

Experimental Investigation on Pervious Concrete Permeability Properties by Variant Mix of Polypropylene

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Abstract- Pervious concrete is a high performance concrete, which has a relatively high permeability compared to conventional concrete due to the interconnected pore structure. We are going to use water cement ratio to 0.38 to 0.42 Water cement ratio and the studies carried out for determining the effect on Pervious concrete with contents of 0%, 0.1%, 0.2%, and 0.3% of Polypropylene fibers. To check the permeability with 4:1 aggregate cement ratio and polypropylene contents.

Keywords- Polypropylene, Falling head permeability test, Water Cement ratio, Aggregate Cement ratio.

I. INTRODUCTION

Pervious concrete is a mixture of cement, coarse aggregate, little or no fine aggregate, water, with or without admixtures. In pervious concrete, carefully controlled amounts of water and cementitious materials are used to create a paste that forms a thick coating around aggregate particles. Pervious concrete is a high performance concrete, which has a relatively high permeability compared to conventional concrete due to the interconnected pore structure. This concrete is being used as paving material to solve or reduce the storm water runoff to the drainage system and minimize water logging problems. We are going to added Polypropylene by percentage weight of cement to check Permeability of Pervious Concrete with aggregate cement ratio of 4:1 water cement ratio to 0.38 to 0.42.

MATERIALS

Polypropylene: - Polypropylene fibers with the length and diameter of 12 and 0.019 mm, respectively, were used in the study. The geometry and properties of the fibers are given in table

PARAMETERS OF POLYPROPYLENE	
Length l (mm)	12
Diameter d (mm)	0.019
Aspect ratio(l/d)	631
Density (g/cm ³)	0.91
Elastic modulus (GPa)	3.5

Cement: - In this experiment Wonder Cement of 53 grade cement was used.

Aggregate: - Aggregate with 100% passing 20mm sieve and 100%retained on 10mm sieve were used in study.

II. METHODOLOGY

For defining the basic characteristics of pervious concrete an experimental investigation was conducted to study the permeability properties.

Permeability Test: - The falling head method was used to measure the water permeability. Figure shows the permeability test setup. For measuring permeability cylinder of size 150 mm diameter x 300 mm height were cast. The cylinders were cast in the PVC pipe.



Figure: Falling Head Permeability Test

Water permeability is then calculated using Darcy's First Law. The equation is as follows:

$$k = (A_1 L) / (A_2 t) \times \log h_2 / h_1$$

Where

k = water permeability

A₁ = cross-sectional area of the specimen

A₂ = cross-sectional areas of the tube

l = length of the specimen

t = time

h₁ = the initial water head

h₂ = the final water head

Mix Proportion of Pervious Concrete

Mix	Aggregate Content (Kg/m ³)	Cement Content (Kg/m ³)	W/C Ratio	Polypropylene	
				Percentage (%)	Content (kg/m ³)
R -1	1500	375	0.38	0	0
R -2				0.10	0.375
R -3				0.20	0.750
R -4				0.30	1.125
R -5			0.40	0	0
R -6				0.10	0.375
R -7				0.20	0.750
R -8				0.30	1.125

Mix	Aggregate Content (Kg/m ³)	Cement Content (Kg/m ³)	W/C Ratio	Polypropylene	
				Percentage (%)	Content (kg/m ³)
R -9	1500	375	0.42	0	0
R -10				0.10	0.375
R -11				0.20	0.750
R -12				0.30	1.125

Casting of Cylinders: - Cylinders for casting of Permeability test of Pervious Concrete casted in PVC pipe of 150*300 cylinder. 72 No's of Cylinder casted in PVC pipe.



Figure: Casting of cylinder in PVC pipes

III. EXPERIMENTAL RESULTS

The Permeability test result for 28th day curing as under table.

Concrete Mix	Average Permeability(mm/s)
R -1	14.04
R -2	14.21
R -3	14.09
R -4	13.96
R -5	15.23
R -6	15.42
R -7	15.29
R -8	15.12
R -9	16.72
R -10	16.95
R -11	16.79
R -12	16.41

Table: Permeability test result for 28th day curing

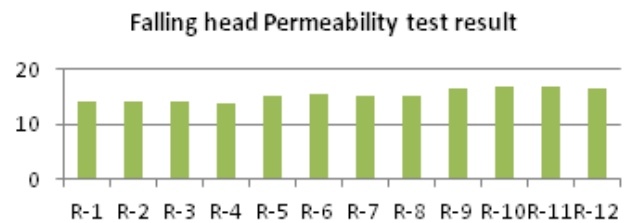


Figure: Permeability test result for 28th day curing

IV. CONCLUSION

The Conclusion of Experiment as under

- The Permeability of Pervious Concrete increased as 1.37% increase of Polypropylene up to 0.1% and after decrease for 0.38 Water Cement ratio.
- For 0.40 & 0.42 W/C ratio Permeability increased as 1.24% and 1.21% compared to normal concrete. Permeability improves 20% for 0.38 W/C ratio compared to 0.42 W/C ratio for normal Pervious Concrete.

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