STUDY ON COMPARISON BETWEEN PREFABRICATED AND CONVENTIONAL STRUCTURES

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ABSTRACT

Construction industry is considered as one of the most important industries in India. It is well known that most construction projects are done through conventional technique but prefabrication technique is a new one for the construction industry. The aim of the project is to study the present situation of the precast construction industry in India. Suggestions for improvement of the industry and study on cost effectiveness of precast concrete construction for single and multi-storey residential buildings are to be given. A literature survey was carried out in order to obtain the comparison between the conventional buildings with precast concrete buildings in India and some field visits are conducted to collect data to investigate the current situation regarding precast industry in India. In order to compare the cost of precast and in-situ construction, G+7 storey housing board colony building is considered.

Key words: conventional, comparison, in-situ, precast, Prefabrication.


1. INTRODUCTION

The construction field in India is at a quick rate of development. It gives wide opportunities in India to prefab division. Currently precast solid structures are the propelled development systems accessible around the world. With wide acceptability, the precast solid structure frameworks are turning into a famous decision for development. Precast concrete are accessible in many shape, sizes, including basic components and unreinforced pieces. The prefab business is the spine for the improvement of new thoughts in development business of any nation; Factory structures, private structures and the mechanical township are required for
all intents and purposes by every one of the divisions, either to help the assembling or administrations of any industry.

The material has inherent properties of thermal idleness (permitting a more consistent temperature both in icy and hot locales) and acoustic protection. Everyone realizes that concrete does not burn. It is adequately solid to oppose effects, impacts and natural calamities like earthquakes, tornadoes and floods. The precast solid industry can source an extensive variety of aggregates locally and offer a colossal assortment of hues and visual impacts.

Construction is the creation of housing or housing units utilizing manufacturing plant motorization. The industrial facility setting improves reasonableness through a mix of mass buy of materials, large scale manufacturing get together procedures and the utilization of less talented work. Construction can take one of three structures: pre-assembled parts, secluded housing. The construction of lodging segments, for example, windows, entryways, and cupboards, has for quite some time been a backbone of the development business, minimizing expenses by lessening nearby, high-cost work. Proceeding with advancement in this feature of construction gives a developing scope of development items that may additionally decrease development costs. Particular lodging includes the construction of areas of lodging that are then amassed nearby in this way decreasing nearby work costs. Measured lodging depends on pre-assembled, manufacturing plant delivered, simple to-transport particular units, which limit the cost of generation. Last structures are planned from the back to front utilizing a progression of standard "modules of utilization" and homes made out of these modules can possibly be configured in an assortment of routes, as per the specific prerequisite of the site or customer

1.1. Need of the Study

Purpose of this study is to determine the constraints in introducing prefabrication method of construction in our industry. To evaluate the different methodologies in both the construction. Determine the pros and cons. Suggest improvements to include prefabrication methods.

Isabelina Nahmens et al [1] investigated on UK housing market and their usage of prefabrication. Investigation of past experiences and existing knowledge of prefabrication has allowed several low cost techniques to be summarized. These minimize the initial investment and increase the market value of UK house constructions.

Yingchen et al [2] suggested to choose prefabrication is highly based on experience and familiarity and personal preference rather than rigorous data. Methodical assessment of an appropriate construction method for a concrete project has been found deficient. This paper showcases a tool called construction method selection model. It helps to detect and evaluate the feasibility of a project in prefabrication at early stages.

Krish.RVillaitramani and Dhruv.PHirani [3] reported on deals with the slum clearance in Mumbai city. Benefits, Limitations and case study of mass housing by prefabrication method is successfully done. A review has been carried out in this paper to plan, analyze and design residential building using prefabricated techniques in Mumbai, bearing in mind, the cost of total construction and planning of the building are done in such a way that the maximum area utilization is achieved for minimum space and cost.

N. Dinesh Kumar and P. Kathirvel [4] investigated on the present situation of precast in India. Suggestion for improvement and study of cost effectiveness for single and multi storey building. Literature survey was done between prefabricated and conventional structure. A detailed investigation on both types of construction was done.

Omid Reza and Baghchesaraei [5] interprets that prefabrication systems might have some potential of increased use in future because of their characteristics. This paper clearly deals
with the standardization and customization involved in prefabrication. Standardization and Customization play such an important role in prefabrication construction process. 

Alistair et al [6] suggested that throws light on how there new methods are evolving in selection of material and construction. This new method can improve productivity and quality of work. A New system is introduced termed as industrial building system (IBS). This comparison is done at a site in Thanjavoor. It helps provide an organised body for determining cost of construction.

Prajwal Paudel et al [7] reported on the concept of modular structure, experiments, classifications, necessity of prefabrication and characteristics are explained. It is concluded with discussing in the benefits of prefabrication and rapid growth of this system in last 15 years.

2. METHODOLOGY

2.1. Plan Preparation

Plan preparation is done for the G+7 building to estimate the quantities of conventional and precast constructions. The plan of the building is shown in Fig. 3.1 and 3.2.

Figure 2.1 Details of G+7 building plan in Semmencherry

Figure 2.2 Details of G+7 building plan in vyasarpadi
2.2. Estimation of Quantities
Estimation is used to find out the requirement of the materials for both the constructions. The details of the materials which are used in the construction from the companies were collected. By getting these details we can estimate the quantities of the materials.

2.2. Project Duration
Project duration of the each construction was collected from the site offices and compares the time of completion period by using Critical Path method gives the project duration of precast and conventional construction of the building.

2.3. Cost Analysis
This is the main factor which is considered in the project is to find out the comparison of cost analysis of building for the prefab construction and conventional construction. In this analysis we want to consider the resources of labor, material and machineries.

2.4. Data Collection
In the data collection we can also know the procedures of the construction work and also find out the difficulties of the work. This collection is helpful to find out cost of the project for the both constructions. We also find the project duration of the construction by using these enquiries.

2.5. Estimated Cost of the Conventional and Prefabricated Structures
The cost of the traditional development was computed through the information gathered from ordinary development site, which help to discover the cost of the aggregate task .The sub structure cost is relatively equivalent in the two strategies, the superstructure cost is more in regular than in pre-assembled structure. Completions is likewise somewhat higher in customary. Add up to cost of the working for ordinary development is 5cr and for prefab is 4.7cr.

**Table 2.1 Conventional Building**

<table>
<thead>
<tr>
<th>SL.NO</th>
<th>DESCRIPTION</th>
<th>COST</th>
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<tbody>
<tr>
<td>1.</td>
<td>Sub Structure - (Site cleaning, Earthwork, Foundation, Basement, Soil filling&amp; Consolidation)</td>
<td>1.75cr</td>
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<tr>
<td>2.</td>
<td>Super Structure – (Wall panels framing and Roofing slabs,)</td>
<td>2.25cr</td>
</tr>
<tr>
<td>3.</td>
<td>Finishing Works – (Electrical, Plumbing Painting, Tiling, and Windows, Extra items)</td>
<td>1 r</td>
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<td></td>
<td>Total cost</td>
<td>5cr</td>
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**Table 2.2 Prefabricated Building**

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<tr>
<th>SL.NO</th>
<th>DESCRIPTION</th>
<th>COST</th>
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<tbody>
<tr>
<td>1.</td>
<td>Sub Structure - (Site cleaning, Earthwork, Foundation, Basement, Soil filling&amp; Consolidation)</td>
<td>1.64cr</td>
</tr>
<tr>
<td>2.</td>
<td>Super Structure – (Wall panels framing and Roofing slabs,)</td>
<td>2.11cr</td>
</tr>
<tr>
<td>3.</td>
<td>Finishing Works – (Electrical, Plumbing Painting, Tiling, and Windows, Extra items)</td>
<td>0.94cr</td>
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<tr>
<td></td>
<td>Total cost</td>
<td>4.7cr</td>
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2.6. Estimated Time of the Conventional and Prefab Buildings

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<th>SL.NO</th>
<th>DESCRIPTION</th>
<th>TIME</th>
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<tbody>
<tr>
<td>1.</td>
<td>Sub Structure - (Site cleaning, Earthwork, Foundation, Basement, Soil filling &amp; Consolidation)</td>
<td>88days</td>
</tr>
<tr>
<td>2.</td>
<td>Super Structure – (Wall panels framing and Roofing slabs.)</td>
<td>477days</td>
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<td>3.</td>
<td>Finishing Works – (Electrical, Plumbing, Painting, Tiling, and Windows, Extra items)</td>
<td>240days</td>
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<td></td>
<td>Total cost</td>
<td>605 days</td>
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Table 2.4 Prefabricated Building

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<tr>
<th>SL.NO</th>
<th>DESCRIPTION</th>
<th>COST</th>
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<tbody>
<tr>
<td>1.</td>
<td>Sub Structure - (Site cleaning, Earthwork, Foundation, Basement, Soil filling &amp; Consolidation)</td>
<td>88days</td>
</tr>
<tr>
<td>2.</td>
<td>Super Structure – (Wall panels framing and Roofing slabs.)</td>
<td>208days</td>
</tr>
<tr>
<td>3.</td>
<td>Finishing Works – (Electrical, Plumbing, Painting, Tiling, and Windows, Extra items)</td>
<td>154days</td>
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<td></td>
<td>Total cost</td>
<td>450days</td>
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3. RESULTS AND DISCUSSION

In this Study, we compare the cost and time taken for convention as well as prefabricated construction show them through graphical representation and network diagram

3.1. Comparison Graphs of Cost and Time for Conventional and Prefabricated Structures

Cost for substructure is lesser in prefabricated structures. The cost for superstructure is almost equal in both cases. Finishes shows a difference of about 6 lakhs lesser in prefabricated. The time for the sub structure is almost equal in both prefab and conventional construction. The superstructure in the conventional methods takes 241 days more than prefabricated structure, which helps to reduce the total duration in prefabrication by large extent. Finishes in conventional takes 114 more days than prefabricated structure.

Figure 3.1 Comparison graph for cost
3.2. Comparison Graphs of Total Cost and Time for Conventional and Prefabricated Structures

The total project cost were calculated for both the constructions and shown in the graph. It represents the cost of the prefabrication construction is lower than the conventional construction by a small fraction. The difference in cost of the project difference is around 6% between the prefabrication and conventional construction. This means that the prefabricated structure proved to be economical.

The total project duration were calculated for both construction and shown in the graph. It represents the duration of the prefabrication construction is lower than the conventional construction. The time duration of the project difference is 355 days between the
prefabrication and conventional construction. This contains very low time duration compared to the conventional method for the structure

3.3. Pert Analysis
The program evaluation and review technique, commonly abbreviated PERT, is a statistical tool, used in project management, which was designed to analyze and represent the tasks involved in completing a given project.

3.4. Network Diagrams
Network diagram helps to represent the activities in a sequential form and shows a distribution in time. Theoretical path method (CPM), or critical path analysis (CPA), is an algorithm for scheduling a set of project activities. It is commonly used in conjunction with the program evaluation and review technique

From these figures we can determine the various sequence and order in which the construction activities occurred and also the duration of each activities. The various sequence and paths are taken and the duration of each path possible is found to determine the critical path for both the network diagrams

4. CONCLUSIONS
The fundamental objectives of the work have been accomplished. The aggregate cost and length have been resolved for both prefab and ordinary development. And additionally we had thought about the focal points and detriments of both construction and traditional development by the overview directed. The examination shows there isn't a colossal cost contrast between the techniques (6%), prefab being more temperate in tall structures when contrasted with regular. In the meantime the prefab development diminishes the undertaking length, lessened by 335 days when contrasted with the ordinary. Because of overview we had
realized that the prefab development have more points of interest and obtainment in industrialized, substantial frameworks. Materials that have turned out to be profoundly particular, with specialist vacillations in cost and accessibility, can be accumulated at construction shops or processing plants. Moreover, the institutionalization of building segments makes it workable for development to occur where the crude material is minimum costly. To decide if construction is a decent choice you have to consider.

- Proper cost analysis and planning can help to achieve at an economical estimate for prefab construction. Educating student’s trainers and even labourers more about prefabrication in depth will help provide more trained and educated work force for prefabrication.
- It can also change the conventional mindset of people and accept to try modern construction methods. Use of standardized elements from companies that have variety of options to choose from can help make structure unique.
- One time investment in good quality lifting machines and proper maintenance can help in further savings.

REFERENCES