**Designation: D344 – 97 (Reapproved 2004)**

# Standard Test Method for
# Relative Hiding Power of Paints by the Visual Evaluation of Brushouts[1]

This standard is issued under the fixed designation D344; 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 test method provides for the qualitative and quantitative visual determination of the hiding power of a test paint relative to that of a comparison paint.

1.2 This test method describes only a brushout application procedure in specific detail, but its concepts are valid for other methods of application as well.

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

1.4 *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]

D16 Terminology for Paint, Related Coatings, Materials, and Applications

D1475 Test Method For Density of Liquid Coatings, Inks, and Related Products

D1729 Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials

D2805 Test Method for Hiding Power of Paints by Reflectometry

D5068 Practice for Preparation of Paint Brushes for Evaluation

E1247 Practice for Detecting Fluorescence in Object-Color Specimens by Spectrophotometry

E1347 Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry

E1349 Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional (45°:0° or 0°:45°) Geometry

## 3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D16 and the *Paint/Coatings Dictionary.*[3]

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *relative hiding power, qualitative*—the characterization of a test paint as being better, equal, or poorer in hiding power than a comparison paint.

3.2.2 *relative hiding power, quantitative*—the spreading rate of a paint expressed as a percent of the spreading rate of a comparison paint at equal hiding.

## 4. Summary of Test Method

4.1 *Qualitative*—The test and comparison paints are brushed out uniformly at the same spreading rate on black and white hiding power charts. After drying the brushouts are compared visually to see which paint has been most effective in reducing the substrate contrast.

4.2 *Quantitative*—Additional brushouts are made with the comparison paint, if and as necessary, to determine the spreading rate at which it matches the hiding of the test paint brushout.

## 5. Significance and Use

5.1 This test method evaluates the hiding power of a test paint relative to a comparison paint. The results have significance only within that relationship. It may be used for production control or quality comparisons.

5.2 When a paint is applied by brush or any other practical method, the opacity of the film is affected by variations in film thickness related to the application procedure and to the application characteristics of the paint. Two paints that hide equally well by this method might therefore differ considerably when applied with a doctor blade, since the latter method gives essentially perfect leveling. Different brushes or surface application conditions can likewise give different results.

NOTE 1—Test Method D2805 describes an instrumental method for

quantitatively determining hiding power without reference to a material paint standard. The paint film is applied at a uniform thickness (for example, with a doctor blade), the film thickness is measured rigorously, and the opacity is evaluated photometrically. Hiding power is thereby determined with a high degree of precision.

5.3 Test Method D344 is less precise than Test Method D2805, but is more practical because it is responsive to the application characteristics of paints, and is simpler in concept and execution.

## 6. Apparatus

6.1 *Balance*, top-loading laboratory balance having a capacity of 100 g and sensitivity of 0.1 g.

6.2 *Syringe*, 10-mL capacity.

6.3 *Paint Brush*, ferrule 50 mm (2 in.) wide and 14 mm (⁹⁄₁₆ in.) thick, tapered polyester filaments 70 mm (2¾ in.) long with flagged chisel trim tip.[4]

6.4 *Container*, ½-pint can or 250-mL beaker.

6.5 *Test Surface*, a smooth-surfaced paper chart having adjacent black and white areas and coated with a suitable varnish or lacquer so as to render the surface impervious to paint liquids. The black and white areas of the chart shall have luminous reflectance factors of 1 % maximum and 75 % minimum, respectively, when tested in accordance with Test Methods E1347 or E1349. The white areas of the charts used in any one testing program shall not differ in their reflectance factors by more than 1 %, and shall be nonfluorescent.[5] Any suitable regular design of contrasting areas may be used. The chart shall have a defined test area of 0.1 m². Larger test areas may be used if available, with appropriate modification of the indicated calculations.[6]

6.6 *Illumination*, a light source providing diffuse light of reasonable intensity, preferably northern sky light or an approximation of same. (See Practice D1729).

## 7. Preparation of Brushouts

7.1 Select a convenient and suitable spreading rate, mutually agreeable to all parties involved in the testing program, and preferably in the range from 9.8 to 19.6 m²/L (400 to 800 ft²/gal). In any case, the spreading rate shall not be so low that the substrate contrast is difficult to see, nor so high that it is difficult to apply the paint at a reasonably uniform film thickness.

NOTE 2—The gallon unit referred to here and throughout this test method is the U.S. gallon (3785.4 mL).

7.2 Determine the density *D* in grams per millilitre of the comparisons and test paints, in accordance with Test Method D1475.

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[4] Describes the brush used by the round-robin participants. Other 50-mm (2 in ) brushes of equivalent quality may be used, no doubt with similar results. Ideally, the same type of brush should be used within a comparison set, and among correspondent laboratories.

[5] As observed visually under ultraviolet illumination or determined in accordance with Practice E1247.

[6] The only manufacturing source of charts known to be in compliance with 6.5 and suitable for this test method is Leneta Company, 15 Whitney Rd., Mahwah, NJ 07430. 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.

7.3 Calculate to three significant figures the volume *V* in millilitres to apply for the selected spreading rate *SR* as follows:

$$V(\text{mL}) = \frac{100}{SR(\text{m}^2/\text{L})} = \frac{4074.6}{SR(\text{ft}^2/\text{gal})} \qquad (1)$$

7.4 Calculate to three significant figures, the weight *W* in grams corresponding to the volume *V* (mL) as follows:

$$W(\text{g}) = V(\text{mL}) \times D(\text{g/mL})$$

7.5 To prepare a brushout, first stir the paint well. Then precondition the brush by dipping it into the paint and working it out on a smooth, nonporous surface as described in Practice D5068. Take up the desired volume of paint in the syringe and weigh it with the brush in the empty container. Place the test chart on a level bench top, distribute the paint evenly over the test area of the chart, then brush the paint out uniformly within the test area. Set the brushout aside to dry in a horizontal position, protected adequately from dust and under normal room conditions of ventilation and temperature. Reweigh the empty syringe with the brush and container. The loss of weight represents the actual weight of paint applied to the test surface as opposed to the intended weight calculated from 7.3 and 7.4. If there is a discrepancy do not attempt to correct it by removing or applying paint since this would disturb the leveling of the brushout. Instead, calculate the actual spreading rate as follows:

$$SR_A = \frac{B}{A} \times SR_B \qquad (2)$$

where:
$SR_A$ = actual spreading rate,
$B$ = intended weight,
$A$ = actual weight, and
$SR_B$ = intended spreading rate.

## 8. Evaluation Procedure

8.1 *Viewing conditions*—When the test and comparison paint brushouts are thoroughly dry, place them vertically side by side against a flat surface and view them from a distance of 1.5 to 3 m (5 to 10 ft) under illumination conditions as described in 6.6.

8.2 *Qualitative Evaluation*:

8.2.1 If the contrast between the black and white areas of the test paint brushout is adjudged less than, equal to, or more than that of the comparison paint brushout, then the hiding power of the test paint is considered as better than, equal to, or poorer than that of the comparison paint.

8.2.2 If the actual spreading rate of the lower contrast paint-out is lower than that of the other paint-out by more than 3 %, prepare a second brushout with either paint so as to eliminate the difference, then compare again to confirm or revise the previous estimation of relative hiding power.

8.3 *Quantitative Evaluation*:

8.3.1 If the hiding of the test paint brushout does not match that of the comparison paint at the same spreading rate, make a series of additional comparison paint brushouts at several