Literature Review on A Case Study on Mivan Formwork Technology

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Abstract- *This study aims to identify feasibility of MIVAN formwork technology over conventional formwork technology. As considering the growth India, India is well developing and having large population country which requires huge housing and infrastructures projects to gives shelters to the rapidly increasing populations of India. Basically coming to the method or techniques of construction the traditional or conventional method which mostly used in India like timber formwork, steel formwork to give the desire shape to the concrete structures. But its require more time to form structures, more labors, and do not provide proper quality of work. Conventional formwork is proved economical in small housing projects but in large housing projects in which its final cost is became high. So it is necessary to identify new advanced technology which provides ideal requirement of formwork and also giver better results in terms of cost, quality, speed. Among this conditions MIVAN formworks become trend in world wide. MIVAN technology is provide one time pouring of concrete for beam, column, slab and wall which develop box like structure with 7 days working cycle per floor. It is made up of aluminum sheet with light weight and available as per sizes. It is easy to operate and handle, also required less no of labors. Due to lesser no of joints in construction structure has highly seismic resistance against the earthquake waves. MIVAN technology reduce the cost of plastering because it already provides finish surface. It is more used in European countries rather than India but from recent few years, In India most of infrastructure company used in their projects. And most important point the government scheme "Housing for All" by 2022 Which is announced in 2015 by PMAY-U to provide 5 lakh houses to people MIVAN formwork is being used to construct the houses due 250 repetitive use of MIVAN it become highly cost effective construction technique. Our study relates the use of MIVAN Formwork over the conventional formwork.*

Keywords- MIVAN formwork, Advanced constructions process, Conventional formwork, Box construction etc.

I. INTRODUCTION

Formwork is a temporary structure that provides support and containment for fresh concrete until it can stand on its own. It shapes and sizes the concrete while also controlling its position and alignment. Throughout the twentieth century, formworks evolved in lockstep with the rise of concrete building.The advancement of technology, increase of population and the space limitation lead the way to construct high-rise buildings. However, the task was difficult at first, but man has since made it easier by inventing new machinery and procedures. The type of formwork utilised in a high-rise building construction project is the most critical component in terms of cost, quality, and speedThe first formwork type to be used is the conventional type formwork where the timber planks were supported on timber columns. With the advancement of technology, it developed gradually and people used ply wood sheets instead of timber planks and steel pipes with jacks were used to support the ply wood. Then little formworks units were designed to connect the repeating units in the structure. When the same elements are repeated, larger units were devised, such as formworks for slab panels, formworks for columns, beams, and so on. Finally, the entire system of formwork is constructed, which was initially composed of steel and was extremely heavy. The goal was then to minimise the system's weight, therefore formwork materials were expanded to include aluminium, plastic, and fibre glass, among other things. Mivan is a formwork system made of aluminium that was developed by a European construction company. In 1990, the Mivan Company Ltd from Malaysia started the manufacturing of such formwork systems. They now operate more than 30,000 square metres of formwork around the world. There are a number of buildings in Mumbai, India, that were built using the aforementioned approach, which has proven to be quite cost-effective and suitable for the Indian construction environment. Other countries, including Europe, the Gulf States, Asia, and the rest of the world, have made substantial use of the technology. Mivan technology may be used to build a large number of dwellings in a short amount of time by using room-size forms to pour concrete in one continuous pour. Hot air curing / curing ingredients can help to remove forms sooner. This allows for quick building, such as two flats each day. All activities are scheduled in an assembly line fashion, resulting in more precise, well-controlled, and high-quality production at the lowest possible cost and in the shortest possible time. Cast-in-situ concrete wall and floor slabs cast monolithically

supply the structural system in one continuous pour in this type of formwork construction. At the job site, large room-sized forms for wall and floor slabs are built. These forms are meant to be strong and durable, as well as accurate and simple to handle. They allow for numerous repetitions (around 250). The concrete is produced in RMC batching plants under strict quality control and convey it to site with transit mixers. Before the form is concreted, the window and door frames, as well as service ducts, are installed. Flights of stairs, facade panels, chajjas and jails, and so on and other prefabricated items are also integrated into the structure. This proves to be a major advantage as compared to other modern construction techniques. . The construction approach is identical, with the exception that the sub-structure is built using traditional methods. Mivan methods are used to build the superstructure. The combined usage of technologies results in a long-lasting structure.

II. LITERATURE REVIEW

1. **Patil Dhanashri Suryakant and Desai D.B (2013)** Mivan formwork was compared to traditional formwork in terms of cost and effectiveness. The case study for this paper is Godrej Garden Enclave, which was built by Godrej's construction division and Boyce Mfg. Co. Ltd. Different types of aluminium formwork components are also detailed. This formwork comparison research is based on the cost and time parameters.

2. **Mayank Patel, Jayesh Kumar Pitroda and J.J. Bhavsar (2015)** have done a case study on Godrej Garden City located in Jagatpur, Ahmedabad which is constructed by using the Aluminium formwork. In this project two types of Aluminium formwork used which are Kumkang Aluminium formwork and Mivan Aluminium formwork. According to this study, aluminium formwork saves duration and cost of the construction work. Due to light weight of Aluminium formwork is labour friendly and easy to handling. Aluminium Formwork gives better surface finishes so no need of plaster.

3. **Parveen, SaShankar Bimal Banerjee, Pawan Dilip Barhate and Vipul Pradip Jaiswal (2015)** study gives the brief introduction of Mivan technology. This study shows Aluminium formwork load bearing capacity is about 7-8 tonnes per square meter and weigh aroun20 kg per square meter. This mentioned cycle time of aluminium formwork is 7 days per floor. Mivan technology provides high quality construction at reasonable price in short duration.

4. **A. sharmila1, Aaron christober (2016)**Through a literature review and expert opinion, factors influencing formwork selection were found in this study. To learn more about the elements that influence formwork choices in construction projects, a questionnaire study was undertaken on high-rise building construction projects (above G+5). Thirty people responded to the survey. Both the Relative Important Index technique and Microsoft Excel were used to analyse the acquired data. For 30 completed surveys, the top 5 criteria were sorted according to their rank indices. Quality and smoothness of the surface, time factor, lifetime, cost, and safety are the top five factors. A comparative table was created based on these factors, and a decision assistance model was created. This was tested on ongoing and completed projects, and the results were found to be more than 90% accurate. The project is based on this model.

5. **Danish Sadruddin Ansari and Pratik Sudhakar Kudale (2016)** performed comparative analysis of Formwork by Mivan Building and traditional formwork depending on price and time. The case study was conducted in a building of G+21 storeys. The sealed area of Mivan formwork is 8747.28 square feet, while the sealed area of conventional formwork is 9786.67 square feet. For material estimation, this study employs the cubic contents approach and the bar bending schedule formula. Peagasus Properties Pvt. Ltd. conducted this analysis for a project in Hinjewadi Phase 3. According to this study, the cost of construction using mivan formwork is 20-25 percent higher than with conventional formwork. Mivan technique requires 25% less time than traditional methods.

6. **Dr. M.N. Bajad, Rohan P. Shah and Harsh Kumar C. Ughareja (2016)** performed study on the aluminium formwork system. Necessity, advantages and disadvantages of aluminium formwork is also described in this study. This report is based on a comparison study of traditional and aluminium formwork.This study shows that selection of aluminium formwork depends on the project type and project requirements. Aluminium gives high quality of construction and it is cost effective for the mass constructing.

7. **Jignesh Chotaliya and Hiren Rathod (2016)** have compared the Aluminium Formwork and Conventional Formwork system. The cost and time characteristics were used to do the comparison.. In this study shows benefits and disadvantages of the aluminium formwork. Aluminium formwork, according to this study, provides

excellent quality construction at a faster rate and at a lower cost.

8. **K. Loganathan and K.E. Vishwanatahn (2016)** have done a study on cost, duration and quality analysis of different formworks in High-Rise Building. The different formwork, on which the study has been done, are Conventional, Modern Conventional, Steel and Aluminium Formwork. This study mentions the various types of factors for selection of the formwork are duration, repetition, quality, cost, safety, type of structure and maximum load capacity etc. The study has been done on four different companies project which are True Value homes, Sri Dhaksha projects, Gannon Dunkerly & Co ltd and Sri Jay Constructions. According to this study aluminium formwork scrap value is 50%, which is higher than other type formwork. The main disadvantage of aluminium formwork in this study is that it cannot be changed once it has been constructed.

9. **Patil R.S., Pawale, D.B., Tambe H.D., Pawar P.D. and Wakchuare A.V. (2016)** performed a study on Mivan technology using aluminium formwork. This study shows a comparison of cost and time in between the conventional formwork and Mivan Formwork technique. Mivan formwork technique gives more seismic resistance to structure than conventional formwork. Mivan technique has less number of joints which reduces the leakages and increase the durability.

10. **Rabi Das, Indranail Bhattacharya and Raja Saha (2016)** have done comparative study on different type of formwork used in construction industry. The formwork was separated into two types in this investigation. Timber formwork, plywood formwork, steel formwork, aluminium formwork, plastic formwork, and fabric formwork are all types of formwork used in the building industry. Wall formwork, column formwork, beam work, and foundation formwork are all types of formwork used in the building industry. This study shows the striking procedure of formwork. This study estimates the cost savings by using aluminium formwork repeatedly.
11. **Aaqib Majid Khan and Chitranjan Kumar (2017**) Mivan formwork is required in the Indian construction industry. A comparison of conventional and aluminium formwork was conducted. This research covers all aspects of mivan technology. For the comparison of mivan formwork with conventional formwork, various parameters were considered. This study demonstrates that mivan technology provides faster construction, higher quality, smoother finishes, and lower maintenance costs than traditional formwork. The concrete used in mivan formwork is stronger than standard formwork concrete.

12. **Himanshu Rivankar and Akshay Chordiya (2017)** have conducted a comparison analysis of the advantages and disadvantages of traditional lumber and aluminium formwork. The cost, time, and quality of the formworks are among the criteria considered in this study. The numerous sorts of components utilised in aluminium formworks were mentioned in the studies. According to this study, the slab cycle time for aluminium formwork is 10 days, while the slab cycle time for traditional formwork is 21 days. According to this study, the overall cost of a project using Aluminum formwork is lower than when using conventional formwork.

13. **Mitul R., Rokade Nikhil S. Bhor, Aniket K. virkar, Aksah yrode, & Maid Nilesh S. maid (2017)**When the concrete has hardened, the formwork is removed, leaving a solid mass in the shape of the formwork's inner face. Formwork systems are one of the most important variables in influencing the quality, quantity, labour, time, and cost of a building project. The goal of this research is to determine the numerous elements that influence the output of formwork. When it comes to construction projects, the contractor wants to complete the work quickly and profitably, while the client wants to use the structure as soon as feasible.

14. **Miss Renuka Hangarge, Mr. Ashish Waghmare Mr. Shridhar Patil (2017)**In the construction sector, there are various forms of formwork. The information was gathered from many companies in order to compare the cost, length, and quality of various forms of formwork. Aluminum formwork has a higher beginning cost than other varieties, according to the analysis. In terms of duration, production, quality, and repetition For large-scale construction projects, aluminium formwork is a viable option. Aluminum formwork is cost-effective for normal floors since the number of repetitions is great and labour expenses are low when compared to other varieties. At the same time, depending on the project type and floor height, aluminium formwork is ineffective for smaller projects.

15. **Naveen V. Chikkaveerayanavar, Naresh Patil (2017)**As the country's population grows, the task of construction has become monumentally more difficult. As we all know, high-rise building construction is becoming more popular, and the process of constructing big structures takes longer, thus new technology is used to shorten the project's duration and expense. New

technological technologies are being developed for the construction of multi-storied complexes, resulting in cost-effective and quick residential construction.

16. **P. Dinesh, M. Soundararajan (2017)**The goal of this study was to discover the qualitative parameters that influence formwork selection in distinct buildings. Flexibility and adaptability (Fixable Sizes) Formwork should be modular and adaptable to varied structural sizes and shapes so that it can be employed on a variety of projects. Quality & Surface Finish Quality, of structural finish, Availability Formwork should be viable for the particular project depending on cost and availability. Availability of materials and suppliers, cost, structure type, and time factor Faster floor cycles have an impact on formwork selection, as do adaptability, flexibility, quality, cost, and structural type. Time variables also play a part in formwork selection.

17. **Prof. Ashish P. Waghmare, (2017)**Early buildings were created utilising a traditional type formwork method with hardwood planks, runners, and poles for the formwork. With the advancement of technology, plywood has replaced planks, and steel jacks have replaced wooden poles for support. People began to construct housing buildings as the population increased. Buildings were developed employing a modern type formwork approach in the beginning.

III. CONCLUSION

From this case study, virtual survey and comparison analysis of mivan and conventional formwork on different factor such as cost, duration, quality, speed, aesthetics, maintenance etc. which play important role in selection of formwork. So considering these factors following conclusion is done.

- By considering the cost comparison analysis, the initial cost of mivan is high but due to no of repetitions of formwork near about 200-250 the final cost of mivan is lesser than conventional formwork cost. So we can consider that the mivan is more economical than conventional in case of no of repetition in construction.
- Convectional formwork is reuse only 4-5 times so it could not be recommended of high rise building where no of receptions will be required.
- Mivan construction required less labour to access as compare to conventional so it will also help to minimize labour cost.
- Mivan formwork is most efficient than conventional formwork because in mivan formwork the working cycle is 7 days per floor and other had in conventional we required 4-5 month to cast one floor. So form this factor we can conclude that mivan increase the speed of construction.
- After the casting in mivan construction there cannot be possible to made any type of changes in structure.
- In mivan, monolithic casting of the structural member at one pour which saves the appreciable and increase strength and durability of structure.
- In mivan there is no need of plastering so that why it reduces the finishes cost of construction
- De-shuttering in mivan is possible in 2 days where conventional required maximum time for de-shuttering according to structure.
- Due to earlier removal of formwork we can move this formwork to next floor.

IV. ACKNOWLEDGEMENT

I avail this opportunity to express my deep sense of gratitude and whole hearted thanks to my guide **Prof. P. D. Kute** for his inspiration and affectionate encouragement to embark this Project.

I also acknowledge my overwhelming gratitude and immense respect to my Project coordinators and H.O.D. **Dr.M.S.Khedkar** and sincere thanks to principal, **Dr.C.M.Jadhao** who inspired me to achieve this goal. Last but not the least I would like to thank my beloved parent and my friends who helped me directly or indirectly in my Endeavour and infused there help for the success of this seminar.

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