



Standard Practice for Using a Copier or Printer as a Test Instrument for Evaluating Paper Performance¹

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1. Scope

1.1 This practice covers a standardized procedure for utilizing a copier or printer as an imaging device when performance properties of paper are to be determined.

1.2 Copiers and printers are limited to those using the indirect electrophotographic process.

1.3 The paper is limited to cut-sized office papers.

1.4 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.5 *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.* Specific precautionary statements are given in Appendix X1.1.

2. Referenced Documents

2.1 ASTM Standards:

D 3460 Specification for White, Watermarked and Unwatermarked Bond, Mimeograph, Duplicator, and Xerographic Cut-Sized Office Papers²

D 4825 Test Method for Measurement of Curl in Cut-Sized Office Paper²

D 5039 Test Methods for Identification of Wire Side of Paper²

F 335 Terminology Relating to Electrostatic Copying²

F 360 Practice for Image Evaluation of Electrostatic Business Copies²

F 807 Practice for Determining Resolution Capability of Office Copiers²

F 875 Test Method for Evaluation of Large Area Density and Background on Office Copiers²

F 909 Terminology Relating to Printers²

F 995 Practice for Estimating Toner Usage in Copiers Utilizing Dry Two-Component Developer²

F 1125 Terminology of Image Quality in Impact Printing System²

3. Terminology

3.1 For definitions used in this practice, see Terminology F 335 and F 909.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *after image curl*—the amount, direction, and axis of curl after imaging in a copier or printer, as determined by Test Method D 4825.

3.2.1.1 *Discussion*—The direction of curl is described as to whether it is toward the felt or wire side. This description as well as the relationship to the image should be recorded, that is, toward or away from the image side. In the case of duplexing, the side imaged first should be recorded.

3.2.2 *before image curl*—the amount, direction, and axis of curl before imaging as determined by Test Method D 4825.

3.2.3 *stickie*—a material, usually in the form of a small speck or spot, that because of its adhesive nature, can be transferred from the paper to the photoconductor where it attracts toner. This toner is subsequently transferred as unwanted image to the paper.

4. Summary of Practice

4.1 This practice describes the use of an electrophotographic copier or printer as a test instrument to evaluate the performance characteristics of cut sized office paper.

4.2 Several image quality characteristics may be evaluated through the use of the following applicable ASTM standards: Practice F 360, Practice F 807, Test Method F 875, and Practice F 995, Terminology F 1125, or both.

5. Significance and Use

5.1 This practice may be used to satisfy the requirements of Specification D 3460 when performance in the intended use in a printer or copier is required.

5.2 Describing physical parameters of paper alone is not sufficient to ensure performance in a copier or printer.

5.3 Curl, both before and after imaging, may effect copier or printer performance.

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.

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

5.4 The presence of contaminants in the paper that are tacky or thermoplastic, or both, may be transferred to the photoconductor or fuser rolls. They may cause an unwanted image. These are referred to as “stickies.” Some papers, especially those containing recycled fiber, have exhibited this problem.

5.5 Transfer of ream sealing adhesive or ream wrapper laminant to the photoconductor or fuser rolls can cause problems similar to those described in 5.4.

6. Interferences

6.1 Many printers and copiers are subject to imaging system variations due to fluctuations in line voltage. Those problems can be avoided by the use of a voltage stabilizing device or conducting the tests during the periods when line load is low or stabilized.

6.2 In manufacturing cut-sized papers, it is common practice to convert several rolls to sheets in a continuous operation. This results in possible variations from sheet to sheet within a ream. A sufficient number of samples should be evaluated to determine that the performance is representative of the lot. It is not always possible to determine the number of rolls used in the cut-sized processing operation.

6.3 Temperature and humidity have an effect on paper properties as well as equipment performance. Tests should be conducted in a stable environment consistent with normal equipment operation (see 10.1). See X1.5.

6.4 The photoconductor in a copier or printer may be in the form of a cylinder or a continuous belt. The circumference of the cylinder or length of the belt may be a multiple of the length of the copies normally produced. For example, a 17 in. (432 mm) circumference drum would produce one 11 by 17 in. (279 by 432 mm) or two 8-½ by 11 in. (216 by 279 mm) documents feeding with the 11 in. edge leading. This multiple copy feature must be taken into consideration when examining copies for extraneous image. The length or circumference may not be an even multiple of the document size. See X1.2.

7. Apparatus

7.1 A copier or printer should be adjusted according to the manufacturer’s specifications.

7.1.1 If possible, the operator should be capable of examining, cleaning, or changing the photoconductor, or combination thereof. See X1.3 and X1.4.

8. Materials

8.1 Supplies sufficient to complete all tests without changing source, lot, etc., should be provided.

8.2 Test Target:

8.2.1 *Copier*—A test target of known overall quality such as described in Practice F 995 may be used. If other test targets are used, they should be consistent with normal job flow for the copier.

8.2.2 *Printer*—A built in test target commonly available in the printer software may be used. As an alternate, a full page text similar to that described in Practice F 995 may be used. The text should be consistent with the normal use of the printer.

8.2.3 *Clean Test Paper*—A sufficient quantity of virgin fiber paper known to be free of potential stickies that has been

examined for cleanliness shall be used to map or designate any extraneous images before and after each procedure.

9. Calibration and Standardization

9.1 Adjust the copier or printer according to the manufacturer’s recommendations.

9.2 Inspect or clean the photoconductor, or both, recording any defects that may be present. See X1.1.

9.3 Determine the circumference of the photoconductor in the case of a drum or the length in the case of a belt.

10. Conditioning and Preparation

10.1 Place the paper to be tested in unopened reams in the room where the test is to be conducted for sufficient length of time to bring the temperature of the paper into equilibrium with room conditions.

10.2 Unwrap the paper just prior to loading into the machine.

10.3 Determine which side of the paper the manufacturer indicates should be imaged or imaged first if duplexed. If information is not provided by a manufacturer, be consistent as to the side imaged for the entire test.

10.4 Determine whether the imaging is conducted on the felt or wire side of the paper.

11. Procedure

11.1 Before Imaging:

11.1.1 Determine size and squareness with conventional measuring instruments.

11.1.2 Determine curl using Test Method D 4825.

11.1.3 Determine wire side using Method D 5039.

NOTE 1—On papers produced on a twin wire paper machine, the wire side is not always apparent. In those instances where the wire side cannot be established, arbitrarily designate the side next to the body seal on the ream wrapper as the wire side.

11.1.4 Visually evaluate the ream edges for lint, fuzz, dust, extraneous material, quality of cut edge, etc.

11.1.5 Examine the top and bottom sheet and ends of the ream for presence of glue or laminant from the ream wrapper. Remove if present.

11.1.6 Examine the top and bottom sheets for turned over edges or other defects. Remove if present.

11.2 Loading Copier or Printer:

11.2.1 Load the copier or printer with paper so that the image is produced on the side designated by the paper or equipment manufacturer. If the paper is not so identified by the manufacturer, load so that the image is produced on the wire side. In duplexing operations, image the wire side first.

11.2.2 Determine the amount of paper required for each portion of the evaluation and place that amount in the feed tray or hopper. If the feed tray or hopper will not accommodate that amount required, set the extra aside and add it when required.

11.3 Preparation of Copier or Printer:

11.3.1 Cleanliness:

11.3.1.1 *Photoconductor*—On either a copier or a printer, inspect and clean the photoconductor. Note any defects that would cause an extraneous image. An excessive number of defects may require the installation of a new photoconductor. See X1.1.



11.3.1.2 On a copier, clean the glass both front and back (if possible) and note any defects that would cause an extraneous image.

11.3.1.3 On a copier, examine lid backing for dirt that can create an image. Cover with a sheet of clean, white paper if necessary.

11.3.1.4 After cleaning the photoconductor and the glass (in the case of a copier) produce a sufficient number of copies on paper that has been examined for cleanliness, see 8.2.3, to utilize the photoconductor for its full circumference or length (see 6.4). Map or designate any image that might be caused by a noncorrectable defect.

11.4 Operation of Copier or Printer and Evaluation of Results:

11.4.1 Evaluation of Sticking Frequency:

11.4.1.1 Load 2500 sheets as directed in 11.2.1. Record the number of sheets. Run copies using test target described in 8.2. Determine the number of copies produced from the machine counter. As the receiving tray reaches its capacity, remove the copies, making certain to keep them in the order in which they were produced.

11.4.1.2 After the 2500 sheets have been run, produce a sufficient number of copies on paper that has been examined for cleanliness, see 8.2.3, to utilize the photoconductor for its full circumference or length. Map or designate any image that might be caused by a stickie, determining the count and reporting as spots per 2500 sheets. Deduct any images detected in 11.3.1.4.

11.4.1.3 *Curl*—At the start of the test run at 500 copy intervals and at the end of the test run, remove a 10 to 20 copy sample and immediately determine the degree, direction, and axis of curl using Test Method D 4825. Note whether it was toward or away from the image. Retest the curl samples after 10 min exposure to the ambient conditions.

11.4.1.4 *Jams*—Count and record the number of jams that occurred. Include in the location in the run that they occurred. Also note the position in the machine where the jam occurred.

11.4.1.5 *Misfeeds and Double Feeds*—Count and record the number of misfeeds and double feeds that occurred including the position in the run. It may be necessary to leaf through the stack of copies to determine when double feeds occurred as indicated by the presence of blank sheets.

11.4.1.6 *Count*—Record number of copies produced as indicated by machine counter.

11.4.2 *Collating Copiers*—Load the feed tray or hopper with 500 sheets as directed in 11.2. Operate the machine in the collating mode using two collating bins. Record the number of sheets required to fill the bin.

11.4.2.1 Repeat the process loading the machine with the opposite side up in the feed tray or hopper.

NOTE 2—A collating or duplexing bin is considered full when it will not accept any more copies or copies cannot be removed without causing damage.

11.4.3 *Duplexing*—When an automatic duplexing mode is available, run 500 sheets in that mode, duplexing one sheet one at a time. In addition, run a sufficient number of copies to fill the duplex tray to capacity and record that number. If both automatic duplexing and collating modes are available, repeat 11.4.2, Collating, in the duplexing mode with the paper loaded in the hopper in the manner recommended by the paper or equipment manufacturer.

11.4.4 *Curl in Collating and Duplexing Modes*—Shortly after each of the tests using the collating or duplexing modes, or both, remove a 10 to 20 sheet sample from the beginning, middle, and end of the operation or from each collating bin. Immediately determine the degree, direction, and axis of curl on each sample. Record whether it was toward or away from the image on simplexing or from the first imaged side on the duplexing mode. Retest curl samples after 10 min exposure to the ambient conditions.

12. Report

12.1 Report the following information:

12.1.1 Size and squareness of paper (see 11.1.1),

12.1.2 Before image curl (11.1.2),

12.1.3 Physical condition of reams (see 11.1.4, 11.1.5, and 11.1.6),

12.1.4 Number of stickies per 2500 sheets (see 11.4.1.2),

12.1.5 Curl after sticky evaluation (see 11.4.1.3),

12.1.6 Jams, misfeeds, and double feeds during sticky evaluation (see 11.4.1.4, and 11.4.1.5),

12.1.7 Count actual number of copies produced compared to paper supplied to machine based on paper manufacturer's count (see 11.4.1.6),

12.1.8 Collating performance as number of sheets to fill bin versus manufacturer's indicated number for both printing configurations,

12.1.9 Duplexing performance including number of copies to fill a recycling bin to capacity compared with amounts indicated by machine manufacturer,

12.1.10 Curl in collating and duplexing modes (see 11.4.4),

12.1.11 Copier or printer identification,

12.1.12 Temperature and humidity at time of testing,

12.1.13 Paper identification including brand name, manufacturer, and lot number identification from ream wrapper or carton, or both.

13. Keywords

13.1 copier paper; paper performance; printer paper; stickies

APPENDIX

(Nonmandatory Information)

X1. ADDITIONAL INFORMATION

X1.1 Ideally, the person using a printer or copier as a test instrument should be capable of examining the photoconductor and cleaning it as necessary at various steps during the procedure. On some machines this is not physically possible and, indeed, steps to clean some photoconductors may do irreparable damage.

X1.2 It is sometimes difficult to determine that the full photoreceptor circumference has been used when there is always some amount of interdocument space. This interdocument space usually precesses as copies are made. The interdocument space would be a constant distance only between copies of a multicopy run.

X1.3 When inspecting or cleaning the photoconductor, or both, is not possible, the operator must depend upon the mapping and identification of spots as detected by the clean test paper before and after each testing run.

X1.4 The act of cleaning a photoreceptor or exposing it to

room light, or both, can cause a temporary disturbance to the photoconductive properties. The photoreceptor should be installed in the machine and rested for at least two hours before starting the test. The length of time the photoreceptor should rest is dependent upon the type of photoreceptor.

X1.5 Cut sized paper is normally wrapped in moisture barrier wrapper to maintain the moisture content deemed necessary by the manufacturer to ensure satisfactory performance in the intended use and packed in cartons to provide physical protection during shipment and storage. Palletizing the cartons provides added protection during handling and shipping. The customer should exercise care in handling and shipping smaller quantities to various user locations.

X1.6 If experience indicates that user distribution procedures may have an adverse effect on the paper, it may be appropriate to subject the paper to typical handling and shipping prior to use testing using this practice.

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