

Improving Productivity in Material Movement on Dam Site Using String Diagram

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Abstract:

Effective Planning & proper Selection of Quarry for materials like soil , Mooroom , Sand may save cost for Earthwork on Embankments at Dam Site. The Expences over fuels and ultimately Transport of Materials increases due to poor selection of quarry . The quarry with minimum distance is helpful to achieve economy and Profit. The aim of this paper is to select good quality materials from nearby quarry so to achieve economy in dam earthwork. The Project considered is Khuntephal Storage Tank , under Krishna Marathawada Irrigation Project , Lift Irrigation Scheme No.3 Tq. Ashti Dist. Beed.

Keywords — **String Diagram.**

I. INTRODUCTION

Work Study , method study & Work Measurement can help Increasing earthwork Quantity using tools like string Diagram . Quarry Search can be Completed using String Diagram .

The Need to select quarry location arise as There is huge problem of Land Acquisition in Submergence Area. The dam work is completed at about 42% till year 2014. Due to Non Grant of Environment Clearance The Project work was stopped 2014 to 2020 . Now after Grant of Environment Clearance , the Dam work is about to start . but now there is Problem of Availability of Quarry as Non Excavated Acquired land is Less in Hand. Till the further Land Acquisition Is done One Need to Plan for Earth Materials using Available Limited Quarries. Since the Land and Quarries are not available easily & Accessible nearby . therefore with available land it becomes necessary to select nearby quarry for materials. This selection plays important role to reduce time and fuel so to

improved Earth Quantity with Transport. All the possible ways to reach the Quarries at Different Locations , Distances can be Planned using one of Works Study tool Called String Diagram.

II. OBJECTIVES

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

- To find Nearby Quarry.
- To Reduce Expense over Fuels.
- TO Reduce time of Transport.
- To Increase Earthwork Quantity in a Shift.

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

This Project Study is done by following the three steps as Work study , Method Study & Application of String Diagram For this an Irrigation Project Khuntephal Storage Tank , under Krishna Marathawada Irrigation Project , Lift Irrigation Scheme No.3 Tq. Ashti Dist. Beed.

Site is Selected and observed Site activities for 15 Days..

4.1) The Present Quarry and its location is Studied in work study . The Expense over fuels is calculated . also time required to travel material is Calculated.

4.2) The land Purchased up to 2013 for project in Submergence area is in Following Survey Numbers – 2,3,4,12,13,14,17,21,26,27,30,36,40, 43,46,47,48,49,50,51,52,53,54,55,56 ,57,58,59,60,61,62,63,64,65,66,67,9 9,108,110.

Total Land Purchased = 190.00 Ha.

Out of 70% Land is Excavated till 2013 = 133 Ha.

The Detailed Land Aquired is shown in Submergence Map.

Remaining Land in Hand = 57 Ha.

4.3) The Submergence map is used to identify lands belong to Govt. The rodas also running over the map which are helpful to use as a string to Calculate distances up to Quarry.

4.4) As the Increased Frequency of aterial Transport from Quarry to Dam Site Increases Earthwork Quantity .

4.5) The Earthwork Quantity Transported With Present Quarry is Compared with the Earthwork Quantity Transported using Different Nearby Quarries . The Effect over Economy is also Checked.

Fig-1 shows the Present Quarry layout & Fig -2 Shows Proposed Quarry layout .

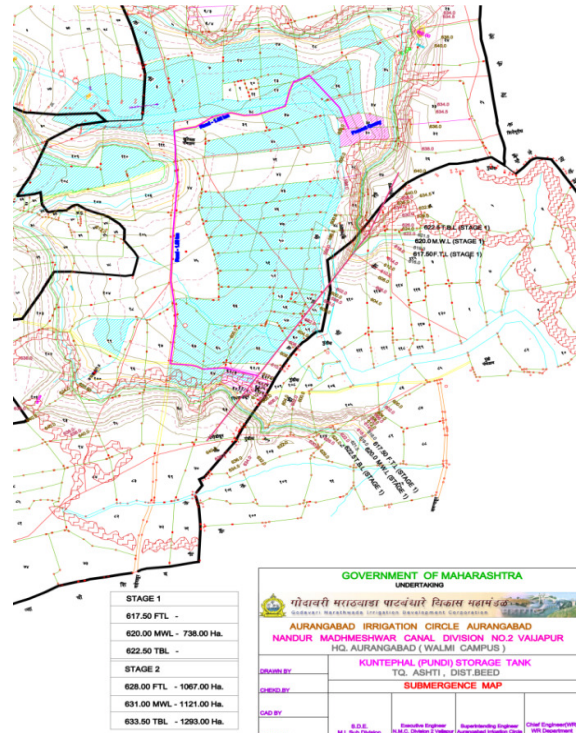


Fig-1 Plan showing PRESENT QUARRY layout (Survey No. 30 , 31) String Distance = 3.04 Km

V. DATA COLLECTION & ANALYSIS

5.1) For the evaluation we have compared Present Quarry layout and it's traveling Path Time with Proposed Quarries and Its traveling Path Time.

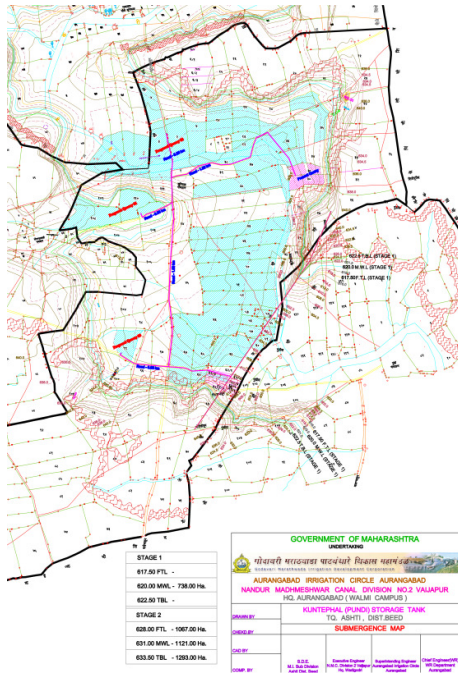


Fig-2 Plan showing Proposed Quarry layout 1,2,3

Proposed Quarry 01 = (Survey No. 108 , 110)

String Distance = 2.13 Km

Proposed Quarry 02 = (Survey No. 2 , 3)

String Distance = 2.36 Km

Proposed Quarry 03 = (Survey No. 99)

String Distance = 0.45 Km

Quar ry SR No	Tipper Filling At	Travel Distan ce in km	Reach to Quarry Time in Minute	Material Filling Time in Minute
1	Present Quarry	6.08	14.5	10
2	Proposed Quarry 1	4.26	10.2	10
3	Pr.Quarr y 2	4.72	5.6	10

4	Pr. Quarry 3	0.90	2.16	10
Transport to Dam site in Minute	Total Time in Minute	Time Saving in Minute	Ammount Required Per Trip in Rs	Ammount Saved Per Trip in Rs
17.5	42.10	19.64	3622	152
12.2	32.49		3548	
6.7	22.46		3470	
2.5	14.75		3410	

Table 1: Observations of Present Quarry and Proposed Quarry layout 1,2,3

5.2) We have observed the The time required to Travel material from quarry to site and Viceversa . the Fuels Required to Vehicle movement also Expense over Material Handeling. The Time and Expenche over Present Quarry and Proposed Quarry 02 is Considered for Evaluation. The Quarry 02 is selected as minimum because there is Less material Available at Quarry No.04.

5.3) Evaluation Of Proposed Highwa Trip

- Time to Transport after Selection of New Quarry = 5.66 Minute
- Time to fill Material =10 Min
- Time to Transport after Filling to Dam Site = 6.79 Min
- There fore Total Time Saved in Single Trip =19.64 Min
- Shift Timing for a Highwa with a Driver = 8 Hrs =480 Min

- Total Available Time in 1 Shift =480 Min
- No. of Trips / 8 Hr shift = 21.37 Nos.

5.4) With Present Quarry –

- No. of Trips that can be performed in 8 Hr Shift =11.40 Trips
- Cost ; Per trip rate considering Transport Distance = Material @ Rs .248/M³ + Diesel Consumption 2 KmPl @ Rs.82/Litre = 3056.00 Rs / Trip + Filling Charges @ Rs 50/M³
- Total Cost for Single Trip= Rs 3622.00
- Total Cost for 8 Hr Shift = Rs 41300
- Total Material Quantity Transported=129.06 M³

5.5) With Proposed Quarry –

- No. of Trips that can be performed in 8 Hr Shift =21.37 Trips
- Cost ; Per trip rate considering Transport Distance = Material @ Rs .248/M³ + Diesel Consumption 2 KmPl @ Rs.82/Litre = 2904 Rs / Trip + Filling Charges @ Rs 50/M³
- Total Cost for Single Trip= Rs 3470
- Total Cost for 8 Hr Shift = Rs 74158
- Total Material Quantity Transported=241.91 M³

5.6) Increment in Transport of Material
 $241.91 - 129.06 = 112.86 \text{ M}^3$
% Increment = 87.44 %

5.7) Increment in work achieved as the material transport increased by 87.44 % as the Travel time for material reduces it effects in Increase in Total Trips in A shift.

The total Work done in Rs with Present Quarry in a Standard Shift was Rs 41300.

And the The total Work done in Rs with Proposed Quarry No.02 in a Standard Shift is Rs 74158.

It is Observed That The work done in Rs Increase by 79.00%

VI. CONCLUSIONS

This Study Analyzed the existing State of Earthwork , cost over fuels , total cost per trip , Total cost required to Standard 8 Hour Shift .The Proposed quarry are compared to their Different Distances so to minimize the Expense Over Material Transport. In this the proposed quarry Number 02 with Quarry Distance 2.36 .Km gives 87.44% more Earth material Quantity. The % of Work done Can be increased by Selecting Nearby Quarry. The % may Vary as per the distance of Quarry Changes. It shows the Correct Application of String Diagram on Dam Site also have a positive impact.

VII. ACKNOWLEDGMENT

This Paper shows Time Analysis and the Material Handelling with Fuel Requirement for Present quarry and Proposed Quarry No. 2 The Economical Analysis Also Included in this Paper.

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