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"EFFECT OF STEEL FIBRES ON MECHANICAL PROPERTIES OF CONCRETE COMPOSITE"

[1] Saurabh Maske, [2]Sachin Salve ,

[1]M.Tech , [2] Assistant . Prof . Diems ,

[1]Civil Engineering ,

[1]DIEMS, Chh. Sambhaji Nagar , India.

Abstract: EFFECT OF STEEL FIBRES ON MECHANICAL PROPERTIES OF CONCRETE COMPOSITE The application of structural fibers to enhance several mechanical characteristics of concrete including increase in residual stress and energy absorption capacity along with significant durability improvements, has gained popularity due to their extreme ease of use and wide availability

I. INTRODUCTION

Concrete, as a mixture of Portland cement, aggregate, water and variety of additives, has been one of the most commonly used materials in almost every construction project because of its low-cost production and convenient mechanical properties. However, non- homogenous and brittle nature of concrete brings about considerably lower tensile strength in comparison to its compressive strength. Customarily, to compensate for such weakness, reinforcing components, most common of which are steel bars, are embedded in structural elements of concrete. Shotcrete, being one of the broadly used types of concrete, is no exception. Although enjoying from a unique process of casting, in which concrete is sprayed onto the surface enabling it to form either a thin or thick layer, the brittleness of the final product has left engineers no choice but to adopt a reinforcement technique to overcome its fragileness. A wire mesh had been employed as the solution since it improves tensile strength of the shotcrete and contributes to a rise in ductility before its drawbacks, in particular, difficulty of installation, corrosion susceptibility of steel wires and their role in preventing complete infiltration of the mortar or concrete into the wire mesh resulting in generation of numerous voids, persuaded engineers to look for other methods which did not suffer such flaws .

2. Literature Review

Tomasz [1] Fibre-reinforced concrete is the concrete with addition of short fibres targeting the improvement of the propriety of this material. Its durability is basely connected with the long-term dynamic loading. The main characteristic in that case are the critical stresses. The object of this article is steel fibre reinforced concrete (SFRC).;

Nguyen Van CHANH [2] It is now well established that one of the important properties of steel fibre reinforced concrete (SFRC) is its superior resistance to cracking and crack propagation. As a result of this ability to arrest cracks, fibre composites possess increased extensibility and tensile strength, both at first crack and at ultimate, particular under flexural loading; and the fibres are able to hold the matrix together even after extensive cracking.

Rajib Kumar [7] Steel fibers and their aspect ratios are important parameters that have significant influence on the mechanical properties of ultrahigh-performance fiber-reinforced concrete (UHPFRC). Steel fiber dosage also significantly contributes to the initial manufacturing cost of UHPFRC. Rajib Kumar [7] Steel fibers and their aspect ratios are important parameters that have significant influence on the mechanical properties of ultrahigh-performance fiber-reinforced concrete (UHPFRC). Steel fiber dosage also significantly contributes to the initial manufacturing cost of UHPFRC.

Inayat Khan [9] The rapid increase in a vehicle's use leads to tire waste, the management of which is of social and environmental concern. The steel wires in a tire have good application in concrete if the proper amount and distribution of steel fiber in the concrete matrix is ensured.

3. Material Properties

- **Steel Fiber**
- **Crimped steel fibre**
- **Cement**
- **Fine Aggregate**
- **Coarse Aggregate**

4. Mix Proportion

The purpose of this experiment is to study the improvement of mechanical properties of different types of steel fiber-reinforced concrete (SFRC) which was made by ordinary stirring and vibratory mixing, respectively. In the field of engineering, steel fiber- reinforced concrete was always used as high-strength concrete, so in this paper, two kinds of high-strength concrete C50 and C60 were studied in this paper, and the amounts of steel fiber admixture were 0.5%, 1%, 1.5%, and 2%, respectively.

GRADE	**WATER CEMENT RATIO**	**MIX PROPORTION**
M25	0.47	1:1:2
GRADE	**WATER CEMENT RATIO**	**MIX PROPORTION**
M30	0.45	1:1.63:2.8

5. Experimental Program

- **Compression Strength**

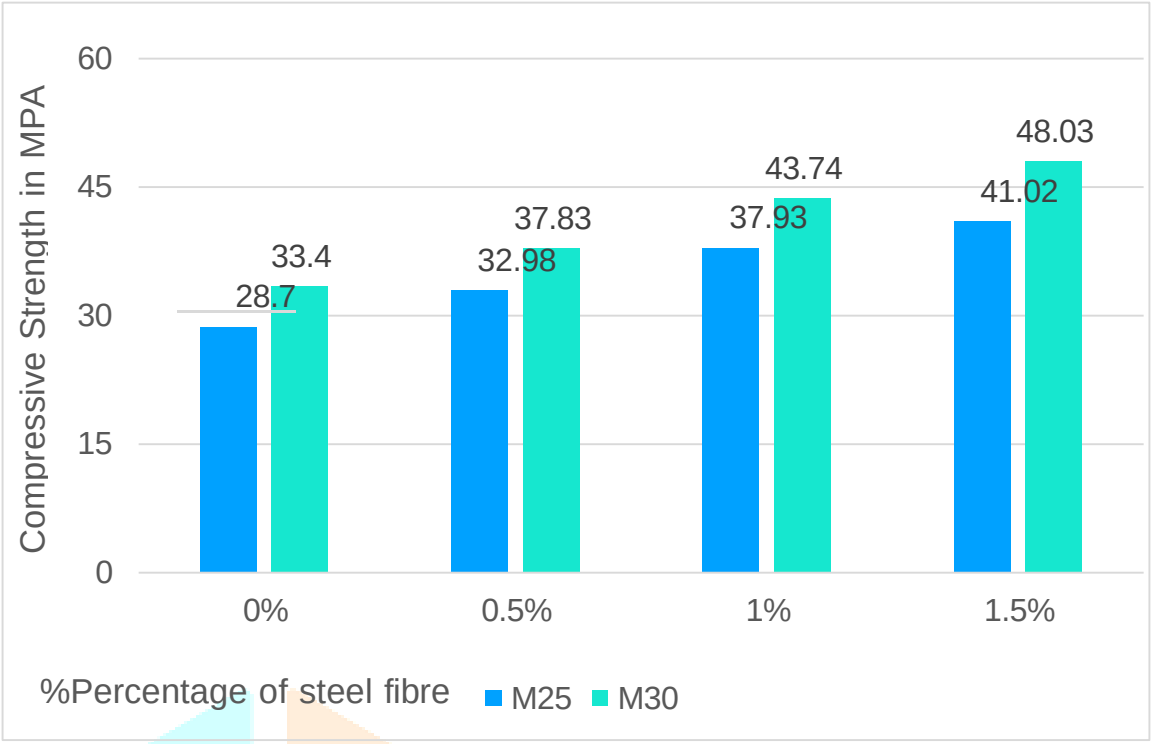
The cubes were casted with steel fibre reinforcement, and tested. The dimensions of the cube are 150X150X150 mm in accordance to IS 456- 2000. The casted cubes kept for curing and tested after 28days and the capacity of concrete cube noted in KN . By placing on any one side of the cube.

As per IS: 516-1959 Compressive testing machine (2000Kn),15cm×15cm×15cm steel cube molds or Cylinder having Dia 15cm and length 30cm are used.

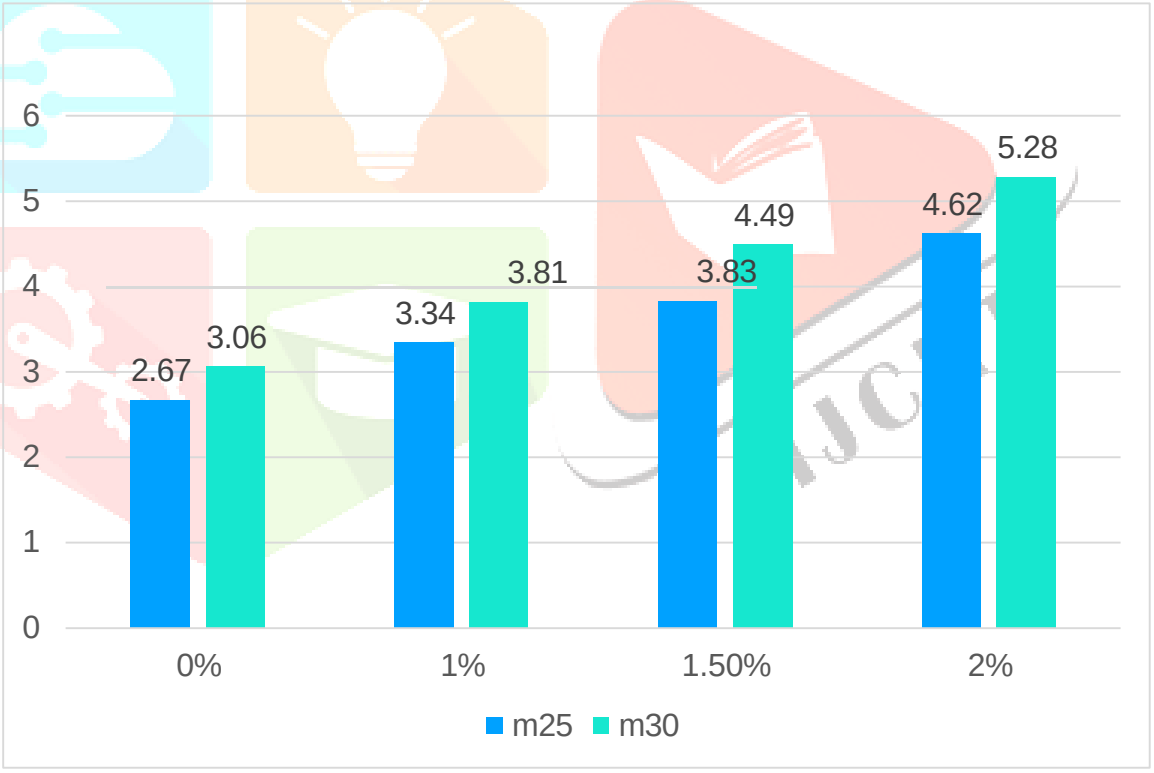
- **Preparing of material for Cube test:**

All the material must be brought and stored to an approximate temperature of 27 ±3 degree Celsius. Cement must be uniformly mixed with a trowel in order there exist no lumps.

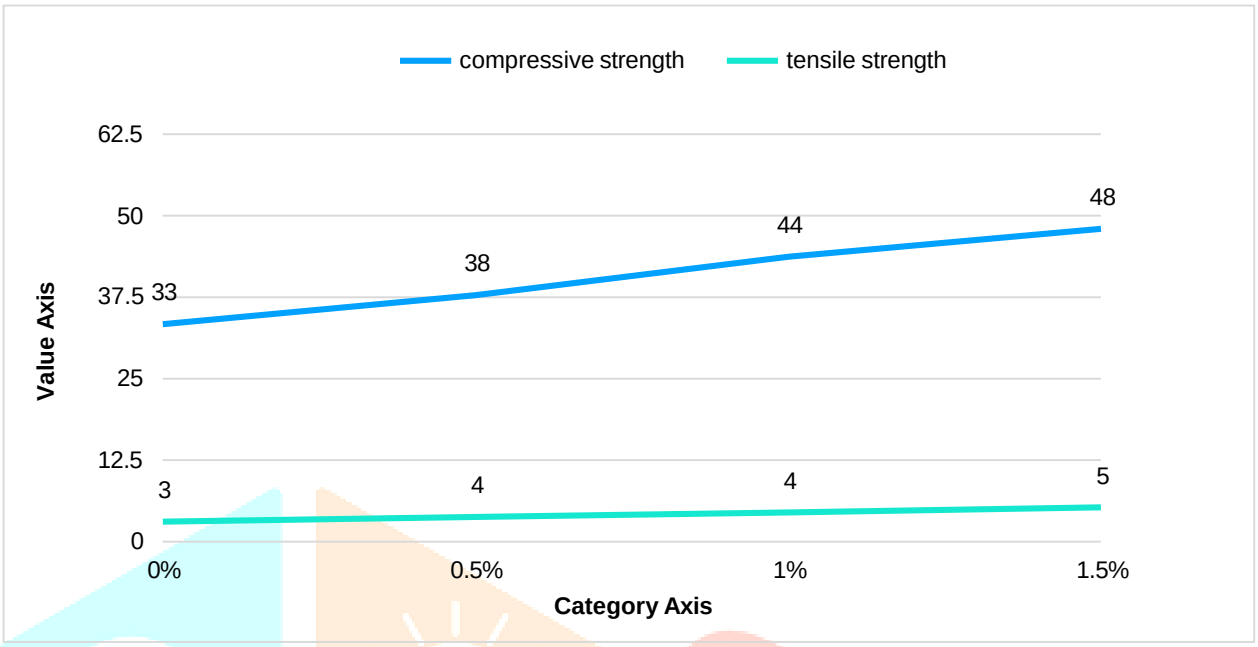
Graphical comparison between compressive strength of M25 and M30 concrete



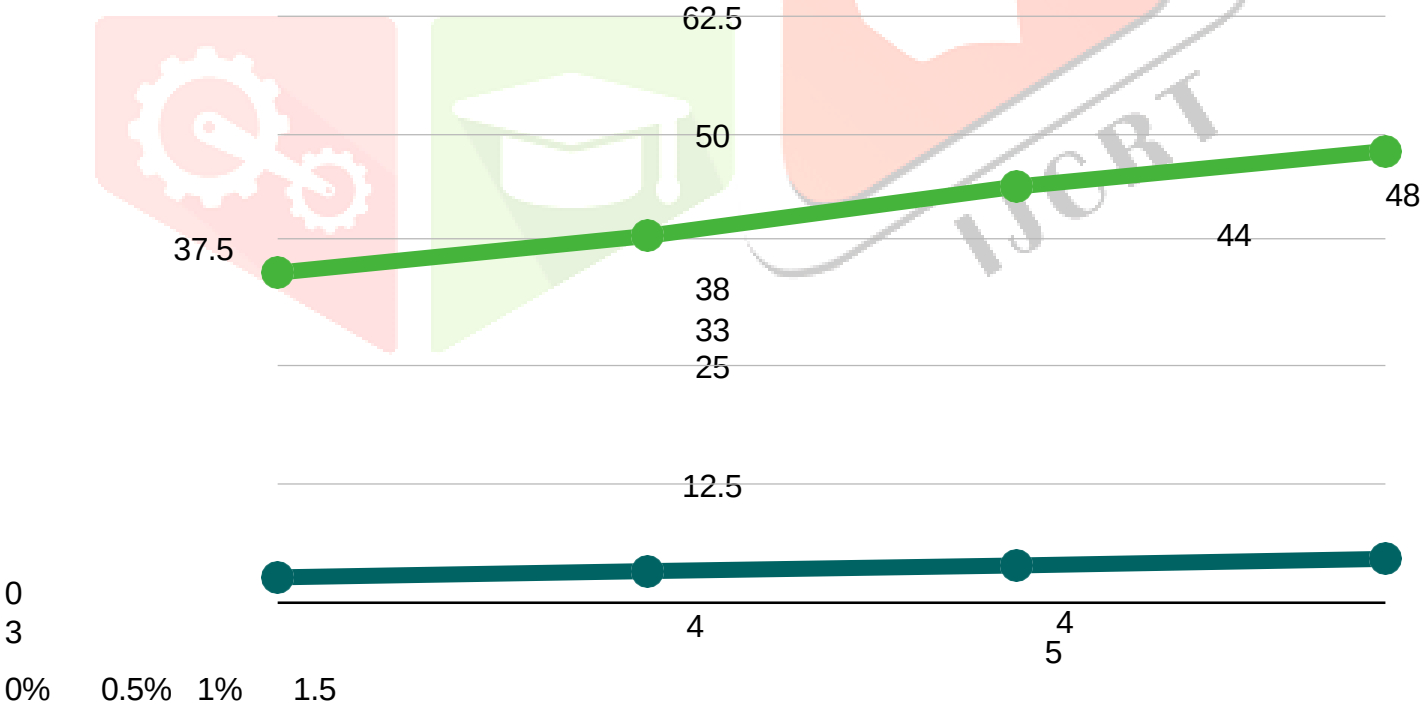
Graphical comparison between Tensile strength of M25 and M30 concrete



COMPRESSIVE STRENGTH TENSILE STRENGTH of M25 For 28 Days S



COMPRESSIVE STRENGTH TENSILE STRENGTH OF M30 for 28 Days



6. Results

RESULTS FOR M25 CONCRETE AFTER 28 DAYS CURING

Fibre type	**Fibre Content**	**Compressive strength(N/mm2)**	**Tensile strength(N/mm2)**
SFRC	**0%**	**28.7**	**2.67**
	0.5	**32.98**	**3.34**
	1.0	**37.93**	**3.83**
	1.5	**41.02**	**4.62**

RESULTS FOR M30 CONCRETE AFTER 28 DAYS CURING

Fibre type	Fibre Content	Compressive strength	Tensile strength
SFRC	0%	33.4	3.06
	0.5	37.83	3.81
	1.0	43.74	4.49
	1.5	48.03	5.28

7.CONCLUSIONTHE COMPRESSIVE STRENGTH OF CONCRETE INCREASES CONSIDERABLY AS THE VOLUME OF STEEL FIBERS IS INCREASED FROM 0.5% TO 1% AND THE INCREASE IS ALMOST SIMILAR TO ALL THE GRADE OF NORMAL CONCRETE THAT IS M25, M30,.

1. The tensile strength increases significantly as the volume of steel fibers is increase is similar to the grade of concreteThe reserve strength and the ultimate strength of FRC is significant than conventional concrete and it is very significant tensile strength of concrete.

2. The toughness of concrete is also increased very significant the crack patterns changes as the failure is more ductile in FRC, as compared to compression shear crack pattern failure of conventional concrete under compression.

3. For Fibre Content 0-0.5 percentage difference is 12.36%.

4. For Fibre Content 0-1 percentage difference is 30.95%.

5. For Fibre Content 0-1.5 percentage difference is 43.80%.CHAPTER 8

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