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Analysis And Comparative Study Of Mivan Formwork System With Conventionsal Shuttering

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1. ***Abstract*****—** The building industry is a major cog in India's economic wheel. Additionally, it is a crucial metric for a nation's progress. Quick production and building of housing units for affordable construction facilities is something that India is frantically preparing for. The use of formwork allows for the casting and construction of structurally critical features and components that must be strong enough to sustain the building. Mivan is a relatively new piece of construction equipment that will be useful for finishing large-scale, repeated projects. In this project, we will examine Mivan Shuttering from every angle: its parts, production, assembly, pros and cons, and comparison to traditional formwork. With respect to time, money, and quality, Mivan technology is light years ahead of the competition. The fundamentalists get to a firm verdict on which of the two methods is better.

Keywords—Construction, Conventional formwork, Mivanformwork, Cost, Time, Quality.

2. Introduction -

2.1 The field of civil engineering is very old, and it focuses on constructing techniques. A technological revolution is taking place in the construction industry, and it's happening step by step. From formwork and roofing to concreting and steel reinforcement, finishing and furniture work, there are many important duties in construction. When working with concrete, formwork refers to the temporary molds used to pour and shape the material before it hardens. The Indian construction industry is notorious for using antiquated methods of formwork in reinforced concrete construction (RCC), in contrast to other developed nations. The current construction industry landscape is drastically altered, yet research is still necessary to choose the most appropriate formwork from a variety of angles. Time and money are the most fundamental metrics, but we also need to pay attention to things like construction waste, quality, and safety.

2.2 Standard plywood panels are often used in the conventional formwork methodA wooden frame holds these panels in place. Walling, which are horizontal components placed above them, aid in supporting the weight and horizontal pressure of the wet concrete. Because of its sensitivity to edge and corner damage, the wall forms need special management. Because each system has its own set of benefits and drawbacks, it is necessary to choose a formwork type. Traditional, low-cost formwork is labor-intensive to use for bigger projects.

2.3 Problem Definition–

Formwork has also been seen ever since buildings are being built using reinforcing cement concrete. The industry makes use of a wide variety of formwork. Due to local conditions, many Indian builders still use traditional wood formwork. While there are undeniable benefits, such as a low entry barrier that lowers starting investment costs, there are also several negatives. Due to their limited reusability, these formworks will not last very long. Wood that isn't already damp will soak up any moisture in the concrete, which might compromise the strength of the final product. Shrinkage causes leaking of cup open joints and grout in wood with an excessively high moisture content or in wet concrete. A lot of people are starting to doubt this approach because of the negative effects it has on the environment from using wood for the formwork.

These considerations emphasize the importance of abandoning the status quo in favor of cutting-edge methods developed for building construction. The Mivan Technology is one example of a breakthrough in formworks. Faster construction, higher quality, and more accuracy are all possible with this approach, which is able to compensate for the traditional system's drawbacks. Unfortunately, only a small number of large cities and companies have begun to employ this building approach due to the widespread ignorance about it. Additionally, a lot of contractors are hesitant to use this formwork since there is a lack of knowledge. By providing comprehensive details regarding the components, manufacturing process, assembly, advantages, and disadvantages of Mivan shuttering, this initiative intends to fill this informational void. Additionally, it suggests comparing Mivan with Conventional Shuttering in an effort to resolve hesitation about selecting Mivan Shuttering.

2.3 Objective

- To study the basic construction techniques and general studies of Formwork it's capabilities and usability.
- To gain an understanding of the existing research.
- To do a Case study of a construction site with Mivan formwork and study its practical aspects see how an aluminum formwork system works and make the activity list with details of the site.
- To compare mivan formwork with other forms of formwork system.

2.4 Mivan Shuttering -

The measure of a nation's development is the construction industry. With the liberalization of the economy, The Indian real estate market is booming. As a vital component of growth, the construction industry is a major player in India's economy. As the world's second-largest urban population grows in the years to come, there will be an even greater need for housing. India must immediately begin making plans to acquire land and build dwelling units at a quick pace to meet this need. One of the most important factors determining the success of a construction project in terms of time, quality, money, and worker safety is the formwork, which comprises around 35 to 40 percent of the total project cost. It is in everyone's best interest to have the project finished quickly so the customer may start using the facility for its intended purpose. This includes the contractor as well. A contractor's bottom line will benefit from a speedy completion of the project. To expedite the construction of functioning mass houses, the most successful strategy is to achieve a very fast floor cycle. The floor cycle, which is the main factor in determining the length of a building project, is greatly affected by the kind of formwork that is used.

2.5 Features of Mivan Formwork –

The major features of Mivan formwork are given below

1. Mivan formwork has a load-carrying capability of 7–8 tons per square meter. Mivan formwork has a low density and weighs only around 18–20 kg/m².
2. 2. When the concrete has reached 2N/mm2 or 12 hours after concreting, the vertical (wall) formwork must be struck. The horizontal (deck) formwork must be struck 36 hours after concreting, or when the concrete has reached 10N/mm2.
3. 3. Sturdiness and longevity –Mivan formwork's panels are constructed from structural grade aluminum alloy, which makes them very long-lasting and robust. It is possible to repeat a single component about 200 times.
4. Cycle Time—This approach allows for high-speed building, which results in speedier project completion. Using Mivan formwork, the floor may be cast in around seven days.

2.6*Formwork- Components*

Mivan Formwork consists of many components which when connected to each using the drawing provided then it can be used for concreting, the material used for making these components are high strength aluminum alloy

The main components of mivan are

1. Wall fittings
2. Components of beams
3. Parts of the deck
4. Supplemental elements

3. MANUFACTURING PROCESS OF MIVAN SHUTTERING-

Buildings are influencing the future at a faster rate than infrastructure is evolving. The infrastructure revolution may be accelerated with the help of human determination and technical know-how.

The building business relies on formwork. It has completely altered the construction industry. Numerous manufacturing businesses come out with new forms of formwork to make building easier and faster for their customers. Some examples of these companies include Cosmos building Machinery and Equipment Pvt. Ltd., KnestAluform, Winntus formwork Pvt. Ltd., and many more. These businesses are a great asset since they speed up the building process while maintaining reliability.

We go to Cosmos' Manufacturing Unit in Nanekarwadi, Chakan, to find out how the Mivan Shuttering is made.

Detailed information on the firm and the manufacturing unit's working method is provided in this report.

3.1 About the Company

A prominent producer, exporter, and supplier of precision construction equipment in India, Cosmos Construction equipment and Equipment Pvt. Ltd. takes great pride in being an Indian-made brand.
Cosmos first sold its affordable aluminum formwork to a contractor in Pune in 2007 for his record-breaking slum rehabilitation project, marking the introduction of Cosmos' aluminium formwork to the Indian market. Mr. Siddharth Shah was the company's leader at the time.

Cosmos went on a tear after that, winning many large-scale projects including Nanded City, Megapolis, Kolte-Patil, Kumar Properties, and many more. A formwork system that is appropriate for a water tank with a capacity of 25 lakh litres, constructed at a height of 110 meters using a column and ring beam construction, has also been offered by the business. Cosmos supplied the column and ring beam in aluminum formwork, which allowed the project to be finished in record time, which was a remarkable feat.

3.2 Highlights of Cosmos Aluminium Formwork

COSMOS's modular Aluminium Formwork system offers well-designed solutions for mass housing, skyscraper, and row house projects, facilitating efficient project planning, scheduling, and asset management. This contributes to attaining the highest level of safety and better quality finish.

Key Features

• An emerging and modernized sustainable construction system.

• Unsurpassed construction speed with higher repetitions achieving time management.

• Cost effective solution ensuring capital and asset management.

• Rigid structure with exceptionally smooth and quality concrete surface finish.

• Highly durable due to anti-corrosive characteristics.

• Easily mobilized with flexibility and adaptability to refurbish.

• Reusable and recyclable, making it earth-friendly.

• No heavy lifting equipment required.

• Minimal involvement of skilled labour resulting into high labour productivity.

• High residual value and less maintenance required.

3.3Obtaining architectural and structural plan

The building's architectural and structural plans are acquired. In order to have a good idea of how much formwork will be needed for the building's construction, it's helpful to examine the drawings. Modulation and product drawing, which follow, also benefit from these blueprints.

3.4Drafting of SHELL PLAN

All structural and non-structural components may be seen in the shell plan, which details the Mivan Shuttering. The meticulous design of this is essential since it serves as the foundation for all the subsequent procedures. This plan is used to create the bill of materials. The site engineer also makes use of it when working on a building site.

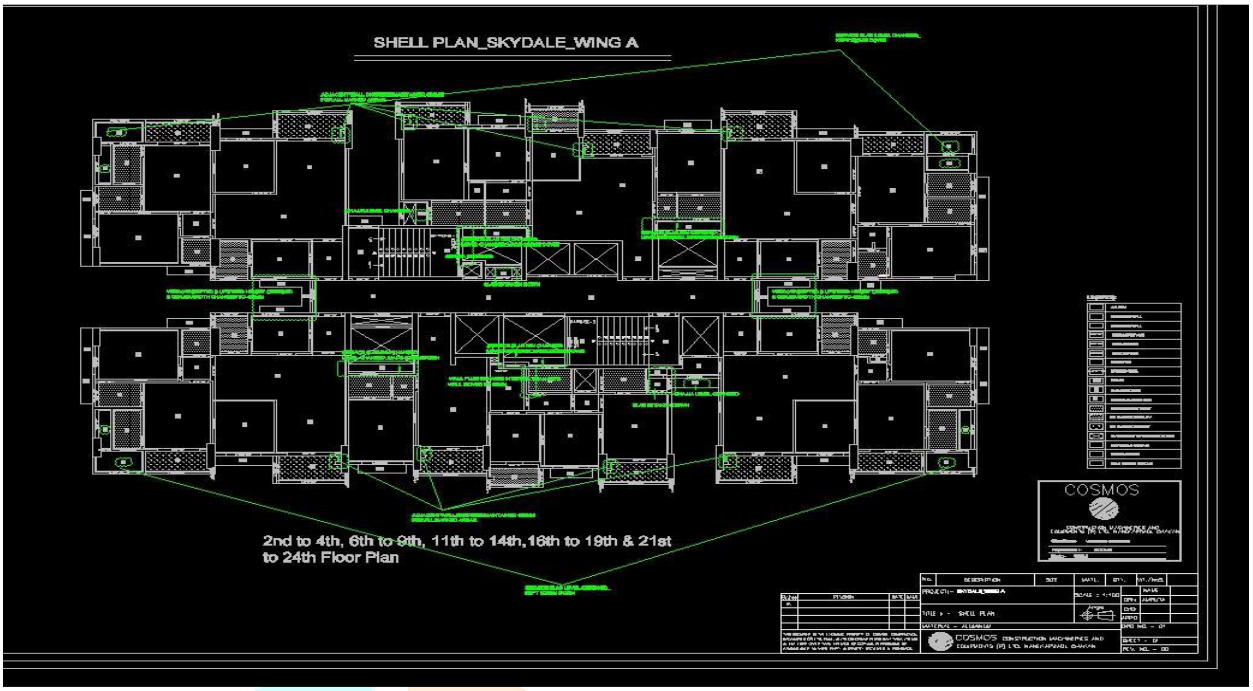

Fig1 shell plan

3.5Resolving Queries, Comparison and Confirmation from consultants

Its difficult to interrupt the production line and make new changes once the process of manufacturing has started.Thus, the shell is submitted by Cosmos and confirmation is taken from consultants, before the production starts

3.6Modulation and Production Drawing :

All the dimensions, forms, materials, procedures, and machinery needed to make a product are shown in a comprehensive production design. During manufacturing, the production drawing serves as the only guidance for the artisan. The simulation of formwork components is done using a variety of applications, including Creo, Solidworks, and Catia.

Raw material stacking

The raw material is procured in form of aluminium extrusion. It is a process by which aluminum alloy material is forced through a die with a specific cross-sectional profile. A powerful ram pushes the aluminum through the die and it emerges from the die opening. It comes out in the same shape as the die and is pulled out along a runout table.

The extrusions cam be made in various shapes and length. The order for the raw material is given on the basis of bill of materials.

3.7Automated Cutting-

The procured extruded sections are cut into desired length and shape with the help of automated cutting machines. These machines are of two types :

1) Normal cutting machine. 2)Degree cutting .

The cutting lengths and widths can either be standardized or can be customized as per client's requirement.

3.8 Hole Punching and Notching

Hole Punching is one of the most important operation of assembly line. The reason being that, if even a single hole mismatches with the remaining assembly, the formwork mould will not be created. The holes are punched at 40mm (minimum distance) from the concerte surface.

3.9 Robotic Welding

After the process of fabrication, stiffeners are attached to the plates, for increasing its strength and preventing deflection once concrete is poured. The welding is either be done manually or by the MIG welding machine, which does welding automatically without need of labour. In argon welding, Argon is used as shielding gas to protect the weld pool from contamination. After the welding process is completed, SS SCAR Rid 0707 chemical is diluted with water and is used to remove the black marks and heat tint left during welding of stainless steel. SS SCAR Rid 0707 removes all the contaminants from the metal weld surface giving it a clean and professional look.

3.10Label and Packing

This the last step of manufacturing operation. On leaving the MIVAN factory all the panels are clearly labelled to ensure that they are easily identifiable on site and can be smoothly fitted together using formwork modulation drawings.

4. ASSEMBLY OF MIVAN SHUTTERING

The various construction activities involved in use of Mivan formwork can be classified into:

1. Pre-Concreting activities.

2. Concreting activities.

3. Post-Concreting activities.

4.1PRE – CONCRETE ACTIVITIES:

• RECEIPT OF EQUIPMENT ON SITE:

a) Unload components from transport and where possible, stack by code and size panels can normally be stacked safely up to 25 panels high on skids or pallets.

b) When stacked, holing in the formwork should be aligned allowing easy identification by code.

c) Ensure the first panel at the bottom of the stack has the contact face upwards.

d) All pins, wedges, wall ties, P.E sleeves, L.D.P.E sheet and special tools to be put into proper storage and only distributed as required.

e) A check requires to be carried out against the packing list ensuring all items stated are received.

4.2CONCRETING ACTIVITIES

At least two operatives should be on stand by during concreting for checking pins, wedges and wall ties as the pour is in damaged. This affected area will then required remedial work after striking of the formwork.

The following things should be observed during concreting :

• progress. Pins, wedges or wall ties missing could lead to a movement of the formwork and possibility of the formwork being Dislodging of pins / wedges due to vibration.

• Beam / deck props adjacent to drop areas slipping due to vibration.

• Ensure all bracing at special areas slipping due to vibration.

• Overspill of concrete at window opening etc.

4.2POST CONCRETING ACTIVITIES: Strike Wall Form- It is required to strike down the wall form. o Strike Deck Form- The deck form is then removed. o Clean, Transport and stack formwork

SITE MANAGEMENT :

The essence of the system is that it provides a production line approach in the construction industry. The laborers are grouped together to form small teams to carry out various tasks within a certain time frame such as, reinforcement, fabrication and erection, formwork erection, concreting etc. Scheduling involves the design and development of the work cycle required to maximize efficiency in the field. The establishment of a daily cycle of work, which when fully coordinated with different trades such as reinforcement fixing, mechanical services installation, and the placing of concrete, includes a highly efficient working schedule in the system, not just for formwork but for all parallel trades as well. Optimum use of the labor force is made by ensuring that each trade has sufficient work on each working day. Experienced site supervisors are sent to site to train supervisory staff and labor for proper handling of the equipment and to assist in establishing the desired work cycle. The disciplined and efficient handling of work ensures that all other trades follow in a united and predetermined manner. The improved coordination and construction management enables the equipment to be used at optimum speed and efficiency and speed of the output are outstanding. Thus a disciplined and systemized approach to construction is achieved.

WORK CYCLE:

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 12-15hrs. It is followed by positioning of the brackets & platforms on the level. It takes about 10-15hrs simultaneously. The deshuttered 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 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 7225cu 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 easil identifiable on site and can be smoothly fitted together using formwork modulation drawings. All formwork begins from corners and proceeds from there.

Advantages of Mivan Shuttering:

1. 1..This method is ideal for large-scale, similar-nature building projects that need to be completed quickly at a single location. Shortly after the foundation, the first stage of set-up, is finished, the following procedures provide a basis upon which to build, and the whole building is practically ready for habitation. Because a result, the full building is finished in less time, which makes this strategy financially viable by lowering the project's indirect cost.
2. No need for heavy lifting equipment: Unlike most current building techniques, the formwork does not rely on machine or equipment-oriented lifting.
3. Thirdly, it is easy to handle since Mivan formwork is lightweight.
4. Installation doesn't need specialized labor since it follows a predetermined set of procedures.
5. High-Quality Building: All openings for windows and doors are precisely measured using this system, and the corners at the intersections of walls, floors, and ceilings are perfectly right angles. The concrete surface finishes are suitable for direct painting without the need for plaster.

Disadvantages of Mivan Technology:

The constraints of MIVAN formwork must be considered despite its many benefits. Nevertheless, there are no major issues with the constraints. Here are the details: -

1.Due to the high cost of aluminium formwork and the time required for initial setup, the initial expenditure is substantial. In addition, the necessary alignment can only be maintained with constant

observation. The high price tag means that only large corporations and very well-off individuals can afford to use the technology.

2.Second, finishing lines will be visible on the concrete surfaces due to the tiny sizes; they will need to be ground off before gypsum plaster or paint can be applied.

3. Challenges with disguised services: The thinness of components makes concealed services more challenging.

4. Necessitates Consistent Planning: For cost-effectiveness, it necessitates consistent planning and uniform altitudes.

CONCLUSION

1. The need for contemporary solutions that allow for rapid building is driven by the rapid rise of the global population. Traditional formwork isn't up to the task and has its own set of problems.
2. Construction companies worldwide have a history of being slow to embrace new ideas and methods. On the other hand, civil engineers must acquire and use these powerful and adaptable building tools.
3. Not only can Mivan technology save building times, but it also optimizes costs and enhances construction quality. The Mivan formwork technology has contributed to the upkeep of site safety while also enhancing the work's efficiency and quality.
4. Mivan Shuttering's high-quality construction, remarkable speed, and inexpensive pricing might make it a huge hit in the Indian market, which is why we've done our best to cover all of its bases in this project. Because it makes it easier to build high-rise, cheap housing for India's rapidly expanding population, it offers enormous growth potential in the country.
5. In light of this, it is clear that cutting-edge building methods, like Mivan technology, are the way to go for affordable, energy-efficient homes.

REFERENCES

1. AtulR.Kolhe, “PLANNING FOR HIGH-RISE BUILDING CONSTRUCTION USING LOCATION BASED REPETITIVE SCHEDULING METHOD (LBRSM)”, International Journal of Project Management, 2014.ISSN 0976 – 6308 (Print) ISSN 0976 – 6316(Online) Volume 5, Issue 5, May (2014), pp. 01-06

2. ArbazKazi, “COMPARATIVE STUDY AND DECISION MAKING FOR A FORMWORK TECHNIQUE TO BE ADOPTED ON A CONSTRUCTION SITE IN MUMBAI ”, International Journal of Research in Engineering and Technology, 2015. eISSN: 2319-1163 | pISSN: 2321-7308 Volume: 04 Issue: 12

3. Kushal Patil, “Mivan Technology”, International Journal of Engineering and Technical Research (IJETR), 2015. ISSN: 2321-0869, Volume-3, Issue-6

4. Ganar A. S., “Comparative analysis on cost and duration of MIVAN formwork building and Conventional Formwork building”, International Journal on Recent and Innovation Trends in Computing and Communication, 2015. ISSN: 2321-8169 6472 - 6474 Volume: 3 Issue: 12

5. Mayank Patel, et.al , “RECENT SCENARIO IN FORMWORK: ALUMINUM FORMS”, International Conference on: “Engineering: Issues, opportunities and Challenges for Development” 2015. ISBN: 978-81-929339-1-7

6. Shankar Bimal Banerjee, et.al, “MIVAN TECHNOLOGY”, INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY [IJIERT] 2015. ISSN: 2394-3696 VOLUME 2, ISSUE 3 MARCH2015

7. Danish Sadruddin Ansari, et.al , “Comparative Analysis of MIVAN Formwork Building and Conventional Formwork Building Based on Cost and Duration ”, International Journal of Engineering Research 2016. ISSN:2319-6890)(online),2347-5013(print) Volume No.5, Issue No.8, pp : 672-675 1 August 2016