

EXPERIMENTAL INVESTIGATION ON BEHAVIOUR OF FLYASH BASED CONCRETE BY REPLACING SAND WITH M-SAND AND CEMENT WITH FLY ASH

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Abstract -.As we know that round the world wide every developing country along with our country the global consumption of manufactured sand as an alternative for natural sand is used extensively because of high demand and scarcity of natural sand. In this regard to understand the behavior of concrete specimens with M-sand and fly ash is studied experimentally. The use of M-sand the density will be more which ultimately results in increase of Strength. The use of fly ash in concrete is desirable because of benefits such as increased workability, reduction in cement consumption and decreased permeability. The use of fly ash leads to reduction in early strength of concrete but there is increase in long term strength. This experiment investigates the strength of concrete in 7days, 28days and 56days curing period containing 0%,20%,40% & 60% of fine aggregate (Sand) replacing with M-sand and 0%,20%,40% & 60% of cementitious materials by fly ash along with Super plasticizer Hyper Fluid plus 3 Admixture is used for the grade M-45 (PSC). The concurrent use of these materials will lead to environmental and economical benefit.

Key Words: PSC, M-sand, Sand, fly ash, cementitious material, Super plasticizer, Economical benefits.

I. INTRODUCTION

Concrete is one of the most widely used construction material because of its good durability to cost ratio. Cement used in concrete is a mixture of complex compounds. With the increasing demand and use of cement, scientists and researchers all over the world are always in quest for developing alternative binders or cement replacement materials. The addition of these products in the production of concrete has positive environmental effects, while minimizing problems associated with its disposal.

As we know that increasing in the development the construction practices also going to be high. In this content many areas in construction using the M-sand in the place of natural sand. This experimental study will judge or notify the behavior of concrete properties by replacing natural sand with M-sand in concrete.

As we know that increasing in the development the construction practices also going to be high. In this content many areas in construction using the fly ash in the place of cement. This experimental study will judge or notify the behavior of concrete properties by using this material in concrete

II. SCOPE AND OBJECTIVES

This project mainly pointing on the strength parameters and economical benefits. As compared to sand using M-sand will have desirable amounts of benefits that we can make particles size and fineness as our requirement. The M-sand will not be affected by mineral deposits so the life span of the structure will increase or any rusting type materials will last for more years. Whereas by replacing cement content with fly ash results in increasing in the long term strength of the structure. The main objective of the experimental investigation is to assess the utility of M-Sand in the production of structural concrete. To fulfill the objective, the work is aimed at the following. To carry out the mix design for grade M-45 for both Conventional concrete and concrete on partial replacement of cement by fly ash and sand by M-sand. To study the strength characteristics of concrete. To arrive at the optimum percentage replacement of cement with fly ash and sand with M-sand in the production of Structural Concrete.

- The main objectives are cost related and by utilizing these type of replacements in the concrete we get required amount strength parameters with in the desirable limits.
- The use of this replacement in girders where the pre stressing will give better resistance to the stresses and these can be mainly used in the highway structures for flyovers and underpasses where the mode of transportation is heavy.
- The use of super-plasticizers will increase in the bonding nature of the concrete and prevent from early fracture of the structure whereas the durability and workability will be in good and desirable limits.

III. MATERIALS

Cement:

In this work the Ordinary Portland Cement 53 grade was used. Cement is a fine, grey powder. It is mixed with water and materials such as sand to make mortar and concrete. The cement and water forms a paste that binds the other materials together.

Coarse aggregate:

Locally available crushed stones conforming to graded aggregate of nominal size of 20mm and 10mm as per MORT-H. The physical properties of coarse aggregate like specific gravity, gradation and fineness modulus are tested.

Fine aggregate:

Locally available river sand.

Water:

The water, which is used for making concrete and for curing, should be clean and free from harmful impurities such as oil, alkali, acid, etc; In general, colorless, odorless portable fresh water was used for mixing the concrete.

M -Sand:

M-Sand is also known as mechanical or manufactured sand in this sand we can use it or replace it with normal sand. Majorly M -Sand will be less reactive with any chemicals or minerals why because of it is manufactured sand we can get it without any mineral content it as we will have many types of silt and chemical and mineral content will present in natural sand.

Fly-Ash:

The fly ash is the out most wastage that can be collected from the end process in any electrical power systems like APZENCO or from any chimney from any industries we can collect the fly ash as it is also having the binding nature as like as cement and comparing to cement the cost will be low and has tendency of early strength of concrete if we use it in desirable conditional limits.

Admixture:

Admixture is a liquid type material where by adding it we can reduce max of 20% of water content and for increasing or decreasing the rate of reaction and for easy workability of concrete we will use admixture. In this study Hyper Fluid Plus 3 Super Plasticizer is used as a admixture.

IV. DESIGN MIX

A mix for M45 (PSC) grade was designed as per IS 10262: 2009 and by using some data from (MORT-H 1700) and the same was used to prepare the test samples. The variation of strength of hardened concrete using M-Sand as partial replacement along with Fly ash as partial replacement of cement is studied by casting cubes for each and every mix design and every replacement. The specimens were tested for compression strength after curing period of 7 days, 28 days and 56 days per the mix design. The design mix proportion is done in table 1 & table 2 for 1 cub.m of concrete. This is done for the live project fly over girders castings purpose.

Table -1:

Design mix proportion for M45 mix without any replacement

	W (Lit)	C Kg/m ³	C.A Kg/m ³	F.A Kg/m ³
By weight	146	430	597	794
By Volume	0.34	1	1.38	1.84

W = Water, C = Cement,

F.A = Fine aggregate, C.A = Coarse aggregate

Table -2:

Table showing the mix proportion of M-45 in terms of percentages

S.no	Proportion of Replacement	w/c	Cement	flyash	F.A	M-sand	C.A	Admixture
		%	%	%	%	%	%	%
1	(C ₀ ,S ₀)	0.34	1	0	1	0	1	0.8
2	(C ₂₀ ,S ₂₀)	0.34	0.8	0.2	0.8	0.2	1	0.64
3	(C ₄₀ ,S ₄₀)	0.34	0.6	0.4	0.6	0.4	1	0.64
4	(C ₆₀ ,S ₆₀)	0.34	0.4	0.6	0.4	0.6	1	0.70

V. EXPERIMENTAL METHODOLOGY

The experiment was conducted by replacing cement with 0%,20%,40%,60% by fly ash as well as normal sand replaced by 0%,20%,40%,60% of M-sand . The cubes are casted for each and every proportion mix for M-45 grade which this type of concrete is majorly used for Girders casting purpose and this whole project will study the strength efficiency and economical way of possible benefits can be investigated by this study. The test will be conducted for the curing period of (7 days, 28days & 56 days) and the results are studied.

VI. RESULTS AND DISCUSSIONS

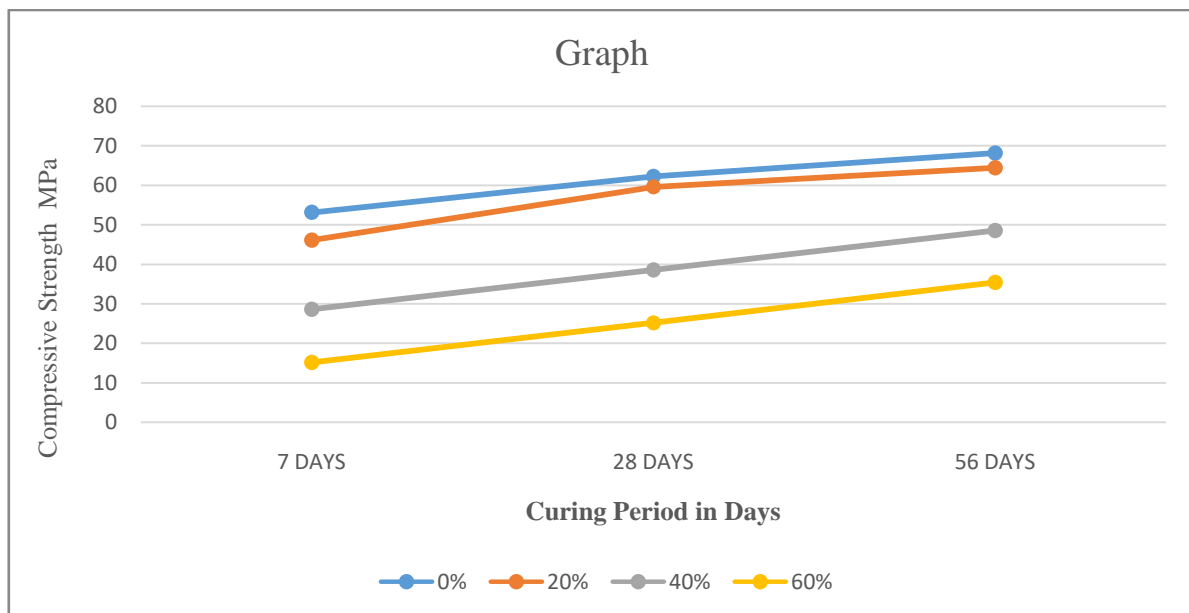


Table -3:

Compressive strength (Mpa) for M-45 grade						
S.no	Days	Compressive Strength(Mpa)				
		0%	20%	40%	60%	
1	7 days	53.11	46.12	28.56	15.12	
2	28days	62.25	59.61	38.55	25.16	
3	56 days	68.15	64.45	48.55	35.44	

The above table No .03 showing the compressive strength (Mpa) of various types of mix proportions of sand and cement replacement with M-sand and fly ash respectively in simultaneous proportions (0%, 20%,40% and 60%) for 7days,28days and 56days.

Table -4:



The above graph showing the compressive strength of concrete M-45 grade for various proportions of equivalent replacements of materials as mentioned above in the paper.

VII. CONCLUSION

From the above graph and experimental procedure we came to conclude the conclusions of the project as

- As we increasing the percentage of fly ash we the strength has become reduced as we observe in the graph.
- The percentages 0% and 20% has attained the maximum nearly same compressive strength of concrete and 40% and 60% has been attained very low strength.
- The reason we have been observed is M-sand will increase density whereas fly ash will have low density basing on these factors strength is effecting.
- By increasing fly ash and M-sand proportions the setting time will be more and workability and durability will decrease.
- So the final conclusion is that up to maximum nearly 40% of the proportions we can replace and further will not be not safe for the structures if we replace more than this percentage on combined replacement.

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