

Work Study, Method Study & String Diagram for Residential Project

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Abstract:

With increase in demand of production, Construction industries requires to attain increase their Abilities in Construction & effectiveness to compete against their competitors. At the same time, the Construction process has to be ready with the ability to have Lower costs with higher proficiency. Hence the methode to simplify the problem regarding the Construction is of huge importance. There are many Methods to Standardize Work, Setup Reduction, Cycle Time Reduction, Waste Elimination, etc. to solve the problems concerning & governing Construction Productivity. Majority of Construction Firms Adapting Work Study to help eliminate wastes and increase proficiencies rather than depending on conventional processes . Work Study is the systematic method of carrying out different yet related activities such as to improve the efficient use of resources and to set up standards of performance & quality for the activities to be carried out. In simple language, it may be defined as the analysis of a job for the sheer purpose of finding the subsequent method of doing it and also determining the required standard time to perform it by the selected or given method. Work Study generally is classified in two areas: Method study (Motion study) and Time study (Work measurement).Work Study can be considered an overarching template which encompasses a broad scope of applications ranging from the design of a new construction, to the design of a new process, to the improvement of an existing process and even to the improvement of an existing workplace. Wherever work is being done, the WS approach ensures that work is being done in the easiest, safest, and most productive way. The method study ensures the economy with the use of economical method. String Diagram Plays important role in Site layout , string diagram reduces the travelling path of materials & Resources , thus making activity short. The effective planning of construction site & Effective material flow plan using string diagram is proved to be Reduction in cost.

Keywords — work study, Method study, String Diagram.

I. INTRODUCTION

Work Study: The Managerial benefit in light of those procedures, especially Method Study And Work Measurement, which are utilized as a part of inspecting human work in the entirety of its settings, and which prompt deliberate examination of the considerable number of assets and components influencing the effectiveness and economy of the circumstance being checked on, with a specific end

goal to impact change. Work ponder standards and practice were created from the mid twentieth century o enhance profitability. Work think about as the strategy of technique study and work estimation utilized to guarantee the most ideal utilization of human and material assets in doing a predefined movement. Work considers has guide connection to profitability change.

Method Study: The precise chronicle and basic examination of the variables and assets engaged with existing and proposed methods for doing fill in as methods for creating and applying less demanding and more viable strategies and decreasing expenses. Strategy to be examined, records the systems right now took after, breaks down the strategy, and builds up the options from which the ideal is chosen, introduced and kept up

String Diagram: It is scale design or model on which a string or a string is utilized to follow and measure the way of laborers, material or gear amid a predetermined grouping of occasions. Generally, the redundant developments are hard to follow on stream outlines, and in this manner string graphs are utilized as a part of such cases. String is extremely valuable to manage complex developments, plant format and outline issues. It ends up being extremely helpful in testing relative estimations of various designs. The string is strung around various areas with the assistance of a peg. A peg is an area around which string can be strung to demonstrate the developments. Accordingly, the string when estimated gives the rough separation went by the laborer or the material for which the string outline is plotted.

Keeping in mind the end goal to comprehend the work think about techniques, we have to comprehend the significance of strategy contemplate and that of time consider. 'Strategy consider' (some of the time additionally called Work Method Design) is generally used to enhance the technique for doing work. At the point when connected to existing items, technique think about means to allot better strategies for assembling the occupations that are sheltered, successful, and temperate, require moderated human exertion, and need littler make-prepared time. The better technique includes the ideal utilization of best materials and proper labor with the goal that work is performed in efficient way prompting expanded asset usage, streamlined quality and mollified costs.

It can in this manner be expressed that through 'Strategy think about' one can have a methodical method for creating human asset domination, giving raised machine and hardware utilize, and making practical utilization of crude materials. 'Time contemplates', in any case, gives the standard required time, that is the time required by laborer to finish a vocation by the standard strategy. By the use of strategy study and time think about together, any industry would thus be able to accomplish more noteworthy yield at less cost and of better quality, and consequently can without much of a stretch accomplish higher efficiency.

To plot and utilize string graph is the following procedure after work study and strategy contemplate:

Plant productivity can be enhanced because of Systematic Layout Planning i.e String Diagram (Varsha Karandikar et al, 2014). By enhancing the design it was demonstrated that the material stream lead time can be cut down.

As the Project Work is in Early Stage We are dealing with only Reduction in Time of an Activity. The Economical Aspect is not Considered Yet.

II. OBJECTIVES

The main objective of this work is to evaluate the effectiveness in Construction Activities after Application of String Diagram:

- Work study : To identify the areas for potential productivity improvement
- To have higher level of output through waste reduction.
- Method Study : To Improve the process & procedures
- To find the productivity & increase the productivity by ensuring the best possible use of human resource, machine, material & to achieve the best quality product.

III. LITERATURE SURVEY

[1] S.Peer.(1986)According to Paper of construction Management & economics 1986 , 4 151-159 has focused mainly on Activity sampling technique for work study . Also researcher stated two techniques for work measurement as continuous time study & work sampling. Researcher also stated that most important application of work measurement is in research, is in analysis, improvement & comparison of different construction Methods. in this paper researcher suggested to record whole process in chart form thereby improved insight in to inter relationship of the observed facts , skilled & unskilled labor are observed separately & production efficiency rating is readily incorporated if Desired.

[2] David W cheetham& john Lewis (2011) they suggested some design strategies to improve productivity are as: Same building sequence for all houses, denote variations in type, size & Layout .Standardization of details. Simplified traditional construction using readily available material. This reduces the operations.Fewer and larger on site operations need to classify thus reduction in return visit to same site

[3] Prathamesh P. Kulkarni , Sagar S. Kshire , Kailash V. Chandratre (2014)Researcher clubbed the lean tool with work study Methods & they proved that improving productivity can be achieved in limited or very less resources

[4] Kevin N. Nassandi (2011)applied the Work study approach to variety of circumstances he concluded the work study approach ensures that work is being done in the easiest, safest & in most productive way. Work study approach constitutes the usage of various charts & analysis, so as to facilitate the accuracy in tracking sequential activities in the workplace .he concluded that the accuracy & effectiveness of the entire productivity model was predicated on the competencies of the standard time & work study procedures.

[5] AniketVekariya .ashutoshkumar (2014)there are number of factors affecting productivity mainly the factor is improper workmanship , improper material handling , unnecessary operations . by use

of work study method we can identify area of improvement in process.

[6] Miss.RajshriShrishirmal&Prof.R.R.Salgude (2015)The labor cost comprise 30 – 50 % of overall project costs. Therefore, while numerous construction labor productivity of labor in construction is utmost important. Provided the productivity of laborers should be measured properly, which will help to improve productivity in construction.

[7] A. Pandey ,M.singh , N.Soni , Mr.P.Pachorkar (2014) the choice of plant layout to adopt can have a significant impact on the long term success of a firm . a major issue to be addressed in plant layout decisions in manufacturing is ; How flexible should the layout be in order to future changes in product demand . Also researcher concluded that, the most common objective of the layout design is to minimize distance travelled, is not always suitable for all manufacturing industries.

[8] A.Jaiswal ,S.Madhukar Sane , V.Karandikar (2016) work study , Method study & developed plant layout , the implementation of which resulted in increased production capacity & reduced human efforts .

[9] A.Rathod , R.Jadhav , A.Babar (2016) They concluded in journal that the thread or string when measured gives the approximate distance travelled by the worker or material for which string diagram is plotted . Further they concluded that good method studies & work studies will results reliable platform to draw a reliable and most productive Plant Layout or Plant String Diagram

IV. RESEARCH METHODOLOGY

4.1 General

This Project Study is done by following the three steps as Work study , Method Study & Application of String Diagram For this a Residential Building Site is Selected and observed Site activities for 15 Days.

4.2 Work Study:

- Identifying the job to be timed and operations to be timed.
- Obtaining an improved procedure from method study department.
- Select worker for study.
- Collecting the equipment and arrange machinery required to conduct time study and ensure accuracy in recording time
- Explaining to the worker the improved working procedure and use of tools and fixtures.
- Breaking the job into operations and operations into elements and writing them in a proper format.
- Conducting the observations and recording them on the time study form.
- Conducting work sampling.
- Determining the productivity.

4.3 Method Study:

- Evaluation of the results: The results attained by using the improved method are then evaluated, compared with the quality of work involved, and the standard time for the work is calculated.
- Definition of the new method: The new method and the related time is defined to all concerned with the work either verbally or in writing using demonstration.
- Installation of the method: Before the new method is installed, certain decisions must be taken on any changes included in the production process, requirement to order any new plants or materials, introduction of new documentation process, setting new quality standards and test procedures, etc. Once the new method is installed, necessary training must be provided to those involved as an agreed practice with the allotted standard time.
- Maintaining the method: New standard practice must be maintained by monitoring the results and comparing them with

original targets. When a new method has been installed, it tends to change slowly as a result of minor alterations made by the operators or supervisors. To detect any alterations, a reference standard e.g. a job instruction sheet is needed against which the job can be compared. Similarly, an analogous document for a motive plan, which also contains details of the standard time for each job, called a job specification, is drafted. As such, with this information, changes in method can be identified. If the changes prove to be useful, the instruction sheet can be revised to include them. Whereas, if they are thought undesirable, they can be eliminated through line management.

4.4 String Diagram:

To have a first-hand knowledge of the Material flow and to be familiar with the activities being performed at the construction site, One need to go through the detailed process and identify each operation process involved from raw materials to finished goods, identify all the places where inventory is stored between the processes, and observe how the material flow from one operation to another. Then after this observation one need to understand the flow of materials and their path of travel. Then through study propose a flow path which uses minimum human or machinery resource and then propose improved flow layout using string diagram on Plan using String.

4.5 Time Analysis

This is the 2nd main factor which is considered in the project to find out the Time required to complete an Activity. As required time is less the activity becomes Economical .In this analysis we want to consider the resources of labor, material and machineries for resources layout design. Here We have considered Concreting of a

single column for Observation Purpose and a healthy labor working on concreting.

V. DATA COLLECTION & ANALYSIS

For the evaluation we have compared Existing Material Stack layout and its traveling Path Time with Proposed Material Stack layout and Its traveling Path Time. Fig-1 shows the Existing & Proposed Material Stack Layout and Material Flow Path for Column No.15.

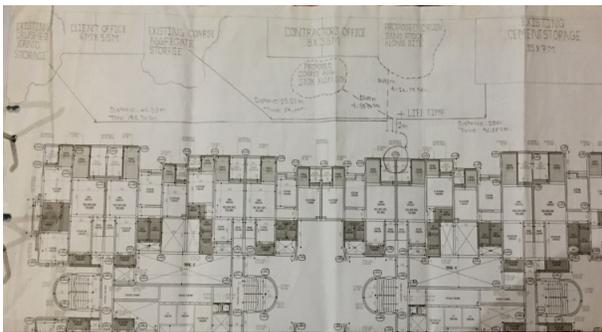


Fig-1 Plan showing Concreting Operation of column No. 15

We have observed the method of concreting which was mixing using tilting mixer. For concreting contractor used weigh batcher. The concrete is lifted using rope and Pulley type lift. As the resource allocation was not planned according the flow process. We found the delay in construction of column on 4th floor.

Table 1: Existing Material Stack layout and its traveling Path Time

Sr	Item of Work	Travel Distance	Time required
1	Crushed sand	45.30m	150.34 sec
2	Coarse Aggregate	25.250m	84.67 sec
3	Cement	29 m	96.88 sec

Table 2: Proposed Material Stack layout and its traveling Path Time

Sr . No.	Item of Work	Travel Distance	Time required
1	Crushed sand	7.86m	24.75sec
2	Coarse Aggregate	12.00m	39.35 sec
3	Cement	29 m	96.88 sec

VI. CONCLUSIONS

The main goal of the work has been achieved. Existing Material Stack layout and its traveling Path Time with Proposed Material Stack layout and its traveling Path Time have been determined for both Material flow Paths (Table 1 & 2 Respectively). From Table 2 it is clear that Material Placement Can Reduce the Length of Travel & Time Required to Travel can be Shorten. The Same Labor force or machinery can be used to other construction Site. To plan the resources the tool like string diagram is useful.

ACKNOWLEDGMENT

This Paper shows only Time Analysis for column no.15. The Detailed Project will include Time analysis for All site activities as Much as Possible . The Current Paper deals only with Time Aspect . The Economical Aspect is not considered yet. The Economical Analysis will be carried out in Remaining Part.

REFERENCES

- [1] S.Peer "An improved systematic activity sampling technique for work study." *Construction Management and economics*, 1986 ,4,151-159.
- [2] David W cheetham& john Lewis "Productivity, Build ability and Constructability: Is Work Study the Missing Link?", 17th Annual ARCOM Conference University of Salford Association of Researchers in Construction Management vol. 1 Issue 8, September 2001.
- [3] Prathamesh P. Kulkarni , Sagar S. Kshire , Kailash V. Chandratre "Productivity Improvement Through Lean Development & Work Study Methods", *International Journal of Research in Engineering and Technology*, Vol. 03, Issue, 02 Feb, 2014.
- [4] Kevin N. Hassanali "A Productivity Model Utilizing a work Study Approach for Performance Measurement", *The Journal of the Association of Professional Engineers of Trinidad and Tobago*, Vol. 40, No.1, April/May, 2011.
- [5] Aniket Vekariya .ashutoshkumar, "A Review on Improvement of Workflow and Productivity through Application of Time and Motion Study Technique", *International Journal of Scientific Research & Development* , Vol. 2, Issue 10, 2014.
- [6] Miss.Rajshri Shrishirmal & Prof.R.R.Salgude "Time And Motion Study of a Residential Site", *International Journal of Innovative and Emerging Research in Engineering*, Vol. 2, Issue 06, 2015.
- [7] A. Pandey , M.singh , N.Soni , Mr.P.Pachorkar – "Process Layout On Advance CNG Cylinder Manufacturing", *International Journal of Application or Innovation in Engineering & Management*, Vol. 3, Issue 12, December 2014.
- [8] A.Jaiswal ,S.Madhukar Sane , V.Karandikar "Improving Productivity in a Paint Industry using Industrial Engineering Tools and Techniques." *International Journal of Advance Industrial Engineering*, Vol. 4, No.1, March 2016.
- [9] A.Rathod ,R.Jadhav , A.Babar, "An Overview of Method Study and Different Recording Techniques", *International Journal of Science and Research, IJSR/ vol. 5 Issue 8, August. 2016*