



## Effect of using Fibre on the Durability of Asphalt Pavement

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### Abstract

Using the fibre additives with a uniform distribution in asphaltic concrete mixture is a well-known technique for improving the mechanical properties and durability of asphalt pavement. The purpose of this study is to investigate the effect of preparing fibre and production of the properties of bitumen and asphalt concrete mixture. In this study, a dense-graded aggregation, mineral fibres (asbestos) and synthetic fibres (polyester and nylon) were used. Laboratory studies were done by comparing different rheological properties, mechanical and moisture susceptibility of mixtures of fibres. Results of the penetration and softening point on mixtures of bitumen – fibre show that fibres improve the mixed rheological properties and stiffening effect of fibre properties. The results of Marshall Tests indicate that adding fibres reduces the strength in Marshall and results in the slight increase in the percentage of optimum bitumen content and asphalt percentage of air voids in comparison with typical fibre. The results of the indirect tensile tests showed that the addition of fibres, depending on the percentage of fibres significantly improves the durability of the mixture.

*Keywords:* Bitumen; Asphalt Pavement; Durability; Mineral Fibres; Synthetic Fibres.

## 1. Introduction

Durability of asphalt mixtures means the resistance against the effects of traffic and weather conditions. The effect of traffic depends on the wheel pressure, traffic speed and volume of traffic. Effects of environmental conditions, including changes in the properties of bitumen and the effect of temperature and water *Polymerization and Oxidation* and repeated freezing which causes stripping and segregation. Durability of asphalt mixtures can be increased by using the percentage of bitumen and et al.

### 1.1. Using Fibres in Asphalt Mixtures

Serfys and Samanos [1] used asbestos (Chrysotile), rock wool, fibreglass and cellulose in asphalt pavement. The experimental results on mixtures of bitumen - fibres showed that adding fibre to bitumen increases the Softening point of bitumen – fibre mixture in other words the bitumen – fibre mixture is harder than the original bitumen. The addition of fibres to the asphalt concrete mixture improves the bitumen characteristics and reduces bitumen drainage that reduces the bitumen content and increases the slippery resistance. The fibres increase the bitumen cover on aggregates is reducing and causes hardening of bitumen and improving the bitumen characteristics. The experimental results on the mixture of asphalt with fibre showed that fibre modified mixture have higher fibres resistant to cracking, fatigue, and moisture compared to unmodified mixtures. Also those showed that the mixtures of asphalt with asbestos fibres than control samples, have more bitumen content, but those have a good resistance.

Stuart and Malm Quest [2] used polymer additives, cellulose fibres and wool in aggregates asphalt mixtures (mastic asphalt) to reduce the drainage properties of bitumen. The results of drainage test showed that fibre has a very important effect in reducing the drainage of bitumen and polymer stabilization, but polymers does not have any effect on the drainage of bitumen. Results of wheel rutting on asphalt mixtures containing cellulosic fibres and polymer

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