been lauded for its potential to increase productivity and efficiency while not sacrificing quality.

II. OBJECTIVES

- ***To find the techno-economical feasibility of using prefabricated and conventional building construction.***

Methodology

This chapter presents the method of the study on the comparison of conventional construction with prefabrication construction. A construction have compared and it included the preparation of the plan, data collection from precast industry, estimation of quantities, and determination of project duration.

4.5.1 Plan Preparation

Plan preparation have for construction building to estimate the quantities of conventional and precast constructions. Double storey building was taken for estimate the quantities.

4.5.2 Estimation of Quantities

Estimation of quantities were find out with the requirement of materials for both the constructions. The details of the materials which are used in the construction from the companies will collect. By getting these details we can estimate the quantities of the materials.

4.5.3 Project Duration

Project duration of each construction was collected from the similar companies and compares at the time of completion period by using Critical Path method with Primavera P6.

4.5.4 Cost Analysis

This was the main factor which is considered in the project was to find out the comparison of cost analysis of total construction for the prefabricated and conventional techniques. In this analysis, we considered the resources of labor, material, and machinery.

4.6 CASE STUDY- MULTI STOREY BUILDING PROJECTS

Name of Company: talib and shamsi construction pvt. ltd.

Total project cost: project cost-1250cr

PROJECT INFO

STATUS: Ongoing

DESCRIPTION

This is an IT Park comprising of 3 buildings B9, B10 & B11 consists of 3 basements (Combined) + Ground Floor + 23 Floors (B9), 9 Floors (B10), 8 Floors (B11).

PEOPLE

CLIENT
M/s. Nirlon Limited

ARCHITECTS
M/s. Venkatramana & Associates, Bangalore

STRUCTURALCONSULTANTS
M/s. JW Consultants LLP

DETAILS

CONSTRUCTEDAREA

Approx. 18,00,000 Sq.Ft.

LOCATION

Off. Western Express Highway, Goregoan (E), Mumba4.6 List of Prefabricated

4.7 Component

The purpose of this project is to determined the cost and quantity of prefabricated and conventional construction component as listed below

- Column
- Beam
- Stair Case
- Lintel and Chajja
- Siporex Slab

Figure 4.1 IT Park comprising of 3 buildings B9, B10 & B11 consists

Figure 4.2 IT Park comprising multi storey building projects under working

Figure 4.3 buildings under construction

Figure 4.4 Slab Casting

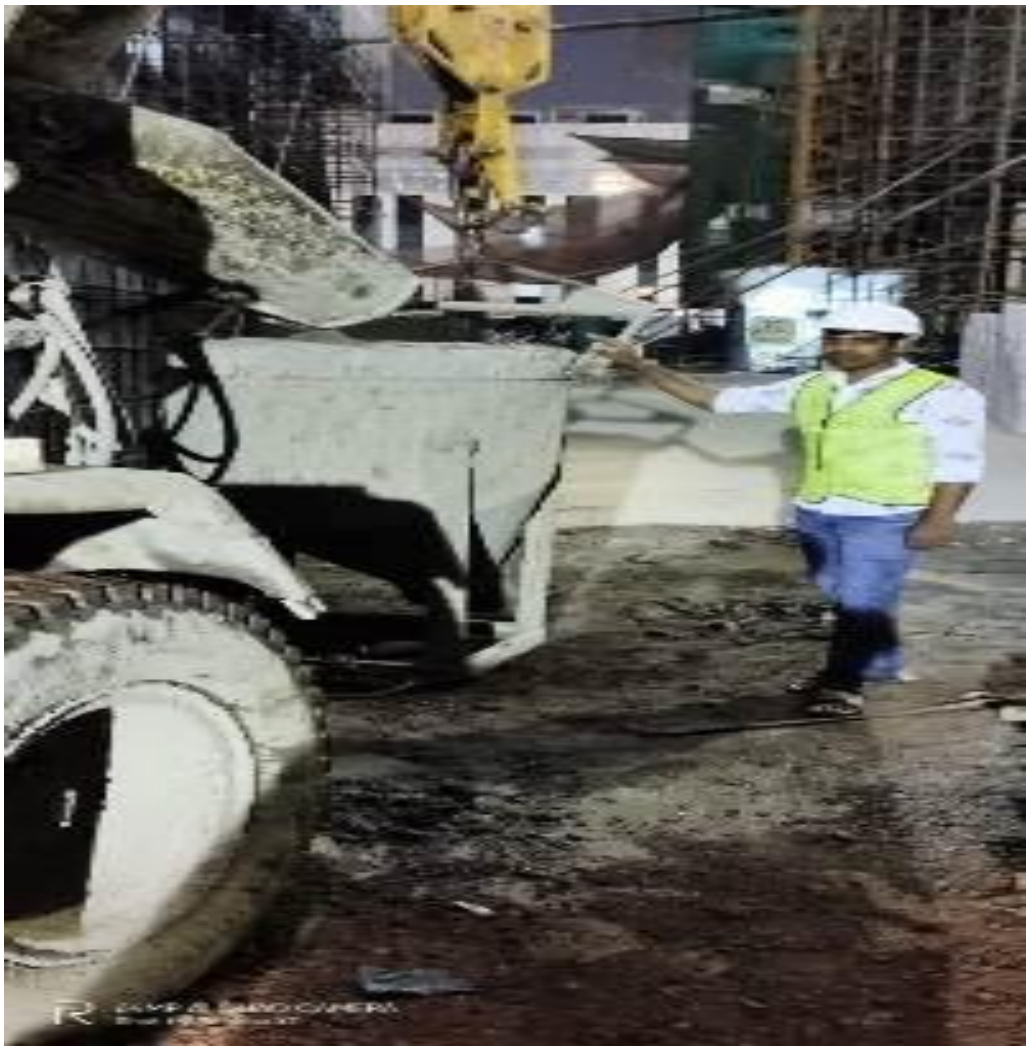

Figure 4.5 Working on Project Site

4.7.1 Column

There are 7 types of column are used in this project and total 17 no of moulds are available on site

Figure 4.6 Sample of Prefabricated Column

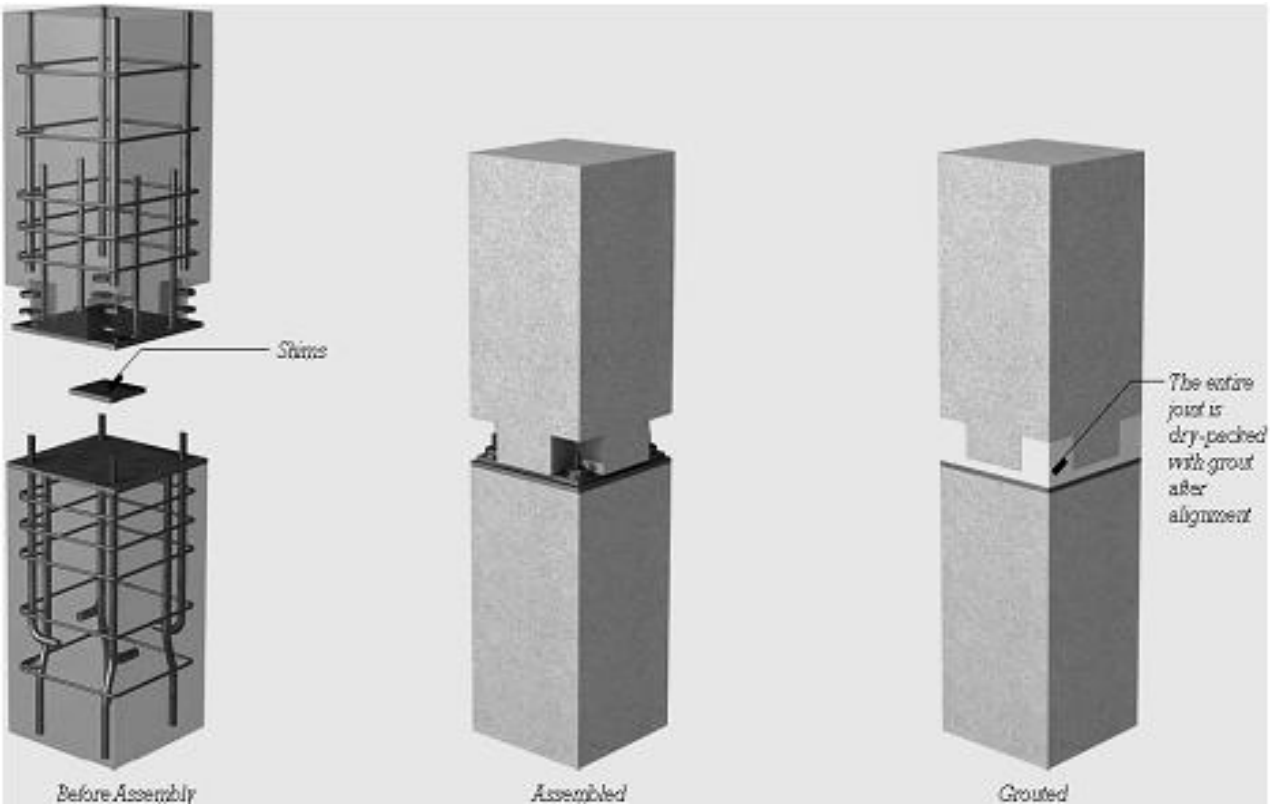

Figure 4.7 Column to Column Connection

4.7.2 Beam

There are 29 types of beams are used in this project and total 33 no of moulds are available on site.

Figure 4.8 Sample of Prefabricated Beam

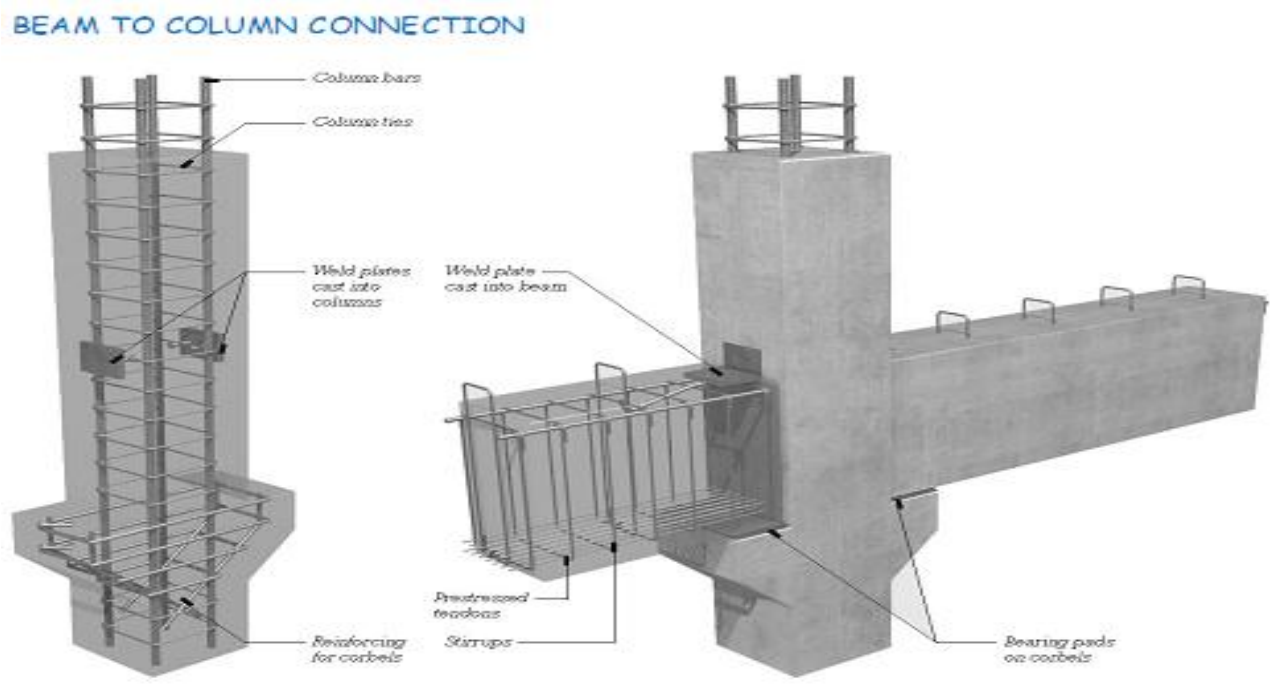

Figure 4.9 Prefabricated Beam Column Connection

4.7.3 Stair Case

Precast staircases are delivered to site ready for installation and can speed up construction schedules to provide safe and immediate routes between floors under construction. Once hoisted into place, the precast stair flight is suitably protected and ready for use.

Figure 4.10 Sample of Prefabricated Stair Case

4.7.4 Lintel and Chajja

Use of precast lintels and chajja speeds up the construction of walls besides eliminating shuttering and centering

Figure 4.11 Sample of Prefabricated Lintel and Chajja

4.7.5 Siporex Slab

Siporex is produced by a highly advanced factory process under the control of chemists and engineers, Siporex products are made either as steel reinforced (panels) or as unreinforced blocks. Panel size is 3.5 meters wide and 600mm deep and thickness 150mm, block size 600mm x 200mm x 100mm. The basic raw materials are sand and cement. The dowel bars for beam, column and reinforcement steel for floor screed is laid on complete floor. The screed of 40 mm thickness is laid on the top of panels with a nominal reinforcement of 8 mm dia @ 230 mm c/c having concrete M25 grade.

Figure 4.12 Sample of Prefabricated Siporex Slab

4.7.6 Precast wall panels

Precast wall panels and claddings are smart substitute for conventional infill blockwork or brick walls. These walls offers superior finish surface, eliminates the plaster and touch ups, facilitate for desired and accurate openings of doors, windows, ventilators etc. These wall panels also improves the overall lateral stability of the structure.

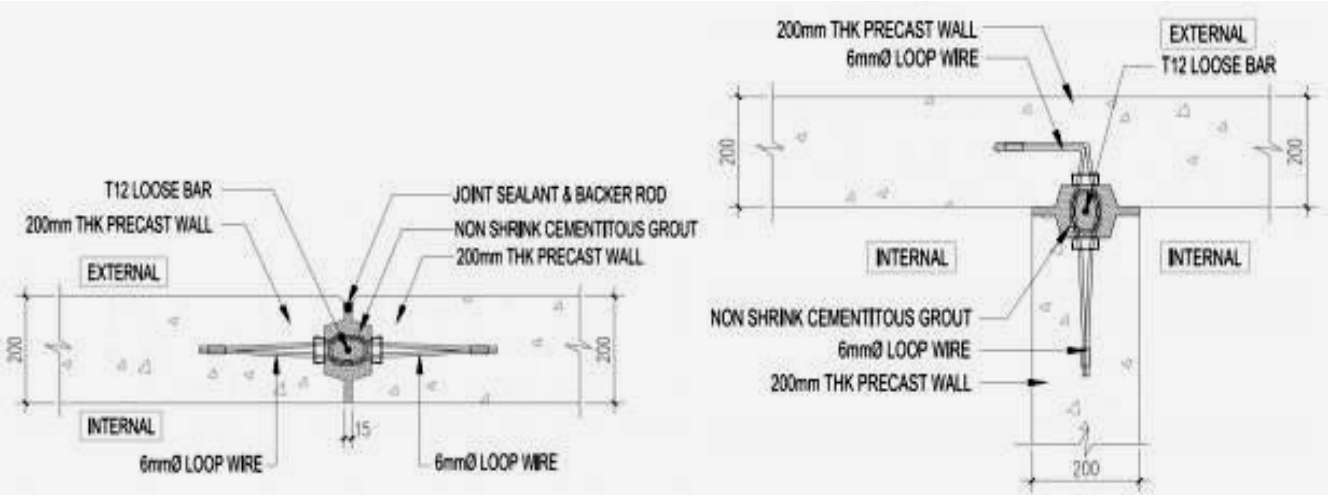

Figure 4.13 Precast wall panels

Figure 4.14 Precast wall panels

III. RESULTS

The similarity between these two conventional and precast constructions is the up to foundation level procedure has been same and time.

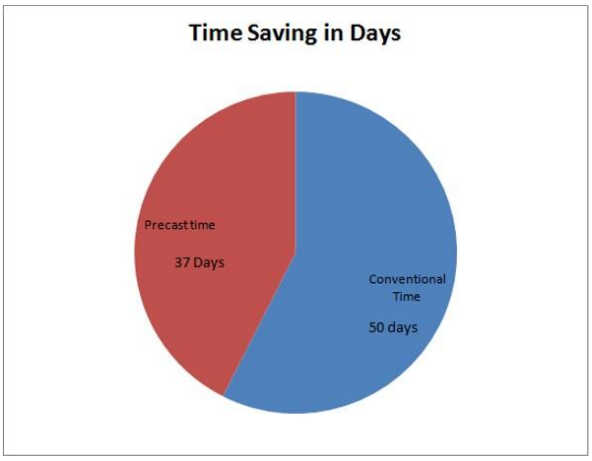

Figure 5.1 Time Saving in Days

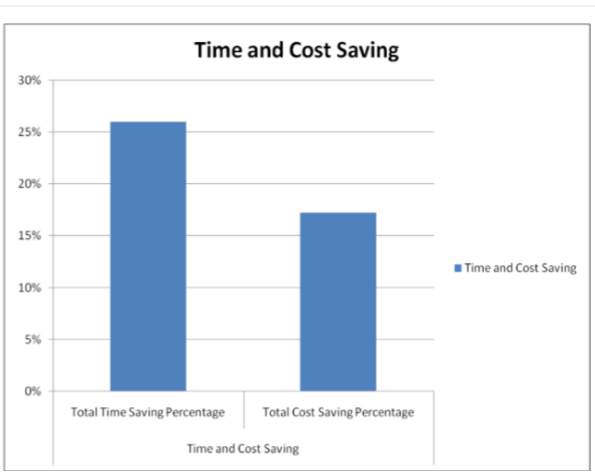

Figure 5.1 Time & cost Saving

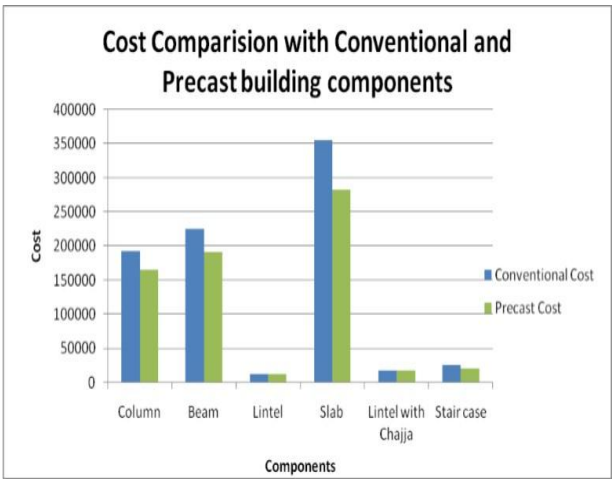

Figure 5.3 Cost Comparison with Conventional & Precast building Component

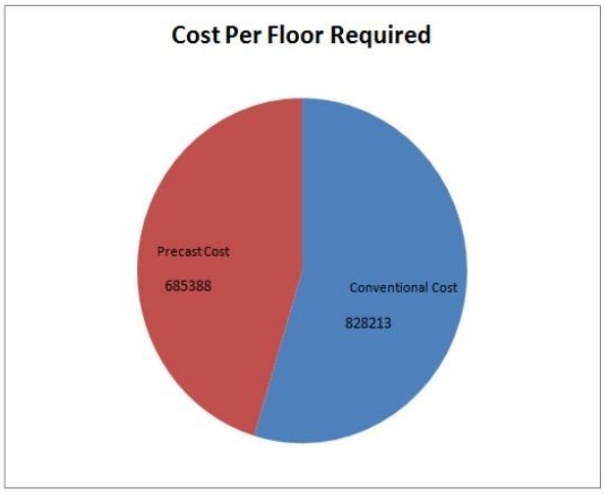

Figure 5.4 Shows Pie Chart shows cost between Conventional & Precast building Component

IV. CONCLUSIONS

The main aim of the research has been accomplished by proposing a cost analysis model for precast technology and comparing the time and cost aspects of precast buildings vs. conventional construction in two live projects. Time savings of 20-35% have been demonstrated using precast technology in comparison to the conventional method of construction. In contrary, cost comparison showed us that there is enormous cost variation when compared to the traditional/conventional method of construction. This analysis and comparison have paved way to identify that there are constraints associated with adoption of precast technology. A questionnaire survey was conducted to collect responses about constraints from all the stakeholders involved with the adoption of precast technology. Respondents have ranked economies of scale, high initial cost, lack of skilled workforce, and leakage issues as the top four constraints. A brainstorming session is conducted with a set of industry experts to propose amicable solutions to the challenges faced by precast technology in its adoption. Experts reviewed and suggested that government or major players have to take the lead in investing in precast manufacturing units thereby supplying precast elements to all the sites so as to utilize the economies of scale to full extent. Taxation is a critical issue owing to double taxation and excise duty.

V. REFERENCES

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