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Use of FWD in Determination of Bonding Condition of Semi-Rigid Asphalt Pavement

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Abstract : In this paper, falling weight deflectometer (FWD) was used to determine the bonding condition of a newly constructed semi-rigid base pavement. Using Evercal back-calculation computer programme, it was possible to quickly and accurately determine the structural condition of the pavement system of FWD test data. The bonding condition of the pavement layers was determined from calculated shear stresses and strains (relative horizontal displacements) on the interface of pavement layers from BISAR 3.0 pavement computer programmes. Thus, by using non-linear layered elastic theory, a pavement structure is analysed in the same way as other civil engineering structures. From non-destructive FWD testing, the required bonding condition of pavement layers was quantified from soundly based principles of Goodman's constitutive models shown in equation 2, thereby producing the shear reaction modulus (Ks) which gives an indication of bonding state of pavement layers. Furthermore, a Tack coat failure Ratio (TFR) which has long being used in the USA in pavement evaluation was also used in the study in order to give validity to the study. According to research [39], the interface between two asphalt layers is determined by use of Tack Coat failure Ratio (TFR) which is the ratio of the stiffness of top layer asphalt layers over the stiffness of the second asphalt layer (E1/E2) in a slipped pavement. TFR gives an indication of the strength of the tack coat which is the main determinants of interlayer slipping. The criteria is that if the interface was in the state full bond, TFR would be greater or equals to 1 and that if the TFR was 0, meant full slip. Results of the calculations showed that TFR value was 1.81 which re-affirmed the position that the pavement under study was in the state of full bond because the value was greater than 1. It was concluded that FWD can be used to determine bonding condition of existing and newly constructed pavements.

Keywords : falling weight deflectometer (FWD), backcaluclation, semi-rigid base pavement, shear reaction modulus
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