Designation: D 870 – 97

Standard Practice for Testing Water Resistance of Coatings Using Water Immersion[1]

This standard is issued under the fixed designation D 870; 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 practice covers the basic principles and operating procedures for testing water resistance of coatings by the partial or complete immersion of coated specimens in distilled or de-mineralized water at ambient or elevated temperatures. Although the apparatus and procedure could be employed in immersion tests using solutions of various materials in water, this practice is limited to tests in water alone.

1.2 This practice is limited to the methods of obtaining, measuring, and controlling the conditions and procedures of water immersion tests. It does not specify specimen preparation, specific test conditions, or evaluation of results.

NOTE 1—Alternative practices for testing the water resistance of coatings include Practices D 1735, D 2247, and D 4585.

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:*

D 609 Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products[2]

D 610 Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces[3]

D 714 Test Method for Evaluating Degree of Blistering of Paints[2]

D 823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, Lacquer, and Related Products on Test Panels[2]

D 1193 Specification for Reagent Water[4]

D 1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environment[2]

D 1730 Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting[5]

D 1735 Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus[2]

D 2247 Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity[2]

D 2616 Test Method for Evaluation of Visual Color Difference with a Gray Scale[2]

D 3359 Test Methods for Measuring Adhesion by Tape Test[2]

D 3363 Test Method for Film Hardness by Pencil Test[2]

D 4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers[3]

D 4585 Practice for Testing Water Resistance of Coatings Using Controlled Condensation[2]

3. Summary of Practice

3.1 Coated specimens are partially or wholly immersed in water in a container that is resistant to corrosion. The exposure conditions are varied by selecting: (*a*) the temperature of the water, and (*b*) the duration of the test. Water permeates the coating at rates that are dependent upon the characteristics of the coating and upon the temperature of the water. Any effects such as color change, blistering, loss of adhesion, softening, or embrittlement are observed and reported.

4. Significance and Use

4.1 Immersion in water can cause the degradation of coatings. Knowledge on how a coating resists water immersion is helpful in predicting its service life. Failure in a water immersion test may be caused by a number of factors including a deficiency in the coating itself, contamination of the substrate, or inadequate surface preparation. The test is therefore useful for evaluating coatings alone or complete coating systems.

4.2 Water immersion tests are used for research and development of coatings and substrate treatments, specification acceptance, and quality control in manufacturing. These tests typically result in a pass or fail determination, but the degree of failure may also be measured. A coating system is considered

[1] This practice is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.27 on Accelerated Testing.

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[2] *Annual Book of ASTM Standards,* Vol 06.01.

[3] *Annual Book of ASTM Standards*, Vol 06.02.

[4] *Annual Book of ASTM Standards*, Vol 11.01.

[5] *Annual Book of ASTM Standards*, Vol 02.05.