



Designation: C217/C217M – 22

Standard Test Methods for Weather Resistance of Slate¹

This standard is issued under the fixed designation C217/C217M; 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 These test methods cover two procedures for weather resistance of slate in all outdoor installations by determining the depth of softening after soaking in 1 % sulfuric acid solution by a shear/scratch tester (Test Method A) or by hand scraping (Test Method B).

NOTE 1—These tests are based on the fact that slates containing calcium carbonate undergo a chemical weathering which produces gypsum and carbon dioxide. The swelling action that results causes disintegration of the slate. Oxidation of iron sulfides (such as pyrite) may also adversely affect weathering durability of a slate. The extent of such action on various slates in the test has been found to correlate with the durability of the materials in actual weathering.

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 are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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

C119 Terminology Relating to Dimension Stone

¹ These test methods are under the jurisdiction of ASTM Committee C18 on Dimension Stone and is the direct responsibility of Subcommittee C18.01 on Test Methods.

Current edition approved June 1, 2022. Published July 2022. Originally approved in 1948. Last previous edition approved in 2021 as C217/C217M–21. DOI: 10.1520/C0217_C0217M-22.

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.

C406/C406M Specification for Roofing Slate

C1799 Guide to Dimension Stone Test Specimen Sampling and Preparation

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in these test methods, refer to Terminology C119.

4. Summary of Test Method

4.1 After grinding the faces of the test specimens smooth and finishing with No. 80 abrasive, the specimen is sheared or scraped in a controlled manner and the thickness of the specimen measured. The specimen is then submerged in a 1 % sulfuric acid solution which is replaced with a fresh solution each day, for a total of 7 days. At the end of 7 days, the specimen is removed and washed, and then dried in an oven for 24 h. The opposite face of the specimen is then sheared or scraped and the thickness of the specimen measured. The depth of softening is the depth of a groove made by the shearing tool after acid treatment minus the depth before acid treatment (Test Method A), or the depth of scrape made by the cutting edge of a hand scraping tool after acid treatment minus the depth before acid treatment (Test Method B).

5. Significance and Use

5.1 This test method is useful in indicating the differences in weather resistance between various slates. For comparison of relative slate performance, Specification C406/C406M provides a classification that includes expected service life based on depth of softening. This test method provides one element in the comparison of slates.

6. Apparatus

6.1 *Test Method A only:*

6.1.1 *Shear/Scratch tester*, (see Fig. 1) with the shearing tool, Model S-20³, or its equivalent. The apparatus includes a removable scale beam that is mounted on a pivotal shaft

³ The sole source of supply known to the committee at this time is Taber Industries, North Tonawanda, NY. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

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

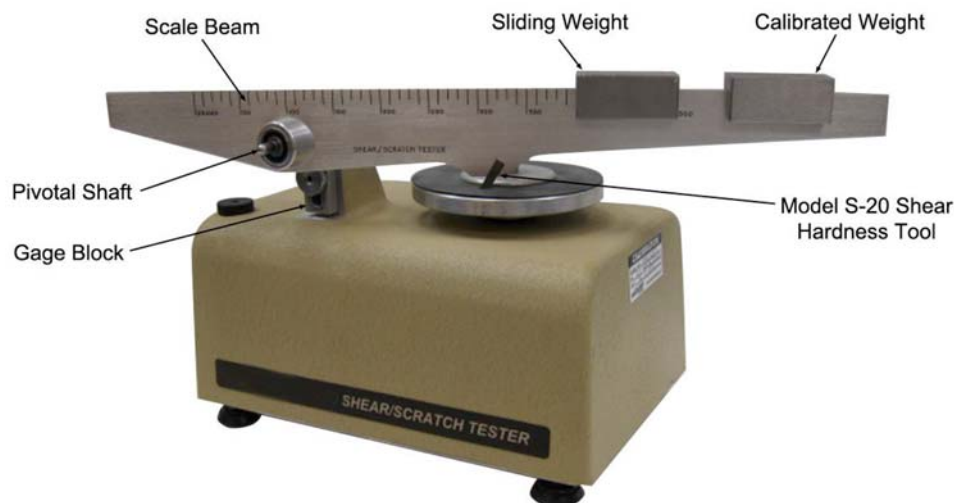


FIG. 1 Shear/Scratch Tester

projecting from an adjustable gage block that can be raised or lowered, corresponding with the thickness of a test specimen up to 0.5 in. [12.7 mm]. The scale beam is set at an angle of 70° referencing the shaft it pivots on. A calibrated weight and sliding weight are mounted on the scale beam to achieve the desired load. Operated by an on/off switch, the motorized turntable rotates counter clockwise at a constant speed of 0.6 ± 0.1 r/min.

6.1.2 Pencil compass.

6.2 Test Method B only:

6.2.1 *Hand Scraping Tool*—The scraping tool shall be made by grinding down the square edge blade of a metal putty knife to a length of 3 ± 1/8 in. [75 ± 3 mm] and a width of 3/4 in. [20 mm]. Prior to every test, the end of the blade shall be ground to a plane surface perpendicular to the length of the tool to form a sharp edge with either side of the blade. These sharp edges are referred to as the “cutting edges.”

6.2.2 Bench Grinder.

6.2.3 *Balance (optional)*, capable of measuring 3 lbf [15 N].

6.3 Both Test Methods:

6.3.1 *Thickness Measuring Device*, such as a point micrometer with ratchet stop mechanism, to measure to nearest 0.0001 in. [0.002 mm].

6.3.2 *Container*, such as a glass vessel, which is chemically compatible with sulfuric acid solution.

6.3.3 *Drying Oven*, capable of operation at 221 °F ± 4 °F [105 °C ± 2 °C], for drying specimens.

6.3.4 *Chemical Resistant Gloves*, for handling test specimens when performing the acid soak.

7. Reagents

7.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society where

such specifications are available.⁴ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.2 Sulfuric acid (H₂SO₄)—1 % solution.

NOTE 2—*Example*—A convenient means of determining the amount of H₂SO₄ required for the test is as follows: Suppose one has 96 % H₂SO₄ (sp gr 1.84) and the volume of diluted acid necessary for the test is 2000 mL. Let X equal the weight of 96 % H₂SO₄ required. Then:

$$\frac{0.96X}{X + 2000} = 0.01 \quad (1)$$

From this equation, X is determined as 21.05 g. The volume of this weight of 96 % H₂SO₄ is 21.05/1.84 = 11.4 mL. (The error due to assuming the weight of 1 mL of water as 1 g is not appreciable.)

NOTE 3—The 1 % sulfuric acid dilution is dependent on the concentration of the stock solution.

8. Test Specimens

8.1 Prepare not less than three specimens, each a minimum of 2 in. by 4 in. [50 mm by 100 mm] measured along the cleavage faces, for determining the depth of softening in a 1 % solution of sulfuric acid. The 2 in. by 4 in. [50 mm by 100 mm] faces shall be ground smooth and finished with No. 80 abrasive. Specimens cut from sheared or punched slate shall have no saw cut nearer than 1 in. [25 mm] from the edges or nail holes.

NOTE 4—Refer to Guide C1799 for additional information on selecting, preparing, and conditioning test specimens.

9. Conditioning

9.1 Dry the specimens for 48 h in a ventilated oven at a temperature of 140 °F ± 4 °F [60 °C ± 2 °C]. At the 46th, 47th

⁴ Reagent Chemicals, American Chemical Society Specifications, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see Anal. Standards for Laboratory Chemicals, BDH Ltd., Poole, Dorset, U.K., and the United States Pharmacopeia and National Formulary, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.