

ANALYSIS OF PRECAST & CAST IN-SITU CONSTRUCTION OF THE STRUCTURE

¹Ashish Kumar, ²Prof. Dharmendra Singh
¹Research Scholar, ²Assistant Professor
Department of Civil Engineering
RNTU, Bhopal (M.P), India

Abstract: The development of the construction industry has been increased rapidly with the introduction of new system of construction and new technologies. Pre-cast concrete technology is being used widely by many countries around the world, which is one of the most cost effective and quality monitored system. Due to the protective environment, the quality and efficiency can be monitored and safety can be assured. In order to improve and speed up the construction, division and specialization of the human workforce and interaction between the design and planning phase has to be carried. Although prefabrication is a common method of construction in the U.S. and in many European countries, several countries in Asia are still not familiar with this method. Because those Asian countries have different social and economic systems from the U.S., they tend to use more actual manpower for constructions rather than prefabrication methods. Construction methods that require a lot of physical labour such as masonry, hand paint or cast-in-place concrete are common in India. Because India is an agricultural society, the labour wage for agricultural work in India is much lower than the labour wage for industrial work in the United States. Furthermore, unlike the United States, a lot of countries in Asia including India may have fewer concerns in many important aspects of building construction, such as preciseness, on-site safety, energy saving and waste management during a construction. All these issues can be resolved by prefabrication methods.

India is an infrastructure starved country. With the rise in technology, the construction boom in India is developing at a fast growth rate. It provides a wide spectrum for the introduction of precast concrete building systems to our construction methodology. Though with the second largest population in the world and majority of people earning below poverty line it deals with a shortage of skilled construction workers. Presently, fast track construction is a rapidly growing technique, and the time save in construction would compensate the overall construction cost, making prefab technology widely accepted all over India.

1. INTRODUCTION

Prefabrication plays an important role in the modern world construction of every building today, it refers to the making of parts in an offsite workshop or factory prior to the installation at the site. "The primary purpose of prefabrication is to produce building components in an efficient work environment with accesses to specialized skills

and equipment in order to reduce overall cost and time expenditures on the site while enhancing quality and consistency". Most new construction will have to use more and more prefabrication. From primary structures to small architectural ornaments, prefabrication has become a major part of building construction.

Although prefabrication is a common method of construction in the U.S. and in many European countries, several countries in Asia are still not familiar with this method. Because those Asian countries have different social and economic systems from the U.S., they tend to use more actual manpower for constructions rather than prefabrication methods. Construction methods that require a lot of physical labour such as masonry, hand paint or cast-in-place concrete are common in India. Because India is an agricultural society, the labour wage for agricultural work in India is much lower than the labour wage for industrial work in the United States. Furthermore, unlike the United States, a lot of countries in Asia including India may have fewer concerns in many important aspects of building construction, such as preciseness, on-site safety, energy saving and waste management during a construction. All these issues can be resolved by prefabrication methods.

2. TYPES OF PRECAST STRUCTURE, ELEMENT, CONNECTIONS, SOCIAL CATEGORY AND CASE STUDY

HOUSING STRUCTURE

Housing generally refers to the social drawback of making certain that members of society have a home in which to live, whether this is a house, or not can be a house, or another reasonably dwelling house, lodging, or shelter.

Mass Housing -The design and construction of standardized multiple domestic house-units typically within the same or several geographical locations, executed within the same project scheme and under the same management and contract.

3. TYPES OF HOUSING STRUCTURE ON THE BASIS OF CONSTRUCTION

1. Cast in situ (traditional) construction
2. Prefab construction
3. Partially Prefab construction

CAST IN SITU CONSTRUCTION- The traditional method of building a house is transport bricks, timber, cement, sand,

steel and construction combination, etc. to the site, and to construct the house on site from these materials.

PREFAB CONSTRUCTION- In prefab construction, only the foundations are constructed in this way, while sections of walls, floors and roof are prefabricated in a factory, transported to the site, lifted into place by a crane and grouping them on the building site.

PARTIALLY PREFAB CONSTRUCTION- In partially prefab construction, some prefab elements such as beam, stair, slab, wall or toilet is utilized in the construction.

4. TYPES OF PREFAB CONSTRUCTION

1. Wooden prefab
2. Steel prefab
3. Concrete prefab

WOODEN PREFAB- The structural members are panels and alternative things product of wood.

Production in factory-> work on building site-> completion



Figure 1 wooden prefab
 Source-(Overview of Prefabricated Housing)

STEEL PREFAB--Steel frame contains the most structural members, exploitation wall panels with steel-frame columns and beams.



Figure 2 steel prefab
 Source-(Overview of Prefabricated Housing)

CONCRETE PREFAB-The main structural members are panels and other components. It is used for low-rise housing as well as middle and high-rise housing.

Production in factory -> work on building site -> completion



Figure 5 Concrete prefab
 Source-(Overview of Prefabricated Housing)

Concrete is one in all the foremost ordinarily used items of materials for construction worldwide. Within the past,

concrete was used solely by a cast-in-place methodology. The forged-in place concrete comes during a liquid style of mixed-cement that makes it very straightforward to cast into a desired form. to assist increase its strength, the liquid cement is often mixed with sand and crushed stone before it's poured into a formwork at a construction web site. due to its strength and suppleness, concrete is commonly used as primary material for building structures like beams, columns, and floor slabs.

5. COMPARISON OF CAST IN-SITU AND PRECAST CONSTRUCTION

Table 4 5 Comparison of Cast In-Situ and Precast Construction

S NO	PARTICULAR	CAST IN SITU CONSTRUCTION	PRECAST CONSTRUCTION
1	LIFE OF STRUCTURE	75 YEARS	100 YEARS
2	ANNUAL REPAIR	0.75% PER YEAR	0.3% PER YEAR
3	SPECIAL REPAIRS	Rs/Sqm=1.75 (0-20 YEARS) Rs/Sqm=2.9 (20-40 YEARS) Rs/Sqm=4.05 (ABOVE 40 YEARS)	NIL NIL NIL
4	ENERGY SAVING	NIL	UPTO 30%
5	TIME SAVING	TAKE MORE TIME	TAKE 40-45% LESS TIME OF CAST IN-SITU
6	AT THE END VALUE	2% OF THE INITIAL COST	50% OF THE INITIAL COST

6. CONCLUSIONS

At present India has only 2% of skilled labour. To introduce precast in India this percentage should be increased which can help in meeting the huge housing demand using precast. The government needs to come up with smart incentives to facilitate the establishment of concrete production plants to avoid any kind of productivity delay. Even on-site management is crucial for enhanced construction speed and ensuring quality and exact specification. The need for adoption of such a methodology also needs a guaranteed market to function and thus contractors, suppliers and managers also need to be made aware of the potential of such a technology in India. A study conducted on the perception of clients, contractors and consultants towards pre cast construction technology”, reveals the acceptability and knowledge of this technology in India. However, future studies are called for the establishment of precast concrete construction methodology as the primary mode of construction technique in India.

SCOPE-

In India 50-70% projects are delayed. Because shortage of time, labour and finance. In India shortage of labour and rising the price of labour is the main issue. In India precast concrete housing is the new method of construction. It's required less time and labour for its completion. And it is recyclable. So, after few years importance of this method is more.

REFERENCES

- [1] N.Dineshkumar, P.Kathirvel “Comparative Study on Prefabrication Construction with Cast In-Situ Construction of Residential Buildings” April 2015
- [2] Wajiha Shahzad, Jasper Mbachu and Niluka Domingo “Marginal Productivity Gained Through Prefabrication: Case Studies of Building Projects in Auckland” February 2015
- [3] Krish R. Villaitramani, Dhruv P. Hirani “prefabricated construction for mass housing in mumbai” October 2014
- [4] Wajiha Shahzad, Jasper Mbachu, and Niluka Domingo “prefab content versus cost and time savings in construction projects: a regression analysis” November 2014
- [5]Rinku Taur and Vidya Devi “low cost housing” October 2009
- [6] Ryan E. Smith, Shilpa Narayanamurthy “Prefabrication in Developing Countries: a case study of India” 2008
- [7] Liberato, Antonella, Paolo and Giandomenico “precast vs. cast-in-situ reinforced concrete industrial buildings under earthquake loading: an assessment via pseudodynamic tests” August 2004
- [8]Yat-Hung Chiang, Edwin Hon-Wan Chan, Lawrence Ka-Leung Lok “Prefabrication and barriers to entry—a case study of public housing and institutional buildings in Hong Kong” 2006
- [9] Lara Jaillon, C.S. Poon “The evolution of prefabricated residential building systems in Hong Kong: A review of the public and the private sector” September 2008
- [10] Xiaoling Zhang, Liyin Shen, Yuzhe Wu “Green strategy for gaining competitive advantage in housing development: a China study” August 2010
- [11] Ying Chen, Gül E. Okudan , David R. Riley “Sustainable performance criteria for construction method selection in concrete buildings” October 2009
- [12] <http://www.precastindiainfrastructurespvt.ltd>
- [13] <http://www.amrapaligrouppvt.ltd>
- [14] <http://www.bbcInfrastructurespvt.ltd>
- [15] <http://www.indianprecastfactory.com>
- [16] Belinda Lopez-Mesa*, Angel Pitarch, Ana Tomàs, Teresa Gallego “Comparison of environmental impacts of building structures with in situ cast floors and with precast concrete floors” 29 May 2008
- [17] A. Carbonari a, M. De Grassi a, C. Di Perna b, P. Principi b,* “Numerical and experimental analyses of PCM containing sandwich panels for prefabricated walls”10 August 2005
- [18] A.N. Baldwin a,*, L.Y. Shen b,1, C.S. Poon c,2, S.A. Austin d,3, I. Wong e, “4Modelling design information to evaluate pre-fabricated and pre-cast design solutions for reducing construction waste in high rise residential buildings”11 May 2007
- [19] <http://www.saipreethiprecastbuilder.com>
- [20] <http://www.supercastinfrastructurespvt.ltd>
- [21] <http://www.vmepprecastpvt.ltd>
- [22] <http://www.innovelabuildingsolutionspvt.ltd>
- [23] <http://www.precastbuildconindiapvt.ltd>