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Ground Penetrating Radar as a powerful tool for use in pavement evaluation and overlay design

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Increasing shifts in resource allocation characterized by the preference of pavement reinforcement or rehabilitation, over new pavement construction, highlights the importance and necessity of both accurate and comprehensive pavement performance assessments. Multiple studies have addressed pavement performance assessment with the goals being amongst others the development of improved methods for the determination of remaining pavement service life and the non-destructive structural evaluation of in-service pavements. In addition various Non Destructive Testing (NDT) methods have been developed to assess the existing pavement structural condition and subsequently identify the necessary corrective actions.

The geophysical Ground Penetrating Radar (GPR) technique is amongst these NDT methods and its utilization is rapidly expanding for uses in mapping subsurface conditions. The measuring speed and high-resolution capabilities of the GPR method makes it well suited for road monitoring integrated into reliable pavement evaluation processes. GPR is utilized by pavement engineers to determine the thickness of a pavement structure without resorting to excavation, and additionally it has the potential to find utilities and/or other subsurface objects. However, GPR is not well suited for determining stiffness parameters and therefore, coring or other non-destructive methods are necessary to compliment GPR data. One such effective, non-destructive method is Falling Weight Deflectometer (FWD) technique that can support the decision for pavement maintenance.

The present paper describes a test protocol for the collection, interpretation and analysis of GPR data for in-service pavements that need to be maintained. However, when major maintenance or repairs, such as an overlay is needed, more data are required for structural modeling. Such information allows the pavement engineer to calculate both the necessity for and the required design of additional layers. In order to better estimate the overlay design, the paper investigates an effective approach for combining GPR and FWD data in order to assess pavement performance of defected pavements and eventually to model the necessary overlay(s). An example case from a highway where the suggested approach was implemented is included in the paper. The example concerns mainly a comparison of the overlay requirements in both cases where GPR and coring data are used for the analysis. The comparison results produce evidence in support of the statement that the use of GPR data for the estimation of asphalt layer thicknesses contributes effectively to the overlay design and optimizes the pavement maintenance activities. Consequently it can be concluded that GPR is a powerful engineering tool for pavement performance assessment to determine optimum solutions regarding pavement interventions.