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# Use of Nylon Fiber in Road Construction

New material and construction techniques are required to provide Civil Engineering with alternatives to traditional road construction practices. Traditional techniques have not been able to bear the mixed traffic load for a long time. Therefore the pavement requires overlaying. To overcome this problem fiber inclusion in pavements is adopted nowadays. This presentation highlights on the use of discrete fiber in road construction. Fiber can be obtained easily form the waste we throw away in day to day used like plastics PVCs etc.

The main purpose of this project investigation is to identify the effect of fiber mix (Fiber reinforced bitumen can be defined as a composite material consisting of mixtures of bitumen tar and discontinuous, discrete, uniformly dispersed suitable fiber) used in road construction.

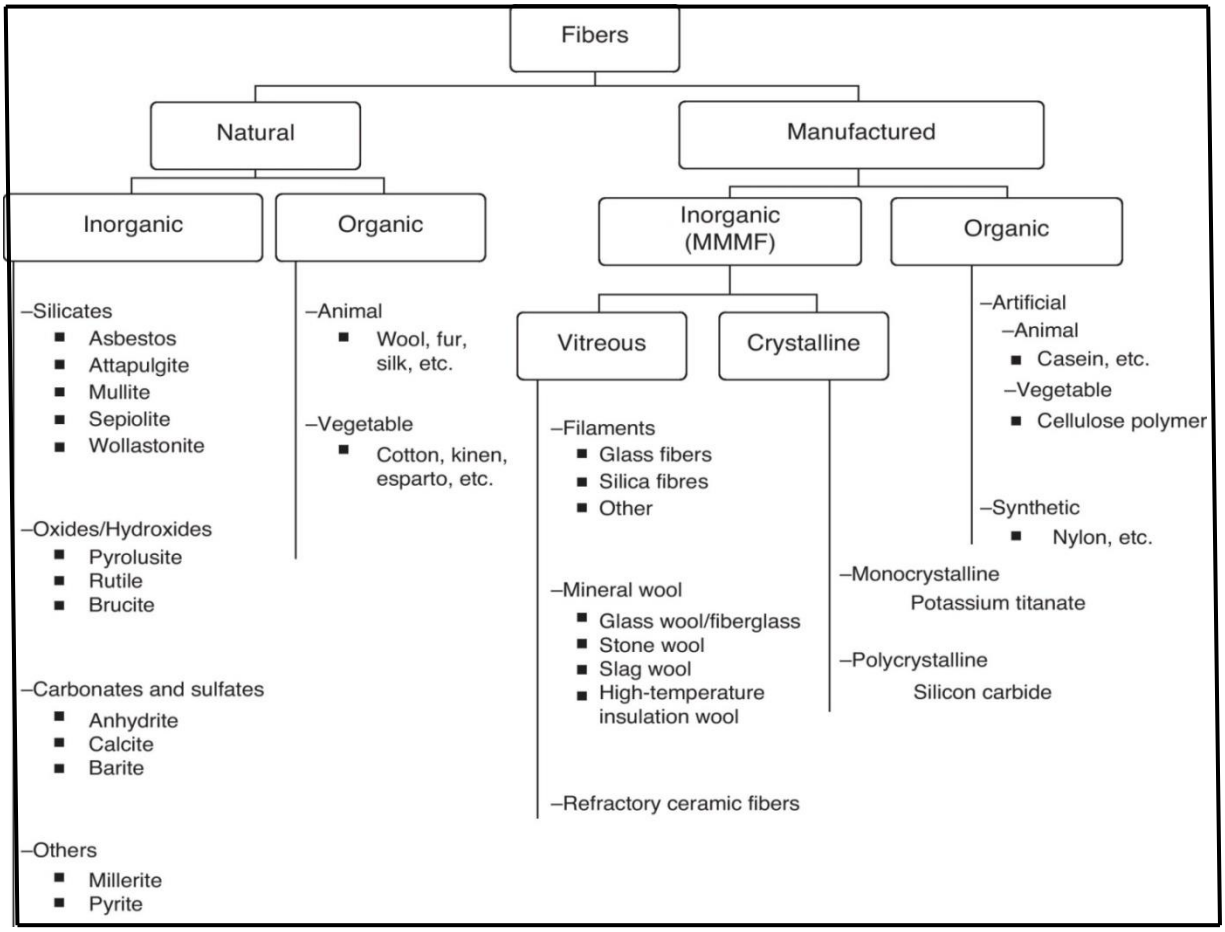
This report describes the laboratory tests conducted on nylon fiber used in road construction material bitumen. The sole purpose is to check whether the fiber mix increase the strength of bitumen or it decreases.

In 80grade bitumen 1, 2 and 3 percentage of nylon fiber was mixed and the length of fiber was divided in 3 cm and 6 cm, so as to make it discrete

The result gives the idea that when the nylon-bitumen mix was tested in ductility test it breaks at nearly approximately 14cm of length which is so much less as compared to 45 cm of normal bitumen and in penetration test it shows 107 mm of penetration which is quite the same to the bitumen only test.

## 1. Introduction:

Fiber is a small discrete reinforced material produced from steel, polypropylene, nylon, glass, asbestos, coir or carbon in various shape and size. They can be circular or flat. Fiber or fiber (from the Latin fibra) is a natural or synthetic substance that is significantly longer than it is wide. Fibers are often used in the manufacture of other materials. The strongest engineering materials often incorporate fibers, for example carbon fiber and ultra-high-molecular-weight polyethylene. Synthetic fibers can often be produced very cheaply and in large amounts compared to natural fibers continuous meshes, woven fabrics and long wires or rods are not considered to be discrete fiber.

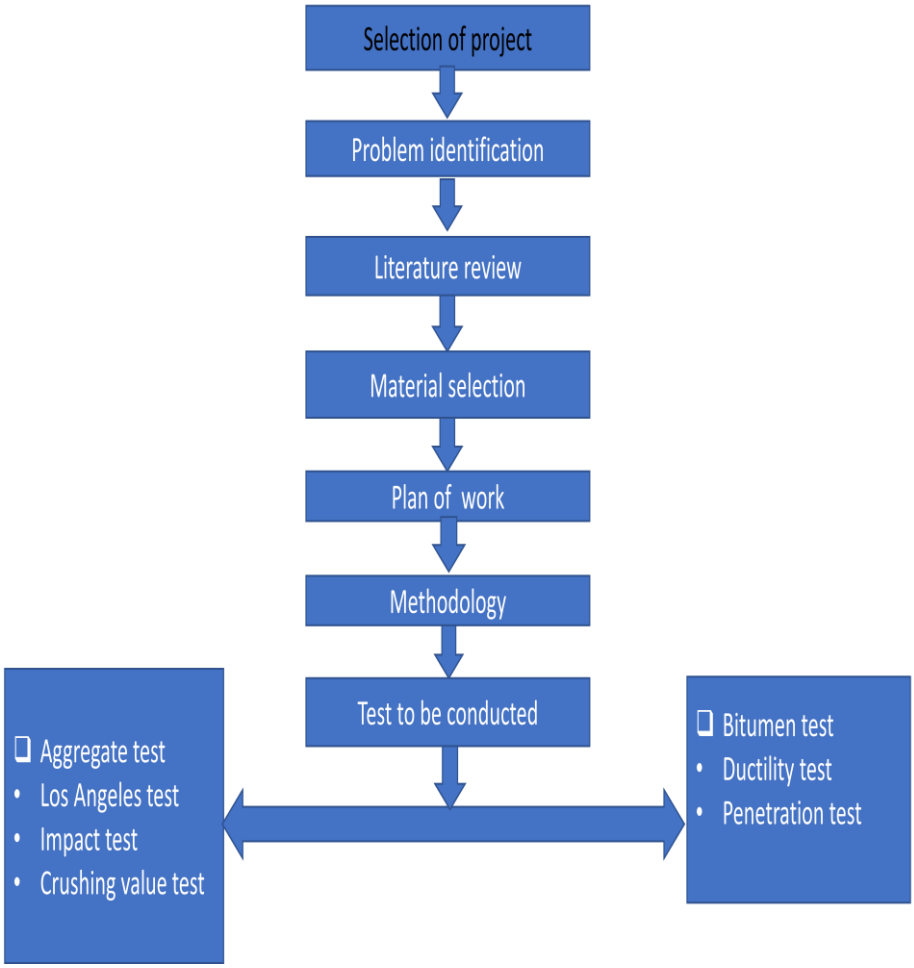



## 2. Background of the Invention & Literature review:

The purpose of this investigation was to identify and quantify the effect of numerous variables on the performance of fiber-stabilized sand specimens. Laboratory unconfined compression tests were conducted on sand specimens reinforced with randomly oriented discrete fibers to isolate the effect of each variable on the performance of the fiber-reinforced material. Five primary conclusions were obtained from this investigation. First, the inclusion of randomly oriented discrete fibers significantly improved the unconfined compressive strength of sands. Second, an optimum fiber length of 51 mm (2 in.) was identified for the reinforcement of sand specimens. Third, a maximum performance was achieved at a fiber dosage rate between 0.6 and 1.0% dry weight. Fourth, specimen performance was enhanced in both wet and dry of optimum conditions. Finally, the inclusion of up to 8% of silt does not affect the performance of the fiber reinforcement.

This invention relates to a process for producing high-strength yarns or split yarns by slitting an ultra-high molecular weight polyolefin film into tapes and longitudinally stretching the tapes at a high stretch ratio, and also relates to a high-strength, webs-crossed laminate and a process for producing thereof using a meshy web having a unidirectional high-strength as a longitudinal or transverse web in which adjacent yarns remains connected to each other by making slits in a web intermittently or in a shape of perforated line.

## 3. Methodology:




## 4. Results and Observations:

### 4.1 Los Angeles test:

To produce the abrasive action by use of standard steel balls which when mixed with the aggregate and rotated in a drum for specific number of revolution cause impact on aggregate. The %age wear due to rubbing with steel balls is determined and is known as abrasion value.

| Sr No. | Description | Sample |
|---|---|---|
| 1. | Weight of sample , ($W_1$) gm | 5000 |
| 2. | Weight of sample retained on 1.70 IS sieve ($W_2$) gm | 4365 |
| 3. | Percentage wear<br>($W_2$ /$W_1$) * 100 | 8.7 % |

### 4.2 Impact test for Aggregate:

This test is done to determine the aggregate impact value of coarse aggregates as per IS: 2386 (Part IV) – 1963. The apparatus used for determining aggregate impact value of coarse aggregates is Impact testing machine.

| Sr No. | Description | Sample 1 | Sample 2 |
|---|---|---|---|
| 1. | Weight of sample , ($W_1$) gm | 370 gm | 343 gm |
| 2. | Weight of aggregate passing through 2.36mm sieve, ($W_2$) gm | 55 gm | 50 gm |

| | | | |
|---|---|---|---|
| 3. | Aggregate impact value in %<br>I.V. = ($W_2$ /$W_1$) * 100 | 14.86 % | 14.20 % |
| 4. | Average Aggregate crushing Value in % | **14.53 %** | |

### 4.3 Crushing value test for Aggregate:

The aggregate crushing value gives a relative measure of the resistance of an aggregate crushing under gradually applied compressive load. With aggregate crushing value 30 or higher' the result may be anomalous and in such cases the ten percent fines value should be determined instead.

| **Sr. No.** | **Description** | **Sample 1** | **Sample 2** |
|---|---|---|---|
| 1 | Weight of sample , ($W_1$) gm | 343 | 352 |
| 2 | Weight of aggregate passing through 2.36mm sieve, ($W_2$) gm | 57 | 50 |
| 3 | Aggregate Crushing<br>= ($W_2$ /$W_1$) * 100 | 16.62 % | 14.20 % |
| 4 | Average Aggregate crushing Value in % | 15.41 % | |

### 4.4 Ductility test for bitumen:

This test is done to determine the ductility of distillation residue of cutback bitumen, blown type bitumen and other bituminous products as per IS: 1208 – 1978.

| **Type of Bitumen** | **Conventional Bitumen** | | **Bitumen With Nylon Fiber** | |
|---|---|---|---|---|
| **Reading** | **Sample 1** | **Sample 2** | **Sample 1** | **Sample 2** |
| **Initial reading** | 00 | 00 | 00 | 00 |
| **Final reading** | 41 cm | 43 cm | 12 cm | 16 cm |
| **Ductility** | 41 cm | 43 cm | 12 cm | 16 cm |
| **Mean value of ductility** | **42 cm** | | **14 cm** | |

### 4.5 Penetration test for Bitumen:

In this test we examine the consistency of a sample of bitumen by determining the distance in tenths of a millimetre that a standard needle vertically penetrates the bitumen specimen under known conditions of loading, time and temperature.

| **Type of Bitumen** | **Conventional Bitumen** | | | | **Bitumen With Nylon Fiber** | | | |
|---|---|---|---|---|---|---|---|---|
| **Sr No.** | **Initial reading** | **Final reading** | **Difference** | **Average** | **Initial reading** | **Final reading** | **Difference** | **Average** |
| 1 | 00 | 87 | - | **93.66** | 00 | 102 | --- | **109** |
| 2 | 00 | 92 | 5 | | 00 | 110 | 8 | |
| 3 | 00 | 102 | 10 | | 00 | 115 | 5 | |

## 5. Conclusion:

The compressive strength of Bituminous mix is one of the most important and useful properties for road construction. In most structural applications bitumen is employed primarily to resist compressive stresses. Therefore, the bituminous mix making properties of various ingredients of mix are usually measured in terms of the compressive strength. The results indicate that the bituminous mix properties were significantly influenced by using fibre. From the penetration test result of

conventional bitumen & Bitumen with Nylon Fiber result, it is clearly show that & Bitumen with Nylon Fiber has highest penetration value with 109 cm and from the ductility test result of conventional bitumen & Bitumen with Nylon Fiber result, it is clearly show that & Bitumen with Nylon Fiber has lowest penetration value with 14 cm, it is evident that for improving the properties of bitumen. In the present investigation, though the available results clearly imply the influence of nylon fibre on the properties of bitumen, it is deemed essential to extend the present studies using different types of aggregate and binders to conclude precisely that the relationships apply irrespective of the constituent types.

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