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REVIEW OF CONCRETE BY USING MANUFACTURED SAND AND RECYCLED COARSE AGGREGATE

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Abstract *— Re-Use of Concrete Waste as Recycled Coarse Aggregate in Concrete Grade of M-15 & M-20.Use of Manufactured Sand in Replacement of Natural Sand in Concrete.To Study The Different Properties Like Workability, Compressive Strength and Flexural Strength of Fresh and Hardened Concrete and also Compare above Said Properties with Normal Concrete. If We achieve Desire Strength in M-20 Mix Concrete then We can use this Concrete In Pavements to Make C.C Roads in Required Area and if we achieve M-15 grade then we can use this concrete for P.C.C Work.By Using Such Concrete of Recycle Coarse Aggregate & Manufacture Sand we Save natural Source of aggregate.*

Keywords*- Manufactured sand, Recycled Coarse Aggregate, Workability, Compressive Strength and Flexural Strength*

I. INTRODUCTION

Aggregate scarcity is the biggest concern today in India. On environmental grounds, there have been strict dredging restrictions from various local authorities pertaining to taking out sea sand as well as river sand. This position is more prevalent in the states of central and southern part of India, where availability of good quality fine aggregate is a constraint.

Manufacture Sand is defined as a Purpose-Made crushed Fine aggregate produced from a suitable source material. Production generally involves crushing, Screening and possible washing separation into discrete function, recombining and blending may be necessary. There are different types of equipment are involved in the sand making process, such as jaw crusher for coarse crushing, impact crusher and cone crusher for fine crushing. In these stages, their will some auxiliary plants such as vibrating screen, which will be used to sieve the material and separated the qualified manufactured sand.

A durable concrete is one that performs well and satisfactorily under different aggressive and hostile environment during its long life service span. Sometimes material other than traditional like admixture is added to concrete before or during mixing, to provide a more economical solution and enhanced concrete properties. Due to a critical shortage of natural aggregate, the availability of demolished concrete for use as recycled coarse aggregate (RCA) is increasing. Use of waste concrete as RCA conserves natural aggregate, reduces the impact on landfills, save energy and can provide cost benefit. Recycled aggregates are the materials for the future.

II. LITERATURE REVIEW:

A. DR.S.ELAVENIL(2013)PROFESSOR IN CIVIL ENGG,S.R.M.UNIVERSITY, KATTANKULATHUR, INDIA" MANUFACTURED SAND, A SOLUTION AND AN ALTERNATIVE TO RIVER SAND AND IN CONCRETE MANUFACTURING"

In this paper Scarcity of good quality Natural River sand due to depletion of resources and restriction due to environmental consideration has made concrete manufactures to look for suitable alternative fine aggregate. One such alternative is "Manufactured sand" A durable concrete covers and bears the responsibility of sustaining the entire R.C.C. structure throughout it service life. A well processed manufactured sand as partial or full replacement to river sand is the need of the hour as a long term solution in Indian concrete industry until other suitable alternative fine aggregate are developed.

The mix with Ms sand as 100% fine aggregate gives initial workability of 170mm, which is much higher than that of the mixes with 100% river sand(RS) and crusher dust. Higher fineness modulus, particles grading, shape, texture and control of microfines have contributed to better workability of Manufactured sand.

The river sand particles have better shape and texture, lower fineness modulus and silt content have contributed to the reduced workability of just 100mm, which is much lower than that of the standard mix with 100% MS. Compressive Strength, The standard mix with 100% manufactured sand has exhibited much higher compressive strength 53 MPa. The standard mix with 100% of river sand has exhibited compressive strength of 49MPa, 7.5% lower than that of manufactured sand. The improved properties of MS by the entire process of manufacturing could have resulted in reduced surface area and better particle packing. This contibuted to the better binding effect with the available cement paste and improved the compressive strength.

B. CHETNA M VYAS (2013)" DESTRUCTIVE STRENGTH PROPERTIES OF RECYCLED COARSE AGGREGATE"

In present Paper Reports on the basic strength properties of recycled coarse aggregate. Use of waste concrete as Recycle Coarse Aggregate (RCA) conserves natural aggregate, reduces the impact on landfills, save energy and can provide cost. It also compares these properties with natural aggregates. Basic changes in all aggregate properties were determined. Basic concrete properties like compressive strength, pull out strength are explained here for different combinations of recycled coarse aggregate with natural aggregate. The compressive strength, pull out strength is used to determine the maximum resistance of a concrete to axial loading of the concrete specimens that having different percentage of recycled coarse aggregate replacement. The testing is just carried out after 28 days of casting. The resting specimen was 100mm diameter and 200 mm height for M25 grade concrete. There were total of six batches of concrete mixes, consists of every 20% increment of recycled aggregate replacement from 0% to 100%.

Testing for compressive strength : Confirming Indian Standard Specification: IS 516 – 1959 Apparatus: A 200 tonne capacity compression testing machine was used for this test. The strength of the concrete specimens with different percentage of recycled aggregate replacement can be indicating through the compression test. The specimens used in the compression test were the resting specimen was 100mm diameter and 200 mm height. Three specimens were used in the compression testing in every batch. Differences of the strength among the different percentage of recycled coarse aggregate used in the age of 28 days also indicated through the compression test.

Figure.1-Setup of Compression Test

Testing for Pull-Out strength: the value of the test depends upon the ability to relate pull-out forces to concrete strength. An important features of method is that the relation between pull out force and concrete strength is relatively unaffected by mix characteristics and curing history. The approach offers the advantage of providing a more direct measure of strength, and at a greater depth than surface hardness testing by rebound methods, but still requires only one exposed surface.

The assembly is pulled out hydraulically against a circular bearing ring. A cone of concrete is pulled out with the assembly and the force required to achieve this is translated to compressive strength by the use of an empirical relation given by Equation.

$$\text{Pull out strength, } fp = P/A$$

Where P and A are the pulling force and failure surface area, respectively.

The area A may be calculated from Equation

$$A = \pi/4\,(d1 + d2)\,[4h2 + (d1-d2)2]^{0.5}$$

Where, d1= internal diameter of bearing ring =50mm
d2 = diameter of pull out insert head = 22.5mm
h = distance from insert head to the surface =21mm

Figure.2-Setup of Pull out Test

TABLE-1 TEST RESULTS:

Sr.No	Mix	Average Compressive strength in N/mm2	Average Pull out Strength in N/mm2
1	Mix:1	28.01	7.54
2	Mix:2	22.28	8.43
3	Mix:3	34.88	8.90
4	Mix:4	20.62	8.20
5	Mix:5	15.66	7.90
6	Mix:6	8.91	7.38

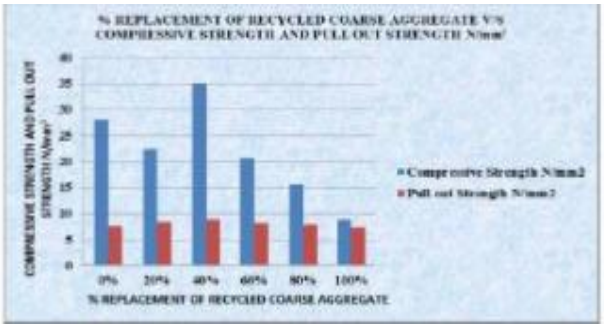

Figure.3-% replacement of recycled coarse aggregate v/s Compressive & Pull out Strength of cylinder (100 mm dia x 200mm ht) for M25 Grade Concrete 28 day

C. PRIYANKA A. JADHAVA RESEARCH SCHOLAR, CIVIL ENGINEERING DEPARTMENT, INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY, MAHARASHTRA, INDIA" AN EXPERIMENTAL INVESTIGATION ON THE PROPERTIES OF CONCRETE CONTAINING MANUFACTURED SAND"

In this Paper The effect of water cement ratio on fresh and hardened properties of concrete with partial replacement of natural sand by manufactured sand was investigated. Concrete mix design of M20 (2900 psi) grade was done according to Indian Standard code (IS: 10262). Concrete cube, beam and cylindrical specimens were tested for evaluation of compressive, flexural and split tensile strength respectively. Workability was measured in terms of slump and compacting factor. The concrete exhibits excellent strength with 60% replacement of natural sand, so it can be used in concrete as viable alternative to natural sand. This paper puts forward the applications of manufactured sand as an attempt towards sustainable development in India. For each trial mix three cube, three beam and three cylinders were casted.

TABLE-2 TEST RESULTS OF CONCRETE:

Percentage replacement of natural sand by manufactured sand	Compressive strength Mpa (Ksi)	Percentage increase of Compressive strength w.r.t Reference mix	Split tensile strength Mpa (Ksi)	Percentage increase of Tensile strength w.r.t Reference mix	Flexural strength Mpa(Ksi)	Percentage increase of Flexural strength w.r.t Reference mix
Mix1(Reference	38.07(5.52)	-	2.01(0.292)	-	5.75(0.834)	-

Mix) (0% Manufactured Sand)						
Mix2 (0% Manufactured Sand)	39.38(5.7)	3.44	2.20(0.319)	9.45	6.02(0.873)	4.69
Mix3 (0% Manufactured Sand)	39.53(5.73)	3.84	2.22(0.322)	10.45	6.15(0.891)	6.96
Mix4 (0% Manufactured Sand)	**42.87(6.22)**	**12.61**	**2.24(0.325)**	**11.44**	**6.59(0.956)**	**14.60**
Mix5 (0% Manufactured Sand)	40.69(5.9)	6.88	2.19(0.318)	8.96	6.09(0.883)	5.91
Mix6 (0% Manufactured Sand)	39.82(5.78)	4.59	2.03(0.294)	0.99	5.86(0.849)	2.43

For Fresh Concrete The Workability Increasing percentage replacement of manufactured sand decreased the workability. Manufactured sand consumes higher amount of water to satisfy the workability. Hardened Concrete Concrete mixes revealed an increase of up to 12.61% in compressive strength, 11.44% in split tensile strength and 14.60% in flexural strength as a result of replacement of manufactured sand up to 60% as seen in Above Table and Fig.1, 2 and 3 respectively.

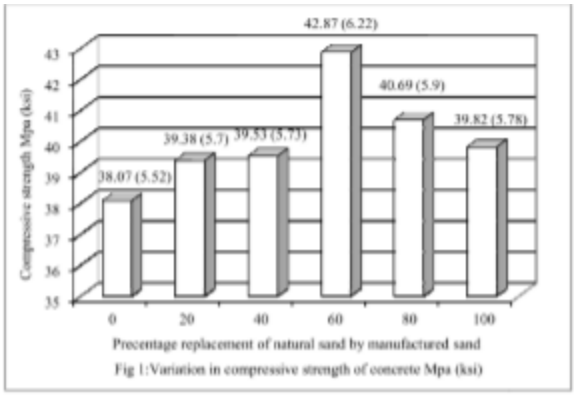

Figure.4-Variation in compressive strength of concrete.

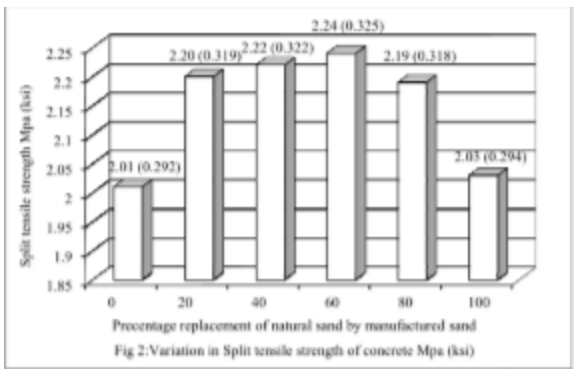

Figure.5-Variation in Split tensile strength of concrete.

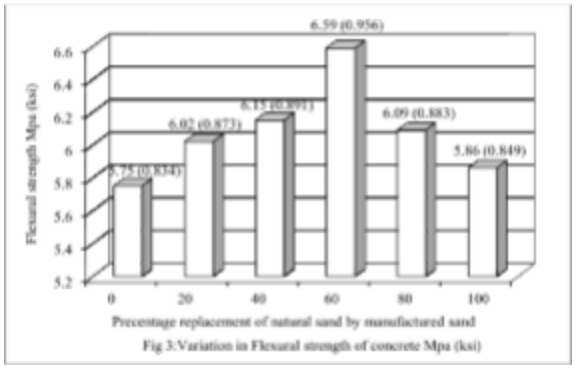

Figure.6-Variation in Flexural strength of concrete.

D. CHETNA M. VYAS 1ASSISTANT PROFESSOR & RESEARCH SCHOLAR, CIVIL ENGINEERING DEPARTMENT, A. D. PATEL INSTITUTE OF TECHNOLOGY, NEW VALLABH VIDYANAGAR, GUJARAT, INDIA. "DURABILITY PROPERTIES OF CONCRETE WITH PARTIAL REPLACEMENT OF NATURAL AGGREGATES BY RECYCLED COARSE AGGREGATES"

Experiments were conducted to study the effect of recycled coarse aggregate on the durability properties. The focus of this paper is to bring out the status of waste generation from construction which is recycled and used to prepare fresh concrete. Durable concrete should perform satisfactorily under the exposed environmental condition during its service life span. Concrete requires almost zero maintenance and normal environment. Main characteristic influencing the durability of concrete is its permeability to the ingress of water. When excess water in concrete evaporates, it leaves voids inside the concrete element. It creates capillaries. They are directly related to the concrete porosity and permeability. By proper selection of ingredients and mix proportioning and following the good construction practices almost impervious concrete can be obtained. The flow of water through concrete is similar to flow through any porous body. The pores in concrete are the result of incomplete compaction. They become voids of larger size which give a honeycomb structure leading to concrete of low strength. There is a need for another type of test rather than the absorption test and permeability tests to measure the response of concrete to pressure. This test should measure the rate of absorption of water by capillary suction, "sorptivity" of unsaturated concrete. In this paper, an attempt is made to study the properties of recycled coarse aggregate concrete to check durability. The mix design was carried out for M35, M40 and M45 grade concrete as per IS: 10262-2009.

III. CONCLUSION:

In first paper conclude that The effect on the use of manufactured sand on early age and long term volumetric properties, such as shrinkage and creep respectively, are not available and should be studied. The fresh properties of concrete are certainly affected by the use of manufactured sand, but the hardened properties such as flexural strength & compressive strength do not seem to be greatly affected by the gradation. compared to concrete made from river sand, high fines concrete generally had higher flexural strength, improved abrasion resistance, and higher unit weight & lower permeability due to fillings the pores with micro fines.

In Second Paper Conclude that The compression test result indicates an increasing trend of compressive strength up to 40% replacement of recycled aggregate & then it decreases at the 100% replacement of recycled aggregate after 28 days. The results also show that the concrete specimens with 40% replacement of recycled aggregate get the highest strength when compared to the concrete specimens with different percentage of recycled aggregate.

In Third Paper The compressive, split tensile and flexural strength of concrete with 60% replacement of natural sand by manufactured sand reveals higher strength as compared to reference mix. The overall strength of concrete linearly increases from 0%, 20%, 40% and 60% replacement of natural sand by manufactured sand as compared with reference mix (mix 1). present study gives better strength and higher water cement ration gives better workability.

In Fourth paper The water absorption and sorptivity of Recycled coarse aggregate concrete shows lower water absorption and sorptivity at 40% replacement with Recycled coarse aggregate for M35, M40 and M45 grade concrete. There after the water absorption and sorptivity shows an increasing trend.

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