Standard Method of Test for

Stress Sweep Rutting (SSR) Test Using Asphalt Mixture Performance Tester (AMPT)

AASHTO Designation: TP 134-19[1]

Technical Subcommittee: 2d, Proportioning of Asphalt–Aggregate Mixtures

Release: Group 3 (July)

AASHTO

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1. SCOPE

1.1. This standard describes a test method to characterize the resistance of asphalt mixtures to rutting using the shift model. The stress sweep rutting (SSR) tests are conducted using the Asphalt Mixture Performance Tester (AMPT).

1.2. This standard is applicable to laboratory-prepared specimens of asphalt mixtures with a nominal maximum aggregate size that is less than or equal to 37.5 mm (1.5 in.).

1.3. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to its use.*

2. REFERENCED STANDARDS

2.1. *AASHTO Standards*:

- R 83, Fabrication of Cylindrical Performance Test Specimens Using the Superpave Gyratory Compactor (SGC)
- T 312, Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of The SHRP Gyratory Compactor
- T 378, Preparing and Determining the Dynamic Modulus and Flow Number for Asphalt Mixtures Using the Asphalt Mixture Performance Tester (AMPT)

2.2. *Federal Highway Administration*:

- Kim, Y. R., et al. *Development of Asphalt Mixture Performance Related Specifications*, Final Report, FHWA Project No. DTFH61-08-H-00005, 2018.

2.3. *Other Documents*:

- Choi, Y. and Y. R. Kim. Implementation and Verification of a Mechanistic Permanent Deformation Model (Shift Model) to Predict Rut Depths of Asphalt Pavement. *Road Materials and Pavement Design*, Vol. 15, 2014, pp. 195–218.
- Kim, D. and Y. R. Kim. Development of Stress Sweep Rutting (SSR) Test for Permanent Deformation Characterization of Asphalt Mixture. *Construction and Building Materials*, Vol. 154, 2017, pp. 373–383.

3. TERMINOLOGY

3.1. *confining pressure*—stress applied to all surfaces in a confined test.

3.2. *deviatoric stress*—difference between the vertical stress and the confining pressure.

3.3. *loading block*—200 repetitions of loading cycles.

3.4. *permanent strain*—non-recovered strain in a repeated load test.

3.5. *repeated load cycle*—loading of 0.4 s followed by a 3.6-s rest period at the high test temperature (T_H) and loading of 0.4 s followed by a 1.6-s rest period at the low test temperature (T_L).

3.6. *shift model*—permanent strain model that can predict permanent strain under various load times, deviatoric stress levels, and temperatures.

3.7. *vertical stress*—total vertical stress, including applied stress and confining pressure.

4. SUMMARY OF THE TEST METHOD

4.1. The SSR test is conducted at two test temperatures, referred to as T_H (the high temperature) and T_L (the low temperature), and under constant confining pressure of 69 kPa (10 psi), with three 200-cycle loading blocks of three deviatoric stress levels.

4.2. The load pulse is 0.4 s for each cycle. The rest period is dependent on the test temperature. The permanent axial deformation that occurs at each load cycle is measured using actuator displacement.

5. SIGNIFICANCE AND USE

5.1. The SSR test measures permanent deformation characteristics of asphalt mixtures as a function of deviatoric stress, loading time, and temperature. The results from two SSR tests at each of the high and low temperatures can be used to develop the shift model. The shift model has been incorporated into the pavement performance prediction program, FlexPAVE™, to predict the permanent deformation of asphalt layers under various deviatoric stress levels, loading times, and temperatures as a function of pavement depth and time. The SSR test results also can be employed as part of a performance-engineered mix design for asphalt mixtures.

5.2. The shift model is based on the permanent deformation behavior of an asphalt mixture in the primary and secondary regions. If tertiary flow occurs during the SSR test, the applicability of the shift model to the test results depends on when the tertiary flow occurs. If the tertiary flow occurs during the first or second loading blocks, the test results should not be used to develop the shift model. If the tertiary flow occurs toward the end of the third loading block, the test results can be used to develop the shift model.

6. APPARATUS

6.1. *Specimen Fabrication Equipment*—Equipment used to fabricate SSR test specimens as described in R 83.

6.2. *Asphalt Mixture Performance Tester (AMPT)*—Dynamic testing apparatus that meets the requirements of Equipment Specification for the Simple Performance Test System, Version 3.0.