EFFECT OF VERMICULITE AND GGBFS ON CONCRETE BY SELF CURING PARAMETER

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ABSTRACT

Self-curing concrete is provided to absorb water from atmosphere from air to achieve better hydration of cement in concrete. It helps to solve the problem that the degree of cement hydration is lowered due to without curing or improper curing, and unsatisfactory properties of concrete. According to the previous research works, high performance self-curing agent about 0.1 – 5 % of cement weight of the concrete is added to the concrete during mixing. The self-curing agent can absorb moisture from atmosphere and then release it to concrete.

In This work, self-curing concrete was prepared by using vermiculite and GGBFS. In this project 50% of GGBFS was used for the replacement of cement and Vermiculite was partially replaced with fine aggregate in various proportions of 20%, 40%, 60%, 80%. Finally self-curing concrete has attained good strength in the replacement for20% Vermiculite and 50% GGBFS for cubes and cylinder. So self-curing concrete has the ability to give strength without any curing condition. Poly ethylene glycol was used as self curing agent

INTRODUCTION

Proper curing of concrete is important to meet performance and durability requirements. In conventional curing, it is achieved by external curing applied after mixing, placing and finishing. Self-curing or internal curing is a technique that can be used to provide additional moisture in concrete for more effective hydration of cement and reduced self-desiccation. Advantages of internal curing are Internal curing (IC) is a method to provide the water to hydrate all the cement, accomplishing what the mixing water alone cannot do. Provides water to keep the relative humidity (RH) high, keeping self-desiccation from occurring. Eliminates largely autogenous shrinkage. Maintains the strengths of mortar/concrete at the early age (12 to 72 hrs.) above the level where internally & externally induced strains can cause cracking. Can make up for some of the deficiencies of external curing, both human related (critical period when curing is required in the first 12 to 72 hours) and hydration.

SCOPE AND OBJECTIVE

- The scope of the this work is to study the effect of vermiculite on strength characteristics of Self-curing concrete

The objective is to study the mechanical characteristics of concrete such as compressive strength and Tensile strength by varying the percentage of vermiculite from 20% to 80% by weight of cement for M20 grade of concrete.

METHODOLOGY

Methodology of this work is shown in fig 1

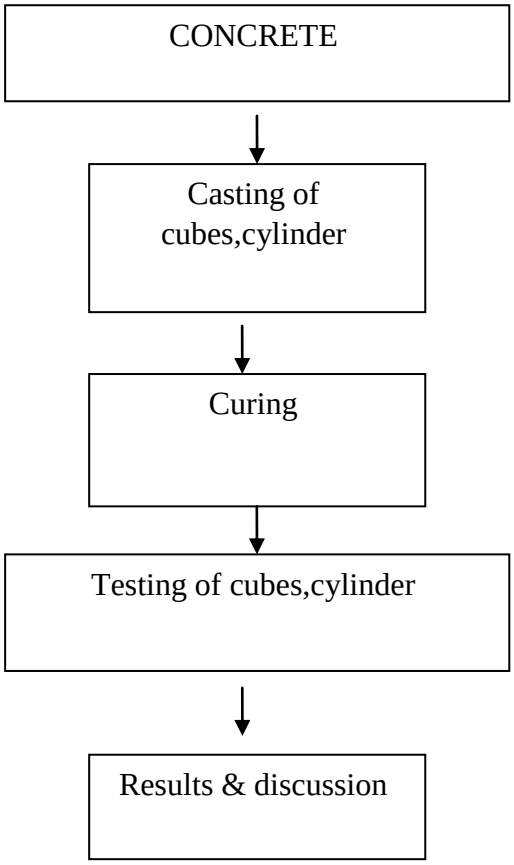

Fig 1 Methodology

EXPERIMENTAL INVESTIGATION

MATERIALS AND ITS PROPERTIES:

Cement

Ordinary Portland cement of53-grade confirming to I.S.8112:1989 specification was used. Specific Gravity of Cement was found to be 3.13

Fine Aggregate

Fine aggregate of size 2.36mm size confirming to zone III as per IS 383 – 1970 was used. Specific Gravity of sand was found to be 2.64

Coarse Aggregate

Coarse aggregate of size 12.5 mm was used. Specific Gravity of Coarse aggregate was found to be 2.95

Ground Granulated Blast Furnace Slag (GGBFS)

GGBFS a by product from iron industry purchased from salem steel plant was used. Specific gravity was found to be 2.99

Vermiculite

Vermiculite is a term applied commercially to micaceous minerals (essentially hydrated silicates of Al, Mg and Fe), usually alteration products of biotite or phlogopite micas formed by the removal of much alkalies and addition of water. Specific gravity of vermiculite was found to be 2.5

Mix Proportion

Mix proportion is shown in table 1 and table 2

Table 1 Mix Proportion

Cement	Fine aggregate	Coarse aggregate
1	**1.5**	**3.00**

DETAILS OF MIX PROPORTION

Table 2 Details of Mix Proportion

S.NO	SPECIMEN	CEMENT (%)	GGBFS (%)	FINE AGGREGATE (%)		COARSE AGGREGATE (%)
				SAND	VERMICULITE	NORMAL COARSE AGGREGATE
1	Controlled	100	0	100	0	100
2	20%	50	50	80	20	100
3	40%	50	50	60	40	100
4	60%	50	50	40	60	100
5	80%	50	50	20	80	100

RESULTS AND DISCUSSION

COMPRESSIVE STRENGTH TEST

Compression strength test was performed as per IS 516:1959. 100 x 100 xs100 mm size of cubes were made.Concrete was made with and without GGBFS and vermiculite, curing was done for 7days and 28days. The test results are given in table 3. . From the test results, it can be seen that increase of compressive strength of GGBFS concrete mixes with 20%, 40%, 60%, and 80% of fine aggregate replacement with vermiculite.

Table 3Compressive strength at 7 days and 28 days

Specimen	Vermiculite (%)	7 days (N/mm^2)	28 days (N/mm^2)
Control specimen	0	12.65	20.39
GGBFS50%	20	12.99	23.85
GGBFS50%	40	10.32	20.40
GGBFS50%	60	10.09	19.67
GGBFS50%	80	10.90	17.98

TENSILE STRENGTH

The tensile strength is one of the basic and important properties of the concrete. Split tensile strength test was performed by casting 150mm diameter and 300mm height cylinder casting and testing was done as per IS 516:1959.Curing was done for 7days and 28 days Tensile strength results are shown in Table 4

Table 4 Split Tensile strength at 7 Days and 28 days

Specimen	Vermiculite (%)	7 Days(N/mm^2)	28 days (N/mm^2)
Control specimen	0	2.19	3.22
GGBFS50%	20	2.58	3.73
GGBFS50%	40	2.23	3.52
GGBFS50%	60	2.11	2.82
GGBFS50%	80	1.99	2.94

CONCLUSION

From the above results it is clear that 60% - 80% vermiculite decreases the strength when compared to normal concrete.

. The result of 20% and 40% vermiculite and 50% was found to be higher than normal concrete. Compression strength for GGBFS 50% and vermiculate 20% to 40% were found to be good. Tensile strength for GGBFS 50% and vermiculate 20% to 40% were found to be good.Using of vermiculate and GGBFS are ecofriendly and cost effective. The main drawback of using GGBFS is setting time is increased than normal setting. Over all the 7days and 28days strength of GGBFS and vermiculate based concrete was found to be good, it can be used as an alternative material for cement and fine aggregate.

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