

# Mivan Construction Technology

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**ABSTRACT:** Construction is one of the significant sectors of Indian economy and is an integral part of the development. Today India's urban population is the second largest in the world and its future development leads to increased demand for housing to cope with this problem India should desperately need to plan for acquisition of land and rapid creation of dwelling units. Construction is a complex process involving basically the areas of Architectural planning, Engineering & Construction. There is growing realization today that speed of construction needs to be given greater importance especially for large housing projects. This is not only essential for the faster turnover of equipment and investment leading possible to the reduction in the housing cost but also for achieving the national objective of creating a large stock to overcome shortest possible time. Fortunately, some of the advanced technologies catering to faster speed of construction are already available in the country. For e.g. Prefabrication, autoclaved blocks, tunnel formwork, aluminium formwork (MIVAN Technology) of construction etc. The aluminum formwork system was developed by the Malasiyan Company, which is why the aluminum formwork technology is named after it. Mivan is coming up with new construction technology for the successful completion of the mass housing project in India.

**Keywords:** MIVAN Formwork System, Cost, Quality, Duration, Speed of construction, etc.

## I. INTRODUCTION -

Formwork is defined as temporary structure whose purpose is to provide support and containment for fresh concrete until it can support itself. It moulds the concrete to the desired shape and size and controls its position and alignment. The development of formworks is parallel with the growth of concrete construction throughout the

20th century. The advancement of technology, increase of population and the space limitation lead the way to construct high-rise buildings. But the task was not very easy at the beginning but now the man made the task easy by inventing new machinery and new techniques. The most important factor in terms of cost, quality and speed in a high-rise building construction project is the type of the formwork used in the project. The 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 people invented small units of formworks and connect the repeating units in the construction. The larger units were invented like formworks for slab panels, formworks for columns, beams etc. when the same elements are repeating. Then finally the whole system of formwork is made and initially the material used to it was steel and it was very heavy. Then the aim was to reduce the weight of the system and the materials for formwork have extended to aluminium, plastic, fiber glass etc. Aluminium formwork system provides aluminium formwork for RCC load bearing or RCC framed multi-storied buildings and enables the walls and slabs to be poured in same operation. These increases efficiency and also produces an extraordinarily strong structure with excellent concrete finish. Due to the fine tolerance achieved in the machined metal formwork components, consistent concrete shapes and finishes are obtained floor after floor. This allows plumbing and electrical fittings to be prefabricated with the certain knowledge that there will be an exact fit when assembled. As described by the manufacturers a low-cost system for housing using aluminium formwork. Aluminium formwork system is construction system for forming cast in

place concrete structure of building. It is also a system for scheduling and controlling the work of other construction trends such as steel reinforcement, concrete placement and mechanical and electrical conduits. This type of construction requires a restructuring of the entire conventional construction process to enable interaction between the design phase and production planning in order to improve and speed up the construction. The speed of construction by this system will surpass speed of most of the other construction method.

## II. GENERAL SPECIFICATION & 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 2.1: Beam side panel and Prop head



FIG 2.2 : Kicker



FIG 2.3: - Deck Panel

## III. LOAD ACTING ON FORMWORK -

In Construction, the formwork has to bear, besides its own weight, the weight of wet concrete, the live load due to labour, and the impact due to pouring concrete and workmen on it. The vibration caused due to vibrators used to compact the concrete should also be taken care off. Thus, the design of the formwork is an essential part during the construction of the building.

For the design of planks and joists in bending & shear, a live load including the impact may be taken as 370kg/m<sup>2</sup>. It is however, usual to work with a small factor of safety in the design of formwork. The surfaces of formwork should be dressed in such a manner that after deflection due to weight of concrete and reinforcement, the surface remains horizontal, or as desired by the designer. The sheathing with full live load of 370 kg/m<sup>2</sup> should not deflect more than 0.25 cm and the joists with 200kg/m<sup>2</sup> of live load should not deflect more than 0.25cm.

In the design of formwork for columns or walls, the hydrostatic pressure of the concrete should be taken into account. This pressure depends upon the quantity of water in the concrete, rate of pouring and the temperature.

#### IV. COMPARISON OF MIVAN FORMWORK SYSTEM WITH CONVENTIONAL CONSTRUCTION

The below shows the relative comparison between the Mivan form work system and the conventional system. The comparison is made on the factors such as speed of construction, quality of construction, aesthetics, external finishes and maintenance.

##### Speed of construction

The speed of construction is much slower due to step by step completion of different stages of the activities such as erection of formwork, concreting and deshuttering and thereafter plastering and other finishing activities. This system the wall and the floors are casted simultaneously in one continuous operation and also the finishing work can be started immediately, so the speed of the construction is much faster.

##### Quality

Due to conventional method of construction normal quality is obtained. Superior quality is obtained due to in-situ casting of whole structure and transverse walls done in continuous operation.

##### Aesthetics

In the case of conventional construction the partition walls are made up of bricks due to which the column and the beam show unsightly projections in room interiors.

In case of Mivan system the partition wall and the ceiling elements are casted together due to which the interiors have neat and clean lines without unsightly projections in various corners. The wall and the ceilings also have a smooth even surface.

##### External finishes

All the external walls are made up of bricks, so it requires manual cement plastering which needs to be repainted frequently.

All the external walls are made up of concrete and do not require manual cement plastering and also have smooth finishing, so this will need no frequent repainting.

##### Maintenance

The maintenance cost is too high as it requires frequent repairs of plasters of wall and ceilings, painting of outer and inner walls due to leakages. The maintenance cost is negligible as the

walls and ceiling are made up of high quality concrete which do not require frequent repairs.

#### V. COMPARISON BASED ON TIME –

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 deshuttering of the panels. It takes about 12-15 hrs. It is followed by positioning of the brackets & platforms on the level. It takes about 10-15 hrs simultaneously.

The deshuttered panels are lifted & fixed on the floor. The activity requires 7-10 hrs. Kicker and External shutters are fixed in 7 hrs. The wall shutters are erected in 6-8 hrs. One of the major activity reinforcement 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 72-25 cu 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. All formwork begins from corners and proceeds from there.

The system usually follows a four day cycle: -

**Day 1:** -The first activity consists of erection of vertical reinforcement bars and one side of the vertical formwork for the entire floor or a part of one floor.

**Day 2:** -The second activity involves erection of the second side of the vertical formwork and formwork for the floor

**Day 3:** - Fixing reinforcement bars for floor slabs and casting of walls and slabs.

**Day 4:** -Removal of vertical form work panels after 24 hours, leaving the props in place for 7 days and floor slab formwork in place for 2.5 days.

#### VI. CONCLUSION –

We will be concluding this topic in this seminar in terms of economics, quality, and value analysis.

We have chosen Mivan formwork as our paper topic because of its speed in construction, quality of product and many such things which are very useful for the effective execution of any project.

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