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Retraction

Retraction: Experimental Investigations on Flexural Behaviour of Self Compacting Concrete Beam with Silica Fume (*IOP Conf. Ser.: Mater. Sci. Eng.* 1145 012101)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Experimental Investigations on Flexural Behaviour of Self Compacting Concrete Beam with Silica Fume

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Abstract. The proposed investigational programme aims to assess SCC efficiency by altering the percentage of silica fumes used as a substitute material. A study of the reliability of fresh and hardened concrete properties was conducted. In this study, the test mix which really compensates the fresh concrete properties provides the highest compressive strength was used. Silica fume is used to substitute cement in varying percentages (0, 10%, 15% and 20%). As compared to other cement replacement, Self-Compacting Concrete with 15% silica fume showed higher performance. Three beams were cast and assessed for flexural behaviour: conventional RCC, self-compacting concrete Beam, and SCC with 15% silica fume. As compared to other instances, SCC with 15% silica fume performed well, which is shown in the load deflection graph.

1. Introduction

It has been done in the past to create concrete structures that are vibration-free. However, the concrete described above is normally of lower strength and is difficult to acquire in a consistent condition. In recent days the use of self-compacting concrete is aimed on achieving high efficiency, enhanced and additional value that is consistent and reliable. Another substance used as an artificial pozzolanic admixture is silica fume, also known as micro silica. Modern Self-compacting concrete relies on the utilization of silica fume in combination with the Super plasticizer. For a better score, the incorporation of Silica fume is critical to the success of the project. Fly ash is also less reactive than micro silica or every other naturally occurring pozzolana.

The properties in the fresh state are the most essential characteristics of SCC. The capability to flow under its own weight without vibrating, the capability to flow through jam-packed reinforcement under its own weight, and the capability to maintain homogeneity devoid of segregation are all factors in the main mix design. SCC has a higher degree of workability than the very high degree of workability stated in IS456:2000. Under its own weight, the concrete must be able to flow and fully fill all sections of the formwork without leaving voids. Since it is extremely fluid, it can flow long distances both horizontally and vertically and fill vertical elements from the bottom. Passing Ability: Concrete with the necessary aggregate size must be able to move through constrained spaces between reinforcements and other embedded artefacts without blocking or isolation under its own weight.

Segregation Resistance: During transport, placement, and after placement, the concrete must be able to meet both the filling and passing capacity criteria while remaining homogeneous.

The main property of self-compacting concrete is it can flow and spread through reinforcement bars over formwork without the use of mechanical vibration. They have a high level of cohesion and capability [1]. SCC can be delivered and placed without the use of vibrators to create concrete that is free of honeycombs. Due to the high cement content, SCC can exhibit more plastic shrinkage or creep than standard concrete mixes [2]. The mechanical properties of SCC were decreased by 66% and 51%, respectively, when the water cement ratio is increased from 0.35 to 0.7 [3]. After a structural evaluation of rusty SCC beams for inhibitory effects such as half-cell potential, cracks, corrosion protection, and so on, beams made with SCC mix outperformed normal concrete beams [4]. The flow performance and mechanical properties of SCC when 10% SF was used as a cement replacement performed better than conventional mix [5-14]. The flexural behaviour of RC beams made of Self Compacting Concrete with Silica fume as a filler material has been investigated based on the literature.

2. Experimental Programme

Tests on fundamental material to consider their physical properties, as well as tests on SCC fresh properties, are part of the experimental programme. The mechanical properties of the hardened state were investigated by preparing required specimens after 28 days of study.

3. Preliminary Investigations on Materials

The basic test on materials such as specific gravity, fineness modulus, bulk density, etc., Ordinary Portland Cement 53 was used as the cement. The cement's properties are tested according to the IS mentioned in Table 1. The coarse aggregate used in this study had a nominal size of 12.5 mm. BIS: 383-1970 was used to analyse both fine and coarse aggregates their properties are shown in Table below. Silica fume is a pozzolano substance that has been utilized in manufacture of SCC. Silica fume is grey in colour and has a particle size of less than one micron. Specific gravity and bulk density of silica fume was 2.2 and 415 Kg/m^3 respectively. CONPLAST SP 430 is a modified polycarboxylic ester-based admixture. This product was designed for use in high-performance concrete where the highest standards of durability and performance are required. It is chloride-free and has low alkali content. It can also be used for any form of cement.

GLENIUM STREAM 2 is a ready-to-use, liquid, organic viscosity-modifying admixture (VMA) that was engineered specifically for manufacturing concrete with improved viscosity and regulated rheological properties. Superior stability and regulated bleeding characteristics are demonstrated in concrete containing GLENIUM STREAM 2 admixtures, resulting in increased resistance to segregation and easier positioning.

Table 1. Properties of Cement

S.No	Properties of Cement	
1	Compressive	53 Mpa
2	Specific gravity	3.15
3	Standard	31%
4	Initial setting time	30 Minutes

4. Experimental Investigations

Table 2 shows the better design and use of high-quality SCC, the European Federation has established a set of standards and guidelines. With the aid of EFNARC guidelines, the mix proportions and quantity of materials for the mixes were determined by trial and error. Complete powder content is 400–600 kg/m^3, coarse aggregate content is 28–35 percent by volume of mix. Complete powder content is 400–600 kg/m3, coarse aggregate content is 28–35 percent by volume of mix, according to EFNNARC requirements. The water content does not exceed 200 litres per square metre. The volume of the other constituents is balanced by the sand material. Glenium B233 as a superplasticizer was used. For each mixture, SCC fresh property tests such as slump flow and T500, L box test, U box test, and V funnel test were performed according to EFNARC guidelines.

Table 2. Properties of Fresh Concrete

Details	SLUMP FLOW (mm)	SLUMP FLOW T50cm (sec)	V – FUNNEL(sec)	V – FUNNEL AT T5 min(sec)	L- BOX (h2/h1)
LIMITS	□□□□□□□□□ □□	□□□□□□□	□□□□□□□	□□□□□□□	□□□□□ □□□
SCC	□□□□	□□	□□	□□□	□□□□
SCC_SF10%	□□□□	□□□□	□□	□□□	□□□□
SCC_SF15%	□□□□	□□□□	□□□	□□□	□□□□
SCC_SF20%	□□□□	□□	□□□	□□□	□□□□

The test specimen used was a concrete cube with dimensions of 150x150x150mm, and 150x300mm concrete cylinders were tested. Mechanical properties of concrete was tested their findings are Dimension of the prism (test specimen) i0s 100 x100 x500 mm was casted and evaluates the flexural strength of concrete and their result was shown below.

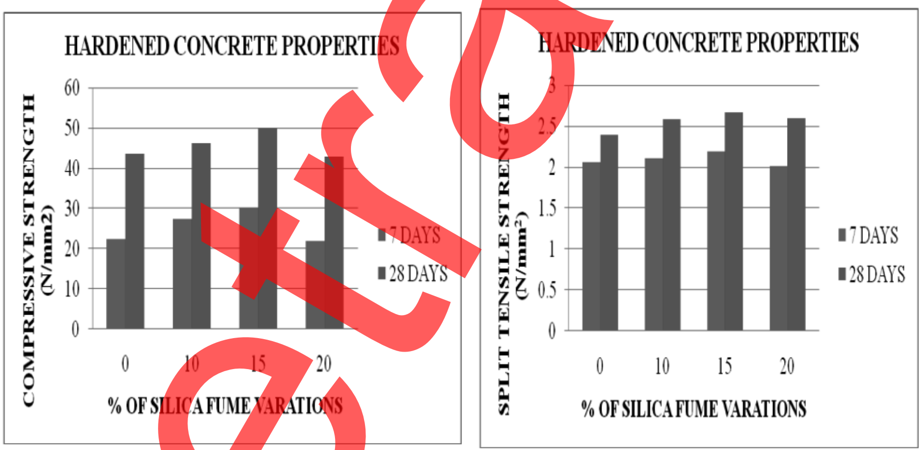

Figure 1. Compressive and Split tensile strength

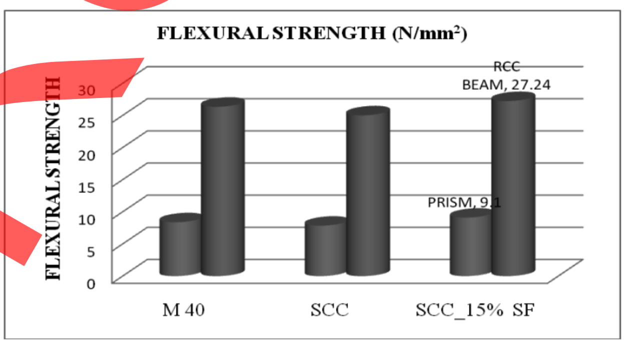

Figure 2. Flexural strength

From the Figure 1and 2 it is clear that the 28 days strength of SCC with Silica fume of 15% mix gives the higher value when compared to all other mixes. One reinforced concrete beam with a width of 100 mm, a height of 150 mm, and a length of 1600 mm was cast for each concrete produced here. In the case of the SCC and SCC SF, there was no need for vibration of any kind to compress it in the formworks, as the name implies. After de-moulding, which took place 48 hours after the moulding process was finished, the beams were subjected to wet curing, which included putting the beam on a sand bed and covering it with cotton waste. Depending on the temperature of the area, the beams were wet once or twice a day. Curing in this manner was repeated until the test age of 28 days. The reinforcement details for a RCC Beam

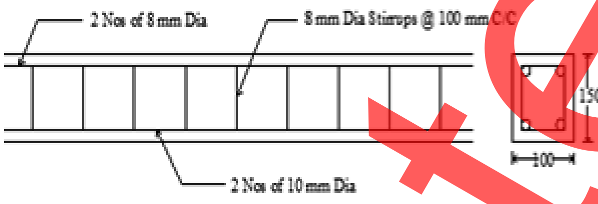

Figure 3. Reinforcement details of a RCC beam

The yield point is found at an earlier stage of loading, while the ultimate point is found at a greater deflection of the beams. In Figure 3 the load vs. mid span deflection, L/3 span deflection, and 2L/3 span deflection plots for a variety of beam profiles were plotted. This beam full load carrying capacity is 66 kN. As compared to the previous blend, this beam's load carrying capacity increases and at the mid span, the maximum deflection of 25.6 mm occurs as shown in figure 4.

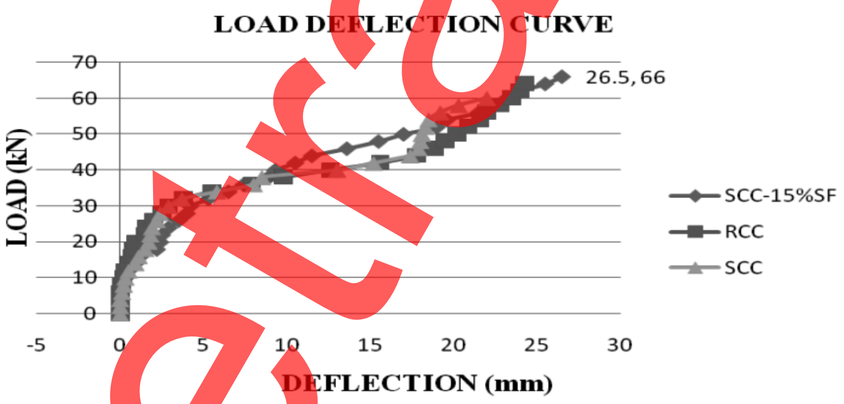

Figure 4. Load deflection curve

5. Conclusion

The subsequent conclusion was established in the present experimental research on self-compacting concrete beams subjected to two point loading.

- The flow of concrete is decreased as the percentage of Silica fume rises (10%, 15%, and 20%).
- SCC showed stronger compression and tension performance when 15% of the cement was replaced with Silica fume.
- When compared to the RCC beam, the benefits of adding silica fume into SCC included only a slower onset of the first crack and the occurrence of smaller deflections.
- In other words, adding silica fume to SCC at a rate of 15% cement replacement improves the flexural behaviour of the SCC beam.
- Based on the results of the experimental investigation, it is clear that Cement can be effectively substituted with 15% Silica fume in SCC, reducing cement consumption and, as a result, cost.

- When compared to RCC and RCC with silica fume, the stronger concrete-steel bond given by SCC's denser internal structure was able to promote improved beam behaviour.

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