

A Review -Mivan Technology

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ABSTRACT

Several techniques have been used for the speedy construction of high-rise buildings over worldwide. Shuttering materials mainly include materials mainly include timber, steel, plywood, aluminium, fabric, plastic and some insulation material. But each one has own advantage and disadvantage and this delay the completion of projects on time. India is a developing nation and in its development construction industry plays an important role. It contributes a large amount of money to country's Gross domestic product (GDP). India's population continues to grow fairly steadily as the years progress. India is expected to surpass China in coming years. Therefore, in upcoming years huge demand for residential and commercial buildings. So, in order to cope up with the increasing demand clients wants fast track construction with low cost of construction with no compromise with the quality of construction. Formwork accounts for 25 to 30% of total cost of construction and also plays an important role in time required for completion of project. Also, quality of construction is also a factor which depends on formwork. Here we are trying to attempt represent a review paper that will help the upcoming researchers in context to formwork with special reference to Mivan technology.

Keywords – GDP, Conventional Formwork, Cost and Time analysis, MIVAN

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I. Introduction

Formwork also known as shuttering in many countries is a temporary support which is provided to steel and concrete till the time concrete attains adequate strength to withstand its own weight and construction load that may act on it. Formwork is also provided so that concrete achieve desired shape. Choosing a right formwork for construction is as important as choosing right amount of steel and concrete in structural members because formwork for concrete structure has large impact on cost and time. Modern formwork systems include MIVAN Technology, Tunnel Formwork, Climbing formwork, Flex formwork, Heavy duty tower system, Slab formwork and Column formwork system. For residential & commercial projects mostly MIVAN & Tunnel Form is used because of less cycle time as compare to all these form work systems. The scope of study

of this paper is limited to only MIVAN Technology & Tunnel Formwork.

II. Formwork Systems

India's population continues to grow fairly steadily as the years progress. India is expected to surpass China in coming years. Therefore, in upcoming years huge demand for residential and commercial buildings. In context to population one formwork system has been replaced by another formwork systems. Formwork systems classified into Traditional formwork system, Flexible formwork system and Recycle formwork system. Traditional formwork system includes wooden formwork and Metal formwork, Flexible formwork system includes Fabric formwork and digitally fabricated formwork and Recycle formwork system includes sand formwork and Ice formwork (Fig 1).

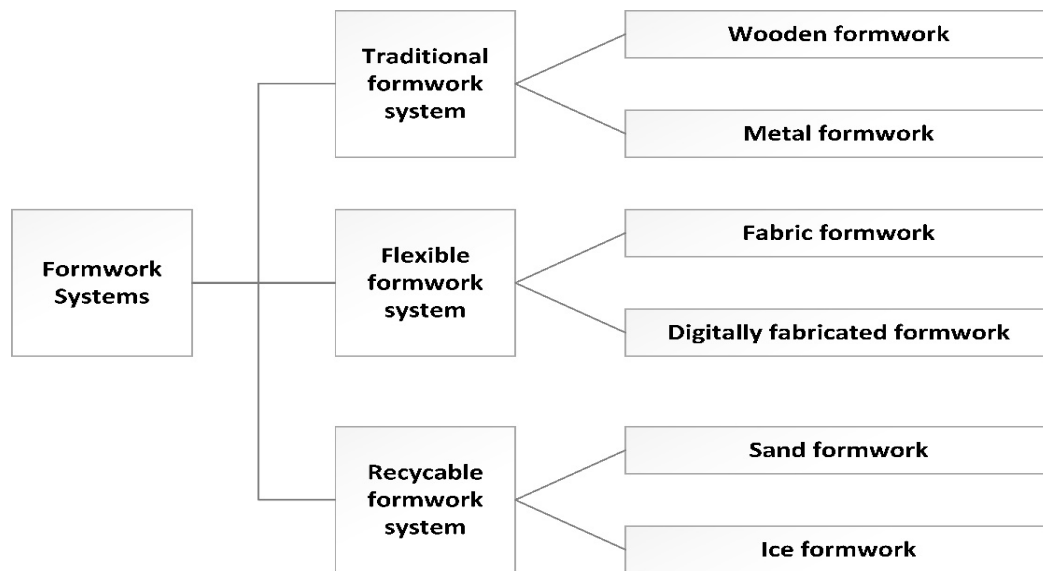


Fig. 1 Classification of formwork systems.

In this paper, a comprehensive review of Metal formwork with special reference to Mivan formwork will be presented, including their materials, characteristics, fabrication technologies and applications.

III. Mivan Technology

MIVAN is an aluminium formwork technology. MIVAN system is formwork construction, cast – in– situ concrete wall and floor slabs cast monolithic provides the structural system in one continuous pour. Large room sized forms for walls and floors slabs are erected at site. These forms are made strong and sturdy, fabricated with accuracy and easy to handle. They afford large number of repetitions (around 250). The concrete is produced in RMC batching plants under strict quality control and convey it to site with transit mixers. Formwork systems for buildings are classified as either horizontal or vertical formwork. Horizontal formwork systems are those used to form the horizontal concrete work slabs or roofs

(Fig.3), while vertical formwork systems are those used to form the vertical supporting elements of the structure, e.g., columns, core walls, and shear walls (Fig.2). Due to the fine tolerances achieved in the machined metal formwork components, consistent concrete shapes and finishes are obtained floor after floor, building after building, confirming to the most exacting standards of quality and accuracy. This allows plumbing and electrical fittings to be prefabricated with the certain knowledge that there will be an exact fit when assembled. The dimensional accuracy at the concreted work also results in consistent fittings of doors and windows. The system of Aluminium forms has been used widely in the construction of residential units and mass housing projects. It is fast, simple, adaptable and cost – effective. It produces total quality work which requires minimum maintenance and when durability is the prime consideration. This system is most suitable for Indian condition as a tailor–made aluminium formwork for cast–in–situ fully concrete structure.



Fig. 2. vertical formwork systems used to form the vertical supporting elements of the structure, e.g., columns, core walls, and shear walls.



Fig.3. Horizontal formwork systems used to form the horizontal concrete work slabs or roofs.

IV. Wall Assembly Details

Mivan aims in using modern construction techniques and equipment in all its projects. On leaving the MIVAN factory all panels are clearly labeled to ensure that they are easily identifiable on site and can be smoothly fitted together using the formwork modulation drawings. All formwork begins at a corner and proceeds from there. The panels are held in position by a simple pin and

wedge system that passes through holes in the outside rib of each panel. The panels fit precisely, simply and securely and require no bracing. Buildings can be constructed quickly and easily by unskilled labour with hammer being the only tool required. Once the panels have been numbered, measuring is not necessary. As the erection process is manually, tower cranes are not required. The result is a typical 4-to-5-day cycle for floor – to – floor construction. One of the principal technical

features which enables this aped to be attained using a single set of formwork panel is the unique V shaped a prop head which allows the 'quick strip' to take place whilst leaving the propping undisturbed. The deck panels can therefore be resumed immediately. Mivan is a system for scheduling & controlling the work of other connected construction trades such as steel reinforcement, concrete placements & electrical inserts. The work at site hence follows a particular sequence. The work cycle begins with the decluttering of the panels. It takes about 12-15hrs. It is followed by positioning of the brackets & platforms on the level. It takes about 10-15hrs simultaneously. The deshuttering panels are lifted & fixed on the floor. The activity requires 7-10 hrs. Kicker & External shutters are fixed in 7 hrs. The

wall shutters are erected in 6-8 hrs One of the major activity reinforcements requires 10-12 hrs. The fixing of the electrical conduits takes about 10 hrs and finally pouring of concrete takes place in these. This is a well synchronized work cycle for a period of 7 days. A period of 10-12 hrs is left after concreting for the concrete to gain strength before the beginning of the next cycle. This work schedule has been planned for 1010-1080 sq m of formwork with 72-25cu m of concreting & approximate reinforcement. The formwork assembling at the site is a quick & easy process. On leaving the MIVAN factory all panels are clearly labeled to ensure that they are easily identifiable on site and can be smoothly fitted together using formwork modulation drawings (Fig.4).

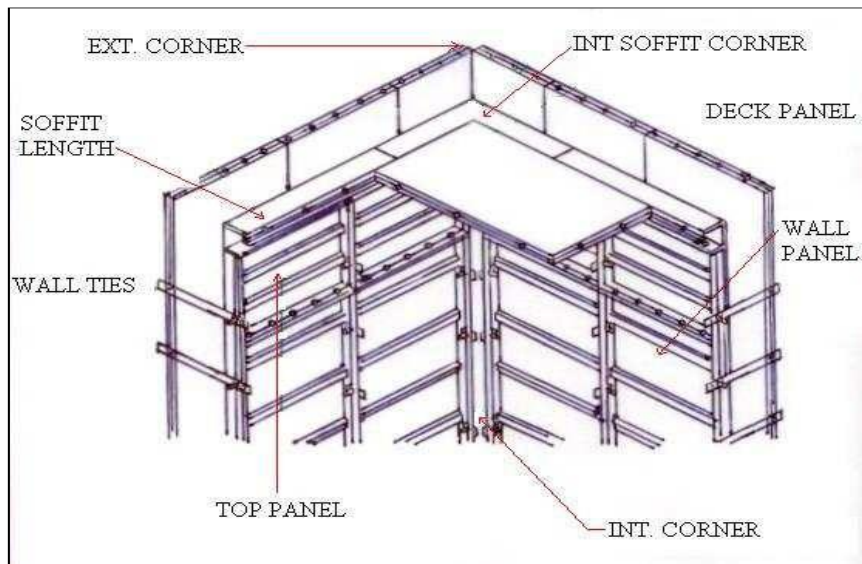


Fig.4. Wall Assembly Details

All formworks have some advantages and disadvantages. Mivan have also but in modern scenario Mivan is the best suitable and acceptable one in both contexts i.e. in time and cost as mentioned in various research papers. Here we are just mentioning/ presenting some literature in summarised way.

1. **A. Sharmila, Aaron Christopher (2016):** in this literature factors affecting selection of formwork were identified through literature study & experts opinion. A questionnaire survey is conducted on high rise building construction projects (above G+5) to find out factors influencing formwork

selection in construction projects. The study received 30 respondents the collected data was analyzed through both Relative Important Index method and Microsoft excel. According to their rank indexes the top 5 factors has been ranked accordingly for 30 completed surveys. The top 5 factors are quality and surface smooth, time factor, lifespan, cost and safety. Based on these factors comparative table was prepared from that decision support model was made. And this was analyzed on ongoing and completed projects it gives more than 90% accurate results. From this model the project managers can select the

formwork easily based on their requirements.

2. **P. Dinesh, Soundararajan (2017):** This study focused on identifying the qualitative factors affecting the selection of the formwork at various constructions. Adaptability & Flexibility (Fixable Sizes) Formwork should be modular and adaptable for various sizes and shapes of the structural system, so that it can be used for many projects. Formwork should be viable for the particular project based on cost and availability, Quality & Surface Finish Quality, of structural finish, Availability Material and supplier availability, Cost, Type of Structure, Time Factor Faster floor cycle is always affects the formwork selection is also adaptability, flexibility, quality cost, type of structure, time factors play major role while selection of formwork.
3. **Prof. R. B. Bajare, Shubham Deshmukh, Ashwin Mahajan, Roohi Karnataki, Indrayani V. Patil. (2017):** The purpose of choosing Mivan Technology over conventional method was the speedy construction, Monolithic homes in landslide prone zone and Strengthened structure in high rainfall intensity area. Due to complexity of reinforcement and less thickness of wall, problems of honeycombing and shear cracks due to mass concreting are observed on sites and also, the problem was identified on other sites too. Therefore, these problems need to be tackled in effective way to ensure quality and safety of structure. These problems can be reduced by improving concrete characteristics to meet the objectives; performed the compression test and slump cone/ flow table test on the concrete using admixture. On site only M25 grade was used as the structure was single story building. But we have tested the M35 and M45 also because the result will be beneficial to multi story building which use the M45 and M 35 commonly and in combinations. Thus, this project concludes that the problem of honeycombing will be reduced and the strength is increased by used of admixture.
4. **Rahul B. Mojidra1, Pinal H. Patel, Vinu R. Patel (2017):** Focused on the seismic design of buildings, reinforced concrete structural walls, or shear walls, act as major earthquake resisting members. Concrete walls are provided for the additional gravity force resistant. The properties of these seismic shear walls dominate the response of the buildings, and therefore, it is important to evaluate the seismic response of the walls appropriately. In these papers conventional, monolithic with external walls structural systems and monolithic with internal wall system for G+ 20, G+ 25, G+ 30 stories was studied with the help of ETABS v 15 analysis and design. Additional Parameters like Lateral displacement, story drift are calculated for both the structures. we concluded that there is drastic improvement in the monolithic structure as compared to conventional structure in term of strength as well as cost.
5. **Naveen V. Chikkaveerayanavar, Naresh Patil (2017):** Discussed on the rise of the population of the country, the task of construction process as monumentally increased. As we all know the construction of high-rise building is becoming a trend and the process of construction of these high-rise building takes more time and hence to reduce the duration and cost of the project advanced technology are adopted. The new advanced technologies are manufactured for the construction of multi stored project which leads to production of cost efficient and speedy construction on residential projects.
6. **Prof. Ashish P. Waghmare, (2017):** Proposed a generalized approach, at early days building were constructed using conventional type form work system where wooden planks, runners, poles were used for the form work. With the development of technology, a tend to used plywood in its place of planks, steel jacks for support instead of wooden poles. Due to increase in inhabitants, people started to construct the dwelling building. At early days buildings were constructed using modern type form work system.
7. **S. Bhargavi pujari, D. B. Bhosale, R. D Shinde. (2018):** Among the total cost of construction a major part is occupied by formwork. Therefore, the cost of construction can be reduced by proper planning of system of formwork to be

used. Usage of Formwork technology has increased extensively in construction industry as it enables faster execution and better results. Indian construction industry has eventually adopted some of the world class formwork technologies which are reasonably economical and easy for operation using semi-skilled labor. These papers aims to save cost invested in construction and reduce the time required for construction by using Kumkang formwork system and show the benefits of the Kumkang formwork system on conventional formwork system. We thus infer that using Kumkang formwork system is cost effective and saves construction time proving better quality of construction.

8. **Bhagirathi Singh, Dr. Pankaj Sing (2019):** Covered every aspect related to conventional and aluminum form of construction. Thus, they infer that aluminum form construction with Conventional formwork, Tunnel formwork, climbing formwork, mivan formwork, slip formwork Tunnel formwork stands to these expectations as it allows a slab cycle within 1 to 3 days and high quality which reduces finishing works. This reduces cost by 40% and time by 60% when compared to conventional formwork.
9. **Rehan Baji, Mayank Gupta (2021),** attempts were made to investigate numerous elements that may influence the selection of advanced equipment, techniques, and materials for accomplishing the following goals: Early completion of structure, cost-effective equipment, technique, or material purchases, lowering the project's direct costs, and producing fewer environmental pollutants in the project's surroundings as a waste product throughout its operation.
10. **Aarti Nanasaheb Kote, Ahanti Nandeshwar (2020),** the cost was discussed. Mivan technology is compared to traditional construction methods. In comparison to conventional technology, Mivan's technology is excellent in terms of cost, quality, and time savings.
11. **Prof. R. B. Bajare, et. al. (2017),** honeycombing, concrete shrinkage cracks, and segregation are examples of problems. To address these flaws,

advancements in concrete characteristics have been made to reduce construction concerns by using aluminium formwork or Mivan Techniques. Cost of capital: \$20,85,000 43,47,500 in total savings Profit: 22,62,500 dollars.

As time progressed, the use of advanced techniques of formwork for construction of structures has gained wide acceptance. In the present competitive market, speed and efficiency are of prime importance; thus, by use of advanced technology, the duration of project is reduced by using latest materials, equipment's and techniques which are effective, durable and intensify the pace of construction.

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