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Strength and Behaviour of Steel Fibber Reinforced Based Concrete of Grade M30

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ABSTRACT-

Steel fibers are common additions that can improve steel performance. The aim of this study was to measure the compressive strength of M30 concrete grade with the ratio of various steel fibers. Concrete samples containing 0.5, 1.0 and 1.5 fibers were tested by weight. A hydraulic testing machine was used to measure the compressive strength of each block. The mean maximum compressive strength was 42.07 MPa at 28 days, which was achieved by mixing 1.0 fiber by 50 mm fiber in length and weight and increasing the strength over regular concrete by 40.23 increments. The addition of steel fibers increases the compressive strength of the concrete.

Key words: Strength; Fibber; Grade M30.

1 Introduction

The infrastructure needs of our country are increasing day by day, and as an important part of this infrastructure system. Concrete is an important component of building materials, and its properties should be enhanced by strength and durability. It is also recommended to use waste materials with compounds such as fly ash, silica foam, etc. as a partial substitute for cement and to make up for concrete in case of cost savings. One of the many methods are available locally to make new concrete composites with fibers that can perform well in unengineered structures even under extreme loads such as earthquakes or human-caused attacks.
To focus on the use of steel fibers in concrete, an experimental program was planned and implemented to study the properties of the materials. Here in this article, work on material properties and structural properties of steel fiber reinforced concrete is described.

2 Materials

Cement: In the present study, ordinary 43-degree Portland cement can be used. The specific gravity of the cement was 3.15, and the initial and final fixing times were 68 and 280 minutes, respectively. The standard strength of the cement was 29%.
Aggregate: It is used locally and is available in a dry aggregate concrete mix. The maximum nominal size of the coarse aggregate (gravel) was 18 mm, the specific gravity was 2.70 and the unit weight was 16.8 kNm-3. A granular unit was measured and found to be 6.80. The specific gravity (sand) of the precision aggregate was 2.66, the unit weight was 16.9 KNm-3 and its best units were 2.33.
Steel fiber: Hooks and flat steel fibers were used in the mixture. The steel fibers were 50 mm long and 0.75 mm in diameter (aspect ratio 100). The fiber density was 7.65 g cm 3 and the small modulus was 210 GPa.
Water: Clean drinking water free from organic, chemical and physical impurities was used during mixing and treatment of concrete samples.

3 Sample preparations

Mixing Ratio 1: 1.53: 2.61 I.S., This study was conducted using a coded method with a water-cement ratio of 0.45 to obtain the M30 characteristic. The exact amount of material for each mixture was calculated by batch mixing. Different parameters were the percentage of fiber content. The components used in the concrete production were tested and the results are shown in Table 1.

Table 1 Detail of Constituent Materials

Sl.No.	Material	Description
1	Cement	Type- OPC 43 grade
2	Fine Agg.	River sand falling on zone II having a Fineness modulus of 2.33
3	Coarse Agg.	20mm nominal size aggregate, Fineness modulus 6.80
4	Steel fibre	0.5mm, Tensile strength minimum 345MPa
5	Fibre Length	50mm ,aspect ratio 100
6	Mix ratio	1 : 1.53 : 2.61
7	w/c ratio	0.45

4 Test procedures

Cement is added first and mixed well in a dry state until uniformity is achieved. Dry aggregate is added to the mixture and mixed well, after which the steel fibers are evenly distributed during dry fiber mixing. The water is added slowly and mixed well for 3 minutes. After all the components were mixed, the concrete samples were poured into steel molds and compacted in three layers using a table vibrator. A cubic mold with a diameter of 150 mm was used. After 24 hours, each sample is dismantled and submerged at 32 + 2 ° C until 7 and 28 day trials. To ensure the same processing conditions, all samples were processed in the same water container.

To measure the compressive strength of concrete samples, the tests were performed on a hydraulic test machine with a load (without impact) at a constant speed in the range of 0.140 to 0.350 MPa per second.

5 Cube compressive strength

The compressive strength of the cubes was tested for 7 days and 28 days and the test results are shown in Table 2. In terms of weight and strength over ordinary concrete, the increase was 40.23%.

Table 2 Result of cube compressive strength in MPa

% of Steel Fibre	Compressive strength in MPa		Average Compressive Strength in MPa
	After 7- days	After 28- days	
0%	24.88	31.11	34.62
	24.93	35.55	
	24.88	34.66	
	24.80	34.55	
	24.90	36.44	
0.5%	25.49	39.20	39.21
	25.33	39.28	
	25.55	39.11	
	25.11	39.28	
	25.44	39.20	
1.0%	26.71	42.13	42.07
	26.75	42.04	
	26.84	42.08	
	26.66	42.00	

	26.75	42.13	
1.5%	25.46	35.86	35.89
	25.42	35.91	
	25.37	35.91	
	25.42	35.86	
	25.46	35.91	

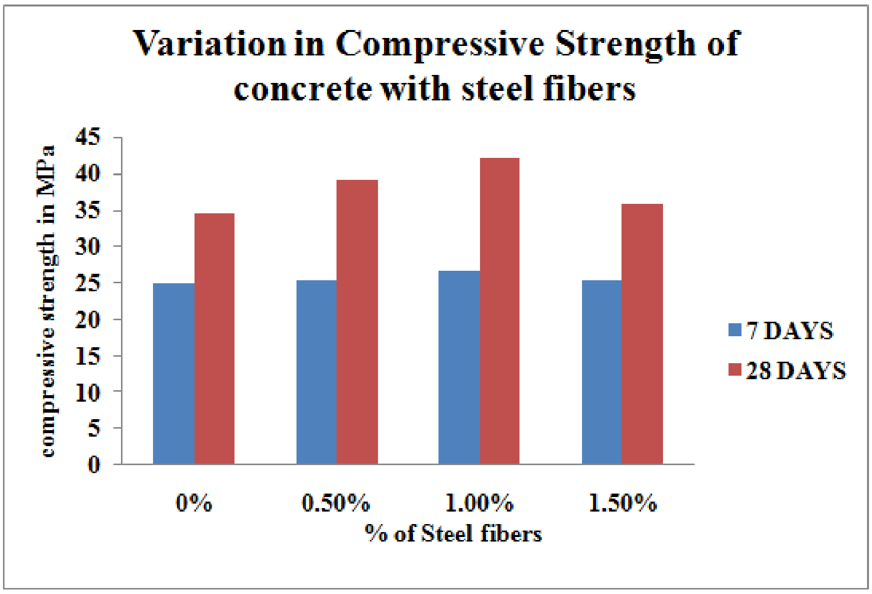

Figure 1 Graph of compressive strength of concrete and % of steel fibers

6 Conclusions

Studying the effects of steel fibers can still be a promising work, as it always have to overcome the problem of concrete swelling. The following conclusions can be drawn from the current study.

1. After 28 days, the maximum compressive strength of the sample was 42.07 MPa with 1% fiber.

2. Observed that 21.51% increase in compressive strength due to fibers added to the 1% blend. There is a tendency to increase the strength of up to 1% of the fibers, but an additional increase in the fibers causes a reduction in strength.

REFERENCE

1. **Muthuswamy,K.R and Thirugunanam,G.S, "**Mechanical properties of hybrid fiber reinforced high performance concrete" The Indian concrete journal,April2013
2. **Muthuswamy,K.R and Thirugunanam,G.S,** "Flexural behavior of high performance hybrid fiber reinforced concrete beams**,** The Indian concrete journal,April2013
3. **Ghughal,Y.Mand Bhalchandras,S.A.,** "Performance of steel fiber reinforced high strength silica fumes concrete". civil engineering and construction review, October 2009,pp32-34
4. **Mehta P. and Aitcin (1995),** "Development in the application of high performance concrete", Chapter 17 University of Memphis
5. **A.M.Alhozaimy, P. Soroushian & F. Mirza (1996),** "Mechanical properties of polypropylene fiber reinforced concrete and the effect of pozzolanic materials".
6. **Fahad A. Kandari, et.al,(2011)**"influnce of fly ash on behavior of Fibres Reinforced Concrete Structures",Journal of applied sciences, 11(17):3185-3191.
7. **Falah A. Almottiri (2011)**, " Physical Properties of Steel Fiber Reinforced Cement Composites Made with Fly Ash", Jordan Journal of Civil

Engineering, Volume 5, No. 2.

8. **Chih-Ta Tsai, Lung-Sheng Li, Chien-Chih Chang, Chao-Lung Hwang (2009)**, "Durability design and application of Steel Fiber reinforced Concrete in Taiwan", the Arabian Journal for Science and Engineering, Volume 34, Number 1B
9. **Indian standard code of practice for specification for coarse and fine aggregate from natural sources of concrete IS: 383-1970**,Bureau of Indian standards, New Delhi.
10. **Indian standard code of practice for recommended guidelines for concrete mix design IS: 10262-2009**,Bureau of Indian standards, New Delhi.
11. **Indian standard code of practice for plain and reinforced concrete IS:456-2000**, Bureau of Indian Standard, New Delhi.
12. **Indian Standard methods of tests for strength of concrete IS: 516-1959**, Bureau of Indian Standards, New delhi.
13. **Santhakumar, A.R., Concrete Technology**, Oxford press, New Delhi, 2005
14. **Gambhir M.L., Concrete Technology**, McGraw Hill Education (India) Private Limited, New Delhi, 2013.