Designation: D5367 – 16

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 D5367; 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 to prevent flash rusting of steel before application of coatings.

1.2 The inhibitors are used with water-blast cleaning surface preparation and may be used with or without abrasives.

1.3 The manufacturer of the coatings shall be consulted to ensure compatibility of inhibitors with the coatings.

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]

A36/A36M Specification for Carbon Structural Steel
B117 Practice for Operating Salt Spray (Fog) Apparatus
D714 Test Method for Evaluating Degree of Blistering of Paints
D1193 Specification for Reagent Water
D1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
D3359 Test Methods for Measuring Adhesion by Tape Test
D4417 Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
D4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
D4585 Practice for Testing Water Resistance of Coatings Using Controlled Condensation
D6677 Test Method for Evaluating Adhesion by Knife

2.2 *SSPC Documents:*[3]

SSPC-SP 5 Surface Preparation Specification No. 5, White Metal Blast Cleaning
SSPC-SP WJ-1/NACE WJ-1 Waterjet Cleaning of Metals Clean to Bare Substrate
SSPC-SP WJ-2/NACE WJ-2 Waterjet Cleaning of Metals Very Thorough Cleaning
SSPC-SP WJ-3/NACE WJ-3 Waterjet Cleaning of Metals Thorough Cleaning
SSPC-SP WJ-4/NACE WJ-4 Waterjet Cleaning of Metals Light Cleaning
SSPC-SP 5 (WAB)/NACE WAB-1 White Metal Wet Abrasive Blast Cleaning
SSPC-SP 10 (WAB)/NACE WAB-2 Near White Wet Abrasive Blast Cleaning
SSPC-SP 6 (WAB)/NACE WAB-3 Commercial Wet Abrasive Blast Cleaning
SSPC-SP 14 (WAB)/NACE WAB-8 Industrial Wet Abrasive Blast Cleaning
SSPC-SP 7 (WAB)/NACE WAB-4 Brush-Off Wet Abrasive Blast Cleaning
SSPC-TR2/NACE 6G 198 Wet Abrasive Blast Cleaning[3]

2.3 *NACE Document:*[4]

NACE TM-01-74 Laboratory Method for Evaluation of Protective Coatings and Lining Materials on Metallic Substrates in Immersion Service

3. Significance and Use

3.1 Water-blast cleaning with (SSPC-TR2/NACE 6G 198; SSPC-SP 5 (WAB)/NACE WAB-1; SSPC-SP 10 (WAB)/NACE WAB-2; SSPC-SP 6 (WAB)/NACE WAB-3; SSPC-SP 14 (WAB)/NACE WAB-8); SSPC-SP 7 (WAB)/NACE WAB-4 or without, (SSPC-SP WJ-1/NACE WJ-1; SSPC-SP WJ-2/NACE WJ-2; SSPC-SP WJ-3/NACE WJ-3; SSPC-SP WJ-4/NACE WJ-4) abrasive, results in flash rusting under some

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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] Available from Society for Protective Coatings (SSPC), 800 Trumbull Dr., Pittsburgh, PA 15205-4365, http://www.sspc.org.

[4] Available from NACE International (NACE), 15835 Park Ten Pl., Houston, TX 77084, http://www.nace.org.

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 A36/A36M 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 D4417. 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. Prepare panels representing 1) dry blasted with no inhibitor, 2) dry blasted with inhibitor at the recommended concentration, and 3) dry blasted with inhibitor at 5 times the recommended concentration. The test and control panels shall be coated on all surfaces, unless otherwise specified, within the time frames discussed in 4.4. The number of panels to be prepared should include the following for each test method/evaluation.

4.1.1 One (1) control panel for each surface prep and time to coat.

4.1.2 One (1) panel for each surface prep and time to coat for each test exposure period of Table 1 or as recommended by the test standard.

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 D1193. 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.

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 B117), (scribed)	1000 2000 4000
High Moisture Condensing Atmosphere, in.		
¼ by 3 by 8	Controlled condensation (Practice D4585)	500 1000 2000
Water Immersion, in.		
¼ by 3 by 12	Deionized water immersion NACE TM01-74, Method B	2190 4380 8760

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 D1193). Care should be taken not to allow the water/inhibitor solutions to puddle since this may cause a high concentration of inhibitor, after evaporation.

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 B117, Practice D4585, and NACE TM-01-74 Method B. Other tests on weathering 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.

5.3 Conduct adhesion testing of the control panels in accordance with Test Methods D3359, D4541, or D6677 as a reference value.

5.4 At each exposure time period listed in Table 1, remove one test panel from the test and conduct adhesion testing in accordance with Test Methods D3359, D4541 or D6677. Use the same test method and equipment for all panels in a given evaluation to facilitate the comparison.

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 D714 and D1654 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 D4417,

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

6.1.3 Inhibitor used and concentration,

6.1.4 Coating, thinner and application method used,

6.1.5 Dry film thickness of each coat.

7. Keywords

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