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Concrete Productivity And Performance Comparison Of Pumped Concrete For High Rise Structure

Prof. Dr. A. W. Dhawale[1], Kazi Rizwan Nizamuddin[2]
1 Dr.A.W.Dhawale(H O D Civil Engineering Department ,J.S.PM's Imperial College of Engineering And Research)
2 Kazi Rizwan Nizamuddin (J.S.P.M's Imperial College of Engineering And Research)

Abstract- This study involves, case study of various sites regarding the productivity of concrete. This study involves collection of data information speed on concrete placing, time of concreting, volume, rate of concreting and relation between them with respect to height and type of structural member is analysed. The quantitative analysis of the collected data's has been discussed by means of graphs and empirical formula. A relation between height of the building and speed of concrete placing is derived using the observations.

Keywords- *Productivity of concrete, pumping of concrete, quantitative analysis, graphs and empirical formula, pumping height.*

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I. INTRODUCTION

Cement concrete is just alongside water as far as the measure of material utilized on our planet. Over many years, concrete has turned into the material of decision for developing private and business structures, infrastructural offices, for example, expressways, dams and extensions, trenches, ports and other imperative offices. The notoriety of cement owes to its economy, capacity to be thrown into any shape, capacity to be manufactured essentially anyplace and last however not the slightest, its inalienable toughness. Countless recorded points of interest in cement say a lot about its strength and adaptability adaptability.

Pumping of Concrete: Position of cement in difficult to reach territories has required the utilization of pumps in today's development. Particularly with the development of prepared blended cement crosswise over India, the requirement for pumping has expanded complex. While the simplicity of pumping relies on upon the sort of pump accessible, the separation over which cement is to be pumped, and the properties of the solid, various better perspectives can influence the operation.

Pumping is an extremely productive and dependable method for putting solid, which makes it an exceptionally efficient technique also. Infrequently, a pump is the main method for setting concrete in a specific area. For example, an elevated structure, or expansive chunks where the chutes of the solid truck can't reach where the solid is required. Different times, the simplicity and rate of pumping solid makes it the most prudent technique for solid arrangement.

Concrete Pump: A concrete pump is a machine used for transferring liquid concrete by pumping. There are two types of concrete pumps. The first type of concrete pump is attached to a truck. It is known as a trailer-mounted boom concrete pump because it uses a remote-controlled articulating robotic arm (called a *boom*) to place concrete with pinpoint accuracy. Boom pumps are used on most of the larger construction projects as they are capable of pumping at very high volumes and because of the labour saving nature of the placing boom. They are a revolutionary alternative to truck-mounted concrete pumps. The second main type of concrete pump is either mounted on a truck and known as a truck-mounted concrete pump or placed on a trailer, and it is commonly referred to as a *line pump* or trailer-mounted concrete pump. This pump requires steel or adaptable cement putting hoses to be physically joined to the outlet of the machine. Those hoses are connected together and lead to wherever the solid should be set. Line pumps ordinarily pump concrete at lower volumes than blast pumps and are utilized for littler volume concrete setting applications, for example, swimming pools, walkways, and single family home solid sections and most ground slabs

II. OBJECTIVES

The main objective of the present study is as follows

1. To generate the empirical formula for average speed of concrete placing.

III. SCOPE OF STUDY

In this study we will be studying various problems related to pumped concrete placing in high rise buildings and causes responsible for it and suggest the probable measures to minimize it. This study shall give better time estimates and enhancement in the productivity with maximum efficiency at the time of placing the concrete. The main aim of this study is to control the delay and productivity which are the biggest threat at the time of concrete placing.

The scope of study is as follow:

1. To find better time estimates for concrete placing.
2. To increase the productivity while concrete placing.

IV. LITERATURE REVIEW

Paul Dunlop and Simon Smith 2003
This paper focuses on the topic of data collection as appropriate for the productivity study of ready mixed concrete placing methods. Classification and description of various concrete placing methods are given.
S. D. Smith 1998
This paper presents a stochastic model of the delivery and pumping of concrete. By investigating data gathered from a major civil engineering project, the random nature of the process has been represented within the model by means of the gamma probability distribution. The model has been analysed using discrete-event simulation techniques, which have been used successfully in other civil and production engineering applications.

V. RESEARCH METHODOLOGY

The methodology adopted for the study is as follows,

1. Collect detailed information and data from the site, i.e. record time required for placing of concrete using a line pump at the site.
2. Analyse the data collected from different sites; find the rate of concrete placing at different floors.
3. Try and plot a curve of rate of concrete placing at different floors verses height of building.
4. Check if a generalised curve can be obtained from the data collected.

VI. Data Collection & Analysis:

From the literature review a comparative study is endeavored here, more than 60 pours were watched and the solid setting time was recorded at various floors or statures. The point by point perceptions are recorded for the putting of solid utilizing a line pump or stationary pump. The time required for setting of cement for various individuals was recorded alongside the amount and stature of putting cement.

Average Speed of Placing Concrete Observed is,
Table No.1, Average Speed of Placing Concrete

Floor	Height	Member	Quantity cu. Mtr.	Time of concreting minutes	Rate cu.mtr/hr
-1	-3	Footing	8	17	28.24
0	0	Footing	8.9	21.6	24.72
1	3	Column	1.32	4.4	18.00
2	6	Column	1.76	6.25	16.90
3	9	Column	2.5	10	15.00
4	12	Slab	115	420	16.43
5	15	Column	2.16	8.1	16.00
6	18	Column	2.16	8.4	15.42
7	21	Column	3.78	15.1	15.02
8	24	Column	1.32	7	11.31
9	27	Column	4.22	20	12.66
10	30	Column	4.04	20.4	11.88

From the above observations a curve of average speed of placing concrete verses the height of building is plotted as shown below,

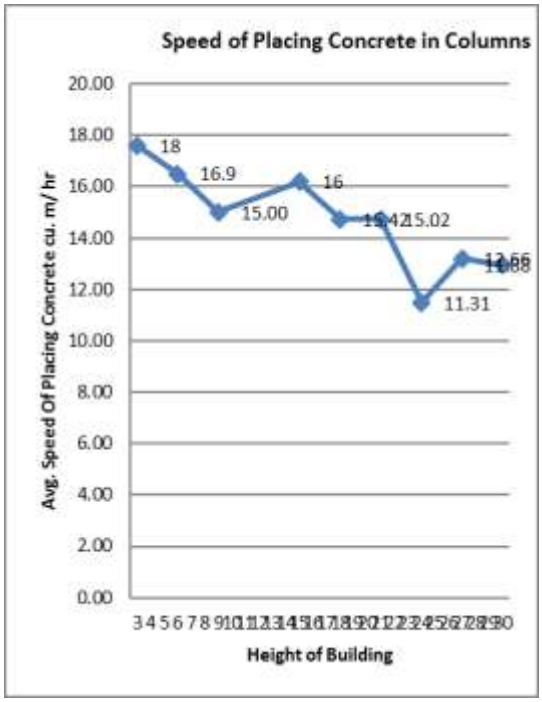

Fig. 1, Average Speed of Placing Concrete Vs Height of Building

Note: The observations for footing and slab are recorded but not considered in drawing the graph.

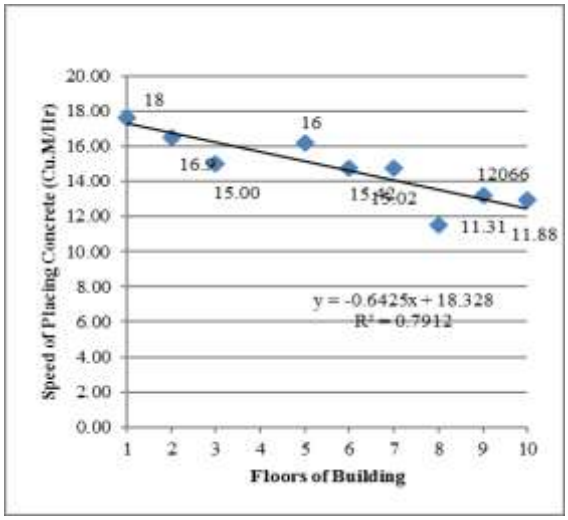

Fig.2, Speed of Placing Concrete Vs Number of Floors of Building

From the above graph is obtained if following points are considered,

1. Concrete pumps of capy between 36-50 CuM/Hr
2. Only observations noted for columns are considered to draw the graph.
3. Observations for slabs, beams and footing are neglected.
4. The climatic conditions when the readings were noted were moderate.
5. The quality of work was observed to be good.
6. The total delay time is not considered for drawing the curve.

Thus considering above points, an equation is obtained as given below,

$$Y = 18.328 – 0.6425X$$

Where,

Y = Avg. Speed of Placing Concrete
X = Number of Floor of Building

VII. DISCUSSION

It can be seen that no definite pattern is observed in the graph below.

For the similar observations in Pune, the height of building was restricted to 30 meters and only line pumped concrete was considered, omitting other methods of concreting like concreting by crane, lift & borrow method of by using boom placer.

It can be seen that from Fig.2 graph that a generalised curve can be obtained. The points considered for drawing a generalized curve are already discussed in the previous chapter. The rate of concreting or productivity of concrete placing was found to go on reducing as the height of building goes on increasing. The equation of the curve obtained is,

$$Y = 18.3285 – 0.6425X$$

Where,

Y = Avg. Speed of Placing Concrete
X = Number of Floor of Building

The reason for this difference or reduced speed of placing concrete may be,

1. Increased length of pipeline
2. More number of bends causing choking of pipe
3. Increased lift of concrete

VIII. CONCLUSION

The following conclusion could be drawn from the observations and data analysis done,

1. The generalised equation was formulated from the observations and graph as given below,

$$Y = 18.328 – 0.6425X$$

Where,

Y = Speed of placing concrete in CuM/Hr,
X = Number of Floors of building

2. From the graph, it could be concluded that the speed of placing concrete reduced gradually as the height of the building went on increasing.

IX. REFRENCES

[1] Michael Anson & Shou Qing Wang (1998), “Performance Of Concrete Placing In Hong Kong”, *Journal of Construction Engineering And Management*, 116-124
[2] Mohan M. Kumaraswamy, “Productivity Matters” (1997), *Association of Researchers in Construction Management*
[3] Ming Lu & Michael Anson (2004), “Record From Hong Kong Building Construction Projects”, *Journal of Construction Engineering And Management*, 216-224
[4] Paul Dunlop & Simon Smith (2003), “Estimating Key Characteristics Of The Concrete Delivery And Placement Process Using Linear Regression Analysis”, *Civil Engineering & Environmental Sciences*, 273-290
[5] S. D. Smith (1998), “Concrete placing analysis using discrete-event simulation”, *Proc. Instn Civ. Engrs Structs & Bldgs*, 351–358
[6] Tariq S. Abdelhamid and John G. Everett (1999), “Physiological Demands Of Concrete Slab Placing And Finishing Work”, *Journal of Construction Engineering And Management*, 47-52
[7] Bhupinder Singh, S.P. Singh and Bikramjit Singh (2004), “Some Issues Related To Pumping Of Concrete”, *The Indian Concrete Journal*, 41-44
[8] C. M. Tam, Thomas K. L. Tong, and Y. W. Wong (2004), “Selection of Concrete Pump Using the Superiority and Inferiority Ranking Method” *Journal of Construction Engineering And Management*, 827-834
[9] M. S. Shetty, Construction Technology.