“Evaluation of the durability of bituminous mixtures SMA in the laboratory"

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Cracking is one of the most common causes of bituminous pavement distress and reduces its service life due to the application of lower cyclic load levels causing significantly lower stresses than the maximum stress that the material can withstand.

Fatigue involves the loss of mechanical properties of the section and the pavement’s structure resulting in a crack, which can become mainstream in time. This cracking eventually leads to an increasing the deflections and a decreasing of the bearing capacity, which are reflected in the value of the stiffness modulus.

Is for these reasons that knowing the behaviour of bituminous mixtures against fatigue solicitations is of vital importance to the development and the maintenance of infrastructures, and therefore, different types of mixtures are developed to improve performance with respect to failure by fatigue, one of them are called Stone Mastic Asphalt (SMA).

Stone Mastic Asphalt is characterized by its high stone content which forms a gap graded skeleton like stone structure. The voids of the structural matrix are filled with a high viscosity bituminous mastic.

This thesis evaluates the durability of bituminous mixtures SMA through the determination of the cracking resistance of two mixtures. This behaviour is performed by applying a standard test, four-point bending, and otherwise with the new tests: EBADE and FÉNIX developed by the Road Research Laboratory of the Technical University of Catalonia (UPC).

Both mixtures have been made using the same polymer modified bitumen (BM-3c) in similar proportion and different aggregate gradations. Likewise in both mixtures have been added cellulose fibers (Viatop 0.3%) in order to to confer greater stability and to prevent the segregation of the binder. These studied mixtures are named SMA 11 and SMA 16.

As a result of the tests, we found that SMA mixtures have an excellent performance against fatigue cracking. Likewise, it has been concluded that usually they have a ductile behaviour and flexible.

Finally, the main conclusion is the high durability and resistance to fatigue cracking of the SMA mixtures. So, despite their limited use in our country, we should stay with the idea that they are mixtures that can be used in response to different questions raised in the area of bituminous pavements.