Journal of Advances and Scholarly Researches in Allied Education
Vol. XV, Issue No. 2, (Special Issue) April-2018, ISSN 2230-7540

An Overview on Prefabricated Elements in Construction Technologies

Ms. Monali Dhakate[1]* Prof. Dr. A. W. Dhawale[2]

[1] PG Student, JSPM's Imperial College of Engineering and Research, Wagholi, Pune

[2] Professor and HOD Civil Engineering Department, JSPM's Imperial College of Engineering and Research, Wagholi, Pune

Abstract – In today world innovation in all the field has become an important part, prefabrication has become an important technology in construction field. Prefabrication is the practice of assembling components of a structure or building in a factor or other manufacturing sites, and transporting complete assemblies or sub-assemblies to the construction site where the structure is to be located. The term is used to distinguish this process from the more conventional construction, practice of transporting the basic materials to the construction sites where all assembly is carried out. The term prefabrication can apply to any construction method where a significant part of the construction takes place offsite in factory that produced relatively large, complex pieces that are then assembled at the site into the finished building.

There are various technologies available worldwide for using prefabricated construction methods, almost all technologies try to reduce cost and time, prefabrication method gives possibilities to the designers for assembling their structures in a short period of time. But the main disadvantage of prefabricated construction is the cost of the building. Use of this technology although reduces the time of construction but fails in reducing the cost, therefore there is a limitation in the usage of prefabrication in the construction industry. Prefabrication technologies could be used more in building construction if the disadvantages of prefabrication are removed and more suitable ways are detected. In this paper, literature review, brief introduction about prefabricated elements and its cost comparison with conventional methods of construction has been given. However, if the disadvantages are overcome and suitable ways are detected it has a wide scope in future.

Keywords: Prefabrication, Prefabrication method, Conventional method, Construction

----------X----------

INTRODUCTION

Prefabrication is the practice of assembling components of a structure or building in a factor or other manufacturing sites, and transporting complete assemblies or sub-assemblies to the construction site where the structure is to be located. Prefabricated structures are also denoted as precast structure. Prefab concrete is available in many shapes, sizes, including structured elements and unreinforced pieces. The prefab industry is the backbone for the development of new ideas in construction business of any country.

Prefabrication is one of the key means of increasing buildability. As the industry strategies itself to build with less labour and shorter construction time, prefabrication of concrete structures has become a viable alternative to the traditional way of construction.

The benefits of using prefabrication would not be fully realized by merely adapting the traditional way of design and construction process. Many different technologies of prefabrication system over all worlds and almost of the technologies have worked over the reduction of cost and time of the construction. Now a days, faster construction at lesser cost has become the important priority of people in this using prefabrication system over conventional construction methods are always welcomed. Although, the time of construction is being reduced in prefabrication the cost has still remained the point to be worried of. But if the disadvantages of prefabrication is removed this technologies of prefabrication can be more used in building construction.

LITERATURE REVIEW:

1. Comparative Study on Prefabrication Construction with Cast In-situ Construction of Residential Buildings (2015):

N.Dineshkumar and P.Kathirvel have studied the total cost and total duration of the double storey residential building with both prefab and conventional construction. The comparison showed that there is enormous cost difference between the methods, which the prefab is very high when compared to conventional on that type of individual houses. And they concluded that the prefab construction for individual double storey residential building is 13% more than the conventional construction. This is main drawback for prefab construction which is not economical to construct.

2. Study of Prefabrication in India (2016):

According to Rinkesh Patel and Dr.Neeraj Sharma the difference between the cost of prefabrication construction and conventional construction is very much. And they also studied the advantages and disadvantages of both prefabrication and conventional construction. According to them the main advantages for prefab construction is that it helps when there is labour shortage.

- They have also done a comparison of duration and cost analysis between the prefabricated construction and conventional construction over a two storied residential building and they concluded that.
- If a conventionally constructed building takes 52 days for the construction of superstructure and 54 days for the finishing work then the prefabricated constructed building will need only 12 days for complete construction of its superstructure and only 31 days for the finishing work.
- This concludes that the time required for the construction of the prefabricated building is much less than that of the conventional building
- And if construction cost is considered, the cost required by the conventional building for the construction of superstructure is 10, 24,000 rupees and that of finishing work is 44,69,000 rupees whereas the cost in prefabricated construction for the superstructures is 24,23,000 rupees and for finishing work it is 43,51,000 rupees.
- Here we can conclude that the cost of the construction for the prefabricated building is more than that of the conventional one.

3. Evaluation of Prefabrication Technologies in Construction (2016):

Alireza Baghchesaraei and Omid Reza Baghchesaraei stated that the future of prefabrication is the improvement of current practices and new development markets. Prefabrication systems might have some potential of increased use in future because of their characteristics.

4. Investigation on the Effective Usage of Prefabricated Elements in Construction Projects and developing a Module to reduce time and cost (2016):

K.V. Vinoth Kumar and R. Nagavinothini stated that the quantitative analysis established that the usage of the prefabricated elements in the construction will result in increased time and cost performance. The comparative study on the prefabrication and the conventional construction reveals that the total duration of the project can be reduced upto 42.5% with the adoption of prefabrication technology. The comparison also showed the increase in cost of construction of the prefabricated building construction.

5. Analyze time-cost required for conventional and prefabricated building components (2017):

Lakhi M. Chavan and Prof. D.B. Desai has analyzed the time-cost required for conventional and prefabricated building components. They stated that by utilizing the precast building components they reduce the cost up to 17.24%, using the methodology we can also reduce the project duration up to 26%. It is also found that time required in case precast construction is quite less as compared to conventional.

6. Development and Efficiency of Prefabricated Building Components (2016):

Tomas U. Ganiron Jr has studied the efficiency of prefabricated building components and he stated that the advantages of this technology is that workers in the factory use lasers to cut the wood and jigs to place the pieces together, the quality is very consistent. Very little waste is created and no materials are damaged by moisture.

CHARACTERISTICS OF PREFABRICATION

- Light weight
- Thermal insulation property
- Easy workability

- Durability in all weather conditions
- Non combustibility
- Economy in cost
- Easy availability
- Sound insulation

ADVANTAGES OF PREFABRICATION

- High capacity - enabling the realization of important projects
- Factory made products
- Shorter construction time - less than half of conventional cast in site construction
- Independent of adverse weather conditions during construction
- Continuing erection in winter time until -20 °C
- Quality surveillance system
- Opportunities for good architecture
- Healthy buildings
- Reduced energy consumption
- Environmental friendly way of building with optimum use of materials, recycling of waste products, less noise and dust, etc.
- Cost effective solutions
- Safety in construction
- Increase in the quality of construction
- Reduction of construction waste

LIMITATION OF PREFABRICATION

- Large prefabricated sections require heavy-duty cranes and precision measurement and handling to place in position.
- Larger groups of buildings from the same type of prefabricated elements tend to look drab and monotonous.
- Careful handling of prefabricated components such as concrete panels or steel and glass panels is required.
- Attention has to be paid to the strength and corrosion- resistance of the joining of prefabricated sections to avoid failure at the joint.
- Leaks can form at joints in prefabricated components.
- Transportation costs may be higher for voluminous prefabricated section than the materials of which they are made, which can often be packed more compactly.

CONCLUSION

After having a view on all the literatures over prefabricated construction we can conclude that

- Prefabricated construction has tried to reduce the cost and duration of the construction.
- The duration of the construction can be reduced with the use of prefabricated construction over conventional method.
- But the cost of construction increases enormously which is the major disadvantage of using of prefabricated construction in the construction industry.
- Prefabricated construction is well used when the construction is in the huge count and if the above disadvantage is overcomed it can be used in small construction which would be more beneficial.
- We can also conclude that the prefabricated construction is more beneficial where there is the scarcity of labour/manpower on site.

REFERENCES

Alireza Baghchesaraei and Omid Reza Baghchesaraei (2016). Evaluation of Prefabrication Technologies in Construction", CSJ-The Caspian Sea Journal, Volume 10, Issue 1, Supplement 1(2016) pp. 87-90

K.V. Vinoth Kumar and R. Nagavinothini (2016). Investigation on the Effective Usage of Prefabricated Elements in Construction Projects and developing a Module to reduce

time and cost", IJSETR-International Journal of Science, Engineering and Technology Research, Volume 5, Issue 4, pp. 856

Lakhi M. Chavan and Prof. D.B. Desai (2017). Analyze time-cost required for conventional and prefabricated building components", IRJET-International Research Journal of Engineering and Technology, Volume 04, Issue 08, pp. 1957

N. Dineshkumar, P. Kathirvel (2015). "Comparative Study on Prefabrication Construction with Cast In-Situ Construction of Residential Buildings", IJISET-International Journal of Innovative Science, Engineering and Technology, Vol. 2 Issue 4, pp. 527

Rinkesh Patel, Dr. Neeraj Sharma : "Study of Prefabrication in India", IJARESM-International Journal of Advanced Research in Engineering, Science and Management ISSN: 2394-1766

Tomas U. Ganiron Jr (2016). "Development and Efficiency of Prefabricated Building Components", IJSH-International Journal of Smart Home", Volume 10, No.06 (2016), pp 85.

Corresponding Author

Ms. Monali Dhakate*

PG Student, JSPM's Imperial College of Engineering and Research, Wagholi, Pune