

A Case Study On Mivan Formwork Technology

Prof.R.R.Sarode¹, Prof.S.M.Borle², Abhay Arun Dhande³, Pavan Suresh Bharti⁴, Amol Ganesh Tayade⁵,
Amol Subhash Jaiswal⁶, Prof.A.Ghanamode⁷

^{1,2,7} Assistant Professor, Dept of Civil Engineering

^{3,4,5,6} Dept of Civil Engineering

^{1,2,3,4,5,6,7} Padm.Dr.V.B.KolteCOE,Malkapur

Abstract- *The Mivan Formwork Technology is a revolutionary construction method known for its efficiency and cost-effectiveness in building high-rise structures. This case study delves into its application in modern construction projects, highlighting its benefits and challenges. Mivan Formwork utilizes aluminum formworks that are lightweight, durable, and easily assembled, offering a faster construction pace compared to traditional methods. The system's modular design allows for swift assembly and disassembly, reducing construction time significantly. This speed not only accelerates project completion but also minimizes labor costs, making it an attractive option for developers. Furthermore, Mivan Formwork ensures precision and consistency in concrete placement, resulting in high-quality finishes and structural integrity. Its versatility enables the construction of complex geometries and customized designs, meeting diverse architectural requirements. However, implementing Mivan Formwork requires skilled labor and specialized training, which can pose challenges in regions with limited access to such expertise. Additionally, initial investment costs may be higher compared to conventional methods, although long-term savings are substantial.*

I. INTRODUCTION

In the realm of construction, innovation is the cornerstone of progress. Mivan formwork technology stands as a testament to this axiom, revolutionizing traditional construction methods with its efficiency, speed, and cost-effectiveness. This case study delves into the transformative impact of Mivan formwork technology on the construction industry, showcasing its application, advantages, and implications through real-world examples. Mivan formwork, pioneered by the Mivan Company in Malaysia, is a system that replaces traditional construction methods with aluminum formwork. This system consists of prefabricated modular panels that are assembled on-site to create the desired structure. Unlike conventional formwork, which relies on timber or steel, Mivan formwork offers unparalleled precision and speed in construction while minimizing material wastage. One notable case study highlighting the efficacy of Mivan formwork technology is the construction of high-rise residential buildings in urban areas. Traditional methods often

struggle with the challenges posed by tight schedules, limited space, and high labor costs. However, Mivan formwork technology streamlines the construction process, enabling rapid assembly and disassembly of formwork, thereby significantly reducing construction time and labor expenses. Furthermore, the seamless integration of Mivan formwork technology ensures superior quality and consistency in the finished structure. The precision-engineered panels eliminate errors commonly associated with traditional formwork, resulting in smoother surfaces and tighter tolerances. This not only enhances the aesthetic appeal of the building but also improves its structural integrity and durability.

Moreover, the adoption of Mivan formwork technology fosters sustainability in construction practices. By minimizing material wastage and reducing the reliance on timber, this technology aligns with eco-friendly principles, making it a preferred choice for environmentally conscious developers and contractors.

In conclusion, the case study on Mivan formwork technology underscores its transformative potential in the construction industry. Through its efficiency, precision, and sustainability, Mivan formwork technology exemplifies the future of construction, reshaping skylines and redefining standards worldwide.

II. DETAILS OF CASE STUDY

- PMC: Feedback Infrastructure Services Private Limited.
- Contractor: Simplex Infrastructure Services Private Limited.
- Design Consultant: RSP Design Consultants Private Limited.
- Total Area: 22.123 Acres
- Built up area: 25.55 Lac. Sq. ft.

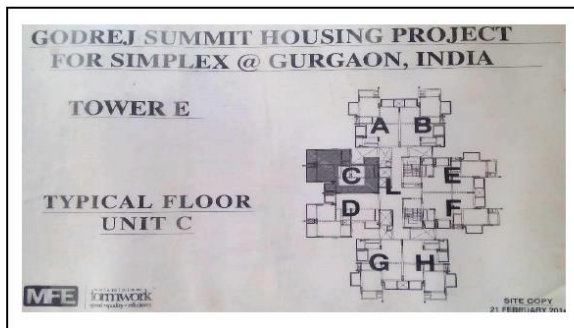


Figure 5.1: Showing the Plan of Tower-E Building

3rd slab – 15 days
 4th slab – 12 days
 5th slab – 9 days
 6th to 18 th slab – 91days (@ 7 days per floor)
 Total – 166 days = 6.38 months considering 26 working days per month.

C. Cost and Time Analysis for Conventional Formwork

Here we considering Tower-E building and approximate cost of conventional formwork (wooden/timber formwork) as 350 Rs. per Sqm.

III. COST AND CONSTRUCTION TIME ANALYSIS FOR MIVAN FORMWORK

A. Cost Analysis of Mivan Formwork

Here we considering Tower-E building and mivan cost as 9,000 per Sqm. without any taxes.

Table 3.1: Table of Shuttering Rate Calculation for Mivan Formwork.

Sr.no.	Shuttering items.	Unit	quantity	Rate in Rs.	Total Rate
1	Column quantity	Sqm	489.75	9,000.00	44,07,750.00
2	Slab quantity	Sqm	487.08	9,000.00	43,83,720.00
3	Chajjas quantity	Sqm	125.01	9,000.00	11,25,090.00
4	Chajjas wall quantity	Sqm	338.49	9,000.00	30,46,410.00
5	Beam bottom quantity	Sqm	108.54	9,000.00	9,76,860.00
6	Beam sides quantity	Sqm	402.57	9,000.00	36,23,130.00
	Total quantity	Sqm	1951.44	9,000.00	1,75,62,960.00

So, 1,75,62,960.00 Rs. that is the one time cost of mivan shuttering. We can use approximately 200 repetitions. So cost would be 87,814.8 Rs.

B. Construction Time Analysis of Mivan Formwork

For slab cycling that totally depend upon availability of workmanship for the shuttering work and we considering 18th floor only. Here we are considering only one tower i.e. Tower-E.

1st slab – 21 days
 2nd slab – 18 days

Table 3.2: Table of Shuttering Rate Calculation for Conventional Formwork.

Sr.no.	Shuttering items.	Unit	Quantity	Rate in Rs	Total Rate
1	Column quantity	Sqm	489.75	350.00	1,71,412.50
2	Slab quantity	Sqm	487.08	350.00	1,70,478.00
3	Chajjas quantity	Sqm	125.01	350.00	43,753.50
4	Chajjas wall quantity	Sqm	338.49	350.00	1,18,471.50
5	Beam bottom quantity	Sqm	108.54	350.00	37,989.00
6	Beam sides quantity	Sqm	402.57	350.00	1,40,899.00
	Total quantity	Sqm	1951.44	350.00	6,83,004.00

Here 6,83,004.00 Rs. is one time cost of conventional formwork (wooden/timber formwork) and for conventional formwork the no. of repetitions is 5. So the cost would be 1,36,600.00 Rs.

IV. CONSTRUCTION TIME ANALYSIS FOR CONVENTIONAL FORMWORK

Here we are considering only one tower i.e. Tower-E for construction time analysis of conventional formwork (wooden/timber formwork).

Table 4.1: Estimate of Time for One Floor of Area of Conventional Formwork

Activity	No of days
Column shuttering	12
Column steel- reinforcement	12
Buffer	12
Beam and slab shuttering	2
Beam and slab steel placing	15
Levelling	12
Concrete placing	3
Removal of formwork	6
Brickwork	15
Plastering	15
Finishing	15
Total	167

So, for 18th floor of Tower-E building the construction time will be 8.4 years approximately by using conventional formwork.

VI. COMPARISON OF MIVAN FORMWORK AND CONVENTIONAL FORMWORK ON DIFFERENT FACTORS

The comparison study is done after the virtual survey on the basis of different factors such as quality, speed, aesthetics, finishes and maintenance etc. as shown in table 6.1 of mivan and conventional formwork. These factors mostly effect on criteria of selection of formwork. This comparative analysis shows the performance of conventional formwork and mivan formwork on different parameters.

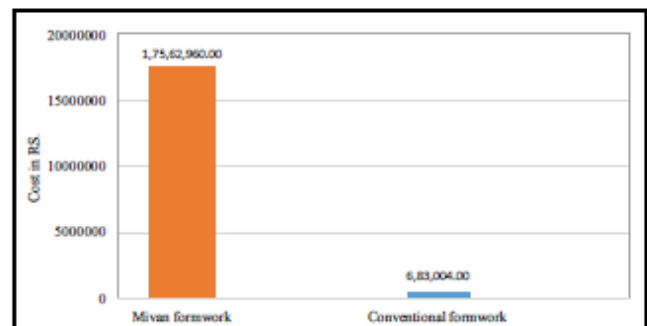
Table 6.1: Comparison of Mivan Formwork and Conventional Formwork.

Factors	Conventional formwork	Mivan formwork
Quality	Normal	Superior
Speed of construction	The pace of the construction is slow due to step-by-step completion of different stages of activities is required. Erection of formwork , concreting and de-shuttering is a 2 week cycle.	In this system, the walls and floor are casted together in one continuous operation in matter of few hours and in built accelerated curing overnight enable removable and reuse of forms on daily cycle.
No of repetitions	4-5	200-250

Aesthetics	In the case of RCC structural formwork of column and beams partition brick wall the columns and beams show unsightly projections in room interiors	The room-sized wall panels and ceiling elements cast against steel plates having smooth finishes and interiors have neat and clean lines without unsightly projections in room interiors.
External finishes	Cement plastered brickwork, painted with cement based paint.	Textured/pattered coloured concrete fascia can be provided which does not need frequent repainting
Useful carpet area as % of plinth area	Efficiency around 83.5%	Efficiency around 8.5%
Consumption of raw material cement	Normal	Consumption is more than that used in conventional structure.
Steel	Less	High
Maintenance	High due to repairs in plaster of wall and ceiling Repainting and leakages dye to plumbing installations.	The walls and ceiling being smooth and quality concrete repairs for plastering and leakages are at all required frequently

V. THE COMPARATIVE COMPARISON ANALYSIS OF INITIAL COST OF MIVAN FORMWORK AND CONVENTIONAL FORMWORK

As shown in graph 5.1 the comparison was done on the basis of estimate prepared for Tower-E Building which is mentioned in case study.

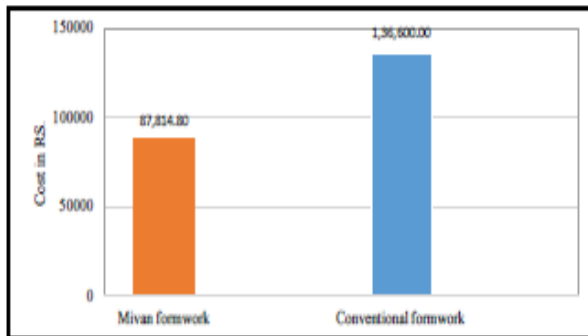


Graph 5.1: Graphical Comparison of Initial Cost of Mivan Formwork and Conventional Formwork

Form above graph, it concludes that the initial cost of conventional formwork is lesser than mivan formwork.

VI. COMPARISON ANALYSIS OF FINAL COST OF MIVAN FORMWORK AND CONVENTIONAL FORMWORK

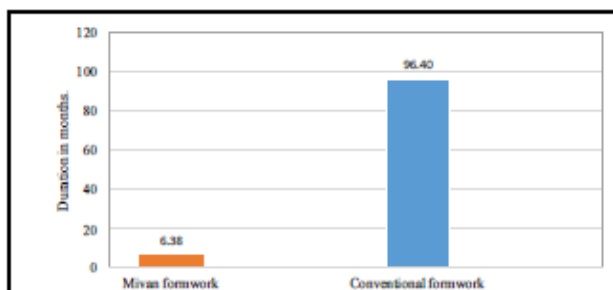
As shown in graph 6.1 the final cost of formwork estimated for Tower-E Building for mivan and conventional formwork in which, mivan formwork cost is comparatively less than conventional formwork because of its maximum no. of repetitions happens. So, mivan formwork is most suitable for this construction.



Graph 6.1: Graphical Comparison of Final Cost of Mivan Formwork and Conventional Formwork

VII. Comparison Analysis of Construction Time Between Mivan and Conventional Formwork

As shown in graph 7.1 the time take by conventional formwork is maximum than the mivan formwork technology. Conventional formwork required 96.4 months as compare to mivan. In this case, mivan is more effective than conventional in term of increasing speed of construction.



Graph 6.3: Graphical Comparison of Construction Time of Mivan Formwork and Conventional Formwork

VIII. CONCLUSION

From the 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.
- Mivan formwork use in construction which help to meet the requirement of affordable housing.
- Mivan technology system is able to provide higher quality construction with respect to economic condition at surprising speed of construction.

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