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# Construction of Permeable Asphalt Pavement using Recron Fiber

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## ABSTRACT

*The present report is utilized to determine the nature and properties of the permeable asphalt pavement with recron-1s fibers. Permeable pavement allows water to pass through then at the same time providing the properties similar to asphalt pavement. Permeable pavements have low strength when compared to the normal pavement. The use of polymer fibers will increase the properties of the permeable asphalt pavement. For this we identified the properties of aggregates to get optimum performance and for bitumen properties we conducted the penetration test, ductility test, softening ball point, Flash and fire test and marshal stability test. Bitumen and filler material and we find flow, stability and bulk density.*

**Keywords:** *Permeable Asphalt pavement, Polyester (Recron-1s) fiber*

## 1. INTRODUCTION

Now-a-days the construction of roads everywhere in the cities is causing a major problem of water percolation into the ground surface. By using the permeable asphalt pavement we can make the water to percolate into the ground easily and to further increase the pavement properties we need to add the fiber. One of the fibers used is fiber polyester (recron-1s) fiber. This fiber is an artificial material which originates from polyester recron fiber prevents shrinkage split cracks in the pavement and provides additional strength to the pavement.

## 2. OBJECTIVE

The objectives of this project were to study the pavement performance, durability, maintenance requirements, hydrologic benefits, and environmental considerations of a full-depth permeable asphalt pavement in any climate. In order to meet this objective, two asphalt test cells were constructed on the Main road low-volume road (LVR) test loop. One permeable asphalt cell was constructed over a sand sub grade and one over a clay sub grade. In addition, a sealed/impervious, dense graded hot mix asphalt (DGHMA) control section was constructed directly adjacent to the porous sections, for comparison of water runoff, pavement performance and pavement durability.

## 3. SCOPE

Permeable asphalt pavements are the general term used to describe the asphalt pavement which can allow the water to percolate through it yet providing a hardened surface. This type of pavement is mainly considered for parking lots. To improve the pavement properties additional fibers are added to further increase the permeable pavement properties. These types of pavements are very easy and advantageous to implement.

## 4. MATERIALS USED

### 4.1 AGGREGATES

It is a term for the mineral materials, for example, sand, rock and pulverized stone that is utilized with a coupling medium. The properties of the aggregates used are:

SI.NO	TESTS PERFORMED	OUTPUT
1	Aggregate crushing value	23.3%
2	impact value	15.1%
3	Specific gravity	2.6
4	Los Angeles abrasion test	30.1%
5	Water absorption	0.82

### 4.2 POLYESTER (RECRON-1S) FIBERS

Recron -1s fiber is used to increase the pavement properties we need to add the fiber .one of the fiber used is fiber polyester (recron-1s) fiber. This fiber is an artificial material which originates from polyester recron fiber prevents shrinkage split cracks in the pavement and provides additional strength to the pavement

### 4.3 BITUMEN

Bitumen is the material which is used to bind the materials together .in this we use 70/80 grade of bitumen which has more viscosity when compared to the other grades.

SI.no	tests	results
1	Ductility	80
2	Softening Point	55
3	Penetration	65
4	Flash and fire	241and221

## 5 .METHODOLOGY

First we collect the Polyester (Recron-3S) Fiber and cut them into pieces of 2cm length. Then we find the aggregates properties by conducting the crushing test, impact test, specific gravity and water absorption and abrasion test.

**4.1. Aggregate Impact Test** Take the aggregates that pass through 12.5 mm and 10 mm with pan below the sieves and Collect the aggregate which retain on 10 mm sieve. Fill the aggregates up to 1/3rd of the Cylinder and tamper with tamper rod for 25 times and again fill it up to 2/3rd level and again tamper and fill up to the level and the place the cylinder at the bottom of the impact machine and lift the hammer up to 300 mm and drop it freely until 15 blows. After that pass the aggregate through 2.36mm sieve and note down the readings.

**5.2. Crushing Test** Collect the aggregates which retain on 10 mm sieve and fill the cylinder by 1/3 proportion giving tamping of 25 times after filling the aggregates place it in the crushing machine and apply the load of 50tonnes , 5tonnes per minute after that sieve the aggregates on 2.36mm sieve and notes the readings.

**5.3. Specific Gravity and Water Absorption Test** Collect the aggregates and place in the wire basket and immersed the aggregates into water and keep it for 24 hours and after that clean the aggregates by using cloth and note the readings.

**4.4. Penetration Test** First we heat the bitumen sample and cool it for 24 hours and then place the bitumen mold in the bottom base of penetration machine and set the time and on the instrument then note the reading.

**4.5. Softening Point** Place the bitumen in the rings and fix it well and place the ball and put the whole apparatus in to the water bath and switch on the temperature and at certain temperature the ball penetrate through the bitumen and touch the bottom the lid.

**4.6. Marshall Mix Design** Marshall Mix design is used to find the optimum binder content of the bitumen, Stability, flow value and bulk density for the bitumen content 1. Select the different types of aggregates for grading by using MORTH table.

2. First we need to assemble the mold with a base plate and we need to apply sum lubricate.
3. Before that we need to sieve the aggregate as par the MORTH table.
4. And then we need to take the sample of aggregate as par the MORTH table and heat the sample up to certain temperature by using pan.
5. And add the bitumen content to the sample and mix thoroughly then take it into the mold immediately.
6. And give 75 blows on the both sides of the sample by using mechanical or manual.
7. Put the sample ideally for 24 hours after that remove the sample from the mold.
8. Take the water bath at 60degrees for the sample after that clean the surface of the sample
9. Then do the marshal stability test and note down the proving ring readings

## 6.RESULTS AND DISCUSSIONS

### 6.1Marshall stability test report

S.NO	% Of FIBERS	STABILITY (KN)	TEST (Kgs)	FLOW
1	0%	109	1069.29	4
2	0%	115	1128.15	4
3	0%	105	1030.05	3.5
4	10%	126	1236.06	3
5	10%	127	1245.87	5
6	10%	120	1177.2	3.5
7	15%	133	1304.73	3.5
8	15%	126	1236.06	3.2
9	15%	105	1030.05	2.8
10	20%	141	1383.21	4
11	20%	142	1393.02	2
12	20%	148	1451.88	5

Preliminary studies on the use of recron fiber as a blending material with bitumen, suggest that the blends behave similar to Polymer Modified Bitumen, thus having improved properties compared to plain bitumen. It is also observed that this process of blending has limitation. At high percentage of blending the voids are being filled and not permitting the water percolation.

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## 7.CONCLUSION

Permeable asphalt pavement will help the water to percolate into the ground and helping the environment ,the use of fibers make the pavement more stable and stronger this type of pavements are best suited for India

The permeable pavements can allow water to percolate through them .when additional polymer fibers are added to the permeable asphalt pavement additional strength, resistance to shrinkage splits and stability may be provided to the pavement

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