

# COMPRESSIVE PERMANENT DEFORMATION BEHAVIOUR OF BITUMEN AND BITUMINOUS MIXTURES



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## BACKGROUND

Permanent deformation is a worldwide distress destructs road pavements and degrades riding quality. It manifests itself as rutting along wheel path due to repeated vehicles passing.

Asphalt mixtures comprises bitumen, filler, aggregate, and air voids. Different proportions of these components that generate various microstructures can produce a wide range of asphalt mixtures.

Bitumen, the main element, is a visco-elastic material that controls the behaviour. Nevertheless, the degree at which different proportions of other components can influence the behaviour is not well understood.

## AIMS AND OBJECTIVES

- Understand filler-bitumen interaction
- Investigate stiffening effect of various aggregates proportions and contents on rutting resistance.
- Characterise aggregates and damage accumulation through X-rays.

- Experimental characterisation of bitumen, mastics, mortars, and asphalt mixtures with creep and creep recovery tests, with models development that correlates well between them.
- Triaxial deformation on asphalt mixtures experimental investigation.
- X-ray application on asphalt mixtures to characterise aggregates.

## METHODOLOGY

## RESULTS

- 2. Stiffening effect of filler against creep deformation (Figure 1) magnifies when the particle interlocking is established with minor temperature dependency.

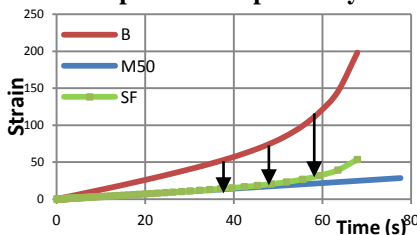


Figure 1. Curve fitting to measure stiffening

- 1. Creep testing of bitumen and mastics revealed that; Steady state deformation of bitumen and mastics is linear at low stress levels and non-linear at higher stresses. In addition, stress limit at which linearity extends is a function of temperature and filler content.

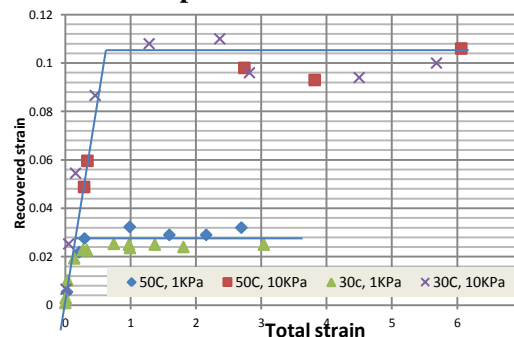


Figure 2. Recovered VS total strains

- 3. Creep-recovery revealed that there is a strain limit after which recovered strain is constant and depends on filler content, temperature and stress level, while before reaching that limit it is independent in a linear relationship with total strain.

- Investigate bitumen, filler and aggregates interactions by means of mortars and asphalt mixtures under creep and recovery tests.
- Apply image processing techniques to characterise damage and aggregates.

## ON PROGRESS AND FUTURE WORK

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