Study of Characteristics Strength of Concrete with Steel Fibre

Submitted in partial fulfilment of the requirements

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MASTER OF TECHNOLOGY

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by

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DECLARATION

I, Sachinpreet Singh(Regd. No. 11506480), hereby declare that this thesis report entitled **" Study of Characteristics Strength of Concrete with Steel Fibre"** submitted in the partial fulfilment of the requirements for the award of degree of Master of Civil Engineering, in the School of Civil Engineering, Lovely Professional University, Phagwara , is my own work. This matter embodied in this report has not been submitted in part or full to any other university or institute for the award of any degree.

Date: **Sachinpreet Singh**

Place:

CERTIFICATE

Certified that this project report entitled "To Study the Characteristics Strength of Concrete with Steel Fibre" submitted individually by student of School of Civil Engineering, Lovely Professional University, Phagwara, carried out the work under my supervision for the Award of Degree. This report has not been submitted to any other university or institution for the award of any degree.

Signature of Supervisor

Mr.R.Navaneethan

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Signature of Student

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ABSTRACT

This study summarizes the characteristics strength of concrete with addition of steel fibre in cement. According to many research papers it founds that the concrete is weak in tension and flexural strength and good in compressive strength, so in this research the steel fibre is added in the concrete to increase the split tensile strength .specimen od cube size 150mm*150mm*150mm. and cylinder size 200mm long and 100mm dia are casted for finding the compressive strength and split tensile strength respectively.

LIST OF CONTENT

LIST OF TABLES

LIST OG FIGURES

CHAPTER 1

INTRODUCTION

1.1 General:-

Concrete is the one of most important material which is using now days in construction of buildings or in case of other constructions. We have so many types of concrete but mostly used concrete is Ordinary Portland Cement (OPC) concrete and that concrete include the coarse aggregate, fine aggregate, cement ,water and others types of concrete:-

Concrete have already enough strength but now days we are adding or replacing so many material in concrete only for increasing the strength. Such materials are steel fibre, silica fume and etc. There are so many materials such as silica fume and rice husk ash by using these material we can increase the surface area so they will absorb more water and by this way we can increase strength or other properties. If we are using the steel fibre for adding in concrete so we need to know the size of fibre and also the diameter of the steel fibre. And also when we are this material in concrete so we have to be very carefully there should not be any ball in concrete when we are adding these materials. And Rice husk is waste material by burning this material we can get a material that is the rice husk ash which is used now days in concrete for increasing the strength of concrete.

1.2 History behind Development of FRC

1. The use of the fiber in the construction is started from 3500 year ago, when straw was used to reinforce sun-baked bricks in Mesopotamia.

2. In mud bricks and mortar the horse hairs was used to increase the strength.

3. In the early 1900 asbestos fibers were used in concrete.

4., the concept of composite materials came into picture in the 1950s.

5. To improve the properties of concrete for the past 30 or 40 years Steel, Glass and synthetic fibers have been used.

1.3 Fibre Reinforced Concrete

Reinforced with fibres can be determined as composite material, hydraulic fine Cement, good and coarse aggregates and discrete short fibres. Wire mesh, yarns and fabrics or long rods are not considered as separate fibres. Round or flat fibre. The fibres are often called by the practical parameter called "Ratio". The ratio of the fibre is the ratio of the length to the equivalent diameter of the fibres. Typical ratios ranging from 50 to 150 any type of fibre has its own characteristics and limits. The concrete is relatively fragile and the tensile strength is generally only about one tenth of the pressure force. Regular concrete is therefore normal steel frame are becoming more and more popular for many applications of concrete with small fibres, randomly distributed for reinforcement. Their main purpose is the ability to absorb energy and increase the hardness of the material, but also increases the tensile and flexural strength of the concrete. Fibbers having different shapes and sizes, of steel, plastic, glass and natural materials used; For most structural purposes and non-structural steel fibres, of all the most common fibres. It has behaviour of cracking fibres of concrete post-improvement significant. Although not significantly increase the reinforced concrete on the tensile strength, causes the train trains to stop. Compared to normal reinforced concrete fibres much harder and shock resistant. When we compared hard concrete panels Normal concrete that their properties are very different in fibre reinforced durability more compared to normal concrete and, as we fibre a light material and normal concrete and heavy material, is now such that the fibre then compared expensive Barer with normal concrete. Reinforced by fibres, that we have the same amount of volume, is the power that is higher than that of concrete, but unlike reinforced concrete. In normal concrete is malleable that comparable FRC.

1.4 Advantages of fibre reinforced concrete:

1. Effective high elastic modulus long term reinforcement and uniform in hardened concrete.
2. It does not rust and requires minimal coverage.
3. Aspect ratio (Ratio between fibre diameter and length), making them ideal for performance is young.
4. To set up easily defines moulding, spraying and less work as reinforcement.
5. Higher toughness retains conventional concrete mixtures.
6. Higher flexural strength, depending on the addition rate.
7. We can find in the form of thin sheets and irregular shape

8. A fit enough plasticity FRC under eleven distortions, but it has reached its maximum load.

9. High tensile strength.

1.5 Disadvantages of Fibre Reinforced Concrete:

1. Workability reduces.

2. Higher cost.

3. In general, the fibres will not be necessary to increase the flexural strength of the concrete, and thus not replace the section modulus and structural reinforcement.

1.6 Application of Fibre Reinforced Concrete:

1. The input delay and controls the extensible breaking the concrete composite fibres. With this new tensile strength of the fibre the spread of cracks is inherently unstable slow crack growth is regulated. The fibre amplifier crack to absorb the introduction of a large delay training affiliation and a significant improvement in the energy absorption capacity and the tenacity of the composite. Concrete previous bundle in sidewalks and industrial floors. Then the fibre concrete target: a variety of applications in the structure of dry coating and hard, airport, industrial mud, water retention and water structures, car parks on the deck, water plants and sewage, sanitary, roof and prefabricated wall panels, concrete and technical applications.

2, for the same wheel load plates FRC are about half the thickness of the mass of the concrete slab. Low offers good CEAF stability even in heavy and light environments. It is used in tracks, tracks, aprons, dykes, docks, parking garages and loading docks.

3. Dams and hydraulic structures CEAF for the construction and repair of dams and other water uses to provide resistance to cavitation and erosion caused by the severe impact of large debris.

4. Thin shell, walls, tubes and fibre concrete shafts enable the use of planar surfaces.

5. Agriculture can be animal structures stored, walls, silos, pavement etc.

6. Mainly trading can be used for exterior and interior floors, slabs and parking areas, roads etc.

1.7 Application of Fibre Reinforced concrete in India:

1. 400 tons of steel used other fibres to make a living for a road project in Mathura (UP).

2. 3.9 km long urban heating tunnel heating cables power islandAmager in the centre of Copenhagen, is the SFC cutting line without conventional steel frame.

3. Bar-free steel fibres for the transport of bending loads in a parking lot in Heathrow. It is a structure with a slab 10 cm thick.

4. Reinforced precast concrete manhole covers and frames are widely used in India.

1.8 Limitation of Fibre Reinforced Concrete:

Fibre, which is randomly distributed over the concrete, cracks, can overcome the shrinkage and better control. These materials have an excellent combination of strength and energy absorption capacity. In general, fibrous reinforcement is not a substitute for the reinforcement of conventional steel. The strengthening of fibre and steel has their own role in concrete technology. Therefore, many applications, which fibres and continuous steel reinforcing rods can be used together. However, the fibres are not effective in resisting tensile stresses with respect to conventional steel reinforcements. But the fibre on the distance of steel reinforcements closely, which better control the shrinkage and cracking. Therefore, the conventional steel frame used to increase the load bearing capacity of the concrete body; more efficient cracking fibres. The absence of corrosion resistance of the normal steel fibres could be a drawback of concrete situations exposed

1.9 Steel Fibre Reinforced Concrete

Fibber of steel, the in fibre for is augmenter uses the resistance of the concrete. In addition, this fibre will improve many technical characteristics and resist cracking. Concrete Fibbers Counter-turns have improved strength, flexion, traction and increased resistance against impact, fatigue and shear wear, and improved toughness and ductility than those of reinforced cement concrete.

Fig1.1: Steel Fibre

1.10 Applications of SFRC:

The use of SFRC over the last thirty years has been so varied and so vast that it is difficult to classify. The app most popular reviews are sidewalks, tunnels, floors and tiles. Concrete aerodrome walkways Plates bridge repair bridges and so on. Fibre also reinforced steel some recent experimental work has been in the CCR. The list is endless, limited only by the ingenuity of the engineers probably concerned. The unfortunate relatively expensive fibre own fibre and 1% of the steel is about twice the cost of the concrete material, which limits the use of steel fibre concrete instead of a specific demand.

1.11 Advantages of Steel Fibre:

1. Creates extensible concrete with reduced cracking.
2. Reduce the effect of narrowing curling.
3. Quick installation that schedule time.
5. Easy Handling of material.
6. with the support of leading manufacturers.

CHAPTER 2

LITERATURE REVIEW

2.1 Compressive Strength

A.M. Shende.et al (2015). did the Experimental study on reinforced concrete of steel fibres of grade M-40.In this study to find the resistance of concrete with addition of steel fibres in different %age in different ratio- proportions.

Table 2.1 Compressive strength of SFRC with 0% steel fibre M40 grade

Compressive strength (MPa)	**Average Compressive strength (MPa)**
48.89 42.22 44.44	45.19

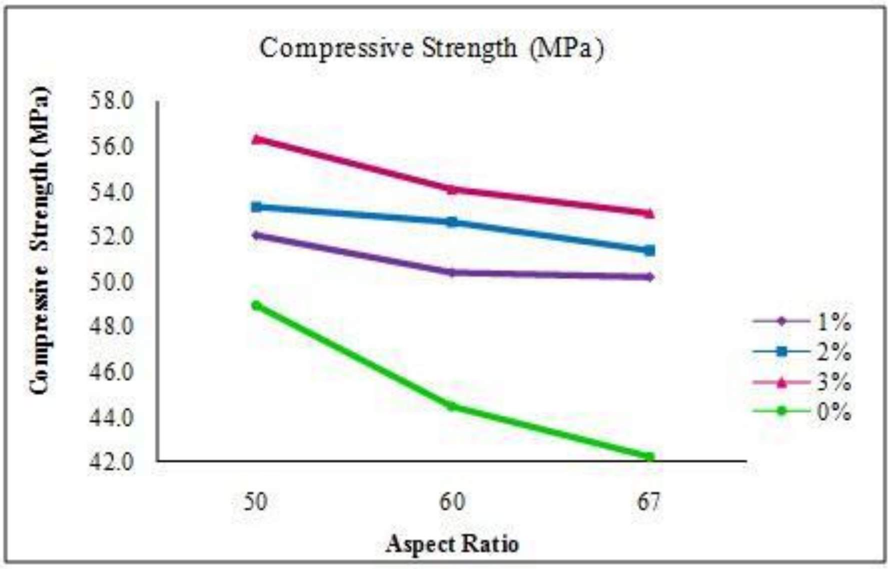

Fig 2.1: PERCENTAGE INCREASE IN 28 DAYS COMPRESSIVE STRENGTH FOR M-40 GRADE CONCRETE

Table 2.2 Compressive strength of SFRC with 1%, 2% and 3% Fibres

Different aspect ratios of fibres	For SFRC with 1% fibres		For SFRC with 2% fibres		For SFRC with 3% fibres	
	Compression strength (MPa)		Compression strength (MPa)		Compression strength (MPa)	
		AVG.		**AVG.**		**AVG.**
50	52.00 51.56 52.44	52.00	53.33 54.67 52.00	53.33	55.56 56.44 56.89	56.30
60	53.33 48.89 48.89	50.37	53.33 52.89 51.56	52.89	53.33 53.78 55.11	54.07
67	50.67 51.56 48.44	50.22	53.33 51.56 49.33	51.41	51.56 52.44 55.11	53.04

Dr. Deepa A Sinha.et al (2014) Investigate the Characteristics Properties of SFRC with varying %age of steel fibres and hence to arrive at optimum percentage of steel fibre also it gives the percentage increased or decreased of strength with respect to the reference mix. The compressive strength was investigated for M25 grade of concrete and their mix proportion shown as

Table 2.3 Overall result of Compression Strength

Percentage of steel fibre added	7 days strength		28 days strength	
	Average compressive strength	%age increased or decreased w.r.t reference mix	Average compressive strength	%age increased or decreased w.r.t reference mix
0%	25.63		40.30	
0.50%	26.52	3	40.80	1
0.75%	27.70	8	41.50	3
1.00%	28.44	11	42.49	5
1.25%	26.93	5	41.85	4
1.50%	26.52	3	40.61	1
1.75%	26.40	3	39.11	-3
2.00%	26.09	2	38.07	-6

Addition of 1% of steel fibre gives higher compressive strength .The use of more than 1% fibre gives less compressive strength as compared to 1% of steel fibre.

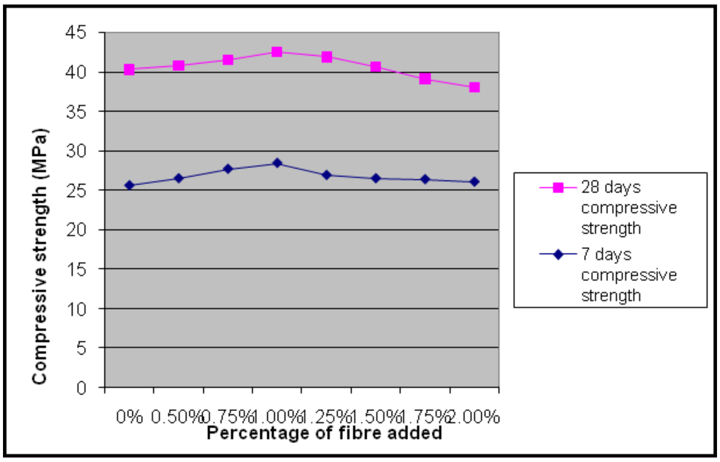

Fig 2.2 variation of compression strength

Ashish kumar parashar .et al (2014). has studied the utility of wastage material as steel fibre in concrete by replacement of cement to the fibres is 5%,10%,15%,20%,25% and30%.The compression strength was investigated for M 20grade of concrete and their mix proportion shown as:

Table 2.4 Compressive strength of cement of different percentage of steel fibre

Curing Age in Days	Mix Without Fibre	5% Steel Fibre	10% Steel Fibre	15% Steel Fibre	20% Steel Fibre	25% Steel Fibre	30% Steel Fibre
	Compression strength						
3	14.73	15.33	16.67	18.37	18.00	17.26	12.82
7	17.78	20.89	19.63	20.52	12.59	21.85	18.30
28	25.33	25.18	23.11	24.15	22.22	20.74	20.52

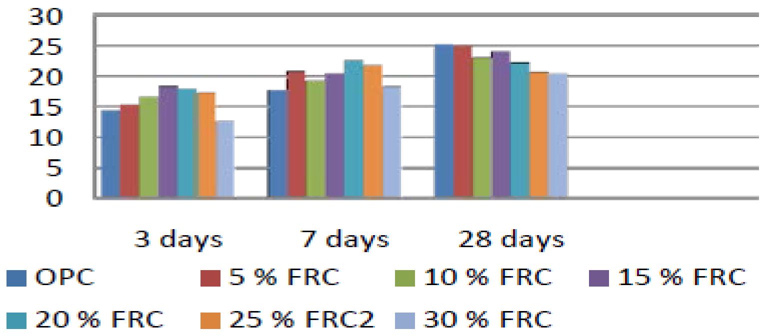

Fig 2.3 Average compressive strength of concrete mix of different percentage of steel fibre.

The Compressive strength of concrete is slightly reduced at (5%,10%,15%) as we increase the steel fibre content in the mix its compressive strength is reduced (25% and 30%).Strength reduced due to decreased the cement content in the concrete matrix and replacement of steel fibre not act as binding material which affected the bond strength.

AiswariyaSukumar, Elson John.et al (2014) describes the fibre addition and its effect on concrete strength. In this we observed that addition of steel fibre in concrete it improve various Engineering properties of concrete but it reduces its workability. Test was conducted on concrete with three different volume fractions. The mix Design is carried out to the quantity required for 1 m3 of concrete as shown:

Table 2.5 Quantity Required for 1m^3 of Concrete

Mix designation	Steel Fibre (kg/m^3)	W/C ratio	Water (kg)	Cement (kg)	Fine Aggregates (kg)	Course Aggregtes (kg)
CM	0	0.45	189	420	828	1050
MS1	20					
MS2	25					
MS3	30					

Table 2.6 Detail of mix corresponding to Slump

Mix Designation	W/C Ratio	Super plasticizers (% of Cement)	Slump (mm)
CM	0.45	0.3	120
MS1	0.45	0.3	111
MS2	0.45	0.3	103
MS3	0.45	0.3	95

Table 2.7 Compressive strength of cement of different percentage of steel fibre

Mix Designation	Fibre Content	Average Compressive Strength(MPa)		
		3rd	7th	28th
CM	0	19.3	25.1	35.4
MS1	20	20.4	26.3	36.7
MS2	25	22.3	28.4	39.0
MS3	30	24.3	30.2	40.7

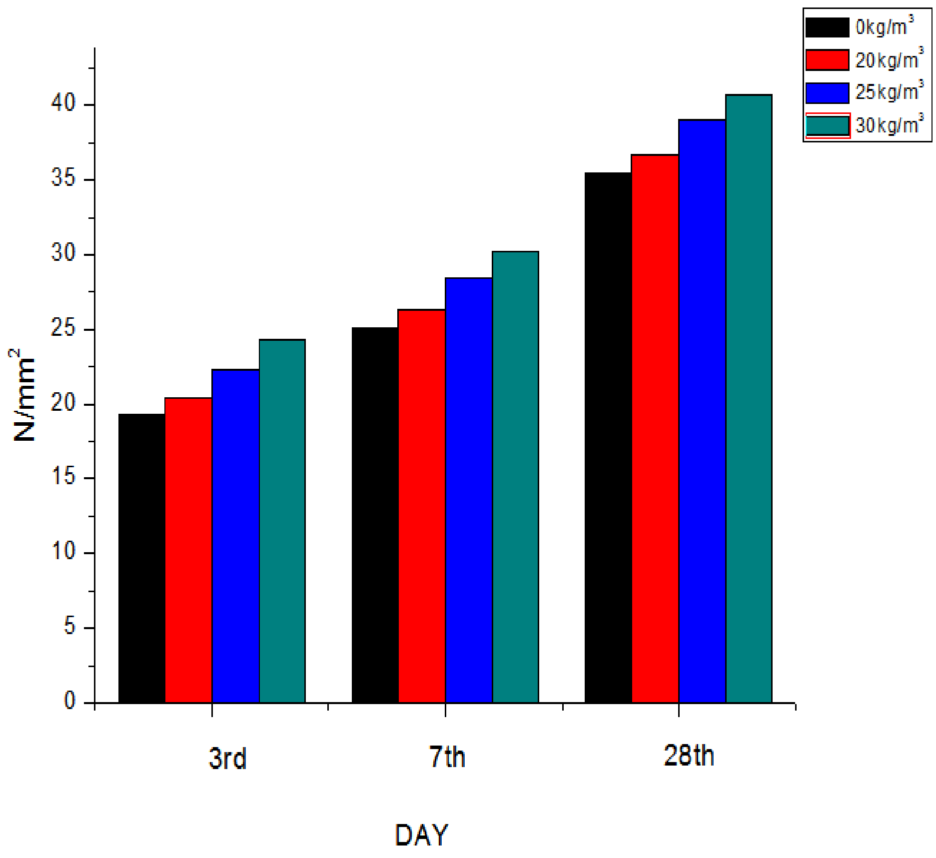

Fig 2.4 Avg. compressive strength of concrete mix

Dr deepa A sinha et al(2014). According to this paper i have studied that the compressive strength will increase will up to a certain limit but after increase the quantity of steel fibre up to a certain limit but after increasing the more in % the strength will start to decrease. In this paper he add the % of steel .75%,1.0%,1.25%,1.50%.

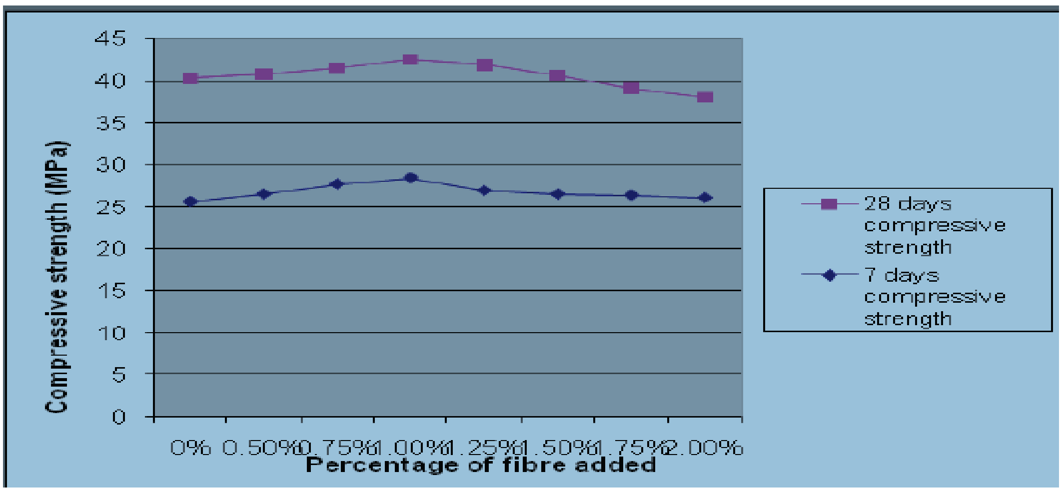

Fig.2.5 Compressive strength with percentage of fibre added

Harish B A et al. According to this paper the strength will increase up to a limit but increasing the quantity of material the strength will decrease.

Table2.8 Overall Result of Compressive strength

Overall result of compressive strength

Mix designation	*Compressive strength (N/mm^2)*		
	7 Days curing	*14 Days curing*	*28 Days curing*
M0	*29.25*	*33.85*	*42.88*
M1	*30.66*	*32.29*	*47.03*
M2	*30.74*	*36.88*	*49.48*
M3	*30.07*	*36.26*	*45.33*

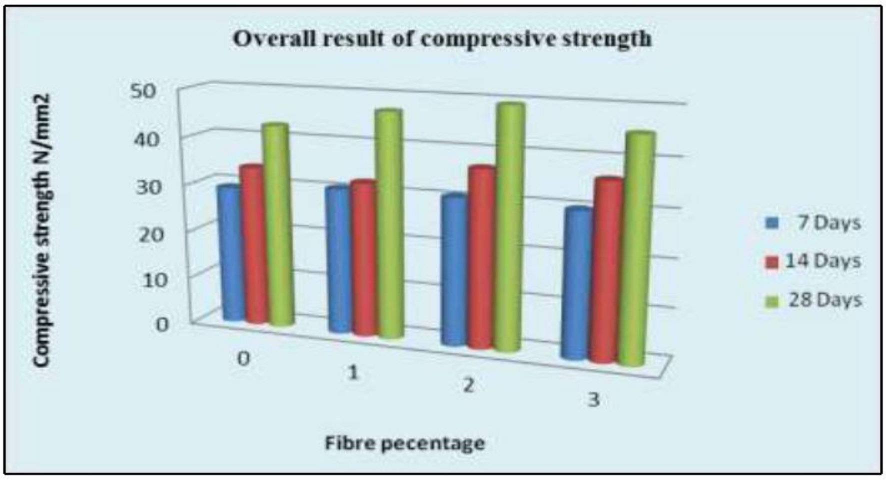

Fig 2.6 Between compressive strength and % of fibre

2.2 Tensile Strength

Dr deepa A sinha et al. The strength will increase up to a certain limit and then the strength will decrease after a limit means increasing the fibre.

Table2.9 Overall result of Split Tensile strength

Overall result of split tensile strength

Mix designation	*Split tensile strength (N/mm^2)*		
	7 Days curing	*14 Days curing*	*28 Days curing*
M0	*2.50*	*2.57*	*2.72*
M1	*1.65*	*2.33*	*2.96*
M2	*2.61*	*2.75*	*3.10*
M3	*2.61*	*2.54*	*3.14*

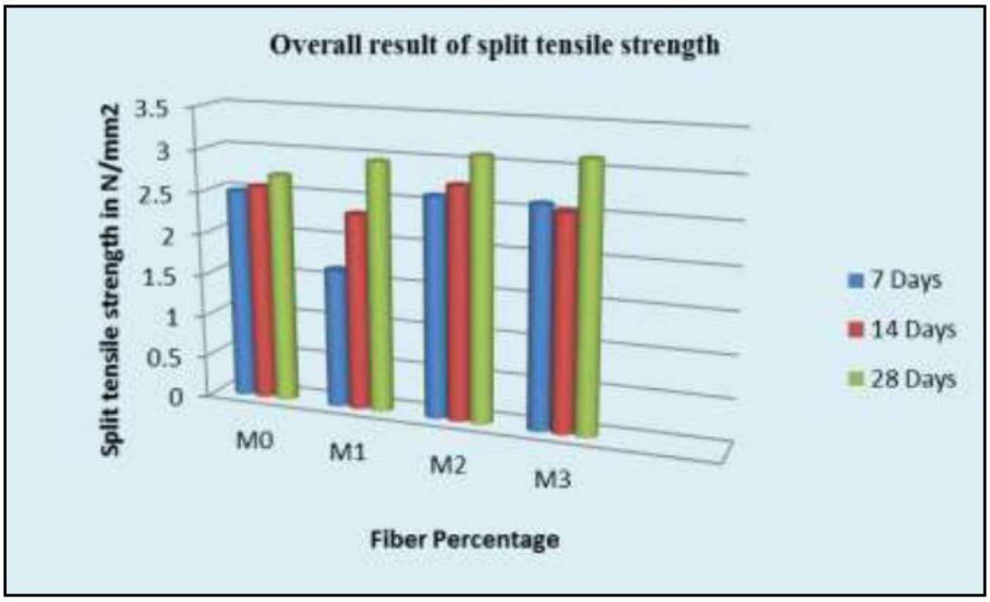

Fig 2.7 overall result of split tensile strength

Anand et al. According to this paper the strength will increase with increasing the fibre in concrete.

Table 2.10 percentage of Steel fibres added

Percentage of steel fibres added	7 days strength		28 days strength	
	Average tensile strength (MPa)	Percentage increase or decrease of tensile strength w.r.t. ref. mix	Average tensile strength (MPa)	Percentage increase or decrease of tensile strength w.r.t. ref. mix
0%	2.50	-	3.54	-
0.50%	2.83	13	3.82	8
0.75%	3.11	24	4.10	16
1.00%	3.54	42	4.67	32
1.25%	3.44	38	4.39	24
1.50%	3.26	30	4.10	16
1.75%	3.11	24	3.96	12
2.00%	2.97	19	3.68	4

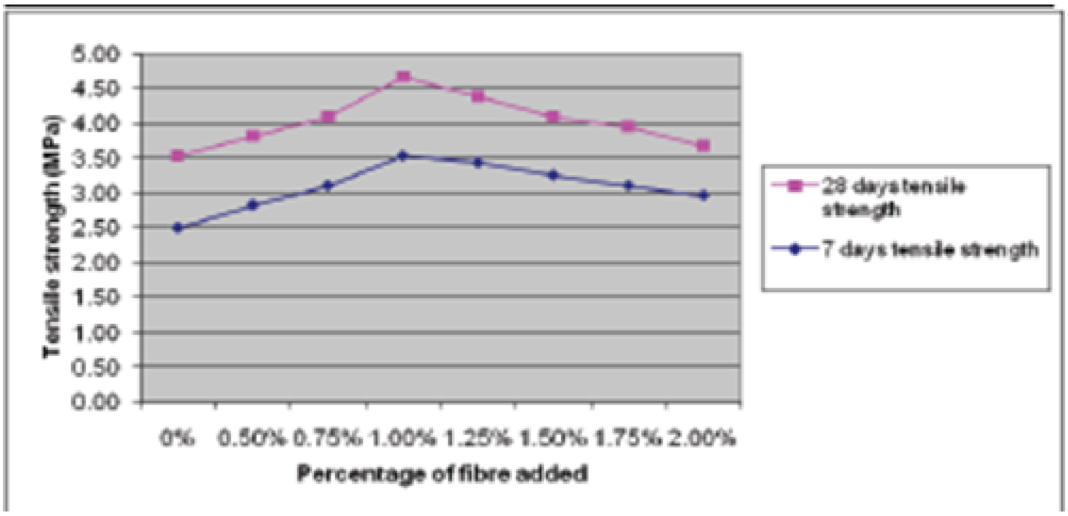

Fig 2.8 percentage of fibre added

Vasudev R, Dr. B G Vishnuram et al. According to this paper i have studied that the strength will increase with the addition of material up to a certain limit but after using more fibre the strength will decrease.

Table 2.11 Fibre Content

Fibre content (%)	7th Day		28th Day	
	Mean Load (kN)	Split Tensile strength (N/mm²)	Mean Load (kN)	Split Tensile strength (N/mm²)
0%	70.3	0.99	167.8	2.373
0.25%	118.8	1.68	175	2.476
0.5%	153.2	2.167	201	2.844
0.75%	110.8	1.528	186.4	2.637
1%	104.6	1.48	171	2.419

P.S. Song et al. According to this paper i have studied that the strength will decrease after the addition the more than the limit.

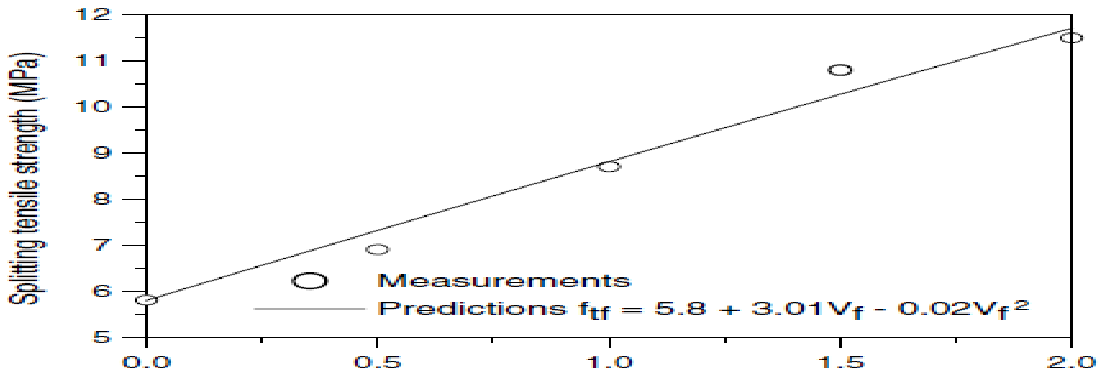

Fig 2.9 Splitting tensile strength

Nguyen Van CHANH according to this paper the strength will increase day by day by the addition of material.

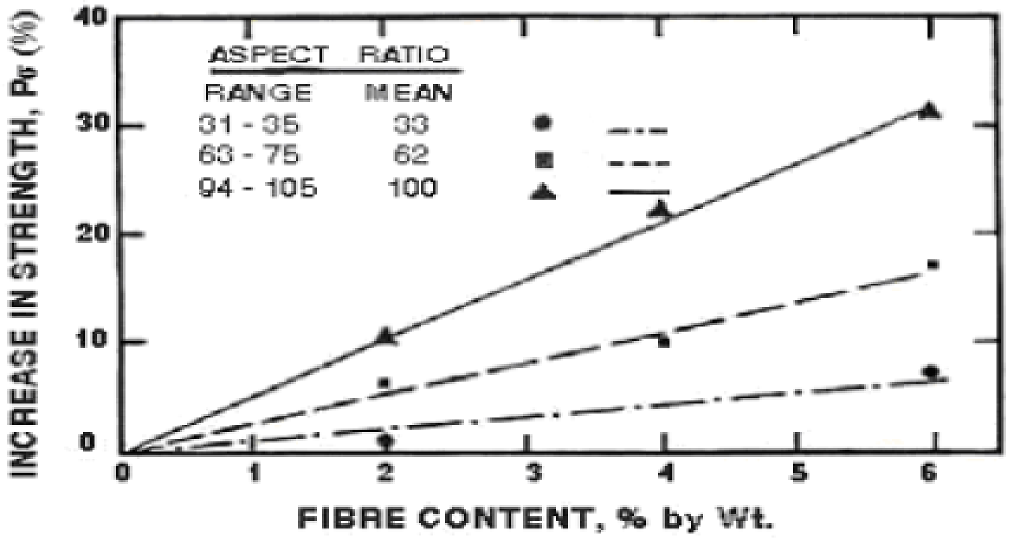

Fig2.10 Increase in Strength and Fibre Content % by Weight

E. Mello, C. Ribellato, E. Mohamedelhassan et al(2014):- According to this paper i have studied that the compressive strength will increase will up to a certain limit but after increase the quantity of steel fibre up to a certain limit but after increasing the more in % the strength will start to decrease. In this paper he adds the % of steel 0.5%, 1.5%, 2.3%, 3%.

Table 2.12 Workablity,Compressive,flexural and Tensile Stregth for different %age od steel Fibre

STEEL RESULTS

	Workability		Compressive		Flexural		Tensile	
	Plasticizer (mL)/m³	Slump (mm)	Strength (MPa)	Δ in Compressive Strength	Strength (MPa)	Δ in Flexural Strength	Strength (MPa)	Δ in Tensile Strength
Plain Concrete	0	85.0	42.9	-	6.46	-	3.75	-
Steel Fibers 0.5%	0	75.0	39.0	-9.0%	6.88	6.4%	3.27	-12.8%
Steel Fibers 1.5%	1145	20.0	41.0	-4.4%	9.43	45.9%	5.47	45.8%
Steel Fibers 2.3%	1135	0.0	45.2	5.3%	11.68	80.7%	7.27	93.3%
Steel Fibers 3%	1127	0.0	51.4	19.9%	10.85	67.9%	8.30	121.5%

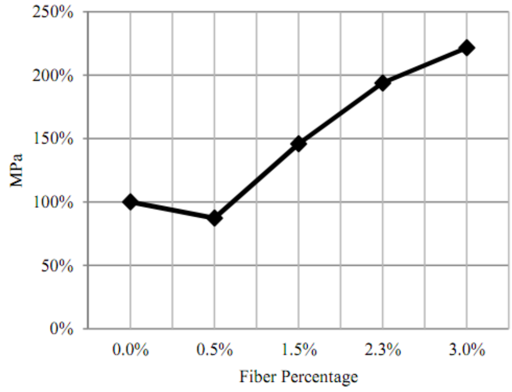

Fig 2.11 Tensile strength for concrete with steel fibres

Addition of steel fibres to concrete increased the compressive strength by up to 20%. Increases 121.5% and 80.7% were reported in tensile and flexural strengths respectively.

CHAPTER 3

Materials and Research Methodology

3.1 General Methodology

The experiment examines the compressive and tensile strength, and the cracking of casting experimental work and classical testing of concrete cubes with a different amount of steel fibres. The quality and properties of concrete on the properties of materials with load. Therefore, the first test of cement and aggregates and fine aggregates, of course, for the expected experiment. Were converted with various added amount of cast steel fibre cement. The sample after 24 hours for water cast for 7.14 to 28 days is hardened. Sample blocks of 150 * 150 * 150mm3. The sample was tested for compression tests and progressively loaded two moments and dice were applied to the test to failure.

Compression strength of the cube is =P/A

Where P is maximum load applied on the cubes before failure.

A is cross section area of the concrete cubes

3.2 Materials and methods

Fig 3.1: Aggregates, Sand, Cement, Water.

3.2.1 Portland Cement

Portland cement material formed generally in the form of powder, usually a paste moulded by addition of water and, if it is made of gold, fixed fixture. The cement used as a binder in concrete. It is a grey-blue powder which is obtained by fine grinding of clinker through the excessive heating of the intimate mixture of limestone and clay minerals. The main raw materials are a mixture of high limestone calcium (cement) and sound. The main goal is to develop to get the power to create a strong force. Usually, three OPC cement grades 33.43.53 in the market.

3.2.2 Fine aggregates

According to Indian standard (383: 1970), the fine aggregates passing through the 4.75 mm sieve pass the aggregates to separate zones. For this project work I collected from Zirakpur aggregates. The sand was dark brown. First, the sand was sieved from 4.75 mm sieve to remove particles, sand beach, tested according to IS (393: 1970).

Fig3.2: Sand

3.2.3 Coarseaggregates

During the addition of stone to make concrete. Many second-hand crushed granite and limestone. It is extremely standard size gradually from 10 to 20 mm; although the device of 40 mm or more sizes has been cooled in the self-compacting concrete. Graded Gap aggregates gene rally better than continuously graduated, the value of all that's the add-on degrees core power, and a solid flow.

The sediment obtained is used for a combination of two blocks in the vicinity of 20 mm and 10 mm fraction 60:40. Aggregates continued to rinse away dirt, dust and dry surface. Angular shape of the aggregates is better resistant to impact load with respect to aggregates and oblong and flaky. In this project I use 60% of the 20mm boxes and the remaining 40% are 10mm aggregates.

Fig3.3:10mm size aggregates

Fig3.4: 20mm size aggregates

3.2.4 Water

The potable water is usually measured reasonable for mixing and curing of concrete. Accordingly potable water was used for making concrete available in Material Testing laboratory.

Fig3.5: Water

3.2.5 Steel fibre:

Fibre Glued steel fibre of length 60mm and 0.75mm diameter with aspect ratio 80. Super plasticizer: High range water reducing admixture of Cerahyperplast XR W40 having a specific gravity of 1.01- 1.11 was used to maintain the workability of mix.

Fig 3.6 steel fibres

3.3 Tests on Concrete

3.3.1 Cement

Usually used ordinary Portland cement of 43 degrees corresponding to IS 8112-1989. The study was carried out at different physical properties of the cement. Before mixing assembly is necessary to examine the physical and chemical properties of the concrete.

Table3.1: Properties of cement

Sr no	Properties	Value
1	Fineness test	5.30
2	Specific gravity	3.18
3	Water absorption	3.5%
4	Setting time	60min (Initial) 150min (final)

3.3.2 Fine aggregates

Fine aggregate Determined by Test compliance set IS 2386 (part 1). The Result of Sieve Analysis Is Determined Is Listed in the Table. The Result Shows That The aggregates are lied in Zone II: 383-1970.

Table3.2: Property of Sand (Fine aggregates).

Sr no	Property	Value
1	Sieve Analysis	Zone II
2	Specific gravity	2.68

3.3.3 Coarse Aggregates

Crushed granite stones are collected from Zirakpur city. The two size of coarse aggregates are used 20mm and 10mm aggregates. The properties of coarse aggregates are determined by conducting test as per IS: 2386 part III.

Table3.3: Property of coarse aggregates.

S No.	Property	Value
1	Specific gravity	2.80
2	Water absorption	1.3%

3.3.4 Water

Portable water free from salts was used for casting and curing of concrete as per IS 456-2000 recommendations.

CHAPTER 4

EXPERIMENTAL WORK

4.1 Casting of Specimen

The experimental Studies consist of testing of specimen sample addition of steel fibre. All specimen cubes having same M35 grade of concrete. The concrete blocks have a size of (150 * 150 * 150) mm and a cylinder with a diameter of 150 mm and 300 mm in length.

Fig 4.1: Concrete cube and cylinder mould.

4.2 Mixing of normal concrete.

First mix the cement, dry natural aggregates and fine aggregates in the relationship well before mixing the water. Add the required amount of water to the concrete mix for 2 minutes to achieve uniformity of the concrete and then poured into cubes and cylinders.

Fig 4.2: Mixing of normal concrete.

4.3 Mixing of concrete with steel fibre

Steel fibres have less water absorption properties, so that steel fibres can be added directly to the concrete so that it cannot affect the water cement ratio. Dry cement, feeders and fine aggregates are mixed manually into the laboratory pan for two minutes. Mix for two more minutes with water. The mixing was continued for a few more minutes and the steel fibres were continuously fed to the concrete for a period of 2-3 minutes with stirring. During mixing, the steel fibre was evenly distributed in the concrete mix.

4.4 Casting and curing

The shape is well placed and placed on a smooth surface. The side walls of the mould are well oiled so that water is removed from the concrete and easily removed after hardening the concrete. While cast to ensure that cement, sand and coarse aggregates are mixed evenly, the concrete cubes are placed on the vibrator machine to compact concrete. The sample was recovered after 24 hours and the specimen was placed in the water for 7, 14 and 28 days healing. After 7, 14 and 28 days, the sample was tested on the compression test machine.

4.5 Testing of the concrete cubes and cylinders

4.5.1 Test Specimen

Manually mixing the cement, dry edge and finished aggregate aggregates, mixing proportionately one minute before mixing the required water, mixing is continued for two minutes after mixing the water to achieve uniformity, Concrete with steel fibre was cast in moulds and cylinders. Concrete cubes each having a size of 150 * 150 * 150 mm and a cylinder of size 150 mm diameter and 300 mm long containing steel fibre.

Fig 4.3: Compression testing machine

4.5.2 Test procedure

After 7.14 and 28 days, the sample was tested by use of a pressure test machine with a capacity of 1,000 KN. The sample is mounted on the lower gripper, slightly affected at the top of the sample machine with the upper clamping plate, which has been applied to the DC power supply on both sides to the sample, can determine the small crack , The charge was continued until we had the breaking load. Finally, the concrete reinforcement compound and normal concrete in comparison.

4.5.2.1 Compressive strength of concrete

Cube samples of dimensions 150 mm x 150 mm x 150 mm formed the curing tank at 7,14and 28 days old and tested immediately after removal of water (while still in the wet state). The surface water that wiped, the samples were tested. The position of the cube during the test a perpendicular has perfectly. The load thus gradually applied without shock to the failure of the sample and thus avoids the resistance to compression.

The quantities of cement, coarse aggregate (20 mm and 10 mm), fine aggregate, steel fibres, and water for each batch i.e. for different percentages of steel fibres which were added separately. Weighed the cement and the steel fibres were dry mixed separately until a uniform colour. The coarse aggregates were mixed to obtain a uniform distribution throughout the batch. The water is added to the mixture and then super plasticizer added. On the one hand, 50-70% water, which is added to the mixture and mixed thoroughly to mix 3-4 minutes. Then, the concrete filled in cube form, then vibrated to ensure good compaction. The final samples were allowed to treat in air for 24 hours. Samples were removed from the moulds 24 hours after casting and placed in the water tank filled with drinking water in the laboratory.

Compressive strength= Ultimate load /cross section area

4.5.2.2 Split Tensile Strength of Concrete

The tensile strength of concrete splitting is determined by the size of the casting rolls being 150 mm x 300 mm. The cylinders were tested by placing them uniform. Samples were taken from the curing tank by 28 days of wet cure and the surface tested post-immersed down into clinical samples. This test we performed compression machine tests. The amplitude of the tensile stress (T) functions uniformly to give the line of the work load applied by the formula

Tensile Strength of Split (TS) = 0.637P / DL

or,

Division T = Tensile strength in MPa

P = applied load,

D = diameter of the concrete cylinder test piece in mm.

L = length of the sample in the cylinder mm concrete.

The quantities of cement, coarse aggregate is (20 mm and 10 mm), fine aggregate, rice husk ash, coconut fibre and water per batch i.e., Different percentage of replacement of the separately weighed rice husk ash. The cement and hull ash rice were dry mixed to a uniform colour separately. Aggregate is mixed with this mixture in dry form. The coarse aggregates were mixed to obtain a uniform distribution throughout the batch. The water was added to the mixture and then added super plasticizer. First, 50 to 70% of the water to the mixture was then thoroughly mixed for 3-4 minutes in the mixer. Has been super plasticizer added to the remaining mixture and during further mixing evenly mix for 2-3 minutes. Then, the concrete is filled into the cylindrical shapes and then vibrated to ensure good densification. The finished concrete surface height of the upper part of the spatula using mould. The finished samples were allowed to treat in air for 24 hours. In the water tank filled with water in the laboratory, the samples were cast from the moulds after 24 hours and were.

Fig 4.4: Testing of cubes on compression testing machine

CHAPTER 5

RESULT AND DISCUSSIONS

5.1 Compressive strength of concrete with addition of steel fibre by the weight of cement.

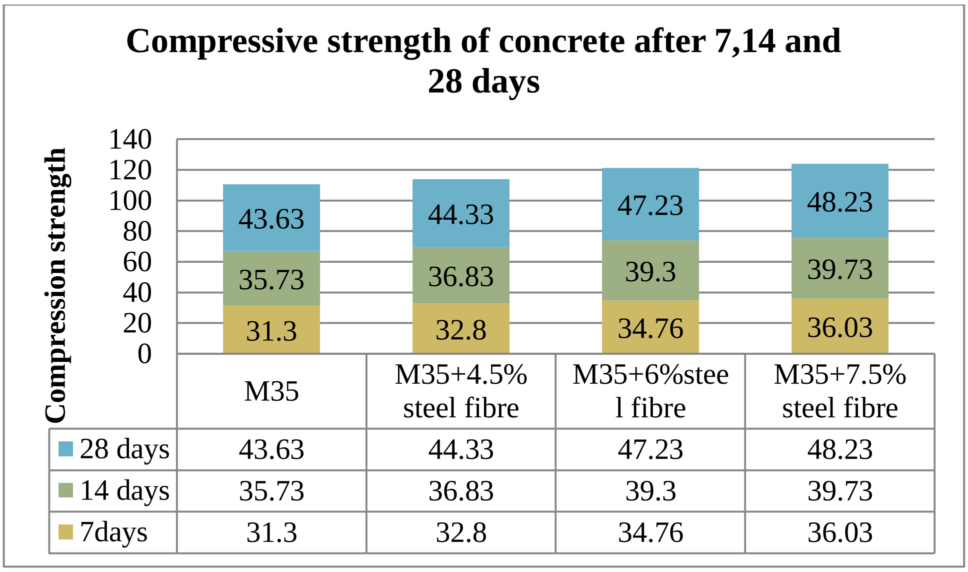

Fig5.1 Compressive strength of concrete after 7,14 and 28 days

The compressive strength of the concrete is increased after the addition of steel fibre because fibre are holds the cracks that produced in the concrete due to the imposed loads. Fibre fills some the voids of the coarse aggregates if we use in the excess the fibre effect the binding property of the cement. At 7.5% addition the concrete mix is heterogeneous.

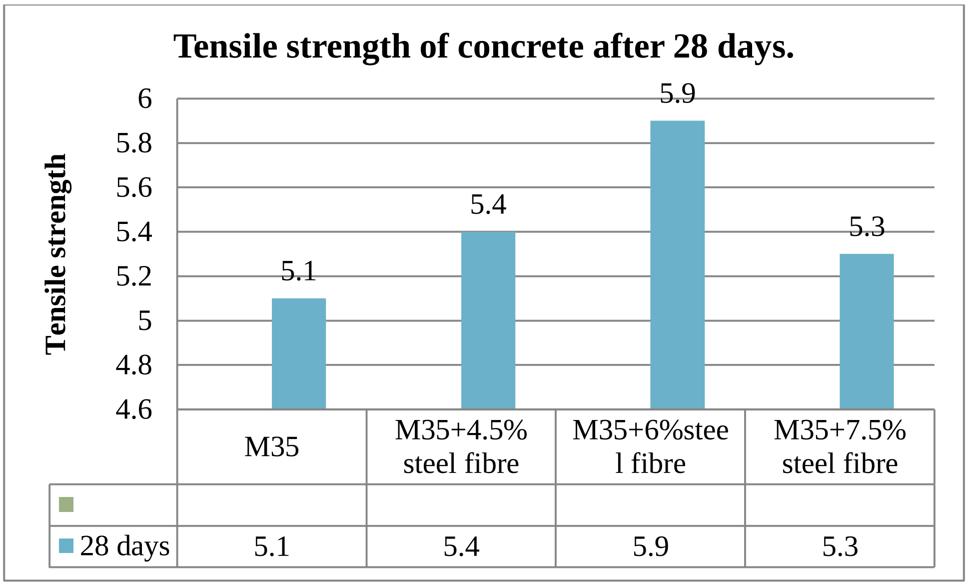

Fig 5.2 Tensile Strength of concrete after 28 days

Tensile strength of concrete is increased because the main tensile member is steel in the structure. Steel act as reinforcement the concrete and reduce the crack in the concrete due to this bonding between the materials increased and hence the tensile strength of the concrete is increased.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

Based on the above experimental study, following conclusions can be drawn regarding the compression behaviour of steel-Fibre reinforced concrete:

1. Toughness of the concrete increased with increasing the Percentage of steel fibre. The increase in tough- ness is directly proportional to the reinforcing index.
2. Compressive strength of the high strength concrete is increased with increasing the percentage of fibre the maximum strength of high strength concrete at 7.5 after 7, 14 and 28days.
3. Tensile strength of the high strength concrete is increased with increasing the percentage of fibre the maximum strength of high strength concrete at 7.5 after 7, 14 and 28days.
4. After every addition of fibre content in the concrete mix workability is reduced.
5. Development of cracks is reduced with addition of steel fibre.
6. With the addition of steel fibre in concrete the industrial waste is decomposes and reduce the effect on nature.

Future Scope:-

1. The workability of the concrete with fibre is reduced it can be improved using super plasticizers
2. Hand mixing becomes very tedious and lead to formation of non -homogeneous mix certain chemicals can be added so as to replace hand mixing by machine mixing.
3. Depth of beam and slab are reduced due to increase in the strength.

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