Designation: D6487 – 10

Standard Practice for Preparing Prints of Paste Printing Inks Using a Hand Operated Laboratory Flat-Bed Press[1]

This standard is issued under the fixed designation D6487; 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 preparing prints of paste inks using a hand operated flat-bed laboratory proof press. The initial method was developed by the National Printing Ink Research Institute.[2]

1.2 This practice is applicable to the preparation of single-color solid-area prints by the dry offset process (also known as Letterset) on a flat substrate such as paper or metal. It can readily be adapted to print by direct letterpress.[3]

NOTE 1—The proofing press described in this practice can also be used with printing gages in accordance with Practice D6846.

1.3 This practice is applicable primarily to lithographic and letterpress inks that dry by oxidation or penetration. With the addition of appropriate drying or curing equipment, it is also applicable to other systems such as heat-set or energy-curable.

1.4 The instructions in this practice are intended to minimize the within-print and among-operator variability inherent in hand operations.

1.5 This practice does not measure the actual film thickness on the print, but evaluates film thickness equivalence by visual or instrumental comparisons of reflection density.

1.6 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precautions are given in Section 7.

2. Referenced Documents

2.1 *ASTM Standards:*[4]

D6073 Test Method for Relative Setting of Heatset Printing Inks

D6846 Practice for Preparing Prints of Paste Printing Inks with a Printing Gage

D7305 Test Method for Reflection Density of Printed Matter

2.2 *ANSI Standards:*[5]

PH 2.30 Viewing Conditions for Graphic Arts and Photography—Color Prints, Transparencies and Photomechanical Reproductions

CGATS.5 Graphic Technology–Spectral Measurements and Colormetric Computation for Graphics Arts Images

3. Summary of Practice

3.1 Prints are prepared by metering the test ink onto a brayer, rolled out evenly, on the distribution plate according to a specified pattern, and then transferred to the printing plate. The substrate is clipped onto the impression plate, and the blanket cylinder is rolled over the inked plate six times followed by once over the substrate.

3.2 After the print is dry to the touch, it is evaluated versus the target reflection density instrumentally or by visual comparison with a standard reference print. Subsequent prints can be made if the target reflection density has not been achieved or if a visual assessment indicates that either more or less ink is needed.

4. Significance and Use

4.1 Laboratory proofing of ink is necessary to establish a reproducible prediction of print appearance and performance properties, most of which are highly sensitive to ink film thickness. The apparatus described in this practice has found wide use for routine control proofing because it provides an

[1] This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.56 on Printing Inks.

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[2] "The NPIRI Standard Procedure for Preparing Little Joe Prints," *American Ink Maker*, March 1994 , pp. 42-50.

[3] The apparatus used to develop this method was the Little Joe Offset Color Proofing Press.

[4] 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] Available from American National Standards Institute, 13th Floor, 11 W. 42nd Street, New York, NY 10036 or Committee on Graphic Arts Technical Standards, 1899 Preston White Drive, Reston, VA 20191-4367.

***A Summary of Changes section appears at the end of this standard**

economical method for producing reasonably large prints at film thicknesses comparable to those obtained on production presses.

4.2 This practice does not duplicate the dynamics of a high speed press, nevertheless, it is useful for quality control and for specification acceptance between the producer and the user where there is an agreed upon specification for reflection density or standard reference print.

5. Apparatus

5.1 *Laboratory Flat-Bed Proof Press*[3], having a press bed approximately 914 mm (36 in.) long and 260 mm (10¼ in.) wide, and a blanket[6] (impression) cylinder having a circumference of approximately 370 mm (14½ in.) such that the cylinder can make two revolutions down the length of the bed. Integral components include a distribution plate, printing plate, inking track guides, and impression plate (see Fig. A1.1). The standard printing plate is 100 by 152 mm (4 by 6 in.).

5.2 *Ink Pipette,* or balance accurate to 0.001 g ink.

5.3 *Torque Screw Driver.*

5.4 *Ink Knives.*

5.5 *Brayer,* with a 63.5-mm (2½-in.) diameter and 152-mm (6-in.) length.

5.6 *Standard Daylight,* preferably a D 50 light source conforming to ANSI Standard PH 2.30.

5.7 *Reflection Densitometer (optional),* conforming to Test Method D7305.

NOTE 2—The filter systems in typical densitometers are suitable only for use with black, white, and the three process colors (yellow, magenta and cyan).

5.8 *Spectrophotometer (optional)* , calibrated according to manufacturer's instructions and used according to CGATS.5.

6. Materials

6.1 *Ink Sample.*

6.2 *Reference Print (optional)* .

6.3 *Printing Substrate* cut to approximately 140 by 210 mm (5½ by 8½ in.).

6.4 *Solvent,* appropriate to ink system.

6.5 *Lint-free Rags or Tissue.*

6.6 *Shim Stock,* metal or plastic, the same size as the printing plate and 0.5, 1, 2, 5 or 10 mils in thickness.

7. Hazards

7.1 **Warning**—Since solvents may be hazardous to the skin and eyes, wear rubber gloves and safety glasses during cleanup to avoid solvent contact with skin and eyes. See supplier's Material Safety Data Sheets for further information on each solvent used.

7.2 *Equipment Cautions*—Avoid any operation that will scratch the metal distribution and printing plates or damage the rubber blanket on the impression cylinder.

8. Flatbed Press Set Up

8.1 Prepare the proof press as described in Annex A1 as seen in Fig. A1.1.

9. Procedure for Dry Offset Printing (Letterset)

9.1 Inspect and ensure that the printing plate, blanket and print roll out area are clean and free from lint.

9.2 Place guide tracks against printing plate and place a 140 by 210-mm (5½ by 8½ in.) piece of test substrate on the impression plate.

9.3 Determine the approximate amount of ink that will give the proper density. If uncoated paper, start with 0.6 mL or 0.6 g of ink. For coated paper, start with 0.4 mL or 0.4 g of ink.

9.4 Using an ink knife or a pipette, apply the ink to the brayer evenly across the roller.

9.5 Roll the ink on the distribution plate with the brayer until a uniform ink film is created and the entire distribution plate has been used.

9.6 Once a uniform film exists, roll the brayer from corner to corner of the ink distribution plate to make a single "*X*" pattern. Then move the brayer from top to bottom and bottom to top without lifting (2 passes) along the middle of the distribution plate. Turn brayer 180° (feet to point in opposite direction) and repeat "*X*" pattern and top to bottom and bottom to top motion.

9.7 Apply ink to printing plate with six passes of brayer using a smooth motion (one pass is motion in one direction only, left to right or right to left). Do not lift brayer between passes. Pressure applied will depend on the ink rheology but last pass (dressing pass) should be less than the pressure for the previous five passes. Push guide tracks away from printing plate.

9.8 Repeat 9.6 and 9.7 to ink the brayer and again apply ink to the printing plate. Push guide tracks away from printing plate.

9.9 Apply ink to the blanket by engaging cylinder, and pass in forward motion over printing plate stopping before the impression plate. Disengage cylinder and return.

9.10 Repeat 9.9 (apply ink to the blanket) for six blanket passes over the printing plate (blanket is inked in forward motion only).

9.11 Repeat 9.6 (inking the brayer), 9.7 (inking the printing plate), and 9.8.

9.12 Prepare first print by engaging the blanket cylinder and rolling it over the printing plate and the substrate on the impression plate in a rapid continuous motion.

9.13 Discard this print.

9.14 Repeat 9.6 (inking the brayer), 9.7 (inking the plate), 9.8, and 9.12 (making the print), and keep this print.

[6] For printing ultra violet (UV) systems, use a special blanket and brayer formulated for the purpose.

9.15 Examine the print from 9.14, preferably under a standard light source as per ANSI PH 2.30. If the operator believes the target density has been reached, prepare three more prints following the directions in 9.14. If the density is wrong, clean the press and start this procedure at 9.2 with a different amount of ink.

9.16 Once four acceptable prints have been made, clean the press with an appropriate solvent and lint-free rags or tissues.

9.17 For inks that dry by penetration or oxidation, lay the "good" prints out singly on a bench top or clip to a line. Wait an appropriate amount of time prior to making test measurements, for example, 15 to 30 min. for initial densitometric or spectrophotometric evaluations, 72 h for chemical resistance tests.

9.18 For letterpress printing, follow the procedure for dry offset printing with the following exceptions: In 9.3, tape or otherwise mount the substrate on the blanket cylinder, not on the impression plate. Skip 9.1-9.12. In 9.13, roll the blanket cylinder containing the substrate over the inked printing plate and then stop.

NOTE 3—For heat-set inks, apply heat or run through the heat set tester in accordance with Test Method D6073. Energy-curable ink prints should be passed through a UV lamp curing unit or other appropriate apparatus.

10. Instrumental Verification of Reflection Density

10.1 If the print is black, white, or a process color, use a densitometer with the appropriate filter. Otherwise, use a color spectrophotometer. After the print has dried to the touch (15 to 30 min), make five measurements, one in each corner 25 mm (1 in.) from each edge and one in the center, and compute the mean.

10.2 A small decrease in reflection density may occur on absorbent substrates between the initial measurements taken after prints were made and those taken 24 h later due to dry back with some types of printing inks. This density decrease should be accounted for so that the final dry average density matches the target reflection density.

10.3 When comparing results between laboratories, densitometers must be calibrated using the same aperture size, filter, band width, etc., and a certified reference material such as the T-Ref standard.

11. Keywords

11.1 dry offset proofing; letterset proofing; paste printing inks; printing inks; proofing of inks

ANNEX

(Mandatory Information)

A1. SETTING UP THE PROOF PRESS

A1.1 Tighten blanket to 8.13 Nm (6-in.) using a torque screw driver. (Fig. A1.1)

A1.2 Use the standard 100 by 150-mm (4 by 6-in.) printing plate. Mark the bottom of the plate "Leading Edge" and "Trailing Edge" and position it in this manner for every test. Mark outline of plate on bed to maintain plate position.

A1.3 Mark each guide track "Far" or "Near" and mark their positions on the bed to maintain position.

A1.4 A smooth noncompressible shim should be placed on top of the impression plate to provide a smooth surface for printing. This may necessitate removal of one of the metal shims under the impression plate.

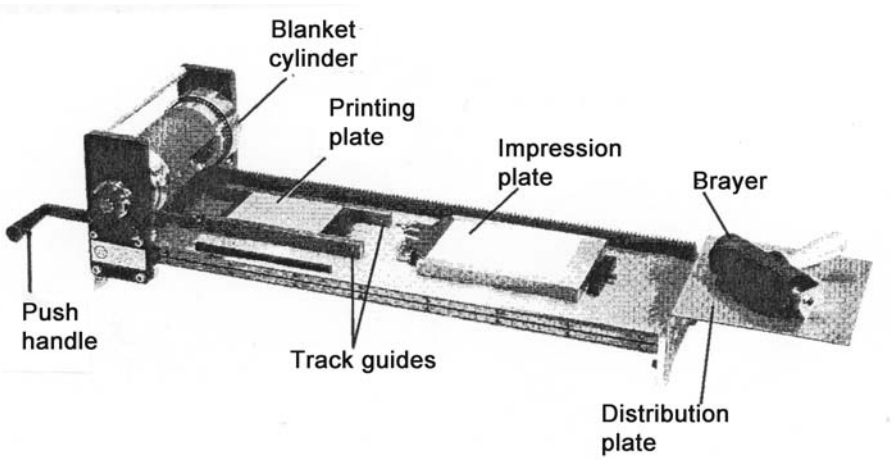

FIG. A1.1 Laboratory Flat-Bed Press Equipped with Push Handle, Set Up for Dry Offset Proofing

A1.5 For older presses (models having a crank-handle drive), adjust height and level of printing and impression plates to produce uniform print in the following manner:

A1.5.1 Hand tighten screw on printing plate and position guide tracks against plate.

A1.5.2 Clean all surfaces with appropriate solvent and lint-free rags or tissues.

A1.5.3 Apply 0.6 mL or 0.6 g of ink to the brayer uniformly directly from the pipet or with an ink knife.

A1.5.4 Roll out the ink on the ink distribution plate until a uniform film is obtained. Minimize time to prevent excessive drying.

A1.5.5 To prepare brayer for application of ink to the printing plate, roll brayer diagonally from corner to corner of the ink distribution plate to make a single "*X* " pattern. Then move brayer from top to bottom and bottom to top without lifting (2 passes) along middle of the ink distribution plate. Turn the brayer 180° (feet point in opposite direction) and roll brayer diagonally from corner to corner of the ink distribution plate to make a single "*X*" pattern. Then move brayer from top to bottom and bottom to top without lifting (2 passes) along middle of the ink distribution plate.

A1.5.6 Apply ink to printing plate with 6 passes of brayer using a smooth motion (one pass is motion in one direction only, left to right or right to left). Do not lift brayer between passes. Pressure applied will depend on the ink rheology but the last pass (dressing pass) should be less than the pressure for the previous 5 passes. Push guide tracks away from printing plate.

A1.5.7 Disengage blanket cylinder by turning handle on top of carriage counter clockwise to the stop position.

A1.5.8 Roll blanket cylinder to a position located about 12 mm (½ in.) past leading edge of printing plate. Engage blanket cylinder by turning handle on top of carriage clockwise to stop position.

A1.5.9 Maintain blanket in this position on printing plate for 1 s to produce an ink stripe on blanket and an ink free stripe on the printing plate.

A1.5.10 Disengage blanket cylinder and roll ahead to position 12 mm (½ in.) before trailing edge of printing plate. Engage cylinder and make a stripe as in A1.5.8 and A1.5.9.

A1.5.11 Measure the width of each stripe on the far and near side of the printing plate (a total of four measurements). Proper press set up requires that both stripes have a constant width of 8 mm (5⁄16 in.).

A1.5.12 If the stripes are not consistent, add shims under the printing plate. After each adjustment, clean the printing plate and blanket and reapply ink to the plate as described in A1.5.4-A1.5.6. If too much time has elapsed, allowing the ink to dry, the ink distribution plate must be cleaned and fresh ink applied following A1.5.2-A1.5.6.

NOTE A1.1—Shims should be metal or plastic. Do not use paper because it is compressible.

A1.5.13 Clean the press with appropriate solvent and lint-free rags or tissues.

A1.5.14 Place substrate to be proofed 108 by 279 mm (approximately 4¼ by 11 in.) beneath the paper clamp and on top of shim positioned on impression plate.

A1.5.15 Apply ink to printing plate following A1.5.2-A1.5.6.

A1.5.16 Engage blanket cylinder and roll over entire printing plate stopping before reaching impression plate. Disengage cylinder. Bring cylinder over impression plate and produce two stripes on the paper in the same manner as used to make the stripes on the printing plate in A1.5.8-A1.5.10.

A1.5.17 As in A1.5.12, add shims under the impression plate, if necessary, to obtain two stripes with a constant width of 8 mm (5⁄16 in.).

A1.6 For newer presses (models have a push-handle drive) adjust height and level of printing and impression plates to produce a uniform print in the following manner:

A1.6.1 Follow A1.5.1-A1.5.17 to produce stripes with the following provisions to allow for the mechanical differences:

A1.6.1.1 Put the impression handle in the 3 o'clock position.

A1.6.1.2 Install the set-up bracket on the print head frame facing the operator.

A1.6.1.3 On the set-up bracket, turn the set screw down until the impression handle is locked in the 3 o'clock position.

A1.6.1.4 On the hexagonal metal bracket under the impression handle, turn the set screw down so that the impression handle can be lowered to the 4 o'clock position.

A1.6.1.5 Follow the instructions in A1.5 with one exception. The stripes will be made by lifting the impression handle up to the 3 o'clock position.

A1.6.1.6 After the printing and impression plate height is set, put the impression handle in the 3 o'clock position and turn the bottom set screw up until the impression handle is locked in the 3 o'clock position, and

A1.6.1.7 Remove the set-up bracket.

SUMMARY OF CHANGES

Committee D01 has identified the location of selected changes to this standard since the last issue (D6487 - 04) that may impact the use of this standard. (Approved July 15, 2010)

(1) In title and 1.1, the term "hand operated" was inserted replacing rollouts.
(2) In 1.5, 3.2, Section 9, and 10.2, the term "reflection" replaced "optical."
(3) In Section 2, Referenced Documents, "by Sinvatrol Tester" was deleted from Test Method D6073, Test Method D7305 was added, and PH 2.17, PH 2.18 and CGATS.4 were deleted.
(4) In 5.7, Test Method D7305 replaced "ANSI Standard" to the end of the paragraph.
(5) In 9.15, "as per ANSI PH 2.30" was inserted at the end of the first sentence.
(6) In Note 3, "heatset tester" replaced "Sinvatrol."
(7) Changed A1.1 from 150 mm/kg to 8.13 Nm.
(8) Moved picture of proofing press (Fig. A1.1) from Keywords section to Annex.
(9) Replaced word "stock" with "substrate" throughout the document.
(10) Changed 10.3 to add need for ensuring densitometer settings, filters, bandwidth and openings are the same.
(11) Removed "A transparent template with five holes can be constructed for this purpose" from 10.1.
(12) Remove Note 4 to become 9.18.
(13) Changed the wording in Note 3 to read "Energy-curable ink prints should be passed through a UV lamp curing unit or other appropriate apparatus."
(14) Deleted specification for print density (it is not a material) from 6.2.
(15) Added to 4.2 "where there is an agreed upon specification for reflection density or standard reference print."