## EXPERIMENTAL INVESTIGATION OF THE FRACTURE MECHANICS OF BITUMEN AND ASPHALT MIXES

#### INTRODUCTION

Cyclic thermal and traffic loads are the principal sources of pavement stress which contribute to crack formation and crack growth. In order to improve the serviceability and design methods of pavements, the nature of the process of crack initiation and growth must be better understood.



Fatigue cracking in asphalt pavement

#### **RESEARCH GOAL**

Investigate the fracture processes in pure bitumen and idealised asphalt mixes during monotonic loading over a range of temperatures and loading rates.

### METHODOLOGY FOR FRACTURE CHARACTERIZATION

- 1. 3-Point bend test [SE(B)].
- 2. Fracture parameters: K, G, J-Integral, C\*-Integral.
- 3. Fracture mechanism maps.
- 4. Crack length analysis.
- 5. Fracture and Failure Finite Element Modelling.



Three-point bend fixture and digital image data acquisition system

#### **EXPERIMENTAL RESULTS**



#### O. Portillo and D. Cebon (2008)



#### CONCLUSIONS

•A wide range of crack behaviour was observed including brittle, ductile, transition and crack arrest. These regimes can be seen clearly on the failure mechanism maps.

•Crack length has been measured as a function of time. Ongoing work will evaluate the C\*-integral parameter to determine the best fracture modelling approach.

# ON-GOING WORK FE Modelling with Cohesive Elements Butt Joint Double Cantilever Beam 3-Point Bend

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