Self Compacting Concrete With Nano Silica Fines

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Abstract- *Nano technology has become a rapid industrial revolution of 21st century .it will affect almost every aspect of life. As concrete is generally used material for construction. By adding silica fumes in concrete in order to decrease the cement content in concrete mix, we can control large amount of co2 emissions from constructed structures. We use nano silica fumes i.e., 10-50 nm size fumes. This research is on the experimental point of view. It aims to find the performance of nano silica in concrete mix. To obtain concrete with better properties and to decrease the harm to environment we are using replacement of cements with different percentages and hence obtain the results.*

Keywords- silica fines, self compacting concrete(SCC).

I. INTRODUCTION

Concrete is a composite material made up of cement, sand, water and Sometimes admixtures. Self-compacting concrete was first developed in 1988 to achieve durable concrete structures. Since then, various Investigations have been carried out and this type of concrete has been Used in practical structures in Japan, mainly by large construction Companies. Investigations for establishing a rational mix-design method And self-compatibility testing methods have been carried out from the view Point of making self-compacting concrete a standard concrete. The use of Self Compacting Concrete with significantly higher compressive strength Of concrete is on increasing trend in the construction industry and is being Seen as an optimized solution considering the economics, strength and Durability required for special structures.

Cement is the most active component of concrete usually has the greatestUnit cost, its selection and proper use are important in obtaining Economical concrete and also concrete of desired properties. One of the Methods to reduce the cement content in concrete mixes is the use of Nano Materials. The properties of concrete in hardened state such as strength And durability are affected by the mix proportions and grading which Results in particle packing. In this study the properties of addition of Nano silica to concrete and the Results are compared with the nominal concrete. The properties of concrete

Prepared with the addition of Nano Silica. In comparison to other Technologies, nanotechnology are much less well defined and well- Structured. It is known that 'Nano' is a Greek word and means 'dwarf'. It Is a common word for everything which is smaller than 1Micron or 1. The main Approaches of applications of Nano technology in concrete. Nano Silica is Mainly added to provide strength to the concrete. Until today, concrete has Primarily been seen as a structural material. Nano technology is helping To make it smart functional material. Nano Silica has been added in order to increase the strength, low permeability and reduces shrinkage. Nano concrete is defined as a Concrete made with Portland cement particles.

II. EXPERIMENTAL WORKS

The present procedure deals with the evolution of self compacting concrete Using nano silica. It also involves the study of the properties of Concrete Compressive Strength and Split-Tensile Strength. Cement is the partially replaced with Nano Silica of dosages (1%, 1.5%, 2%) in Standard Grade of M20 which was designed in accordance with IS: 10262-2009. We have Chosen mix design of M20 grade, in order to increase the compressive strength of the self compacting concrete. The program involves Casting and Testing of specimens where the standard size of cube (150mm x 150mm x 150mm) and standard size of cylinder (150mm x 300mm). In order to be useful in construction the product must meet minimum compressive and requirements which are determined through a Mechanical Test of Concrete and to check the strength of the concrete used for buildings, and other structures where the principal stresses are compressive cube samples were obtained and tested in compression testing machine. In this study, the standard specification from the Compression Testing Machine (CTM) will be used as a minimum compressive strength of per minute.

Tensile Strength:

It can be observed that as the percentage of Nano-silica is increased, split Tensile strength of concrete is also decreased. The split tensile strength of M20 grade controlled concrete is 3.306N/mm2.

Table 5: Tensile strength of concrete

S.NO	DESIGNATION	TENSILE STRENGTH(N/MM²)
1	NORMAL CONCRETE	3.16
2	SCC WITH 1% NANO SILICA	2.34
3	SCC WITH 1.5% NANO SILICA	2.094
4	SCC WITH2 %NANO SILICA	1.732
5	SCC	2.606

Compressive Strength Test:

The dimensions of the specimens to the nearest 0.2 mm and their weight Shall be noted before testing. The bearing surfaces of the testing machine Shall be wiped clean and any loose sand or other materials removed from The surface of the specimen which are to be in contact with the

Compression plates. The cube shall be placed in the machine in such a Manner that the load shall be applied to opposite sides of the cubes as Cast that is not to the top and bottom. The axis of the specimen shall be carefully aligned with the center of the

Thrust of the spherically seated platen. No packing shall be used between The faces of the test specimen and the steel platen of the testing machine. As the spherically seated block is brought to bear on the specimen, the Movable portion shall be rotated gently by hand so that uniform seating May be obtained.

The load shall be applied without shock and increased continuously at a Rate of approximately 140 kg/sq cm/min until the resistance of the Specimen to the increasing load breaks down and no greater load can be Sustained. The maximum load applied to the specimen shall then be Recorded and the appearance of the concrete and any unusual features in The type of failure shall be noted. The compressive strength of concrete

Shall be calculated from:

Compressive strength = (Maximum load)/ (Cross-sectional area)

TABLE 6: Compressive strength results

S.NO	SILICA ADDED(% BY Wt)	Compressive Strength for 7 days	For 28 days
1	1%	0.25	1.28
2	1.5%	2.26	1.38
3	2%	1.25	2.9

III. CONCLUSION

From the above experimental study, it can be concluded that the optimum Replacement of Nano Silica is 1.5% for M20 concrete. The compressive

Strength of cement concrete can be increased considerably by the addition Of Nano-silica. Based on the experimental results, use of Nano-Silica as

Partial replacement of cement in small quantities is advantageous on the Performance of concrete. Nano-Silica added in small quantities can Improve the compressive strength. The increase in various strength

Characteristics of concrete containing nano-silica content can be due to the availability of additional binder in the presence of nano-silica. Nano Silica has high amorphous silicon dioxide content. The Portland cement in concrete releases calcium hydroxide during the hydration process. The Nano silica reacts with the calcium hydroxide to form additional binder Material.

Compressive strength with NS dosage of 1% has increased by 0.25 And 1.28 percentage for 7 and 28 days respectively compared to normal. The percentage increase in compressive strength with NS dosage

Of 1.5% is 2.26 for 7 days and 1.38 for 28 days over normal Concrete. Similarly, a percentage increase of 1.25 for 7 days and 2.9 for 28 days has been observed when compared to that of concrete With 2% NS dosage. The workability of the concrete along with Nano-silica has decreased. It is clearly observed form the graph 4.4 that the Tensile Strength of the concrete is decreased with the increase in the Percentage of Nano silica added to concrete.

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