TRIAL EDUCATION ON CONCRETE WITH MARBLE POWDER BY WAY OF FRACTIONAL EXTRA OF CEMENT

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ABSTRACT

Sensitive to environment. The potential use of MDP can be an ideal choice for substituting in a cementitious binder as the reactivity efficiency increases due tothe presence of lime. In this experimental study, the effect of MDP in concrete onstrength is presented. Five concrete mixtures containing 0%, 10%, 15%, and 20% MDP as cement replacement by weight basis has been prepared. Compressive strength, split tensile strength & flexural strength of the concrete mixtures has beenobtained at 7, 14 and 28 days.

Key Words - Marble Powder, compressive strength, split strength, flexural strength, workability, concrete.

Introduction

Hence utilization of marble powder has become an importantalternative materials towards the efficient utilization in concrete for improvedharden properties of concrete. The purity of the marble is responsible for its colour and appearance it is white if the limestone is composed solely of calcite (100% CaCO3). Marble is used for construction and decoration.

The result is that the mass of marble waste which is 20% of total marble quarried has reached as high as millions of tons. Leaving these waste materials to the environment directly can cause environmental problem.

Moreover, there is a limit on the availability of natural aggregate and minerals usedfor making cement, and it is necessary to reduce energy consumption and emission of carbon dioxide resulting from construction processes, solution to this problem are sought through usage of MDP as partial replacement of Portland slag cement.In India, MDP is settled by sedimentation and then dumped away.

Therefore, utilization of the MDP in various industrial sectors especially the construction, agriculture, glass and paper industries would help to protect theenvironment.

Literature Collection

The compressive strength properties of concrete containing marble dust powder at 0%, 5%, 10%, 15%, 20% and 25% of Portland cement. The result obtained for 28 day compressive strength confirms that the optimal percentage for replacement of cement with marble dust powder is about 10%. This will post less on the production of carbon dioxide and solving the environmental pollution by cement production, thereby enhances the urban surroundings.

They found that the MDP up to 10% by weight of cement was investigated for hardened concrete properties. It can be noted that the influence of fine to coarse aggregate ratio and cement-to-total aggregate ratio had a higher influence on the improvement instrength properties. A phenomenal increase in the compressive strength of 46.80 MPa at 7 days for 10% replacement of MDP in cement content was noted and also showed an improved mechanical property compared to controlled concrete

Vaidevi C (2013): Found that the use of this waste was proposed in different percentages both as an addition to and instead of cement, for the production of concrete mixtures.

increase in all mechanical properties. The replacement of 12% of cement with waste marble powder attains maximu m compressive and tensile strength. The optimum percentage for replacement of marble powder with cement is almost 12% cement for both cubes and cylinders. To realm of saving the environmental pollution by cement production being our main objective.

Experimental Investigation

Cement

Ordinary Portland cement of 53 grades conforming to IS: 12269-1987 was used for the present experimental investigation. The following experiments were conducted to identify the properties of cement as per IS code.

Properties of cement

Properties of cement				
Standard consistency	**Specific gravity of cement**	**Fineness test**	**Initial setting time**	**Final setting time**
32%	3.16	7.11%	60 minutes	400min

Fine Aggregate

In places where sand is not available or a large quantity of sand is required, crushed stone dust is used. The fine aggregate should be free from clay particles because it reduces strength and it takes more amount of water during the period of concrete mixing. Tests Performed on Fine Aggregates as per IS 383-1970.

Coarse Aggregate

Coarse aggregate shall consist of naturally occurring materials such as gravel or resulting from the crushing of parent rock, including natural rock, slags, expanded clays and shelves (lightweight aggregates)

The coarse aggregate gives volume, stability, resistance to wear or erosion, and other desired physical properties to the finished product.

Properties of coarse aggregate

Properties of coarse aggregate				
Sieve analysis of coarse aggregate	**Specific gravity of Coarse aggregate**	**Water absorption test**	**Impact test**	**Abrasion test**
7.33	2.65	0.98	10.28	10.8

Marble Powder

Construction materials are more judged by their ecological characteristics because of the continual depletion of quarry aggregates. In India huge amount of marble waste is being generated because of lack of technology and also unscientific methods of quarrying marble.

Due to generation of marble waste there is a direct exposure of this material with the environment because of which serious environmental problems occur.

Marble is composed primarily of calcite, dolotimite, Typically, marble is composed of the following major constituents:38-42% Lime (CaO), 20-25% Silica (SiO2), 2-4% Alumina(Al2O3), 1.5-2.5% various oxides (NaO and MgO), and 30- 32% various carbonates (MgCO3 and others).

Marble Powder

1 Specific gravity 2.57 2 Fineness 5 micro 3 Colour White 4 Particle shape Powder form

Mix Proportioning

Final Mix proportion: Conventional Mix

CCM 425.73 647.11 - 1110.21 191.58 - CCR 425.73 - 647.11 1110.21 191.58 - CC.MP5% 404.44 - 647.11 1110.21 191.58 21.28 CC.MP10% 383.15 - 647.11 1110.21 191.58 42.57 CC.MP15% 361.87 - 647.11 1110.21 191.58 63.85 CC.MP20% 340.58 - 647.11 1110.21 191.58 85.14

Fresh Concrete Properties

Slump cone Test

This test is performed to measure the workability of fresh concrete as per IS 1199-1959. The apparatus for conducting the slump test essentially consist of a metallic mould in the form of frustum of the cone having the internal dimension of bottom diameter 20cm, top diameter 10cm, and a height of 30cm.

Slump cone Test

Compacting Factor test

It was developed by Road Research Laboratory in United Kingdom and is used to determine the workability of concrete As per IS1199:1959 Compaction factor test apparatus consists of two conical hoppers and a bottom cylinder which is arranged as shown in Fig, steel rod of 1.6cm Diameter with a length of 61cm is used to tamp the concrete and a weight balance is used to weight the concrete.

Compaction factor = (W2-W1)/ (W3-W1)

Compacting Factor test

Hardened Concrete Properties

Compressive strength test

For each mix combination, three identical specimens were tested at the ages of 7, 14, 28 days using compression testing machine of 2000 KN capacity under a uniform rate of loading of 140 kg/cm2/min. and the compressive strength will calculated as per IS: 516 – 1959. Fig shows the experimental set up of compressive testing machine.

Flexural strength test

In order to determine the flexural strength of concrete, prismatic specimens of a size 100 mm x 100 mmx 500 mm were cast with various proportions of all the concrete mixtures. After 28 days of moist curing the specimens were tested in flexural testing machine under a uniform rate of loading of 180 kg/cm2/min. Flexural strength of specimens expressed as the modulus of rupture (fb) is then calculated using the formula and procedure given in IS: 516- 1959.

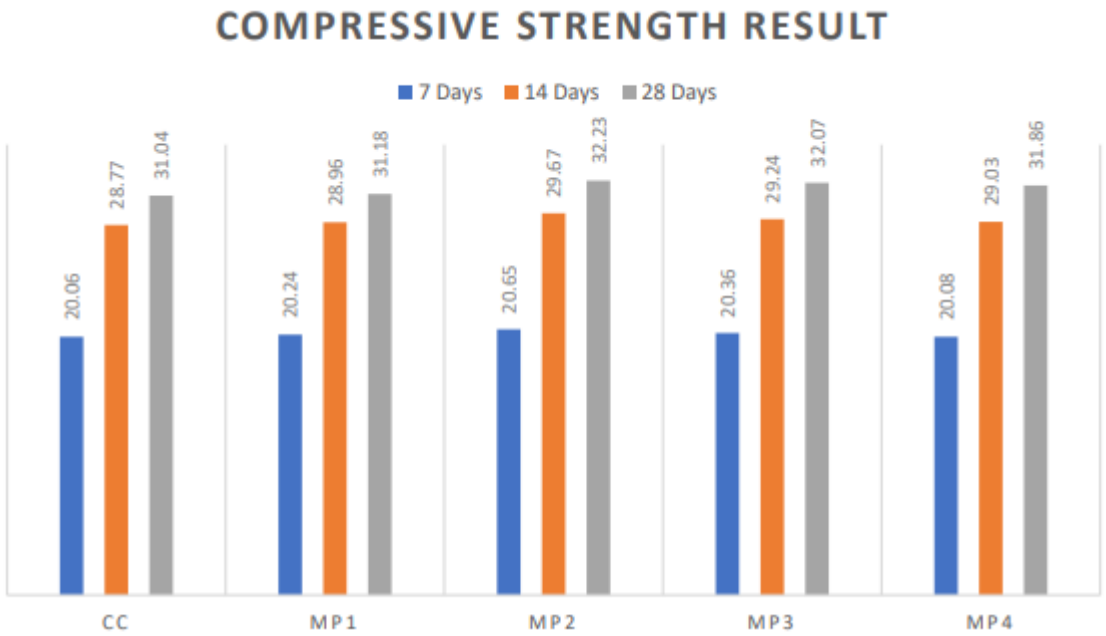
Experimental Procedure

The specimen of standard cube of (150mmx150mmx150mm) and standard cylinders of (200mmx100mm) and beam of (100mmx100mmx500mm) were used to determine the compressive strength, split tensile strength and flexural strength of concrete. Three specimens were tested for 7,14&28 days before crushing. The following experiments are conducted on the specimen is the compressive strength test, split tensile strength test and flexural strength test.

RESULTS AND DISCUSSION:

Compressive strength test is done as Per IS 516-1959. Mechanical behaviour of concrete was studied for M30 grade of cubes were casted and cured for 7,14 and 28days.The compressivestrength is computed from following formula.

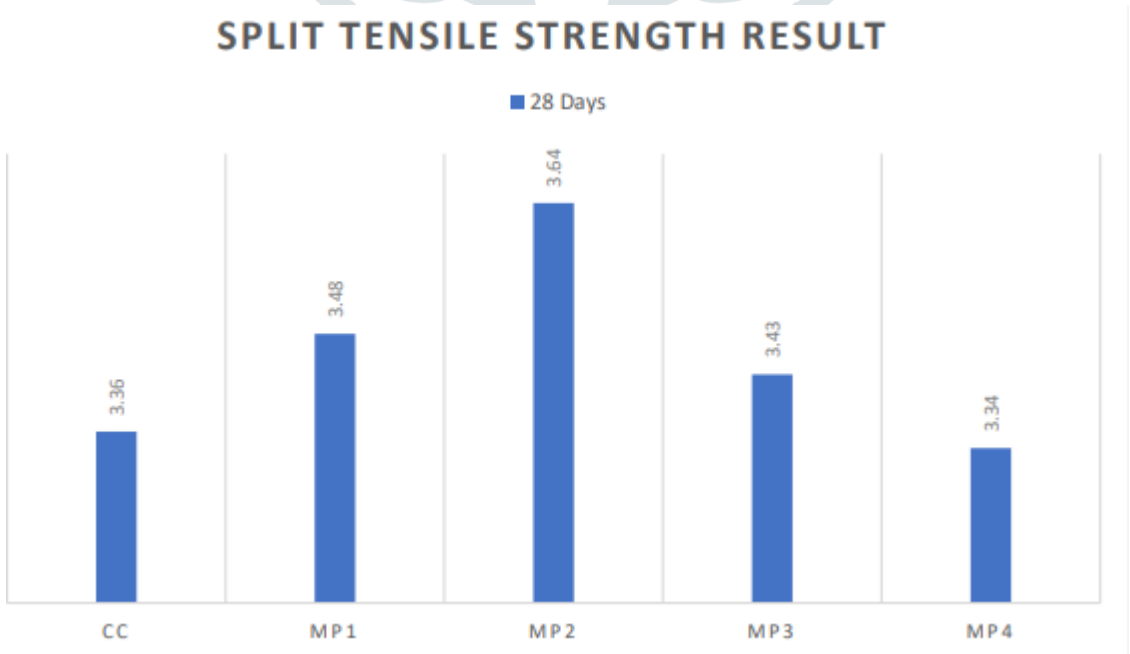
Mix Designation	Mix proportion				Compressive strength N/mm^2		
	Cement	River sand	Marble powder	Coarse aggregate	7 days	14 Days	28 Days
CC	100%	100%	0%	100%	20.06	28.77	31.04
MP1	95%	100%	5%	100%	20.24	28.96	31.18
MP2	90%	100%	10%	100%	20.65	29.67	32.23



SPLIT TENSILE STRENGTH TEST RESULT

The Split tensile strength is represented in the following table.

Mix Designation	Mix proportion				Split Tensile strength N/mm^2
	Cement	River sand	Marble powder	Coarse aggregate	28 Days
CC	100%	100%	0%	100%	3.36
MP1	95%	100%	5%	100%	3.48
MP2	90%	100%	10%	100%	3.64



FLEXURAL STRENGTH TEST RESULT

Flexural strength of the concrete was tested as per IS :516-1959 using the prism of size 100mmX100mmX500mm and the results were given in the Table

Mix Designation	Mix proportion				Split Tensile strength N/mm^2
	Cement	River sand	Marble powder	Coarse aggregate	28 Days
CC	100%	100%	0%	100%	4.32
MP1	95%	100%	5%	100%	4.46
MP2	90%	100%	10%	100%	4.68

CONCLUSION

1. Compressive strength increases with increases of marble powder. 2. Upto to 10% replacement of cement there is increase in all mechanical properties 3. The optimum percentage for replacement of marble powder with cement and it is almost 10% cement for cubes 4. The replacement of 10% cement with waste marble powder attains maximum compressive strength 5. To minimize the cost of construction with usage of marble powder which is freely or cheaply available 6. More important to saving the environmental pollution by cement production. Being the main objective as civil engineering.

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