

SSPC: The Society for Protective Coatings

COATING APPLICATION STANDARD NO. 7

Applying Thin Film Coatings to Concrete

1. SCOPE

1.1 This standard covers methods and procedures for applying thin film (less than 500 μm [20 mils] thickness) 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 film (greater than 500 μm [20 mils]) coatings or surfacings are applied by trowel or mechanical equipment. Surface preparation, pretreatments, and selection of coatings are not addressed, except where application requirements are affected, since these are discussed in referenced documents.

1.2 This standard 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 shall not be used for the coating of other substrates.

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

2.3 Units of Measure: This standard makes use of both the IEEE/ASTM⁽¹⁾ SI 10, "American National Standard for Metric Practice" International System Units (SI) units and U.S. Customary units. The measurements are not exact equivalents; therefore each system must be used independently of the other without combining in any way. This standard uses SI units with the U.S. Customary conversions shown in parentheses.

3. REFERENCED STANDARDS

3.1 The date of the referenced standard in effect at the time of publication of this standard shall govern unless otherwise specified. Standards marked with an asterisk (*) are referenced only in the Notes, which are not requirements of this standard.

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

3.3 SSPC STANDARDS AND JOINT STANDARDS:

PA 9	Measurement of Dry Organic Coating Thickness on Cementitious Substrates Using Ultrasonic Gages
* 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) STANDARDS⁽²⁾

CT-16	ACI Concrete Terminology
* 224.1R	Causes, Evaluation, and Repair of Cracks in Concrete Structures

3.5 ASTM INTERNATIONAL STANDARDS

C1583/ C1583M	Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-Off Method)
D16	Standard Terminology for Paint, Related Coatings, Materials, and Applications
D4138	Standard Practices for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive, Cross-Sectioning Means
D4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
D4285	Standard Method for Indicating Oil or Water in Compressed Air
D4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages
* D4541	Standard Test Method for Pull-Off Strength of Coatings using Portable Adhesion Testers

⁽¹⁾ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Phone: 610-832-9500. For referenced ASTM standards, visit the ASTM website, <<http://www.astm.org>>

⁽²⁾ ACI International, 38800 Country Club, Farmington Hills MI 48331. Phone 248-848-3700, <<http://www.concrete.org>>

- D4787 Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
- * D5064 Standard Practice for Conducting a Patch Test to Assess Coating Compatibility
- D6132 Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Over Concrete Using an Ultrasonic Coating Thickness Gage
- * D7234 Standard Test Method for Pull Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
- * F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

3.6 INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)⁽³⁾

- * Guideline Selecting and Specifying Concrete No. Surface Preparation for Sealers, 310.2R Coatings, Polymer Overlays and Concrete Repairs

3.7 NACE INTERNATIONAL STANDARD⁽⁴⁾

- SP0188 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Surfaces

4. DEFINITIONS⁽⁵⁾

Coating: A thin, liquefiable, or mastic composition that is converted by evaporation, cross-linking, or cooling to a solid or semisolid protective, decorative, or functional adherent film after application as a thin layer. The solid or semisolid layer resulting from application of the composition above (ASTM D16). Generic term for paint, lacquer, enamel, etc.

Concrete: A mixture of hydraulic cement, aggregates, and water, with or without admixtures, fibers, or other cementitious materials (ACI).

⁽³⁾ International Concrete Repair Institute (ICRI), 10600 West Higgins Road, Suite 607 Rosemont, IL 60018. Phone: 847-827-0830. Pdf downloads available online from <<https://icri.site-ym.com/store/>>

⁽⁴⁾ NACE International, 15835 Park Ten Place, Houston, Texas 77084. Phone: 218-281-6200 Pdf downloads available online from <<https://store.nace.org/>>

⁽⁵⁾ Definitions from SSPC Protective Coatings Glossary 2011, except as noted.

Curing Agent: An additive component, sometimes called a hardener or (incorrectly) a catalyst, which helps a coating film on 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.

Feathering: Reducing the thickness of the edge of a dry paint film, such as the edge of a damaged area, by sanding or rubbing down prior to repainting.

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.

Surface Air Void: A small hole in a coating or on a surface of a coating, sometimes called a "bug hole."

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 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 and must be stored at temperatures between 10 and 32°C (50 and 90°F) unless otherwise stated by the manufacturer. Containers shall be opened only as necessary to provide material to the installers. 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.

5.1.4 Coating that has livered, gelled, or otherwise deteriorated during storage shall not be used but removed

from the work site. However, the use of thixotropic materials capable of being stirred to attain normal consistency is permitted.

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. Materials shall be rotated; the oldest material shall be used first.

5.2 MIXING: In all cases, the manufacturer's written instructions for mixing shall be followed. Care shall be taken to avoid air entrainment during the mixing process, and the products shall be checked for complete uniformity. The mixing container shall be scraped periodically to ensure complete blending.

5.2.1 Single Component Coatings: Single component coatings shall be thoroughly mixed to obtain a uniform composition. If settling or phase separation has occurred in the time between mixing and the start of application, the coating must be remixed immediately before using. Coating shall not remain in spray pots, etc., overnight, but shall be stored in a sealed 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 recommended induction 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 13.1).

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 13.2).

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 ASTM D4263, ASTM F1869, or ASTM F2170, to establish that the moisture content meets the manufacturer's requirements for the specific coating used (see Note 13.3).

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.