



Designation: E605/E605M – 19

# Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members<sup>1</sup>

This standard is issued under the fixed designation E605/E605M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

## 1. Scope

1.1 These test methods cover procedures for determining thickness and density of sprayed fire-resistive material (SFRM) used in structural assemblies. These include sprayed fiber and cementitious types. The test methods are applicable to both laboratory and field procedures, as indicated in Section 7.

1.2 These test methods require the application of SFRM in accordance with the manufacturers' published instructions. The apparatus, materials, and procedure used to apply the SFRM for laboratory tests shall be the same as is used for the construction of either of the test assemblies described in Test Methods E119 and E84.

1.3 There is no intent in these test methods to establish levels of performance.

1.4 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.

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

1.6 *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.*

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.21 on Serviceability.

Current edition approved April 1, 2019. Published May 2019. Originally approved in 1977. Last previous edition approved in 2015 as E605/E605M – 93 (2015) <sup>$\epsilon$ 1</sup>. DOI: 10.1520/E0605\_E0605M-19.

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

E84 Test Method for Surface Burning Characteristics of Building Materials

E119 Test Methods for Fire Tests of Building Construction and Materials

E631 Terminology of Building Constructions

## 3. Terminology

3.1 *Definitions*—For definitions of terms found in these test methods, refer to Terminology E631.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *density, n*—the weight<sup>3</sup> per unit volume of the SFRM.

3.2.2 *sprayed fire-resistive materials, n*—materials that are sprayed onto substrates to provide fire-resistive protection of the substrates.

3.2.3 *thickness, n*—the distance measured from the substrate sprayed with the SFRM, through the SFRM, to the outer surface of the SFRM.

## 4. Summary of Test Method

4.1 The basic properties of density and thickness are determined using a thickness gauge, scales, steel rules, and templates.

## 5. Significance and Use

5.1 Certain properties, namely thickness and density, of SFRM are basic. It is the intent of these test methods to provide procedures to determine these properties.

## 6. Apparatus

6.1 *Steel Rule*, graduated in at least 1 mm [ $1/16$  in.] intervals.

<sup>2</sup> 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.

<sup>3</sup> Although *mass* is determined, the term *weight* is used in these test methods as a field-accepted substitute.

6.2 *Thickness Gauge*, consisting of a needle or a pin and a sliding disk perpendicular to the needle (see Fig. 1). The pin shall be of sufficient length for the thickness of the material to be measured. This gauge shall be graduated in 1 mm [ $1/16$  in.] intervals. This disk shall be perpendicular to the needle at all times and shall have a friction device to grip the pin unless purposely moved. The disk diameter shall be a minimum of 22 mm [ $7/8$  in.] and a maximum of 30 mm [ $1\ 1/8$  in.], to permit contact with the surface of the specimen to be measured. For materials not readily penetrated by the depth gauge, see 8.1.2.1 and Note 2.

6.3 *Scales* of sufficient capacity and sensitivity to weigh the test specimen to an accuracy of at least 0.1 g.

6.4 *Rectangular Template* of predetermined length and width having a minimum area of 310 cm<sup>2</sup> [48 in.<sup>2</sup>]. No dimension shall be less than 76 mm [3 in.].

6.5 *Knife*, or other suitable device, for cutting the specimen.

6.6 *Drying Oven*, or other device capable of maintaining temperature and humidity conditions during the specimen curing cycle, in accordance with the SFRM manufacturer's requirements. (See Section 7.2.)

6.7 *Unexpanded Polystyrene Beads, 500 mL*—Designation *C Bead* with a nominal diameter of 1.0 mm [0.04 in.] (preferred) or lead shot—size #8 (alternate).

6.8 *Graduated Cylinders*, two 250 cm<sup>3</sup>.

6.9 *Funnel*—Polypropylene funnel having a top diameter of 150 mm [6 in.] and a bottom diameter of 28 mm [1.1 in.].

6.10 *Beaker*, 400 mL smooth wall type.

6.11 *Screed*, minimum 150 mm [6 in.] long rigid straight edge.

6.12 *Pan*—Two flat pans minimum 150 mm [6 in.] diameter with minimum 150 mm high rim.

## 7. Test Specimen

### 7.1 Laboratory Tests:

7.1.1 The test specimens shall be SFRM applied to 1.5 mm [0.06 in. (16 ga.)], 400 by 400 mm [16 by 16 in.] bare or galvanized steel plates.

7.1.2 The specimens shall be conditioned for a period of not less than 72 h at room temperature,  $20 \pm 5$  °C [ $68 \pm 9$  °F] and a relative humidity not greater than 60 %, until successive weight readings, taken at 24 h intervals, differ by less than 1 %.

### 7.2 Field Tests:

7.2.1 As an alternate to 7.1.2, the specimens shall be force dried at a temperature of  $43 \pm 6$  °C [ $109 \pm 10$  °F] and a relative humidity not greater than 60 % until successive readings, taken at 8 h intervals, differ by less than 1 %.

## 8. Procedure

### 8.1 Thickness:

8.1.1 Selected areas to be measured for thickness shall be a predetermined, repetitive pattern to ensure obtaining representative average thickness.

8.1.2 Determine the thickness by inserting the penetrating pin of the thickness gauge perpendicular to and through the SFRM, to the substrate. When the point of the pin touches the substrate, move the sliding disk to the SFRM surface with sufficient force on the disk to register the average plane of the surface. Withdraw the gauge to read the thickness in 1 mm [ $1/16$  in.] increments as shown by the position of the sliding clip indicator.

8.1.2.1 For the purpose of averaging measurements, any measurement 6 mm [ $1/4$  in.] or more, over the required design thickness, shall be recorded as the design thickness plus 6 mm. No individual measured thickness shall be more than 6 mm less, or more than 25 % less, than the required design thickness.

NOTE 1—Specific fire resistance rating criteria for beams, trusses, and columns may allow for a reduced thickness on flange tips. These thicknesses are to be averaged apart from other sections of the structural member. Also, some fire rating assemblies have different thickness requirements for crests and valleys of floor decks and should be averaged apart.

NOTE 2—Medium and high density SFRM may be too hard to test for thickness by standard procedure. It is recommended to check thicknesses immediately after application, and before curing.

The applicator shall adjust the thickness of the freshly applied SFRM to yield thickness after cure, in accordance with the SFRM manufacturer's recommendations.

If the product is cured and too hard to insert the thickness gauge, drill small diameter holes into the product just large enough to accommodate the thickness gauge pin. The thickness gauge is then inserted into these holes and thickness is determined by the standard procedure. These holes are to be closed off immediately following the test using the same SFRM.

8.1.3 *Conducting Thickness Testing*—One bay per floor or one bay for each 10 000 ft<sup>2</sup>, whichever provides the greater number of tests. Thickness determinations for the following structural elements shall be conducted in each randomly

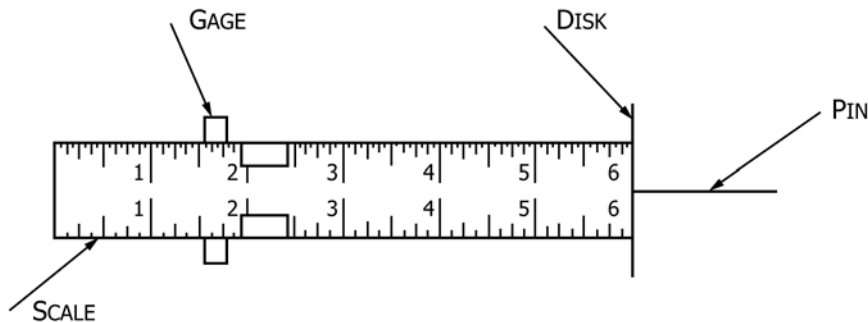


FIG. 1 Thickness Gauge