

FRACTURE MECHANICS OF ASPHALT MIXES

INTRODUCTION

Bituminous mixes are used extensively in the construction of highway pavements. Asphalt pavements have to sustain increasingly large traffic loads. When these loads are combined with adverse environmental conditions, rapid deterioration can result. There are several types of distress that determine pavement performance. Cracking is one of the principal factors, particularly for roads designed for lower traffic volumes. In order to improve the engineering properties of asphaltic materials used in roads, the crack behaviour of asphalt mixes must be understood.

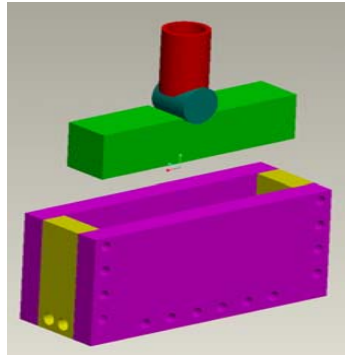


Fatigue cracking [Source: Jackson, 1988]

OBJECTIVE

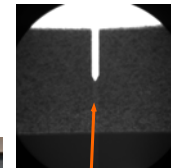
The overall objective of this research is to investigate the micromechanical processes that lead to fracture of asphalt mixes. Experimental and numerical analyses will be performed to study the fracture mechanism of bituminous-mix specimens.

EXPERIMENTAL SETUP

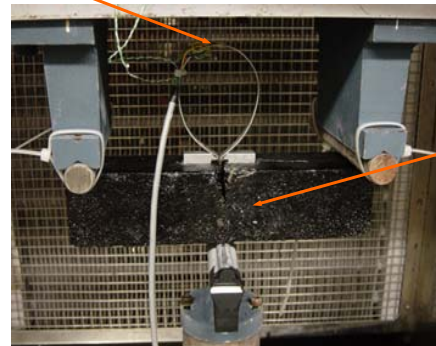


Mould for casting asphalt specimens

Novel clip-gauge



Pre-cracked asphalt beam



3-Point bend test

In the experimental part of this project, 3-point bending tests are performed in order to measure the crack opening displacement of asphalt and pure-bitumen samples which can be used as measures of fracture toughness and fatigue crack growth behaviour.

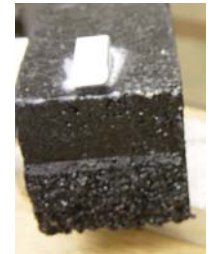
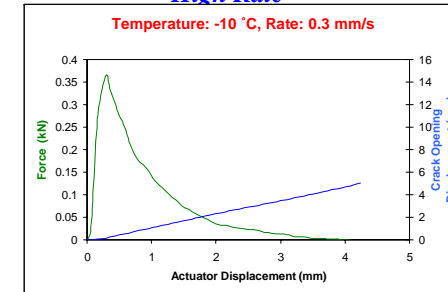
Novel developments:

- Cast beam specimens.
- Novel clip-gauge for measuring CTOP.

PRELIMINARY RESULTS

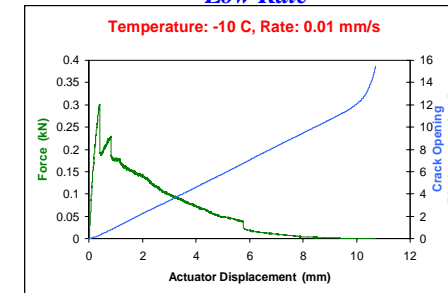
ASPHALT MIX SPECIMENS

High Rate

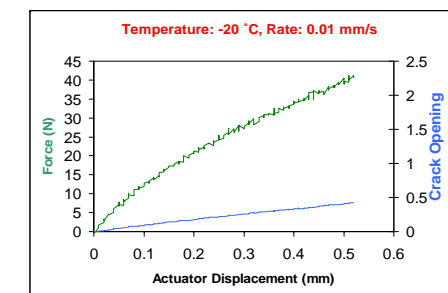


Fracture Surface

Low Rate



PURE BITUMEN SPECIMEN



Fracture Surface

ON-GOING WORK

- Systematic experiments on bitumen (low temperatures) and various asphalt mixes.
- Data analysis.
- Analytical modelling.
- FEA using Costanzi's material model.