



Standard Practice for Application of Sprayed Fire-Resistive Materials (SFRMs)¹

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1. Scope

1.1 This practice covers guidelines for application of sprayed fiber and cementitious fire-resistive materials.

1.2 This practice is general in nature. It is not intended to cover all requirements for application.

1.3 The values stated in both inch-pound and SI units are to be regarded separately as the standard. The values given in parentheses are for information only.

1.4 *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. Specific precautionary statements are given in Section 10 and Note 2.*

2. Referenced Documents

2.1 ASTM Standards:

E 119 Test Methods for Fire Tests of Building Construction and Materials²

E 605 Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members³

E 631 Terminology of Building Constructions³

E 736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members³

E 759 Test Method for Effect of Deflection of Sprayed Fire-Resistive Material Applied to Structural Members³

E 760 Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members³

E 1368 Practice for Visual Inspection of Asbestos Abatement Projects³

3. Terminology

3.1 Definitions:

3.1.1 Many items in this practice are defined in Terminology E 631.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *application, n*—an act of applying sprayed fire-resistive materials.

3.2.2 *sprayed cementitious material, n*—consisting of one or more binders, aggregates and fibers, the material is mixed with water to form a slurry and is conveyed through a hose to a nozzle where compressed air is typically used to disperse the material into a spray pattern and directed to the substrate requiring protection.

3.2.3 *sprayed fire-resistive materials (SFRM), n*—materials that are sprayed onto substrates to provide fire-resistive protection of the substrates.

3.2.4 *sprayed mineral fiber material, n*—consisting of one or more binders, fibers and aggregates, the material is conveyed by low pressure air through a hose to a nozzle where it is mixed with atomized water and directed to the substrate requiring protection.

4. Summary of Practice

4.1 This practice describes the procedures for selecting, specifying, applying, and testing SFRM.

5. Significance and Use

5.1 This practice is intended for use by the material specifier, general contractor, applicator, or any individual group requiring information regarding the application of SFRM.

5.2 This practice is not intended to replace the manufacturers' application instructions.

6. Materials

6.1 The SFRM shall be either sprayed fiber or cementitious types. The material shall be manufactured in accordance with the manufacturer's specifications and quality control procedures. The material shall be free of any contamination that could impair its performance.

7. Storage and Handling

7.1 All materials shall be delivered to the job site in clearly labeled, unopened bags. Labels shall include the manufacturer, product name, surface burning characteristics of the product and list of appropriate fire resistance classified assemblies in which the product is a component.

¹ This practice 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 *Annual Book of ASTM Standards*, Vol 04.07.

³ *Annual Book of ASTM Standards*, Vol 04.11.

7.2 Materials with a shelf life shall be used within that period. Materials that have gone beyond their shelf life shall be removed from the job site, or manufacturer shall provide documentation attesting that the product is still usable for its original intended purpose.

7.3 Materials shall be kept dry until used and stored off the ground under cover.

8. Equipment and Utilities

8.1 Equipment used for application shall be of a type recommended by the SFRM manufacturer. Equipment shall include, but is not limited to: application machine, material mixer, material hoses, stand pipe, and spray nozzles.

8.2 The following utilities are typically provided by the general contractor: electricity, potable water, and lighting.

8.3 The following utilities may be needed depending upon job conditions and, if needed, shall be provided by the general contractor:

8.3.1 Heating (see 12.1.1), and

8.3.2 Forced ventilation (see 12.1.2).

9. Fire Resistance Classifications

9.1 *General*—Required fire resistance classifications are outlined by building codes such as those published by BOCA,⁴ SBCCI,⁵ ICBO⁶ and enforced by local authorities having jurisdiction. Required fire resistance classifications are determined by construction type, occupancy, and location.

9.2 Architects and material specifiers shall indicate on construction drawings and in specifications the required fire resistance classification(s) for a project. They shall also indicate what elements of that project are to be so protected. (See Note 1.)

NOTE 1—The architect and material specifier may indicate on construction drawings and in specifications a reference number for a fire resistance system capable of providing the required protection.

10. Safety

10.1 Current OSHA, applicable local ordinances, or code regulations shall be followed at all times.

10.1.1 Equipment shall have safety guards that meet applicable OSHA regulations in place. Grounded electrical connections shall be used.

10.1.2 *Protective Equipment*—All persons in the application area shall wear protective equipment as required. Examples of equipment that may be needed are: respirators, dust masks, coveralls, goggles or safety glasses, and hard hats.

10.1.3 Workmen shall not wear loose fitting clothing that could become caught in the machinery. Note, however, that personnel actually spraying product may wear loose, long sleeve clothing for protection and comfort reasons.

10.1.4 *Scaffold*—When required, a strong, lightweight, stable, rolling scaffold shall be used. An open grate flooring will help prevent material build up on the scaffold floor. Safety railing meeting OSHA regulations shall surround the scaffold floor area.

10.1.5 *Floors*—The floors in the work area shall be kept free of obstructions, excessive moisture, waste material, or other unsafe conditions.

11. Substrate Preparation

11.1 Prior to the application of SFRM, all areas to be sprayed shall be inspected by the applicator to ensure a suitable surface for proper SFRM bonding. The following recommendations shall be followed:

11.1.1 All surfaces to be sprayed shall be free of dirt, grease, oil, mill scale, loose scale, loose rust, or any material that will impair proper adhesion.

11.1.2 *Cleaning*—The applicator shall bring to the general contractor's attention any surface that does not meet the requirements of 11.1.1. Responsibility for cleaning substrates shall be established prior to submittal of SFRM bid. Unacceptable surfaces shall be cleaned in accordance with substrate or SFRM manufacturers recommendations. (On asbestos removal projects it is necessary to coordinate substrate conditions and cleaning procedures to ensure the integrity of the post removal encapsulant coatings.)

11.1.3 *Masking*—Surfaces that are susceptible to damage and are not to be sprayed shall be masked, covered or otherwise protected from the overspray of SFRM.

11.1.4 *Painted Surfaces*—SFRM manufacturers generally do not recommend application to painted surfaces. If it has been established that a paint or primer is necessary, the primed substrate sprayed with SFRM shall be tested in accordance with Test Methods E 119.

11.1.5 Post removal encapsulated surfaces (lockdown coatings) shall be inspected in accordance with Practice E 1368. If it has been established that a lockdown coating is necessary, the coated substrate sprayed with the SFRM shall be tested in accordance with Test Methods E 119.

11.1.6 Where UL fire resistance rating designs are utilized, unless specifically prohibited in a design, SFRM may be applied to primed or painted wide flange steel shapes provided: the beam flange width does not exceed 300 mm (12 in.); the column flange width does not exceed 400 mm (16 in.); the beam or column web depth does not exceed 400 mm (16 in.); and bond tests conducted in accordance with Test Method E 736 shall indicate a minimum average bond strength of 80 % and a minimum individual bond strength of 50 % when compared to the bond strength of the fire resistive coating as applied to clean uncoated 1/8 in. (3.2 mm) thick steel plate. The average minimum bond strength values shall be determined based upon a minimum of five bond tests conducted in accordance with Test Method E 736.

12. Application Environment

12.1 *General*:

12.1.1 A minimum ambient and substrate temperature of 4.4°C (40°F) shall be maintained for 24 h before, during, and a minimum of 24 h after the application of the SFRM unless otherwise recommended by the material manufacturer. If necessary for job progress, enclosures and heat shall be provided to maintain temperatures.

⁴ Building Officials and Code Administrators International.

⁵ Southern Building Code Congress International, Inc.

⁶ International Conference of Building Officials.

12.1.2 In most instances, natural ventilation is sufficient. In enclosed areas, forced ventilation shall be introduced for curing.

13. Application

13.1 *General*—SFRM shall be applied by an experienced firm. The firm shall be licensed or otherwise approved to apply the SFRM.

13.1.1 Equipment, mixing, and application shall be in accordance with SFRM manufacturers' written specifications and application instructions.

13.1.2 Application shall not start until SFRM applicator inspects the substrates to receive protection and they are found acceptable.

13.1.3 Work shall be coordinated with other trades so that project progress is not delayed. Application of SFRM shall be completed prior to the installation of duct work, piping, conduit, and other suspended items. Hangers for these items may be installed prior to SFRM application, thus reducing subsequent SFRM damage.

13.1.4 SFRM shall be applied after all roof construction, installation of roof-top HVAC equipment and other related work is completed.

13.1.5 Bonding adhesive or other surface preparation shall be used when required and as recommended by SFRM manufacturer.

13.1.6 No SFRM shall be applied to steel deck prior to completion of concrete work on steel deck.

13.1.7 Surface sealers are optional. When used, the surface sealer shall be as recommended by the SFRM manufacturer and shall be applied in accordance with the SFRM manufacturer's written application instructions.

14. Protection During Curing

14.1 SFRM are susceptible to damage while they are curing. Precautions shall be taken to allow the materials to cure without physical abuse.

14.1.1 Heating and ventilation shall be provided when needed for curing (see 12.1).

14.1.2 No roof traffic shall be allowed during application or during the curing period of the SFRM applied to the roof.

NOTE 2—**Caution**—Roof traffic at any time after the SFRM is fully cured shall be avoided if possible. Excessive traffic, loading or impact, can cause SFRM delamination.

14.1.3 Care shall be taken so that deflection or impact greater than the SFRM manufacturer's recommended limits do not occur. The maximum allowable steel deck deflection shall be determined in accordance with Test Method E 759 and the effects of impact shall be determined in accordance with Test Method E 760.

15. Inspection Procedures

15.1 An independent testing laboratory shall inspect the applied SFRM upon the completion of each floor for thickness and density in accordance with Test Methods E 605.

15.2 Results of thickness and density testing shall be made available to the SFRM applicator before application progresses more than two floors beyond the floor in question.

15.3 Where required by contract documents or building code authority, the SFRM shall be tested upon curing for cohesion/adhesion in accordance with Test Method E 736 by an independent testing laboratory.

15.4 Results of cohesion/adhesion testing shall be made available to the SFRM applicator as soon as practical. Depending upon job scheduling and jobsite conditions, it may not be possible to conduct cohesion/adhesion tests in a timely manner.

16. Patching

16.1 *Patching*—In areas where the SFRM has been removed, it shall be resprayed or patched with the same material or with a compatible material as determined by a fire test.

16.2 Patching shall be done by the SFRM applicator. Responsibility for payment of patching shall be decided prior to bid submittal.

17. Clean up

17.1 Upon completion of the application, the work area shall be cleaned.

17.1.1 *Equipment*—All equipment shall be removed from the site.

17.1.2 *Floors*—All floors shall be swept clean.

17.1.3 *Miscellaneous*—All waste materials such as polyethylene, floor sweepings, or trash bags shall be removed from the work area and disposed of in an appropriate manner.

18. Keywords

18.1 application; sprayed cementitious material; sprayed fire-resistive materials; sprayed mineral fiber material

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