

An Experimental Investigation On Partial Replacement Of Cement With Granite Powder And M-Sand With GBFS

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Abstract: In current situation, increasing cement producing industries produces large extent of carbon dioxide to nature and due to industries the large extent of industrial by products (waste) are being accumulated to environment and economic concerns related to their disposal (land filling). Utilization of wastes materials like granite powder, GGBS, risk husk ash, saw dust ash, coconut shell ash are used partial in concrete to minimize environmental and ecological problems. Hence partial replacement of cement and fine aggregate by granite powder and GBFS is suitable. With different combination of mixes of granite powder and GBFS the strength tests such as compressive strength test, split tensile strength test and water absorption test were tested.

Index Terms–GBFS, compressive strength, split tensile strength, water absorption.

I. INTRODUCTION

Concrete is one of the most common construction materials, requires a large amount of natural resources and energy. The combination of cement, coarse aggregate, fine aggregate and water makes up a concrete. Now a days concrete is being used for wide varieties of purpose to make it suitable in different conditions. In those conditions ordinary concrete may fail to exhibit the required quality performance or durability. The high and increasing cost of these materials has greatly hindered the development of shelter and other infrastructure facilities in developing countries. In such cases, partial replacement of some other waste material is used to modify the property of concrete so as to make more suitable for any situation. Since the cost of cement and sand have increased due to increase the cost of production, there is an urgent need to replace them partially by cheaper materials like granite powder instead of cement and GBFS replace by sand.

MATERIALS AND METHODOLOGY

Raw materials used

It is essential to check the properties of raw materials before it is put in to the experimental work. This chapter involves various physical properties of the constituent materials and raw materials used to produce PPC are listed below.

- Cement (OPC-53 Grade).
- Granite Powder.
- Manufacturing Sand.
- Granulated Blast Furnace Slag (GBFS).
- Course Aggregates.
- Super Plasticizer (Conplast SP-430).
- Water.

I. METHOD FOR PREPARATION OF CONCRETE CUBE

- a) Collection of materials from various sources.
- b) Basic tests on materials
- c) Mixing the materials in definite proportions as per obtained mix proportions.
- d) Replacing of materials.
 - i. Replacing cement by granite powder in various percentages.
 - ii. Replacing M-Sand by GBFS.
- e) Testing the specimen for Compressive strength.
- f) Testing the specimen for Split tensile strength test.
- g) Testing the specimen for Water absorption test.

II. EXPERIMENTAL INVESTIGATIONS

TESTS ON HARDEN CONCRETE

- a) Compressive strength test
- b) Split tensile strength test
- c) Water absorption test

III. RESULTS AND DISCUSSION

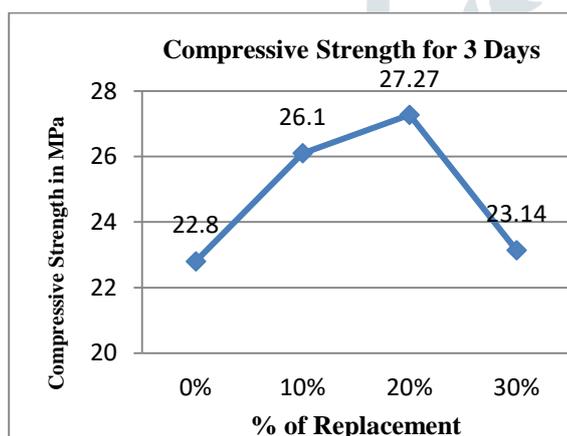
The specimens are casted for different proportion of partial replacement of cement with 30% GGBS and wood powder with 5%, 10%, 15%, 20%.

COMPRESSIVE STRENGTH TEST

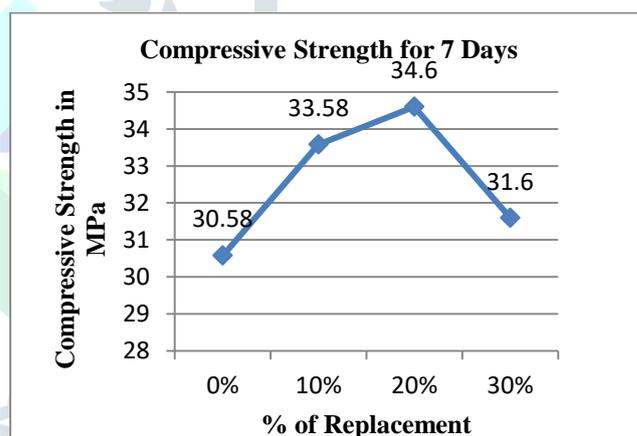
I. COMPRESSIVE STRENGTH OF NORMAL CONCRETE MIX AND CEMENT REPLACED CONCRETE MIXES WERE DETERMINED AT 3, 7 AND 28 DAYS. THE TEST RESULTS ARE SHOWN IN TABLES AND GRAPHS.

Percentage Added		Compressive strength in N/mm ²		
Percentage of GP	Percentage of GBFS	3days	7days	28days
0%	0%	22.8	30.58	39.87
10%	30%	26.10	33.58	43.75
20%	30%	27.27	34.6	45.00
30%	30%	23.14	31.60	40.79

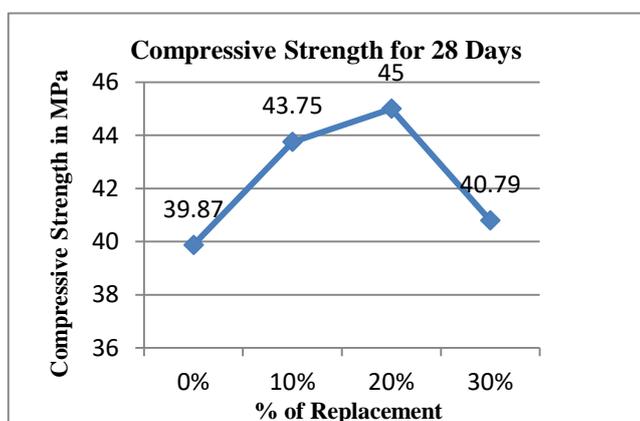
Table-1 CS of M-30 concrete for 3, 7 & 28 days strength in Mpa



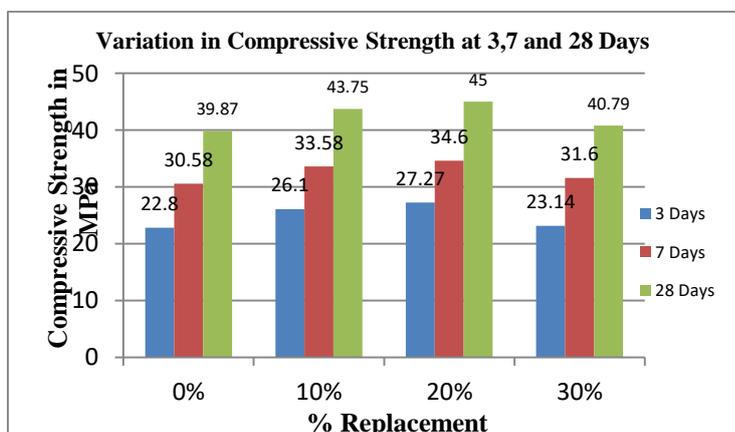
Compressive Strength values for 3 days



Compressive Strength values for 7 days

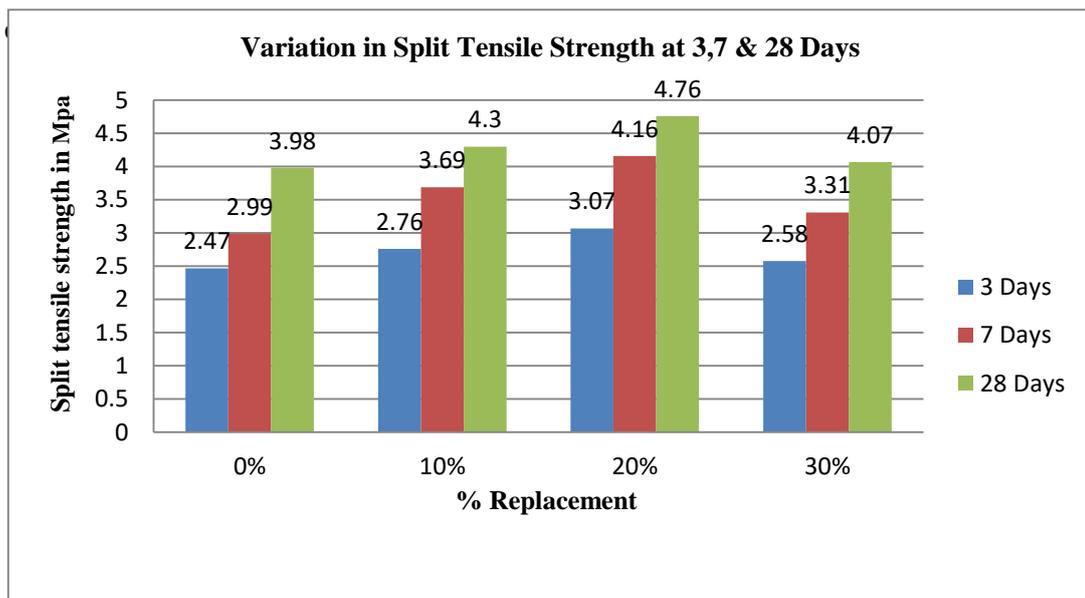


Compressive Strength values for 28 days



SPLIT TENSILE STRENGTH TEST

Percentage Added		Split tensile strength in N/mm ²		
Percentage of GP	Percentage of GBFS	3days	7days	28days
0%	0%	2.47	2.99	3.98
10%	30%	2.76	3.69	4.30
20%	30%	3.07	4.16	4.76
30%	30%	2.58	3.31	4.07

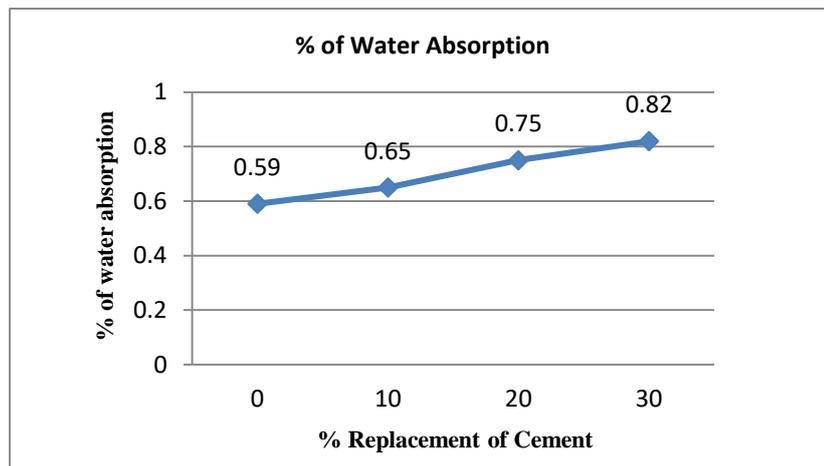


Split Tensile Strength of M30 grade Concrete

WATER ABSORPTION TEST

Percentage of GP	Percentage of GBFS	Initial dry weight W ₁ in kg	Wet weight W ₂ in kg	%Water absorption
0%	0%	8.201	8.250	0.59%
10%	30%	8.261	8.315	0.65%
20%	30%	8.385	8.453	0.75%
30%	30%	8.390	8.459	0.82%

Water absorption test



IV CONCLUSION

- In our work, we got maximum Compressive strength of 45N/mm^2 for 20% replacement of granite powder for cement and GBFS for M-Sand for M30 grade concrete and strength decreases for 30% replacement.
- Split tensile strength also increases at 20% replacement of granite powder and GBFS.
- Workability of the concrete decreases with increase in Granite powder and GBFS.
- Water absorption is more for GBFS compared to conventional concrete.
- We can conclude that GBFS can be used as a partial replacement of M-Sand.

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