Designation: D 6464 – 03

Standard Specification for Expandable Foam Adhesives for Fastening Gypsum Wallboard to Wood Framing[1]

This standard is issued under the fixed designation D 6464; 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 specification establishes minimum performance requirements for determining strength, aging, and working properties of expandable foam adhesives intended for bonding back surfaces of gypsum wallboards of all thicknesses to wood framing. Minimum physical and performance requirements are specified for all measured properties of adhesives and adhesive bonds.

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

1.3 *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:*

C 1396/C 1396M Specification for Gypsum Board[2]

D 905 Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading[3]

D 907 Terminology of Adhesives[3]

E 4 Practices for Force Verification of Testing Machines[4]

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods[5]

3. Terminology

3.1 *Definitions*—Many terms in this specification are defined in Terminology D 907.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *expandable foam adhesive, n*—any polymer that expands during delivery or cure to fill the space between substrates.

4. Significance and Use

4.1 This specification applies to expandable foam adhesives used to bond the back surface of gypsum wallboard to Douglas-fir dimensional lumber or other lumber species of equivalent bonding qualities capable of meeting the test requirements.

4.2 The specification establishes the minimum strength requirements of the bond for the selected assembly materials.

4.3 The adhesive is not considered a substitute for mechanical fasteners. Fasteners will be required to restrict expansion of the foam adhesive while it cures. The recommended fastening schedule must appear in the manufacturer's application instructions.

4.4 The tests are suitable for product performance certification and quality control programs, and can be useful to the general public, adhesive manufacturers, distributors, specifiers, architects, contractors, testing laboratories and other businesses and professionals.

4.5 The results do not include all possible conditions, which may occur during final assembly, but indicate a set of performance characteristics for laboratory controlled bonding variables.

5. Adhesive Physical Property Requirements

5.1 *Open Assembly Time*—These adhesives have a distinct open assembly time and this time must be agreed upon by the user and the manufacturer.

5.2 *Storage Life*—The adhesive shall remain serviceable and meet all the requirements of this specification for not less than six months after delivery, when stored in original unopened containers at temperatures ranging from 40 to 85°F (4 to 30°C).

6. Adhesive Properties and Performance

6.1 The adhesives shall conform to the requirements summarized in Table 1.

7. Materials and Apparatus for Conducting Tests

7.1 *Adhesives*—The adhesive shall be an expandable foam adhesive.

7.2 *Gypsum Wallboard*—½ in. (12.7 mm) thick, complying with Specification C 1396/C 1396M; the dimensions are specified in each test.

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[1] This specification is under the jurisdiction of ASTM Committee D14 on Adhesives and is the direct responsibility of Subcommittee D14.70 on Construction Adhesives.

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[2] *Annual Book of ASTM Standards*, Vol 04.01.

[3] *Annual Book of ASTM Standards*, Vol 15.06.

[4] *Annual Book of ASTM Standards*, Vol 03.01.

[5] *Annual Book of ASTM Standards*, Vol 14.02.

***A Summary of Changes section appears at the end of this standard.**

TABLE 1 Adhesive Properties and Performance Requirements

Test Method	Section	Property	Condition	Requirements
Rate of shear strength	10.1.4	shear strength	24 h at RT	10 psi (69 kPa) min
	10.1.5	shear strength	14 days at RT	40 psi (276 kPa) min
	10.1.6	shear strength	14 days at RT, + cyclic lab exposure, + 2 days at RT	32 psi (220 kPa) min
	10.1.7	resistance to static load in shear	(a) 40 lb (178 N) for 24 h at RT	no bond separation
			(b) 20 lb (89 N) for 24 h at 100°F	no bond separation
Rate of strength development	10.2.2	tensile strength	24 h at RT	15 psi (103 kPa) min
	10.2.2	tensile strength	14 days at RT	25 psi (172 kPa) min
Adhesive open-time determination	10.3	open time	24 h at RT	75 % paper transfer, min
Substrate wet-out by adhesive				
1. Plywood	10.4.1	wet out	spatula applied	good wetting property
2. Wallboard	10.4.2	wet out	spatula applied	good wetting property
Adhesive aging	10.5	accelerated aging	500 h at 158°F	no cracking or chipping
Freeze thaw stability	10.6	low temperature storage	3 cycles of 24 h at 0°F + 24 h at RT	no change in workability; 10 psi (69 kPa) shear strength, min
Suitability of a laminating adhesive for vinyl-covered wallboard	10.7	compatibility	24 h at 100°F	no blistering, vinyl-film discoloration, or bond failure
Suitability for Stain Resistance for Vinyl-covered wallboard	10.8	staining	1 h at RT	no swelling or discoloration
Bridging	10.9	gap-filling	48 h at RT	intact adhesive bond line, report length and paper failure %

7.3 *Plywood*—¾ or 23⁄32 in. (19.0 or 18.3 mm)-thick U.S. Product Standard PS-1-95 grade marked stamped, commercial plywood, Exterior, Group 1 Species, A-A or A-B grade face and back veneers. The test specimen dimensions are specified in each test.

7.4 *Douglas-Fir Lumber*—1½ by 1½ by 3½ in. (38.0 by 38.0 by 89.0 mm), clear, dry lumber, (moisture content of 8 to 10 %), with the bonding surface free of bark, knots, splits, and pitch.

NOTE 1—The tensile test will use one of the ends of the block as a bonding surface and should be an edge grain face.

7.5 *Tensile Test Fixture*—An assembly of one, 5 by 5 in. (127 by 127 mm)-by-½ in. (6.35 mm) thick steel plate and two 6 in. long sections of 1½ by 1½ (38.1 by 38.1 mm) by ¼ in. (6.4 mm) thick steel angles (Fig. 1).

7.6 *Garnet Paper*—No. 120 grit, 3/0.

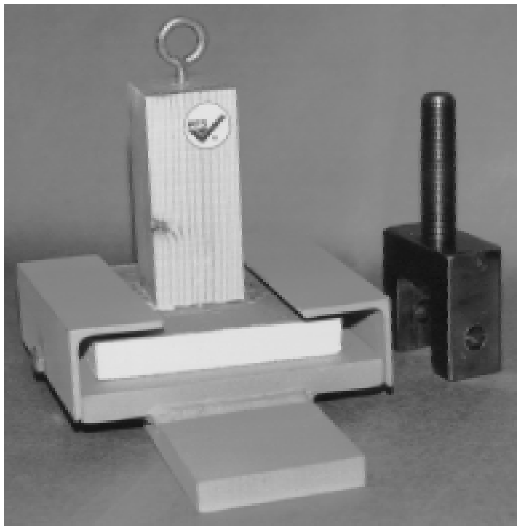

FIG. 1 Tensile Strength Test Specimen Assembly

7.7 *Plywood Shim*—4 by 3½ in. or 4 by 4 in. (101.6 by 88.9 mm or 101.6 by 101.6 mm) piece of ¾ -in. (19 mm) or 23⁄32 -in. (18.3 mm)-thick U.S. Product Standard PS-1-95 grade marked stamped, commercial plywood, Exterior, Group 1 Species, A-A or A-B grade face and back veneers.

7.8 *Manila Folder*—Plain manila paper, 11 point weight, (0.011-in. (0.28 mm) thick).

7.9 *Vinyl-Covered Wallboard*—A manufactured product consisting of gypsum wallboard with 2 mil minimum thickness vinyl overlay bonded to the wallboard front face.

7.10 *1-Pt and 1-Gal Non-Reactive Metal Can*.

7.11 *Food Wrap Polyethylene Film*—0.8 mil thickness sheet.

7.12 *Steel Mandrel*—1.0 in. (25.4 mm) diameter steel rod or pipe section with smooth and uniform surface.

7.13 *Tension Rod*—A steel rod for connecting the tensile test specimen assembly to the test machine.

7.14 *Testing Machine*—Any suitable testing machine that is capable of operation at a constant rate of motion of the moveable head and has an accuracy of ±1 % when calibrated in accordance with Practices E 4 requirements.

7.15 *Compression Shear Test Fixture*—A compression-shear apparatus that is similar to, but of a larger scale than the fixture recommended in Test Method D 905. A similar fixture is shown in Fig. 2.

7.16 *Wood Screw with Eyelet*—#6 by 1½ in. (38.1 mm) long, ⅜ in. (19.5 mm) inside diameter eyelet.

7.17 *Scaffolding Nails*—6d, double-head, smooth shaft, 0.113–in. (2.870 mm) diameter 2 in. (51 mm) long.

8. Sampling

8.1 The test adhesive sample size of 1 qt (approximately 1 L) is a minimum amount to complete one full series of testing. The sample is to be handled and stored according to the manufacturers recommendations. The sample is to be representative of the final product for which recognition is sought.

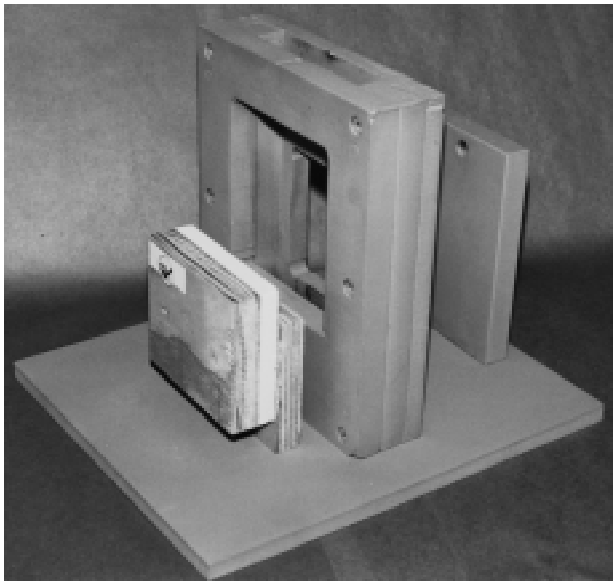

FIG. 2 Shear Strength Test Specimen Assembly

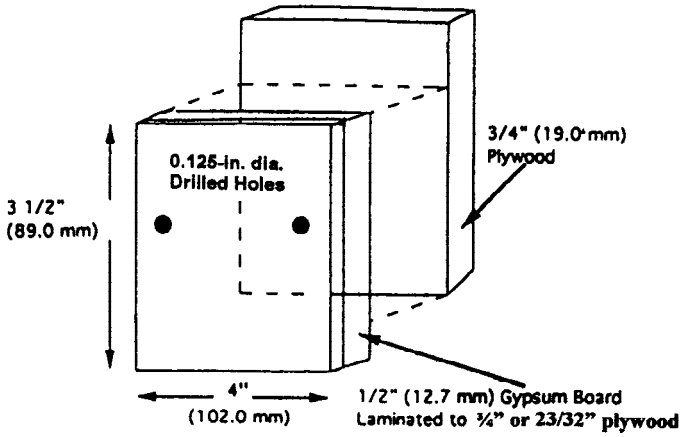

FIG. 3 Predrilled Shear Test Specimen Prior to Assembly

9. Conditioning of Materials and Adhesives

9.1 Standard condition will be defined as being 73 ± 2°F (23 ± 1°C) and 50 ± 5 % relative humidity.

9.2 Condition the Douglas-fir lumber, plywood, gypsum wallboard, and plain manila file folder for 48 h as described in 9.1. (The Douglas-fir lumber and plywood should not vary by 0.5 % after consecutive weighings.)

10. Test Methods

10.1 *Shear Strength (Rate-of-Shear Strength Development)*:

10.1.1 *Preparation of Wallboard-Plywood Laminates*—The gypsum wallboard must be reinforced with plywood. The plywood reinforced gypsum wallboard is referred to as the wallboard-plywood laminate. Each laminate is made by bonding the front surface of a piece of 4 by 3½ by ½ in. (101.6 by 88.9 by 12.7 mm) thick wallboard to a ¾ or 23⁄32 in. (19.0 or 18.3 mm) thick plywood piece of the same dimensions with a commercially available adhesive. The grain of the wallboard back surface facing paper shall run parallel with the 3½ in. (89.0) direction. Cure the adhesive in accordance with the adhesive manufacturer's recommendations. Condition the wallboard-plywood laminate to a constant weight in accordance with 9.2.

10.1.2 *Preparation of Test Assembly*—Prepare the test assembly by bonding a 4 by 3½ by ¾ or 23⁄32 in. (102.0 by 89.0 by 19.0 mm) piece of plywood (7.3) to the previously prepared laminate as follows and shown in Fig. 3.

10.1.2.1 Sand the face of the ¾ -in. (19.0-mm) thick plywood smooth with garnet paper and wipe the sanded surface free of dust. Drill two pilot holes through the wallboard-plywood laminate. Use a standard 0.125 in. (3.175 mm) drill bit and locate each pilot hole at ⅜ -in. (9.5 mm) from the sides and ⅞ -in. (22.2 mm) from the overlapped end.

10.1.2.2 Apply the adhesive on the sanded surface with the self-contained delivery system set at the manufacturer's recommended bead size. The amount of adhesive should be sufficient to cover the entire bond area without gaps in the adhesive.

10.1.2.3 Allow an open time of 30 s upon completion of spreading.

10.1.2.4 Squarely position the wallboard-plywood laminate on the coated plywood overlapping exactly 2½ in. (63.5 mm), thus forming the 10 in.^{2} (64.5 cm^2) bonded area (see Fig. 3).

10.1.2.5 Insert four wire spacers (No. 20 gage) at least 2 in. (51.0-mm) long in the joint. Position the spacers so that they are at each end of the test region. With the test specimen positioned horizontally on a firm surface and the wallboard plywood laminate piece on top, install two 6d scaffolding nails into the predrilled pilot holes.

NOTE 2—The pilot hole diameter should be slightly larger than the nail diameter. This is necessary to prevent the laminate from binding against the nail shaft and interfering with the uniform compression at the bond line. Carefully and uniformly set the nails into the lower plywood piece. Drive the nails until the scaffold head initially encounters the wallboard-plywood laminate.

10.1.2.6 After the adhesive has hardened, remove the scaffolding nails. Remove the spacers and cut away the excess adhesive from the bonded edges. Do not disturb the alignment of the bond line.

10.1.3 *Shear Strength—Dynamic Loading Determination*—Following the appropriate conditioning, test the specimen in shear using a compression-shear test fixture as shown in Fig. 2. The bottom edge of the wallboard-plywood laminate shall rest on a self-aligning seat as the test loading is simultaneously applied to the top edge of the plywood. The stress applied must be parallel and uniformly distributed to the joint (shear plane) and must require careful orientation using shims and self-aligning apparatus as necessary. Determine the shear strength at a cross head speed of 0.2 in. (5.1 mm)/min. Observations are made during stress application to ensure the test assembly maintains proper alignment throughout the test. The test fixtures cannot in any way cause stress measurement error(s) such as with binding or friction. Report the maximum shear strength and the average shear strengths for the 24 h, the 14 day, and the cyclic exposure test conditions.

10.1.4 *Shear Strength After 24 h*:

10.1.4.1 Prepare five test assemblies using the procedure in 10.1.1 and 10.1.2.

10.1.4.2 After aging the assemblies 24 h at standard condition (9.1), remove the scaffolding nails and determine the shear strength in accordance with 10.1.3.

10.1.5 *Shear Strength After 14 Days*:

10.1.5.1 Prepare five test assemblies using the procedure in 10.1.1 and 10.1.2.

10.1.5.2 After aging the assemblies 14 days at standard condition (9.1), remove the scaffolding nails and determine the shear strength in accordance with 10.1.3.

10.1.6 *Shear Strength After Cyclic Exposure*:

10.1.6.1 Prepare five test assemblies using the procedure in 10.1.1 and 10.1.2.

10.1.6.2 After aging the assemblies 14 days at standard condition (9.1), process the assemblies through four complete cycles (see Table 2). Store the assemblies at standard condition (9.1) for 24 h after each cycle.

10.1.6.3 At the end of the cycling, remove the scaffolding nails and determine the shear strength in accordance with 10.1.3.

10.1.7 *Resistance to Static Load in Shear*:

10.1.7.1 Prepare ten assemblies using the procedure in 10.1.1 and 10.1.2. Use a razor blade to scribe a line at both edges and perpendicular to the bond line where the gypsum wallboard-plywood laminate meets the plywood. The line will be useful when examining the assembly for noticeable separation or slippage.

10.1.7.2 Condition the assemblies 14 days at standard condition (9.1). Remove the scaffolding nails after 14 days.

NOTE 3—This will allow sufficient time for the adhesive to cure.

10.1.7.3 Load five test assemblies to 40 lb (178 N) at 73 ± 2°F (23 ± 1°C) and five assemblies to 20 lb (89 N) at 38 ± 1°C (100.2 ± 2.0°F) for a period of 24 h. When testing, clamp the top (wallboard/plywood) of the assembly to a rigid frame and attach the load to the bottom (plywood), making sure that perfect alignment of the suspended assembly and the loads are achieved.

10.1.7.4 At the end of each condition's 24-h period, examine each test specimen assembly for bond separation and slippage between the wallboard-plywood laminate and the plywood adherend. Slippage or separation at the bond line of the adhesive is considered a failure. Report the results of analysis for each of the five static load shear test specimens for both conditions.

10.2 *Tensile Strength (Rate of Strength Development)*:

10.2.1 *Preparation of Wallboard-Plywood Laminates*—Prepare the laminates using the same procedure in 10.1.1, but with 4 by 4 in. (101.6 by 101.6 mm) gypsum wallboard and plywood shims, or without plywood shim as shown in Fig. 1. Drill one pilot hole with a 0.125 in. (3.175 mm) drill bit through the center of the wallboard–plywood laminate. The pilot hole is for the installation of the 6d scaffolding nail to be used for the Douglas-fir wood block connection.

10.2.1.1 Prepare the 1½ by 1½ by 3½ in. (38.0 by 38.0 by 89.0 mm) Douglas-fir wood block by drilling a pilot hole for the wood screw with eyelet at the exact center end of test machine connection block end and a pilot hole for the 6d scaffold nail at the approximate center of the opposite block end. This eyelet will be used for the connection to the test machine. The pilot hole should be drilled straight and parallel with the block's length. The wood block end used for bonding to the wallboard back surface paper should be an edge grain face. Install the wood screw into the pilot hole with sufficient thread engagement to withstand the tensile force application.

10.2.1.2 Bond the back paper surface of the wallboard-plywood laminate to the Douglas-fir wood block. Apply excess foam adhesive to completely cover the bonding area. Uniform squeeze-out of excess adhesive should occur on all sides when the bond area is compressed to a bond line thickness of approximately 1/32 in. (0.8 mm).

10.2.1.3 Insert and position the tip of four wire spacers of No. 20 gage at least 2-in. (51.0-mm) long into the bonded area with the spacers positioned ¼ -in. (6.3 mm) from each edge of the wood block. With the test specimen's wood block on a firm surface and the wallboard-plywood laminate centered on top, install the 6d scaffolding nail into the pre-drilled pilot hole.

NOTE 4—The pilot hole diameter should be slightly larger than the nail diameter. This will prevent the laminate from binding against the nail shaft and interfering with the uniform compression at the bond line. Carefully and uniformly set the nail into the wood block. Drive the nails until the scaffold head initially encounters the wallboard-plywood laminate.

10.2.1.4 Scrape all excess adhesive away from edges using a square-tipped spatula. After the adhesive has hardened, remove the scaffolding nails. Remove the spacers and cut away the excess adhesive from the bonded edges. Do not disturb the alignment of the bond line.

10.2.2 *Tensile-Strength Determination*—Measure the tensile strength of the test specimen assembly on a testing machine capable of providing a loading rate of 60 lb (267 N)/min. Position the test specimen with the Douglas-fir wood block centered between the angles. Refer to Fig. 1. The test fixture is mounted to a permanent base and includes self-alignment features to ensure the stress application is perpendicular to the joint until failure. Connect the tensile test specimen to the test machine by connecting the tension rod with a clevis to the wood screw with the eyelet. Ensure the test assembly maintains proper alignment throughout the test. Report the maximum tensile strength of each specimen and the averages for the 24-h and 14-day tests.

10.2.3 *Tensile Strength After 24 h*:

10.2.3.1 Prepare five test assemblies using the procedure outlined in 10.2.1.

10.2.3.2 After aging the assemblies 24 h at standard conditions, determine the tensile strength in accordance with 10.2.2.

10.2.4 *Tensile Strength After 14 Days*:

TABLE 2 Cyclic-Exposure Conditioning for Shear-Test Assemblies (see 10.1.6)

NOTE 1—Four complete aging cycles to be used.
NOTE 2—Room temperature storage required over weekends.
NOTE 3—This 24 h procedure represents one complete cycle.

Time, h	Temperature, °F (°C)	Relative Humidity, %
4	100.0 (38.0)	85 ± 2
4	40.0 (4.5)	uncontrolled
16	122.0 (50.0)	uncontrolled

10.2.4.1 Prepare five test assemblies using the procedure outlined in 10.2.1.

10.2.4.2 After aging the assemblies 14 days at standard conditions, determine the tensile strength in accordance with 10.2.2.

10.3 *Adhesive Open Assembly Time Determination*:

10.3.1 *Wallboard*—Prepare five assemblies as follows:

10.3.1.1 Using a suitable template (Fig. 4), spread a uniform bead of adhesive ⅜ in. (9.5 mm) by ⅜ in. (9.5 mm) at least 2 in. (51.0 mm) long on the back surface of a 2 by 2 in. (51.0 by 51.0 mm) piece of wallboard that has been conditioned for 24 h at standard conditions (see 9.1).

10.3.1.2 After conditioning the assembly for the recommended open time at standard conditions, position a 2 by 2 in. (51.0 by 51.0 mm) piece of wallboard centrally over the bead and press it onto the substrate. Immediately place a 5-lb (2.3-kg) weight on the assembly. Remove the weight after 30 min.

10.3.1.3 After a period of 24 h at standard condition (see 9.1), pull the assembly apart by hand or other suitable means so that the directional pull is perpendicular to the bond line.

10.3.1.4 Examine the assembly for percent of transfer and paper failure. Report the average for the five assemblies.

10.4 *Substrate Wet-Out by Adhesive*:

10.4.1 *Plywood*—Prepare five assemblies as follows:

10.4.1.1 Using a spatula, press a small amount of adhesive on the plywood's A grade surface, which has been conditioned 48 h at standard condition (see 9.1). By reversing the pressure of the spatula, lift the spatula from the adhesive.

10.4.1.2 Examine the surface of the plywood and the spatula to determine whether the separation is adhesive or cohesive. The adhesive is considered to have wetted the plywood if the separation is cohesive.

10.4.2 *Wallboard*—Prepare five assemblies as follows:

10.4.2.1 Using a spatula, press a small amount of adhesive on the surface of the wallboard which has been conditioned 48 h at standard condition (see 9.1). By reversing the pressure of the spatula, lift the spatula from the adhesive.

10.4.2.2 Examine the surface of the wallboard and the spatula to determine whether the failure is adhesive or cohesive. The adhesive is considered to have wetted the wallboard if the failure is cohesive.

10.5 *Accelerated Adhesive Aging (Oven Test)*:

10.5.1 Select a piece of manila folder as conditioned in 9.1. Place strips of conditioned manila folder parallel, and 2 in. apart. Place the strips on a single sheet of conditioned manila folder. Apply a sufficient amount of adhesive to fully cover the 2 by 6 in. (51 by 152 mm) area. Before hardening occurs, cover the wet adhesive film with a sheet of polyethylene film. Place a flat and smooth weight over the spacers. The weight should be of sufficient mass to prevent expansion of the adhesive and form a flat and smooth surface on the dried film. The total thickness of the cured film and polyethylene film should be 11 ±2 mil. Cut out the 2 by 6-in. (51 by 152 mm) test specimen from the manila folder and place it into a 150 ± 5°F (66 ± 3°C) oven (humidity uncontrolled) for 500 h.

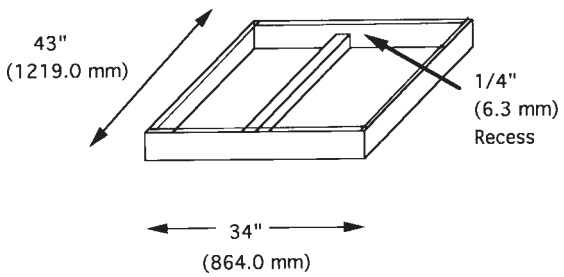

FIG. 4 Test Stud Frame

10.5.2 Allow the specimen to cool for 1 h at standard condition (see 9.1). Then slowly bend the specimen around a 1-in. (25.4-mm) steel mandrel with the adhesive side out. The specimen must be free of cracks and show no sign of breaking of the adhesive from the substrate.

10.6 *Freeze-Thaw Stability*:

10.6.1 Store the adhesive in the manufacturer's standard package at 0 ± 5°F (–17.8 ± 2.8°C) for 24 h. Then store it at standard condition (see 9.1) for another 24 h. This completes one cycle.

10.6.2 After three additional cycles, test the sample in accordance with 10.1.4.

10.7 *Suitability of a Laminating Adhesive for Vinyl-Covered Wallboard*:

10.7.1 Place 6 oz (177.0 mL) of adhesive into a clean, dry, open, 1 pt (0.5 L) tin-lined can. Place the can into a 1 gal (3.8 L) container. Seal a piece of vinyl-covered wallboard face-up on top of the gallon container using water-impervious duct tape. Place the assembly into an oven at 100 ± 5°F (38 ± 3°C).

10.7.2 Remove the assembly and the vinyl-covered wallboard and evaluate for blistering, vinyl film discoloration, and bond failure.

10.8 *Suitability for Stain Resistance for Vinyl-Covered Wallboard*:

10.8.1 In two areas, apply two dabs of adhesive approximately 2 in. (51.0 mm) in diameter to the face surface of the vinyl-covered wallboard. Following the adhesive manufacturer's recommendations, clean both areas 1 h after application of the adhesive to the vinyl surface.

10.8.2 Evaluate the sample for discoloration.

10.9 *Gap-Filling (Bridging Characteristics)*:

10.9.1 Construct a test frame 34 by 48 in. (864.0 by 1219.0 mm) as shown in Fig. 4 using 2 by 4 in. (51.0 by 102.0 mm) Douglas-fir lumber. Nail a stud 16 in. (406.0 mm) on center between the two outer studs, and recessed ¼ in. (6.3 mm). By using a level, make sure the frame is perfectly flat. Condition the frame for 48 h at standard condition (see 9.1).

10.9.2 Apply a uniform ⅜ by ⅜ in. (9.5 by 9.5 mm) bead of adhesive along the length of the center-recessed stud. Immediately nail a ½ in. (12.7 mm) thick piece of wallboard 34 by 48 in. (864.0 by 1219 mm) to the outside longitudinal studs using 10 in. (254 mm) nail spacing. Fasten the gypsum wallboard to the central stud by installing a No. 6 1¾ in. long drywall screw at the center of the gypsum wallboard to hold the backside firmly against the central stud during the 48 h conditioning period. Condition the test frame 48 h under standard condition (see 9.1).

10.9.3 Remove the nails from the outside studs and the drywall screw from the center-recessed stud. Grasp one edge of

the wallboard at points adjacent to each side of the recessed stud and pull outwardly at 90° to the stud. Examine the back of the wallboard and the stud and note the adhesive's gap-filling or bridging characteristics. A passing result is when an intact adhesive bond occurs between the recessed wood stud and gypsum wallboard back surface paper. Report the intact adhesive bondline length and paper failure percentage.

11. Report

11.1 Report the following information:

11.1.1 Complete identification of the material tested, including form, type, source, manufacturer's code number, etc., and

11.1.2 Complete listing of the results in accordance with Table 1. Attached is a sample format for reporting test results (see Fig. 5).

12. Precision and Bias

12.1 *Precision*—The precision information given below is in the units of measurement (psi), each of which is the average of five test determinations:

	Average	Sr	SrCOV%	SR	SRCOV%	r	R
Shear Strength (psi)	83	19	23	33	40	52	91
Tensile Strength (psi)	72	15	21	18	25	43	51

Sr = Repeatability Standard Deviation
SR = Reproducibility Standard Deviation
r = 95 % Repeatability Limit (within a laboratory)
R = 95 % Reproducibility Limit (between laboratories)
COV = Coefficient of Variation (Average/Standard Deviation) percentage

NOTE 5—The table was calculated using the relationship: 95 % Limit = 2.8 × standard deviation.

12.1.1 The term repeatability and reproducibility limits are used as specified in Practice E 177.

12.2 *Bias*—No information can be presented on the bias of the procedure in Test Method D 6464 for measuring shear and tensile strength because no material having an accepted reference value is available.

13. Keywords

13.1 adhesive; gap filling; gypsum wallboard; shear strength; tensile strength; vinyl; workability

ADHESIVE: TEST NO.:
MANUFACTURER: DATES:

TESTED BY:

9.1.4 24-Hour Shear	
Specimen #	Load (lbf)
1	
2	
3	
4	
5	
Average lbf	
Avg. psi	
Req. psi	10
Status	
Std. Dev.	
C.O.V.%	
Range	

9.1.5 14-Day Shear	
Specimen #	Load (lbf)
1	
2	
3	
4	
5	
Average lbf	
Avg. psi	
Req. psi	40
Status	
Std. Dev.	
C.O.V.%	
Range	

9.1.6 Cyclic Exposure Shear	
Specimen #	Load (lbf)
1	
2	
3	
4	
5	
Average lbf	
Avg. psi	
Req. psi	32
Status	
Std. Dev.	
C.O.V.%	
Range	

9.2.3 24-Hour Tensile	
Specimen #	Load (lbf)
1	
2	
3	
4	
5	
Average lbf	
Avg. psi	
Req. psi	15
Status	
Std. Dev.	
C.O.V.%	
Range	

9.2.4 14-Day Tensile	
Specimen #	Load (lbf)
1	
2	
3	
4	
5	
Average lbf	
Avg. psi	
Req. psi	25
Status	
Std. Dev.	
C.O.V.%	
Range	

9.6 Freeze Thaw Shear	
Specimen #	Load (lbf)
1	
2	
3	
4	
5	
Average lbf	
Avg. psi	
Req. psi	10
Status	
Std. Dev.	
C.O.V.%	
Range	

Shear Strength under Static Load (9.1.7)
(a) 40 lb load: _____
(b) 20 lb load: _____

Open Time (9.3): _____

Wet out (9.4.1, 9.4.2)
(a) on plywood: _____
(b) on wallboard: _____

Aging (9.5): _____

Laminating suitability on vinyl-covered wallboard (9.7 & 9.8)
(a) compatibility: _____
(b) staining: _____

Bridging (9.9): _____

FIG. 5 Sample Format for Reporting Test Results

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SUMMARY OF CHANGES

Subcommittee D14.70 has identified the location of selected changes to this standard since the last issue (D 6464 - 02) that may impact the use of this standard.

(1) Added word “Apparatus” to Section 7 title.
(2) Added 4.4 to Significance and Use.
(3) Added Section 8 Sampling.
(4) Edited 10.9 Gap-Filling (Bridging Characteristics) procedure instruction, test requirement and reporting detail.
(5) Edited Table 1 Gap-Filling test requirement.
(6) Added Precision and Bias statement.
(7) Added Summary of Changes section.