# Feasibility of Self Compacted Concrete For Short Column Using Steel Fiber

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***Abstract***- *This paper presents the aftereffects of a test examination of as of late fiber fortified self-compacting solid composite have discovered an ever increasing number of wide applications in building. Self-compacting concrete is changed to act in an extra flexible sort by the expansion of all over circulated separate strands inside the solid lattice. Likewise, Fiber fortified self-compacting Concrete is laid out as a stuff comprising of blends of concrete, mortar or cement along with broken, discrete, consistently spread filaments. Steel Fibers is laid out as minuscule wire like fortifications that square measure produced using steel or polymers having high flexibility. Self-compacting concrete (SCC) blends of variable qualities and exhibitions were created to fulfill the stream capacity, passing capacity and isolation obstruction measures. Exploratory examination of conduct of small scope ferroconcrete short segments with steel fiber done.*

***Keywords***- SCC; Steel fiber; Compressive Strength; Short column; Load-Deformation behavior

## I. INTRODUCTION

Concrete has a few experts and cons am enthusiastic about it is decent at compressive quality, firmness, low electrical and warm conduction, low instability and poisonousness anyway it's insufficient shrewd in pressure and tolerability and for disinfecting the lacks of cement. Steel Fiber reinforced Self Compacted Concrete (SFRSCC) square measure presented. SFRSCC might be a fortifying material that generally contains concrete, water, fine blend, course blend, super plasticizers and consistency altering specialist (VMA). some of the inverse significantly utilized strands regardless of steel square measure glass, asbestos, plastic and so on.

At the point when the majority mandatory on the solid methodology that for disappointment, split can engender, commonly hack cleave, strands in concrete gives a strategy for great the break development. On the off chance that the modulus of snap of fiber is high with pertinence the modulus of snap of cement or mortar fastener the fiber assists with holding the heap, consequently expanding the lastingness of the texture. Strands increment the durability, the flexural quality, and scale backs the wet blanket strain and shrinkage of cement.

A few European nations perceived the significance and possibilities of SCC created in Japan. All through 1989, they based European alliance of characteristic exchange affiliations speaking to makers and instruments of master building item (EFNARC). the work of SCC began developing hack slash. EFNARC, making utilization of board reasonable encounters of all individuals from European league with SCC, has submerged detail and rules to create a system for style and utilization of top quality SCC, all through 2002.

The primary choices of Self-Compacting Concrete (SCC) concern the ongoing state condition (high flowability that maintains a strategic distance from outer vibration and a fair isolation obstruction); anyway inside the most recent 20 years a few inquiries about are administered concerning the alternatives of the solidified condition of the SCC and subsequently the auxiliary impacts inferable from its usage. The conduct of basic parts made-up exploitation SCC, similar to dividers bars, pillar section hubs and casings has been broke down by recommends that of test tests and investigative examinations.

The goal of the investigation is to highlight the qualification in conduct of Steel fiber fortified SCC in a word segment and conventional moving Concrete underneath the comparative conditions. Various examinations were apportioned by analysts and found that the presentation of SFRSCC than NVC because of SFRSCC empower better break the executives capacity and at the more often than not freshness is also over NVC.

*Why SFRSCC?*

1. To improve construction systems antecedently supported standard concrete that needed moving compaction.

2. To eliminate several undesirable property and to boost several fascinating property of the plain concrete.
3. To study the serving to behavior of fiber to transfer masses at the interior small cracks.
4. To improve the fatigue strength property in the slightest degree stresslevels.
5. To arrest the first orthography of the duvet and increase the load taking capability furthermore because the malleability of the columns over that of comparable non fiber-reinforced specimens.
6. To study the structural behavior of steel fiber bolstered self-compacting concrete column having sq. in cross section of size 150mm X 150mm X 600mm beneath axialloading

## II. LITERATURE REVIEW

**K.C Denesh** directed trial examination to see totally various characters like functionality and quality of Self-Compacting Concrete (SCC). Tests including fluctuated fiber extents for a chose join of SCC. check methodologies wont to contemplate the properties of contemporary cement were droop check, U – tube, V – channel and L – Box. The properties like compressive, ductile and flexural quality of SCC were conjointly researched. check Results shows that the functionality qualities of SCC square measure at stretches the restricting requirements of SCC. The variety {of diverse of varied} parameters of solidified cement (M30 and M40) with connection to different steel fiber substance were broke down.

**Vasudev R, Dr. B G Vishnuram** watched the outcomes were directed to audit the compressive & tractable conduct of composite cement with differed extent of such filaments all the more thereto. The solid join embraced were M20 and M30 with fluctuated extent of filaments beginning from 0, 0.25, 0.5, 0.75 and 1%. On the examination of check results the solid with flip steel strands had improved execution when contrasted with the solid with normal steel filaments that were immediately available in advertise. These property improvements or changes can be just received by the human in their standard developments.

**EfeEwaenIkponmwosa** tested inside the examination work that the aftereffect of short heedlessly orientating and spasmodic steel strands on the auxiliary conduct of laterized solid sections. The thickness and block quality of fiber supported laterized solid will increment on the grounds that the fiber substance of the solid is aggregated. 1.5% fiber content by volume is considered as ideal worth of fiber in laterized concrete. The pliancy of fiber reinforced laterized solid will increment in light of the fact that the extent of fiber content is amassed and in this way the versatility arrives at its most at with respect to a 1% fiber content.

**Bhoopathi Vivek Reddy** assigned test examination on quality angles like compressive, flexural and split enduringness of self-compacting concrete containing inside and out totally extraordinary mineral admixtures and usefulness tests for various mineral admixtures (droop, L-box, V-pipe, U-box and T50) ar distributed. The philosophy embraced is "Nan–Su" technique for join style according to "EFNARC" details (i.e., 55, 56, 57, 58 %) that fulfills the contemporary properties and likewise the solidified properties of SCC restrict the water/powder quantitative connection is consistent. The impact of mineral admixtures on the usefulness, compressive quality, and flexural quality of self-compacting concrete was explored. the mix extent is acquired according to the standards given by European Federation of makers and contractual workers of extraordinary item for structure. Accordingly, in general upgrades at stretches the stream capacity, filling capacity and isolation obstruction of oneself compacting concrete were resolved.

## III. MIX DESIGN

We have used IS 10262 -2009 for M -30 grade of concrete with the 3 trials.

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We used OPC 53 grade cement, regionally out there Sand. We used OPC 53 grade cement, locally available Sand, Aggregates having a max size of 20 mm in that 40% of was passing through 20 mm IS sieve and retaining on 12.5 mm IS sieve and 60% was passing on 12.5 mm IS sieve and retained on 4.7 5mm sieve. Commercially out there
superplasticiser CICO Plast Super C 300.SPL BS 3000 Modifying Admixture (VMA) and Steel

Fig 1: Super plasticizer

Fig 2: Steel FibersFibers with hook end.

Table 1: Properties of SteelFibers

| Fiber Type | Aspect Ratio | Length(mm) | Diameter (mm) | Tensile Strength ($N/mm^2$) |
|---|---|---|---|---|
| KL HT 80/60 | 80 | 60 | 0.75 | 1250 |

Table 2: Properties of SteelFibers

| Mix Proportion | Cement $kg/m^3$ | Fine Aggregate $kg/m^3$ | Coarse Aggregate $kg/m^3$ | W/C ratio |
|---|---|---|---|---|
| Trial-1 | 350 | 896 | 1140 | 0.40 |
| Trial-2 | 388.88 | 849.24 | 1153.69 | 0.36 |
| Trial-3 | 318.18 | 949.08 | 1114.13 | 0.44 |

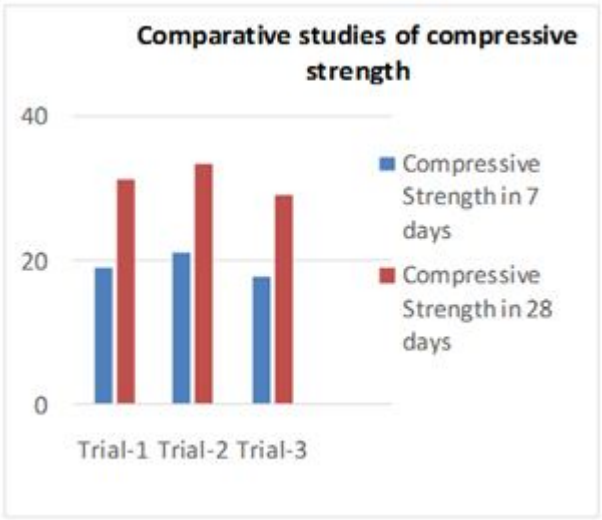


Fig.3: Comparative Study of Compressive Strength

From these three trials we conclude that the compressive strength for trial-2 is maximum as compared to other trials. So, I used trial-2proportions.

## IV. TESTSONFRESHPROPERTIESOFSFRSCC

We have performed the various test and got the result of those test as follows

### A. Slump Cone

The droop stream investigate is utilized to evaluate the flat free progression of SCC inside the nonattendance of hindrances. On lifting the droop cone, packed with concrete, the solid streams. The run of the mill width of the solid circle might be a live for the filling capacity of the solid. The time T50 cm might be an optional sign of stream. It quantifies the time taken in seconds from the second the cone is raised to the second once flat stream arrives at distance across of 500 mm.

Fig.4: Slump Flow of SFRSCC

### B. V- Funnel test

To survey the flowability and dependability of newly prepared solid, all the four blends in with very surprising substance of steel filaments were investigate ated by V-pipe test. The flowability of the contemporary cement are regularly investigate acted with the V-pipe test, whereby the stream time is estimated.

The pipe is loaded with in regards to 12 litters of cement and furthermore the time taken for it to course through the gear is estimated. Further, T5 min is moreover estimated with V-channel that shows the inclination for isolation, whereby the pipe are frequently topped off with concrete and left for 5 minutes to settle. On the off chance that the solid shows isolation, the stream time can increment significantly.

Fig.6: V- Funnel test of SFRSCC

### C. L- Box Test

The L–Box check is utilized to see the filling and spending capacity of SCC. The obstruction quantitative

connection (H2/H1) of grouped SCC blends is appeared in Figure 7. The impedance quantitative connection should be among 0.8 and 1.0. Though evaluating the contemporary cement for passing capacity, it's resolved that every one the four blends withstand the bars of L-box frightfully just and no blockage is found in any of the blends. The aftereffects of L-box check show that, however the impedance quantitative connection (H2/H1) a tiny bit at a time diminishes with the ascent inside the measure of fiber content, the quantitative connection (H2/H1) for all the blends is on zero.8, that is according to EFNARC principles. Following chart shows the aftereffects of the check led on different blends.

Fig.7: L- Box Test of SFRSCC

Table 4: Workability Results of SFRSCC

| Sr. No. | Fiber Content % | Slump Flow(mm) | T50 Slump flow (sec) | V-Funnel (sec) | L-Box (H2/H1) |
|---|---|---|---|---|---|
| 1 | 0 | 680 | 3 | 8 | 0.86 |
| 2 | 0.5 | 675 | 3 | 9 | 0.83 |
| 3 | 1 | 650 | 4 | 9 | 0.82 |
| 4 | 1.5 | 630 | 5 | 10 | 0.80 |

Table 5:Recommended values for different tests given by EFNARC for mix to be characterized as SCC mix.

| Sr. No | Methods | Unit | Typical range of values | |
|---|---|---|---|---|
| | | | Minimum | Maximum |
| 1 | Slump flow test | Mm | 650 | 800 |
| 2 | T50cm slump flow | Sec | 2 | 5 |
| 3 | V-funnel test | Sec | 6 | 12 |
| 4 | L-Box test | $H_2/H_1$ | 0.8 | 1 |

## V. DESIGN OF COLUMN

Given $l$ = 600 mm, $b$ = 150 mm and $D$ = 150 mm.
So, we have
$l_{ex}/D$= 600/150 = 4 < 12
$l_{ey}/b$= 600/150 = 4 < 12 Hence, it is a short column.

## VI. LOAD-DEFORMATIONBEHAVIOUR& DUCTILITY

The load was applied gradually at the rate of 50 KN/min and the deformation readings were taken at regular intervals. The column was gradually loaded up to the ultimate load till failure. As the load level was increased in each interval, the observed displacement was greater than that it was in earlier interval. The ductility value has been calculated as the ratio of ultimate or maximum deformation to the yield deformation. Graph showing load deformation behavior is presented below.

Table 6: Ductility of columns

| Type of Column | Ultimate load carrying capacity (KN) | Ductility Factor |
|---|---|---|
| Plain SCC | 539.5 | 2.24 |
| SFRSCC with 0.5 % fiber | 900 | 2.40 |
| SFRSCC with 1 % fiber | 976 | 2.84 |
| SFRSCC with 1.5 % fiber | 919 | 2.43 |

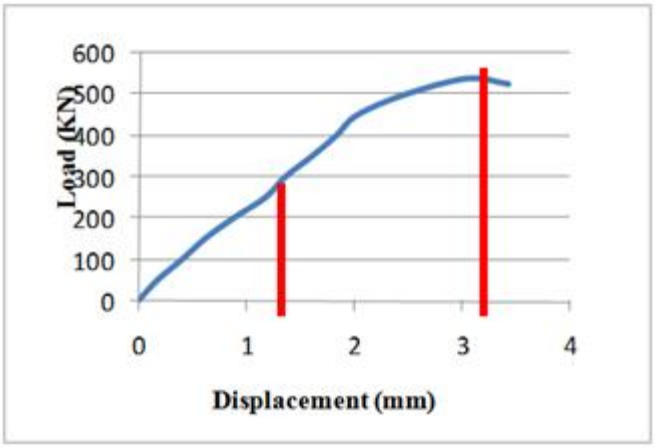


Fig 8: Average Load–deformation curve for Plain RCC column

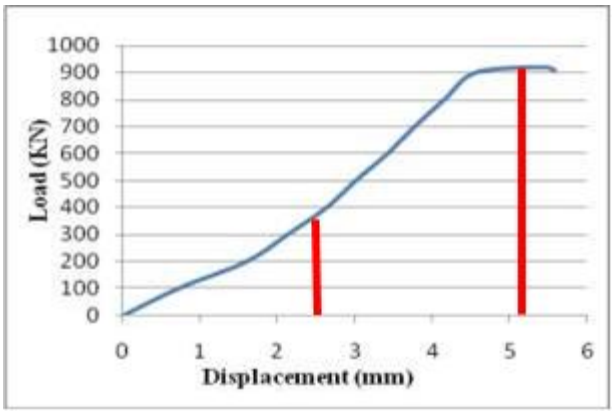


Fig 9: Avg. Load–deformation curve for SFRC column with 0.5% fibers

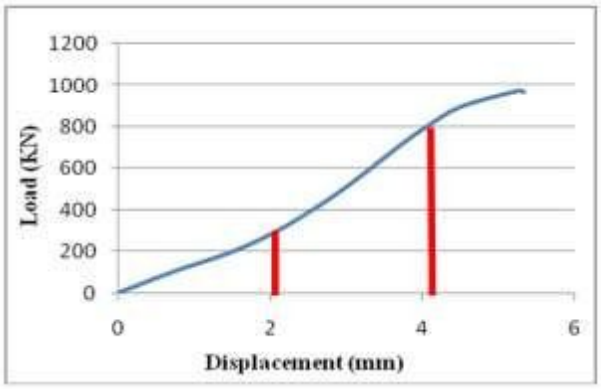


Fig 10: Avg. Load–deformation curve for SFRC column with 1% fibers

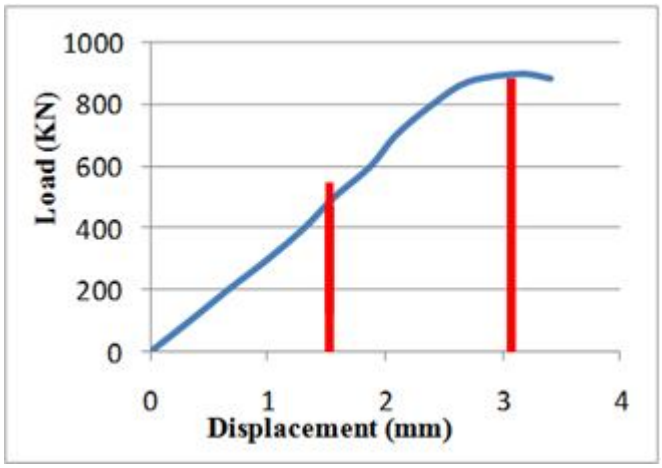


Fig 11: Avg. Load–deformation curve for SFRC column with 1.5 % fiber

## VII. CONCLUTION

The following conclusions are made of the on top of experimental study:

1. The functionality results are seen as agreeably worthy in accordance with EFNARC guidelines. SFRSCC with high functionality and reasonable droop maintenance are regularly acquired for a fiber content upto 1.0% for the fiber tried.
2. It's found to have reasonable consistency and functionality for all the four blends at a persistent w/c of 0.36 and steady super plasticizer portion of 2 % on weight of concrete.
3. Comparison of usefulness investigate consequences of different combos of joins with the reference blend shows that with increment inside the fiber content inside the blends, the mix becomes thick and along these lines less plausible.
4. It demonstrates that compressive quality in any regard ages will increment inside the expansion of steel strands up to 1.0%.
5. The expansion of 0.5% to 1.0% steel fiber to M-30 Grade of cement has expanded the heap conveying ability of the SFRSCC segments by 8.44 % at 28 days of development
6. The SFRSCC section having 1 % steel strands indicated firm incline chart in this manner it conveyed higher burden with peripheral pivotal twisting when contrasted with SFRC segment with 0.5% steel filaments.
7. Generally it's discovered that SFRC section has higher estimations of pliability when contrasted with plain RCC segment. SFRC section could likewise be required for tremor opposing structures.

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