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Standard Test Method for Sieve Analysis of Glass Spheres[1]

This standard is issued under the fixed designation D1214; 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 Department of Defense.

1. Scope

1.1 This test method covers the sieve analysis of glass spheres used for retroreflective pavements markings and industrial uses.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis

D2013 Practice for Preparing Coal Samples for Analysis

E11 ~~Specification for Woven Wire Test Sieve Cloth and Test Sieves~~ Specification for Woven Wire Test Sieve Cloth and Test Sieves

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Summary of Test Method

3.1 The spheres are hand-sieved through standard sieves, starting with the sieve with the largest opening specified and progressing successively through the specified sieves in the order of decreasing size of opening, and computing the weight of glass spheres and the percent passing each of the sieves.

4. Significance and Use

4.1 The size or gradation of glass spheres is one measurable aspect of performance as a retroreflective media. The function of this test is to measure the size of glass spheres and to determine compliance with applicable specifications.

NOTE 1—This method has been used in other industrial areas outside the intended scope of this test method.

5. Apparatus

5.1 *Balance*, sensitive to 50 mg.

5.2 *Sieves*, 200 mm (8 in.) in diameter, conforming to Specification E11, and including such sieves as may be required by the specifications for the glass spheres.

5.3 *Oven*.

6. Samples

6.1 By quartering or riffle sampling (Note 2), select a representative sample from the material to be tested. Take at least two representative samples of approximately 500 g each from separate packages from each shipment in the ratio of two samples for each 5000 kg (10 000 lb) or fraction thereof. Approximately 50 g (0.02 oz) of dry glass spheres are required for each test. This specimen is also selected by quartering or riffling.

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[1] This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.44 on Traffic Coatings.

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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.

NOTE 2—The quartering procedure for reducing bulk samples, to obtain representative test samples of suitable size, is described and illustrated in Practice D346. Various types of riffle samplers are illustrated in Practice D2013.

7. Procedure

7.1 *Hand Sieving*:

7.1.1 Dry the specimen to substantially constant weight at a temperature of 105 to 110 °C.

7.1.2 Weigh 50 g of the dried glass spheres to the nearest 0.1 g and place on the sieve with the largest opening in the series specified for the test, which shall be thoroughly dry. Hold the sieve, with pan and cover attached, in one hand in a slightly inclined position so that the specimen will be well distributed over the sieve, at the same time gently striking the side about 150 times per minute against the palm of the other hand on the upstroke. Turn the sieve every 25 strokes about one sixth of a revolution in the same direction. Continue the operation until not more than 0.05 g passes through the sieve in 1 min of continuous sieving. Each time, before weighing the material passing through the sieve, tap the side of the sieve with the brush handle in order to remove any material adhering to the wire cloth.

7.1.3 When the sieving has been finished, remove the cover of the sieve and carefully remove the residue remaining on the sieve to a tared container. Invert the sieve over a piece of glazed white paper and clean the wire cloth by brushing the underside. Add the material thus removed from the wire cloth to the residue removed from the sieve.

7.1.4 Weigh the portion of the specimen retained on the sieve to the nearest 0.1 g. Place the material passing through the largest sieve on the sieve with the next smaller opening for the series selected for the sieve analysis. Continue sieving in a similar manner, using successively each of the selected series of sieves in the order of decreasing size of opening, and recording the weight of that portion of the specimen retained on each sieve.

7.1.5 Washers, slugs, or shot shall not be used on the sieves.

7.2 *Machine Sieving*:

7.2.1 Mechanical sieving devices may be used but the glass spheres shall not be rejected if they meet the specification requirements when tested by the hand-sieving method described in 7.1. When mechanical sieving devices are used, their thoroughness of sieving shall be tested by using the hand method for comparison.

8. Calculation

8.1 Calculate the weight of material and the percent of the specimen passing each of the sieves.

9. Report

9.1 Report the following information:

9.1.1 Results of the sieve analysis reported as the total ~~per- cent~~percent passing each sieve, expressed to the nearest 0.5 %, and

9.1.2 The method of sieving used.

10. Precision and Bias

~~10.1*Precision*—The repeatability standard deviation has been determined to be 0.11 with values that ranged from 0.00 to 0.24. The reproducibility of this test method is being determined and will be available on or before December 31, 2005.~~ [3]

10.1 The precision of this test method is based on an interlaboratory study of Test Method D1214 for Sieve Analysis of Glass Spheres conducted in 2008. Five laboratories participated in this study. Each of the labs reported triplicate test results for a single material. Every "test result" reported represents an individual determination. Except for the use of data from only a single laboratory, Practice E691 was followed for the design and analysis of the data; the details are given in ASTM Research Report RR:D01-1150.

10.1.1 *Repeatability Limit (r)*—Two test results obtained within one laboratory shall be judged not equivalent if they differ by more than the "*r*" value for that material; "*r*" is the interval representing the critical difference between two test results for the same material, obtained by the same operator using the same equipment on the same day in the same laboratory.

10.1.1.1 Repeatability limits are listed in Tables 1-15.

10.1.2 *Reproducibility Limit (R)*—Two test results shall be judged not equivalent if they differ by more than the "*R*" value for that material; "*R*" is the interval representing the critical difference between two test results for the same material, obtained by different operators using different equipment in different laboratories.

[3] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D01-1150.

TABLE 1 Sieve Size 30 — Average Grams Retained

Material	Average Grams Retained $\bar{x}$	Repeatability Standard Deviation S_r	Repeatability Limit r	Reproducibility Standard Deviaiton S_R	Reproducibility Limit R
A	1.8283	0.3237	0.9062	0.4583	1.2833