

## Self-Compacting Concrete Properties by Using Rice Husk Ash & Recycled Aggregates

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### Abstract

The advancement of Self Squeezing Concrete is reformist achievement all through the whole presence of improvement industry achieving extraordinary use of SCC by and large nowadays. It has various advantages over run of the mill concrete in regards to redesign in effectiveness, decline in labor and as a rule cost, staggering finished thing with splendid mechanical response and toughness. Joining of rice husk further improves its properties. In this way the reason for the current investigation is to make a review of new properties of self-joining concrete, created utilizing rice husk. This evaluation explores the new properties of self-compacting concrete by utilizing rice husk debris as a strong substitution. The explanation behind this assessment is to survey the genuine properties of self-compacting concrete by using 0%, 4%, 8%, 12%, 16%, 20% climb husk flotsam and jetsam as a solid replacement and 5% Recycled Aggregates. The real properties of new concrete were analyzed using hang test, V-channel test, and L box test for self-compacting concrete. Total 5 illustration of self-compacting concrete were prepared, every model contains 25% of cement with different paces of rise husk garbage as a solid replacement, 39% of sand with 5% of Recycled Aggregate sand 36% of coarse aggregate. The water to cement extent 0.50 is used in every model and 0.40% super plasticizer moreover used in every model.

**Key Words:** Rice Husk ash, fresh properties, admixtures, Recycled Aggregate, Self-Compacting Concrete properties.

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### I. Introduction

Advancement of Self-compacting concrete was first done in Europe and Japan. It is a strong that can stream and fill all parts of the side of the formwork, even inside seeing thick help, totally by strategies devoid of the requirement of any compaction or any kind of vibration. The improvement of Self Compacting Concrete by Prof. Okamura in 1986 generally influences the advancement business by vanquishing a segment of the inconveniences associated to recently organized concrete. The SCC in new construction describe different difficulties in relation with the inclination of laborers, thickness of help, type and plan of hidden zone, siphon limit, for the most part compaction and, detachment check. The Self Consolidating Concrete, that is ironic in fines content, is presented to be really continuing on. Regardless, it occurred in Japan; measures of examination were recorded on the general progress of SCC and its downsized well-disposed framework and strength focuses. Regardless, the Bureau of Indian Standards (BIS) has not used a standard mix way while total of progress frameworks and specialists completed an extensive evaluation to discover bona fide blend plan essentials and self-insignificant cutoff testing moves close. Made without assistance from any other person Compacting Concrete takes after that of normal concrete, including, admixtures, coarse aggregates and fine total, fines, water and catch. For changing the rheological properties of SCC from ordinary solid that is a shocking extraordinary, SCC ought to have more fines content, super plasticizers with consistency changing specialists reasonably.

### II. Literature Review

In normal terms, when poured, SCC is an incredibly fluid mix in with the going with specific sensible features – it streams adequately inside and around the formwork, can flow through impediments and around corners ("passing limit"), is close to self-leveling (though not actually self-leveling), needn't bother with vibration or pressing ensuing to pouring, and monitors the shape of a structure (or design) eagerly once set. Accordingly, pouring SCC is in like manner altogether less work concentrated stood out from standard concrete mixes. Once poured, SCC is commonly similar to standard concrete concerning its setting and facilitating time and strength. SCC doesn't use a serious degree of water to get fluid – to be sure SCC may contain less water. Taking everything into account, SCC gains its fluid properties from a shockingly serious degree of fine

aggregate, similar to sand (routinely half), got together with super plasticizers (added substances that ensure particles disperse and don't get settled the fluid mix) and consistency updating admixtures (VEA).

Ordinarily, concrete is a dense, sticky material when mixed, and when used being developed, needs the use of vibration or various systems (known as compaction) to dispense with air bubbles (cavitations), and honeycomb-like openings, where air has been found during pouring. Such an air content (rather than that in coursed air through concrete) isn't needed and cripples the strong expecting to be left. In any case it is troublesome and needs some venture to wipe out by vibration, and unseemly or inadequate vibration can provoke undetected issues later. Additionally some staggering designs can just with critical exertion be shaken. Self-joining concrete is proposed to dodge this issue, and not need compaction, consequently decreasing work, time, and a possible wellspring of particular and quality control issues.

The first time SCC was used in North America and was depicted by the use of commonly high substance of folio similarly as high estimations of engineered materials, typically super plasticizer to improve flow ability and constancy. Such unrivaled concrete had been used commonly in fix applications and for extending concrete in restricted locales. The SCC was thusly depicted and decided for explicit applications.

SCC is used for projecting seriously upheld territories, places where there can be no induction to vibrators for compaction and in complex conditions to project, giving a far unparalleled surface than normal concrete.

At Present-day self-compacting concrete can be assigned an overall progression material. As the name recommends, it shouldn't be vibrated to accomplish full time compaction. This arrangements different benefits and prizes over customary concrete. These incorporates an improved nature of concrete and reduction of on the spot fixes, quicker headway times, bring down all around costs, help of presentation of mechanization into solid unforeseen development. The development of SCC mixes joins liberal degrees of fine-grained inorganic materials and this gives openings for use of mineral admixtures.

**Saifuddin et al. (2008)** showed that shrinkage occurunce concrete concretes and become dry at the main ages. It begins probably stream diverts as downsized breaks. These breaks give the enlistment to hurtful prepared experts, and hence sway the force of concrete. The drying withdrawal of SCC doesn't separate mostly from that of ordinary concrete. Several appraisals clear that it very well may be even substandard in SCC. Taking everything into account, the reduced coarse supreme substance and the all-encompassing extent of setting up material are predictable for causing genuinely drying shrinkage in SCC. By and by, the porosity besides impacts the drying shrinkage of concrete. As the porosity is condensed in SCC, it repays the harmful impacts of total and lock on drying shrinkage. Additionally, the drying shrinkage will when everything is said in done reduction in SCC since a subtle measure of open water is presented in the framework. Also, SCC has least void voids on solid surface which are all around at risk for drying shrinkage.

Research performed on the effect of w/c degree on novel and solidified properties of SCC by **Felekoglu et al. (2005)**. As specified by the creator variation of w/c degree and super plasticizer assessment is basic properties in proportioning of SCC mixes. In this evaluation, fine mixes with various mixes of w/c degree and super plasticizer assessment levels were explored. The aftereffects of this examination show that the ideal w/c degree for creating the SCC is in the degree of 0.84-1.07 by volume.

**Bui et al. (2002)** discussed a quick technique to test the insurance from confinement of Self-compacting concrete. Expansive test lead of SCC with different water-latch extents, stick volumes, mixes among coarse and fine sums and various sorts and substance of mineral admixtures was finished. The test was helpful in wrapping up the strategy close by the mechanical get together used for breaking down the disconnection resistance of SCC in both the manners (vertical and level).

**Cengiz (2005)** used fly-flotsam and jetsam with SCC in different relating requirement of 0%, half and 70% substitution of standard Portland strong (NPC). He examined the strength properties of self-compacted concrete coordinated utilizing HVFA (high volume fly debris). Solid mixes made with water cementations material degrees went from 0.28 to 0.53 were set up at wet and dry quieting conditions.

He assessed the strength properties of the blend and built up an association between compressive strength and flexural firmness. The assessment showed that it is conceivable to change over a RCC (zero hang) concrete to a supportive concrete with the use of reasonable super plasticizer.

**M.Collepari, et al.(2006)** pondered crafted by VMA with the non-receptiveness of the picked volume range 270-300 liters/m<sup>3</sup> of confining material (max size = 30 $\mu$ m) to make obvious SCC and watched that the mix of VMA and denied of mineral filler. A minor growth conveyed by strong substance should be in the assessment of VMA (for instance from 4 to 9 Kg/m<sup>3</sup> to achieve an un-segregable SCC without mineral filler. To spread it out basically, the assessments of mineral and designed admixtures are fundamental in keeping the new and established properties, and improving the strength credits of SCC.3. EXPERIMENTAL PROGRAM

In this section, the materials utilized in the test program are expressed alongside their qualities and sources. As per the subject of this examination, the greater part of the materials utilized in the exploration program were obtained from neighborhood sources inside the Pakistan. Additionally the test methods continued

in the examination are unmistakably spread out. Three distinctive surplus materials that are accessible nearby notwithstanding two other imported materials were utilized as filler materials for building up the Self-compacting solid combinations. The examination work was effected in three significant stages. The main stage included choice and securing of the waste materials, aggregates and planning the preliminary blends for chosen ternary mixes of materials. In the subsequent stage, the errand comprised fixing the ideal measurements of SP and Rice Husk Ash needed for getting flow able SCC. This was finished by running a few preliminaries and estimating the stream boundaries (droop stream, V pipe stream time and L box) until the qualities were inside as far as possible. 5 blends, including the control, were attempted.

### III. Materials Used In The Development of SCC Mixes

The concrete sort utilized was standard Portland concrete, having a particular gravity of 3.15. This is the most utilized concrete sort in the Pakistan. Its substance synthesis is appeared in.



Fig 3.1 regular Portland cement

Table 3.1 chemical composition of regular Portland cement

COMPONENTS	WEIGHT %
CaO	55.6
SiO <sub>2</sub>	0.6
Al <sub>2</sub> O <sub>3</sub>	0.4
Fe <sub>2</sub> O <sub>3</sub>	0.2
K <sub>2</sub> O	0.1
MgO	-
Na <sub>2</sub> O	-
Cl	0.1
LOL	43
SPECIFIC	2.7

Marble has been typically used as a construction material since the out of date events. In this way, Marble waste as a result is an essential material which requires adequate natural expulsion effort. In addition, reusing waste without real organization can achieve environmental issues more conspicuous than the genuine waste. Marble dust is a result molded during formation of marble.

Table 3.2 Chemical Composition of Marble Powder

IS Sieve Size	Weight of the Retained Aggregate			Percentage of the Total Retained Weight	Cumulative Percentage of Retained Weight	Percentage Passing
	Sr. No.					
	(i)	(ii)	Average			
20	82.1	48.3	65.2	6.52	6.52	93.48
12.5	660	751.1	705.55	70.555	77.075	22.925
10	99.5	93.3	96.4	9.64	86.715	13.285
5	150.1	101.8	125.95	12.595	99.31	0.69
Pan	8.3	5.5	6.9	0.69	100	0



**Fig 3.2 Marble powder**

A huge proportion of powder is made during the cutting cycle. The outcome is that about 25% of the essential marble mass is lost as development. Leave these waste materials to the climate obviously can cause ordinary issues like expansion in the earth alkalinity, impacts the plants, impacts the human body, and so forth Marble dust, a strong waste material produced using the marble dealing with can be utilized both as a filler material in concrete or fine aggregate while organizing concrete.

A colossal proportion of powder is made during the cutting participation. The outcome is that about 25% of the fundamental marble mass is lost as development. Leaving these waste materials to the climate obviously can cause regular issues like augmentation in the dirt alkalinity, impacts the plants, impacts human body, and so forth Marble dust, a strong waste material conveyed from the marble dealing with can be utilized either as a filler material in concrete or fine entireties while getting ready concrete. Marble powder can be utilized as an admixture in concrete, so strength of the solid can be broadened. The creation of more moderate and more grounded utilizing this waste can assist the basic master cooperation with guaranteeing economy in the infrastructural experience and overview the basic defilement issue.

### COARSE AGGREGATES

The coarse sums in this examination were crushed limestone sourced from close by pitMargala in Taxila.The coarse complete has a most extraordinary absolute size of 10 mm, express gravity of 2.10 and osmosis of 0.4%.



**Fig 3.3 Coarse aggregates**

### FINE AGGREGATES

Edge sand, an endlessly open material in the Pakistan, was utilized as satisfactory supreme in this investigation. The particular gravity of fine hard and fast was 2.56, and the support was 0.4%. Fine assessment open in Lawrancepur are the absolute best fine complete in Pakistan.

**Table 3.4: Sieve Analysis of Fine Aggregate**

IS Sieve #	IS Sieve Size (mm)	Weight Retained in g	Percentage Weight Retained	Cumulative Percentage Weight Retained	of	Cumulative Percentage of Passing
3/8"	10	0	0	0		100
4	4.75	3.3	0.339715874	0.339715874		99.66028413
8	2.36	5.7	0.586781964	0.926497838		99.07350216
16	1.18	39.1	4.025118386	4.951616224		95.04838378
30	0.6	235.1	24.20218242	29.15379864		70.84620136
50	0.3	379.6	39.07761993	68.23141857		31.76858143
100	0.15	259.3	26.69343216	94.92485073		5.075149269
200	0.075	41.1	4.231006794	99.15585753		0.844142475
Pan		8.2	0.844142475			

**Water**

Consumable water acclimating to IS: 3025-1986 area 22 &23 and IS 456-2000 was used in the assessments.

**Admixture**

The SikaViscoCreteLeading from Sika is super plasticizer and thickness evolving admixture, used in the current assessment.

**Rice Husk Ash (RHA)**

The rice husk garbage has a manufactured association like an enormous number of the characteristic strands. Rice husk flotsam and jetsam involves the going with:

- Cellulose (C<sub>5</sub>H<sub>10</sub>O<sub>5</sub>)
- Lignin (C<sub>7</sub>H<sub>10</sub>O<sub>3</sub>)
- Hemicellulose
- SiO<sub>2</sub>
- Holo-cellulose

These are compounds inside them in like manner. The rice husk trash may differentiate subordinate upon the source also as such a treatment. Treatment in the sense the rice husk is singed to have fitting properties.

Consequently, the strategy for warming can correspondingly get changes the generally designed course of action of the junk. The silicates are one of the major bits of the rice husk debris.

During the eating up collaboration, the parts that can dissipate are dispersed and the singular segment left are the silicates. The rice husk junk to be more exact have credits dependent on the segments, the temperature of consuming and the hour of eating up.



**Fig 3.4 Rice Husk Ash**

Likewise, this clarifies that legitimate quality eating up of rice husk to get the trash would discard the cellulose and rice husk areas saving the essential cell plan of the rice husk particles.

**MIX DESIGN OF PLAIN SCC AND TESTING OF ITS FRESH**

Figurings of trimmings used to discover the new properties of self-compacting concrete was done. Viscocrete admixture was used to diminish the water content and advance usefulness as indicated by the need for SCC. To choose the new properties of the mix orchestrated changing in accordance with SCC, unmistakable new tests like hang stream, L-Box, V-Funnel were performed. The test work was driven at lab of help strong lab in Civil Engineering Department of UET Taxila

**Table 3.5 calculation of different ingredients in the mixture**

MATERIAL	WEIGHT (KG)	PERCENTAGES %
CEMENT	31.22	17
COARSE AGGREGATE	54	35
FINE AGGREGATE	60	30
RHA	5.08	12
M.P	8.3	5

WATER	17.8	0.45 W/C Ratio
SP	0.83	1

### MIXING OF INGREDIENTS

The mixing material was remembered degrees for the mixing plate by then put it into the strong blender in dry state two or three minutes. By then the water were added and involve it for 3 minutes. Throughout this period the air entrain trained professional and the water demeanor are similarly added. Lazy era was 10 mins. To gain the flowable self-compacting strong super plasticizer was incorporated the blender by then mix it suitably after that finds the new properties of self-compacting concrete.



Fig 3.5 mixing of material

### WAYS FOR DETERMINING THE NEW PROPERTIES OF SCC

To choose new properties of SCC, various procedures were made. Hang stream and V-Funnel tests have suggested for analyzing the deformability and consistency independently. L-Box test has proposed for choose the confinement resistance.

### T50 TEST AND SLUMP FLOW TEST

The hang stream test is applied to pick the free development of self-compacting concrete without impediments.



Fig 3.6 slump cone test

- Six liter of concrete was prepared for the test.
- Then inside surface of hang cone was sprinkle. The test stage was resolved to the leveled surface then the hang cone unintentional with the 200 mm circle on the stage and stands firm on in foothold by remaining on the foot pieces, guaranteeing that no spillage of concrete was occur under the cone.
- Cone was done off with concrete without passing. By then base was washed if any flood concrete around the improper of the cone.
- The cone was straight up lifted and allows the strong to stream out uninhibitedly. Expediently the stopwatch was on track, and scrutinizing was recorded for T50 test when concrete showed up at 600mm marked circle.
- The last distance across of the strong spread was assessed in two contrary directions. The ordinary of the two distances across was assessed. (This is hang stream in mm)



Examination of the results: Higher hang stream respect shows the more prominent capacity to fill the formwork under its own mass. A base appraisal of 650mm is fundamental for SCC. The T50 time is a subordinate sign of stream. A lower time recommends more critical stream limit. The examination proposed a period degree of 2-5seconds for general lodging applications.

#### **IV. FUNNEL TEST**

The test is completed to choose the satisfying limit (stream limit) of self-compacting concrete.

- 12 liter of concrete was set for the test. By hose private surfaces of the channel we remoistening.
- The V-pipe gadget was determined to level surface.
- The whole organized SCC test was full the line with no pressing or pulsating.
- At that time, after 10 seconds of making full the secret entrance was released and licenses the strong to stream out below gravity.
- Directly examining was noted by strategies for stop watch till the delivery to totally whole (the stream time) and lights wereperceived from upperoverthe funnel.
- Overshort of clearing or hose privilegedexteriors of the V-funnel apparatus.
- ThecompletereadySCCmodelwasfullthefunneldeprived ofanyvibratingor filling.
- A can was set under.
- Afterward five minutes of substantial the secret doorway was unlocked and permits the strong to stream out below gravity.
- Analysis of results: The exceeding tests give meandering extent of consistency. Periodwas assessed to deliver the strong through the base opening. The guidelines for SCC is time should be  $10\pm 3$ secs.



**Fig 3.7 v funnel test**

#### **L-BOX TEST**

- This type of test is performed for determining the movement of the SCC and the hindering check.
- 14 liter of concrete wasset for thetest.
- Mechanical gathering was determined to the flattened surface. Inner surfaces of the L-Box contraction were dampened.
- Vertical piece of container was stacked up with strong, which is absent to rest for 10secs.
- Then the entryway was opened.

#### **V. Experimental Investigations' results On Frsc**

This part manages the aftereffects of trial examinations and conversation did in various stages.

##### **PREPARATION OF SCC AND STUDIES ON FRESH AND HARDENED PROPERTIES**

The principal phase in the examinations was completed to create SCC blend of base strength M30 grade by utilizing Rice Husk Ash and substance admixtures and also to contemplate its new and harden properties. For making SCC of solidarity M30 grade. In conclusion, SCC blends that generated essential compressive strength and adequate new properties, were selected, and hold for extra review. In the another period of assessment SCC with unchanged fiber substances with unchanged volume

##### **Water/concrete Ratio of Self-Compacting Concrete**

To keep up the fundamental attributes of self-compacting concrete a water concrete proportion of 0.45 was received and a % measurement of super-plasticizer Visconcrete of Sika brand were permanent for whole blends.

Results and Discussion

SAMPLE	SLUMP FLOW (500-750 MM)	T50 FLOW (2-5)sec	L BOX (H2/H1) 0.8-1.0	V-Funnel 6-12sec
RHA1	720	2.9	0.95	6
RHA2	685	3.2	0.90	8
RHA3	665	3.9	0.82	9
RHA4	625	4.0	0.78	10
RHA5	595	4.3	0.77	12

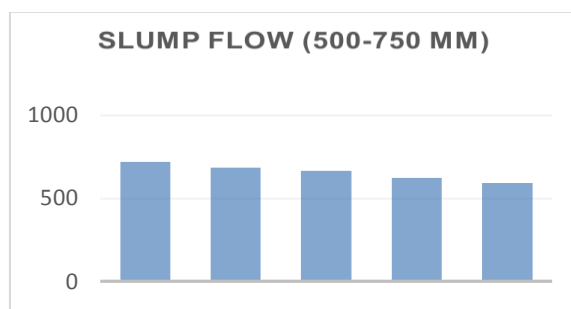


Fig 4.1 Variation inflow of Slump with respect to different mixes

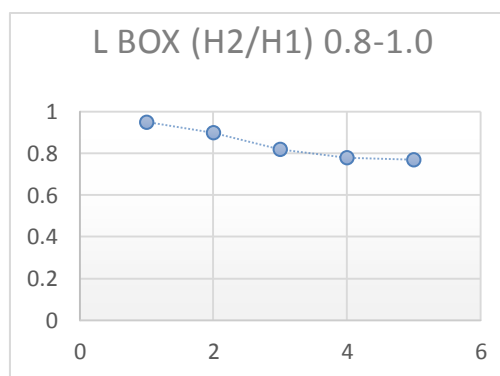


Fig 4.2 Variation of L box with different Mixes

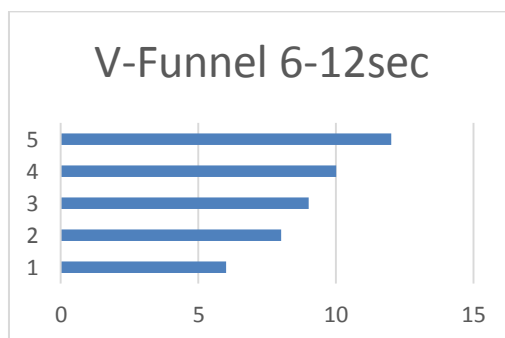


Fig 4.3 Variation of V funnel ratios with different Mixes

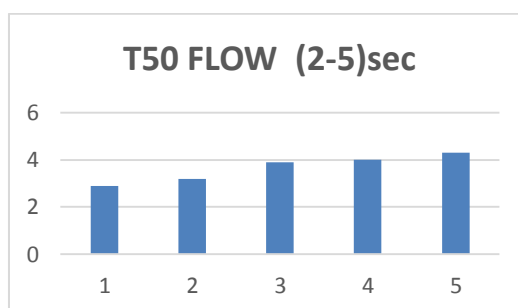


Fig 4.4 Variation of T50 FLOW with different Mixes

Freshstate's Properties

The Fig 4.1 and the Table 4.1, fig 4.2, fig 4.3, fig 4.4 shows the new properties of SCC cement of various blends. The explanation behind this marvel is that an organization construction may shape because of the SCC, which limits combination from isolation and stream.



### SlumpFlow

The droop stream diminishes with increment in RHA Ratio. The reduction in stream esteem is noticed greatest when 25% RHA is present in the solid. At that point with the further expansion in RHA carbon content is additionally increments in RHA with Absorb more prominent measure of water subsequently droop stream diminishes.

### L-Box

The L-Box esteem increments as the droop stream esteem increments. The increment in droop esteem is because of the expansion in the level of RHA just as the L-Box esteem likewise increments. The most extreme worth got on account of 12% expansion of RHA in concrete.

### FUNNEL

The V-Funnel test and T50 stream, which was estimated regarding time (seconds) and both the worth estimated are needy with one another. V-Funnel worth and T50 stream increments as the droop stream esteem diminishes. The reduction in droop esteem is because of the increment in the level of RHA.

## VI. Conclusion

From the current assessment the going with finishes can be drawn

- The hang stream regard was gained inside the acceptable value up to replacement of 25% cement by RHA.
- The V-channel and L-box Test showed sufficient motivating force up to replacement of 25% cement by RHA.
- Hence, as indicated by the essentials of new state properties of
- SCC the Addition of 25% RHA can be allowed.
- The SCC mixes in with replacement of 25% cement by RHA gave ideal results.
- Adding RHA to self-compacting strong give harm of essential credits of SCC assessed similarly as hang flowed.
- Reduction in hang stream was seen generally extraordinary with high paces of RHA. Since growing RHA contain high assessment of carbon which ingest more water than common concrete.
- RHA can be used in tremendous sums in SCC and solid substance can be diminished to as low as 305.6 kg/m<sup>3</sup> for M: 30 assessment of SCC.

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