Designation: D5360 – 15

Standard Practice for Design and Construction of Bituminous Surface Treatments[1]

This standard is issued under the fixed designation D5360; 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 and construction of bituminous surface treatments. It is a guide and should be used as such. End-use specifications should be adopted to conform to job and user requirements.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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.* For specific precautions see Section 9.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D140 Practice for Sampling Bituminous Materials
D448 Classification for Sizes of Aggregate for Road and Bridge Construction
D490 Specification for Road Tar
D946 Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
D977 Specification for Emulsified Asphalt
D1139 Specification for Aggregate for Single or Multiple Bituminous Surface Treatments
D1369 Practice for Quantities of Materials for Bituminous Surface Treatments
D2027 Specification for Cutback Asphalt (Medium-Curing Type)
D2028 Specification for Cutback Asphalt (Rapid-Curing Type)
D2397 Specification for Cationic Emulsified Asphalt
D2399 Practice for Selection of Cutback Asphalts
D2995 Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors
D3381 Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
D3628 Practice for Selection and Use of Emulsified Asphalts
D5624 Practice for Determining the Transverse-Aggregate Spread Rate for Surface Treatment Applications
D6114 Specification for Asphalt-Rubber Binder
D6154 Specification for Chemically Modified Asphalt Cement for Use in Pavement Construction
D6373 Specification for Performance Graded Asphalt Binder

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *multiple surface treatment*—the bituminous surface produced by the repeat application of bitumen and aggregate a second or even a third time, with the aggregate size usually becoming smaller with each application. Each layer is immediately rolled, preferably with a pneumatic-tired roller.

3.1.2 *single surface treatment*—the bituminous surface produced by the application of bitumen to a prepared surface followed at once by an aggregate cover. The surface is immediately rolled, preferably with a pneumatic-tired roller.

3.1.3 *surface treatment*—an application of bituminous material followed by a layer of mineral aggregate. Multiple applications of bituminous material and mineral aggregate may be used.

3.1.3.1 *Discussion*—The terms "seal coat" and "chip seal" have been used interchangeably with the term "surface treatment."

4. Significance and Use

4.1 This practice is to be used as a guide and not a specification.

5. Ordering Information

5.1 Orders for seal coat and surface treatment materials under this guide shall include the following information:

[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.

Current edition approved Dec. 1, 2015. Published January 2016. Originally approved in 1998. Last previous edition approved in 2009 as D5360 – 09. DOI: 10.1520/D5360-15.

[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.

5.1.1 Type of bitumen (asphalt binder, emulsified asphalt, cutback asphalt, road tar) specification designation,
5.1.2 Grade of bitumen,
5.1.3 Quantity of bitumen required,
5.1.4 Type of aggregate (crushed stone, crushed gravel, crushed slag, gravel, slag) specification designation,
5.1.5 Size or sizes of aggregate to be furnished,
5.1.6 Quantity of aggregate required, and
5.1.7 Special requirements.

6. Aggregate

6.1 *Cover Aggregate,* shall conform to Specification D1139 and Classification D448.

6.2 *Size*—Aggregate should be as close to one size as is economically practical, preferably in the range of ½ to ¼ in. (13 to 6 mm) for single surface treatments. For multiple surface treatments, aggregate in the range of 1 to ½ in. (25 to 13 mm) is used for the bottom layer with each successive layer using aggregate approximately ½ the size of the previous aggregate layer. Larger sizes may be used in multiple treatments.

NOTE 1—Aggregates larger than ½ in. (13 mm) can cause objectionable tire noise.

NOTE 2—Aggregates finer than ⅛ in. (3 mm) are difficult to spread evenly. Also, the finer the aggregate, the smaller is the tolerable range for the bituminous material application rate.

6.3 *Shape*—The ideal shape is cubical. Flat or elongated particles are undesirable. Flat particles tend to become aligned on their flat sides and may be completely covered with bituminous material when enough is used to hold the cubical particles in place. Rounded particles tend to roll and have poor retention, and therefore, are undesirable.

6.4 *Cleanliness*—Clean aggregate is extremely important. If the coarse aggregate particles are dusty or coated with fine material, the bituminous material may not adhere to the aggregate, resulting in loss of cover aggregate and poor performance. It is recommended that the fraction passing the No. 200 mesh screen not exceed 1 % by weight.

7. Bitumen

7.1 When asphalt binder is used, it shall conform to one of the following specifications: D946, D3381, D6114, D6154, or D6373.

NOTE 3—The grade of asphalt binder to be used depends on climatic conditions and amount and type of traffic.

7.2 When cutback asphalt is used, it shall conform to either Specification D2027 or Specification D2028.

NOTE 4—Selection of cutback type (rapid-cure or medium-cure) and grade depends on the type of construction, climatic conditions, amount and nature of traffic, and cleanliness of aggregate. Refer to Practice D2399 for selection guide.

7.3 When emulsified asphalt is used, it shall conform to either Specification D977 or Specification D2397.

NOTE 5—The emulsified asphalt type and grade to be used depends on the type of construction, climatic conditions, amount and nature of traffic, and cleanliness of aggregate. Use Practice D3628 for a selection guide. Other types of emulsified asphalt may be used if experience has shown that satisfactory performance will result.

7.4 When road tar is used, it shall conform to Specification D490.

8. Application Rates

8.1 The bituminous material application rate shall be estimated by using Practice D1369 for guidance.

8.2 The bituminous material shall be applied by a bituminous distributor that has had the transverse and longitudinal application rates determined by Practice D2995.

8.3 The aggregate application rate shall be estimated by using Practice D1369 as a guide.

8.4 The aggregate shall be applied by a self-propelled mechanical spreader or other aggregate spreading device that is capable of uniformly spreading the aggregate at the desired rate and width. The spreader shall be calibrated to apply the quantity of cover aggregate indicated by the design requirements for a given project. This calibration can be accomplished with several sheets of canvas or other similar material, each being one square yard (square metre), and a suitable scale. This is done in a manner similar to Test Method D5624 for bituminous distributors.

9. Precautions

9.1 Surface treatment operations should not be carried out during periods of cold or wet weather, or both. The surface shall be clean and dry while performing the work.
9.1.1 The air temperature should be at least 50°F (10°C) in the shade and rising before starting the operation. The operation should not be permitted when the temperature is 60°F (15.6°C) or less and falling.
9.1.2 The operation should not be carried out in the rain, or when rain is threatening.

10. Method of Sampling and Testing

10.1 Sample materials in accordance with Practice D140.

10.2 Calibrate application equipment in accordance with the following standards:
10.2.1 *Determining Application Rate and Residual Application Rate of Bituminous Distributors*—Practice D2995.
10.2.2 *Determining the Transverse Aggregate Spread Rate for Surface Treatment Applications*—Test Method D5624.

11. Construction Procedure

11.1 Patch potholes, fill cracks, and repair damaged areas in existing pavement or consolidated base.

11.2 The surface to be covered should be cleaned with a rotary broom or other approved means.

11.3 Spray bituminous material at the specified rate and proper temperature for type and grade of material. The recommended viscosity range for spraying is 20–120 cSt, kinematic (approximately 10–60 SFS). A guide to the range that encompasses the correct spraying temperature for various types and grades of material can be found in the appropriate standard for the material (that is, asphalt binder, cutback asphalt, emulsified asphalt, road tar).

NOTE 6—The flash point of some grades of bituminous materials is

below 250°F (121°C); therefore, caution must be used when applying heat to these materials.

11.4 Spread cover aggregate at the specified rate immediately behind the bituminous material spray application to achieve maximum possible chip wetting and embedment depth. This is essential in the case of asphalt binder and road tar because of the rapid increase in viscosity with cooling, and is greatly desirable in the case of emulsified asphalt and cutback asphalt to maximize the meniscus effect. The cover aggregate should be placed on the bituminous material within 2 min of the bituminous application.

11.5 Roll the surface immediately after application of the cover aggregate to ensure embedment, preferably with a pneumatic-tired roller, to seat chips in the bituminous membrane. The speed of the roller should not exceed 5 mph. Depending on environment conditions, type and amount of bituminous material, three (3) passes of a 12 to 15-ton pneumatic-tired roller are normally used. Initial rolling of the aggregate should occur within 5 min of the application of the bituminous material, and the final of the three rolling coverages should be completed within 15 min.

11.6 Control traffic speed until bituminous material has set. It is recommended that traffic speed not exceed 20 mph for a period of 4 h after placement of the surface treatment.

11.7 For multiple surface treatments, repeat steps 11.3 – 11.6. Successive applications should be applied only after the previous bituminous surface treatment has set and cured, usually one day. Remove excess aggregate before applying the second or third layer of surface treatment.

12. Keywords

12.1 chip seal; multiple surface treatment; seal coat; single surface treatment; surface treatment