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Performance on Partial Replacement of Fine Aggregate with Marble Dust Powder

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ABSTRACT-The construction buildings which are present in and around coastal area are severely facing lot of problems. This is due to penetration of sea salts. This leads to damage of structure fast. The average NACL Concentration of sea water is about3.5%. In this study , Marble Dust powder as been taken to analyze the chemical and physical properties of the concrete which is partial replaced with marble dust powder as fine aggregate by 10%,20%,30%,40% and 50%by weight of fine Aggregate. After replacing this marble dust powder as fine aggregate, cylinders and cubes are casted. After casting this cubes and cylinders, they are using to know its both compressive as well as tensile strength by using compression test and split tensile strength for 7 days and 28 days.

KEYWORDS- Water Cement ratio , Cement Content , Gradation of the Aggregate , Consistency, marble dust

I. INTRODUCTION

NOW a day's marble powder is a source which a cause lot of problems to the environment[1]. It is necessary to maximum utilization of marble waste in a range of sectors, especially the construction, agriculture, glass and paper industries would help to save the environment. Concrete generally used in construction projects in the civil construction work because of its huge structural strength and firmness[2]. The over use of river sand for construction has a variety of unwanted social and eco-logical penalty, fine aggregate is main constituents of concrete and mortar in construction industry as there is a huge demand of sand it is becoming a limited ma-terial [3]. As natural sand deposits are depleting it is necessary to replace partially or fully of fine aggregate with alternative. As a solution for this various alternative are explored [4]. Before this study, different experiments are found the solutions on concrete composite materials. Natural resources are decreasing day by day from earth and rising wastes from industries generated simultaneously[5]. The eco friendly and consistent improvement for construction includes the use of non conventional and unusual waste materials, and use of waste material for reducing emissions in environments and decreasing the utilization of environmental resources [6]. Sand is ordinary form of fine aggregate used in concrete production. Marble powder is the waste which is generated from Marble finishing industries in construction which has similar physical and chemical actions of sand [7-9]. Marble powder is the byproduct of Marble factories; the sludge or wet powder is obtained from the sprucing, dressing, and cutting of the marble stones, and also the fine marble powder that is left when dressing sprucing and cutting of the marble, is dropped into the landfills, watersheds, rivers, blind wells and also the seasonal rivers that are then administered by the rainwater to the agriculture lands so inflicting adverse effects on the soil and reducing the fertility of the soil, so by reducing the production of the annual crop [10-12]. The marble waste principally consists of boulders that are used as aggregates relying upon the sizes, and also the fine powder that isn't employed regionally and drops directly into the streams, wells, and watersheds that are then washed away by the rainwater) [13] it absolutely was complete that out of fifty tons raw stone of marble the twenty tones it been waste whereas the thirty tones is the finished product. The waste marble powder may be a waste product [14-15].

II. MATERIAL USED

A. Cement

The cement used in this work is ordinary portland cement(43 grade). The specific gravity of cement is 3.15 [16]

B. Waste Marble Dust

Fig. 1 shows the sample of marble dust. Wastes generated in the marble stone industry is proclaimed and used as Waste Marble Dust [17].

Figure 1: Marble dust powder

C. Graded Fine Aggregate

Sand grains passing through a 4.75 mm sieve are called fine aggregates [18]. Natural sand is used as fine aggregate. Regionally available river sand compliant with zone II of IS: 383-19707 was used as fine aggregate having a specific gravity of 2.54 [19]. Table 1 shows the Sieve analysis of sand. Particle size distribution curve is shown in Fig.2

Table 1: Sieve Analysis of Sand

A. Sieve size (mm)	***B.*** Aggregate wt. retained (Kg)	***C.*** %Wt. retained	***D.*** Cumulative % Wt. retained	***E.*** 100-cumulative % passing
F. 4.25	***G.*** 0.039	***H.*** 3.9	***I.*** 3.9	***J.*** 96.1
K. 2.36	***L.*** 0.27	***M.*** 2.7	***N.*** 6.6	***O.*** 93.4

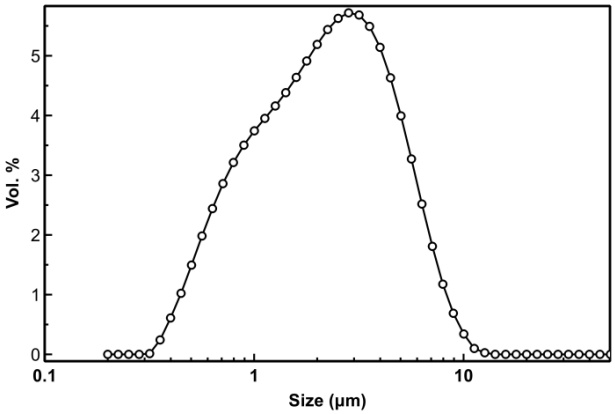

Figure 2: particle size distribution of marble dust

D. Graded Coarse Aggregate

Commonly sized, locally available well-graded aggregates larger than 4.75 mm and smaller than 12.5 mm are used as coarse aggregate. Fig.3 shows the particle size distribution curve:

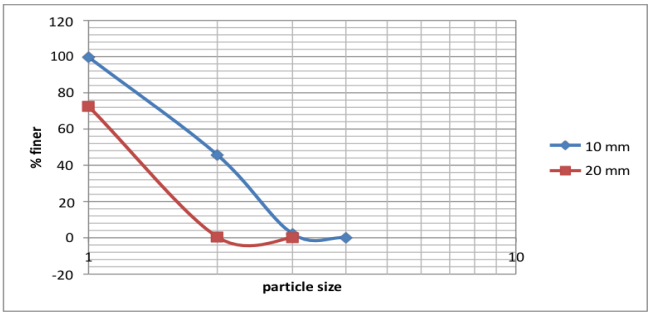

Figure 3: Particle size distribution of Coarse Aggregates

E. Procedure

crushed stone of 20 mm and 10 mm size, taken from a local quarry with a specific gravity of 2.68 [20].

Water Portable water available at the site was used to prepare concrete in the entire project.

- Normal consistency of different binder mixes determined by using the procedure referring to IS 4031: part 4(1988):
- 300 gram of sample coarser than 150µ sieve is taken.
- After applying oil to the surface of mould, paste was filled in the vicat's mould and was placed under the needle of vicat's apparatus.
- Release quickly the needle allowing it to sink in the paste and note down the penetration reading when the needle becomes stable.
- If the penetration reading is less than 5 to 7 mm, prepare the paste again with more water and repeat the above procedure until the needle penetrates to a depth of 5 to 7mm.
- The percentage of the water with which the above situation is satisfied is called normal consistency.

Figure 4: Particle size distribution of Coarse Aggregates

III. WORKABILITY OF CONCRETE

The final output results for different sample groups regarding slump values for fresh concrete are listed in table .The slump test was also conducted after 15 minutes to measure the slump loss from the time of original batching [21]. Results of workability shown in Table 2 below:

Table 2: Slump Test Results

	Slump Test	
GP GROUP	**At 0 min**	**At 15 min**
0 %	11 cm	09 cm
15 %	14 cm	12 cm
20%	17 cm	16 cm
25 %	19 cm	17 cm
30%	20 cm	18 cm

IV. COMPRESSIVE STRENGTH

- For each series, five-set were cast to determine compressive strength. Each set comprises of eleven standard cubes out of which nine cubes were cast to measure the compressive strength after 07 days and 28

days. The size of the cube is as per the IS code 10086 – 1982.

- The results of compressive strength testing of laboratory-cured cubes are presented below for First series with 30% cement replacement, Second series with 25% cement replacement ,third series 20% and fourth series 15% respectively. The strength values reported are the average of three test results. Results of Compressive strength shown in Table 3 below:

Table 3: Compressive strength

S.NO	% OF MARBLE POWDER	COMPRESSIVE STRENGTH OF CONCRETE (N/mm2)		
		7 days	14 days	28 days
1	5%	21.97	23.70	40.68
2	15%	17.50	18.55	25.77
3	25%	17.62	20.95	25.02
4	35%	17.82	18.97	22.20
5	45%	16.57	18.37	24.10
6	50%	17.97	19.75	29.90
7	100%	17.23	20	21.55

Compressive strength of concrete with various percentages of marble powder shown in Fig.5.

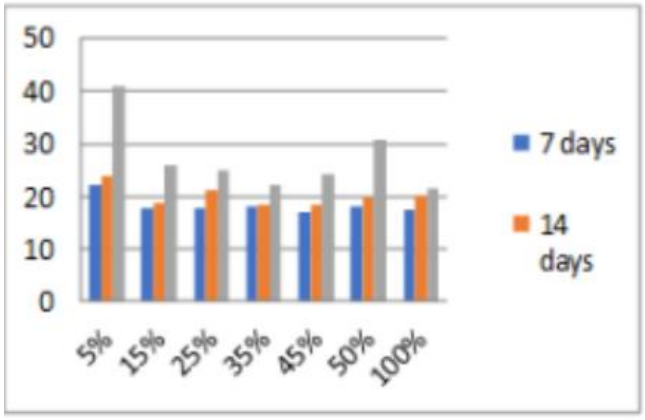

Figure 5: Various percentages of marble powder

V. CONCLUSIONS

- The compressive strength of concrete is increased when we replace 5% of fine aggregate with marble dust powder and when we increase futher the compressive strength start decreasing.
- When we add 5% of marble dust in partially replacing of fine aggregate and at 28 days after curing the compressive strength is to be found 40.68N/mm2.
- In replacement of fine aggregate with marble dust powder in concrete mix it boosts the compressive strength of the concrete.
- Test indicates that the waste marble powder can be used or utilized as partial replacement of fine aggregate in concrete.
- The marble powder is easily contaminates air and water and it pollutes environment if we use this in concrete will ease the problem of their disposal and environmental pollution.
- Cost of the concrete is also reduced when we use marble powder as partially. Hence its becomes economical
- The over use of river sand for construction has various unwanted social and eco-logical penalty, fine aggregate is one of the important constituents of concrete and mortar in construction industry as there is a huge demand of sand it is becoming a scarce material.

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