

Analytical Study of New Methods and Techniques of Construction

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Abstract - The construction industry in developing countries like India even today goes with the larger use of conventional methods of construction. It faces some major problems in construction, like low speed of construction, poor quality control, and formation of more wastage from concrete, formwork and other construction materials which leads environmental issues. In the increasing demands of construction, quality and eco-friendly construction leads the construction industry worldwide to use or adopt new and more efficient methods and materials for construction purpose. This paper throws light on some of the new important methods of construction, and analyses how they are strongly needed to be practiced as a solution to major issues in construction programmes such as overrun or delay, labour safety, green, stable, safety measures, and strong structure, life span of structure and many more. It also focuses on new materials and techniques which make the work of construction easier, speedy and eco-friendly.

Key Words: Construction, building material, formwork, falsework, innovative methods.

1. INTRODUCTION

The world changes continuously and it is a high time today for evolution of many things ever before. "In this modern world, construction industry is considered as one of the significant businesses that have a major role in development and advancement of the economic condition of their countries" (Pradip Ajugiya 168). During this faster changing scenario, it is very challenging and tough time for the construction industry and civil engineers worldwide to fulfil the requirements of affordable housing, transportation and utility infrastructure for the fast increasing population. In the phase to cope up with these challenges, industries need to adopt some new methods leading to reducing construction cost and making buildings more eco-friendly. In order to apply new methods and materials in constructions one has to study well about some main components of buildings such as foundation, column, beam, slab, staircases, walls, doors and windows.

2. CONVENTIONAL METHODS OF CONSTRUCTION

In conventional type of building construction, the construction knowledge and techniques are transferred by the old generation to their upcoming generations without using new technology in it. The building material like bricks, timber, cement, sand, steel and construction aggregate is transported to the site and then construction of building structure is made on the site from these materials. Traditionally, the wet concrete is used to build concrete structural members such as beams, columns, concrete frames and roofs in the formwork on the site itself allowing it to be hard in a certain time period. "Some conventional material used in this process is formwork and falsework, reinforcement and concrete" (Tan Keh Heng 2010). Some of the limitations of the conventional methods are:

- The quality control of the work done in conventional method is not an easy task and in maximum cases, the quality is not controlled as it should have been, as a result, honeycombing, cracks formation etc occurs.
- The wastage of concrete, formwork and falsework is in a very high quantity after the completion of the work.
- Speed of construction by this method is relatively very much low because of the handling and many more consequences in the process.
- The labourers need to be very attentive and to some extent skilful enough to handle the methods on the site remembering the safety measures.

3. NEW METHODS AND TECHNIQUES OF CONSTRUCTION

In the increasing demands of construction, quality and eco-friendly construction leads the construction industry worldwide to use or adopt new and more efficient methods and materials for construction purpose. "The modern methods of construction (MMC) are defined as those which provide an efficient product management process to provide more products of

better quality in less time” (S. Burwood and P. Jess 9). Originated in the United Kingdom (UK), modern methods of construction as a common term is used for offsite and onsite methods of construction” (Lenka Kyjaková 28). “MMC offers predictability, value, improved health, safety, speed and greater efficiency in terms of minimizing waste” (S. Burwood and P. Jess 13). From last few years every country is focusing on their research of new and innovative construction methods, hence, coming out with some measurable results. Some of these can be discussed as follows:

3.1 Precast construction method

Precast concrete technology, the so-called unconventional method of construction can facilitate both speed and quality of construction. It can be efficiently and effectively used in various construction projects and in mass construction project too. “In this method of construction, component of building structures such as beam, column, rigid frames, roofing and flooring members, wall panels etc are casted in the factory and then transported to sides where they are assembled” as per the requirements and functions (V.K Kumavat 10.1).



Fig. - 1: Precast construction (<https://theconstructor.org>)

3.2 Aluminium formwork

Timber formwork is going to be replaced to some extent, by aluminium formwork in the time to come. Timber formwork doesn't provide good finish and desirable efficiency in concrete work. In exchange to the timber formwork of traditional system, “the aluminium formwork system can be used and it also will surpass the speed of most of the other construction technologies” (Ninjal M. Parekh 229).

Aluminium formwork can be used in every type of RCC construction for single storey as well as multi-storey building and offers good finish and a great efficiency in work. The aluminium formwork has certain advantages: this system is believed to be very much suitable for the Indian conditions of mass construction; and this technique is environment friendly as there is no issue of timber. However, the initial cost of aluminium formwork is more than that of timber formwork and it consumes more time in its set up on site because it requires to take more precaution while handling.



Fig. - 2: Aluminium Formwork (<https://www.goldapple-alu.com>)

3.3 Pervious Concrete

Generally, flood and storm water make high damage to roads and pavements. The concrete roads runoff takes place and this becomes a big problem. Pervious pavement is one of the best solutions to this problem as it absorbs water by a rapid rate of three to five gallons per minute per square feet. Hence, it contributes in increase of ground water which is the need of hour to maintain environment.

According to Nitesh Dogne, "Pervious pavement is cement based concrete product that has a porous structure which allows rain water to pass directly through the pavement into the ground without compromising the strength, durability or integrity of the concrete structure itself" (13). Hence, it is very helpful especially in the rainy seasons. However, it cannot be applied in the high traffic areas and for heavy vehicle zone because there is possibility to get it compressed. Also, the maintenance of pervious concrete pavement requires to be done from time to time.



Fig. - 3: Pervious Concrete (<https://www.slideshare.net>)

3.4 Light transmitting concrete

Nitesh Dogne rightly points it out that, "Soon the era of dull grey concrete could be at an end. A Hungarian architect has combined the world's most popular building material with optical fibre from Schott to create a new type of concrete that transmits light" (13).

Light transmitting concrete is also known as translucent concrete. It can be used as decorative blocks with same strength as that of grey concrete blocks. It is a unique discovery from the architectural point of view. As it gives a very beautiful and classic look to walls and satisfies the costumers well as compared to ordinary concrete without applying any type of paint on it. However, it has very high initial cost because of the optical fiber used in it; and it requires skilled persons for the casting of this concrete.

3.5 Floating concrete

Generally, a lot of wood is used in floating construction work and naturally wood comes from trees causing damage to Nature and environment. It is a very good evolution coming up in concrete mainly from the perspective of good environment as it opens the door to use floating concrete in exchange of wood where the structures are desired to float on water because of its light weight property. The university of Washington material scientists have created a concrete stronger than the traditional concrete, but so light weight that can even float on water (Dogne 13). By using tiny polymeric sphere and low density materials floating concrete can be prepared. Hence, it can be used in various constructions that are connected to water. However, the corrosion can occur under a certain condition in the floating concrete to nearly 2 times of the possibility in ordinary concrete.

3.6 High performance concrete

High performance concrete (HPC) is an evolution of the upgraded version of conventional concrete that is made by careful selection and mixing the ingredients like sand, cement, water, gravel, admixtures etc. This gives the concrete additional qualities like low permeability, smooth surface and many more. Nitesh Dogne has rightly pointed it out that, "high performance concrete has high compressive and flexural strength and their special characteristic enables the achievements of outstanding architectural feats" (15). However, it leads to emission of some gases such as CO₂ and greenhouse gases which are hazardous to environment.

Along with these major methods and materials of new constructions, there are some other important materials and methods as follows:

- Geo web – It's a cellular confinement system for vertical vegetation on green walls.
- 3D moulded plywood – It is fast manufacturing furniture.
- Fly ash concrete – It is made up by using fly ash residue as strengthening material with cement.
- Sidewalks – Sidewalks or walk ways are made by using used tyres and hard boarding sheets.

4. CONCLUSION

To conclude, the new methods and materials available for construction purpose have many more advantages over the traditional or conventional system of construction such as improved quality, cost reducing, time cutting, eco-friendly etc. Precast concrete technology facilitates both speed and quality of construction. Aluminium formwork is environment friendly that offers good finish and a great efficiency in work. Pervious concrete contributes in increase of ground water and minimizes runoff of roads and pavements in water calamities. Light transmitting concrete gives beautiful and classic look to walls. Floating concrete offers best option for reducing the usage of wood in water floating construction. Thus, the modern methods have revolutionized the potential of construction.

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