

GUIDE FOR APPLYING SPI PURE POLYUREA PRODUCTS TO CONCRETE

1. SCOPE

- 1.1 This Guide describes basic procedures for surface preparation and application of SPI PURE POLYUREA PRODUCTS to portland cement 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 to be used by owner's representatives and applicators.

2. DESCRIPTION AND DEFINITIONS

- 2.1 DESCRIPTION
 - **2.1.1** SPI PURE POLYUREA PRODUCTS are applied to concrete surfaces to prevent degradation or water infiltration.
 - **2.1.2** The major procedures covered in this Guide are surface preparation, coating application, inspection, and safety.

2.2 DEFINITIONS

- **2.2.1** BUG HOLES OR VOIDS: Air pockets left on or near the surface of vertical formed concrete not removed during the vibration process.
- **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 course aggregate. In portland cement concrete, the binder is a mixture of portland cement and water.
- **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 stripping.
- **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. Laitance can create an eggshell surface over hidden void. If not removed before coating the laitance may disintegrate and leave unfilled holes on the surface or cause the polyurea to disband.
- **2.2.9** OUTGASSING: The upward and outward emission of air or moisture vapor from concrete.
- **2.2.10** PH: A measure of hydrogen ion concentration indicating whether a solution is acidic, alkaline, or neutral.



- **2.2.11** SURFACE POROSITY: The presence of numerous visible pits or pinholes in the concrete. Small interconnected voids which allow fluids to penetrate an otherwise impervious material.
- **2.2.12** SURFACE HARDENERS: Compounds applied to 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 to 3.6.
- **3.2** The latest issue, revision, or amendment of the references standards in effect on the date of invitation to bid should govern unless otherwise specified.
- **3.3** SSPC STANDARDS:

SSPC SP13 Surface Preparation of Concrete
PA Guide 3 A Guide to Safety in Paint Application

SP1 Solvent Cleaning

3.4 ASTM STANDARDS:

- D-3359 Standard 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 Abrading Concrete
- D-4260 Practice for Acid Etching Concrete
- D-4262 Test Method for determining pH of Chemically Cleaned or Etched Concrete Surfaces
- D-4263 Test Method for Indicating Moisture in Concrete
- D-4414 Practice for Measurement of Wet Film Thickness by Notch Gages
- D7234-12 Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
- D-4787 Practice of Continuity Verification of Liquid or Sheet Linings Applied to Concrete Surfaces.
- D-5064 Process for Conducting a Patch Test to Assess Coating Compatibility
- D7682-12 Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty

3.5 NACE STANDARDS:

6GI-91 Surface Preparation of Contaminated Concrete for Corrosion Control

RP0187-87 Standard Recommended Practice for Discontinuity (Holiday) Testing of Protective Coatings

RP0172-72 Surface Preparation of Steel and other Hard Materials by Water Blasting Prior to Coating or Recoating

3.6 ACI STANDARDS (See Note 9.1)

3.7 ICRI STANDARDS:

310.2R-2013 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair

4. SURFACE PREPARATION OF CONCRETE

- 4.1 Requirements for preparing new concrete for SPI PURE POLYUREA PRODUCTS application
 - **4.1.1** Verify Concrete Cure: Unless otherwise recommended by Specialty Products, Inc. cure new concrete for a minimum of 28 days before application of SPI PURE POLYUREA PRODUCTS. (See Note 9.2)
 - **4.1.2** Checking 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 Specialty Products, Inc. for required

- **4.1.3** Remove Surface Contaminants: Remove oil, grease, dirt, efflorescence, laitance, or other foreign contaminants before applying coatings. The concrete surface also needs to be free of water.
- **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 Curing Membrane: Remove curing membrane (if any), if it is determined that the membrane would interfere with the adhesion or performance of the applied SPI POLYUREA PRODUCTS. Membranes shall be removed in accordance with methods in Section 4.3.2 or 4.3.4 (consult manufacturer).
- **4.1.6** Roughen Concrete Surface for Improved Adhesion: Roughen the concrete if required by the specification using the methods specified in 4.3.2 (See Note 9.3).
- Repair Forming Defects: Fill or remove all form voids, honeycombs, fins, and other surface irregularities with a suitable repair or patching product which is compatible with the SPI POLYUREA PRODUCTS. Grind all form ties or other metallic protrusions below the surface and then patch or fill with a suitable material prior to coating. Consult Specialty Products, Inc. for recommendation on appropriate cure time(s) for patching materials before coating application.
- **4.2** Requirements for preparing aged concrete for SPI PURE POLYUREA PRODUCTS application.
 - **4.2.1** Evaluate General Condition of Concrete: Visually inspect for loose or deteriorated concrete. Identify any previous coatings and any deterioration in the condition (e.g., flaking, peeling, delamination). If possible, identify any contaminants on the surface such as chemicals, oil, or grease, residues of concrete, hardeners or curing membrane. Refer to NACE Standard 6G1-91.
 - **4.2.2** Determine compatibility of SPI PURE POLYUREA PRODUCTS with existing coating. If portions of the existing coating are sound and intact, determine the compatibility of SPI PURE POLYUREA PRODUCTS with the existing coating in accordance with ASTM D-5064. If SPI PURE POLYUREA PROUDUCTS are incompatible with the existing coating, the existing coating must be removed using methods in Sections 4.3.2 and 4.3.4.
 - **4.2.3** Remove Surface Contaminants: Oil, grease, dirt, efflorescence, laitance, or other foreign contaminants should be removed before applying. The concrete surface also needs to be free of water. Use methods described in 4.3.3.
 - **4.2.4** Remove Chemical Contaminants: Chemicals may have contaminated the surface due to exposure to chemical fumes, chemical immersion, or other conditions. Remove chemical contaminants using methods in 4.3 or by special methods to be established. If deep penetration is suspected, core sampling to one-third of the concrete depth is recommended. Refer to NACE 6G1-91.
 - **4.2.5** Produce Sound Surface: Ensure a sound surface with adequate surface roughness by abrading, scarifying, or acid etching of the concrete, using methods in 4.3.1 or 4.3.2.
 - **4.2.6** Repairing Defects: Evaluate and repair cracks, voids, and other defects in the concrete in accordance with owner's specifications. Refer to ACI 224.1R-89.
- **4.3** Methods of Concrete Surface Preparation
 - **4.3.1** Acid Etching: A procedure for acid etching of concrete surfaces is given in ASTM D-4260. Note: Acid etching must be used with caution because of the detrimental effect of residual acid(s) or unremoved salts on adhesion



and performance. This method is primarily used for horizontal surfaces. Practicality and personnel safety make it prohibitive to acid etch overhead concrete surface at the present time. While vertical surfaces are not normally acid etched, if acid etching is used on those surfaces, care must be taken to keep the concrete wet with the acid until the desired end result is achieved.

- **4.3.2** Abrading Concrete: Concrete may be abraded by methods such as air abrasive blasting, portable centrifugal wheel blasting, power tool cleaning, water-jetting with abrasive injection, and rotary peening or scarifying. Relevant standards include ASTM D-4259 and NACE RP 0172-72. A representative area of concrete at the jobsite can be prepared as specified and used as an acceptable standard after its acceptability is agreed on by involved parties. Note: Some methods of abrading concrete may result in surface weakening.
- **4.3.3** Surface Contaminant Removal: Cleaning methods include vacuuming, broom cleaning, air blast cleaning, water cleaning (low pressure), detergent cleaning, and steam cleaning. These methods are described in ASTM D-4258 and SSPC-SP-1. If solvent cleaning is needed to remove oil and grease it should be performed before abrading. Please consult Specialty Products, Inc. for recommended methods for cleaning of concrete.
- **4.3.4** Chemical Stripping: Previously applied coatings will usually be removed using the methods given in 4.3.2 but some coatings may be removed by chemical stripping. Chemical stripping consists of the application of a solvent or alkaline gel which strips the existing coating from the underlying concrete. Chemical stripping should only be performed after consulting with Specialty Products, Inc.
- **4.4** Special Conditions: Expansion/control joints, joint sealants, floor drains, floor termination points and corings or upturns require special attention. High traffic areas may require additional coating thickness or entail rebuilding during maintenance. Consult Specialty Products, Inc. for recommended procedures for surface preparation and SPI PURE POLYUREA PRODUCT application. Contact Specialty Products, Inc. for information on joint sealants.

5. STEPS PRIOR TO APPLICATION OF SPI PURE POLYUREA PRODUCTS

5.1 ENVIRONMENTAL CONDITIONS

Apply SPI PURE POLYUREA PRODUCTS according to specifications regarding the air and substrate temperature, dew point, and relative humidity. Consult Specialty Products, Inc. latest published technical data sheets and application instructions. Also observe recommendations given in SSPC PA 1.

- **5.2** SPECIAL PRECAUTIONS:
 - Protecting Below Grade Concrete: For concrete slabs or walls at or below grade, that will be internally lined or coated with SPI PURE POLYUREA PRODUCTS, a vapor barrier is mandatory on the unprotected side of the concrete. These below grade exterior surfaces of lined concrete structures need a complete vapor barrier system, such as a coating or sheet membrane, to create a continuous barrier in order to be effective.
 - **5.2.2** Outgassing: To minimize problems associated with outgassing. SPI PURE POLYUREA PRODUCTS should not be applied when concrete temperature is rising. See Note 9.9.4
 - **5.2.3** Surface Porosity: For concrete with unacceptable porosity, a filler or one of the full line of urethane and epoxy primers available through SPI as a sealer may be required. See Note 9.9.5. Contact an SPI technical representative for the product best suited for your application.
 - **5.2.4** Observe other special conditions or requirements as specified by the owner.
- **5.3** PRE-APPLICATION PROCEDURES:
 - **5.3.1** Data Sheets: Ensure that Specialty Products, Inc.'s latest published product application data sheets and material safety data sheets (MSDS) are available and reviewed before starting job.



- **5.3.2** MIXING: Ensure that SPI PURE POLYUREA PRODUCTS B Component is thoroughly mixed before start up. A power mixer with collapsible blades is necessary to adequately mix the product. Contact an SPI technical representative for further information. There shall be no thinning of SPI PURE POLYUREA PRODUCTS "A" or "B" Components.
- **5.3.3** EQUIPMENT: All application and mixing equipment shall be free of contaminants and be operated and maintained in accordance with latest published instructions from the manufacturer.

5.4 COATING APPLICATION

- **5.4.1** GENERAL: SPI PURE POLYUREA PRODUCTS shall be applied in accordance with Specialty Products, Inc. recommendations and according to good coating application practice as described in SSPC-PA 1.
- **5.4.2** SURFACE CLEANLINESS: Immediately prior to SPI PURE POLYUREA PRODUCTS application, check the concrete surface for dust removal.
- **5.4.3** DRY FILM THICKNESS: The film thickness shall be within the minimum and maximum levels specified. Dry thickness can be estimated based on coverage rates of 100 sq. ft. per gallon at 16 mils (1 sq. meter per liter at 1mm).

6. INSPECTION

- **6.1** DRY FILM THICKNESS: Measure dry film thickness of coatings up to 50 mils (1.2mm) in accordance with ASTM D-4138. This method will require patching of the coating.
- **6.2** ADHESION: Measure the bond strength of the coating to the concrete in accordance with ASTM D-3359 or ASTM D-4541. These methods will usually require patching of the coating and may require patching of the concrete.
- **6.3** HOLIDAY DETECTION: When specified, inspect for holidays in accordance with NACE RP-0187-87 or ASTM D-4787. This method may require patching of the coating, if holidays are found, or if holidays have to be intentionally made to set the test voltage.
- **6.4** CURE OF APPLIED COATING
 - **6.4.1** SPI PURE POLYUREA PRODUCTS will be tack free in 10-20 seconds. Service can normally resume in 30 to 60 minutes.

7. SAFETY, HEALTH AND ENVIRONMENTAL COMPLIANCE

- SAFETY AND HEALTH: Activities described in this standard shall be done in accordance with all safety and health precautions as described in the MSDS and relevant portions of SSPC PA-Guide 3, in addition to any applicable Federal, State, and local rules and requirements.
- **7.2** ENVIRONMENTAL COMPLIANCE: Activities described in this standard shall be done in compliance with applicable Federal, State and local environmental regulations.

8. DISCLAIMER

While every precaution is taken to ensure that all information furnished in this guide specification is as accurate, complete and useful as possible. Specialty Products, Inc. cannot assume responsibility nor incur any obligation resulting from the use of any materials, or methods specified therein, or of the specification or standard itself.



9. NOTES

9.1 The following ACI Standards, while not referenced in this document, may provide additional helpful information:

302.1 R-89 Guide for Concrete Floor and Slab Construction 224R-89 Control of Cracking in Concrete Structures

503.3-92 Standard Specifications for Producing Skid-Resistant Surface on Concrete by the use of a Multi-Component

Epoxy System

515.1 R-79 A Guide to the Use of Waterproofing, Damp-proofing, Protective and Decorative Barrier Systems

for Concrete

Also refer to NACE publications: 6G191, 6G175 and NACE standard RP0892-92.

9.2 New concrete generally requires a minimum 28 day curing time under favorable environmental conditions to achieve its design strength. SPI PURE POLYUREA PRODUCTS can be sprayed over damp or green concrete, however this may reduce adhesion and increase potential of water vapor and/or gas caused blisters.

9.3 Roughening the concrete surface will provide greater surface area for adhesion between the coating and the concrete.

9.4 Heating the concrete surface before application of SPI PURE POLYUREA PRODUCTS will enhance adhesion and reduce outgassing from bug-holes, voids, and capillaries.

9.5 One of the SPI Urethane or Epoxy primers or other approved primers/sealers may be used to improve surface tensile of the concrete as well as increase chemical bond.

WARNING & DISCLAIMER

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