

SSPC: The Society for Protective Coatings

PAINT APPLICATION SPECIFICATION NO. 7

Applying Thin Film Coatings to Concrete

1. Scope

1.1 This specification covers methods and procedures for applying thin film organic coatings to concrete surfaces by brush, roller, or spray. It is not intended for coatings applied to concrete floors or similar surfaces where thick coatings or surfacings are applied by trowel or mechanical equipment. Surface preparation, pretreatments, and selection of coatings are not covered, except where application requirements are affected, since these are discussed in referenced documents.

1.2 This specification is intended for use by owners, applicators, and others in the coating industry.

2. Description

2.1 This document was prepared to meet the unique physical and chemical properties of concrete and should not be used for the coating of other substrates.

2.2 This specification is only applicable to thin-film coatings.

3. Referenced Standards

3.1 The latest issue, revision, or amendment of the referenced standards in effect on the date of invitation to bid shall govern unless otherwise specified. Those documents marked with an asterisk (*) are referenced only in the Notes, which are not requirements of this specification.

3.2 If there is a conflict between the requirements of any of the cited referenced standards and this specification, the requirements of this specification shall prevail.

3.3 SSPC STANDARDS AND JOINT STANDARDS:

PA 1	Shop, Field, and Maintenance Painting of Steel
PA Guide 3	A Guide to Safety in Paint Application
PA Guide 5	Guide to Maintenance Painting Programs
Paint 32	Coal Tar Emulsion Coating
Paint 33	Coal Tar Mastic, Cold-Applied
*PS Guide 17.00	Guide for Selecting Urethane Painting Systems

***SP 12/NACE No. 5** Surface Preparation and Cleaning of Metals by Waterjetting Prior to Coating

***SP 13/NACE No. 6** Surface Preparation of Concrete
TU 2/NACE 6G197 Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment

3.4 ACI INTERNATIONAL (ACI) STANDARDS¹

*** 224.1R** Causes, Evaluation, and Repair of Cracks in Concrete Structures
*** 503R** Use of Epoxy Compounds with Concrete
504R Guide to Joint Sealants for Concrete Structures

3.5 ASTM INTERNATIONAL STANDARDS²

D 16 Terminology Relating to Paint Related Coatings, Materials, and Applications
*** D 2240** Standard Test Method for Rubber Property - Durometer Hardness
*** D 2583** Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
*** D 3363** Standard Test Method for Film Hardness by Pencil Test
D 4138 Standard Test Method for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means
D 4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
D 4285 Standard Method for Indicating Oil or Water in Compressed Air
D 4414 Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notch Gages
*** D 4541** Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
D 4787 Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
*** D 5064** Standard Practice for Conducting a Patch Test to Assess Coating Compatibility

¹ ACI International, P.O. Box 9094, Farmington Hills, MI 48333.

² ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2951.

- * **D 5402** Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs
- D 6132** Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Over Concrete Using an Ultrasonic Gage
- E 1907** Standard Practices for Determining Moisture-Related Acceptability of Concrete Floors to Receive Moisture-Sensitive Finishes
- F 1869** Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

3.6 INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI):³

- * **Guideline No. 03732** Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

3.7 NACE INTERNATIONAL STANDARD:⁴

- RP0188** Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Surfaces

3.8 AMERICAN WATER WORKS ASSOCIATION (AWWA) STANDARD:⁵

- C-203** Coal Tar Protective Coatings and Linings for Steel Water Pipelines — Enamel and Tape - Hot-Applied

4. Definitions⁶

Bituminous Coating: A protective asphalt- or tar-based coating applied as a hot melt, solvent cutback, or water emulsion.

Bug Holes: Small regular or irregular cavities, usually not exceeding 15 mm (0.6 inch) in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation.

Coating: A thin, liquefiable, or mastic composition that is converted to a solid protective, decorative, or functional adherent film after application as a thin layer. Generic term for paint, lacquer, enamel, etc.

Concrete: A composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregate, usually a combination of fine aggregate and coarse aggregate; in Portland cement concrete, the binder is a mixture of Portland cement and water.

Curing Agent: An additive component, sometimes called a hardener or (incorrectly) a catalyst, that helps a coating film or concrete cure by chemical reaction.

Efflorescence: A white crystalline or powdery deposit on the surface of concrete. Efflorescence results from leaching of lime or calcium hydroxide out of a permeable concrete mass over time by water, followed by reaction with carbon dioxide and acidic pollutants.

Form Release Agents: Compounds, such as petroleum oil, wax, and silicone, applied to concrete forms to allow easy removal from placed concrete after it has cured.

Laitance: A thin, weak, brittle layer of cement and aggregate fines on a concrete surface. The amount of laitance is influenced by the type and amount of admixtures, the degree of working, and the amount of water in the concrete.

Maintenance Coating: A coating designed to protect highway and railroad structures, chemical and manufacturing plants, public utilities, and other heavy-duty industrial facilities from deterioration.

Outgassing: The spontaneous discharge of air or moisture vapor from concrete.

Pores: Small interconnected voids, such as in concrete, which allow fluids to penetrate an otherwise impervious material.

Porosity: The ratio, usually expressed as a percentage, of the volume of voids in a material to the total volume of the material including the voids.

Thin Film Coatings for Concrete: In this document, thin film coatings are defined as coatings with less than 500 μm (20 mils) dry film thickness.

5. Pre-Application Procedures

5.1 MATERIALS HANDLING AND USE

5.1.1 All coating products shall be delivered to the work site in original, unopened containers with labels intact. Minor damage to containers is acceptable if the container has not been punctured or crimped or has had the lid seal broken. Each product shall have a readily accessible material safety data sheet.

5.1.2 Each container shall be clearly marked or labeled to show coating identification, date of manufacture, batch number, basic chemical composition, special instructions, and other information as needed to meet governmental requirements.

5.1.3 All containers of coating shall remain unopened until required for use. Containers should be opened only as necessary to provide material to the painters. Any mixed material that has exceeded the stated pot life shall be disposed of promptly and not used. The data on the container label shall remain legible throughout the use of the contents. See Note 13.1 for additional information on storage temperatures.

³ International Concrete Repair Institute, 1323 Shepherd Drive, Sterling, VA 20164.

⁴ NACE International, P.O. Box 218340, Houston TX 77218.

⁵ American Water Works Association, 6666 West Quincy Ave, Denver, CO 80235.

⁶ Definitions taken from SSPC Protective Coatings Glossary (SSPC 00-07) with the exception of the definition of Thin Film Coatings.

5.1.4 Coating that has livered, gelled, or otherwise deteriorated during storage shall not be used but removed from the work site. However, thixotropic materials that can be stirred to attain normal consistency may be used.

5.1.5 No coating shall be used which has exceeded its manufacturer's listed shelf life. While this is normally one year for most conventional coatings, products such as 100% solids coatings often have longer shelf lives and some vinyl esters have much shorter shelf lives. Toward this end, the oldest container of coating shall be used first. The owner, at his own discretion, may permit a coating that has exceeded its shelf life to be used, after recertification by the manufacturer.

5.2 MIXING: In all cases, the manufacturer's written instructions for mixing shall be followed, and the products shall be checked for complete uniformity.

5.2.1 Single Component Coatings: Single component coatings shall be thoroughly mixed to obtain a uniform composition. Coating that does not have a limited pot life or does not deteriorate on standing may be mixed at any time before using, but if settling or phase separation has occurred it must be remixed immediately before using. Coating shall not remain in spray pots, painters' buckets, etc., overnight but shall be stored in a covered container and remixed before use.

5.2.2 Multiple Component Coatings: For multiple component coatings, each component shall be thoroughly mixed before combining and further mixing. Normally, catalysts, curing agents, or hardeners are added to the base resin. The manufacturer's induction time (sweat-in time) and pot life for the ambient temperature and volume of coating used shall be observed. Any unused catalyzed coating shall be discarded at the end of its pot life, or each work day, whichever occurs first.

5.2.3 Mixing Dry Pigments: 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.

5.2.4 Mixing Pastes: Pastes shall be made into coatings in such a manner that the paste shall be uniformly blended and all lumps and particles broken up to form a homogenous coating.

5.2.5 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 thoroughly mixed with the remaining vehicle. The poured-off vehicle shall be returned to the coating with simultaneous stirring, or boxed until the composition is uniform. "Boxing" is the process of mixing coating by pouring from one container to another. The maximum container size for "boxing" shall be five gallons.

5.2.6 Power Mixing: The coating manufacturer's instructions shall be followed when power mixing (see Note 13.2).

5.2.7 Straining: All pigmented coating shall be strained after mixing except where application equipment is provided with strainers. Strainers shall be of a size to remove only skins and undesirable matter but not to remove the pigment.

5.2.8 Skins: 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.

5.2.9 Ventilation: Mixing of solvent-containing coatings in open containers shall be done in a well-ventilated area away from sparks or flames.

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

5.2.11 Plural Component Spray: When plural component spray equipment is used for application, each component of the coating shall be thoroughly mixed in accordance with the manufacturer's instructions and then applied by the plural component equipment in the ratio recommended by the manufacturer.

5.3 THINNING

5.3.1 No thinner shall be added to the coating unless necessary for proper application (see Note 13.3).

5.3.2 The type of thinner shall be that recommended by the coating manufacturer, and the amount of thinning shall not exceed that recommended by the manufacturer.

5.3.3 Each coating, after thinning, must conform to published government regulations regarding volatile organic compound (VOC) content.

6. Factors Affecting Application of Coatings to Concrete

6.1 MOISTURE

6.1.1 The moisture in the concrete shall be tested by the plastic sheet test (ASTM D 4263), by a calcium chloride test (ASTM E 1907 or ASTM F 1869), or by a moisture meter approved by the owner to establish that it meets the manufacturer's requirements for the specific coating used (see Note 13.4).

6.1.2 Coating shall not be applied in rain, fog, or mist or when the surface temperature is less than 3 C° (5 F°) above the dew point.