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## Study of bituminous mixes made with cellulose fiber

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### ABSTRACT

*In the present experimental investigation, attempts are made to study on the various properties like penetration test, ductility test, softening point test, specific gravity test, viscosity test, flash and fire point test, Experiments were conducted for both Ordinary bitumen and cellulose fiber bitumen. It was observed that as the addition of cellulose fiber bitumen mix increases, and penetration value decreasing with increasing percentage of cellulose fiber in bitumen mix. Ductility of cellulose fiber percentage increasing with increasing ductility of cellulose fiber bitumen similarly flash and fire value increasing with increasing fiber in bitumen. Finally observed that maximum value stability obtained in 5% bitumen with 0.3 % cellulose fiber 1953kg. further in future use of bitumen 5% and cellulose fiber 0.3% is more suitable mix compare to another mix.*

**Keywords:** Cellulose Fiber, Penetration, Ductility, Flash and Fire Test, Softening Point, Marshall Stability

### 1. INTRODUCTION

Construction of highway involves huge outlay of investment. A precise engineering design may save considerable investment as well a reliable performance of the in-service highway can be achieved. Two things are of major considerations in flexible pavement engineering Pavement design and the mix design. The present study is related to the mix design considerations. A good design of bituminous mix is expected to result in a mix which is adequately (i) strong (ii) durable (iii) resistive to fatigue and permanent deformation (iv) environment friendly (v) economical and so on. A mix designer tries to achieve these requirements through a number of tests on the mix with varied proportions and finalizes with the best one. The present research work tries to identify some of the issues involved in this art of bituminous mix designed the direction of current research. Cellulose fibers are fibers made with ethers or esters of cellulose, which can be obtained from the bark, wood or leaves of plants, or from other plant-based material. Cellulose fiber are also known as manufactured fibers that are either made from the cellulose of wood pulp or from the stalks of plants.

### 2. MATERIALS USED

#### 2.1 Fine aggregate

An aggregate which has great and adequate quality, hardness, strength and sufficiency must be picked. Squashed totals produce higher strength. Basic physical parameters of aggregates are found using various tests as tabulated in tab the specific gravity 2.73 and water absorption 0.39 % percentages. Aggregate impact value is 22.91 respectively

#### 2.2 Bitumen

Bitumen is a material which is a byproduct of petroleum refining process. It is a highly viscous at temperature above 100 degrees Celsius and is solid at room temperature. In this study bitumen used is 80/100 grade. Basic physical parameters of bitumen are found using various tests as tabulated in table.

#### 2.3 Cellulose fiber

Cellulose fibers are fibers made with ethers or esters of cellulose, which can be obtained from the bark, wood or leaves of plants, or from other plant-based material. In addition to cellulose, the fibers may also contain hemicellulose and lignin, with different percentages of these components altering the mechanical properties of the fibers. The main applications of cellulose fibers are in the textile industry, as chemical filters, and as fiber-reinforcement composites, due to their similar properties to engineered fibers, being another option for biocomposites and polymer composites. Specific gravity of Cellulose fiber is 0.72 and diameter of Cellulose fiber 4mm and 6-7 mm length use in the bitumen.



Fig. 1: cellulose fiber

### 3. MIX PROPORTIONS

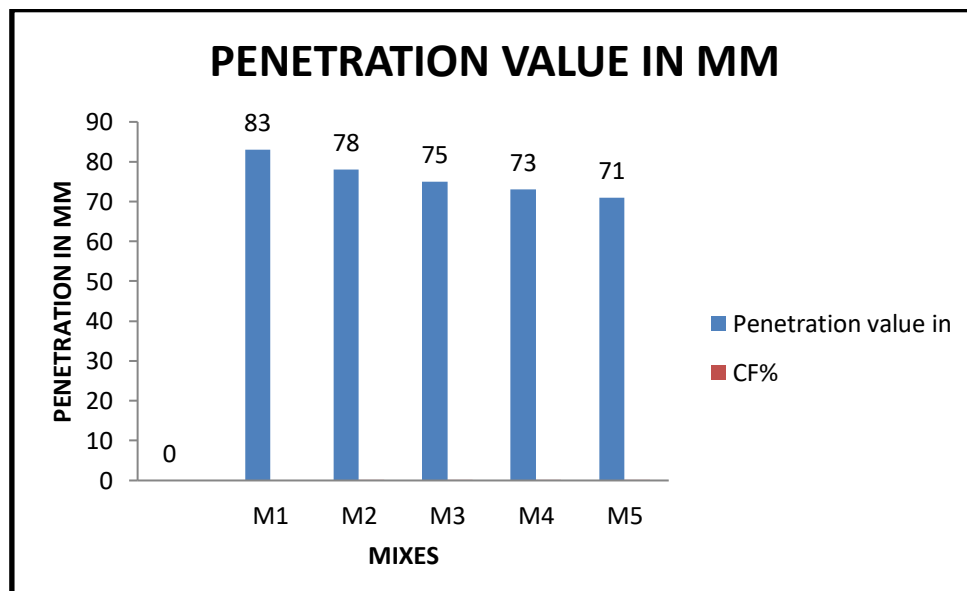
Table 1: Mix details

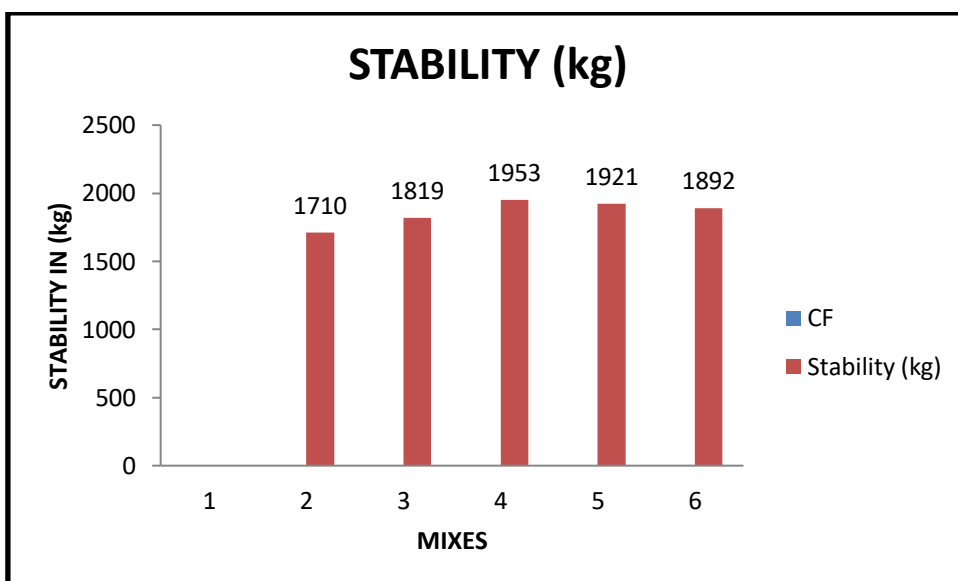
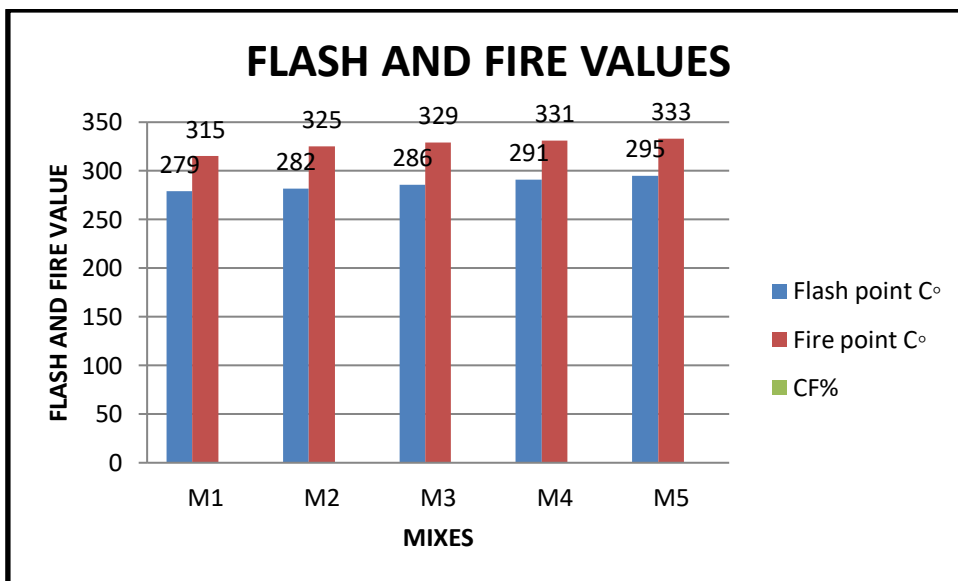
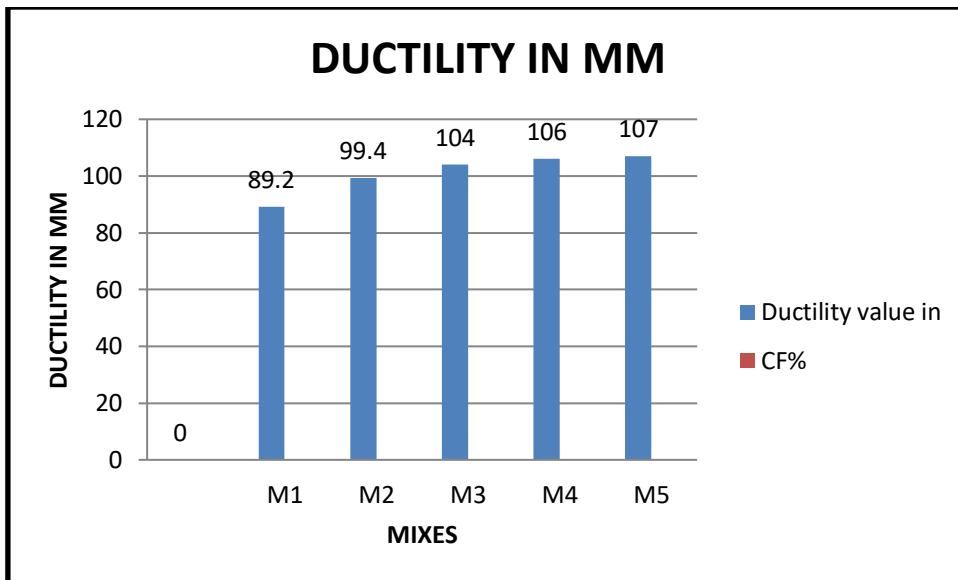
Mix. No.	CF%
M1	0%
M2	0.2%
M3	0.3%
M4	0.4%
M5	0.5%



### 4. RESULT AND DISCUSSION ON EXPERIMENTAL TESTS

#### 4.1 Penetration Results





## 5. CONCLUSIONS

### 5.1 Introduction

In the current investigation, cellulose fiber was used to examine the performing basic tests such as Penetration, Ductility, Softening Point, Flash and Fire Point and Marshall Stability Values Tests. Some of the significant conclusions and observations emerging from the present study are given below.

### 5.2 Conclusions

- Cellulose fiber can be efficiently used to produce good quality bitumen mix with satisfactory all properties. The test results shows that results are within the permissible limits prescribed by the IS Standards.
- It was observed that penetration value decreasing with increase percentage of cellulose fiber.
- It is found that ductility of bitumen increase with use of cellulose fiber in bitumen.
- It is found that flash and fire value increase with increase percentage of cellulose fiber in bitumen. Mix respectably.
- Under certain conditions, addition of cellulose fiber in bitumen of appears to increase the strength and stability of bitumen pavement
- It is observed that the Marshal Stability value is Maximum at 0.3% of cellulose fiber added in bitumen at 5% adding bitumen.

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