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A STUDY ON SELF COMPACTING CONCRETE WITH DIFFERENT MINERALS AS ADMIXTURE

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Abstract— A highly fluid type of concrete that spreads into the form without the need for mechanical vibration may be self-consolidating concrete. Self-compacting concrete is a non-segregating concrete that is laid down under the weight of itself. The benefit of self-compacting concrete is that it keeps all of the strength and features of regular concrete while still performing as planned. To lessen bleeding and segregation, super plasticizers and viscosity modifiers are added to the combine. Segregated concrete weakens and causes honeycombed patches near to the formwork. A clean SCC mix offers great stability, high deformability, and no segregation. Due to the lack of vibration improving the interface between the mixture and the hardened paste, self-compacting concrete with an equivalent water cement or cement binder ratio typically has a higher strength than conventional vibrated concrete. SCC concrete must be laid at a rate that is noticeably faster than regular concrete. Micro silica, also known as silica fume, is an ultrafine powder that is produced as a by-product during the production of ferrosilicon alloys and silicon. GGBS (Ground Granulated Blast Furnace Slag) may be a byproduct of the heater's propensity to produce iron or it may be a concrete material with concrete as its primary usage. In mix used Conmix superplasticizer to reduce water content in concrete.GGBS 10%,20%30% and 40% partial replacement of cement and 30% ggbs optimum strength increases and maintaining 30% ggbs as constant and silicafume is varying 5%,7.5% and 12.5%. Test performed is compressive strength and split tensile strength.

Key words: Self Compacting Concrete, Silicafume, Ground granulated blast furnace slag.

1. INTRODUCTION

Development of SCC could also be a really desirable achievement within the construction industry for overcoming the problems associated with cast-in place concrete. It is not suffering from the skill of workers, shape and amount of reinforcing bar arrangement of a structure. Due to its high fluidity and resisting power to segregation, it are often pumped over longer distances. It extends the likelihood of use of varied by products in its manufacturing.

Silica fume is an ultrafine material with spherical particles with an average diameter of about 0.15 microns. It shrinks down to a size that is around 100 times smaller than a typical cement particle as a result. Depending on the degree of densification in the silo, silica fume has a bulk density that ranges from 130 kg/m3 (undensified) to 600 kg/m3. A specific gravity of 2.2 to 2.3 is common for silica fume.

A great substitute for cement replacement, this kind of slab, known as GGBS, is created in the furnaces of iron ore refineries. It shields concrete from both thermal cracking and the alkali-silica reaction and is white in appearance. This slag frequently taps out as a molten liquid, so if it's going to be used to make GGBS, it needs to be swiftly cooled in a lot of water.

2. OBJECTIVE

1. Self-compacting concrete needs to have a few certain qualities when it is first made.

2. The creation of self-compacting concrete with features such as filling, passing, resistance to segregation, open time, pumping ability, finishing ability, and open time is crucial.

3. To optimize the usage of silicafume and ggbs cement.

3. MATERIALS

Cement: Ordinary hydraulic cement of 53 grade (IS:12269-1987, Specifications for 53 grade Ordinary Portland cement) has been utilized in the study. It was procured from one source and stored as per IS: 4032-1977.

Fine aggregates: The fine aggregate was tested for its physical requirements such as gradation, fineness modulus, specific gravity and bulk density in accordance with IS: 2386 – 1963 [Methods otest for aggregate for concrete] The sand was surface dried before use.

Coarse aggregates: Locally available 10mm angular crushed stone aggregate with a selected specific gravity of 2.70 and a bulk density of 1420 kg/m^3 is used on this have a look at coarse aggregates confirming to EN 12620 are suitable for the manufacturing of SCC. Light weight aggregate has been efficiently used for SCC. However, observe that the mixture might also migrate to the surface if the paste viscosity is low and this can not be detected by the sieve segregation resistance take a look at. SCC flows through the reinforcement and the L-box test is indicative of the passing capability of an SCC mix. The maximum mixture sizes have to normally be restrained to 10-12 mm, despite the fact that large sizes are getting used. The particle sixe distribution and the form of coarse aggregate without delay influence the glide and passing potential of SCC and its paste.

Workabilty: This admixture is high range water reducing, Superplasticizer based on polycarboxylic ether formulation.

Silica fume: A by-product of the manufacture of silicon and ferrosilicon is silica fume.It is a highly reactive pozzolona and an essential ingredient in high-performance concrete, which can greatly increase the structure's service life. When coke and high-purity quartz are reduced in electric arc heat systems to create silicon and ferrosilicon alloys, silica flume is a byproduct.The outer area on the arrangement of the tiny particles in silica flumes is 215,280 ft2/lb (20,000 m2/kg).

GGBS:GGBS (Ground Granulated Blast-furnace Slag) is a cement-related material that is derived from the blast furnaces used to produce iron and is mostly used in concrete. The remaining material transforms into a slag that floats on the iron after the iron ore is converted to iron. When used to create GGBS, this slag is frequently released as a melt and needs to be quickly quenched with a lot of water.

4. RESULTS

4.1 Compressive strength test: Compression test was conducted on the cast specimen of 150mm cubes. The cured specimen was tested to evaluate compressive strength at 7 and 28 days .

Table 1: Compressive Strength Result of Self Compacting Concrete by using Ggbs

S.No	% of GGBS	Compressive Strength Results, N/mm^2	
		7 days	28 days
1	0%	26.47	39.05
2	10%	28.35	41.82
3	20%	29.36	42.02
4	30%	30.09	43.05
5	40%	22.68	35.12

Graph 1: Compressive Strength Result of Self Compacting Concrete by using Ggbs

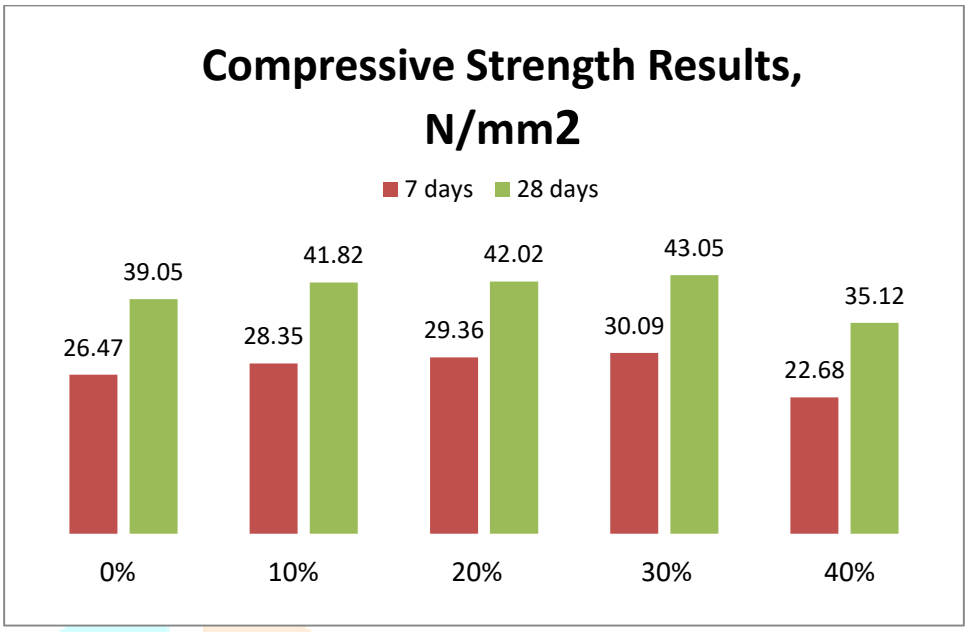
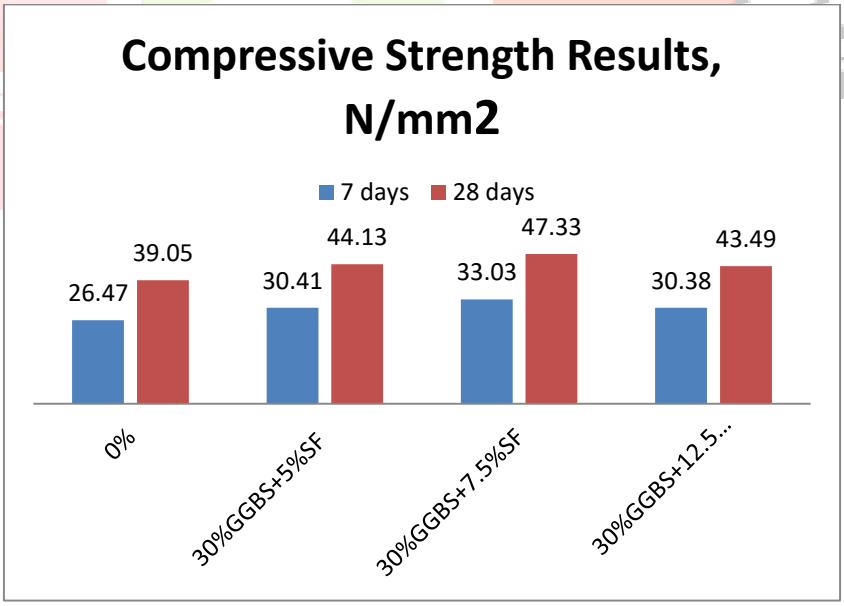


Table 2: Compressive Strength Result of Self Compacting Concrete by using 30%Ggbs and different percentages of Silica fume.

S. No	30% of GGBS and % of Silica fume	Compressive Strength Results, N/mm^2	
		7 days	28 days
1	0%	26.47	39.05
2	30%GGBS+5%SF	30.41	44.13
3	30%GGBS+7.5%SF	33.03	47.33
4	30%GGBS+12.5%SF	30.38	43.49

Graph 2: Compressive Strength Result of Self Compacting Concrete by using 30%Ggbs and different percentages of Silica fume.



4.2 Spilt tensile strength test: The cylinder specimen is 300 mm long and has a 150 mm diameter. In order to conduct the test, a cylindrical specimen must be placed horizontally between the loading surfaces of a compression testing machine. A load must then be applied along the cylinder's longitudinal direction until the cylinder fails after 7 and 28 days.

Table 3: Split tensile Strength Result of Self Compacting Concrete by using Ggbs

S.No	% of GGBS	Split tensile Strength Results, N/mm^2	
		7 days	28 days
1	0%	2.61	3.86
2	10%	2.75	4.07
3	20%	2.92	4.18
4	30%	2.98	4.23
5	40%	2.44	3.47

Graph 3: Split tensile Strength Result of Self Compacting Concrete by using Ggbs

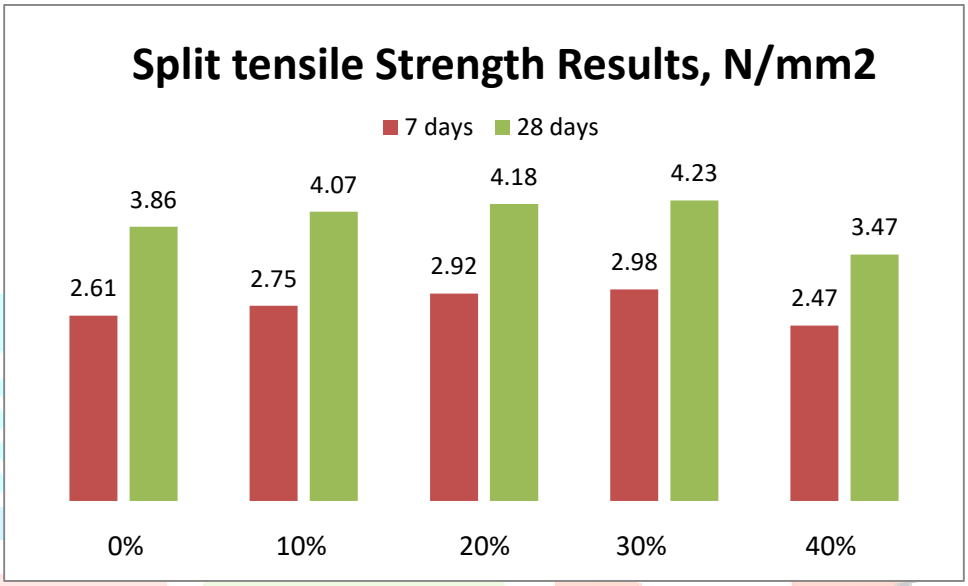
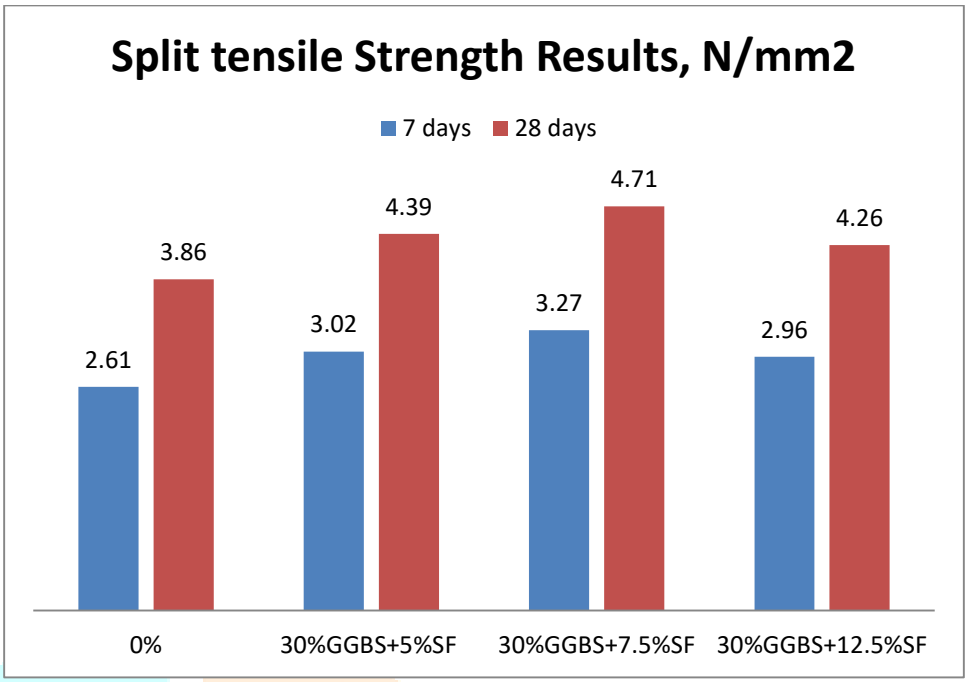


Table 4: Split tensile Strength Result of Self Compacting Concrete by using 30%Ggbs and different percentages of Silica fume.

S.No	30% of GGBS and % of Silicafume	Split tensile Strength Results, N/mm^2	
		7 days	28 days
1	0%	2.61	3.86
2	30%GGBS+5%SF	3.02	4.39
3	30%GGBS+7.5%SF	3.27	4.71
4	30%GGBS+12.5%SF	2.96	4.26

Graph 4: Split tensile Strength Result of Self Compacting Concrete by using 30%Ggbs and different percentages of Silica fume.



5. CONCUSSION

1. The Normal Compressive strength result achieved is 26.47 and 39.05N/mm^2 for 7 and 28 days.

2. 30% of GGBS the Compressive strength result achieved is 30.09 and 43.05N/mm^2 for 7 and 28 days.

3. 30% of GGBS+7.5%SF the Compressive strength result achieved is 33.03 and 47.33 N/mm^2 for 7 and 28 days.

4. The Normal Split tensile strength result achieved is 2.61 and 3.86 N/mm^2 for 7 and 28 days.

5.30% of GGBS the Split tensile strength result achieved is 2.98 and 4.23 N/mm^2 for 7 and 28 days.

6.30% of GGBS+7.5%SF the Split tensile strength result achieved is 3.27 and 4.71 N/mm^2 for 7 and 28 days.

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