Project Title: Interconversion of Dynamic Modulus, E* to Creep Compliance, D(t) and Relaxation Modulus, E(t): Numerical Modeling and Laboratory Validation

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Abstract:
Asphalt concrete’s (AC) dynamic modulus (E*) and creep compliance (D(t)) are important input parameters for asphalt pavement design using the new Pavement ME Design software. In this software, the E* of asphalt concrete is used to predict rutting and fatigue cracking of asphalt concrete in addition to mechanical stress-strain calculations, and D(t) is primarily used to predict low temperature cracking in asphalt pavements. Therefore, both E* and D(t) tests are required to be performed separately, which have resulted in significant volume of laboratory work and necessitated for expensive and sophisticated laboratory equipment and technicians. As such, if D(t) values of an asphalt concrete can be derived from E* test data, laboratory time and expenses can be saved. To this end, this study proposes to conduct dynamic modulus (E*) testing on selected asphalt mixes collected from actual pavement construction sites, develop methods/codes based on existing theory or modifying existing theory to convert dynamic modulus to creep compliance, and validate the numerical E*-D(t) interconversion protocol using actual creep test data generated through laboratory testing. In addition, selected relaxation modulus (E(t)) testing will be performed for examination and validation of E*-E(t) numerical interconversion. It is hoped that D(t) or E(t) testing can be eliminated or at least can be reduced and thus this study will expedite the use of new Pavement ME design software at its full benefit.