Impact of Prefabrication Technology & Equipment on Profitability

Er.Mukunda B. Shep[1], Prof. Ashish P. Waghmare[2]
[1]Dept of Civil Engineering
[2]Assistant Professor, Dept of Civil Engineering
[1, 2] D. Y. Patil School of Engineering & Technology, Lohegaon, Pune

Abstract- *Prefabricated buildings and structures are mounted from uniform prefabricated three-dimensional units, providing strength, preset thermal properties of structures, dynamic stability, and immutability of geometric dimensions of the prefabricated elements during their manufacture, transportation, and installation in special and difficult conditions. Prefabrication has been widely regarded as a sustainable construction method in terms of its impact on environmental protection. One important aspect of this perspective is the influence of prefabrication on construction waste reduction and the subsequent waste handling activities, including waste sorting, reuse, recycle, and disposal Suggestions for improvement of the industry and study on cost effectiveness of precast concrete construction. In this project the replacement of non-structural component with prefabrication element is proposed. The cost benefit analysis will be studied including prefabrication element in conventional building.*

I. INTRODUCTION

1.1 General

Prefabrication has been widely regarded as a sustainable construction method in terms of its impact on environmental protection. One important aspect of this perspective is the influence of prefabrication on construction waste reduction and the subsequent waste handling activities, including waste sorting, reuse, recycle, and disposal. Never the less, it would appear that existing research with regard to this topic has failed to take into account its innate dynamic character of the process of construction waste minimization; integrating all essential waste handling activities has never been achieved thus far. This report proposes a dynamic model for quantitatively evaluating the possible impacts arising from the application of prefabrication technology on construction waste reduction and the subsequent waste handling activities

1.2 Objectives

- To study construction process of prefabrication systems.
- To compare prefabrication construction with conventional construction in terms of cost, work breakdown structure and feasibility.
- The object of this seminar is to identify new methodologies in the Construction Industry.
- To identify the cost benefit analysis to change parts of RCC building with prefabrication parts for instance doors and windows frame, prefabrication walls, w.c., bath and staircase.

1.3 Scope of the Project

- Project deals about the theoretical apparatus defining a classification of prefabrication in construction.
- It deals about the criteria that influence the decision on the deployment of prefabricated elements to the project.
- It also brings the results of survey focused on the application of prefabricated construction methods.

II. LITERATURE REVIEW

VaishaliTurai The growth of Indian construction is going to become a fast to fulfill (meet) the need of future generation, time effective and achieving advance technique. The paper based on time comparison of precast concrete vs. cast-in-place (i.e. traditional) concrete. How total time of construction by precast concrete system is less than the time by use of cast-in-place concrete. Time of any construction is directly varied with cost of construction. The time required for steel binding, shuttering, concreting then time required for curing will be minimize (7 days).The Precast is manufactured in factory (i.e. in controlled environment) with required quality, easily mix, and cure till achieved good quantity with desired strength. Precast concrete is manufactured in factory and transport to site. The strength of precast concrete is achieved in greater extent by using high technology, controlled system. For precast construction less manpower is required, labors are required only to joint precast members. The time of rework due to improper work, faulty construction

method, unskilled labor, material quality, onsite environmental problem can be eliminated by using precast members.

T.Subramani1, M. Muhammad Ansar Prefabricated buildings and structures are mounted from uniform prefabricated three-dimensional units, providing strength, preset thermal properties of structures, dynamic stability, and immutability of geometric dimensions of the prefabricated elements during their manufacture, transportation, and installation in special and difficult conditions. Prefabrication has been widely regarded as sustainable construction method in terms of its impact on environmental protection. One important aspect of this perspective is the influence of prefabrication on construction waste reduction and the subsequent waste handling activities, including waste sorting, reuse, recycle, and disposal suggestions for improvement of the industry and study on cost effectiveness of precast concrete construction. The prefabricated building process usually starts with assembling of the steel, concrete and wood, or pure concrete frames.

Radziszewska-ZielinaA Poland to compare the economic benefits of traditional construction methods to prefabricated building systems indicated that the latter provided site labor savings of up to 70% while its incurred total construction where savings of close to 50% are achieved through the use of whole prefabrication methods. These examples are pointers to the immense positive benefits of prefabrication, in addition to reduced energy consumption, waste minimization, mitigation of GHG emission and overall negative environmental impacts. An appraisal of building systems, their characteristics and the challenges they pose to the construction industry, especially in urban, fast-paced regions like the UAE, constitutes the background of this study Lu, W. and Yuan The construction industry around the globe has been increasingly advocated to utilize prefabrication to minimize waste, thereby alleviating associated negative impacts on environment and the society. Previous studies have reported on waste reduction potential from adopting prefabrication in various economies including Hong Kong. A significant shortcoming of these studies, however, is the neglect of the upstream processes of prefabrication including the manufacturing and transportation of components, which causes construction waste as well. To date it is still unclear how this portion of construction waste is generated and quantified. This study provides insights into understanding construction waste reduction through offshore prefabrication from a holistic view.

III. METHODOLOGY

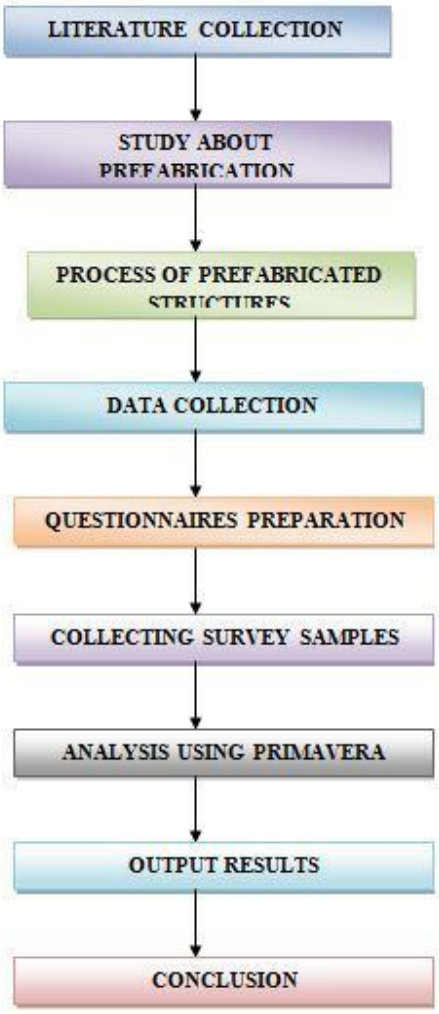

Fig. 1 Methodology

3.1Prefabrication in housing construction

It is very clear that automation brings great value to businesses. It allows them to achieve higher capacities, improved quality and a wider product range, as well as allowing more options to be offered at significantly higher productivity. Companies that run automated prefabrication thus appear to be very satisfied. As to the question of whether the machine technology pays off, we are seeing a consistently positive image. It is important to think through and plan the transition process precisely. Ideally, experts should be involved at an early stage in the process in order to get the best possible result. By taking a step towards automation, businesses are set up for the future.

Fig 2 prefabrication In Housing Construction

3.2 Prefabrication Elements

- Flooring / Roofing system.
- Precast Beams
- Precast Columns
- Precast wall panels
- Precast Slabs

3.3 Method

- Economy in large scale project with high degree of repetition in work construction.
- Special requirement in finishing.
- Consistency in structural quality control.
- Fast speed of construction.
- Constraints in availability of site resources (e.g. Materials & Laborites)
- Overall assessment of some or all of the above factors which points to the superiority of adopting precast construction over convention method.
- Local Jobs are last.

3.4 Problem Statement

- Name of site: Shivsai developers
- Name of builder : KiranVitthalNagawade
- Location of site : Plot no. 25&26 at nhawaretal. Shirur, dist. Pune
- Area of site : 6000 sqft
- Cost of project : 1.8 cr
- Name of consultant : Mahesh kadam
- Details of site :
  i. 2bhk -- 3 flats per floor
  ii. 1 bhk – 2 flats per floor
- Present condition : excavation and prep for centrelinning for foundation
- Total built up area : 4800 per floor slab area (P+4)
- Owner and developer : kiranNagawade
- Architect : SidheshSonawane
- Structural engineer ; Sachin Sharma
- Total flats : 20 flats
  i. 12 flats : 2bhk
  ii. 8 flats : 1bhk
- This structure is conventional residential building. These case study having 20 flats and it is having (P+4) structure.

Fig 3 Elevation plan

IV. RESULT

4.1 Work Breakdown Structure Of Conventional Construction

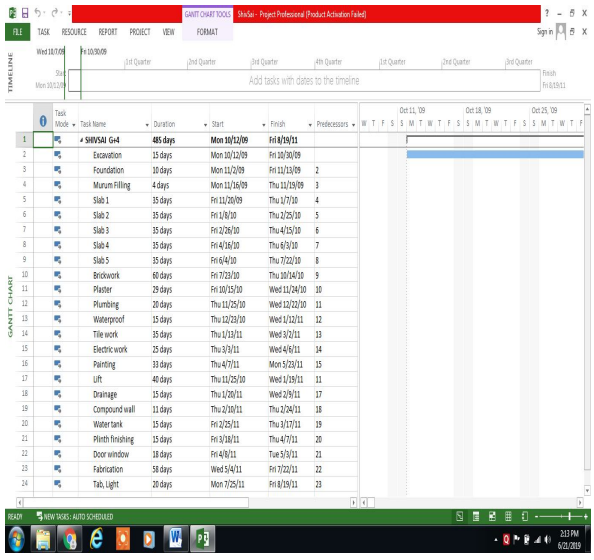

Fig 4 WBS Of Conventional Construction

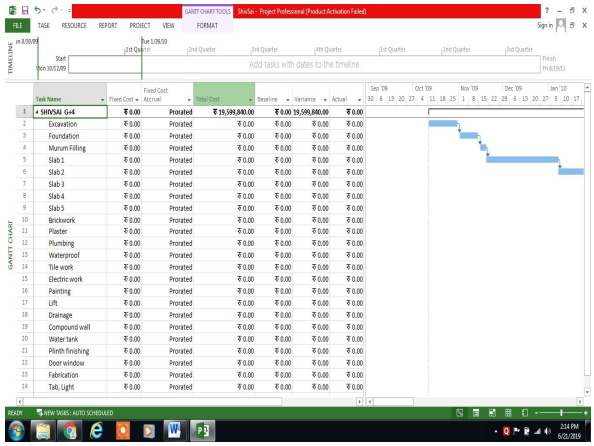

Fig 5 Costing Of Conventional Construction

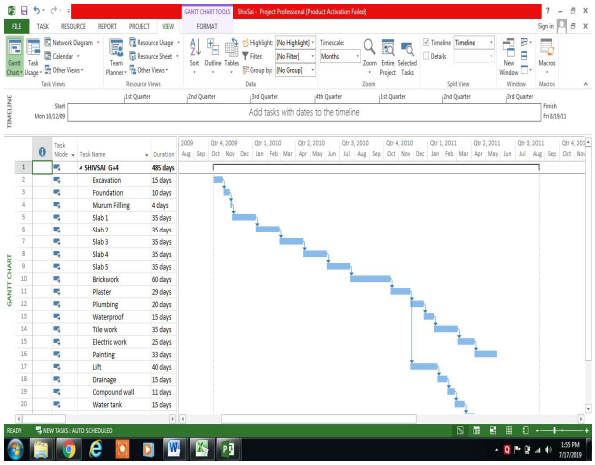

Fig 6 Work Flow Of Conventional Construction

Result from WBS of Conventional Construction from MSP is:

- No. of days - 485
- Cost with material+labour-1,96,00,000/-

4.2 Work Breakdown Structure Of Prefabrication Construction

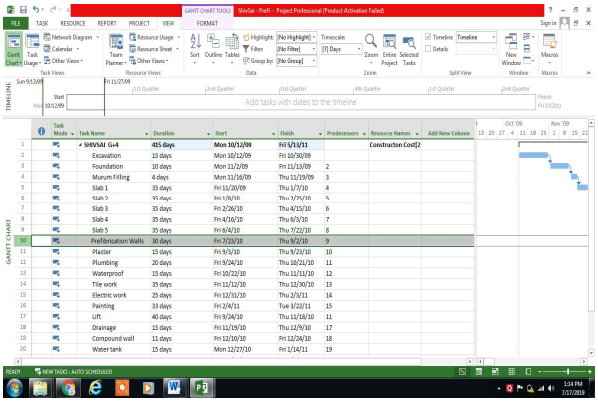

Fig 7 WBS Of Prefabrication Construction

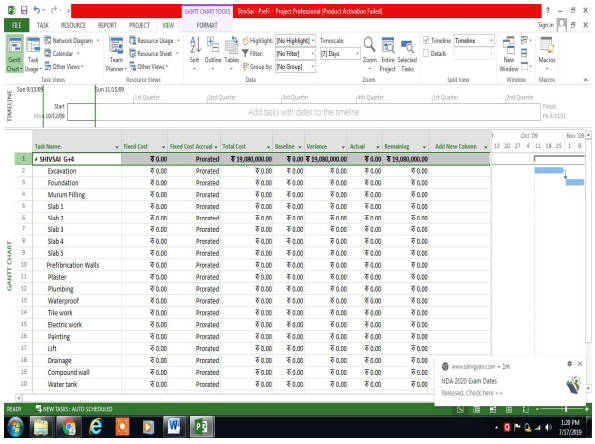

Fig 8 Costing Of Prefabrication Construction

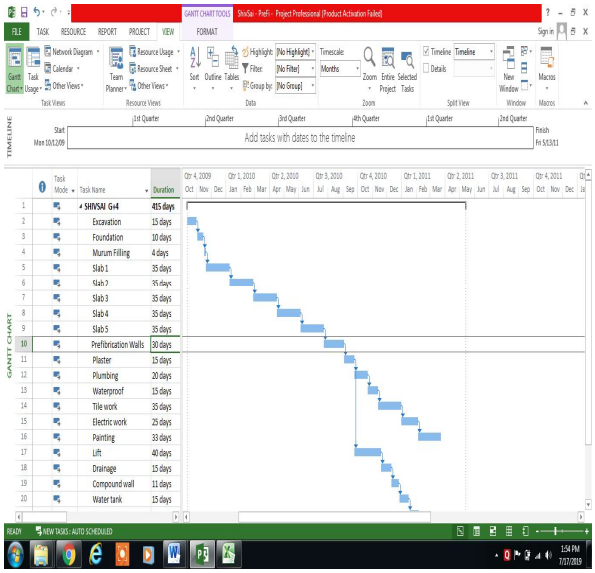

Fig 9 Work Flow Of Conventional Construction

Result from WBS of Prefabrication Construction from MSP is:

- No. of days - 415
- Cost with material+labour-1,90,80,000/-

4.3 Comparison Of Conventional Construction To Prefabrication Construction

Type	Duration	Cost
Conventional Construction	485	19600000
Prefabrication Construction	415	19080000

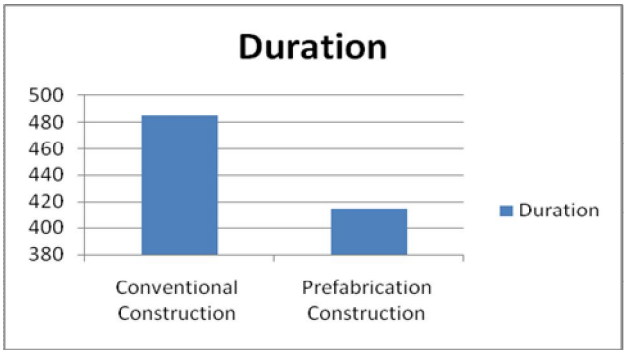

Fig 10 Comparison of Duration for Conventional Construction To Prefabrication Construction

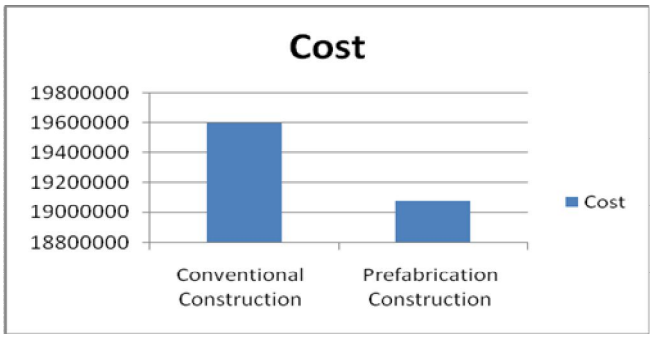

Fig 11 Comparison of Cost for Conventional Construction To Prefabrication Construction

V. CONCLUSION

- A comparative survey from site found that prefabrication reduced activities associated with repetitive body movements, ergonomic challenges and ergonomic problems.
- A conventional RCC case study is selected and its cost estimate, schedule and work break down structure in MSP is prepared.
- Prefabrication technology has not transferred as easily when compared with other technologies because it is a production technology or knowledge based and not a consumption technology or product based.
- The survey found that 92% workers reported that the use of prefabrication Preassembly and precast would reduce hazards related to material handling on site and that the reduction of scaffolding through the use of prefabricated preassernbly or precast components would lead to less falls on sites.

REFERENCES

[1] H. W. Lee' Macroeconomic Labor Productivity and Its Impact on Firm's Profitability' August 2013

[2] VaishaliTurai' A Study of Cost Comparison of Precast Concrete Vs Cast-In-Place Concrete' Volume – 2, Issue – 2, June – 2016

[3] Aki Aapaoja1'THE CHALLENGES OF STANDARDIZATION OF PRODUCTS AND PROCESSES IN CONSTRUCTION'

[4] Tony Cunningham' Factors Affecting The Cost of Building Work – An Overview'2013-10-09

[5] T.Subramani' Impact Of Prefabricated Technology And Equipment On The Profitability Using Primavera'Volume 6, Issue 3, May- June 2017

[6] N.Dineshkumar' Comparative Study on Prefabrication Construction with Cast In-Situ Construction of Residential Buildings' ISSN 2348 – 7968

[7] EvanjalineLibie' IMPACT OF PREFABRICATION ON PROFITABILITY OVER TRADITIONAL CONSTRUCTION' ISSN: 2455-5797

[8] Abhishek K.Taware1' Prefabrication, Sustainable Technique in Building Construction' Volume 1, Issue 2, February 2017

[9] Ong Ying Rui1' The Productivity Rate of Prefabricated Pre-Finished Volumetric
a. Construction (PPVC)'