



Standard Test Method Using the Taber Abraser for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic^{1,2}

This standard is issued under the fixed designation C 1353; 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 establishment of an index of abrasion resistance by determination of loss of weight resulting from abrasion of dimension stone as described in Terminology C 119 and is modeled after Test Method C 501.

1.2 The values stated in metric units are to be regarded as the standard.

1.3 This test method makes use of a Taber abraser machine to determine the weight loss of dimension stone under controlled conditions.

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

1.5 *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:

C 97 Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone³

C 119 Terminology Relating to Dimension Stone³

C 121 Test Method for Water Absorption of Slate³

C 501 Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *index of abrasion resistance, n*—a number calculated from the weight loss of a specimen subjected to a given number

of revolutions against a standard bonded abrasive wheel.

3.1.2 *sample, n*—a geometrically regular block of stone.

3.1.3 *test specimen, n*—a flat prism of specified size and shape cut from the submitted sample.

4. Summary of Test Method

4.1 This test method consists of mounting the stone specimen in suitable holders, attaching the mounted holder to the spindle of the Taber abraser, and subjecting the specimen to a prescribed number of revolutions under abrasive wheels of specified coarseness for a definite applied load. From the loss of weight due to abrasion, the abrasive wear index is calculated by a given formula.

5. Apparatus

5.1 Taber abraser machine, Model 5130 or 5150, equipped with replaceable hard abrasive H-22 Calibrate wheels that can be loaded by weights.

5.2 Table Model 200 refacing machine.

5.3 Vacuum pick up to remove the abraded material.

5.4 Revolution counter.

5.5 Balance with a capacity of 500 g (0.5 lb) and capable of reading to two decimal places.

5.6 Desiccator containing a drying agent of sufficient size to contain samples to be tested.

5.7 Diamond saw (cut-off) with diamond-edged blade lubricated with water.

5.8 Electrically powered drill capable of drilling a 6 mm (¼ in.) hole through the specimen.

5.9 A ventilated drying oven.

6. Sampling

6.1 Three stone samples 100 mm (4 in.) square and 10 mm (⅜ in.) thick shall constitute a sample and shall be chosen from material to be tested.

7. Test Specimen

7.1 Three test specimens are required. Each test specimen shall meet the following conditions:

7.1.1 A slab 100 mm (4 in.) square with the corners cut off to give a maximum radius of 60 mm (2⅜ in.) with a 6 mm (¼ in.) hole in the center and the thickness equal to 10 mm (⅜ in.) or less.

7.1.2 The upper surface shall be flat with either a finish as

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² The Taber abraser is available in two models: the 5130 with a single head or the 5150 with dual testing heads. The 5130 machine replaces Model 503, which is a single head machine. Both machines function in the same manner. The Taber abraser and Model 200 wheel surfacer are available from Taber Instrument Corp., 455 Bryant Street, North Tonawanda, NY 14120.

³ *Annual Book of ASTM Standards*, Vol 04.07.

⁴ *Annual Book of ASTM Standards*, Vol 15.02.

required for the test or ground and smoothed with 120 mesh grit. Rough surfaces, such as thermal, bush-hammered, gang-sawn, and cleft finishes, are not suitable for testing in accordance with this test method.

8. Procedure

8.1 Determine the bulk density (p) of dimension stone in accordance with Test Methods C 97 and C 121 for slate. Dry in an oven at a temperature of $60^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($140^{\circ}\text{F} \pm 4^{\circ}\text{F}$) for 48 h. Cool in a desiccator and weigh (w_o). The test specimens shall remain in desiccator until tested. Tests should not begin unless the relative humidity is 45 to 55 % and the temperature is at $22 \pm 3^{\circ}\text{C}$ ($72 \pm 4^{\circ}\text{F}$).

8.2 Weigh the test specimen to the nearest 0.01 g (0.01 lb).

8.3 Place the test specimen on the table of the abraser with the surface to be tested uppermost.

8.4 Perform test work in a controlled environment, space, or room.

8.5 Set the vacuum cleaner-extractor to 90 to 100 % capacity. Lower and adjust the orifice arm so the orifice is a distance of 1 to 2 mm ($\frac{1}{8}$ to $\frac{1}{16}$ in.) above the test surface.

8.6 Load each holder with a 1 kg (2.2 lb) weight above the abrasive wheel and gently lower the wheels onto the surface of the test specimen.

8.7 Switch on the vacuum cleaner-extractor.

8.8 Rotate the table for 1000 revolutions. Gently brush the abrasive wheels while the test specimen is rotating to assist in the removal of loose dust and prevent clogging the abrasive wheels.

NOTE 1—The preferred number of revolutions is 1000 regardless of the stone type. Some stones may wear through before 1000 revolutions. For these stones, the equipment should be stopped when the wear has reduced the thickness by 70 to 80 %.

8.9 Remove the specimen carefully from the table, brush clean the dust and abrasive grains, and weigh (w_1).

9. Calculation

9.1 Calculate the index of abrasion resistance as follows:

$$I_w = \frac{36.75}{w_o - w_1} \times p \times \frac{n}{1000}$$

where

I_w = index of abrasion resistance,

w_o = initial weight of test specimen,

w_1 = weight of test specimen after 1000 revolutions,

p = bulk density, and

n = number of revolutions actually run during the test.

10. Report

10.1 Report the following information for each test specimen:

10.1.1 Identification number and source of sample,

10.1.2 Commercial name or description of stone and surface tested,

10.1.3 Date of test,

10.1.4 Identity of test operator,

10.1.5 Identification number of each test specimen,

10.1.6 Value of bulk density used in the calculations,

10.1.7 Index of abrasion resistance of each test specimen and average of the three test specimens,

10.1.8 Presence of any defect or surface feature likely to have influenced the result,

10.1.9 Identification of the operator and laboratory carrying out the test,

10.1.10 The relative humidity of the test area, and

10.1.11 The actual number of revolutions run.

11. Precision and Bias

11.1 *Precision*—Not enough data exists that will serve as a basis for preparing a precision statement.

11.2 *Bias*—There is no accepted reference material, therefore, no bias statement can be made.

12. Keywords

12.1 abrasion resistance; dimension stone; Taber abraser

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