A Brief Review on Pervious Concrete

E.VALAVAN[1], B.JOSE RAVINDRA RAJ[2]

[1]PG scholar, [2]Assistant Professor
Department of Civil Engineering, PRIST UNIVERSITY,
Trichy-Thanjavur Highway, Vallam, Thanjavur- 613 403

***Abstract*: Pervious concrete has introduced in rural road as a road pavement material. The most dangerous problem that we are going to face is groundwater deficit. So the pervious concrete having the ability of penetrate the surface water and transfer it to the underground due to its high porosity property. The surface run off of water can be also avoided by it. The pervious concrete can be applied to footpaths, parking lots, and paths in parks and more. This type of concrete contains little or no fine aggregates such as sand, it is sometimes referred to as 'No fines' concrete. By using this pavement land use can be made efficient which further results in elimination of retention pond, swell, and other costly storm water management devices. Pervious concrete is widely used in US, Europe, England and Japan for roadway applications as a surface course over 30 years. Using aggregates of selected variety, fine minerals and different types of admixtures and by adjusting the concrete mix proportion, strength and abrasion resistance can improve the pervious concrete greatly. This introduction to pervious concrete pavements reviews its applications and engineering properties, including environmental benefits, structural properties, and durability.**

***Keywords*: Pervious concrete, durability, rural road, Water absorption, Porosity, Cost.**

I. INTRODUCTION

Pervious Concrete is a homogeneous mixture of cement, aggregate / gravel and water. Pervious Concrete is a special type of concrete in which no fine aggregates are used and gravel has been used in place of the coarse aggregate. One of the new parameter in designing a structure is concrete durability when assessing the condition of existing structures. According to EPA (Environmental Protection Agency's) storm water runoff can send as much as 90% of pollutant such as oil and other hydrocarbon. Water flows through itself in pervious concrete and minimizes the extent of pollution and storm water runoff. Pervious concrete pavement in rural areas is a unique and effective means to achieve important environmental issues and support green, sustainable growth. This concrete having applications include walls for two-story houses, load-bearing walls for high-rise buildings (up to 10 stories) and infill panels for high-rise buildings. Porous concrete gained its popularity in areas such as Venezuela, West Africa, Australia, Russia and the Middle East.

II. OBJECTIVES

THE MAIN OBJECTIVE OF THIS INVESTIGATION IS TO DEVELOP A STRONG AND DURABLE PERVIOUS CEMENT CONCRETE (PCC) MIX. IN ADDITION, IT IS ALSO AIMED TO COMPARE THE PROPERTIES OF THESE PCC MIXES. THE PROPERTIES OF PCC MIXES INVESTIGATED ARE COMPRESSIVE STRENGTH, FLEXURAL STRENGTH, ABRASION RESISTANCE, PERMEABILITY, AND CLOGGING POTENTIAL. ALSO FOR SAVING THE STORM WATER IN UNDERGROUND TO AVOID GROUND WATER DEFLICT

III.LITERATURE REVIEW

M. HarshavarthanaBalaji and M.R.Amarnaath carried out research on Design of eco friendly pervious concrete. From the test results it was concluded that the mix design with aggregate and cement ratio of 3 has the maximum strength, This mix design gives us the required strength of M20 grade concrete and this mix design has the required void ratio for the water seepage.

Meininger studied the effect of different aggregate sizes (10mm and 19mm) on hardened properties of non-fine concretes and the results showed that compressive strength reduces with increase in aggregates size. It claimed the decrease of aggregate size led to higher pervious concrete strength, resulting from the increase of the interface strength between the aggregate and cement paste.

D. Tennis Paul etal., studied the replicated simples of pervious concrete formed from two rock sources for coarse aggregates and different size fractions to determine hydrologic relationships. Linear relationships were found between porosity and density. Permeability and density, porosity and permeability, porosity and specific yield. The results suggest that properties such as permeability, porosity and specific yield are not significantly affected by different aggregate types.

Kevern J.T., Schaefer R et. al. studied the current methods of curing pervious concrete is to cover with plastic for 7 days, although no studies have been performed to determine if that is sufficient or even required. They presented results of combinations of four different pervious concrete mixtures cured using six common curing methods. The surface abrasion of the concrete was tested using a rotary cutter device. The results show that the concrete abrasion resistance was improved with a majority surface-applied curing compounds; however the surfaces covered with plastic sheets produced the lowest abrasion levels. The best abrasion resistance and higher strength overall was obtained with the mixture containing fly ash and cured under plastic for 28 days.

Omkar Deo, Narayanan Neithalath studied that the properties of pervious concrete are strongly dependent on its pore structure features, porosity being an important one among them. Different pore structure for pervious concrete was proposed and subjected

to static compression tests. The compressive stress-strain response of pervious concretes, a model to predict the stress-strain response and its relationship to several of the pore structure features are outlined. A statistical model was used to relate the compressive strength to the relevant pore structure features. It was observed that a proper understanding of the influence of pore structure features on compressive response can lead to optimized material design for the desired properties.

Ravindrarajah et al. investigated the properties of pervious concrete by replacing 20% and 50% of cement with fly ash.He found out that pervious concrete with high porosity shows low compressive strength and high permeability.The results of their investigation described that the permeability of pervious concrete was not notably affected when 50% of cement was replaced by fly ash and compressive strength will decrease with increase of the fly ash content.

Na Jin worked on "fly ash applicability in pervious concrete" using 2% and 32% fly ash in pervious concrete. He found out that using 2% fly ash pervious concrete can achieve higher compressive strength than that of using 32% fly ash in pervious concrete. He also indicated that fly ash helps to increase long term compressive strength of pervious concrete .

Dr.G.Vijayakumar found out that replacement of cement by 20 percent, 30 percent and 40 percent glass powder increases the compressive strength by 19.60 percent, 25.3 % and 33.7 % respectively whereas replacement of cement by 40 percent glass powder increases the split- tensile strength by 4.4 percent respectively and replacement of cement by 20 percent , 30 percent and 40 percent glass powder increases the flexural strength by 83.07 percent, 99.07 percent and 100 percent respectively.

Dhanaraj MohanPatil found out that addition of glass powder increases the strength of concrete and the replacement of cement by 20 percent glass powder achieves maximum strength as compared to that of normal concrete.

IV.LIMITATIONS

1. While this thirsty pavement is an excellent option for certain situations, it may not always be a viable choice.
2. The main reason pervious concrete is not used for high-traffic pavements, such as highways, is surface raveling," says Youngs, who notes that tire sheer can loosen the aggregate at the surface.
3.The compressive strength of the nominal pervious concrete is around 20MPa. So this can't be installed for the heavy load traffic situations.

V.ADVANTAGES

1. It reduces the storm water runoff
2. Eliminates the need for detention ponds and other costly storm water management practices.
3. Mitigates surface runoff
4. Replenishes the aquifers and water table
5. Allows more efficient land development
6. Prevents water from entering into the stream and also prevents it from being polluted
7. Green building alternative suitable for many applications.
8. Protects streams and lakes and allows local vegetation to thrive.

VI. CONCLUSION

The following conclusion comes through the study of the pervious concrete pavement in rural areas becomes more suitable to meet the rural area requirement such as to reduce the storm water runoff, to increase the ground water level, to eliminate the costly storm water management practices. One main result is found out such as, water absorption and durability are inversely proportional to each other means. that, concrete made by 1:6 mix proportion has more durability and less water absorption and concrete made by 1:10 mix proportion has more water absorption and less durability. It is crystal clear that the utilization of these waste materials is beneficial from the environmental and economical point of view.

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