



Designation: D5146 – 10

## Standard Guide to Testing Solvent-Borne Architectural Coatings<sup>1</sup>

This standard is issued under the fixed designation D5146; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope

1.1 This guide covers the selection and use of procedures for testing solvent-borne coatings to be used on exterior, interior or both types of surfaces (see [Note 1](#)). The properties that can be examined or, in some cases, the relevant test procedures are listed in [Table 1](#) and [Table 2](#).

NOTE 1—The term “architectural coating” as used here combines the definition in Terminology [D16](#) with that in the FSCT Paint/Coatings Dictionary, as follows: “Organic coatings intended for on-site application to interior or exterior surfaces of residential, commercial, institutional, or industrial buildings, in contrast to industrial coatings. They are protective and decorative finishes applied at ambient temperatures. Often called Trade Sales Coatings.”

NOTE 2—Architectural coatings that are designed to give better performance than most conventional coatings because they are tougher and more stain- and abrasion-resistant are covered by Guide [D3730](#).

1.2 The types of organic coatings covered by this guide are as follows:

- (1) Type 1 Interior Low-Gloss Wall Finish,
- (2) Type 2 Interior Gloss and Semigloss Wall and Trim Enamels,
- (3) Type 3 Exterior House and Trim Coatings, and
- (4) Type 4 Floor Enamel, Exterior and/or Interior.

1.2.1 Each is intended for application by brushing, rolling, spraying, or other means to the materials appropriate for its type, which may include wood, plaster, wallboard, masonry, steel, previously painted surfaces, and other architectural substrates.

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.*

<sup>1</sup> This guide 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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### 2. Referenced Documents

#### 2.1 *ASTM Standards*:<sup>2</sup>

- [D16 Terminology for Paint, Related Coatings, Materials, and Applications](#)
- [D56 Test Method for Flash Point by Tag Closed Cup Tester](#)
- [D93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester](#)
- [D154 Guide for Testing Varnishes](#)
- [D185 Test Methods for Coarse Particles in Pigments](#)
- [D215 Practice for the Chemical Analysis of White Linseed Oil Paints \(Withdrawn 2005\)<sup>3</sup>](#)
- [D344 Test Method for Relative Hiding Power of Paints by the Visual Evaluation of Brushouts](#)
- [D358 Specification for Wood to Be Used as Panels in Weathering Tests of Coatings](#)
- [D522 Test Methods for Mandrel Bend Test of Attached Organic Coatings](#)
- [D523 Test Method for Specular Gloss](#)
- [D562 Test Method for Consistency of Paints Measuring Krebs Unit \(KU\) Viscosity Using a Stormer-Type Viscometer](#)
- [D660 Test Method for Evaluating Degree of Checking of Exterior Paints](#)
- [D661 Test Method for Evaluating Degree of Cracking of Exterior Paints](#)
- [D662 Test Method for Evaluating Degree of Erosion of Exterior Paints](#)
- [D772 Test Method for Evaluating Degree of Flaking \(Scaling\) of Exterior Paints](#)
- [D869 Test Method for Evaluating Degree of Settling of Paint](#)
- [D968 Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive](#)
- [D1006 Practice for Conducting Exterior Exposure Tests of Paints on Wood](#)
- [D1014 Practice for Conducting Exterior Exposure Tests of Paints and Coatings on Metal Substrates](#)
- [D1038 Terminology Relating to Veneer and Plywood](#)

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

**TABLE 1 List of Standards in Sectional Order**

Property (or related test)	Section	ASTM Standard	Federal Test Method Standard 141D
Sampling	6.2	D3925	
Liquid Paint Properties			
Skinning	7.1	D154	3021
Condition in container	7.2		3011
Coarse particles and foreign matter	7.3	D185	
Density or Weight per gallon	7.4	D1475	
Fineness of dispersion	7.5	D1210	
Flash point	7.6	D56, D93, D3278	
Odor	7.7	D1296	
Absorption	7.8		4421
Colorant acceptance	7.9		
Dilution stability	7.10		4203
Package stability	7.11		
Heat stability	7.11.1	D1849	
Settling	7.11.2	D869	
Coating Application and Film Formation			
Application properties	8.1		4541
Brush application	8.1.1	D5068	
Brush drag	8.1.1.1	D4958	
Roller application	8.1.2	D5069	
Roller spatter	8.1.2.1	D4707	
Spray application	8.1.3		2131
Touch-up uniformity	8.2	D3928, D7489	
Rheological properties	8.3		
Consistency (Low-shear viscosity)	8.3.1	D562	
Rheological properties of non-Newtonian liquids	8.3.2	D2196, D4287	
Sag resistance	8.3.3	D4400	4494
Levelling properties	8.3.4	D4062	
Drying properties	8.4	D1640	4061
Appearance of Dry Film			
Color difference	9.1		
Color appearance	9.1.1		
Color differences by visual comparison	9.1.2	D1729	
Color differences using instrumental measurements	9.1.3	D2244	
Directional reflectance	9.2	E1347	
Gloss	9.3		
Gloss, 60°	9.3.1	D523	
Sheen (85° gloss)	9.3.2	D523	
Hiding power	9.4	D344, D2805	
Yellowness index	9.5	E313	6131
Properties of Dry Film			
Interior and Exterior Coatings	10.1		
Abrasion resistance	10.1.1	D968, D4060	6192
Adhesion	10.1.2	D2197, D3359, D5179	
Flexibility	10.1.4	D522, D2370	6221 <sup>A</sup>
Resistance to household chemicals	10.1.5	D1308	
Interior Coatings	10.2		
Color change of white enamels	10.2.1		6132
Ink Stainblocking	10.2.5	D7514	
Washability and cleansability	10.2.2		
Washability	10.2.2.1	D2486, D4213	
Cleansability	10.2.2.2	D3450, D4828	6141 <sup>B</sup>
Exterior Coatings	10.3		
Blister resistance	10.3.1	D4585	
Exposure resistance	10.3.2	D1006, D1014	
Chalking	10.3.2.2	D4214	
Checking	10.3.2.3	D660	
Cracking	10.3.2.4	D661	
Erosion	10.3.2.5	D662	
Flaking	10.3.2.6	D772	
Mildew resistance	10.3.3	D3456	<sup>C</sup>
Fume resistance	10.3.4		
Tannin Stain Resistance	10.3.6	D6686	
Coating Analysis			
Chemical analysis	11.1	D215	
Volatile content	11.2	D2369	
Nonvolatile volume content	11.3	D2697, D6093	
Water content	11.4	D3792, D4017	
Pigment content	11.5	D2371	4021
Pigment analysis	11.6	D215	7261
Nonvolatile vehicle content	11.7	D215	
Vehicle separation	11.8	D2372	
Nonvolatile vehicle identification	11.9	D2621, D2245	

<sup>A</sup> Equivalent only to Method B of Test Methods D522.

<sup>B</sup> Except for scrub medium.

<sup>C</sup> 6271 is not equivalent.

**TABLE 2 Alphabetical List of Properties**

Property (or related test)	Section	ASTM Standard	Federal Test Method Standard 141D
Abrasion Resistance	10.1.1	D968, D4060, D6037	6192
Absorption	7.8		4421
Adhesion	10.1.2	D2197, D3359	
Analysis, chemical	11.1	D215	
Application properties	8.1		4541
Blister resistance	10.3.1	D4585	
Brush application	8.1.1	D5068	
Brush drag	8.1.1.1	D4958	
Chalking	10.3.2.2	D4214	
Checking	10.3.2.3	D660	
Cleansability	10.2.2.2	D3450, D4828	6141 <sup>A</sup>
Coarse particles and foreign matter	7.3	D185	
Colorant acceptance	7.9		
Color appearance	9.1.1	...	
Color change	10.2.1	...	6132
Color differences by visual comparison	9.1.2	D1729	
Color differences using instrumental measurements	9.1.3	D2244	
Condition in container	7.2		3021
Consistency	8.3.1	D562	
Cracking	10.3.2.4	D661	
Density or weight per gal	7.4	D1475	
Dilution stability	7.10		4203
Drying properties	8.4	D1640, D5895	
Erosion	10.3.2.5	D662	
Exposure resistance	10.3.2	D1006, D1014	
Fineness of Dispersion	7.5	D1210	
Flaking	10.3.2.6	D772	
Flash point	7.6	D56, D93, D3278	
Flexibility	10.1.4	D522, D2370	6221 <sup>B</sup>
Fume resistance	10.3.4		
Gloss	9.3		
Gloss, 60°	9.3.1	D523	
Heat stability	7.11.1	D1849	
Hiding power	9.4	D344, D2805	
Ink Stainblocking	10.2.5	D7514	
Levelling properties	8.3.4	D4062	
Mildew resistance	10.3.3	D3456	<sup>C</sup>
Nonvolatile vehicle content	11.7	D215	4053
Nonvolatile vehicle identification	11.9	D2621, D2245	
Nonvolatile volume content	11.3	D2697, D6093	
Odor	7.7	D1296	
Package stability	7.11	D1849	
Pigment analysis	11.6	D215	7261
Pigment content	11.5	D2371	4021
Reflectance, directional	9.2	E1347	
Resistance to household chemicals	10.1.5	D1308	
Rheological properties of non-Newtonian liquids	8.3.2	D2196, D4287	
Roller application	8.1.2		2112
Roller spatter	8.1.2.1	D4707	
Sag resistance	8.3.3	D4400	4494
Sampling	6.2	D3925	
Settling	7.11.2	D869	
Sheen (85° gloss)	9.3.2	D523	
Skinning	7.1	D154	3021
Spray application	8.1.3		2131
Tannin Stain Resistance	10.3.6	D6686	
Touch-up uniformity	8.2	D3928, D7489	
Vehicle separation	11.8	D2372	
Volatile content	11.2	D2369	
Washability	10.2.2.1	D2486, D4213	
Water content	11.4	D1208, D3792, D4017	4081
Yellowness index	9.5	E313	6131

<sup>A</sup> Except for scrub medium.

<sup>B</sup> Equivalent only to Method B of D522.

<sup>C</sup> 6271 is not equivalent.

[D1208 Test Methods for Common Properties of Certain Pigments](#)

[D1210 Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage](#)

[D1296 Test Method for Odor of Volatile Solvents and Diluents](#)

[D1308 Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes](#)

- D1475 Test Method For Density of Liquid Coatings, Inks, and Related Products
- D1554 Terminology Relating to Wood-Base Fiber and Particle Panel Materials
- D1640 Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
- D1729 Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials
- D1849 Test Method for Package Stability of Paint
- D2196 Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer
- D2197 Test Method for Adhesion of Organic Coatings by Scrape Adhesion
- D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
- D2245 Test Method for Identification of Oils and Oil Acids in Solvent-Reducible Paints
- D2369 Test Method for Volatile Content of Coatings
- D2370 Test Method for Tensile Properties of Organic Coatings
- D2371 Test Method for Pigment Content of Solvent-Reducible Paints
- D2372 Practice for Separation of Vehicle From Solvent-Reducible Paints
- D2486 Test Methods for Scrub Resistance of Wall Paints
- D2621 Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints
- D2697 Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings
- D2805 Test Method for Hiding Power of Paints by Reflectometry
- D3273 Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- D3278 Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
- D3359 Test Methods for Measuring Adhesion by Tape Test
- D3450 Test Method for Washability Properties of Interior Architectural Coatings
- D3456 Practice for Determining by Exterior Exposure Tests the Susceptibility of Paint Films to Microbiological Attack
- D3730 Guide for Testing High-Performance Interior Architectural Wall Coatings
- D3792 Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph
- D3925 Practice for Sampling Liquid Paints and Related Pigmented Coatings
- D3928 Test Method for Evaluation of Gloss or Sheen Uniformity
- D3960 Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
- D4017 Test Method for Water in Paints and Paint Materials by Karl Fischer Method
- D4060 Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
- D4062 Test Method for Leveling of Paints by Draw-Down Method
- D4213 Test Method for Scrub Resistance of Paints by Abrasion Weight Loss
- D4214 Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
- D4287 Test Method for High-Shear Viscosity Using a Cone/Plate Viscometer
- D4400 Test Method for Sag Resistance of Paints Using a Multinotch Applicator
- D4585 Practice for Testing Water Resistance of Coatings Using Controlled Condensation
- D4707 Test Method for Measuring Paint Spatter Resistance During Roller Application
- D4828 Test Methods for Practical Washability of Organic Coatings
- D4946 Test Method for Blocking Resistance of Architectural Paints
- D4958 Test Method for Comparison of the Brush Drag of Latex Paints
- D5068 Practice for Preparation of Paint Brushes for Evaluation
- D5069 Practice for Preparation of Paint-Roller Covers for Evaluation of Architectural Coatings
- D5179 Test Method for Measuring Adhesion of Organic Coatings to Plastic Substrates by Direct Tensile Testing
- D5895 Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders
- D6037 Test Methods for Dry Abrasion Mar Resistance of High Gloss Coatings
- D6093 Test Method for Percent Volume Nonvolatile Matter in Clear or Pigmented Coatings Using a Helium Gas Pycnometer
- D6686 Test Method for Evaluation of Tannin Stain Resistance of Coatings
- D7489 Practice for Evaluating Touch-Up Properties of Architectural Coatings under Various Environmental Conditions
- D7514 Test Method for Evaluating Ink Stainblocking of Architectural Paint Systems by Visual Assessment
- E105 Practice for Probability Sampling of Materials
- E313 Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates
- E1347 Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry
- 2.2 *U.S. Federal Standard:*  
**Federal Test Method** Standard No. 141D<sup>4</sup>  
 2131 Application of Sprayed Films  
 3011 Condition in Container  
 4203 Reducibility and Dilution Stability  
 4421 Absorption Test  
 4541 Working Properties and Appearance of Dried Film  
 6132 Accelerated Yellowness

<sup>4</sup> Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil>.

### 2.3 Other Document:

**Paint/Coatings Dictionary** of the Federation of Societies for Coatings Technology<sup>5</sup>

## 3. Terminology

3.1 For definitions of terms in this guide refer to Terminology **D16**, **D1038**, and **D1554** and to the FSCT Paint/Coatings Dictionary.

## 4. Conditions Affecting Solvent-Reducible Coatings

### 4.1 Interior and Exterior Coatings:

4.1.1 *Substrate Type*—The substrate to be painted can affect not only the application properties of a coating, such as gloss and uniformity, but is also a factor in determining the type of coating to use. For instance, low-gloss wall finishes do not have the abrasion resistance required on floors, whereas finishes intended only for interior service probably do not have adequate resistance to weather factors. Other factors are the type and quality of metal, wood or wood composite (plywood, particle board or hardboard), the type, quality and alkalinity of concrete, plaster and joint cement systems, and the type and condition of any previous coatings.

4.1.2 *Substrate Conditions*—Conditions such as porosity, hardness or, in the case of unpainted concrete, alkalinity determine the kind of coating that can be applied. The condition of previously painted substrates, such as degree of chalk, presence of grease, dirt, and mold, film adhesion and porosity, all influence the performance of coatings. Smoothness of the substrate affects the spreading rate, final appearance, and texture.

4.1.3 Preparation of previously painted substrates including detergent cleaning, solvent cleaning, and sanding.

4.1.4 Type and quality of primer or undercoat and time of drying before topcoating.

4.1.5 Environmental conditions such as temperature and humidity at the time of coating application and during drying.

### 4.2 Exterior Finishes:

4.2.1 *Substrate Weathering*—Weathering of wood before painting will probably adversely affect the performance of exterior coatings. Some weathering of masonry surfaces may have beneficial effects on the performance.

4.2.2 *Substrate Aspects of the Building*—If construction defects or defects due to age are such that excessive moisture from the inside or the outside makes its way through the substrate or if the substrate is in direct contact with damp ground, blistering, flaking or peeling may result.

4.2.3 Environmental conditions after application, both general for the area and specific, such as under eaves, behind shrubbery, northside and southside exposure.

## 5. Selection of Tests

5.1 Because the conditions to which a coating is subjected vary with (a) the surface type: wall, floor, ceiling, and (b) the service environment: exterior or interior, specialized types of solvent-borne coatings have been developed for the different

locations. The recommended test methods presented in **Table 1** and **Table 2** cover practically all the properties of solvent-reducible coatings but all of them are not required with each type. Coatings intended for exterior use only or both exterior and interior use require certain properties not relevant to those for interior use only. Selection of the methods to be followed must be governed by experience and the requirements in each individual case, together with agreement between the purchaser and the seller.

5.2 The purchaser should first determine the properties a coating should have and then select only those test methods that measure or evaluate those properties. After selecting the desired tests, the purchaser should then decide which properties are the most important and establish the requirements or specifications accordingly. Since coating properties frequently tend to oppose each other, such as low sheen versus good cleansability, some properties may need to be less emphasized if others are to be accentuated. This balance of properties must be considered when selecting the tests and establishing the requirements. The significance of the tests and the normal range of values are presented in the different sections, in most cases.

5.3 This guide does not indicate relative importance of the various tests nor does it recommend specific test values because properties very important to one purchaser may be less so to another.

## 6. Sampling

6.1 Prior to sampling, the condition of the container should be checked since damage to it may cause evaporation, skinning, or other undesirable effects on the coating.

6.2 Sample in accordance with Practice **D3925**. Determine the density in pounds per kilograms/litre (gallon) in accordance with Test Method **D1475**. Continue sampling and determining density until successive results agree within 45 g (0.1 lb) or as agreed upon between the purchaser and seller. Then take samples for testing.

6.3 Specify the amount required for a representative sample, the package sizes, and an identification code. A 4-L (or 1-U.S. gal) sample is usually sufficient for the recommended tests, but for guidance in selecting a sampling plan consult Practice **E105**.

## 7. Liquid Coating Properties

7.1 *Skinning*—Coatings that contain a binder that dries by oxidation may be subject to skin formation in a partially-filled can. Since skins are insoluble in the material, they must be removed before use. The referenced test in a partially-filled container indicates the tendency of the material to skin. A typical minimum time for skinning in accordance with this method is 48 h. Examine the original sample for skins, both on and below the surface. Using a well-mixed skin-free portion of the sample, perform a skinning test in accordance with Guide **D154**.

7.2 *Condition in Container*—Thickening, pigment settling, and separation are undesirable and objectionable if material that has been stored cannot be readily reconditioned and made

<sup>5</sup> Available from Federation of Societies for Coatings Technology (FSCT), 492 Norristown Rd., Blue Bell, PA 19422-2350, <http://www.coatingstech.org>.

suitable for application with a reasonable amount of stirring. The referenced method covers procedures for determining changes in properties after storage and lists characteristics that are undesirable and objectionable in a stored paint. Determine condition in the container in accordance with Method 3011 of Federal Test Method Standard No. 141D. (See also 7.11, Package Stability.)

**7.3 Coarse Particles and Foreign Matter**—Liquid coatings must be free of coarse particles and foreign matter to be able to form uniform films of good appearance, a typical maximum being 0.5 weight % of the total material. The referenced method with a 325-mesh (45- $\mu\text{m}$ ) screen gives the percent of these particles. Determine content of coarse particles and foreign matter in accordance with Test Methods **D185**.

**7.4 Density or Weight per Gallon**—The density measured in pounds per kilograms per litre = g/mL (gallon) is used to ensure product uniformity from batch to batch, provides a check against the theoretical weight calculated from the formula, and is useful for determining the similarity of two samples. The referenced method gives a procedure for measuring the density of the coating at a specified temperature. Most interior paints have densities of about 1.2 to 1.4 kg/L (10 to 12 lb/gal). Determine density in accordance with Test Method **D1475**, using a calibrated weight per gallon cup.

**7.5 Fineness of Dispersion**—Generally, the more finely a pigment is dispersed, the more efficiently it is being utilized. One method for measuring the degree of dispersion (commonly referred to as “fineness of grind.”) is to draw the liquid coating down a calibrated tapered groove varying in depth from 100 to 0  $\mu\text{m}$  (0–8 Hegman units) (4 to 0 mils) . The depth at which continuous groupings of particles or agglomerates, or both, protrude through the surface of the wet film is taken as the fineness of dispersion value. Higher readings in Hegman units or lower readings in mils or micrometres indicate finer dispersion. Low sheen finishes may have a dispersion value of 50  $\mu\text{m}$  or 4 Hegman (2 mils) while gloss enamels might be near zero (8 Hegman) indicating that the pigment agglomerates are too small to be detected by the referenced method. Determine fineness of dispersion in accordance with Test Method **D1210**.

**7.6 Flash Point**—Organic solvents used in these coatings have characteristic temperatures at which they support combustion. This temperature is known as the flash point and is often used for danger classification in shipping by common carrier. It is also used to determine conditions of storage to meet fire regulations and the safety requirements of the U.S. Occupational Safety and Health Act (OSHA). Determine flash point in accordance with Test Methods **D56**, **D93**, Part B, or **D3278**.

**7.7 Odor**—Some solvent combinations produce obnoxious odors, particularly when painting indoors with inadequate ventilation and at elevated temperatures. Interior solvent-borne coatings usually contain low-odor or odorless mineral spirits. Nevertheless, they should be evaluated to ensure that they are acceptable. Although not specifically designed for liquid coatings Test Method **D1296** may be used with the solvent-reducible type.

**7.8 Absorption**—On porous surfaces, binder penetration can result in pigment volume concentration changes as the film dries. This may cause appearance to vary. The referenced method provides a rough measure of the wetting and penetrating properties of the binder on a porous surface. Determine the absorption in accordance with Method 4421 of Federal Test Method Standard No.141D.

**7.9 Colorant Acceptance**—Tintability of white bases with colorants of standardized tinting strength is a trade requirement. If tinting colors are not adequately compatible with tint bases, lighter, darker, or nonuniform shades of colors are produced. There is no accepted ASTM test method at present. Test methods may be agreed upon between the purchaser and seller.

**7.10 Dilution Stability**—Dilution with a specified thinner shows whether the materials are compatible and whether the reduced coating is stable. Consequently the suggested diluent should be readily incorporated into the coating without excessive stirring or shaking. The referenced method evaluates the stability of the material that has been reduced by a given amount or to a specified viscosity. Determine dilution stability in accordance with Method 4203 of Federal Test Method Standard No. 141D.

**7.11 Package Stability**—Since coatings are normally not used immediately after manufacture, they must remain stable in the can for some time. At normal temperatures most solvent-borne coatings can be stored for over a year with little change in properties. However, exposure in uninsulated warehouses, or during shipping to high temperatures in the summer, may cause unacceptable changes in these products. Another unsatisfactory condition that may occur during storage is excessive settling.

**7.11.1 Heat Stability**— Exposure to high temperatures can be used to test for the stability of a packaged coating that frequently encounters such conditions in service, or as an accelerated test to predict stability at normal temperatures. Although indications of long term package stability can usually be obtained in several days or weeks at an elevated temperature such as 50°C (125°F) or 60°C (140°F), occasionally the results of the accelerated test do not agree with those at prolonged normal storage conditions. In the referenced method the changes in consistency and certain other properties of the accelerated aged material are compared to those occurring in a control kept at normal temperatures for a longer period. When testing for heat stability, as such, changes in viscosity, flow, gloss, foam resistance, color uniformity, and wet adhesion are usually checked. Determine heat stability in accordance with Test Method **D1849**.

**7.11.2 Settling**—Modern coatings are generally resistant to hard settling, but do at times show separation and soft settling. The referenced method covers the degree of pigment suspension in and ease of remixing of a shelf-aged specimen to a homogeneous condition suitable for the intended use. Determine settling in accordance with Test Method **D869**.

## **8. Coating Application and Film Formation**

**8.1 Application Properties**—Application or working properties of a paint are generally compared to a standard or