Experimental Study on Self Compacting Concrete
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Abstract—Self-compacting concrete (SCC) is portrayed by a low yield stress, high deformability, and moderate viscosity necessary to guarantee uniform suspension of strong particles amid transportation, position (without outer compaction), until the concrete sets. The self-compaction cement is alluded as concrete which streams upon its own weight with no compaction or mechanical vibration all through the structure work. The upside of innovation behind self-compacting cement is to minimize the arrangement issues in troublesome stages. This procedure including the choice of legitimate elements of concrete and planning a fitting blend outline to deliver a cement of obliged quality, workability and strength. Indian Standard Code IS: 10262-1982 is used to design mix proportion for self-compaction cement of M30 evaluation.

Key words: Self Compacting Concrete, SCC

I. INTRODUCTION

Due to its different preferences, Self-compacting cement (SCC) has been portrayed as "the most progressive advancement in history of concrete development". Initially grew in the year 1988 to balance a developing lack of skilled labor, it has demonstrated beneficial and financially because of different number of variables, for example,

- Due to self-compacting property, Need no compaction at site accordingly lessens noise level on account of absence of vibration
- Takes less time to finish, Good surface finishes and reduce labor charges
- Greatly enhances the property like Workability and Durability and strength

The materials used to deliver self-compacting cement were purchased from customary concrete industry. The materials used for SCC are coarse aggregate, fine aggregate, cement, mineral admixtures (fly ash, ground – granulated blast furnace slag).

A. Cement:
Ordinary Portland cement of 43 grade, which passes through 0.9µ IS sieve and having specific surface of 350-450Kg/m3 is used.

B. Fine aggregate:
Sand is brought from quarry which passes through 4.75mm of IS sieve with specific gravity 2.56 and confirming grading zone III.

C. Coarse aggregate:
Locally available crushed gravels are used. Gravels which retained on 4.75 IS sieve and passes through 20mm IS sieve are used. The maximum size of gravel should not be more than 20mm and specific gravity is 2.67

D. Water:
The water from nearer source is selected.

E. Admixture:--
Chemical Admixture: Super Plasticizer: Conplast P211 confirming IS: 9103:1979 Type F is used of Specific gravity : 1.18- 1.19 at 25:C

F. Mineral Admixture:
Fly Ash: Class F Fly ash obtained from 'Kakatiya Thermal Power Station, Warangal’ was used. The size of particle is 5 micron sieve following IS 460:1962

II. METHODOLOGY

The mix proportion from IS: 10262-1982 is obtained as 1:1.662:2.907:0.5. The concrete cubes of dimensions 150x150x150 mm are casted. Total 24 cubes are casted with increment percentage of fly ash (0, 10, 20, 30) as admixture and kept for curing for 7, 14, and 28 days with constant dosage of Conplast P211 (0.6%). Test performed for workability and compressive strength of concrete.

A. Slump Flow Test
Aim: To find the slump
Equipment:--
Slump cone, Base plate, Trowel, Scoop, Ruler

Procedure:--
1) The internal surface of the mould is thoroughly cleaned and applied lubricant.
2) The mould is then filled in three layers with freshly mixed concrete, each approximately to one-third of the height of the mould.
3) Each layer is tamped 25 times by he tamping. After the top layer is rodded, the concrete is struck off the level with a trowel.
4) The mould is removed from the concrete immediately by raising it slowly in the vertical direction.
5) The difference in level between the height of the mould and that of the highest point of the subsided concrete is measured. This difference in height in mm is the slump of the concrete.

B. Compressive strength (IS: 516-1959)
Aim:-- Determination of compressive strength of concrete.
Apparatus:- Testing Machine: Compressive testing machine
Procedure:-
1) Representative samples of concrete shall be taken and used for casting cubes 15 cm x 15 cm x 15 cm.
2) The concrete shall be filled into the moulds in layers approximately 5 cm deep
3) The specimen shall be stored at site for 24+ ½ h under damp matting or sack. After that, the samples shall be stored in clean water at 27+2°C; until the time of test.
4) Specimen shall be tested immediately on removal from water and while they are still in wet condition.
5) The bearing surface of the testing specimen shall be wiped clean and any loose material removed from the surface. In the case of cubes, the specimen shall be placed in the machine in such a manner that the load cube as cast, that is, not to the top and bottom.
6) Align the axis of the specimen with the steel platen, do not use any packing.
7) The load shall be applied slowly without shock and increased continuously at a rate of approximately 140 kg/sq.cm/min until the resistance of the specimen to the increased load breaks down and no greater load can be sustained. The maximum load applied to the specimen shall then be recorded and any unusual features noted at the time of failure brought out in the report.

III. RESULT

A. Slump Cone:
The slump flow is used to assess the horizontal free flow of SCC in the absence of obstructions. It was first developed in Japan for use in assessment of underwater concrete. The test method is based on the test method for determining the slump. The diameter of the concrete circle is a measure for the filling ability of the concrete.

In order to study the effect on fresh concrete properties when fly ash is added into the concrete as cement replacement, the SCC containing different proportion of fly ash were tested for Slump flow

<table>
<thead>
<tr>
<th>Cube Mix</th>
<th>Slump (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample 1</td>
</tr>
<tr>
<td>CC0 (0% FA)</td>
<td>547</td>
</tr>
<tr>
<td>SCC1(10% FA)</td>
<td>583</td>
</tr>
<tr>
<td>SCC2(20% FA)</td>
<td>772</td>
</tr>
<tr>
<td>SCC1(30% FA)</td>
<td>689</td>
</tr>
</tbody>
</table>

B. Compressive Strength:
In order to study the effect on compressive strength when fly ash is added into self-compacting concrete as cement replacement, the cube containing different proportion of fly ash were prepared and kept for curing for 7, 28 and 56 days. The test was conducted on UTM of capacity 3000 KN.

<table>
<thead>
<tr>
<th>Cube mix</th>
<th>Compressive Strength (N/mm²)</th>
<th>Average Compressive Strength(N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 days</td>
<td>14 days</td>
</tr>
<tr>
<td>CC0 (0% FA)</td>
<td>19.5</td>
<td>27.6</td>
</tr>
<tr>
<td>SCC1(10% FA)</td>
<td>19.8</td>
<td>27</td>
</tr>
<tr>
<td>SCC2(20% FA)</td>
<td>14.3</td>
<td>21.4</td>
</tr>
<tr>
<td>SCC1(30% FA)</td>
<td>15</td>
<td>21.3</td>
</tr>
</tbody>
</table>

Table 1: Effect of percentage of Fly ash on compressive strength of self-compacting concrete

The compressive strength test results for Self Compacting Concrete mixes are given above. With the increase in fly cinder substance from 10–30%, SCC mixes developed compressive strengths between 19.05 and 14.2 MPa at 7 days; between 27.85 and 21.5 at 14 days; between 37.55 and 28.4 at 28 days. The compressive strength increased with a decrease in the percentage of the fly ash. An increase of about 21% strength at 14 days and 25% at 28 days was observed with the decrease of fly ash content from 30% to 10%.

IV. CONCLUSION

Following observations have been made:
- The compressive strength increased with a decrease in the percentage of the fly ash. An increase of about 21% strength at 14 days and 25% at 28 days was observed with the decrease of fly ash content from 30% to 10%.
- As no specific mix design procedures for SCC are available mix design can be done with conventional BIS method and suitable adjustments can be done as per the guidelines provided by different agencies.
- Trail mixes have to be made for maintaining flow ability, self-compatibility and obstruction clearance.
- Use of fly ash (a waste material from industry) has made project economical
- Increase in workability for replacement of 20% of fly ash with replacement of cement and Increase of strength at 10% of fly ash with replacement of cement.
REFERENCES


