

ANALYSIS ON CONCRETE MECHANICAL PROPERTIES EXPERIMENTALLY STUDIED USING RECRO3S FIBER

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Abstract

Using Recron's polypropylene fibre, the current experiment was conducted to ascertain the compressive strength and split tensile strength of concrete. Contrary to ordinary concrete, fiber-reinforced concrete has a higher strength, eliminates shrinkage cracks, and enhances the durability of concrete. Recron's fibre has the advantages of increasing fracture resistance, split tensile strength, and compressive strength. This inquiry looks at the workability and strength characteristics of concrete with varying ratios of Recron3s by the volume of concrete, including 0%, 0.05%, 0.10%, 0.15%, 0.20%, 0.25%, 0.30%, and 0.35%. To determine the ideal proportion of fibre, a comparison investigation was done. The workability parameter of M30 grade concrete were obtained by using slump test, compaction factor test and Vee-Bee test, the strength properties of concrete were obtained by using compression strength test and split tensile strength test. The strength tests are carried after 7 days and 28 days of curing for each proportion.

Key words: Recron3s, compressive strength, split tensile strength

Introduction

Concrete is a very diverse material used in the building or housing industries. It consists of a certain ratio of cement, sand, aggregate, and water. Concrete is created when these components react with the aid of water. It is utilized for building the most frequently in the globe because to its enormous demand. Concrete is formed using non-renewable materials. Concrete is a crucial component of many constructions and structures. Depending on the work, it is a composite comprised of Portland cement, sand, gravel, or other material, and water in different amounts. While it is weak in tension, concrete is robust in compression. It has to be strengthened with steel rods for certain reasons.

Literature Review

Ridha Nehvi et al (2016), studied variation in the compressive strength, split tensile strength and flexural strength of M35 grade concrete by addition of polypropylene fibre (Recron3s) in the proportions of 0%, 0.1%, 0.2%, 0.3%, 0.4% and 0.5% by the volume of concrete. The strength tests were performed after 7 days, 14 days and 28 days curing and got optimum percentage as 0.3%.

Prem Kumar: In this study recron3s fibre is added an additive to the concrete. This fibre is added as 1%, 2% by the weight of fine aggregate in concrete to improve its performance. The compression strength, split tensile strength and flexural strength of M25, M60, M80 grade concretes are tested for 14,28,56 days of curing and compared to find the optimum dosage of recron3s. 1% recron3s in concrete provided better results than 2% recron3s in concrete.

KorrapatiAnil Kumar: He studied the strength properties of concrete with recron3s fibre in the proportion of 0%, 0.2 %, 0.3% and 0.4% for M25 and M40 grade concrete cubes, cylinders and prisms for strength parameter each grade of concrete cubes, cylinders, prisms were casted for 7 days, 28 days, 56 days and 91 days strength. The Recron3s fibre of 0.3% showed better results for M25 and M40 grade of concrete.

D.Hipparkar: This study presence the results of experimental investigation on M40 grade concrete fibre content varies from 0 to 1.25% (0%, 0.25%, 0.5%, 0.75%,1.25%) fibres by mass of cement concrete. He used materials are ordinary portland cement, naturally available aggregates and super plasticizers 2% by weight of cement. The compressive strength, split tensile strength of M40 grade concrete are tested for 28 days of curing and find optimum dosage of Recron3s fibre. 0.20% Recron3s shows better results than 0.5%, 0.75% 1.25%, 1%) in concrete.

Harsh Patel: In this study Recron3s fibre is used for road transportations pavements and cement concrete pavements there are several advantages by using Recron3s fibre on percent concrete pavements and bituminous pavement which reduce micro shrinkage, cracking and low water permeability, these typeproblems can be overcome by using Recron3s fibre. The specific minimum strength at 28 days to attained in 1 in 20 all the testing beams when fibre is added the strength with be increases 1.65 times of flexural strength of beam. The fibre is available length is 6mm and 12mm length Recron3s fibre is used in concrete will increases the compressive strength and flexural strength. The grade of concrete used in M30.

Prathamesh D Pawaskar: In this study Recron3s fibre is aimed to increasing the tensile and flexural strength of concrete which is weak in tension and in strong compression The grade of cement used is OPC45 grade (ultra tech) The fibre percentages 0.25%, 0.50% 0.75% by the weight of cement for tested compressive strength. In this experiment it was observed the fibre percentage 0.50% gave the maximum strength of compression test, flexural test and split in tensile. The grade of concrete is M20, water cement ratio is 0.45. The fibre percent taken 0.25%, 0.50% 0.75% shows the better results in 0.50% in 7 days and 28 days.

Mylavarapu Phani Sekhar: In this study Recron3s fibre is added an 01%, 0.15%, 0.2%, 0.25%, 0.30%, 0.35%, 0.4% by the of weight concrete. The compression strength, split tensile strength of M30 grade, M35 grade, M40 grades of concrete are tested for 7 days to 56 days of curing and compared to find optimum dosage Recron3s 1%. Recron3s in concrete provided better results than 0.15%, 0.2% in Recron3s in concrete the maximum results occurred for compressive strength and split and tensile strength of M30 grade, M35 grade, M40 grade at 0.30% of Recron3s fibre.

M Prabu: In this study, Recron3s fibre Be added an additive to the cement. This fibre is added of 0%, 0.25%, 0.5%, 1% by the weight of cement in order to improve its performance. The compression strength, flexural strength and split tensile strength of M25, M20, M30, M35 grade of concrete are tested for 7 days, 14 days, 28 days of curing and compared to find 0.50% optimum dosage of Recron3s in concrete provides better results than 0.75% Recron3s in concrete.

G Priyanka: The study of Recron3s fibre increases the compressive and tensile strength. Fibre is added 0.1%, 0.2%, 0.4%, 0.6%, 0.8% by the weight of the grade of concrete is used is M30 grade to improve its performance. The compressive strength, split tensile strength, flexural strength of M30 grade concrete were tested for 7 days, 14 days and 21 days and compared with normal concrete. The optimum dosage of Recron3s in M30 grade concrete is 0.6% gives the better results than 0.4% Recron3s in concrete.

Material and Properties:

A cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together. Cement mixed with fine aggregate produces mortar for masonry, or with sand and gravel, produces concrete. Concrete is the most widely used material in existence and is behind only water as the planet's most-consumed resource.

Table1. Properties of Cement

Property	Specification
Fineness	3.5%
Specific gravity	3.15
Consistency Limit	31%
Initial setting time	45 minutes

Fine aggregate

Fine aggregate is the essential ingredient in concrete that consists of natural sand or crushed stone. The quality and fine aggregate density strongly influence the hardened properties of the concrete. The concrete or mortar mixture can be made more durable, stronger and cheaper if you made the selection of fine aggregate on basis of grading zone, particle shape and surface texture, abrasion and skid resistance and absorption and surface moisture.

Table2. Properties of Fine aggregate

Property	Specification
Specific gravity	2.51
Zone	II
Bulk density	1405.3 Kg/m ³

Coarse aggregate

Coarse aggregates refer to irregular and granular materials such as sand, gravel, or crushed stone, and are used for making concrete. In most cases, Coarse is naturally occurring and can be obtained by blasting quarries or crushing them by hand or crushers. It is imperative to wash them before using them for producing concrete. Their angularity and strength affect the concrete in numerous ways. Needless to say, the selection of these aggregates is a very important process.

Table3. Properties of Coarse aggregate

Property	Specification
Specific gravity	2.77
Bulk density	1720 Kg/m ³

Recron3s:

Recron3s is a virgin polyester & polypropylene mono-filament fibres. It is a specially Engineered and shaped (Triangular) synthetic fibres for use in concrete and mortar to Overcome shortcomings of concrete. Triangular fibres provide higher surface bonding. It complements structural steel in enhancing concrete's resistance to shrinkage cracking and improves mechanical properties such as flexural/split tensile and transverse strengths of concrete along with the desired improvement in abrasion and impact strengths. The Recron3s Polyester fibres and Polypropylene fibres. Recron3s is a polypropylene monofilament, discrete, discontinuous short fibres that can be used in concrete to control and arrest cracks.

Table4. Properties of Recron3s

Property	Specification
Length of fibre	12 mm
Diameter of fibre	30 microns
Specific gravity	1.36
Aspect ratio	400

Experimental study

Mix design specifications:

Grade of concrete = M30

Type of cement = OPC 53 grade

Maximum size of aggregate = 20mm

Minimum cement content = 320 kg/ 3 Slump = 100 mm

Target strength for mix proportioning (fck1)= 38.25 N/mm² Based on experience, adopting water-cement ratio as 0.45

Super Plasticizer: Super Plasticizer of 430 Grade (Fosroc

Sulphonated Naphthalene Formaldehyde) was used to increase the workability.

Proportions for 1m³ of mix

Cement = 329 kg/ 3 Water = 0.45

Fine aggregate = 690 kg/ 3

Coarse aggregate = 1300 kg/ 3 Mix proportion = 1: 2.101: 3.965

Results and Discussion

Compressive strength

Compressive strength can be defined as the capacity of concrete to withstand loads before failure. Compressive strength of concrete is done by using cubes of standard dimensions 150*150*150 mm.

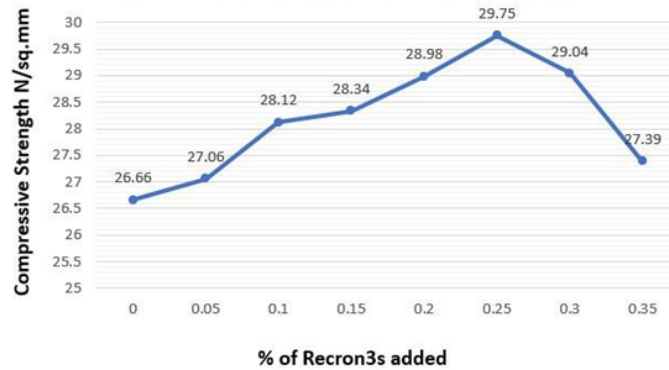


Figure 1. Compressive strength for 7 days curing

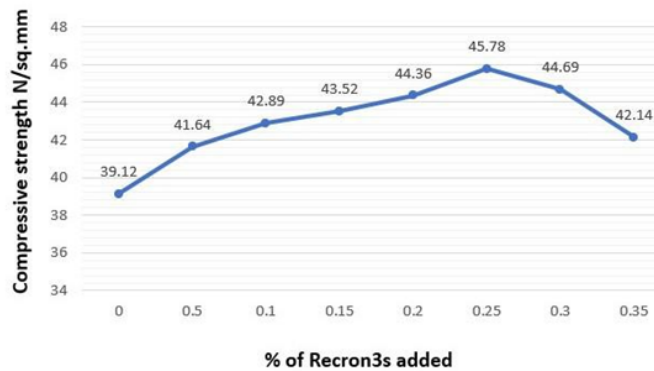


Figure 2. Compressive strength for 28 days curing

From the above two graphs, it can be observed that the compressive strength of concrete is high at 0.25% of Recron3s when compared to other percentages. So that the optimum percentage of Recron3s by volume of concrete in M30 grade concrete is 0.25%.

Split tensile strength:

Split tensile strength is defined as a measure of the maximum stress on the tension face of an unreinforced concrete beam or slab at the point of failure in bending. Split tensile strength of concrete is done by using cylinders of standard dimensions 150mm*300mm.

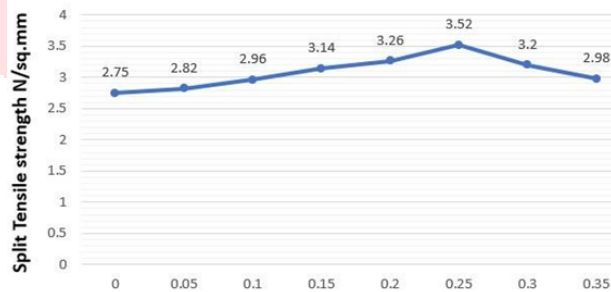


Figure 3. Split Tensile strength for 7 days curing

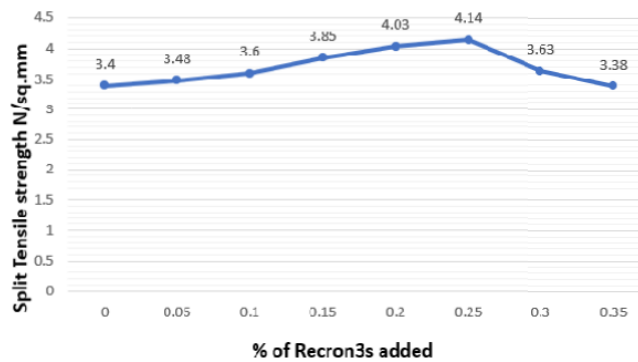


Figure 4. Split Tensile strength for 28 days curing

From the above two graphs, it can be observed that the Split Tensile strength of concrete is high at 0.25% of Recron3s when compared to other percentages. So that the optimum percentage of Recron3s by volume of concrete in M30 grade concrete is 0.25%.

Conclusion

The workability of fibre reinforced concrete is decreased with the increase in percentage of Recron3s fibre. Addition of Recron3s to concrete gives good results for both compressive strength and split tensile strength. Compressive strength test indicated that for 0.25% addition of Recron3s polypropylene fibre gives maximum compressive strength of 45.78 MPa. So that the optimum percentage of Recron3s fibre by volume of concrete is 0.25%. The Split tensile strength test indicated that for 0.25% addition of Recron3s polypropylene fibre gives maximum the split tensile strength of 4.14 MPa. So that the optimum percentage of Recron3s fibre by volume of concrete is 0.25%.

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