Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 09, September-2019

Labour Productivity Measurement for Precast Fly Over Bridge Construction Project

Pradip A. Desai
M.Tech: Construction Management
Ashokrao Mane Group of Institutions
Vathar Tarf Vadgaon, , Maharashtra,India

Satyajeet. B. Patil
Asst. Professor
Ashokrao Mane Group of Institutions
Vathar Tarf Vadgaon,, Maharashtra,India

***Abstract*—The Productivity is that the key issue for any growth of the development. In construction sector, there are number of resources involved such as labour, machinery, material & fiance are used for performing the daily activity .The productivity of the any construction firm is primary depend upon the efficiency of manpower ,but now days these labour productivity rate is decreasing due to allocating the uneducated or unskilled labour ,old equipment on work site,affect on overall time &profits of the construction. The main of aim of the study is to find out the critical factor those are affect on labour productivity by using the questionnaires survey & these factor are checked on site observation by using work study method.The activity of productivity is finished by employing a time-and-motion study methodology & identify that high most issue that affecting on period of the project and value**

Keywords—Productivity, RII method, labour scheduling, controlling

I. INTRODUCTION

Construction industry is the largest industry rated after the agriculture industry .In India the major infrastructure work such as highway ,bridges, airport, railways etc more investment are utilized for construction of this activity .Such work involves planning, oragansing ,scheduling, controlling of the resources are in better way to achieve the company goals. But the current condition the value of the development project and length of the project is increase to numerous factors. Among these issues labour resources ar the foremost factor poignant on the performance of the firm.. Now a days The performance of labour are decline due to environment condition, wages policies, management system etc have impact on the productivity .The human resources are play a significant role in growth of the development firm. On construction site the contractor are allocating the unskilled labour for performing the daily construction activity without hired the skilled labour from outside the area, which may result in lower the labour productivity .Improvement in the productivity will result in contractor or organization taken more construction project for development. This result the contractor or organization make famous among the stakeholder .Therefore measuring the labour productivity on site is essential for increasing the growth of the firm. The aim of the study is to identify the top most factors affect on labour productivity by questionnaires survey & rank the top most factor by Relative importance index. The Work &Time study method are used to measure the onsite productivity by taking the time for completion of the construction activity by stopwatch method& set new procedure for completion of activity by changing the labour as per there skill, knowledge, recent technology for performing the activity .After adopting the new standards it has been seen that the total cost and duration of the construction activity is minimize. The organization should be taken study on onsite labour productivity and new standards for improving the productivity is needed today.

II. OBJECTIVE

To investigate the labour productivity measurement the following are the objectives are taken

1. To study the various factor affecting on labour productivity in precast fly over bridge construction project .
2. To measure the productivity on Fly over precast bridge construction project.
3. To analysis the factor affecting on labour productivity
4. To provide best solution for improvement of productivity

III. PROPOSED METHODLOGY

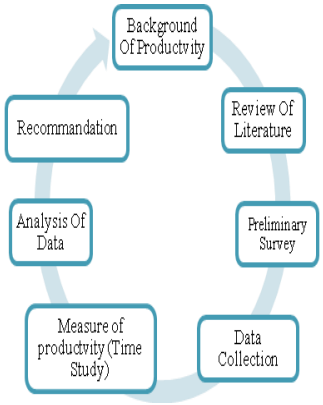

Fig.1 flow chart of proposed methodology

IV. RESEARCH METHODLOGY

A. Research Methodology :

A preliminary survey consist of fieldwork & collection of data from the various sources to identify the current issue in the construction sector. Survey is nothing but collection of data by asking question to respondents. The data collection process consist of two steps i.e by questionnaire survey and by personal interview. Out of these questionnaire survey is quite popular, self-analysis tool with web-design questions with appropriate response.

B. Types of Research :

Qualitative research is help in gaining the knowledge about problem under study. This types of research aims at

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 09, September-2019

discovering the underlying motives and desires,using depth of interview for the purposes. Qualitative research is specially important in the behavioral science where the aim is to discover the underlying motives of human behavior. Quantitative research is based on quantitative measurement .This research is applicable to phenomena that can be expressed in terms of quantities. In this type of research the collection of data is in a qualitative research and this human behavior is expressed in quantitative research

C. Sample Design:

A sample design is defined as the plan is determine before any data is actually collected for obtaining a sample from given population .Sample design is the number of item that involved in sample. The sample design is determined before the data is collected .Sampling are important part in sample design. Sampling is defines as taken certain item in given population .In sample design ,there are two methods such as Non-Probability sampling and Probability sampling. Out of two method we have selected Non-Probability sampling for this research.

D.Convenient sampling :

Non-Probability sampling that involves the sample being drawn from that part of the population .For this study we select the convenient sampling for collection of the data from population

F. General assumption:

To study the labour productivity measurement on precast flyover bridge construction ,we have made the following assumption of the factors affecting on labour productivity with respect to cost and work.

1) Performance of labour:

Performance of labour is directly proportional to work and inversely proportional to time.

$$PL \propto W \ldots\ldots\ldots (1)$$

$$PL \propto 1/T \ldots\ldots (2)$$

2) Use of recent Equipment :

Use of recent Equipment'sare directly proportional to work and inversely proportional to time.

$$UE \propto W \ldots\ldots\ldots (3)$$

$$UE \propto (1/T) \ldots\ldots\ldots (4)$$

3) Location of material :

Location of materialsare directly proportional to work and inversely proportional to time.

$$LM \propto W \ldots\ldots\ldots (5)$$

$$LM \propto (1/T) \ldots\ldots (6)$$

V. DATA COLLECTION

The collection of data is to done by work study is a system which is examine or investigate the performance of the construction firm by applying the setup of the standards for all the activities which held in the organization by proper utilizing the men, machine & material .Organization want to achieve better result with minimizing the cost of construction material with the least time .This work study can give the standards for the improving productivity This work study is divided into two parts i.e method study& time study (work measurement).

G:On Site Productivity Measurement:

Method study is outlined because the examine the manner of doing work or applying the new techniques to eliminate the waste of raw material or avoid the unnecessary work which has effect on the performance of work. Method study is additionally referred to as methods engineering, or work design which is focus on improving men and machine by analysis the collection of data. Time study is basically work measurement techniques which collecting the time for a carry out a new job or activity under a condition .The work study method consist of following steps:1) Select the work on which methods are to be apply. 2)Record the observation on site with respect to time and work.3)Investigate the collection of data in steps no 2 4)Modify the existing methodology by adding new methodology & record time & work. 5)Applying the new standards after check the alternative in various way.The following chart shows the various activity with recording time & work.

Table No I Work measurement sheet for method study

Sr No	Observed activity	Total time	Quantity	labour		
				F	H	S
01	Foundation A1	3600	2016kg	01	16	10
02	Foundation A2	3240	2016kg	01	08	12
03	Placing Rewall	240	400	nil	03	02
04	Placing Rewall	240	525	nil	02	02

Table No I Work measurement sheet for time study

Sr No	Observed Actvity	Time (before implement)			Time (After implement)		
01	Lifting of reinforcement	10.15	10.23	9.40	1.31	1.38	1.48
02	Bar bending	6.0	8.5	9.13	0.4	0.6	1.0
03	Selection of bar	12.17	7.43	9.49	4.70	4.18	3.37

VI. ANALYSIS THE DATA

For the identification of the factor affecting on labour productivity questionnaires survey are prepared .From this survey all the respondents give there opinion through a Google forum technology. The top most factor affecting on productivity is to identify after the relative importance index ranking. These top most factor are checked on site observation .To check these factor ,the measurement of all activity on site are measure with time & work. The factor are listed below with there analysis by work study approach .

H. Performance Of Labour :

Productivity of any construction firm depends upon the skill of the worker, firm policy ,age, working condition, environment etc.The skilled labour have qualities such as skill, training, experience, education improving the productivity of the construction firm. The skilled labour is unavailable /absent ,the contractor has completing the activity with use of less skilled labour and it will affect the productivity .The performance on the labour is to be measured on site by using work study approach .The time required to completed activity is to be measured with stop-watch . The table no2 show that two cases observed on sitesuch as Placing & Erecting the steel bar along with

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 09, September-2019

holding the stirrups with binding wire(size of foundation 10.5 m *8.0 m) for Foundation No: A2.are done with worker (foreman, helper, skilled labour) &placing & leveling of the precast block. For case 1 .The average time before changes labour quantity 3600 min. For this activity work study approach is used .after the same changes in labour quantity & time is recorded by stop-watch .The average time after changes in labour quantity is 3240 min.

- ***Productivity Calculation for work for footing***

To estimate the Productivity the activity oriented model are used as below

$$\frac{\text{Output}}{\text{Input}}$$

For a trapezoidal foundationA2 the total quantity of steel reinforcement was 2016 KG. The foundation can completed in 5 days. The working hour on site 12 hr.

Productivity =33.6 kg/hr

For a trapezoidal foundationA1 the total quantity of steel reinforcement was 2016 KG. The foundation cancomplted in 4.5 days. The working hour on site 12 hr

Productivity =

Productivity =38.3 kg/hr

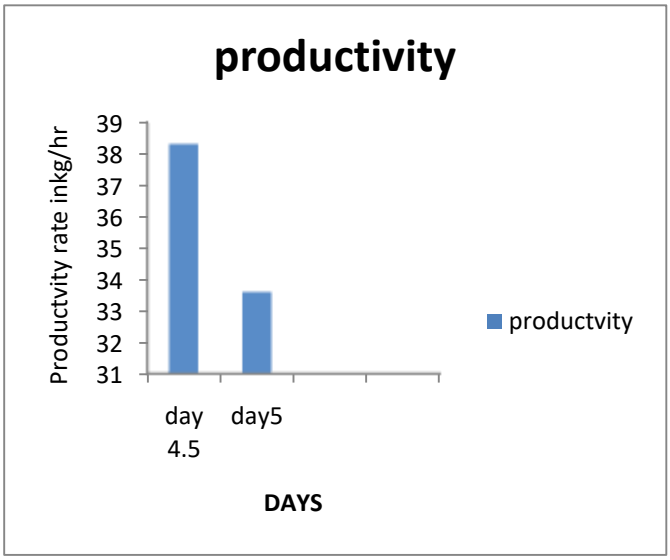

Chart no01 Productivity changes w r t to time

I. USE OF RECENT EQUIPMENT:

The proper procurement process for material ,tools are playing important role for performing the productivity .The material ,tools or equipment can be used at right place ,at right time result in saving the cost and time .For selection of equipment types and size can approach to the amount of the equipment ,the project manager can aware of the major types of equipment utilized in frequently. The on site productivity can be increased with a proper selection of equipment types, and suitable at the work condition . The table no 3 shows that time required to completed work by labour and recent equipment.

From the below chart it shows that the comparison between total time taken by labour and equipment at working site conditions. From chart no 2 show that lifting and placing of the reinforcement at height of 2.2 m has done crane and labour .The time taken to lift and place the reinforcement by crane&labour is 1.39mins. and 10.32mins.From chart no.3 show that bending of reinforcement at an angle of 90^0,45^0,60^0 has done bending machine and labour .The time taken to bending of reinforcement at an angle of 90^0,45^0,60^0 by bending machine and labour is 1.02mins and 8.22mins. By proper procurement process the productivity can improved with less time.

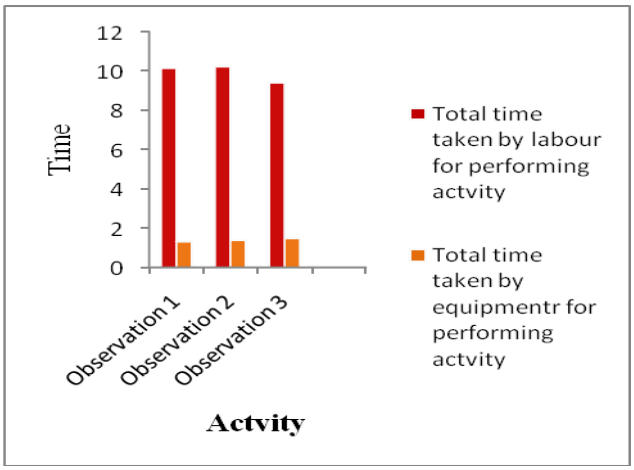

Chart no 02Total time taken by labour and equipments (crane)

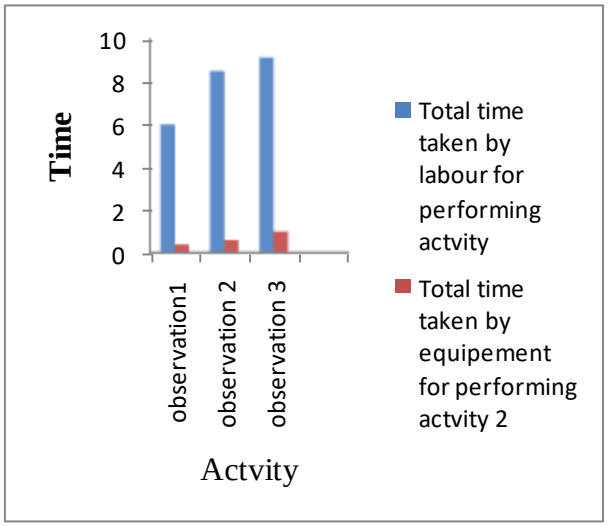

Chart no 03 Total time taken by labour and equipment(bar bending)

J.Location Of Material:

Proper material management is key aspect of the construction firm. The productivity can go decreasing if the required material ,tools& equipment are not available at a particular instances of time &location .The material storage location has more significant impact on productivity because the labour requires the extra time to discover the required material from the appropriate location

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 09, September-2019

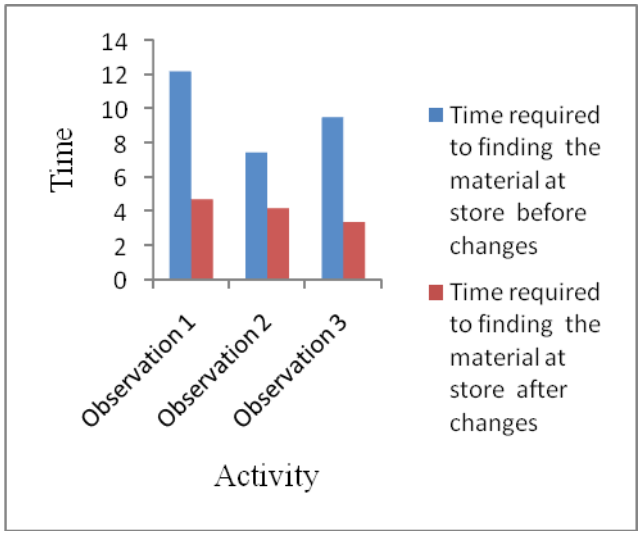

Chart no04 Total time required to complete the work done by before & after implementation

It was seen that all the steel reinforcement are not staked properly and away from work location . The average Time required to finding the material at store before changes in site layout is 10.10 min. The required steel bar and stirrups are placed separately and the average Time required to finding the material at store after changes in site layout is 8.08 min. The total time saving is 2.02mins.From this result the location of material is near by working area as well as the material is stacked with proper way. The codification & classification of the material are done so that it can easily assessable to worker .The store in charge should take record of the received material and reporting the sending material with inspection .

VII. RESULT

The top most factor affecting on labour productivity are identify on site observation. The observation are taken by using work study method .In this method the observation are taken with respect to work & time of such activity before & after implementation .The results of such activity are as below

Hperformance Of Labour :

Observation 1 :

The performance of labour is measuring on site of 2 job location .First observation ,The placing & erection activity of foundation of job location 272 m chainage was completed within in 5 days with productivity rate was 33.6kg/hr & cost of labour was 1,37,500/. The placing & erection activity was completed within in 4.5 days with productivity rate was 38.3 kg/hr. cost of labour was 1,06,000/. Due to changes in labour quantity the productivity are increased by 13.98% and cost saving around 31,500/-

From above observation, it is conclude that the performance of labour is directly proportional to work and inversely proportional to time

I Use Of Equipments :

Observation 2.

Use of the equipment are play important role for any performing construction site with a time saving. The observation are taken job location of 271+84m ,labour are lifting & placing of steel bar of 25 mm diameter bar at height of 2.2 m from ground surface. The average time for this activity are 10 min. The same observation are taken instead of lifting & placing of steel bar by crane. The average time for this activity are 1.39.By comparing this activity the total time saving is 8.61 min.

Observation 3.

On site the reinforcements are bend at an angle of 450,600,900.This observation are taken of a job location271+84m,it has found that the total average time required for bend the reinforcement by the manually is 8.27 min and total average time required for bend the reinforcement by the machine is1.20 min.The total time saving is 7 min.

From above observation, it is conclude that the Use of Equipments is directly proportional to work and inversely proportional to time.

J. Location Of Material:

Observation 4:

Before implementation the average time required for collecting the material on site of job location 271+80 m chainages are 10.09 min. After implementation average time required for collecting the material on site of job location 271+80 m chainages are 4.08 min. The total time saving are 7.22 min.

From above observation, it is conclude that the Location of material is directly proportional to work and inversely proportional to time.

VIII. RECOMMENDATIONS

Generally the progress of any construction firm may affect due to argument between owner ,contractor and labour. The environment of the construction firm should be maintain so that the performance of the construction firm is to be stable.The project can completed within the duration ,cost of project will lowered also contractor gains more work through a tendering process.It necessary to study the problem of particular task on site and give the remedial measure on site. Following are the recommendation for those factor affects on productivity

L.Performance Of Labour :

The organization should have check the worker age, wages, worker effort, work environment at the time of supervision. The performance of the labour should measure with changing the semi-skilled labour with skilled labour. While recruitment process contractor should have check the skill of the worker .At the time of allocating the work to labour, contractor should decided the categories of labour as per skill, age and work effort. The contractor should have assign the work time to the workers. If the work environment was not suitable to the worker those hired from outside the area, contractor should analysis the the environment and hired the workers form the workplace area.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 09, September-2019

M.Use Of Recent Equipment:

The use of the recent equipment should be introduced at work site. This can help for reducing time and cost and increase the labour productivity .The organization should consider the size, cost, efficiency of the equipment at the process of procurement & also study the suitability of the equipment with respect to working conditions .

N.Location Of Material :

Purchasing material should stored at the workplace so it can accessible to the worker, so that the time required for collecting material is less hence the productivity is increased. The material should be stored at close to constructed site. The store in charge should take record of the received material and reporting the sending material with inspection also the material are stacked according to the codification and classification .The Supervisor or Engineer should prepare the required material list for performing the next activity on site to the store manager through the process of requisition letter .So that while performing the activity on next day ,the material ate located near to the workplace such that the time required for discovering material is less.

REFERENCES

[1]. Shree. Raja .Gopal T. G, MuraliK,"Analysis of factors affecting labour productivity in construction", International Journal of Recent Scientific Research Vol. 7, Issue, 6, pp. 11744-11747, June, 2016
[2]. PrachiR.Ghate, Asok B. More .,Prof. PravinR.Minnde. ,"Importance of measurement of labour productivity in construction"., International Journal of Research in Engineering and Technology 5(7).july 2016
[3]. Pratik Vaid,Prof.,Dr. Sunil Pimplikar.,"Labour Productivity of Precast Construction in Housing Projects", International Journal of Current Trends in Engineering & Research (IJCTER), Volume 2, PP. 101 – 106, 2016
[4]. Vivek Kumar Patel, Sohit Agrawal, Dr. Mukesh Pandey, "A review on critical factors affecting labour productivity in construction industry" International Journal of Innovative Research in Science, Engineering and Technology Vol. 6, Issue 8, August 2017
[5]. Vivek Kumar Patel, Sohit Agrawal, Dr. Mukesh Pandey, "Study of factors affecting labour productivity in construction industry" Journal of Emerging Technologies and Innovative Research (JETIR) Volume 4, Issue 09 September 2017
[6]. Mahesh K.S,Reshma Kassim.,"Factors Affecting Labour Productivity in Construction Industries", Imperical Journal of Interdisciplinary Research,Vol.3 Issue 6, 2017
[7]. Apiha R. Sonawane, Milind.M.Darade ., "Analysis of labor productivity in Indian building construction and methods to improve productivity", International Journal for Research Trends and Innovation, Volume 3, Issue 7,2018
[8]. B.NirmalKumar,MR.U.Yoganandhan&DR.P.L.Meyyappan"Improve the factors affecting labour productivity in Indian construction industry" International Journal Of Engineering Sciences & Research technology, April, 2018
[9]. Srilakshmi V. Annigeri, Prof. Amey A. Kelkar, Rajani V. Kulgude3,"A review of impact on labour management in construction industry", International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 06 ,June-2018
[10]. .Maruthamuthu.P , KiranKumar.G , Karthi.S ,Velmurugan.P , Yuvaraj.D, "A study on the factors affecting onsite labour productivity in residential construction in Chennai", International Journal of Pure and Applied Mathematics, Volume 119 No. 15, 1307-1314,2018
[11]. Shreyank S Murali1 ,Ashwini M Joshi2, "A factor affecting labour productivity in precast construction industry", Proceedings of fourth national conference on road and infrastructure ,4-5 April,2019