

Experimental Investigation on Strength of Concrete with Polyethylene Terephthalate as Fibrous Filament

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ABSTRACT: In this, Polyethylene Terephthalate is added as fibrous filament to the concrete in the ratio of 0.75%, 1.00%, and 1.25% to compute the performance of concrete. The tests to be conducted are slump test, split tensile strength test, compressive strength test and flexural strength test for both the conventional and hardened concrete with and without the addition of fibrous filament. Cubes are moulded to test the compressive strength of concrete at the period of 7 days and 28 days. Cylinders were moulded for Split tensile and prisms were moulded for flexural strength of concrete and tested at the duration of 28 days. The outcome shows that addition of fibrous filament had high split tensile strength and flexural strength on comparison with normal concrete showing strong in tension.

KEYWORDS: Polyethylene Terephthalate, fibrous filament

I. INTRODUCTION

In constructions, concrete is the most widely used composite material due to its sustainability, high strength, durability and flexibility. However, concrete have some drawbacks like lower tensile strength and less ductility. To overcome this fragility of the composite material, advances in concrete technologies has been accomplished. The research outcome showed that the addition of fibrous filament significantly improved the performance of concrete. Polyethylene Terephthalate is commonly abbreviated as PET, is a stiff synthetic fiber of the polyester family. It is a thermoplastic polymer, widely used as synthetic fibers in fabrics, and extensively used plastics in the world for mass production of beverage containers, food and liquid containers. Poly Ethylene Terephthalate containers are aluminized or crystallized for various causes. Poly Ethylene Terephthalate containers are filled with water and left in the sun to carry out the process of disinfection by ultraviolet radiation.

Mostly the Polyethylene Terephthalate bottles, used as beverage container are turned down once used. The disposed Poly Ethylene Terephthalate bottles are treated by landfills and Incineration mechanism, which creates major issues to the surrounding environment. Disposal and management of wastes are the major issues which have been faced in recent days. Poly Ethylene Terephthalate containers in fibrous form are used in concrete to get better mechanical properties. The compressive strength, tensile strength and flexural strength tests are carried out and its behavior in concrete are studied.

II. SALIENT FEATURES OF THE PROJECT

- Increasing material's resistance to cracking
- Light weight material
- Low price
- Renewable material

III. EXPERIMENTAL INVESTIGATION

Properties of material used in this concrete were determined by testing of cement, fine aggregate and coarse aggregate. The test results are given below.

Cement Test

Type of cement : PPC

Specific gravity : 3.14

Fineness of cement : 1

Standard consistency : 32%

Fine Aggregate Test

Specific gravity : 2.65

Coarse Aggregate Test

Specific gravity : 2.64

PET bottles(fiber)

Size : 120mm*3mm

Aspect ratio : 40



Fig.1

Material for M25 mix	W height of materials for 1m ³ of concrete (kg)
PPC	394
Fine aggregate	750
Coarse aggregate	1086
Water	197liters
Water cement ratio	8 0.5

Table 1. Mix Proportion for M25 Grade Concrete

IV. RESULTS

SLUMP VALUES FOR MIXES WITH ADDITION OF PLASTIC FIBERS

Mix ratio	Slump value in mm
0%	15mm
0.75%	20mm
1%	15mm
1.25%	35mm

**Table 2. Slump Value for Various Mixes
COMPACTION FACTOR FOR VARIOUS MIXES**

Mix ratio	Compaction factor
0%	0.81
0.75%	0.84
1%	0.83
1.25%	0.82

Table 3. Compaction Factor Values

COMPRESSIVE STRENGTH OF VARIOUS MIXES

Mix ratio	Compressive strength (N/mm ²)	
	7 days	28 days
0%	20.15	-
0.75%	20.6	37.67
1.00%	17.88	38.5
1.25%	22.88	40.89

Table 4. Comparison of conventional mix vs fiber mix

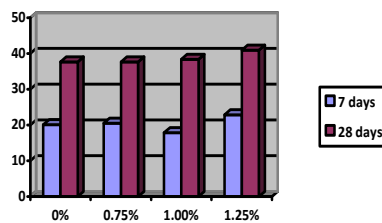


Fig 2

Mix ratio	Split tensile strength (N/mm ²)
	28 days
0%	1.93
0.75%	2.15
1.00%	2.65
1.25%	2.79

Table 5. Split tensile strength of conventional mix vs fiber mix

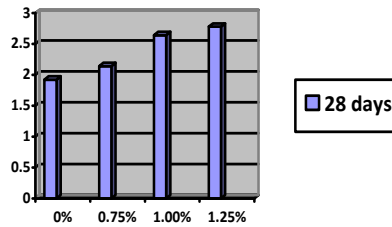


Fig 3

Mix ratio	Split tensile strength (N/mm ²)
-	28 days
0%	6.81
0.75%	6.88
1.00%	7.62
1.25%	7.67

Table 6. Flexure strength of conventional mix vs fiber mix

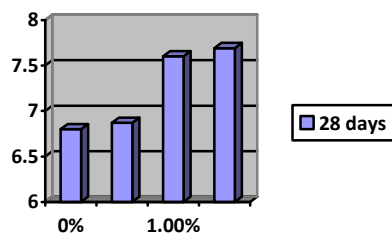


Fig 4



V. CONCLUSION

The compressive strength values are increase up to 6.66% by adding PET (bottle) as fiber. The split tensile strength of the concrete is increasing up to 12.91% by adding PET (bottle) as fiber. The flexural strength of the concrete is also increasing up to 5.50% by adding PET (bottle) as fiber.

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