Designation: D3910 – 21

Standard Practices for Design, Testing, and Construction of Slurry Seal[1]

This standard is issued under the fixed designation D3910; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These practices cover the design, testing, and construction of mixtures for surface treatment of pavements. 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.

1.2 The values stated in SI units are to be regarded as the standard. The non-SI units used in this standard are allowed by the subcommittee for clarification in the use of the standard.

1.3 The text of this standard references notes and footnotes that 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]

C128 Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate

D8 Terminology Relating to Materials for Roads and Pavements

D242/D242M Specification for Mineral Filler for Asphalt Mixtures

D977 Specification for Emulsified Asphalt

D1073 Specification for Fine Aggregate for Asphalt Paving Mixtures

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

2.2 *Other Documents:*[3]

ISSA A105 Recommended Performance Guidelines for Emulsified Asphalt Slurry Seal

ISSA Technical Bulletin No. 106 Test Method for Measurement of Slurry Seal Consistency

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 *emulsified asphalt slurry seal mixtures*—as related to these practices, mixtures of fine aggregate with or without mineral filler, with or without mixing water, uniformly mixed with emulsified asphalt.

4. Significance and Use

4.1 These slurry seal practices are written as a guide and should not be construed as specifications.

4.2 End-use specifications should be adopted to conform to job and user requirements.

NOTE 1—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

[1] These practices are under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and are the direct responsibility of Subcommittee D04.24 on Asphalt Surface Treatments.

Current edition approved Nov. 1, 2021. Published November 2021. Originally approved in 1980. Last previous edition approved in 2015 as D3910 – 15. DOI: 10.1520/D3910-21.

[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 the International Slurry Surfacing Association, 800 Roosevelt Road, Building C, Suite 312, Glen Ellyn, IL 60137, http://www.slurry.org.

TABLE 1 Grading Requirements for Aggregate

Sieve Size	Amount Passing Sieve, weight %		
	Type I	Type II	Type III
⅜ in. (9.5 mm)	100	100	100
No. 4 (4.75 mm)	100	90 to 100	70 to 90
No. 8 (2.36 mm)	90 to 100	65 to 90	45 to 70
No. 16 (1.18 mm)	65 to 90	45 to 70	28 to 50
No. 30 (600 µm)	40 to 60	30 to 50	19 to 34
No. 50 (300 µm)	25 to 42	18 to 30	12 to 25
No. 100 (150 µm)	15 to 30	10 to 21	7 to 18
No. 200 (75 µm)	10 to 20	5 to 15	5 to 15

means of evaluating and controlling some of those factors.

5. Design

5.1 *Aggregates:*

5.1.1 The fine aggregate shall consist of natural or manufactured sand, slag, crushed fines, or other mineral aggregate that conforms to the quality requirements of Specification D1073.

5.1.2 Recommended grading requirements are shown in Table 1. These requirements are taken from those given in ISSA A105.

5.1.3 Smooth-textured sand of less than 1.25 % water absorption shall not exceed 50 % of the total combined aggregate. (For heavy duty surface requirements, use 100 % crushed material.)

5.1.4 When tested by Test Method D2419, the combined aggregate prior to the addition of any chemically active mineral fillers shall have a sand equivalent of not less than 45.

5.2 *Mineral Filler:*

5.2.1 Mineral fillers are of two types, chemically active and chemically inactive. Both shall conform to Specification D242/D242M.

5.2.2 Chemically active mineral fillers such as portland cement, hydrated lime, and aluminum sulfate are used to improve the workability, regulate the setting time and, in some cases, to alter the aggregate gradation.

5.2.3 Chemically inactive mineral fillers such as limestone dust, fly ash, and rock dust are used mainly to alter aggregate gradation.

5.3 *Emulsified Asphalt*—The Slow Set (SS-1, CSS-1, SS-1h, and CSS-1h) or Quick Set (QS-1, CQS-1, QS-1h, and CQS1h) grades of emulsified asphalt used in the design shall conform to one of the emulsified asphalt grades fitted for slurry seal applications as found in Specification D977 or Specification D2397/D2397M.

5.4 *Composition of Slurry Seal Mixtures:*

5.4.1 A job mixture shall be selected that conforms to the specification limits, and that is suitable for the traffic, climatic conditions, curing conditions, and final use. All materials to be used shall be pretested for their suitability in the mixture as described in Section 6.

5.4.2 The mixture shall attain an initial set in not less than 15 min nor more than 12 h. The setting time may be regulated by the addition of mineral fillers or chemical agents.

5.4.3 The mixture shall be one of three types whose combined aggregates conform to the gradation requirements of Table 1.

5.4.3.1 Type I is suitable to seal cracks, fill voids, and correct surface erosion conditions. The residual asphalt content shall be from 10 to 16 weight % of dry aggregate. It shall be applied at a rate of 3.3 to 5.4 kg/m^2 (6 to 10 lb/yd^2).

NOTE 2—This type is used on airfields, parking lots, and urban and rural streets where surface sealing and skid resistance are the primary needs.

5.4.3.2 Type II is suitable to fill surface voids, correct severe surface erosion conditions, and provide a minimum wearing surface. The residual asphalt content shall be from 7.5 to 13.5 weight % of dry aggregate. It shall be applied at a rate of 5.4 to 8.2 kg/m^2 (10 to 15 lb/yd^2).

NOTE 3—This type is used on airfields and pavements that are severely eroded or have numerous cracks. It may also be used as wearing surface on bituminous base courses or soil-cement bases, or as a sealer on stabilized base courses.

5.4.3.3 Type III is suitable to provide a new wearing surface or build up a crown. The residual asphalt content shall be from 6.5 to 12 weight % of dry aggregate. It shall be applied at a rate of 8.2 or more kg/m^2 (15 or more lb/yd^2).

5.4.4 *Consistency Test*—This test is used to determine optimum mix design for aggregate, filler, water, and emulsified asphalt. A flow of 2 to 3 cm is considered to be the consistency normally required for a workable field mix (see 6.1).

5.4.5 *Set Time*—This test determines the time required for slurry seal to reach initial set with paper blot method. A properly mix-designed slurry seal should be set at the end of 12 h. A 1-h set time is considered acceptable for a quick-setting slurry seal (see 6.2).

5.4.6 *Cure Time*—This test is used to determine initial cohesion of slurry seal mat and resistance to traffic. A properly designed slurry seal mix should be completely cured at the end of 24 h after placement (see 6.3).

5.4.7 *Wet Track Abrasion Test*—This test method covers measurement of the wearing qualities of slurry seal under wet abrasion conditions.

NOTE 4—As a guide, slurry seal shall not show a loss of more than 75 g/ft^2.

6. Test Methods for Emulsified Asphalt Slurry Seal

6.1 *Consistency Test:*

6.1.1 This test method is used to determine the proper consistency (mix formulation) for a slow-setting slurry seal mixture.

6.1.2 The consistency test should be performed as a method of determining the optimum mix formulation (proper ratio of aggregate, filler, water, and emulsified asphalt) as related to proper mixture consistency for pavement surface placement. Several mixes are made using dried aggregate and various ratios of portland cement, or hydrated lime or chemical modifier, or both, water, and emulsified asphalt.

NOTE 5—Ideal relative humidity for this test is 50 ± 5 %. Results will vary at different relative humidity values.

6.1.3 Mold, metal or plastic, in the form of a frustum of a cone 38 mm (1½ in.) in diameter at the top, 89 mm (3½ in.) in diameter at the bottom, and 76 mm (3 in.) in height (see Test Method C128).