

EXPERIMENTAL INVESTIGATION ON IMPROVING THE STRENGTH CHARACTERISTICS OF PERVIOUS CONCRETE

Mr. M. Kirubakaran, M.E¹.,

Head of the department, Civil Department, Loyola Institute of Technology, Chennai, Tamilnadu.

Mr. M. Murugalingam, M.E¹.,

Assistat Professor, Loyola Institute of Techonology, Chennai, Tamilnadu.

M. S. Ajith Kumar¹, J Jayakrishnan², J Joshua³.

UG Student, Loyola Institute of Techonology, Chennai, Tamilnadu.

Email: ajith_asoo7@yahoo.in, jayakrishnan03011996@gmail.com, joshuaheberaja@gmail.com

Contact Number: +91-9790718417, +91-9500108525, +91-9442726483

ABSTRACT: Pervious concrete is a relatively new concept in concrete technology with rapid spread of urbanization. Now a days the construction of roadways, impervious concrete is used. Due to impervious concrete rain water is not able to seep into the ground. Pervious concrete is used as a road material has been renewed interest due to its ability to allow water to flow through itself to recharge ground water level and reduce surface runoff. This concrete technology creates more efficient land use by eliminating the need for well and other costly storm water management devices by capturing rainwater and allowing it to seep into the ground. By compare the strength of pervious concrete and pervious concrete with admixtures, the new mix design ratios are followed using Polypropylene and Super plasticizer as admixture is added to increased the strength of pervious concrete.

KEYWORDS: Pervious Concrete, No Fineness concrete, Water drain, Ground water improvement.

1.INTRODUCTION

Water logging and depleting ground water table are the two major problems faced by the people all over the world. Even though some places have very well planned drainage facilities it becomes difficult sometimes to drain water from road surfaces. In modern times due to increasing population in developing countries like India the exposure of soil surface to the nature is highly reduced because of increased construction activities. Urbanization reduced soil surface exposure on the top earth surface which is often being covered by a layer of Tar or Concrete for roadway. The ground water level is also reducing due to low rate of infiltration and also the run-off water is generally high. Pervious concrete is one of the modern methods which is highly capable of draining water and also has low strength characteristics.

Implementation of pervious concrete roads for Indian conditions is very essential for a beneficial town planning with efficient collection system for run-off water. Pervious concrete is a zero-slump, open graded material consisting of hydraulic cement, coarse aggregate, admixtures and water.

2.MATERIALS USED

CEMENT

General pervious concrete consists of only Cement & Coarse aggregate. Cement is the only binder material used in the project and hence OPC53 grade cement is used. Coarse aggregate size of 15mm to 25mm is used in the project to obtain maximum permeability.

Apart from Cement and Aggregate admixtures such as Polypropylene fiber are used in this project to increase the Compressive strength and abrasion strength of pervious concrete.

Polypropylene fiber is added in 2% to 5% weight of cement particles. Polypropylene fibers are used with the concrete and sheets are shredded into pieces and are mixed with concrete.

Barium DiPhenylamine Sulphonate is used as Superplastizicer. It is a form of Benzene

TABLE 1: PROPERTIES OF POLYPROPYLENE

Density	/ kgm-3	905
Tensile Strength	/ Mpa	33
Tensile Modulus	/ Gpa	1.4
Elongation at Break	/ %	150
Hardness	/ Rockwell "R" Scale	90
Heat Distortion Temp (HDT)	@ 0.45 MPa / °C	105
Heat Distortion Temp (HDT)	@ 1.80 MPa / °C	65
Volume Resistivity	/ logΩm	19

TABLE 2 : PROPERTIES OF COARSE AGGREGATE

S.NO	Property	Actual Value	Value
1.	Specific gravity	2.6-2.9	2.8
2.	Sieve analysis	<2	0.0004
3.	Crushing test	<10%	9.4%
4.	Impact test	<30%	19%

3.MIX DESIGN

Due to the absence of fine aggregate the general design mix is considered as per IS standards from 1:5 to 1:10. The mix ratio of 1:6 is considered to be the mix which yields maximum strength i.e., 1 part of cement and 6 parts of coarse aggregate.

Totally 2 design mix were used such as

- Plain Pervious concrete
- Pervious concrete with Polypropylene fiber

	Mix 1	Mix 2
Mix Ratio	1:6	1:6
Water Cement Ratio	1:0.45	1:0.4
Weight of Admixtures	NA	100g

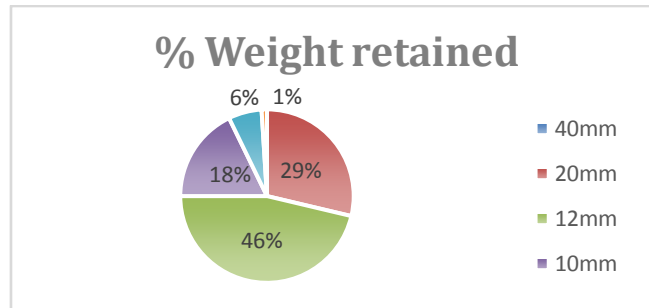
4.MIXING METHODS FOR ADMIXTURES

POLYPROPYLENE FIBER

- Mixing partial proportions of polypropylene fibers and sheet pieces with cement and coarse aggregate in equal ratios
- Then mixing those 2 ingredients with adequate amount of water.

5.MATERIAL TESTING RESULTS

SIEVE ANALYSIS



SPECIFIC GRAVITY

Specific gravity of coarse aggregate is found to be 2.8 and as per IS 2386 (part3):1963, the specific gravity of coarse aggregate should be 2.6 to 2.9. % of water absorption of coarse aggregate = 3.5 %

The specific gravity of cement obtained is 3.08.

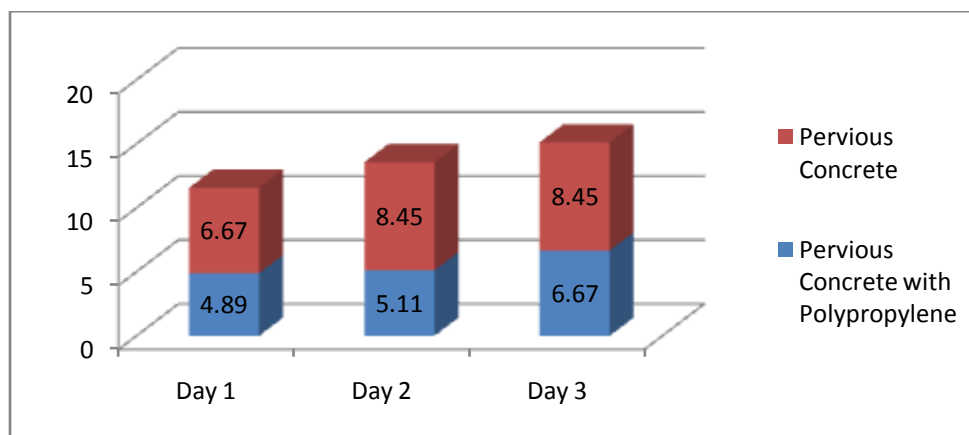
Fineness of cement = 1%

The percentage of water required for obtaining cement paste of standard consistency = 22.5%

6.TESTING RESULTS

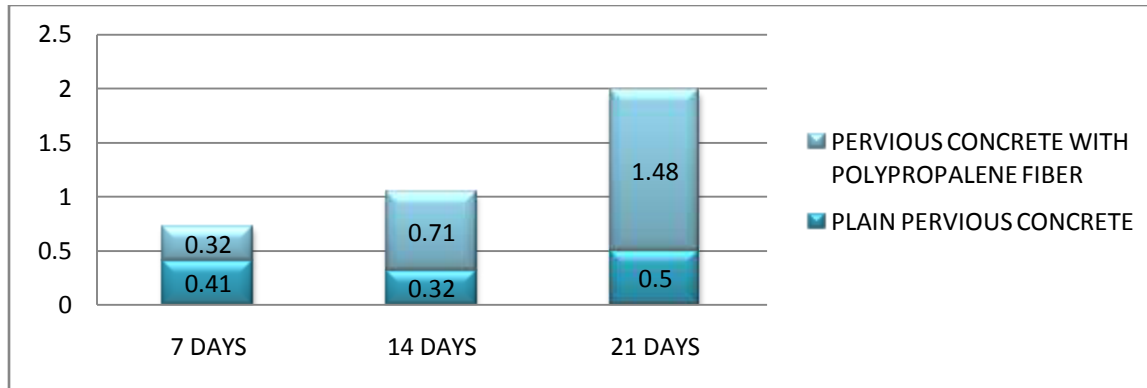
Comparative results for Compression

Comparing the results of compression from the 2 type of specimens it is typically found that the mix2 containing Polypropolene Fiber has relatively high strength compared with that of the conventional one. It is clearly observed that even though there is a failure in the mix1 but the cubes underwent partial failure rather than complete failure.



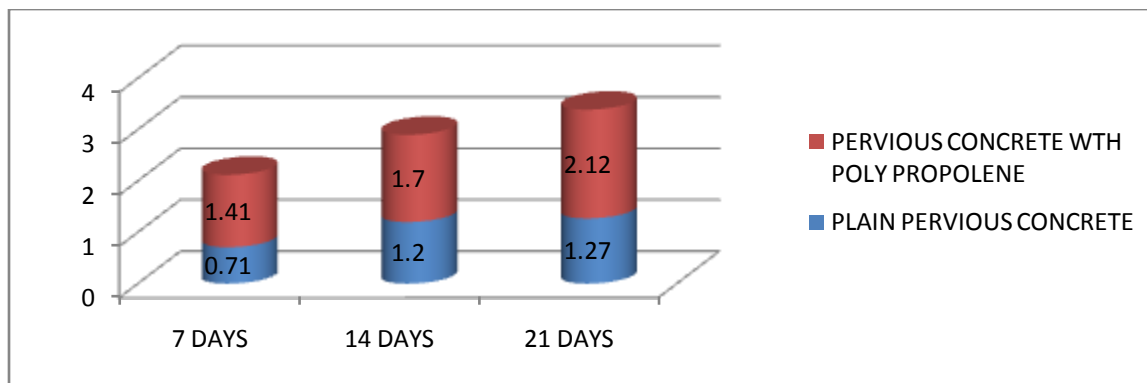
Comparative results for Flexure

Comparing the results of compression from the 2 type of specimens it is typically found the mix2 containing Polypropolene Fiber has relatively high strength compared with that of the conventional one. The 2nd mix withstands a high flexural strength than the other 1st mix



Comparative results for Split Tensile

It is clearly seen that the split tensile strength is high for the first mix due to the bonding between aggregates and cement. Whereas for mix 2 the split tensile strength is slightly lower than the other one. This might be due to the low bonding between polypropylene fibers and the aggregate.



7. PERMEABILITY ANALYSIS

Permeability test is an important test required for determining the permeability or draining capacity of pervious concrete, which is the core idea of the project. From the testing values it is found that the values of permeability are relatively higher for Conventional concrete, a little low for Pervious concrete with Polypropylene Fiber.

TYPE OF MIX	DISCHARGE (m ³ /hr)
PERVIOUS CONCRETE	12.62
PERVIOUS CONCRETE WITH POLYPROPYLENE	15.43

8. CONCLUSION

Pervious concrete or No fineness concrete can be used as pavement generally and the usage of admixture with conventional Polypropylene Fiber increases the strength and the mix attained its maximum strength in 14 days itself. So can be used for low load bearing roads. It is also an Environment Friendly system where the ground water is recharged simultaneously.

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