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Experimental Analysis of Properties of Ready-Mix Concrete Over Conventional Site Mix Concrete to Improve the Quality and Strength of the Structure

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ABSTRACT:In this research work, the main focus is firstly to check various engineering properties of materials which are used in the preparation of RMC and hand mix concrete and then to analyse important engineering properties of ready mixed concrete and site mixed concrete cube samples and deviation / variation, if any, used at smart construction project at Nagpur. The strength and workability parameter of concrete are essential to analyze with respect to the design of structure. The tests are conducted in laboratories and results and its comparison is checked. The results of both ready mix concrete, mix designs and site mixing are analysed and finding result are presented in the findings of research.

KEYWORDS:Ready Mix Concrete, Conventional Site Mix Concrete, Compressive Strength, Concrete Properties, Design Mix,

I. INTRODUCTION

The Indian development industry has been customarily work arranged. The speed of automation in the past has been exceptionally delayed because of the accessibility of modest work in plenitude, absence of capital venture and the profoundly divided nature of the development business. The level of automation is still around 25%-30% while it is well above 70% in the greater part of the created nations. One of the significant causalities of weighty dependence on work escalated strategies of development is the nature of work. Site-blended cement has genuine restrictions to the extent nature of cement and speed of development are concerned. Presently developing acknowledgment is surfacing that quality and consistency can't be accomplished by depending on age-old methods of development. The development possibilities of RMC in India in this setting looks exceptionally splendid the new age developments required speed and better quality than acquire beneficial life cycle cost of the undertakings. Barely any things are more disturbing to create on a worksite than concrete. Sacks of concrete, sand, total (rock) and conceivably different added substances should be conveyed to the development region. A stock of clean water is likewise important, alongside a leased substantial blending container. Indeed, even after every one of the dusty and substantial fixings have been stacked into the container, one little mistake in the wet/dry proportion can deliver a whole cluster of cement unusable. One normal answer for this muddled and tedious issue is Ready Mix Concrete. Prepared blend concrete (RMC) is a prepared to-utilize material, with foreordained combination of concrete, sand, totals and water. RMC is a kind of cement fabricated in a production line as indicated by a set formula or according to determinations of the client, at a halfway found clustering plant.

Aim of the Project

The aim of this project is to unfold various aspects of ready-mix concrete over Conventional Site Mix Concrete in order to improve the quality and productivity of ready-mixed used in construction projects and to improve the quality and strength of the structure.



Research Objectives

1. To Test the Properties of Ingredients Used for RMC And In-Situ Concrete.
2. To Analyse Strength and Workability Parameter of Ready Mixed Concrete (RMC) Used in Smart Construction Projects to Produce Better Quality Concrete Increasing Life of the Structure.
3. To Identify the Influencing Factors Involved in Equipment Quality Management and Transportation in Ready-Mix Concrete Plant.
4. To Establish the Comparative Results and Deviation of RMC and site mixed concrete Properties.

II. RELATED WORK

A. K. Gaikwad and S. B. Thakare (2019) [1] : Considering the infrastructural development in India over past decades, especially in Maharashtra due to industrialization and urbanization, the construction sectors rule the Indian economy. Concrete being most popular material of the construction sector, concrete batch plants will see a massive growth in line with the infrastructural expansion. The RMC batch plant manager has to prepare an efficient schedule of dispatching RMC trucks, which will optimize the operations at the construction sites and also at the batch plant. there is a need to develop a systematic model that incorporates soft computing techniques, to find optimal dispatching schedule which not only will provide the “Un-interrupted” dispatching schedule but also minimizes the total waiting time of RMC trucks. This paper tries to give an overall idea of the research work done till date in this area along with the hurdles in dispatching and also to suggest the scope for the future research work.

KarthikPrabhu and Sampath Kumar (2018) [2] : Accomplishing great quality in scheduled time and planned cost is one of the harder errands. The utilization of ready-mix concrete for the development activities will diminish the time with a little variation in cost. The part of ready-mix concrete in huge ventures, high innovation structures, dams, and modern structures and so on keeps on developing quickly. Thus, equipment quality management integrates and continuously interacts with human, technical, financial, and production system in order to achieve efficiency and quality in transportation. This task includes an investigation on factors associated with equipment quality administration and quality transportation which are impacting in ready mix concrete. It clarifies quickly about the question, nature, extent of study, devices utilized for consider, need of study and gathering information from settled ready mix concrete plants in India.

Rahul Kumar and J.P. Tegar (2018) [3] : Concrete is most extensively used constructional material. Depending upon the scope of the work and site conditions, the concrete can be in-situ (conventional mix/ manual mix) or Ready Mixed Concrete (RMC). Concrete being used for both major as well as minor constructional projects, it is necessary to maintain its properties and quality irrespective whether it is site mixed or Ready Mixed Concrete. It is of great concern to analyze the properties of both conventional mixed concrete and ready mixed concrete to assume quality control of concreting. In this research work, the main focus was to analyse important engineering properties of ready mixed concrete and site mixed concrete and deviation/ variation, if any, used at smart road construction project at Bhopal. The strength and workability parameter of concrete are essential to analyze with respect to the design of smart road project, the results of both ready-mix concrete mix designs and site mixing are analysed and results are presented in the findings of research.

III. METHODOLOGY

Materials Required for Concrete

Concrete is a composite material consisting of a binder, which is typically cement, fine and coarse aggregates, which are usually sand, gravel stone and water. Admixtures may be included in the mix to control setting properties. These Comprise the Constituent Materials of Concrete. Materials Taken for Research Work such as cement, sand, aggregate, water were remained same in both the cases of concrete preparation i.e. Ready Mix Concrete and Hand Mix Concrete and are as follows:



Materials used in RMC

Sieve Analysis

Sieve Size mm.	Percent Passing		
	20 mm.	Natural Sand	Crushed Sand
40	100	100	100
20	68.7	100	100
10.0	1.1	99.5	100
4.75	0	94.7	95.6
2.36	--	90.2	88.5
1.18	--	76.1	62.7
0.6	--	46.9	41.8
0.3	--	10.3	26.0
0.15	--	1.7	15.4
Fineness Modulus of Sand	2.80		2.70
Sand Conforming to Zone	II		II

Properties of Aggregate				
Sr.	Properties	Natural Sand	Crushed Sand	Coarse Aggregate
a.	Specific Gravity	2.64	2.72	2.84
b.	Water absorption	1.2%	2.0%	1.0 %
c.	Surface moisture	NIL	NIL	NIL

IV. EXPERIMENTAL RESULTS

The Test Results of different concrete mixes (M15, M20, M25) For compressive strength and workability for the research work are as follows :

Type ↓	S.N. →	1	2	3
Hand Mixed Concrete	Samples	7 Days	14 Days	28 Days
	Compressive Strength N/mm ²	12.44	15.25	17.78
Ready Mixed Concrete	Samples	7 Days	14 Days	28 Days
	Compressive Strength N/mm ²	14.36	17.04	19.99

Table 6.1 : Grade of Concrete : M15, Water Cement Ratio: 0.55



Size of Cube : (150mm*150mm*150mm)

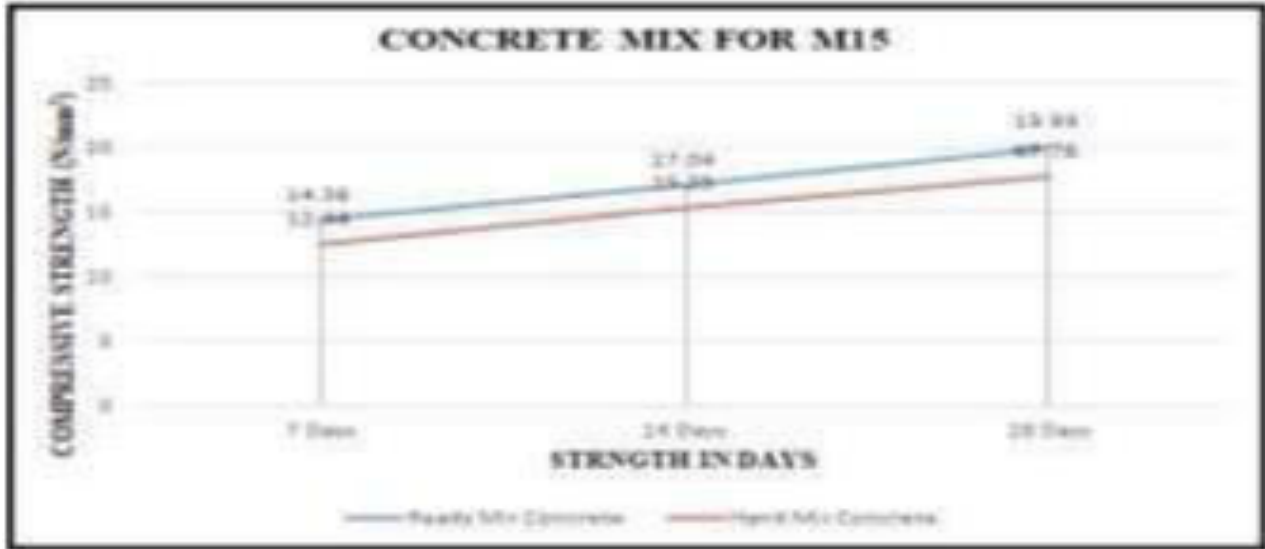


Fig 6.1 : Graph showing comparison of RMC & HMC

Type ↓	S.N. →	1	2	3
Hand Mixed Concrete	Samples	7 Days	14 Days	28 Days
	Compressive Strength N/mm ²	14.96	19.55	22.37
Ready Mixed Concrete	Samples	7 Days	14 Days	28 Days
	Compressive Strength N/mm ²	17.04	21.18	26.55

Table 6.2 : Grade of Concrete : M20 Water, Cement Ratio: 0.53

Size of Cube : (150mm*150mm*150mm)



Fig 6.2 : Bar chart showing comparison of RMC & HMC

V. CONCLUSION

- The results on strength parameters of RMC are found 11.64% for M15, 11.83% for M20 and 12.6% for M25 and for workability are found to be 7.69%, 8.33% and 6.66% are better as compared to in-situ concrete parameter, where as core or basic ingredients such as cement, sand, aggregate, water were remain same in both the cases of concrete preparation.
- The properties of ingredients used for RMC and in-situ concretes are as per design requirement and within the permissible limits of BIS.
- The slump value of few samples of RMC is deviated by 8.33 % that is because of other factors such as elongation and flakiness and quality control parameters which are beyond the scope of this research.
- The comparative variation in results of RMC and in-situ concrete are about 1 to 5KN/mm², which is very very marginal.
- The in-situ and RMC parameters if controlled as per the guide lines and engineering procedures of quality control. This deviation may be bridged by site engineers. The results of the study are in-line with the theoretical prospective of RMC and in-situ concrete which have been proved practically on the site of smart road project of Bhopal.

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