

Review Paper on Permeable Paver

^[1]Mr. Vivek D. Jayale, ^[2]Mr. Atul S. Kurzekar
^[1]M-Tech. Structure, ^[2]M-Tech. Structure
^{[1][2]}Yeshwantrao Chavan College of Engineering, Nagpur

Abstract— Pavement systems are suitable for a wide variety of residential, commercial and industrial applications. The purpose of this review paper is to study permeable pavements. Permeable pavements serve as an alternative to conventional road and parking lot construction materials. Their primary advantage is their ability to reduce urban runoff. The intent of this review is to foster acceptance of permeable pavement systems as a viable alternative to the traditional paver systems.

Index Terms: Permeable pavement system, Interlocking concrete block pavement, Storm water, Permeable paver, Geocells.

I. INTRODUCTION

Climate change and global warming are crucial problems worldwide and, as a consequence, sustainable practices for both energy and water are prominent issues at present. In this paper we discuss about the permeable pavement which helps to reduce one of prominent issue at present that is water.

Water Quality & pollutants

Pollution which presents on the road and car park surfaces as a result of oil and fuel leaks, and drips, tire wear, and dust from the atmosphere. This type of pollution arises from a wide variety of sources and is spread throughout an urban area also known as diffuse pollution. Permeable pavements are alternatives to traditional impervious asphalt and concrete pavements. The general function of a permeable pavement is to collect, treat and filter surface runoff to enhance groundwater recharge. This paper looks at research conducted by several groups' show the applications of permeable pavement in different locations and also shows numerous advantages of adopting this system few advantages are given below.

- ◆ Recharging of ground water regimes and aquifer
- ◆ Better management of storm water at source
- ◆ Pollution control

General

Permeable pavement system are design for allowing movement of storm water through the pavement surface into the base or sub base reservoir it is also designed for the purpose that when storm water percolates through the block must achieve water quality and quantity benefits

Water passes through voids provided or holes made in pavement block or through the gap provided between two pavement blocks sometimes pavement blocks are

made of permeable material so water percolates through voids available in the material. So this is why permeable pavement system are design to serve conventional road and parking lots. This system has ability to reduce runoff cause due to heavy rainfall or flood and it also provide the opportunity to mitigate the impact of urbanization on receiving water system by providing at source treatment and management of storm water .

II. PERMEABLE PAVEMENT SYSTEMS

There are several types of permeable pavement system, installation of permeable pavement have different procedures and specification which must be followed, installation may also get easier if done by skilled person.

1. Porous concrete

Porous concrete which is also known as permeable concrete, gap graded concrete or Enhanced porosity concrete is concrete with reduced sand or fine materials allows water to drain through it. This pervious concrete is widely available and can bear frequent traffic load quality of this type of block depends on installer knowledge and experience



Figure 1. Porous concrete

2. Plastic reinforcement grid pavers

Plastic reinforcement grid pavers are also called as Geocells. This type of paver block consist of

flexible plastic interlocking unit these units are available in different shapes which allows water infiltration into ground. These gaps are generally provided with gravel and sand. About 90-99% percolation can be obtain, but this type of paver block cannot sustain heavy loads therefore not effectively used for roads. Capacity of percolation is generally depends upon filter media used over flexible plastic. Plastic grid system are also popular with homeowners due to their lower cost of installation and ease of installation and versatility.



Figure 2. Plastic grid reinforcement pavers

3. Interlocking concrete pavements

Permeable interlocking concrete pavements give an architectural appearance. These are concrete units which are designed with small openings between joints of two pavers .opening typically comprises of 5%-15% of paver surface area and it is then filled with highly permeable material. This type of paver block can be used for heavy load but cannot be used for high speed vehicle moving roads as well as high traffic volume roads.



Figure 3. Interlocking concrete paving blocks or pavers

4. Pavers with holes

Pavement block is made of sand aggregate cement water and rise husk. Rice husk ash (RHA) is very light weight material which is used as replacement for cement .Replacement is carried out on the basis of different percentage by weight. Purpose of using rice husk is as follows

- ◆ It is light in weight-makes the block light weight for handling purpose
- ◆ Use of natural material
- ◆ Good binding property
- ◆ Reduced heat of hydration
- ◆ improves strength
- ◆ Economical
- ◆ RHA Easily available

Replacement is done using 25% and 30% RHA by weight with cement. Blocks which are prepared is of round dumble shape with different pattern of holes. Holes of different diameter are made on paver block which allows the movement of water through paver blocks.



Figure 4 Pavers with holes

III. APPLICATION OF PERMEABLE PAVERS AT PARKING LOTS

Parking lots are an obvious model to test and implement permeable pavement designs. This is because of the large quantities of pavement used to construct parking lots. Parking lots can also have negative effects of the environment due to their size. Additionally parking lots

experience less traffic than roadways so the pavement lasts longer which eliminates the need for frequent repaving. The majority of studies related to permeable pavements being installed in parking lots attempt to mitigate the negative impact that impervious parking lots have on the environment. This is because many parking lots are located in residential areas where storm water runoff and retention ponds are common. Before the parking lots were built rainwater was able to percolate through the soil before entering retention ponds or other ground water supplies. This process is a form of natural filtration in which chemicals and particles dissolved in the rainwater runoff are removed through the soil.

A study conducted by Brattebo and Booth of the University of Washington attempted to determine the environmental effects of parking lot construction. They found that unusually high out flows of water during rainstorms was caused by the inability for water to be absorbed directly in to the ground. This caused severe bank erosion on the edges of surrounding bodies of water they installed permeable pavement designs in six different locations. Their results shows that rainwater could be absorbed directly into the ground through the permeable pavement with little to no run off even with the heaviest of storms. The only times runoff was detectable from the permeable pavement was at hours four, six, eleven, fourteen and seventeen. Not only permeable pavement significantly reduce the run off of storm water but it also drastically improved the water quality of absorbed water compared to the runoff water from the impervious pavement designs

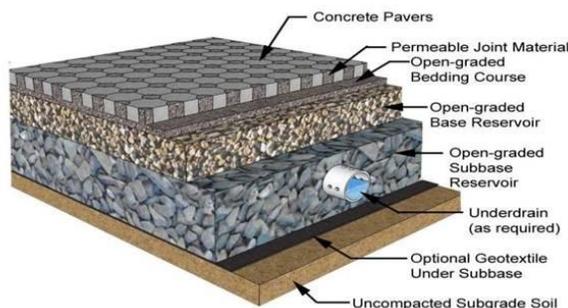


Figure 5 Cross setion of permiable paving system

IV. CONCLUSION

This paper looked at various studies conducted on permeable pavement systems and their current application. These permeable pavement systems are changing the way

human development interacts with the natural environment. Its application in parking lots, gardens, residential walkways are very beneficial for ground water recharging, pollution control etc.

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