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Reapproved 1995

ASTM INTERNATIONAL  
1910 ROUTE 2  
PHILADELPHIA, PA 19103  
Approved by the American Society of Civil Engineers, Reapproved 1995

## Standard Test Method for Test for Resilient Modulus of Bituminous

This designation is the number immediately following the designation indicates the year of original approval or the last year of extension, the year of last revision, a number in parentheses indicates the year of last reapproval, and superscripts indicate an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers procedures for preparing and testing laboratory-fabricated or field-constructed cores of bituminous mixtures to determine resilient modulus values using the repeated-load indirect tension test. The procedure described covers a range of temperatures, loads, loading frequencies, and load durations. The recommended test series consists of testing at 41, 77 (Note 1), and 104°F (5, 25 (Note 1), and 40°C) at one or more loading frequencies, for example, at 0.33, 0.5, and 1.0 Hz for each temperature. This recommended series will result in nine test values for one specimen which can be used to evaluate the overall resilient behavior of the mixture.

Note 1—Ambient laboratory temperature may be substituted as appropriate.

1.2 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

### 2. Referenced Documents

- 2.1 ASTM Standards:
  - D 1559 Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus<sup>1</sup>
  - D 1561 Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Rammed Compactor<sup>2</sup>
  - D 1567 Test Method for Compaction and Shear Properties of Bituminous Mixtures by Means of the U.S. Corps of Engineers Cyclic Testing Machine (CTM)<sup>3</sup>
  - D 1568 Method for Preparation of Bituminous Mixture Specimens for Dynamic Modulus Testing<sup>4</sup>
  - D 1575 Specification for Hot Mixed, Hot-Laid Bituminous Paving Mixtures<sup>5</sup>

### 3. Summary of Test Method

3.1 The repeated-load indirect tension test for determining resilient modulus of bituminous mixtures is conducted by applying compressive loads with a hammer or other suitable

waveform. The load is applied vertically in the vertical diametral plane of a cylindrical specimen of asphalt concrete (Fig. 1). The resulting horizontal deformation of the specimen is measured and, with an assumed Poisson's ratio, is used to calculate a resilient modulus. Resilient modulus may also be calculated using the measured horizontal deformations.

3.2 Interpretation of the data revealed in two resilient modulus specimens resilient modulus is a measure of the recoverable deformation that occurs during one cycle of one cycle. The resilient modulus calculated using the total strain includes both the instantaneous recoverable and the time-dependent continuing recoverable deformation during the unloading and re-period portion of one cycle.

### 4. Significance and Use

4.1 The values of resilient modulus can be used to evaluate the relative quality of materials as well as to generate input for pavement design or pavement evaluation and analysis. The test can be used to study effects of temperature, loading rate, test periods, etc. Since the procedure is nondestructive, tests can be repeated on a specimen to evaluate conditioning as with temperature or moisture. This test method is not intended for use in specifications.

### 5. Apparatus

5.1 Testing Machine—The testing machine should have the capability of applying a load pulse over a range of frequencies, load durations, and load levels.

Note 2—An electrohydraulic testing machine with a reaction generator capable of producing the desired wave form has been shown to be suitable for use in repeated-load indirect tension testing. Other commercially available or laboratory constructed testing machines such as those using pneumatic repeated loading can also be used. However, these latter machines may not have the load capability to handle larger specimens at the colder testing temperatures.

5.2 Temperature-Control System—The temperature-control system should be capable of controlling a temperature range from 41 to 104°F (5 to 40°C) and within ±2°F (±1.1°C) of the specified temperature within the range. The system should include a temperature-controlled cabinet large enough to hold at least three specimens for a period of 20 h prior to testing.

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