



Standard Test Method for Flexural Modulus of Elasticity of Dimension Stone¹

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1. Scope

1.1 This test method covers the procedure for determining the flexural modulus of elasticity of stone by using a simple beam with quarter-point loading.

1.2 Stone tests may be made with load applied perpendicular to the bedding plane or rift and with load applied parallel to the bedding plane or rift.

1.3 Stone tests may be made for wet and dry specimen conditions.

1.4 The specifier of the test shall determine which conditions shall be used.

1.5 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.6 *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 119 Terminology Relating to Dimension Stone²

C 880 Test Method for Flexural Strength of Dimension Stone²

E 4 Practices for Force Verification of Testing Machines³

3. Terminology

3.1 *Definition*—For definitions of terms used in this test method, refer to Terminology C 119.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *modulus of elasticity, n* —stress per unit strain, also known as Young's Modulus.

4. Significance and Use

4.1 This test method is useful for providing engineering values for stress and deflection analysis of stone panels. It is also useful in indicating the differences in flexural modulus of

elasticity between various dimension stones and stones of the same type in different loading directions (parallel and perpendicular to rift or bedding planes).

5. Apparatus

5.1 *Testing Machine* (see Fig. 1), conforming to the requirements of the applicable sections of Practices E 4. The quarter-point loading method shall be used in making flexure tests of stone employing bearing blocks that will ensure that forces applied to the beam will be vertical only and applied without eccentricity. The apparatus should be capable of maintaining the span length and distances between load-applying blocks and support blocks constant within ± 1.3 mm (± 0.05 in.). The load should be capable of being applied at a uniform rate and in such a manner as to avoid shock.

5.2 *Deflection Gages*, capable of reading to 0.002 mm (0.0001 in.) shall be used to measure mid-span deflections at the two free edges and support deflections at each end.

6. Test Specimens

6.1 The test specimens shall measure 100 mm (4 in.) wide by 32 mm (1.25 in.) thick by 380 mm (15 in.) long with a span as tested of 320 mm (12.5 in.). The sides of the specimens shall be at right angles with the top and bottom. The specimens shall have a fine abrasive finish on the planes perpendicular to the load and a fine saw finish on the other four planes. The dimensions of the specimen shall be measured and recorded to the nearest 0.2 mm (0.01 in.). A minimum of five specimens shall be tested for each condition of test. The average value calculated from plots of the test results is reported as the flexural modulus of elasticity for that condition.

6.2 Where the job thickness has been set (the thickness of the stone panels for the project has been established), it is often requested to perform flexural modulus of elasticity tests at the job thickness. The following shall govern the specimen size where it is requested to test at the job thickness, and the job thickness is other than 32 mm (1.25 in.). The span as tested shall be ten times the thickness. The specimen lengths shall be not less than 50 mm (2 in.) and not more than 100 mm (4 in.) greater than the span as tested. Where the thickness is less than 70 mm (2.67 in.), the width of the specimen shall be 100 mm (4 in.). Where the thickness is greater than 70 mm (2.67 in.) the width shall be 1.5 times the thickness. Where the thickness is other than 32 mm (1.25 in.) and the specimen size is in

¹ This test method is under the jurisdiction of ASTM Committee C-18 on Dimension Stone and is the direct responsibility of Subcommittee C18.01 on Test Methods.

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² *Annual Book of ASTM Standards*, Vol 04.07.

³ *Annual Book of ASTM Standards*, Vol 03.01.