



Designation: C473 – 24

Standard Test Methods for Physical Testing of Gypsum Panel Products¹

This standard is issued under the fixed designation C473; 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 gypsum panel products.

1.2 The test methods appear in the following order:

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Core, End and Edge Hardness (Method B)	12
Nail Pull Resistance (Method B)	13
Humidified Deflection	14
End Squareness	15
Nominal Thickness	16
Recessed- or Tapered Edge Depth	17
Width	18
Length	19
Water Resistance of Core-Treated Water-Repellent Gypsum Panel Products	20
Surface Water Resistance of Gypsum Panel Products with Water-Repellent Surfaces	21

1.3 The values stated in inch-pound units are to be regarded as standard with the exception of weight of samples in SI gram units. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 The text of these test methods 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 these test methods.

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 Recom-*

mendations 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

C1264 Specification for Sampling, Inspection, Rejection, Certification, Packaging, Marking, Shipping, Handling, and Storage of Gypsum Panel Products

E4 Practices for Force Calibration and Verification of Testing Machines

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 *Other Standards:*³

TAPPI T441 Water Absorptiveness of Sized (Non-Bibulous) Paper, Paperboard, and Corrugated Fiberboard (Cobb Test)

3. Terminology

3.1 Definitions used in these test methods are in accordance with Terminology **C11**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *Test Uncertainty Ratio (TUR), n*—(tolerance of measure) / (precision of the standard measuring instrument).

4. Sampling

4.1 Test specimens shall be taken from the samples obtained in accordance with Specification **C1264**.

5. Conditioning

5.1 Condition specimens to constant weight at a temperature of 85 °F ± 15 °F (29.5 °C ± 8.5 °C) and relative humidity of 50 % ± 2 % (**Note 1**). Test specimens individually after

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 **C11.01** on Specifications and Test Methods for Gypsum Products.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. 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 (TAPPI), 15 Technology Parkway South, Norcross, GA 30092, <http://www.tappi.org>.

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

constant weight is reached and within 10 min upon removal from the conditioning chamber.

NOTE 1—Laboratory test results indicated that conditioning temperatures may range from 70 °F to 100 °F (21 °C to 38 °C) without significantly affecting the results. However, relative humidity is critical. This is the reason for testing specimens within 10 min upon removal from the conditioning chamber.

Method A—Constant Rate of Loading

INTRODUCTION

The following procedures are applicable to so-called “shot machines” that utilize lead or steel shot that applies a load to the specimen at a constant stress rate or any other device that applies the load at a constant stress rate.

6. Apparatus—Method A

6.1 *Testing Machine*—Apply the test load at a uniform rate of 1 lbf/s (4.45 N/s) $\pm$ 10 %. Apply the load with a device independent of manual control of the rate of loading during an individual sample test (see Fig. 1). The deformation of the specimen controls the cross head speed.

7. Flexural Strength (Method A)

7.1 *Summary of Test Method*—Flexural properties of gypsum panel products are evaluated by supporting the specimen near the ends and applying a transverse load midway between the supports.

7.2 *Significance and Use*—This test method covers a procedure for evaluating the ability of gypsum panel products to withstand flexural stresses during handling or use of the material. This test method is used to determine compliance with gypsum panel product specifications. The degree of correlation between this test and service performance has not been fully determined.

7.3 *Apparatus*—See 6.1.

7.3.1 *Specimen Supports*—All specimen bearing supports and load surfaces shall be true, shall engage the full width of the test specimen, shall be of such strength they will not deform under the test load, and shall be rounded to a radius of 0.125 in. (3.2 mm). The specimen supports shall be spaced 14 in. $\pm$ 0.016 in. (356 mm $\pm$ 0.41 mm) on centers measured at the points of surface contact with the specimen. The supports

shall be attached to a plate that shall be rigidly attached to the test apparatus. The supports shall be parallel to each other and perpendicular to the long dimension of the test specimen. The bearing surface of the end supports shall be on the same plane to ensure contact along the entire bearing surfaces. Supports shall be not less than 12 in. (305 mm) in length. When a load is being applied, the loading bar shall be in contact with the full width of the specimen. The load-bearing surface shall be parallel to the bearing surface of the specimen supports. The specimen and supports shall be located so that the vertical axis through the center of the load-bearing surface passes through the specimen at one half of the specimen width and one half of the distance between the supports.

7.4 *Sampling*—Sampling shall be in accordance with Section 4.

7.5 *Test Specimens*:

7.5.1 Cut four specimens, each 12 in. (305 mm) by approximately 16 in. (406 mm) from each gypsum panel product in the sample, two having the 16-in. dimension parallel to the edge and two having the 16-in. dimension perpendicular to the edge. Cut the specimens not less than 4 in. (102 mm) away from the ends and edges of the gypsum panel product except where the product is 24-in. or less in width, where it is impossible to do so.

7.5.2 Condition specimens in accordance with Section 5.

7.6 *Procedure*:

7.6.1 Use the apparatus in 7.3, supporting each specimen centrally on the fixed parallel bearings, 14-in. (356 mm) on centers, and apply the load on a similar bearing midway between the supports. Position perforated gypsum lath so the load is not applied over perforations.

7.6.2 For specimens with the long dimension parallel to the edge, test one specimen from each gypsum panel product face up and the other face down. For specimens with the long dimension perpendicular to the edge, test one specimen from each gypsum panel product face up and the other face down.

7.6.3 For gypsum panel products with surfacing material, the load is determined at the time of transverse failure of the surfacing material and core through the thickness of the specimen. The specimens shall not show a break in the bond between the surfacing and the core before transverse failure of the gypsum panel product. If a single specimen fails, test two

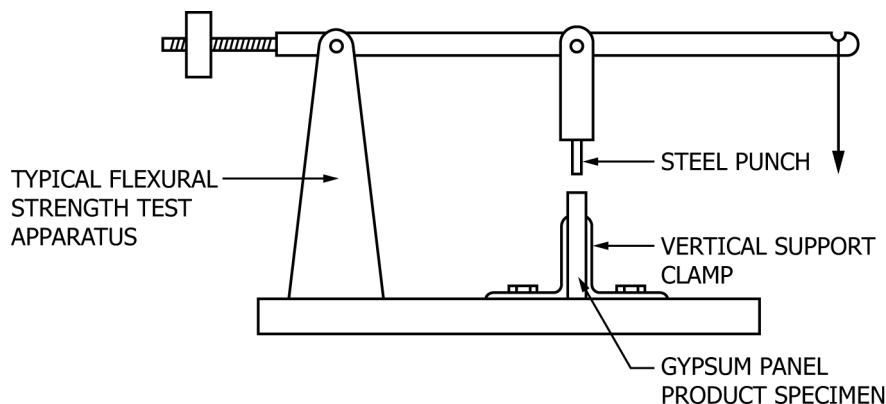


FIG. 1 Apparatus Schematic for Core, End, and Edge Hardness Test