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Studies Undertaken to Incorporate Granite Wastes and Fly Ash in Green Concrete Production

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Abstract: This study is related to assess the performance of green concrete containing granite waste powder as partial replacement to sand and fly ash as partial replacement to cement with various percentages. The general aim of this study is that the incorporation of granite sludge waste to the concrete mix was beneficial to some durability-related characteristics. Furthermore, adding the granite waste sludge whether as sand replacement, showed a positive response in terms of enhancement of strength of concrete under elevated temperatures. Recent study is on combine effect of granite waste and fly ash on green concrete production. Experiments are produced on M50 concrete. Workability, compressive strength, flexural strength, split tensile strength are durability test to be performed on concrete.
Keywords: green concrete, granite waste, fly ash, durability, cement substitution, etc…

I. INTRODUCTION

The technical importance of using wastes is expressed by performance improvement of the product. The economical benefit usually attributes to the reduction of the amount of expensive and scarce ingredients with cheap materials. Environmentally, when industrial wastes are recycled, less material is dumped as landfill and more natural resources are saved. The construction industry nowadays is putting great efforts in highlighting the importance of durability in buildings. It is a pressing need today for the concrete industry to produce concrete with lower environmental impact, the so-called green concrete. This can be achieved in three ways. The first one is by reducing the quantity of cement as one tonne of cement saved will save equal amount of CO2 to be discharged into atmosphere. Secondly by reducing the use of natural aggregates whose resources are limited and are exhausting very fast. It is also achieved by utilizing maximum possible waste materials like fly ash in concrete. This will reduce the requirement of landfill area and make system more sustainable. Fly ash is generally used as replacement of cement, as an admixture in concrete, and in manufacturing of cement. Concrete containing fly ash as partial replacement of cement poses problems of delayed early strength development. Concrete containing fly ash as partial replacement of fine aggregate will have no delayed early strength development, but rather will enhance its workability and strength. This higher workability and strength achieved gives scope for indirectly reducing the cement quantity in concrete.

This paper is literature investigates the durability of construction building materials with an aim to search for alternate mortar and concrete components, made from granite waste materials. The basic condition for the implementation of such research is the assurance that it will not result in any significant reduction in the quality of the structures and elements built with the green concrete produced.

II. EXPERIMENTAL INVESTIGATION

Table 1. Sample ID

Sample ID	Full Form
A1(40%GS,0%FA)	M50 With 40% granite sludge & 0% Fly ash replacement
A2(40%GS,10%FA)	M50 with 40% granite sludge and 10% Fly ash replacement
A3(40%GS,20%FA)	M50 with 40% granite sludge and 20% Fly ash replacement
A4(40%GS,30%FA)	M50 with 40% granite sludge and 30% Fly ash replacement

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A. Result Analysis for Compressive Strength Test

150 x 150x 150 mm concrete cubes should were casted by using M50 grade concrete. The result of the compressive strength and strength effectiveness of concrete specimens at 7 Days, 14 Days and 28 Days.After Curing the specimens were tested for compressive strength using a calibrated compression testing machine of 3000 KN Capacity.

Table 1 Compressive strength result

Sr. No	Sample ID.	Age of Testing in Days	Max. Laod (KN)	Comp. Strength (N/mm²)
1	Cubes- A1 (40%GS,0%FA)	7 Day	950	42.22
2		14 Day	1109.25	49.30
3		28 Day	1203.75	53.50
1	Cubes- A2 (40%GS,10%FA)	7 Day	914.6	40.65
2		14 Day	1129.5	50.20
3		28 Day	1260	56.00
1	Cubes- A3 (40%GS,20%FA)	7 Day	995.6	44.25
2		14 Day	1257.75	55.90
3		28 Day	1341	59.60
1	Cubes- A4 (40%GS,30%FA)	7 Day	855	38.00
2		14 Day	945	42.00
3		28 Day	1068.75	47.50

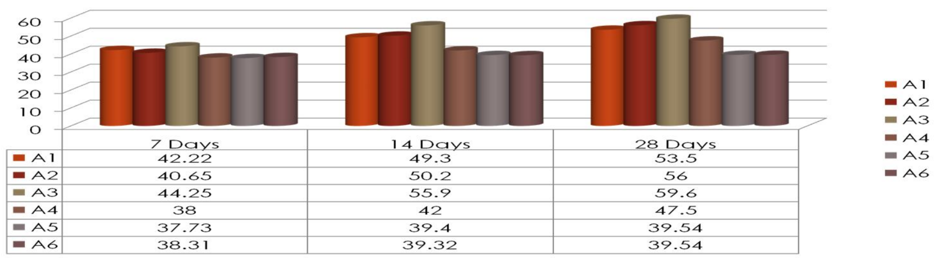

Fig 1 Compressive strength result

B. Flexural Strength Test Result of [M-50]

Flexural Strength is the capacity of the concrete (usually beams) to resist deformation under bending moment. Flexural strength is usually found by testing beam samples under either central point loading , third point loading or two point loading. To evaluate flexural strength it is decided to prepare 150 mm thick specimens. For this purpose Iron moulds are prepared having width and length as 150 mm and 700 mm respectively.

Table 2 Flexural strength result

Sr. No	Sample ID.	Age of Testing in Days	Flexural Strength (N/mm²)	Average Flexural Strength (N/mm²)
1	Beam- A1 (40%GS,0%FA)	28 Days	5.60	5.61
2		28 Days	5.72	
3		28 Days	5.53	
1	Beam – A2 (40%GS,10%FA)	28 Days	6.08	5.98
2		28 Days	5.78	
3		28 Days	5.84	
1	Beam – A3 (40%GS,20%FA)	28 Days	5.88	6.16
2		28 Days	6.11	
3		28 Days	6.00	

III. CONCLUSION AND RECOMMANDATION

A. It could be concluded that, the Granite fly ash mixes satisfy the compressive strength requirement of M50. Fly ash can be added in concrete as partial replacement of OPC up to 20% without compromising compressive strength of concrete.

B. The results of the study show that, the decrease in the workability of concrete when the percentage of the replacement is increasing.

C. The values of slump tests for all mixes were ranging from 5-10 cm indicating insignificant effects on the workability of concrete produced. It was observed that there was an inversely proportional relation between the granite waste as a partial replacement of cement and the compressive strength of the concrete mix produced.

D. The target mean strength is achieve at replacement of cement with 20% of fly ash, It show's positive increment in compressive strength and flexural strength.

E. Using granite waste increases the workability of concrete. Permeability tests demonstrated that the permeability of green concrete is less compared to that of conventional concrete.

F. Recommend that, some test should be performed on variation of 20%,40%,60% of granite waste compare to 20% of fly ash replacement.

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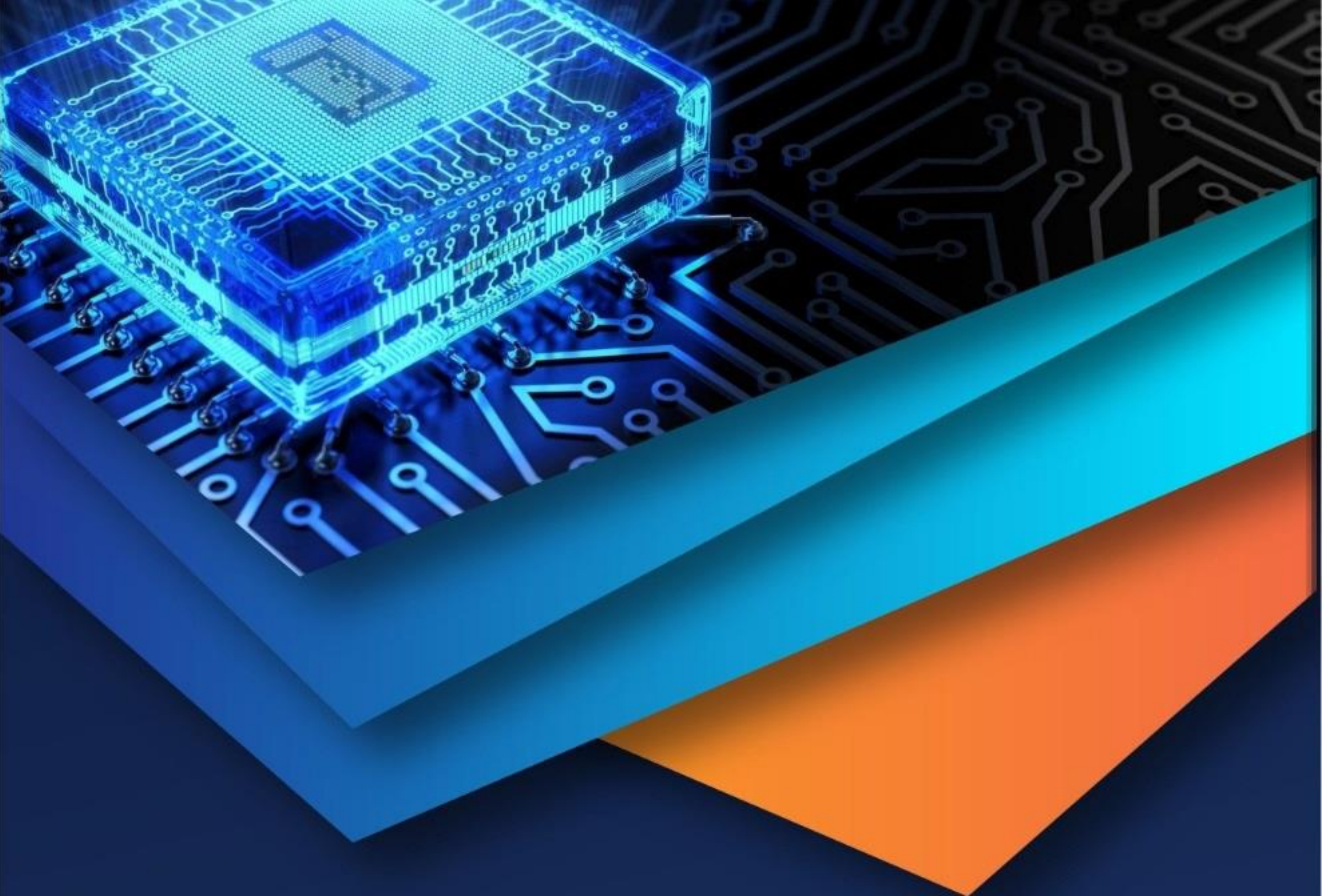

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