International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 10 | Oct -2016 www.irjet.net p-ISSN: 2395-0072

STUDY ON STRENGTH CHARACTERISTICS OF CONCRETE BY CONSIDERING SLURRY INFILTRATED CONCRETE LAYERS

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Abstract - *The material SLURRY INFILTRATED CONCRETE has no coarse aggregates but has a high cementitious content. Later, he extended the application of SLURRY INFILTRATED CONCRETE to refractories. The strengthening mechanism of the fibres involves transfer of stress from the matrix to the fibre by interfacial shear or by interlock between the fibre and matrix, if the fiber presently, steel fibres are considered as structural fibres as they enhance strength of the structure to a great extent. The addition of steel fibres into concrete mass can dramatically increase the strength properties like compressive strength, tensile strength, and flexural strength and impact strength of concrete. The strength properties of FRC can be increased by increasing the percentage of fibres in the concrete. But as the percentage of fibres increases, there are certain practical problems which have to be faced. The higher percentage i.e. higher volume content of fibres may cause balling effect in which the fibres cling together to form balls. Thus uniform distribution of fibres cannot be guaranteed, if percentage of fibres is more.*

Key Words: Steel fibres, GI fibres , HDPE fibres, Regression Analysis

1. INTRODUCTION

Most of previous research work on slurry infiltrated concrete has focused mainly on investigating the mechanical properties of this material. This study brings out the effect of SLURRY INFILTRATED CONCRETE layers on the strength of concrete.

1.1 OBJECTIVES OF THE STUDY

- The main objective of this research programme is to find out the effect of slurry infiltrated concrete layers on the strength characteristics of concrete.
- The strength characteristics such as compressive strength, tensile strength, flexural strength, and shear strength are studied with respect to different depths of SLURRY INFILTRATED CONCRETE.
- The different depths of SLURRY INFILTRATED CONCRETE layers adopted in the experimentation are d/6 and d/2 from bottom and top. Also d/6 and d/2 from bottom.

MIX DESIGN FOR M30 GRADE CONCRETE (According to IS: 10262 – 2009)

Table -1: Stipulations for proportioning

1.	Grade designation	M 30
2.	Type of cement IS: 8112 - 1989	OPC 43 grade conforming
3.	Maximum nominal size of aggregate	20 mm (Table 5 of IS: 456 – 2000)
4.	Minimum cement content	320 Kg/m3 (Table 5 of IS: 456 – 2000)
5.	Maximum water-cement ratio	0.45 (Table 5 of IS: 456 – 2000)
6.	Workability	50 mm (slump)
7.	Exposure condition	Severe
8.	Method of concrete placing	Conventional
9.	Degree of supervision	Good
10.	Type of aggregate	Crushed angular aggregate
11.	Maximum cement content	450 Kg/m3
12.	Chemical admixture type	----------

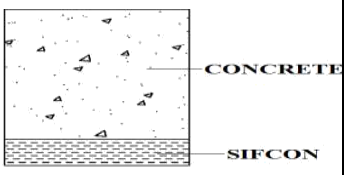
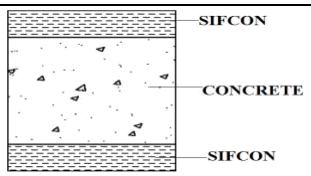
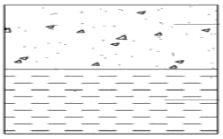
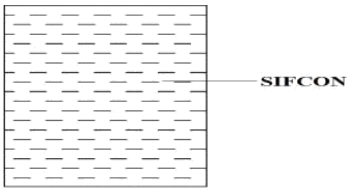
Table-2: Test data for materials

1.	Cement used	OPC 43 grade conforming
		IS: 8112 – 1989
2.	Specific gravity of cement	3.15
3.	Chemical admixture	----------
4.	Specific gravity of	
	i. Coarse aggregate	2.61
	ii. Fine aggregate	2.58
5.	Water absorption	
	i. Coarse aggregate	0.6%
	ii. Fine aggregate	1.0%
6.	Free (surface) moisture	
	i. Coarse aggregate	Nil
	ii. Fine aggregate	Nil

Table 3- Specimen nomenclature

Depth of SIFCON	Steel fibre	GI fibre	HDPE fibre
d/6-B	S1	G1	H1
d/6-BT	S2	G2	H2
d/2-B	S5	G5	H5
d/2-BT(SIFCON)	S6	G6	H6

Table 4- Schematic representation of different depths of SIFCON layers adopted in the experimentation.

Depth of SIFCON	Schematic representation
d/6-B	
d/6-BT	
d/2-B	
d/2-BT	

2. EXPERIMENTAL RESULTS

2.1 Overall results of compressive strength

Following Table-5 gives the overall results of compressive strength of concrete with different depths of SIFCON layers for different fibres. Fig 1 shows the comparison of compressive strength of concrete with different depths of SIFCON layers for different fibres.

Table 5 –Overall results of compressive strength

Depth of SIFCON	Compressive strength (MPa) for different fibres					
	Steel Fibre	Percentage increase in Compressive Strength w.r.t ref mix	GI fibre	Percentage increase in compressive strength w.r.t ref mix	HDPE fibre	Percentage increase in Compressive strength w.r.t ref mix
Ref. Mix (plain concrete)	37.77	-	37.77	-	37.77	-
d/6-B	42.22	12%	41.32	9%	38.52	2%
d/6-BT	49.63	31%	43.41	15%	40	6%
d/2-B	68.89	82%	56.59	50%	54.22	44%
d/2-BT (SIFCON)	78.07	107%	69.93	85%	58.67	55%

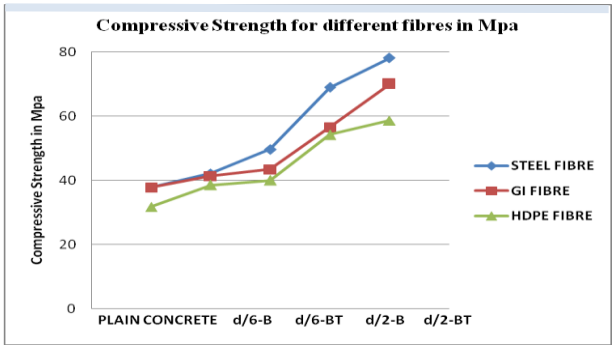


Chart-1 Comparison of compressive strength of concrete with different depths of SIFCON layers for different fibres

2.2 Overall results of tensile strength:

Following Table 6 gives the overall results of tensile strength of concrete with different depths of SIFCON layers for different fibres. Figure 2 shows the comparison of tensile strength of concrete with different depths of SIFCON layers for different fibres.

Table 6 -Overall results of tensile strength

Tensile strength (MPa) for different fibres						
Depth of SIFCON	Steel fibre	Percentage increase in tensile strength w.r.t ref mix	GI fibre	Percentage increase tensile strength w.r.t ref mix	HDPE fibre	Percentage increase in tensile strength w.r.t ref Mix
Ref. Mix (Plain concrete)	2.6	-	2.6	-	2.6	-
d/6-B	3.44	32%	3.06	18%	2.88	11%
d/6-BT	4.1	58%	3.54	36%	3.39	30%
d/2-B	6.08	134%	5	92%	4.72	82%
d/2-BT	6.88	165%	5.94	128%	5.19	100%

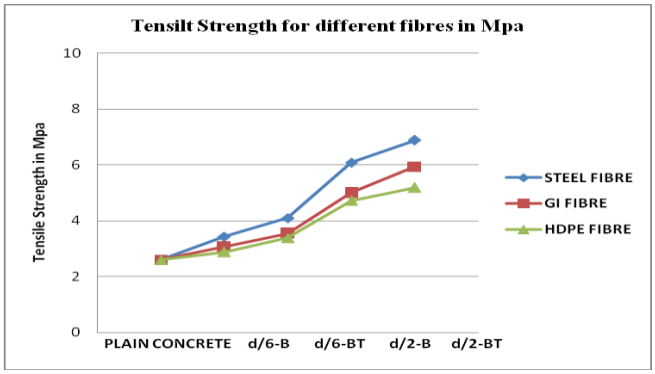


Figure 2-Comparison of Tensile strength of concrete with different depths of SIFCON layers for different fibre

3.3 REGRESSION ANALYSIS

Compressive strength test result analysis

Following Figure 3 gives the regression model (RM) for compressive strength of concrete with SIFCON layer of different depths at bottom and both at top and bottom produced with steel fibre.

Regression model for compressive strength of concrete with SIFCON layer of different depths at bottom produced with steel fibre.

The regression model for compressive strength of concrete with SIFCON layer of different depths at bottom produced with steel fibre is found to be **y= 0.35553x + 32.137** where **x=** Depth of SIFCON in mm
Regression coefficient value R^2 is found to be **1**

Table 7: Comparison of experimental values and analytical values of compressive strength of concrete with SIFCON layer at bottom produced with steel fibre.

Depth of SIFCON (mm)	Experimental values of compressive strength (MPa)	Analytical values of compressive strength (MPa)
d/6-B (25mm)	42.22	41.02
d/2-B (100mm)	68.89	67.67

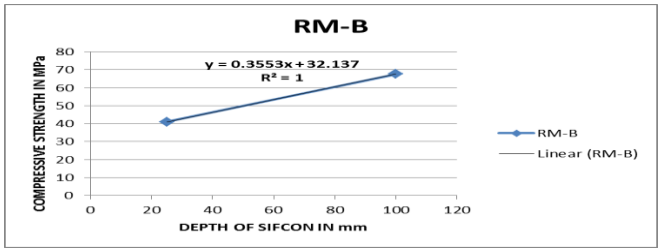


Figure 3-Regression model for compressive strength of concrete with SIFCON layer at bottom produced with steel fibre

Tensile strength test result analysis

Following Table 8 gives the regression model (RM) for tensile strength of concrete with SIFCON layer of different depths at bottom and both at top and bottom produced with steel fibre.

Regression model for tensile strength of concrete with SIFCON layer of different depths at bottom produced with steel fibre.

The regression model for tensile concrete with SIFCON layer of different depths at bottom produced with steel fibre is found to be **y=0.0268x+2.1618** where **x=** Depth of SIFCON in mm Regression coefficient value R^2 is found to be **1**

Table 8: Comparison of experimental values and analytical values of tensile strength of concrete with SIFCON layer at bottom produced with steel fibre.

Depth of SIFCON	Experimental values of tensile strength (MPa)	Analytical values of tensile strength (MPa)
d/6-B (50mm)	3.44	3.5
d/2-B (150mm)	6.08	6.176

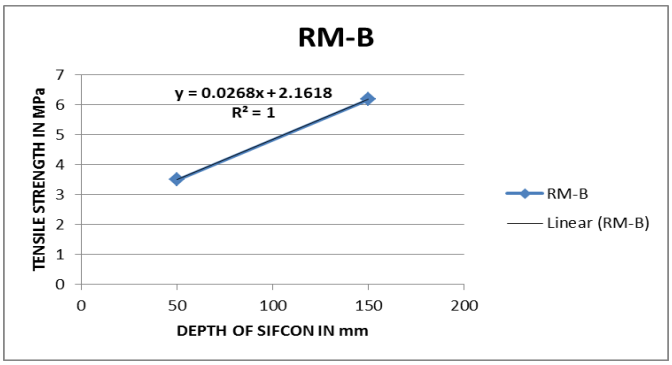


Figure 4 Regression model for concrete with SIFCON layer at bottom produced with steel fibre

3. CONCLUSIONS:

1) Concrete with SIFCON layer at both top and bottom can exhibit more compressive strength as compared to SIFCON only at bottom .This is true for different depths of SIFCON layers such as d/6 and d/2 produced from steel fibres and HDPE fibres

2) Compressive strength of concrete with SIFCON layers either at the bottom or at both top and bottom is higher as compared to the plain concrete. This is true for concrete with SIFCON layers made of steel fibres, GI fibres and HDPE fibres.

3) Concrete with SIFCON layers produced with steel fibre yields higher compressive strength as compared and HDPE fibres.

4) Concrete with SIFCON layer at both top and bottom can exhibit more tensile strength as compared to SIFCON only at bottom .This is true for different depths of SIFCON layers such as d/6 and d/2 produced from steel fibres and HDPE fibres.

6) Tensile strength of concrete with SIFCON layers either at the bottom or at both top and bottom is higher as compared to the plain concrete. This is true for concrete with SIFCON layers made of steel fibres rather than HDPE fibres.

7) Concrete with SIFCON layers produced with steel fibre yields higher tensile strength as compared to that of HDPE fibres.

REFERENCES

1. Fibre Reinforced Cement and Concretes,1989
2. Parameswaran .V.S, Krishnamoorthy .T.S, Balasubramanian .K —Behaviour of high volume fibre cement mortar in flexure|| Cement & Concrete Composites.
3. Parameswaran .V.S, Krishnamoorthy .T.S, Balasubramanian .K —Studies on slurry infiltrated fibre concrete|| Transportation Research Record 1382, 1990
4. Naaman.A.E and Otter .D, Najm .H — Elastic modulus of SIFCON in tension and compression|| ACI Material Journal Dec-1991.
5. Naaman.A.E and Reinhardt.H.W, Christopher. F —Reinforced concrete beams with a SIFCON matrix|| ACI Structural Journal, Jan-Feb 1992.
6. Naaman.A.E, Fritz.C, Reinhardt.H.W and Alwan.J, —Non linear analysis of C beams using a SIFCON matrix|| Materials and Structures, Nov 1993.
7. Naaman .Antonie. E —Shear response of dowel reinforced SIFCON|| ACI Structural Journal, Sep-Oct 1995.
8. Parameswaran .V.S, Krishnamoorthy .T.S, Balasubramanian .K , Bharatkumar B.H — Behaviour of SIFCON under pure torsion|| Journal of Structural Engg, Vol 24.
9. Thirugnanam .G.S , Govindan P, Sethuraman .A — Ductile behaviour of SIFCON structural members|| Journal of Structural Engg ,vol 28 ,No 1, Apr-2001.

BIOGRAPHIES

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