Designation: D452/D452M – 19 (Reapproved 2022)

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

This standard is issued under the fixed designation D452/D452M; 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 test method covers the determination of the particle size distribution of surfacing material, other than mineral granules, such as sand, mica, talc, or other powdered or flaky mineral particles, used on both sides of "smooth" roll roofing and on the reverse side of asphalt shingles and mineral-surfaced roll roofing.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the 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]

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Summary of Test Method

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

4. Significance and Use

4.1 This test method is used to determine the grading of materials used as 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 E11. For routine testing, the group of sieves actually used shall include only those appropriate for the 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.

NOTE 1—For relatively coarse or flaky materials, such as coarse mica, sieves from 1.18 mm to 212 µm (Nos. 16 to 70) inclusive, will usually be found suitable. For finer surfacing materials, such as fine mica or talc flour, sieves from 600 to 75 µm (Nos. 30 to 200) inclusive, will usually give a satisfactory sieve analysis.

5.2 *Sieve Shaker*—A mechanically operated sieve shaker, which 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 plug shall be one of the following: a hard maple plug; a #9 black rubber plug; or a #22 cork plug as chosen by the user. Plug dimensions are: top diameter 44 ± 1 mm, bottom diameter 37 ± 1 mm, and length of 38 ± 6 mm. See Note 2. The entire apparatus shall be rigidly mounted by bolting to a solid foundation, preferably concrete.

NOTE 2—Supporting data on the equivalency of the plug materials is given in Appendix X1.

5.3 *Sample Splitter*—The riffle sample splitter is an open V-shaped box in which a series of chutes is mounted at right angles to the long axis to give a series of rectangular slots of equal area alternatively feeding two trays placed on either side of the trough. The sample is poured into the chute and split into equal portions by the slots, until, after repeated cycles, a sample of the desired size is obtained. A riffle sampler with 9.5 or 12.7 mm [⅜ or ½ in.] divisions shall be used for reducing the sample to the specimen required for sieve analysis.

5.4 *Oven,* capable of maintaining 105 °C [221 °F].

NOTE 3—Supporting data on the equivalency of the plug materials is given in Appendix X1.

[1] This test method is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.02 on Steep Roofing Products and Assemblies.

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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.

TABLE 1 Report Form

Retained on Sieve		Passing Sieve		Percent
1.70 mm	(No. 12)	...	...	...
1.18 mm	(No. 16)	1.70 mm	(No. 12)[A]	...
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)	...
75 µm	(No. 200)	150 µm	(No. 100)	...
		75 µm	(No. 200)	...
Total				...

[A] Designates U.S. standard sieve.

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

6. Sampling

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

6.2 Take the sample of surfacing 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 be not 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 discharged from the chute or conveyor.

6.3 Take the sample from a shipment of surfacing shipped in bags, selected at random and equal in number to the cube root of the total number of bags in the vehicle. Collect equal portions of not less than 0.23 kg [0.5 lb] from each of the bags taken from sampling and combine.

7. Test Specimen

7.1 Reduce the sample by riffling to a specimen of 100 to 112 g. Use the entire specimen obtained from reduction of the sample for the sieve analysis.

7.2 *Riffle Splitting Procedure*—Place one empty pan (A and B) under each side of the splitter trough. Pour the entire sample into the third splitter pan (C). Hold the pan directly above the riffle and 1 to 2 in. over the exact middle of the splitter. Tip the pan so the sample falls into the splitter directly over the convergence of the chutes. Take the pan (A) from one side only for next split and replace with an empty pan. Remove the pan (B) from other side and replace with an empty pan and save this material until final split has been completed. Shake the pan (A) to distribute sample over entire bottom of pan. Introduce the entire sample from pan A of the first split into the splitter again. Repeat this process until one of the split pans contains the target sample amount.

7.2.1 If needed, it is acceptable to combine two or more split samples to achieve the target sample weight; however, the entire split samples must be used when combining. Do not adjust a sample size by pouring, scooping, or pinching material to or from the sample to achieve the target weight. Also, do not discard any of the initial sample material until an accurate split has been completed.

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. Dry the test specimen in an oven at about 105 °C [221 °F] for 2 h. Remove from the oven, cool in a desiccator, and then weigh to within ±0.1 g. Place the specimen in the topmost sieve and 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 20 ± 1 min. At the end of this period, remove the solid collecting pan containing the portion of the material passing the finest sieve and weigh the contents to within ±0.1 g. Then reassemble the collecting pan with the sieves and continue shaking for an additional 10 min. At the end of this period, remove the collecting pan and weigh the contents again. If the additional material passing the finest sieve during this second shaking period does not exceed 0.5 mass % of the specimen, consider the sieving complete. If it does exceed 0.5 %, reassemble the collecting pan and sieves and shake for successive additional 10 min periods, weighing the material collected in the pan after each period of shaking, until the amount passing the finest sieve in a 10 min shaking period is less than 0.5 mass % of the specimen.

8.3 Carefully remove the portion of the specimen retained on 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 ± 1.5 %.

10. Precision and Bias

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 25.0 % was retained originally on the 212 µm (No. 70) sieve, a retest should give between 24.0 and 26.0 %.

11. Keywords

11.1 asphalt roofing; minerals; sieves; surfacing

APPENDIX

(Nonmandatory Information)

X1. SUPPORTING DATA ON THE EQUIVALENCY OF PLUG MATERIALS

NOTE X1.1—The data given in the following tables was developed by CertainTeed Corporation, Malvern Innovation Center, in March 2017.

TABLE X1.1 Sand A

A	Wood	Cork		Rubber	
Sieve #	% Retained	% Retained	Δ vs Wood	% Retained	Δ vs Wood
12	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
16	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
20	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
30	3.5 %	3.1 %	0.3 %	3.9 %	–0.5 %
40	25.4 %	24.3 %	1.1 %	25.5 %	–0.1 %
50	33.4 %	33.3 %	0.2 %	32.8 %	0.6 %
70	17.9 %	18.3 %	–0.4 %	17.4 %	0.5 %
100	10.2 %	10.9 %	–0.8 %	10.4 %	–0.2 %
200	7.6 %	8.1 %	–0.5 %	7.9 %	–0.4 %
PAN	2.1 %	2.0 %	0.1 %	2.0 %	0.1 %

TABLE X1.2 Sand B

B	Wood	Cork		Rubber	
Sieve #	% Retained	% Retained	Δ vs Wood	% Retained	Δ vs Wood
12	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
16	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
20	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
30	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
40	0.0 %	0.0 %	0.0 %	0.1 %	0.0 %
50	0.2 %	0.2 %	0.0 %	0.3 %	–0.1 %
70	3.0 %	2.9 %	0.1 %	3.9 %	–0.9 %
100	58.7 %	55.2 %	3.5 %	63.3 %	–4.6 %
200	36.3 %	39.1 %	–2.8 %	31.4 %	4.9 %
PAN	1.8 %	2.6 %	–0.8 %	1.0 %	0.7 %

TABLE X1.3 Sand C

C	Wood	Cork		Rubber	
Sieve #	% Retained	% Retained	Δ vs Wood	% Retained	Δ vs Wood
12	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
16	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
20	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
30	0.0 %	0.0 %	0.0 %	0.0 %	0.0 %
40	0.4 %	0.4 %	0.0 %	0.4 %	0.0 %
50	14.8 %	14.8 %	0.0 %	14.2 %	0.6 %
70	29.7 %	27.1 %	2.6 %	31.9 %	–2.1 %
100	43.1 %	44.8 %	–1.6 %	41.2 %	2.0 %
200	10.9 %	12.1 %	–1.2 %	11.7 %	–0.8 %
PAN	1.1 %	0.8 %	0.3 %	0.7 %	0.4 %