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An American National Standard

Standard Practice for Encapsulants for Spray- or Trowel-Applied Friable Asbestos-Containing Building Materials[1]

This standard is issued under the fixed designation E 1494; 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.

1. Scope

1.1 This practice covers encapsulants intended to reduce or eliminate the release of asbestos fibers from a matrix of friable spray- or trowel-applied asbestos-containing materials.

1.2 This practice includes: (*1*) a series of laboratory tests to show whether an encapsulant is capable of acceptable performance on a specified asbestos-free model matrix, and (*2*) a series of determinations to be conducted in the field at each location for which encapsulation has been accepted, to show whether a given encapsulant is acceptable on the specific asbestos-containing matrix.

1.3 The values stated in SI units are to be regarded as the standard. The values 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.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents[2]

D 4226 Test Methods for Impact Resistance of Rigid Poly-(Vinyl Chloride) (PVC) Building Products[3]

D 4240 Test Method for Airborne Asbestos Concentration in Workplace Atmosphere[4]

E 84 Test Method for Surface Burning Characteristics of Building Materials[5]

E 119 Test Methods for Fire Tests of Building Construction and Materials[5]

E 605 Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members[6]

E 631 Terminology of Building Constructions[6]

E 736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members[6]

E 849 Practice for Safety and Health Requirements Relating to Occupational Exposure to Asbestos[4]

2.2 *ANSI Standards:*

Z9.2 Fundamentals Governing Design and Operations of Local Exhaust Systems[7]

Z88.1 Practices for Respiratory Protections[7]

2.3 *Other Standards:*

1-GP-205M205 Sealer for Application to Asbestos-Fiber Releasing Materials[8]

2.4 *OSHA Regulations:*

29 CFR 1910.1001 Asbestos[9]

3. Terminology

3.1 *Definitions*—For definitions of building terms, refer to Terminology E 631.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *bridging encapsulant, n*—an encapsulant that forms a discrete layer on the surface of an in situ asbestos matrix.

3.2.2 *encapsulant, n—for friable asbestos-containing building materials,* a water insoluble material that surrounds or embeds asbestos in an adhesive matrix to prevent release of fibers.

3.2.3 *matrix, n*—a combination of one or more materials that provides a representative specimen of the system combination.

3.2.4 *penetrating encapsulant, n*—an encapsulant that is absorbed by an in situ asbestos matrix without leaving a discrete surface layer.

3.2.5 *substrate, n*—a structural building component to which a surfacing material is applied.

4. Significance and Use

4.1 The purpose of this practice is to provide criteria for the selection of an encapsulant once the decision to encapsulate an asbestos installation has been made. It is assumed that the users

[1] This practice is under the jurisdiction of ASTM E06 on Performance of Buildings and is the direct responsibility of Subcommitte E06.21 on Serviceability.
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[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 08.04.

[4] Discontinued; see *1994 Annual Book of ASTM Standards*, Vol 11.03.

[5] *Annual Book of ASTM Standards*, Vol 04.07.

[6] *Annual Book of ASTM Standards*, Vol 04.11.

[7] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[8] Available from Canadian General Standards Board, Ottawa, Ontario K1A 1G6 Canada.

[9] Available from Occupational Safety and Health Review Commission, 1825 D St. NW, Washington, DC 20006.

of this practice have already made a decision to encapsulate friable asbestos-containing material and that this decision is appropriate. Test Method D 4240 and Practice E 849 shall be consulted for the measurement of airborne fibrous materials in the environmental air space.

4.2 Since existing asbestos-containing materials installed in buildings may have been applied for a variety of purposes in addition to fire-resistance, encapsulant properties and performance characteristics not addressed in this practice may be important for preservation of original qualities of the asbestos-containing material and should be considered.

4.3 The results of the test methods described in this practice on nonasbestos-containing materials will not necessarily predict encapsulant performance on friable asbestos-containing building materials. These test methods are designed to characterize the behavior of the encapsulants, rather than to give a definitive indication of their performance on any particular friable asbestos-containg materials.

4.4 The test methods described in this practice measure characteristics of encapsulants in order to retain essential properties of the building material intended for encapsulation.

5. Laboratory Test Specimens

5.1 Tests shall be conducted on replicate matrices (fibrous or cementitious) at the following specified thicknesses: 10 and 40 mm (⅜ and 1½ in.), respectively.

5.1.1 The inorganic fibrous test matrices shall consist of a commercially available blend of factory mixed mineral fiber and inorganic binders of fire resistive composition designed for spray application.[10] The inorganic cementitious test matrices shall consist of a commercially available factory mixed blend of lightweight aggregate and inorganic binder of fire-resistive composition designed for wet-mixed spray application.[10]

5.1.2 The sprayed fibrous matrix shall have the following properties:

5.1.2.1 A flame spread index of 25 or less and smoke developed value of 50 or less when tested in accordance with Test Method E 84.

5.1.2.2 The density of the dry spray-applied matrix shall be 160 to 224 kg/m^3 (10 to 14 lb/ft^3) as measured in accordance with Test Methods E 605.

5.1.3 The sprayed cementitious matrix shall have the following properties:

5.1.3.1 A flame spread index of 25 or less and smoke developed value of 50 or less when tested in accordance with Test Method E 84.

5.1.3.2 The density of the dry spray-applied matrix shall be 240 to 320 kg/m^3 (15 to 20 lb/ft^3) as measured in accordance with Test Methods E 605.

5.1.4 Prior to the application of the encapsulant, the sprayed fibrous or cementitious test matrix shall cure sufficiently to obtain the specified constant weight that shall be measured and recorded.

5.1.5 Panels of the cured spray-applied matrices shall be mounted in a rack that holds them in an overhead position to simulate ceiling application (the most severe condition found in the field). Encapsulants shall be applied with equipment equivalent to that used for application under field conditions.

5.1.6 After application of encapsulant to the test substrate, allow it to dry according to manufacturer's instruction. Full drying is usually confirmed when there is less than 0.1 % change in weight of the test specimen over 24 h.

5.2 For all laboratory tests, apply the encapsulant to separate replicate matrices at both the maximum and minimum rate as described in the individual test procedures.

5.3 *Conditioning Cycles for Laboratory Specimens*—After drying, condition the treated specimens for three days at 25 ± 2°C (73 ± 4°F) and 50 ± 5 % relative humidity prior to testing, unless otherwise indicated in the individual test method.

6. Laboratory Test Requirements

6.1 *Cohesion and Adhesion Test (Annex A1)*:

6.1.1 The cohesion and adhesion test values shall determine whether or not the encapsulant affects adversely the cohesive and adhesive strength of the specified test matrix when performed in accordance with the test method in Annex A1.

6.1.2 *Acceptance Criterion*—The force required to cause failure of the encapsulated matrix shall not be less than the adhesion or cohesion force required to cause failure of the unencapsulated matrix, and in no case shall the load be less than 2.4 kPa (50 lbf/ft^2).

6.2 *Penetration Test (Annex A2)*:

6.2.1 The penetration test values shall determine whether or not the encapsulant shall be classified as a penetrating encapsulant or bridging encapsulant, in accordance with the test method in Annex A2. Encapsulation coverage rate used to prepare specimens for testing shall be the saturation (maximum) coverage rate as determined in 7.2.

6.2.2 *Acceptance Criterion*—If penetration to a depth of 10 mm (⅜ in.) of the 40-mm (1½-in.) matrix occurs, the product is classified as a penetrating encapsulant. Products having lesser penetrations are classified as bridging encapsulants. Differing fibrous matrices as installed in the field may affect the penetration rate. Determination of penetration as described in 7.2 and A1.7.2.1 is imperative.

6.3 *Fire Resistance Test (Annex A3)*:

6.3.1 The fire-resistance test is conducted to determine if significant changes in the fire resistance of asbestos containing materials will occur because of application of the encapsulant.

6.3.2 *Acceptance Criterion*:

6.3.2.1 The sprayed material with the encapsulating agent in place shall not fall from the steel deck during the fire test in amounts greater than for the unencapsulated matrix.

6.3.2.2 If the endpoint of the fire test on the steel deck protected with the encapsulated sprayed material does not differ unfavorably from the endpoint of the fire test on the steel deck protected with the unencapsulated sprayed material by more than 10 %, the encapsulant shall be deemed not to affect the fire-resistance rating of an assembly protected with sprayed material.

6.4 *Surface Burning Characteristics Test (Annex A4)*:

[10] The following materials have been found suitable for this purpose; Blaze Shield as manufactured by U.S. Mineral Products Co., Stanhope, NJ 07874, or Monokote as manufactured by W.R. Grace and Co., 62 Whittemore Avenue, Cambridge, MA 02140.

6.4.1 The surface burning characteristics test shall determine the surface flamespread and smoke developed for sprayed or troweled asbestos-containing materials treated with an encapsulating agent.

6.4.2 *Acceptance Criteria*:

6.4.2.1 The surface flamespread shall not be greater than 25.

6.4.2.2 The smoke developed values shall not be greater than 50.

6.4.2.3 All encapsulants shall be water insoluble after curing when tested in accordance with Practices D 543.

6.5 *Impact Resistance Test*:

6.5.1 The impact resistance test shall measure the resistance of the encapsulated matrix to impact.

6.5.1.1 The test shall be conducted using the impact tester[11] described in Test Methods D 4226: a weight of known surface area and known weight shall be raised a given distance above the steel panel and dropped, giving a known force of impact (measured in inch-pounds) that will produce a minimum penetration of 7.6 mm (3⁄10 in.) into the encapsulated matrix.

6.5.2 *Acceptance Criterion*:

6.5.2.1 The force to produce a minimum penetration into the encapsulated matrix of 7.6 mm (3⁄10 in.) shall not be less than 43 in.·lbf.

7. Field Test Requirements

7.1 Field tests shall be conducted under inspection or observation of the owner of the building in which the encapsulation application is taking place, or of the building owner's designated representative.

7.2 *Coverage (Thickness) Rate*, for encapsulants used in the field tests shall be at the level required by the matrix system field installation, as established by spraying a test area (test patch) using the specified encapsulant.

7.2.1 For penetrating encapsulants, the coverage rate to achieve encapsulation is the saturation (maximum) coverage rate for the particular asbestos-containing material. Saturation is achieved when no further absorption of the encapsulant into the matrix is observed. Coverage shall be reported as liquid volume applied per unit area.

7.2.2 For bridging encapsulants, the coverage rate to achieve encapsulation occurs when a void-free uniform coating is formed over the surface of the matrix. Application quantity must be sufficient to achieve the manufacturer's minimum dry-thickness requirements. Coverage shall be reported as liquid volume per unit area.

8. Required Field Test

8.1 *Cohesion/Adhesion Test*:

8.1.1 The cohesion/adhesion test shall determine whether the encapsulant affects adversely the in situ cohesive and adhesive strength of the friable asbestos-containing installation and shall be in accordance with Annex A1.

8.1.2 The force required to cause failure of the encapsulated matrix shall not be less than the adhesion or cohesion force required to cause failure of the unencapsulated matrix; in no case shall the load-holding capabilities of the unencapsulated matrix be less than the load imposed by the applied encapsulation materials.

9. Keywords

9.1 asbestos; bridging encapsulant; encapsulant; penetrating encapsulant

[11] This apparatus may be obtained commercially from: Gardner Laboratory, Inc., Bethesda, MD 20014, or Custom Scientific Instruments, Inc., P.O. Box A, Whippany, NJ 07981, or Testing Machines, Inc., 400 Bayview Ave., Amityville, LI, NY 11701.

ANNEXES

(Mandatory Information)

A1. TEST METHOD TO DETERMINE THE EFFECT OF ENCAPSULANT ON COHESION/ADHESION OF FRIABLE SPRAYOR TROWEL-APPLIED ASBESTOS-CONTAINING BUILDING MATERIALS

A1.1 Scope

A1.1.1 This test method covers a procedure for determining the effect of an encapsulant on the cohesion/adhesion strength measured perpendicular to the surface of friable spray- or trowel-applied building materials. This test method is applicable to both laboratory and field procedures and indicated in A1.6.

A1.2 Referenced Documents

A1.2.1 *ASTM Standard*:

E 736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members[5]

A1.2.2 *OSHA Regulations*:

29 CFR 1910.1001 Asbestos[8]

A1.3 Summary of Test Method

A1.3.1 The property of cohesive/adhesive strength is determined using a metal dish with a hook and having a spring-loaded scale or weights attached to the materials by a two-component polyurethane resin adhesive system and thereafter manual application of increasing force until failure occurs.

A1.4 Significance and Use

A1.4.1 This test method measures the force required to separate either untreated or encapsulated material from the base, as well as the internal cohesive strength of the material, and is an indication of the ability of the applied material to remain in place and resist separation during anticipated service conditions.

A1.5 Apparatus

A1.5.1 The apparatus shall be in accordance with the apparatus section of Test Method E 736. Actual masses (weights) may be substituted for the spring-loaded scale.

A1.6 Hazards

A1.6.1 Personnel coming into contact with friable asbestos materials must observe safety precautions specified in 29 CFR 1910.1001 that mandates the following: local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2; a personnel respirator program shall be established in accordance with ANSI Z88.2. (See also Practice E 849.)

A1.7 Test Specimens

A1.7.1 For laboratory tests, prepare specimens as described in Test Method E 736. Specimens shall be 10 and 40 mm (⅜ and 1½ in.) thick.

A1.7.1.1 Treat separately the test specimens with penetrating encapsulant applied in accordance with the manufacturer's minimum coverage (thickness) recommendations for the 10-mm (⅜-in.) thick specimen and the maximum application recommendations for the 40-mm (1½-in.) specimen. For bridging encapsulant, apply in accordance with the manufacturer's recommendations so as to achieve a void-free uniform coating over the surface.

A1.7.1.2 Condition the treated and untreated test specimens at room temperature 20 ± 10°C (68 ± 18°F) and 50 ± 10 % relative humidity until constant mass (weight) is reached.

A1.7.2 For field tests, select areas in accordance with Test Method E 736.

A1.7.2.1 Treat each of the test specimens by spraying with the encapsulant. For penetrating encapsulant, apply until saturation is achieved. For bridging encapsulant, apply at the manufacturer's recommended coverage rate.

A1.7.2.2 After curing, score to the depth of the substrate an area 300 by 300 mm (12 by 12 in.) with a knife or saber saw.

A1.8 Procedure

A1.8.1 Test in accordance with Test Method E 736.

A1.9 Calculation

A1.9.1 Calculate the cohesive/adhesive force as follows:

$$C4 = F/A$$

where:

$C4$ = cohesive/adhesive force, Pa (lbf/ft^2)
F = recorded force, N (lbf), and
A = area of the metal dish, m^2 (ft^2).

A1.10 Report

A1.10.1 Report test results for laboratory specimens and field test areas in accordance with Test Method E 736.

A2. TEST METHOD TO DETERMINE THE DEPTH OF PENETRATION OF WATER INSOLUBLE PENETRATING ENCAPSULANTS

A2.1 Scope

A2.1.1 This test method covers a procedure for estimating the depth of penetration of a penetrating encapsulant when applied to a fibrous matrix substrate.

A2.2 Significance and Use

A2.2.1 The effectiveness of a penetrating encapsulant applied over an asbestos-containing material is shown by the extent to which a plug removed from the matrix by the technique outlined below retains its physical integrity after immersion in water as described in A2.5.

A2.3 Apparatus

A2.3.1 *Cork Borer or Hole Cutter*—Approximately 17.5-mm (11⁄16-in.) standard diameter laboratory cork borer and an 11-mm (7⁄16-in.) hardwood dowel to be used as a plunger to expel the cut specimen from the borer with minimal mechanical damage.

A2.3.2 *Small Jar with Cap*, to contain specimen.

A2.3.3 *Metric/English Rule*, 150 mm (6.0 in.).

A2.4 Test Specimens

A2.4.1 Prepare specimens in accordance with A1.7.

A2.5 Procedure

A2.5.1 Examine a minimum of four specimens.

A2.5.2 Using the cork borer or hole cutter, carefully excise a core or plug of the encapsulated matrix from the substrate. To prepare a clean-cut specimen, when the substrate is reached, move the borer laterally to the left or right to shear cleanly the core or plug from the substrate. Remove the borer and plug from the matrix.

A2.5.3 Using the bore plunger, gently push the plug from the interior of the borer into the open glass jar. Add sufficient water to immerse it totally. Allow this specimen to soak for a period of 4 h with no agitation.

A2.5.4 After soaking for 4 h at 25 ± 2°C (77± 5°F) remove the plug for examination. Using a rule, measure the length of the plug that is still intact, that is, held together by the encapsulant.

A2.6 Report

A2.6.1 Report the length of plug that has remained intact as the depth of penetration, using an average of the values obtained on the four specimens.

A2.6.2 Describe the encapsulant tested, including manufacturer's type or designation, number of coats, total coverage rate realized for the particular installation, cure conditions, and total cure time.

A2.6.3 Describe the matrix system encapsulated, including type (fibrous or cementitious) and thickness.

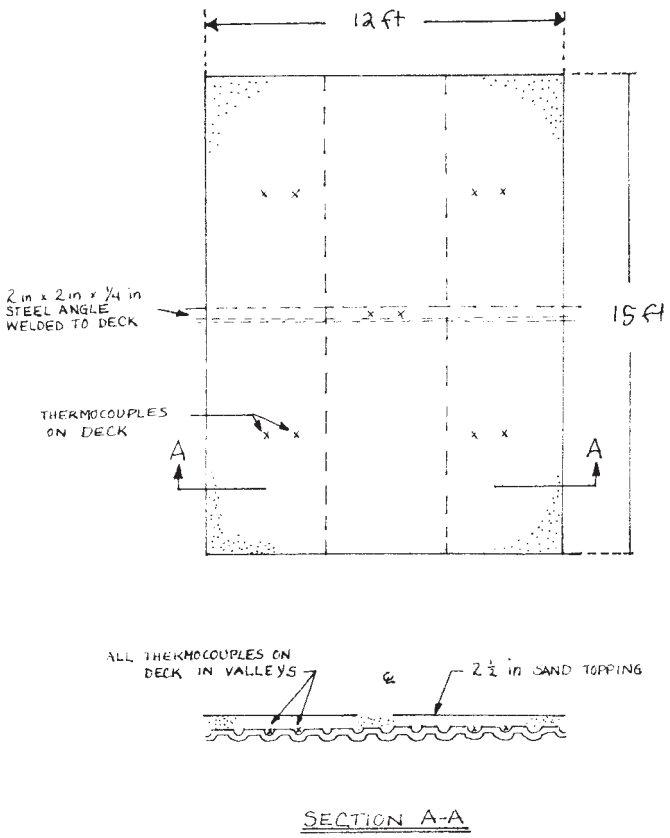
A3. TEST METHOD TO DETERMINE FIRE RESISTANCE OF ASSEMBLIES

A3.1 Scope

A3.1.1 This test method enables the comparison of the fire-resistance performance of a floor/ceiling assembly with and without an encapsulant in accordance with Test Methods E 119. The fire-resistance performance is determined by observing the behavior of the encapsulant during fire exposure and measuring temperatures on steel deck units to which a fibrous or cementitious matrix has been applied with and without encapsulating sealant.

A3.1.2 The floor/ceiling assembly shown in Fig. A3.1 is used to view and measure the fire-resistance properties of an assembly with and without encapsulant. Building assemblies to which asbestos-containing materials have been applied by spray or trowel, or both, include beams, ceilings, and columns. These assemblies can include various materials having different hourly fire-resistance ratings.

NOTE A3.1—This assembly contains representative thicknesses of fibrous or cementitious materials necessary to obtain the hour-rated fire-resistance required by building codes. The steel deck unit substrate provides a representative surface for the observations of bonding characteristics of the fibrous material with and without encapsulants, and the measurement of heat transmission of the fibrous or cementitious materials with and without the encapsulants.



NOTE 1—X indicates location of thermocouples on deck.

FIG. A3.1 Steel Deck Plan and Sections Showing Locations of Thermocouples

A3.1.3 *This test method should be used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions and should not be used to describe or appraise the fire-hazard or fire-risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire-hazard assessment or fire-risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard or fire risk of a particular end use.*

A3.2 Test Furnace

A3.2.1 The test furnace shall be capable of maintaining the time-temperature exposure defined in Test Methods E 119.

A3.3 Test Specimens

A3.3.1 The test specimen exposed to the fire shall be a floor/ceiling assembly with an area of not less than 16.8 m^2(180 ft^2). Neither dimension of the specimen shall be less than 3.66 m (12 ft). This 16.8 m^2 assembly may be broken down into a maximum of four similar sections, none of which may have a length or width dimension less than 1.8 m (6 ft). It is preferred that multiple specimen areas, with and without encapsulant, be tested simultaneously.

A3.3.2 The test specimen shall be constructed as shown on Fig. A3.1. The components of test sample are as follows:

A3.3.2.1 *Steel Deck*—The steel deck units shall consist of 38 to 51 mm (1½ to 2 in.) fluted and/or cellular sections. Steel deck thickness shall be 1.2 ± 0.08 mm (0.047 ± 0.003 in.). Deck type shall be determined by submitter's scope of need, and evaluation agency's guidelines.

A3.3.2.2 *Joint Covering*—The joint covering shall be pressure-sensitive tape approximately 50 mm (2 in.) wide.

A3.3.2.3 *Steel Angles*—The steel angles shall be 50 by 50 by 6 mm (2 by 2 by ¼ in.) thick.

A3.3.2.4 *Sand*—The dry silica sand shall be a type normally used for sand blasting.

A3.3.2.5 *Sprayed Material*—The fibrous test matrices shall consist of a commercially available blend of factory-mixed mineral fiber and inorganic binders of fire-resistive composition designed for spray applications. The cementitious test matrices shall consist of a commercially available factory-mixed blend of lightweight aggregate and inorganic binder of fire-resistive composition designed for wet-mixed spray application. These must have been evaluated in accordance with Test Methods E 119. Material shall be applied in accordance with the manufacturer's instructions by an approved applicator and with the manufacturer's written permission.

A3.3.2.6 *Encapsulating Agents*—Product applied to the sprayed material (see A4.4.1).

A3.4 Procedure

A3.4.1 Construct two specimens for each type of sprayed material and encapsulating agent being investigated. The sprayed material thicknesses shall be 10 ± 1.5 mm and 19 ±

1.5 mm (⅜ ± 1⁄16 in. and ¾ ± 1⁄16 in.). For all specimens, apply the encapsulating agent at the maximum recommended rate.

A3.4.1.1 If agreeable to the submitter and the testing agency, prepare one sample consisting of 10 ± 1.5 mm (⅜ ± 1⁄16 in.) thick sprayed material and encapsulating agent applied at the maximum (thickest) coverage rate intended for the 19-mm (¾ in.) thick sprayed material.

A3.4.2 Construct one sample for each type and thickness of sprayed material being tested. Do not apply the encapsulating agent to this sample. The construction and testing of this sample may be waived if performance data have been previously obtained for the identical material by the same testing agency. The data shall have been obtained using the identical test equipment and methods to be used in testing the samples described in A4.4.1.

A3.4.3 Condition the specimens in accordance with Test Methods E 119.

A3.4.4 Measure the temperature of the steel deck units with ten thermocouples, two in each quadrant and two on the mid support structure. The thermocouple wires shall be not heavier than Nos. 18 B and S (1.02-mm (0.04-in.)) diameter.

A3.4.5 Take the temperature readings at intervals not exceeding 5 min.

A3.4.6 Results are to be reported in accordance with the performance in the tests described in these requirements and are to be expressed in time periods of fire resistance, to the nearest integral minute. Reports are to include observations of significant details of the behavior of the material or construction during the test and after the furnace is extinguished, including information on deflection, spalling, cracking, burning of the specimen and its component parts, continuance of flaming, and production of smoke.

A3.5 Report

A3.5.1 Report the following information:

A3.5.1.1 Description of the material and installation procedures used to construct the test specimens, including dosage used.

A3.5.1.2 The visual observations recorded during the fire test.

A3.5.1.3 The temperatures recorded within the furnace chamber and on the steel deck units.

A4. TEST METHOD TO DETERMINE SURFACE BURNING CHARACTERISTICS

A4.1 Scope

A4.1.1 This test method determines the surface burning characteristics of the encapsulated matrix in accordance with Test Method E 84.

A4.1.2 *This test method should be used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire-hazard assessment or a fire-risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard or fire risk of a particular end use.*

A4.2 Test Furnace and Procedure

A4.2.1 The test furnace and the procedure to be followed shall be in accordance with Test Method E 84.

A4.3 Test Specimens

A4.3.1 The test specimen shall consist of the following components:

A4.3.1.1 *Fiber Cement Board*—See Test Method E 84.

A4.3.1.2 *Sprayed Material*—The inorganic fibrous test matrices shall consist of a commercially available blend of factory-mixed mineral fiber and inorganic binders of fire-resistive composition designed for spray application. The inorganic cementitious test matrices shall consist of a commercially available factory-mixed blend of lightweight aggregate and inorganic binder of fire-resistive composition designed for wet-mixed spray application. Material shall be applied to the asbestos cement board in accordance with the manufacturer's instructions.

A4.3.1.3 *Encapsulant*—Product applied to the sprayed material.

A4.3.2 Separate specimens shall be prepared to represent the minimum and maximum thicknesses of sprayed materials. The encapsulant shall be applied to all specimens at the maximum (thickest) coverage rate applicable for the sprayed material thickness.

A4.3.2.1 If agreeable to the submitter and the testing agency, one specimen each of the minimum and maximum application of encapsulant shall be prepared consisting of the minimum sprayed material thickness and encapsulant applied at the maximum (thickest) coverage rate intended for the maximum sprayed material thickness. This specimen would replace the two specimens described in A4.3.2.

A4.4 Report

A4.4.1 Report the following information:

A4.4.1.1 Description of the materials and procedures used to construct the test samples, including coverage used.

A4.4.1.2 Surface burning characteristics calculated in accordance with Test Method E 84.

A4.4.1.3 Observations of the burning characteristics of the specimen during test exposure, such as delamination, sagging, shrinkage, and falloff.

APPENDIX

(Nonmandatory Information)

X1. COMMENTARY

X1.1 This commentary provides background information and rationale for applications and limitations of encapsulating agents for friable asbestos-containing building materials.

X1.2 A two-part document[12,13] contains information to help inspect for the presence of asbestos-containing materials and take corrective action where it is warranted.

X1.2.1 The following three corrective actions are described therein:

X1.2.1.1 Removal of asbestos-containing material.

X1.2.1.2 Encapsulation of the friable material by spraying a water-based sealant to bind the fibers together and to prevent the release of invisible fibers into the building indoor space.

X1.2.1.3 Containment of the asbestos-containing material within a closed space such as with gypsum wall board with taped and sealed joints.

X1.2.2 Removal of the asbestos-containing material is considered the surest way to eliminate the asbestos inhalation hazard, but in many cases the difficulty of the removal task or other factors make the sealing or encapsulation treatment attractive.

X1.3 About 1977, a project was sponsored by the U.S. Environmental Protection Agency (EPA) at Battelle Columbus Laboratories. A final report was issued in 1981, which described the research program.[14]

X1.3.1 The objectives of the program were as follows:

X1.3.1.1 To determine what commercial products, if any, were available that could be used as encapsulants to either contain, prevent, or restrict the release of asbestos fibers from friable asbestos-containing materials.

X1.3.1.2 To determine methods of evaluating these commercial products for their efficiency as encapsulants.

X1.3.1.3 To determine the effectiveness of the evaluation methods by evaluating a group of commercial products.

X1.3.1.4 To evaluate fiber release during field trials.

X1.3.2 *Properties Desired As Encapsulant*:

X1.3.2.1 To seal or lock in the asbestos fibers by either bridging over the surface or penetrating into the matrix of asbestos-containing materials.

X1.3.2.2 To avoid adding any toxic substances to the insulation, and also to resist breakdown under direct flame impingement, thus not releasing any toxic gases or an undue amount of smoke.

X1.3.2.3 To avoid significant reduction in the fire-retardant properties of the insulation.

X1.3.2.4 To be adaptable to application with a minimum of effort and technical skill.

X1.3.2.5 To have sufficient impact resistance, flexibility and resistance to penetration to withstand some moderate physical contact.

X1.3.2.6 To be insoluble in water when cured.

X1.3.2.7 To be nontoxic and without noxious fumes during application.

X1.3.2.8 To have sufficient aging characteristics to withstand normal atmospheric changes for a minimum of six years and still to have sufficient surface integrity to allow recoating.

X1.4 The EPA requested Battelle to propose a specification that could be used to qualify materials for this use. However, no specification was produced which the EPA considered suitable.

X1.5 In 1979, ASTM was told by the EPA Cincinnati office that a specification for materials suitable for sealing or encapsulation of friable asbestos-containing materials was needed.

X1.6 A joint task group of Committees D-1 on Paint and Related Coatings, Materials, and Applications and E-6 on Performance of Buildings was organized early in 1980 to develop the needed standards. Its charge was two-fold: *(1)* development of a material standard for the encapsulant and *(2)* development of a performance standard for the encapsulant.

X1.6.1 Subsequently, the task group came directly under the supervision of Subcommittee E06.21 on Serviceability and was designated as E06.21.06 because expertise already existed in Subcommittee E06.21 in sprayed fibrous materials for insulative, fire-retarding, and acoustical purposes.

X1.6.2 A large representative task group met frequently to evaluate existing (see Note X1.1) and proposed laboratory and field test methods and to prepare and circulate two proposed documents:

X1.6.2.1 Specifications for Encapsulating Agents for Friable Asbestos-Containing Building Materials, and

X1.6.2.2 Test Method for Encapsulating Agents for Friable Asbestos-Containing Building Materials.

NOTE X1.1—Canadian Standard 1-GP-205M includes useful test methods related to those chosen in this proposed specification. Another valuable reference is the U.S. Navy Technical Report R-900.[15]

X1.6.3 Accordingly, the task group decided to concentrate on developing a standard specification including tests for evaluation of encapsulants for asbestos-containing materials in

[12] *Asbestos-Containing Materials in School Buildings: A Guidance Document,* Office of Pesticides and Toxic Substances, U.S. Environmental Protection Agency, Washington, DC 20460, March 1979.

[13] EPA 560/5-85-024, *Guidance for Controlling Asbestos-Containing Materials in Buildings,* U.S. Environmental Protection Agency, Washington, DC 20460, March 1983.

[14] Mirick, W. et al, *Evaluation of Encapsulants for Sprayed-on Asbestos-Containing Building Materials,* Battelle Columbus Laboratories for the U.S. Environmental Protection Agency, 1981.

[15] U.S. Navy Technical Report R-900, *Encapsulation of Friable Insulation Materials Containing Asbestos,* Naval Civil Engineering Laboraory, Port Hueneme, CA, May 1983.

buildings, acepting that the standards development must continue. Future work will permit carrying out the original charge to provide a more complete material specification and test methods.