



Designation: D6372 – 23

Standard Practice for Design, Testing, and Construction of Microsurfacing¹

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 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- [C88/C88M Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate](#)
- [C131/C131M Test Method for Resistance to Degradation of](#)

[Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine](#)

[D8 Terminology Relating to Materials for Roads and Pavements](#)

[D2397/D2397M Specification for Cationic Emulsified Asphalt](#)

[D2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate](#)

[D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials](#)

[D3910 Practices for Design, Testing, and Construction of Slurry Seal](#)

[E145 Specification for Gravity-Convection and Forced-Ventilation Ovens](#)

2.2 ISSA Documents:³

[ISSA Technical Bulletin No. 100 Test Method for Wet Track Abrasion of Slurry Surfaces](#)

[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](#)

[ISSA A143 Recommended Performance Guidelines For Micro-Surfacing, revised May 2003](#)

[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. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology [D8](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *flashing, n*—as related to the compaction of microsurfacing test specimens, the excess material overhanging the two parallel bases of the cylindrical specimen.

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 Asphalt 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.

3.2.2 *polymer-modified emulsified asphalt microsurfacing mixtures*, *n*—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 microsurfacing. 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 surface within 1 h after placement in 24 °C temperature and 50 % or less humidity.

5. Significance and Use

5.1 This microsurfacing 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.

NOTE 2—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 Specification D3666 are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Specification D3666 alone does not completely ensure reliable results. Reliable results depend on many factors; following the suggestions of Specification D3666 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.

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/C88M 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/C131M 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/D2397M for CQS-1h. 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 Microsurfacing 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/m². 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/m² for primary and interstate routes. The application for wheel ruts shall be as prescribed in Appendix X1.

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

8.1 Cohesion Test:

8.1.1 This test procedure is used to determine various set times of the microsurfacing 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 after which 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.

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 %