



Standard Test Method for Peeling Resistance of Paper and Paperboard¹

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1. Scope

1.1 This test method covers the determination of the peeling resistance of paper and paperboard. It is intended primarily for testing linerboard that is to be converted into corrugated or solid fiber containers. Most liners do not exhibit the tendency of peeling covered in 3.1, so that it is not the primary intention in this method to carry the test to the quill forming stage or to final failure regardless of how long it may take. This test is not intended to measure abrasion.

NOTE 1—Occasionally linerboard shows a distinct tendency to peel or form quills on rubbing, and this tendency has been noticed on the corrugated combiner, on roller conveyor systems in the shipper's plant, and in freight cars where one box rubs against another.

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 whoever uses this standard to consult and 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 Product²

D 685 Practice for Conditioning Paper and Paper Products for Testing²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *peeling*—the actual lifting of the surface of the paper formation and its subsequent rolling into a “quill” (Note 1) rather than the production of ground or powdered fibers.

4. Significance and Use

4.1 The peeling resistance of paperboard is greatly influenced by the extent of pulp refining on the paper machine and the moisture content of the board at the time of combining on the corrugator. Although few liners fail in this manner, the failures that do occur result in poor quality board from an appearance and printability standpoint.

5. Apparatus

5.1 The apparatus shall consist essentially of a motor-driven testing machine which cycles 40 to 60 double strokes/min, having a reciprocating or circular motion arm to which is attached a smooth flat plate free to slide over a fixed plate. Both plates shall be equipped with clamps capable of holding taut the test specimen in such a manner that the corresponding surfaces of two specimens are held flat against each other. The upper plate shall have a total weight of 12 lb (5.4 kg) (Note 2). The leading edges of both plates shall be beveled or rounded away from the test specimens to avoid the presence of a square edge moving across the surface of the specimens. It is recommended that both plates be covered with a thin layer of sponge rubber to provide a backing for both upper and lower specimens. It is found that this ensures a more uniform contact of the two test specimens than a backing of nonresilient material. The drive mechanism shall be such as to cause the arm and moving plate to cycle at a predetermined constant rate of double strokes per minute, a double stroke being the forward plus the backward movement of the plate, or one full cycle of the mechanism. The distance of travel of the moving plate shall be 6 in. (152 mm) in each direction, that is, a total of 12 in. (305 mm) for one double stroke. The machine shall be constructed so as to minimize any tendency of the moving plate to move laterally. The apparatus shall be provided with a counter to indicate at all times the number of double strokes produced.

NOTE 2—If it is necessary to test specimens smaller than those prescribed in Section 7, the weight of the upper plate shall be adjusted so as to provide a pressure equal to 0.5 psi (3.4 kPa) of constant contact area. Constant contact area is the area of the lower (fixed) test specimen that is at all times in contact with the moving specimen. For example, the full-size 12 by 6-in. (305 by 152-mm) test specimen that provides a 10 by 6-in. (254 by 152-mm) exposed surface for rubbing, has a constant contact area of 24 in.² (155 cm²).

6. Sampling

6.1 The material shall be sampled in accordance with Practice D 585.

7. Test Specimens

7.1 Not less than 20 representative test specimens measuring 12 by 6 in. (305 by 152 mm) shall be cut from the sample. One half of the test specimens shall be cut with the 12-in. sides parallel to the grain direction, and the other half shall be cut with the 6-in. sides parallel to the grain direction.

¹ This test method is under the jurisdiction of ASTM Committee D-10 on Packaging and is the direct responsibility of Subcommittee D10.27 on Paper and Paperboard.

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

8. Conditioning

8.1 Condition the test specimens before testing in accordance with Method D 685. These conditions shall also prevail during the performance of the test.

9. Procedure

9.1 Test at least ten pairs of specimens, one half with the grain direction parallel to and the other half with the grain direction at right angles to the direction of the stroke. In all cases, the grain direction shall be parallel in the two specimens in each pair.

9.2 Test two specimens simultaneously, rubbing one against the other with corresponding surfaces in contact. Clamp the specimens to the plates of the testing machine in such a manner as to leave clear a flat exposed surface 10 by 6 in. (254 by 152 mm), with the 10-in. dimension parallel to the direction of the stroke.

9.3 With the two specimens clamped in place and their surfaces in contact, start the testing machine. Stop the test at intervals to permit inspection of the specimens. The frequency of these inspections will necessarily vary, depending upon the expected peeling resistance of the material under test. Remove loose fiber particles from the specimens by lightly brushing the surfaces at intervals of ten double strokes to prevent rolling or balling. Usually a relatively short time under test is sufficient to disclose a tendency to peel. If the specimen does not show this tendency at 100 double strokes, discontinue the test and report that this specimen is not susceptible to peeling. If the specimen

does show a tendency to peel in the early stages, carry on the test to failure of the specimen.

9.4 The end point is not always clear-cut in those specimens carried to failure, and the type of failure will vary with different types of materials. Usually it takes the form of a quill of fibers peeled from the surface. The appearance of loose fibers in the form of dust shall not be considered failure. Consider failure to have occurred when surface fibers in formation are lifted from the main body of the sheet.

10. Report

10.1 The report shall include the following:

10.1.1 Number of specimens tested,

10.1.2 Number of specimens that failed with grain direction parallel to stroke,

10.1.3 Number of specimens that failed with grain direction perpendicular to stroke,

10.1.4 Exposed area and pressure in pounds per square inch of constant contact area (Note 2), and

10.1.5 Where tests are carried to failure of the specimens, the number of double strokes required to produce failure.

11. Precision and Bias

11.1 Because of the nature of this test method, and because it has pass-fail results, a precision and bias statement is not applicable.

12. Keywords

12.1 paper; paperboard; peeling resistance; quilling

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