



Standard Test Method for Determination of Liquid Water Absorption of Coated Hardboard and Other Composite Wood Products Via “Cobb Ring” Apparatus¹

This standard is issued under the fixed designation D5795; 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 test method is intended to serve as a means for measurement of liquid water that passes through a wetted paint film, and which is subsequently absorbed and retained by the underlying wood substrate. Alternative techniques for the use of the “Cobb Ring” apparatus are described.

1.2 The values stated in SI units are to be regarded as the standard. The values 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:*²

D1193 Specification for Reagent Water

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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *Cobb unit (C.U.), n*—The weight of distilled water absorbed by the underlying wood substrate in grams per 645 cm² (100 in.²) of surface area (discounting additional areas contributed by texturing or grooves) per 24-h time period.

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.52 on Factory Coated Wood 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.

3.1.2 *Cobb unit (C.U.) factor, n*—a dimensionless mathematical term which, for a given ring size, may be multiplied times the weight change after 24 h to calculate the Cobb unit value.

3.1.2.1 *Discussion*—The C.U. factor is calculated as follows:

$$\text{C.U. Factor} = \frac{100}{\text{Area (ring)}} = \frac{100}{\pi r^2} \quad (1)$$

where:

r = radius

For example, for 101.6-mm (4-in.) inside diameter ring.

or

$$\text{C.U. Factor} = \frac{100}{3.14(2)^2} = \frac{100}{12.56} = 7.96 \quad (2)$$

3.1.3 *composite wood products, n*—boards or other structured or decorative materials manufactured from wood fibers, flakes or strands and various resin binders.

3.1.3.1 *Discussion*—One example is hardboard.

3.1.4 *hardboard*—a generic term for a panel manufactured primarily from interfelted lignocellulose fibers consolidated under heat and pressures in a hot press to density of at least 31 lbs (13.95 kg) per cubic foot (cubic metre).³

4. Summary of Test Method

4.1 Suitable size rings of metal or plastic are adhered or clamped to the flat, coated surface of composite wood panels to be tested.

4.2 The assembly is equilibrated at a constant temperature and humidity and weighed.

4.3 The weighed assembly is placed on horizontal⁴ surface in a controlled temperature and humidity room or environmental chamber. Water is placed in the ring and left in contact with the board face for 24 h.

³ “Today’s Hardboard.” American Hardboard Association, 1210 W. Northwest Highway, Palatine, IL 60067.

⁴ The specification of a solid, continuous horizontal surface or a discontinuous (wire rack, expanded metal, etc.) is required. Surface must be consistent from laboratory to laboratory since this can influence the rate of evaporation of moisture and, thus, retention of moisture and Cobb values.

4.4 After 24 h the remaining water is removed from the ring, the assembly blotted dry and reweighed.

4.5 The increase in weight of the assembly due to water uptake is calculated by simple subtraction and then converted to Cobb units through the use of the C.U. factor (see 3.1.2).

5. Significance and Use

5.1 This test method provides a simple quantitative measure of water absorption by coated composite wood products. Although primarily used to evaluate factory-primed composite wood products, this test method may be of service for other wood substrates and coating systems.

5.2 This test method has demonstrated utility for composite wood siding products ranging in thickness from approximately 6.35 to 25.4 mm ($\frac{1}{4}$ to 1 in.). Extension of this test method to wood substrates of other types and thickness may be useful.

5.3 Conditioning of substrate, coated sample preparation, application method, dry film thickness, cure conditions, and number of replicate specimens should be agreed upon between the purchaser and the supplier of the coating material.

5.4 Such measurements are used as indicators or predictors of the anticipated performance of coated composite wood products during exterior exposure. They may be used for developmental evaluation of coatings, substrates, or both. They may also be useful for quality control or monitoring of the production of coated composite wood products.

6. Apparatus

6.1 *Rings*, may be cut from stainless steel, aluminum or PVC pipe. The ring diameter can be any size, but useful results have been obtained with rings of 101.6 mm (4 in.) or larger⁵ inside diameter, wall thickness of 9.53 mm ($\frac{3}{8}$ in.) and height of 25.4 mm (1 in.).

6.2 *Environmental Chamber*, set at $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) and $50 \pm 5\%$ relative humidity, or other agreed upon options.

6.3 *Saw*, suitable for cutting of samples.

6.4 *Caulk Gun or Applicator*, or, a clamp and gasket device for holding the ring tightly against the board is needed.

6.5 *Balance*, with sufficient capacity (typically 400 g) and 0.01-g accuracy.

7. Materials

7.1 *Butyl or Silicone Caulk*, which has been determined not to contribute to assembly weight change through absorption of water or interaction with the coating.

7.2 *Distilled Water*, (see Specification D1193).

7.3 *Test Boards*, appropriately identified, coated or uncoated,⁶ cut to a square size that is 25.4 mm (1 in.) greater than the ring diameter. A minimum of three replicates is recommended.

7.4 *Control Samples*, coated or uncoated without rings will also be required. These will be used to assess the degree of equilibration that is achieved.

8. Hazards

8.1 Use saws with goggles, dust mask, and proper machine safeguards to prevent injury.

8.2 Caulking compounds may be flammable and contain toxic solvents. See manufacturer's instructions for proper use and disposal.

9. Procedure

9.1 *Sealing of Rings to the Coated Face of the Samples:*

9.1.1 A continuous bead of caulk is applied to one edge of the ring. The caulked side of the ring is then attached to the sample with gentle pressure and a slight twisting motion; to maintain an accurate and uniform test area, only minor caulk "squeeze-out" should occur inside of the ring. Carefully wipe out this minor caulk "squeeze-out" to prevent errors in later calculations.

9.1.2 Alternatively, the assembly may be produced with a clamp and gasket device.⁷ Satisfactory results can also be obtained from clamp and gasket devices that are of self design and locally produced by any machine shop.

9.1.3 To enhance reproducibility, do not generate data by a combination of the caulk procedure and the clamp and gasket procedure.

9.1.4 Also, for improved reproducibility, all rings must be of the same nominal internal diameter.

9.2 *Equilibration:*

9.2.1 Allow the samples with rings and controls without rings to equilibrate for seven days at $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) and $50 \pm 5\%$ relative humidity.

9.3 *Initial Weighing:*

9.3.1 Weigh (grams) the controls and samples with rings to the nearest 0.01 g; record the weight.

9.4 Fill each ring with the volume of distilled water required to achieve a depth of 12.7 ± 3.2 mm ($\frac{1}{2} \pm \frac{1}{8}$ in.) of distilled water.

9.5 Store test assemblies at the same conditions used for equilibrating the panels.

9.6 *Final Weighing:*

9.6.1 After 24 h, pour out the water and blot the surface inside the ring completely dry with a soft paper towel. Immediately weigh (grams); record the new weight of the samples with rings.

9.6.2 After all measurements from 9.6.1 have been completed, weigh (grams) and record the weights of the control boards without rings. Compare the weights with the initial weights. If the weight change of the control boards is more

⁵ Rings of 01.6 to 254.0 mm (4 to 10 in. 1) are commonly used.

⁶ The use of the uncoated test boards is not intended for direct comparison with the coated samples, but may be used to ascertain the substrate variability and suggest the number of replicates needed.

⁷ The sole source of supply of clamp and gasket devices known to the committee at this time is the Teledyne Gurley Cobb Sizing Tester, T.M.I., 400 Bay View Ave., Amityville, NY 11701. 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.