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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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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 practice does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this practice 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 Test Method for Resistance of Plastics to Chemical Reagents[2]

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

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

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

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

E 605 Test Methods for Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members[5]

E 631 Terminology of Building Constructions[5]

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

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[6]

Z88.1 Practices for Respiratory Protections[6]

2.3 *Other Standards:*

1-GP-205M Sealer for Application to Asbestos-Fiber Releasing Materials[7]

2.4 *OSHA Regulations:*

29CFR 1910.1001 Asbestos[8]

3. Terminology

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

3.2 *Descriptions of Terms Specific to This Standard:*

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

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

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

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

3.2.5 *substrate*—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 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.

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[1] This practice is under the jurisdiction of ASTM E-6 on Performance of Building Construction 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] *Annual Book of ASTM Standards,* Vol 11.03.

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

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

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

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

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.[9] The inorganic *cementitious* test matricesp 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.[9]

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 Method 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 Method 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 a 24-h period.

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):*

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

[9] 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.

curing when tested in accordance with Test Method 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[10] 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 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

[10] 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 SPRAY- OR 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, which mandates the following: Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2-1971; a personnel respirator program

shall be established in accordance with ANSI Z88.2-1969. (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 (3/8 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 (3/8-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 a 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 (that is, 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 Method E 119. The fire-resistance performance is determined by observing the behavior of the encapsulant during fire expo-