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Comparison Between MIVAN Formwork over Conventional Formwork: A Review

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Abstract

These Building is an important part of growth, one of the main sectors of the Indian economy. India's population today is the world's second-largest urban community. Its potential development contributes to increased demand for accommodation, a challenge that India would desperately need to plan to purchase property and rapidly construct houses. The Building is a complex method that includes mainly Architectural Design, Architecture & Building. Today, we are increasingly conscious of the need to increase the speed of development, particularly for major housing projects. It is necessary to achieve the national goal of ensuring appropriate provision to accomplish as little time as practicable, not just in terms of improved facilities and product transition, resulting in a lower cost of accommodation. Fortunately, there are already some advanced technologies in the country which cater for higher building speeds. Prefabrication, self-clogging, tunnel forming, Aluminum design (MIVAN), etc. For example. The business in Malaysia has built the formwork method for Aluminum, and that is why it is the name of the Aluminum formwork process. We addressed cost differences between MIVAN technology and traditional building technology in this phase. With expense, efficiency and time saving, relative to traditional, MIVAN technology is perfectly perfect. We addressed cost differences between MIVAN technology and traditional building technology in this phase. With expense, efficiency and time saving, relative to traditional, MIVAN technology is perfectly perfect.

Keywords: Aluminum System, Aluform System, Block Work and Plastering, Cost, Construction, Deck Panel, Formwork, Modular Aluminum formwork, MIVAN formwork, Quality, Speed of construction, Wall Panel.

1. Introduction

Ease of Use Given the rushing rate of construction, a traditional architecture solution is totally inadequate to the mass housing industry for individual buildings featuring load bearing walls with an installation roof over them or reinforced cement (RC) constructed base construction with retained walls. However, these buildings are often susceptible to poor quality assurance, except with builders with substantial resources and experience.

"It’s crucial that innovative technology is able to evolve rapidly to have a high-quality, functional framework that provides cost-effective affordable housing"

In different countries around the globe, a range of programs are implemented; eventually, in India, comparatively expensive and easily managed systems are useful. Some solutions are in fashion, and increasing numbers are seeking to introduce new technology. The architectural design, i.e., pre-cast construction or in situ architecture, is basically the foundation for both.

2. Literature Review

These literature reviews are experimental work carried out by researchers on the monolithic structure system.

Can Balkaya et al. (2004) studied rendered Reinforced Concrete model in a multistory and put a high stress concentration on it, they claim that the outer shell of the monolithic framework had a shear wall from experimental finite element approach (FEM analysis); it was less prone to cracks in the building. Compared to traditional construction, they offer the highest seismic efficiency at a low price.

Nuzul Azam Haron et al. (2005) price research was carried out with the old method and the new formwork framework. It allows you to realize that the conventional and monolithic form is simpler and faster. Interview questionnaires and case studies were used to collect study results. The mathematical 't-test' showed that the expense reduction for conventional design systems varied greatly from the form system.

H. Gonzales et al. (2011) addressed the seismic survey was also completed in Peru of seven existing shear walls and typical high buildings. Static and fluid nonlinear analyzes have been performed with specified bodies. The seismic performance of all measured installations was considered to be insufficient. The first move is to avoid failure of the binding belts. Any of the feasible beam modifications, therefore improve the seismic performance.

N. H. Abdul Hamid et al. (2012) studied joint slab-wall performance in RC wall construction at lateral loading. It prepares a blade model, and with linear potential meters and actuators, it is deduced that, after 2.1 percent drift, the stiffness of the blade joint falls from 0.2 percent drifting to 2.1 percent drifting.

D. M. Wijesekara et al. (2012) recognized for the estimation of the construction project in terms of tempos, development costs and protection, the formwork is one of the most important factors as it compensates for about 40 % of the total project expense of the framework. The contractor must finish the job as quickly as possible in order to reduce the expenses because the client wants to utilize the building because early as possible for the intended purpose. A very short floor of high-rise building architecture is the most productive way to speed up the work. This is directly based on the form of shape picked. This paper outlines Sri Lanka's traditional formwork styles and modern techniques for building design. This paper will include precisely a summary and assessment, utilizing various formworks, of costs and the project duration. The main objective of this paper is to identify, using Aluminum panel shaping method, the minimum number of typical stores needed in a high-level construction project.

Rajesh M. N. et al. (2014) exclaimed strengthened concrete wall make-up design, analyzed using layered shell components for 3D schematic analysis and pushover (SAP 2000's) research. Different parameters, such as the aspect ratio of the walls, RC detection and existence of openings, are used to check the seismic performance of the wall reinforced concrete building the second to second enhance the strength of the base of the external border shear.

H. G. Vivek prasad et al. (2015) study of conventional construction methods, pre-cast and monolithic. The competitive considerations are mostly building materials and the required period, costs involved when the construction of the mass housing is designed using traditional precast and monolithic methods. Curing development costs and reducing the average time required to build the project are current and innovative methods developed. For conventional processes, the best approach is short distance construction of monolithic and prefabricated frameworks.

Matej Spak et al. (2016) research the process of manufacture of precast parts has been long before traditional concrete. Including modern concrete structure building methods with validated structural technologies (HPC, UHPC) to boost the advantages of pre-cast design. There is also tremendous scope to enhance construction efficiency by the usage of advanced concrete materials. At the other side, HPC and UHPC technologies may also be used in the monolithic concrete building because of their structural and mechanical properties. Imports to mitigate the environmental effects of reduced material consumption are significant changes in systems weight and thickness.

Rahul B. Mojidra et al. (2017) explains an important resistance feature to earthquakes, the seismic design of buildings, concrete structural walls or shear walls. Concrete walls are resistant to additional gravitational energy. The properties of the seismic shear walls influence the reaction of buildings, and thus the seismic response of walls should be properly evaluated.

3. Formwork

It is made from plastic, like concrete is built. Before it is sturdy enough to hold its own weight, temporary support is required and castings of the correct type. This partial covering is called a shuttering or shuttering. The word moulds are often used to define the structure of very limited units, including lintels, cornices etc.

Definition of Formwork

"The receptacles that concrete is put into and cured are the forms of shapes of shutters that it should have perfect form or contour. Once concrete achieves the power it requires to bear its own weight, it may be withdrawn."

"Shape is the term offered to temporary or permanent moulds that have been moved into concrete or related matter."

The basic formwork and/or shuttering specifications are:

(1) It should be strong enough in construction to carry the dead and living loads.

(2) The joints of the shaft should be secure to prevent bulging, curvature or shrinkage attributable to dead and live loads

(3) Coating design would require removal the different pieces without harm to the concrete in required sequences.

(4) The formwork material will be inexpensive, readily accessible and reusable.

(5) The outline should be exactly matched to the target line, and the dimensions should be smooth.

(6) So much as light can be.

(7) Once exposed to water, the substance of the shell will not be bent or blurred.

(8) Will sit on a strong basis

Types of Formwork

Wood is the most popular wood used to date. The use of alternative materials such as furnace and steel, however, has been popular due to the diminishing forest stocks and the increasing cost of timber. In recent years, products such as plastics and fiberglass are increasingly used for pre-molding shape. The material type to be used depends on the building's complexity as well as the quality and cost of the material. For the usage of a particular formwork material, the project limitations as overall cost, completion times are often of great significance. Figure 1 and 2 shows the typical structure of wooden and steel formwork, respectively.

(1) Timber Formwork

(2) Steel Formwork

(3) Plastic Formwork

Figure 1. Wooden Formwork

Figure 2. Steel Formwork

Aluminum Formwork (MIVAN)

Aluminum forms are identical in many ways to steel types. However, Aluminum forms are lighter than stainless steel because of their lower density, and this is its main advantage compared to steel. Since the resilience of Aluminum is smaller than that of steel in storage, stress and strain, wide parts may be utilized. When a huge amount of reuse is rendered in building, the shape is economical. The biggest drawback to Aluminum forms is that when the formwork is formed, no modifications can be made.

MIVAN: - A Versatile Formwork

MIVAN is widely used for community and social housing initiatives. The Aluminum-shaped system is the most significant. Simple, easy, scalable and cost-effective. This produces research of absolute coherence, which needs minimal upkeep and where the primary concern is reliability. This tool is suitable for the Indian climate as a tailor-made Aluminum shaft for the cast-in building. Fig.3 shows the typical MIVAN formwork system formation and whole structural unit. Figure 3. Shows typical MIVAN system.

Figure 3. MIVAN Formwork System

Background

MIVAN is actually an Aluminum shaping tool designed by one of Europe's manufacturing corporations. In 1990, MIVAN Company Ltd from Malaysia started producing such formwork devices. Currently, there is demand in the world of more than 30 000 square meters of coating. There are numerous buildings in Mumbai, India that have been designed using the above method and which have proved very economic and successful for the Indian construction climate. In many countries such as Europe, the Gulf Nations, Asia, and other parts of the world, this system is commonly used. MIVAN is an effective method for constructing vast numbers of houses in a short period, utilizing room form in a single continuous concrete to construct walls and tiles. Curing/curing materials from hot air can allow for the early removal of forms. It's quick constructing, two flats a day say. All processes are formulated in the fashion of a line of construction, which means that output is reliable, managed, and of good quality at the highest expense and as soon as feasible.

It designed design system includes continuous shielding of the building foundation of built-in concrete walls and monolithic floor slabs. Wide space systems for walls and floor plaques are installed on location. Such forms are rendered solid and robust, correctly crafted and simple to handle. They have several repeats (approximately 250). The concrete is produced in RMC batching plants and is shipped to the transit mixer factory, under strict quality control.

Before concreting in the process, the windows and door frames and service pipes are mounted. Structure often involves staircase steps, front doors, chajjas and prisons, etc. and all other pre-manufactured pieces. Compared with many conventional building methods, this appears to be a significant benefit.

The building approach used is no different because the sub-structure is constructed using traditional techniques. The super-structure is built using techniques from MIVAN. The combined implementation of the system contributes to a robust framework.

Modular Formwork

The form frame is precisely built-in Aluminum. This approach allows for the construction of cast concrete with all building materials, including walls with load bearing, columns, beams, floor slabs, stairs, balconies, etc. This system has a solid finish on the top and good dimensional tolerances. In fact, the construction pace is strong, and the work can be achieved economically. The compact nature of the formwork structure makes for easy installation and removing of the formwork, and the building will proceed quickly with very little difference in dimensional tolerances. The system is still very versatile and can quickly be adjusted to certain style variations.

The procurement of cement from a ready-mix concrete plant is well planned with the implementation of this job process. The usage of Aluminum formwork systems, however, has been improved by plentiful RMC plant in India's cities and the potential to use mechanized transportation and concrete positioning methods. The resulting concrete has a surprising quality.

The structurally stable alternatives were known as the most effective application of the closed box framework with a monolithic concrete design. Beton and steel pressures are shown to be somewhat lower, while the lateral influences of wind or earthquake are paying heed.

The shape system can be used to build a framed structure with beam-slab elements or a structure of the type with a combination of platform walls of all types of concrete systems.

4. Construction Activities with Mivan Formwork

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

Pre – Concrete Activities

(1) Inventory delivery on site – Equipment is provided on site on request.

(2) Controversy thresholds – The lateral stage tests are done.

(3) Selection – The outline is changed.

(4) Deviation control / correction – Deviation or other correction is made.

(5) Erect forming – the form is installed on the ground.

(6) Form Build Deck – Deck is fitted up for function.

(7) Kickers are mounted – kickers are distributed over the plate.

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

(1) Every shape will be washed and painted by a professional artist.

(2) Ensure that the wall form is matched to the walls. Verify that all openings are of the same scale, not spinning.

(3) Test all horizontal form (deck sofa, base sofa, etc.) standard.

(4) Ensure that the deck and beam supports are perpendicular and that the component spans are perpendicular.

(5) The wall links are tested; both pins and wedges are in place and are secure.

(6) Some surplus content or objects to be withdrawn from the casting process.

(7) Ensure a safe connection of the job platform braces to the concrete.

(8) Figure 4. & 5 represent the pre-concreting work of formwork.

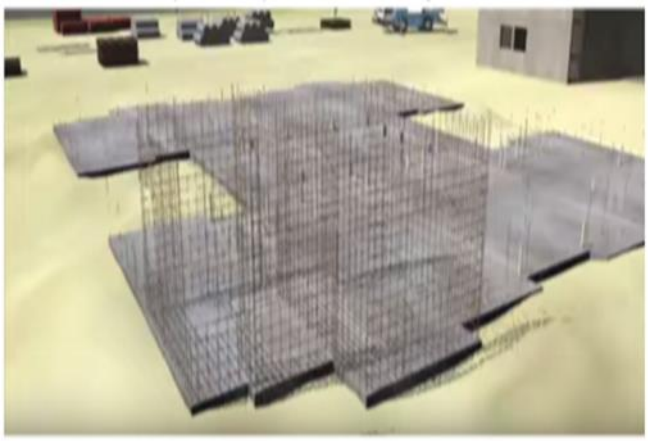

Figure 4. Pre-concreting

Figure 5. Placing of formwork

On Concrete Activities

For pin tests, wedges and wall links, at least two team members will be on hand during concreting while the pour is in progress. Failure to push the shaft and the risk of destroying the shape may contribute to pins, wedges or wall contact. Once the surface has been compromised, this – contaminated region would also need remediation. Figure 6 includes the on-concreting process.

Things to look for during concreting:

(1) Unloading of acceleration pins / wedges.

(2) Beam / deck supports next to vibration-related drop-offs.

(3) Ensure that all bracing is vibrated in special areas.

(4) Excess asphalt at the bottom of the doors etc.

Figure 6. On Concreting

Post – concrete activities

(1) Strike Wall form-The wall form is important.

(2) Strike Deck Type- The outline of the deck shall be withdrawn.

(3) Clear form, transport and stacking

(4) Kicker Strike Shaped – Removed the kicker.

(5) Strike wall – The wall is fitted to the next floor on a work platform.

(6) Erect frame – the job platform is set up on the mount and the roof.

(7) Normally all formwork can be struck after 12 hours.

Cleaning

Both pieces will be washed as soon as they've been struck with scraper and wire brushes. For side rails, just the wire brush is to be found. The more time it takes to scrub, the tougher the job. In the area where they are hit, it is usually better to clean panels.

Transporting

There are basic three methods recommended when transporting to the next floor:

(1) The largest and longest wall panel is the highest one to take up the next move.

(2) Crossing stagnant zones.

(3) To this end, grew through slots shaped explicitly in the floor plan. They are closed by casting in concrete filters when they have fulfilled their function.

Striking

Panels will be placed at the correct position and in perfect condition until cleaned and moved to the next stage of erection. Proper stacking is a clean sign of a wall – controlled operation greatly contributes to the next installation sequence and avoids clutches and further activities.

Objective of the Study

1) To compare building costs through the use of conventional moulding and MIVAN moulding technology.

2) Compare construction duration with conventional shaping technology and use MIVAN shaping technology.

3) In the design of houses, which shape is the strongest.

4) To grasp the MIVAN shape principle.

5) All the above mention points will have been studied on a live case study.

5. Comparison of Mivan Formwork System with Conventional Construction

The definition demonstrates the relative difference between typical systems and the MIVAN style feature method. This distinction is based on aspects such as construction speed, construction efficiency, design, exterior finishes and maintenance.

Speed of construction

Construction pace is often slower when various phases of the construction are slowly finished, such as outline forming, concretion and shuttering, and eventually plastering and finishing. This approach allows for walls and floors to be cast continually, so the finishing work will then commence instantly, and the speed of construction is considerably higher.

Quality

Thanks to the conventional construction method, uniform production is obtained. In-situ construction of the entire frame and transverse walls in continuous service achieves superior performance.

Aesthetics

The controversial walls are made of bricks in the case of traditional architecture, which cause the column and the beam to reveal a gloomy plot in the house. Through the MIVAN system it is easy to co-plant the partition wall and ceiling elements, since the interior is clear and flat, without awkward projections through various corners. There's even a seamless layer between the roof and walls.

External finishes

Also, the external walls are made up of bricks, which entail frequent repainted manual cement plastering. The outside walls are made of concrete and require no manual cement plastering and even smooth finish, so it is not important to rebuild them annually.

Maintenance

The upkeep expense is too high as the wall, and ceiling plaster were constantly cleaned, the outer and inner walls are stained with leakage. The maintenance costs are low, as walls and floors are constructed of good quality concrete and need to be repaired frequently.

Comparison based on time

The Work cycle of MIVAN system:

MIVAN is the command-and-control framework for many associated building tasks, including the strengthening of steel, concrete foundations and electrical installation. So, there is a certain cycle of function on location. The research starts with the shuttering of the windows. It takes about 12-15 hours. The brackets and frames are then mounted on the board. It needs between 10-15 hours at the same time.

For a period of 7 days, this is a well-synced work cycle. Upon concreting, the concrete stays for a duration of 10-12 hours to become solid prior to the start of the next process. The research cycle has been scheduled for 1010-1080 m2 of coating and 72-25 cubic meters.

The assembly of the form is a simple and easy operation. After the MIVAN plant has been left, both panels are labelled specifically to make them readily visible after location and can be seamlessly combined via shape modulation sketches. Each form starts at the corners and departs. Usually, the system follows a cycle of four days:

Day 1: The first operation consists of the building, in the floor or a portion of a floor, of vertical reinforcing bars and one end of vertical formwork.

Day 2: The second activity includes the construction of the vertical second side shape and floor shape

Day 3: Setting of reinforcing bars and casting walls and plates on floor slabs.

Day 4: Delete the vertical form panels from the office after 24 hours and keep the panels for seven days.

The following Figure 7. shows complete four-day work cycle of MIVAN formwork.

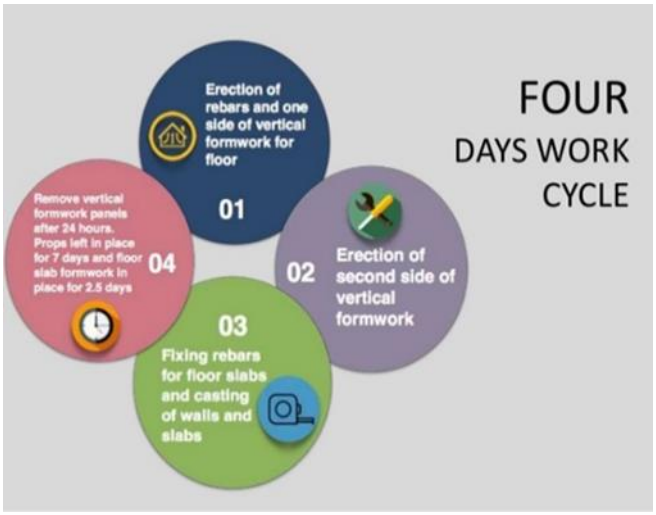

Figure 7. MIVAN Formwork Work Cycle

6. Construction Advantages and Disadvantages

Advantages of MIVAN Formwork are:

(1) The surface of good quality achieves dimensional continuity.

(2) A high-quality concrete finish for precise tolerances and verticality is created while extracting a mold.

(3) The full concrete systems are created by the entire method.

(4) Customized to satisfy the needs of the client.

(5) Unmatched construction pace.

(6) Up to 250 times panel may be reused

(7) Using professional labor may be installed.

Advantages of MIVAN over conventional formwork:

(1) It retains greater seismic tolerance.

(2) By comparison to traditional brick bat mazing, a full cement framework is more robust.

(3) The walls are thin and thus expand in the region of the tapestry because of the shear walls.

(4) Thanks to the light weight of designs, unparalleled production speed can be accomplished.

Disadvantages of MIVAN formwork:

(1) Since there are such a vast number of MIVAN focal points, the downside cannot be overlooked. However, the restrictions are not complicated. The criteria are: –

(2) In the asphalt surfaces are shown attributable to a few limited sizes following sections.

(3) After the completion of the facilities, the limited range of the pieces renders things slightly challenging.

(4) The cost-effectiveness of standardized configurations and even elevations are needed.

(5) MIVAN form requires the amount of wall tie-ups, spacers etc., causing drainage issues and monsoon leakages.

(6) Compression breaks are usually due to box style creation.

(7) High hydration heat is generated because of shear walls

(8) Once in position, the design becomes inflexible, and all modifications become severe later.

7. Conclusion

The following conclusions are drawn from the experimental results:

(1) Creating businesses around the globe have historically been reluctant to develop and adapt. The businessmen are a cautious group. This requires time to evaluate the problem in detail and to consider appropriate solutions. Aluminium shafting serves as a powerful, cost-effective method for addressing mass housing problems worldwide. Aluminium design helps to optimize the use in its full scheme of existing construction technologies and appliances.

(2) From the tests, we are able to infer that the overall project expense and length of the project are not as large as the traditional casting method where the Aluminium formwork is used in a building project.

(3) When the Aluminium shaft used in modern floors and therefore the length of the building will be shortened by 35 % to 40% relative to the traditional construction process, the floor interval will be 7- 10 days. Simultaneously, no such acts such as blocking and plastering would take place and would further shorten the maximum length of the project to 3 or 4 months.

(4) Different acceleration of the construction, outstanding surface finish, excellent dimensional efficiency, prevent time consuming by work in brickworks and plastering, attributable to the reduction in dead-weight, superstructure and base costs and sizes are reduced without sacrificing on energy, incomparable resilience to earthquakes, reasonable quality of water, accurate preparation and certification.

(5) Construction costs of MIVAN coating are about 25-30 percent higher than the conventional method. Building expense per. In MIVAN, Sq. Ft is 33% higher than in the traditional form. The discrepancy between them. Building expenses are increasing in the MIVAN by nearly 392 Rs / Sq.ft. Construction times in MIVAN are almost 25 percent and 534 days, i.e., 1.5 years, less than conventional methods. It is also evident from the above points that MIVAN shapes are more costly than the traditional approach. Yet in constructing high-rise towers, it will save substantial time.

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