EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF CEMENT BY USING FLYASH WITH GLASS FIBER

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Abstract : Concrete is a material which is weak in tension to increasing strength in concrete by using AR glass fiber. The replacement of cement with fly ash in glass fiber reinforced concrete reduces the environmental pollution and increase the mechanical and durability properties of concrete.Fly ash as partial replacement of cement and glass fiber are used as additional reinforcement, which satisfies the various structural properties of concrete like compressive, tensile, flexural strength. From the entire study it is concluded that mix M20 Grade of concrete replacement of cement by fly ash with glass fiber with various proportions and conduct the test for 7,14,28 days

Keywords: Glass Fiber, Flyash,

I.Introduction

Concrete is composite material containing hydraulic cement, water, coarse aggregates and fine aggregates. The resulting material is a stone like structure which is formed by the chemical reaction of the cement and water. This hard material is a brittle material which is strong in compression but very weak in tension. So to increase the tensile strength of concrete a technique of introduction of fibers in concrete is being used. These fibers act as crack arrestors and prevent the propagation of the cracks. These fibers are uniformly distributed and randomly arranged. This concrete is called as fiber reinforced concrete. The main reasons for adding fibers to concrete is to improve the postcracking response of the concrete, i.e., to improve its energy absorption capacity and ductility, and to provide crack resistance and crack control. Also, it helps to maintain structural integrity and cohesiveness in the material. Studies conducted so far proved that the short and discrete, small fibers can improve the flexural load carrying capacities and impact resistance for non ferrous fibers.

Fiber reinforced concrete is concrete containing fibrous material which enhances its structural integrity. So we can define fiber reinforced concrete as a composite material of cement concrete or mortar and discontinuous discrete and uniformly dispersed fiber. Fiber is discrete material having some characteristic properties. The fiber material can be anything. But not all will be effective and economical. Some fibers that are most commonly used are steel, glass, carbon, and natural fibers.

II.REVIEW OF LITERATURE

. Jemin Joel, S. Varatharajan, D.Maruthachalam, S. Antony Jeyendran (2014) investigated the influence of Polypropylene fiber on fresh and hardened properties of concrete which is self-cured with super absorbent polymer. Their work main aim is to optimize the percentage of polypropylene fiber content in self-curing concrete and they achieved it. The self-curing is attained by use of super absorbent polymer of 0.3% by weight of cement. The polypropylene fiber content is varied as 0.1%, 0.2%, 0.3% & 0.5% by weight of cement and they optimized 0.3% of fiber for its strength characteristics for M40 grade concrete. They have recommended that the effectiveness of internal curing by means of SAP applied to concrete is the highest if 45 kg/m3 water is added by means of 1 kg/m3 of SAP.

This system was named alkali resistance glass fiber reinforced concrete. In the present experimental investigation the alkali resistance Glass fibers has been used to find out workability , resistance of concrete due to acids , sulphates and Rapid chloride permeability tests of M 30 , M40 and M 50 grade of glass fiber reinforced concrete and ordinary concrete at the 28 and 90 days with varying percentages of glass fibers .

R. Satheesh Raja, et al. This paper describes the mechanical behavior of fly ash impregnated E-glass fiber reinforced polymer composite (GFRP). Initially the proportion of fiber and resin were optimized from the analysis of the mechanical properties of the GFRP. It is observed that the 30 wt% of E-glass in the GFRP without filler material yields better results. Then, based on the optimized value of resin content, the varying percentage of E-glass and fly ash was added to fabricate the hybrid composites. Results obtained in this study were mathematically evaluated using Mixture Design Method. Predictions show that 10 wt% addition of fly ash with fiber improves the mechanical properties of the composites.

III. METHODOLOGY

Need For Study

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Literature Review

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Material Test

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Mix Propagation Design

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Testing of Specimen

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Result And Conclusion

VI. PRELIMINARY TEST ON MATERIALS

Cement : Ordinary Portland cement of 53grade [IS: 8112] specifications for 53 grade OPC is used. Table 1

Physical Properties	Test Results
Specific Gravity(G)	3.2
Consistency	30%
Initial Setting time	32min
Fineness	4%

Flyash: Fly ash is naturally occurring product from combustion process.
Table 2

Properties	
Specific Gravity(G)	2.56
Water absorption%	0.95
Fine particles	10-13

Coarse aggregate : Table 3

Properties	
Specific Gravity(G)	2.67
Impact Value(%)	18.58%
Water absorption%	0.9

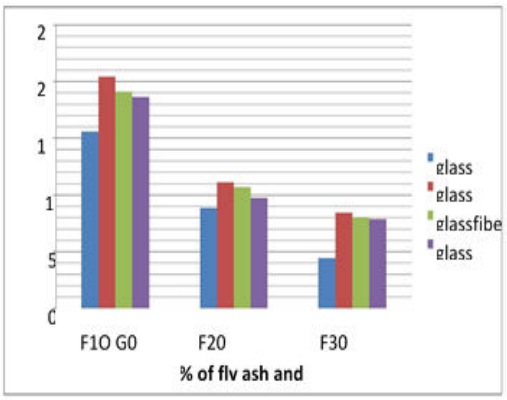
Cement:
Fineness of Cement= 4%
Table 4

Physical Properties	
Specific Gravity(G)	3.2
Fineness	4%
Consistency	30%

Mix Design :
Designed a mix for M20 grade concrete for the following datas.
Grade designation : M20
Type of cement : OPC 53 grade
Size of aggregate : 20mm
Water cement ratio : 0.40
Chemical admixture :super plasticizer
Min cement content : 320kg/m3
Max cement content : 450kg/m3

Fresh concrete Tests:
slump cone test:
Table 5

S.No	Water cement ratio	Slump value in mm
1.	0.5	0
2.	0.55	20
3.	0.6	70



Compaction factor test:

Compacting factor of fresh concrete is done to determine the workability of fresh concrete by compacting factor test as per IS: 1199 – 1959.Compaction factor value is 0.98.The degree of workability of fresh concrete is medium.

Tests on Harden concrete:

Compressive Strength:

The strength compressive strength of concrete cubes were tested of size 150mmx150mmx150mm for different proportion of replacement. And at the end of tests the results were compared with conventional concrete to check the strength obtained. Table 6

Mix M20	7 days (N/mm ^{2})	14 days (N/mm^2)	28 days (N/mm^2)
F(10%) G(6%)	18.67	20.12	47.34
F(20%) G(6%)	9.78	13.32	23.4
F(30%) G(6%)	7.89	11.67	17.78

Tensile strength test:
Table 7

Mix M20	7 days (N/mm ^{2})	14 days (N/mm^2)	28 days (N/mm^2)
F(10%) G(6%)	2.5	3.45	3.65
F(20%) G(6%)	2.33	2.5	3.18
F(30%) G(6%)	2.27	2.4	3.32

Flexural strength test: Table 8

Mix M20	7 days (N/mm ^{2})	14 days (N/mm^2)	28 days (N/mm^2)
F(10%) G(6%)	3.32	4.45	4.96
F(20%) G(6%)	3.25	3.95	4.71
F(30%) G(6%)	3.19	3.85	4.65

Conclusion:

In the paper we made an attempt to study the properties of glass fiber concrete with partial replacement of fly ash with cement. The maximum compressive strength value for 28 days is obtained when 10% cement replaced with fly ash along with 2% glass fiber. Compressive strength increases with increase of glass fiber. And with increase of fly ash compressive strength decrease. However 10% replacement of cement with fly ash along with 2% &4% glass fiber showed increase in the compressive strength by increase fiber percent. The maximum split tensile strength value for 28 days is obtained when 10% cement replaced with fly ash along with 2% glass fiber. Due to additional of glass fiber split tensile strength increased and is optimum when 20% cement replaced with fly ash along with 2% &4% of glass fiber.

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