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Standard Practice for Evaluating Coatings Applied Over Surfaces Treated With Inhibitors Used to Prevent Flash Rusting of Steel When Water or Water/Abrasive Blasted[1]

This standard is issued under the fixed designation D 5367; 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 procedures to evaluate the compatibility of coatings with inhibitors used with water-blast cleaning surface preparation with or without abrasive to prevent flash rusting of steel prior to application of coatings.

1.2 *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:*

A 36 Specification for Structural Steel[2]

B 117 Practice for Operating Salt Spray (Fog) Testing Apparatus[3]

D 714 Test Method for Evaluation Degree of Blistering of Paints[4]

D 822 Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus[4]

D 1193 Specification for Reagent Water[5]

D 1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments[4]

D 2247 Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity[4]

D 3359 Test Methods for Measuring Adhesion by Tape Test[4]

D 4417 Test Methods for Field Measurement of Surface Profile of Blast Clean Steel[6]

D 4541 Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion Testers[6]

2.2 *Other Standards:*

SSPC-SP 5 Surface Preparation Specification No. 5, White Metal Blast Cleaning[7]

NACE TM-01-74 Laboratory Method for Evaluation of Protective Coatings Used as Lining Materials in Immersion Surfaces[8]

3. Significance and Use

3.1 Water-blast cleaning with or without abrasive will result in flash rusting under most environmental conditions. Inhibitors are used to prevent flash rusting while drying and before coating application. The inhibitor or reaction products of the inhibitor on the substrate becomes part of the coating systems. Coating performance may be influenced by the inhibitor. Soluble contaminants or unreacted inhibitors left on the surface under the coating may cause premature failure. This practice includes a comparison of coating performance with and without inhibitors using various laboratory tests to simulate a range of conditions such as high moisture, marine atmospheric or water immersion.

3.2 The user or specifier must determine the specific test methods to be used and exposure conditions. Some test methods referenced may not be applicable to all types of coatings.

4. Specimen Preparation

4.1 Carbon steel samples of an appropriate size, in accordance with Specification A 36 for the specified test method shall be white metal blast-cleaned in accordance with SSPC-SP 5 and measure profile in accordance with Test Methods D 4417. Select an abrasive that is suitable for use with water-blast applications. Control panels shall be coated with the same coating system and dry film thickness as the inhibitor-treated panels with the topcoat time as follows:

[1] This practice is under the jurisdiction of ASTM D-33 on Protective Coating and Lining Work for Power Generation Facilities and is the direct responsibility of Subcommittee D33.05 on Surface Preparation.

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[2] *Annual Book of ASTM Standards*, Vol 01.04.

[3] *Annual Book of ASTM Standards*, Vol 03.02

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

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

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

[7] Available from SSPC, 4400 5th Avenue, Pittsburgh, PA.

[8] Available from National Association of Corrosion Engineers, P.O. Box 218340, Houston, TX 77218.

Number of Panels for Each Exposure Test[A]	Topcoat Time 6–8 h	Topcoat Time 48–56 h
Dry Blasted—no inhibitor	2	2
Dry Blasted—inhibitor-recommended concentration	2	2
Dry Blasted—inhibitor-recommended concentration × 5	2	2

[A] For each of the test and topcoat times, one panel shall be designated as control and shall receive no exposure.

4.2 Test panels will be treated with the inhibitor by immersing the dry abrasive-blasted panel in a water solution, at 75 ± 10°F (24 ± 5.5°C), of the inhibitor at the concentration recommended by the inhibitor manufacturer and at five times this concentration (five times to simulate excessive concentration above that recommended by the inhibitor manufacturer). Use deionized water in accordance with Specification D 1193. Deionized water, Type II Reagent Grade, is used to minimize test variables. Tap water is typically used in the field and may contain varying amounts of salts.

4.3 Remove panel after 1 or 2 min immersion in the inhibitor solution and hang in a vertical position allowing the inhibited water solution to drain and dry at 75 ± 10°F (24 ± 5.5°C). If required by the inhibitor manufacturer, rinse panels with deionized water to remove excess inhibitor or in accordance with the manufacturer's recommendations (see also Specification D 1193).

4.4 After completely drying and prior to any appearance of flash rusting, apply the first coat of the coating system. Apply coating within 6 to 8 h to one set of control and exposure test specimens and apply coating to another set of control and exposure test specimens within 48 to 56 h. Select shorter times when inhibitor shows flash rusting before either of these time periods.

4.5 Record relative humidity range and drying time after treatment and before coating. Apply remaining coats as recommended by the coating manufacturer.

5. Procedure

5.1 Select as a minimum, one of the tests that best simulates the intended service condition of the coating system (see Table 1): Specification B 117, Practice D 2247, and NACE TM-01-74 Method B. Other tests on weathering, such as Practice D 822, or cyclic testing, elevated temperatures, chemical immersion, radiation or design basic accident (DBA) may also be used to examine inhibitors with a coating for specific exposure conditions.

5.2 Use a different time schedule for comparison testing depending on the generic coating being tested with the inhibitor. Schedule more frequent examination schedules in order to more accurately identify time when changes in coating conditions occur.

TABLE 1 Recommended Exposure Tests and Examination Schedules

	Exposure Test Method	Guide to Recommended Test Time Examination Schedule, h
Marine Atmosphere		
Steel panel size, in. ¼ by 4 by 12	Salt fog (Test Method B 117), (scribed)	1000
		2000
		4000
High Moisture Condensing Atmosphere, in.		
¼ by 3 by 8	Cleveland condensing (Practice D 2247)	500
		1000
		2000
Water Immersion, in.		
¼ by 3 by 12	Deionized water immersion NACE TM01-74, Method B	2190
		4380
		8760

5.3 Conduct two adhesion tests in accordance with Test Methods D 4541 or D 3359, Test Method B, elcometer or tape test procedures at each time period on both the control and exposure test samples.[9] Repair adhesion test areas before continuing the test.

6. Report

6.1 Report blistering and scribe corrosion as appropriate for the test method and report conditions of test samples in accordance with Test Methods D 714 and D 1654 at each test time. Report adhesion test values and where failure occurred for each test condition and time. Report sample preparation conditions including:

6.1.1 Abrasive blast profile in accordance with Test Methods D 4417,

6.1.2 Dry film thickness of each coat,

6.1.3 Inhibitor used and concentration,

6.1.4 Time between inhibitor treatment to coating application and relative humidity range, and

6.1.5 Coating, thinner and application method used.

7. Keywords

7.1 abrasive blasting; coatings; inhibitors; surface preparation; water blasting

[9] The two adhesion tests will not provide the precision, if any, indicated in the referenced methods.