Designation: D7377 – 09 (Reapproved 2013)

Standard Practice for Evaluating the Water Wash-Off Resistance of Traffic Paints using a Water Faucet[1]

This standard is issued under the fixed designation D7377; 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 traffic paint film freshly applied to a roadway, air strip, or parking lot may be exposed to rain of varying intensities shortly after application. This practice was designed to determine the relative water wash-off resistance of an applied traffic paint film under controlled laboratory conditions using a water faucet to simulate a heavy rain. This laboratory practice can also be used to compare conventional and fast-dry waterborne traffic paints and the effects of binders and other components in traffic for their relative ability to withstand a heavy rain soon after application.

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

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

D4414 Practice for Measurement of Wet Film Thickness by Notch Gages

3. Terminology

3.1 *Definitions:*

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

3.1.1.1 *Discussion*—Typical no-pick-up dry times for conventional traffic paints by Test Method D711 are 20 to 45 min. These paints are often used for zone marking of parking lots and garages.

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

3.1.2.1 *Discussion*—Air or airless spray application on roadways is typically 0.65 mm (25 mils) wet or about 0.41 mm (16 mils) dry. The range of application for durable waterborne paints is 0.56 to 0.89 mm (22 to 35 mils) wet, but sometimes durable paints are striped at standard line thickness. Typical no-pick-up dry times by Test Method D711 for durable paints applied at standard line thickness are 5 to 8 min.

3.1.3 *effective water wash-off dry time, n*—the traffic paint dry time required for no visible loss of coating when conducting the water wash-off Standard Practice.

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

3.1.4.1 *Discussion*—These paints are sometimes also referred to as fast-hardening since they still may contain a substantial amount of moisture even though they feel dry. Typical no-pick-up dry times by Test Method D711 for fast-dry traffic paints are <10 min.

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

3.1.5.1 *Discussion*—Air or airless spray application on roadways is typically 0.38 mm (15 mils) wet or about .223 mm (9 mils) dry. Typical no-pick-up dry times for standard line traffic paints by Test Method D711 are 5 to 8 min.

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

[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.

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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 Document Summary page on the ASTM website.

3.1.7 *water wash-off resistance, n*—the resistance of a traffic paint line to partial or complete wash-out during a rain.

4. Summary of Practice

4.1 This standard 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, and then each paint film is subsequently tested with the water-wash-off test to determine the relative amount of coating remaining at the end of the wash off period.

5. Significance and Use

5.1 After waterborne traffic paints are applied to a road, airstrip, or parking lot pavement, it is important that the paint films be sufficiently hardened, coalesced, or cured so they will not be removed by rain. This practice can be used to determine the relative performance of binders and other components within traffic paint for their effect on the water-wash off resistance of the coating. Some key elements of the coating that may affect water-wash-off performance are the quality and type of latex binder, the dry time of the coating (often conducted by Test Method D711), pigment volume concentration (PVC), and the relative water sensitivity of additives (for example, pigment dispersants, and surfactants) in the coating.

6. Apparatus and Equipment

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

6.2 *Conditioning Room,* to provide a constant standard environment of 23 ± 2°C (73.5 ± 3.5°F) and 50 ± 5 % relative humidity during film draw-downs and film drying.

6.3 *Conditioning Chamber,* convenient to provide a constant standard high humidity environment of 23 ± 2°C (73.5 ± 3.5°F) and 90 ± 3 % relative humidity during film draw-downs and film drying.

6.4 *Graduated Cylinder,* to determine and adjust water flow rate from faucet.

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

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

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

6.8 *Glass Plates,* for film draw-downs (see also option for charts in 6.9).

6.9 *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 (6½ by 8½ in.) size. Use of these charts instead of a glass plate allows for a permanent record of the test results.

6.10 *Film Applicator (15 cm (6 in.)) width,* to obtain 0.38 mm (15 mil) wet thickness for standard traffic paints or 0.64 mm (25 mil) wet thickness for durable traffic paints.

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

6.12 *Sink with combined hot and cold tap water faucet,* to apply water stream onto test panel film during the water wash-off testing.

6.13 *Lab Jack,* to support the applied paint film, and to control distance from the water nozzle.

6.14 *Timer,* to time the film-drying and the water wash-off periods.

6.15 *Camera,* to record the image of the panel after completion of the test.

7. Reagents

7.1 *Tap Water (Cold)*—applied to the film preferably with a standard nozzle, at controlled flow rate, controlled water temperature, and constant distance from the test paint films.

7.2 *Acetone*—to clean glass plates prior to 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 *Application of Paint Films:*

8.2.1 For most consistent results and for testing under controlled conditions, it is recommended that paint film draw-downs be applied and allowed to dry in a controlled temperature/controlled humidity (CTCH) room and/or in a small conditioning chamber. The conditioning chamber is convenient for high humidity testing. Standard conditions are shown in 6.2 and 6.3 respectively. Select the appropriate draw-down bar to obtain the desired film thickness. A 0.38 mm (15 mil) wet film thickness is typical for standard-line traffic paints, and a 0.64 mm (25 mil) wet film thickness is typical for durable traffic paints. The film thickness 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 25 mil gap may produce a 15 mil wet film thickness. Dry film thickness can optionally be determined using Test Method D1005. Clean a series of four glass plates with acetone, or optionally use the preferred black draw-down charts for the film draw-downs. Allow the glass plates or charts to equilibrate to room temperature. 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. Immediately start a timer for each film drawn-down, and allow the films to dry undisturbed for the designated time period. Let one film dry for exactly 15 min., one for 30 min., one for 45 min., and one for 60 min. At the end of each dry time period, the water wash-off test is conducted on the paint film (see 8.3).

8.3 *Running Water Wash-Off Test:*

8.3.1 Select a sink deep enough for the wash-off test with a minimum of 40 cm (16 in.) distance from the faucet nozzle to bottom of sink. Place a lab jack in the sink and adjust the height

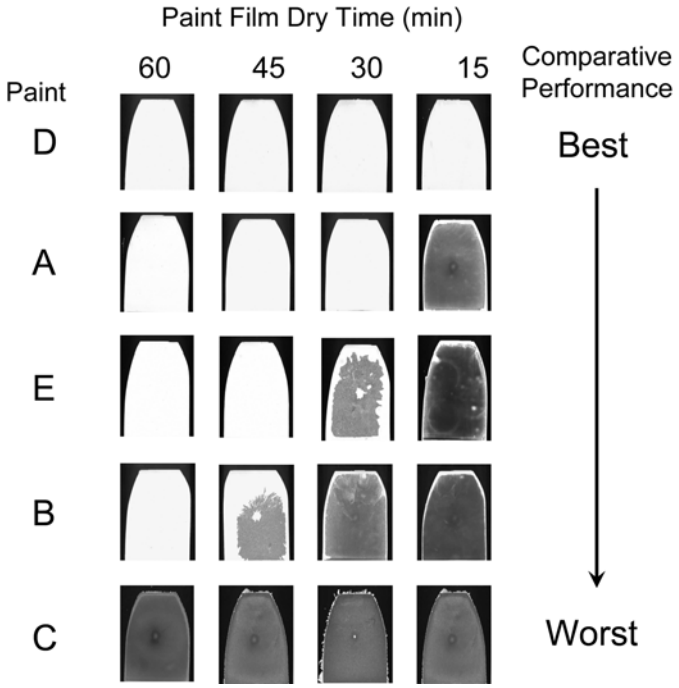

FIG. 1 Illustrative Example of Water Wash-Off Performance for a Traffic Paint Test Series

from the platform to the water faucet nozzle to keep the distance constant. A distance of 30.5 cm (12 in.) is standard. This adjustment is important particularly if different sinks are used for the test. The drain should remain unobstructed so that the sink does not fill with water during the test. Turn both the cold and hot water faucets on, and adjust the flow rate and water temperature to 5.7 L/min (1.5 gal/min) and 25°C respectively. The flow rate can be determined using a graduated cylinder to measure the volume over a fixed period of time. The standard nozzle opening is 1.0 cm (0.40 in.). Any deviation from nozzle size, flow rate, or water temperature will give different results and should be recorded if not standard. A flow regulator to control the water pressure may be helpful to provide the correct predetermined flow rate.

8.3.2 When the dry time is expired for a paint test film and with the water flow/temperature already adjusted, place the glass panel or draw-down chart on the lab jack. Move the faucet over the panel with the flow impinging on the center of the paint film and immediately start the timer. Watch the paint film and record the time it takes for the water to break through the film. Allow the film to remain under the flow of water for a full 5 min. and then remove it. Note any blistering or softening of the remaining paint film. At the appropriate times, test the remaining film panels in similar fashion. A camera can be used to obtain a picture for a comparative record of the test results. The black chart substrates are particularly good for contrast of the area washed off (black substrate will show through) with the remaining white or yellow paint films. If glass panels are used, they can be placed on a black substrate for similar contrast. 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.

8.4 *Relative Running Water Wash-Off Performance for a Test Series,* see Fig. 1.

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 times for each draw-down,

9.1.3 Water temperature, distance to panel, and water flow rate, and

9.1.4 Relative water wash-off performance comparisons for a given set of panels, that is, panels can be ranked from best to worst or pictures can be taken as a relative performance record, or both.

10. Keywords

10.1 rain resistance; traffic paint; water resistance; water wash-off; water wash-out