Designation: E761 – 92 (Reapproved 2011)

Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members[1]

This standard is issued under the fixed designation E761; 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 Department of Defense.

1. Scope

1.1 This test method covers a procedure for measuring the compressive strength of sprayed fire-resistive material (SFRM) applied to a rigid substrate. These fire-resistive materials include sprayed fibrous and cementitious materials applied directly in contact with these structural members. The test method is applicable to laboratory procedure.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2092 Guide for Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting[3]

E84 Test Method for Surface Burning Characteristics of Building Materials

E119 Test Methods for Fire Tests of Building Construction and Materials

E605 Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members

3. Summary of Test Method

3.1 The compressive strength of SFRM applied to a steel sheet is determined by applying a crushing load normal to the surface of the specimen. This test method measures the stress at 10 % deformation or at failure, whichever is smaller.

4. Significance and Use

4.1 The intent of this test method is to determine properties of direct-applied SFRM that may be used to provide an indication of serviceability. Satisfactory performance of fire-resistive material applied to structural members and assemblies depends upon its ability while in place to withstand the various influences that may occur during the life of the structure, as well as upon its satisfactory performance under fire tests.

4.2 This test method measures the compressive strength of SFRM and is a measure of the resistance to deformation under a compressive load. It is an indication of the ability of SFRM to remain in place and resist removal during anticipated service conditions.

5. Apparatus

5.1 *Testing Machine*—Any form of standard hydraulic or mechanical compression testing machine accurate to 0.005 kg (0.01 lb) and 0.25 mm (0.001 in.).

5.2 *Spherical Bearing Block Assembly*, having a plane bearing surface of 150 mm (6 in.) square. The upper bearing shall be a spherically seated, hardened metal block firmly attached at the center of the upper head of the machine. The center of the sphere shall lie at the center of the surface held in its spherical seat, but shall be free to turn in any direction, and its perimeter shall have at least 6-mm (¼-in.) clearance from the head to allow for specimens whose bearing surfaces are not exactly parallel (see Fig. 1).

[1] This test method is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.21 on Serviceability.

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[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.

[3] Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

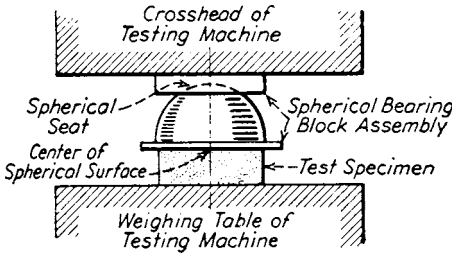

FIG. 1 Spherical Bearing Block for Compressive Strength Test

5.3 *Drying Oven*, capable of maintaining temperature and humidity conditions during the specimen curing cycle, in accordance with the SFRM manufacturers' published requirements.

6. Materials and Manufacture

6.1 This test method requires the application of SFRM in accordance with manufacturers' published instructions. The apparatus, materials, and procedures used to apply the SFRM for this test shall be representative of application in the field.

6.2 The density of the prepared sample shall be similar to the density tested and reported during the Test Methods E119 and Test Method E84 fire exposure tests or as required by the sponsor of the test.

6.3 Determine the density and thickness of each of the laboratory-prepared specimens. Report in accordance with Test Methods E605.

7. Test Specimen

7.1 The test specimen shall be SFRM applied to galvanized steel sheet, 1.5 mm (0.060 in. (16 ga.)) minimum thickness, 175 by 600 mm (7 by 24 in.). Clean with solvent to remove any oil on the surface to be sprayed, in accordance with Guide D2092.

7.2 Apply the fire resistive material to the galvanized steel sheet at a minimum thickness of 19 mm (¾ in.). Individual thickness measurement shall be +3.0 mm (+0.125 in.) with no measurement less than 19 mm (¾ in.).

7.3 Condition the prepared specimen for a period of not less than 72 h at room temperature (20 ± 10°C (68 ± 18°F)) and at relative humidity not greater than 60 %. After 72 h, the specimen may be force dried in a drying oven at 43 ± 6°C (110 ± 10°F), and at a relative humidity not greater than 60 % until reaching constant weight.[4]

[4] Although mass is being determined, the term *weight* is used in this test method as a field-accepted substitute.

7.4 Testing may be performed after it has been determined that the specimen has reached constant weight.

7.5 Where necessary, even the surface of the specimen at two areas 150 mm (6 in.) square at opposite ends of the specimen with an appropriate capping material such as polyurethane, epoxy, polyester, or other similar materials. The top plane of the capping material shall not exceed the thickest point of the test area of a test specimen with an irregular surface by more than 1.3 mm (0.05 in.).

7.6 Make two compression tests at opposite ends of the test specimen. Make one density test on the specimen.

7.7 Other types of non-compressible backing may be used if specified.

8. Procedure

8.1 Apply the load perpendicular to the face of the test specimen, with the bearing block on top of the specimen. The initial thickness of the test specimen for deformation calculations shall be the distance between the plane bearing surface of the block assembly and the steel (backing) plane, after an initial load of 0.7 kPa (0.1 psi) has been applied to the specimen.

8.2 The speed of the moving head of the testing machine shall be not more than 1.3 mm (0.05 in.)/min. Compress the specimen until either a deformation of 10 % or ultimate load is reached, whichever occurs first.

9. Report

9.1 Report the following information:

9.1.1 Compressive strength in kilopascals (or pounds-force per square inch), including weight of spherical test block assembly at 10 % deformation or at ultimate load, whichever is the smaller,

9.1.2 Mode of failure, and

9.1.3 Thickness in millimetres (or inches) and the density in kilograms per cubic metre (or pounds per cubic foot) of the SFRM.

10. Precision and Bias

10.1 *Precision*—The precision of the test method is being developed and will be added when available.

10.2 *Bias*—The procedure in this test method has no bias because the value of the compressive strength can be defined only in terms of a test method.

11. Keywords

11.1 compressive strength; sprayed cementitious; sprayed fibrous; sprayed fire resistive materials (SFRMs)