Standard Method of Test for

Rutting and Fatigue Resistance of Asphalt Mixtures Using Incremental Repeated Load Permanent Deformation (iRLPD)

AASHTO Designation: TP 116-20 (2021)[1]

Technically Revised: 2020 **Reviewed but Not Updated: 2021** **Editorially Revised: 2021**

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

AASHTO

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1. SCOPE

1.1. This standard describes a test method for measuring the resistance of asphalt mixtures to rutting and fatigue cracking using minimum strain rates (m^*) from an incremental repeated load permanent deformation (iRLPD) test conducted by means of a dynamic testing system (DTS). This practice is intended for dense- and gap-graded mixtures with nominal maximum aggregate sizes to 37.5 mm.

1.2. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns 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.*

1.3. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- R 29, Grading or Verifying the Performance Grade (PG) of an Asphalt Binder
- R 30, Mixture Conditioning of Hot Mix Asphalt (HMA)
- R 83, Preparation of Cylindrical Performance Test Specimens Using the Superpave Gyratory Compactor (SGC)
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
- T 378, Determining the Dynamic Modulus and Flow Number for Asphalt Mixtures Using the Asphalt Mixture Performance Tester (AMPT)

2.2. *Other Document*:

- TRB. Equipment Specification for the Simple Performance Test System, Version 3.0. In Appendix F of *National Cooperative Highway Research Report 629: Ruggedness Testing of the Dynamic Modulus and Flow Number Tests with the Simple Performance Tester*. National Cooperative Highway Research Program, Transportation Research Board, Washington, DC, 2008.

3. TERMINOLOGY

3.1. *Definitions*:

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

3.1.2. *contact stress*—the constant axial stress applied to hold the specimen in place.

3.1.3. *deviator stress*—difference between the total axial stress and the confining pressure in a confined test.*loading increment*—500 cycles of a repeated load.

3.1.4. *loading increment*—500 cycles of a repeated load in the rutting test and 100 cycles of a repeated load in the fatigue test.

3.1.5. *minimum strain rate (m*)*—the lowest permanent strain per cycle in a loading increment, which is the permanent strain due to the last cycle of a loading increment.

3.1.6. *permanent deformation* on-recovered deformation in a repeated load test.

3.1.7. *repeated load cycle*—loading of 0.1 s followed by 0.9-s rest period.

3.1.8. *secondary stage*—the loading cycles where the permanent axial strain rate is stable.

3.1.9. *strain rate*—the permanent axial strain due to one repeated load cycle.

3.1.10. *strain acceleration*—the rate of change of the strain rate.

4. SUMMARY OF THE TEST METHOD

4.1. This test method describes procedures for evaluating resistance of asphalt mixtures to rutting and fatigue cracking by measuring the minimum strain rate (m^*) at the critical temperature and various load levels using the iRLPD method.

4.2. The iRLPD test is conducted at one test temperature and in several increments. The deviator load is held constant during each increment and is increased for each subsequent increment. The load pulse is 0.1 s every 1.0 s. Permanent axial strains due to each load cycle (permanent strain rate) are measured by the actuator. The minimum strain rate for each increment is defined as the permanent axial strain due to the last cycle.

4.3. There are two methods of conducting the rutting test.

4.3.1. Method A is conducted on a 150-mm (6.0-in) diameter by 115-mm (4.5-in.) high volumetric specimen without applying confinement, in one increment of 500 cycles.

4.3.2. Method B is conducted on a 100-mm (4.0-in.) diameter by 150-mm (6.0-in.) high cylinder with 69-kPa (10-psi) confinement, in four increments of 500 cycles each.