Experimental Investigation On Partial Replacement Of Fine Aggregate By Using River Crushed Stone

D.Karthik[#1], N.Balasubramaniam[*2], K.S.Navaneethan[#3]

[#1]*Assistant Professor & Department of Civil Engineering & Anna University KPR institute of Engineering and Technology, Coimbatore, Tamil Nadu, India*

[#2]*Assistant Professor & Department of Civil Engineering & Anna University KPR institute of Engineering and Technology, Coimbatore, Tamil Nadu, India*

[#3]*Assistant Professor & Department of Civil Engineering & Anna University Kongu Engineering College, Erode, Tamil Nadu, India*

Abstract *— Throughout the world, concrete is being widely used for the construction of most of the buildings, bridges etc…Hence currently the entire construction industry is in search of a suitable and effective usage of waste product that would considerably minimize the construction cost .The waste which is retained after sieving the sand is crushed and further again used and can be minimise the waste production in the construction industry. This waste can be used to produce new products or can be used as partial replacement in concrete so, that the natural resources are used efficiently and hence environmental waste can be reduced. Here Crushed river stone is used for partial replacement of fine aggregate in concrete for studying the strength property of concrete. The aim of the experiment is to find the maximum content of Crushed river stone partial replacement of cement in concrete. The percentages of Crushed river stone as partial replacement of cement in concrete are 0%, 5%, 10%, 15%, 20%, 25%, From the experimental studies 25% of partial replacement of cement with Crushed river stone improved hardened concrete properties.*

Keywords — *Crushed river stone, Partial replacement and Harden properties*

I. INTRODUCTION

Now a days, Pozzolona Portland cement (PPC) concrete is the most popular and widely used building materials, due to its availability of the raw materials over the world its ease for preparing and fabricating in all sorts of conceivable shapes. Advancement in utilization of wastes in concrete as fine aggregate reduces pollutants in environment and maximizes usage of natural resources. By reducing sand consumption environment can be protected. An attempt was made to partially replace the sand with waste material Crushed river stone with an aim not to loose the strength far from original concrete mix. From the observations of test results, sand can be replaced with 0%, 5%, 10%, 15%, 20%, 25%, of Crushed river stone in concrete. The physical and mechanical properties of materials used in concrete were investigated. For each replacement 6 cubes were cast for measuring 7days and 28days compressive strength.

II MATERIAL USED

A. Cement

Portland Pozzolona Cement conforming to IS: 269:1976 and IS: 4031-1967 was used in this study. The cement is of 53Grade and the tests conducted on cement are tabulated in table.

TYPE OF CEMENT	PPC-53 (IS12269-1987)
Specific Gravity	3.15 (IS8112)
Initial Setting Time	30 Minutes
Final Setting Time	10 Hrs

B. Aggregate

Aggregate are inert material which give body to the concrete reduce shrinkage and effect economy. General certain volume of concrete is occupied by aggregate. The aggregate limits the strength of concrete but the aggregate properties greatly affect the durability and structural performance of concrete. If the concrete is to be workable, strong, durable and economical the aggregate must be of proper shape, clean, strong, durable and economical.

C. Fine Aggregate

It is the aggregate most of which passes through a 4.75mm IS sieve and contains only so much coarser material as is permitted by the specification. According to the size, the fine aggregate may be described as coarse, medium and fine sand. Depending upon the practical size distribution IS 383-1970 has divided fine aggregate into four Grading Zone.

D. Coarse Aggregate

The aggregate most of which are retained on the 4.75mm IS sieve and contain only so much

of the material as permitted by the specification are termed as coarse aggregate.

E River Crushed Stone

The waste which is retained after sieving the sand is crushed and further again used and can be minimise the waste production in the construction industry. This type of waste sand to be used our project effectively. In this waste having appropriate properties and etc.

III TESTRESULTS

Specific gravity of sand is defined as the ratio of mass of given volume of solid to the mass of on equal volume of water at specific gravity of sand is an important parameter for the determination of voids and particle size. The sand specific gravity is smaller value indicating the coarse sand. The sand specific gravity is smaller value indicating the coarse sand. Specific gravity of aggregate is made use of in calculations if concrete mixes, and calculating the compaction factor in connection with the workability measurements.

$$\text{Specific gravity} = \frac{W2 - W1}{(W2 - (W4 - W1) - (W3 - W2))}$$

W1= Weight of pycnometer (gm)
W2 = weight of pycnometer+ sand (gm)
W3 = weight of pycnometer+ sand + water(gm)
W4 = weight of pycnometer filled with water (gm)

A. Specific Gravity Result

Specific Gravity of Sand Grains (Gfa)

Sample Number	W1 in (gms)	W2 in (gms)	W3 in (gms)	W4 in (gms)	Specific Gravity G
1	0.610	1.839	2.265	1.440	2.62
2	0.610	1.850	2.270	1.440	2.65
3	0.610	1.865	2.272	1.440	2.61
				Average	2.62

Specific Gravity of Coarse aggregate Grains (Gfa)

Sample Number	W1 in gms	W2 in gms	W3 in gms	W4 in gms	Specific Gravity
1	0.160	1.738	2.230	1.440	2.71
2	0.160	1.745	2.248	1.440	2.61
3	0.160	1.759	2.276	1.440	2.60
				Average	2.67

B. Determination Of Sieve Analysis

Apparatus

A set of IS Sieves of sizes – 4.75mm, 2.36mm, 1.18mm, 600µm, 300µm, 150µm and 75µm.
Balance with an accuracy to measure 0.1 percent of the weight of the test sample.

Weight of sample taken = 1000 g

Sieve Analysis of Fine Aggregate

IS Sieve Size	Weight of Aggregate Retained (g)	% Weight Retain	Cumulative % Weight Retained	% Passing
4.75 mm	41.00	4.10	4.1	95.90
2.36 mm	36.50	3.65	7.75	92.25
1.18 mm	120.00	12.00	19.75	80.25
600 µ	195.00	19.50	39.25	60.75
300 µ	383.00	38.30	77.55	22.45
150 µ	216.00	21.65	99.2	0.80
PAN	3.00	0.40	99.5	0.40

Grading Zone : Zone II as per IS: 383-1970

C. Mix Design

The mix design is in accordance with method Indian mix design method. The aggregate occupy the largest volume about (70%-80% by mass) in concrete. The unit weight of concrete=2400Kg/m3

Mix Proportion = 1:2:2.73

D. Compression Strength Test

$$Compressive\ Strength = \frac{Load\ Applied}{Area\ of\ the\ Specimen.}$$

MCR -1 is 5% of replacement
MCR –2 is 10% of replacement
MCR –3 is 15% of replacement
MCR –4 is 20% of replacement
MCR -5 is 25% of replacement

SL.NO	Mix Identification	COMPRESSIVE STRENGTH FOR CUBE (150x150x150mm) In N/Mm^2	
		7 DAYS	28 DAYS
1	MCR-1	22.01	29.70
2	MCR-2	22.40	29.40
3	MCR-3	22.78	29.11
4	MCR-4	22.87	28.82
5	MCR-5	20.38	28.53

SL.NO	Mix Identification	Split Tensile Strength For Cylinder in N/mm^2 (Diameter=150mm) (Height=300)	
		7 DAYS	28 DAYS
1	MCR-1	1.79	2.44
2	MCR-2	1.80	2.46
3	MCR-3	1.84	2.34
4	MCR-4	1.78	2.43
5	MCR-5	1.88	2.56

E. Split Tensile Strength Test

$$split\ tensile\ Strength = \frac{2P}{\pi LD}$$

F. Flexural Strength Test

$$fluxtural\ Strength = \frac{PL}{bd2}$$

Sl.No	Mix Identification	Deflection Test For Beam (100X150X1200mm) in mm
		28 DAYS
1	MCR-1	3.74
2	MCR-2	3.72
3	MCR-3	3.81
4	MCR-4	3.76
5	MCR-5	3.89

IV RESULT AND DISSCUSSION

- The mechanical properties such as compressive strength, split tensile and flexural strength of replaced without solution concrete is increasing upto10% and decreased above 10% replacement.

- The mechanical properties such as compressive strength, split tensile and flexural strength of replaced with solution concrete is increasing slightly upto20% of replacement and decreasing above 20% of replacement.

- The solution used concrete is slightly increasing the strengths to compares the solution used concrete.

V CONCLUSION

Based on the conducted experiment and according to the results obtained, it can be concluded that: By investigating through various journals, mix design for the concrete is arrived. Still now 5%, 10%, 15%, 20%, 25%, of partial replacement of fine aggregate by using crushed river stone. Specimens are casted and test will be conducted for 7 days and 28 days curing. Results will be compared with conventional concrete. Then optimum replacement of river crushed stone content has to be determined in compressive, tensile, flexural strength.

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