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EFFECT ON STRENGTH USING MARBLE POWDER

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Abstract -The solid waste coming out from the industries will help in the conservation Of natural resources. The marble powder as a waste material coming out from the marble industries by cutting and sawing process and can be used as the partial replacement of fine aggregates in concrete pavements. Marble powder is present abundantly and degrades the land on which it is laid. This paper reports the evaluation on the properties of marble dust. The marble dust used as fine aggregate in replacement of natural sand, as the sand is expensive because of the excessive cost of transportation from natural sources. Marble powder also has cementations properties and may help in binding the aggregates. The marble powder can improve Various properties of concrete viz; and reduces the water cement ratio .57 Marble powder is used at different percentages like 10%, 20%, 30%, 40% & 50% and are tested after test slump and sieve analysis

Key word ,marble powder slump cone sieve

1. INTRODUCTION

In developing countries economical construction material plays Very important role in making the country`s infrastructures economical. Waste material like marble dust play very important role for making its Economical. India is producing about 10% of world production of Marble. Marble is a metamorphic rock resulting from the transformation Of pure limestone. A large quantity of marble dust is produced by Cutting or sawing process of marble blocks. The marble industries produce both solid waste and stone slurry And solid waste production is much more, and approximately 40% of Waste is generated in the marble industries. This much amount of marble Dust generated leads to the environmental problems and may affect the Land fertility. There are different methods or solutions in which the Marble dust can be used for different purposes such as it can be used as The soil stabilization, partial replacement of fine aggregates and partial Replacement of cement in concrete structures etc.

The marble powder which is taken from the **BHAGWATI MARBLES VKI ROAD, JAIPUR** and **is** free of cost and they takes the marble rocks from district Makrana, Rajpur, Rajnagar and Jaipur Rajasthan. The name of the marble is given on the basis of village name. The amount of marble dust produced at Bhagwati Marbles 40 – 45 Tonnes per month. The marble dust which is produced by the cutting of Marble stones, during the cutting process the water is added which acts As the lubricant for the sawing blades (FIG 1.1). The water is then Drained off from the cutting spot and the water along with the marble Powder in the form of slurry is accumulated in rectangular type basin in Which the sedimentation of marble powder occurs and the water which gets evaporated

Fig. 1: Cutting of Marble Blocks

After the heap formation of marble powder causes the land degradation on which it is laid and also contaminates the ground reserves, increases the soil alkalinity. Nowadays the marble waste powder leads to the environmental pollutions, thus it can be used for different purposes like it can be used in brick industry, used in concrete as the filler material, used as the fine aggregate.

2.Test

- Sieve analysis.
- Specific gravity of fine aggregates.
- Workability by slump test.

3.Sieve Analysis of Fine Aggregates

This test is done as per IS: 383- 1970 [14]. This test gives idea about the gradation of fine aggregates, fine aggregates will be called as graded if it has variety of dimensions and such type of fine aggregate will be recommended for the construction purpose.

4.Apparatus required:

• IS sieves (4.75mm,2.36mm,1.18mm,0.6mm, 0.3mm, 0.15mm)
• Oven dry
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• Mechanical sieve shaker
• Digital weight balance

5.Procedure:

• Take a sample of 500gms in pan and place it in oven dry for 24hrs
• After drying take 200gms and note it down
• The sieves are arranged in 4.75mm, 2.36mm,1.18mm,600µ, 300µ, 150µ, and pan
• After arrangement of sieves, the sieves are put on the mechanical shaker
• Then switch on the mechanical shaker and shaking is done at least for 5 minutes
• After the shaking is done the sample weight is recorded at each sieve
• Finally determine the cumulative weight of the samples retained on each sieve

Table 1 : Sieve Analysis

IS Sieve Opening, mm	Weight of Dish, g	Weight of Dish + Sand retained	Weight of Sand Retained (g)	Cumulative wt. Retained (g)	Cumulative % Retained	% of passing
4.75	375	375	0	0	0	100
2.36	311	312	1	1	0.50	99.5
1.18	397	414	17	18	9	91
600µ	415	438	23	40	20	80
300µ	373	456	83	123	61.5	38.5
150µ	352	412	60	183	91.5	8.5
Pan	327	344	17	200	100	0
TOTAL					282.5	

Therefore fineness modulus of aggregate=cumulative %retained/ 100=285.5/100=2.825
It means that the average value of aggregates is in between the 2nd and 3rd sieve that is average size is in between 0.3mm to 0.15 mm

6.Sieve Analysis of Marble Dust:

This test is performed as per IS 2386 (part I) 1963 (methods of Test for aggregates for concrete) reprinted in august 1997[18]. This test Is performed to give the exact idea regarding gradation of the marble Dust. The test results observed during the test are as follows:
Type of Sieve analysis: Dry
Total weight of marble powder = 500g, Weight of dish = 3188g

Table2:Sieve Analysis Of Marble Dust

IS Sieve Opening, mm	Weight of dish, (g)	Weight of dish +marble dust retained (g)	Weight of marble dust retained(g)	Cumulative wt. Retained(g)	Cumulative % retained	% of passing
4.75	375	375	0	0	0	100
2.36	311	321	10	10	2	98
1.18	397	428	31	41	8.2	91.8
600µ	415	513	98	139	27.8	72.2
300µ	373	555	182	321	64.2	35.8
150µ	352	455	103	424	84.8	15.2
Pan	327	407	71	495	100	0
TOTAL					287	

Therefore the fineness modulus of marble powder is =
(cumulative % retained) / 100= 287/100=2.87. Therefore this value indicates that the average value of aggregates Is in between 2nd and 3rd sieve that is average aggregate size lie between
300µ and 600µ.

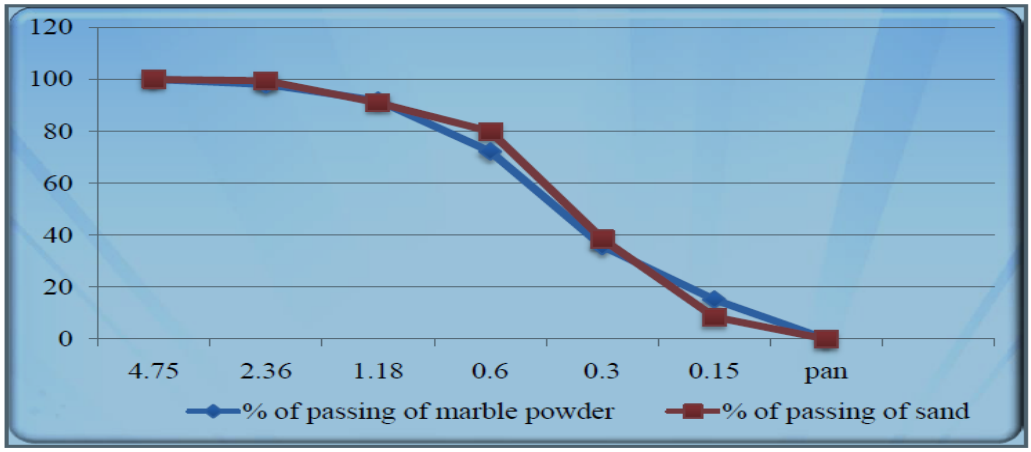

Figure1: Gradation of Fine Aggregates

Specific Gravity of Fine Aggregate:
This test is done as per IS: 2386 part 3[18] and is used to
Determine the density of fine aggregate.

7.Apparatus Required:

• Balance: (5kg with accuracy 0.5g)
• Oven : maintain the temperature between 105- 1100C
• Pycnometer: one litre capacity having a metal conical screw top
With of a 6-mm diameter hole at its apex.
• Air tight container to take the sample
• Filter paper and funnel.

8.Test Procedure:

• Take the sample of fine aggregate (marble powder and sand
Separately) and placed in the tray.
• The tray is place in the oven for 24 hours.
• Take the 200gms of sample and put in the pycnometer
• Fill the water in the pycnometer then shake well the contents.
• Remove air bubbles for about 20 minutes
• Remove the water and then clean the pycnometer.
M1 = mass of the empty pycnometer
M2 = mass of pycnometer + marble powder
M3= weight of pycnometer +marble powder +water
M4= mass of the pycnometer + mass of water

$$\text{Specific gravity } \frac{M_2 - M_1}{(M_2 - M_1)(M_3 - M_4)}$$

$$\frac{824-624}{(824-624)(1648-1520)}$$

$$= 2.77$$

9.Workability by slump test:

This test is done as per IS-1199-1959 [15]. This test is used to
Determine the consistency of fresh concrete. Indirectly used to checking
The correct amount of water that has been added to the concrete.

10.Apparatus Required:

• Slump cone having top diameter 100mm, bottom diameter that is
Base 200mm, and height of slump cone is 300mm
• Scale for measurement
• Temping rod (steel) having diameter 16mm.

11.Test Procedure:

The base of the slump cone is placed on a smooth surface and
Then the slump cone is filled with concrete paste. The concrete is filled in three layers and each layer is blown 25 Times with the tamping rod. When the cone is filled the top layer is leveled by trowel and then. The cone is lifted slowly and vertically. Difference in height of mould and the concrete is called slump. Three different types are slump shapes are formed (i) true slump
(ii) shear slump (iii) collapsible slump.

Table 3:Slump range

Degree of	**Workability**	**Slump**
(mm)	**Placing Conditions**	Very low 0-25 Very dry mixes, used in road makings,
roads vibrated by power operated	Machines.	Low 25-75 Low workable mixes manually compacted,
Flat slabs using crushed aggregates. Normal	reinforced concrete manually compacted	and heavily reinforced sections with
Vibrations.	Medium 50-75 Medium workability mixes manually	compacted and heavily reinforced sections
with vibrations, road pavements	High 100-	150
High workable concrete, trench fill, termite	Concrete.	

Table 2: Slump at different percentage of marble

S. No. Name of the test % of marble powder Slump(mm)	S. No. Name of the test % of marble powder Slump(mm)	S. No. Name of the test % of marble powder Slump(mm)
Slump test	0	67
	10	65
	20	60
	30	65
	40	65
	50	62

The above table 4.2 indicates the workability of the concrete by using slump test having water cement ratio **0.52**. The table indicates the Slump value of concrete, as the percentage of marble powder is increased beyond 30% the slum value decreases. To maintain the slump value as per IS-456 2000 water is added to the concrete mix and maintaining the water cement ratio **0.57**.

12.Conclusion

The uniformity in the gradation of particles of natural sand and marble powder, the marble powder can be used as the replacement of fine aggregates (natural sand).With the use of marble powder there is reduction in the land degradation, due to this there is reduction in the environmental pollution. So we ensure optimum percentage 30% of marble slurry we increase this percentage then slump is decrease

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