

SSPC: The Society for Protective Coatings

TECHNOLOGY GUIDE NO. 9

Guide for Atmospheric Testing of Coatings in the Field

1. Scope

1.1 This guide covers the procedures for planning, performing, and documenting field evaluations of atmospheric testing of coatings applied to steel panels or steel structures.

1.2 It is intended for coating systems applied to new or previously coated structures.

1.3 It is intended for use by coatings specifiers, end users, manufacturers, formulators, and test laboratories.

2. Description

2.1 USE OF GUIDE: Coating field evaluation data developed in accordance with this guide may be used to document field performance requirements of SSPC specifications, facility owner specifications, or other purchaser documents. SSPC specifications with field performance requirements include Paints 28, 29, 31, 34 and 36, and Painting System 24.

2.2 CONTENT OF GUIDE: The procedures for planning, performing, and documenting field evaluations are organized into the following steps, as outlined in Appendix A:

- Establish Scope and Objectives of Field Testing Program (Section 4)
- Select and Identify Coating Systems (Section 5)
- Select and Characterize Test Structure (Section 6)
- Apply Coatings (Section 7)
- Design Periodic Rating and Inspection Procedure (Section 8)
- Perform Field Inspection and Rating (Section 9)
- Assess and Analyze Data (Section 10)

3. Referenced Standards

3.2 SSPC AND JOINT STANDARDS:

PA 1	Shop, Field and Maintenance Painting of Steel
PA 2	Measurement of Dry Film Thickness with Magnetic Gages
PA Guide 3	A Guide to Safety in Paint Application
Paint 28	Water-Borne Epoxy Primer for Steel Surfaces
Paint 29	Zinc Dust Sacrificial Primer, Performance-Based

PS 24.00

Latex Painting System for Industrial and Marine Atmospheres, Performance-Based

SP 1

Solvent Cleaning

SP 2

Hand Tool Cleaning

SP 3

Power Tool Cleaning

SP 5/NACE No. 1

White Metal Blast Cleaning

SP 6/NACE No. 3

Commercial Blast Cleaning

SP 7/NACE No. 4

Brush Off Blast Cleaning

SP 10/NACE No. 2

Near White Blast Cleaning

SP 11

Power Tool Cleaning to Bare Metal

VIS 1

Guide and Reference Photographs for Steel Surfaces Prepared by Dry

Abrasive Blast Cleaning

VIS 2

Standard Method of Evaluating

Degree of Rusting on Painted

Steel Surfaces

3.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS:

A 36

Specification for Carbon Structural Steel

D 523

Test Method for Specular Gloss

D 610

Method of Evaluating Degree of Rusting on Painted Steel Surfaces

D 660

Test Method for Evaluating Degree of Checking of Exterior Paints

D 714

Test Method of Evaluating Degree of Blistering on Painted Steel Substrates

D 1654

Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

D 1729

Practice for Visual Evaluation of Color Differences of Opaque Materials

D 3359

Test Methods for Measuring Adhesion by Tape Test

D 4214

Test Methods for Evaluating Degree of Chalking of Exterior Paints

D 4417

Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel

D 4541

Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

D 4940

Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasive

D 5065

Guide for Assessing the Condition of Aged Coatings on Steel Surfaces

- F 1133** Practice for Inspecting the Coating System of a Ship's Underwater Hull and Boottop During Drydocking (withdrawn, replaced by F 1130)
- G 92** Practice for Characterization of Atmospheric Test Sites

3.4 NACE INTERNATIONAL STANDARDS:

- RP0287** Standard Recommended Practice for Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape

4. Establish Scope and Objectives of Field Testing Program

4.1 ESTABLISH OBJECTIVES: The evaluator should prepare a short written statement on the objectives of the field evaluation. Examples of objectives are as follows:

- To compare new coatings with standard (reference) coatings used by a facility.
- To evaluate the merits of a variety of new coatings for field practicality and performance.
- To evaluate the influence of surface preparation and coating application variations on coating performance.

Specific items to be addressed in the statement include:

- The intended exposure environment.
- The approximate or desired service life (e.g., comparison with standard).
- The type of structure.
- The condition of the steel.
- The primary functions of coatings (e.g., to provide corrosion protection, good appearance, and identification or safety related information).

It is recommended that the objective statement be signed or authorized by appropriate supervisory or management personnel.

4.2 DETERMINE SCOPE OF TESTING PROGRAM:

The evaluator should identify the general nature of the test program, including the type of candidate and control coatings, the intended exposure environment, and the type of structure.

4.2.1 Coating Systems

4.2.1.1 Candidate Coating: Identify the types of coatings to be evaluated (e.g., low-VOC alternatives or one-coat epoxy mastics), including type and thickness of primer, intermediate coat and topcoat (as appropriate), and total film build. Also identify the sources of the candidate coatings (e.g., submissions to a Qualified Product List [QPL]), new proprietary products,

or newly developed laboratory formulations). Adequate data to support special performance requirements, such as chemical resistance, should be available prior to field testing.

4.2.1.2 Control Coating: Include a control coating in the test to help account for the affect of the local environment on the coating performance. The specific control coating materials should be identified (e.g., standard coating in use at facility should be identified by brand and generic name or by Federal or SSPC specification). In addition, include a short explanation of why this particular control coating has been selected.

4.2.1.3 Surface Preparation: An important part of the coating system is the type of surface preparation to be evaluated in the program (e.g., blast cleaning or hand- or power-tool cleaning) and the specific degree of cleaning.

4.2.1.4 Regulations: Ensure that the materials and procedures selected comply with all local regulations. In addition, consider the impact of tests upon surrounding facilities and the local environment.

4.2.1.5 Exposure Environment: Identify the types of exposures for which the coatings are intended. An SSPC classification procedure may be used. If the environmental exposure zone is not one that is listed in Note 12.1, identify the specific type of chemical or condition (e.g., fumes, de-icing salts, or waste treatment plant peroxide fumes).

4.2.1.6 Surface Condition of Steel: Identify the surface condition of the steel to which each coating is to be applied, e.g., whether it is a new or existing surface and the degree of pitting and salt contamination. If the surface is coated, measure the dry film thickness and adhesion of the coating.

4.2.1.7 Structure Type: Identify the structure type (e.g., bridge, floor, or tank) or structural details desired (e.g., lattice work, crevices, or floating tank roof), including the type of steel, whether it is new or has been previously painted, and the area to be painted.

5. Select and Identify Coating Systems

5.1 This step is to identify, describe, and determine the sources of the candidate coating materials and the controls. In addition, the specific surface preparation and application details are to be established, along with any other special requirements.

5.2 COATING SYSTEM: The test will normally include candidate coating systems and control or reference coating systems. Together, the surface preparation procedure, coating materials, and application method make up a coating system. For each of the candidate and control coating systems, provide the following information:

5.2.1 Surface Preparation. The surface preparation for the test should be that expected to be done for a full-scale job application. Applicable SSPC standards include SSPC-SP 1 (Solvent Cleaning), SSPC-SP 2 (Hand Tool Cleaning), SSPC-SP 3 (Power Tool Cleaning), SSPC-SP 6/NACE No. 3 (Commercial Blast Cleaning), SSPC-SP 7/NACE No. 4 (Brush-Off Blast Cleaning), SSPC-SP 10/NACE No. 2 (Near-White Blast Cleaning), and SSPC-SP 5/NACE No. 1 (White Metal Blast Cleaning).

Certain preparation methods may require additional information such as the surface profile and method of measuring profile, the type and qualification of abrasive, and specific equipment or components such as nozzles, compressors, filters, and pressure for water jetting.

5.2.2 Coating Materials. The minimum information required for all coatings is the generic (chemical) type, number of components, volatile organic compound (VOC) content, recommended dry film thickness (DFT), number of coats, and the specific source of the product (e.g., brand name, or government or SSPC paint specification). Other physical properties that may be useful are the volume percent solids, theoretical spreading rate, active pigments (e.g., corrosion-inhibiting or sacrificial), dry time, and flexibility. Prior to the application of the coating, the evaluator must obtain product data sheets for application instructions and an MSDS for handling and safety instructions.

5.2.3 Application. The application procedure that would be used for full-scale application of the coating should be selected. If another procedure is used, consideration must be given to its effect on coating performance. Any application procedure must be approved by the coating manufacturer. Determine what information is to be monitored and recorded. The minimum information required is the application procedure, ambient weather conditions when the coating was applied, including air and surface temperatures, humidity and dew point, and time intervals after surface preparation and before painting, as well as between coats. Other information, such as the manufacturer of the spray equipment, may be desirable.

6. Select and Characterize Test Structure

6.1 SELECT STRUCTURE AND APPROPRIATE ENVIRONMENT: Based on the requirements set out in the planning stage, select a structure or structures in the appropriate exposure environment. Because of the limited availability of sites and access to structures, it is not always possible to match the exposure conditions proposed in the planning stage. Document the structure, test locations, and other local conditions that may affect the test with photographs and written records. A model report form is found in Appendix B.

When selecting a structure, the following points should be considered:

- Authorization to use for testing
- Clearances and access for application
- Access for inspection
- Security
- Condition of steel and configuration
- Environmental impact
- Expected duration of test site
- Direction of exposure for gloss retention studies

6.2 SELECT STRUCTURAL COMPONENTS FOR TESTING

6.2.1 Select a portion of the structure for the coating testing program. The portion should be readily dividable into a minimum of two locations. The different locations should be relatively similar in surface condition, exposure, corrosivity (e.g., exposure to chemicals, water runoff, and saltwater runoff), and structural configuration. The test location for each coating system should be picked at random. Test each coating system, including candidates and controls, in more than one location since the reliability of the results increases as the number of replicates increases. This will also permit comparisons of candidate coatings with control coatings and with one another. Document the selection with photographs.

6.2.2 Three levels of field site evaluations have been established:

Level A - Production Scale Structure Evaluation: Each test area should be a minimum of 40 square feet (4 m²). The area should include a variety of configurations representative of the actual structural surface, such as planar areas, edges, and welded or bolted connections.

Level B - Patch Scale Structure Evaluation: Each test area should be a minimum of 6 square feet (0.6 m²). If possible, at least two linear feet (0.6 m) of edge should be included in the test. Where early results are sought, scribes may be placed in three to five locations on the flat areas. With small areas, it is important that each candidate and each control system be applied on the most uniform area that can be found.

Level C - Test Panel Evaluation: Where suitable structural surfaces are not available, or where there are a relatively large number of systems to be evaluated, test panels may be used. Test panels should be a minimum of 4 by 6 inches (100 by 150 mm) in area, at least 1/8 inch (6.4 mm) thick. They should be made of hot-rolled steel meeting the requirements of ASTM A36 unless otherwise agreed upon. Alternatively, use hot-rolled steel similar to the steel in structures to be coated. A minimum of four replicate test panels for each coating system or control system is recommended. The panels may be placed on test racks on the ground, on test racks suspended from the structure, or individually suspended from structures. The location of each panel on the rack or elsewhere should be chosen at random. Electrical insulation of the panels from a structure or other support must be assured.