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Study on Effect of Admixtures onSelf Compacting Concrete

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Abstract- The concrete today can take care of any specific requirements under most critical exposure conditions. The concrete in modern days has to satisfy various performance criteria's. As a result, concrete is required to have properties like high fluidity, self compactability, high strength, high durability, better serviceability and long service life. In order to address these requirements, self-compacting concrete (SCC) was developed. Self compacting concrete is a mix that can be compacted into every corner of formwork, by means of its own weight and without the need for vibrating compaction. In spite of its high flowability, the coarse aggregate is not segregated. At the same time there is no entrapped air.

Keywords- Concrete, Compressive Testing machine, Admixtures, Cubes.

I. INTRODUCTION

Nowadays, performance expectations from concrete structures are more demanding. As a result, concrete is required to have properties like high fluidity, self compactability, high strength, high durability, better serviceability and long service life. In order to address these equirements, self- compacting concrete (SCC) was developed in 1980s in Japan. Self compacting concrete is a mix that can be compacted into every corner of formwork, by means of its own weight and without the need for vibrating compaction.In-spite of its high flowability; the coarse aggregate is not segregated

Thus, SCC eliminates the need of vibration either external or internal for compaction of concrete without compromising its engineering properties. Concrete is now no longer a material consisting of cement, aggregate, water and admixtures but it is an engineered material with several new constituents. The concrete today can take care of any specific requirements under most of different exposure conditions. EFNARC has published specifications and guidelines for self compacting concrete. Self compacting concrete can be defined as the concrete that is able to flow in the interior of the formwork, passing through the reinforcement, filling it in a natural manner, consolidating under the action of its own weight. The filling ability, passing ability and stability can be considered as the main properties of fresh SCC.

1. Advantages of self-compacting concrete:

- Some of the important advantages that are commonly experienced by adopting SCC are as follows:
- SCC yields homogeneous concrete in situation where the castings are difficult due to congested reinforcement, access etc. SCC shows a good filling ability especially around reinforcement.
- Reduces noise at sites, the pre-cast factory, and neighborhood; hence, it is a silent concrete.
- Eliminates problems with blood circulation leading to "white fingers" caused by compacting equipment, hence called a healthy concrete.
- Its ease of placement improves the productivity and the cost saving through reduced equipment and labor equipment.

2. Disadvantages of self-compacting concrete:

- Some of the important disadvantages of SCC may be as listed below;
- The production of SCC places more stringent equirements on the selection of materials in comparison with conventional concrete.
- Proper stock pilling of aggregate, uniformity of moisture in the batching process, and good sampling practice are essential for SCC mixture.
- λA change in the characteristics of a SCC mixture could be a warning sign for quality control and while a subjective judgment, may some times be more important than the quantitative parameters.

II. MATERIALS USED

1. Cement:

Ordinary Portland cement of grade 53 was used. The Initial setting time of cement is 30 minutes and the specific gravity of cement is 3.15.

2. Fine Aggregate:
Fine aggregate used in this research work was conforming to IS and was clear sand passing through4.75mm sieve with a specific gravity of 2.68. The grading zone of aggregate was zone II.

3. Coarse Aggregate:
Coarse aggregate used in this research work was conforming to IS and was angular crushed aggregate with a specific gravity of 2.70.

4. Water:
Potable water available in the laboratory with the pH of 7.0 ± 1 and conforming to the requirement of IS: 456-2000 was used for mixing concrete and also for curing of specimens.

4. Coarse aggregates:
Locally available crushed stone aggregates are used as coarse aggregates. The coarse aggregates used in the experimentation were 20mm and down size aggregate.

5. Superplasticizer:
A high performance concrete superplasticizer Structuro 100 based on modified polycarboxyloic ether was used.Structuro 100 combines the properties of water reduction and workability retention. It allows the production of high performance concrete with high workability.

6. Viscosity modifying admixture:
The viscosity modifying admixture called Structuro 485 was used to induce the flow without segregation.Structuro 485 is a high performance cohesion agent specially designed to ensure good consistency and stability in concrete with high fluidity.

7. Air entraining agent:
Air entraining admixture used is Conplast PA21(S)

8. Accelerator:
The accelerator used in the experimentation was Conplast NC.

9. Retarder:
The retarder used in the experimentation was Conplast RP264.

III. OBJECTIVES

- To know the effect of addition of combination of admixtures on the flow characteristics of self-compacting concrete.
- To know the effect of addition of combination of admixtures on the Strength characteristics of self-compacting concrete.
- To know the effect of addition of combination of admixtures on the properties of self- compacting concrete subjected to durability characteristics.

IV. FIGURES AND TABLES

Fig 1. Cube Testing.

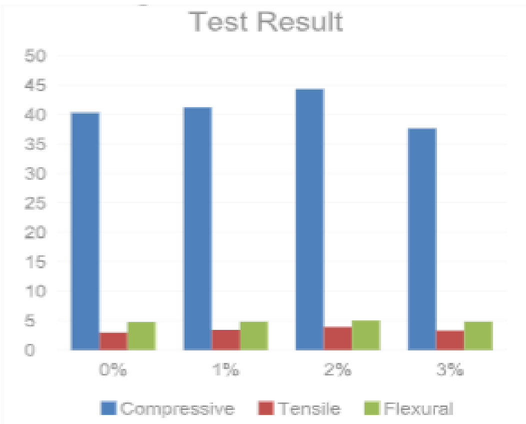

Fig 2. Strength Test Results.

V. VARIOUS TESTS

1. Compressive Strength Test:
The compressive strength test was conducted after the concrete specimens were cured. The cube specimens were of dimensions 150x150x150 mm.

The compressive strength of concrete can be calculated using the following formula:

$$fc = P/A$$

Where: fc = Compressive strength of concrete.
P = Maximum load applied to the specimen. A = Cross sectional area of the specimen.

2. Tensile Strength Test:
Concrete specimens for indirect tensile test were 150mm diameter and 300mm length.The specimens were placed

with its axis horizontal, between the platens of a compression- testing machine. Load was applied until the specimen failed in its vertical diameter.

The tensile strength of concrete is calculated using the following formula:

$$f'ct = 2P/ \pi \times L \times D$$

Where,
fct = Indirect tensile strength of concrete
P = Maximum load applied to the specimen
L = Length of the specimen
D = Diameter of the specimen

3. Flexural Strength Test:
Concrete specimens for flexural strength were of dimensions 100mm x 100 x 500mm. The specimen is subjected to bending, using two point loading until it fails. The distance of the loading point is 133mm and the effective span (L) is 400mm. The test was carried out under controlled conditions, which measures the load and deflection of concrete beam specimens.

The flexural strength of the specimen shall be expressed as the modulus of rupture and shall be calculated using the following formula:

$$fr = P \times L/ B \times D2$$

P = Maximum load applied to the specimen
L = Length of the specimen
B = Width of the specimen
D = Depth of the specimen

VI. CONCLUSION

It is observed that the compressive strength of self compacting concrete produced with the combination of admixtures goes on increasing up to 2% addition. It is observed that the Tensile strength of self compacting concrete produced with the combination of admixtures goes on increasing up to 2% addition. It is observed that the Flexural strength of self compacting concrete produced with the combination of admixtures goes on increasing up to 2% addition. Flow properties and strength properties increasing up to 2%.

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