

flexible pavement distress this research investigates the fundamentals of rutting behavior for full depth flexible pavements the scope incorporates an experimental study using full scale accelerated pavement tests apt to monitor the evolution of the transverse profiles of each pavement structural layer the findings were then employed to improve the rutting model that is embedded in the current pavement design method the mechanistic empirical pavement design guide mepdg four apt sections were constructed using two typical pavement structures and two types of surface course material a mid depth rut monitoring and automated laser profile system was designed to reconstruct the transverse profiles at each pavement layer interface throughout the process of accelerated pavement deterioration that is produced during the apt the contributions of each pavement structural layer to rutting and the evolution of layer deformation were derived this study found that the permanent deformation within asphalt concrete does not increase with an increase in pavement thickness once the pavement is sufficiently thick additionally most pavement rutting is caused by the deformation of the asphalt concrete with about half the amount of rutting observed within the top four inches of the pavement layers and only around ten percent of rutting observed in the subgrade a guideline was developed to calibrate the mepdg prediction models using a database that contains both apt sections and field roadway segments and accounts for the rutting in individual pavement layers a procedure was developed to provide the most faithful simulations of the apt conditions using virtual weather station generation special traffic configuration and falling weight deflectometer evaluation new calibration factors of the mpegd rutting model from this study have been successfully implemented by the indot design team since 2017

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roadway construction is challenging since it is hard to control and there are many factors that might change the quality of the resulting roadway pavement thickness variation is one of those factors that varies due to poor construction practices as it was observed that the variabilities in pavement thicknesses affect the overall flexible pavement performance this research study examined the effect of the asphalt layers thickness variability on flexible pavement structural capacity and performance two non destructive testing ndt devices including ground penetrating radar gpr and falling weight deflectometer fwd were used in this study layer thicknesses were obtained using both extracted field cores and gpr while fwd was utilized to back calculate layers moduli using deflections measured on each pavement layer the structural capacity represented by the effective structural number sneff of each roadway section was calculated according to the aashto 1993 procedures while pavement performance was evaluated using the mepdg software for just the thinnest 5eb and thickest 6wb roadway sections two mepdg runs were conducted for each roadway section which includes using the planned and as constructed thicknesses results revealed that the structural capacity of all roadway sections had a sneff value greater than the designed sn values calculated ranged from 7.0 to 10.31 because each section had a subgrade modulus and total pavement thickness that varied from others predicted performance results showed that the runs conducted using mepdg software passed all indicators except the thermal cracking even though the two roadway sections failed by thermal cracking and passed other indicators it was found that as the thickness of the ac layer increase the predicted performance value of all distresses and iri will decrease therefore it was concluded that the thickness variability across all tested roadway sections in this research study did not affect the flexible pavement s structural capacity however the performance of tested roadway sections was impacted

pavements are the most ubiquitous of all man made structures and they have an enormous impact on environmental quality they are responsible for hydrocarbon pollutants excess runoff groundwater decline and the resulting local water shortages temperature increases in the urban heat island and for the ability of trees to extend their roots in

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