

# Experimental Investigation on Various Grades of Self Compaction Concrete by Partial Replacement of Glass Powder in Fine Aggregates

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**Abstract-** Self - compacting concrete (SCC) is a high - execution solid that can stream under its very own load to totally fill the shape work and self-solidifies with no mechanical vibration. Such cements are a quicken for the position, to decrease the work prerequisites required for combination, completing and dispense with ecological contamination. This will guarantee that the solid got has great stream capacity, self-compacting capacity and other wanted SCC properties. The European Federation of Producers and Applicators of Specialist Products for Structures (EFNARC) [2005] have additionally set out specific rules for crisp properties of SCC.

In this investigation the primary point is to concentrate on the likelihood of utilizing modern result as a waste material in a readiness of inventive cement. One sort of waste was recognized as Glass Powder (GP). The utilization of this Glass Powder is the halfway substitution of fine total and bond was proposed in various rate for generation of self-compacting concrete. The trial work manages the element of these blends (Glass powder, super plasticizer, and bond) to enhance the quality by analyzing their particular job in self-compacting concrete.

**Index terms-** flow ability, Glass Powder, super plasticizer, strength.

## I. INTRODUCTION

One of the essential infrastructural offices that man requirements for good living is shield. The advancement of innovation in materials and development has made it conceivable to assemble even high rises. Be that as it may, the expanding cost of ordinary development materials has made it hard to meet the haven prerequisites of the abounding

populace of creating nations. Quick extension in the development business delivered with it related issues.



Fig.: Self compacting concrete

Self-compacting concrete (SCC) additionally alluded to as "self-solidifying concrete," has recently been a standout amongst the most essential improvement in the development business.

## SELF COMPACTING CONCRETE

Self-compacting concrete is a type of solid that is equipped for streaming in to the clogged inside of frame work going through the support and filling it in a characteristic way, merging under the activity of its own load without isolation and dying.



Fig.: Self compacting concrete

Characteristics of Fresh Self- Compacting Concrete  
Self-Compacting concrete is described by its extraordinary properties in crisp state to be specific stream capacity, thickness, blocking propensity, self-leveling and quality of blend. These usefulness parameters are ground into three key properties, to be specific.

1. Filling ability or deformability.
2. Passing ability.
3. Stability.

## II LITERATURE REVIEW

Suraj N. Shah., Shweta S. Sutar, YogeshBhagwat (2014) completed a preliminary look at on to find the effect of extension of red mud, which is a waste thing from the aluminum adventures, and foundry misuse sand, which is a waste thing from foundry, on the properties of self-compacting concrete containing two admixtures and experimentation blends of admixtures which is taken Super plasticizer and VMA. It will in general be assumed that most noteworthy compressive nature of self-compacting concrete with the mix of admixtures (SP+VMA) may be obtained by including 2% foundry waste sand which is a waste material of ferrous industry (foundry).

Pacheco Torgal.F et al. (2011)chosen the effect of Metakaolin and Fly searing flotsam and jetsam on quality and strength of bond. The solidness was observed by three techniques to be explicit water ingestion, oxygen vulnerability and strong resistivity. They itemized that fragmented substitution of Portland concrete by 30% Fly powder prompts authentic decrease in early age compressive quality than the reference mix made with 100% Portland bond. The usage of hybrid of them at 15% Fly ash and 15% Metakaolin based mixes achieved minor quality disaster

## III: MATERIALS AND METHODOLOGY

### Cement

In this undertaking we employed Commercially accessible 53 review common Portland bond produced by Ultra Tech Cement with Specific Gravity of 3.2 and Fineness Modulus of 225m<sup>2</sup>/kg utilized in all solid blends.



Fig.: Cement

### Coarse Aggregate

Innovation is expanding to incorporate the make utilization of reused materials and man-made items. In this examination utilized 12mm size totals are utilized for Self-Compacting Concrete.



Fig.: Coarse Aggregate

### Fine Aggregate

To accomplish a harmony between deformability or ease and security, the all-out substance of fineness must be high, generally around 520 to 560kg/m<sup>3</sup>



Fig.: Fine aggregate

Glass powder: Waste glass accessible locally in Pondicherry shops is been gathered and made into glass powder. In this examinations glass powder ground in ball/pulverizer for a time of 30 to 60 minutes brought about molecule sizes not exactly estimate 150 µm and sieved in 75 µm.



Fig.: Glass Powder

**MIX PROPORTIONING OF SCC**

1. Air content (by volume)
2. Coarse total substance (by volume)
3. Glue content (by volume)
4. Folio (cementitious) content (by weight)
5. Substitution of mineral admixture by rate folio weight
6. Water/folio proportion (by weight)
7. Volume of fine total/volume of mortar
8. SP dose by rate cementitious (folio) weight
9. VMA measurements by rate cementitious (cover) weight



Fig.: Mixing of concrete

**MIX DESIGN PROCEDURE FOR SELF COMPACTING CONCRETE**

MIX	MIX ID
NORMAL CONCRETE	A1
75% FINE AGGREGATE + 25% SAW DUST	A2
50% FINE AGGREGATE+ 50% SAW DUST	A3
25% FINE AGGREGATE+ 75% SAW DUST	A4
0% FINE AGGREGATE+ 100% SAW DUST	A5

**Batching and Mixing**

Clustering is procedure of estimating the amounts of cement either by volume or by mass for planning of solid blend. In this weight clumping strategy is embraced to gauge the amounts of fine total, concrete, coarse total, fly fiery debris and GGBS and super plasticizer. For blend extent for configuration were estimated by utilizing gauging balance. The elements of cement in the required amounts were upgraded into the limit lab solid blender. After through blending i.e., having accomplished uniform shading, useful consistency to concrete, the solid was transported into plate for throwing examples.

**Casting and Curing of Specimens**

IS standard 150mm×150mm ×150mm for 3D shapes, 150mm ×300mm for barrels, and 700mm×150mm×150mm for shafts for throwing examples the solid has been set in the standard metallic forms in three layers and compacted with packing pole by giving 25 blows. Before putting the solid in molds a thin layer of oil was connected for the dividers of the molds inside for simple evacuation. At that point molds were put on needle vibrator for 10 r 15 seconds in the wake of completing easily on the best surface of examples.

**IV EXPERIMENTAL INVESTIGATION  
COMPRESSIVE STRENGTH TEST**

**TEST PROCEDURES FOR SELF-COMPACTING CONCRETE (SCC):**

This area portrays the different tests for the most part performed on self-solidifying concrete (SCC). The physical attributes of SCC as decided utilizing these tests are basic for guaranteeing quality structures that are protected, sturdy and efficient.

**Workability Tests for SCC**

In this investigation workability tests are followed by

1. Slump Flow Test with T500
2. L-Box Test
3. V-funnel and T5
4. J-Ring Test

**COMPRESSIVE STRENGTH TEST**

Solid 3D shapes of sizes 150mm×150mm×150mm were tried for smashing quality. Compressive quality relies upon heaps of factor, for example, w/c proportion, bond quality, brilliance of solid material and greatness control amid produce of cement.



Fig. Compressive Strength Test

**SPLIT TENSILE STRENGTH OF CONCRETE**

The following tests are conducted for the calculation of compressive strength

- ACID RESISTANCE TEST
- SULPHATE ATTACK TEST
- ALKALINITY TEST
- RCPT (RAPID CHLORIDE PERMEABILITY TEST)

#### Acid Attack Test

The solid 3D square examples of different solid blends of size 150 mm were thrown and following 28 days of water restoring, the examples were expelled from the relieving tank and permitted to dry for one day. The loads of solid 3D square example were taken. The corrosive assault test on solid 3D shape was directed by drenching the 3D squares in the corrosive water for 90 days following 28 days of relieving. Hydrochloric corrosive (HCL) with pH of around 2 at 5% load of water was added to water in which the solid blocks were put away.

#### Sulfate Attack Test

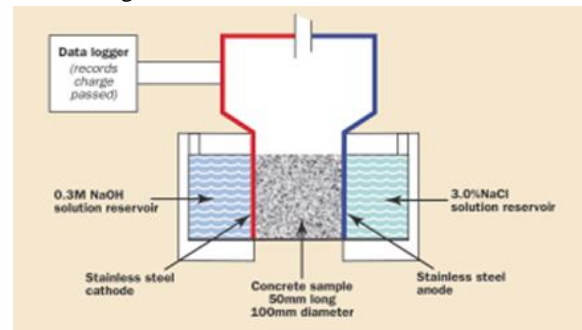
The obstruction of cement to sulfate assaults was concentrated by deciding the loss of compressive quality or variety in compressive quality of solid 3D shapes drenched in sulfate water having 5% of sodium sulfate ( $\text{Na}_2\text{SO}_4$ ) and 5% of magnesium sulfate ( $\text{MgSO}_4$ ) by load of water and those which are not submerged in sulfate water. The solid 3D squares of 150mm size after 28days of water relieving and dried for one day were inundated in 5%  $\text{Na}_2\text{SO}_4$  and 5%  $\text{MgSO}_4$  included water for 90days. The convergence of sulfate water was kept up all through the period.

#### Antacid Attack Test

To decide the opposition of different solid blends to basic assault, the leftover compressive quality of solid blends of shapes submerged in basic water having 5% of sodium hydroxide ( $\text{NaOH}$ ) by load of water was found. The solid 3D shapes which were restored in water for 28 days were expelled from the relieving tank and permitted to dry for one day. The loads of solid 3D square example were taken. At that point the 3D squares were inundated in basic water constantly for 90 days.

RCPT (RAPID CHLORIDE PERMEABILITY TEST)

Consumption of fortifying steel because of chloride entrance is a standout amongst the most widely recognized natural assaults that lead to the crumbling of solid structures. Consumption related harm to connect deck overlays, parking structures, marine structures, and assembling plants results in a huge number of dollars spent every year on fixes. This sturdiness issue has gotten far reaching consideration as of late in view of its incessant event and the related mind-boggling expense of fixes. Chlorides infiltrate split free cement by an assortment of instruments: fine assimilation, hydrostatic weight, dissemination, and evaporative transport. of these, dissemination is dominating.



The RCPT setup is simple and provides results relatively quickly.

#### V RESULTS

This part elucidates the mechanical quality properties like compressive quality, split inflexibility, flexural quality, non-hazardous test (skip back hammer) and young's modulus preliminary of strong mix with fly soot and ground granulated effect warmer slag and talk are presented.

#### COMPRESSIVE STRENGTH RESULTS

Compressive strength of the cubes when they are tested under the following parameters are given below

1. ACID RESISTANCE TEST
2. SULPHATE ATTACK TEST
3. ALKALINITY TEST
4. RCPT (RAPID CHLORIDE PERMEABILITY TEST).

#### NOTE:

Before setting off to the test for the threw example, we should exercise with the loads of the examples when the relieving, by the manner in which we can

plainly see which blend extent will support the concoction, corrosive restoring.

TEST RESULTS IN NORMAL CURING

Table COMPRESSION TEST RESULT @ NORMAL CURING.

Mix Designation	Compressive strength N/mm <sup>2</sup>	
	28 days	
A1	33.0	
A2	33.8	
A3	36.3	
A4	41.6	
A5	32.4	

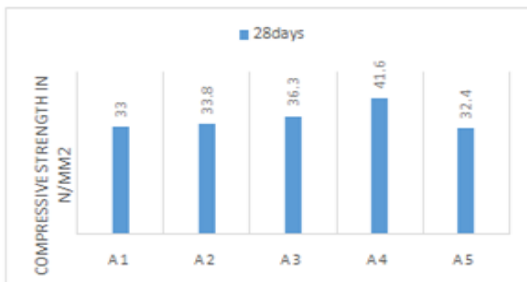
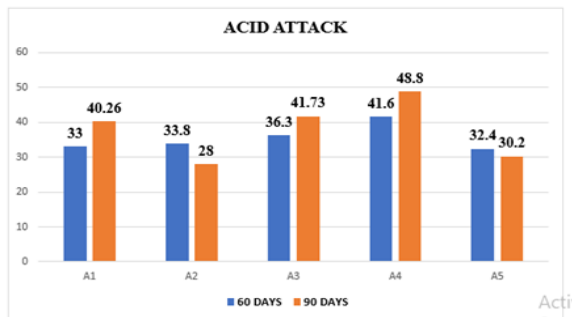


Fig.6.2: Compressive Strength test results (Acid Attack @ 60 DAYS)

TEST RESULTS IN ACID ATTACK:

Table COMPRESSION TEST RESULT @ ACID ATTACK

Mix Designation	Compressive strength N/mm <sup>2</sup>	
	60 days	90 days
A1	33.0	40.26
A2	33.8	28.0
A3	36.3	41.73
A4	41.6	48.8
A5	32.4	30.2



Compressive Strength test results (Acid Attack)

TEST RESULTS IN SULPHATE ATTACK

Table COMPRESSION TEST RESULT @ SULPHATE ATTACK

Mix Designation	Compressive strength N/mm <sup>2</sup>	
	60 days	90 days
A1	37.4	35.53
A2	38.26	37.4
A3	31.56	40.2
A4	43.73	41.36
A5	32.50	30.5

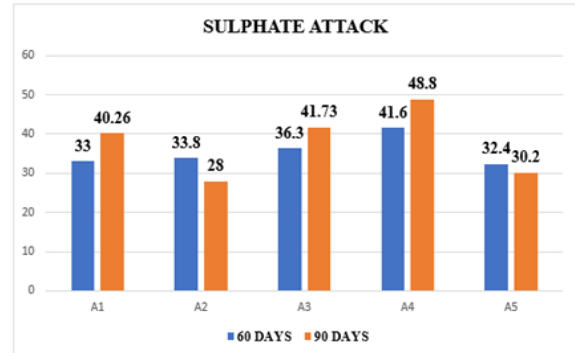


Fig.: Compressive Strength test results (Sulphate attack)

TEST RESULTS IN ALKALINITY TEST

Table.COMPRESSION TEST RESULT @ ALKALINITY TEST

Mix Designation	Compressive strength N/mm <sup>2</sup>	
	60 days	90 days
A1	37.93	41.53
A2	42.6	45.96
A3	29.23	33.26
A4	38.06	39.83
A5	28.42	29.82

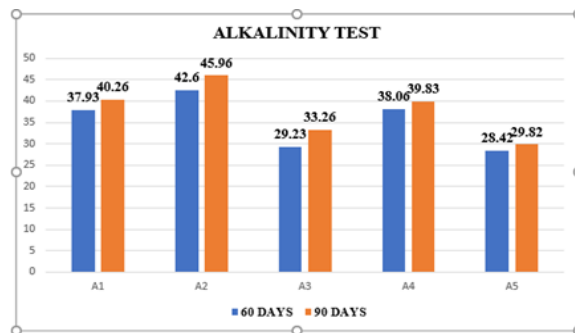


Fig.: Compressive Strength test results (ALKALINITY TEST)

RCPT test values:

Table.:RCPT VALUES @28 DAYS & 60 DAYS.

MIX PROPORTIONS	CHARGE PASSED (COULOMBS)	
	28DAYS	60 DAYS
A1	1652.5	1286.7
A2	1435.4	1058.5
A3	1173.6	953.55
A4	1058.7	735.89
A5	1175.6	985.3

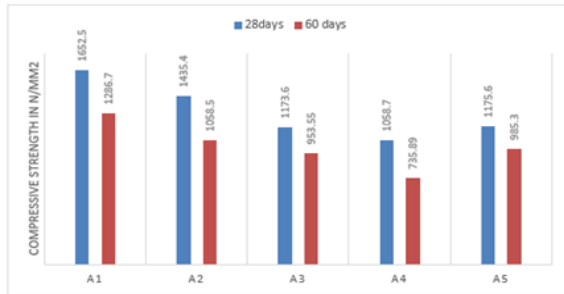


Fig.: RCPT test results

VI. CONCLUSION

- According to our examination, expansion of Saw residue to the solid, can enhance the new solid properties.
- The results demonstrated that the utilization of Saw Dust in solid balances the impact of Saw Dust has expanding the measurement of admixture in cement to accomplish new solid properties.
- From this undertaking we can infer that the blend extent @A4 withstands every one of the qualities and we got ideal outcomes for the above blend
- Replacing FA with Saw Dust diminishes the quality of SCC blend when contrasted and rate augment in sawdust.

SCOPE OF FUTURE WORK

- Fly fiery debris can supplant a critical piece of the fundamental filler when utilized into a self-compacting solid organization.
- The disposal of vibrating hardware enhances nature insurance close development and precast destinations where concrete is being set, diminishing the presentation of laborers to clamor and vibration.

- The enhanced development practice and execution, joined with the wellbeing and security benefits, make SCC an extremely alluring answer for both precast concrete and structural designing development. In light of these certainties it tends to be presumed that SCC will have a brilliant future.

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