

# “Application of Precast Technology In Infrastructure Projects...( A Review)”

Prof . S.B. Kadam<sup>1</sup>, Mr. Savant Pratik Anilkumar<sup>2</sup>

<sup>1</sup>Professor, Civil Engg., Construction & Management, PVPIT Bavdhan Pune.

<sup>2</sup>PG Scholar, Civil Engg., Construction Management, PVPIT Bavdhan Pune.

Date of Submission: 05-06-2023

Date of Acceptance: 16-06-2023

**ABSTRACT:** India is a developing country and its present economy is depend on the firstly on agriculture and secondly on the construction sector. The development of a country’s infrastructure is vital to the growth of its sectors and the overall economy. Considering the rapid urbanization expected in the future, it becomes imperative to analyze the bottleneck of growth in the infrastructure sector. We are in the 21<sup>st</sup> century and where the work or construction should be done with less possible time with good quality to satisfy the client’s requirement. For the speedy construction pre-cast concrete/construction is very important which satisfy the client’s requirement of less time and good quality. The adaptation of precast concrete construction (PCC) technology is limited to infrastructure projects like Metro, Monorail, Bridges, etc. Metro projects are capital intensive public oriented projects and their timely completion is of paramount importance both from economic and convenience to public aspects. Due to cost economics, elevated lines are the first choice for metro corridors, which from land

availability point of view are generally planned along the major city roads. The construction of Metro puts constraints on traffic movement in the construction reach and therefore to reduce the construction time and space, choice of suitable construction methodology becomes more relevant and important in such conditions. As metro projects are generally linear in nature, in-situ construction requires barricading of site by traffic diversion or restrictions over long stretches. Cast-in-situ methodology requires more time & space and hence adds inconvenience to public. From environmental consideration also, cast-in-situ methodology is not a preferred option. Therefore use of precast elements to the maximum extent becomes the natural choice for the elevated metro projects in cities. This paper focuses on importance of Precast Technology In Infrastructure Projects in metro city.

**Keywords:** : Infrastructure growth, rapid construction, Pune Metro, Precast Super structure.

Indian scenario in general and urban areas in particular.

## I) INTRODUCTION:

Precast is the simple technique which consists of production of a structural elements in the proper or in a good environment as well as of require quality then transporting them on the site by suitable arrangement (i.e. on trailers, long trucks) and erecting this elements on proper location as shown in drawing with the help of tower cranes.

Precast construction is a construction product produced by casting concrete in a reusable mold or form which is then cured in a controlled environment, transported to the construction site and lifted into place. By producing precast concrete in a controlled environment (typically referred to as a precast plant/precast Factory), the precast concrete is afforded the opportunity to properly cure and be closely monitored by plant employees. Pre-cast construction is gaining significance in

## II) PROBLEM STATEMENT:

As the infrastructure work are increasing rapidly in metro cities .But due to non availability of land and moving traffic conditions in metro cities the alternative is required for cast in situ construction. The precast Super Structure is one of the best alternatives for this which serves also quality, cost and time parameters

## III) RESEARCH BACKGROUND :

1)VPS Nihar Nanyama,( 2017 ) : This paper finds that 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 In this

paper 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. Authors 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. The team of experts proposed to reduce the additional taxes which are loaded on precast technology to open up the opportunities.

Paper Stated that High-quality stringent checks to ensure that the leakage issues are reduced in the building projects where precast technology is utilized. The skill level of workforce required for implementing precast technology has to be upgraded through effective training programs. One major observation from the research is that cost savings potential can be utilized if the precast technology is adopted to projects where there is scope for huge repetition and standardization. Precast technology shall be a game changer for Indian construction sector.

**2)Rangesh M. Jajodia (2017) :** Authors found that Large amount of land is not required as the major portion of the track is elevated and only 02 stations are atgrade. Paper indentify that the foundation used is mainly pile foundation with 0.8 to 1.0m diameter and cutoff level at 1.5m to 2.0m depth below the existing ground. Various geo-technical investigations are carried out to find the preferred type of foundation, which concluded that cast-in situ RC pile is most suitable. Segmental method of construction is adopted for rapid and effective construction of project.

**3)Ashish Wanve (2019) :** Author point out that the current urban transport arrangement of Pune City which is street based has just gone under pressure prompting longer travel time, expanded air contamination and ascend in number of street mishaps. With anticipated increment in the number of inhabitants in the city fortifying and enlarging of transport framework has expected criticalness. For this reason arrangement of rail-based Metro framework in the city has been considered. The task has numerous positive ecological effects like decrease in rush hour gridlock blockage, sparing in movement time, decrease in air and commotion contamination, lesser fuel utilization, lesser absolute mishaps and so forth with a couple of

negative effect (particularly because of usage period of the undertaking) for which Environment Management Plan has been proposed. Paper stated After analyzing the different choices for execution of Pune Metro Project, it has been suggested that the task ought to be got executed through a SPV on DMRC financing design. Reserach stated that The passage structure has been evaluated dependent on Delhi Metro tolls chosen by the charge obsession council in 2009 properly heightening the equivalent for year 2018. In this way, to assess comes back from the task, the tolls have been updated each second year with an acceleration of 12 % at regular intervals.

**4)David K. (2001) :** Author stated that the first objective of the research was to determine the current state of the art in precast pavement technology worldwide, as well as in the precast concrete and concrete paving industries in general .This was accomplished primarily through a comprehensive literature review. The second objective was to identify possible concepts for a precast pavement. As the amount of literature and experience with precast pavements was very limited, possible concepts were generated primarily through two expert panel meetings on eat the beginning of the project and one near the end of the project. The expert panels consisted of various professionals from transportation agencies, the precast industry, and the concrete paving industry. The third objective of the research was to perform a feasibility analysis on the possible concepts that were generated through the literature review and expert panel meetings. The feasibility analysis examined the possible concepts from the standpoint of design, construct ability, economics and durability. Finally, once a feasible concept for precast pavement was established, the final objective of the research was to make recommendations for future implementation and guidelines for performance monitoring of future precast pavement test sections.

**5)Sandeep Jain (2016):** From this research authors be concluded that precast construction, if designed and executed with thorough planning, has a great potential to respond to new market demands. Further author stated that adopting mix of CIS & factory made precast units wherever required, instead of usually considered 'all precast or no precast' approach offers more benefits in terms of time, cost, and quality. Paper stated that Repetition of precast components is essential in order to meet quantity for cost effectiveness. The adoption of precast compared with traditional

constriction demonstrated significant advantages, such as improved quality control, reduction of construction time, construction waste, dust & noise on site, and labour requirement on site. In addition, it results in higher useful gross floor area which contributed to significant cost benefits. Author found that A considerable reduction in steel factor can be achieved even for seismic zones IV & V. It becomes easy to perform non-destructive testing (NDT) if the need arises and becomes easy to mitigate. Precast has evolved towards the use of non-standard design approach with modular elements optimising site opportunities & constraints. For commercial construction and other standard products like boundary wall etc. precast has unprecedented benefits. Precast technology allowed for flexible design and longer clear spans in the non-tower areas like parking. Precast is smart way to achieve the sustainability objectives of Green Building.

**6)Shubham D. (2019) :** Author find that prefabrication construction technology generates less waste on site because building elements are cast in the warehouse and then transported to the site for final erection and installation. Therefore, saving in time as well as money is achieved. Further paper stated that it is remarkably seen that the cost of building constructed using prefab technology is significantly less and duration of construction is also much lesser as compared to traditional method. The prefab construction method helps in reducing the adverse impacts on the environment and offers an environmental friendly construction. Hence, prefab construction technique is much more efficient and sustainable. The better quality control may be achieved if this technology is adopted for repetitive type of works. Author also conclude that the prefab technology is economical than conventional cast in place method, but still there are certain aspects as mentioned earlier which may be taken into consideration while using this technology. The sustainability aspects viz. social, economic and environmental may promote prefab technology as a promising alternative in construction industry.

**7)Anand Kanade (2018) :** Paper finds that most economical and safe section can be achieved by taking numbers of trials with minimum of time. This type of atomization is most useful in all design offices. It could be easily concluded that this option of segmental box girder is more economical compared to conventional precast girders. The dimension of a bridge plays a governing role for the involvement of various loads and there cases

for the designing purpose. For designing any metro railway bridge relevant IRS codes, design basis reports are to be very meticulously followed.

**8)Akash Lanke (2016 ):** Paper finds 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. we have identified that for standard & Repetitive work precast is the best option to choose. In observation the most important thing is to be observed project is in precast construction technique is the time effective it require less time to construct. It requires skilled worker and qualified contractor, Lower initial cost especially for large project. We can achieve better concrete quality control and lighter concrete unite. The main limitation of precast is transportation from place of manufacturing to place of site where it is to be fixed.

**9)Harshit Soni (2017) :** This research stated that The physical barrier caused by the realization of an elevated system is also less than that of a metro system at ground level. With Metro Rail construction rapidly growing in our country it is therefore necessary to decide which practices are best selected for its construction. India is facing a serious problem of cost and time overruns due to adoption of poor construction methodologies in infrastructure projects, which is very unfortunate part of the construction industry. Construction of Superstructure in a significant part of elevated viaduct construction and constitutes a major portion of cost, time and resources required for development of the project. Various different construction methodologies are available for construction of both Pier cap and Girder which have been critically evaluated selecting five major parameters for comparison. This document attempts to compare different methods on basis of aforementioned criteria and identify the best possible technique for superstructure construction.

#### IV) CONCLUSION :

- The application of precast concrete construction technology is constantly providing efficient and improvised quality for the last fifty decades.
- Developing countries like India needs to full fill the huge demand of housing, commercial buildings & infrastructure projects.
- The Precast T Beam type superstructure basically saves construction cost only. The

Precast structure is also stronger than Cast in situ. The cast in situ type superstructure is susceptible for corrosion, tensile cracks, etc. Due to heavy reinforcement steel at tensile zone there are chances of honeycombing during Concrete.

### REFERENCES

- [1]. VPS Nihar Nanyama, Riddha Basua, Anil Sawhneyb, Harsh Vikrama, Gourav Lodhaa, "Implementation of Precast Technology in India: Opportunities and Challenges", Science Direct Creative Construction Conference 2017, CCC 2017, 19-22 June 2017, Primosten, Croatia
- [2]. Rangesh M. Jajodia, Prof. K. R. Burkul, "Study of Structural Features of Nagpur Metro", International Journal of Innovative Research in Science, Engineering and Technology. Vol. 6, Issue 11, November 2017.
- [3]. Ashish Wanve, Gaurank Patil, "Constructability & Cost Feasibility Analysis of Pune Metro Rail Project Including Planning & Design Specifications" International Journal of Innovative Research in Science, Engineering and Technology. Vol. 8 Issue 2, November 2019
- [4]. David K. Merritt, B. Frank McCullough, Ned H. Burns, and Anton K. Shindler (2001) Feasibility of Precast Prestressed Concrete Panels for Expediting PCC Pavement Construction", Project Summary Report 1517-S Project 9-1517: Feasibility of Precast Slabs in PCC Pavements
- [5]. Harshit Soni (2017), "Critical Evaluation of Super Structure Construction for Metro Corridor", International Journal of Engineering Technology Science and Research Volume 4, Issue 9 page 210-219
- [6]. Sandeep Jain (2016) "A CASE STUDY ON USE OF PRECAST TECHNOLOGY FOR CONSTRUCTION OF HIGH-RISE BUILDINGS, Reseach Gate
- [7]. Pasquire, C.L & Gibb, A.G.F. Considerations for assessing the benefits of standardisation and preassembly in construction, Journal of Financial Management of Property and Construction, Vol. 7, Number 3, December 2002, pp. 151-161, ISSN: 1366-4387
- [8]. Shubham D. Auti, Dr. Jalindar R. Patil, "Prefabrication Technology - A Promising Alternative in Construction Industry" International Journal of Science and Research (IJSR) Volume 8 Issue 8, August 2019
- [9]. Anand Kanade, "STUDY OF STRUCTURAL ANALYSIS OF PSC BOX GIRDER VIADUCT FOR PUNE METRO" International Journal of Research in Engineering and Technology Volume: 07 Issue: 11 | Nov-2018
- [10]. Akash Lanke, Dr. D. Venkateswarlu, "Design, Cost & Time analysis of Precast & RCC building" International Research Journal of Engineering and Technology, Volume: 03 Issue: 06 | June-2016
- [11]. Mayur P. Choude, Milind M. Darade, "FEASIBILITY STUDY OF METRO RAIL PROJECT IN PUNE CITY", International Research Journal of Engineering and Technology Volume: 06 Issue: 05 | May 2019.
- [12]. ZainalAbidin Akasah, "An Overview of Precast Concrete System for Building maintenance: Malaysian Perspective", International Journal of Engineering Science & Advanced Technology.
- [13]. Yakubu Adisa Olawale, (2010), "Cost and Time Control of Construction Projects"
- [14]. Shweta Rai, Prateek Ghavate, Aug 2013, "Current infrastructure scenario and rise in construction and allied industries in India", International Journal of Science, Engineering and Technology Research (IJSETR) Volume 2.