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Enhancing the Strength of Porous Concrete by using the Polyvinyl Acetate

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Abstract: ***In India water irrigation is very important for the growing crops, the main source of water is from rain, but preferment of village into city heavy amount of cementation is carried out that's the reason the water may not be infiltrated hence resulting shortage of surface water as well as groundwater The overland flow occurred with the runoff coefficient 0.6 - 0.8. Porous concrete has large voids which is 15-35%, and it will be used for the recharging the groundwater but here porous concrete has low strength as compared to normal concrete.***

This project has seen whether the mixture of polyvinyl acetate is strengthening or not. The result (compressive strength) is getting almost the same as normal concrete. The purpose of this project is to recharge the water under the earth and to remove the possibility of flood.

Keywords: Strength of concrete, polyvinyl acetate.

I. INTRODUCTION

The porous concrete is also known as pervious concrete is a special type of concrete which has the property of porosity and used for concrete flooring to recharge the groundwater table. Porous concrete mainly consists of ordinary Portland cement, coarse aggregate, and water. There are no fine aggregates, therefore, it is also called as no fine concrete. It is such a concrete that water can be passed which can prove to be very beneficial to recharge groundwater. It does not heat more as compare to normal conventional concrete. It cleans the dirty water and removes harmful pollutants and it's like ponds and rivers are not easily spoiled. The main advantage of concrete is its porosity and high runoff coefficient and the main disadvantages of this concrete is a low compressive strength. Conventional concrete can water flows on the surface of the concrete, but the porous concrete passes water from top to bottom surface through its pores. Porous concrete is used in light traffic areas, parking areas, and pedestrians etc. also where excessive water is maintained. Most people floor concrete to the area outside the house to avoid dust clogging to the house, if concrete is heated, then water is excuse on top to keep it cool but that water gets evaporated, but the porous concrete is such a concrete which is not too hot and does not even allow water to flow.

Polyvinyl acetate is the synthetic glue used as carpenters glue, wood glue or as consolidate for porous building stone when it dried it make solid rubber. This rubber is fully waterproof, which is very beneficial and it may help to enhance the strength of concrete.

II. EXPERIMENTAL WORK

In this experimental project work, mix proportion was taken of 1:2:4 which is cement: fine aggregate: coarse aggregate. The water-cement ratio for proper mixing 0.4%.

In this project, 7 cubes were cast of size 15×15×15cm. Each proportion 0%, 0.25%, 0.5%, 0.75% and 1% are casted and also one reference cube casted for compare the strength.

A. Cement

This is an Ordinary Portland Cement which surpasses the requirements of IS: 12269-53 Grade. It is produced from high-quality clinker ground with high purity gypsum. ACC 53 Grade OPC provides high strength and durability to structures because of its optimum particle size distribution, superior crystalline structure, and balanced phase composition. It is available in specially designed 50-kg bags.

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B. Coarse aggregate

Locally available crushed stones conforming to the graded aggregate of nominal size range from 4.75mm to 20mm with a specific gravity of 2.77.

C. Fine aggregate

Crushed stone with sizes ranges from 2.75mm to 4.75mm especially known as churri/gravels.

D. Water

The quantity of *water* in the mix plays a vital role in the strength of the *concrete*.

Sr. No.	Components	Quantity (in Kg)
I.	Cement	7.5
II.	Fine aggregate	15
III.	Coarse aggregate	30
IV.	Water	3.5 lit.

E. Polyvinyl acetate

Poly(vinyl acetate), PVA, Polyvinyl acetate is a colorless, non-toxic thermoplastic resin, used as carpenters glue, wood glue, paints water-based emulsion or as consolidate for porous building stone when it dried it make solid rubber. It was discovered in 1912 by Dr. Fritz Klatte in Germany. It is insoluble in water that's a way for the preparation of polyvinyl acetate for making the gel formation acetone were added and kept it for 24 hrs. Acetone is flammable liquid and easily get evaporated. The polyvinyl acetate was taken proportions 0%, 0.25%, 0.5%, 0.75% and 1%.

Sr. No.	Particulars	Description
I.	Density	1.17-1.20 gm/cm^3
II.	Soluble in	Acetone, Ethanol
III.	Chemical formula	(C4H6O2)n
IV.	Boiling point	112^{0}C
V.	Melting point	60^{0}C
VI.	Nature	Crystalline
VII.	Color	It is colorless but when it dried gets white milky in color
VIII.	pH	5.0-6.5

F. Acetone

It is the organic compound. It is a colorless, volatile, flammable liquid and used as a solvent (good solvent) for many plastic and synthetic fibers.

Sr. No.	Particulars	Description
I.	Chemical formula	C_3H_6O
II.	Appearance	Colorless liquid
III.	Density	0.7845 gm/cm^3
IV.	pH	Neutral
V.	Boiling point	56^{0}C
VI.	Melting point	-95^{0}C

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III. ADVANTAGES OF POROUS CONCRETE

A. It is lighter than normal concrete.
B. It is high voids 18%-20%.
C. It is the low cost of paver as comparing effective tiles.

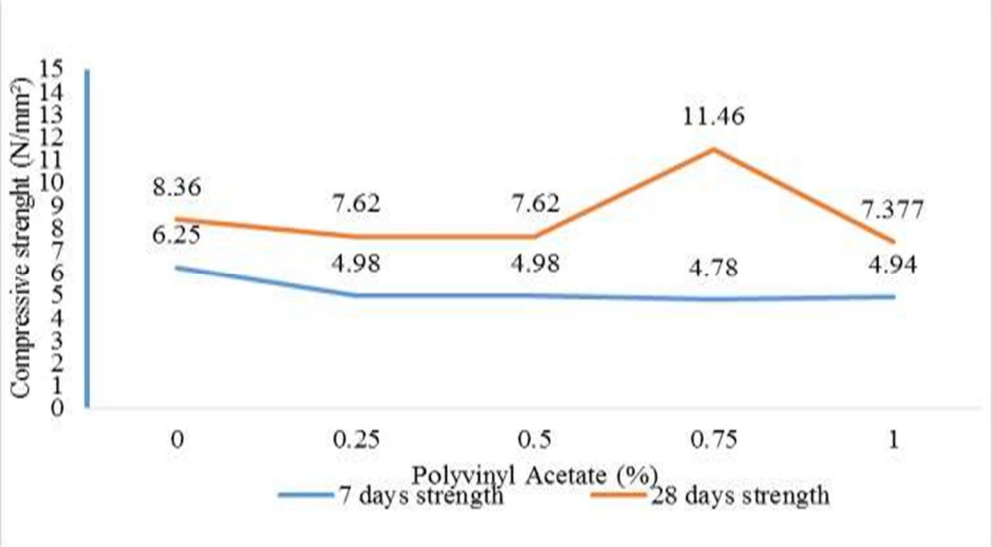
IV. USES OF POROUS

A. Concrete
1) Low light traffic pavements.
2) Parking areas
3) Pedestrians.
4) Flooring on the ground surface.
5) Boundaries of the wells, ponds, rivers, bore wells.

V. RESULTS AND GRAPHS

As shown below the results were recorded after 7 days and 28 days curing. The maximum strength of porous concrete by using polyvinyl acetate was found to be 11.46 N/mm^2 and without using polyvinyl acetate was found to be 8.36 N/mm^2.

Sr no.	Poly Acetate (%)	Compressive Strengths N/mm²	
		7 Days	28 Days
I.	0	6.25	8.36
II.	0.25	4.98	7.62
III.	0.5	4.98	7.62
IV.	0.75	4.78	11.46
V.	1	4.94	7.377



VI. CONCLUSION

A. From this project the acetate proportion 0.75% gives the 11.46 N/mm^2 strength which is beneficial to the pervious concrete.
B. This concrete protects the river and the pond from being dirty by cleaning storm water.
C. This concrete will be used on the side of the road when the water at the time of the rain, which will save the water from the flow of the camber.
D. The Increased compressive strength of a certain level by polyvinyl acetate.

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E. Compressive Strength is nearer to normal concrete.

VII. FUTURE SCOPE

Later, we seen the drinking straw to increase the void ratio and its porosity.

VIII. ACKNOWLEDGEMENT

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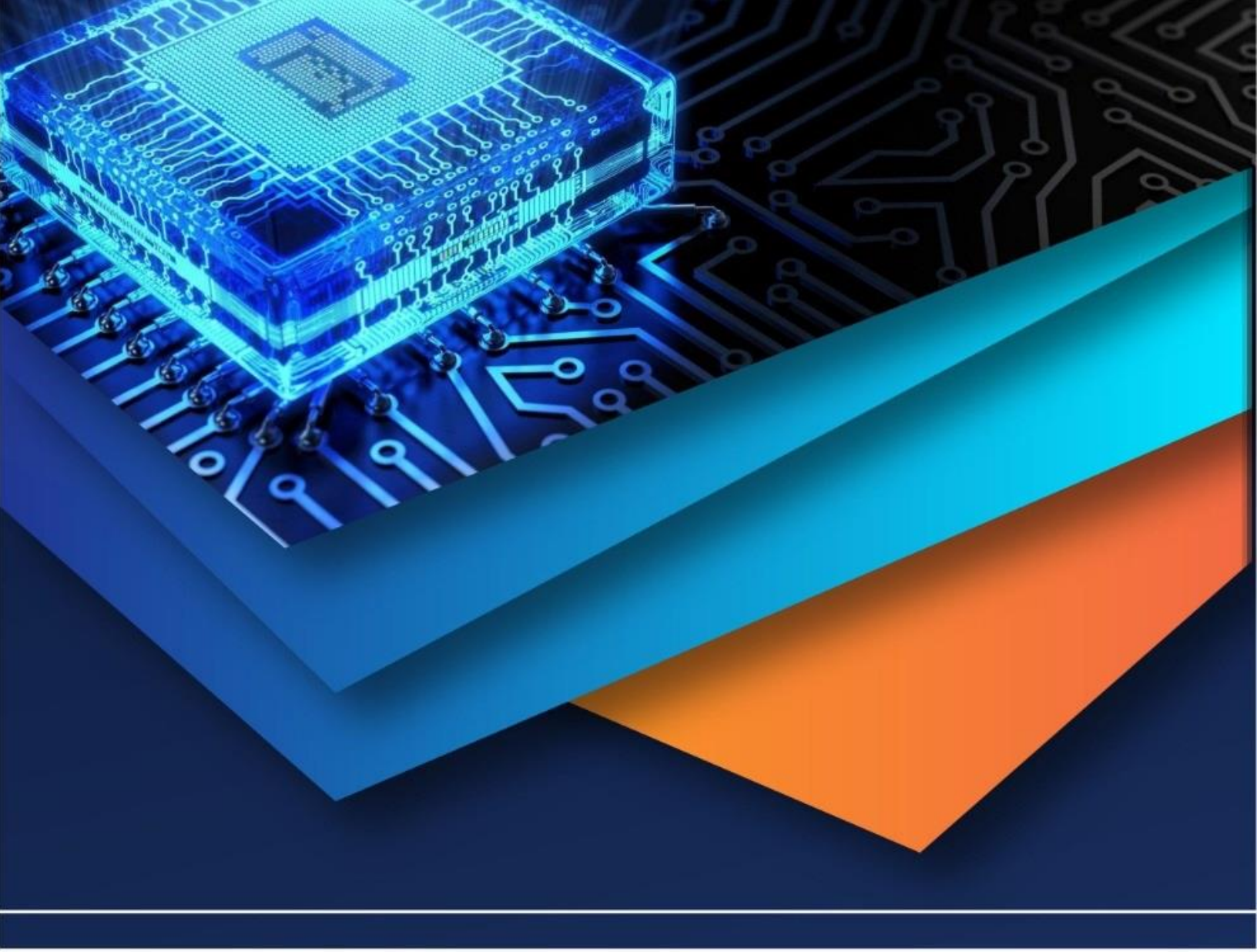
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