IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

COMPARISON OF STRENGTH OF CONCRETE USING STEEL FIBRES IN M30 GRADE OF CONCRETE

Ankit kumar[1], Deepak[2], Deepanshu[3], Harshit panwar[4], Mr. Yogesh Mohan[5]
1. *B.tech Student, Civil Engineering, Meerut Institute of Engineering Technology, Meerut, UP*
2. *B.tech Student, Civil Engineering, Meerut Institute of Engineering Technology, Meerut, UP*
3. *B.tech Student, Civil Engineering, Meerut Institute of Engineering Technology, Meerut, UP*
4. *B.tech Student, Civil Engineering, Meerut Institute of Engineering Technology, Meerut, UP*
5. *Astt. Professor, Civil Engineering, Meerut Institute of Engineering Technology, Meerut, UP*

ABSTRACT
The main objective of this project is to study the behavior of steel fiber Reinforcement concrete (SFRC). Basically, fiber is used as resistance of cracking and strengthening of concrete. From the experimental work, it was that with increment in steel fiber content in concrete there was a enormous increase in compressive strength and Flexural strength. The aim of our project is to use hooked end steel fibers as Fibers reinforced to concrete to study the strength properties of concrete. The strength properties being studied in our thesis are as follows: Steel fibers widely used as main and unique reinforcing for industrial concrete floor slab and prefabricated concrete products. It is also used for structural purposes in the reinforcement of slabs on piles, tunnel linings, foundation slabs and prestressed elements. Apart from increased load carrying capacity, one of the main benefits of adding fibers in concrete is to provide superior resistance to cracking and crack propagation, which totally depends on the amount of steel fibers added. In this project Specimens were cast without fiber and with fiber and tests were conducted for studying the compressive strength, split tensile strength and workability.

KEYWORDS: *Workability, Compressive and Split Tensile Strength, Cracks and Crack propagation.*

INTRODUCTION
Steel fiber concrete is a type of reinforced concrete and it's basically made up of different types of ingredients such as cement, water, sand, gravel, and steel fibers. In some cases, additives are added. Steel fibers percentages in between 0.3% to 2.5% by volume of plain concrete. SFRC products are manufactured by adding steel fibers to the ingredients of the concrete in the mixer and by transferring the green concrete into the Moulds. The prepared product is then compacted and cured by the conventional methods. Bleeding and Segregation of the concrete is one of the problems encountered during mixing and compacting SFRC and this should be avoided for uniform distribution of steel fibers. The energy required for mixing, conveying, placing and finishing of SFRC is slightly higher. Use of pan mixer and fiber dispenser to assist in better mixing and reduce the formation of fiber ball in the mixer is essential. Addition of steel fiber up to 5% by volume increased the flexural strength up to 2.5 times that of conventional concrete.

ADVANTAGES OF SFRC
- Cost saving.
- Reduction of concrete slab thickness.
- Increased durability.
- Increased load bearing capacity of concrete.

DISADVATAGES OF SFRC

- The corrosion at the surface of the concrete.
- Proper inspection while mixing is needed.
- Requires precise composition.
- An increase in the number of fibers can reduce the workability and can cause finishing problems.

MATERIALS

The materials used in this study were steel fibers together with the basic ingredients of concrete matrix i.e. Fine aggregate, coarse aggregate, Ordinary Portland Cement (OPC) and water in a suitable quantity as per the standard mix design.

1. CEMENT

OPC 43 Grade was used in this study. The chemical composition of OPC included Al_2O_3 (6.03%),
Fe_2SO_4 (3.2%), SiO_2 (20.67%), CaO (59.63%), MgO (3.66%), K_2O (0.67%), SO_3 (2.49%), Free lime (1.36%), and loss of Ignition (8.44%).

2. WATER

In this project we used portable water for concrete mixing. The amount of water in concrete controls many hardened and fresh properties in concrete including compressive strength, permeability, durability and weathering also.

3. FINE AGGREGATE

Natural river sand is used as a fine aggregate in this project. The advantage of natural river sand is that the particles of fine aggregate are cubical and rounded with smooth surface texture and gives good workability.

4. COARSE AGGREGATE

As per the IS CODE:456 2000, the material whose particles are of sizes as are retained on Sieve No 480(4.75mm) is termed as coarse aggregate. The coarse aggregate used in this project are of 20mm sizes, crushed angular in shape. The aggregate is free from dust before used in the concrete.

5. STEEL FIBER

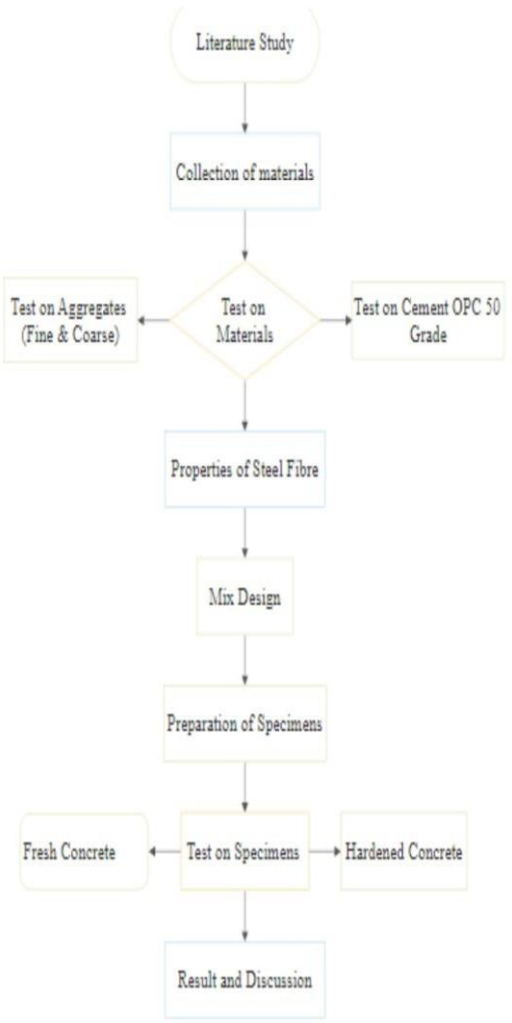
Hooked end steel fibers were used in this project with the following properties:

- SHAPE: Hooked end
- LENGTH: 40mm
- DIAMETER OF STEEL FIBRES: 0.50mm
- DENSITY: 7850 kg/m^3

METHODOLOGY

The experimental work is done as per the following flow chart:

There will be general steps that will be carried out for the testing of specimens and report making.



MIX DESIGN

- Grade of designation: M30
- Type of cement: OPC 43 GRADE
- Size of coarse aggregate: 20 mm
- Workability in term of slump: 100mm
- Exposure condition: Severe (IS CODE 456 2000)
- Specific gravity of cement: 3.16
- Specific gravity of fine aggregate: 2.46
- Specific gravity of coarse aggregate: 2.73

MIX PROPORTIONING

- Water cement ratio: 0.45
- Cement content: 437.7 kg/m3
- Fine aggregate content: 723 kg/m3
- Coarse aggregate content: 1013 kg/m3

RESULT AND DISCUSSIONS

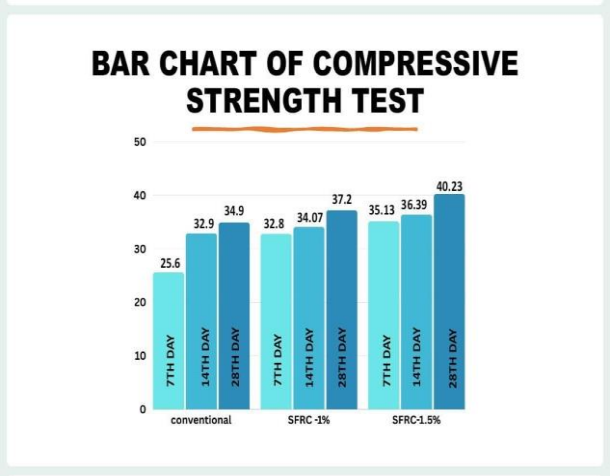
1.WORKABILITY

Sno.	Fibers content in concrete	W/C	Slump value
1	0%	0.45	120
2	1%	0.45	110
3	1.5%	0.45	105

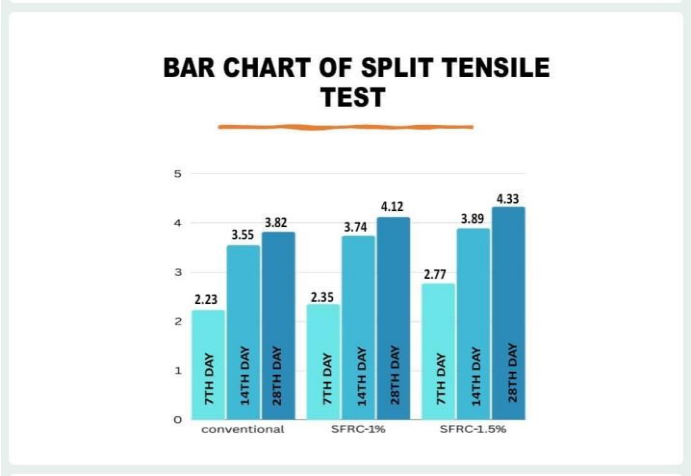
2. COMPRESSIVE STRENGTH

Name of specimen	Percentage of fiber in M30	7 DAY Strength N/mm²	14 DAY Strength N/mm²	28 DAY Strength N/mm²
PCC-0%	M30 - 0%	25.6	32.9	34.9
SFRC-1%	M30 -1%	32.8	34.07	37.2
SFRC-1.5%	M30 - 1.5 %	35.13	36.39	40.2

TABLE 2: Compressive strength of concrete at 7,14 & 28 days.



BAR CHART OF TABLE 2: As per the above bar chart the compressive strength of concrete goes on increasing with the increment of steel fibers.



BAR CHART OF TABLE 3: As per the above bar chart the split tensile strength of concrete goes on increasing with the increment of steel fibers.

3. SPLIT TENSILE TEST

Name of specimen	Percentage of fiber in M30	7 DAY Strength N/mm²	14 DAY Strength N/mm²	28 DAY Strength N/mm²
PCC-0%	M30-0%	2.23	3.55	3.82
SFRC-1%	M30-1%	2.35	3.74	4.12
SFRC-1.5%	M30-1.5%	2.77	3.89	4.33

TABLE 3: Split tensile strength of concrete at 7,14 and 28 days

CONCLUSION

- In this project we found that the workability of concrete gets reduced when we increased the steel fibers.
- The compressive strength and split tensile strength of concrete goes on increasing with the increase of steel fibers.
- This experimental study helps to know the properties and behavior of steel fiber reinforced concrete (SFRC).
- In this experimental study we observed that SFRC can be used to increase ultimate strength and durability because the satisfactory improvement in strength is observed with the inclusion of steel fibers but the gain in strength is found to depend upon the amount of fiber content.