Designation: D7538 – 09 (Reapproved 2013)

Standard Practice for Evaluating the Water Wash-Off Resistance of Traffic Paints Using an Atomizing Spray Device[1]

This standard is issued under the fixed designation D7538; 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 A newly applied traffic paint film may be exposed to rain of varying intensities shortly after application. Practice D7377 describes a practice for evaluating the water wash-off resistance of traffic paints to a hard rain using a steady stream of water from a faucet at a rate of approximately 5.7 L per min. Practice D7538 is a similar practice that describes the use of an adjustable nozzle atomizing spray device to deliver a spray of water that simulates rain rates from approximately 0.05 to 0.5 L per min. This test can be used to compare conventional and fast-dry traffic paints for their relative ability to withstand rain soon after application on roadway surfaces.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *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]

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

D823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels

D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers

D1212 Test Methods for Measurement of Wet Film Thickness of Organic Coatings

D3924 Specification for Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials

D4414 Practice for Measurement of Wet Film Thickness by Notch Gages

D7377 Practice for Evaluating the Water Wash-Off Resistance of Traffic Paints using a Water Faucet

3. Terminology

3.1 *Definitions:*

3.1.1 *conventional waterborne traffic paint, n*—an aqueous traffic paint that uses a conventional-dry latex binder.

3.1.1.1 *Discussion*—Typical no-pick-up dry times, as prescribed in Test Method D711, for conventional traffic paints are 20 to 45 min.

3.1.2 *durable fast-dry waterborne traffic paint, n*—an aqueous traffic paint that uses a third generation durable fast-dry latex binder.

3.1.2.1 *Discussion*—Air or airless spray application on roadways is typically 0.64 mm wet or about 0.39 mm dry. The range of application for durable waterborne paints is 0.56 to 0.89 mm wet, but sometimes the durable paints are also striped at standard line thickness.

3.1.3 *fast-dry waterborne traffic paint, n*—an aqueous traffic paint that uses a fast-dry traffic latex binder.

3.1.3.1 *Discussion*—Typical no-pick-up dry times, as prescribed in Test Method D711, for fast-dry traffic paints are <10 min.

3.1.4 *standard line fast-dry waterborne traffic paint, n*—an aqueous traffic paint that uses a first or second generation fast-dry latex binder.

3.1.4.1 *Discussion*—Air or airless spray application on roadways is typically 0.38 mm wet or about 0.23 mm dry.

3.1.5 *waterborne traffic paint, n*—an aqueous traffic paint (usually white or yellow) containing either a conventional or fast-dry latex binder.

3.1.6 *water wash-off, n*—the erosion or removal of freshly applied traffic paint in the field by rain or in the laboratory using simulated rain.

3.1.6.1 *Discussion*—Sometimes referred to as water washout.

[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 D01.44 on Traffic Coatings.

Current edition approved Nov. 1, 2013. Published November 2013. Originally approved in 2009. Last previous edition approved in 2009 as D7538 – 09. DOI: 10.1520/D7538-09R13.

[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.

4. Summary of Practice

4.1 This practice involves preparing a series of uniform thickness films of traffic paint on standard substrates. The films are allowed to dry over different time periods in a conditioned environment, and then each paint film is subsequently subjected to a water spray. Films are wash-off resistant when no paint is removed by the water spray.

5. Significance and Use

5.1 After waterborne traffic paints are applied to a road pavement, it is important that they be sufficiently coalesced or cured so they will not be removed by rain. This practice can be used to determine the relative water wash-off resistance of waterborne traffic paints when exposed to a water spray simulated rain.

6. Apparatus and Equipment

6.1 *Paddle Type Viscometer,* to measure viscosity (in Krebs units) of the traffic paint prior to application.

6.2 *Conditioned Room,* at 23 ± 2°C and 50 ± 5 % relative humidity for film draw-downs and film drying.

6.3 *Humidity Gauge,* to record relative humidity during the drying period.

6.4 *Thermometers,* to record the air and water temperatures.

6.5 *Spatula,* to mix the paint prior to application.

6.6 *Glass Plates,* for film draw-downs (see also option for charts in 6.7).

6.7 *Draw-Down Chart,* preferred option for film draw-downs. Black Scrub Test Panels are preferred and can be cut in half to give two test panels of 16.5 by 21.6 cm size. Use of these charts instead of a glass plate allows for easier visualization of paint film removal.

6.8 *Film Applicator (15 cm width),* to obtain 0.38 mm wet thickness for standard traffic paints or 0.64 mm wet thickness for durable traffic paints.

6.9 *Wet Film Gauge,* to measure wet film thickness.

6.10 *Atomizing Spray Device (finger pumped, adjustable nozzle spray bottle or adjustable nozzle garden-type sprayer capable of delivering a continuous spray),* to provide a water spray as described in 8.2.

6.11 *Graduated Cylinder and Funnel or Beaker,* to determine the number of finger pumps (finger pumped spray device) or the time (continuous garden-type spray device) required to spray 25 mL of water.

6.12 *Timer,* to time the film-drying and the water spray periods.

7. Reagents

7.1 *Tap Water*—to partially fill the sprayer container.

7.2 *Acetone*—to clean glass plates prior to paint application (not needed for draw-down charts since they are not reused.)

8. Procedure

8.1 *Paint Consistency:*

8.1.1 Determine the Krebs (KU) viscosity of the paint in accordance with Test Method D562 using a paddle-type viscometer as prescribed by Test Method D562. This determination is optional but can be important since the dry time of the traffic paint and water-wash off performance can be affected by the paint viscosity.

8.2 *Calibration of Atomizing Spray Devices:*

8.2.1 Partially fill the finger pumped, adjustable nozzle spray bottle or adjustable nozzle garden-type sprayer with at least 250 mL of clean tap water and allow to equilibrate to room temperature.

8.2.2 Adjust the spray nozzle to deliver a 10 to 15 cm diameter spray area from a 15 cm distance.

8.2.3 For a finger pumped spray device, aim the spray into a funnel placed in a graduated cylinder or into a beaker to determine the number of finger pumps required to deliver 25 mL of water. The time to deliver 25 mL of water should be between 15 and 30 s.

8.2.4 Alternatively, for a continuous spray garden-type sprayer, determine the time to deliver 25 mL of water. The time to deliver 25 mL of water should be between 5 and 10 s.

8.3 *Application and Conditioning of Paint Films:*

8.3.1 Select the appropriate draw-down bar to obtain a 0.38 mm wet film thickness for standard traffic paints or a 0.64 mm wet film thickness for durable traffic paints. This determination should be made in advance using Practice D823 by making a series of draw-downs with different applicator gaps and measuring the wet-film thickness of each using Test Method D1212 or Test Method D4414. The actual wet film thickness is often much lower than the indicated film applicator gap, for example, a 0.64 mm gap may produce a 0.38 mm wet film thickness. Dry film thickness can optionally be determined using Test Method D1005. Clean glass plates with acetone, or optionally use the preferred black draw-down charts for the film draw-downs. Place about 10 ml of paint on the top center of the glass plate or draw-down chart and drag the draw-down bar over the paint to produce a coating of uniform thickness.

8.3.2 Immediately start a timer for each film drawn-down and place each coated panel in a conditioned room at 23 ± 2°C and 50 ± 5 % relative humidity, as defined in Specification D3924.

8.3.3 Allow the films to dry undisturbed for a set time period. Dry time intervals of 15, 30, 45 and 60 min. are suggested.

8.4 *Water Wash-Off Test:*

8.4.1 After the designated dry time interval, hold or affix the coated panel in a vertical position 15 cm from the spray nozzle.

8.4.2 Spray 25 mL of water by either counting the number of finger pumps or time interval as determined in the calibration procedure for the two types of spray devices (8.2.3).

8.4.3 Watch at the bottom of the panel for the first indication of paint washing off and note the number of finger pumps or time required to reach this point. The paint film is considered wash-off resistant when no paint is visibly washed down from the test area. Black substrates such as black vinyl draw-down charts are particularly useful for seeing and rating wash-off failure.

8.4.4 For clean-up of glass plates, run the plates under hot water to loosen the film and then scrape the paint off with a razor blade scraper. The draw-down charts can simply be discarded or retained for visual record.

9. Report

9.1 The following ideally should be recorded when using this practice:

9.1.1 Viscosity of the paint in Krebs Units (KU),

9.1.2 Drying conditions (temperature and humidity), wet film thickness, and dry time intervals for each draw-down,

9.1.3 Atomizing spray device used, distance to panel, and number of finger pumps (finger pump device) or time (continuous spray device) to deliver 23 mL of water, and

9.1.4 Number of finger pumps (finger pump device) or time (continuous spray device) to first indication of wash-off failure at each drying time interval.

10. Keywords

10.1 rain resistance; traffic paint; water spray; water wash-off test