



Designation: D6846 – 02 (Reapproved 2020)

Standard Practice for Preparing Prints of Paste Printing Inks with a Printing Gage¹

This standard is issued under the fixed designation D6846; 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 laboratory prints of paste inks using a printing gage in conjunction with a flat-bed proof press.

1.2 This practice is applicable to the preparation of solid-area prints by direct letterpress or by dry offset on a flat substrate such as paper, paperboard, or metal.

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 paste ink 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 features built-in ink film thickness control. It does not measure the film thickness transferred to the print; however, film thickness equivalence may be evaluated by visual or instrumental comparisons of optical density.

1.6 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 user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use. Specific precautions are given in Section 7.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D1316 Test Method for Fineness of Grind of Printing Inks By the NPIRI Grindometer](#)

[D6073 Test Method for Relative Setting of Heatset Printing Inks](#)

[D6487 Practice for Preparing Prints of Paste Printing Inks Using a Hand Operated Laboratory Flat-Bed Press](#)

3. Summary of Practice

3.1 The printing gage is inked by a drawdown technique; a double drawdown is recommended to minimize scratches and improve print appearance.

3.2 The inked gage is placed in the bed of the proof press from which the regular printing plate has been removed.

3.3 To make a letterpress print, the appropriate stock is attached to the impression (blanket) cylinder, which is rolled once over the inked gage. To make a dry offset print, the stock is clipped onto the impression plate and the blanket cylinder is rolled over the inked printing gage two to four times followed by once over the stock.

3.4 Two-color prints may be prepared by utilizing two inked gages in the bed of an offset proofing press.

4. Significance and Use

4.1 Laboratory proofing of inks 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 economical method for producing reasonably large prints at film thicknesses comparable to those obtained on production presses.

4.2 A unique advantage of printing gages is that, depending on the design selected, prints can be produced at a range of tapered film thicknesses or at several levels of uniform thicknesses in a single proofing. Because of the built-in film

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 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.

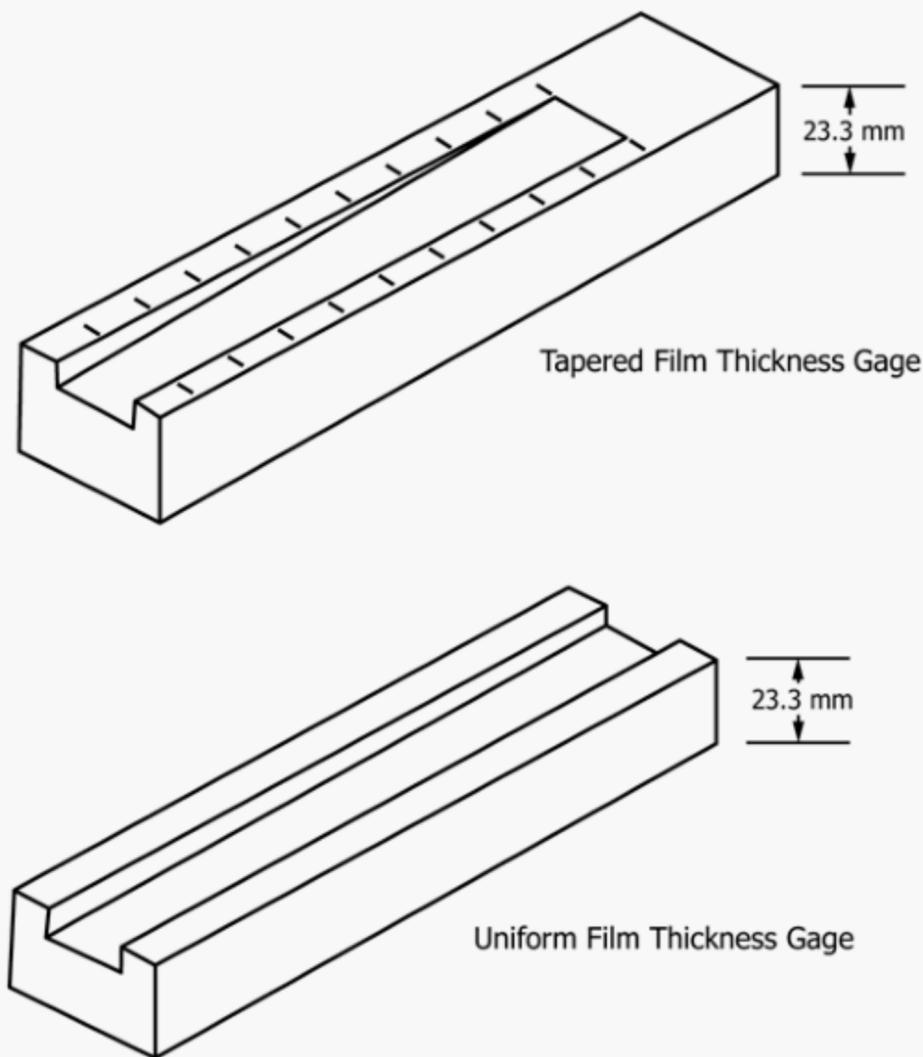


FIG. 1 Schematic Diagram of Printing Gages (not drawn to scale)

thickness control, ink metering is not necessary. Relatively small quantities of test samples are used, and less than two minutes are required to ink a gage, pull a letterpress print, and clean up. In addition, problems due to ink distribution systems are eliminated, two inks may be proofed at the same time, and multi-color printing is possible.

4.3 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.

5. Apparatus

5.1 *Printing Gage*,³ consisting of a type-high (approximately 23.3 mm, 0.918 in.) block of steel, the top surface of which contains precision-machined channels that may be tapered in depth similar in principle to the grind gages described in Test Method D1316. Alternatively, the channels may be uniform in depth at one or more levels. See Fig. 1 for schematic diagrams of the two types of gages. A description of popular models is given in Table 1.

5.2 *Drawdown Blade*,³ having a length sufficient to span the width of the printing gage being used.

5.3 *Flat Bed Proof Press*, with a bed wide enough to accommodate the printing gage. If proofing by dry offset is

³ The sole source of supply of the apparatus known to the committee at this time is Precision Gage and Tool Co., 375 Gargrave Rd., Dayton, Oh 45449. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

TABLE 1 Popular Models of Printing Gages^A

Model	Number of Paths	Dimensions of Each Path	Dimensions of Gage Top	Ink Film Thickness		
				Machined	Calibrated ^B	
		mm	mm	mils	µm	µm
<i>Tapered Film Thickness</i>						
NPIRI-A ^C	2	25 × 159	89 × 241	0-1.0	0-25	0-20
NPIRI-B	2	38 × 159	114 × 241	0-0.6	0-15	0-12
<i>Uniform Film Thickness, Single Depth</i>						
Warren-2	1	76 × 165 ^D	102 × 165 ^D	0.3	7½	6
Warren-3	1	76 × 165 ^D	102 × 165 ^D	0.4	10	8
Warren-4	1	76 × 165 ^D	102 × 165 ^D	0.5	12½	10
Warren-5	1	76 × 165 ^D	102 × 165 ^D	0.6	15	12
Huber-2	1	63 × 152	89 × 152	0.8	20	16
BSI-10	2	51 × 165 ^E	140 × 165 ^E	0.4	10	8
Lindner	2	51 × 165 ^E	140 × 165 ^E	0.6	15	12
<i>Uniform Film Thickness, Three Depths^F</i>						
FPBAA-C	3	38 × 102	165 × 102	0.2	5	4
				0.4	10	8
				0.6	15	12
6960-1	3	38 × 102	165 × 102	0.2	5	4
				0.3	7½	6
				0.4	10	8
6960-2	3	38 × 102	164 × 102	0.5	12½	10
				0.6	15	12
				0.7	17½	14
<i>Combination Uniform and Tapered Film Thickness</i>						
6401	2	51 × 203	153 × 203	0.6	15	12
		51 × 159		0-0.6	0-15	0-12

^A All models have paths ca. 23.3 mm (0.918 in.) high, parallel to bottom face.
^B Calibrated microns listed are based on 80 % path fillage for normal paste inks. Fillage for thinner inks is less.
^C This model serves as a type-high grindometer in Test Method D1316.
^D Also available in a 190 mm length.
^E Also available in a 203 mm length.
^F Each path has a uniform depth, but the depth is different in each path. Any other combination may be ordered.

specified, the cylinder of the press must be capable of making two revolutions down the length of the bed, as in Practice D6487.

5.4 *Ink Knife*, small.

5.5 *Accelerated Drying Equipment (Optional)*, for example, source of heat as in Test Method D6073 or energy-curing, as appropriate to the system.

5.6 *Print Quality Measuring Equipment (Optional)*, as described in Practice D6487 or as agreed upon between producer and user.

6. Materials

6.1 *Reference Standard (Optional)*, such as an ink sample, reference print, or a target level of quality attribute.

6.2 *Printing Substrate*, cut to slightly more than the dimensions of the gage top cited in Table 1.

6.3 *Shim Stock*, metal or plastic, the same size as the printing gage and 0.5 or 1 mil in thickness.

6.4 *Wash-up Materials*, including lint-free rags or tissue and an appropriate solvent.

6.5 *Grease*, to protect top face of printing gage when not in use.

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. In case of contact, wash skin with water; flush eyes for 15 min with water and call a physician. See supplier's Material Safety Data Sheets for further information on each solvent used.

7.2 Equipment Cautions:

7.2.1 Avoid any operation that will scratch or damage the printing gage and the blade. Refer to Test Method **D1316** for their care and for checking wear on the blade.

7.2.2 When proofing by the dry offset process, avoid any operation that will damage the impression blanket. If additional printing pressure is found necessary during the setup process, be especially careful to raise the plate a minimum amount. Since indentation by the printing gage on the blanket is a possibility in any event, it may be useful to dedicate a blanket to each gage being utilized. A dedicated blanket is essential for proofing with energy-curable systems.

8. Test Specimen

8.1 Approximately 1 to 2 mL of ink specimen is sufficient to fill the paths of a typical printing gage. When taking a specimen from the sample container, push aside the top layer and take the sample from below so as to avoid skin or surface dust.

9. Procedure for Proofing

9.1 Ink the Printing Gage:

9.1.1 Clean the gage and scraper with appropriate solvent and lint-free wiping materials. Set the gage in a position comfortable to the operator, such as on the bed of the press or a sturdy bench top.

9.1.2 Using an ink knife, place a small quantity of test ink in each path about 15 mm in from the far end of each path. Depending on test instructions, two inks may be placed in the same channel or in separate channels of a multi-path gage. In this case, use separate ink knives for the two inks.

NOTE 1—If ink is placed at the very end of the path(s), it is virtually impossible to avoid a thick ridge of ink at that end of the gage. A “messy” print will result.

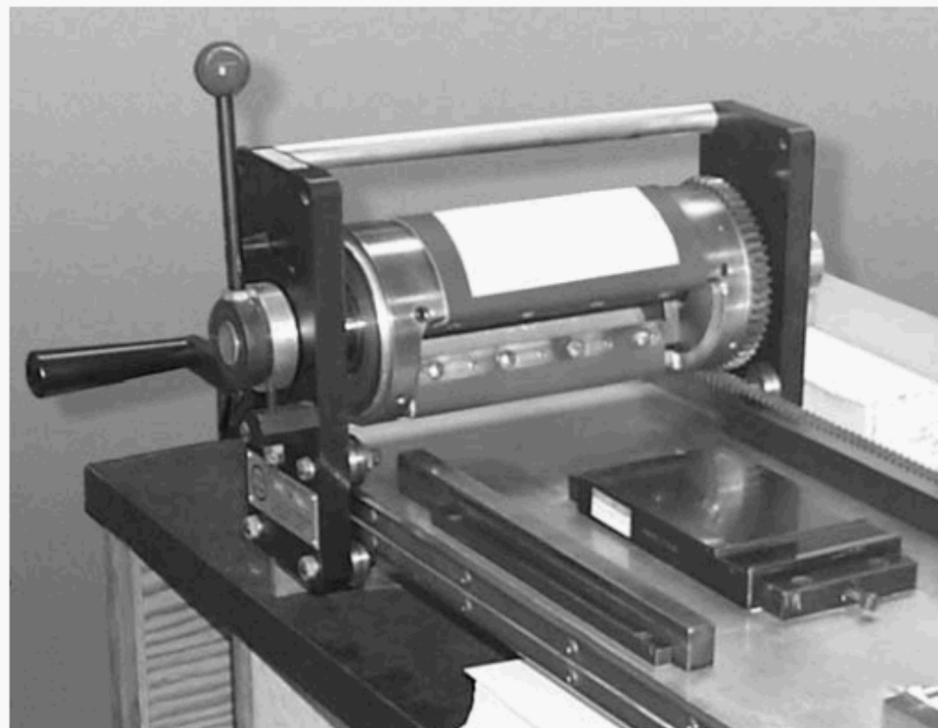


FIG. 2 Printing Gage in the Bed of an Offset Color Proof Press Set Up for Letterpress Printing

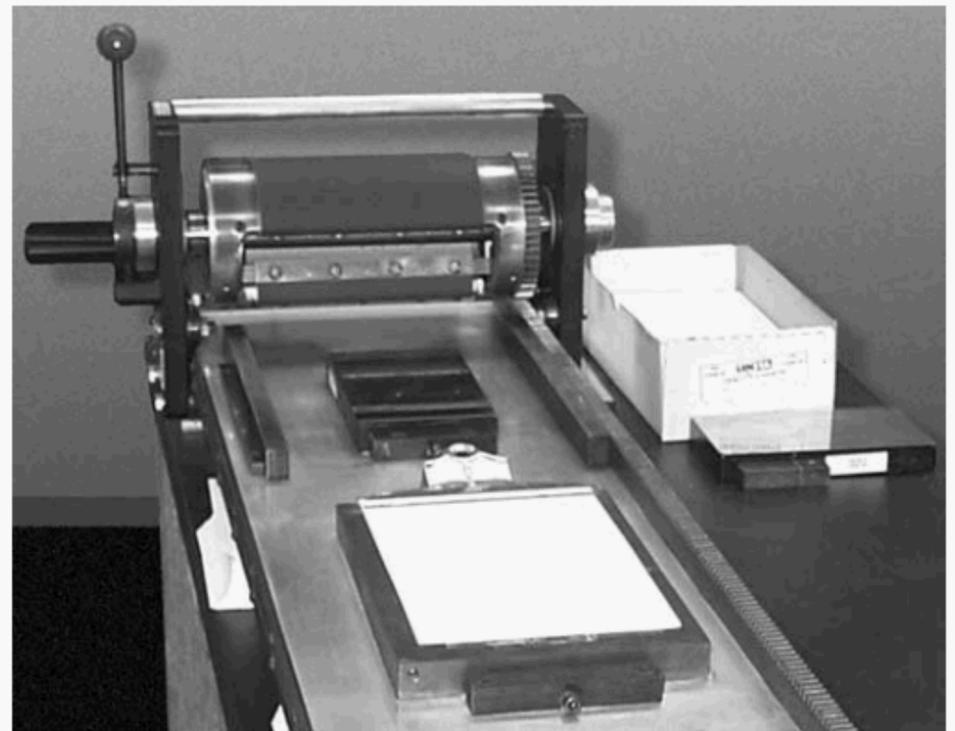


FIG. 3 Printing Gage in the Bed of an Offset Color Proof Press Set Up for Dry Offset Printing

9.1.3 Hold the drawdown blade with the thumb and next two fingers. Place in a vertical position behind the ink on the plate. Using the third finger as a loose guide along side of the plate, draw the ink down the plate slowly, steadily and with adequate pressure. At the end of the drawdown, come off the plate with a downward motion but without hitting the press bed. The natural inclination to come off the plate with an upward motion results in a thick ridge of ink on the gage and, in turn, on the print.

9.1.4 Examine the drawdown(s). If there are scratches in the ink film(s) that will interfere with the final purpose of the print, they may be minimized or eliminated altogether by making a double drawdown in the following manner. At the end of the first drawdown, hold the blade in the left hand. With the right hand, turn the plate around 180°. Gently scrape off excess ink from the blade and transfer to the plate as in 9.1.2 (about 15 mm in from the far end of each path). Using the clean side of the blade, draw down the ink as 9.1.3.

NOTE 2—It should be pointed out that the milled depths of most printing gages are of the same orders of magnitudes as grind gages. Hence, scratches in the first drawdown may be unavoidable. The second drawdown has been found to fill the scratches but not to alter the ink film thickness in the channel.

9.2 Printing by Direct Letterpress:

9.2.1 Remove the normal inking plate and other press furniture from the bed of the proof press.

9.2.2 Center the inked gage in the press bed next to the dead line bar (the plate bracket closest to the impression cylinder) so that the paths run parallel to the axis of the cylinder. See Fig. 2. A plate bracket or other press furniture on the opposite side of the plate (corresponding to the trailing edge of the print) and the guide tracks are not necessary but may be left in place.

9.2.3 Mount the sheet of the test substrate directly on the impression (blanket) cylinder. Engage the cylinder and turn the handle one revolution as fast as possible.

9.2.4 Remove the print and examine. If contact appears insufficient, add a minimum of shim stock below the gage and/or, if possible, alter the amount of packing on the cylinder. Repeat 9.2.2 and 9.2.3 with a freshly inked gage.

9.3 *Printing by Dry Offset:*

9.3.1 This operation requires a flat bed press (Fig. 3) capable of making two revolutions. Remove only the regular inking plate from the bed, and if necessary, change the blanket (see 7.2.2).

9.3.2 Ink the printing gage as per 9.1 and center in the press bed as in 9.2.2. Clip the test substrate onto the flat impression plate.

9.3.3 Ink the blanket by engaging the cylinder and making only one revolution, during which it passes over the printing gage. Disengage the cylinder and return (blanket is inked in forward motion only). Repeat the number of times required to ink the blanket properly, usually two to four. If no ink at all is transferred to the blanket, raise the plate with a minimum of shim stock.

9.3.4 After the blanket is properly inked, make the printing pass by engaging the cylinder and rolling it over the gage and the substrate in one rapid continuous motion.

9.4 *Multi-Color Printing:*

9.4.1 It is possible to study wet trapping of two inks by utilizing two inked printing gages in the bed of an offset press. To illustrate the effects of ink film thickness, a multi-path uniform film thickness gage is utilized (such as FPBAA-C or #6960-1 in Table 1); however it is recommended that only the two lower depths be inked, giving a print with four squares: four and eight (or six) microns of the second color over four and eight (or six) microns of the first color.

9.4.2 Remove all press furniture from the bed of an offset color proof press.

9.4.3 Using the procedure in 9.1, draw down (double if needed) the first ink in the path(s) of a printing gage. Draw down (double if needed) the second ink in the paths of another gage.

9.4.4 Place the gage with the first ink in the bed of the press next to the deadline bar. Set the gage with the second ink in the place formerly occupied by the impression plate; the orientation of the second gage should be 90° from the first gage.

9.4.5 Attach the appropriate stock to the blanket cylinder, engage the cylinder, and roll it over the two gages in one rapid continuous motion.

10. Post Press Operations

10.1 Immediately after the print is made, remove from the press and perform specified tests on the wet print, the print air dried for a specified time (usually 24 to 48 h), or the print dried by running through the Sinvatrol as in Test Method D6073 or through UV lamps or other appropriate apparatus.

10.2 As soon as possible, clean up the printing gage and blade prior to making additional prints. If long-time storage is anticipated, it is recommended that both be protected with a layer of grease.

11. Keywords

11.1 flat-bed (offset) proof press; paste printing inks; printing gage; printing inks; proofing of inks

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- (1) Connell, H. J., "The Printing Gage," *Tappi* 38, No. 8:460, 1955.
- (2) Steinberg, S., Geffken, C., and Herrmann, W. K., "The NPIRI Printing Wedge as a Measure of the Commercial Print Quality of Newsprint," *Tappi* 43, No. 6:539, 1960.
- (3) Fetsko, J. M., Schaeffer, W. D., and Zettlemoyer, A. C., "Routine Control Printing with Wedge Plates," *American Ink Maker* 40, No. 5:72, 1962. (Note—The appendix to this article gives methods for measuring impression pressure, calibration of path fillage, and measurement of printing speed.)

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