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Standard Practice for Selection and Use of Emulsified Asphalts[1]

This standard is issued under the fixed designation D3628; 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 selection of emulsified asphalts for various paving and allied uses.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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]

D8 Terminology Relating to Materials for Roads and Pavements

D977 Specification for Emulsified Asphalt

D2397/D2397M Specification for Cationic Emulsified Asphalt

3. Terminology

3.1 For definitions of terms used in this practice, refer to Terminology D8.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *asphalt-aggregate applications*—applications of emulsified asphalt to a prepared aggregate base or pavement surface followed by the application of aggregate.

3.2.2 *asphalt-aggregate mixtures*—a combination of emulsified asphalt and aggregate that is physically mixed by mechanical means, spread on the job site, and compacted.

3.2.3 *asphalt applications*—the application of sprayed emulsified asphalt not involving the use of aggregates.

3.2.4 *graded aggregate seal, n*—a single surface treatment in which the aggregate is graded with little or no mineral filler, typically with a nominal maximum size of about 19 mm, and containing sufficient sand that the emulsified asphalt will be required to penetrate upward into the aggregate cover; the nominal maximum aggregate size may vary depending on the course thickness desired and aggregate availability. It is an application method used in lieu of a chip seal to provide a lower cost road.

3.2.4.1 *Discussion*—In this case, nominal maximum size refers to the definition in Terminology D8.

3.2.5 *multiple surface treatment*—two or more single surface treatments placed one on the other. The maximum aggregate size of each successive treatment is usually one half that of the previous one, and the total thickness is about the same as the nominal maximum size aggregate particles of the first course.

3.2.6 *pavement bases and surfaces*—the lower or underlying pavement course atop the subbase or subgrade and the top or wearing course. Cold-laid mixtures that are bound together with emulsified asphalts use either open or dense aggregate gradations.

3.2.7 *sand*—a mineral aggregate material consisting of particles of rock passing a 4.75-mm sieve and only about 5 % passing the 75-µm sieve.

3.2.8 *sand seal*—a bituminous-sand application to an existing pavement surface to seal the surface and to function as a light-wearing course.

3.2.9 *sandy soil*—a material consisting essentially of fine aggregate particles smaller than 2.00-mm sieve and usually containing material passing a 75-µm sieve. This material usually exhibits plasticity characteristics.

3.2.10 *single-surface treatment (chip seal)*—a wearing surface of emulsified asphalt and aggregate in which the aggregate is placed uniformly over the applied emulsified asphalt in a single layer, the thickness of which approximates the nominal maximum size of the aggregate used.

[1] This practice is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of D04.41 on Emulsified Asphalt Specifications.

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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.

3.2.11 *treatments and seals*—a bituminous aggregate application to any type of road or pavement surface for the purpose of providing a wearing course, or a surface seal, or both.

4. Significance and Use

4.1 As indicated by Specifications D977 and D2397/D2397M, emulsified asphalts are classified by type (rapid, medium, or slow setting) and by grade within type (viscosity in the case of the rapid-setting type or characteristic of the residual asphalt in the case of the medium and slow-setting types). Selection for use of a particular type and grade is controlled by type of construction (whether an application or a mix type), properties of the mineral aggregate (both grading and mineral composition), and environmental conditions during construction. For surface treatments and seals, emulsified asphalts are formulated to set rapidly upon contact with the mineral aggregate or pavement surface. When used in mix types, slower breaking is required to allow time for mixing and laydown. If the mix aggregate is open graded without appreciable fines, a medium-setting emulsified asphalt may be used that deposits a relatively hard asphalt. If the aggregate is dense-graded but does not contain a large amount of very fine material (dust), a medium-setting emulsified asphalt with a soft residue may be a good choice. However, if the dense-graded aggregate contains a large amount of very fine mineral matter, a slow-setting emulsified asphalt may be required.

4.2 The recommendations in Table 1 should be considered only as a general guide for the selection of an emulsion for use. If the user is uncertain as to which to select for an intended use, the emulsified asphalt supplier should be contacted.

5. Keywords

5.1 emulsified asphalt

TABLE 1 General Uses of Emulsified Asphalt

NOTE 1—Only those grades of emulsified asphalt in general use have been indicated herein. It is possible that under certain variations of aggregates, or climatic conditions, or both, additional selections might be appropriate. Where the use of emulsified asphalt for applications other than those listed in the table is contemplated, the emulsified asphalt supplier should be consulted. Prior to selecting asphalt emulsion, the user should check with local regulations to determine if any emulsified asphalts are prohibited.

Type of Construction[A]	Specification D977							Specification D2397/D2397M (Cationic)									
	RS-1[B]	RS-2	HFRS-2	MS-1, HFMS-1	MS-2, HFMS-2	MS-2h, HFMS-2h	HFMS-2s	SS-1	SS-1h	QS-1h	CRS-1[B]	CRS-2	CMS-2	CMS-2h	CSS-1	CSS-1h	CQS-1h
Asphalt-aggregate mixtures:																	
For pavement bases and surfaces:																	
Plant mix (hot)	...	...	...	...	...	X[C]	...	...	...	...	...	...	...	...	...	...	...
Plant mix (cold)																	
Open-graded aggregate	...	...	...	...	X	X	...	...	...	...	...	...	X	X	...	...	...
Dense-graded aggregate	...	...	...	...	...	...	X	X	X	...	...	...	...	...	X	X	...
Sand	...	...	...	...	...	...	X	X	X	...	...	...	...	...	X	X	...
Mixed-in-place:																	
Open-graded aggregate	...	...	...	X	X	X	...	...	...	...	...	...	X	X	...	...	...
Dense-graded aggregate	...	...	...	...	...	...	X	X	X	...	...	...	...	...	X	X	...
Sand	...	...	...	...	...	...	X	X	X	...	...	...	...	...	X	X	...
Sandy soil	...	...	...	...	...	...	...	X	X	...	...	...	...	...	X	X	...
Slurry seal	...	...	...	...	...	...	...	X	X	X	...	...	...	...	X	X	X
Asphalt-aggregate applications:																	
Treatments and seals:																	
Single surface treatment (chip seal)	X	X	X	...	...	...	...	...	...	...	X	X	...	...	...	...	...
Multiple surface treatment	X	X	X	...	...	...	...	...	...	...	X	X	...	...	...	...	...
Graded aggregate seal	...	...	...	...	...	...	X	...	...	...	...	...	...	...	...	...	...
Sand seal	X	X	X	X	...	...	X	...	...	...	X	X	...	...	...	...	...
Penetration macadam:																	
Large voids	...	X	X	...	...	...	...	...	...	...	...	X	...	...	...	...	...
Small voids	X	...	...	...	...	...	...	...	...		X	...	...	...	...	...	...
Asphalt applications:																	
Fog seal	...	...	...	X[D]	...	...	...	X[D]	X[D]	...	...	...	...	...	X[D]	X[D]	...
Prime coat-penetrable surface	...	...	...	...	...	...	...	X[D]	X[D]	...	...	...	...	...	X[D]	X[D]	...
Tack coat	...	...	...	X[D]	...	...	...	X[D]	X[D]	...	...	...	...	...	X[D]	X[D]	...
Dust binder	...	...	...	...	...	...	...	X[D]	X[D]	...	...	...	...	...	X[D]	X[D]	...
Mulch treatment	...	...	...	...	...	...	...	X[D]	X[D]	...	...	...	...	...	X[D]	X[D]	...
Crack filler	...	...	...	...	X	X	X	X	X	...	...	...	X	X	X	X	...
Maintenance mix:																	
Immediate use	...	...	...	X	X	X	X	...	...	...	...	...	X	X	...	...	...
Stockpile	...	...	...	...	...	...	X	...	...	...	...	...	...	...	...	...	...

[A] For definitions of terms used in this table, refer to Section 3 or Terminology D8.
[B] RS-1 and CRS-1 may be used as a tack coat in special cases where night construction or high humidity exists.
[C] Grades of emulsified asphalt other than MS-2h may be used where experience has shown that they give satisfactory performance.
[D] May dilute with water by manufacturer or contractor per state regulation. Refer to specifying agency.