ASTM Specification, Standards and Definitions

Material Specification:

ASTM C503-99e1: Standard Specification for Marble Dimension Stone (Exterior)

ASTM C568-99: Standard Specification for Limestone Dimension Stone

ASTM C615-99: Standard Specification for Granite Dimension Stone

ASTM C616-99: Standard Specification for Quartz-Based Dimension Stone

ASTM C629-99: Standard Specification for Slate Dimension Stone

ASTM C1526-02: Standard Specification for Serpentine Dimension Stone

ASTM C1527-02: Standard Specification for Travertine Dimension Stone

Test Standards:

ASTM C97-02: Standard Test Method for Absorption and Bulk Specific Gravity of Dimension Stone.

ASTM C99-87 (2000): Standard Test Method for Modulus of Rupture of Dimension Stone.

ASTM C120-00: Standard Test Method for Flexure Testing of Slate (Modulus of Rupture, Modulus of Elasticity).

ASTM C121-90 (1999): Standard Test Method for Water Absorption of Slate.

ASTM C170-90 (1999): Standard Test Method for Compressive Strength of Dimension Stone.

ASTM C199-84 (2000): Standard Test Method for Refractory Mortars.

ASTM C217-94 (1999): Standard Test Method for Weather Resistance of Slate

ASTM C 241-90 (1997): Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.

ASTM C880-98: Standard Test Method for Flexural Strength of Dimension Stone.

ASTM C1028-96: Standard Test Method for Determining the Static Co-efficient of Friction of Ceramic Tile and other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.

ASTM C1201-91 (1996): Standard Test Method for Structural Performance of Exterior Dimension Stone Cladding Systems by Uniform Static Air Pressure Difference.

ASTM C1352-96 (2002): Standard Test Method for Flexural Modulus of Elasticity of Dimension Stone.

ASTM C1353-98-e1: Standard Test Method Using the Taber Abraser for Abrasion Resistance of Dimension Stone Subjected to foot traffic.

ASTM C1354-96: Standard Test Method for Strength of Individual Stone Anchorages in Dimension Stone

ASTM Test Definitions:

ASTM 170-90 (1999): ***Compressive Strength of Dimension Stone:***

Compressive strength is a measure of resistance to crushing loads. A stone floor must be able to bear crushing loads of people, furniture, and other objects on the floor. The compressive strength is the maximum load per unit area that a stone can bear without crushing. A higher compressive strength indicates that the stone can withstand a higher crushing load. The required values range from 1,800 psi for marble to 19,000 psi for granite.

ASTM 99-87 (2000) and ASTM C120-00 (Slate): Bending ***Strength of Dimension Stone:***

The tests for the **Modulus of Rupture**, ASTM C99-97 (2000) and ASTM C120-00 (Slate), and for Flexural Strength ASTM C880-98, determine the strength of the stone in bending. A stone or door lintel must resist the bending loads from the weight of the stone. A veneer must bear bending loads, between anchor points, from exterior wind loads or persons leaning against interior veneers. Floor stone must bridge possible gaps in the grout or thin-set support. For all three tests, the stone specimens are supported near the ends and a downward load applied to the top. The modulus of rupture tests, ASTM C99-87 (2000) and ASTM C120-00, prescribe applying the load to a single point at mid-span. The flexural strength test, ASTM C880-98, prescribes to applying the load simultaneously to two points, each one quarter of the span from the end support. The flexural modulus is expressed as LB/in2 or a. A higher flexural strength or modulus of rupture indicates a higher bending strength. The required minimum values range from 400 psi for low- density limestone to 10.3 for granite.

ASTM C120-00 Flexure Testing of Slate:

The modulus of rupture testing for slate, specified in ASTM C120-00, is somewhat different then C99-87 (2000). The specimens are 12” x 1 1/2” x 1” thick. Rubbing or sanding the cleft faces achieves the specified 1” thickness. The test is helpful, but does not indicate any reduction in the strength for thinner stone when used as a veneer or for flooring. They are valid for thicker sections. Because of the mid-span loading, any weakness that is not in the center third (approximately) of the specimen will usually not affect the strength value determined by the test. These limitations are overcome by the flexural strength test of ASTM C880-98.

ASTM C880-98 Flexural Testing of Dimension Stone:

This test is similar to the modulus of rupture tests, with two significant differences. First, the stone is tested at the thickness in which it will be used. The test span is proportional to the thickness by ratio of 10:1. Thus any reduction is the bending strength due to the stone structure, e.g., grain size, grain cementing, etc., will be reflected in the test results. The second difference that distinguishes the ASTM C880-98 flexural strength test from the modulus of rupture test is the flexural strength test is conducted with quarter-point loading. That is, the test load on the top of the specimen is not applied to a single location at mid-span, but rather, the total test load is split. With half of the load applied to at each of two points one quarter of the span from the supports. In this way, the entire center half of the specimen is subjected to the same maximum bending forces. Thus local weakness, as from a vein, is more likely to be reflected in the resulting flexural (bending) strength.

ASTM C241-90 (1997) Abrasion Resistance of Stone Subjected to Foot Traffic:

Wear resistance is an essential characteristic that will determine whether a stone is suitable for use as a floor. The abrasion test of ASTM C241-90 (1997) result in an index number proportional to the volume of material abraded or worn off the stone during the stone test. The abrasion index numbers are scaled to generally range between 0 to 100. There are two concerns regarding this test method. First, it is not always possible to obtain specimens that are 1” thick. The second concern is the abrasive. ASTM C97-02 specifies a particular abrasive that is no longer being produced (please check with ASTM Int’l for updates).

Static Coefficient of Friction Testing:

Slippery floors are a safety hazard, thus some measure of slip resistance is needed to evaluate stone and its finish as floor material. In the U.S., slip resistance is determined by measuring the static coefficient of friction.

All stone floors should have safe and comfortable walking surface. Those concerned with this issue usually turn to the Americans with Disabilities AT (ADA) recommendations.

Slips and falls are caused primarily by a change of COF of a floor caused by, for example, a spilled beverage. Because of this, the maintenance of the floor is more important to its ability to provide safe walking surface then the COF of the stone.