Designation: F1486 – 96 (Reapproved 2013)

Standard Practice for Determination of Abrasion and Smudge Resistance of Images Produced from Office Products (GA-CAT Method)[1]

This standard is issued under the fixed designation F1486; 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 covers the procedure for determining the abrasion and smudge resistance of images produced from office products using a GA-CAT comprehensive abrasion tester.

1.2 This practice is applicable to images produced from business imaging products such as typewriters, copiers, impact printers, and nonimpact printers.

1.3 Other test methods using the Crockmeter, Sutherland rub tester, and Taber Abrader can be employed to evaluate smudge and abrasion characteristics. The results obtained by these units are not necessarily equivalent to those obtained with the GA-CAT.

1.4 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.

1.5 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D685 Practice for Conditioning Paper and Paper Products for Testing

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *abrasion resistance*—the ability of an image to withstand the frictional forces attempting to remove the surface material.

3.1.2 *receptor*—film or paper of standard abrasiveness onto which material removed from the specimen is deposited during the abrasion testing process.

3.1.3 *smudge*—the tendency of an image to smear or streak onto an adjacent area when rubbed. Smudge involves the redeposition of abraded material.

3.1.4 *smudge resistance*—the ability of an image to withstand smudging.

4. Summary of Practice

4.1 The test print and a receptor are sandwiched in the panel holder of the GA-CAT comprehensive abrasion tester, clamped together with a known force, and made to slide over each other at a known frequency and over a known distance for a predetermined time period.

4.2 The test specimen is examined for the degree of print degradation and the receptor for the amount of image material transferred from the specimen surface. The results may be rated relative to a comparative control run in the identical manner, or they may be quantified by comparison to a ranking scale numbered from zero to ten (with zero being the most abrasion/smudge resistant and ten being the least abrasion/smudge resistant).

5. Significance and Use

5.1 Abrasion and smudge resistance during handling, transport, and storage is essential to prevent the marring or smudging of images produced from business imaging products. Recognizing that the actual amount of abrasion/smudge occurring depends on relative humidity, temperature, and a host of other variables, this practice provides a means for comparing the abrasion and smudge resistance of images produced from business imaging products under laboratory conditions.

5.2 This practice may be used to determine the abrasion and smudge resistance of images produced from business imaging products such as typewriters, copiers, impact printers, and nonimpact printers.

5.3 This practice may also be used to evaluate the relative abrasion and smudge resistance of various ribbons, inks, and toners.

[1] This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.04 on Electrostatic 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.

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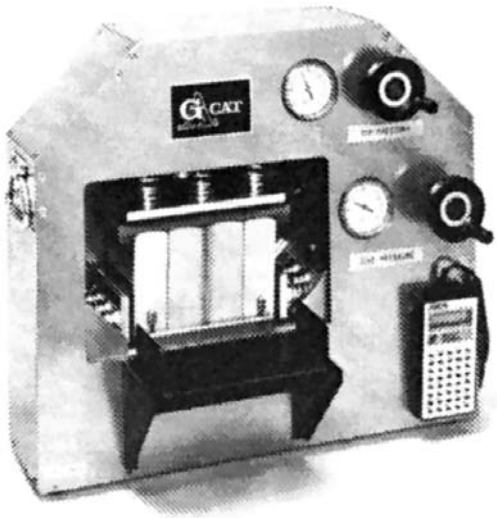

FIG. 1 GA-CAT Comprehensive Abrasion Tester

5.4 This practice may be used for control of product quality, comparative analysis of machines, or as a research and development tool.

6. Interferences

6.1 A number of factors may affect specimen image creation and contribute to inconclusive results. It is recommended that the following factors be taken into consideration:

6.1.1 Resistance to abrasion and smudge of images may vary as a result of the sequential position of a given print or copy in a series of prints or copies. For example, the abrasion and smudge resistance of the third copy or print of a run of 20 copies or prints may be different from that of the 15th copy or print.

6.1.2 The fusing temperature of the laser printer, copier, or other toner-based unit will affect the degree of abrasion and smudge resistance. If the temperature is low, the toner may not be fused properly to the substrate and may be abraded or smudged easily.

6.1.3 If the temperature of the head on a thermal transfer printer is low, or too high, the image may not be affixed properly to the substrate and may be abraded or smudged easily.

6.1.4 Extreme variations in temperature and humidity may affect both the degree of image fixing and the copy quality. For this reason, it is recommended that the environmental conditions be noted when conducting comparison tests between machines or supplies. For the most accurate comparisons, the environment should be kept as constant as is reasonably possible during the entire test.

7. Apparatus

7.1 *GA-CAT Comprehensive Abrasion Tester*—See Fig. 1.[3]

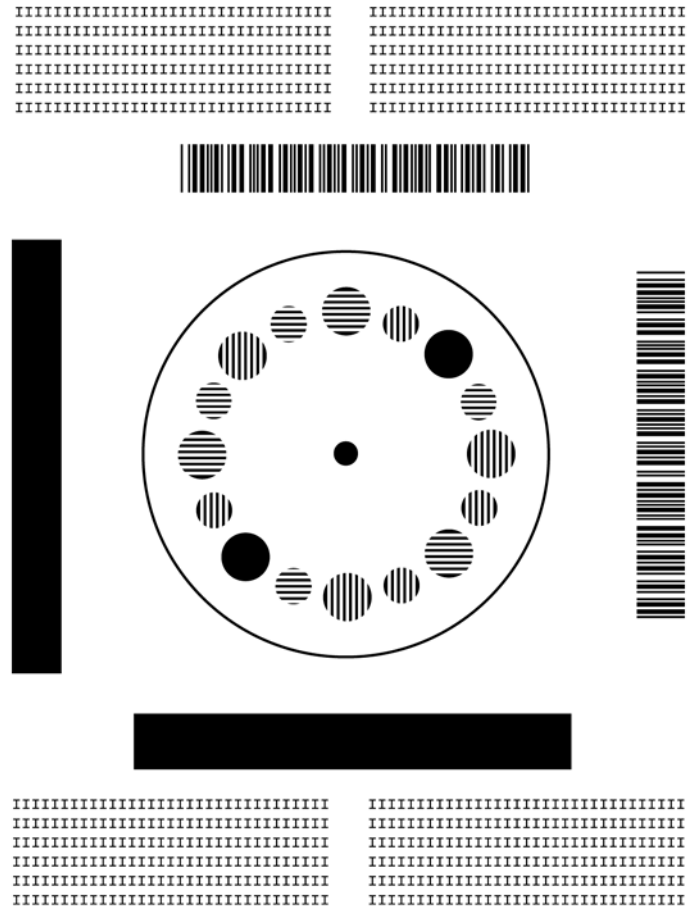

FIG. 2 Abrasion Test Target

7.2 *Ranking Book,* [3] containing specimens whose degree of ruboff is ranked from 0 (no ruboff) to ±10 (most ruboff).

7.3 *Test Copier or Printer,* adjusted and equipped with appropriate ribbons, paper, toner, fuser oil, and other supplies as required. If the copier or printer is to be used to evaluate a supply item, all other supply items should be unchanged during the duration of the comparison test.

7.3.1 If comparison tests are being made between copiers or printers, all supply items should be as specified by the manufacturer. Unless otherwise specified by the manufacturer, the same paper should be used in each machine.

7.4 *Copier Test Target,* available from ASTM. This test target incorporates designs suitable for various smudge and abrasion testers. Consult Fig. 2 for a printed example of the target. A suitable alternative may be used.

7.5 *Printer Test Target Diskettes,* [4] available for several types of personal computer systems. The diskette allows the generation of an image comparable to the Copier Test Target. A suitable alternative may be used.

8. Materials

8.1 *Standard Receptors,* approximately 4 by 4 ½ in. (102 by 114 mm), of an appropriate grade, as follows:

[3] Available from Gavarti Associates, Ltd., 9240 N. Sleepy Hollow Lane, Milwaukee, WI 53217.

[4] Available from Industry Analysts, Inc., Technical Services Division, 1275 Bloomfield Avenue, Building 3, Suite 50-C, Fairfield, NJ 07004.

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