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An American National Standard

Standard Test Method for Surface Wax Coating On Corrugated Board[1]

This standard is issued under the fixed designation D 3521; 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 covers determination of the weight of wax that is present as a coating on the surface of corrugated board. This method is applicable to board to which wax has been applied by curtain coating, roll coating, or other methods; the substrate board may or may not contain impregnating (saturating) wax within its structure.

NOTE 1—If it is known that the specimen has coating wax only, with no internal saturating wax, the total coating wax applied may be determined by Test Method D 3344.

1.2 *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:*

D 585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Product[2]

D 3344 Test Method for Total Wax Content of Corrugated Paperboard[3]

3. Terminology

3.1 *Definition:*

3.1.1 *weight of wax coating*—the weight of wax present as a surface film on corrugated paperboard, expressed as weight per unit area, usually grams per square metre or pounds of coating per thousand feet of board covered.

3.1.1.1 *Discussion*—This definition excludes any portion of wax that is located below the surface, that may have been permitted to soak into the fibrous paperboard structure.

4. Summary of Test Method

4.1 The amount of wax present as a coating on the surface is determined by delaminating the coated facing to obtain a ripple-free sheet, then scraping off the wax using a razor blade and calculating the wax removed.

5. Significance and Use

5.1 Wax coatings are applied to corrugated board to provide a better barrier against moisture or other agents or to provide improved appearance or abrasion resistance. These performance features are influenced by the amount of wax present on the surface.

5.2 During most coating operations, the major portion of the wax applied will congeal on the surface, while a minor proportion will migrate into and become embedded in the fibers of the facing. This method measures only the portion on the surface.

6. Apparatus

6.1 *Sample-Trimming Equipment*—A suitable trimming board or template arrangement equipped with a razor edge knife for even cutting of specimens to required size, with parallel sides. (A guillotine-type paper cutter is not recommended.)

6.2 *Measuring Rule*, steel edged, for measuring the size of specimen to within 0.5 mm.

6.3 *Razor Blades*, common single-edge, having a rigid rim for holding in the fingers. The blade is used for surface wax scraping and an adequate supply of fresh blades with sharp edges is required.

6.4 *Analytical Balance*, reading to nearest 1 mg.

7. Sampling and Test Specimen

7.1 From each test unit, obtained in accordance with Practice D 585, that is, each finished carton blank or paperboard sheet, cut specimens free from obvious defects. Each specimen should measure 100 by 100 mm, cut to the nearest 0.5 mm. Record the area of the surface to be tested, and whether it is an inside or outside facing. Duplicate specimens are required from each sample unit.

NOTE 2—The operator may be required to increase the replication and treatment of specimens to obtain a better estimate of "average" wax loading, (*1*) if the waxing is at an extremely low level, or (*2*) if the wax loading shows obvious wide variations in distribution over the board area.

NOTE 3—Optionally, specimens of other dimensions may be used if required by sampling limitations. In such cases, calculations need to be appropriately adjusted.

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[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.10.0A on Physical and Chemical Properties..

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[2] *Annual Book of ASTM Standards*, Vol 15.09.

[3] *Annual Book of ASTM Standards*, Vol 05.02.

7.2 Condition all boards at 23°C (73°F) and 50 % relative humidity for a minimum of 48 h before beginning test procedure.

8. Procedure

8.1 Take each duplicate specimen and separate the coated facing from the combined board as follows:

8.1.1 Delaminate the fibers of the facing in a manner that causes minimum disturbance of the surface coating and produces a thin continuous paper sheet. To do this, pry with a fingernail or blade at the corner of the specimen to start separating the fibers within the facing itself, then pull to delaminate, maintaining a low angle and a diagonal direction. Mark the reverse side to identify the specimen number. Weigh the duplicate delaminated pieces together before scraping and record the weight to the nearest 1 mg.

NOTE 4—For some types of combined board, the surface is smooth and free of ridges. In such cases, delamination of the liner may not be necessary.

8.2 Remove the surface wax from the surface of each delaminated piece by scraping the wax in four separate operations as follows:

8.2.1 Place the delaminated piece on a smooth hard surface such as a glass plate. Using a fresh razor blade for each test (100 cm^2 total), begin scraping in the direction parallel to the flutes as seen by the residual impressions. Hold the blade so that it is drawn toward the operator and is held close to the vertical. Place the blade so that it covers the width of the first flute. Use a moderately firm stroke and completely traverse the section of the specimen on one steady motion. It is important to do thorough scraping to ensure that there is no surface film of wax remaining. In removing the wax film it is acceptable to also remove a minor amount of paper fibers, but avoid excessive removal of fibers (see Note 5). After the first stroke, move the blade to cover an additional portion of the specimen about the width of the next flute impression and repeat the scraping stroke. Proceed across the specimen discarding the wax scrapings but preserving the integrity of the paper sheet.

NOTE 5—The minor amount of fibers removed with the wax scrapings may be ignored; this error tends to cancel the error of incomplete scraping. Tests indicate that with normal surface scraping the fibers scraped off should constitute only about 5 % of the weight of the scrapings.

8.2.2 After completing the uniform scraping in one direction, then turn the specimen by 90° and repeat the progressive scraping. Continue turning and scraping through the next 90° and the last 90° to complete the full rotation. Finally, inspect the specimen carefully to detect any areas with remaining surface wax and re-scrape such areas.

8.2.3 Carry out the same procedure with the duplicate facing specimen. Weigh the scraped specimens together and record the weight loss to the nearest 1 mg.

9. Calculation

9.1 Calculate the weight of surface coating on the facing, *a*, in g/m^2, as follows:

$$a = \frac{c - d}{b} \quad (1)$$

where:

b = specimen area, total, m^2,
c = weight of duplicate delaminated facings, before scraping, g, and
d = weight of facings, after scraping, g.

10. Report

10.1 Identify which facing of the corrugated board was tested and report—Surface Coating on Facing in grams per square metre. If desired, the surface coating weight may be reported in pounds per thousand square feet by multiplying *d* by 0.205.

11. Precision and Bias

11.1 The precision of this test method as obtained by statistical examination of interlaboratory test results is as follows:

11.1.1 *Repeatability*—The difference between successive test results, obtained by the same operator with the same apparatus under constant operating conditions on identical test material, would in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in twenty:

15 % of the mean

11.1.2 *Reproducibility*—The difference between two single and independent results, obtained by different operators working in different laboratories on identical test material, would in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in twenty:

24 % of the mean

11.2 Precision has been determined by interlaboratory testing of corrugated board samples of two types: (*1*) having the coating applied to plain untreated board, and (*2*) having the coating applied to board previously partially impregnated (saturated) with wax.

11.3 Due to the high degree of normal variability from specimen to specimen, close precision may be difficult to obtain. In cases where close precision is needed or precision is suspect, multiple sampling and testing should be done.

11.4 *Bias*—The procedure for measuring surface wax on corrugated board has no bias because the value for the surface wax can be defined only in terms of a test method.

12. Keywords

12.1 coating; corrugated; wax