Designation: D 451 – 91 (Reapproved 1996)ε1

Standard Test Method for Sieve Analysis of Granular Mineral Surfacing For Asphalt Roofing Products[1]

This standard is issued under the fixed designation D 451; 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.

ε[1] NOTE—Section 11 was added editorially in November 1996.

1. Scope

1.1 This test method covers the determination of the particle size distribution of granular mineral surfacing material such as crushed slate, stone, coated granules, etc., used on the weather surface of prepared asphalt roofing and shingles.

1.2 *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:*

E 11 Specification for Wire-Cloth Sieves for Testing Purposes[2]

3. Summary of Test Method

3.1 A weighed sample of granular mineral surfacing material is separated through a series of sieves of progressively smaller openings for the determination of particle size distribution.

4. Significance and Use

4.1 This test method is used to determine the grading of materials used as granular mineral surfacing. The results are used to determine compliance of the particle size distribution with applicable specification requirements.

5. Apparatus

5.1 *Sieves*—A set of the sieves listed in Table 1, conforming to Specification E 11. For routine testing, the group of sieves actually used shall include only those appropriate for the granular material being graded. Coarser or finer sieves, on which less than 0.05 mass % of the specimen would be found after sieving, need not be included in the group.

5.2 *Sieve Shaker*—A mechanically operated sieve shaker that produces a uniform rotary motion and tapping action with 140 to 160 taps per minute. The sieve shaker shall be fitted with a hard maple plug to receive the impact of the tapping device. The entire apparatus shall be rigidly mounted by bolting to a solid foundation, preferably concrete.

5.3 *Sample Splitter*—A riffle sampler with 9.5 or 12.7-mm (⅜or ½-in) divisions, for reducing the sample to the specimen required for sieve analysis.

5.4 *Balance*—A laboratory balance sensitive to 0.1 g.

TABLE 1 Report Form

Retained on Sieve		Passing Sieve		Percent
3.35-mm	(No. 6)	...	...	...
2.36-mm	(No. 8)	3.35-mm[A]	(No. 6)	...
1.70-mm	(No. 12)	2.36-mm	(No. 8)	...
1.18-mm	(No. 16)	1.70-mm	(No. 12)	...
850-µm	(No. 20)	1.18-mm	(No. 16)	...
600-µm	(No. 30)	850-µm	(No. 20)	...
425-µm	(No. 40)	600-µm	(No. 30)	...
300-µm	(No. 50)	425-µm	(No. 40)	...
212-µm	(No. 70)	300-µm	(No. 50)	...
150-µm	(No. 100)	212-µm	(No. 70)	...
		150-µm	(No. 100)	...
Total				

[A]Designates U.S. Standard Sieve.

6. Sampling

6.1 Each shipment of mineral granules of a single type shall be considered a unit for sampling. If a shipment contains more than one type of granule, the entire quantity of each type in the vehicle shall be considered a unit for sampling.

6.2 Take the sample of mineral granules shipped in bulk from the chute or conveyor while the vehicle is being loaded or unloaded. The ideal place is just where the material drops from the chute or belt. Collect equal portions from the full width and thickness of the stream at regular intervals with such frequency that a minimum of five samples will be taken and the total mass of the sample will not be less than 7.3 kg (16 lb). Do not allow the sampling receptacle to overflow under any circumstances. Overflow would tend to reject a higher proportion of the large particles than the small ones, and a representative sample would not be obtained. The sample should not include the initial material discharge from the chute or conveyor.

6.3 Take the sample from a shipment of mineral granules shipped in bags, selected at random and equal in number to the

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[2] *Annual Book of ASTM Standards*, Vol 14.02.

cube root of the total number of bags in the vehicle. Collect equal portions of 800 to 900 g from each of the bags taken for sampling and combine.

7. Test Specimen

7.1 Reduce the sample by riffling to a specimen of 200 to 250 g. Use the entire specimen obtained from reduction of the sample for the sieve analysis.

8. Procedure

8.1 Assemble the group of sieves selected from Table 1 in order, with the sieve having the largest opening at the top and the one having the smallest opening at the bottom. Add a solid collecting pan below the bottom sieve. Weigh the test specimen to within ±0.1 g and place in the topmost sieve. Complete the assembly by placing a solid cover over the top sieve. Securely fasten the sieve assembly in the mechanical sieve-shaking device (see 5.2).

8.2 Pass the specimen through the assembled group of sieves by subjecting it to the action of the sieve shaker for a period of 300 ± 10 s.

8.3 Carefully remove the portion of the specimen retainedon each of the sieves and on the pan, and weigh each portion to within ±0.1 g.

9. Report

9.1 Report the results of the sieve analysis to the nearest 0.1 % (omitting the results for those sieves on which less than 0.05 mass % of the test specimen was collected), as illustrated in Table 1.

9.2 The sum of the percentages reported shall be 100± 0.2 %.

10. Precision

10.1 A retest made after recombining a freshly screened sample by the same operator using the same sieves, should give results within± 1 percentage point of the results previously obtained on each sieve. For example, if 32.0 % was retained originally on the 1.18-mm (No. 16) sieve, a retest should give between 31.0 and 33.0 %.

11. Keywords

11.1 asphalt roofing; mineral surfacing; particle size distribution; sieve analysis