



Designation: ~~E1494 – 12~~ E1494 – 18

Standard Practice for Encapsulation Testing Physical Properties of Friable Asbestos-Containing Surfacing Materials¹

This standard is issued under the fixed designation E1494; 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 surfacing material.

1.2 This practice includes a series of determinations to be conducted in the field on asbestos abatement projects for which encapsulation is being considered or has been performed.

1.3 This practice is to be used to determine the appropriateness of encapsulation as an abatement measure in accordance with Practice E1368, as part of a Project Design Survey in accordance with Practice E2356, and to demonstrate completeness of abatement in accordance with Practice E1368. Performance of the encapsulated surfacing material for other purposes is not within the scope of this practice. Use Test Methods E84, E119, and E605 to determine other properties of the material.

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

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 **Warning**—Asbestos fibers are acknowledged carcinogens. Breathing asbestos fibers can result in disease of the lungs including asbestosis, lung cancer, and mesothelioma.² Precautions in this standard practice should be taken to avoid creating and breathing airborne particles from materials known or suspected to contain asbestos. See 2.3 for regulatory requirements addressing asbestos.

1.7 *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.*

2. Referenced Documents

2.1 ASTM Standards: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

E631 Terminology of Building Constructions

E736 Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

E1368 Practice for Visual Inspection of Asbestos Abatement Projects

E2356 Practice for Comprehensive Building Asbestos Surveys

2.2 Other Standards:

1-GP-205M2003 Sealer for Application to Asbestos-Fiber Releasing Materials⁴

¹ This practice is under the jurisdiction of ASTM D22 on Air Quality and is the direct responsibility of Subcommittee D22.07 on Sampling and Analysis of Asbestos. Current edition approved April 1, 2012; July 1, 2018. Published July 2012; July 2018. Originally approved in 1992. Last previous edition approved in 2010 as E1494 – 92 (2010); E1494 – 12. DOI: 10.1520/E1494-12; 10.1520/E1494-18.

² "Elimination of Asbestos-Related Diseases," World Health Organization, September 2006.

³ 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.

⁴ Available from Canadian General Standards Board (CGSB), Place du Portage III, 6B1-11 Laurier Street Gatineau, Quebec K1A 1G6 Canada, <http://www.tpsgc-pwgsc.gc.ca/cgsb>; 11 Laurier St., Phase III, Place du Portage, Gatineau, Quebec K1A 0S5, Canada, <http://www.tpsgc-pwgsc.gc.ca/ongc-cgsb>.

2.3 EPA and OSHA Regulations:

40 CFR Part 763 Subpart E, Appendix C (Model Accreditation Plan) Environmental Protection Agency, February 3, 1994⁵
 29 CFR 1926.1101 Occupational Exposure to Asbestos (Construction Industry Standard), Occupational Safety and Health Administration, August 10, 1994⁶

3. Terminology

3.1 *Definitions*—For definitions of building terms, refer to Terminology E631.

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 *encapsulation, n*—the process of applying an *encapsulant*.

3.2.3.1 *Discussion*—

The terms encapsulation and encapsulant are frequently used to describe the post-removal operation on abatement projects to inhibit the release of fibers from an abated surface. Although the material used for this purpose may be an encapsulant as defined herein, the proper terms are sealer and lock-down. See Practice E1368.

3.2.4 *disturbance, n*—activities that disrupt the matrix of asbestos-containing materials, crumble or pulverize asbestos-containing materials, or generate visible debris from asbestos-containing materials.

3.2.5 *load, n*—force per unit area (kPa or lbf/ft²) applied to the matrix of the surfacing material, with the area equal to that of the interface between the material and the disc or lid holding the adhesive.

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

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

3.2.8 *surfacing material, n*—material that is sprayed, troweled-on, or otherwise applied to interior and exterior structural and architectural surfaces, including but not limited to fireproofing, plaster, and sound-proofing.

4. Significance and Use

4.1 The purpose of this practice is to provide test methods and performance criteria involving encapsulants for surfacing material on an asbestos abatement project in accordance with Practice E1368, including the application of encapsulants to the surfacing material as an abatement measure and the removal of existing encapsulated surfacing material. *astm-e1494-18*

4.1.1 Abatement projects involving application of encapsulants require coverage, penetration, and cohesion/adhesion tests to determine encapsulation requirements during project design, on test patches, and at conclusion of the project to determine completeness of abatement.

4.1.2 Removal projects requires penetration tests during project design on test patches to determine thicknesses of encapsulated and un-encapsulated surfacing material.

4.2 The test methods and performance criteria described in this practice may also be used during a Project Design Survey in accordance with Practice E2356 to provide information for preparing the plans and specifications for applying or removing the encapsulated surfacing material.

4.3 Asbestos-containing surfacing materials installed in buildings may include fireproofing, acoustical and decorative plaster, and soundproofing. Properties not directly addressed in this practice may be important and appropriate test methods should be considered. See Test Methods E84, E119, and E605, and 1-GP-205M2003.

4.4 The test methods described in this practice are designed to (1) determine the depth of penetration, or lack thereof, of the encapsulant into the matrix of the surfacing material, (2) determine the coverage of the encapsulant on the surfacing material, and (3) to determine the adhesive and cohesive properties of the encapsulated surfacing material.

4.5 Compliance with the acceptance criteria in this practice and with referenced specifications does not guarantee that the abatement project will pass the visual inspection for completeness of clean-up in Practice E1368, or that the project will pass final air sampling for clearance, as other factors besides encapsulant performance affect these outcomes.

⁵ Available from United States Environmental Protection Agency (EPA), Ariel Rios-William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, <http://www.epa.gov>.

⁶ Available from Occupational Safety and Health Administration (OSHA), 200 Constitution Ave., NW, Washington, DC 20210, <http://www.osha.gov>.

5. Qualifications

5.1 The test methods in this practice require disturbance of asbestos-containing materials. Activities that disturb asbestos-containing materials are subject to regulations of the Occupational Safety and Health Administration (OSHA), the Environmental Protection Agency (EPA), and other jurisdictions including certain state agencies.

5.2 The test method described in **Annex A1** to determine the adhesive and cohesive properties of encapsulated surfacing material can result in a release of asbestos-containing debris. Persons conducting this test must have the appropriate credentials and training to clean up the debris.

5.3 The test method described in **Annex A2** to determine depth of penetration requires taking core samples of the encapsulated surfacing material. This activity requires accreditation as an asbestos inspector according to the EPA Model Accreditation Plan.

6. Cohesion/Adhesion Tests

6.1 Tests On Encapsulated Surfacing Materials:

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

6.1.2 The load required to cause adhesion or cohesion failure of the encapsulated matrix shall not be less than the load 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.

6.1.3 The load required to cause adhesion or cohesion failure of the encapsulated matrix shall not be less than the load required to cause failure of the unencapsulated matrix, and in no case shall the load be less than 2.4 kPa (50 lbf/ft²).

6.1.4 Internal failure of the encapsulated matrix is due to horizontal delamination within the encapsulated or un-encapsulated material, separation at the interface between the encapsulated and un-encapsulated materials, or separation at the interface between the un-encapsulated material and the substrate. Shear forces across a vertical cylindrical surface equal to the diameter of the disc or lid times the thickness of the material from the exposed surface to the plane of delamination act to resist failure but are not considered in the calculation of loads.

6.2 Tests On Un-Encapsulated Surfacing Materials:

6.2.1 The cohesion/adhesion test shall determine the *in situ* cohesive and adhesive strength of the friable asbestos-containing surfacing material and shall be in accordance with **Annex A1**.

6.2.2 The load required to cause adhesion or cohesion failure of the matrix shall not be less than the manufacturer's specification for the surfacing material.

6.2.3 Internal failure of the matrix is due to horizontal delamination within the material or separation at the interface between the material and the substrate. Shear forces across a vertical cylindrical surface equal to the diameter of the disc or lid times the thickness of the material from the exposed surface to the plane of delamination act to resist failure but are not considered in the calculation of loads.

7. Coverage and Penetration Tests

7.1 **Coverage Rate**—The coverage rate for encapsulants used on surfacing material 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.

7.1.1 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.

7.1.2 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.

7.2 Penetration Depth:

7.2.1 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 **7.1**.

7.2.2 If penetration to a depth of 10 mm (3/8 in.) of the 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.

8. Keywords

8.1 asbestos; bridging encapsulant; encapsulant; penetrating encapsulant

ANNEXES

(Mandatory Information)

A1. TEST METHOD TO DETERMINE THE COHESION/ADHESION PROPERTIES OF FRIABLE SPRAY- OR TROWEL-APPLIED ASBESTOS-CONTAINING SURFACING MATERIALS

A1.1 Scope

A1.1.1 This test method covers a procedure for determining the cohesion/adhesion strength of friable spray- or trowel-applied surfacing materials by the application of a force perpendicular to the surface. This test method is applicable to both encapsulated and unencapsulated surfacing materials.

NOTE A1.1—This Annex A1 is based on Test Method E736.

A1.2 Summary of Test Method

A1.2.1 The property of cohesive/adhesive strength is determined using a disc or lid attached to the material with an adhesive. A spring-loaded scale or weights are suspended from the disc or lid with a hook to allow manual application of increasing force until cohesive/adhesive failure occurs or a predetermined load is reached.

NOTE A1.2—The lid can be an ordinary jar lid. The disc can be the removable insert from a two-piece canning jar lid.

A1.2.2 This test method is intended for surfacing materials applied to horizontal surfaces such as ceilings, decks, and bottoms flanges of beams. It may be used on vertical surfaces with modifications to the testing apparatus that are beyond the scope of this method.

A1.3 Significance and Use

A1.3.1 This test method measures the load required to separate either untreated or encapsulated material from the substrate, as well as the internal cohesive strength of the material, and is an indication of the ability of the material to remain in place and resist separation during anticipated service conditions.

A1.3.2 Unless the presence or absence of asbestos in the surfacing material has previously been established, collect bulk samples and analyze them according to Practice E2356. If the surfacing material does not contain asbestos, the precautions for exposure to asbestos fibers may be dispensed with.

A1.4 Health and Safety Hazards

A1.4.1 This test method may require contact with, and result in disturbance of, friable asbestos-containing material. Persons conducting the testing must be trained according to applicable EPA, OSHA, and state regulations.

A1.4.2 The materials to be tested are commonly installed on ceilings, decks, and structural steel elements, requiring some steps of the method to be done at elevated locations. Ladders, scaffolds, and man-lifts must be used in accordance with OSHA regulations, which may also require fall protection devices.

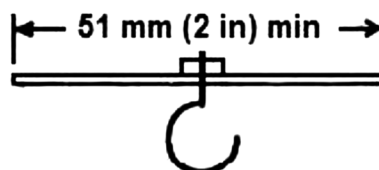


FIG. A1.1 Disc and Hook

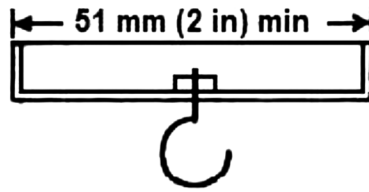


FIG. A1.2 Lid and Hook

A1.4.3 Failure of the material to withstand the applied load may result in hazards that require the following precautions.

A1.4.3.1 The release of asbestos-containing debris and airborne asbestos fibers requires that persons conducting the test wear protective clothing and respiratory protection. If a release occurs they must be prepared to decontaminate their clothing and themselves.

A1.4.3.2 Unless measures are taken to restrain it, the part of the test apparatus that separates from the material will fall while the person applying the load is directly underneath. This person must wear a hard hat and be prepared to move quickly out of the way of falling objects and debris.

A1.4.3.3 Material failure may constitute a fiber release episode that contaminates the immediate area. Preparation for the test must include isolation measures to restrict access by unauthorized persons and negative pressure enclosures may be required in occupied buildings. Plastic sheeting is required to protect floors, furniture and fixtures that may be contaminated by falling debris. Clean-up of debris will require a HEPA-filtered vacuum and wet-wiping of surfaces.

A1.4.4 Personal air sampling must be performed on persons conducting the testing to demonstrate compliance with the OSHA Permissible Exposure Limits for asbestos. In occupied buildings area air samples should be taken to show that fiber levels are below specified limits.

A1.5 Test Apparatus

A1.5.1 The test apparatus consists of the following devices.

A1.5.2 The device that is attached to the bottom surface of the material to be tested consists of a disc or lid with a hook attached in the center (Fig. A1.1 and Fig. A1.2). The disc or lid shall be a minimum of 51 mm (2 in.) in diameter. The disc or lid is attached to the material with an adhesive.

A1.5.3 The device that applies the load shall be a spring-loaded scale (Fig. A1.3) or a fixture to which weights are added (Fig. A1.4). This device is suspended from the disc or lid by a light rope or metal chain.

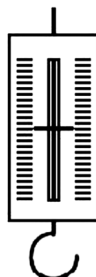


FIG. A1.3 Spring-Loaded Scale

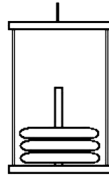


FIG. A1.4 Weights and Holder

A1.6 Test Preparation

A1.6.1 If an encapsulant is being tested as an abatement procedure, several test patches must be prepared prior to conducting the tests. Treat an area 300 by 300 mm (12 by 12 in.) for each test patch.

A1.6.2 For a penetrating encapsulant treat each test patch in accordance with the manufacturer’s coverage recommendations for a minimum 10-mm (3/8-in.) thickness or until saturation is achieved. Determine the depth of penetration according to Annex A2 of this method.

A1.6.3 For a bridging encapsulant, apply in accordance with the manufacturer’s recommendations so as to achieve a void-free uniform coating over the surface.

A1.7 Test Procedure

A1.7.1 For each set of tests a written procedure shall be prepared that incorporates the requirements of this method, specifies the objectives of the testing, the locations of the materials to be tested, the loads to be applied and the manner in which they are to be applied, and the criteria for passing the tests.

A1.7.2 The procedures shall include provisions and precautions applicable to the specific set of tests, including any health and safety requirements in addition to those in Section A1.4.

A1.7.3 Apply adhesive sufficient to cover the disc or fill the lid and immediately place the disc or lid against the surface of the material and press firmly. Refer to Fig. A1.5.

A1.7.4 Support the disc or lid at the surface until the adhesive has adequately cured. Wipe away any excess adhesive around the disc or lid before it cures, or carefully cut it away after it cures.

A1.7.5 Attach the top end of the rope or chain to the hook on the disc or lid.

A1.7.5.1 To use the spring-loaded scale, attach it to the bottom end of rope or chain and pull down on the scale’s bottom hook.

A1.7.5.2 To use the weight holder, attach it to the bottom end of rope or chain and begin adding weights to the holder.

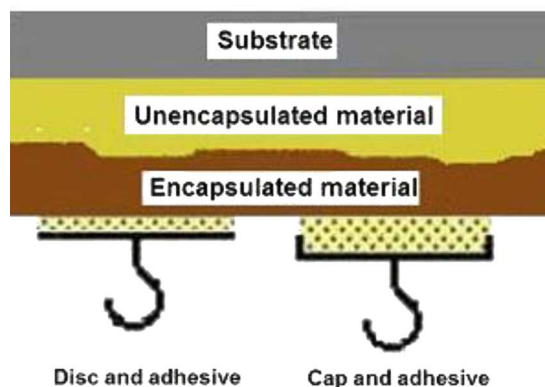


FIG. A1.5 Disc and Lid Attached to Material