

# Comparison of mivan formwork system with conventional system construction essay



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In recent times due to globalization, the construction industry has started focusing on new innovative ways of working. The construction industry has started adopting new technologies and approaches in order to increase the overall efficiency of the project. This report is about the modern methods of construction and smart materials that can be used to improve the overall construction process.

The first half of the report is on the “ aluminium formwork systems” (Mivan System) which is used for mass housing construction. This system of aluminium forms is fast, durable, cost effective and also produces quality work which requires minimum maintenance. The second half of the report is on “ green roofs” a smart material which is a replacement for traditional roofs. Today in this modernized world where global warming is the major concern for all countries, green roofs can be one of the innovative ways to reduce the energy consumption which ultimately helps in reducing the CO2 emissions.

## **1. Introduction**

The construction industry is one of the biggest industries in the whole world. The contribution of this industry towards the global GDP is enormous. In recent years due to globalization and advancement in technologies there has been a tremendous development in the construction industry. However despite of the boom in construction activities the scenario on the housing front remains far from satisfactory. In the countries like India and China the situation on the housing front is even worst. Due to ever increasing population in these countries there is an overgrowing demand for housing.

Now keeping in view the gigantic task of providing affordable shelter to

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masses, adoption of modern and cost effective technology assumes greater significance.

The modern methods of construction are broad range of processes and products that aims to improve business efficiency, quality, customer satisfaction, environmental performance, sustainability and the predictability of delivery timescales (Baker 33 Cross industry Group, 2006).

Today there is a growing realization that the speed of construction needs to be given greater importance especially for large housing projects. “ For undertaking mass housing works, it is necessary to have innovative technologies which are capable of fast rate construction and are able to deliver good quality and durable structure in cost effective manner” (Anon, 2010). Several systems are adopted all over the world but Mivan system has proved to be reasonably economical and capable of fast rate construction of mass housing. In this system walls and slabs are cast simultaneously at site by use of specially designed, easy to handle light weight aluminium forms (Anon, 2010). The system is far more faster than the traditional beam and column construction.

However as per Sir John Egan report “ Rethinking Construction” (1998), the commitment from major clients, from the construction industry itself and from the government is the only way forward to create and sustain the environment that is needed for significant improvement in performance, efficiency and quality of the construction.

The construction projects are getting more complex in nature due to growing human endeavour and the construction industry need to respond to the <https://assignbuster.com/comparison-of-mivan-formwork-system-with-conventional-system-construction-essay/>

unique challenges presented in front in terms of time cost and quality. Also the industry will need to respond to the major issues such as ' global warming' and ' health and safety of the workers'. We as a member of the construction industry will need to overcome these issues by using modern methods of construction (like Mivan System) and smart materials (like green roofs) for carrying out projects.

The main objective of this report is to explore modern methods of construction and smart materials and also to evaluate their impact on the construction process in terms of time, cost and quality. In the first half of the report, the use of Mivan formwork system during the construction process is discussed while in the second half idea of using green roofs is discussed.

## 2. Mivan formwork System: (Aluminium formwork system)

Mivan is basically an aluminium formwork system developed by the Mivan Company Ltd from Malaysia in the year 1990. 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. In this system of formwork construction, cast - in - situ concrete wall and floor slabs are casted monolithically in one continuous pour. Large room sized forms for walls and floors slabs are erected at site as shown in the figure1 below. These forms are strong, easy to handle and are fabricated with accuracy. They can be used repetitively around 250 times.

The frames for windows and door as well as ducts for services are placed in the form before concreting as shown in the figure 1. Staircase flights, façade  
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panels, chajjas and jails etc. and other pre-fabricated items are also integrated into the structure as shown in figure 1 and 2. This proves to be a major advantage as compared to other modern construction techniques.

Figure 1: A set of Mivan formwork

Figure 2: Staircase flight formwork

## **2. 1 Comparison of Mivan formwork system with Conventional Construction**

The table 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.

### **Factors**

#### **Conventional Construction**

#### **Mivan formwork system**

#### **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.

In 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.

Table 1: Comparison of Mivan Formwork System with Conventional construction

## **2. 2 Benefits of Mivan formwork System**

According to Mivan (Thailand) Limited the following are the main benefits of using Mivan formwork system.

### **2. 2. 1 Speed of construction:**

The structure is completed much faster than the traditional formwork as a large amount of work can be completed in each daily work routine.

There is no need for brick laying and plastering as all walls can be formed at the same time.

Finishing work such as window fixing, wall tiling and plumbing work can be installed immediately once the concrete is casted.

### **2. 2. 2 Building strength and durability:**

The walls and the floor slabs are casted simultaneously so there are no weak joints.

The walls are made of reinforced concrete which provides much greater stability than columns with brick walls.

The wall surfaces are made of concrete which do not crack like plaster and maintains a smooth surface for much longer time.

### **2. 2. 3 Quality of finishing building:**

The formworks are manufactured precisely which allows the concrete to be cast to exact dimensions as designed.

Services like water supply & some waste pipes and electrical conduits, can be cast into the concrete where it is protected and not visible.

### **2. 2. 4 Financing cost:**

Fast project completion saves financing charges as the buildings can be transferred to the owners much earlier than traditional methods.

### **2. 2. 5 Efficiency and cost saving:**

There is no requirement of labours for building brick walls and plastering as major part of the structure is cast in concrete by small group of workers.

The project can be completed in shorter time due to fast production methods which save onsite running, operating and financing cost.

The formwork panels are light in weight and can be lifted manually, so there is no need of spending money for heavy cranes for lifting.

Less skilled labours are required on the site as all the finishing items are prefabricated.

### **2. 2. 6 Environmental benefits:**

The formworks are made up of aluminium which can be reused and also can be recycled to make other products.



## **2.3 Case study**

The following is a case study which justifies that incorporating Mivan formwork system in the construction project is very beneficial to the project.

### **2.3.1 Infinity tower- Dubai**

As per MFE formwork technology (2008), the Infinity Tower in Dubai is a 73 storey residential tower with a dynamic twisting shape as shown in the figure 3 below. The tower is more than 300 meters in height and has been designed by Skidmore Owings & Merrill who also designed the world's tallest tower, Burj Khalifa which is 828 meters in height. The contract was awarded to Arabtec Construction. The structural system for the tower is high strength with a reinforced concrete column superstructure that rotates with the twisting shape. In addition, each floor will accommodate a 1.08-degree twist to achieve the full 90-degree spiral.

Figure 3: Infinity Tower (Source: MFE formwork technology)

The tower was constructed by using a light weight aluminium formwork system. A special twisting aluminium panels were made to obtain the precise design. The tower was constructed at a speed of 8 floors per month when the site was in full flow, maintaining zero tolerance with regard to site safety. Now by referring to this case study, it is clear that the use of Mivan formwork system not only improves the quality and speed of construction but also maintains site safety.

## **2.4 Limitations of Mivan formwork System**

The following are the limitations of using Mivan formwork System

Modifications are not possible as all members are cast in RCC.

Concealed services become difficult due to small thickness of the components.

The aluminium formworks are far more expensive than the conventional formwork.

Heat of hydration is high due to shear walls.

The finishing lines can be seen on concrete surfaces due to small sizes.

It requires uniform planning as well as uniform elevations to be cost effective.

The shrinkage cracks are likely to appear due to box type construction.

The formwork can be cost effective only if it is used in symmetrical type of structure.

### **3. Green Roofs**

Green roof refers to a system of roofing that uses plant life for roof covering instead of traditional covering materials (Green Roofs Today, 2010).

Department of Trade and Industry (2004) defines the smart material as ' a material that senses its environment and responds'. Green roofs provides constant temperature throughout the year due to high degree of insulation they provide, hence they can be termed as smart materials.

Green roofing has become increasingly popular in the cities as it creates additional green spaces that bring some nature in concrete and steel jungle

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(Green Roofs Today, 2010). Green roofs are visually appealing and create an attractive contrast to concrete and steel as show in the figure 4-5 below.

Figure-4 (Green Roofs) Figure-5 (Green Roofs)

There are several components of green roofs which besides plants include a growing medium, a filter cloth, drainage, insulation and a waterproof membrane (Green Roofs Today, 2010). These components are shown in the figure 6. The construction of rooftops and the selection of plants for roof covering depend on the factors such as size of the building and type of roof. Now for construction of green roof both flat and slopped roofs are suitable but for construction of large park like roof system only larger buildings are appropriate as accommodation of large plants and trees are too heavy for medium sized buildings.

Figure 6: Components of Green Roofs (Source: Green Roofs Today, 2010)

Green roofs are mainly of three types; ' Intensive', ' Semi-Intensive' and ' Extensive' roofs, depending upon the selection of plants (Green Roofs Today, 2010). Intensive green roofs are those that accommodate large plants, trees, full lawns etc. This type of green roofing requires a significant depth of soil and also requires heavy maintenance. Semi Intensive green roofs are those that accommodate moderate size of plants and require less maintenance. Extensive green roofs is the most convenient of all types of green roof systems and involves roof covering with a thin layer of growing medium and vegetation that requires minimal care and maintenance (Green Roofs Today, 2010).

The factors which are taken into consideration while designing green roofs are orientation of roofs, preferred planting, level of maintenance and performance expected from the plant layer (Green roofs, 2006). As the intensive roofs consist of deep layer of growing medium, it needs special consideration at the time of designing as they require specific support from the building. Conversely, extensive green roofs require negligible structural support from the building, hence no special consideration is given at the time of designing them (The green roof centre, 2010).

### **3. 1 Benefits of Green Roofs System**

The following are the benefits of Green Roof systems;

Plants reduce the air pollution by absorbing harmful gases including carbon dioxide and releasing oxygen. Green roof system therefore reduces the air pollution and makes the air cleaner and healthier especially in urban areas where quality of air is a major problem.

Plants tend to absorb the heat from the air and release it into the air when the temperature drops. Green roof system therefore helps in lowering the temperature of the urban areas. It also helps the building owners to reduce their cost for heating for heating and cooling which is good for the environment too because most cooling and heating systems are powered by energy that is obtained from non-renewable sources such as fossil fuels.

Plants that cover the roofs can absorb up to 75% of the rain water. Therefore the green roofs system significantly reduces the amount of water that runs in to the sewage system. The plants also filter many pollutants in rainwater

including heavy metals. The rainwater that is absorbed by the green roofs is then released into the air via condensation (Green Roofs Today, 2010).

Green roofs system offer a natural habitat to many local animal life including insects and birds that were virtually driven out from urban centres.

Green roofs systems are extremely durable and can last up to 50 years. It also does not virtually require any repair like many other roofing systems.

Green roofs combined with other green technology such as solar thermal collectors and solar photovoltaic panels can further reduce the costs for heating and cooling as well as help combat the global warming (Green Roofs Today, 2010).

The figure below from the (Green Roofs Today, 2010) shows the main benefits of green roofs system.

### **3. 2 Limitation of Green Roofs System**

The following are some of the limitations in installing the green roofs system;

Higher capital cost

Lack of awareness and knowledge

No insurance cover is provided for green roofs

Difficulty in maintaining and accessing roofs.

#### **4. Recommendation**

Due to globalization and competition there is a tremendous pressure on the construction industry regarding the time, quality and cost of the work. With the implementation of the modern construction methods such as ' Mivan Formwork System' and smart materials like ' Green Roofs' the issues related to the time, cost and quality can be overcome. Although the initial cost of implementing such methods and smart materials are quite high the total amount saved at the end of the project life cycle is substantially more than the increase in the initial cost.

The construction firms all over the world have been slow to adopt new innovation and changes. It is the need of time to analyse the depth of problems and find effective solution. Mivan system serves as an efficient tool to solve the problems of mass housing fronts all over the world. The system has a great potential to provide high quality construction at unbelievable speed and at reasonable cost which was justified in the report with the help of a case study. Hence it is recommended to use Mivan formwork system over the traditional formwork system

Amid fears of global warming, deforestation, melting of ice on both the poles, increase in average temperature in next few decades, green roofs can be looked up to as a potential solution which can help in optimising use of rain water, conserving energy, improving aesthetical view of buildings and improving living conditions inside the building. Hence implementation of green roof is recommended as it will save large amount of resources.

## **5. Conclusion**

It can be concluded that the modern methods of construction such as ‘ Mivan formwork system’ are the key to meeting the demand for efficient, sustainable housing. Also the quality and speed must be given due consideration with regards to economy. Mivan formwork system not only helps in improving the quality and efficiency of the work but also has helped in maintaining the site safety.

Anything that is good for the environment is good for humankind as well, so the investment in the green roofs is considered to be the best way in reducing the negative impact of humans on the environment. Green roofs not only reduce the adverse impact on the environment but also help the people in reducing their bill for heating and cooling.