

Joint Surface Preparation Standard

SSPC-SP 13/NACE No. 6 Surface Preparation of Concrete

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Foreword

This standard covers the preparation of concrete surfaces prior to the application of protective coating or lining systems. This standard should be used by specifiers, applicators, inspectors, and others who are responsible for defining a standard degree of cleanliness, strength, profile, and dryness of prepared concrete surfaces.

This standard was originally prepared in 1997 by SSPC/NACE Joint Task Group F on Surface Preparation of Concrete. It was reaffirmed in 2003 by NACE Specific Technology Group 04 on Protective Coatings and Linings—Surface Preparation and SSPC Group Committee C.2 on Surface Preparation. This standard is issued by SSPC Group Committee C.2. and by NACE International under the auspices of STG 04.

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Section 1: General

1.1 This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.

1.2 The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces.

1.3 An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

1.4 When required, a minimum concrete surface strength, maximum surface moisture content, and surface profile

range should be specified in the procurement documents (project specifications).

1.5 The mandatory requirements of this standard are given in Sections 1 to 7 as follows:

Section 1:	General
Section 2:	Definitions
Section 3:	Inspection Procedures Prior to Surface Preparation
Section 4:	Surface Preparation
Section 5:	Inspection and Classification of Prepared Concrete Surfaces
Section 6:	Acceptance Criteria
Section 7:	Safety and Environmental Requirements

1.6 Appendix A does not contain mandatory requirements.

Section 2: Definitions

Coating: See *Protective Coating or Lining System*.

Concrete: A material made from hydraulic cement and inert aggregates, such as sand and gravel, which is mixed with water to a workable consistency and placed by various methods to harden and gain strength.

Curing (Concrete): Action taken to maintain moisture and temperature conditions in a freshly placed cementitious mixture to allow hydraulic cement hydration so that potential properties of the mixture may develop.

Curing Compound (Membrane Curing Compound): A liquid that can be applied as a coating to the surface of newly placed concrete to retard the loss of water.¹

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

Fin: A narrow linear projection on a formed concrete surface, resulting from mortar flowing into spaces in the form work.¹

Finish: The texture of a surface after consolidating and finishing operations have been performed.¹

Finishing: Leveling, smoothing, consolidating, and otherwise treating surfaces of fresh or recently placed concrete or mortar to produce desired appearance and service.¹

Hardener (Concrete): A chemical (including certain fluoro-silicates or sodium silicate) applied to concrete floors to reduce wear and dusting.¹

High-Pressure Water Cleaning (HP WC): Water cleaning performed at pressures from 34 to 70 MPa (5,000 to 10,000 psig).³

High-Pressure Waterjetting (HP WJ): Waterjetting performed at pressures from 70 to 210 MPa (10,000 to 30,000 psig).³

Honeycomb: Voids left in concrete due to failure of the mortar to effectively fill the spaces among coarse aggregate particles.¹

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.²

Lining: See *Protective Coating or Lining System*.

Placing: The deposition, distribution, and consolidation of freshly mixed concrete in the place where it is to harden.¹

Porosity: Small voids that allow fluids to penetrate an otherwise impervious material.

Protective Coating or Lining System (Coating): For the purposes of this standard, protective coating or lining systems (also called *protective barrier systems*) are bonded thermoset, thermoplastic, inorganic, organic/inorganic hy-

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brids, or metallic materials applied in one or more layers by various methods such as brush, roller, trowel, spray, and thermal spray. They are used to protect concrete from degradation by chemicals, abrasion, physical damage, and the subsequent loss of structural integrity. Other potential functions include containing chemicals, preventing staining of concrete, and preventing liquids from being contaminated by concrete.

Release Agents (Form-Release Agents): Materials used to prevent bonding of concrete to a surface.¹

Sealer (Sealing Compound): A liquid that is applied as a coating to a concrete surface to prevent or decrease the penetration of liquid or gaseous media during exposure. Some curing compounds also function as sealers.

Soundness: A qualitative measure of the suitability of the concrete to perform as a solid substrate or base for a coating or patching material. Sound concrete substrates usually exhibit strength and cohesiveness without excessive voids or cracks.

Spalling (Concrete): The development of spalls which are fragments, usually in the shape of a flake, detached from a larger mass by a blow, by the action of weather, by pressure, or by expansion within the larger mass.¹

Surface Porosity: Porosity or permeability at the concrete surface that may absorb vapors, moisture, chemicals, and coating liquids.

Surface Preparation: The method or combination of methods used to clean a concrete surface, remove loose and weak materials and contaminants from the surface, repair the surface, and roughen the surface to promote adhesion of a protective coating or lining system.

Surface Profile (Texture): Surface contour as viewed from edge.

Surface Air Voids: Cavities visible on the surface of a solid.

Section 3: Inspection Procedures Prior to Surface Preparation

3.1 Concrete shall be inspected prior to surface preparation to determine the condition of the concrete and to determine the appropriate method or combination of methods to be used for surface preparation to meet the requirements of the coating system to be applied. Inherent variations in surface conditions seen in walls and ceilings versus those in floors should be considered when choosing surface preparation methods and techniques. For example, walls and ceilings are much more likely than floors to contain surface air voids, fins, form-release agents, and honeycombs.

3.2 Visual Inspection

All concrete surfaces to be prepared and coated shall be visually inspected for signs of concrete defects, physical damage, chemical damage, contamination, and excess moisture.

3.3 Concrete Cure

All concrete should be cured using the procedures described in ACI⁽¹⁾ 308.⁴ Curing requirements include maintaining sufficient moisture and temperatures for a minimum time period. Surface preparation performed on insufficiently cured or low-strength concrete may create an excessively coarse surface profile or remove an excessive amount of concrete.

3.4 Concrete Defects

Concrete defects such as honeycombs and spalling shall be repaired. The procedures described in NACE Standard RP0390,⁵ ICRI⁽²⁾ 03730,⁶ or ACI 301⁷ may be used to ensure that the concrete surface is sound prior to surface preparation.

3.5 Physical Damage

3.5.1 Concrete should be tested for soundness by the qualitative methods described in NACE Publication 6G191⁸ or Paragraph A1.4.3.

3.5.2 When qualitative results are indeterminate, or when a quantitative result is specified, concrete shall be tested for surface tensile strength using the methods described in Paragraph A1.6.

3.5.3 Concrete that has been damaged because of physical forces such as impact, abrasion, or corrosion of reinforcement shall be repaired prior to surface preparation if the damage would affect coating performance. Repairs should be made in accordance with ACI 301,⁷ NACE Standard RP0390,⁵ or Paragraph A1.4.

3.6 Chemical Damage

3.6.1 Concrete is attacked by a variety of chemicals, as detailed in ACI 515.1R⁹ and PCA⁽³⁾ IS001.¹⁰

⁽¹⁾ American Concrete Institute International (ACI), 38800 International Way, Country Club Drive, Farmington Hills, MI 48331.

⁽²⁾ International Concrete Repair Institute (ICRI), 3166 S. River Road, Suite 132, Des Plaines, IL 60018.

⁽³⁾ Portland Cement Association (PCA), 5420 Old Orchard Rd., Skokie, IL 60077.

3.6.2 All concrete surfaces that have been exposed to chemicals shall be tested and treated for contamination as described in Paragraph 3.7.

3.6.3 Concrete that has been exposed to chemicals shall be tested for soundness by the qualitative methods described in NACE Publication 6G191⁸ or Paragraph A1.4.3.

3.7 Contamination

3.7.1 Contamination on concrete surfaces includes all materials that may affect the adhesion and performance of the coating to be applied. Examples include, but are not limited to, dirt, oil, grease, chemicals, and existing incompatible coatings.

3.7.2 Contamination may be detected by methods described in NACE Publication 6G191⁸ and Paragraph A1.5. These methods include, but are not limited to, visual examination, water drop (contact angle) measurement, pH testing, petrographic examination, and various instrumental analytical methods. Core samp-

ling may be required to determine the depth to which the contaminant has penetrated the concrete.

3.7.3 Concrete surfaces that are contaminated or that have existing coatings shall be tested by the method described in Paragraph A1.6.3 to determine whether the contamination or existing coating affects the adhesion and performance of the coating to be applied. Concrete surfaces that have existing coatings shall also be tested by the method described in Paragraph A1.6.3 to determine whether the existing coating is sufficiently bonded to the concrete.

3.7.4 In extreme cases of concrete damage or degradation, or thorough penetration by contaminants, complete removal and replacement of the concrete may be required.

3.8 Moisture

Moisture levels in the concrete may be determined by the methods described in Paragraph 5.6.

Section 4: Surface Preparation

4.1 Objectives

4.1.1 The objective of surface preparation is to produce a concrete surface that is suitable for application and adhesion of the specified protective coating system.

4.1.2 Protrusions such as from burrs, sharp edges, fins, and concrete spatter shall be removed during surface preparation.

4.1.3 Voids and other defects that are at or near the surface shall be exposed during surface preparation.

4.1.4 All concrete that is not sound shall be removed so that only sound concrete remains.

4.1.5 Concrete damaged by exposure to chemicals shall be removed so that only sound concrete remains.

4.1.6 All contamination, form-release agents, efflorescence, curing compounds, and existing coatings determined to be incompatible with the coating to be applied shall be removed.

4.1.7 The surface preparation method, or combination of methods, should be chosen based on the condition of the concrete and the requirements of the coating system to be applied.

4.1.8 All prepared concrete surfaces shall be repaired to the level required by the coating system in the intended service condition.

4.2 Surface Cleaning Methods

4.2.1 The surface cleaning methods described in Paragraphs 4.2.2 and 4.2.3 shall not be used as the sole surface preparation method of concrete to be coated as they do not remove laitance or contaminants or alter the surface profile of concrete. These methods shall be used as required, before and/or after the mechanical and chemical methods described in Paragraphs 4.3 and 4.4.

4.2.2 Vacuum cleaning, air blast cleaning, and water cleaning as described in ASTM⁽⁴⁾ D 4258¹¹ may be used to remove dirt, loose material, and/or dust from concrete.

4.2.3 Detergent water cleaning and steam cleaning as described in ASTM D 4258¹¹ may be used to remove oils and grease from concrete.

4.3 Mechanical Surface Preparation Methods

4.3.1 Dry abrasive blasting, wet abrasive blasting, vacuum-assisted abrasive blasting, and centrifugal shot blasting, as described in ASTM D 4259,¹² may be used to remove contaminants, laitance, and weak concrete,

⁽⁴⁾ ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.