



Designation: ~~D2205 – 85 (Reapproved 2010)~~ D2205 – 15

Standard Guide for Selection of Tests for Traffic Paints¹

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1. Scope

1.1 This guide covers the selection and use of procedures for testing traffic paints in the laboratory and in the field.

1.2 This guide covers the testing of ~~a ready-mixed paint product~~ ready-mixed solvent base and waterborne paint products of sprayable consistency that shall be suitable for use as a reflecting traffic guide on paved roadways.

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

[C219 Terminology Relating to Hydraulic Cement](#)

[D8 Terminology Relating to Materials for Roads and Pavements](#)

[D16 Terminology for Paint, Related Coatings, Materials, and Applications](#)

[D154 Guide for Testing Varnishes](#)

[D185 Test Methods for Coarse Particles in Pigments](#)

~~[D215D522/D522M Practice for the Chemical Analysis of White Linseed Oil Paints](#)~~ [Test Methods for Mandrel Bend Test of Attached Organic Coatings](#) (Withdrawn 2005)

[D562 Test Method for Consistency of Paints Measuring Krebs Unit \(KU\) Viscosity Using a Stormer-Type Viscometer](#)

[D711 Test Method for No-Pick-Up Time of Traffic Paint](#)

[D713 Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials](#)

[D868 Practice for Determination of Degree of Bleeding of Traffic Paint](#)

[D869 Test Method for Evaluating Degree of Settling of Paint](#)

[D870 Practice for Testing Water Resistance of Coatings Using Water Immersion](#)

[D913 Practice for Evaluating Degree of Traffic Marking Line Wear](#)

~~[D968 Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive](#)~~

~~[D969 Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint](#)~~ (Withdrawn 2010)³

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

[D1309 Test Method for Settling Properties of Traffic Paints During Storage](#)

[D1475 Test Method For Density of Liquid Coatings, Inks, and Related Products](#)

~~[D1644 Test Methods for Nonvolatile Content of Varnishes](#)~~

~~[D1647 Test Methods for Resistance of Dried Films of Varnishes to Water and Alkali](#)~~ (Withdrawn 2004)³

[D1729 Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials](#)

~~[D1737 Method of Test for Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus](#)~~ (Withdrawn 1988)³

[D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates](#)

[D2369 Test Method for Volatile Content of Coatings](#)

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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~~ standard's Document Summary page on the ASTM website.

- D2371 Test Method for Pigment Content of Solvent-Reducible Paints
 D2372 Practice for Separation of Vehicle From Solvent-Reducible Paints
~~D4061~~D2698 Test Method for Retroreflectance of Horizontal Coatings
 Determination of the Pigment Content of Solvent-Reducible Paints by High-Speed Centrifuging
 D2805 Test Method for Hiding Power of Paints by Reflectometry
 D3723 Test Method for Pigment Content of Water-Emulsion Paints by Low-Temperature Ashing
 D4060 Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
 D6628 Specification for Color of Pavement Marking Materials
 D7377 Practice for Evaluating the Water Wash-Off Resistance of Traffic Paints using a Water Faucet
 D7538 Practice for Evaluating the Water Wash-Off Resistance of Traffic Paints Using an Atomizing Spray Device
 E97E179 ~~Method of Test for Directional Reflectance Factor, 45-Deg 0-Deg, of Opaque Specimens by Broad-Band Filter Reflectometry~~ Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials (Withdrawn 1991)
 E308 Practice for Computing the Colors of Objects by Using the CIE System
 E1164 Practice for Obtaining Spectrometric Data for Object-Color Evaluation
 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
 E1710 Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
 E2367 Test Method for Measurement of Nighttime Chromaticity of Pavement Marking Materials Using a Portable Retro-reflection Colorimeter
 2.2 U.S. Federal Test Methods Standard 141B.⁴
 4121 Dry Opacity

3. Terminology

- 3.1 *Definitions*—For definitions used in this guide, refer to Terminology C219, D8, and D16.
- 3.2 *retroreflective optics, n*—a particle manufactured for use with pavement marking materials to provide retroreflective properties to the marking, allowing them to be visible when viewed at night under automobile headlights.
- 3.2.1 *composite optics, n*—a multi-component retroreflective particle comprised of a pigmented core (typically white or yellow) combined with very small glass or ceramic beads having a refractive index of between 1.90 and 2.4.)
- 3.2.2 *glass beads, n*—round spheres manufactured from glass of a specific refractive index and size distribution.

4. Summary of Guide

4.1 This guide consists of the following tests that, although not exhaustive, cover the areas normally of concern in traffic paint testing:

Liquid Paint Properties	Sections 6 through 11
Application and Appearance Properties	12 through 17
Properties of the Dried Film	18 through 20
Analysis of Paint	21 through 24
Field Evaluations	25 through 29
Field Sampling	30

5. Conditions Affecting Traffic Paint

- 5.1 Practical requirements for traffic paint may vary with:
- 5.1.1 Substrate type, such as portland cement and asphaltic concretes, and the various coarse aggregates used therein.
- 5.1.2 Climatic conditions, both generally and specifically, at the time of paint application.
- 5.1.3 Service density, such as heavy traffic areas in cities versus lightly traveled rural highways and parking lots.
- 5.1.4 Traffic type, whether light passenger cars or heavy trucks and airplanes.
- 5.1.5 Presence of foreign matter on the road surface, such as oil, old paint, skid marks, sand, salt, concrete curing compound, etc.
- 5.2 New portland cement concrete surfaces have a greater degree of moisture and alkalinity than older surfaces and thereby adversely affect paint adhesion. Paint adhesion is also affected by the ratio of cement to fine aggregate, coarse aggregate, and mixing water, as well as by the surface character of the aggregate that can range from impervious smooth quartz to irregular, porous slag.

LIQUID PAINT PROPERTIES

6. Skinning

6.1 Paints containing a binder that dries by oxidation are subject to skin formation in a partially filled can or by diffusion of air into a filled can. Since skins are insoluble in the paint they must be removed before use. The referenced test employs a partially filled container to indicate the tendency of a paint to skin. A typical minimum time for skinning is 18 to 24 h.

6.2 Examine the original sample for skins both on the surface and in the mass. Using a well-mixed, skin-free portion of the sample, perform a skinning test in accordance with Guide **D154**, except use a 0.5-L (1-pt) friction-top can instead of a 0.25-L (8-oz) jar.

7. Coarse Particles

7.1 Paints must be free of oversize particles and foreign matter to avoid clogging application equipment, a typical maximum being 1 % by weight of total paint. The referenced test with a 325-mesh (45- μm) screen gives the percent of this material in the paint.

7.2 Determine coarse particles in accordance with Test Methods **D185**.

NOTE 1—This test is not used for traffic paint containing pre-mixed glass beads, retroreflective optics.

8. Fineness of Dispersion

8.1 ~~The more finely a pigment is dispersed, the more efficiently it is being used. One method for measuring the degree of dispersion (commonly referred to as “fineness of grind”) is to draw the material.~~ A key aspect of the pigment dispersion process in paint is fineness of grind, which can be measured by drawing the paint sample down a calibrated, tapered groove in a hardened steel block with the groove varying in depth from 4 to 0 mils (100 to 0 μm). The point at which continuous groupings of particles or agglomerates, or both, protrude through the surface of the liquid is taken as the fineness reading. Lower readings in mils or micrometres or higher reading in Hegman units indicate better fineness of dispersion.

8.2 Fineness of grind is not generally specified for traffic paint but some application equipment may require a limit of 1 to 2 Hegman units (3 to 3.5 mils, 75 to 90 μm). If additional assurance is needed that the paint will not clog application equipment, determine the fineness in accordance with Test Method **D1210** ~~after reducing~~. When testing solvent based paint it may be necessary to reduce the traffic paint with mineral spirits, or compatible aromatic solvent with a similar evaporation rate, to keep the film wet long enough to determine the end point more easily. When a premix traffic paint is being tested, conduct the test on the paint before addition of the beads.

9. Density or Weight per Gallon

9.1 Density as measured by weight per unit volume is not a performance characteristic but is used to check product uniformity from batch to batch. A calibrated weight per gallon cup is used.

9.2 For an unbeaded paint, determine the density in accordance with Test Method **D1475**.

9.3 For beaded paints, use a special weight-per-gallon cup³ having a modified cap so that the beads do not interfere with a snug fit of the cap to the cup. Proceed in accordance with Test Method **D1475**.

9.4 Traffic paints are viscous and known to entrap air giving erroneous low values. Air may be visible as bubbles or too finely dispersed to be seen. The Appendix XI to Test Method **D1475** provides a practice of diluting of a material to improve air release. This method is widely used on waterborne paints where equal amounts of water and paint are mixed. The density split mixture is measured and density of the paint calculated using Eq X1.1.

10. Consistency

10.1 Paints of a given type should fall within a stated consistency range as agreed upon between the purchaser and the seller. Consistency is used mainly to ensure product uniformity. Improper consistency, however, can adversely affect application properties, and in turn, paint performance.

10.2 Determine consistency using the Stormer viscometer in accordance with Test Method **D562**. If the requirement is in Krebs units, Table 1 of Test Method **D562** permits changing seconds to KU. Method B (Digital Display Stormer-Type Viscometer) is the preferred method.

³ The last approved version of this historical standard is referenced on www.astm.org.

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

³ The sole source of supply of the satisfactory modified cup known to the committee at this time is **BYK-Gardner, Inc., Gardner Laboratory, 2435 Linden Lane, Silver Spring, MD 20910; BYK Additives and Instruments, 9104 Guilford Rd., Columbia, MD 21046**. 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.

11. Package Stability

11.1 Since paints are not normally used immediately after manufacture, they must remain stable in the can for some time, which for traffic paints does not generally exceed 6 months. Although package stability can usually be determined by alternatively heating and cooling a specimen, occasionally the results do not coincide with storage at normal temperature. The referenced methods determine the degree of pigment settling after 2 weeks cycling or after 6 months storage at room temperature. These are usually sufficient as it is difficult to rate numerically the ease of redispersing an aged traffic paint.

11.2 Determine the degree of pigment settling in the accelerated test in accordance with Test Method [D1309](#). Determine the degree of pigment settling and ease of remixing a shelf-aged specimen in accordance with Test Method [D869](#).

APPLICATION AND APPEARANCE PROPERTIES

12. Drying Time

12.1 The drying time of a traffic paint is particularly important because it determines how quickly a lane can be opened to free flow of traffic without the paint being transferred to adjacent pavement.

12.2 ~~Though no-pick-up~~ No-pick-up time as determined by Test Method [D711](#) is typically used as a quality control test for dry time. While this method does not predict actual drying time during field application, it has been found the Test Method [D711](#) has no direct correlation with field application, it is employed as a quality control test. ~~testing accurately predicts trends in most cases.~~ Controlling both humidity and air flow is critical for accurate test results.

13. Bleeding

13.1 Bleeding refers to the passage of colored matter such as bitumen from an asphalt pavement through the traffic paint film. It is a function of the age of the asphalt, its compatibility with the paint, and the speed of drying of the paint. ~~Typical traffic paints give results of 6 to 10 on an arbitrary scale of photographic standards where 10 is no bleeding and 2 is considerable bleeding.~~ Determine bleeding in accordance with Test Methods ~~Practice~~ [D868](#) and [D969](#).

14. Hiding Power

14.1 Hiding power or opacity is a measure of the ability of a paint to hide the substrate. It varies, naturally, with the thickness of the applied film that may be influenced by the flow and application properties of the paint.

14.2 Determine the dry hiding power of traffic paints in accordance with Procedure A, Method 4121 of U.S. Federal Test Method [D2805](#) ~~Standard 141B. (This method is being rewritten in ASTM form.)~~

15. Color and Color Difference

15.1 The color of a paint may be determined precisely by means of a spectrophotometer. However, the exact color is not usually as important as how closely a paint matches a standard. Color difference between a product and a standard can be determined visually or with ~~less elaborate instruments than for color measurement.~~ a suitable instrument. Visual comparison of color is fast and often acceptable although numerical values are not obtained. ~~Color difference instruments, while not more sensitive than the eye,~~ Spectrophotometers provide numerical values that can be subsequently compared to later measurements.

15.2 If required, determine the color in terms of tristimulus values or chromaticity coordinates in accordance with Practice [E308](#).

15.3 Determine color difference by visual comparison against standard color chips⁴ in accordance with Practice [D1729](#). This practice covers the spectral photometric, and geometric characteristics of light source, illuminating and viewing conditions, size of specimens, and general procedures to be used in the visual evaluation of color differences of opaque materials.

15.4 Determine color difference instrumentally in accordance with Practice [D2244](#). The method covers the instrumental measurement of small color differences observable in daylight illumination between nonfluorescent, nonmetameric, opaque surfaces. The instrument used shall conform to all requirements of Guide [E179](#), Practice [E1164](#), Test Method [E1347](#), Test Method [E1349](#), and Practice [E308](#) (bidirectional 45°:0°, capable of reporting data for the CIE D65/2°, D6510°, or C/2° illuminant/observer conditions).

16. Reflectance

16.1 Reflectance is a measure of the light reflected from the surface of a paint. It determines which of two specimens appears lighter when viewed in average daylight at an angle that eliminates gloss effects.

⁴ The sole source of supply of the standard yellow color chips known to the committee at this time is ~~Traffic Control Systems Div., HTO-20, Office of Traffic Operations, Federal Highway Administration, Washington, DC 20590.~~ www.fed-std-595.com/FS-595-Paint-Spec.html. 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.