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POROUS ASPHALT PAVEMENT FOR RAINWATER HARVESTING

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Abstract: At present time a water problem is everywhere within urban area or rural area. We studied on this problem for positive solution. So need study on porous asphalt parking lot. The asphalt is highly porous material and is environmentally friendly material. Porous asphalt has been used all over the world to reduce the amount of runoff water and improve the water quality near light volume streets and parking lots. The top thick layer is specially designed to make it porous. Rainwater goes quickly without any ponding and freely absorb. The water is then stored in an underlying open-graded stone layer.

Keywords: Asphalt, Porous, Rainwater, Parking lot, Pavement

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INTRODUCTION

Porous asphalt pavement is one alternative solution to the problem of stormwater drainage from parking places and other low traffic roads or streets. Further, this type of pavement allows preliminary rainfall and local runoff to dip through the pavement surface of open graded asphalt mix compile in a porous base consisting of large open graded gravel from which rainwater percolate into the natural ground below. (Prof. Prithvisinh Kandhal, March 2014)

In urban area and rural area, which essentially need for water supply. In any case, extra water supply is not really accessible. The Central Ground Water Board has recognized around 900 areas in India in which ground water level decreased. As indicated by the 2005 information of CGWB, for every 125 units of ground water being taken out in every state, just 100 units are recharged by rain. It is evaluated that the ground water level in every state is falling at the rate of around two meter each year. The Franklin Institute of Philadelphia, Pennsylvania was tasked in early 1970s to develop technologies to address the problem of plunging water table in urban areas. This concept was successful used. (Prof. Prithvisinh Kandhal, March 2014)

This is based on porous asphalt which can be used for parking lots, low-trafficked streets and pavement. The asphalt pavement as shown in (Fig. 1). The top thick asphalt layer is designed for make it porous. Rainwater goes through it rapid without any ponding at the surface. The water is then stored in an underlying open-graded stone bed also it is called stone reservoir. From there, water percolates into the natural soil. (Prof. Prithvisinh Kandhal, March 2014)

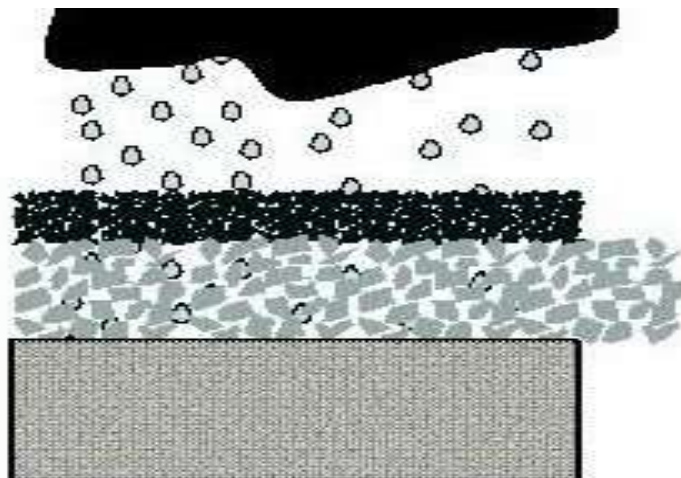


Figure 1 Schematic of porous asphalt pavement
(<http://www.indiawaterportal.org/sites/indiawaterportal.org/files/jda1.jpg>)



Figure.2 View just after rain: parking lot in the background
(<http://www.indiaparkinglotwater.org/sites/indiawaterportal.org/files/jda1.jpg>)



Figure.3 General view of parking lot in rain season
(<http://www.indiaparkinglotwater.org/sites/indiawaterportal.org/files/jda1.jpg>)

Problem Statement

- The most common problem is water logging on roads in rainy season in urban area and also faced a problem of road side drainage line due some reason. To avoid this problem installed a lot or streets as a asphalt parking lot or streets especially in urban area. To avoid this problem installed a lot or streets as a asphalt parking lot or streets especially in urban area.

- Scope of study
 - Volume of water runoff is decreases
 - To store rain water
 - Reuse rain water
 - Recharge ground water in aquifer
 - Permeability of the porous asphalt mixtures
 - Strength characteristics
 - The evaluation properties of mixes

- Advantages
 - Recharge of aquifer.
 - Water budget decrease
 - Less need for storm sewer.
 - Natural run-off allows rainwater to drain directly to sub-base.
 - Reduced construction requirements for drainage structures.

- Disadvantages
 - Requires frequently maintenance.
 - Proper construction stabilization and erosion control are required to prevent clogging.
 - Seal coating or similar surface treatment will cause failure.

OBJECTIVES

1. Establish the experimental procedure to determine influence of aggregate and bitumen on the properties of porous asphalt by preparing different mix proportion.
2. Determine the optimum mix from permeability and the performance of porous asphalt.

MATERIALS AND METHODS

Porous asphalt (PA) also namely open-graded asphalt has been use as a wearing surface since the 1950s. Its first major use in Australia was about 1973 and in Japan was about 1987. Porous asphalt is a developing in road surfacing technology; Porous asphalt is an innovative road surfacing technology, which allows water to enter into the asphalt mixes beyond its continuous air voids. (Daines M.E, Crowthorne, June 1992.)



Figure 4. Porous Asphalt

(<http://www.indiaparkinglotwater.org/sites/indiawaterportal.org/files/jda1.jpg>)

The porous asphalt course should be designed as per established guidelines contained in the US Manual on Design, Construction and Maintenance of Open Graded Asphalt Friction Course. OGFC is used in the US as a wearing course on highway, ranging in thickness from 20 to 25 mm. (Prof. Prithvisinh Kandhal, March 2014)

Methodology of study

Step 1 : Problem Identification

Step 2 : Introduction to project

Step 3 : Literature Review

Step 4 : Analysing stability of pervious pavement

Step 5 : Los Angeles Abrasion Test for to measure toughness of aggregate

❖ Los Angeles Abrasion Test

Los Angeles Abrasion Test on aggregates is the measure of aggregate toughness and abrasion resistance such as crushing, degradation and disintegration. Resistance to degradation of small size course aggregate by abrasion and impact in the Los Angeles Machine. When vehicles move

on the road, the soil particles present between the tyres and road surface cause abrasion on road aggregates. The steel wheels of vehicles also cause considerable abrasion of the road surface.

Therefore, the road aggregates should be hard enough to resist abrasion. Resistance to abrasion of aggregates is determined by Los Angeles test machine. The principle of this test is to produce abrasive action by use of standard steel balls which when mixed with aggregates and rotated in a drum for specific number of revolutions also causes impact on aggregates. The percentage wear of the aggregate rubbing with steel balls is determined and is known as Los Angeles Abrasion value. (FG Bartley, 2010)

RESULT AND DISCUSSION

Porous asphalt pavement or parking lot is one of the responses to plunging ground water table in an area and elsewhere in India. It can be integrated with the roof rainwater harvesting system effectively and economically. According to the US manual, properly designed and constructed porous asphalt pavement or parking lot can last more than 25 years. Such a pavement can be used for parking lots, recreational areas, and low-volume roads and streets.

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