

Formwork Techniques in Construction – Case study of EWS Housing Scheme Buildings.

Dr. Mahendra Sonawane¹ Ar. Akshata Yashwant Behere²

¹ Principal, S. B. Patil College of Architecture and Design, Maharashtra, India

² Assistant Professor, S. B. Patil College of Architecture and Design, Maharashtra, India

Corresponding Author: Ar. Akshata Yashwant Behere, a.behere@sbpatilarchitecture.com

Article Information

ABSTRACT

Article history:

Received Jun 10, 2023

Accepted Dec 10, 2023



In today's world of faster growing construction industry formwork systems are being getting more advanced to speed up the construction of a project with respect to time, finance of the complete project, more security safety of the labor during construction. The main objective for any construction project is to get it completed in time by using optimum resources. As there are more advancement and new technology emerging in construction industry the work is becoming easier. New advancement in aluminium formwork system has reduced the time of construction work which results in getting the project complete on-time also it improve the quality of the construction. Aluminium formwork is commonly used for apartments and buildings, these construction can be in lower and higher budget cost.

In this research paper an attempt through a case-study has been made to show how the system of aluminium formwork is used in an EWS (i.e Economically Weaker Sections) housing project. The objective of this case-study was to study the complete project data, construction technique process, reinforcement details, finishing materials used for the project.

Keywords: Aluminium formwork, cost effective, speed.

1. INTRODUCTION

Pimpri Chinchwad Municipal Corporation (PCMC) had implemented EWS housing scheme under JNNURM scheme and constructing 13,250 tenements at Chikhli. It is constructing 6,720 tenements under the first phase at Chikhli.

Location – Near Spine Road, Chikhali, Pradhikaran, Pune

Connectivity – Closest highways are Mumbai-Pine highway and Nashik highway

Financing Details –

- Project was for low income group of people having income less than Rs. 60,000/-
- Central government had funded 5-% of the cost
- State government had funded 30% of the cost
- PCMC (Pimpri Chinchwad Municipal Corporation) + Applicant has to bear 20% of the cost.
- Cost of construction per flat was Rs. 7.75 lakh
- Cost to be paid by the applicant is Rs. 3.35 lakh



Project Details -

- Total number of flats – 6720
- Total number of buildings – 160
- Total number of flats per building – 42
- Total number of flats per floor – 06
- Total number of floors – stilt parking +07
- Built-up area per flat – 500 sq.ft.
 - Hall – 10' x 12'
 - Kitchen – 7.5' x 10'
 - Bedroom – 10' x 10'
 - Balcony
- Amenities provided – Parking, lift, electrification, drainage, water supply, compound walls, landscaping, shops, school and hospitals.
- Type of construction – MIVAN Technology
- Quality concrete used in construction
- Earthquake-proof structure
- Modular Planning

2. Construction Technique used i.e. MIVAN

For the construction of residential units and mass quantity of housing projects the most widely used construction technique is aluminium formwork (MIVAN). This type of construction is more durable, cost effective and fast in construction. The quality of work which is produced after construction is more durable and requires less maintenance.

In India now-a-days this type of aluminium formwork (MIVAN) is more prominently used for faster construction so that the given project is completed on time so as to avoid extra cost overruns, delay in time of project, use of extra resources for construction.

3. METHDOLOGY

The case study done was in the form of questionnaire prepared which were being asked to the Project Manager, Site Engineers, Safety Managers and Labour staff. The following are the prominent questionnaire been asked.

1. What type of construction is used for this project ?
2. How is it beneficial in terms of cost and time of the complete project ?
3. How this technique is different from other type / conventional type of construction ?
4. What are the different components used in the construction ?
5. What are the advantages and disadvantages in this type of construction ?

Modular Formwork and construction process -

The aluminium modular formwork system is engineered precisely. By using this method most of the building element can be built on site like walls, columns, beams, slabs, staircase, balconies etc. The big advantage if this system is the accuracy used while constructing which results in good finished surface. This type of system allows easy installation and removal of the formwork, its flexibility in design allows one to use many cycles while constructing.



Image 3. - MIVAN construction EWS building



Image 4. - Staircase reinforcement and panel support





The aluminium formwork (MIVAN) components used are as follows :

1. Wall Panel which is used for the proper size of the wall to be built.
2. Rocker is the L-shaped supporting member for wall.
3. Kicker acts as a supporting ledge for top wall panels.
4. Stub pins used for joining wall panels
5. Beam side panel is used for casting the beam.
6. Prop head is used for soffit beam its shape is easy for removal of the formwork.
7. Beam soffit acts as a supporting member for beam.
8. For carrying bulk load beam soffit bulkhead is used.
9. For safety of workers & casting, the slab Deck panel is used.

10. Deck prop, deck beam bar and deck mid-beam acts as a supporting member for the beam.
11. For the corner of the junction of beam, column and slab internal and external soffit corner are used.

System of formwork casting –

1. The design of the layout needs to be marked first. All the components which are going to be used needs to be cleaned before using.
2. Reinforcement of all the vertical and horizontal bars to be done of the complete floor plate.
3. Formwork to be placed and erected in proper position and get it checked from the structural engineer.
4. Once all the checking of proper fixing of rebar's and formwork is complete concreting is done for the entire floor plate of the building.
5. After 24 hours all the vertical panel members are removed, other members for beam and slab are removed after 7 days. During this period the curing is also done simultaneously.

Finishing material used –

1. Internal Finish to walls and ceiling - Providing internal cement plaster 20mm.
2. Flooring for all rooms except toilet – The ceramic tile sizes were 30cm x 30cm of RAK / Kajaria manufacturing company
3. Skirting and Dado in Kitchen and Toilets – The ceramic tiles were been laid having sizes of 30cm x 30cm of Kajaria / Nitco manufacturing company.
4. Skirting in Rooms - Skirting is replaced in rooms with 2 coats of oil paint upto skirting height of 100mm from and above the flooring.
5. Kitchen Otta – 30mm thick and 75cm kitchen otta was provided and laid.
6. Steel Windows – Provided and fixed steel window of sizes as mentioned in the drawing having guard bars of 12mm square at 10cm c/c.
7. Door Frame and shutter – Size of 105mm x 65mm having hold fast hinge member. Door size of 1000mm x 2100mm.
8. Terrace Railing - M.S Railing to Balcony upto a height of 600mm, with antirust paint and 2 coats of oil painting.
9. Electrification - Surface type PVC Conduit wiring to all the rooms with switch boards provided at 1200mm height, with required switches and sockets.

4. ADVANTAGES AND DISADVANTAGES

Advantages - The benefit of using this type of formwork is rapid speed in construction, as good quality of concrete is used the durability and strength

of the construction last very long thus resulting in increasing the shelf-life of the construction.

As the same type of formwork is repeated for every floor plate the overall cost of the construction is saved. The material of this formwork is used up to 100 cycles and can be recycled as well thus it is having more environment benefits.

Disadvantages – Not much modifications are possible as all the formwork panels been designed as per the building components, thus similar type of floor plans can be seen. Services which are to be done concealed becomes more challenging due to thickness of the building components. As compared to cost this type of formwork is more expensive than the traditional formwork. Number of wall ties and spacers are needed for all the joints thus resulting in leakages during rainy seasons.

5. CONCLUSION

The case study for aluminium formwork (MIVAN) covered a lot of aspects regarding its installation type, construction techniques, reinforcement details, casting of concrete, and its further steps of curing method.

In today's faster growing construction industry sector, many projects are competing in being completed on time with optimum use of all the resources. As there are more modern techniques been developed in construction industry the overall projects quality also increases. This type of new technology provides a great prospective for application to provide more projects for growing population.

REFERENCES

- [1] Aluminium Formwork (Mivan) - Detailed Study, Criteria, Features, And Component Parts. <https://www.blogforcivilengineers.com/2021/06/aluminium-formwork-mivan-detailed-study.html#!>
- [2] Detail of Mivan Shuttering https://www.academia.edu/39682711/Detail_of_Mivan_Shuttering
- [3] MIVAN Technology - <http://civilenggseminar.blogspot.com/2016/06/mivan-technology.html>
- [4] Learn about MIVAN aluminium Formwork (Shuttering) - <https://www.linkedin.com/pulse/learn-mivan-aluminium-formwork-shuttering-anil-kumar-tiwari>