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A Review Study on Effect of Binary Blended Concrete

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ABSTRACT: Cement production consumes a considerable amount of raw material and energy, and releases a large quantity of CO_2. Industrial byproducts, such as coal fly ash, silica fume, and blast furnace slag, have been successfully used in cementitious materials and have achieved sufficient social and environmental benefits. Currently, agricultural and forestry residues are mainly used as biomass fuel. The resulting bottom ash or fume ash is the final waste, which has aroused wide research interest. In the present study, a literature survey study was done on Bagasse Ash & Marble waste as a partial replacement on concrete & brick specimens that can improve the strength properties. From detailed study it is found that at 10% replacement of cement with sugarcane bagasse ash, the compressive strength of concrete is higher when compared to other proportions and at 50% replacement of coarse aggregate with marble waste the strength of concrete is increased. A numerical investigation is done from a research paper and found that the modulus of Elasticity of concrete also seems to increase on replacing cement with sugarcane bagasse ash and Marble waste.

Key Words: Concrete, Bagasse Ash, Marble waste, Compressive strength, Split Tensile Strength test.

I. INTRODUCTION

Concrete is one of the most widely used construction materials in the world. It can be cast in diverse shapes. Concrete is a composite material forming by the combination of cement, sand, coarse aggregate and water in a particular proportion in such a way that the concrete produced meets the needs as regards its workability, strength, durability and economically. Portland cement is normally an essential binder ingredient used in concrete. Cement production consumes a considerable amount of raw material and energy, and releases a large quantity of CO_2. Several researchers have made efforts to utilize industrial and agricultural by-products or waste materials for mixed cement production to reduce costs, save resources, reduce energy consumption, and decrease the amount of CO_2 generated during OPC production. To reduce carbon emissions, attempts have been made to find substitutes for cement to minimize the environmental impact of the concrete industry. With rapid industrial and agricultural development, large quantities of industrial and agricultural waste have been generated. Disposal of these wastes is a serious environmental problem, as most final wastes go to landfills, which not only reduces useful land area but also pollutes the environment. Industrial byproducts, such as coal fly ash, silica fume, and blast furnace slag, have been successfully used in cementitious materials and have achieved sufficient social and environmental benefits. Currently, agricultural and forestry residues are mainly used as biomass fuel. The resulting bottom ash or fume ash is the final waste, which has aroused wide research interest. Sugar cane is a kind of tropical and subtropical crop and is the main sugar crop worldwide. Global sugar crop acreage is approximately 31.3 million hectares, among which sugar cane accounts for approximately 70%. Sugar cane bagasse ash when used as a partial replacement it decreases the amount of CO2 and enhance the strength properties.

1.1 SCOPE OF THE WORK

The objectives of this study are:

- Necessary materials are to be collected (Cement, Sand, Fine aggregate, Coarse aggregate, Bagasse Ash, Marble waste) and the test are done (Finess test, Specific gravity, Moisture test, Aggregate test).
- Mix design as per requirements is prepared based on the test values as per code book.
- Fresh concrete tests are carried over and the quality of concrete is found.

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- The specimens are then casted & Cured for 28 & 56 days test in required shapes i.e. Cube, Cylinder& Brick.
- Standard hardened concrete test are done to find strength of concrete. The test results are then compared with standard values and Concrete nature found

II. LITERATURE REVIEW

Prashant Guleria.,et al., (2019), presented the experimental study to find out strength parameter of sugarcane with partial replacement of cement and marble waste as partially and fully replacement with coarse aggregates. Addition of sugarcane is 5%, 10%, 15%, 20% in cement and coarse aggregates contain 50% & 100% of marble. To find out the properties for specimens of compressive strength test, rebound hammer test and ultrasonic pulse velocity test (UPV), flexural strength test and water absorption tests are performed. Results indicate that the maximum strength and durability getting observed when the sugarcane replacement was 5% with 100% replacement of marble.

Vairagade.,et al., (2017**),** studied effective utilization of industrial wastes such as Sugarcane Bagasse Ash (SCBA) and Marble Slurry Dust (MSD as a supplementary cementitious material in masonry mortar. Ordinary Portland cement (OPC) was partially replaced with finely sugarcane bagasse ash (SCBA) and Marble Slurry Dust (MSD) with 0%, 5%, 10%, 15% and 20% by weight of cement. Compressive strength of mortar was determined by casting cube specimen of size 70.6 mm x 70.6 mm x 70.6 mm with water to binder ratio 0.4. The cubes were tested at 7, 21 and 28 days of curing ages for compressive strength of mortar and comparing the test results of sugarcane bagasse ash (SCBA) and Marble Slurry Dust (MSD) with respect to the control specimen, this paper validated the positive effect of sugarcane bagasse ash and Marble Slurry Dust (MSD) in strength improvement of mortar at 7, 21 and 28 days. Results revealed that Sugarcane Bagasse Ash (SCBA) and Marble Slurry Dust (MSD) both can be used as a pozzolanic material in mortar up to 10%.

Sudarshan et al., (2009), Marble industry produces large amount of waste during mining and processing stages. This waste is dumped on to open land which creates a lot of environmental problems. The main objective of this study was utilization of marble waste as a replacement for conventional natural coarse aggregate in concrete. Experimental investigations were carried out to examine the feasibility of use of marble waste as a coarse aggregate in concrete. Conventional natural coarse aggregate was replaced by marble aggregate in different percentages 0–100% by weight. The concrete formulations were prepared with a constant water–cement ratio 0.60. It was observed that workability of concrete mixes containing marble aggregate was 14% more than that of control concrete. The average compressive strength of all the concrete mixes containing marble aggregate increased by 40% and 18% at 7 and 28 days, respectively.

Sounthararajan et al., (2016), presented on two different mixture of GGBS/SCBA have been used for preparing the geopolymer alkali-activated concrete, by using NaOH (12 M solution), sodium silicate (12 M solution in Na+ and SiO_2 /Na_2O molarity ratio of 0.3) and KOH (12 M solution) as activating solutions. Replacements of 10%, 20% and 30% of GGBS by SCBA were carried out for various mixes. It is observed that 20% replacement of GGBS showed better strength enhancement in the range 25-40 MPa at 3 days curing. However, the addition of waste steel fibers up to 1.5% by volume fraction (Vf) showed a reasonable improvements on the compressive strength and split tensile strength of geopolymer concrete. Further test results showed drastic improvement in flexural strength of geopolymer concrete for various mixes. The various comparative assessments were made for different geopolymer mixtures and the reinforcing effects of steel fibers were investigated in different concrete matrix.

III. MATERIALS USED

3.1 Cement

Ordinary Portland Cement (OPC) of 53grade conforming to Indian standard code IS: 12269 are used in concrete.

3.2 Sugarcane Bagasse Ash (SCBA)

Sugarcane Bagasse Ash collected from the nearby sugar mill at Salem. A large amount of sugarcane processed on sugar mill and sugarcane bagasse is burn in boiler around at temp 400C to 600 C. The samples were collected from the landfill of the sugar mill. The Sieving is done in the laboratory to remove other dust particles and the fine sugarcane ash obtained.

3.3 Fine Aggregate

The fine aggregate used for the experimental program was locally procured and conformed to Indian Standard Specifications IS: 383-1970.

3.4 Coarse Aggregate

The crushed stones are collected from nearby areas. The nominal size of these aggregates is 20 mm, Spherical in shape.

3.5 Marble Aggregates

The waste marbles are collected from nearby areas and crushed into the specific size aggregates as per requirement. The nominal size was 20 mm.

IV. CONCLUSIONS

From the present investigations, the results are concluded as

- At 10% replacement of cement with sugarcane bagasse ash, the compressive strength of concrete is higher when compared to other proportions.
- At 50% replacement of marble waste with coarse aggregate the strength of concrete is increased.
- When compared with a nominal mix, the compressive strength of concrete increases for replacement of cement with sugarcane bagasse ash up to 10%. There is a decrease in compressive strength beyond 10% replacement of cement with sugarcane bagasse ash.
- When compared with nominal mix, the compressive strength of concrete increases for replacement of coarse aggregate up to 50% Marble waste. There is a decrease in compressive strength beyond 50% replacement of coarse aggregate.
- The modulus of Elasticity of concrete also seems to increase on replacing cement with sugarcane bagasse ash and Marble waste.

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