An Experimental Investigation On Concrete By Partial Replacement In Cement And Aggregates With Marble Dust,M-Sand And Granite Waste

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ABSTRACT

*concrete is the most important component used in the construction industry throughout the work. Due to urbanization the use of cement in the construction industry gets increased rapidly. During the production process Co2 is emitted into the atmosphere which causes severe damage to the environment. Due to the increasing demand for cement is used Marble Dust Powder as a partial replacement for cement. The series of test are conducted to study the effect of **15% 20% 25% 30%** and **35%** Marble Dust powder, creates the environmental problems. Due to environmental problems it has a great impact on human health as well as on nature. To control its effect we have to use this waste in concrete mix and also compare the compressive, flexural and split tensile strength , workability and durability of concrete mix. The M-sand sample was found to be well graded and the concrete mix had true slumps with decreasing consistency as the quality M- sand . The series of test are conducted to study the effect of **50%** of M-Sand. The Granite waste mainly pollute the environment .Therefore this Project Aim is to utilize the granite waste in the effective way. The different Percentage of replacement of materials is increased a strengths. This Waste materials used to economy, and cost reduces in concrete works. The series of test are conducted to study the effect of **35%** of granite waste. This materials use in concrete is reduced a environmental pollution in the earth.*

I INTRODUCTION

Concrete is the most widely used construction material in civil engineering industry because of its high structural strength and stability. The secret of its popularity lies in the simples fact that except cement all other ingredients of concrete are commonly available local materials like aggregates and water. Earlier we knew only about the conventional ingredients of concrete like cement, aggregates and water but today we are well conversant of the importance of admixtures too. The service life of a structural depends upon durability which depends upon various factors such as Water / cement ratio, compaction, and curing. water cement ratio should be kept minimum and compaction and curing should be ensured to the fullest extent so as to reduce the permeability and increase the durability.

II MATERIALS USED

A. CEMENT

Ordinary Portland cement was for most important type of cement. Cement is well known building

material and has occupied an indispensable place in construction works. It is obtained by burning together, in a definite proportion, a mixture of naturally occurring argillaceous and calcareous material to a partial fusion at high temperature. The product obtained by burning, cooled and ground to the required fineness is known as cement.

B. FINE AGGREGATES

Locally available river sand was used as fine aggregate. Fine aggregate most of which passes through a 4.75 mm IS sieve and contains only so much fine material as its permitted by the specification. Fine aggregate is added to concrete to assist workability and to prevent segregation of the cement paste and coarse aggregate during its transportation. It fills the voids in coarse aggregate.

C. COARSE AGGREGATE

In coarse aggregate most of which are retained on the 4.75mm IS sieve and contain only so much of coarse material as is permitted by the specification are termed coarse aggregate. The graded coarse aggregate is described by its nominal size i.e. 40mm, 20mm, 16mm and 12.5mm. The grading of coarse aggregates should be as per specifications of IS 383-1970.

D. MARBLE DUST POWDER

Marble stone industry generates both solid waste and stone slurry. Whereas solid waste results from the rejects at the mine sites or at the processing units, stone slurry is a semi liquid substance consisting of particles originating from the sawing and the polishing processes and water used to cool and lubricate the sawing and polishing machines. Stone slurry generated during processing corresponds to around 20% of the final product from stone industry. There are several reuse and recycling solutions for this industrial by-product, both at an experimental phase and in practical applications

Fig : 2.1 Marble Dust Powder

Properties of Marble Dust Powder

Color	: White
Form	: Powder
Specific gravity	: 2.74
Blaine fineness	: 1500 m/kg
Bulk density	: 1118 kg/m3

E. M- SAND

Crushed sand less than 4.75 mm is produced from hard granite rock using state of crushing plants. It was initially dry in condition when collected and was sieved by IS: 90 micron sieve before mixing in concrete. It is grey in color and it is like fine aggregate. The advantages of M-Sand are cost effective, easily available, consumption reduces the pollution in environment and effectively used as a replacement material for river sand.

Fig:2.2 M-Sand

Properties of M-Sand

Fineness modulus : 3.15 (**Zone II**)

Specific gravity : 2.712
Water Absorption : 1.2%
Moisture Content : 1.5%

F. GRANITE WASTE

Granites was used as a coarse aggregates in concrete .granite are plutonic light colored igneous rocks. The world granite is derived from latin world granum meaning a grain and obviously refers to the equigranular textures of the rock. Crushed aggregates less than 20 mm is produced from hard granite rock using state of crushing plants. The advantages of Granite Waste are cost effective, easily available, consumption reduces the pollution in environment and effectively used as a replacement material for coarse aggregates. They generally posses all the essential qualities of a good building stone showing very high crushing strength, low absorption values, least porosity.

Fig:2.3 Granite waste

Properties of Granite waste

Fineness modulus :4.834

Specific gravity : 2.6
Water Absorption : 0.5%
Moisture Content : NIL
Crushing strength :1250kg/m2
Frost resistance :Good

G.Chemical admixture

Type: super plasticizer

III MIX DESIGN

A.MIX RATIO M35

Cement	FA	CA	Water
547.05	590.23	1170	186
1	1.08	2.14	0.334

B: TRAIL MIXES

Conventional Mix

MIX1:[100% cement+100% Fine Aggregate+100%CourseAggregate]

Nominal Mix: (Trail : 02)

MIX01 : (10 % MP + 90% Cement) + (50 % MS + 50 % FA) + (35 % GW+ 65 % CA)

MIX02 : (15 % MP + 85 % Cement) + (50 % MS + 50 % FA) + (35 % GW + 65 % CA)

MIX03 : (20 % MP + 80 % Cement) + (50 % MS+ 50 % FA) + (35 % GW + 65 % CA)

MIX04 : (25 % MP + 75 % Cement) + (50 % MS + 50 % FA) + (35 % GW+ 65 % CA)

MIX05 : (30 % MP + 70 % Cement) + (50 % MS + 50 % FA) + (35 % GW + 65 % CA)

IV TEST ON CONCRETE

A. **COMPRESSIVE STRENGTH TEST**

The compressive strength test for cubes was conducted in compression testing machine as per IS 516 : 1964. The Compressive strength characteristics of the concrete is calculated for 7, 14, 28 days.

Compressive strength = P/A (N/mm^2).

B. **SPLIT TENSILE STRENGTH TEST**

A tensile test is a method for determining behavior of materials under axial tensile loading.

Split Tensile Strength = 2P / πld

Where,

P = Maximum load applied (N)

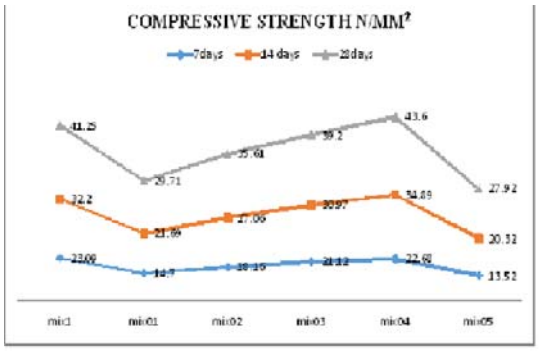
L = Length of the specimen (mm)

D= Diameter of the specimen (mm)

V RESULT AND DISCUSSION

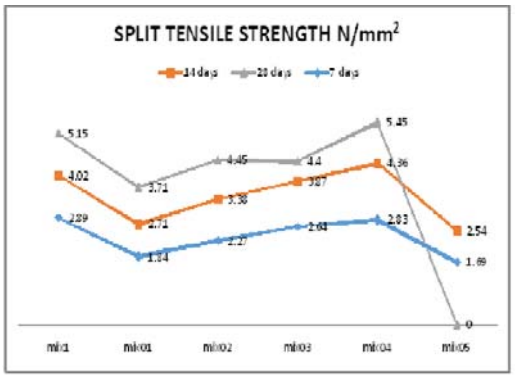
COMPRESSIVE STRENGTH TEST RESULT(N/mm^2)

S.NO	MIX	7 days	14 days	28 days
01	Mix1	23.09	32.20	41.25
02	Mix01	14.70	21.69	29.71
03	Mix02	18.16	27.06	35.61
04	Mix03	21.12	30.97	39.20
05	Mix04	22.68	34.89	43.06
06	Mix05	13.52	20.32	27.92



SPLIT TENSILE STRENGTH RESULT(N/mm^2)

S.NO	MIX	7 days	14 days	28 days
01	Mix1	2.89	4.02	5.15
02	Mix01	1.84	2.71	3.71
03	Mix02	2.27	3.38	4.45
04	Mix03	2.64	3.87	4.40
05	Mix04	2.83	4.36	5.45
06	Mix05	1.69	2.54	3.49



CHAPTER 09

CONCLUSION

- ✓ The physical and chemical properties of Marble powder satisfy the requirements of cement up to some extent.
- ✓ Use of Marble powder and M-Sand in concrete is economical.
- ✓ From the results, the replacement of cement with marble powder of **25%** replacement gives a good results. further increase of marble powder in concrete reduces the strength when compared to the conventional concrete.
- ✓ Cement concrete is one of the important component in the construction industry
- ✓ By using this materials will not affect the geometry and shape section.

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