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SUMMARY REPORT

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CALIBRATION OF THE AASHTO PAVEMENT DESIGN GUIDE TO SOUTH CAROLINA CONDITIONS – PHASE I

This report presents the findings from a study undertaken to identify existing historical data within the South Carolina Department of Transportation (SCDOT) for use in the local calibration of the Mechanistic Empirical Pavement Design Guide (MEPDG) for South Carolina (SC). Priority was given to identifying and reviewing pavement performance data collected from high traffic primary and interstate routes across SC. The review process focused on pavements constructed between 1985 and 2000 to best represent SCDOT's current design, materials, and construction practices. Historical data for both asphalt concrete (AC) and Portland cement concrete (PCC) pavement sections located within the SCDOT Office of Materials and Research, Division of Traffic Engineering, and Division of Maintenance were reviewed, and information gaps were identified. The existing historical data found to be compatible with the MEPDG protocol were compiled and 20 in-service pavement sections - 14 AC sections with lengths ranging from 1.0 to 24.35 miles and 6 PCC sections with lengths ranging from 1.47 to 14.17 miles - were selected from 15 counties. The major categories of data include climate, traffic, pavement structure and materials, and pavement performance. For 3 of these sections (i.e., 1 in the Piedmont Region and 2 in the Coastal Plain), field sample collection, Falling Weight Deflectometer tests, soil classification, and resilient modulus tests were performed to determine project specific material inputs.

The data collected for the 20 pavement sections was used to perform a preliminary analysis

of the MEPDG AC rutting models, AC fatigue cracking models, AC transverse cracking model, and the JPCP transverse cracking model. Inputs for the analysis were from all 3 hierarchical categories: Level 1 (project specific), Level 2 (region specific), and Level 3 (national or default values). Level 2 and Level 3 inputs were used for many of the material property inputs due to their unavailability in the SCDOT files and databases for the selected 20 pavement sections. SCDOT measures IRI, rutting, fatigue cracking, longitudinal cracking, and transverse cracking for AC pavements; however, the cracking and rutting data cannot be implemented into MEPDG with the highest confidence level because bottom-up and top-down cracking are not clearly distinguished by their visual inspection procedure and only the total rut depth is measured. Because not all of the necessary data was available in the SCDOT files and databases, and the quality of the distress data is uncertain, the local calibration factors presented herein are preliminary, and are not recommended to be used for design until further research is performed in a Phase II study to obtain high quality, high priority data.

Tasks that need to be performed as part of a Phase II study before the MEPDG local calibration can be performed for SC with confidence include: (1) Identify additional pavement sections (i.e., AASHTO (2010) recommends using data from 30 pavement sections to calibrate load related cracking models); (2) Collect distress survey data and perform trench studies (i.e., distinguish between top-down and bottom-up cracking and measure rut depth of individual pavement layers); (3) Collect high priority materials data for AC, PCC and unbound base pavement layers; (4) Install portable WIM stations to obtain load spectra; and (5) Study the seasonal variation of subgrade modulus. Then, after the models are calibrated for SC conditions in a Phase II study, a Phase III study will need to be performed to identify additional pavement sections to validate the models. Fully instrumented test sections will need to be constructed to monitor long-term pavement performance.

This research project was conducted at the University of South Carolina by Sarah L. Gassman, Ph.D., P.E. and M. Mostaqur Rahman.
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