



Designation: C241/C241M – 21

Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic¹

This standard is issued under the fixed designation C241/C241M; 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 U.S. Department of Defense.

1. Scope*

1.1 This test method covers the determination of abrasion resistance of all types of stones for floors, steps, and similar uses where the wear is caused by foot traffic.

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 non-conformance with the standard.

1.2.1 *Exception*—The formula for calculation of the result of this test method relies on the use of SI units; all measurements of weight in this test method shall be recorded in SI units. See 10.1 and 11.1.

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

C97/C97M Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone

C119 Terminology Relating to Dimension Stone

C1353/C1353M Test Method for Abrasion Resistance of

Dimension Stone Subjected to Foot Traffic Using a Rotary Platform Abraser

C1799/C1799M Guide to Dimension Stone Test Specimen Sampling and Preparation

3. Terminology

3.1 *Definitions*—All definitions are in accordance with Terminology C119.

4. Summary of Test Method

4.1 Three stone specimens are mounted in rotating specimen holders. While the grinding lap and the specimen rotate, a loose abrasive grit flows onto the grinding lap to abrade the bottom of the specimens. Each specimen supports a load of 4.4 lb [2000 g], which includes the weight of the specimen holder, but not the specimen itself. The abrasion resistance index, which is proportional to the volume abraded, is calculated for each specimen using the average weight (before and after abrading), the weight loss, and the apparent density.

5. Significance and Use

5.1 This test method is useful in indicating the differences in abrasion resistance between various building stones. This test method also provides one element in comparing stones of the same type.

NOTE 1—Test Method C1353/C1353M is an alternative method to evaluate abrasion resistance for stone subjected to foot traffic, but is not applicable for hard and coarse-grained stones such as granite. Preliminary assessments by Subcommittee C18.03 indicate it results in similar H_a values as established by this method.

6. Apparatus

6.1 The abrasion testing apparatus shall consist of the elements described in 6.1.1 to 6.1.6 (see Fig. 1).

6.1.1 *A power-driven grinding lap, A*, which is 10 in. [250 mm] in diameter and revolves at a speed of 45 r/min. Connected to the grinding lap shall be a vertical center drive shaft that includes a gear to drive three shafts with specimen holders;

6.1.2 *Three shafts*, that are located 3 in. [76 mm] rad at 120° from the center drive shaft; can move vertically and include:

6.1.2.1 *A detachable specimen holder, B*, to secure test specimens as specified in 8.1;

*A Summary of Changes section appears at the end of this standard



FIG. 1 Apparatus for Abrasion Resistance Test of Stone

NOTE 2—Fig. 1 shows one of the specimen holders removed from the shaft.

6.1.2.2 A gear, C, to rotate the specimen holders (see Note 3);

NOTE 3—The original instrument this test method is based on, includes specimen holders that rotate in the same direction as the grinding lap (counter-clockwise) at a speed of 22.5 r/min.

6.1.2.3 A weight hopper, D, to which additional weights may be added to achieve the specified load as stated in 6.1.3;

6.1.3 Each shaft shall apply a load of 4.4 ± 0.01 lb [2000 \pm 5 g] on the specimen which is the combined load of the vertical shaft, specimen holder, gear, and weight hopper, but not the specimen itself;

6.1.4 A rigid frame, E, that includes bearing sleeves, F, to ensure the shafts are perpendicular to the grinding lap;

6.1.5 An abrasive grit feeder, G, capable of continuously feeding abrasive to the grinding lap during testing;

6.1.6 A collection bin, H, to collect used abrasive grit.

6.2 Abrasive grit, No. 60 Alundum abrasive (Norton treatment 138S), or equivalent.

NOTE 4—The abrasive grit Norton treatment 138S is now referred to as Norton 3001 60 Grit 38a Alundum (white fused alumina).

6.3 Soft bristle brush, to remove loose particles from the abrasive wheels or surface of the specimen.

6.4 Balance, with a capacity of 1 lb [500 g] and capable of reading to two decimal places.

6.5 Desiccator, containing a drying agent and of sufficient size to contain samples to be tested.

6.6 Diamond saw (cut-off) with diamond-edged blade, cooled and flushed with water.

6.7 Ventilated drying oven.

7. Sampling

7.1 The sample shall represent the average quality of the type or grade of stone under consideration. It shall be of sufficient size to permit the preparation of at least three test specimens, and one face should have the finish to be exposed to traffic. The sample preferably should be 1 in. [25 mm] thick and 8 in. [200 mm] square.

NOTE 5—Refer to Guide C1799/C1799M for additional information on selecting, preparing, and conditioning test specimens.

8. Test Specimens

8.1 At least three specimens 2 in. [50 mm] square and preferably 1 in. [25 mm] in thickness shall be sawed from the sample and include any surface finish. One 2 in. [50 mm] square face shall have the finish to be evaluated, the other faces may have saw marks but should not be cut in a manner that fractures the stone. The edges of the surface to be tested shall be rounded by grinding to a radius of between $\frac{1}{32}$ in. to $\frac{1}{16}$ in. [1 mm to 2 mm].

NOTE 6—Specimens of other thicknesses may be utilized by adjusting the load specified in 6.1.3, so the load applied to the abrading face is the same as it would be if the specimen were 1 in. [25 mm] thick. For example, a specimen $\frac{3}{4}$ in. [19 mm] thick, the load would be increased by the weight of the missing $\frac{1}{4}$ in. [6 mm] thickness of the specimen.