SM18S_12634

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

An Elastoplastic Model for Prediction of Permanent Deformations of Unbound Granular Pavement Layers

Absamad El Abd[(1)], Pierre Hornych[(1)], Denys Breysse[(2)], Alain Denis[(2)], Cyril Chazallon[(3)]

(1) *Laboratoire Central des Ponts et Chaussees, Centre de Nantes*
(2) *Centre de Developpement des Geosciences Appliquees, Université de Bordeaux*
(3) *Laboratoire de Genie Civil d'Egletons, Université de Limoges*

This paper presents a simplified method for modelling of permanent deformations in order to estimate the rutting of unbound layers. This method is based on three steps: first, the material is characterised using repeated load triaxial tests, with different stress levels. Then, the tests results are analysed using an elastoplastic model of prediction of permanent deformations recently developed. Finally, a finite element analysis, with the program CESAR-LCPC, is used to determine the stress distribution in the pavement, and subsequently the permanent deformations. The calculation is performed with a CESAR's module, which includes non linear elastic models for unbound granular materials, and visco-elastic models for bituminous materials. The stresses calculated at different points in the structure allow to determine the permanent vertical strains at each point, by applying the permanent deformation model. Finally the permanent strains are integrated along the vertical direction to obtain the vertical displacements in the structure (i.e. rutting of the layer). The elastoplastic model is used to analyse repeated load triaxial tests performed on an unbound granular material tested on the LCPC accelerated pavement testing facility. The effect of the different model parameters on the modelling predictions is analysed and discussed. Finally, the model is applied to simulate the rutting of pavements with different thicknesses of bituminous materials.

View the extended summary