

Effect of Micro fines on characteristics of Manufactured sand

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Abstract - In the world, concrete is broadly used. Every year about 10 billion tons of concrete is used. In the process of manufacturing sand it the most important material, but due to the over exploitation of natural resource the replacement is necessary and nowadays as a replacement M-sand is used which is obtained from the quarries. The m-sand which is used has better strength when compared to the normal used sand in the construction and it is also environmental friendly material whose cost is also low when compared with the Normal sand and hence preferred. The strength and durabilities properties for the various Fines replacement of the M-sand in concrete is studied with variation of percentage of fines like 0%, 5%, 10%, 15%, 20%. is analyzed. The strength studies such as compressive strength, flexural strength, Split tensile strength and durability tests such as water absorption, sorptivity, density, permeability test were done and the results are compared with the variation of fines in M-sand.

From the above mentioned studies it was concluded that for the variation of each percent of fines in M-sand. the percentage for about 5% fines gives more value for both the strength and durability parameters when compared to the other percentage of fines .i.e., when M-sand has 5% fines in it it gives the good results for the strength and durability parameters.

Key Words: compressive strength, split tensile strength, Flexural strength, sorptivity, Water absorption, Permeability....

1. INTRODUCTION

Concrete is a collective material which is made up of a mixture of cement, aggregates and water, it is extensively used around the world in the construction industry. It is surveyed that annually ten billion tonnes of concrete is consumed every day. The natural river sand plays a main role in concrete but due to increase in demand in the construction industry large amount of sand is being brought, which led to an ecological imbalance. Due to the unavailability and high price, the replacement of the river sand with an alternative

material is necessary i.e, Manufactured sand, slag sand, pond ash etc.

Both coarse aggregate and fine aggregate play an eminent role in the strength development. About 65-80% of concrete is occupied by the aggregates which affects the fresh and hardened properties of concrete among these, the fine aggregate consumption is around 20-30% by volume.

Mr. Praveen Kumar and Radhakrishna (Feb-2015) [1] based on the experimental results they have concluded that with 80% alternate of M-sand when compared with the constituent sand, so strength increases, with complete replacement the strength decreases. For all the replacement levels the strength of M-sand is more compared to that of natural sand.

Mr.Pethkar and Deshmukh (April-2014) [2]: Concluded that the maximum strength is obtained at retempering time of 45 minutes without adding any retarder then upto Retempering time of 60 minutes

Mr. Bhandre et al., (2014) [3] : Concluded that at 50% replacement of foundry sand the compressive and the flexural strength increased

Mrs. Swapnil Fate (2014) [4]: Experimental investigation lead to the following conclusion that M-sand has no organic impurities and chemical impurities like sulphates and chlorides, which improves the durability and strength, but reduces workability of concrete .

Mr. Ajay Sherlokar et al., (May 2014) [5] :Concluded that M-sand is economically used as an marginal since the strength and durability results obtained for all the replacement was good.

Mr. Arivalagan (Oct-2013) [6] :Clarified that M-sand has minimum voids and also satisfies the compression, bending and flexure qualities, since it is close graded.

Mr. Beemamol et .al (2013) [7] :Reported that the replacement of manufactured sand with ceramic dust

showed no strength gain for 1:3 mix. For 1:4 mix the strength gain of about 4% was observed.

1.1 Results of Basic test

The test results are done on the basis of basic experiments

- Specific Gravity of Cement = 3.10
- Specific Gravity of Fine Aggregate = 2.607
- Specific Gravity of Coarse Aggregate = 2.67
- Water Absorption of Coarse Aggregate = 0.603%
- Water Absorption of Fine Aggregate = 1.08%
- Fineness of Cement = the %age of fineness of Cement is 3.33. (Which is below 10%, hence it is well graded.)
- Bulk density of Fine Aggregate = 1504.58 kg/m³.
- Bulk density of Coarse Aggregate = 1597.79 kg/m³.

1.2 MIX DESIGN FOR M-SAND

The mix design was followed according to IS10262-2009

Cement	430.76 kg
Water	140 ltr
Fine aggregate	722.93 kg
Coarse aggregate	1097.01 kg
Water cement ratio	0.325
1: 1.68: 2.54: 0.325	

Table 1: Mix design chart

2. TESTS

2.1 STRENGTH TESTS

The uniformity of fresh concrete is determined by slump test, which is the most commonly used method. In this test the workability of manufactured sand with different proportion of fines of M60 grade concrete was prepared. To attain the desired slump the superplasticizer percentage was varied for each percent variation in fineness.

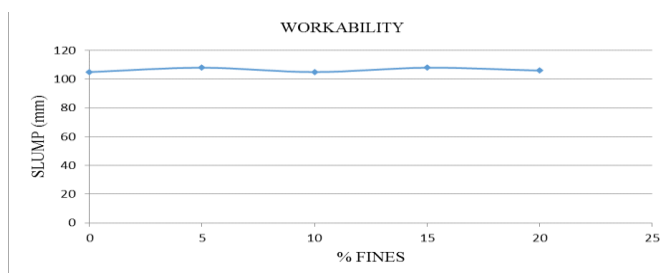


Chart 1: Variation of Workability with fines

Compressive strength

It is a mechanical test which measures the amount of load that a material can bear before fracturing. Cubes of size 150mmx150mmx150mm were cast and cured for a 7 and 28 days and then tested in a compressive testing machine

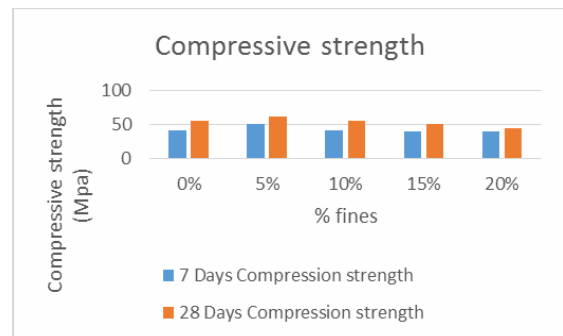


Chart 2: Compressive strength

The compressive strength is maximum for 5% fines

Split tensile strength

The split strength of concrete is measured by the split tensile strength of concrete, the moulds, size being 15cm diameter X 30 cm height. Cylinders were cast, cured and tested in the testing machine by placing the cylindrical specimen such that the load is acting perpendicular to the direction of compaction and the failure load is noted down

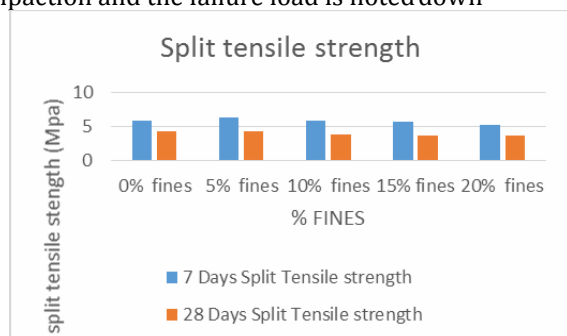


Chart 3: Split tensile strength

The split tensile strength is maximum for 5% fines

Flexural strength

To determine the flexural strength, the prisms of size 100mm*100mm*500mm were cast, cured and tested for 28 days.

