

Time and Cost Optimization of Construction Project Using Mivan Technology

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ABSTRACT

Construction is one of the significant sectors and integral part of Indian economy. Also, it is of the important parameter in development of country. India is desperately planning for rapid manufacturing and creation of dwelling units for economical construction facilities Formwork enables to cast and construct the important elements and components of any construction facilities, which are required to be strong and effectively handle the structure. Mivan is comparatively a new construction technology upcoming for successful completion of mass project especially repetitive in nature. In this paper we have discussed about cost as well as time comparison of mivan technology with conventional formwork technology. The Mivan technology is appreciably efficient with cost, quality and time saving as compare to conventional one. The basic ideology is to reach a sturdy conclusion regarding the superiority of the two techniques over another.

Keywords – Formwork, MIVAN, Time and Cost optimization, Project

Date of Submission: 09-08-2018

Date of acceptance: 24-08-2018

I. INTRODUCTION

The Mivan Technology System was developed by Malaysian company as a efficient system for constructing the mass housing projects in the developing countries. To be erected by the structural elements many time that to of a repetitive design, the system ensures a fast and economical method of construction. The strong concrete surface finish produced with the aluminium forms allows achievement of a excellent quality wall finish without the need for external as well as internal plastering. This particular system is identified to be very much suitable for Indian conditions for mass structural construction, where quality and speed can be achieved at excellent level that too at economical cost. The speed of construction by this particular system will surpass the speed of most of the other recent construction methods and technologies used.

Mivan is one of the sophisticated-engineered formwork fabricated in Aluminium Monolithic pouring. Walls, columns, slabs & beam are poured together in particular system. The utilization of mivan formwork in the construction industry of India is comparatively very less as to the other developing or developed countries around the globe. The utilization of mivan formwork technology in construction industry has the greater potential. This formwork as an sophisticated construction material but it is also economical in heavy type of construction. This recent method of

construction by this technology can appreciably increase the productivity of construction, built quality and durability of construction work through the use of efficient construction tools, construction materials, and time for construction saving compared to conventional technologies or methods. This technology is one of the recent construction technologies upcoming at the greater speed for the successful completion various construction project across Indian construction industry, especially mass housing project. This particular study is very essential because it can provide the necessary important information on the building total cost and complete duration comparison between the conventional available systems and Mivan building system in Indian construction industry, where economy and time both play very important role.

II. OBJECTIVES

- Quantity estimation of construction material required for building by both MIVAN formwork and Conventional formwork.
- To determine complete time required for completion of the building by both the above methods.
- To compare the cost of buildings based on the cost of materials required in each of them.
- To carry out the comparative analysis between the mentioned two methods of construction and define suitability difference between them.

III. GENERAL SPECIFICATIONS AND COMPONENTS OF MIVAN

The basic elements included in Mivan Formwork are the sets of panels, which are a shear extruded aluminium rail section, fully welded to an aluminium metal sheet. This produces include a sets of completely lightweight panel with an excellent stiffness to weight ratio also yielding minimal deflection under complete concrete loading. These Panels are costumed manufactured in the particular size and shape to suit the complete requirements of specific types of projects. The formwork panels are made from very high strength aluminium alloy with a minimum thickness of 4 mm skin plate and 6mm thick ribbing behind to fully stiffen the panels restricting them from falling apart. These mivan formwork components are very much durable so they can be efficiently used repetitively up to 200 times for the construction projects. With the durability they also are very much light weighted so heavy lifting them is easy thing, the heaviest components is of 25 kg, so that human lifting methods are also possible.

Following are the some of the components that are generally used in the construction projects.

- a) Beam components
- b) Deck components
- c) Wall components
- d) Miscellaneous components

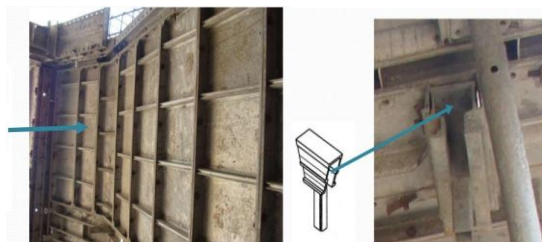


FIG 3.1: Beam side panel and Prop head



Fig 3.2: - Deck Panel

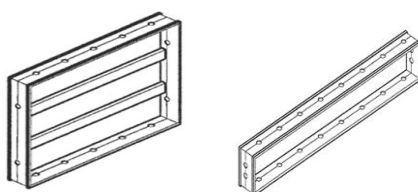


FIG 3.3: - Wall panel and Kicker

IV. METHODOLOGY

• Cubic Contents Method

Cubic Contents Method is particularly used to find the complete volume of the construction activities. In this precise method the length, width and the depth of the construction elements is multiplied to obtain the total quantity of that particular element. In the case of plastering of the surfaces and other surfacing works the complete surface area is found by multiplying the length with the width for which the work is to be done. The rate per unit of the construction work is then multiplied with the total quantity of the work to get the amount required to do the particular work.

This method is more often used for multi-storeyed construction facilities. It is more accurate than the other two methods viz., plinth area method and unit base method of computing. The cost of a construction facility is computed approximately as the total cubical contents i.e. Volume of structure multiplied by the available Local Cubic Rate. The total volume of building is obtained by Length multiplied by breadth and depth or height of the structure. The complete length and breadth are measured out to out of walls excluding the plinth offset of the structure. The complete cost of the string course, cornice, corbelling etc., is neglected.

• Formwork Planning

The complete Formwork planning process is categorized into 3 main stages

In First stage all the necessary information and limiting conditions must be efficiently collected and appropriately defined. When construction projects of the similar nature are being executed, a proper and formatted checklist can be of immense help in obtaining complete information required to prepare a complete pre-plan.

In second stage The formwork system which has to be used in the building the construction facility can be properly selected. In addition to total cost of the materials which has to be used, the choice of the efficient system will be influenced by the experience of the planning team. A complete database that particularly captures the complete experience collected over the number of years can contribute in cost effective system selection.

The third stage involves all engineering related designing tasks. This is most time consuming part of the particular process. One of the important thing is to have the flexibility in the working of system in later stages of the project. The complete emphasis should be on maximum reuse of available materials and procuring minimum materials that to Just-In-Time.

• **Aluminum Formwork System**

The aluminium System is one of the fast, simple, easily adaptable and very cost effective. Aluform is one of the advanced formwork system in which cast in place concrete facility can be efficiently constructed. The system is so fast that have only the 7 to 10 days slab cycle, simple to use easily adaptable and very cost effective as total number of reuses the system is more and that can be around about 150-200 repetitions under various conditions. One can construct all structural components such as slabs, beams, columns, walls, stairs, and window hoods etc. using aluform. The system provides smoother complete wall finish after the Deshuttering of structural eliminates and there is no need of wall plastering as we get direct paint finish surface. One can get Monolithic RCC load bearing construction facility formed by the continuous pouring of concrete in the walls and the slabs in the same operation of construction. Excellent seismic resistant construction facility with considerably greater efficiency and appreciably smooth finish is achieved by using Aluform formwork system. Due to this consistent and excellent concrete shapes and finishes are obtained on each floor of the facility. The prefabricated electrical and plumbing components of good quality are used to increase the overall speed of construction as one knows the exact location and positions of all these components. Panels are kept in position by using simple stup pin wedge system



FIG 4.1: - Construction using mivan technology

V. ANALYSIS AND RESULT

Table 5.1: - Details material used

S R. N O.	CONTE NT	MIVAN	CONVEN TIONAL
1	Concrete grade	M15,M20,M25	M15,M25, M40
2	Thicknes s of wall	140mm,160 mm	160mm,200mm,230 mm

3	Steel	8mm,12mm,16mm	8mm,12mm,16mm,25mm,32mm
4	Slab	130mm	150mm,175mm
5	No of floors	P+7	P+7
6	Floor area	771.92 sqm	771.92 sqm

Table 5.2:- Cost analysis of material per unit

CONT ENTS	CONVE NTIO- NAL BUILDI NG	MIVAN TECHNO LOGY	COST SAVI NGS
Concret ing	1400/sq. m	1505/sq.m	- 105/sq. m
Reinfor cement	1480/sq. m	2115/sq.m	- 633/sq. m
Shutteri ng (Woode n)	Rs. 80/Sq.m	- Rs. 86.67/Sq. m	Rs. 143.33 /Sq.m
(Mild Steel)	Rs. 150/Sq.m		
Brickw ork	Rs. 525/sq.m	0	Rs. 525/sq. m
Plaster	Rs. 1487/Sq. m	0	Rs. 1487/S q.m

• **Total Analysis Of Cost**

Using Mivan technology

Cost of foundation of building = Rs.5000000
 Cost of P+7 floor of area 771.92 Sqm= Rs.42250000
 Total cost of building=Rs.42750000

Using Conventional technology

Cost of foundation of building =Rs.5000000
 Cost of P+7 floor of area 771.92 Sqm=Rs.48250000
 Total cost of building=Rs.48750000

Table 5.3: - Duration using mivan technology

Sr. no	Activity	No. of days
1	All Shuttering	18
2	Conceal electrification & plumbing	18
3	Steel Reinforcement	6
4	Alignment checking	3
5	Buffer time	2
6	Concrete placing	3
7	Removal of Vertical formwork	2
8	Removal of Other formwork	14
9	Lifting of wall panels	2
10	Gypsum plastering & painting etc	30
	TOTAL	98

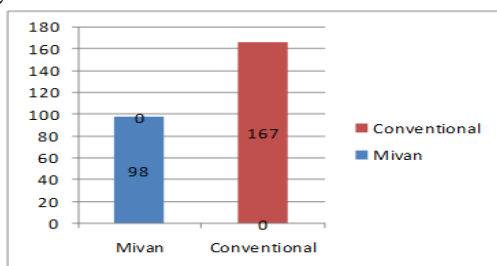
FIG 5.4: - Duration using conventional techniques

Sr. no	ACTIVITY	No. of days
1	Column shuttering	12
2	Column steel-reinforcement	12
3	Buffer	2
4	Beam & slab shuttering	15
5	Beam & slab steel placing	12
6	Leveling	3
7	Concrete placing	6
8	Removal of formwork	15
9	Brickwork	30
10	Plastering	30
11	Finishing	30
	Total	167

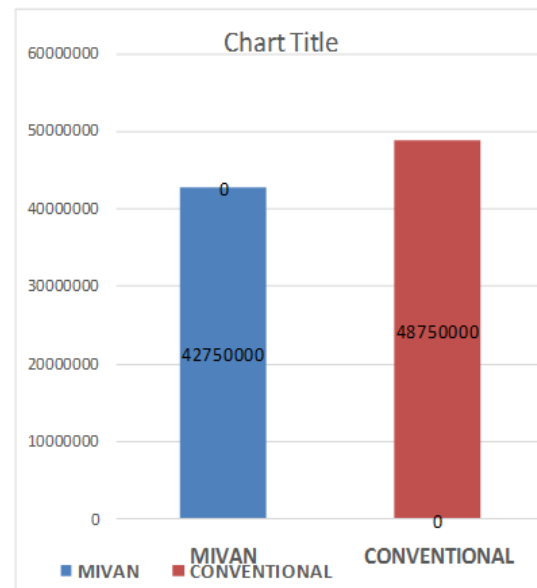
VI. RESULT

Graph 6.1: Comparison of duration

Using the mivan technology the total duration required of finishing P+7 storey building is 98 days and using conventional techniques the total duration required for complication of P+7 storey building is 167 days. So the total time saving is 69 days .



Graph 6.1: Comparison of duration



Graph 6.1: Comparison of cost

Using the mivan technology the total cost of P+7 storey building is Rs.42750000 and by using conventional techniques the total total cost of P+7 storey building is Rs.48750000. So the total cost saving is Rs.6000000.

VII.CONCLUSION

It is concluded that construction facilities built by by using the mivan formwork technology is quite cheaper than the Conventional Method and total cost saving is nearly about 12.5 percent. This technology also enables us in saving considerable amount of time in construction of high rise building. Also, many of the finishing works is saved in using Mivan technology which includes plastering (both internal and external), brickwork etc. Monolithic casting of the structural members at one pour saves appreciable time and increases strength and durability of the structure. The advantages of mivan technology include higher durability of material, uniform quality of construction, low maintenance of formwork system and faster completion of activities. Whereas the drawbacks are high initial cost, structural symmetry is required and requirement of skilled labour at every stage of construction.

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Akshay Gulghane "Time and Cost Optimization of Construction Project Using Mivan
Technology "International Journal of Engineering Research and Applications (IJERA) , vol. 8,
no.8, 2018, pp 70-74