

## Use of Cellulosic Fibres in Double Layer Porous Asphalt

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**Abstract :** Climate change, namely precipitation patterns alteration, has led to extreme conditions such as floods and droughts. In turn, excessive construction has led to the waterproofing of the soil, increasing the surface runoff and decreasing the groundwater recharge capacity. The permeable pavements used in areas with low traffic lead to a decrease in the probability of floods peaks occurrence and the sediments reduction and pollutants transport, ensuring rainwater quality improvement. This study aims to evaluate the porous asphalt performance, developed in the laboratory, with addition of cellulosic fibres. One of the main objectives of cellulosic fibres use is to stop binder drainage, preventing its loss during storage and transport. Comparing to the conventional porous asphalt the cellulosic fibres addition improved the porous asphalt performance. The cellulosic fibres allowed the bitumen content increase, enabling retention and better aggregates coating and, consequently, a greater mixture durability. With this solution, it is intended to develop better practices of resilience and adaptation to the extreme climate changes and respond to the sustainability current demands, through the eco-friendly materials use. The mix design was performed for different size aggregates (with fine aggregates &ndash; PA1 and with coarse aggregates &ndash; PA2). The percentage influence of the fibres to be used was studied. It was observed that overall, the binder drainage decreases as the cellulose fibres percentage increases. It was found that the PA2 mixture obtained most binder drainage relative to PA1 mixture, irrespective of the fibres percentage used. Subsequently, the performance was evaluated through laboratory tests of indirect tensile stiffness modulus, water sensitivity, permeability and permanent deformation. The stiffness modulus for the two mixtures groups (with and without cellulosic fibres) presented very similar values between them. For the water sensitivity test it was observed that porous asphalt containing more fine aggregates are more susceptible to the water presence than mixtures with coarse aggregates. The porous asphalt with coarse aggregates have more air voids which allow water to pass easily leading to ITRR higher values. In the permeability test was observed that asphalt porous without cellulosic fibres presented had lower permeability than asphalt porous with cellulosic fibres. The resistance to permanent deformation results indicates better behaviour of porous asphalt with cellulosic fibres, verifying a bigger rut depth in porous asphalt without cellulosic fibres. In this study, it was observed that porous asphalt with bitumen higher percentages improve the performance to permanent deformation. This fact was only possible due to the bitumen retention by the cellulosic fibres.

**Keywords :** binder drainage, cellulosic fibres, permanent deformation, porous asphalt

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