AN EXPERIMENTAL INVESTIGATION ON POLYPROPYLENE FIBER CONCRETE WITH REPLACEMENT OF FINE AGGREGATE WITH M SAND

[1]M. Ruben Pradeep, [2]N. Rushwanth Chowdary

[1 &2] *Academic Consultant, Department of Civil Engineering, S.V.U.C.E, S.V. University,Tirupati 517501*

ruby.albert146@gmail.com,

ABSTRACT:

Polypropylene is a thermoplastic polymer utilized as a part of wide assortment of uses including bundling, materials (e.g., ropes, warm clothing and covers). Polymer cement is a piece of gathering of cements that utilizes polymers to supplement bond as a cover. The sorts incorporate polymer-impregnated solid, polymer cement, and Polymer-Portland-bond concrete. The aim of the study was to achieve maximum strength of concrete by using optimum weight of polypropylene fibers. Fiber reinforced concrete is used in a variety of engineering applications because of its satisfactory and outstanding performance in the industry and construction field. Polypropylene fiber in concrete mix design is used for multiple purposes that includes rigid pavement, self- compacting concrete and other applications. Cubes and Cylinders of polypropylene concrete were casted and tested for 7 and 28 days strength for both compressive and split tensile strength respectively. It was concluded that the significant improvement was observed in ultimate compressive strength after 7 and 28 days. The optimum percentage of Polypropylene fiber was obtained to be 1.0 percent of cement by volume. The addition of small amount of polypropylene improved the mechanical properties of concrete.

INTRODUCTION:

The fiber dispersion into concrete is one of the technique to improve the building properties of concrete. Polypropylene fibers are synthetic fibers obtained as a by-product from textile industry. These are available in different aspect ratios and are cheap in cost. Polypropylene fibers are characterized by low specific gravity and low cost. Its use enables reliable and effective utilization of intrinsic tensile and flexural strength of the material along with significant reduction of plastic shrinkage cracking and minimizing of thermal cracking. It provides reinforcement and protects damage of concrete structure and prevents spalling in case of fire.

The fibers are manufactured either by the pulling wire procedure with circular cross section or by extruding the plastic film with rectangular cross-section. They appear either as fibrillated bundles, mono filament. The fibrillated polypropylene fibers are formed by expansion of a plastic film, which is separated into strips and then slit. The fiber bundles are cut into specified lengths and fibrillated. In monofilament fibers, the addition of buttons at the ends of the fiber increases the pull out load.

Cracks play an important role as they change concrete structures into permeable elements and consequently with a high risk of corrosion. Cracks not only reduce the quality of concrete and make it aesthetically unacceptable but also make structures out of service. If these cracks do not exceed a certain width, they are neither harmful to a structure nor to its serviceability.

Therefore, it is important to reduce the crack width and this can be achieved by adding polypropylene fibers to concrete. Thus, addition of fibers in cement concrete matrix bridges these cracks and restrains them from further opening. In order to achieve more deflection in the beam, additional forces and energies are required to pull out or fracture the fibers. This process, apart from preserving the integrity of concrete, improves the load- carrying capacity of structural member beyond cracking.

In this project polypropylene fibers of blended 12mm type is used. The project deals with the effects of addition of various proportions of polypropylene fiber on the properties of concrete in fresh and hardened state. An experimental program was carried out to explore its effects on workability, compressive and flexural strength.

SCOPE AND OBJECTIVES:

The properties of polypropylene fiber reinforced concrete mixes and various factors such as w/c ratio, type of fiber, volume, aspect ratio and its effect on strength has now been well established and much research has been carried up to date. The improvement in strength of polypropylene fiber reinforced concrete is accompanied by a relatively greater increase in flexural toughness & impact resistance, which are important factors. The structural behavior of polypropylene fiber reinforced concrete needs to be examined

(1) Main laboratory tests on Cement, Polypropylene fiber, Coarse Aggregates and fine aggregates.

(2) Mix design and proportion of ingredients of concrete mix, for M25 grade of concrete.

(3) Acquiring the compressive strength, Split tensile strength, for a period of 7 and 28 days of M25 grade of concrete with varying percentages of Polypropylene fiber

The objective is to study the effect of polypropylene fiber in concrete. To conduct a comparative study on fiber in concrete and conventional concrete.

The following are the main objective of study:

a) Compare the crushing strength of plain cement concrete with fiber reinforced concrete.

b) To evaluate flexural strength of plain cement concrete and fiber reinforced concrete.

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 06 | June – 2025 DOI: 10.55041/ISJEM04541
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

MATERIALS:

In general Concrete is a composite material comprises of cement, fine aggregate, coarse aggregate and water. To make concrete of desired strength, we are adding Polypropylene fiber. So it is mandatory to analyse the basic properties of cement, fine aggregate and coarse aggregate.

Cement:

Although all materials that go into concrete mix are essential, cement is very often the most important because it is usually the delicate link in the chain. The function of cement is first of all to bind the sand and stone together and second to fill up the voids in between sand and stone particles to form a compact mass. It constitutes of about 15-20 percent of the total volume of concrete mix, it is the active portion of binding medium and is the only scientifically ingredient of concrete. Any variation in its quantity affects the compressive strength of the concrete mix. Ordinary Portland cement (OPC) is the most important type of cement and is a fine powder produced by grinding Portland cement clinker. The OPC is classified into three grades, namely 33 Grade, 43 Grade, 53 Grade depending upon the strength of 28 days. It has been possible to upgrade the qualities of cement by using high quality limestone, modern equipments, maintaining better particle size distribution, finer grinding and better packing. Generally, use of high grade cement offers many advantages for making stronger concrete. Although they are little costlier than low grade cement, they offer 10-20% saving in cement consumption and they offer many hidden benefits. One of the most important benefits is the faster rate of development of strength. Ordinary Portland Cement (OPC) is the cement best suited to general concreting purposes. OPC 53 grade confirming with IS: 12269 (1987) is used. The cement is kept in an airtight container and stored in the humidity control room to prevent cement from being exposed to moisture.

Aggregate:

The aggregate forms the main matrix of the concrete. The aggregate particles are glued together by the cement and water paste. With cement and water the entire matrix binds together into a solid mass called concrete. Aggregate influence the properties of concrete such as water requirement, cohesiveness and workability of the concrete in plastic stage, while they influence strength, density, surface finish, durability and colour in hardened stage. It is therefore significantly important to investigate the various properties of aggregate.

Aggregate are generally inert and broadly divided into two categories, i.e. fine and coarse depending on their size. Aggregate with grain size below 4.75mm are termed as fine aggregate and above 4.75mm are termed as coarse aggregate. The material passing through 4.75mm is termed as fine aggregate. Here fine aggregate used is Manufactured sand. The fine aggregate should be clean and free from organic matter, silt & clay.

M Sand (Manufactured Sand): is a type of artificial sand produced by crushing hard granite stones into fine particles. It is increasingly used as a substitute for river sand in construction due to environmental concerns and the depletion of natural sand sources.

Polypropylene Fiber:

Polypropylene is an economical material that offers a combination of outstanding physical, mechanical, thermal and electrical properties not found in any other synthetic fibers. There are two general types of fibers currently available in the market. These are referred to as fibrillated and monofilament In this project we have used **Polypropylene Homopolymer.** It is the most widely utilized general-purpose grade. It contains only propylene monomer in a semi-crystalline solid form. Main applications include packaging, textiles, healthcare, pipes, automotive and electrical applications.

Water:

Water is an important ingredient of concrete as it actively participates in the chemical reaction with cement. Since it helps to form the strength giving cement gel, the quantity and quality of water is required to be looked in to very carefully. Mixing water should not contain undesirable organic substances or inorganic constituents in excessive proportion. Some specification also accept water for making concrete if the pH value of water lies between 6 and 8 and the water is free from organic matter. Carbonates and bi-carbonates of sodium and potassium effect the setting time of cement. While sodium carbonate may cause quick setting time, the bi- carbonates may either accelerate or retard the setting. The other higher concentration of these salts will materially reduce the concrete strength.

EXPERIMENTAL INVESTIGATION:

The main purpose of experimental investigation is to prepare the mix design and to obtain various properties of concrete made with different percentages of polypropylene fiber and to compare with conventional concrete.

Properties to be studied:

Workability - Slump cone test

Strength - Compressive strength test, Split tensile strength test

MIX DESIGN

General

Mix design can be defined as the process of selecting suitable ingredients of concrete such as cement, aggregate, water and determining their relative proportions with the object of producing concrete of required minimum strength, workability and durability as economically as possible, is termed the concrete mix design. The purpose of designing can be seen from the above definitions, as two-fold. The first objective is to achieve the stipulated minimum strength and durability. The second objective is to make the concrete in the most economical manner. The mix design procedure as per Indian Standard recommended guidelines given in IS: 10262- 2019 and IS: 456-2000 were adopted.

Stipulations for Proportioning

Grade Designation	: M 25
Type of Cement	: OPC 53 grade Maximum nominal size of aggregate : 20 mm
Workability	: 100 mm
Method of Concrete placing	: Non-Pumping
Degree of supervision	: Good
Type of aggregate	: Crushed Angular Aggregate
Minimum cement content	: 300 kg/m^3
Exposure Condition	: Moderate

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 06 | June – 2025 DOI: 10.55041/ISJEM04541
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

Test Data for materials

a) Specific gravity of cement : 3.12

b) Specific gravity of

i) Coarse Aggregate : 2.66

ii) M sand : 2.67

c) Water Absorption of

i) Coarse Aggregate : 1.0%

ii) M sand : 3.45%

Target Strength for mix proportioning

a) f_{ck} +1.65(s) =25+1.65(4)

=31.6 N/mm^2

b) f_{ck} + X =25+5.5

=30.5N/mm^2

The higher value is to be adopted. Therefore, target strength will be

31.6 N/mm² > 30.5 N/mm².

Approximate Air Content

The approximate amount of entrapped air to be expected in normal (non-air entrained) concreteis 1% of total volume of concrete for 20mm nominal maximum size of aggregate.

Selection of Water-Cement Ratio

The water-cement ratio required for target strength of 31.6 N/mm2 is 0.49 for OPC 53 grade curve. This is lower than the maximum value of 0.50 prescribed.

Selection of Water Content

The water content for 20 mm aggregate = 186 kg (for 50mm slump without super plasticizer)

Estimated water content for 100mm slump (increasing at the rate of 3% for every 25mm slump)

=186 +6% of 186 kg

= 198 kg

Calculation of cement content

Optimum Cement Content = Water Content/water-cement ratio

=198/0.5

=396 kg

Since this cement content is very high for 1m^3 of concrete, we assume 360 kg of cement which is greater than minimum cement content (300kg/m^3) and mix the proportions according to 360 kg of cement.

Therefore, for 360 kg of cement and water-cement ratio of 0.47, Water Content = 360*0.47 = 170 kg

Proportion of volume of coarse aggregate and fine aggregate content

Volume of coarse aggregate corresponding to 20mm size of aggregate and fine aggregate grading Zone II is 0.62 per unit volume of total aggregate. This is for water-cement ratio of 0.5.

<u>For water-cement ratio of 0.5:</u>

Volume of Coarse Aggregate = 0.622 Volume of Fine Aggregate = 0.378

Mix Calculations

a) Total volume = 1 m^3

b) Volume of entrapped air in wet concrete = 0.01 m^3

c) Volume of cement = 320/ (3.12*1000) = 0.115 m^3

d) Volume of water = 170/ (1*1000) = 0.170 m^3

e) Volume of all in aggregate = (1-0.01)-(0.103+0.160) = 0.705 m^3

f) Mass of Coarse Aggregate = 0.705*2.66*0.622*1000 = 1165 kg

g) Mass of Fine Aggregate = 0.705*2.67*0.378*1000 = 712 kg

Mix Proportions

a) Cement = 360 kg/m^3
b) Water = 170 kg
c) Fine Aggregate = 712 kg/m^3
d) Coarse Aggregate = 1165 kg/m^3
e) W/C Ratio = 0.47

Mix proportion of M25 grade concrete for 1m^3

Materials	Cement	Fine aggregate	Coarse aggregate	Water
Weight	360 kg	712 kg	1165 kg	170 kg
Ratio	1	1.97	3.23	0.47

PREPARATION OF FRESH CONCRETE:

In this project work concrete specimens were cast in fresh state, which include cubes for compression test, cylinders for split tension test and prisms for flexural tension test. All the materials of required quantity were kept ready by weighing for mixing.

MIXING:

Thorough mixing of the materials is essential for the production of uniform concrete. The mixing should ensure that the mass becomes homogenous, uniform in colour and consistency. There are two methods for mixing concrete. 1. Hand mixing & 2. Machine mixing

Here we adopted machine mixing. First of all, wet the inner surface of the drum of concrete mixer. Coarse aggregates are placed in the mixer first followed by sand and then cement. Mix the materials in the dry state in a mixing machine. Normally it should be 1.5 to 3 minutes. After proper mixing of dry materials, gradually add the correct quantity of water while the machine is in motion. Do not add more water than required. It is not advisable as it reduces strength. After adding the water, we must mix the concrete for a minimum of two minutes in the drum.

TESTS ON FRESH CONCRETE:

The consistency of the concrete mix should be such that the concrete can be transported, placed and finished easily without segregation. Workability is a deciding factor for Water- Cement ratio. All the mixes were evaluated for workability during fresh concrete stage by means of slump cone test and compaction factor test.

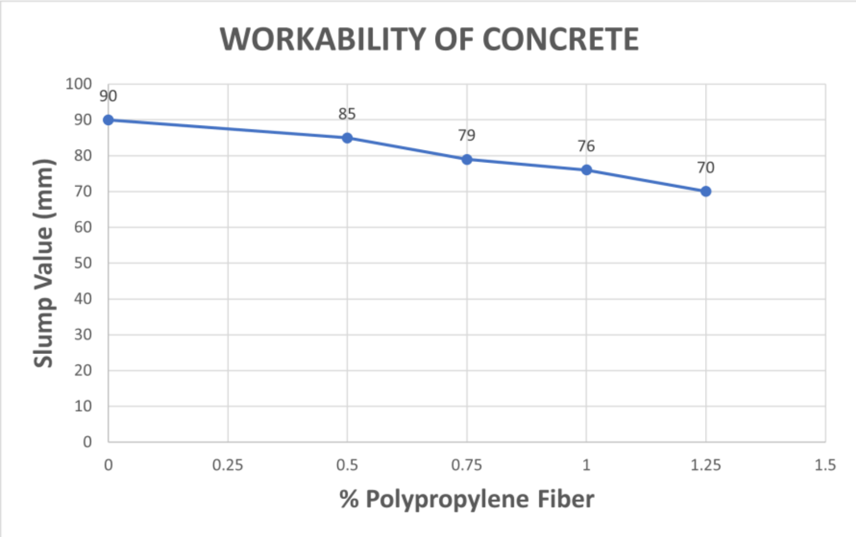
Slump cone test:

Normally the slump cone test can be used in laboratory using a metal mould in shape of conical frustum known as slump cone or Abram's cone. The cone has an internal diameter of 100 mm at the top and 200 mm at the bottom with a height of 300mm.The cone is filled with fresh concrete in 3 layers with 25 blows for each layer and the mould is carefully lifted upwards, not to disturb the concrete cone, then it subsides. The slump of the concrete is measured by measuring the distance from the top of the slumped concrete to the level of top of slump cone.

% Fiber	Slump Value (mm)
0	90
0.5	85

ISSN: 2583-6129
DOI: 10.55041/ISJEM04541

0.75	79
1.00	76
1.25	70



% Polypropylene Fiber Vs Slump Value

PREPARATION OF TEST SAMPLES:

Moulds

Metal moulds, preferably steel or cast iron, thick enough to prevent distortion is required. They are made in such a manner as to facilitate the removal of the mould specimen without damage and are so machined that, when it is assembled ready for use. The dimensions and internal faces are required to be accurate within the IS specifications. Cubes of size 150 mm × 150 mm × 150 mm and cylinders of size 300 mm × 150 mm were used to obtain the compressive strength and split tensile strength values respectively.

Casting

The cast iron moulds are cleaned of dust particles and applied with mineral oil on all sides before concrete is poured into the moulds. The moulds are placed on a level platform. The well mixed concrete is poured in the moulds, compacted and kept on vibration table and vibrated till good finish is obtained on top of the mould. Excess concrete on top of the surface was removed with trowel.

Demoulding

The specimens were removed from the moulds after 24 hours from the time of adding water to the ingredients. Unmoulding should be done carefully so that there must be no damage to concrete specimens.

© 2025, ISJEM (All Rights Reserved)

Curing

After Unmoulding, the specimens were marked and immediately submerged in clean fresh water and kept there until taken out just prior to test. In this study specimens are tested at 7days and 28days of curing.

TESTS ON HARDENED CONCRETE

Testing of hardened concrete plays an important role in controlling and confirming the quality of cement concrete works. One of the purposes of testing hardened concrete is to confirm that the concrete used at site has developed the required strength. In this project work hardened concrete specimens are tested for Compressive Strength and Split Tensile Strength at the age of 7 and 28 days.

Compressive Strength Test

Remove the specimen from the water after specified curing time and wipe out excess water from the surface. Take the dimension of the specimen to the nearest 0.2mm and weigh the specimen before testing. Clean the bearing surface of the testing machine. Place the specimen in the machine in such a manner that the load shall be applied to the opposite sides of the cube cast. Align the specimen centrally on the base plate of the machine. Rotate the movable portion gently by hand so that it touches the top surface of the specimen. Apply the load gradually without shock and continuously at the rate of 140 kg/cm2/minute till the specimen fails. Record the maximum load and note any unusual features in the type of failure.

Split Tensile Strength Test

Initially, take the wet specimen from water any desired age at which tensile strength to be estimated. Then, wipe out water from the surface of specimen. After that, draw diametrical lines on the two ends of the specimen to ensure that they are on the same axial place. Next, record the weight and dimension of the specimen. Set the compression testing machine for the required range. Place plywood strip on the lower plate and place the specimen. Align the specimen so that the lines marked on the ends are vertical and centred over the bottom plate.

Place the other plywood strip above the specimen. Bring down the upper plate so that it just touches the plywood strip. Apply the load continuously without shock at a rate within the range 0.7 to 1.4 MPa/min (1.2 to 2.4 MPa/min based on IS 5816 1999). Finally, note down the breaking load.

EXPERIMENTAL PROCEDURE

In this project, at first specimens were casted for finding workability and strength of conventional concrete of M25 grade. Then Polypropylene fiber is added in the concrete with varying percentages i.e., 0%, 0.5%, 0.75%, 1.00% and 1.25% to find variations in workability and strength and to find optimum percentage of fiber.

RESULTS AND DISCUSSION

COMPRESSION TEST

The following procedure is adopted to conduct the compressive strength test

- Size of the specimen is 150×150×150mm cubes determined by averaging perpendicular dimensions at least at two places.

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 06 | June – 2025 DOI: 10.55041/ISJEM04541
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

- Place the specimen centrally on the compression testing machine and load is applied continuously and uniformly on the surface parallel to the direction of tamping.
- The load is increased until the specimen fails and record the maximum load carried by each specimen during the test as shown in figure
- Compressive strength was calculated as follows

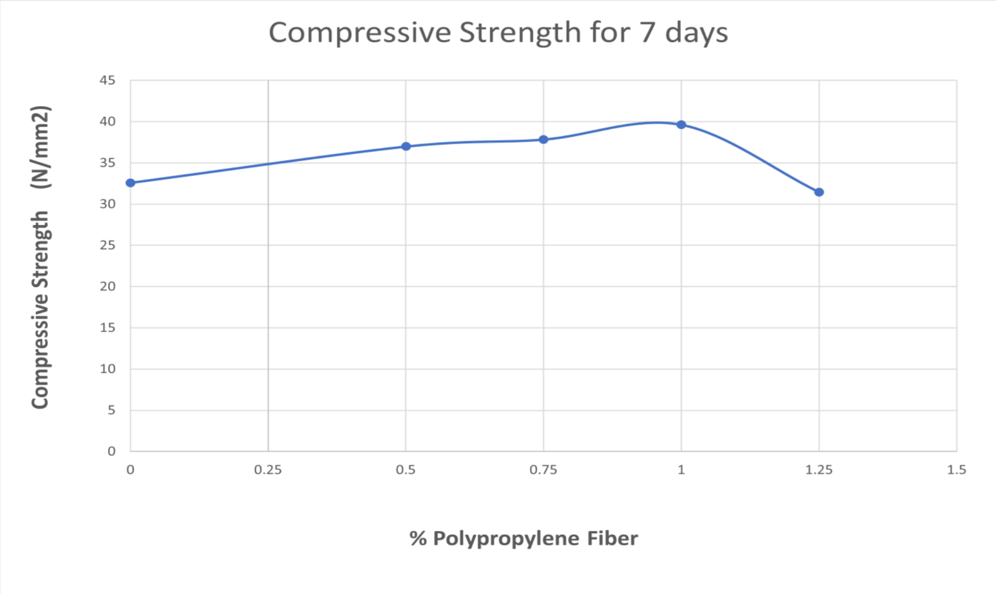
  Compressive strength = $\frac{P}{A}$ x 1000 N/mm^2

  Where, P = Load in KN, A =Area of cube surface =150×150mm^2

Table 1. Compressive Strength of Concrete for 7 days

% Polypropylene Fiber	Trails	Weight (kg)	Load (KN)	Compressive Strength (N/mm^2)	Avg. Compressive Strength (N/mm^2)
0	1	8.55	666.20	36.80	32.59
	2	8.67	768.90	29.60	
	3	8.57	765.00	34.17	
0.5	1	8.47	857.30	38.10	36.99
	2	8.55	898.90	39.91	
	3	8.40	760.00	33.77	
0.75	1	8.21	881.30	39.17	37.84
	2	8.21	739.30	32.86	
	3	8.28	934.00	41.51	
1.00	1	8.14	850.43	37.80	39.63
	2	8.63	920.00	40.88	
	3	8.20	904.90	40.22	
1.25	1	8.28	735.30	32.68	31.46
	2	8.25	673.50	29.84	
	3	8.12	717.20	31.88	

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 06 | June – 2025 DOI: 10.55041/ISJEM04541
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata



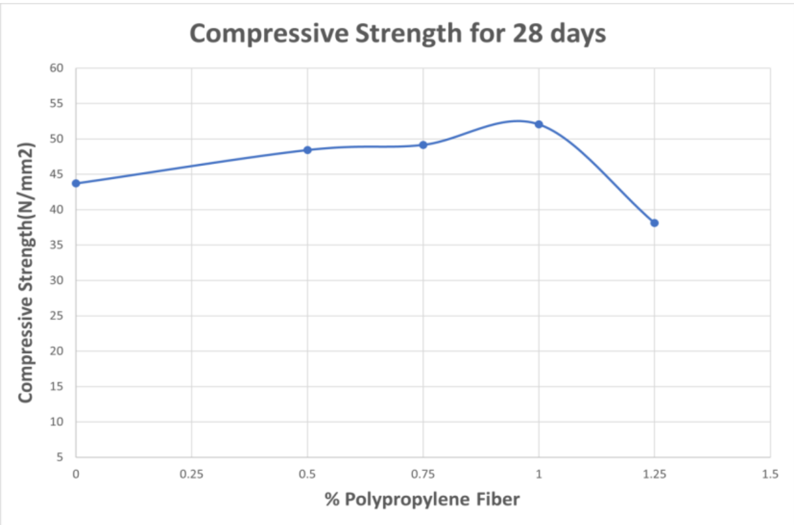
Graph 1: Compressive strength after 7 days curing

Graph1 illustrates the compressive strength of Polypropylene Fibers concrete achieved after 7days. The graph concludes that the strength of polypropylene fibre concrete increase firstly from 0% to 1.0% of polypropylene fibers. But after 1.0% it was observed that the strength decreases which depicts that 1.0 percent is the optimum value of PP fibers in concrete yielding highest value among all.

Table 2. Compressive Strength of Concrete for 28 days

% Polypropylene fiber	Trails	/eight (kg)	Load (KN)	ompressive strength (N/mm^2)	Avg. Compressive Strength (N/mm^2)
0	1	8.28	974.80	43.32	43.70
	2	8.50	971.10	43.16	
	3	8.41	1004.00	44.62	
0.50	1	8.47	1183.90	52.62	48.42
	2	8.37	954.80	42.44	
	3	8.57	1129.40	50.20	

0.75	1	8.53	1213.80	53.95	49.15
	2	8.40	870.60	38.75	
	3	8.48	1231.90	54.75	
1.00	1	8.22	1237.50	55.00	52.04
	2	8.04	1186.30	52.72	
	3	8.31	1089.20	48.40	
1.25	1	8.07	747.90	33.24	38.12
	2	8.12	872.30	38.77	
	3	8.30	853.10	42.36	



Graph 2: Compressive strength after 28 days curing

Graph 2 demonstrates the compressive strength of polypropylene fiber concrete after 28 days. Similar trend was observed for 28 days strength as depicted by 7 days strength graph. It is concluded that 1.0% is optimum percentage for polypropylene fiber.

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 06 | June – 2025 DOI: 10.55041/ISJEM04541
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

Split Tensile strength Test

The following procedure is adopted to conduct the tensile strength test

- Draw diametrical lines on two ends of the specimen so that they are in the same axial plane. Diameter of specimen is 150mm and length 300mm.
- Determine the diameter of specimen to the nearest 0.2 mm by averaging the diameters of the specimen lying in the plane of pre marked lines measured near the ends and the middle of the specimen. The length of specimen also shall be taken be nearest 0.2 mm by averaging the two lengths measured in the plane containing pre marked lines.
- Centre one of the plywood strips along the centre of the lower pattern. Place the specimen on the plywood strip and align it so that the lines marked on the end of the specimen are vertical and cantered over the plywood strip. The second plywood strip is placed length wise on the cylinder cantered on the lines marked on the ends of the cylinder.
- Apply the load without shock and increase it continuously at the rate to produce a split tensile stress of approximately 1.4 to 2.1 $N/mm^2/min$, until no greater load can be sustained. Record the maximum load applied to specimen as shown in fig
- Computation of the split tensile strength was as follows.

Split Tensile Strength = $\frac{2P}{\pi DL}$

X 1000

Where,

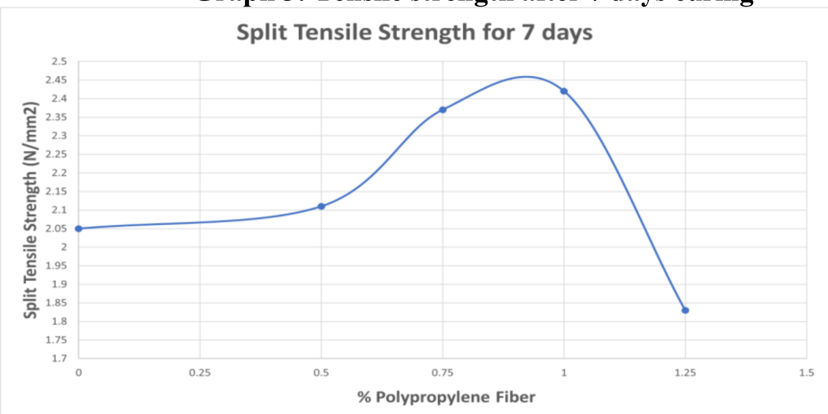
P = Load in KN and π = 3.142

d = Diameter of cylinder = 150 mm L = Length of cylinder = 300 mm

Table 3 Split Tensile Strength of Concrete for 7 days

% Polypropylene fiber	Trails	/eight (kg)	Load (KN)	›mpressive rength (N/mm^2)	Avg. Compressive Strength (N/mm^2)
0	1	12.30	145.29	2.05	2.05
	2	12.50	147.10	2.08	
	3	12.48	142.19	2.01	
0.50	1	12.48	153.16	2.16	2.11
	2	12.44	151.72	2.14	
	3	12.63	145.00	2.05	
0.75	1	12.46	167.70	2.37	2.37
	2	12.26	169.23	2.39	
	3	12.27	168.08	2.37	
1.00	1	13.05	166.71	2.35	2.42
	2	12.75	178.48	2.52	
	3	13.03	164.75	2.33	
1.25	1	12.22	109.00	1.54	1.83
	2	12.00	120.00	1.69	
	3	13.34	160.00	2.26	

Graph 3: Tensile strength after 7 days curing

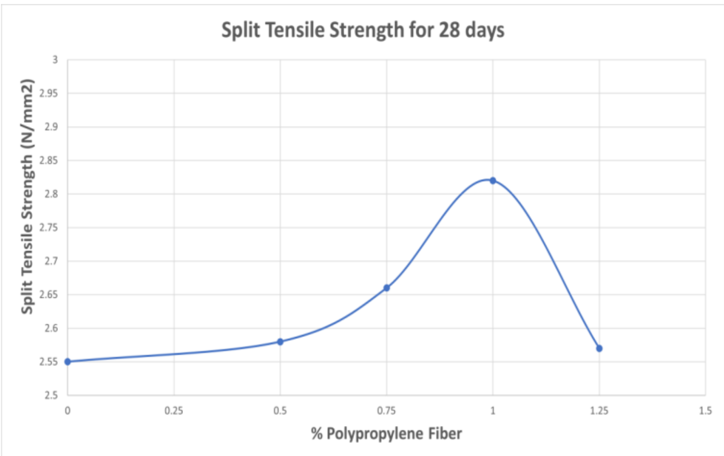


Graph 3 shows a similar trend depicting 1.5 percent to be the optimum percentage

International Scientific Journal of Engineering and Management (ISJEM) ISSN: 2583-6129
Volume: 04 Issue: 06 | June – 2025 DOI: 10.55041/ISJEM04541
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata

Table 4. Split Tensile Strength of Concrete for 28 days

% Polypropylene fiber	Trails	/eight (kg)	Load (KN)	)mpressive rength (N/mm^2)	Avg. Compressive Strength (N/mm^2)
0	1	13.02	181.33	2.57	2.55
	2	13.05	182.56	2.58	
	3	13.01	172.61	2.50	
0.50	1	13.20	196.27	2.78	2.58
	2	12.86	176.91	2.50	
	3	12.82	173.87	2.46	
0.75	1	12.86	153.86	2.18	2.66
	2	12.83	201.99	2.86	
	3	12.82	207.89	2.94	
1.00	1	12.77	235.80	3.33	2.82
	2	13.15	169.10	2.39	
	3	12.83	225.84	3.19	
1.25	1	12.73	179.91	2.55	2.57
	2	12.62	189.54	2.68	
	3	12.42	176.86	2.50	



Graph 4: Tensile strength after 28 days curing

Graph 4 depicts the effect of PP fibers on split tensile strength after 28 days. The maximum value obtained for 1.0 percent PP fibre.

CONCLUSIONS AND FURTHER STUDY:

- ✓ The usage of polypropylene fibers has been increased in recent years due to their superior mechanical properties over conventional concrete.
- ✓ The resulting of polypropylene fibers can actually improve the tensile strength of concrete, which is eminent for durability of concrete and has also been used for controlling shrinkage and temperature cracking.
- ✓ The peak tensile strength (i.e., 2.42 N/mm^2 for 7 days and 2.82 N/mm^2 for 28 days) were obtained at 1.0 % of PPF by volume of concrete which is more than the tensile strength of conventional concrete. Hence, the optimum percentage of PPF in concrete which is 1.0% to be recommended.
- ✓ It is concluded that inclusion of PP fibers that has increased the compressive strength by 21% and 19% after 7 days and 28 days respectively as compared to controlled samples, whereas 18% and 11% increment was observed in split tensile strength after 7 days and 28 days respectively.

APPLICATIONS

- ✓ Due to enhance performances and effective cost-benefit ratio, the use of polypropylene fibers is often recommended for concrete structures recently.
- ✓ PFRC is easy to pace, compact, finish, pump and it reduces the rebound effect in sprayed concrete applications by increasing cohesiveness of wet concrete.
- ✓ Being wholly synthetic there is no corrosion risk. PFRC shows improved impact resistance as compared to conventionally reinforced brittle concrete.
- ✓ The use of PFRC provides abrasion resistance in concrete floors by controlling the bleeding while the concrete is in plastic.
- ✓ The possibility of increased tensile strength and impact resistance offers potential reductions in the weight and thickness of structural components and should also reduce the damage resulting from shipping and handling.

REFERENCES:

- PRITI A PATEL and Dr. ATUL K DESAI were studied on “Evaluation of engineering properties for polypropylene fiber reinforce concrete’’ January-march,2012.
- VIKRANTH S. and KAVITA S were studied on “effects of fibrillated polypropylene fiber on plain cement concrete composites” July 2012.
- BHAVINI K. and prof. JAYESHKUMAR P were studied on “Effects of Polypropylene Fibers on Abrasion Resistance and Flexural Strength for Interlocking Paver Block” MAY 2013.
- RAMUJEE K was studied on “Strength properties of polypropylene fibre reinforced concrete”.

- Balaguru, P. N., and Shah, S. P., Fiber-Reinforced Cement Composites, Singapore, McGraw-Hill, 1992.
- Banthia, N.,and Sheng, J.,“Fracture Toughnessof Micro- Fiber Reinforced Cement Composites”, *Cement and Concrete Composites*, Vol. 18, 1996, pp. 251-269.
- Bentur, A., and Mindess, S., Fiber Reinforced Cementitious Composites, London, Elsevier Applied Science, 1990.
- Dave U. V. and Desai Y. M. “Effect of Polypropylene, Polyester and Glass fibres on various strength of ordinary and standard concrete”, *The First International Conference On Recent Advance In Concrete Technology,* Sep. 2007, Washington D.C. U.S.A.
- Troxel G.E, Davies H.E and Kelly J.W, Composition and properties of concrete (New York, McGraw Hill Books Company, 1968).