



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 5, May 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118



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Porous Pavements Block for Rain Water Harvesting

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ABSTRACT: Porous concrete paving block (PCPB) is a block with continuous voids which are intentionally incorporated into concrete. The permeability and strength of PCPB with different sizes of coarse aggregate was presented in this study. Three different sizes of coarse aggregate were used namely passing 10 mm retained 5 mm (as control), passing 8 mm retained 5 mm (CA 5 – 8) and passing 10 mm retained 8 mm (CA 8 – 10). Furthermore, a series of test were conducted in this study such as compressive strength, porosity and permeability. It was found that the size of coarse aggregate affects the strength and porosity of the specimens. The result also shown that PCPB with CA 8 – 10 caused in low strength, but high in porosity and permeability compared to the other blocks. Beside that PCPB using CA 8 – 10 is able to remove surface runoff efficiently.

I. INTRODUCTION

Rapid economic growth in the last two decades has turned many sub-urban areas into busy cities, which created unpredictable urbanization effects. Coupled with the global climate change and also the large ratio of road compares paved to water-permeable (porous) surface road, these in turn lead to increased volume of surface runoff and flash flood. High volume of surface runoff, low skid resistance, minimum appearances, glaze and splash water is the factors contributing to the increased number of accidents during rainy weather.

Recently, road pavements with a water-permeable (porous) surface have been increasingly used. Porous surface for pavements are adopted for various reasons, such as to increase the driving safety during rainy weather, to reduce the traffic noise, to recharge ground-water and to alleviate the heat island phenomena in urban city centres. It is designed to reduce surface runoff by allowing infiltration [1]. Unlike traditional installation of concrete, porous concrete usually contains a void content 15 % to 25 %, which allows water to infiltrate directly through the pavement surface to the sub surface. It was very difficult to imagine few decades before that you will require to buy drinking. The use value of water was never undermined, but it's about time that even its exchange value is given due importance.

Fresh water today is a scarce resource, and it is being felt the world over. More than 2000 million people would live under conditions of high water stress by the year 2050 according to the UNEP (United Nations Environment Programme), which warns water could prove to be limiting factor for development in a number of regions in the world to date, much attention has been given to the first option and only limited attention has been given to optimising water management systems. Among the various alternative technologies to augment freshwater resources, rainwater harvesting and utilisation is a decentralised, environmentally sound solution, which can avoid many environmental problems often caused in conventional large-scale

Project using centralised approaches cope of project work. Porous block for Concrete Blocks Pavement nowadays enthused by many developed countries. It is known as porous concrete paving blocks, permeable or pervious interlocking concrete paving blocks.

Report that permeable concrete block pavement is suitable for trafficking and also acts as the drainage system. Other than that, porous surface in parking lots are believed to help infiltration and the cleansing of storm water



II. OBJECTIVES

1. Rain water harvesting under pervious concrete.
2. Drain of water to avoid water logging and optimization of rain water.
3. To reduce problem with traditional surface water drainage system.
4. To minimize risk of surface water flooding.
5. Use of stored water for various purposes.

Materials and methods

Selection of standard quality material.

1. Portland Pozzolana cement, Angular Aggregates, Domestic water and Admixture. (Silica Fume And Marble Dust)
2. Preparation of Mix design. Casting a cube of permeable concrete with various size of aggregates as per mix design.
-For getting more permeable concrete we have used different aggregates size (20mm, 16mm, 12.5mm etc). We have reduced the aggregates size to get smooth surface and to get strength as designed for M30 grade. For getting strength we used Admixture (Silica fume, Marble dust)
3. Test for compression strength-
-We have made a cube of 80*80*80mm and made curing for 28 days after that we took test on compression testing machine.
4. Comparative statement of conventional concrete with permeable concrete.
Cost of permeable concrete is less than conventional concrete. (25-30% economical than conventional concrete)
5. Smart model making for showing its application for rain water harvesting. The water from the Permeable concrete goes down and water is collected through the perforated pipe. That water can be stored and reused for various purposes. This type of concrete is more useful where there is less rain and it also can be used where there is heavy rainfall it can drain off. And it also helps to reduce the runoff.

Permeability test Permeability test was carried to determine the relative permeability of PCPB. Falling head permeability test was used by using a flexible wall Parameter and the permeability was measured in term of its discharge time in seconds, which indicate the time taken for a specified volume of water permeate through the sample. The coefficient of water permeability, k , was a product of Darcy's Law equation as state in ASTM PS129. The experiment was repeated three times for each sample and the average value was calculated.

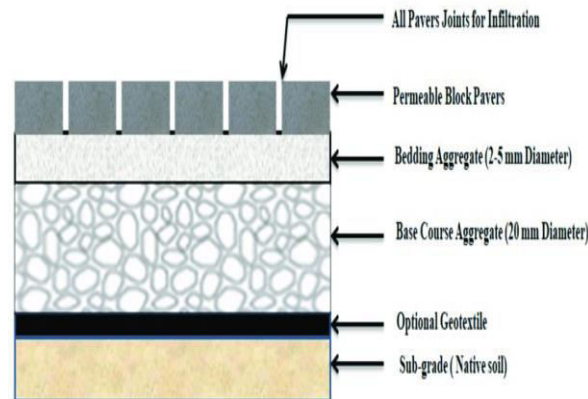


Fig 1. Internal structure of porous pavement block

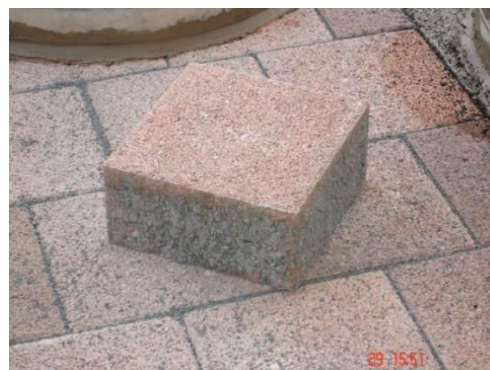


Fig 2. Porous pavement block

Compressive strength test Compressive strength of PCPB was performed according to BS EN 1338:2003 . The blocks were compressed by using a compression machine with maximum capacity of 3000Kn and a loading rate of 3.0 kn/s at 7 days and 28 days. The reported compressive strength was the average of three block measurements.

III. CONCLUSIONS

All PCPB with different size of coarse aggregate cause a great reduction in the water volume during permeability test. However, differences in this reduction between the samples are depending on the coarse aggregate size and porosity. PCPB with CA 8 – 10 give better results in permeability and more suitable be applied at areas with high surface runoff. The permeability results indicate that there are large differences in permeability for all samples when the curing duration increases. Furthermore, the permeability of sample with 28 days curing was lower than the sample with 7 days curing; indicating that age is a factor affecting permeability.

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