



Standard Practice for Abrasion and Scuff Resistance of Inkjet Media by the Sutherland Rub Tester¹

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^{ε1} NOTE—Revised the units presentation and added a units statement editorially in October 2011.

1. Scope

1.1 This practice covers a procedure for determining the abrasion resistance of printed and unprinted inkjet media using the Sutherland Rub Tester, or its equivalent, equipped with full-width rubber pads and using standardized receptors.

1.2 This practice is applicable to printed and unprinted inkjet media.

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

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:*²

[D5264 Practice for Abrasion Resistance of Printed Materials by the Sutherland Rub Tester](#)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *abrasion resistance*—ability of a printed surface to resist mechanical destruction.

3.1.2 *abrasiveness*—the degree to which another material can abrade the surface of the test specimen.

3.1.3 *Ink jet media*—refer to recording elements used by ink jet printers to receive inks. The substrate may be paper, plastic,

canvas, fabric, or other ink receptive material. The substrate may, or may not, be coated with an ink receptive layer(s).

3.1.4 *Microporous ink jet media*—refer to ink media having ink absorbing microporous layer(s).

3.1.5 *receptor*—film, paper, or fabric of a specified abrasiveness onto which coatings (for example, ink or protective coating) removed from the specimen are deposited during the abrasion test. An example of a receptor is a fine grade crocus cloth or the backside of the inkjet media being evaluated.

3.1.6 *scuffing*—gloss change of ink jet media under applied pressure.

4. Summary of Practice

4.1 The inkjet media is mounted on top of the rubber pad on the Sutherland base and the receptor is cut to fit the 2-lb (0.91-kg) or the 4-lb (1.81-kg) weight (depending on which one is being used). The receptor is mounted to the weight. The specimen is rubbed for a total of approximately 10 cycles (20 strokes) at a rate of 43 cycle/min, where a cycle is one back-and-forth stroke. The number of cycles is preset on the Sutherland Timer. The weight is mounted on the Sutherland and the machine is turned on. The Sutherland will shut off automatically when the desired number of cycles is completed.

4.2 The test specimen is removed from the Sutherland base and examined for degree of print degradation by measuring the change in gloss, density, or change in physical appearance. The receptor is analyzed for the amount of ink or coating transferred from the specimen. Results are compared to an untested specimen.

5. Significance and Use

5.1 Abrasion resistance is a desirable and sometimes critical property of printed materials. Abrasion damage can occur during shipment, storage, handling, and end use. The result is a significant decrease in product appearance and legibility of product information. The amount of abrasion damage to a printed substrate is dependent on shipping conditions, possibly temperature and humidity, time, and many other variables. This practice provides a way of comparing abrasion resistance of printed materials under laboratory conditions.

¹ This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.07 on Ink Jet Imaging 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.

5.2 This practice also can be used to evaluate the relative abrasion and scuff resistance of printed and unprinted inkjet media.

5.3 This practice can provide a reasonably simple procedure that can be used by both the buyer and the seller of printed materials to determine if the product offered for sale meets some predetermined standard for abrasion or scuff resistance.

6. Interferences

6.1 Since the abrasion resistance of inkjet inks and media may be dependent on temperature and humidity, it is important that the measurements be made under the conditions appropriate to the end use applications.

6.2 Abrasion resistance should be measured within the temperature and humidity ranges specified by the printer or media manufacturer.

6.3 The abrasion resistance of printed inkjet media is dependent on the printing mode, the type of color, and the amount of applied ink.

6.4 Microporous ink jet media tends to be particularly sensitive to scuffing.

7. Apparatus

7.1 Sutherland Rub Tester, as specified in Practice D5264.

8. Materials

8.1 Standard receptors cut to fit the Sutherland Receptor Block minimum of 2 by 4 in. (51 by 102 mm) and fastened with double-sided pressure-sensitive tape such that it covers the entire bottom surface of the block. An appropriate receptor should be selected in accordance with 9.2.

8.1.1 Unprinted sheet of substrate,

8.1.2 Printed sheet of substrate,

8.1.3 Double-sided Pressure-sensitive tape or any double-sided tape suitable for holding the sample without interfering with the operation of the tester.

9. Preparation of Apparatus

9.1 Set the Sutherland Rub Tester on a sturdy bench, preferably in a room conditioned at about 73.4 °F (23 °C) and 50 % relative humidity.

9.2 If test criteria have not been specified, select an appropriate receptor by running an agreed-upon reference material for the number of strokes required to achieve a visible level of degradation.

10. Specimen Preparation and Conditioning

10.1 The specimen should preferably be a flat sample with no scoring, ridges, or other surface irregularities. Further, in testing multiple samples, it is important that each has comparable, if not identical, ink coverage and ink density.

10.2 The method of printing, ink, ink laydown, and handling of printed samples shall be consistent with the anticipated end use.

10.3 The test image may be generated with personal computer word processing, drawing/graphics, or page layout soft-

ware, saved as a print file for each printer/method of printing (contributing its unique ink and ink/receiver interactions that may impact drying time), trial-printed, and evaluated for appropriate ink letdown (purity and amount) and ease of printing and testing. Each print file should have its filename, type, and version identified in the image area and a place for experimental notes (such as, time, printer, environmental conditions, operator). The printer settings and a trial print of each print file version should be archived.

10.4 An unprinted sample and a sample with the test image consisting of a solid color patch of cyan, magenta, yellow, red, green, blue, and black ink shall be tested. The printed sample should be allowed to dry for 24 h prior to testing.

10.5 Cut the specimen 3 by 6 in. (76 by 152 mm) whenever possible. Smaller samples may be tested as long as they are mounted to a 3 by 6-in. (76 by 152-mm) template.

10.6 Care should be taken to avoid contaminating the sample with fingerprints during handling.

10.7 Condition the specimen at 73.4 °F (23 °C) and 50% relative humidity unless otherwise agreed upon.

10.8 Prior to testing the specimens, measure the density of colors, surface gloss at 20 and 60 degrees and examine the physical appearance of the specimens.

11. Procedure

11.1 Mount a 3 by 6-in. (76 by 152-mm) rubber pad both on top of the Sutherland base as well as to the bottom face of the detectable receptor block.

NOTE 1—This pad will need periodic replacing as the rubber becomes brittle due to oxidation or if the rubber wears off the pad. This periodic replacing is also true of the pads that come with the Sutherland receptor weight. Failure to replace worn pads could result in distorted test results. The pad face should be uniformly flat (level) with a Shore A durometer of 15 6 5.

NOTE 2—For scuff resistance softer pads are recommended.

11.2 Attach the test specimen to the rubber pad on the Sutherland base with the test surface face exposed.

11.3 Attach the receptor to the receptor block. Receptors cut to a 178-mm length (51-mm width) can be held in place by the clamps on the sides of the block, while shorter receptors (minimum of 102-mm length) should be held in place by pressure-sensitive double-sided tape.

NOTE 3—The choice of receptor block weight is based on the type of substrate and ink being tested. The heavier weight, 4.0 lb (1.82 kg), is appropriate for samples that experience severe shipping and handling conditions. The receptor may be the backside of the test specimen, a crocus cloth, or another abrasive material.

11.4 Lightly brush the sample and receptor with a camel's hair anti-static brush to remove any potentially abrasive particles from the surface.

11.5 Place the block in the receptor block holder.

11.6 Preset the dial on the Sutherland Rub Tester to the desired number of strokes.

11.7 Turn the Sutherland on. It will automatically shut off when the preset number of strokes has been completed.

11.8 Repeat 11.1-11.8 with each test specimen.

12. Evaluation

12.1 Examine each specimen for degree of degradation and each receptor for the amount of coating or ink, or both, transferred from the specimen.

12.2 Measure the density of colors and the 20 and 60 degree gloss of the specimens after the Rub Test (average of 3 measurements) and record the density and gloss change from the measurement prior to rubbing.

12.3 Report test conditions and results for abrasion using predetermined criteria established by the interested parties.

13. Report

13.1 Report the following information

13.1.1 Sample identification, including the printer, method of printing, and the media type.

13.1.2 The change in density and gloss after rubbing the sample.

13.1.3 Any change in physical appearance or receptor material.

14. Keywords

14.1 abrasion; gloss; ink; Inkjet media; printing; rub; scuffing; Sutherland

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