International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 03 , March 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

IBS AS A SUSTAINABLE BUILDING CONSTRUCTION & MANAGEMENT

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ABSTRACT

The Indian construction system is going to a transitional change from a construction industry employing conventional construction to a more modernized and advanced system. Like a pre-fabricated component system, steel framing system, block work and mould system, and timber framing system in all such system is known as the (IBS) Industrialized Building System. In this new technique of construction in order to increase the productivity of construction an d improve quality of work. The system can be used good construction, equipment, materials and better project planning. This study is present and defines d actual difference between conventional and industrialized building system. Which can provide the necessary information on the building cost comparison between these two system. This study also addresses the building cost comparison, more advantages and effective in between two systems. Such provides the details building cost indicates which of the two are cheaper. The data was collected through questionnaire survey from the respondent and case study in Nasik city, which consisting of residential buildings of low cost housing project in MAHADA construction. The data analysis of statistical test or average index method 'it is shown that there is a significant difference in cost saving. for the conventional & IBS system.

Keywords:Construction Cost Co Imprison, Industrialized Building System, Conventional System, Project Planning, Average Index.

I. INTRODUCTION

The industrialize d Building System (IBS) construction system is old in India. It is used in India from last many years.But mostly limited or heavy structures such as bridges/flyovers Tunnels, and underground passes. Precast System was firstly used in India during the construction of foundation for Gate Way of India. An industrialized Building System (IBS) can be defined as the Building Constructed using Prefabricated Building components. It consists of Symmetrical Components which are casted i n cast yards with similar moulds. The components manufactured in Cast yards are then transported on Site by using heavy vehicle, erected and assembled on site. The application of the industrialized building system (IBS) has a more advantages over the conventional method. A various examples of the advantages are the reduction of the site labours, minimization in wastage of materials, less in environmental impact and reduction in labour. The advantages showing that, IBS also provide

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

a safety and more managed construction site, and the completion time of construction is also reduced. The IBS indirectly denoted that the its much more economical in terms of construction cost than the conventional system. And the focus of this st udy is to generate a comparison between Construction cost of Conventional system and the similar building casted using Industrialized Building System and subsequently provide information guideline for the construction cost comparison for local construction site in IBS system and conventional construction system by the data generated through the interviews of general contractor, site engineer, project manager, general manager, etc and analysis the data.

II. CLASSIFICATION OF INDUSTRIALISED BUILDING SYSTEM

The study basically means the various methods employed, are as follows.

2.1 Pre-cast Concrete Framing, Panel and Box Systems.

This is the most common group of IBS products pre-cast concrete elements. It includes precast column, beam, walls, staircase, slabs, etc are constructed in mould and after placed in on site.[5]

2.2 Steel Formwork Systems.

In this type of system is low level and last prefabricated IBS system. It is made and casted on the site. Such types include better quality control and good finishes of the surface. These include less site labour and material. It include –tunnel, beam columns, tilt up system in moulding forms & steel framework. [5]

2.3 Steel Framing Systems

This system is mostly used pre-cast concrete slabs, steels columns and beams, steel framing systems. It's properly choice in the fast-track construction of skyscrapers. In modernization of this type to design light weight steel trusses consisting of cost effective profiled cold-formed channels and steel frame system.[5]

2.4 Prefabricated Timber Framing Systems.

Such system is used in timber building frames and timber roof trusses. Then its include more popular, timber building frame systems. This system can be use and design is very interesting designs from simple dwelling unit and more aesthetical view.[5]

2.5 Block work Systems.

The general construction method is of using conventional clay bricks. In development and usage of interlocking concrete masonry lightweight concrete blocks. Its time consuming than traditional bricks-laying this is effective solution and simple to the usage and fast construction [5]

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III. CONSTRUCTION COST COMPARISION

Referring to the various papers in similar topic to study & research in there are 3 signified principal are used for comparing costs of building projects.

1. Comparison standardized identical buildings.[5]
2. Comparison of standard buildings with local modifications.[5]
3. Comparison of functionally similar building. [5]

3.1. Cost

1. Material costs
2. Labour costs
3. Equipment cost
4. Overhead costs
5. Profit

3.2. Speed

The IBS construction required short construction time because most of activity are done by precast yard then on site work is minimum. In on site construction the placing and fixing the component of building. Then speed of construction is more. In less construction time then to require less labour and project can be complete within the time and to avoided overhead cost of project.

3.3. Labour

The IBS system required less labour because more activity can be done in machine operation. The Labour wages include all labour cost, like direct cost and indirect cost. The direct cost includes payment on workmen. And Indirect labour cost include payments made by a contractor on the employee's behalf, the IBS reduced the labour cost of project.

3.4 Quality

In construction industry quality is most important factor .the quality is depends upon design of building, method of construction, material of construction, and such thing affect the building cost. This is important to building appearance and aesthetical purposes to attracting to the customer.

IV. METHOD OF ANALYSIS

The case study data needed consist of the total construction cost for a particular construction project, such data can be generated through the interviews of engineers, contractors ,project manager ,general manager, architect etc. In industrialised building project. And same data can be collect on conventional building system from the chosen consultant company. This data is basically for the analysis of comparison for the two different types of the construction system. It provide indirectly information and knowledge obtained through the interview that

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

need been done. All such data collect and analyzed by descriptive and analytical methods. This data was analyzed using the Index Average Method as follows:

$$\text{Index Average} = \frac{\sum ai*xi}{\sum xi}$$

Where: ai = constant

xi= variables representing respondents' frequency.

4.1. Case study

The case studies for Industrialized Building system campus. Project of MAHADA in NASHIK city near the Mahasrulgaon is a G+7-storey residential Building using IBS with a Gross Floor Area (GFA) of 1.5 hector 3 nos. Building. Commanding a construction period of 14 months. Construction methods, commanding a Comprising Living Room, Kitchen, WC & Bath – structure, having area 1 flat 645 sq ft (1BHK) &715sq ft(2BHK)

4.2. Results

Figure 1 shows building cost-saving in term of percentage. Forty two percent of the respondents agreed that the conventional construction method is more cost saving, 25% agreed that composite construction method are most cost saving, 21% agreed that formwork system are most cost saving. Last but not least only 12% agreed that prefabricated construction method is most cost saving. The previous study showed clearly the advantages of using formwork system (cast in-situ). These were spared, quality and economics[5]. However, the results of the analysis revealed that the conventional construction method is more cost saving compared to the IBS method.

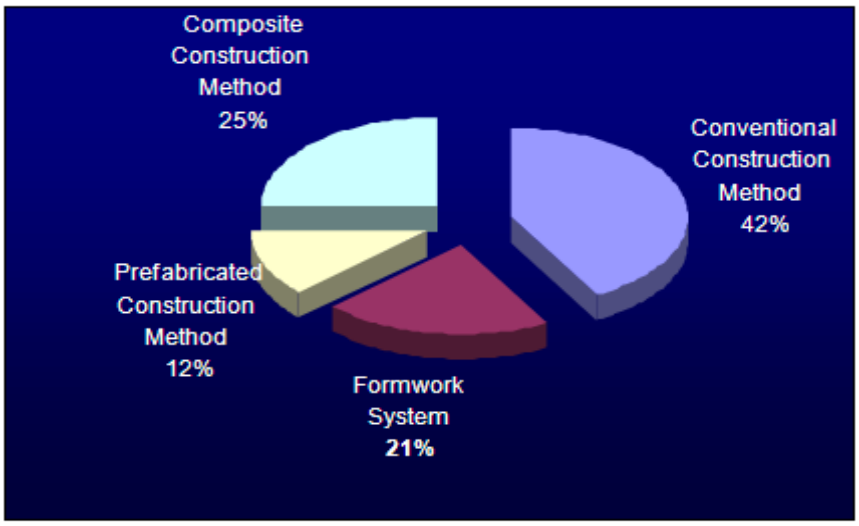

Fig. 1: Building Cost Saving

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

According to the reasons given by the respondents, the conventional system is more cost saving as compared to formwork system was because of better negotiations and chances to get the most competitive tender price appropriate to the developer's budget. There is also flexibility in choosing alternative building materials at a lower cost. Therefore, building cost can be reduced. As for the IBS, there are limited to a few manufacturers or specialized contractors. This contributed to the high cost of building due to higher licensing cost and they tend to be monopolized by the higher price of the building panel or other building components.

4.3 Formwork System Case Study

The selected industrialized building system case study is based on formwork system. This system is suitable for a country where unskilled labor is limited. There is no heavy machinery or high technology involved. The system is technically applicable to almost all types of buildings. Formwork is used as a mold, where wet concrete, is poured into a temporary system. The temporary system also acts as a temporary support for the structures. This In-situ method is to eliminate and reduce the traditional site based trades like traditional timber formwork, brickwork, plastering and to reduce labor content. Carefully planned in-situ work can maximize the productivity, speed and accuracy of prefabricated to study the cost comparison of school building cost of1 unit 4-Storey (academic block) project carried out by the Public Works Department, Malaysia, which uses a conventional / traditional system and formwork system. The conventional and formwork system building cost is based on analysis of the Elemental Cost Analysis (ECA) form. The formwork system is based on the combination of pre-fabrication and in-situ conventional construction, which features the utilization of permanent concrete form elements instead of conventional timber formwork

4.4 Building Cost Information

The main objective of this case study is to study the cost comparison of 4-storey school buildings, which used conventional/traditional system and formwork system. The conventional system building and the formwork system cost is based on elemental cost analysis form from the Public Work Department, Malaysia[10].

4.5 Cost Comparison

Table 1 shows the main difference between 1 unit four storey school building of conventional and formwork system for 20 numbers of data. The mean cost of conventional systems is RM 432 per square meter whereby the formwork system is RM 544 per square meter. The difference is RM 112 per square meter. Although the difference is RM112 per square meter the total of the square meter for 1 unit 4- storey school building is about 2000 square meters.

This shows that there is a wide difference between IBS and Conventional. In layman's terms the IBS is very expensive. For example, if the government wishes to build 20 school buildings of the same IBS, this means the cost will be very high. Therefore, all efforts must be made to reduce this so as to ensure the future use of IBS method is feasible.

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Difference between 1 Unit Four Storey School Building of Conventional and Formwork System (IBS)

Paired Samples Statistics

		Mean	N	SD	Mean SE
Pair 1	CONV	432.3940	20	73.4217	16.4176
	IBS	544.4355	20	69.8597	15.62

Chart 1 Comparison of conventional and IBS system.

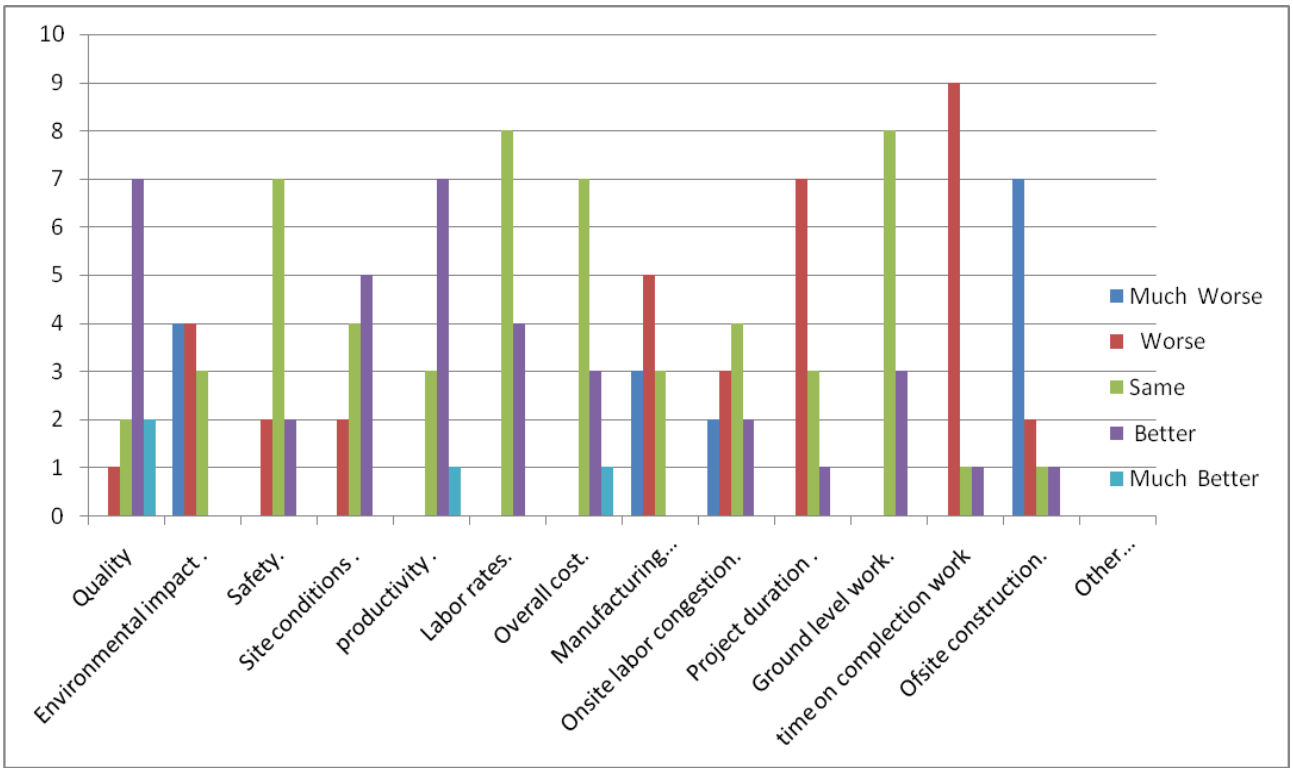

Chart 2 Rate the significance of possible impediments to the use of prefabrication.

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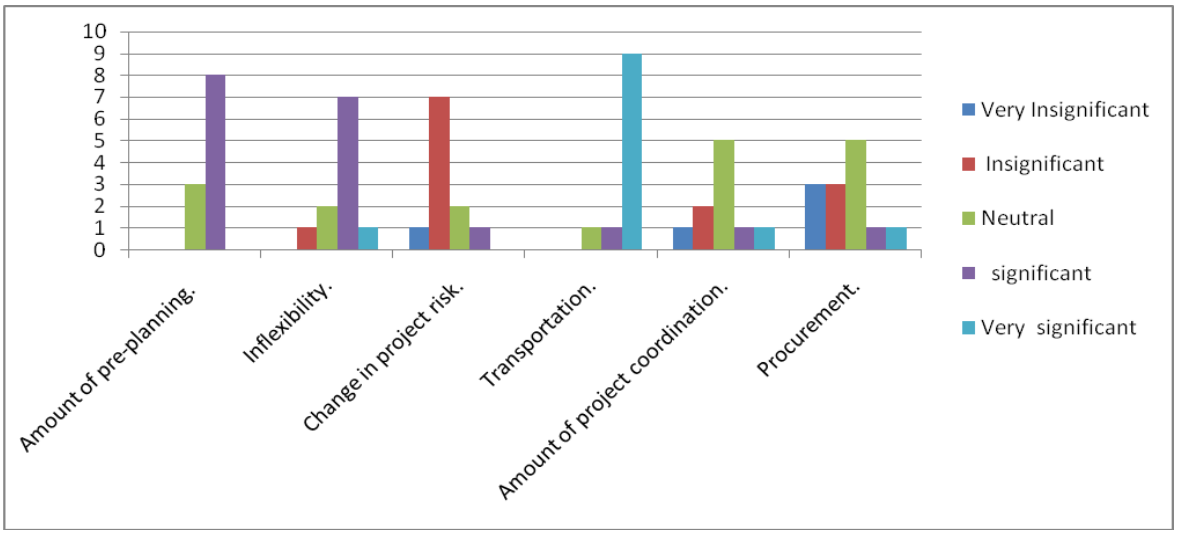


Chart 3 Cost of labour.

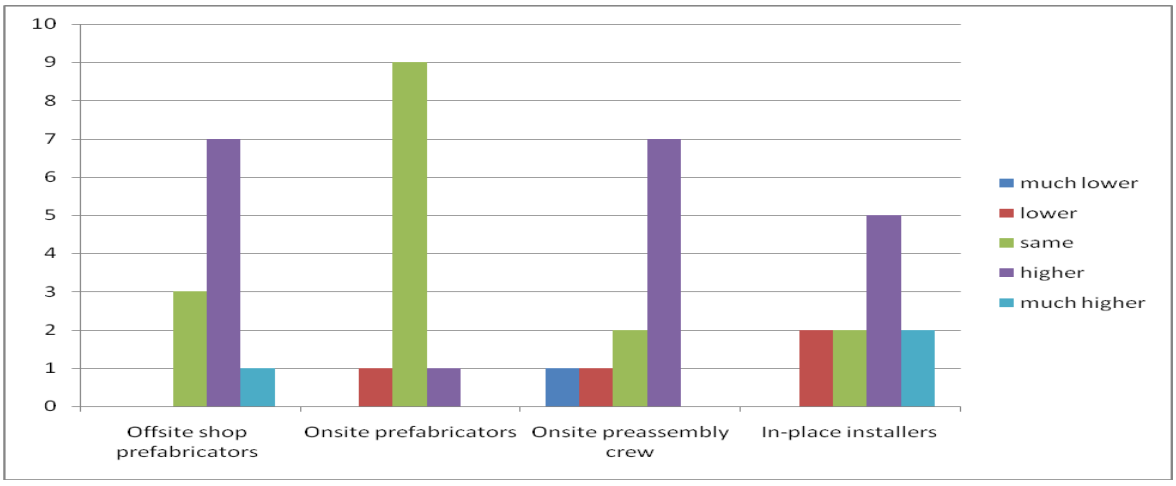
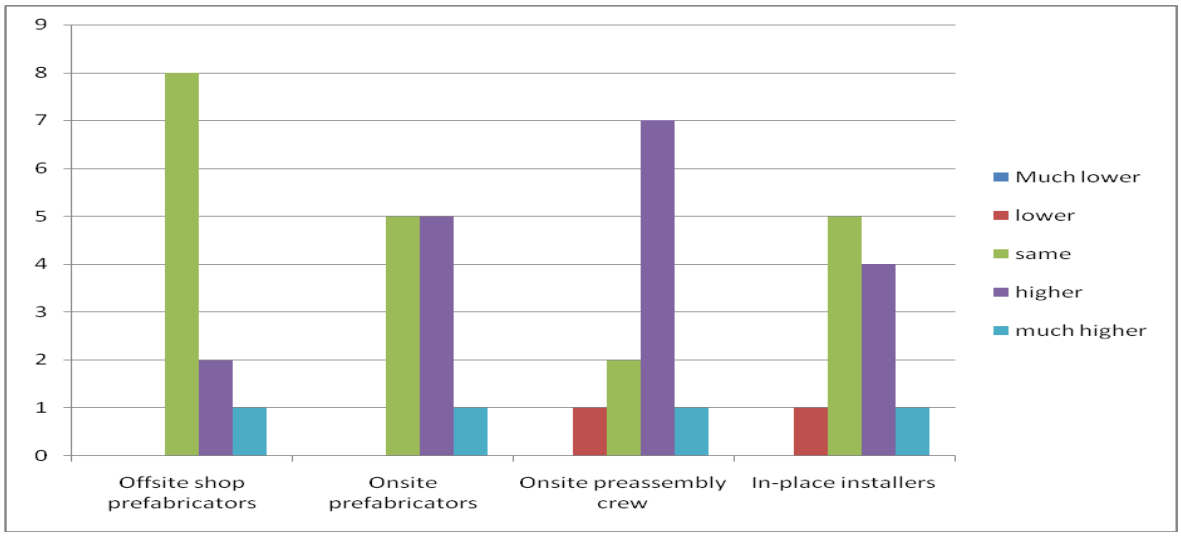


Chart 4 labour productivity



IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

V. CONCLUSION

The study assesses the use of industrialized building system and its impact on time, quality, waste minimization and labour usage compared to the conventional cast in-situ construction method is comparatively low. The study shows IBS is costly, But such system to increase quality, reduced time, labour, & of material. The case studies showed that the use IBS system to improved quality con beneficial. In result shows that the quality of IBS system is better, less envoimental impact, better site condition, productivity, same labour rate, less project duration and less time from completion of project. Overall result showing of the respondent the IBS construction is more flexible as compare CBS construction. According to the reasons given by the respondents,the conventional system is more cost saving as compared to formwork system (IBS) since it provides better negotiation chances so as to obtain the most competitive tender price appropriate to the developer's budget. There is also flexibility in choosing alternative building materials at lower cost. Therefore, building cost can be reduced. As for the IBS, there are limited to a few manufacturers or specialized contractors. This contributes to the higher cost of building for a higher licensing cost is levied on the IBS panel and they tend to be monopolized by the higher price of the building panel or other building components. From the results of the case study, it can be concluded that the conventional construction system is more cost saving as compared to the formwork system (IBS). The case study results are also in coherence with the result of the survey analysis. Most of the organized body in the construction industry thought that the building cost of IBS is more cost saving compared to conventional system. However, the present study proved the results was opposite to what was thought earlier

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