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Sensitivity Analysis of Principal Stresses in Concrete Slab of Rigid Pavement Made From Recycled Materials

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Abstract : Complex sensitivity analysis of stresses in a concrete slab of the real type of rigid pavement made from recycled materials is performed. The computational model of the pavement is designed as a spatial (3D) model, is based on a nonlinear variant of the finite element method that respects the structural nonlinearity, enables to model different arrangements of joints, and the entire model can be loaded by the thermal load. Interaction of adjacent slabs in joints and contact of the slab and the subsequent layer are modeled with the help of special contact elements. Four concrete slabs separated by transverse and longitudinal joints and the additional structural layers and soil to the depth of about 3m are modeled. The thickness of individual layers, physical and mechanical properties of materials, characteristics of joints, and the temperature of the upper and lower surface of slabs are supposed to be random variables. The modern simulation technique Updated Latin Hypercube Sampling with 20 simulations is used. For sensitivity analysis the sensitivity coefficient based on the Spearman rank correlation coefficient is utilized. As a result, the estimates of influence of random variability of individual input variables on the random variability of principal stresses s1 and s3 in 53 points on the upper and lower surface of the concrete slabs are obtained.

Keywords : concrete, FEM, pavement, sensitivity, simulation
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