

# TENSILE BEHAVIOUR OF THIN FILMS OF BITUMEN

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## SUMMARY

The adhesive and cohesive properties of bitumen have resulted in their widespread usage in the road construction industry. Tests must be performed on the bitumen to ensure that it has the necessary properties for its use in the proposed pavement system under the expected conditions of load and environment.

Most tests used to assess the properties of bituminous materials are designed to test bitumen in bulk and therefore do not simulate actual field conditions. In a pavement structure, bitumen forms thin films between the aggregate surfaces. The thin film physical properties of a material are different from their properties when measured in bulk. When evaluating the tensile stress of bitumen it is desirable to test thin films in the range of thicknesses expected to be encountered in pavement structure.

This study reports the results of a laboratory investigation on the tensile properties of thin bitumen films. The variables studied were film thicknesses (from 30 $\mu$  to 200  $\mu$ ), testing temperature (0°C, 20°C and 60°C) and binder type (a base bitumen 100 penetration and two polymer modified binders). The experiments were carried out at a constant rate of extension 100mm/min.

The results show that film thickness and temperature determine the type of failure in tension. Bitumen in thick films and high temperature behave as a plastic material and failed by flow. In very thin films and low temperature the bitumen behaves as a brittle solid. The experimental data also indicates that polymer modified bitumens exhibit high tensile strength without reduction of tensile strain. This results in the bitumens' high tensile modulus and high strain capacity.