Designation: C474 – 15 (Reapproved 2020)

Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction[1]

This standard is issued under the fixed designation C474; 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 These test methods cover the physical testing of joint compound, paper joint tape, glass-mesh joint tape, and an assembly of joint compound and paper joint tape.

1.1.1 Joint treatment materials are specified in Specification C475/C475M.

1.1.2 The joint treatment material described in this standard are for use with gypsum board installed in accordance with Specification C840.

1.2 The test methods appear in the following order:

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in brackets are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 The text of this standard references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the 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 *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:*[2]

C11 Terminology Relating to Gypsum and Related Building Materials and Systems

C472 Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete

C475/C475M Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

C840 Specification for Application and Finishing of Gypsum Board

C1396/C1396M Specification for Gypsum Board

D685 Practice for Conditioning Paper and Paper Products for Testing

D828 Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus

D1000 Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

D3699 Specification for Kerosine

D3882 Test Method for Bow and Skew in Woven and Knitted Fabrics

E100 Specification for ASTM Hydrometers

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

2.2 *TAPPI Standard:*[3]

T 411 Thickness (Caliper) of Paper, Paperboard, and Combined Board

[1] These test methods are under the jurisdiction of ASTM Committee C11 on Gypsum and Related Building Materials and Systems and are the direct responsibility of Subcommittee C11.02 on Specifications and Test Methods for Accessories and Related Products.

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[2] 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.

[3] Available from Technical Association of the Pulp and Paper Industry, Technology Park, P.O. Box 105113, Atlanta, GA 30348.

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

3. Terminology

3.1 *Definitions*—For definitions of terms relating to gypsum, see Terminology C11.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *bond, n—in joint systems*, the quality of adhesion between the paper joint tape and joint compound.

3.2.1.1 *Discussion*—A 0 % bond means that no paper fiber is adhering to the joint compound. 100 % bond means that there is cohesive failure of the paper joint tape.

3.2.2 *check cracking, n—in joint systems*, short, narrow cracks randomly oriented in the surface of the dried joint compound.

3.2.3 *joint compound, powder, n*—a drying-type or setting-type cementitious material to be mixed with water.

3.2.4 *joint compound, ready-mix, n*—a drying-type cementitious material that is factory mixed in ready-to-use form.

4. Specimen Preparation

4.1 *Joint Compound, Powder:*

4.1.1 Mix 300 g of joint compound, powder, with approximately 150 to 160 mL of water.

4.1.2 Allow the specimen to stand for 30 min (Note 1), remix and adjust the temperature to 77 ± 2 °F [25 ± 1 °C] by placing the container holding the specimen in warm or cool water.

NOTE 1—Allow setting type compounds to stand for one half of their setting times, as determined by Test Methods C472 but not more than 30 min, prior to remixing.

4.1.3 Measure the viscosity in accordance with Section 5.

4.1.4 If the measured viscosity is not between 480 and 520 Brabender units, repeat 4.1.1 – 4.1.3 through with an increase or decrease in water as necessary.

4.1.5 Record the volume of water used to adjust the viscosity to 500 ± 20 Brabender units (see Note 2).

NOTE 2—Making note of the volumes of water, in millilitres per 100 g of material, used to adjust the viscosity, will facilitate specimen preparation in other tests.

4.2 *Joint Compound, Ready-Mix:*

4.2.1 Remix joint compound, ready-mix, to reincorporate any separated ingredients. Adjust the temperature to 77 ± 2 °F [25 ± 1 °C] by placing the container holding the specimen in warm or cool water.

4.2.2 Measure the viscosity in accordance with Section 5.

4.2.3 If the viscosity is more than 520 Brabender units, add water to achieve a viscosity of 500 ± 20 Brabender units (see Note 2).

4.2.3.1 If the original sample viscosity is less than 480 Brabender units, test as received.

JOINT COMPOUND

5. Joint Compound Viscosity

5.1 *Significance and Use:*

5.1.1 This test method provides a procedure for measuring joint compound viscosity.

5.2 *Sampling:*

5.2.1 Sampling shall be in accordance with Specification C475/C475M.

5.3 *Specimen Preparation:*

5.3.1 Prepare specimens in accordance with Section 4.

5.4 *Apparatus:*

5.4.1 *Viscosity Specimen Container,* metal or plastic with an open top having an inside diameter of 2½ to 3 in. [65 to 75 mm] and a height of 2½ to 3 in. [65 to 75 mm].

5.4.2 *Viscometer*[4], adjusted to operate at 78 ± 1 r/min.

5.4.3 *Viscometer Pin (Spindle),* having dimensions as follows:

	in. [mm]
Shaft diameter	0.187 ± 0.015 [4.75 ± 0.38]
Pin diameter	0.094 ± 0.015 [2.39 ± 0.38]
Immersion depth (from bottom of spindle)	1.625 ± 0.015 [41.3 ± 0.38]
Length of pin projecting from shaft	0.750 ± 0.015 [19.1 ± 0.38]
Upper pin from bottom of shaft	0.313 ± 0.015 [7.95 ± 0.38]
Lower pin from bottom of shaft	0.125 ± 0.015 [3.28 ± 0.38]

5.5 *Procedure:*

5.5.1 Fill the viscosity container with the mixed specimen until level with the top of the container.

5.5.1.1 Remove all air bubbles by puddling the sample container with a spatula and sharply rapping the bottom of the container on a hard flat surface.

5.5.2 Secure the filled container in the center of the viscometer spindle platform. Position the spindle so that the sample comes up to the immersion mark on the pin (spindle).

5.5.3 Start the viscometer and record the viscosity reading on the digital display after 30 s. If the viscometer readout goes to a strip chart recorder, read the viscosity after the pen starts to trace a straight line (usually within 1 min); if the tracing remains inconsistent, estimate the average viscosity reading.

5.6 *Report:*

5.6.1 Report the viscosity of the joint compound specimen in Brabender units.

5.7 *Precision and Bias:*

5.7.1 The precision of this test method is based on an interlaboratory study conducted in 2011. Seven laboratories using Brookfield equipment and eight laboratories using Brabender equipment tested two different materials, by alternative methods. Every test result represents an individual determination, and each lab was asked to report five replicate results for each material/instrument combination. Except for the limited amount of data reported for several of the material/instrument combinations, Practice E691 was followed for the design and analysis of the data.

5.7.1.1 *Repeatability Limit (r)*—Two test results obtained within one laboratory shall be judged not equivalent if they differ by more than the "r" value for that material; "r" is the interval representing the critical difference between two test results for the same material, obtained by the same operator

[4] The sources of supply of the apparatus known to the committee at this time are the Brabender "Visco-Corder" Model VC-E, manufactured by C.W. Brabender Instruments Inc., South Hackensack, NJ. and the Brookfield R/S-SST Rheometer, manufactured by Brookfield Engineering Laboratories Inc., Middleboro, MA. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

TABLE 1 Brookfield R/S SST (Brabender Units)

Material ID	Average[A] x	Repeatability Standard Deviation S_r	Reproducibility Standard Deviation S_R	Repeatability Limit r	Reproducibility Limit R
Sample A	660.0	7.6	23.6	21.2	66.0
Sample B	133.6	1.8	5.7	5.2	15.9

[A] The average of the laboratories' calculated averages.

TABLE 2 Brabender VC-E (Brabender Units)

Material ID	Average[A] x	Repeatability Standard Deviation S_r	Reproducibility Standard Deviation S_R	Repeatability Limit r	Reproducibility Limit R
Sample A	602.7	7.2	28.3	20.1	79.3
Sample B	123.1	1.9	8.0	5.4	22.4

[A] The average of the laboratories' calculated averages.

using the same equipment on the same day in the same laboratory. Repeatability limits are listed in Tables 1 and 2 below.

5.7.1.2 *Reproducibility Limit (R)*—Two test results shall be judged not equivalent if they differ by more than the "R" value for that material; "R" is the interval representing the critical difference between two test results for the same material, obtained by different operators using different equipment in different laboratories. Reproducibility limits are listed in Tables 1 and 2 below.

5.7.1.3 The above terms (repeatability limit and reproducibility limit) are used as specified in Practice E177.

5.7.1.4 Any judgment in accordance with statements 9.1.1 and 9.2 would have an approximate 95 % probability of being correct.

5.7.2 *Bias*—At the time of the study, there was no accepted reference material suitable for determining the bias for this test method, therefore no statement on bias is being made.

5.7.3 The precision statement was determined through statistical examination of 296 results, by alternative methods, on two materials (described below).

5.7.3.1 *Sample A*—A representative conventional weight ready-mixed all-purpose joint compound prepared specifically for the round-robin test and distributed to all testing laboratories.

5.7.3.2 *Sample B*—A representative low-viscosity wall texture compound prepared specifically for the round-robin test and distributed to all testing laboratories.

6. Shrinkage

6.1 *Significance and Use:*

6.1.1 This test is used to measure the amount of shrinkage in joint compound. The degree of correlation between this test and service performance has not been determined.

6.2 *Sampling:*

6.2.1 Sampling shall be in accordance with Specification C475/C475M.

6.3 *Specimen Preparation:*

6.3.1 Specimen preparation shall be in accordance with Section 4.

6.4 *Apparatus:*

6.4.1 *Plastic or Rubber Film,* approximately 5 by 5 in. [130 by 130 mm]. Any thin, flexible film that peels clean from a partially dried patty may be used.[5]

6.4.2 *Balance,* having a sensitivity of 10 mg (Figs. 1 and 2).

6.4.3 *Beaker, Ring Stand, and Wire Cradle* (see Fig. 1).

6.4.4 *Forced Air Drying Oven,* capable of being maintained at 90 to 120 °F [32 to 49 °C].

6.4.5 *Spatula,* having a blade approximately 4 in. by ½ in. [100 by 13 mm].

6.4.6 *Steel-reinforced Broad Knife,* a 5 to 8 in. [130 by 200 mm] drywall broad knife reinforced by a steel bar, 1 in. [25 mm] wide by ⅛ in. [3 mm] thick, by the knife width, attached to the back of the knife blade ¼ in. [6 mm] from the edge.

6.4.7 *Hydrometer,* having a range of 0.7 to 0.8 sp gr, in accordance with Specification E100.

6.4.8 *Volumetric Container,* a container which has a volume between 25 and 300 cm^3.

6.5 *Reagents and Materials:*

6.5.1 *Displacement Fluids.*

6.5.1.1 *Mineral Spirits,* odorless.

6.5.1.2 *Kerosine* (see Specification D3699).

6.6 *Preparation of Apparatus:*

6.6.1 *Support Plates*—Cover three plastic or glass plates with plastic or rubber film.

6.6.2 Obtain and record the tare weight of each assembly.

6.7 *Calibration:*

6.7.1 *Volumetric Container*—Determine the container volume in cubic centimetres and its tare weight in grams.

6.7.2 *Mineral Spirits, Kerosine*—Using the hydrometer, determine the specific gravity and record the result as density *M*, g/mL.

6.8 *Determination of Density of Wet Compound:*

6.8.1 Prepare a specimen to determine the density of wet compound by weighing the specimen in the volumetric container.

6.8.1.1 Adjust the temperature to 70 ± 2 °F [21 ± 1 °C] by placing the container holding the specimen in warm or cool water.

6.8.1.2 Puddle the specimen within the container with the spatula to remove entrapped air bubbles.

6.8.1.3 Finish filling the container and strike off the surface flush with the top using the steel-reinforced broad knife.

6.8.1.4 Weigh the filled container to the nearest 0.01 g. Record the weight of the filled container.

6.8.1.5 Determine the net weight of the compound in the volumetric container by subtracting the weight obtained in 6.8.1.4 from the weight obtained in 6.7.1.

[5] Rubber dental dam dusted with talc, polyethylene, or PTFE films have been found satisfactory for this use.