International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

Study of Modern Methods of Construction by and Feasibility Analysis of Miraj City

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Abstract: ***Increasingly in the construction industry appears concept of modern methods of construction in delivering faster and more efficient construction. One of these systems and methods are volumetric structural systems. This article analyzes the modern methods of constructions, and points to one of their components, specifically to modular constructions. Examined their design and also shows the benefits that come with this of type modern methods of constructions. Common ground benefits of modular construction philosophy begin to break the unprofessional especially from the public. Examples from abroad clearly demonstrate that this technology has potential even in modern architecture. The success of this technology depends on how they use the possibilities architects, planners and building engineers.***

Keywords: M.M.C.(Modern Method of Construction), Construction Components

I. INTRODUCTION

A. What is MMC?

MMC stands for "Modern Methods of Construction" which can be defined as "A construction process that can encompass the use of composite new and traditional materials and components often with extensive factory produced sub-assembly sections and components. This may be in combination with accelerated on-site assembly methods and often to the exclusion of many of the construction industry traditional trades. The process includes new buildings and retrofitting, repair and extension of existing buildings." In the Real Estate business with companies actively competing for tenants to occupy their buildings to sustain their income flow and maximize profits the development of new attractive modern buildings using innovative construction materials and techniques can provide a real market advantage. Consequently designers of buildings are under tremendous pressure to reduce erection and manufacturing costs and to consider sustainable materials that offer sufficient thermal insulation properties, whilst still producing aesthetically pleasing buildings. To achieve this many new and innovative methods of construction are being adopted and the use of Modern Methods of Construction (MMC) is becoming increasingly prevalent. However, from a Risk Engineering and Insurance perspective the introduction of new materials and innovative construction techniques can create uncertainty about the risk posed and the performance of these buildings in the longer-term. Many people prefer homes built the traditional way, board by board, nail by nail, right close by at the construction site. Nevertheless, they don't construct them like they used to. The huge mainstreams of houses these days are built with at least some factory-built components. And a healthy proportion are put together almost totally off-site. The cause is generally cost. The building method approach to home building save time, and time is money, not just to the people who raise houses but as well to the people who pay money for them. The Fig-1 shows the Building constructed By MMC.

(Fig-1)

II. METHODOLOGY

A. Title & Objective

1) To Study the Modern Methods of Construction

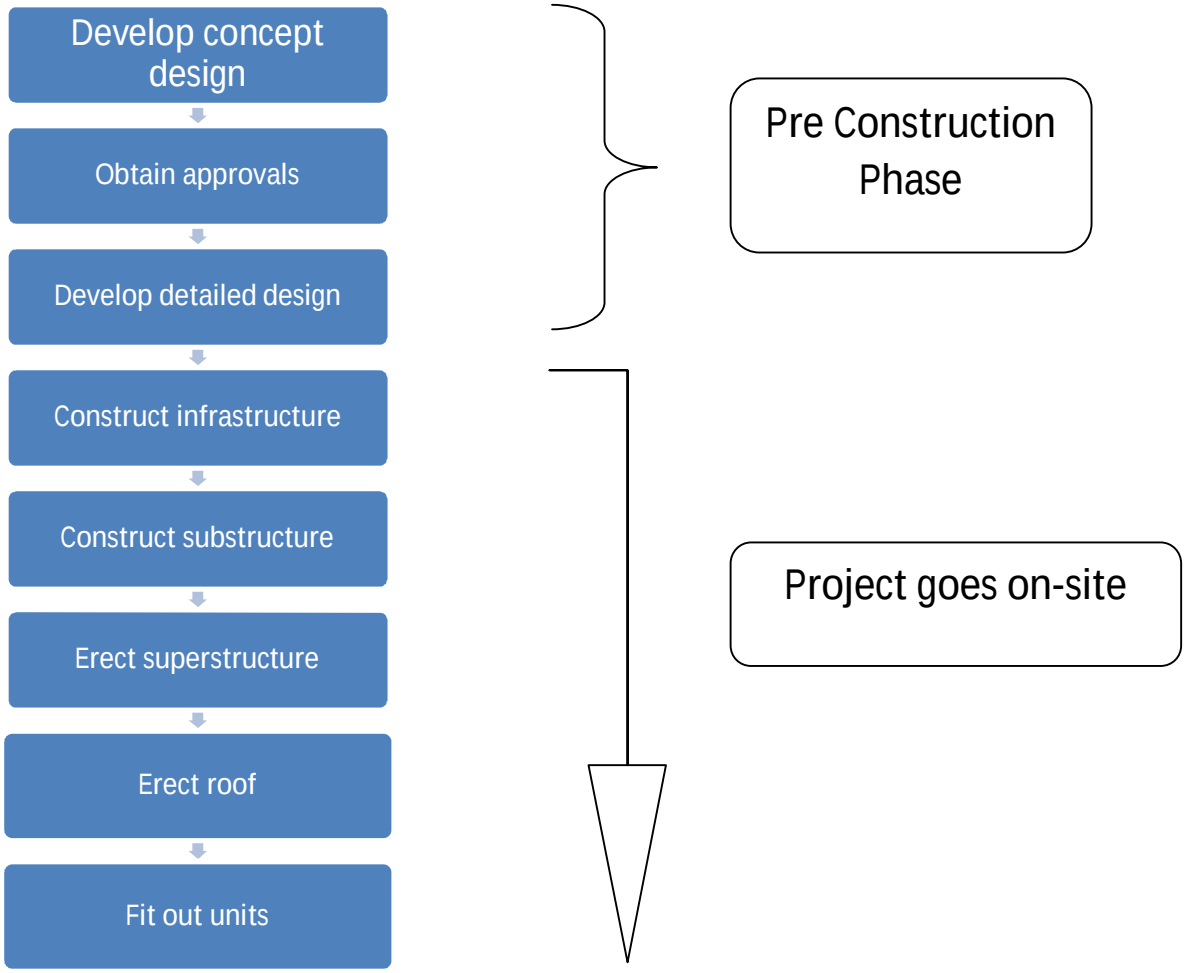
a) To Perform comparison of cost analysis of Modern Methods of Construction and Traditional Methods of Construction

b) To Perform comparison of the time analysis of Modern Methods of Construction and Traditional Methods of Construction

c) To Suggest Feasibility of Modern Methods of Construction in Miraj City.

d) To Perform comparison of The life Period analysis of Modern Methods of Construction and Traditional Methods of Construction

*2) How Modern Methods of Construction Fit Into the Construction Process:*Procurement and construction of conventionally constructed dwellings is by necessity a sequential process, which is represented in its simplest form in Table given below.



3) Types Of Mmc

a) Off-site Manufacturing: Offsite construction refers to structures built at a different location than the location of use. Offsite construction occurs in a manufacturing plant specifically designed for this type of process. Individual modules of the building are constructed in the factory (Fig-2) then transported to the site on specially designed trailers. Concrete foundations are dug into the earth allowing the building to be set at grade level, eliminating the need for ramps and stairs. Once on site, the building will be installed onto a permanent foundation by fastening it to the ground and to other modules and covering and sealing the seams. These buildings meet all applicable building codes and are indistinguishable from traditional site-built construction. Off-site construction is similar to modular construction, but it is focused primarily on permanent construction; modular construction can be either permanent or reloadable.

(Fig-2 off site Manufacturing)

4) *Panel Building System:* elements of the structure that then require various levels of finishing. The most common approach is to use open panels or frames which consist of skeletal structure only with services, insulation, external cladding and internal finishing occurring on-site. Another system that is used frequently involves closed panels. These are more complex, involve more factory fabrication and may include lining materials and insulation. Types of panel systems build include timber frame and steel frame, both of which usually consist of prefabricated load baring panels. Figure 3.3 shows the Panel Building System.Fig- 3 Shows Panel Building Systems.

(Fig-3Panel Building System)

B. 3D Volumetric Construction (Modular Construction)

Units are used to form the structure of the building, thereby enclosing the usable space. Typically, modular construction means that between 80 to 95 per cent of the building-come manufacturing process is completed at the factory and then delivered to the site for final assembly. This process involves connecting the completed modules to each other on site. There is no requirement for any additional supporting superstructure. Modular construction is often used on larger, more standardized schemes due to the economies of scale of many similar sized modules and the discernable benefit of reduced construction times. Prefabricated modules are often referred as pods and are factory finished internally, complete with mechanical and electrical services. Pods are available in timber frame, light-steel frame, hot rolled steel frame, concrete or GAP superstructure and are mainly used in more specialized areas that can be standardized and repeated, such as kitchens and bathrooms. Fig-4 shows 3D Volumetric construction

(Fig-4 3D Volumetric construction)

C. Precast Components

1) *Jet floor:* Jet Floor Super is the first composite suspended system for ground floors incorporating polystyrene infill blocks to provide high levels of insulation. The integrated insulation effectively reduces the overall floor zone by obviating the need for sheet insulation material, thereby reducing construction heights. In this way, Jet floor Super actually reduces construction costs. Contractors also benefit from the system's speed and simplicity of use that makes for rapid and easy installation. This enables floors to be finished early in the construction process, allowing for earlier drying out and faster follow on for other trades. Fig-5 shows Jet Floor.

(Fig-5 Jet Floor)

2) *Hollow core:* Prestressed hollow core units are ideal for all suspended floor applications, particularly where a clear spanning durable deck is required. With clear, un propped spans of up to 13 meters, they can be used on masonry, steel or concrete structures, offering benefits of fast erection and the provision of an immediate working platform. With excellent sound and fire resistant properties, the units can be supplied with preformed service holes and notches. Fig-6 shows Hollow Core.

(Fig-6 Hollow core)

3) *Twin wall:* Using prefabricated panels comprising two slabs connected by means of cast in lattice girders to form a single unit into which concrete is poured on site, Twin Wall is a fully flexible walling system that combines the speed and quality of precast concrete with the structural and waterproof integrity of a continuously poured in situ concrete structure. Without restriction on architectural layout, the system eliminates the need for expensive formwork and the waiting time for the removal of formwork to provide for fast build, with installation rates of up to 100m2 per hour. No edge shutter is required when pouring upper floor concrete and Building Products plastering to ceiling is not necessary to achieve a high quality finish. The panels are machine manufactured to exacting tolerances and can incorporate cast-in cable ducts, electrical boxes and service ports. They are supplied complete with floor, window, door and ventilation openings. Once installed, panels provide superior sound insulation. Fig-7 shows Twin Wall.

(Fig-7 Twin Wall)

4) *Staircases:* Individually designed and manufactured, precast concrete staircases combine the advantages of quality-controlled production with rapid construction and immediate access for follow-on trades. The range now includes both straight flight and winding staircases in both standard and bespoke arrangements. Suitable for virtually any situation in most masonry, concrete and steel structures, they require no propping or formwork and are inherently fire resistant. Fig-8 shows precast staircase.

(Fig-8 Stair case)

III.RATE ANALYSIS

A. *Rate Analysis for Traditional Methods*

R.C.C. work (1:1.5:3) for a beam with 2% steel for 10 cum

Volume of wet concrete = 10 cum

Volume of dry concrete = $\frac{52}{100}$ X 10 + 10 = 15.2 cum

Volume of cement = $\frac{15.2}{1+1.5+3}$ X 1 = 2.763 cum

Number of bag's = $\frac{2.763}{0.0347}$ = 80 bags.

Quantity of sand = 2.763 X 1.5 = 4.14 cum

Quantity of aggregate = 2.763 X 3 = 8.289 cum

Steel = 2% of 10 cum

= $\frac{2}{100}$ X 7850 = 1570 kg.

Binding wire = 1% of total steel i.e.1570 kg.

= $\frac{1}{100}$ X 1570

= 15.7 kg.

B. *Feasibility of MMC for Miraj City*

As per questionary survey conducted at Miraj city, the data obtained by contractors, after discussion with them and by studying the Different MMC we have faced the following points of observation.

1) Problem faced by Contractors
2) Problems regarding the availability of labours.

3) Problems regarding the availability of materials.
4) Delay in projects due to weathering conditions.
5) Increase in Interest on money invested due to delay in construction.
6) No. of labours required for different types of works.
7) Uncertainty in construction due to fund unavailability.
8) Demand of customers is high due to increase in population.
9) Demand of customers for early completion of project which is not possible by traditional method
10) Problem regarding security of materials and there storage
11) Problems occurred due to incorrect casting of members because of formwork deflection which results in change in shape of members. Selection of Feasible MMC for MIRAJ City. During the study of different MMC we have carried out the following

C. Panel Building System

Panel Building system can be damaged by moisture, and should be carefully protected. The Panels of the Panel Building System is not exactly the ideal place for pests to multiply, but the panels should be properly protected from pests. Panels should be treated with inexpensive and harmless (to people and to animals) acid boric, or other insecticide, especially in climates with cold winters and warm summers.

1) Restrictive in Design due to modularity.
2) Limited use in Larger scale building such as high rise.

D. 3D Volumetric Construction

1) Problems in handling the rooms or units from one place to other place
2) Additional efforts required to erect the structure.
3) Risk of failure of structure due to lack of coordination between one unit exactly over another unit.
4) Unavailability of Production Factories in our Locality

E. Tunnel form Construction

1) Investment cost of formwork system increases formwork cost per sqm.
2) A continuous and fast cash flow that complies with the speed of production is essential.
3) Skilled labour force is needed compared to traditional systems.
4) Unavailability of such type of formwork systems in our locality

F. Hybrid Construction

1) Increase in the cost of construction due to combined use of off-site and on-site construction.
2) Negative response from the contractors to use the Hybrid construction due to combination of off-site and on-site construction.
3) Connection is a critical part of Hybrid Construction and these must meet a wide variety of design, performance and other criteria.

G. By considering the above points and analyzing to overcome these problems, The Precast Construction Method of MMC which is nearly suitable apart from other methods by following points

1) Precast Component Manufacturing Factory is available Near the District.
2) The transport and storage of various components of concrete for cast in-situ work are eliminated when precast members are adopted.
3) The work can be completed in a short time, when precast units are adopted.
4) When precast structures are to be installed, it is evident that the amount of scaffolding and formwork is considerably reduced.
5) The labour required in the manufacturing process of the precast units can easily be trained.

In precast construction method the members are designed in factories quality control and hence increase the durability of structure.

Comparison Of Traditional Method With Precast Construction

Point of Comparison	Traditional Method	Precast Construction
1. Unit Rates		
Beam	Rs. 13,894/- per cum	Rs. 14,224/- per cum
Column	Rs. 12,268/- per cum	Rs. 14,224/- per cum
Slab	Rs. 10,826/- per cum	Rs. 14,224/- per cum
Brickwork	Rs. 04,962/- per cum	Rs. 14,224/- per cum
Foundation	Rs. 10,826/- per cum	Rs. 14,224/- per cum
2. Transportation cost	Depends upon availability of materials	Rs. 12,000/- per 50km
3. Plastering for members	Required	Not Required
4. Cycle time of construction	7 days	2 days
5. Special Equipments Required	Tower crane , Mobile crane, Gantry may be required	Tower Crane, Mobile Crane, Gantry must required
6. Life Span of Structure	80 years	120 years
7. Joint Precautions	Not required	Special care taken for structural member joints For e.g. wire mesh skidding, use of sleeve and dowels.
8. Speed of construction	Slow as compare to Precast construction	Fast as compare to Traditional Methods
9. Wastage of Materials	More as compare to Precast construction	Less as compare to Traditional Methods
10. Testing of Structural Members	Not taken	Testing is carried out before erection of members
11.Shifting of openings	Possible	Not possible

IV. CONCLUSION

The project "study of modern methods of construction (mmc) and feasibility analysis with special reference to miraj city", which is based on the use of modern methods of construction in our locality over the traditional methods, are hereby completed by us and by observing the detailed study of above chapters we are here concluded the following points about the use of one of the MMC i.e. Precast Construction,

A. The speed of Precast construction method is more which can provide faster growth of service for customers
B. Wastage of materials in Precast Construction method is less and hence economy can be achieved.
C. Life span of the structure in Precast construction method is more than 40 yrs above traditional method which is more durable.
D. Cycle time of construction in Precast construction method is less and hence it gives the early completion of project and provides economy w.r.t. money invested for project.

Thus by comparing above points we conclude that Precast construction method is Feasible in Miraj city when Mass construction is there & for that they built the precast company in nearby area.

V. ACKNOWLEDGMENT

This research was supported by , Prof M.M.Gidd, Prof A.A.Mahajan and V. G. Awasare. V.T.C.Patgaon, Miraj. We are thankful to our colleagues from Civil Department, who provided expertise that greatly assisted the research.
We have to express out -appreciation to the Prof. M.M.Gidd for shearing their pearls of wisdom with us during the course of research.

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