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TO STUDY THE DURABILITY OF CONCRETE WITH THE PARTIAL REPLACEMENT OF SAND BY MARBLE WASTE

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Abstract: Concrete is the most widely used construction material in civil engineering industry because of its structural strength and stability. Leaving this waste material to the environment directly can cause environmental problem. Hence the reused of waste material has been emphasized. Waste can be used to produce new products or can be used as admixtures so that natural resources are used more efficiently and the environment is protected from waste deposited. Marble stone industry generates both solid waste and stone slurry. The concrete industry is constantly looking for supplementary material with the objective of reducing the solid waste disposal problem. In that paper waste marble is replaced by sand the result is carried out by using M25 grade concrete with replacement of 10% 20% and 50% marble waste by sand and is carried out to determine the optimum percentage of replacement at which maximum compressive strength and also split tensile strength is achieved these are several reuse and recycling solution for this industrial by product , both at an experimental phase and in practical application these industrial waste are dumped in the nearby land and the natural fertility of the soil is spoiled. The physical, chemical and mechanical properties of the waste are analysed.

Keywords: Cement, Compressive Strength, Marble Waste, Sand, Split Tensile Strength.

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INTRODUCTION

special concrete is define as concrete which meets special performance and uniformity requirements that cannot always be achieved routinely by using only conventional material normal mixing, spacing and curing practices. The requirement may involve enhancement of characteristics such as placement and compaction without segregation, long term mechanical properties early age strength, toughness volume stability or service life in severe environments

Marble is a metamorphic rock resulting from transformation of pure lime stone. The purity of the marble is responsible for its colour and appearance: it is white if the lime stone is composed solely of calcite (100% caco3). Marble is used for construction and decoration; marble is durable, has a noble appearance and it's consequently in great demand. A large quantity of powder is generated during the cutting process .The result is that the mass of marble waste which is 20% of total marble quarried has reached as high as millions of tons. This huge unattended mass of marble waste consisting of very fine particles is today one of the environmental problem around the world concrete is heterogeneous mix of cement, aggregate and water. The global consumption of natural sand is too high due to extension use in concrete. The demand for natural sand is quite in high developing countries owing to rapid infra structural growth which results supply scarcity. To overcome from this crisis, partial replacement of natural sand with waste marble sand is economic alternative. The concrete industry is constantly looking for supplementary material with the objective of reducing the solid waste disposal problem.

MATERIAL USED:

1) CEMENT: ordinary Portland cement of 43 grades was used in this study conforming to IS: 8112-1989 which has specific gravity 3.15, normal consistency 32%.

2) MARBLE WASTE : in that project the collection of marble powder from MIDC AMRAVATI, the specific gravity of marble waste is 2.82 gm/cc , specific surface area 11.4x103 marble is a metamorphic rock resulting from the transformation of a pure lime stone the purity of the marble is responsible for its colour and appearances marble used for construction and decoration; marble is durable, has a noble appearances, and is consequently in great demand a large quantity of powder is generated during cutting process the result is that the mass of marble waste which is20% of total marble quarried has reached as high as millions of tons. This huge unattended mass of marble waste consisting of very fine particles is today environmental problem around the world.

3) AGGREGATE: good quality river sand was use as a fine aggregate conforming to zone -‖ of IS: 383-1970 have fineness modulus of 2.735, specific gravity of 2.5 and water absorption of 0.98% the coarse aggregate passing through 20mm and retain on 10mm sieve was used in research. Its specific gravity if 2.85 and water absorption of 0.8% and crushing strength of 20.14%used. That are finding by using CTM machine as illustrate below:

4) WATER: In these research potable water free form organic substances was used for mixing as well as curing if concrete.

5) CHEMICAL PROPERTIES OF MARBLE WASTE:

Table 1: Following Are The Chemical Properties Of Marble Waste.

Material	Marble waste
LOI	40.63
SiO_2	4.99
Al_2O_3	1.09
Fe_2O_3	1.09
CaO	32.23
MgO	18.94
SO_3	0.02
K_2O	0.91
Na_2O	0.63

EXPERIMENTAL PROGRAMME:

A) MIXTURE PROPORTIONING: the M25 mix proportioning is design as per guide line, according to the Indian standard recommended method IS: 10262-2009. This research is carried out in two phase, in first phase mix of M25 grade concrete with replacement of 10% 20% and 50% of natural sand with marble waste is carried out to determine the optimum percentage of replacement at which maximum compressive strength is achieved. In second phase beam were

cast for determining the flexural strength. From each concrete mixture, cubes of size 150x150x150 mm have been casted for the determination of compressive strength as shown in table no.4 The three specimen of each mix was preferred and left for curing in the curing tank for 7, 14 and for 21 days.

Table 2: Mix Proportion For Every Mix Marble Waste By Sand

Sr. No.	Grade of concrete	Mix proportion	W/C
1.	M25-(10%)	1:0.9:2 (0.1)	0.45
2.	M25 (20%)	1:0.8:2 (0.2)	0.45
3.	M25 (50%)	1:0.5:2 (0.5)	0.45

Table 3: Detail of Replacement Of Sand By Marble Waste.

Sr no.	cement	sand	marble	aggregate
1.	100%	90%	10%	100%
2.	100%	80%	20%	100%
3.	100%	50%	50%	100%

Step 1: Making of concrete

Step 2: casted cube using certain material

Step 3: cube is place for curing in water.

B) TESTING METHOD: testing is done as per following IS code. The testing is carried out for compressive strength on cubes. As per IS: 516-1959, flexural strength on beam as per IS: 516-1959, permeable voids test is carried out as per ASTM C642-1907

Step 4: testing of compressive strength of the cube using CTM

Table 4: Compressive strength, Flexural strength

Sr.no.	1	2	3
Replacement (%)	10%	20%	50%
7days strength(N/mm^2)	26.97	29.09	35.05
14days strength(N/mm^2)	27.02	29.67	37.52
21days strength(N/mm^2)	28.73	31.03	39.45
Flexural strength (N/mm^2)	35.07	38.40	40.09

CONCLUSION:

Based on the result present above, the following conclusion can be obtained. Compressive strength increases with increase of zero size marble waste. Compressive strength increases with replacement of 10% 20%, 50% marble waste simultaneously. We have put a simple step to minimize the costs of construction with usage of marble waste which is freely or cheaply available. We have also stepped into a realm of saving the environment pollution by cement production; being our main objective as civil engineers.

Marble slurry utilization in black cotton soil is one of the best ways to improve soil properties and to protect the environment up to some extent from the harmful effects of disposal of marble slurry in land and water.

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