

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

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**Abstract-** This examination paper we tend to display the exploratory aftereffects of an investigation on huge scale bound self-compacting solid sections; this study is a part of an enormous program concerning the conduct of self-compacting concrete and along these lines the basic impacts on account of its use. The inspected factors have encased solid kind SCC. SCC is primarily utilized once a decent smoothness is mentioned (for instance high steel fortification extent. The outcomes show that once a SCC is utilized as opposed to high flowability concrete, each the texture and along these lines the auxiliary conduct square measure on the normal comparative; regularly a bigger disperse of the exploratory amounts recognizes the aftereffects of the tests on SCC individuals. We tend to conjointly deal with totally unique system like, Steel fiber. Droop Test, V-channel investigate, L-Box Test, J-Ring investigate, Self Compacted Concrete, Short Column. The objective that normal from the paper is to arrange the ongoing developments in SCC, study their effect on the properties of SCC and set up a world benchmarking for extra investigation work right now.

**Keywords-** SCC, Compressive strength, Mix Design, Super plasticizer.

## I. INTRODUCTION

Despite the fact that solid have high compressive quality, solidness, low warm and electrical conduction, low instability and harmfulness anyway 2 attributes limited its utilization square measure, it's fragile and powerless in strain. be that as it may, the improvements of Fiber fortified Composites (FRC) have given a specialized premise to up these lacks. Filaments square measure little things of fortifying materials more to a solid join that normally contains concrete, water, fine and course blend.

Among the preminent basic filaments utilized is steel, glass, asbestos, polypropene and so forth once the hundreds mandatory on the solid methodology that for disappointment, split can spread, by and large apace, strands in concrete give a technique for shocking the break

development. On the off chance that the modulus of physical property of fiber is high with connection to the modulus of physical property of cement or mortar folio the fiber assists with holding the heap, along these lines expanding the enduringness of the texture. Filaments increment the durability, the flexural quality, and cut back the jerk strain and shrinkage of cement.

Numerous European nations perceived the significance and possibilities of SCC created in Japan. All through 1989, they based European organization of characteristic exchange affiliations speaking to makers and implements of pro structure stock (EFNARC). The utilization of SCC began developing apace. EFNARC, making utilization of board reasonable encounters of all individuals from European alliance with SCC, has required determination and rules to create a structure for style and utilization of prime quality SCC, all through 2002.

The fundamental alternatives of Self-Compacting Concrete (SCC) concern the on-going state condition (high stream capacity that stays away from outside vibration and a tolerable isolation obstruction); anyway inside the most recent twenty years a few looks into are distributed concerning the choices of the solidified condition of the SCC and furthermore the auxiliary impacts because of its usage. The conduct of basic parts anecdotal misuse SCC, similar to dividers pillars, bar section hubs and casings has been dissected by implies that of test tests and logical examinations.

The point of the investigations was to concentrate on potential varieties of the conduct of the SCC individuals, contrasted with the traditional vibrate Concrete (NVC) – underneath a comparative conditions -, because of the greater conservativeness and furthermore the higher cling to the steel bars of the SCC. A few specialists alludes that the SCC individuals have a more grounded auxiliary execution than a NVC individuals, because of the SCC licenses to get a more grounded split administration capacity, anyway by and large a ton of weak conduct showed up.

There are several benefits of exploitation SCC, particularly once the fabric value is reduced. These include:

1. Reducing the development time and labor value
2. Eliminating the necessity for vibration
3. Reducing the pollution
4. The filling capability of extremely full structural members
5. Facilitating constructability and guaranteeing smart structural performance

## II. LITERATURE REVIEW

**Nan Su** proposes a trade consolidate style approach for self-compacting concrete (SCC). To begin with, the quantity of totals required is chosen, and accordingly the glue of folios is then packed into the voids of totals to ensure that the solid so got has flow ability, self-compacting capacity and diverse wanted SCC properties. the quantity of totals, fasteners and aggravating water, comparatively as sort and portion of super plasticizer (SP) to be utilized region unit the premier variables impacting the properties of SCC. Droop stream, V-channel, L-stream, U-box and compressive quality tests were apportioned to take a gander at the presentation of SCC, and in this way the outcomes demonstrate that the arranged strategy may turn out with progress SCC of prime quality. during this procedure utilization of super conditioner region unit utilized for up the stream or usefulness for lessen water concrete quantitative connection while not forfeit inside the compressive quality, furthermore utilized violence changing operator (VMA) for giving extra danger of prevailing isolation.

**Dr.Mrs. S.A. Bhalchandra** examined concerning the Steel Fiber strengthened Self Compacting Concrete (SFRSCC) inside the ongoing and in solidified state. The super plasticizer utilized for this examination & The consistency altering specialist for the most part, the various improvement in various qualities is resolved with the consideration of Hooked completion steel strands inside the plain concrete. Nonetheless, most increase in quality of cement is found to depend upon the quantity of fiber content. The ideal fiber substance to give most pick up in various qualities changes with kind of the qualities. for the most part the compressive quality and thusly the flexural quality increment with increment inside the extent of fiber content. Palatable usefulness was kept up with expanding volume portion of strands by exploitation super plasticizer.

**Ahmed Fathi** considered that the Self-compacting concrete (SCC) could be a very solid join that take out the ideal for the vibration apparatuses as their high liquidness and moderate consistency all through the ongoing characteristics Fiber support fundamentally upgrades the post breaking

characteristics of cement and gains inside a great deal of flexible material conduct, numerous examinations have made a creative arrangement to broaden the solid versatility and it's vitality assimilation capacity, to be prepared to improve by and large pliancy. In his examination the mechanical-properties in light of further particular suspends fiber to customary cement, the expansion of fiber can encourage the blends of conventional cement to keep away from the splits that created through it because of the solid could be a fragile material with an intermittent strain capacity and an incidental solidness. He brought up that the fiber concrete (FRC) will convey imperative worries over similarly monstrous strain ability if the strands square measure adequately strong and with progress verified to material.

**Raghu. H.** contemplated the consequences of different sorts of strands on the properties of Self-compacting concrete (SCC). Self - compacting concrete containing strands could be an elite relic that has the joined properties of SCC having improved attributes with the expansion of strands. Steel filaments improve the standard of solidified state concrete by showing increment in quality up to bound volume part. Utilization of extra strands division in SCC improves the solidified state anyway decreases the contemporary state properties, thereupon ideal portion of filaments square measure to be utilized while making SCC. Steel filaments fortified self-compacting solid shows wonderful lastingness, flexural quality, stun obstruction, exhaustion opposition, pliability and split capture.

**Anette.Jansson** tried on pull-out tests with short installation length misuse self-compacting steel-fiber-fortified cement. The bra support neglected to upset or improve the bond properties at the interface layer. In this way, the pre-top conduct seems, by all accounts, to be unaffected by the consideration of steel fibers. One in everything about most benefits of misuse fiber support depends to an outsized degree on the solid rebar bond. Pull-out trial of examples with short implant length was dole out and furthermore the outcomes indicated no effect from the fibers on the standardized bond-slip conduct before top burden.

**Vasudev R.** Relative investigation between ordinary cement and steel fiber concrete. The strands that were utilized in the investigation were the flip filaments. They were the pieces from the molding machine outlets. Trial examinations and investigation of results were led to check the compressive & malleable conduct of composite cement with variable portion of such filaments intercalary thereto. On the examination of check results the solid with flip steel filaments had improved execution when contrasted with the solid with standard steel strands that were immediately offered in

showcase. These property improvements or alterations can be just embraced by the human in their normal developments.

**Osman Gencela** Steel fibers adjustment the properties of solidified cement significantly. Be that as it may, expansion of fibers to late solid prompts lost usefulness. Self-compacting concrete (SCC) is partner degree creative solid that is prepared to flow underneath its own weight, totally filling formwork and accomplishing full compaction while not vibration. Droop flow, J-ring and V-pipe tests were led for assessing the fluidity, filling capacity and isolation danger of the ongoing cements. there have been no issues with aggravating or usefulness though the fiber conveyance was uniform. Steel fibers will significantly improve sturdiness of SCC and repress the commencement and development of splits

**B. Fathima** tested inside the investigation work that the properties of strands and talks about the nature of these properties to change steel filaments to be utilized in the solid. the extra of steel support extensively increment the quality of cement, anyway to supply concrete with homogenized pliable properties, the occasion of little breaks might be an ought to stifle. Strands square measure most typically intermittent, aimlessly circulated all through the concretes grids. The term 'Fiber strengthened Concrete' (FRC) is shaped up with concrete, twenty millimeter sizes of mix, that consolidate with isolated, irregular filaments. The work of the sporadic filaments appropriated unpredictably is to fill the splits inside the composite. They conjointly bring down the penetrability of cement and in this manner cut back the progression of water. A few assortments of filaments produce greater effect, scraped spot and break obstruction inside the solid. the quantity of strands required for a solid consolidate is frequently decided as an extent of the general volume of the composite materials.

**SatishRathod** examined concerning the arranging of partner degree appropriate consolidate extent and assessing the properties of the solid so acquired. Steel fiber ferroconcrete (SFRC) has been with progress utilized in changed assortments of development because of the undeniable reality that including steel filaments improves the durability and mechanical properties of solidified cement, quite flexural quality, sturdiness, sway quality, protection from exhaustion, and powerlessness to breaking and spalling. Be that as it may, the expansion of steel filaments conjointly diminishes the functionality of late solid; in this way the work of SFRC as concrete infill is wrong.

**Akshay P.** Bit tested the examination related with the reinforcing of R C short segments solid with BFRP wrap underneath pivotal stacking .The sections were verified with BFRP sheets in single layer and twofold layers with various

designs. The trial results show that the segments solid with BFRP show high burden conveying ability and versatility file.

**PayalPainuly** concentrated to expand the adequacy of ongoing solid (cohesiveness) exploitation overstated amount of fine materials inside the blends. To improvement of self-compacting concrete with diminished isolation potential. The efficient trial approach indicated that halfway substitution of coarse and fine blend with better materials may produce self-compacting concrete with low isolation potential as evaluated by the V-Funnel check. it's been confirmed, by exploitation the droop stream, T50 cm droop stream J-ring check, L-box check and U-tube tests, that self-compacting concrete (SCC) accomplished consistency and self-similarity underneath its own weight, with none outside vibration or compaction. SCC with mineral admixture displayed agreeable winds up in usefulness, on account of little molecule size and extra territory.

### III. EXPENRIMENTAL PROGRAM

**A. Cement** - Ordinary Portland Cement (OPC) of 53-grade, conforming to IS: 12269 were used.

**B. Fine aggregate-** domestically on the market sand from Man River with 4.75 mm maximum size. With specific gravity 2.55, Fineness Modulus = 2.65.confirming to IS 383–1987.

**C. Coarse aggregate-** having a maximum size of 20mm were employed in this project work wherever 40 % of it had been passing through 20mm IS sieve and retentive on 12.5mm IS sieve and remaining was passing on 12.5mm IS sieve and preserved on 4.75mmsieve.

**D. Super plasticizer-** CICO Plast super c 300, the particular gravity and pH scale of super plasticizer used are 1.12 and 5.0 severally. Additional book of cementitious material. Super- plasticisers or high-range water-reducing admixtures (HRWRAs) contribute to the accomplishment of denser packing and lower consistency in concrete by increasing the flow-ability and raising the association throughlargerdispersion of the cement particles, and so aiding in manufacturing SCCs of high strength and smart sturdiness.

**E. Viscosity modifying agent (VMA) -** SPL BS 3000, having a pH of 5.0-6.0 and Density 1.20-1.30. else 5 exploit cementitious material. VMA, conjointly referred to as anti-washout admixtures, may be else to the concrete mixtures to boost segregation resistance, cohesiveness and scale back bleeding.

#### IV. MIX DESIGN

Mix design procedure by is 10262-2009

The procedures of the proposed mix design method can be summarized in the following steps.

##### Step 1- Calculate Target Strength for Mix Proportioning

$$f'_{ck} = f_{ck} + 1.65 s$$

Therefore, target strength =  $30 + 1.65 \times 5 = 38.25 \text{ N/mm}^2$

##### Step 2- Selection of Water-Cement Ratio

From Table 5 of IS 456, maximum water-cement ratio = 0.45. Based on experience, adopt water-cement ratio as 0.40.  $0.40 < 0.45$ , hence O.K.

##### Step 3- Selection of Water Content

From Table 2, maximum water content = 186 liter (for 25 to 50 mm slump range) for 20 mm aggregate. Estimated water content for 100 mm slump =  $186 + (6/100) \times 186 = 197$  liter

As super plasticizer is used, the water content can be reduced up to 20 percent and above.

Based on trials with super plasticizer water content reduction of 29 percent has been achieved. Hence, the arrived water content =  $197 \times 0.71 = 140$  liter

##### Step 4- Calculation of Cement Content

Water-cement ratio = 0.40

Cement content =  $(180/0.40) = 350 \text{ kg/m}^3$

From Table 5 of IS 456, minimum cement content for 'severe' exposure condition =  $320 \text{ kg/m}^3$

$350 \text{ kg/m}^3 > 320 \text{ kg/m}^3$ , hence, O.K.

##### Step 5- Proportion of Volume of Coarse Aggregate and Fine Aggregate Content

From Table 3, volume of coarse aggregate corresponding to 20 mm size aggregate and fine aggregate (Zone II)

for water-cement ratio of 0.40 = 0.62.

Therefore, corrected proportion of volume of coarse aggregate for the water-cement ratio of 0.40 = 0.62.

For pumpable concrete these values should be reduced by 10 percent.

Therefore, volume of coarse aggregate =  $0.62 \times 0.9 = 0.56$ .  
Volume of fine aggregate content =  $1 - 0.56 = 0.44$ .

From this we get Mix Proportion for SCC for trial 1. Similarly,

For trial 2 W/C ratio should be decrease by 10% and For trial 3 W/C ratio should be increased by 10%.

The mix calculations per unit volume of concrete shall be as follows:

Volume of concrete =  $1 \text{ m}^3$

Volume of cement Content =  $\frac{\text{Mass of cement}}{\text{Specific Gravity}} \times \frac{1}{1000}$

$$= \frac{350}{3.15} \times \frac{1}{1000} = 0.111 \text{ m}^3$$

Volume of Water Content =  $\frac{\text{Mass of water}}{\text{Specific Gravity of water}} \times \frac{1}{1000}$

$$= \frac{140}{1} \times \frac{1}{1000} = 0.140 \text{ m}^3$$

Volume of chemical admixture (Super plasticizers) (@ 2 percent By mass of cementitious material

$\frac{\text{Mass of Chemical Admixture}}{\text{Specific gravity of Admixture}} \times \frac{1}{1000}$

$$= \frac{7}{1.12} \times \frac{1}{1000} = 0.006 \text{ m}^3$$

Volume of dead mixture =  $[a - (b + c + d)]$   
=  $1 - (0.111 + 0.140 + 0.006)$   
=  $0.743 \text{ m}^3$

Mass of coarse aggregate = e X volume of fine aggregate X Sp. Gravity of fine aggregate 1000

$$= 0.743 \times 0.56 \times 2.74 \times 1000$$

$$= 1140 \text{ kg/m}^3$$

Mass of fine aggregate = e X volume of fine aggregate X Sp. Gravity of fine aggregate 1000

$$= 0.743 \times 0.44 \times 2.55 \times 1000$$

$$= 896 \text{ kg/m}^3$$

Table1: Mix Proportion For SCC for 3 trials

Mix Proportion	Cement kg/m <sup>3</sup>	Fine Aggregate kg/m <sup>3</sup>	Coarse Aggregate kg/m <sup>3</sup>	W/C ratio	Compressive Strength N/mm <sup>2</sup>
Trial-1	350	896	1140	0.40	31.4
Trial-2	388.88	849.24	1153.69	0.36	33.53
Trial-3	318.18	949.08	1114.13	0.44	29.13

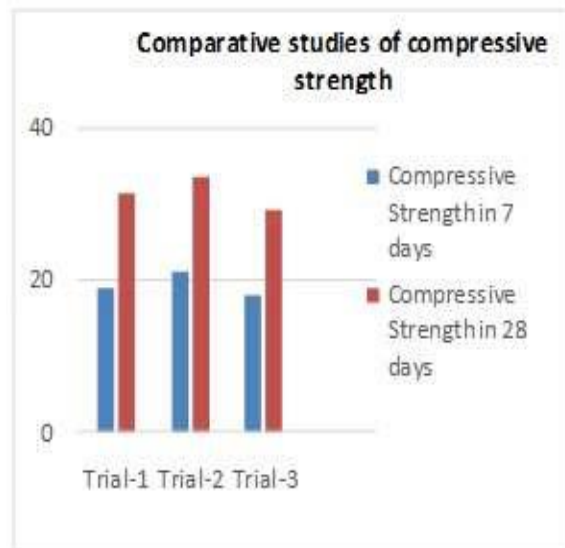


Fig. 1: Comparative Study of Compressive Strength

## V. CONCLUSION

The following conclusions are drawn from the literature Review done on fibers inclusion in self-compacting concrete:

1. From these 3 trials we tend to conclude that the compressive strength for trial-2 is most as compared to alternative trials.
2. Steel fibers improve the standard of hardened state concrete by showing increase in strength upto bound volume fraction
3. Usage of a lot of fibers fraction in SCC improves the hardened state however reduces the contemporary state properties, thus optimum share of fibers area unit to be used whereas making SCC.
4. Fibres kind a bridge between small cracks and thus they resist in enlargement of the crack dimension.
5. Hooked or crimped steel fibers area unit established simpler than straight steel fibers as higher bonding is seen within the matrix

6. Steel fibers strengthened self-compacting concrete shows glorious tensile strength, flexural strength, shock resistance, fatigue resistance, plasticity and crack arrest.
7. Slump flow, V-funnel, L-flow, U-box and compressive strength tests were dispensed to look at the performance of SCC
8. If we tend to add the mineral admixture replacement for we are able to have a stronger practicable concrete.
9. SCC with mineral admixture exhibited satisfactory ends up in workability, thanks to tiny particle size and a lot of surface area.

## VI. FUTURE SCOPE

The application of SCC facilitates the assembly method and its conditions, since vibration is eliminated. The advantages of SCC additionally apply for SFRSCC just in case the result of the fibers on the key characteristics filling ability, passing ability and segregation resistance is taken into consideration. Will increase in compressive strength were ascertained within the experiment by the addition of Steel fiber. More studies may be created by variable the share of Steel fiber within the combine. Fibers cut back the cracks throughout plastic and hardening stage. This property may be studied for more analysis.

SCC additionally contains a future within the formed trade providing sturdy concrete at a lower price due to lower initial investments of vibratory facilities and lower continual prices attributable to quicker restage of moulds. Steel fiber controls the crack propagation in inflexible vary.

In this study the rise in compressive strength, and better load carrying capability with higher ductility of column were ascertained during this analysis work by the addition of Steel fiber to the M30 designed concrete. More studies may be created by variable the share of Steel fiber within the short column.

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