

A Study on Comparison of Strength Properties of Fibre Reinforced Concrete

L.Maria Subashini¹, Shamini Valentina*²

¹Assistant Professor, Department of Civil Engineering, Bharath University, Chennai, India

^{2*} Assistant Professor, Department of Civil Engineering, Bharath University, Chennai, India

ABSTRACT: Fibers have played a dominant role for a long time in a variety of applications for their high specific strength and modulus. They can be effectively controlled cracking and use the concrete with crack free and also increase the overall properties like compressive, ductility, flexural, quality of the concrete. Past studies show that only Cold rolled, Undulated, Flattened, Spiral I, II types of fibers have been used in reinforced concrete results in good properties, but their fields of application are very limited because of their inherent higher cost of production. Hence in this project polypropylene fibres were used which is a cheap and easily available type of fiber. Fiber reinforced concrete (FRC) is concrete containing fibrous material which increases its structural integrity. So we can define fibre reinforced concrete as a composite material of cement concrete or mortar and discontinuous discrete and uniformly dispersed fibre. Fibre is discrete material having some characteristic properties. The fibre material can be anything. Polypropylene is one of the cheapest and abundantly available polymers. Polypropylene fibers are resistant to most chemical attacks. Its melting point is high (about 165 degrees centigrade). So that it can withstand a working temp, as (100 degree centigrade) for short periods without detriment to fiber properties.

In this thesis the scope and objective of the work has been finalized, the properties of materials such as cement, fine aggregate, coarse aggregate and fibre that are going to be used in the specimen preparation were determined and the values have been tabulated. Finally the mix design of grade M30 was calculated to prepare the concrete specimens, the concrete cubes and beams are prepared and the strength properties such as compression strength and flexural strength are to be determined and compared by both

KEYWORDS: polypropylene fibres, strength properties, concrete specimens.

I.INTRODUCTION

Fiber-reinforced concrete (FRC) is concrete containing fibrous material which increases its structural integrity. It contains short discrete fibers that are uniformly distributed and randomly oriented. Fibers include steel fibers, glass fibers, synthetic fibers and natural fibers – each of which lend varying properties to the concrete. In addition, the character of fiber-reinforced concrete changes with varying concretes, fiber materials, geometries, distribution, orientation, and densities. Steel fibre is one of the most commonly used fibres. Generally round fibres are used. The diameter may vary from 0.25 to 0.75mm. The steel fibre sometimes gets rusted and lose its strength. But investigations have proved that fibres get rusted only at surfaces. It has high modulus of elasticity. Use of steel fibres makes significant improvements in flexure, impact and fatigue strength of concrete. It has been used in various types of structures. Glass fibre is a recently introduced fibre in making fibre concrete. It has very high tensile strength of 1020 to 4080Mpa. Glass fibre concretes are mainly used in exterior building façade panels and as architectural precast concrete. This material is very good in making shapes on the front of any building and it is less dense than steel.

Use of carbon fibre is not a developed process. But it has considerable strength and young's modulus. Also investigations have shown that use of carbon makes the concrete very durable. The study on the carbon fibres is limited. Mainly used for cladding purpose. Natural fibres are low cost and abundant. They are no hazardous and renewable. Some

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

of the natural fibres are bamboo, jute, coconut husk, elephant grass. They can be used in place of asbestos. It increases toughness and flexural strength. It also induces good durability in concrete. Polypropylene is one of the cheapest and abundantly available polymers. Polypropylene fibers are resistant to most chemical attacks. Its melting point is high (about 165 degrees centigrade). So that it can withstand a working temp, as (100 degree centigrade) for short periods without detriment to fiber properties.

II.OBJECTIVE

The main objective of the thesis to obtain the concrete with fibres to be effectively controlled cracking and use the concrete with crack free [1]. To increase the overall properties like compressive, ductility, flexural, quality of the concrete. To compare the results of various strength obtained by NDT and DT methods. In this thesis the scope and objective of the work has been finalized, the properties of materials such as cement, fine aggregate, coarse aggregate and fibre that are going to be used in the specimen preparation were determined and the values have been tabulated. Finally the mix design of grade M30 was calculated to prepare the concrete specimens, the concrete cubes and beams are prepared and the strength properties such as compression strength and flexural strength are to be determined and compared by both [2].

III .NEED FOR STUDY

The uniformly dispersed fibers strengthen the cement matrix and bridge over cracks, reduce the cracking sensitivity of the matrix and decrease the crack width. Although addition of fibres is expected to improve the engineering properties, it is not well understood for various types of fibres and should be tested for each kind of fiber [4-5]. Because use of steel fiber has disadvantage like corrosive nature. Therefore there is a need for the researchers to investigate on new type of fibers made of synthetic which are non-corrosive and chemically inert for use in fibre reinforced concrete to improve its quality. A FRC sub-category named Engineered Cementitious Composite (ECC) claims 500 times more resistance to cracking and 40 percent lighter than traditional concrete. ECC claims it can sustain strain-hardening up to several percent strain, resulting in a material ductility of at least two orders of magnitude higher when compared to normal concrete or standard fiber-reinforced concrete. ECC also claims a unique cracking behavior. When loaded to beyond the elastic range, ECC maintains crack width to below 100 μm , even when deformed to several percent tensile strains [3]. Field results with ECC and The Michigan Department of Transportation resulted in early-age cracking. Recent studies performed on a high-performance fiber-reinforced concrete in a bridge deck found that adding fibers provided residual strength and controlled cracking. There were fewer and narrower cracks in the FRC even though the FRC had more shrinkage than the control. Residual strength is directly proportional to the fiber content.

A new kind of natural fiber-reinforced concrete (NFRC) made of cellulose fibers processed from genetically modified slash pine trees is giving good results. The cellulose fibers are longer and greater in diameter than other timber sources [6-7]. Some studies were performed using waste carpet fibers in concrete as an environmentally friendly use of recycled carpet waste. A carpet typically consists of two layers of backing (usually fabric from polypropylene tape yarns), joined by CaCO_3 filled styrene-butadiene latex rubber (SBR), and face fibers (majority being nylon 6 and nylon 66 textured yarns). Such nylon and polypropylene fibers can be used for concrete reinforcement. Other ideas are emerging to use recycled materials as fibers: recycled Polyethylene terephthalate (PET) fiber, for example Steel fibre-reinforced shotcrete (SFRS) is a kind of spray concrete (shotcrete) with steel fibres added [8].

IV. METHODOLOGY

The properties of materials such as cement, fine aggregate, coarse aggregate and fiber are determined and Calculation of mix design for PC and PFRC M40 grade concrete to be designed as per IS 10262-1982. The experimental investigation to be carried out on casting cubes, and beams for both Plain Concrete (PC) and Polypropylene Fibre Reinforced Concrete (PFRC) by varying the percentage of addition of fibres. A set of three samples for different percentages of fibres added to concrete should be casted, cured and tested for fresh and hard properties of concrete. The Engineering properties of the concrete like compressive, flexural, split tensile strength are tested by using both Destructive

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

and Non-Destructive testing methods. Finally the results of strength obtained by the methods of various percentages of fibers in concrete have to be compared and the research of the project is to be explained [9-10].

V. TESTING OF MATERIALS

A. CEMENT

Ordinary Portland cement of 53 grade conforming to IS 12269-1987 standards are used in this experimental works. The cement is tested in lab for its physical characteristics and found to be conforming to the requirements as per IS 12269-1987.

FINENESS TEST

Fineness of cement can be determined in two ways by sieving and by air permeability method. Here sieving method is used to determine the fineness of cement. The principle of this is that we determine the proportion of cement whose grain size is larger than specified mesh size.

PROCEDURE

Weigh correctly 100 grams of cement and take it on a standard IS SIEVE No.9 Break down the air-set lumps in the sample with fingers. Continuously sieve the sample giving circular and vertical motion for a period of 15 minutes. Mechanical sieving devices may also be used. Weigh the residue left on the sieve. This weight shall not exceed 10% for ordinary cement.

STANDARD CONSISTENCY TEST

The basic aim is to find out the water content required to produce a cement paste of standard consistency as specified by the IS: 4031 (Part 4) – 1988. The principle is that standard consistency of cement is that consistency at which the Vicat plunger penetrates to a point 5-7mm from the bottom of Vicat mould.

PROCEDURE

Take about 500 grams of cement and prepare a paste with a weighed quantity of water (say 24% by weight of cement) for the first trial. The paste must be prepared in a standard manner and filled into the Vicat mould within 3-5 minutes. After completely filling the mould, shake the mould to expel air. A standard plunger, 10mm diameter, 50mm long is attached and brought down to touch the surface of the paste in the test block and quickly released allowing it to sink into the paste by its own weight. Take the reading by noting the depth of penetration of the plunger. Similarly conduct trials with different percentage of water, that particular percentage of water which allows the plunger to penetrate only to a depth of 33-35mm from the top is known as the percentage of water required to produce a cement paste of standard consistency.

INITIAL AND FINAL SETTING TIME

As we need to calculate the initial and final setting time as per IS: 4031 (Part 5) – 1988.

PROCEDURE

Prepare a cement paste by gauging the cement with 0.85 times the water required to give a paste of standard consistency [11]. Start a stop-watch, the moment water is added to the cement. Fill the Vicat mould completely with the cement paste gauged as above, the mould resting on a non-porous plate and smooth off the surface of the paste making it level with the top of the mould. The cement block thus prepared in the mould is the test block.

INITIAL SETTING TIME

Lower the needle gently and bring it in contact with the surface of the test block and quickly release. Allow it to penetrate into the test block [12]. In the beginning, the needle will completely pierce through the test block. But after some time when the paste starts losing its plasticity, the needle may penetrate only to a depth of 33-35mm from the top. The

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

period elapsing between the time when water is added to the cement and the time at which the needle penetrates the test block to a depth equal to 33-35mm from the top is taken as initial setting time.

FINAL SETTING TIME

Replace the needle of the Vicat apparatus by a circular attachment. The cement shall be considered as finally set when, upon, lowering the attachment gently cover the surface of the test block, the centre needle makes an impression, while the circular cutting edge of the attachment fails to do so. In other words the paste has attained such hardness that the centre needle does not pierce through the paste more than 0.5mm

COMPRESSION STRENGTH TEST

The compressive strength of hardened cement is the most important of all the properties.

PROCEDURE

Take cement and sand of ratio 1:3 in a tray and mix them with a trowel for 1 minute, then add water to it and mix it thoroughly until the mixture is of uniform color. Immediately after mixing, the mortar is filled into a cube mould and compacted either by hand or vibrating equipment for 2 minutes. Keep the compacted cube in the mould at a temperature of relative humidity for 24 hours. After 24 hours the cubes are removed from the mould and immersed in clean fresh water until taken out for testing. Three cubes are tested for compressive strength at the periods of 3 days, 7 days, 21 days and 28 days. The compressive strength shall be the average of the strengths of the three cubes for each period respectively.

B. FINE AGGREGATE

SIEVE ANALYSIS OF FINE AGGREGATE

The sieve analysis is conducted to determine the particle size distribution in a sample of aggregate, which we call gradation. This is done by sieving the aggregates as per IS: 2386 (Part I) 1963. In this we use different sieves as standardized by the IS code and then pass aggregates through them and thus collect different sized particles left over different sieves. The sample for sieving should be prepared from the larger sample either by quartering or by means of a sample divider.

PROCEDURE

The test sample is dried to a constant weight at a temperature of $110 \pm 5^\circ\text{C}$ and weighed. The sample is sieved by using a set of IS Sieves. On completion of sieving, the material on each sieve is weighed. Cumulative weight passing through each sieve is calculated as a percentage of the total sample weight. Fineness modulus is obtained by adding cumulative percentage of aggregates retained on each sieve and dividing the sum by 100.

SPECIFIC GRAVITY TEST

The specific gravity of an aggregate is considered to a measure of the quality or strength of the material.

PROCEDURE

Determine and record the weight of the empty clean and dry pycnometer, W_1 Place 10g of sand in the pycnometer. Determine and record the weight of the pycnometer containing the sand, W_2 The Pycnometer with sand is filled with distilled water to the mark, clean the exterior surface of the pycnometer with a clean, dry cloth. Determine the weight of the pycnometer and contents, W_3 Empty the pycnometer and clean it. Then fill it with distilled water only (to the mark). Clean

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

the exterior surface of the pycnometer with a clean, dry cloth. Determine the weight of the pycnometer and distilled water, W4.

BULK DENSITY TEST

PROCEDURE

Weigh the empty cylinder, Calculate the volume of the empty cylinder. Take the weight of cylinder with aggregate. The Procedure will be same for fine and coarse aggregate.

C. COARSE AGGREGATE

Aggregate physical properties are the most readily apparent aggregate properties and they also have the most direct effect on how an aggregate performs as either a pavement material constituent or by itself as a base or sub base material. These are not the only physical properties of aggregates but rather the most commonly measured. Tests used to quantify these properties are largely empirical.

Toughness and Abrasion Resistance

Los Angeles Abrasion Test

The principle of Los Angeles Abrasion test is to find the percentage of wear due to the relative rubbing action between the aggregate and steel balls used as abrasive charges.

PROCEDURE

The specified weight of aggregates are placed in the machine along with the abrasive charges and the drum is rotated for 500 revolutions at a speed of 30 - 33 revolutions per minute (RPM). The material is then extracted and separated into material passing the 1.70 mm (No. 12) sieve and material retained on the 1.70 mm (No. 12) sieve. The retained material (larger particles) is then weighed and compared to the original sample weight. The difference in weight is reported as a percent of the original weight and called the "percent loss". Some aggregates with high L.A. abrasion loss, such as soft limestone, provide excellent performance. However, no matter the performance characteristics, aggregate with high L.A. abrasion loss values will tend to create dust during production and handling, which may produce environmental and mixture control problems.

Moisture Content

Since aggregates are porous (to some extent) they can absorb moisture. This is a concern for PCC because aggregate is generally not dried and therefore the aggregate moisture content will affect the water content (and thus the water-cement ratio also) of the produced PCC and the water content also affects aggregate proportioning (because it contributes to aggregate weight).

PROCEDURE

The application of drying method is fairly simple. Drying is carried out in an oven and the loss in weight before and after drying will give the moisture content of the aggregate. If the drying is done completely at a high temperature for a long time, the loss in weight will include not only the surface water but also some absorbed water.

SHAPE TESTS

FLAKINESS INDEX

The flakiness index of aggregates is the percentage by weight of aggregate particles whose least dimension is less than 0.6 of their mean dimension.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

PROCEDURE

The sample of aggregates to be tested is sieved through a set of sieves and separated into specified size ranges. The width of the appropriate slot would be 0.6 of the average of the size range. The flaky material passing the appropriate slot from each size range of test aggregates are added up and let this weight be w . If the total weight of sample taken from the different size ranges W , the flakiness index is given by $100 w/W$ %

ELONGATION INDEX

The elongation index of an aggregate is the percentage by weight of particles whose greatest dimension is greater than 1.8 times their mean dimension.

PROCEDURE

The sample of aggregates to be tested is sieved through a set of sieve and separated into specific size ranges. The aggregates from each of the size range are then individually passed through the appropriate gauge length with the longest side in order to separate the elongated particles.

The gauge length would be 1.8 times the mean size of the aggregate. The portion of the elongated particles having length greater than the specified gauge from each range is weighed and the total weight of the elongated stones expressed as a percentage of the total weight of the sample to get the elongation index.

IMPACT TESTING

The test sample consists of aggregates passing 12.5mm sieve and retained on 10mm sieve and dried in an oven for four hours at a temperature 100°C to 110°C and cooled. Test aggregates are filled up to about one-third full in the cylindrical measure and tamped 25 times with rounded end of the tamping rod. Further quantity of aggregates is then added up to two-third full in the cylinder and 25 stocks of the tamping rod are given. The measure is now filled with the aggregates to over flow, tamped 25 times. The net weight of the aggregates in the measure is determined to the nearest gram and this weight of the aggregates is used for carrying out duplicate test on the same material. The impact machine is placed with its bottom plate flat on the floor so that the hammer guide columns are vertical. The cup is fixed firmly in position on the base of the machine and the whole of the test sample from the cylindrical measure is transferred to the cup and compacted by tamping with 25 strokes. The hammer is raised until its lower face is 380mm above the upper surface of the aggregates in the cup, and allowed to fall freely on the aggregates. The test sample is subjected to a total 15 such blows, each being delivered at an interval of not less than one second. The crushed aggregate is then removed from the cup and the whole of it sieved on the 2.36mm sieve until no further significant amount passes. The fraction passing the sieve is weighed accurate to 0.1gm.

The fraction retained on the sieve is also weighed and if the total weight of the fractions passing and retained on the sieve is added it should not be less the original weight of the specimen by more than one gram, if the total weight is less than the original by over one gram the results should be discarded and a fresh test made.

VI.WATER

The water used in this experiment is portable and tested in Chennai metro water supply and drainage board lab for its quality. The result confirms as per IS and suitable for construction and curing purposes.

VII.POLYPROPYLENE FIBERS

The manufacturing process is of Melt processing of polypropylene can be achieved via extrusion and molding. Common extrusion methods include production of melt-blown and spun-bond fibers to form long rolls for future conversion into a wide range of useful products, such as face masks, filters, diapers and wipes.

Very thin sheets of polypropylene are used as a dielectric within certain high-performance pulse and low-loss RF capacitors. As polypropylene is resistant to fatigue, most plastic living hinges, such as those on flip-top bottles, are made from this material.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

Benefits of PP fibers

1. Reduces Water Permeability :

Prevents water or moisture from entering and migrating throughout the concrete Helps prevent the corrosion of steel used for primary reinforcement in the structure, improving the longevity of the structure

2. Controls Cracking :

Prevents the shrinkage cracks developed during curing, making the structure/plaster/component inherently stronger Arrests cracking caused by volume change (expansion & contraction)

3.Reduces Rebound Loss and Brings Direct Saving & Gain :

Recron3s reduces rebound "splattering" of concrete and shotcrete The raw material wastage reduces & results in direct saving in terms of raw material The wastage of raw material reduces resulting in direct saving over and above cost of Recron 3s

4.Increases flexibility:

Safe And Easy To Use :Environmental friendly and non hazardous Easily disperses and separates in the mix .

VIII.RESULTS OF TESTING

PHYSICAL PROPERTIES OF CEMENT

The values obtained from the testing of properties of cement are tabulated below:

PHYSICAL PROPERTIES	RESULTS	REQUIREMENTS AS PER IS 12269-1987
Specific gravity	3.15	
Consistency	28.5%	Not specified
Initial setting time	150 min	Not less than 30 min
Final setting time	365 min	Not more than 600 minutes
Fineness	268 m ² /kg	Not less than 225 m ² /kg
compressive strength 3 days	35.0 MPa	Not less than 27 MPa
7days	43.5 MPa	Not less than 37 Mpa
28 days	61.2 MPa	Not less than 53 Mpa

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

PHYSICAL PROPERTIES OF FINE AGGREGATE

The fine aggregates are tested for sieve analysis and the graduations are tabulated below:

Physical properties	Results	Requirements as per IS:383-1970
Specific gravity	2.63	-
Bulk density	1400kg/m ³	-
Material finer than 75 microns	0.80%	Max. 3% by weight

PHYSICAL PROPERTIES OF COARSE AGGREGATE

The results obtained from the testing are given in the below tabular column:

PHYSICAL PROPERTIES	RESULTS	REQUIREMENTS AS PER IS 12269-1987
Toughness	36.5%	Not more than 50%
Specific gravity	2.75	2.6 – 2.9
Soundness	14%	12% - 18%
Water absorption	0.42%	Not more than 0.6%
Elongation index	12%	Not more than 15%
Flakiness index	38%	Not more than 50%
Crushing strength	26.83%	Not more than 30% for pavements and not more than 45% for other structures

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

PROPERTIES OF PP FIBERS

The properties of polypropylene are given in the below tabular column.

PROPERTIES	UNITS	VALUES
Shape		Triangular
Cut length	mm	3/6/12/18/24
Effective Diameter	microns	25-40
Specific Gravity		0.90-0.91
Melting point	Deg C	160-165
Elongation	%	60-90
Youngs modulus	Mpa	>4000
Alkaline stability		Very Good

IX.DESIGN MIX FOR CONCRETE

Parameters for mix design M40

Grade Designation = M-40

Type of cement = O.P.C-53 grade confirming to IS-12269-1987

Fine Aggregate = Zone-II as per IS: 383-1970

Sp. Gravity of Cement = 3.15

Sp. Gravity of Fine Aggregate = 2.63

Sp. Gravity of Coarse Aggregate (20mm) = 2.67

Sp. Gravity of Coarse Aggregate (10mm) = 2.65

Chemical Admixture Type = Superplasticiser Confirming to IS-9103

Minimum Cement Content (MORT&H 1700-3 A) = 310 kg/m³

Maximum water cement ratio (MORT&H 1700-3 A) = 0.45

Mix Calculation

1. Target Mean Strength

$$= 40 + (5 \times 1.65)$$

$$= 48.25 \text{ Mpa}$$

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

2. Selection of water cement ratio:-

Assume water cement ratio = 0.4

3. Calculation of cement content: -

Assume cement content 400 kg / m³

4. Calculation of water: -

Quantity of water=400 X 0.4

= 160 kg Which is less than 186 kg

(As per Table No. 4, IS: 10262)

Hence o.k.

5. Calculation for C.A. & F.A.: -(As per IS : 10262 , Cl.No. 3.5.1)

$$V = [W + (C/S_c) + (1/p) \cdot (f_a/S_{fa})] \times (1/1000)$$

$$V = [W + (C/S_c) + \{1/(1-p)\} \cdot (ca/S_{ca})] \times (1/1000)$$

Where

V = absolute volume of fresh concrete, which is equal to gross volume (m³) minus the volume of entrapped air ,

W = mass of water (kg) per m³ of concrete ,

C = mass of cement (kg) per m³ of concrete ,

S_c = specific gravity of cement,

(p) = Ratio of fine aggregate to total aggregate by absolute volume ,

(fa) , (ca) = total mass of fine aggregate and coarse aggregate (kg) per m³ of Concrete respectively, and

S_{fa} , S_{ca} = specific gravities of saturated surface dry fine aggregate and Coarse aggregate respectively.

As per Table No. 3 , IS-10262, for 20mm maximum size entrapped air is 2%

Assume F.A. by % of volume of total aggregate = 36.5 %

$$0.98 = [160 + (400 / 3.15) + (1 / 0.365) (Fa / 2.61)] (1 / 1000)$$

$$\Rightarrow Fa = 660.2 \text{ kg}$$

Say Fa = 660 kg.

$$0.98 = [160 + (400 / 3.15) + (1 / 0.635) (Ca / 2.655)] (1 / 1000)$$

$$\Rightarrow Ca = 1168.37 \text{ kg.}$$

Say Ca = 1168 kg.

Considering 20 mm : 10mm = 0.6 : 0.4

20mm = 701 kg .

10mm = 467 kg .

Hence Mix details per m³

Cement = 400 kg

Water = 160 kg

Fine aggregate = 660 kg

Coarse aggregate 20 mm = 701 kg

Coarse aggregate 10 mm = 467 kg

Admixture = 0.6 % by weight of cement = 2.4 kg.

Polypropylene fibers = 900 gm

Water: cement: F.A.: C.A. = 0.4: 1: 1.65: 2.92

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

X.CONCLUSION

The thesis have been concluded with the mix design of M40 grade of concrete and the physical properties of various materials such as cement, fine aggregate, coarse aggregate and fibers have been tabulated by performing the various testing of materials in laboratory. As an extension of the work, the concrete cubes and beams are to be casted and the various strength like compression, flexural, split tensile strengths of the specimens are found by Destructive and Non-Destructive Testing.

Thus the evaluation and comparisons of various strength of Polypropylene Fiber Reinforced Concrete with the plain concrete have been proposed in this thesis. Further the results are collected and suitable suggestions will be framed according to the result.

ACKNOWLEDGMENT

Apart from the efforts of me, the success of this project report depends on the encouragement and guidelines of many others. I take this opportunity to express my gratitude to the people have been instrumental in the successful completion of this project. Author express our thanks to PROF.M.MALA, CEO and DR.D.PADMA SUBRAMANIAN, Principal Jerusalem college of Engineering, Dr.N.S.ELANGO VAN, Head of the Department, department of Civil Engineering for his understanding and constant efforts in bringing out the project in the stipulated time. And author also thanks MS JAYALAKSHMI, Associate Professor, Department of Civil Engineering, Jerusalem College of Engineering for providing the guidance and encouragement for the successful completion of the thesis.

REFERENCES

- [1] Kyoungsoo Park, Glaucio H. Paulino, Jeffery Roesler (2009) 'Cohesive fracture model for functionally graded fiber reinforced concrete', Cement and Concrete Research 40 (2010) 956-965
- [2] Jaikumar S., Ramaswamy S., Asokan B.R., Mohan T., Gnanavel M., "Anti ulcer activity of methanolic extract of Jatropha curcas (Linn.) on Aspirin-induced gastric lesions in wistar strain rats", Research Journal of Pharmaceutical, Biological and Chemical Sciences, ISSN : 0975-8585, 1(4) (2010) PP.886-897.
- [3] Carl Redon, Jean-Louis Chermant (1998) 'Damage mechanics applied to concrete reinforced with amorphous cast iron fibers, concrete subjected to compression', Cement & Concrete Composites 21 (1999) 197 ~204
- [4] Ronald F. Zollo (1996) 'Fiber-reinforced Concrete: an Overview after 30Years of Development', Cement and Concrete Composite 19 (1997) 107-122.
- [5] Subhashree A.R., Shanthi B., Parameaswari P.J., "The Red Cell Distribution Width as a sensitive biomarker for assessing the pulmonary function in automobile welders- a cross sectional study", Journal of Clinical and Diagnostic Research, ISSN : 0973 - 709X, 7(1) (2013) PP. 89-92.
- [6] Naaman A.E&Hammoud.H (1997) 'Fatigue Characteristics of High Performance Fiber - reinforced concrete', Cement and Concrete Composites 20 (1998) 353-363
- [7] Kumar S.S., Rao M.R.K., Balasubramanian M.P., "Anticarcinogenic effects of indigofera aspalathoides on 20-methylcholanthrene induced fibrosarcoma in rats", Research Journal of Medicinal Plant, ISSN : 5(6) (2011) PP. 747-755.
- [8] Cunha.V.M.C.F, Barros.J.A.O, Sena-Cruz.J.M (2010) 'An integrated approach for modelling the tensile behaviour of steel fibre reinforced self - compacting concrete', Cement and Concrete Research 41 (2011) 64-76
- [9] Garkhail.S.K, Heijenrath.R.W.H and Peijs.T (2000) 'Mechanical Properties of Natural-Fiber-Mat-Reinforced Thermoplastics based on Flax Fibers and Polypropylene', Applied Composite Materials 7: 351-372, 2000.
- [10] Gopalakrishnan K., Prem Jeya Kumar M., Sundeep Aanand J., Udayakumar R., "Analysis of static and dynamic load on hydrostatic bearing with variable viscosity and pressure", Indian Journal of Science and Technology, ISSN : 0974-6846, 6(S6) (2013) PP.4783-4788.
- [11] Lau.A, Anson.M (2005) 'Effect of high temperatures on high performance steel fibre reinforced concrete', Cement and Concrete Research 36 (2006) 1698-1707
- [12] Srinivasan V., "Analysis of static and dynamic load on hydrostatic bearing with variable viscosity and pressure", Indian Journal of Science and Technology, ISSN : 0974-6846, 6(S6) (2013) PP.4777-4782.
- [13] Dr. T.Nalini, Dr.K.Manivannan, Vaishnavi Moorthy, Efficient Remote Data Possession Checking In Critical Information Infrastructures Ensuring Data Storage Security In Cloud Computing, International Journal of Innovative Research in Computer and Communication Engineering, ISSN (Online): 2320 - 9801,pp 12-18, Vol. 1, Issue 1, March 2013
- [14] Dr.K.P.Kaliyamurthie, Cervical Cancer Screening and Classification Using Acoustic Shadowing, International Journal of Innovative Research in Computer and Communication Engineering, ISSN(Online): 2320-9801,pp 1659-1662, Volume 1, Issue 8, October 2013
- [15] Dr.K.P.Kaliyamurthie, Automated Information Retrieval System Using Correlation Based Multi- Document

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

Summarization Method, International Journal of Innovative Research in Computer and Communication Engineering, ISSN(Online): 2320-9801,pp 4328-4335, Vol. 1, Issue 7, September 2014

- [16] Dr.K.P.Kaliyamurthie, D.Pameswari, Modelling Cloud Storage, International Journal of Innovative Research in Computer and Communication Engineering, ISSN: 2249-2651,pp 1-5, Volume1 Issue3 Number2–Dec2011
- [17] Dr.K.P.Kaliyamurthie, D.Pameswari, Implementation of Customized Greencall Algorithm for Energy-Efficient Of Wireless LANs, International Journal of Innovative Research in Computer and Communication Engineering, ISSN: 2249-2615,pp 15-21, Volume1 Issue 1 Number2-Aug 2011