



# Standard Test Method for Hardness of Mineral Aggregate Used on Built-Up Roofs<sup>1</sup>

This standard is issued under the fixed designation D 1865; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method covers the determination of hardness of all types of mineral surfacing for use on built-up roofs and is intended to provide an index of their ability to withstand physical breakdown in handling.

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:*

D 75 Practice for Sampling Aggregates<sup>2</sup>

D 451 Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products<sup>3</sup>

E 11 Specification for Wire Cloth and Sieves for Testing Purposes<sup>4</sup>

## 3. Summary of Test Method

3.1 Mineral aggregate is empirically evaluated for degree of breakdown into smaller pieces. The procedure calls for a sample, free of fines, to be dropped a distance of 1.2 m (4 ft) 400 times while inside a standardized test apparatus.

## 4. Significance and Use

4.1 This test method measures the resistance to physical breakdown in handling of built-up roofing aggregates.

## 5. Apparatus

5.1 A 1.2-m (4-ft) length of clean 50-mm (2-in.) iron pipe fitted with a removable screw cap on both ends, and mounted

on a suitable stand so that it can be rotated about an axis perpendicular to the long dimension of the pipe.

5.2 *Balance*, 500-g (1 lb) capacity, sensitive to 0.01 % of the capacity.

5.3 *Sample Splitter*, riffle-type.

5.4 *Sieves*—A series of square-opening sieves, 8 in. in diameter, conforming to the requirements prescribed in Specification E 11 and consisting of the following:

Sieve Designation	
9.5-mm	( $\frac{3}{8}$ in.)
6.3-mm	( $\frac{1}{4}$ in.)
3.35-mm	(No. 6)

A solid collecting pan shall be fitted to the bottom of the stack of sieves.

5.5 *Mechanical Sieve Shaker*, conforming to the requirements prescribed in Test Method D 451.

## 6. Sampling

6.1 Sample aggregates received in bulk in accordance with Practice D 75.

6.2 For aggregates received in bags or small containers, select a number of bags or small containers at random equivalent to the cube root of the total number in the shipment.

## 7. Procedure

7.1 Fractionate the aggregate, previously dried at 110°C (230°F) utilizing the riffle-type sample splitter, until a fraction is obtained that will permit the recovery, after hand sieving, of about 227 g (0.5-lb) of aggregate passing through the 9.5-mm ( $\frac{3}{8}$ -in.) sieve and retained on the 6.3-mm ( $\frac{1}{4}$ -in.) sieve.

7.2 Place the 9.5-mm ( $\frac{3}{8}$ -in.) and 6.3-mm ( $\frac{1}{4}$ -in.) sieves containing the 227 g (0.5-lb) sample on the mechanical sieve shaker and agitate for 10 min to ensure complete removal of the finer materials.

7.3 Weigh out 200 g (0.44 lb) of the aggregate retained on the 6.3-mm ( $\frac{1}{4}$ -in.) sieve and place inside the 50-mm (2-in.) pipe tester. Screw the caps tightly in place. Beginning with the pipe in a substantially vertical position, rotate the pipe in an arc of 180°, reverse direction, and repeat this action by turning end-for-end 200 complete revolutions (400 half turns), controlling the rate of travel so that the aggregate drops cleanly without sliding.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.03 on Surfacing and Bituminous Materials for Membrane Waterproofing and Built-up Roofing.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.03.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.04.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.02.

7.4 At the end of the test, unscrew the top cap, turn the pipe over, and empty the contents onto a nest consisting of the 6.3-mm (¼-in.) and No. 6 (3.35-mm) sieves and the pan. Tap the tube sharply to remove all of the sample. Place the nest of sieves in the mechanical sieve shaker and run for 5 min. Carefully weigh the portion of the sample retained on each of the sieves and on the pan to an accuracy of  $2 \times 0.1 \text{ g}$  ( $10^{-4}$ -lb).

## 8. Report

8.1 Record the percentage retained on each sieve and in the pan to the nearest 0.1 % on the basis of the original sample weight.

8.2 Report the breakdown of the mineral surfacing as the percentage passing the No. 6 (3.35-mm) sieve, on the basis of the original sample weight.

## 9. Precision and Bias

9.1 The following data should be used for judging the acceptability of results (95 % probability) on samples from the same lot from the same supplier.

9.1.1 Duplicate results by the same operator should not be considered suspect unless they differ by more than the following amount:

Breakdown Range, % 0 to 15	Repeatability, percentage points $\pm 5$
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9.1.2 The results submitted by each of two laboratories should not be considered suspect unless they differ by more than the following amount:

Breakdown Range, % 0 to 25	Reproducibility, percentage points $\pm 10$
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9.2 *Bias*—The procedure in Test Method D 1865 for measuring the hardness of mineral aggregate has no bias because the value obtained can be defined only in terms of the test method.

## 10. Keywords

10.1 aggregate fiber; built-up roofs; mineral aggregate; sieve analysis

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