

# The advancement of precast development in India:A Critical survey of challenges & benefits within the rising residential sector

Abhi K. Rakholiya, Pravin R. Minde

<sup>1</sup>PG Scholar, Dr. Vishwanath Karad MIT World Peace University, Pune, Maharashtra, India

<sup>2</sup>Assistant Professor, Dr. Vishwanath Karad MIT World Peace University, Pune, Maharashtra, India

Corresponding Author: [abhirakholiya321@gmail.com](mailto:abhirakholiya321@gmail.com)

Abhi K. Rakholiya

PG Scholar

Dr. Vishwanath Karad MIT World Peace University,

Survey No. 124. Paud Road, Kothrud, Pune, Maharashtra, India

[abhirakholiya321@gmail.com](mailto:abhirakholiya321@gmail.com)

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## Abstract.

In India, traditional construction processes must be improved by the use of contemporary technologies. For the past fifty years, precast concrete construction technology has consistently provided efficient and improved quality. Modern tools and technologies can improve quality while using fewer resources such as time, money, personnel, and materials. The concept of "built it fast" within the most conservative way has not changed since the beginning; in any case, unused advances have been created to suit present-day world development. We are currently on the cusp of large-scale urbanization, which means we are facing a massive need for housing construction. With a financial development rate of 7.5 percent over the last five years, India is the world's fastest developing nation. Pre-cast concrete development innovation is one such arrangement. Pre-cast innovation, the so-called unusual strategy within the Indian field, can encourage both speed and quality and abuse the preferences that ventures offer in terms of reiterations and volume by creating structural components in a productive work environment with access to specialized abilities and hardware to reduce fetched and time uses on the location while improving the quality and consistency of Pre-cast innovation, the so-called unusual strategy within the Indian field can encourage both speed and quality and abuse the preferences that ventures offer in terms of reiterations. In the industry, pre-cast concrete technologies are now widely used and used. Many countries currently have and deploy thermal, acoustic, and seismic resistant technology, as well as visually beautiful architectural pre-cast facades for structures.

**Keywords:** Project management., Pre-cast construction, Infrastructure sector,

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## 1 Introduction

In the United States of America and many other European countries, pre-cast development has become a typical development strategy. Private Development, on the other hand, Pre-cast concrete has been utilized in India for less than a decade, although it has grown rapidly in the last five years. To stay up with the present trend in the Indian residential market, modern engineers and temporary employees have shifted from general or conventional development to pre-cast. We are currently amid urbanization and are therefore facing a huge demand for housing. The development industry contributes about 10% of the Gross Domestic Production (GDP) of the country, demanding an annual increase of about 9%. To meet this housing need, the nation must build 30 to 35 thousand houses a day for at least another eight years. Staying is a necessary necessity for each person. With the rapidly growing population, and the satisfaction of the aforementioned settlement application, a reliable, rapid, and economical development strategy are considered important by the development industry.

The concept of "building quickly" within a highly secure system has not changed from the beginning; however, modern development is designed to keep pace with today's world developments. Pre-cast concrete construction technology is one of these arrangements. Pre-cast development not only helps contractors and builders build faster and more profitably, but it also helps to reduce development waste and produce high-quality, energy-saving structures that provide long-term advantages to businesses. Nowadays, the application of precast concrete construction is widely used for a superstructure of a building. It will be difficult to meet the growing demand for housing in the country if the building industry does not focus on mechanization and continues to rely primarily on manpower. If properly planned, constructed, and implemented, moving toward large-scale mechanization and new construction technologies like pre-cast concrete construction (PCC) appears to be a viable solution. If PCC is deployed without proper planning and design, and then by inexperienced employees, the benefits will not be completely realized, and many will incorrectly blame the PCC technology. Despite the numerous benefits, precast building project managers strive to avoid any potential dangers. The reasons must be clarified, and the precast management must be improved. It is not only a challenge of putting precast components together, but it also involves some other factors such as module design, production, transportation, and installation.

## 2 Critical findings from Literature

Pre-cast Development is an excellent stage-wise process that involves creating objects in a plant-based environment (according to the required dimensions), moving these objects, setting them up, and assembling them. Pre-cast can be a popular strategy and you can adapt to the planning and implementation process till pre-cast components are transferred as per the plan. The various advantages relate to the pre-cast allocation to the construction site compared to standard or conventional frames. The main points of interest for pre-cast development are reduction of time, reduced waste of building materials, low demand for workers in the area, improved product quality, improved safety in the area, etc. These benefits can assist in increasing effective and efficient transfers.



Fig. 1 Scope of work in precast projects

In many developing countries such as India, the cost of doing business with traditional or conventional strategies is always cheaper than the costs incurred in securing increased development (such as pre-cast) for a variety of reasons such as low-wage industries, need for research and improvement, networking issues, need for stable partnerships. new advances in development, as well as adequate training of staff to work with innovative technologies. This study focuses on categorizing the challenges facing pre-cast design based on system and text-related components, innovation, and discovery-related, resource-related, and user-related variability

The purpose of early development options is to reduce general costs and extend benefits to all stakeholders. Because of this goal, the European nations and the UK have a common sharing of overall 20-25 percent in terms of pre-cast frameworks for development divisions and 40-50 percent share in northern European Nations.

## 3 Methodology

The methodology for this research objectives are to identify opportunities and challenges of the pre-cast industry and are as follows: -

- 3.1. Comparative Study of Pre-cast and Conventional Methods
- 3.2 Cost Comparison
- 3.3 Time Comparison
- 3.4 Productivity
- 3.5 Quality
- 3.6. Challenges that are faced by precast technology's

### 3.1. Comparative Study of Pre-cast and In-situ or Conventional method

The most important element of any concrete structure is quality and its strength. There are many different mixing

techniques such as the standard cast-in-situ method pre-cast construction method. In a cast-in-situ system, the concrete is ready in place, and in the pre-casting method, they are cast in a factory that is away from the location, and then it is transported to the site location for site installation.

Cast-in-situ is the oldest development strategy but has its low-level features and productivity. The quality of the building concrete is the most important factor so that the modern construction era has adopted a continuous set of so-called "pre-cast" methods where quality can be improvised to provide maximum efficiency for any project. The pre-cast method is widely used worldwide these days, due to the level of construction rather than the speed of cast-in-situ construction.

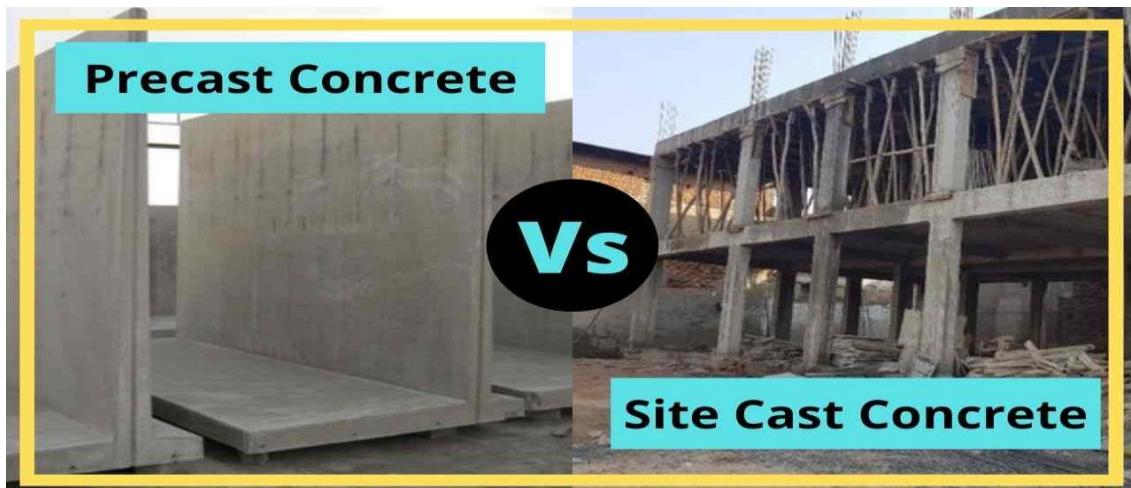


Fig.2 Precast concrete vs. Site cast concrete

### 3.2 Cost Comparison

Quantity-Cost from the drawings and the unit rates which are taken from the plan of rates are utilized to define the charge of amounts for both the ventures (Project). Ventures (Project) considered for this ponder have pre-cast as well as conventional structure of a similar measure. Cost is dissected in terms of the rate per sqft Venture 1(Project 1) may be a private venture with 36,000 square feet for an economically weaker segment and venture 2(Project 2) may be a luxury venture comprising of the estate with 4,500 square feet. Cost (incorporates gracious works and wrapping up works) from the figure appears that pre-cast building caused 16 percent more than that of conventional structure for venture 1(Project 1) and 29 percent more as compared to the ordinary structure for venture 2(Project 2).

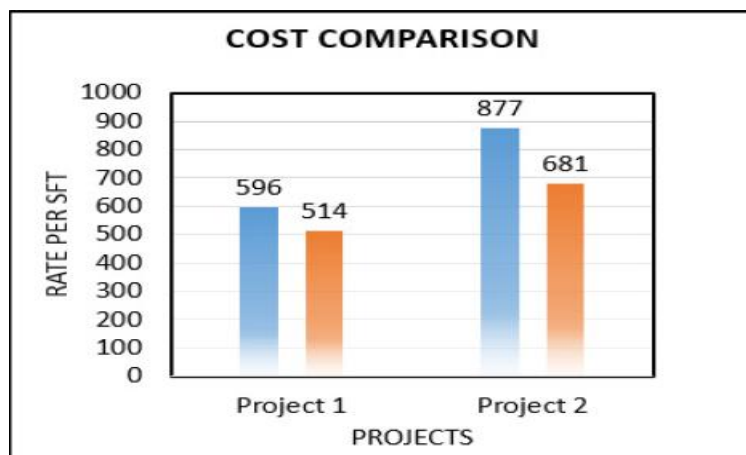


Fig.3 Cost comparison

### 3.3 Time Comparison

Compared to the In-situ streaming strategy, the pre-cast method is less time-consuming because of the fixed objects that are transferred promptly and set on a site that minimizes unnecessary care and equipment usage. This allows for other exchanges to start working faster which accelerates development time and is even more fun with minimal negative influences around them. Cast-in-situ mixing strategy requires time components because concrete requires a minimum of 28 days to obtain 90 percent quality of its complete strength.

In many construction projects, the pace of development and solid construction programs are crucial and often when pre-cast concrete exceeds expectations. To increase pre-cast focus points these two changes should be considered:

- Create a structural design to expand duplication or repetition of pre-cast units.
- Plan development points of interest to maximize the no. of standard pre-cast components.

Pre-installed build time was calculated with information collected from pre-cast producers. The time frame for the completion of the business is divided into three stages – the lower structure, the upper structure, and the finishing works. Where a sub-structure took the same amount of time for situ and pre-cast installation but the upper structure was immediately wrapped in pre-cast, as the walls and slides were built outside the site and were introduced to the site and installed during the project.

Table 1: Total period of Precast Construction

Sr.no.	Description	Duration(days)
1	Sub Structure	21
2	Super Structure	11
3	Finishing Work	30

Table 2 –Total Period for Traditional Construction

Sr.no.	Description	Duration (Days)
1	Sub Structure	21
2	Super Structure	51
3	Finishing Work	53

Precast development takes less time in terms of finishing works than compared to In-situ because the electrical channeling work is already installed in pre-cast components. Plastering work is not required for precast components, which is good in aesthetics and wrapping up.

### 3.4 Productivity

The efficiency of the structure with the pre-caste system is superior to the In-situ framework. The time required to install building materials using precast is relatively short compared to the Cast-in-situ method. Product variability in the pre-distribution method, which means that there are consistent production rates over a certain period.

The loss of performance in the precast method is as small as a result of very few workers in pre-installation construction sites shown. These are the costs incurred in the construction project which are involved in the efficiency of staff. Foundation product of both methods, pre-cast units of objects, and integration of the production characteristics in product production were found out.

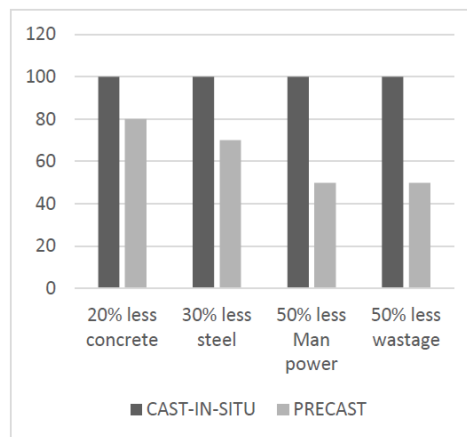


Fig. 4 Benefits of Precast

As we can observe in the above bar chart, It portrays that pre-cast uses 20 percent less concrete, 30 percent less steel, 50 percent less labor, and 50 percent less wastage during construction than that of Cast-in-situ construction

### 3.5 Quality

Technological advances are changing the way business is done in the construction industry. Companies that still use traditional methods in the construction process do not have the opportunity to find success in today's competitive business environment.

Adopting new technologies and approaches to technology is a necessity for corporate success and industry development. Precast concrete solutions can help reduce site-generated waste by up to 50% of building construction compared to the Cast-in-situ way.

A design program that can be used by a manufacturing company is tridimensional modeling software that helps maintain connections between different building elements. Further research on the software will help designers better understand the design and specification of materials that can be produced or transported.

The waste minimization method, therefore, needs to be defined before production and construction on-site can be done

A web-based quality management system can offer many benefits to the precast concrete quality control process. The purpose of this program is to obtain information on production time, transportation, and suspension stages as well as to assess the quality and specificity of pre-made concrete that can control the properties, product sizes, and malfunctions in the production phase. The transport and stopping stages were also preceded by this plan. This helps to understand the precast categories from production, transportation to suspension.

It greatly reduces errors and increases construction speed. Saving time and money is another important benefit. A better-quality control method is available through this program.

### 3.6 Challenges faced by pre-cast technology

A survey was arranged and drifted to all the stakeholders such as architects, experts, engineers, etc. associated with the appropriation of pre-cast innovation. Information obtained from 50 reactions is analyzed for relative importance record and the list of challenges are displayed below

Table 3 Challenges faced

Sr.no	Challenges faced
1	High Investment in factory and economies of scale
2	Skilled Manpower required
3	The additional burden of taxes viz. Excise & VAT
4	Leakage related issue

5	Joint stability Issues during Erection
6	Lack of Standardisation
7	Design changes issues
8	Lack of expertise and technical Knowledge
9	Complex design related issues
10	Scheduling-Lead Time & delivery
11	Standard manuals, schedule of rates
12	Transportation (location related)
13	MEP Services

Most of the respondents have pointed out that the economies of scale, tall beginning speculation, the extra burden of charges, and the need for talented labor are pushing pre-cast innovation to be a financially unviable alternative for adoption in the Indian construction Industry.

### Conclusion

Pre-cast could be a cost and time-saving construction method that guarantees the quality of concrete to its maximum degree. The efficiency of the construction is high and wastes are least. Time savings of 20-35% have been illustrated utilizing pre-cast innovation in comparison to the ordinary strategy of development. Indeed, after being very economical, it has its claim disadvantage as the pre-cast system has not been completely implemented in India and there is less information about this strategy in the Indian construction industry. Being a region with the greater the number of unskilled jobs, the harder it is to do work with heavy equipment without experience to the cost of transporting building materials from factory to various sites varies. Pre-cast costs vary in size of the structure, in small one floor or two floors, very few are the same elements, and construction costs increase due to its unique nature.

India currently has only 2 percent of skilled workers. To introduce pre-cast in India this rate ought to be increased which can offer assistance in assembly the tremendous housing demand utilizing pre-cast. The government needs to come up with clever incentives to help the establishment of concrete plants to avoid any kind of product delays. Even site management is important with improved construction speed and quality assurance and specific specifications. The need for such an acceptance method also requires a certified market to work therefore contractors, suppliers, and managers and requires information on the power of technology in India.

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