International Journal of Advanced Technology in Engineering and Science
Vol. No.4, Issue No. 02, February 2016
www.ijates.com
ijates
ISSN 2348 - 7550

EXPERIMENTAL INVESTIGATION ON STRENGTH DEVELOPMENT OF CEMENT USING RECRON 3S FIBER

V.GUNASEKARAN

Lecturer Senior Grade, Department of Civil Engineering, Nachimuthu Polytechnic College, Pollachi, India

Abstract- In this investigation was done on the influence of RECRON 3S fibers on the strength development and behavior of high strength mortars. It was also tried to standardize the optimum fiber content. Ordinary Portland cement (53 grade) and locally available river sand sieved through 2.36mm IS sieve were mixed in the ratio 1:2 to Cast the specimen with a water cement ratio of 0.43. The effect of addition of 0.5%, 0.75%, 1 % and 1.25% of fibers by weight of cement to high strength cement mortar was studied by conducting compressive, tensile and flexural strength tests. Nine specimens were cast in each percentage of fiber and without fiber content to study the strength development after 3, 7 and 28 days. It was observed that the cement mortar with 0.5% fiber gave good workability when compared to other percentages of 0.75% and 1% though there was strength improvement in later.

Key Words – High Strength Cement, Recron 3S Fiber, Development of strength in Cement, etc…

I. PROPERTIES OF MATERIALS

1.1 CEMENT

Ordinary Portland Cement (OPC 53 grade, Zuari brand) was used for the investigation The cement was tested for its properties and the results are given in table 1

1.2 FINE AGGREGATE

Locally available River sand conforming to zone II according to IS 383(1970) was used.

1.3 Water

Ordinary Portable water available in the laboratory was used for the experimental investigations and for cutting purpose.

Table 1 Physical Properties of Cement (OPC-53 Grade)

S.No	Nature of test	Test Value
1	Consistency	33%
2	Initial setting time	125 min
3	Final setting time	230min
4	Specific Gravity	3.11
5	Compressive Strength (28 days)	54.32Mpa

International Journal of Advanced Technology in Engineering and Science
Vol. No.4, Issue No. 02, February 2016
www.ijates.com
ijates
ISSN 2348 - 7550

1.4 FIBER

Recron 3s fibers are environmental friendly and non-hazardous. They easily disperse and separate in the cement mortar mix. Recron 3S Fiber were added as 0.5%, 0.75%, 1.0%, 1.25% to the matrix by weight of cement

Fig1: Recron 3s fibers

Specification of Recron 3S

Cut length	-	12mm
Shape of fiber	-	Trianular for improved holding of cement aggregates
Tensile strength	-	4000-6000 Kg/cm^2
Melting point	-	> 250^0 C

II MIXING PROCESS

2.1 CASTING OF TEST SPECIMENS

Forty five cubes of size 100mm x 100mm, forty five cylinders of size 150mm dia and 300mm height and forty five beams of size 500mm x 100mm x 100mm were cast to investigate the compressive strength, Tensile strength and flexural strength of high strength mortar mix. Out of forty five specimens in each nine were without fibers. The other specimens were cast with 0.5%, 0.75%, 1.0%, and 1.25% fiber by weight of cement. Three specimens were cast and tested for each 3rd, 7th and 28th day strength of different percentage of fiber content.

Fig 2 Mixing the fiber with concrete

Fig 3 Concrete mix

Fig 4: Casting the mix

2.2 CURING OF SPECIMENS

All the specimens were well immersed in water for curing immediately removing from the moulds after 24 hours. Curing was continued till the respective age of testing (i.e. 3rd, 7th and 28th).

Fig 5: Casted Specimen

Fig 6: Curing the Specimen

III EXPERIMENTAL INVESTIGATIONS

The experimental investigations were carried out for the determination of compressive, tensile, and flexural strength.

3.1 COMPRESSIVE STRENGTH TEST

Compressive strength tests were conducted on various cube specimens at the ages of 3, 7, 28 days using a compressive testing machine of capacity 200 tonnes. Totally forty five specimens were tested with various percentages of fibers (i.e. 0%, 0.5 %, 0.75 %, 1.0 %, and 1.25%).

3.2 SPLIT TENSILE STRENGTH TEST

Split Tensile tests were conducted for the cylindrical specimens at the ages of 3, 7, 28 days in the compression testing machine of capacity 200 tonnes. Split Tensile strength is given by $2P/\pi DL$. Totally forty five specimens were tested with various percentages of fibers (i.e. 0%, 0.5 %, 0.75 %, 1.0 %, and 1.25%).

3.3 FLEXURAL STRENGTH

The determination of flexural strength is essential to estimate the load at which the specimen will crack. Flexural strength tests were conducted for various beam specimens under two point loading at the age of 3, 7, 28 days using universal testing machine capacity of 40tonnes. Totally forty five specimens were tested with various percentages of fibers (i.e. 0%, 0.5 %, 0.75 %, 1.0 %, and 1.25%).

Table 2. Strength Properties of various specimens for different % of fiber content at 3rd 7th & 28th day.

% of Fiber added	Age of Specimen (Day)	Mean Compressive strength (Mpa)	Mean Split Tensile strength (Mpa)	Mean Flexural Strength (Mpa)
0%	3	21.065	1.89	8.86
	7	26.30	2.36	10.27
	28	30.51	2.86	12.16
0.5%	3	25.13	1.94	8.88
	7	32.11	2.36	11.87
	28	35.02	2.91	12.65
0.75%	3	26.73	2.03	8.96
	7	33.85	2.59	11.70
	28	36.90	3.56	13.14
1.0%	3	28.33	2.82	9.74
	7	35.88	3.19	12.30
	28	39.81	4.11	14.25
1.25%	3	30.37	3.00	10.95
	7	38.50	3.47	13.73
	28	40.97	4.35	14.28

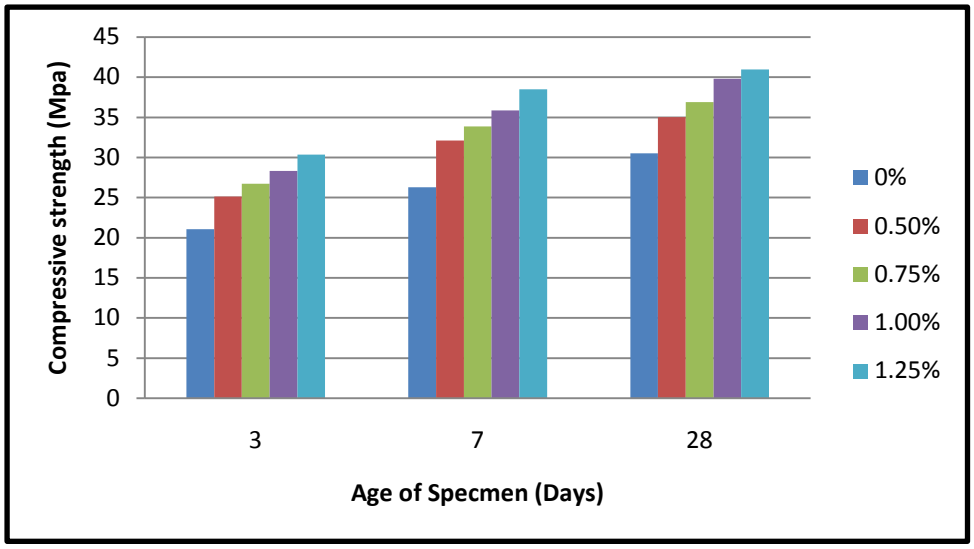

Fig 7. Variation of Compressive strength with different % of fiber

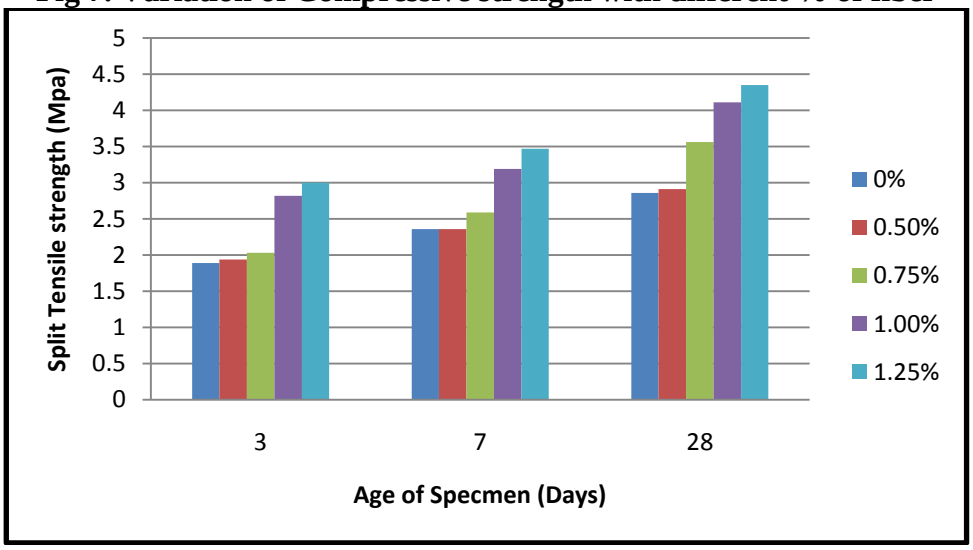

Fig 8. Variation of Split Tensile strength with different % of fiber

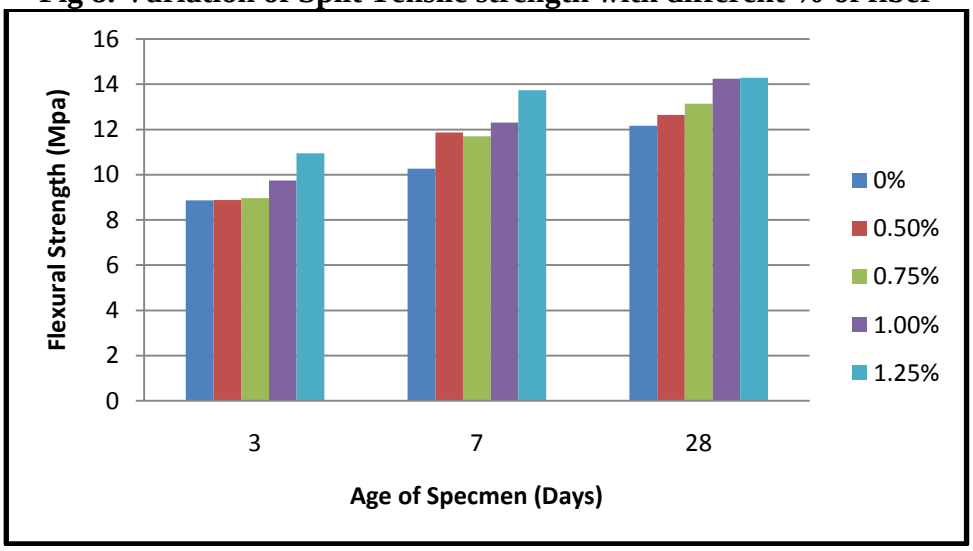

Fig 9. Variation of Flexural Strength with different % of fiber

IV DISCUSSION ON RESULTS

4.1 Observation of Compressive strength of cubes with varying fiber content

Compressive strength of cubes with varying fiber content (0%, 0.5 %, 0.75 %, 1.0 %, and 1.25%) with respect o age of the specimen presented in Table 2.

Fig 7 shows variations of compressive strength at different days for different percentages of fiber. The average compressive strength of cubes 0% of fiber for 3 days and 7 days tests is about 69% and 86% of the final strength. For cubes with 0.5%, 0.75%, 1.0% and 1.25% fiber the corresponding strengths are about 71% and 91%, 72% and 91%, 71% and 90% & 74% and 94% respectively. The final compressive strength at 28 days for cubes with 0%, 0.5%, 0.75%,1.0% and 1.25% fiber content are 30.51Mpa, 35.02 Mpa, 36.9 Mpa, 39.81Mpa and 40.97 Mpa respectively. The results show that there is a considerable increase in compressive strength due to addition of fibers.

4.2 Observations of Split Tensile Strength of cylindrical specimens:

The results of the split tensile strength tests are presented in table 2 for different percentages of fibers. Fig.8 shows variation of split tensile strength of cylindrical specimen at different ages for varying percentages of fiber. The average split tensile strength achieved at 28 days for cylindrical specimen 0% fiber is 2.86 Mpa and for specimen with a fiber content of 0.5%, 0.75%, 1.0% and 1.25% the average split tensile strength achieved at 28 days are 2.91Mpa, 3.56Mpa, 4.11 Mpa and 4.35 Mpa respectively. The results show that there is not much increase in the tensile strength upto 0.5% fiber content. However for further increase in percentage of fiber it is observed that there is a gradual increase in the tensile strength.

4.3 Observation of Flexural Strength of Beam specimens:

The results of the flexural strength are presented in table 2, Fig. 9 shows variation of flexural strength of beam specimens at different ages for different percentages of fibers. The average flexural strength achieved at 28 days for beam specimen 0% of fiber is 12.16 Mpa and for specimen with a fiber content of 0.5%, 0.75%, 1.0% and 1.25% the average flexural strength at 28 days are 12.65 Mpa 13.14Mpa, 14.25 Mpa and 14.28 Mpa respectively. The results show that there is no appreciable increase in flexural strength for upto 0.75% addition of fibers for 3rd day tests. It was also found that there is a gradual increase in flexural strength in 7th days and 28th days of testing.

V CONCLUSIONS

1. Recron 3S fiber enhances in the strength development of high strength cement mortars.
2. There is no considerable increase in compressive strength for even 0.5% addition of fibers.
3. There is not much increase in tensile strength. However for further increase in percentage of fiber it is observed that there is a gradual increase in the tensile strength
4. There is no appreciable increase in flexural strength for upto 0.75% addition of fibers for 3rd day tests. It was also found that there is a gradual increase in flexural strength in 7th days and 28th days of testing.

REFERENCES:

1. Alexander, july 1994 “The enhancement of ferrcement properties using steel fiber addition to mortar” Jural of ferrocement Vol 24, No3.
2. Shetty M S Concrete Technology, S.Chand Company .Ltd New Delhi.
3. Ashish Kumar Dash, Mahabir Panda and Kishore Chandra Biswal, “Effect of Silica Fume on Engineering Properties of Fiber Reinforced Concrete” in Modern methods and Advanced in Structural Engineering and Constuction, 2011
4. A.Sivakumar, Manu Santhanam, “Mechanical Properties of High Strength Concrete Reinforced wth Metallic and Nonmetallic Fibers”,in Cement and Composites, volume 29,
5.] Balvirsingh and jaspalsingh “Experimental study on recron 3s fiber”, International journal, Vol.2,pp-263-273,(2005)