

EXPERIMENTAL STUDY ON STRENGTH AND DURABILITY OF M35 GRADE SELF COMPACTING CONCRETE BY USING CORN FIBER AND STEEL FIBERS

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ABSTRACT

Self compacting concrete (SCC) is presently a developing procedure in the field of concrete innovation. SCC is an inventive plan to handle the issue of cementing through thick reinforcement. SCC is novel, due to its properties, similar to fill capacity, stream capacity, pump capacity, and make creation of concrete more industrialized. The utilization cementations its material like fly ash makes the concrete practical. It become important to build up a compaction free creation system consequently decreasing the general expense of the venture; improve the nature of work, and giving wellbeing in workplace. The expansion of filaments into the concrete has been found to improve a few of its properties like tensile strength, cracking resistance, impact, ductility, wear and tear etc.

In the present study an experimental investigation was conducted on M35 grade self compacting concrete by using steel fibres and corn husk fibres. The percentage of steel fibres and corn fibers used in the proportion like 0%SF+0%CHF, 1%SF+0%CHF, 0.5%SF+0.25%CHF, 0.75%SF+0.5%CHF, 1%SF+0.5%CHF. The results like compressive strength, tensile strength and flexural strength values are studied along with this strength values durability is also studied for M35 self compacting concrete

Key words : Self compacting concrete, steel fibres, corn husk fibres, strength, durability

1. INTRODUCTION

Self-compacting concrete (SCC) become first brought in Japan at some point of 1980's, given that then it has been the trouble to a few examinations in order to achieve the favored homes of concrete structures. Simultaneously the makers of parts have created more noteworthy and more prominent advanced plasticizers and stabilizers custom-made for the precast and the equipped mix industry. Self compacting concrete (SCC) has created as a progressive time, equipped for achieving the notoriety of being a spectacular advancement inside the field of concrete time. No vibration is crucial for SCC which could stream around obstacles, exemplify the reinforcement and top off the system totally under its own one of a kind self weight. Making concrete system without vibration were executed inside the past. For example, placement of concrete submerged is performed by means of the utilization of tremie without vibration.

Steel fiber Reinforced concrete is a composite material having strands as the additional decorations, dissipated constantly at unpredictable in little rates, for example in the region of 0.3% and 2.5% by volume in plain concrete SFRC things are passed on by adding steel filaments to the portions of concrete in the blender and by trading the green concrete into molds. The thing is then compacted and facilitated by the standard strategies. Parcel or balling is one of the issues experienced in the midst of mixing and compacting SFRC. This should be kept up a key not too bad ways from for uniform game plan of strands. The essentialness required for mixing, passing on, putting and finishing of SFRC is maybe higher. Utilization of compartment blender and fiber contraction to help better mixing and to lessen the plan of fiber balls is essential.

2. MATERIALS USED FOR THE STUDY

For this experimental study initially we have collect the necessary materials to make self compacting concrete the details of materials collection and specification are discussed in the below

2.1 Cement

Ordinary Portland cement of 53 grade was utilized in this experimentation adjusting to I.S. – 12269-1987. For the current examination I was gathered ultra tech cement of 53 grade from local area Hyderabad. The example cement bag utilized in this investigation is appeared in the below figure 1



Figure 1: Ultra Tech OPC 53 Grade cement Bag

2.2 Silica Fume

Silica fume, likewise called miniature silica, It is a ultrafine powder accumulated because of the silicon and ferrosilicon blend creation and involves round particles with an ordinary atom estimation of 150 nm. The fundamental field of usage is as pozzolanic material for unrivaled concrete. The general case of silica fume is showed up in the figure 2 which is assembled from mechanical territory near Hyderabad city.



Figure 2: Silica Fume

2.3 Steel Fibres

Stainless steel wire of 0.5 mm separation across has been used as an aspect of the technique of SFRC. The steel fiber of length 40 mm and of viewpoint degree 80 has been used as an aspect of this exploratory work. All the steel strands are ensured about, caught, isolated fit as a fiddle.



Figure 3: Steel fibers

2.4 Corn Fiber

Corn fiber is an artificial fiber gotten totally from yearly inexhaustible assets. These fibers have the exhibition focal points frequently connected with manufactured materials, and supplementing properties of characteristic items, for example, cotton and wool. In the current investigation the locally accessible corn strands is utilized which is appearing in the underneath figure



Figure 4: Corn fiber

2.5 Fine Aggregates

Locally open sand zone II with specific gravity 2.65, water absorption 2% and fineness modulus 2.92, changing as per I.S. – 383-1970. It is the aggregate the a lot of which passes 4.75 mm IS sifter and contains basically such an unprecedented proportion of coarser as is allowed by detail.



Figure 5: Fine aggregates

2.6 Coarse Aggregates

Coarse aggregates are those stones which are held on IS4.75 strainer number squashed stone mix of 20mm size is incorporated from near to quarry. Aggregates of length more critical than 20mm size are secluded by using sieving. The underneath figure shows the example of Coarse totals which are utilized in this investigation.



Figure 6: Coarse aggregates

2.7 Mix Design And Trials Used For The Study

The mix design used for this study is 1:1.58:1.44 for M35 grade design mix as per the materials properties

For this study of experimentation I was taken five trials to get the optimum value of strength and durability values which are shown in the below discussions

1. 0% Steel fibers + 0% Corn Husk fiber : Mix 1
2. 1% Steel fibers + 0% Corn Husk fiber : Mix 2
3. 0.5% Steel fibers + 0.25% Corn Husk fiber : Mix 3
4. 0.75% Steel fibers + 0.5% Corn Husk fiber : Mix 4
5. 1% Steel fibers + 0.5% Corn Husk fiber : Mix 5

3. METHODOLOGY

In order to test the strength and durability of self compacting concrete using steel fibers and corn fibers for M35 grade concrete we need to cast the cubes, cylinders and prism specimens for compressive strength, split tensile strength, flexural strength and durability of various curing periods. Along with those strength tests workability is also studied for various trial mixes. For this project the following methodology is used

3.1 Batching

Batching is the process of taking the quantity of materials required for the project. Generally measuring the material quantity is done by two methods one is weight batching, second is volume batching. In the present study I was taken weight batching to measure the materials quantity.

3.2 Mixing Of The Concrete

After measuring the materials quantity I mixed the materials as per the trails. Firstly we have to mix coarse aggregates, fine aggregates, steel fibers and coir fibers for some time to get uniform mix after that add cement and silica fume to the mixture again mix for some more time to get same mix throughout the material. Now add the water as per the calculations from the mix design to make freshly prepared concrete for M35 grade concrete.

3.3 Casting Of Specimens

After mixing the concrete materials we have to cast the specimens like cubes, cylinders, prisms to check the strength and durability. For this study we have to cast 45 cubes, 45 cylinder and 45 prisms to check the compressive strength, split tensile strength and flexural strength at 7days, 14 days and 28 days curing period along with these strength we have to cast 15 cubes for the durability of concrete for these five trial mixes.

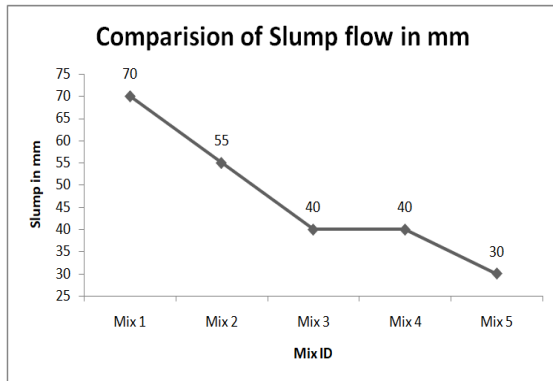
3.4 Curing Of The Specimens

In case of compressive strength, split tensile and flexural strength studies we have to cure the specimens for 7 days, 14 days and 28 days of curing periods with all five trial mixes. While in case of durability we have to cure the specimens to at least for acid attack and alkaline attack tests.

4. RESULTS AND ANALYSIS

4.1 Workability Of Concrete

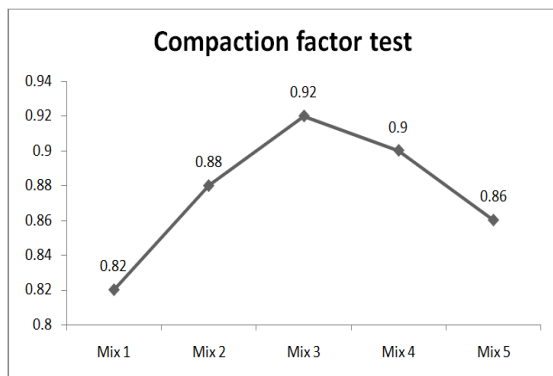
Workability is one of the most important property of the freshly prepared concrete mixtures in the present study workability of concrete mix is find out with the help of the slump cone test and compaction factor tests the below graph shows the slump cone comparison for various mixes



Graph 1: Comparison of slump cone test

4.2 Compaction Factor

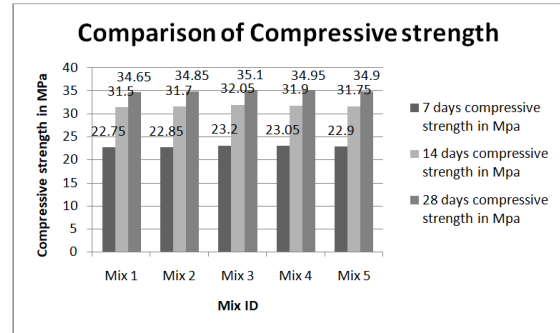
Compaction factor is the weight of partially compacted concrete to the weight of full compacted concrete. For the present study compaction factor is determined with the help of mix trials from mix trial 1 to mix trial 5 the below graph shows the compaction factor test results.



Graph 2: Comparison of compaction factor

4.3 Compressive Strength Of Concrete

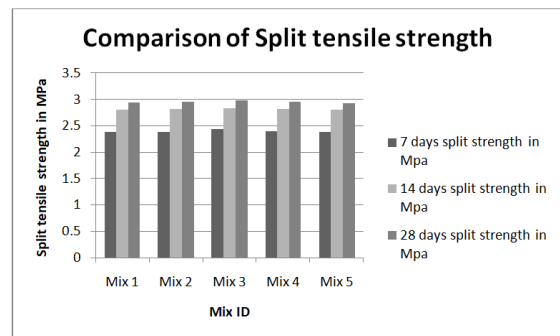
After curing cubes the compressive strength of concrete is resolved with the assistance of universal testing machine (UTM) for trial 1 to trial 5. The below figure shows the compressive strength of concrete for 7 days, 14 days and 28 days curing.



Graph 3: Comparison of Compressive strength

4.4 Split Tensile Strength

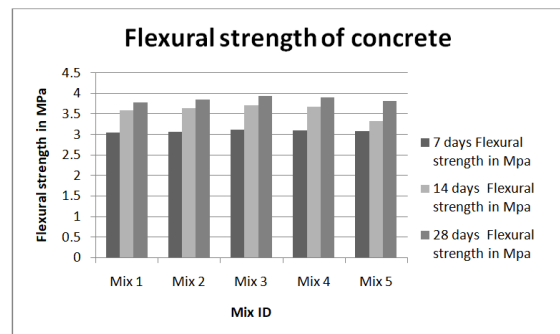
Split tensile strength of concrete is determined for M35 grade concrete with the help of cylinder specimens for various mix trials from trial 1 to trail. The dimension of the cylinder was taken as 150mm diameter and 300mm length. The below graph shows the split tensile strength for 7days, 14 days and 28 days.



Graph 4: Comparison of Tensile strength

4.5 Flexural Strength Of Concrete

Generally flexural strength of concrete is determined for prism specimens of 150mmX150mmX700mm dimensions. The flexural strength of prism specimens is determined for trials 1 to trails 5 for M35 grade concrete, the below graph shows the flexural strength of concrete for 7days, 14 days and 28 days curing

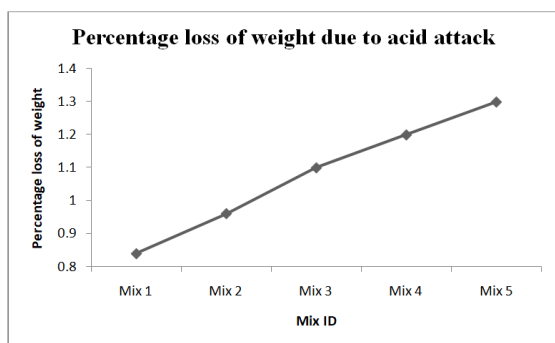


Graph 5: Comparison of Flexural strength

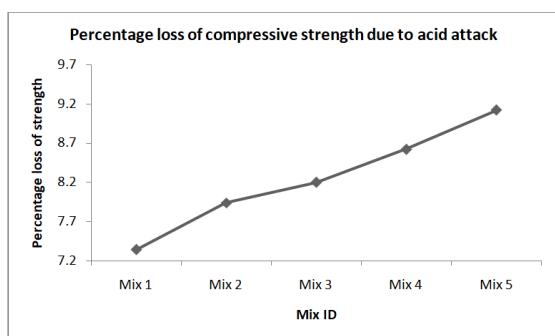
4.6 Durability Of Concrete

Durability is one of the most critical pieces of concrete on account of its focal rate in the usefulness life of structures. In such manner, breaking accept a key activity in the quality of strong structures. Durability is one of the most significant viewpoint in concrete this property is controlled by restoring the block samples in corrosive arrangement and basic arrangement the beneath chart shows the rate loss of weight and rate loss of compressive quality for both relieving techniques.

4.6.1 Acid attack

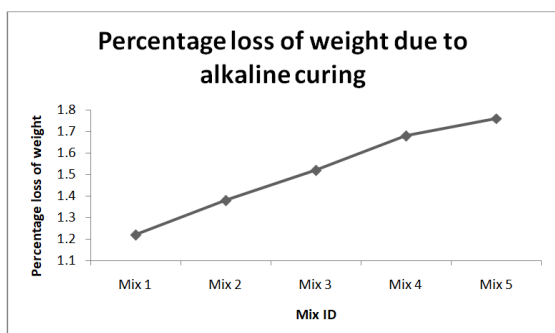


Graph 6: Comparison of percentage loss of weight

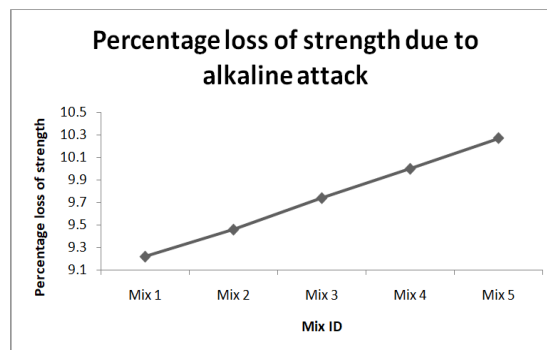


Graph 7: Comparison of percentage loss of strength

4.6.2 Alkaline attack



Graph 8: Comparison of weight loss



Graph 9: Comparison of percentage loss of strength

5. CONCLUSIONS

1. Self compacting concrete is made with the help of the various mineral admixtures.
2. The self compacting concrete can be compacted with vibrations by its own weight. The strength of self compacting concrete is higher than the normal concrete mixture.
3. By using steel fibers the cracking effect of concrete will be reduces and it is also helps to increase the strength values related to compressive, split tensile and flexural.
4. The determination of slump cone esteem diminishes from trial 1 to trial 5. The most extreme estimation of compaction factor was seen at mix 3 for 0.5% Steel fibers + 0.25% Corn Husk fiber.
5. The most extreme estimation of compressive , tensile and flexural was observed at mix 3 which is of 0.5% Steel fibers + 0.25% Corn Husk fiber blend.
6. The rate loss of weight and the rate loss of compressive quality for corrosive relieving and soluble restoring increments from trial 1 to trial 5.
7. As per the strength characteristics the maximum strength is obtained at trial 3 0.5% Steel fibers + 0.25% Corn Husk fiber

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