

A COMPARATIVE STUDY ON PRECAST CONSTRUCTION AND CONVENTIONAL CONSTRUCTION

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Abstract - Construction is an important activity that has to be done very carefully. In present scenario there is a large need for housing. So it has to be completed at some faster rate without affecting the cost. But with the conventional construction the speed cannot be achieved. So we opt for some other methods of construction. Precast construction is one of the method by which the total time of construction can be minimized. Precast construction has its own advantages such as it reduces the construction time; the erection is easy etc. but still in countries like India there is a hesitation to accept the precast technology. So a study is done comparing the conventional construction and precast construction based on time and cost. So, various literatures are studied and the scheduling and estimation is done separately for both the methods of construction and results are obtained based on this comparison. Also a questionnaire is done to analyse the various risks in precast construction and the analysis is done based on several factors that leads to injury. Further a checklist is also prepared so that to ensure safety in precast construction by collecting data from precast office.

Key Words: Precast, Conventional, comparison, risks, checklist

1. INTRODUCTION

Precast concrete is a construction product produced by casting concrete in a reusable mould or "form" which is then cured in a controlled environment, transported to the construction site and lifted into place ("tilt up"). In contrast, standard concrete is poured into site-specific forms and cured on site. Precast stone is distinguished from precast concrete using a fine aggregate in the mixture, so the final product approaches the appearance of naturally occurring rock or stone.

1.1 Objective

The main objective of this project is to find out an optimal construction technique which has a minimal cost and gives a minimum duration of time by doing a comparative study between precast and conventional construction.

- ✓ To compare the cost and time of precast construction vs conventional construction.
- ✓ To determine the type of construction that would reduce the construction cost.

- ✓ To determine the method of construction that would help to finish the construction project in shorter duration.

1.2 Scope

The scope of this study is to compare the conventional construction and precast construction and the results arrived based on the cost and duration of the project.

1. Construction can be done effectively so that the overall construction cost could be saved.
2. The time duration of the project can be minimized in precast construction.'
3. Generally resources wastage is common in construction. The effective construction process reduces the wastage of resources in large amount.

2. LITERATURE REVIEW

Dinesh Kumar et al., (April 2015) conducted a research so as to study the present situation of the precast construction industry in India. In his study two main factors are considered which are cost and time. For this research purpose data collection is done in the form of questionnaire survey and from this survey the present status and scope of precast techniques are known. A residential building is taken for comparing and it includes the preparation of plan, data collection from precast industry, estimation of quantities, and determination of project duration. The comparison showed there is enormous cost difference between the methods, which the precast is very high when compared to conventional on this type of individual houses. The precast construction for individual double storey residential building cost is 13% more than the conventional construction. This is main drawback for precast construction which is not economical to construct in this case. At the same time the precast construction is easy to work and reduces the project duration, is reduced by 63 days when compared to the conventional. But in individual houses there are lot of constraints and lack of knowledge its get struggling to implement in our country. At this stage conventional construction is economical and comfortable when compared to the prefabrication construction.

Ninjal M Parekh et al (November 2015), discusses about the importance and scope of recent trends in construction techniques through this thesis. Through his research study comparison is done for various techniques of construction such as conventional construction, precast construction and aluminium formwork system of construction. In this research thesis various factors such as delays, quality, economic impact of accidents, safety etc in a project are considered and evaluated. The delays in project are discussed in detail in this study. In conventional construction project time, cost, quality, safety, economy etc become major constraints whereas in can be eliminated in precast and aluminium formwork. Also Aluminium Formwork System (AFS) identified to be suitable for Indian conditions for mass housing construction where quality and speed can be maintained at a reasonably high level.

Siva Priya et al., (May 2016) carried out this research as the construction industry replacing its method of implementing conventional methodology by various new innovations in the process of construction and selection of materials. This method of construction can increase productivity and quality of work through the use of better construction machinery, equipment, materials, and extensive pre-project planning. This study is essential since there is no organised body. In this research thesis the precast construction and conventional method is compared and it is found that the cost overall cost required for constructing the building using precast concrete method is reduced by 20% when compared to conventional method.

Nuzul Azam Haron et al., (2005) conducted a research in which he compared the conventional system with formwork system. In his study he carried out an questionnaire survey so that to know about the queries related to conventional and formwork system. This survey is conducted to various construction industry professionals and data are collected regarding the survey. According to the reasons given by the respondents, the conventional system is more cost saving as compared to formwork system (IBS) since it provides better negotiation chances so as to obtain the most competitive tender price appropriate to the developer's budget. Also a case study is chosen by them so that to compare the building cost both by conventional system and formwork system. So a four storey school building was chosen as a case study for this thesis. The author concluded that Through the statistical test 't-test' it is shown that there is a significant difference in cost saving for the conventional System as compared to the formwork system (industrialized building system).

Akash Lanke et al., (June 2016) carried out a thesis to analyze the design, cost and time of precast and RCC buildings. Apart from these factors various other minor factors such as speed of construction, quality control, environmental conditions, labor resources, durability, connection, size, shape etc are also considered for the

analysis. The cost and duration are compared as major factors.

One building as a case study and Design the same building as a precast building and Traditional Cast in-situ building. From this analysis It is remarkably seen that the cost of precast building is significantly reduces & duration of construction is also much lesser than traditional method. From all this study we can be conclude that the precast concrete system is economical than conventional cast in place method but still there are some conditions which we have to take care of while using precast, those are quantity of construction, Distance of site from manufacturing unit, Type of building etc.

3. CASE STUDY

For the purpose of comparison and analysis of conventional technique and precast technique a case study is chosen. It is a real time project that is located near Ambattur Dunlop. The building is residential building comprising of stilt plus nineteen floors and each floor has eight flats. Cost estimation and scheduling is done for the same building for both precast construction and conventional construction.

3.1 COST ANALYSIS

The cost of the entire project including labour charges, cost of material in conventional construction is found to be Rs. 24,79,83,764. Whereas in precast construction the total cost for this project is Rs. 25,17,01,966 which includes the cost of casting, transporting and fixing the elements. It was found that the cost of precast construction for this project was found to be higher than the conventional construction by Rs. 37,18,202. It is found that the cost of precast method of construction is only 1.4 percentage higher than that of the conventional method.

3.2 SCHEDULE ANALYSIS

The total duration of the entire project is calculated for both precast construction and conventional construction separately from constructing the substructure to the final finishing. The total duration required for the construction using conventional method of construction is 705 days whereas the total duration in precast construction is only 598 days. After comparison of both the schedule it is found that the precast construction can be completed 15 percentages earlier than the conventional construction.

4. QUESTIONNAIRE SURVEY

A questionnaire is prepared to know about the perspective of different people in the construction industry about the precast construction. A general questionnaire is prepared to know about the general perception regarding the precast construction. Another questionnaire is prepared with the objective to find out which factors are to be given more

importance in both conventional construction and precast construction. The various factors that are considered in the study are type and size of project, location of site, project design, risk factors, planning and design time, construction time, workmanship, availability of labours and equipment, project completion at estimated cost and time, safety requirement, communication, quality control and assurance, aesthetic appearance etc.

The respondents from the construction industry are aware of the precast construction. They know well about the advantages of precast but still they consider conventional construction to be economic.

5. CHECK LIST

A check list is the one which contains a list of things that need to be checked before performing any work. In precast construction a lot of checks need to be done before starting the work. Checks are to be done mainly while erecting, transporting and manufacturing. So data has been collected regarding various checks need to be done in precast construction and a check list is prepared.

6. RISK ANALYSIS

A questionnaire is done to know about the various risks and their level of impact on and off the people on the site. It is prepared based on the factors or conditions that cause injury such as due to heavy lifting, structural collapse, improper barricades and braces, working with heavy equipment etc. The questionnaire was surveyed from various people working in the field of precast.

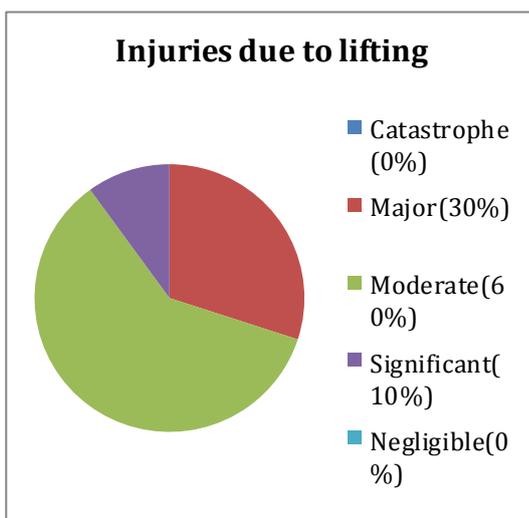


Chart -1: Injuries due to lifting

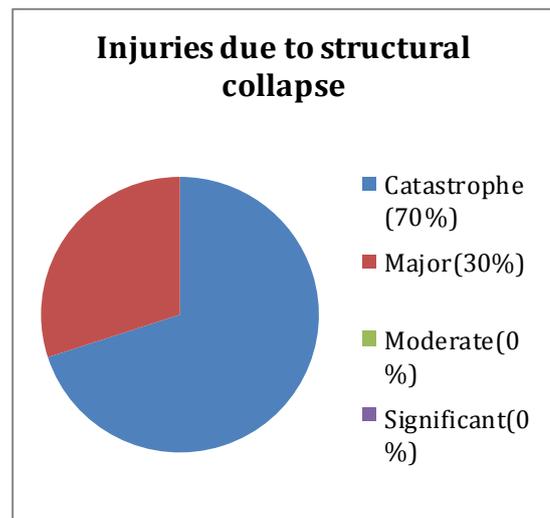


Chart -2: Injuries due to structural collapse

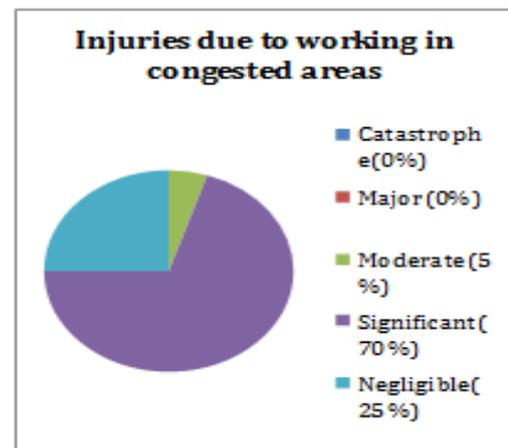


Chart -3: Injuries due to working in congested areas

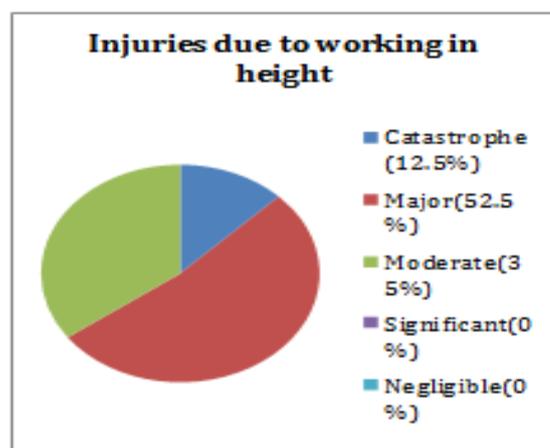


Chart -4: Injuries due to working in height

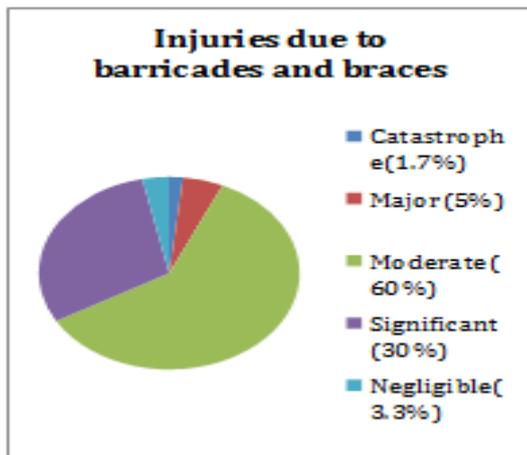


Chart -5: Injuries due to barricades and braces

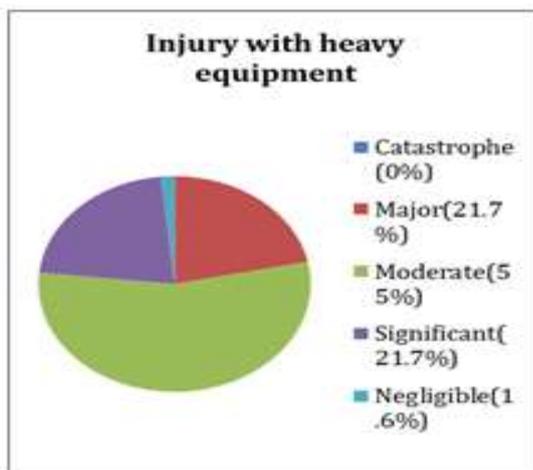


Chart -6: Injury with heavy equipment

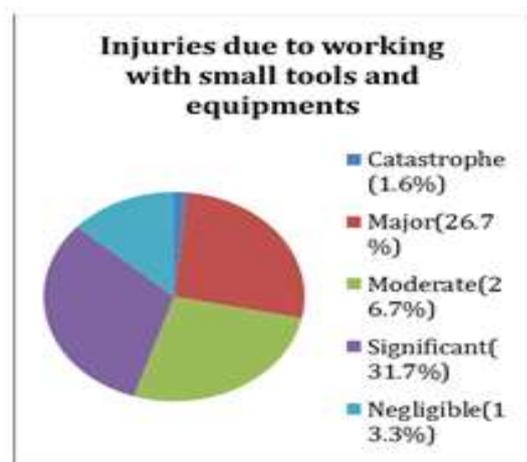


Chart -7: Injuries due to working with small tools and equipments

7. CONCLUSIONS

A comparative study is done for both precast construction and conventional construction. In this study two main factors are considered for the comparative study. They are time and cost. In any construction project time and cost are the most important factors that have to be given more importance. If any delay occurs in the project these are the factors that get affected directly. So in this project comparison is done between precast construction and conventional construction based on time and cost.

For this purpose various literatures are reviewed and the estimation and scheduling is done for both the conventional and precast construction. After comparison it is found that the cost of precast construction is 1.4% higher than that of the conventional construction. The precast construction can be completed at a rate of 15.17% earlier than the conventional construction.

A questionnaire is prepared and analysed for the various risks on precast construction. Charts are drawn to know the impact of injury on various factors in precast construction and they are analysed and the results are provided. Earlier a questionnaire is done to know the importance of precast, so a comparative survey study on conventional and precast is done based on several factors.

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