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EXPERIMENTAL INVESTIGATION ON SYNTHETIC FIBER REINFORCED CONCRETE PAVEMENTS

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ABSTRACT
If properly designed, constructed and maintained, reinforced or pre-stressed concrete structures are generally very durable. However, for structures in aggressive environment, corrosion of steel can be significant problem. Shrinkage cracking of concrete is a major problem in plain cement concrete pavements especially in tropical regions. Examples of structures that may be particularly at risk include marine structures, bridges subjected to de-icing salts and industrial buildings. In the last decade, there has been a considerable increase in interest in the use of non- metallic reinforcement to cope with this corrosion problem at many institution, advanced composite reinforcing materials have been developed, typically consisting of align continuous fibers embedded in resin and shaped to form beams and slabs, grid shape structures.
To overcome corrosion and shrinkage cracking of plain concrete, sometimes the addition of synthetic fiber to the concrete mix is suggested. Synthetic fibers used in our study are Polypropylene and Polyester. Recron'3s Fibers are engineered micro fibers with a unique "Triangular" Cross-section, used as secondary reinforcement of Concrete. It complements Structural Steel in enhancing Concrete's resistance to shrinkage cracking and improves mechanical properties such as Flexural / Split Tensile and transverse Strengths of Concrete along with the desired improvement in Abrasion and Impact Strengths.
Six concrete mixes with fiber dosages 0.1%, 0.2% and 0.3% by volume fraction besides the control concrete mix were manufactured. In this work, the results of strength properties of synthetic fiber reinforced concrete are presented. Also conducted the conventional tests for concrete such as the compressive strength and flexural strength of concrete samples are made with different amounts.
Compressive strength test and flexural strength test was conducted on the cubical and beam specimens respectively for all the mixes at different curing periods as per IS 516 (1991). The cubes of size 150 mm x 150 x 150 mm were cast and tested for compressive strength. The beams of size 500 mm x 100 x 100 mm were cast and tested for flexural strength.

INTRODUCTION
Plain concrete has a low tensile strength, little imperviousness and limited ductility to cracking. Interior miniaturized scale cracks are naturally exhibit in the concrete and its poor strength is because of the propagation of such micro cracks, eventually leading to brittle crack of the concrete [1].In plain concrete and similar brittle material micro cracks grow even before loading, especially because of drying shrinkage or different reasons for volume change. The width of these introductory cracks from time to time exceeds a few microns; however their other two measurements may be of higher magnitude [2].
At the point when loaded, the micro cracks out

proliferate and up, and inferable from the impact of stress concentration, additional cracks frame in places of minor deformities. The structural cracks continue gradually or by tiny jumps because they are retarded by different obstacles, change of direction in bypassing the more safe grains in matrix. The improvement of such small scale cracks is the main cause of inelastic deformations in concrete. It has been recognized that the addition of little, closely spaced and uniformly dispersed fibers to concrete would go about as crack arrester and would considerably enhance its static and dynamic properties. This kind of concrete is known as "Fiber Reinforced Concrete" [3].

Fiber reinforced concrete can be characterized as a "composite material comprising of mixtures of cement mortar or concrete and irregular, discrete, uniformly dispersed suitable fibers".FRC is cement-based compound material that has been developed in recent years. It has been effectively used in construction with its excellent flexural-tensile strength, resistance to spitting, impact resistance and excellent permeability and frost resistance. It is a successful way to increase toughness, shock resistance and resistance to plastic shrinkage cracking of the mortar. Fiber is a small part of reinforcing material possessing certain characteristics properties. They can be rounding, triangular or flat in cross-section. The fire is often described by a convenient parameter called ―aspect ratio. The aspect ratio of the fiber is the ratio of its length to its diameter. The principle reason for incorporating fibers into a cement matrix is to increase the toughness and tensile strength and improve the cracking deformation characteristics of the resultant compound. For FRC to be a viable construction material, it must be able to complete cheaply with existing reinforced system [4].

It has been recognized that the additional of small, closely spaced and uniformly dispersed fibers to concrete would act as crack arrester and would substantially improve its static and dynamic properties

.this type of concrete is known as fiber reinforced concrete.

FRC is gaining concentration as an effective way to improve the performance of concrete .The fibers are added to fresh concrete during the batching and mixing process to allow them to be equally distributed throughout the concrete.

The idea of utilizing fibers as fortification (reinforcement) is not new. Fibers have been utilized as reinforcement since old times. Historically, horsehair was utilized the concept of composite materials initiated existence and fiber-reinforced concrete (FRC) was one of the themes of interest. Once the health dangers associated with asbestos were found, there was a need to find a substitution for the substance in concrete and other building materials. By the 1960s, steel, glass (GFRC), and manufactured fibers, for example, polypropylene fibers were utilized as a part of concrete. Research into new fiber-reinforced concretes (FRC) continues today.

FIBER REINFORCED CONCRETE

Fibers are generally used in concrete to control cracking due to plastic shrinkage and to drying shrinkage. They also decrease the permeability of concrete and thus reduce bleeding of water. Some types of fibers produce better impact abrasion, and shatter resistance in concrete. Generally fibers do not increase the flexural strength of concrete, and so cannot replace moment resisting or structural steel reinforcement. Indeed, some fibers [5]

The amount of fibers added to a concrete mix is expressed as a percentage of the total volume of the composite (concrete and fibers), termed "volume fraction" (Vf). Vf typically ranges from 0.1 to 3%. The aspect ratio (l/d) is calculated by dividing fiber length (l) by its diameter (d). Fibers with a non-circular cross section use an equivalent diameter for the calculation of aspect ratio. If the fiber's modulus of elasticity is higher than the matrix (concrete or mortar binder), they help to carry the load by rising the tensile strength of the material. rising the aspect ratio of the fiber usually segments the flexural strength and toughness of the matrix. However, fibers that are too long tend to "ball" in the mix and make workability problems.

Some recent investigate indicate that using fibers in concrete has limited effect on the impact resistance of the materials. This finding is very important since conventionally, people think that ductility increase when concrete is reinforced with fibers. The results also indicate that the use of micro fibers offers better impact resistance to that of longer fibers.

EFFECT OF FIBERS IN CONCRETE

Fibers are regularly used in concrete to control cracking due to both plastic shrinkage and drying shrinkage. They also decrease the permeability of concrete and thus reduce bleeding of water. Some type's offers produced greater impact, abrasion and shatter resistance in concrete. Generally fibers do not increase the flexural strength of concrete and so cannot replace moment resisting or structural steel reinforcement. Indeed, some fibers actually reduce the strength of concrete. The amount of fibers added to the concrete mix is expressed as percentage of total volume of the composite (concrete and fibers), termed volume fraction (Vf) [6]. VF typically ranges from 0.1 to 3%. Aspect ratio (l/d) is calculated by dividing fiber length (l) by its diameter (d). Fibers with a noncircular cross section use an equivalent diameter for the calculation of aspect ratio. If the modulus of elasticity of the fiber is higher than the matrix (concrete or mortar binder), they help to carry the load by increasing the tensile strength of the material. Increase in the aspect ratio of their usually segments the flexural strength and the toughness of the matrix. However, fibers which are tooling tend to —ball in the mix and create workability problems. Some recent research indicates that using fibers in concrete has limited effect on the impact resistance of the materials. This finding is very important since usually, people think that the ductility increases when concrete is reinforced with fibers. The results also indicated out that the use of micro fibers offers improved impact resistance compared with the longer fibers.

STRUCTURAL BEHAVIOR OF FRC

Fibers combined with reinforcing bars in structural members widely used future. The following are some of the structural behavior,

Flexure: The use of fibers in reinforced concrete flexure members increases ductility, tensile strength, moment capacity, and stiffness [7]. The fibers improve crack control and preserve post cracking structural integrity of members.

Torsion: The use of fibers eliminates the sudden failure characteristic of plain concrete beams. It increases stiffness, torsion strength, ductility, rotational capacity, and the number of cracks with less crack width.

Shear: Addition of fibers increases shear capacity of reinforced concrete beams up to 100 percent. Addition of randomly distributed fibers increases shear friction strength, the first crack strength, and ultimate strength. The increase of fiber content slightly increases the ductility of axially loaded specimen.

Column: The use of fibers helps in reducing the explosive type failure.

High strength concrete:

Fibers increase the ductility of high strength concrete. The use of high strength concrete and steel produces slender members. Fiber addition will helping in controlling cracks and deflections [8].

SYNTHETIC FIBER REINFORCED CONCRETE

Material technology has pointed out the adding of synthetic fibers in concrete to improve the main characteristics of concrete, such as, stiffness, toughness and ductility. Presently, synthetic fibers are the most commonly researched fiber type concrete. In the 1970s synthetic fibers such as polypropylene, polyester, nylon etc were considered as possible sources of reinforcement in concrete [9]. Through both research and experimental work, synthetic fibers were finally introduced as an effective concrete reinforcement in the 1970s. Today, synthetic fiber reinforced concrete has been used at an increasing rate in various applications like: RCC &PCC like lintel, beam, column, flooring and wall plastering, foundations, tanks, manhole covers and tiles, plastering, roads and pavements, hollow blocks and precast [10].

POLYPROPYLENE FIBER

Polypropylene fibers are new era chemical fibers [11]. They are fabricated in huge scale and have fourth biggest volume in production after polyesters, acrylics and polyamides. Around 4 million tons of polypropylene fibers are produced on the planet in a year. Polypropylene fibers were initially recommended for utilization in 1965 as an admixture in concrete for construction of blast impact buildings implied for the US Corps of Engineers. Thusly, the polypropylene fiber has been enhanced further and is presently utilized as short discontinuous fibrillated material for creation of fiber reinforced concrete. Further, the utilization of these fibers in construction increased generally in light of the fact that expansion of fibers in concrete enhances the flexural strength, tensile strength, toughness, impact strength and also failure mode of concrete.

POLYESTER FIBER

Polyester [12] however not as generally utilized as polypropylene filaments, polyester strands are offered by several manufacturers. The fiber groups come just in monofilament shape in lengths from 3⁄4 to 2 inches. Like polypropylene, polyester filaments are hydrophobic. In any case, they tend to deteriorate in the alkaline environment of Portland cement concrete. To retard this degradation, manufacturers of polyester strands coat the strands to oppose alkaline attack. Be that as it may, the long-term performance of the covered fibers has not been determined.

MATERIALS

The materials used in the investigation include:

1. Cement, 53- grade Ordinary Portland concrete (OPC)
2. Aggregates
   - Coarse Aggregate
   - Fine Aggregate
   - Synthetic fibers
   - Polypropylene fibers (strands)
   - Polyester fiber (strands)
   - Water reducing agent (Admixture)
   - Water

CEMENT

Cement is considered to be the best binding material and at present, no construction work can be taken up without cement. As a rule, normal cement takes after in numerous regards to famously water driven lime in building properties. The product got by burning and crushing to powder, a close mixture of proportional calcareous and argillaceous material is called cement.

This is carefully proportioned and specially processed combination of lime, silica, iron oxide and alumina. It is usually manufactured from limestone mixed with shale, clay.

Ordinary Portland Cement (53 grade):

Ordinary Portland Cement (OPC) is one of several types of cement being manufactured throughout the world, are some of the more commonly used. OPC is the general purpose cement used in concrete constructions. OPC is a compound of lime (Cao), silica (SiO_2), alumina (AL_2O_3), iron (Fe_2O_3) and sulphur trioxide (SO_3), Magnesium (Mgo) is present in small quantities as an impurity associated with limestone [13]. SO_3 is added at the grinding stage to retard the setting time of the finished cement. When cement raw materials containing the proper proportions of the essential oxides are ground to a suitable fineness and then burnt to incipient fusion in a kiln, chemical combination takes place, largely in the solid state resulting in a product aptly named clinker. This clinker, when ground to a suitable fineness, together with a small quantity of gypsum (SO3) is Portland cement. In fact, cement powder is "nothing else" other than a combination of oxides of calcium, silicon, aluminum and iron. The cement used throughout the test program was Ordinary Portland Cement (OPC) [7-10] of 53 grades confirming to IS 4031:1988 was used in the present study. The specific gravity of cement is taken as 3.15. The chemical and physical properties of cement are presented in following tables.

Chemical composition O.P.C:

Although Portland cement consists essentially composed of four major oxides: lime (Cao), silica (SiO2), alumina (Al2O3), and iron (Fe2O3) and also Portland cement contains small amount of magnesia (Mgo), alkalis (Na2O and K2O), and sulfuric anhydrite (SO3).

TABLE NO 4.1: Chemical composition of cement

SI.NO	Oxides	Percentage of substance
1	CaO	65.49
2	SiO2	21.67
3	Al2O3	5.97
4	Fe2O3	3.85
5	SO3	1.66
6	MgO3	0.78
7	K2O	0.46
8	Na2O	0.12

AGGREGATES

Aggregate is defined as an inactive or artificially inert material which when bonded together by cement from concrete. The greater part of the aggregates utilized is naturally occurring aggregates, for example, crushed rock, sand and gravel. The aggregates are utilized basically with the purpose of giving mass to the concrete and are around 75 percent of the body of the concrete. They should to accordingly have specific qualities if the concrete is to be workable, economical and strong durable. Aggregates are divided into fine and coarse categories.

COARSE AGGREGATE (CA)

1. Aggregates which retain on 4.75 mm sieve
2. Grading of CA is supplied in nominal sizes.
3. Granite, angular crushed of maximum size 20 mm conforming to IS: 383:1970 is utilized.
4. Proportions of different sizes are determined as per IS: 2386:1986

The specific gravity of coarse aggregate is taken as 2.63. Coarse aggregate is tested for specific gravity, in accordance with IS: 2386-1963. However, in massive structures, such as dams, the coarse aggregate may include natural stones or rock.

FINE AGGREGATE

Naturally available sand is used as fine aggregate in the present work. The most common constituent of sand is silica, usually in the form of quartz, which is chemical inert and hard. The sand is free from clayey matter, silt and organic impurities etc. Hence used as a fine aggregate in concrete. The size of sand is that passing through 4.75 and retained on 150 micron IS sieve. The specific gravity of fine aggregate is taken as 2.54. Sand is tested for specific gravity, in accordance with IS: 2386-1963. Fine aggregate is confined to Zone II.

1. Aggregates passing 4.75 mm sieve.
2. Fines are graded into zones in light of their fineness.
3. Based on percentage passing through 600 micron sifter gives the zone of the aggregate.
4. River sand is utilized.

Table No 4.3: Specification of Fine Aggregates Grading

Sieve size	%passing for Grading Zone			
	I	II	III	IV
10mm	100	100	100	100
4.75mm	90-100	90-100	90-100	95-100
2.36mm	60-95	75-100	85-100	95-100
1.18mm	30-70	55-90	75-100	90-100
600µm	15-34	35-59	60-79	80-100
300µm	5-2	8-30	12-40	15-50
150µm	0-10	0-10	0-10	0-15

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DETAILS OF MIXES

Concrete mix design in this experiment was designed as per the guidelines specified in by IS10262-1982 and ACI committee. All the samples were prepared based on the design trail mix of M45 grade of concrete was used in the present investigation. Three different concrete samples are prepared with two different fibers namely polypropylene fibers and polyester fibers various percentages such as (0.1, 0.2, and 0.3) by volume concrete and the percentage of aggregates was kept constant for all mixes.

Casting and curing of concrete cubes and beams: Control concrete was utilized as the reference for comparing the performance of the fiber. The cement content, water-cement proportion and admixture dosage adopted were 410 Kg/m3, 0.4 and 0.5%. According to the manufacture the dosage of fibers was adopted for the concrete mixes. Hand mixing is done to mix the ingredients of concrete.

In mixing procedure, aggregates are added and permitted to mix consistently. Next cement is included and waited for uniform mix .Then little water is included before the addition of water reducing admixture (VALAPLAST) Akarsh SP 123 which will respond with the cement paste, then remaining water is included and is very much mixed. Slump test is led and slump value is recorded before casting in the molds.

Compelling consideration was taken to recreate comparable conditions for every concrete mixes cast in a day including the materials utilized. Concrete samples are casted in steel molds. Sizes of Cube molds: 150mm x 150mm x 150mm. The above method must be utilized for the preparation of cubes. Concrete samples are casted in steel molds. Sizes of Beam molds: 500mm x 100mm x 100mm. All these specimens were casted in cast iron moulds confirming to relevant codes of Indian standards. Prior to casting of specimen, moulds were cleaned, lubricated with oil and all the bolts are fastened tightly so that there is no leakages in the mould. The samples are cured in water at temperature of 27 0c after de- molding after 24 hours. Correlation is done between polypropylene fiber concrete, polyester fiber concrete and control concrete with compressive strengths of corresponding cubes and flexural strengths of beams.

TESTS ON CONCRETE

Workability

We know that it is usually incorrect to add water to concrete for workability. The main trouble with workability of steel fiber reinforced concrete is in getting proper distribution of the fibers so that they don't ball up. This difficulty is usually overcome by slow, continuous and uniform feeding of the fibers into the wet or dry mix by means of vibratory feeders. Sometimes the fibers are passed through screens as they are introduced. Proper feeding can virtually eliminate the problem of balling. On the other hand, addition of water to get better workability can reduce the flexural strength considerably; a critical matter when one considers that one of the main reasons for using steel fibers is to improve the flexural strength. In such cases use of suitable admixture probably would improve the workability to certain extent and may not to the extent that you require. The workability can be finding by using slump test.

Compressive Strength Test

Out of many tests connected to the concrete, this is the most extreme important which gives an idea about all the attributes of concrete. By this single test one judge that whether Concreting has been done properly or not. For cube test two types of samples either cubes of 150mm x 150mm x 150mm or 100mm x 100mm x 100 mm depending on the size of aggregate are utilized. For most of the cubical molds of size

150mmx150mmx150mm are normally utilized. This concrete is poured in the mold and tempered properly so as not to have any voids. Following 24 hours these molds are removed and test samples are placed in water for curing. The top surface of these samples should to be made even and smooth. This is done by putting cement paste and spreading smoothly on entire area of sample.

These samples are tested by compressive testing machine after 7 days curing or 28 days curing. Load should be applied gradually at the rate of 140 kg/cm2 every minute till the Specimens fails. Load at the failure divided by area of sample gives the compressive strength of concrete.The compressive testing machine is shown in figure n0-3.3.2.3. The cubes were tested on their sides without packing between the cube and the steel plates of the testing machine. One of the plates is carried on a base and is self-adjusting and the load was steadily and uniformly applied, beginning from zero at the rate of 350 kg/cm 2 per minute.

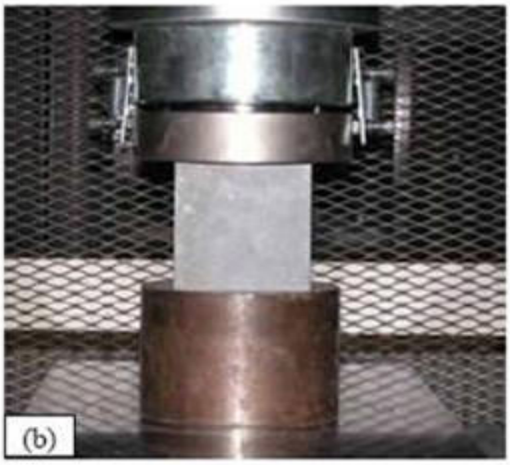

Fig No-4.2: Compressive strength testing machine.

Flexural Strength Test

Flexural strength test was led on the samples for all the mixes at different curing periods according to IS 516 (1991). Three concrete beam samples of size 500 mm x 100 mm x 100 mm were casted and tested for each age and each mix. The load was applied gradually till the failure of the sample occurs. The maximum load applied was then noted. The distance between the line of crack and the close support "a" was measured. The flexural strength (fcr) was ascertained as takes after: At the point when "a" is greater than 13.3 cm for 10 cm example, fcr is fcr = (P x l)/ (b x d2)

At the point when "a" is less than 13.3 cm yet more noteworthy than 11.0 cm for 10 cm sample, fcr is fcr = (3 x P x a)/ (b x d2)

Where, fcr = Flexural strength of concrete (N/mm2)
P = Maximum load applied to the sample (in Newton) b = Measured width of the sample (in mm)
d = Measured depth of the sample at the point of failure (in mm)
l = Length of the example on which the sample was supported (in mm)

Fig 4.3: Flexural strength testing machine

RESULTS

COMPRESSIVE STRENGTH OF CONCRETE CUBES

The different cubes are casted and tested were led on the concrete cubes after standard curing and results are as per the following:

Table : Compressive Strengths results of concrete cubes at 0.1% (by volume of concrete) of polypropylene fibers and polyester fiber

S.No	Type of Sample	Compressive Strength(N/mm^2)		
		7 Days	14 Days	28 Days
1	Control sample without fiber	33.82	46.75	52.17
2	Concrete with polypropylene fiber	36.70	42.80	55.50
3	Concrete with polyester fiber	34.50	43.25	54.15

Table 5.3: Compressive Strengths results of concrete cubes at 0.2% (by volume of concrete) of polypropylene fibers and polyester fiber

S.No	Type of Sample	Compressive Strength (N/mm^2)		
		7 Days	14 Days	28 Days
1	Control example without fiber	33.82	46.75	52.17
2	Concrete with polypropylene fiber	35.00	48. 50	57.50
3	Concrete with polyester fiber	34.60	47.15	55.05

Table 5.4 : Compressive Strengths results of concrete cubes at 0.3% (by volume of concrete) of polypropylene fibers and polyester fiber

S.No	Type of Sample	Compressive Strength (N/mm^2)		
		7 Days	14 Days	28 Days
1	Control example without fiber	33.82	46.75	52.17
2	Concrete with polypropylene fiber	36.40	50.25	60.50
3	Concrete with polyester fiber	36.05	48.05	57.03

FLEXURAL STRENGTH OF CONCRETE BEAMS

The different beams are casted and tests were led on the beams after standard curing and results are as per the following:

Table 5.5: Flexural Strengths results of concrete beams at 0.1% (by volume of concrete) of polypropylene fibers and polyester fiber

S.No	Type of Sample	Flexural Strength (N/mm^2)		
		7 Days	14 Days	28 Days
1	Control specimen without fiber	3.0	5.2	6.6
2	Concrete with polypropylene fiber	4.1	5.5	6.9
3	Concrete with polyester fiber	4.0	5.3	6.1

Table 5.6: Flexural Strengths results of concrete beams at 0.2% (by volume of concrete) of polypropylene fibers and polyester fiber

S.No	Type of Sample	Flexural Strength (N/mm^2)		
		7 Days	14 Days	28 Days
1	Control specimen without fiber	3.0	5.2	6.6
2	Concrete with polypropylene fiber	4.3	5.6	6.5
3	Concrete with polyester fiber	4.2	5.2	5.9

Table 5.7 : Flexural Strengths results of concrete beams at 0.3% (by volume of concrete) of polypropylene fibers and polyester fiber

S.No	Type of Sample	Flexural Strength (N/mm^2)		
		7 Days	14 Days	28 Days
1	Control specimen without fiber	3.0	5.2	6.6
2	Concrete with polypropylene fiber	4.0	5.2	6.4
3	Concrete with polyester fiber	4.4	4.9	6.0

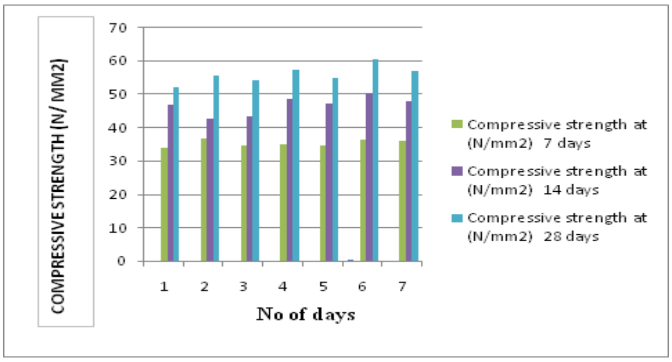

Fig 5.1: Variation of Compressive strength with age

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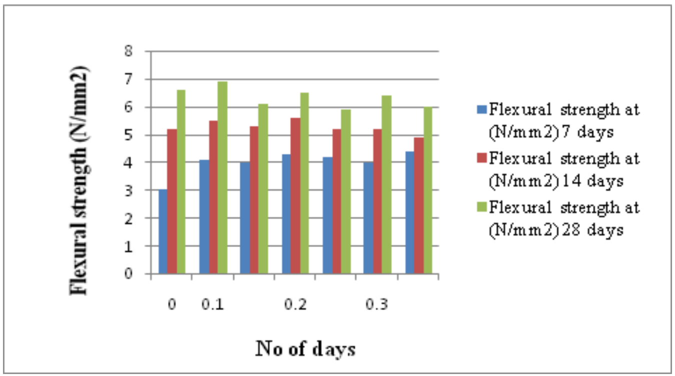

Fig 5.2: Variation of Flexural strength with age

It is observed that from Figure 1 that the cube compressive strength of polypropylene and polyester fiber reinforced concrete increased up to 0.3% of fiber content. The compressive strength of the polypropylene fiber reinforced concrete is 55.50N/mm2, 57.0 N/mm2 and 60.0 N/mm2 at fiber dosage of 0.1%, 0.2% and 0.3% by volume of concrete respectively at 28 days. The compressive strength of the polyester fiber reinforced
concrete is 54.15N/mm2, 55.05 N/mm2 and 57.3 N/mm2 at fiber dose of 0.1%, 0.2% and 0.3% by volume of concrete respectively at 28 days, which is obviously better than required i.e., 45N/mm2. So, the compressive strength of polypropylene has higher values when contrasted with polyester fiber reinforced samples and control sample.

It is observed that from Figure 2 that the Flexural strength of the polypropylene fiber reinforced concrete is 6.9N/mm2, 6.5N/mm2 and 6.4N/mm2 at fiber dose of 0.1%, 0.2% and 0.3% of fiber content respectively at 28 days. The flexural strength of the polyester fiber reinforced concrete is 6.1N/mm2, 5.9N/mm2 and 4.50 N/mm2 at fiber dose of 0.1%, 0.2% and 0.3% of fiber content respectively at 28 days. The Flexural strength of polypropylene and polyester fiber reinforced concrete increased up to 0.1% of fiber concrete from that point the flexural strength is decreased 0.2-0.3% by volume of concrete of fiber content. The flexural strength of polypropylene has higher values when contrasted with polyester fiber reinforced samples and control sample.

CONCLUSION

From the discussion it has been demonstrated that the fiber-reinforced concrete has ability to reduce the cracks as well as has capacity of inciting extra compressive strength to the concrete.

1. Fiber reinforced concrete utilization in pavements reduces the maintenance cost by reducing the overall lifecycle cost though it has high initial cost.
2. The inclusion of fibers is more advantage in case of pavements by reducing the crack formation and also giving additional early compressive strength to the concrete.
3. The concrete with Polypropylene fiber is most efficient in inducing the additional strength to the concrete when compared to Polyester fibers.
4. The concrete with Polypropylene fiber is most economical when compared to polyester fibers.
5. Compressive strength of polypropylene and polyester fiber reinforced concrete increased up to 0.3% of fiber contentThe Flexural strength of polypropylene and polyester fiber reinforced concrete increased up to 0.1% of fiber concrete from that point the flexural strength is decreased 0.2-0.3% by volume of concrete of fiber content.
6. The flexural strength of polypropylene has higher values when contrasted with polyester fiber reinforced samples and control sample.
7. So we conclude that the concrete with Polypropylene fiber dosage of 0.1% by volume of concrete is efficient for Pavement Quality Concrete when compared to Control plain sample and Polyester fiber.

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