

SSPC: The Society for Protective Coatings

SSPC-PA 1

SHOP, FIELD, AND MAINTENANCE COATING OF METALS

1. SCOPE

1.1 This standard provides basic requirements for best practices for application of industrial/marine protective coatings to coated or uncoated metallic substrates, and is intended for use by both specifiers and contractors, either in its entirety or by referencing specific sections. It focuses on the coating application process and application-related items that are included as one element of the contractor's work plan or process control procedures. The scope of this standard includes specific as well as general requirements for the application of liquid coatings applied by brush, spray, or roller. Detailed descriptions of site preparation, surface preparation, pretreatments, or selection of primers and finish coats are beyond the scope of this standard. Appendix A provides additional information about the value and use of project-specific contractor work plans. Appendix B provides an example of language that can be used in procurement/specification documents to specify compliance with requirements of SSPC-PA 1. Appendix C provides a list of additional SSPC reference materials.

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3. REFERENCED STANDARDS

3.1 The latest issue, amendment, or revision of the referenced documents in effect at the time of publication of this standard is shown below and shall govern unless otherwise specified. Items preceded by an asterisk (*) are referenced in the Notes and are not requirements of the standard.

3.2 If there is a conflict between the requirements of any of the cited reference documents and this standard, the requirements of this standard shall prevail.

3.3 SSPC DOCUMENTS:

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| PA 2 (2015) | Determining Compliance to Dry Coating Thickness Requirements |
| PA 17 (2012) | Determining Compliance to Steel Profile Requirements |
| Guide 12 (1998) | Guide for Illumination of Industrial Painting Projects |
| Guide for Planning Coatings Inspection | |

3.4 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS:¹

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| D16 (2014) | Standard Terminology for Paint, Related Coatings, Materials, and Applications |
| D660-93 (2011) | Standard Test Method for Evaluating Degree of Checking of Exterior Paints |
| D714-02 (2009) | Standard Test Method for Evaluating Degree of Blistering of Paints |
| D4285-83 (2012) | Method for Indicating Oil or Water in Compressed Air |
| E337-15 | Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures) |

3.5 NACE INTERNATIONAL STANDARD:²

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| * SP0178 (2007) | Fabrication Details, Surface Finishing Requirements, and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Service |
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4. DEFINITIONS

BLISTERING: Formation of dome-shaped projections (blisters) in paints or varnish films resulting from local loss of adhesion and lifting of the film from an underlying paint film

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. 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.

² NACE International, 15835 Park Ten Place, Houston, Texas 77064. Phone 281-228-6200. <<http://www.nace.org>>

(intercoat blistering) or the base substrate. The standard test method for evaluating the degree of blistering of paints is described in ASTM D 714.

CHECKING: Fine cracking that develops in paint films during prolonged curing or weathering which does not penetrate to the underlying surface.

DEFECT: A surface or film imperfection (flaw), deficiency, or incompleteness that deviates from a specification or industry-accepted condition.

DRIP: A drop of wet coating that forms on or falls from the edge of the coated substrate.

DRY SPRAY: A rough, powdery, non-coherent film produced when an atomized coating partially dries before reaching the intended surface.

FIELD COATING: The on-site coating of new or previously coated metallic substrates.

HOLD POINT: Critical point in an operation where the process is stopped until the work completed to date has been evaluated against the project specification or work standard.

HOLIDAY: An unintentional void in a coating.

INDUCTION TIME: Sometimes called "sweat-in time," the time interval that must elapse after combining the mixed components of multi-component paint before satisfactory application can begin.

MAINTENANCE PAINTING: (1) In broad terms, all painting on industrial structures conducted for protection or aesthetics; (2) Any coating work conducted subsequent to the coating work associated with construction to ensure continuous protection of coated surfaces.

MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS: These (or similar terms such as Product Data Sheet) are used to refer to an equipment supplier's or coating manufacturer's latest published or written instructions and recommendations. Approval of these recommendations shall be obtained from the facility owner or authorized representative. Oral recommendations or instructions from an equipment or coating manufacturer are not acceptable unless backed up in writing by the manufacturer's technical staff.

PAINT: Any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate in a thin layer that is converted to an opaque solid film after application. Used for protection, decoration, identification, or to serve some other functional purposes.

PINHOLE: A holiday or discontinuity that extends entirely through a coating film, approximately the size of a pin; normally caused by solvent bubbling, moisture, or foreign particles.

POT LIFE: The length of time during which the mixed coating can be applied after combining two or more components of a multiple-component coating in accordance with the manufacturer's product data sheet.

PRECONSTRUCTION PRIMER: Thin primer coat for steel components, usually applied in a shop prior to construction of a structure, to provide temporary corrosion control during construction.

PRETREATMENT: (1) Chemical treatment to prepare a bare metal surface for painting; (2) A wash primer, such as vinyl butyral.

PROCESS CONTROL PROCEDURE: A detailed written description of a process to ensure that it is performed and evaluated consistently.

RUNS: Irregularities of a surface due to uneven flow, frequently due to application of a coat that is too heavy and not brushed out well. Also known as "sags" or "curtains."

SAGGING: The irregular downward flow of wet paint under the force of gravity to produce a thicker lower edge.

SHOP COATING: The surface preparation and coating of metallic substrates inside a shop or plant before shipment to the site, or when returned to the shop for refurbishment or repair.

STRIPE COAT: A coat of paint applied to edges, welds, rivet or bolt heads, nuts, rivets and other irregular surfaces on steel structures before or after a full coat is applied to the entire surface. The stripe coat is intended to give those areas sufficient film build to resist corrosion.

TIE COAT: A coating recommended by the manufacturer of a given paint system that creates an effective chemical or adhesive bond between two coats when the recoat window has been exceeded, or is needed to effect positive adhesion of a coating to a known existing coating system.

WORK PLAN: Document containing a list of all actions and procedures that a contractor should perform in logical sequence in order to meet all requirements of the procurement/specification documents.

WRINKLING: A defect that creates small furrows or ridges in a coating film.

5. REQUIREMENTS FOR HANDLING AND STORAGE OF COATING

5.1 All coating shall be delivered to the shop or jobsite in original, unopened containers with labels intact. Minor damage to containers is acceptable provided the container has not been punctured or the lid seal broken. The shipment shall be checked upon receipt to verify that:

- the correct material has been delivered
- the product was shipped in accordance with manufacturer's shipping requirements
- all material is from the same batch, unless otherwise specified

5.2 Each container of coating shall be clearly marked or labeled to show coating identification, date of manufacture, batch number, and other information as needed to meet regulatory requirements. The container label information shall be legible and shall be checked at the time of use to verify that the material's shelf life has not expired.

Each type of coating shall be accompanied by the manufacturer's Safety Data Sheet (SDS) and product data sheet (PDS).

5.3 Coatings shall be stored in original unopened containers in weather-tight spaces where the temperature is maintained between 40 °F and 100 °F (4 °C and 38 °C) unless otherwise recommended in writing by the manufacturer. The coating temperature shall be brought to the manufacturer's

written recommended application temperature before use. (See Note 15.1 for more information on coating storage.)

5.4 Coating shall be used before its shelf life has expired. A coating that has exceeded its shelf life shall not be used unless the contractor or applicator, with permission from the facility owner or authorized representative, has first obtained a certificate of conformance (COC) from the coating manufacturer. The COC shall verify the acceptability of that batch of coating for use for a specified period of time.

5.5 All containers of coating shall remain unopened until required for use. Coating that has livered, gelled, or otherwise deteriorated during storage shall not be used. Thixotropic materials that are within the viscosity range specified on the product data sheet shall be stirred to attain normal consistency.

6. REQUIREMENTS TO ADDRESS BEFORE COATING APPLICATION

6.1 AMBIGUOUS OR CONFLICTING APPLICATION INSTRUCTIONS OR REQUIREMENTS: Items needing clarification such as omissions, discrepancies, apparent errors, or conflicting requirements identified in the procurement/specification documents shall be identified, addressed and resolved prior to beginning the application process. The resolutions shall be documented. See Appendix A for additional information.

6.2 EXEMPT SURFACES: The contractor shall ensure that areas, components and fittings exempt from coating as identified in the procurement/specification documents are noted in any written communication with the application crew. The contractor shall ensure that the areas are protected with materials sufficient to withstand surface preparation and coating operations. If masking instructions are unclear or lacking in the project procurement/specification documents, the contractor shall obtain clarification from the facility owner or authorized representative or those who manage coating projects for the owner or authorized representative. Machine finished or similar surfaces that should not be coated, but do require protection, shall be protected as specified.

6.3 ILLUMINATION: The type of lighting fixtures and the level of illumination of the work area shall comply with the minimum requirements listed in SSPC-Guide 12 for the operation being performed (general work area, surface preparation and coating application, or inspection).

6.4 SURFACE PREPARATION

6.4.1 Immediately prior to coating application, the surface to be coated shall meet the level of cleanliness, surface profile and other surface condition requirements (e.g., grinding of welds and sharp edges) specified in the procurement/specification documents. If surface preparation requirements are not addressed in the procurement/specification documents, the surface shall meet the level of cleanliness and surface profile

requirements stated in the coating manufacturer's written recommendations. Unless otherwise specified by the facility owner or authorized representative, the surface cleanliness and profile shall be within the coating manufacturer's written recommendations for the intended service environment.

If the surface to be coated is degraded or contaminated subsequent to surface preparation and prior to coating, the contractor shall verify that the surface has been restored to the specified condition before coating application (see Note 15.2). When verified in accordance with SSPC-PA 17, the surface profile shall be within the profile range appropriate for the coating as specified in the procurement/specification documents, as shown on the product data sheet, or in the manufacturer's written application instructions.

6.4.2 Previously applied coating shall be roughened prior to overcoating whenever necessary for the development of proper intercoat adhesion (see Section 7.9). If special surface preparation procedures are required before application of field coats, the coating manufacturer's instructions shall be followed.

6.4.3 Weld Preparation: Before applying the coating, verify that all welds and all areas adjacent to welds meet, at minimum, the cleanliness level and profile range specified for the metallic substrate (see Section 7.4 and Note 15.3).

6.5 REQUIRED AMBIENT CONDITIONS

6.5.1 Temperature: The application of a coating system shall occur only when the air and substrate temperatures are within the ranges indicated by the manufacturer's written instructions for both application and curing and can be expected to remain in those ranges. Coatings shall not be applied outside the manufacturer's recommended temperature ranges without the written approval of the manufacturer and the facility owner or authorized representative (see Note 15.4).

6.5.2 Surface Moisture: Unless otherwise specified, or authorized by the facility owner or authorized representative, coating shall not be applied in rain, wind, snow, fog, or mist, or when the metallic substrate's surface temperature is less than 5 °F (3 °C) above the dew point. Coating shall not be applied to wet or damp surfaces unless the coating is formulated and certified by the manufacturer for this type of application. Coating shall not be applied on frosted or ice-coated surfaces.

6.5.3 Humidity: Because curing of coatings may be adversely affected by humidity that is too low or too high, no coating shall be applied unless the manufacturer's written recommendations for the humidity range are met (see Note 15.5).

6.5.4 Wind Speed: Unless otherwise specified by the facility owner or authorized representative, exterior application of paint shall cease when wind velocity reaches 25 miles per hour or more at the point of application, either in gusts or at a steady state (see Note 15.6).



6.6 PROTECTION OF EXPOSED SUBSTRATE FROM WEATHER: If ambient conditions are not suitable for coating application, the metallic substrate shall remain under cover or be protected by enclosure in containment until ambient conditions permit coating application to proceed.

6.7 REQUIRED PRETREATMENT

6.7.1 When specified, the surface shall be pretreated prior to application of the prime coat. The pretreatment shall be compatible with the specified primer as documented by the coating manufacturer.

6.7.2 The provisions of Section 5 and Section 6.4 shall also apply to pretreated surfaces and the materials used for this purpose.

6.7.3 In order to control the degradation or contamination of cleaned surfaces, the pretreatments, or, in the absence of a pretreatment, the prime coat, shall be applied as soon as possible after the surface has been cleaned and before degradation or contamination has occurred. Succeeding coats shall be applied before contamination of any existing coating occurs.

6.7.4 When chemical pretreatments are specified, sufficient time shall elapse between pretreatment and application of the prime coat to permit any chemical reactions to be completed and the surface to dry. Multi-component pretreatments shall be applied within the specified interval after mixing. When pretreatments are used, the instructions of the pretreatment manufacturer shall be followed.

6.7.5 Inhibitive water washes used to prevent rusting of cleaned surfaces prior to coating shall not be considered pretreatments. These shall be used only as specified and only if it is documented by the coating manufacturer that the inhibitor is compatible with the coating to be used and will not have adverse long-term effects on the performance of the coating. When specified, test patches shall be used to check adhesion of the coating prior to coating the entire surface.

6.8 MIXING OF COATING COMPONENTS

6.8.1 Manual mixing shall be limited to mixing/blending of low-viscosity single-component coatings. The coating shall be blended completely to ensure that all elements of the materials are suspended properly in the coating (see Note 15.7). Coating shall be strained or filtered after mixing according to the manufacturer's recommendations, except where application equipment is provided with strainers. Strainers shall be of a size to remove skins and undesirable matter, but not to remove the pigment.

6.8.2 The following are acceptable methods for mixing most single-component coatings:

6.8.2.1 Manual (Hand) Mixing: Most of the vehicle shall be poured off into a clean container. The pigment in the coating

shall be lifted from the bottom of the container with a broad, flat paddle. Lumps shall be broken up, and the pigment shall be thoroughly mixed with the remaining vehicle. The poured-off vehicle shall be returned to the coating with simultaneous stirring, until the composition is uniform.

6.8.2.2 Power Mixing: Power mixing of single-component materials is permitted unless otherwise recommended in product data sheets. Power mixing shall be carried out with a suitable high-torque variable-speed mixer at a sufficient speed to blend the materials. The agitator blade shall be capable of lifting material that dropped out of suspension off the bottom of the container. Care shall be taken to limit the speed to ensure that there is no entrainment or entrapment of air in the coating while ensuring that the blending action is suitable. Mixed coating shall not show evidence of air entrapment. Mixing of solvent-containing coatings in open containers shall be done in a ventilated area away from sparks or flames in accordance with applicable safety regulations.

6.8.3 Where a skin has formed in the container, the skin shall be cut loose from the sides of the container, removed and discarded. If the volume of such skins is visually estimated to be more than 2% of the remaining coating, the coating shall not be used.

6.8.4 Coating shall not be mixed or kept in suspension by means of an air stream bubbling under the coating surface.

6.8.5 Dry pigments that are separately packaged shall be mixed into coatings in such a manner that they are uniformly blended and all particles of the dry powder are wetted by the vehicle.

6.8.6 Multiple-component coatings shall be mixed in the correct proportions in accordance with the coating manufacturer's written recommendations. Proper mix ratio shall be maintained when mixing multi-component coatings to ensure that they are blended properly and achieve a proper cure.

6.8.7 Coating materials shall be pre-mixed prior to catalyzing or introduction into equipment to ensure that the material is homogeneous and all the solids are properly dispersed.

6.8.8 Catalysts, curing agents, or hardeners that are separately packaged shall be added to the base coating only after the latter has been thoroughly mixed. The proper volume of the catalyst shall then be slowly poured into the required volume of base with constant agitation. To avoid mixing incorrect ratios of components, mix only complete kits. Do not pour off liquid that has separated from the pigment and then add the catalyst to the settled pigment to aid mixing. The mixture shall be used within the pot life specified by the manufacturer. Therefore, only enough coating shall be catalyzed for prompt use. Most mixed, catalyzed coatings cannot be stored, and unused portions of these shall be placed in proper storage containers for later appropriate disposal (see Note 15.8).