



Standard Test Method for Machine Direction of Paper and Paperboard¹

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1. Scope

1.1 This test method covers four procedures for determining the machine direction of most grades of paper and paperboard, embodying the principle that machine direction alignment of fibers results in:

1.1.1 Cross-direction shrinkage to produce curl with axis in machine direction,

1.1.2 Higher cross-direction tear,

1.1.3 Higher tensile strength in machine direction, and

1.1.4 Higher stiffness in machine direction.

1.2 Application of the procedures in this method to certain grades of paper, such as sheets laminated to film, creped papers, extensible papers (where it is not unusual for the machine direction tensile to be relatively low and the stretch to be relatively high) and papers reinforced with textile materials, may result in unreliable determinations.

1.3 *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 Product²

D 774 Test Method for Bursting Strength of Paper²

D 828 Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus²

D 1968 Terminology Relating to Paper and Paper Products²

2.2 TAPPI Standard:

T 409 Machine direction of paper³

3. Terminology

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

4. Summary of Test Method

4.1 This test method describes four physical procedures for determining the machine direction of paper and paperboard. Two of the procedures employ no special apparatus, the one using the difference in stiffness between machine and cross directions, and the other utilizing the tendency of paper to curl when preferentially wetted on one side. The remaining two procedures use standard test equipment, a tensile tester in one case and a bursting tester in the other.

5. Significance and Use

5.1 From the standpoint of use requirements, the determination of the machine direction of paper is essential where creasing is required, such as the folding of pages in books and pamphlets, or when scoring or creasing is performed as for cut-outs and folders.

5.2 Determination of machine direction is necessary, in many instances, before further testing can be done. For example, machine direction must be known when determining brightness, gloss, tear, tensile and folding endurance.

6. Apparatus

6.1 *Bursting Tester*, meeting the requirements set forth in Test Method D 774, to be used for Procedure C.

6.2 *Tensile Tester*, meeting the requirements set forth in Test Method D 828, to be used for Procedure D.

6.3 *Other Apparatus*—Indelible pencil (optional for 9.1), shallow glass or metal pan.

7. Sampling and Test Specimens

7.1 Obtain a sample of the paper in accordance with Practice D 585. From each test unit sheet of the sample prepare specimens as follows:

7.1.1 *Procedure A*—For purposes of identification, draw a line through adjacent parts of the paper and the specimen to be cut. Cut circular specimens approximately 50 mm in diameter or square specimens approximately 50 mm on a side. For

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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, Technology Park/Atlanta, P.O. Box 105113, Atlanta, GA 30348.

