Arkansas Department of Transportation

Transportation Research Committee

RESEARCH PROBLEM STATEMENT

DATE: 09/10/2017 PROJECT AREA: Materials

TITLE: Elimination of Empirical, Ineffective and Expensive PG Plus Test

PROBLEM STATEMENT:

Like some other state DOTs, ArDOT evaluates high temperature resistance of asphalt binders by using a dynamic shear rheometer (DSR) in accordance with AASHTO T 315, which is unable to adequately capture the effects of elastomeric modification. Thus, ArDOT requires to conduct a PG (Performance Grade) Plus test, namely, Elastic Recovery (AASHTO T 301), which is empirical in nature, expensive and time consuming. Findings of a recent project, TRC 1501, reveals that the Elastic Recovery test is ineffective to characterize high PG grade binders (i.e., PG 70-22 or PG 76-22) modified with non-polymeric additives such as acid. On the other hand, the recently released multi stress creep recovery (MSCR) test (AASHTO T 350) is meant to replace AASHTO T 315 along with the PG Plus tests. The MSCR test is usually performed at 64 degree Celsius at two consecutive stress levels (0.1 kPa and 3.2 kPa) by applying a haversine load for 1 second followed by a 9-second rest period, which mimics the actual traffic condition and pavement temperature. At each stress level, 10 creep-recovery cycles are applied and the recoverable and non-recoverable strains are estimated. Based on non-recoverable strains and local traffic condition, MSCR grading of the binder is performed. Neighboring states of Arkansas have already adopted (fully or partially) the MSCR test method in their quality control processes. For ArDOT to adopt AASHTO T 350, local binders will have to investigated with respect to local weather and traffic conditions along with the ArDOT Elastic Recovery requirements. Also, both ArDOT and refineries needs to on-board with the process so that the former will be paying based on the quality of binders being received from the latter. Since AASHTO T 350 is not effective for acid-modified binders, the effective of other mechanistic tests and chemical based test methods such as FTIR (Fourier-transform Infrared) spectroscopy and SARA (saturate, aromatic, resin and asphaltene) analysis will explored to find simple and effective test protocols for characterizing high PG grade binders irrespective of the modification process.

OBJECTIVES:

Specifically objectives of the proposed study are given below:
1. Test ArDOT certified binders with respect to local service conditions (temperature and traffic levels) by following MSCR and Elastic Recovery test methods
2. Develop guidelines toward adopting AASHTO T 350 so that neither suppliers nor users are penalized
3. Perform chemical analyses (e.g. FTIR and SARA) and other mechanistic tests to characterize non-polymeric high PG binders.
4. Propose a simple and effective test method for characterizing non-polymeric high PG grade binders (PG 70-22 and PG 76-22)

FORM OF RESEARCH IMPLEMENTATION:

1. A report containing guidelines adopting AASHTO T 350 and the proposed technique to characterize non-polymeric high grade binders.
2. A workshop as a technology transfer seminar for local suppliers and ArDOT personnel.

Estimated Project Duration: 24 months
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Standing Subcommittee Ranking: 4 / 12 Advisory Council Ranking: 29 / 44

Statement Combined with Statement Number(s)

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