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An American National Standard
Technical Association of
Pulp and Paper Industry
Test Method T 455.

Standard Test Methods for Identification of Wire Side of Paper[1]

This standard is issued under the fixed designation D 5039; 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 The test methods describe procedures for identifying the wire side of paper made on a one-wire fourdrinier paper machine.

1.2 It is desirable to have means of distinguishing between the two sides because they generally differ in some physical and chemical characteristics. It is not always possible to identify the sides, particularly with coated and other surface-treated papers, certain high-grade papers made from well-beaten rag stock and specialties made with variations in the usual paper-making practices. If one procedure does not give a definite identification, the other procedures should be tried. Nevertheless, if any one of the following procedures gives a clear result, identification is established.

1.3 The procedures in these test methods are not applicable to paper made on cylinder, twin-wire, or other special machines.

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:*

D 1968 Terminology Relating to Paper and Paper Products[2]

3. Terminology

3.1 *Definitions*—Definitions shall be in accordance with Terminology D 1968 and the *Dictionary of Paper*.[3]

4. Summary of Test Methods

4.1 These test methods consist of a series of six procedures found suitable for identifying the wire side of paper, as follows:

5. Significance and Use

5.1 The wire and felt sides of a sheet of paper generally differ in some physical and optical characteristics[4] so it is desirable to have some means of distinguishing between them.

6. Procedure A—Direct Observation

6.1 Fold a specimen sheet of paper so that both sides are visible at the same time.

6.2 Observe the relative surface appearance of structure of the two sides by holding the specimen in a horizontal position with the light striking at a very low angle (less than 10°) and the line of vision normal to the light path. Varying the angles of illumination and viewing and rotating the sheet in a horizontal plane may more clearly bring out the wire marks. Look for rectangular or diamond-shaped impressions made by the machine wire, which identify the wire side. A low-power binocular microscope is helpful. Do not confuse the larger and irregular pattern of felt marks with the regular and finer pattern of wire marks. These wire marks are invariably smaller than 2 mm.

7. Procedure B—Carbon Smudge

7.1 Make a black smudge or mark on the paper surface by wiping with a small piece of carbon paper held between the thumb and middle or forefinger, so that the finger presses the black surface of the carbon paper into the surface of the paper under test. Using considerable pressure, slowly pull the carbon paper along the surface of the specimen, thus producing a black mark about ½ in. (12 mm) in width and 2 to 3 in. (51 to 76 mm) in length. During this operation, support the specimen on a smooth surface such as plate glass. Make such a mark on both sides of the specimen across both the machine and cross

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

[3] Available from the Technical Association of the Pulp and Paper Industry, P.O. Box 105113, Atlanta, GA 30348.

[4] Casey, J. P., *Pulp and Paper Chemistry and Chemical Technology*, Second edition, Vol 3, New York, 1961, pp 1256, 1257.

directions. Use a fresh spot on the carbon paper in making each mark. Examine the marks as described in 6.2.

8. Procedure C—Wetting

8.1 Dip a specimen of paper in water or in a weak sodium hydroxide solution (1 to 2 % NaOH), drain the excess liquid, and allow the specimen to stand for a few minutes. This treatment tends to restore the texture that the paper had prior to calendering. Coated sheets may need to be lightly rubbed after wetting to remove some of the coating. View as described in 6.2.

9. Procedure D—Wetting and Charring

9.1 Wet the paper specimen surface with a mixture of 50 % saturated ammonium chloride and 50 % ethyl alcohol. Then char the surface using an electric heat gun. Repeat on the other side of the sheet and visually compare sides for appearance of the wire pattern. View as described in 6.2.

10. Procedure E—Tearing

10.1 Place a specimen sheet of the paper on a table in such a way that the grain (machine direction) is parallel to the line of vision and the sheet surface is approximately horizontal. Holding the sheet in this position with one hand, pull upward with the other to start a tear in the sheet so that the line of tear follows the grain of the paper. As the tear is being made, gradually guide it so that it moves in the cross direction and toward the outer edge of the sheet, producing a tear line following a curved path. Turn the sheet over so that the opposite side faces upward and make a similar tear. Observe the feathering caused by the splitting of the sheet at the edge of each of the two tears which have been made. One of these tears will show a more distinctly feathered edge than the other, especially in the curved portion where the tear changes from the machine direction towards the cross direction. The tear with the more feathered edge is produced when the wire side of the sheet faces upward. This procedure often gives a positive determination when the other simpler procedures fail. Its successful use, however, requires some experience which may be gained by applying it to papers with identified sides.

11. Procedure F—Marking With a Soft Metal

11.1 Fold a specimen sheet of paper to view both sides at one time. Using the edge of a piece of soft metal, such as solder or a silver alloy coin, mark both sides with a single stroke of the metal. Compare the darkness of the marks so produced. Because of the lower concentration of filler on the wire side of the sheet, that side will give a lighter mark on papers containing an abrasive filler. With unfilled or with coated papers, however, identification cannot be made because the marks will be of equal intensity. Papers containing titanium dioxide fillers give especially clear results with this procedure.

12. Report

12.1 Report the specific procedure used to identify the wire side of the submitted sample.

12.2 Attach the sample, indicating the wire side.

13. Precision and Bias

13.1 No statement is being made about either the precision or bias of these test methods since the results merely state a qualitative result based on criteria specified in the procedure.

14. Keywords

14.1 felt side; top side; wire side.