Designation: F2296 – 04 (Reapproved 2012)

Standard Practice for Determining the Adhesion of Lamination Films to Prints Utilizing Mechanical Stress: Four Different Test Methods—Score/Tape, Cross Hatch, X-Cut, and Crease-Folding[1]

This standard is issued under the fixed designation F2296; 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 practice describes procedures for assessing the adhesion between lamination films and black and white or color images produced by printers, copies and other reprographic devices.

1.2 This practice can be used to test different laminates with a given set of inks and media or it can be used to evaluate inks and media with a given laminate.

1.3 This practice is applicable to laminated images, where the substrate surface is subject to failure under mechanical stress from mostly peel conditions (that is, paper, film, cloth, and so forth).

1.4 *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:*

F2226 Practice for Determining the Adhesion of Prints and Laminating Films

3. Significance and Use

3.1 The image life of printed media displayed in both typical office and outdoor environments can be extended by lamination or encapsulation. While natural aging is the most reliable method of assessing lamination adhesion, the length of the time required makes this method impractical for most materials. This practice utilizing mechanical stress allows comparative studies of prints and laminating films.

3.2 Factors in the office and outdoor environments, such as heat, cold, thermal shock, ultraviolet/visible radiation and water vapor can have effect on laminate stability. The resistance of the laminate to these factors can be assessed by applying mechanical stress.

3.3 Good adhesion is a prime consideration for laminating films and prints. A laminating film, which does not adhere to a print or vice versa generally, has no commercial value. This practice is used to obtain comparative data of adhesion strength of encapsulated or laminated media.

4. Interferences

4.1 Since the ability of laminating film to adhere to printed media is dependent on temperature and humidity, it is important that the effects of mechanical stress be assessed under the conditions appropriate to the end use applications. While printed media may be handled and displayed under a variety of conditions, this practice is intended to determine adhesion in indoor environments.

4.2 The laminate adhesion is dependent on lamination temperature and should be applied at the manufacturers' recommended temperature for the best performance.

4.3 The adhesion between lamination films and color images is dependent on the printing mode, the type of color and the amount of applied ink, lamination conditions such as lamination temperature, the lamination speed and the pressure on the nip.

4.4 This practice is intended to measure adhesion of printed media without specifying above-mentioned parameters.

5. Conditioning

5.1 It is recommended that samples be conditioned at 23°C and 50 % RH for at least 24 h prior to printing and for at least 24 h subsequent to lamination. Specimens should be visually inspected for surface irregularities, which could adversely affect lamination.

5.2 It is recommended that samples be conditioned at 23°C and 50 % RH for 24 h prior to delamination to provide additional time for equilibrium of adhesive containing interfaces.

[1] This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.03 on Research.

Current edition approved Oct. 1, 2012. Published November 2012. Originally approved in 2003. Last previous edition approved in 2004 as F2296 – 04. DOI: 10.1520/F2296-04R12.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

Documents
Document Sharing Hub
Full document details: ASTM F2296-04(2012)

5.3 The above conditioning steps are pertinent only where media evaluation or comparison is needed. Obviously, as a production tool, the conditioning period is not practical. Therefore, when media are coated in production, the specimens should be obtained from each roll and checked as soon as possible in a repeatable procedure appropriate to the operation. It is imperative that operators use caution in selecting and preparing specimens to maintain good uniformity.

6. Materials

6.1 Razor blade, single edge or cutting board, pressure sensitive tape (25 mm (1 in.) wide).

6.2 The adhesion strength of pressure-sensitive tapes is dependent on lot number due to batch production process and storage time. The same manufacturing tape with identical lot number should be used for testing conducted in different laboratories. The pressure-sensitive tape's adhesion varies depending on the coating and substrate. The adhesion strength of the tape should be agreed upon between the manufacturer of the tested coating and the end user.

6.3 At least three test specimens printed with a test image and subsequently laminated.

7. Test Specimens

7.1 The substrate, method of printing, ink or toner lay down, and handling of printed specimens shall be consistent with their anticipated end use.

7.2 The test image can be any picture printed using print files containing the appropriate printer setup specific for each application.

7.3 The same test image and printer set up should be used for comparison purposes.

7.4 The recommended test image should consist of a standardized arrangement of color patches printed using print files containing the appropriate printer setup specific for each application. This test image should contain color patches at maximum print density of 100 % for each of the primary colors of cyan, magenta, yellow and black, 200 % for the secondary colors of red, green, and blue, and 300 % for composite black.

7.5 The recommended color patches should be circular with minimum diameter of 125 mm (5 in.).

7.6 It is recommended that the samples be laminated 24 h after printing. The actual lamination time after printing should be presented in the report.

7.7 Laminating films that are 75 µ (3 mil) thick should be used for comparison purposes. Thinner or thicker laminating films can be used depending on application.

7.8 Speed of lamination for paper media having base weight in the range 90 to 170 g/m^2 should be 0.9 m/min (3 ft/min). Lower or higher speed can be used depending on film thickness, paper base weight, and lamination temperature.

8. Delamination Tests

8.1 Tests should be carried out under temperature and humidity conditions similar to those of end use applications.

8.2 *Score/Tape Procedure:*

8.2.1 Place a sample of the laminated print media to be tested on a flat surface, printed side up.

8.2.2 Take a 75 by 25 mm (3 by 1 in.) piece of the pressure-sensitive tape and firmly adhere 50 mm (2 in.) of it to the surface of each of the colored patches and a non-printed area by pressing down with the flat of a finger.

8.2.3 While holding the specimen against a flat, horizontal surface, grasp the loose end of the tape and pull the tape away sharply from the sample at a 90° angle from the sample (altering the 90° angle may cause the results to be invalid).

8.2.4 All tests are to be conducted in the CD (cross direction) of the sample.

8.2.5 Examine the laminated surface and the tape for coating removal.

8.2.6 Results shall be reported as Pass or Fail.

8.2.7 A passing result is one where the delamination does not occur between the laminate and the first interface after the adhesive, but in a later layer(s).

8.3 *Cross Hatch Procedure—Non Paper Substrate:*

8.3.1 Place a sample of the laminated print media to be tested on a flat surface, printed side up.

8.3.2 Using a sharp razor blade, cut cross hatch lines 3 mm (0.125 in.) apart through the laminating film for each of the colored patches and a non-printed area, being careful not to cut through the ink jet coating and the base material.

8.3.3 Take a 75 by 25 mm (3 by 1 in.) piece of the pressure-sensitive tape and firmly adhere 50 mm (2 in.) of it to the cross hatched surface to be tested by pressing it down with the flat of a finger.

8.3.4 While holding the specimen against a flat, horizontal surface, grasp the loose end of the tape and pull the tape away sharply from the sample at a 90° angle (altering the 90° angle may cause the results to be invalid).

8.3.5 All tests are to be conducted in the CD (cross direction) of the sample

8.3.6 Examine the laminate surface and the tape for coating removal.

8.3.7 The results are to be reported as Pass or Fail.

8.3.8 A passing result is one where the delamination does not occur between the laminate and the first interface after the adhesive, but in a later layer(s).

8.4 *Cross Hatch Procedure—Porous Paper Substrate:*

8.4.1 Place a sample of the laminated print media to be tested on a flat surface, printed side up.

8.4.2 Using a sharp razor blade, cut cross hatch lines 3 mm (0.125 in.) apart through the laminating film for each of the colored patches and a non-printed area, being careful not to cut through the ink jet coating and the base material.

8.4.3 Take a 75 by 25 mm (3 by 1 in.) piece of the pressure-sensitive tape and firmly adhere 50 mm (2 in.) of it to the cross hatched surface to be tested by pressing it down with the flat of a finger.

8.4.4 While holding the specimen against a flat, horizontal surface, grasp the loose end of the tape and pull the tape away sharply from the sample at a 90° angle (altering the 90° angle may cause the results to be invalid).

AVA Documents
Document Sharing Hub

Full document details: ASTM F2296-04(2012)