Designation: D6372 – 05

Standard Practice for Design, Testing, and Construction of Micro-Surfacing[1]

This standard is issued under the fixed designation D6372; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the design, testing, and construction of mixtures of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed and spread on a paved surface. It is written as a guide and should be used as such. End use specifications should be adapted to conform to job and user requirements.

NOTE 1—This practice references test methods outside the jurisdiction of ASTM that may or may not have a precision statement.

1.2 The values stated in SI units are to be regarded as the standard.

1.3 *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:*[2]

C88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

D2397 Specification for Cationic Emulsified Asphalt

D2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate

D3910 Practices for Design, Testing, and Construction of Slurry Seal

E145 Specification for Gravity-Convection and Forced-Ventilation Ovens

2.2 *ISSA Documents:*

ISSA Technical Bulletin No. 100, Test Method for Wet Track Abrasion of Slurry Surfaces[3]

ISSA Technical Bulletin No. 109, Test Method for Measurement of Excess Asphalt in Bituminous Mixtures by Use of a Loaded Wheel Tester and Sand Adhesion

ISSA Technical Bulletin No. 139, Test Method to Classify Emulsified Asphalt/Aggregate Mixture Systems by Modified Cohesion Tester, Measurement of Set and Cure Characteristics[3]

ISSA A143 Revised May 2003 Recommended Performance Guidelines For Micro-Surfacing[3]

ISSA Technical Bulletin No. 144, Test Method for Classification of Aggregate Filler—Bitumen Compatability by Schultze-Breuer and Ruck Procedures

ISSA Technical Bulletin No. 147, Test Methods for Measurements of Stability and Resistance to Compaction, Vertical and Lateral Displacement of Multilayered Fine Aggregate Cold Mixes[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *polymer modified emulsified asphalt micro-surfacing mixtures*—as related to this practice, mixtures of fine aggregate with mineral filler, mixing water, and field control additive, uniformly mixed with polymer modified emulsified asphalt.

4. Summary of Practice

4.1 This practice outlines the basic properties for materials, mix design procedures, and application techniques for the design and application of micro-surfacing. The mix developed through this practice should be capable of being spread in variable thick cross sections, which after curing and initial traffic consolidation, resist compaction through the entire design tolerance range of bitumen content and variable thickness to be encountered. The end product should maintain a high friction surface and variable thick sections throughout its surface life. The mix should be a quick traffic system and should be able to accept rolling traffic on a 12.7 mm thick

[1] This practice is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.24 on Bituminous Surface Treatments.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from International Slurry Surfacing Association, 3 Church Circle, PMB 250, Annapolis, MD 21401.

surface within 1 h after placement in 24°C temperature and 50 % or less humidity.

5. Significance and Use

5.1 This micro-surfacing practice is written as a guide and should not be construed as a specification. End use specifications should be adapted to conform to job and user requirements.

6. Design

6.1 *Aggregates*—The aggregate shall be a manufactured crushed stone such as granite, slag, limestone, chat, or other high quality aggregate or combination thereof. The aggregate shall be totally crushed with 100 % of the parent aggregate being larger than the largest stone in the gradation to be used. Recommended grading requirements are shown in Table 1. When tested by Test Method D2419, the combined aggregate prior to the addition of any chemically active mineral filler shall have a sand equivalent of not less than 65. When tested by Test Method C88 the aggregate shall have a weighed average loss not greater than 15 % using sodium sulfate or 25 % using magnesium sulfate. Testing by Test Method C131 shall show an abrasion resistance of 30 % maximum.

6.2 *Mineral Filler*—Mineral filler shall be any recognized brand of nonairentrained portland cement or hydrated lime. The mineral filler shall be free of lumps and accepted upon visual inspection. The type and amount of mineral filler needed shall be determined by a laboratory mix design and will be considered as part of the aggregate gradation.

6.3 *Emulsified Asphalt*—The emulsified asphalt shall be a quick set polymer modified asphalt emulsion conforming to the requirements of Specification D2397 for CSS-1h or section 377, SSIA. The polymer material shall be milled or blended into the asphalt or emulsifier solution prior to the emulsification process. The cement mixing test shall be waived for this emulsion. The five day settlement test may be waived. Refer to ISSA Document A143.

7. Composition of Micro-Surfacing Mixtures

7.1 A job mixture shall be selected that conforms to the specifications for a quick traffic system, meaning that it will be able to accept traffic after a short period of time and is capable of being spread in variable cross sections, wedges, ruts, scratch courses, and surfaces and that after curing and initial traffic consolidation resists compaction throughout the entire design tolerance range of bitumen content and variable thickness to be encountered. The mixture should maintain a high friction surface, and variable thick sections throughout the service life of the mixture. The mixture shall be able to accept rolling traffic on a 12.7 mm thick surface within 1 h after placement at 24°C temperature and 50 % or less humidity. The mixture shall conform to one of the gradation types listed in Table 1. Type II is suitable for urban and residential streets and airport runways. It shall be applied at the minimum rate of 5.4 to 8.1 kg/m^2. Type III is suitable for primary and interstate routes and to fill wheel ruts. It shall be applied at the rate of 8.1 to 16.2 kg/m^2. for primary and interstate routes. The application for wheel ruts shall be as prescribed in Appendix X1.

TABLE 1 Grading Requirements

Sieve Size	Type II Percent Passing	Type III Percent Passing	Stockpile Tolerance
9.5 mm	100	100	
4.75 mm	90 to 100	70 to 90	± 5 %
2.36 mm	65 to 90	45 to 70	± 5 %
1.18 mm	45 to 70	28 to 50	± 5 %
600 µm	30 to 50	19 to 34	± 5 %
330 µm	18 to 30	12 to 25	± 4 %
150 µm	10 to 21	7 to 18	± 3 %
75 µm	5 to 15	5 to 15	± 2 %

8. Test Procedures For Mix Design of Polymer Modified Emulsified Asphalt Micro-Surfacing Systems

8.1 *Cohesion Test*:

8.1.1 This test procedure is used to determine various set times of the micro surfacing mixture. It measures torque of a microsurfacing mixture as it coalesces and develops cohesive strength. The amount of torque developed plotted over time shows how the mixture is developing resistance to movement. Specific torque and time values are defined as "set time" and "early rolling traffic time" (see Fig. 1).

8.1.2 Set time is defined as the lapsed time after casting a specimen of the microsurfacing mixture that it cannot be remixed homogeneously (there is no free emulsion to lubricate the system) and no lateral displacement is possible when it is compacted. It is further defined as the time when there are no signs of free emulsion when pressed with an absorptive paper towel and there is no free emulsion diluted and washed away when rinsed with water.

8.1.3 Early rolling traffic time is defined as the time at which the micro-surfacing mixture will accept rolling traffic without picking or deformation.

8.1.4 Set times for the micro-surfacing mixture shall be determined as outlined in 6.3 of Practice D3910.

NOTE 2—Referenced ISSA Technical Bulletin No. 139.

8.2 *Wet Track Abrasion Test*:

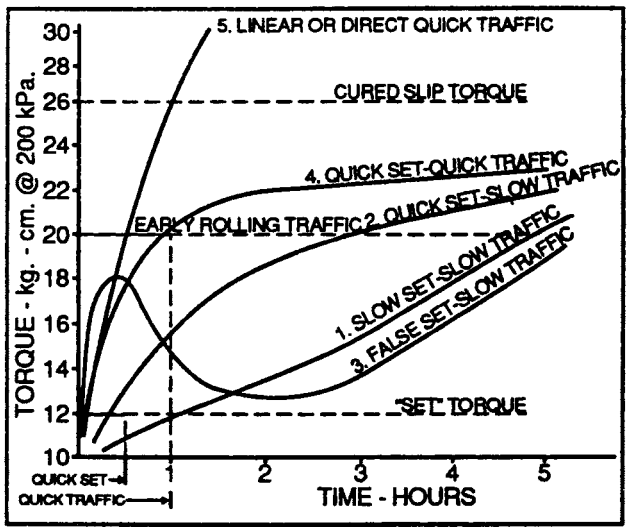


FIG. 1 Classification of Mix Systems by Modified Cohesion Test Curves

8.2.1 This test procedure is used to determine the minimum asphalt content and resistance to stripping.

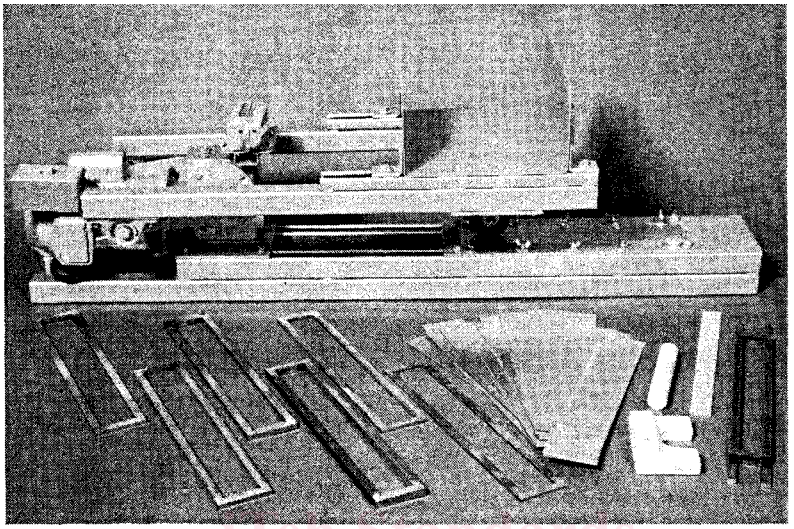
8.2.2 It establishes the minimum permissible emulsion content of a given micro-surfacing system and the long term moisture susceptibility of the system.

8.2.3 The test shall be run in accordance with Practice D3910, Section 6.4.

NOTE 3—Referenced ISSA Technical Bulletin No. 100.

8.3 *Loaded Wheel Test*—This test procedure measures the amount of compaction and displacement characteristics of multi-layered micro-surfacing mixtures under simulated rolling traffic compaction (see Fig. 2).

8.3.1 *Summary of Test Procedure*:



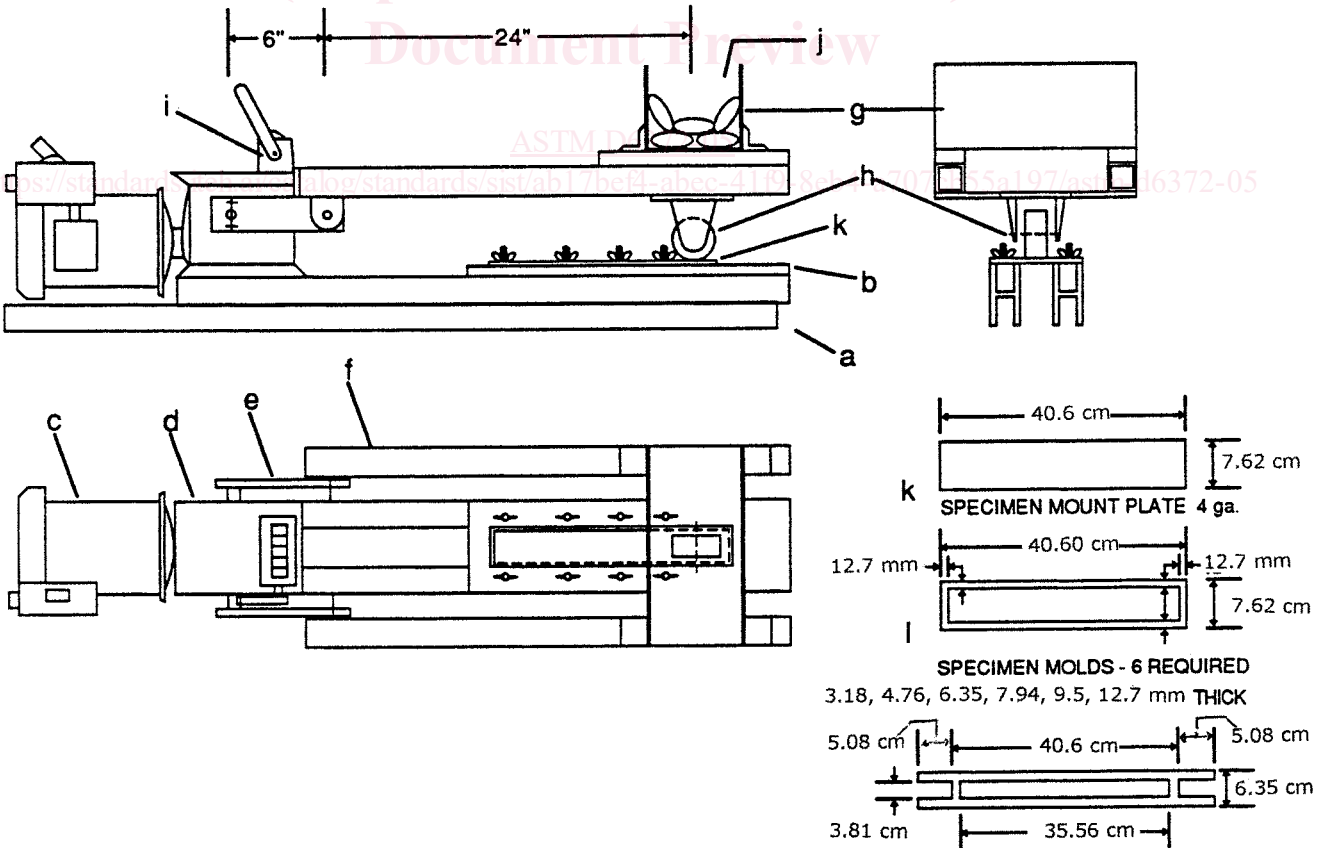


FIG. 2 Loaded Wheel Tester