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"DISCRETE FIBER USED IN ROAD PAVEMENT"

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Abstract*: Concrete roads are very conventional roads and can provide a safe and smooth flow of traffic. Due to the use of concrete in roads it has become quite an advantage for a greater life span and low maintenance. But concrete roads may undergo cracking, spalling and concrete is weak in tension and also little ductility. So as to mitigate these problems Inclusion of fiber can provide a great benefit to concrete pavement. This Research "The Use of Discrete Fiber in Road Pavements" is done so as to improve the quality of concretepavement. In this research the fiber used is polypropylene fiber and polyester fiber. The concrete mix used is M35. In one specimen only plain, concrete mix is tested for compressive strength, flexural strength and split tensile strength. Insecond specimen of polypropylene fiber is added with the concrete mix and again tested for the same three tests. In the third sample of polyester fiber is used in the concrete mix and tested for compressive strength, flexural strength and split tensile strength. In fourth specimen both polypropylene fiber and polyester fiber is mixed with the concrete mix and tested for the three tests It was seen a great increment in the strength which showed the addition of fiber can improve the quality of concrete.

Keywords: Pavement, Discrete fiber, Fiber Reinforced concrete, Types of fiber reinforced concrete, Polypropylene Fiber, Polyester Fiber, Compressive Strength, Flexural Strength, Split Tensile Strength, Tests.

1. INTRODUCTION

Roads are cheap means of transportation. It is used for the safe movement of vehicles. It is important to maintain for its long service. For the safe movement of traffic, the road pavement should be durable enough. The most important purpose of a pavement is to transfer loads to the sub-base. The benefit of using rigid pavement is its sturdiness and capability to tolerate hard environmental conditions. A rigid pavement is created from cement concrete or reinforcement concrete slab. A rigid road pavement provides an efficient, comfortable, and cost-effective design for the roadways and highways. Due to its high flexural stiffness and mechanical resistance, a rigid pavement allows to homogeneously transfer the vehicular loads to the underlying layers, preventing load and stress concentrations in the subgrade. But concrete pavements may suffer quick weakening, in the form cracks, fissures and failures, which can cause loss of serviceability and unsafe driving situation. This occurrence is chiefly due to the stiff behavior of cement concrete together with its little resistance to fatigue phenomena and its small resilience. Shrinkage cracking of concrete is a major problem in basic cement concrete pavements. However, these aspects can be diminished through the implementation of fibers. Fiber reinforced concrete (FRC) is a concrete which contain fibrous materials that increase the structural integrity of concrete. Different sorts of fibers can be used in concrete to mend the properties of concrete. Each fiber has the ability to improve produce

greater the quality of concrete. The fiber is added during the mixing of the concrete blend. The amount to be added is expressed in percentage to the total volume. The fibers that can be used in concrete pavements to improve their strength are steel fiber, polypropylene fiber, and synthetic fiber. Each fiber has different properties which can enhance the quality of concrete. It depends on the quantity of the fiber added to the concrete mix by which it can improve the behavior of the concrete.

Pavement: - Pavement is the durable surface material laid down on an area intended to sustain vehicular or foot traffic such asroad or walkway. In India two types of road pavements is commonly use likely Rigid Pavement and Flexible Pavement.

Rigid Pavement: - Rigid pavement is the technical term for any road surface made of concrete. Concrete roads are called rigid whileasphalt-covered roads are flexible. In Rigid pavements those which are surfaced with Portland cement concrete (PCC).

Discrete fiber: -

It contains short discrete fibers that are uniformly distributed and randomly oriented. Fibers include steel fibers, glass fibers, synthetic fibers and natural fibers.

Flexible Pavement: -

Flexible pavements are constructed using bituminous materials. These can be either in the form of surface treatments such as bituminous surface treatments generally found on low volume roads or, asphalt concrete surface courses generally used on high volume roads such as national highways. Flexible pavements those which are surfaced with bituminous (or asphalt) materials.

Fiber Reinforced concrete: -

Fiber reinforced concrete (FRC) is defined as a composite material consisting of concrete reinforced with discrete randomly but uniformly dispersed short length fibers.

Historical Background: -

The concept of using fibers as reinforcement is not new. Fibers have been used as reinforcement since ancient times. Historically, horsehair was used in mortar and straw in mudbricks. In the 1900s, asbestos fibers were used in concrete. In the 1950s, the concept of composite materials came into being and fiber-reinforced concrete was one of the topics of interest. Once the health risks associated with asbestos were discovered, there was a need to find a replacement for the substance in concrete and other building materials. By the 1960s, steel, glass (GFRC), and synthetic (such as polypropylene) fibers were used in concrete. Research into new fiber-reinforced concretes continues today.

Fibers are usually used in concrete to control cracking due to plastic shrinkage and to drying shrinkage. They also reduce the permeability of concrete and thus reduce bleeding of water. Some types of fibers produce greater impact, abrasion, and shatter resistance in concrete. Larger steel or synthetic fibers can replace rebar or steel completely in certain situations. Fiber reinforced concrete has all but completely replaced bar in underground construction industry such as tunnel segments where almost all tunnel linings are fiber reinforced in lieu of using rebar. Indeed, some fibers actually reduce the compressive strength of concrete.

Discrete fiber reinforced concrete: -

Concrete roads may undergo spalling cracking and concrete is weak in tension and also a little ductile. So to mitigate these problems adding discrete fiber can provide a benefit to concrete pavement. Fiber used is polyester fiber and polypropylene fiber and M30 concrete mix is used. The fibers are aggregate with the extreme deviation in shape from the rounded smooth aggregate. Fibers in tangle and interlock around aggregate particles and considered as it reduces the workability, this the mix becomes less prone and more cohesive to segregation. The fibers are suitable to reinforced the concrete products from glass, steel and polymers of organic material. Vegetable fibers and asbestos fibers that occur naturally such as jute also usable for reinforcement. Fibers are available in different shapes and sizes. They can be classified into two following categories. First one those which have a higher modulus of elasticity than a concrete matrix called a hard intrusion. Second one with a lower modulus of elasticity called a soft intrusion. The fibers restrain the shrinkage and creep movements of the unreinforced matrix. To extent and location to create under load will depend upon the number and orientation of fibers in cross section. However, fibers have found to be such a great effect in controlling the compressive creep than the tensile creep of the unreinforced matrix**.**

Types of fiber reinforced concrete

- **Steel fiber concrete: -**

Aspect ratio of steel fibers is 30 to 250. It has high structural strength. The diameter of steel fibers varies from 0.25mm to 0.75mm. Steel fibers control the crack width tightly and hence improves the durability of the concrete.It's used in airport and highway pavement, structural and precast applications, bridge decks, industrial flooring, etc.

❖ Glass fiber concrete: -

Glass fibers have a tensile strength of 1020 to 4090 N/mm2. The lengths of fibers that are used in this type of fibers are generally 25mm.It has high flexural strength, ductility, and also resistance to thermal shock. Glass fibers have a variety of uses in swimming pools, swelling lining, formwork, ducts, and roofs etc.

❖ Synthetic fibers: -

Synthetic fibers are manmade fibers from textile and petrochemical industries. It has high chemical resistance the melting point of synthetic fibers is high and the modulus of elasticity is low.There are different types of synthetic fibers like carbon, nylon, and polyester, polypropylene etc. Synthetic fibers are used in shotcrete, road construction and cladding panels.

❖ Natural fibers: -

Natural fibers obtain by using local manpower and technology. Examples are jute, coir, bamboo, etc. There may be organic decay in these fibers. It has a high impact strength and low modulus of elasticity.

Application of Fiber Reinforcement Concrete: -

- Runway Pavement and Aircraft parking: - Nowadays fiber reinforcement concrete is widely used in the construction site of runways and aircraft parking. Pavements of fiber reinforcement concrete are now in service in mild and severe environments.
- Slope stabilization and tunnel lining: - Steel fiber reinforced concrete is used to rock slope stabilization and line underground opening. It helps to eliminate the scaffolding and need for a mesh environment.
- Hydraulic structures and dams: - Fiber-reinforced concrete is being used for repairing dams and construction and some other hydraulic structures for providing resistance to severe erosion and cavitation that is caused by the impact of large water-born debris.
- Other applications: - There is also some other application of fiber-reinforced concrete that includes oil tanks, concrete repairing, water tanks, machine tool frames, lightning poles, etc.

Aim of the project: -

- To Make Use of Discrete Fiber in Road Pavement.

Objective: -

- To study the variation in compressive strength in concrete pavement with the incorporating the mixture of different amounts of polypropylene and polyester fibers.
- To control the cracking due to plastic shrinkage and to drying shrinkage which is the major problem in the concrete pavements
- To study the changes in tensile strength in concrete pavement with the addition of mixture of different amounts of polypropylene and polyester fibers.

Problem Statement: -

- In fiber reinforced concrete it can adversely affect workability
- Generally, fiber do not increase the flexural strength of concrete and cannot replace movement resisting
- Concrete is weak intention or strong in compression
- In concrete there are many defects in pavement but most common defect is cracking
- In Cracking plastic shrinkage and drying shrinkage is common. Plastic shrinkage concrete common cause is rapid surface moisture evaporation and in drying shrinkage concrete caused by moisture loss from drying concrete

2. LITURATURE REVIEW

K. Vamshi krishna1, J. Venkateswara Rao [1]. "Experimental study on behaviour of fiber reinforced concrete for rigid pavements" This paper deals with experimental investigation on mechanical properties of M20 grade concrete by incorporating polyester fibers in the mix. Polyester fibers of 0.1%, 0.2%, 0.3%, and 0.4% by weight of cement is added to the mix. A comparative analysis has been carried out for conventional concrete to that of the fiber reinforced in relation to compressive, split tensile, flexural strengths. As the fiber content increases compressive, split tensile and flexural strengths are proportionally increasing. It is observed that 0.3% fibers by weight of cement is the optimum dosage. It is found that with 0.3% fiber content results in 20% reduction of pavement thickness.

S.A Kanali, Ramu Palankar, Bharath Kumar, Praveen Kumar, Prakash S.K [2]. "Comparative study of polymer fiber reinforced Concrete with conventional concrete pavement" Road transportation is undoubtedly the lifeline of the nation

and its development is a crucial concern. The traditional bituminous pavements and their needs for continuous maintenance and rehabilitation operations points towards the scope for cement concrete pavements. There are several advantages of cement concrete pavements over bituminous pavements. This paper emphasizes on Polymer Fiber Reinforced Concrete Pavement, which is a recent advancement in the field of reinforced concrete pavement design. A comparative study of these pavements with the conventional concrete pavements has been made using Polypropylene fiber waste as fiber reinforcement.

Chintan Patel, Kishan Patel, Prof. Manjurali, I. Balya, Prof. Vikrant A. Patel [3]. "Performance Evaluation of Polymer Fiber "RECRON-3S" in Pavement Quality Concrete" Road transportation is undoubtedly the lifeline of the nation and its development is a crucial concern. The traditional bituminous pavements and their needs for continuous maintenance and rehabilitation operations points towards the scope for cement concrete pavements. There are several advantages of cement concrete pavements over bituminous pavements. But there are also some problems outcomes with concrete pavement like micro-shrinkage.

Nitin Kumar, Sangeeta [4]. "A Review study on use of Steel Fiber as Reinforcement Material with Concrete" Reinforcement is defined as the process of mixing various materials whether chemical, natural or Artificial for Improving the strength and durability of parent substance. Now a day there exists many Reinforcement techniques for improving the strength of t Hose materials which lacks load carrying and less Durable capacity. Use of steel fiber to enhance the strength and reduce maintenance is an effective technology Established in recent times. Fiber reinforced Polymer (FRP) application is very effective way to Repair and Strengthen structures that have become structurally weak over their life span. FRP repair system provides an economically viable alternative to traditional repair system and material.

N. Sagaresan [5]. Fracture in quasi-brittle materials such as concrete is accompanied by excessive cracking. Numerical Analysis of concrete fracture is either based on smeared crack method or discrete crack method. Smeared crack methods are computationally less challenging than the discrete crack method. However, this simplicity brings loss of accuracy. We propose a novel simplified and highly efficient meshless method for discrete cracks and study fracture of concrete. The method exploits the advantages of smeared crack method and maintains the accuracy of discrete crack method. The Discrete crack is modeled by set of discrete crack segments placed through the entire domain of influence of a node. We Use Neo-Hooke material in the bulk material and cohesive zone model once discrete cracks occur.

3. METHODOLOGY

Mixing of fiber in concrete can be achieved in many different ways or methods. Paired to plain concrete, Febriferous concrete mixtures are distinguished by greater cement factor, greater fine aggregate content, and smaller size coarse aggregate. The fiber mixture properly unites the concrete. External vibrations are better than others to prevent fiber segregation. trowels, floats and revolving power floats of metals are also used to polish the surface. The same equipment and procedures can be used for standard concrete. The tests necessary to perform are the flexural test, Compressive strength test, and split tensile strength test. Every test is performed on a set of 3 samples for every mix. Polypropylene and polyester fiber have used in the test while performing.

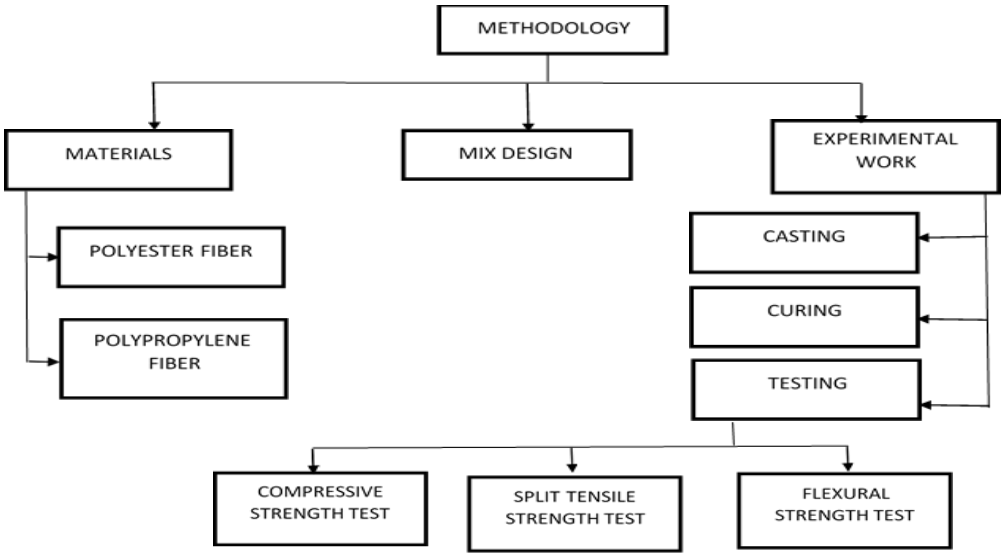


Fig No. 3.1 Flow Chart of Project Methodology

Materials: -

- Cement
- Aggregates
- Fine aggregates
- Coarse aggregates
- Polypropylene fiber
- Polyester fiber
- Water

Mix Proportion: -

- Grade designation = M35
- Type of cement = Ordinary Portland Cement
- Size of the aggregate = 20mm
- Min cement content = 340 kg/cu-m
- Max W/C ratio = 0.45
- Type of aggregate = Crushed angular

Fiber Used

polypropylene Fiber: -

The Polypropylene fiber, correspondingly known as polypropylene or PP, is a synthetic fiber, altered from 85% propylene, and is used in a variety of uses. As we know concrete provides a strong road pavement but it may undergo plastic and shrinkage cracking. So, to mitigate these problems polypropylene Fiber reinforced concrete (PFRC) has provided for improving these deficiencies. The accumulation of fibers in concrete increases the stiffness, flexural strength, tensile strength and bearing strength. The polypropylene fiber also reduces the steel reinforcement requirement and also improves the ductility.

Polyester fiber: -

Polyester fiber is an artificial fiber which can be used in The pavement construction to avert micro cracking and Also helps to increase flexural strength, compressive Strength of pavement. These fibers also reduce drying Shrinkage as well. The use of polymeric fiber has been Increased nowadays because there is no menace of decay and is very cost effective. There is no risk of corrosion Because polyester fibers are alkali resistant. Generally Polyester fibers can be used in industrial and warehouse Floor, pavements and even in overlays and pre-cast Products. Polyester macro-fibers can be used as a true Substitute to welded wire fabric, steel fibers and Conventional light gauge steel reinforcing for pre-cast Slabs on grad and shotcrete applications. The Properties of polyester fiber-reinforced concrete.

Cement: -

In this test Khyber cement Grade M53 OPC is used. When water is added to it paste is formed which Hardens with time. This cement grade is used for focused Works such as pre stressed concrete components, precast Items such as paving blocks, building blocks, etc., runways, Concrete roads, bridges, and other RCC works where the Grade of concrete is M35 and above

Aggregates: -

Aggregates are one of the vital constituents of the concrete which gives body to the concrete and also reduce shrinkage. For a good concrete mix aggregate need to be clean, hard, and strong. Generally, two types of Aggregates are used Fine Aggregate and Coarse Aggregate.

Fine Aggregate: -

These are typically sand or crumpled Stone that are less than 9.55mm in diameter. Sand was used as a fine aggregate. Fine aggregate is used to improve Workability and consistency. The general fineness of sand Is given by variable called fineness modulus.

Coarse Aggregate: -

These are particulates that are Greater than 9.55mm. Coarse aggregate used for this Research is 20mm.

Fiber: -

The fiber used for the test is Polyester and Polypropylene. These fibers have hydrophobic surface. Usage of these fibers as reinforcement diminishes Permeability, shrinkage resistance, mends both Compressional and tensile strength of concrete. The fiber used for this test were Polypropylene and Polyester fiber.

Water: -

The water used should be free from Impurities so as it does not affect the mix. If the water contains extensive amounts of chlorides may bring about Efflorescence and dampness

Design Mix for Concrete of M-30 Grade

STEP: - 1 DISIGN STIPULATION FOR PROPORTION

a) Characteristic compressive strength required at 28 days. : 35 N/ mm2
b) Type of cement. : OPC grade-53 (IS :269-2015)
c) Maximum nominal size of aggregate. : 20mm
d) Maximum cement content. : 340 kg/me (Table-5 of IS 456:2000 Amendment no.4)
e) Maximum water-cement ratio. : 0.45 (Table 5 of IS 456:2000 Amendment No.4)
f) Degree of workability : 115 mm slump
g) Exposure condition : Moderate
h) Method of placing. : Pumpable /Chute
i) Degree of supervision. : Good
j) Type of aggregate. : Crusher broken angular

STEP: - 2 TEST DATA FOR MATERIAL

a) Cement used : OPC grade – 53 (IS: 269-2015)
b) Sp. gravity of cement : 3.10
c) Specific gravity
d) Coarse aggregate. : 2.74
e) Fine aggregate. : 2.65
f) Water absorption. : Neglected

STEP: - 3 TARGET MEAN STRENGTH OF CONCRETE AS PER IS 10262:2019

Targeted mean strength = fck + t × s
=35 + 1.65 × 5 = 43.25 N/mm2
Where fck = Characteristic's compressive strength t = 1 65 from table – 2 of IS: 10262
S = Standard Deviation = 5 as per table 2 of IS 10262- 2019

MIX DESIGN: -

STEP: - 4 SELECTION OF WATER CEMENT RATIO

From table of IS 456, maximum water cement ration = 0.45 Based on the experience, adopt water cement ratio as = 0.40
0.40 < 0.45, hence O.K

STEP: -5 SELECTION OF WATER CEMENT

From table 4, Maximum water content = 186 liters (for 25 to 50 mm slump range) For 20 mm aggregate
Estimated water content for 115 mm slump 186+7 8/100×186= 200.5 liter

As superplasticizers is used, the water content can be reduced to 20 percent to 25 percent.
Based on the trails with superplasticizers water content reduction of 20 percent is considered
While using super plasticizers (SIKAMENT 2004 NS) as the rate 0.7 percent by weight of cement.
Hence the water content = 200.5 X 0.8 = 160.41 kg

STEP: - 6 CALCULATION OF CEMENT CONTENT

Water cement ratio : 0.40
Cement content. : 160.41/0.40 = 401.03 kg / me from table 5 of IS 456,
Minimum cement content for
Moderate condition. : 340 kg/m3 403 kg/m3 > 340 kg/ m3, hence O.K.

STEP: - 7 PROPORTION OF VOLUME OF COARSE AGGREGATE AND FINE AGGREGATE CONTENT

From table 5, the proportionate volume of coarse aggregate corresponding to 20 mm size Aggregate and fine aggregate

(ZONE -2) for water cement ratio of 0.40 = 0.62 in the present case water cement ratio is 0.40. Therefore, volume of coarse aggregate is required. To be increased to decreased the fine aggregate content. As the water cement ratio is lower by the .10

Proportion of volume of coarse, aggregate is increased by 0.10 (at the rate of 0.10 for every +, - 0.05 change in water cement ratio) Therefore, corrected proportion of volume of coarse Aggregate for the water cement ratio of 0.40 = 0.62 + 0.02 = 0.64. Volume of fine aggregate content = 1 – 0.64 = 0.36

STEP: - 8 MIX CALCULATIONS

The mix calculations per unit volume of concrete shall be as follows:

a) Total volume = 1 me
b) Volume of entrapped air in wet concrete = 0.01 me
c) Volume of cement = mass of cement / specific gravity of cement X 1/1000 = 401/3.10 X 1/1000
= 0.13 me
d) Volume of water = mass of water / Specific gravity of water X 1/1000 = 160.4/1 X 1/1000
= 0.16 me
e) Volume of Chemical Admixtures (Superplasticizers@0.7% by mass of cementious material)
= Mass of chemical Admixtures / Specific gravity of admixtures X 1/1000 = 4.01/1.145 X 0.7 /1000
=0.00245 m3
f) Volume of all ingredients in aggregate
= [(a-b)-(c+ d+ e)] = [(0.10-0.01)-(0.13 + 0.16 + 0.00245)] = [0.99-0.292] = 0.697 m
g) Mass of coarse aggregate = f X Volume of coarse aggregate X Specific gravity of coarse Aggregate X 1000
= 0.697 X 0.64 X 2.74 X 1000 = 1222.25 kg
h) Mass of fine aggregate
= f X Volume of fine aggregate X specific gravity of fine aggregate X 1000
= 0.697 X 036 X 2.65 X 1000 = 664.94 kg

STEP: -9 MIX PROPORTIONS FOR TRIAL NUMBER

a) Cement = 401 kg/m3
b) Water = 160 kg/m3
c) Fine aggregate = 665 kg/m3
d) Coarse aggregate = 1222 kg/m3
e) Chemical admixtures = 2.81 kg/m3
f) Free water cement ratio = 0.4

4. RESULT AND DISCUSSION

TEST PROCEDURE

Compressive Strength Test: -

In this test, cubes were casted and the dimension of these cubes was taken as 150×150×150 mm. In first cube only conventional concrete mix with M35 mix design was prepared. The second cube with same dimension was prepared with the incorporation of polypropylene fiber. The third cube with same mix proportion was made with the inclusion of polyester fiber and the last cube was prepared with the mix design with the addition of both polypropylene and polyester fiber with the same percentage. The casting molds are chosen to be made of cast iron and must be cleaned with oil on inner side for easy removal of cubes. The specimen must be cast in 3 layers (5cm each) and appropriately compacted in order that honeycombing creation does not take place.

The casted specimens are kept for 24 hours until it sets. After setting the specimens are detached from the mold and submerged underwater for stipulated time. The cube test for Compressive strength was done on 7 and 28 days respectively. Before placing on the UTM the specimen was completely dried. Then these testing specimens were placed in the space between bearing surfaces. The loading is applied axially on specimen without any shock and increased at the rate of 140kg/sq. cm/min. till the specimen downfall. Due to the constant application of load, the specimen starts cracking at a point & final failure of the specimen is noted.

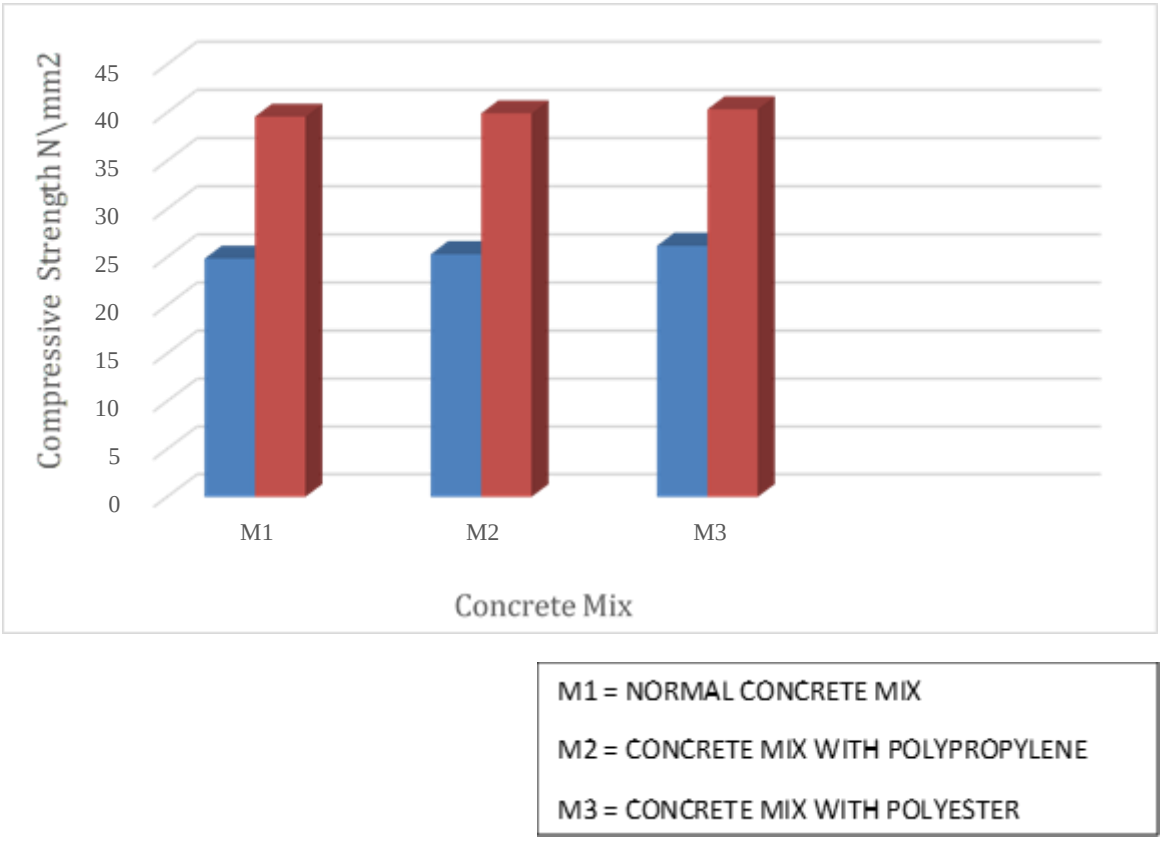
Fig No. 4.1 Casting of cube

Fig No. 4.2 Testing of sample

COMPRESSIVE STRENGTH TEST

Table No 4.1. Result Compressive test

Sr No.	Description	Compressive Strength Test	
		7 Days average strength N/mm2	28 Days average strength N/mm2
1	Normal concrete mix	24.20N/mm2	39.53 N/mm2
2	Concrete mix with 3% polypropylene fiber	25.65 N/mm2	39.92N/mm2
3	Concrete mix with 3% polyester fiber	27.41 N/mm2	40.34N/mm2



Graph no. 01 Compressive Strength Test

Flexural Strength Test: -

For flexural strength test beam samples of dimension 100x100x500 mm were casted. These flexural strength specimens were tested under four-point loading, using universal testing machine. In this test the required apparatus is mold in which specimen is casted, tampered rod for tamping purpose and flexural testing machine. The test specimen was prepared by filling the concrete into the mold in 3 layers of almost equivalent thickness. In first mold only conventional concrete mix with M35 mix design was prepared. The second cube with same dimension was prepared with the addition of polypropylene fiber. The third cube with same mix proportion was made with the addition of polyester fiber of and the last cube was prepared with the mix design with the addition of both polypropylene and polyester fiber with the same percentage. Each layer was tampered 35 times using the tamping bar as specified above.

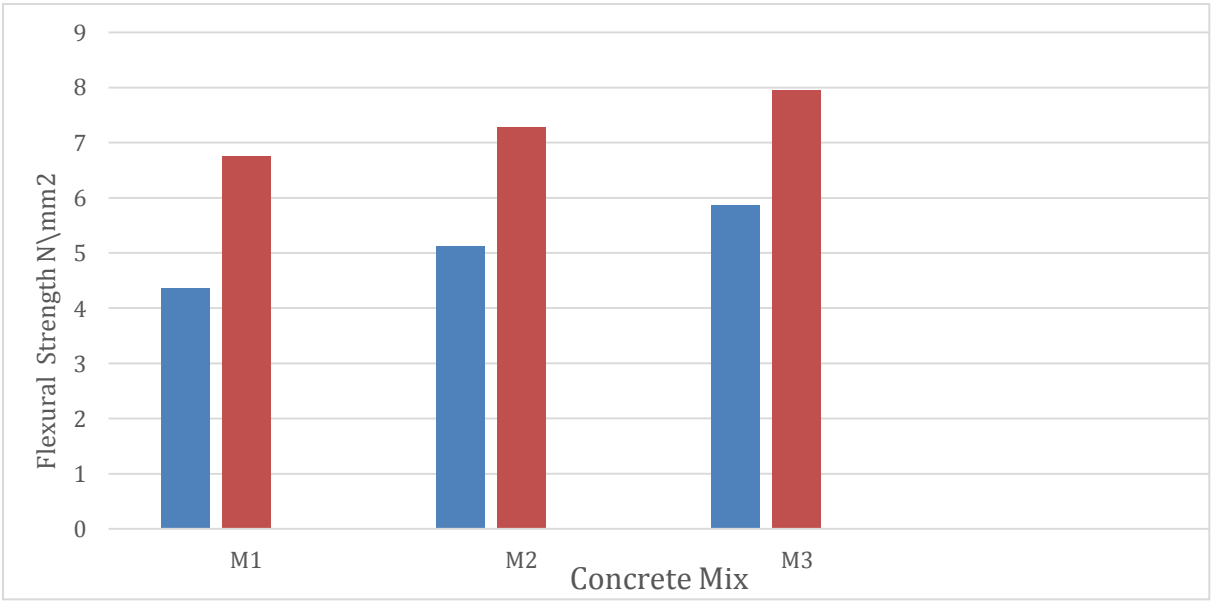
Fig No. 4.3 Casting of sample

Fig No. 4.4 Testing of sample

FLEXURAL STRENGTH TEST

Table No 4.2. Result of Flexural test

Sr.No.	Description	Flexural Strength Test	
		7 Days average strength N/mm2	28 Days average strength N/mm2
1	Normal concrete mix	4.36 N/mm2	6.75 N/mm2
2	Concrete mix with 3% polypropylene fiber	5.12 N/mm2	7.27 N/mm2
3	Concrete mix with 3% polyester fiber	5.86 N/mm2	7.95 N/mm2



Graph No02 Flexural Strength Test

Split Tensile Strength Test: -

In this test the sample size is cylinder of diameter 15 cm and height of 30 cm. The Mold used is metal. The Molds were coated with a thin film of Mold oil before use to prevent adhesion of concrete. All the 4 concrete mixes were placed into the Molds in layers of almost 5 cm thickness. Each layer was compacted either by hand. The test specimens were kept in a place at a temperature of 27° +/- 2°C for 24 hrs. After this time, samples were detached from the Molds in unpolluted fresh water for 28 days. The water was changed every 7 days. After curing the water was wiped from the surface of specimen, then by using marker diametrical lines were drawn on the two ends of the specimen to verify that they are on the same axial place. Then dimensions of the specimen were measured.

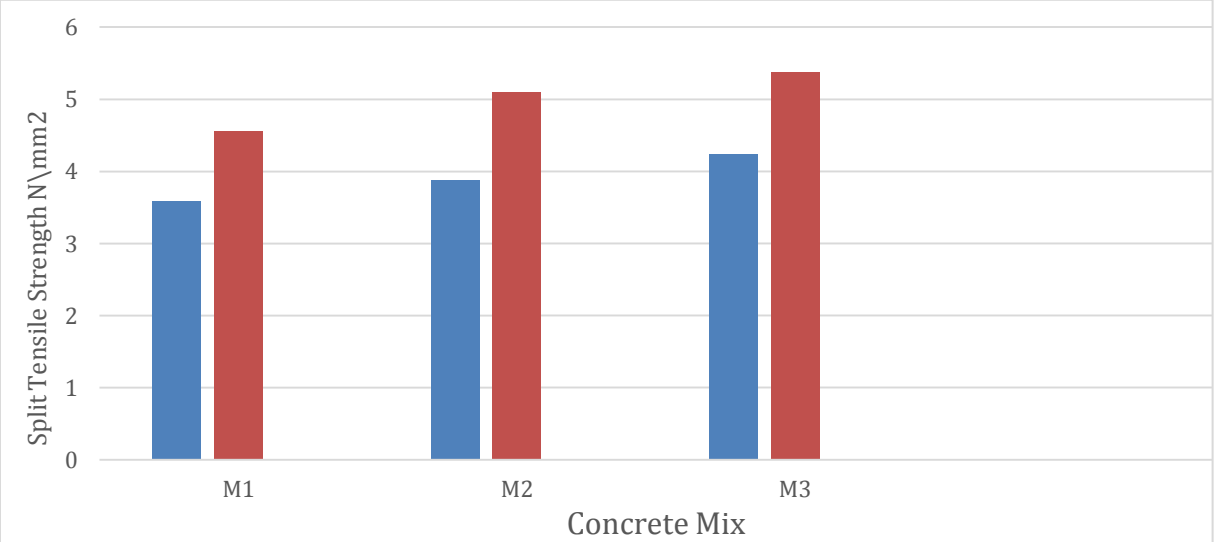
Fig No. 4.5 Casting of sample

Fig No. 4.6 Testing of sample

SPLIT TENSILE STRENGTH TEST

Table No 4.3. Result of Split Tensile strength test

Sr.No.	Description	Split Tensile Strength Test	
		7 Daysaverage strength N/mm2	28 Days average strength N/mm2
1	Normal concrete mix	3.58 N/mm2	4.55 N/mm2
2	Concrete mix with 3% polypropylene fiber	3.88 N/mm2	5.09 N/mm2
3	Concrete mix with 3% polyester fiber	4.24 N/mm2	5.37 N/mm2



M1 = NORMAL CONCRETE MIX

M2 = CONCRETE MIX WITH POLYPROPYLENE

M3 = CONCRETE MIX WITH POLYESTER

Graph No. 03 Split Tensile Strength Test

5. CONCLUSION

- Use of fibre in reinforced concrete improve the ductility of concrete and load carrying capacity.
- Fibre rainfalls concrete are control cracking and deformation.
- Use of fibre in concrete produce more closely space crack and reduce width of crack.
- No workability problem was encountered for the use of polypropylene fibre and polyester fibre.
- The addition of polyester fibre in concrete shows a greater increment in strength than polypropylene fibre.
- The compressive strength of the normal concrete mix is less than the other two mixes which are 3% of polypropylene and polyester. And same as another split tensile strength test and flexural strength test.
- It is less in cost and should be economical**.**

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