

## Analysis of Labour Productivity in Construction Sector around Mumbai region

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**Abstract**— Productivity is an important aspect of construction industry that may be used as an index for efficiency of production. Efficient management of construction resources can lead to higher productivity which can help to achieve cost and time saving. Construction is labour oriented industry. It heavily relies on the skills of its workforce. The labour is industry's most valuable asset. It is important to improve efficiency of production by improving productivity of labour. Aim of this paper is to give the data collection for calculation of labour productivity. The data have been collected by using time study technique in Mumbai region. Method study for placing and binding the reinforcement of column has been done previously. Applying the changes in method the data have been again collected and analysis for productivity have done which results in saving of project time, labour cost with maintaining quality of work.

**Keywords**- Labour Productivity

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### I. INTRODUCTION

Construction performance and productivity improvement are key focus areas in construction industry for any nation. Indian construction industry forms an integral part of economy. Construction constitutes 40% to 50% of India's capital expenditure on projects in various sectors such as highways, roads, railways, energy, airports, irrigation, etc. and is the second largest industry in India after agriculture. It accounts for about 11% of India's GDP.

Improving productivity is major concern for any profit oriented organization. In general terms productivity is termed as ratio between input and output. Productivity is said to be high when more output is obtained through same input or when same output is obtained with lesser input.

Proper management of available asset can help in improving productivity. Labour is the most important asset to a construction company. In spite of many technological advances, construction continues to be a labor intensive industry. 30% to 50% of total cost of project is spent on labours. Quality of the construction largely depends upon the quality of work done by labour. Labour productivity directly affects construction productivity; it is important to know the factors affecting labour productivity.

Productivity is generally ratio of output to input. In form of equation it can be shown as follows:

$$\begin{aligned} \text{Productivity} &= \text{Output} \div \text{Input} \\ &= \text{Total output} \div \text{Total work hour} \end{aligned}$$

### II. LITERATURE REVIEW

Serdar<sup>(1)</sup> et.al In construction projects, there are three basic planning elements: time, cost, and quality. These concepts are in a close relationship with each other. Labour productivity is also a key concept of construction planning

efforts and has a direct interrelationship with the triple constraint mentioned above. H.Randolf<sup>(2)</sup> et.al Lower labour performance is strongly related to the presence of change of work, disruptions and rework. On average 30% loss of efficiency occurs when changes are done. The most significant types of disruptions are lack of materials and information and having to perform the work out of sequence. These disruptions result in daily loss of efficiency in range of 25% - 50%. Wen Yi<sup>(3)</sup> et. al Labour productivity is also one of the performance indicators to assess the success of the construction project. Because construction is a labour intensive industry, it can be argued that the work force is the dominant productive resource. Thus construction productivity is primarily dependent on human effort and performance. Labour productivity is important index because of concentration of labour needed to complete specific work.

### III. METHODOLOGY

Previous findings show that that Skilled labour, availability of material and tools, construction method, number of labours on site, safety conditions on site, project manager leadership, miscommunications between site management, labour supervision, scheduling work, payment, proper communication with labour, design complexity are factors which highly affect labour productivity; whereas site layout and material storage locations are the factors which affect the labour productivity on low level. For purpose of finding labour productivity erection and binding of reinforcement of column has been selected for present study. Skilled labour and change in site layout are the two factors considered for calculating changes. Data required to carry out the research was collected by time study method. Overall twenty observations were taken for research.

TABLE 1:  
 TIME STUDY FOR COLUMN BEFORE ANY CHANGE APPLIED

Sr. No.	Description	No. of Labours	Time taken (min)	Remark
1	Getting steel bars and stirrups at place	2	25	Time can be reduced
2	Erecting bars and completing lapping	2	30	
3	Selecting stirrups and placing	2	30	Time can be reduced if placed properly
4	Binding stirrups with binding wire at position	2	100	Time can be reduced if skilled labours used
Total			185	

Similarly data have been collected after changing site layout and after changing semiskilled labour with skilled labour.

#### IV. RESULT AND DISCUSSION

##### A. Details of Site:

For research purpose we considered reinforcement binding of column of building with nos. of floors: G + 19 and from varying sizes of column we took size of Column as 600mm x 600mm

##### B. Effect Of Changes In Site Layout:

It was seen that steel bars and stirrups are stacked away from the construction and also not properly placed. The steel bars and stirrups should be placed separately according to their diameter and side so that time required to finding the bar required can be minimized.

Average time taken for erection and binding of reinforcement of column without changes = 185 min/column

Average time taken for erection and binding of reinforcement of column with changes in site layout = 170 min/column  
 Time saving = 15 min/column

With this collection of data of labour can help while planning of activities for further construction.

##### C. Effect Of Changes In Site Layout And Changing Labour With Skilled Labour:

It was seen that labour used for preparation of column were semiskilled. This was resulting in compromising with quality of work and time consuming. With use of two skilled labours instead of two semiskilled labours the time could be reduced and there was no need to compromise with quality of work.

Average time taken for erection and binding of reinforcement of column without changes = 185 min/column

Average time taken for erection and binding of reinforcement of column with changing of labours = 140 min/column

Time saving = 45 min/column

##### D. Saving In Time And Cost Due To Changes In Site Layout And Changing Labour With Skilled Labour:

Number of columns per floor = 32

Number of columns completed prior to changes = 2 per day

Number of days to complete reinforcement of column = 16 days

Time for 32 columns without applying changes = 32 X 185 = 5920 mins

Time for 32 columns after changes in site layout and changing labour with skilled labour = 32 X 140 = 4480 min

Time saving per floor = (5920-4480) = 1440 mins

This time is equivalent to (1440/140=10.28≈ 10) 10 extra columns.

With time of 140 min per column and 8 hours of working day per labour number of columns completed per day = 3 column

Time required to complete 32 columns = 10.6≈11 days

Cost of semiskilled labours (fitter) per floor when changes were not applied on site= 16 X350X2 = Rs. 11200/-

Cost of skilled labours (fitter) per floor when changes are applied on site = 11 x 400x2 =Rs.8800/-

Savings per Floor = 11200-8800 = Rs. 2400/-

Net Saving = 19 x 2400= Rs. 45600/-

#### V. CONCLUSION

Skilled labour is a factor which highly affects the labour productivity; since with skilled labour work can be done in less time without compromising quality of work. Also changes in site layout affects labour productivity since proper arrangement of material on site can reduce time consumption for completion of work. Changing the unskilled labour with skilled labour along with change in site layout helped in reducing time by 5 days and labour cost by Rs.45600/- for this project. Data collection of labour work is helpful in saving time while planning construction activities and can also help in labour cost reduction for the project without compromise in quality of project.

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