

SSPC: The Society for Protective Coatings

GUIDE NO. 11

Guide for Coating Concrete

1. Scope

1.1 This Guide describes basic procedures for surface preparation and application of coatings to concrete surfaces in industrial plants or commercial facilities.

1.2 The Guide is pertinent for both new construction and maintenance applications.

1.3 This Guide is intended for use by the owner's representatives and applicators.

2. Description and Definitions

2.1 DESCRIPTION

2.1.1 Coatings are applied to concrete surfaces to prevent degradation, to maintain appearance and to preserve purity of product contained within a concrete structure.

2.1.2 The major procedures covered in the Guide are surface preparation, coating application, inspection, and safety.

2.2 DEFINITIONS

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

2.2.2 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.

2.2.3 Curing Membrane: Materials applied to prevent the moisture in uncured concrete from evaporating too rapidly.

2.2.4 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.

2.2.5 Form Release Agents: Compounds such as petroleum oils, waxes, and silicones applied to forms to allow easy removal of forms.

2.2.6 Hydration: The reaction of water with the calcium silicate, aluminate or aluminoferrite components of fine cement grains, necessary for the setting and densifying of concrete. Hydration results in the formation of calcium hydroxide and colloidal gels which occupy a larger volume than the original cement.

2.2.7 Hydrostatic Pressure: The pressure exerted by water at rest.

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

2.2.9 Outgassing: The upward and outward emission of air or moisture vapor from concrete.

2.2.10 Surface Porosity: Porosity or permeability at the concrete surface that may absorb vapors, moisture, chemicals, and coating liquids. Small interconnected voids which allow fluids to penetrate an otherwise impervious material.

2.2.11 Surface Hardeners: Compounds applied to a concrete surface to improve hardness, and to decrease permeability.

3. Reference Standards

3.1 The standards referenced in this guide are listed in Sections 3.3 through 3.6 and form a part of this Guide.

3.2 The latest issue, revision, or amendment of the reference standards in effect on the date of invitation to bid should govern unless otherwise specified.

3.3 SSPC STANDARDS:

PA Guide 1 Shop, Field and Maintenance Painting of Steel

PA Guide 3 A Guide to Safety in Paint Application
SP 1 Solvent Cleaning

3.4 ASTM STANDARDS:

D 3359 Test Methods for Measuring Adhesion by Tape Test

- D 3363** Test Method for Film Hardness by Pencil Test
- D 4138** Test Method for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means
- D 4258** Practice for Surface Cleaning Concrete for Coating
- D 4259** Practice for Abrading Concrete
- D 4260** Practice for Acid Etching Concrete
- D 4263** Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
- D 4414** Practice for Measurement of Wet Film Thickness of Organic Coatings by Notch Gages
- D 4541** Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
- D 4787** Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
- D 5064** Process for Conducting a Patch Test to Assess Coating Compatibility
- D 6132** Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Over Concrete Using an Ultrasonic Gage

3.4.1 ASTM PUBLICATION:

ASTM 2800809014, 1990: Manual on Maintenance Coatings for Nuclear Power Plants

3.5 NACE INTERNATIONAL (NACE) STANDARDS:

- 6G191** Committee Report on Surface Preparation of Contaminated Concrete for Corrosion Control
- RP0188** Standard Recommended Practice for Discontinuity (Holiday) Testing of Protective Coatings
- RP0172** Surface Preparation of Steel and Other Hard Materials by Water Blasting Prior to Coating or Recoating
- RP0288** Inspection of Lining on Steel and Concrete

3.6 AMERICAN CONCRETE INSTITUTE (ACI) STANDARDS:

- 116R** Cement and Concrete Terminology
- 224.1R** Causes, Evaluation, and Repair of Cracks in Concrete Structures
- 504R** Guide to Joint Sealants for Concrete Structures

4. Surface Preparation of Concrete

4.1 REQUIREMENTS FOR PREPARING NEW CONCRETE FOR COATING APPLICATION:

4.1.1 Verify Concrete Cure: Unless otherwise recommended by the coating manufacturer, cure new concrete a minimum of 28 days before application of coatings. (See Note 9.2.)

4.1.2 Check for Excess Moisture: Prior to application of coatings, check for the presence of moisture beneath the surface according to the Plastic Sheet Method described in ASTM D 4263. Other appropriate alternate test methods may be submitted for consideration. Conduct the test on representative sections of each pour. If moisture is present, consult the coating manufacturer for required action.

4.1.3 Remove Surface Contaminants: Remove oil, grease, dirt, water, or other foreign contaminants before applying coatings. The concrete surface also needs to be free of excess water unless coating systems tolerant to damp surfaces are employed. Use methods described in 4.3.3.

4.1.4 Remove Surface Hardeners: If a surface hardener has been used on the concrete to be coated, abrasive blasting or some other means of mechanical surface preparation must be used to remove the hardener and roughen the surface. Use methods described in Section 4.3.2.

4.1.5 Remove Efflorescence and Laitance: Efflorescence and laitance shall be removed in accordance with methods described in Section 4.3.1 or 4.3.2. Laitance can create an eggshell surface over hidden voids; if not removed before painting, the laitance may disintegrate and leave unfilled holes on the surface, or cause the coating to disbond.

4.1.6 Remove Curing Membrane: Remove any curing membrane if required by the specification or if it is determined that the membrane would interfere with the adhesion or performance of the applied coating. Membranes shall be removed in accordance with methods in Section 4.3.2 or 4.3.4; consult manufacturer for recommended method.

4.1.7 Roughen Concrete Surface for Improved Adhesion: Roughen the concrete if required by the specification using the methods specified in 4.3.1 or 4.3.2. (See Note 9.3.)

4.1.8 Repair Forming Defects: The contracting parties should agree in advance on the treatment of defects which must be repaired. Repair and remove or fill all form voids, honeycombs, fins, and other surface irregularities