



## Standard Test Method for Leveling of Paints by Draw-Down Method<sup>1</sup>

This standard is issued under the fixed designation D 4062; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method<sup>2</sup> covers the laboratory determination of the relative leveling of water and solvent-reducible architectural paints in white and light tints by comparing the ridges produced in a draw-down film to a series of plastic leveling standards.

1.2 Unpigmented, texture, and deep-tint coatings cannot be readily evaluated with the shadowing produced by oblique lighting employed in this test method. Such coatings may be rated by comparing them with the plastic standards at various angles of reflection. For this purpose ordinary room lighting is satisfactory.

1.3 Since other factors may influence the tendency of liquid paints to sag, this test method is not intended to measure sagging.

1.4 The values stated in SI units are to be regarded as the standard. The values 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.*

### 2. Terminology

#### 2.1 Definitions of Terms Specific to This Standard:

2.1.1 *leveling*—of a paint, a measure of its ability to flow out after application so as to obliterate any surface irregularities such as brush marks, orange peel, peaks, or craters that have been produced by the mechanical process of application.

### 3. Summary of Test Method

3.1 The material to be tested is presheared and then applied to a sealed chart by means of a special leveling test blade designed to lay down a film with parallel ridges simulating brush marks. After allowing the completed draw-down to dry in a horizontal position, leveling of the test paint is rated by

viewing the draw-down under a strong, oblique light source and comparing the contrast of lightness and shadow caused by the paint ridges to that of a series of plastic leveling standards under the same lighting conditions.

### 4. Significance and Use

4.1 Leveling can affect the hiding and appearance of applied architectural coatings, the presence of brushmarks and surface irregularities being more conspicuous with gloss and semi-gloss finishes than with flat finishes. Instrumental evaluations of leveling by this test method have been shown to correlate with those made by brush application.

### 5. Apparatus

5.1 *Leveling Test Blade*<sup>3,4</sup>—A grooved draw-down blade designed to lay down a wet film with parallel ridges (see Fig. 1).

5.2 *Draw-Down Plate*,<sup>5</sup> with two parallel, smooth-faced straightedges to guide the blade during film application and ensure that the ridges are straight.

5.3 *Syringe and Needle*—A 10-mL LuerLok syringe and 38-mm (1½-in.) No. 15 gage needle for placing a fixed amount of the paint in front of the blade while simultaneously preshearing it (as during brushing) prior to drawing-down. Either glass or disposable plastic syringes may be used with water-reducible paints. Glass syringes only may be used with solvent-reducible paints due to swelling of disposable syringes by the solvent.

5.4 *Test Chart*,<sup>6</sup> plain white (for white or light tints) or predominantly black chart (for deep tints) coated with a suitable varnish or lacquer to render the test surface impervious to the volatile portion of the paint.

<sup>3</sup> The Leneta Company, 15 Whitney Road, Mahwah, NJ 07430, is the sole manufacturer of the leveling test blade. This blade, the draw-down plate, chart, light source, and levelness standards are all manufactured solely by the Leneta Co., and can be obtained from Leneta and most scientific supply houses.

<sup>4</sup> The Leneta Leveling Test Blade used in this test method is a modification of the threaded draw-down bar described in an article by Dodge, J. S. "Quantitative Measures of Leveling," *Journal of Paint Technology*, Vol 44, No. 564, January 1972.

<sup>5</sup> A suitable draw-down plate may be constructed from the description given in 5.2 of this test method.

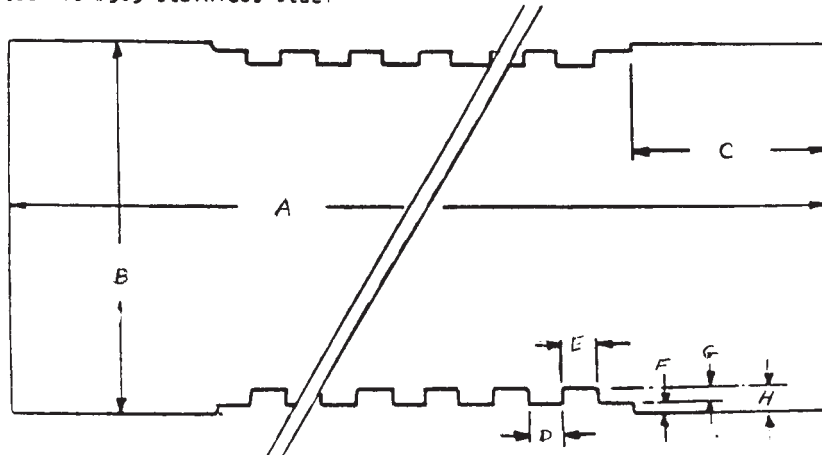
<sup>6</sup> Leneta Form WB, a plain white sealed chart, and Leneta Form 7B, a black and white sealed chart, have been found suitable for light- and deep-tint paints, respectively for use in this test method. These charts can be obtained from Leneta and most scientific supply houses.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.42 on Architectural Coatings.

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<sup>2</sup> This test method was essentially developed by the Leneta Company as outlined in Leneta Catalog No. 3, pp. 26–7 (1976).

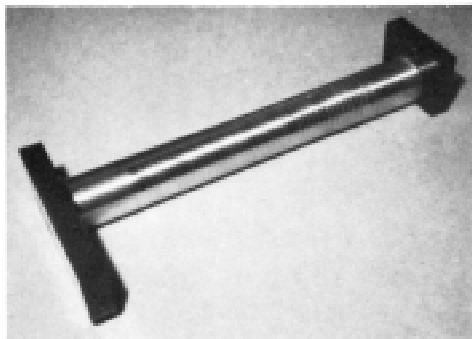
Stock is #303 stainless steel



| Dimensions:            | mm   | in. (approx.) | Dimensions:            | mm   | in. (approx.) |
|------------------------|------|---------------|------------------------|------|---------------|
| A—Length               | 165  | 6.5           | E—Major doctoring edge | 1.25 | 0.05          |
| B—Diameter             | 22   | 0.87          | F—Minor clearance      | 0.10 | 0.004         |
| C—Supporting edge      | 25   | 1.0           | G—Clearance step       | 0.20 | 0.008         |
| D—Minor doctoring edge | 1.25 | 0.05          | H—Major clearance      | 0.30 | 0.012         |

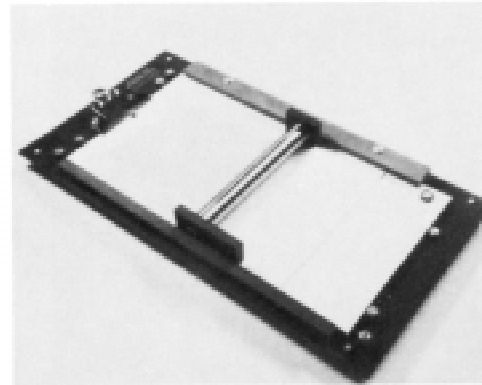
Note—This is actually a cylindrical rod, the term “blade” being employed as a conventional reference to film applicators. Auxillary plastic side arms not shown. See Fig. 1 (b) and 1 (c).

FIG. 1 (a) Leneta Leveling Test Draw-Down Blade



Note—Plastic sidearms are for guidance to assure rectilinearity of blade movements.

FIG. 1 (b) Photograph of the Leneta Leveling Test Draw-Down Blade



Note—Illustration of use of draw-down plate and catch papers. Note that sidearms are attached to the test blade and parallel straightedge guides on draw-down plate.

FIG. 1 (c) Application With the Leneta Leveling Test Draw-Down Blade

5.5 *Light Source*,<sup>7</sup> oblique, to illuminate the test draw-down and leveling standards (see Fig. 2).

5.6 *Levelness Standards*<sup>8</sup>—Three-dimensional full-scale replicas of draw-downs made with the leveling test blade and nine paints exhibiting very poor to very good leveling, for comparison with the test draw-down.

<sup>7</sup> A suitable light source may be constructed from the description given in 5.5 and Fig. 2 of this test method.

<sup>8</sup> Leneta Draw-Down Levelness Standards, a series of nine 3 by 5 in. (75 by 125 mm) plastic full-scale replicas of draw-downs of paints having very poor to very good leveling were used in this test method. These standards can be obtained from Leneta and most scientific supply houses.

5.7 *Catch Papers*, disposable, any type for catching excess paint is adequate.

## 6. Preparation of Sample

6.1 Adjust the temperature of the paint to  $23 \pm 2^\circ\text{C}$  ( $73.5 \pm 3.5^\circ\text{F}$ ) or to a temperature agreed upon between buyer and seller.

6.2 Thoroughly mix the paint by hand with a spatula to a smooth, uniform composition and consistency to ensure that the specimen to be taken for testing is representative.

## 7. Procedure

7.1 Affix the test chart to the draw-down plate. Position the leveling blade at the far end of the chart, between the parallel

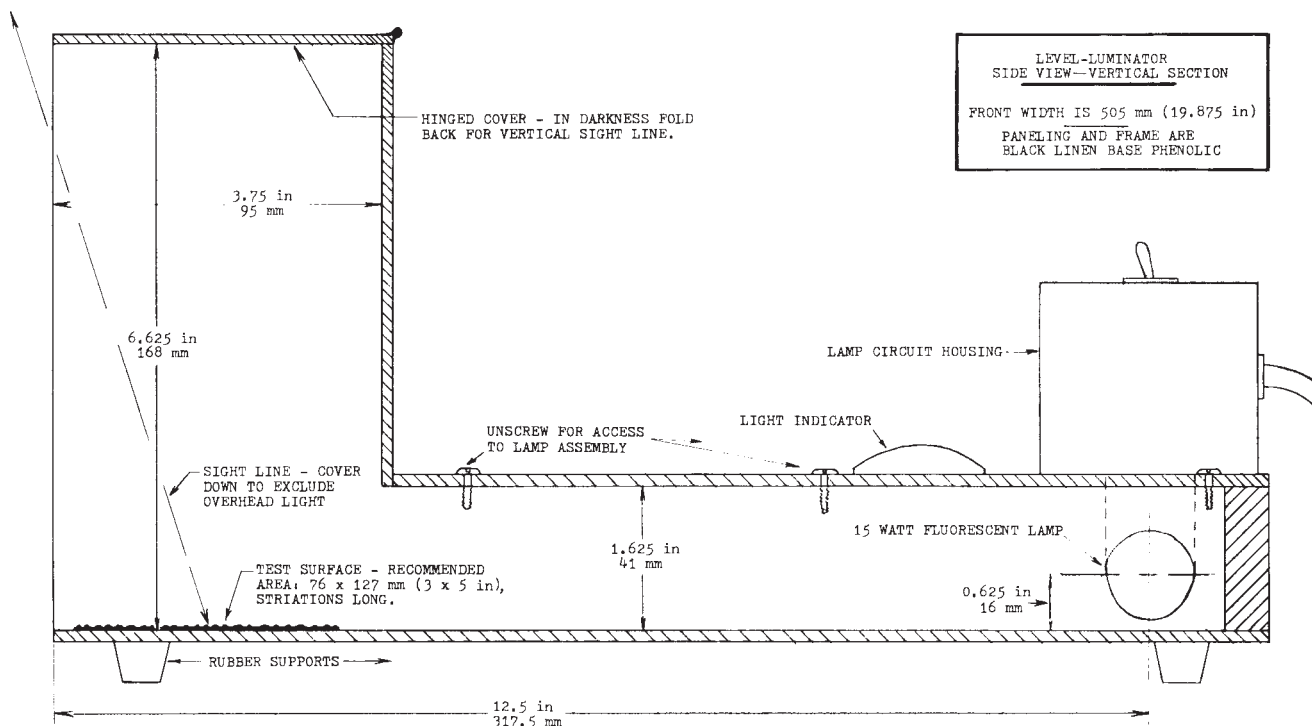


FIG. 2 Oblique Light Source (The Level Luminator) ( Side View)

straightedges, with the longer arm of the blade adjacent to the left edge and pointing toward the operator.

7.2 Place a catch paper just below but in contact with the chart so that it is slightly to the right of the longer arm of the blade.

7.3 With the needle not attached, take up 8 to 10 mL of the material under test into the syringe (Note 1). Wipe off the syringe orifice and attach the No. 15 gage needle. Eject within 3 to 5 s the entire amount in front of the blade, forming a puddle. Immediately lay the syringe down, grasp the blade arms with both hands, and draw the leveling blade rapidly but smoothly over the test paint at a rate of about 0.6 m (2 ft) per s, keeping the long arm on the left parallel to the surface during the draw-down.

NOTE 1—Filling the syringe and cleaning the orifice are greatly facilitated by temporarily attaching to the orifice a 2-in. (50-mm) length of clear vinyl tubing with inside diameter of 3.2 mm (1/8 in.) and outside diameter of 5 mm (3/16 in.), which is removed prior to attaching the needle.

7.4 Allow the completed draw-down to dry overnight in a horizontal position, preferably at  $23 \pm 2^\circ\text{C}$  ( $73.5 \pm 3.5^\circ\text{F}$ ) and  $50 \pm 5\%$  relative humidity, or under other conditions agreed upon between the buyer and the seller.

7.5 Place the dry draw-down, with its ridges perpendicular to the direction of the light, in front of the oblique light as shown in Fig. 2. Place two leveling standards similarly oriented on either side of the test draw-down and view the center portion of the draw-down and the standards from above (that is

at a  $90^\circ$  angle to the surface), or as close to  $90^\circ$  as possible if in a lighted room (see Fig. 2). Then successively interchange standards until one is found having the same distinctness of lightness and shadow as the test draw-down. Leveling poorer than Standard No. 1 is designated as 0 or very poor leveling. Leveling better than Standard No. 9 is designated as 10 which represents perfect leveling or no perceptible ridges. Estimate and record the number of the leveling standard that corresponds to the leveling of the test draw-down.

## 8. Report

8.1 Report the leveling of the test paint on the scale of 0 to 10 as determined by comparison with the numbered leveling standards.


## 9. Precision

9.1 On the basis of a study in which seven operators, each using a different blade, rated twelve different paints, the between-laboratories standard deviation was found to be 1.5 units on the 0 to 10 scale. Based on this standard deviation, the following criteria should be used for judging the acceptability of results at the 95 % confidence level:

9.1.1 *Reproducibility*—Two single results obtained by operators in different laboratories, should be considered suspect if they differ by more than 1.5 scale units.

## 10. Keywords

10.1 leveling of paints; rheological properties, flow

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