

## Simplified modelling of a cracked composite pavement

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For the last ten years, new composite pavement structures have raised a significant interest. These are made of a concrete layer bonded on an asphalt sub-base. If the durability of this bond is proved, these structures benefit by a reduction both on the layers thickness and the cost (Pouteau et al., 2004). However, the restrained shrinkage of the concrete layer leads to vertical cracks. As the two materials have different elastic properties, stress singularities appear at the interface on the free edges generated by these cracks. To make a proper analysis of crack initiation and propagation in such a pavement structures, a simplified model (named the multi-particle model of multi-layer materials, M4) linked to the Boussinesq model for the soil has been developed (Tran et al., 2004). This approach has the advantage of reducing the real 3D problem to the determination of regular plane fields  $(x, y)$  per layer and interface. To study the bond of composite pavement structures, an in-situ experiment has been performed using an accelerated pavement loading facility. With that so-called M4-Boussinesq model, the aim of this study is to analysed the initial mechanical fields of that in-situ experiment.

Being in the linear elastic mode, we can superimpose various loading cases. Thus to determine the interface stress state, it is only necessary to study the case where the load is at the edge of the crack. In that case, following figures show maximum shear  $\tau_1^{1,2}(x,0)$  and normal  $\nu^{1,2}(x,0)$  stresses at the edge of the crack at the interface between the concrete ( $e_1 = 0.08m$ ,  $E_1 = 36500 MPa$ ,  $\nu_1 = 0.25$ ) and the asphalt ( $e_2 = 0.095m$ ,  $E_2 = 8485 MPa$  et  $\nu_2 = 0.35$ ) layers (Guillo, 2004).

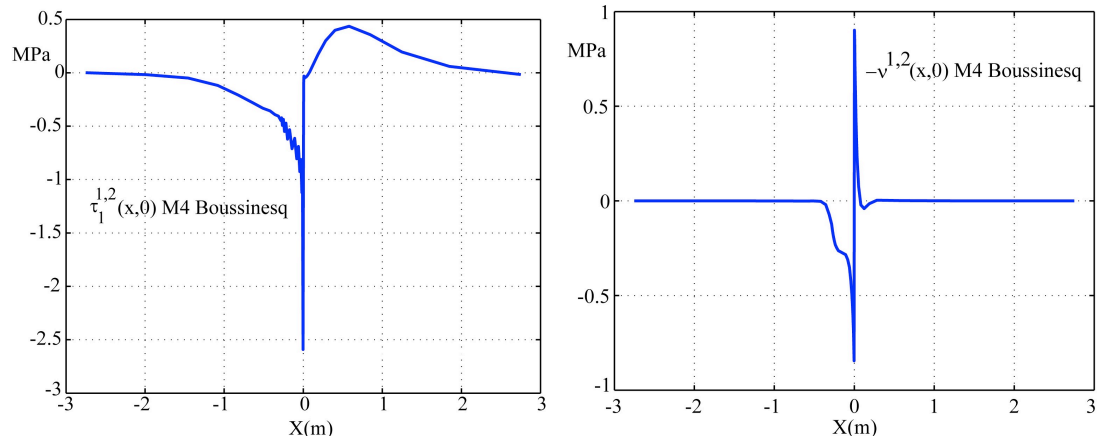


Figure 1: M4- Boussinesq stress fields between the cracked concrete layer and the asphalt layer

The opening of the centred vertical concrete crack is 0.005m. The load is uniformly distributed ( $q=0.662 MPa$ ) on a rectangular area ( $0.14 \times 0.09 m^2$ ). The half space soil has for Young modulus  $E_s = 120 MPa$  and Poisson's ratio  $\nu_s = 0.35$ .

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