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"Experimental Study on Properties of Polymer Modified and Steel Fiber Reinforced Concrete"

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Abstract— Concrete is by and large most generally utilized as a development material on the planet. Lately, there is a ton of advancement in the field of concrete innovation because of its high strength. An exploratory examination was done to consider the mechanical successes of polymer adjusted and steel fiber strengthened concrete, for example, compressive strength, split tensile strength and flexural strength. The trial work was taken up on M40 review of concrete according to IS 10262:2009 having mix extent 1:1.50: 2.58. Blocks of size 150 mm x 150 mm x 150 mm for compressive strength were threw; chambers of size 300 mm length and 150 mm breadth for split tensile strength were threw and light emissions 100 mm x 100 mm x 500 mm for flexural strength were threw. Different examples were tried following 7 and 28 long stretches of relieving. The test work speaks to the subtle elements of the trial examinations and graphical arrangement to decide end.

Keywords— Concrete, Styrene butadiene rubber(SBR) latex polymer, steel fiber, compressive strength, split tensile strength, flexural strength, mix design.

I. INTRODUCTION

Numerous new development materials are being created everywhere throughout the world to enhance the execution of concrete. Concrete assumes an essential job in the improvement of any country or any human progress from old occasions. Concrete is ordinarily utilized material in different kinds of development, from the ground surface of a little working to an elevated structure, from pathway to an airplane terminal runway and development of dam. Concrete has capacity to splash to fill the into breaks and coating burrows. Concrete is the mixture of bond, coarse totals, fine totals, and water in certain extent in order to make a concrete of wanted quality that is effectively formed into various shapes. The development business utilizes concrete to a vast degree. Bond is one of the vital parts of concrete. Bond is utilized as a coupling specialist for various materials. As the occasions change, there is a prerequisite to give best concrete, regarding its strength and sturdiness and so forth. Uncommon concrete required to be designed. So certain fibers and polymers are utilized these days, to accomplish the concrete mixes. Extraordinary concrete increment the toughness and decrease the wet blanket. SFRC is a cutting edge kind of concrete created by expansion of steel Fiber with concrete at the season of mixing with settled extents. There are numerous kinds of fibers, for example, steel fiber, glass fiber, polypropylene and so forth which are utilized to get ready high strength concrete. Steel fibers are for the most part utilized now daily. These steel fibers are useful to decrease the smaller scale splits in concrete part. Because of this concrete increases high strength for an extensive stretch of time. Steel fiber additionally enhances the heap conveying limit of concrete part. Presently a days numerous polymers, for example, styrene butadiene rubber, acrylic latex polymer and epoxy latex. Out of these polymers Styrene butadiene rubber (SBR) polymer has a consistent shading which makes its extremely reasonable development material. The properties of polymer altered and steel fiber fortified concrete (PMSFRC) are examined in this venture.

1.1 Objective of the Research

1. To determine effective quantity of steel fiber and polymer used in concrete mix.
2. To compare the various strength parameters of concrete when we used steel fiber and polymer in it.

3. To develop very high performance cement – based composites using polymer and steel fiber.

II. RELATED WORK

Dr. Awchat .G.D [1] studied experimental studies on polymer modified steel fiber reinforced recycled aggregate concrete. The quality and durability of concrete is improve by addition of steel fibers and polymer i.e. Styrene Butadiene Rubber (SBR Latex) which improves overall properties of concrete. In experimental work, cubes, cylinders and beams were casted to determine the mechanical properties of concrete such as compressive strength, split tensile strength and flexural strength.

Bedi Raman[2] studied mechanical properties of polymer concrete. It has been reported that addition of steel fibers improves the behavior of polymer concrete. The strength and toughness of polymer concrete also increase with addition of other fibers. It is well known that polymer concrete shows better mechanical properties than ordinary Portland cement concrete.

Ghaffar Abdul [3] studied steel fiber reinforced concrete .This investigation was carried out using compressive test, tensile test and flexural test. 'Hooked' steel fibers were tested to determine the mechanical properties of concrete.

Kene Kavita S [4] studied introduction to steel fiber reinforced concrete on engineering performance of concrete. Based on the experimental work, cubes, cylinders and beams have been casted with steel fiber reinforced concrete (SFRC). Comparing the result of FRC with plain M20 grade concrete after 7 and 28 days curing of specimens.

Nishane Utkarsh R [5] studied experimental studies on fiber reinforced concrete For glass and steel reinforcement, strength of concrete increased with, increased in fiber content. The concrete is design for M20 grade of concrete. According to various research papers, it has been found that steel fibers give the maximum strength in comparison and glass fiber is used for crack resistance but simultaneously gives strength.

Dr. Rao K. Srinivasa [6] studied performance of steel fibers on standard concrete in compression, tension & flexure. The grade of concrete designed for investigation was M30. The strengths considered for investigation are Compressive strength, Flexural Strength and Split tensile strength. Cubes to check compressive strength, Cylinders to check split tensile strength were casted and the beam was casted to check the flexural strength. All the specimens were cured for 3, 7 and 28days.

Singh Dharmender [7] studied polymer modified steel fiber reinforced concrete**.** Steel fiber reinforced concrete (SFC) is superior than ordinary concrete in strength. The properties of SFC can be improved by the addition of a polymer styrene butadiene rubber emulsion (SBR) to produce polymer modified steel fiber reinforced concrete (PSFC).

III. EXPERIMENTAL WORK

The exploratory work was done in example for planning 3 quantities of shapes estimate 150mm x150mm, 3 quantities of chambers of 150mm measurement and 300mm stature and 3 quantities of shafts 100mm depth,100mm width and 500mm length are taken for watching the compressive strength, split tensile strength and flexural strength of concrete individually. This investigation has been identified with the conduct of Plain bond concrete (M40 review of concrete), Plain bond concrete with Styrene butadiene rubber latex (M40 +SBR-latex), Plain bond concrete with Steel fibers (M40 + Steel fibers),Plain concrete with steel fibers and Styrene butadiene rubber latex (M40 + SBR-latex + Steel fibers).

3.1 Materials Used:

3.1.1 Cement- 53 grade ordinary Portland cement (OPC) was used throughout the experimental work.

3.1.2 **Physical properties of steel fibers are listed below.**

Type	Diameter(*d*)	Length(*l*)	Aspect ratio(*l/d*)
Hooked end	0.75 mm	60mm	80

3.1.3 **Properties of polymer**

Polymer Type	Percent solid	Color
Styrene butadiene rubber (SBR) latex	44	White

IV. CONCRETE MIX DESIGN

Mix proportioning-For Plain bond concrete (M40 review of concrete) 1:1.50:2.58 proportion is embraced with w/c proportion of 0.45.For Plain concrete with Styrene butadiene rubber latex (M40+SBR-latex) 1: 1.5: 2.58 proportion is received with w/c proportion of 0.45., and 10% SBR-latex by weight bond was added to the mix. For Plain bond concrete with Steel fibers (M40 +Steel fibers) 1: 1.5: 2.58 proportion is received with w/c proportion of 0.45., and steel fiber content was 1% by volume of concrete.For Plain bond concrete with steel fibers and Styrene Butadiene Rubber Latex (M40 + steel Fibers + SBR-latex) 1: 1.5: 2.58 proportion is embraced with w/c proportion of 0.45., and 10% SBR-latex by weight of concrete was added to the mix and steel fiber content was 1% by volume of concrete..

V. CASTING AND TESTING

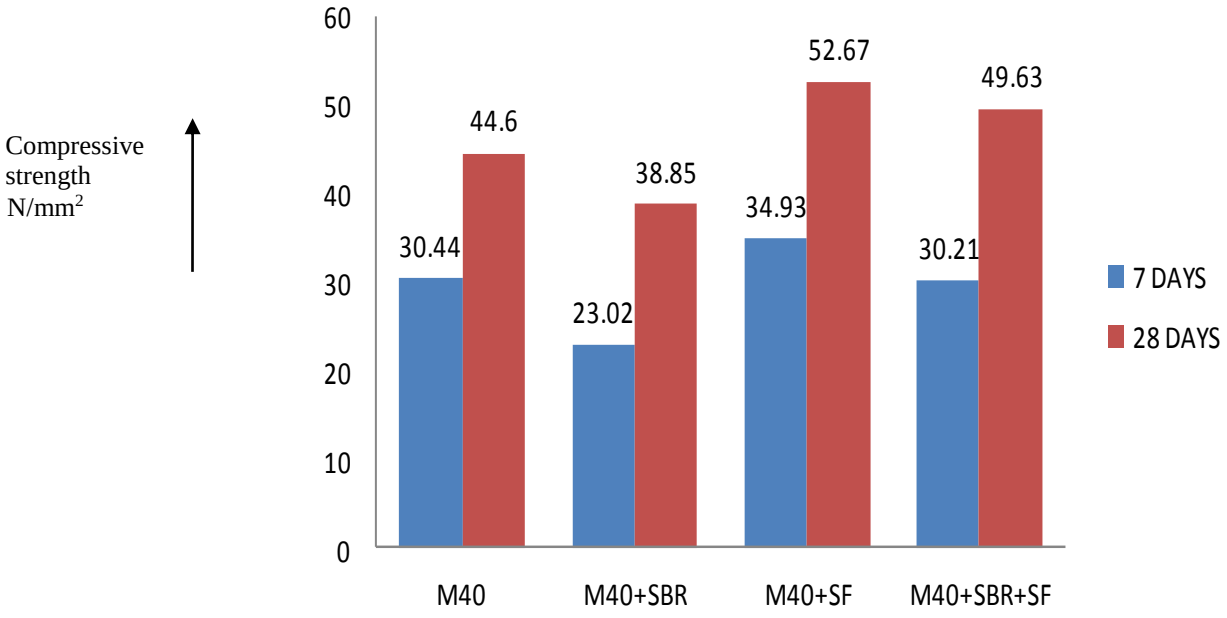
A total of 24 specimens 6 for each different design mix of concrete were casted and their testing is done after 7 days and 28 days.

VI. RESULTS

The average test readings of specimens after 7 days and 28 days are listed in the following table.

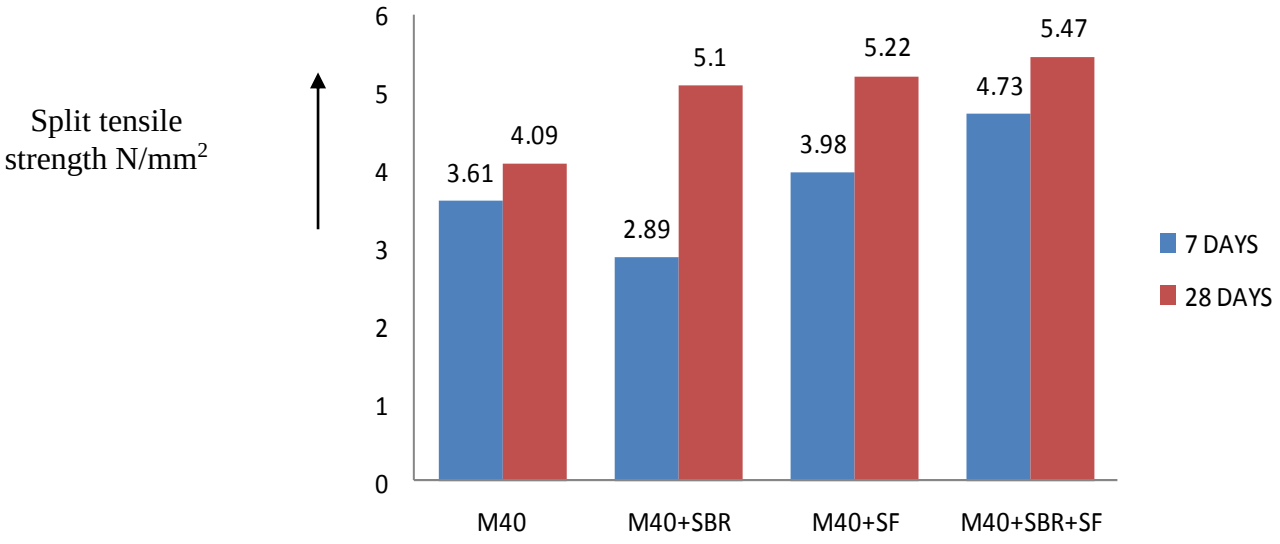
Properties	Days	M40	M40+SBR	M40+SF	M40+SBR+SF
Compressive strength(N/mm²)	7	30.44	23.02	34.93	30.21
	28	44.60	38.85	52.67	49.63
Split Tensile strength(N/mm²)	7	3.61	2.89	3.98	4.73
	28	4.09	5.10	5.22	5.47
Flexural strength(N/mm²)	7	3.87	4.64	4.26	5.01
	28	4.39	5.39	5.31	5.94

CUBE



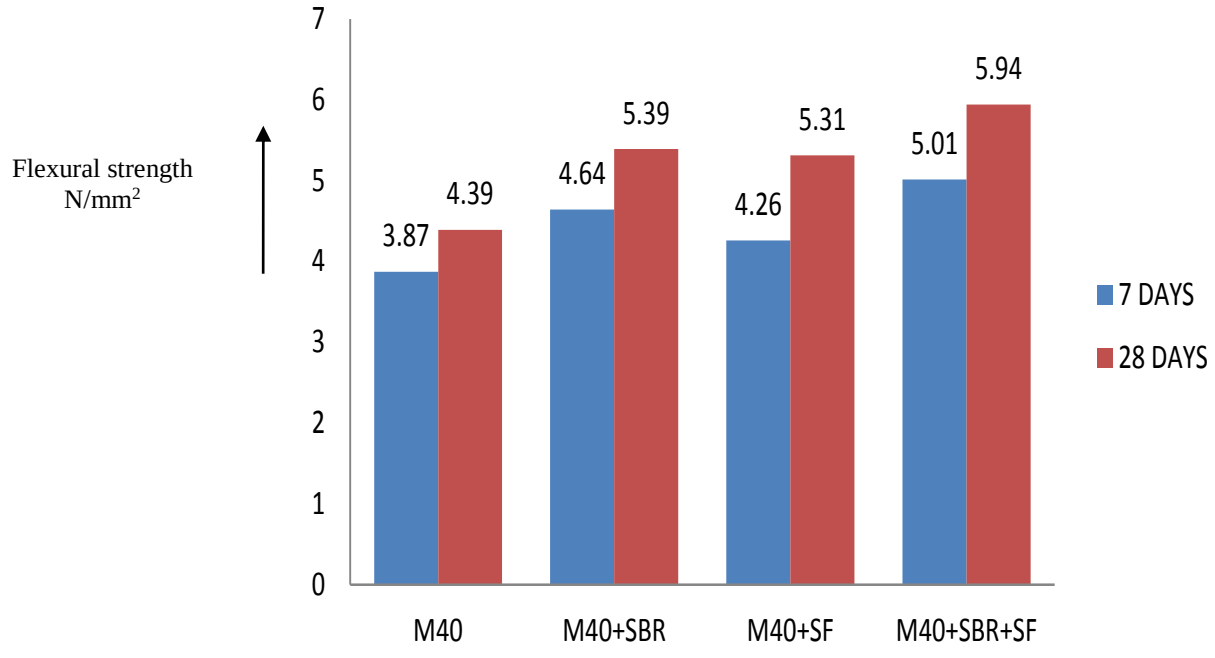
Graph 1: Variation of compressive strength with days

CYLINDER



Graph 2: Variation of split tensile strength with days

BEAM



Graph 3: Variation of flexural strength with days

VII. CONCLUSION

We see that the four mixes in the present examination to be specific M40, M40+SBR,M40+SF, M40+SBR+SF,the compressive strength got at 28 days are 44.60 N/mm2,38.85 N/mm2,52.67 N/mm2 and 49.63 N/mm2 respectively.In instance of shape testing there is a diminishing in compressive strength utilizing SBR latex, however expansion of

steel fibers to a concrete will enhance compressive strength. Utilization of steel fibers is additionally used to build the heap conveying limit of concrete individuals. While in the event of barrel testing there is increment in tensile strength utilizing steel fiber. Utilizing of SBR latex, flexural conduct of bar demonstrates an expansion in the flexural strength of concrete. Consolidate utilization of SBR latex and steel fiber indicates diminish in compressive strength of concrete solid shapes than expansion of steel fiber in concrete however join utilization of SBR latex and steel fiber demonstrates an increments in tensile strength of concrete chamber and flexural strength of concrete pillar.

REFERENCES

[1] **DrAwchat .G.D and Dr Kanhe, (2013) "Experimental Studies on Polymer Modified Steel Fibre Reinforced Recycled Aggregate Concrete" Vol. 2, No 12,pp 126-134**

[2] **Bedi Raman, Chandra Rakesh and. Singh S. P,(2013) "Mechanical Properties of Polymer Concrete" Hindawi Publishing Corporation Journal of Composites Vol.9,No 12, pp1-12**

[3] **Ghaffar Abdul, Chavhan Amit S , Dr. Tatwawadi R.S,(2014) "Steel Fibre Reinforced Concrete," International Journal of Engineering Trends and Technology (IJETT) Vol. 9 ,No 15, pp 791-797.**

[4] **Kene Kavita S , Vairagade Vikrant S and Sathawane Satish, (2012) "Introduction to Steel Fiber Reinforced Concrete on Engineering Performance of Concrete," International Journal of Scientific & Technology Research Vol. 1,No 4, pp139-141**

[5] **Nishane Utkarsh R, (2017) "Experimental studies on fiber reinforced concrete", International Journal of Engineering Research and Application, Vol. 7,No 5, pp.40-44**

[6] **Dr. Rao K. Srinivasa, (2016) "Performance of Steel Fibers on Standard Concrete in Compression, Tension & Flexure," International Journal of Scientific & Engineering Research, Vol. 7, No 11,pp1031-1041**

[7] **Singh Dharmender, Kumar Praveen,(2016) "Polymer Modified Steel Fiber Reinforced Concrete" International Journal of Technical Research (IJTR) Vol. 5,No 2, pp157-160**

[8] **Shetty M. S. (Reference Book) Concrete Technology By Chand Publications, Seventh Revised Edition, Unit No. 11 Concrete Mix Design (IS Code Method).**

[9] **S 456:2000 Plain and Reinforced Concrete – Code of Practice.**

[10] **IS 10262: 2009 Indian Standard Guidelines for Concrete mix design.**

[11] **IS 383: 1970 Indian Standard specifications for coarse and fine aggregate from natural sources for concrete.**