Study Paper on MIVAN Technology

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Abstract: Aluminium Formwork System, a comparatively a new technology in India, saves cost, time and improves the quality of construction. Aluminium Formwork is successfully used in Japan, Singapore and Malaysia for the construction of apartments and buildings, both low high rises. For repetition of building layouts and for above-the-plinth work, Aluminium Formwork system is very cost effective. This is one of the systems identified to be very much suitable for Indian conditions for mass construction, where quality and speed can be achieved at a hight level. The speed of construction of this system will surpass the speed of most of the other construction, to assure quality control and durability. Aluminium Formwork panels can be designed for any condition/ component of building such as bay window, stairs, balconies and special architectural features. This system is unique as all the components in building, including slabs, floors, walls columns, beam, staircase, balconies and window hood, are concrete and there is no need for block works or bark words.

Key Words: —*Study Paper, MIVAN Technology, Construction.*

I. INTRODUCTION

Mivan is basically an aluminium formwork system develope d by one of the construction companies from Europe. In 1990, the Mivan Company Ltd from Malaysia started the manufacturing of such formwork systems. Now a days more than 30,000 sq m of formwork used in the world are under their operation. In Mumbai, India there are number of buildings constructed with the help of the above system which has been proved to be very economical and satisfactory for Indian Construction Environment. The technology has been used extensively in other countries such as Europe, Gulf Countries, Asia and all other parts of the world. MIVAN technology is suitable for constructing large number of houses within short time using room size forms to construct walls and slabs in one continuous pour on concrete. Early removal of forms can be achieved by hot air curing / curing compounds. This facilitates fast construction, say two flats per day.

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All the activities are planned in assembly line manner and hence result into more accurate, well – controlled and high-quality production at optimum cost and in shortest possible time. In this system of 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.

Fig.1. System of formwork construction

II. COMPONENTS OF MIVAN SHUTTERING

2.1 Definition of formwork:

"Forms or moulds or shutters are the receptacles in which concrete is placed, so that it will have desired shape or outline when hardened. Once concrete develops the adequate strength

to support its own weight they can be taken out".

"Formwork is the term given to either temporary or permanent moulds into which concrete or similar materials are poured"

Requirements of a good formwork:

The essential requirements of formwork or shuttering are:

- It should be strong enough to take the dead and live loads during construction.
- The joints in the formwork should be rigid so that the bulging, twisting, or sagging due to dead and live load is as small as possible. Excessive deformation may disfigure the surface of concrete.
- The construction lines in the formwork should be true and the surface plane so that the cost finishing the surface of concrete on removing the shuttering is the least.
- The formwork should be easily removable without damage to itself so that it could be used repeatedly.

Why Aluminium?

Certain aluminium alloys, which are resistant to wet concrete as well as atmospheric corrosion, are used for making aluminium forms. These forms are very similar to steel forms. Aluminium formwork has been developed in recent years because of their lightweight and corrosion resistance. Aluminium panels are generally made with aluminium frames. Lightweight props are made from aluminium alloy tubes.

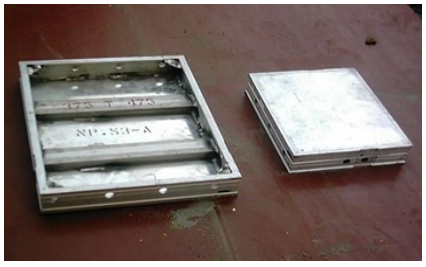

Fig.2. Wall Panel

Fig.3. Rocker

Fig.4. Pins

Table.1. Comparison Between Conventional Formwork and Mivan Formwork

SR. NO.	Factors	Conventional Formwork	MIVAN Formwork	Remark
1	Quality	Normal	Superior. In –situ casting of whole structure and transvers wall done in a continuous operation, using controlled concrete mixer obtained from central batching, mixing plants and mechanically placed through concrete buckets using crane and compacted in leak proof moulds using high frequency vibrators.	Superior quality in "System Housing"
2	Speed of construction	The pace of construction is slow due to step-by-step completion of different stages of activity the masonary is required to be laid brick by brick. Erection of formwork concreting and deshuttering forms is a two-week cycle. The plastering and other finishing activities can commence only thereafter.	In this system, the walls and floors are cast together in one continuous operation in matter of few hours and in-built accelerated curing overnight enable removal and re-use of forms on daily cycle basis.	System Construction is much faster.
3	Aesthetics	In the case of R.C.C. structural framework of column and beams with the partition brick wall is used for construction, the column and beams show unsightly projections in room interiors.	The room-sized wall panels and the ceiling elements cast against steel plates have smooth finishing and the interiors have neat and clean lines without unsightly projections in various corners. Walls and ceilings also have smooth even surfaces, if only need colour/white wash.	
4	External Finish	Cement plastered brickwork, painted with cement-based paints finishing needs painting every in three years	Textured/patterned coloured concrete facia can be provided. This will need no frequent repainting.	Permanent facia finishes feasible with minor extra initial cost.
5	Useful Carpet Area as % of plinth area	Efficiency around 83.5%	Efficiency around 87.5%	More efficient utilization of land for useful living space.
6	Consumption of raw materials	Normal		
	Cement		Consumption somewhat more than that used in conventional structure.	Although greater consumption strength and durability is also more.
	Reinforcing Steel	Reinforcing steel required is less as compared to the in-situ construction as RCC framework uses brick wall as alternative	It may, however will be slightly more than corresponding load-bearing brick wall construction for which, requirements of IS-456 have to be followed for system housing.	Steel requirement is more, as it is required for the shear wall construction. But shear wall construction increases safety against earthquake
7	Maintenance	In maintenance cost, the major expenditure is involved due to: • Repairs and maintenance of plaster walls/ceilings etc.	The walls and ceilings being smooth and high-quality concrete repairs for plastering and leakages are not at all required frequently.	It can be concluded that maintenance cost is negligible.

2.2 Advantages and Disadvantages of Mivan Shuttering

Advantages:

- No plastering required.
- Savings on overhead expenses due to speedy construction (10-15 days per floor).
- Monolithic crack free structures.
- Doesn't require timber or plywood for construction activities.
- Casting of walls and slabs possible simultaneously.

Disadvantages:

Even though there are so many advantages of MIVAN formwork the limitations cannot be ignored. However, the limitations do not pose any serious problems. They are as follows:

- Because of small sizes finishing lines are seen on the concrete surfaces.
- Concealed services become difficult due to small thickness of components.
- It requires uniform planning as well as uniform elevations to be cost effective.
- Modifications are not possible as all members are caste in RCC.
- Large volume of work is necessary to be cost effective i.e., at least 200 repetitions of the forms should be possible at work.

2.3 Construction Technique Of MIVAN

The construction activities are divided as pre – concrete activities, during concreting and post – concrete activities. They are as follows: -

2.3.1 Pre – Concrete Activities:

- Receipt of Equipment on Site – The equipment's is received in the site as ordered.
- Level Surveys – Level checking are made to maintain horizontal level check.
- Setting Out – The setting out of the formwork is done.
- Control / Correction of Deviation – Deviation or any correction are carried out.
- Erect Formwork – The formwork is erected on site.
- Erect Deck Formwork – Deck is erected for labours to work.
- Setting Kickers – kickers are provided over the beam.

After the above activities have been completed it is necessary to check the following.

- All formwork should be cleaned and coated with approved realize agent.
- Ensure wall formwork is erected to the setting out lines.
- Check all openings are of correct dimensions, not twist.
- Check all horizontal formwork (deck soffit, and beam soffit etc.) in level.
- Ensure deck and beam props are vertical and there is vertical movement in the prop lengths.
- Check wall ties, pins and wedges are all in position and secure.
- Any surplus material or items to be cleared from the area to be cast.
- Ensure working platform brackets are securely fastened to the concrete.

III. METHODOLOGY

3.1 Case Study of Amanora Adreno Tower Hadapsar, Pune.

3.1.1 Information About Site

Project Name : Amanora (Adreno) Towers

Owner : AMANORA Park Town

Address : 'Amanora Park town' Amanora Magarpatta Road, Hadapsar,

Pune. PIN: 411 028

Location :

Size of Project : 26.5 lakh sq. ft.

Tower area : 20 lakh sq. ft.

Project Cost : 700 cr INR.

Type of Project : Adreno Residential Towers, 1312 flats

(1BHK,2BHK,3BHK,3.5BHK,4BHK)

Client : City Development Corporation

Architect : P & T Consultants pvt. Ltd. Singapore.

Structural Consultant : J W Consultants LLP. Pune.

Contractor : S J Contracts Pvt. Ltd. Pune. (www.sjcpl.in)

Formwork Company : Hyundai Aluminum Co. Ltd. Korea.

Cycle : 15 Days per floor.

Storey : 32 Storey

Date of starting : March 2017

3.2 Cost and Duration Analysis of Mivan and Conventional Formwork

Comparative study between MIVAN and Conventional Building.

Sr. no.	Contents	MIVAN Building	Conventional Building
1	Concrete grade	M15, M25, M40.	M15, M25, M30, M40.
2	Wall thickness	140mm,160mm,300 mm,. 310mm	100mm,150mm,160mm,200mm, 230mm
3	Steel	8mm,12mm,16mm,25mm ,32mm	8mm,12mm,16mm,25mm.
4	Slab thickness	110mm,130mm,180mm, 200mm.	110mm,130mm,110mm,200mm.
5	No. of. Floors	32	32

IV. CONCLUSION

On the mean point of research are return in this section ensure that abstract and conclusion. should not same graphs and tables should not use in conclusion.

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