

Numerical modelling of road with chip seal surfacing layer

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Abstract: Most low-traffic roads are primarily thin chip seal surfacing with an unbound granular base and subgrades layers. This paper describes the development of a 3-D numerical model of a low-traffic road. The numerical model was built using the finite element modelling. A 3-D chip seal surface was constructed using Xray tomography scans of multiple layer seal samples removed from a road. Stones particles were modelled as rigid body; the bitumen was modelled as deformable using a viscoelastic constitutive model. A stress dependent nonlinear anisotropic material model was used for the granular base and subgrade. The material parameters for the bitumen and granular layers are estimated using inverse modelling technique from experimental measurements. The inverse model is formulated as a non-linear least squares minimization problem coupled with a finite element model. It is done by constructing an iterative procedure using an optimisation routine in MATLAB's and at each iteration, finite element problem is solved.

Keywords: Finite element modelling; Inverse modelling; Parameter estimation; Chip seal surfacing, Pavement deformation;