



POLYSOURCE
INDUSTRIES

GUIDE FOR APPLYING “PSI” PURE POLYUREA PRODUCTS TO CONCRETE

1. Scope

- 1.1. This Guide describes basic procedures for surface preparation and application of “PSI” 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. “PSI” 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 alumino ferrite 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:**
 - PA Guide 1 Shop, Field, and Maintenance
 - PA Guide 3 Painting A Guide to Safety in Paint
 - SP 1 Application
 - 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 for 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
- D-4541 Method for Pull-Off Strength of Coatings Using Portable 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

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)

4. Surface Preparation of Concrete

4.1 Requirements for preparing new concrete for “PSI” PURE POLYUREA PRODUCTS application

- 4.1.1. **Verify Concrete Cure:** Unless otherwise recommended by “PSI” cure new concrete for a minimum of 28 days before application of “PSI” 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 “PSI” for recommendations.
- 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 “PSI” 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).
- 4.1.7. **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 “PSI” 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 “PSI” for recommendation on appropriate cure time(s) for patching materials before coating application.

4.2 Requirements for preparing aged concrete for “PSI” 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 “PSI” PURE POLYUREA PRODUCTS with existing coating. If portions of the existing coating are sound and intact, determine the compatibility of “PSI” PURE POLYUREA PRODUCTS with the existing coating in accordance with ASTM D-5064. If “PSI” PURE POLYUREA PRODUCTS 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 “PSI” 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 “PSI”.

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 “PSI” for recommended procedures for surface preparation and “PSI” PURE POLYUREA PRODUCT application. Contact “PSI” for information on joint sealants.

5. Steps Prior to Application of “PSI” PURE POLYUREA PRODUCTS

5.1. Environmental Conditions

Apply “PSI” PURE POLYUREA PRODUCTS according to specifications regarding the air and substrate temperature, dew point, and relative humidity. Consult “PSI’s” latest published technical data sheets and application instructions. Also observe recommendations given in SSPC PA 1.

5.2. Special Precautions:

5.2.1. Protecting Below Grade Concrete: For concrete slabs or walls at or below grade, that will be internally lined or coated with “PSI” PURE POLYUREA PRODUCTS, a vapor barrier requirements on the unprotected side of the concrete should be reviewed.

5.2.2. Outgassing: To minimize problems associated with outgassing. “PSI” 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 “PSI” as a sealer may be required. See Note 9.9.5. Contact an “PSI” 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 - Primer(s) & Pure Polyurea Coatings

5.3.1. Data Sheets: Ensure that “PSI’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 “PSI” 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 a “PSI” technical representative for further information. There shall be no thinning of “PSI” 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 Procedure - Primer(s) & Pure Polyurea Coatings

5.4.1. General: “PSI” PRIMER(S) & PURE POLYUREA PRODUCTS shall be applied in accordance with “PSI” recommendations and according to good coating application practice as described in SSPC-PA 1.

5.4.2. Surface Cleanliness. Immediately prior to “PSI” PRIMERS & 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. “PSI” 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

7.1. 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, Provincial and/or Municipal rules and requirements.

7.2. Environmental Compliance: Activities described in this standard shall be done in compliance with applicable Federal, Provincial and/or Municipal 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. “PSI” 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. New concrete generally requires a minimum 28 day curing time under favorable environmental conditions to achieve its design strength. “PSI” 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.

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

9.3. Heating the concrete surface before application of “PSI” PRIMER(S) & PURE POLYUREA PRODUCTS will enhance adhesion and reduce outgassing from bug-holes, voids, and capillaries.

9.4. One of the “PSI” Urethane or Epoxy primers or other approved primers/sealers may be used to improve surface tensile strength of the concrete as well as increase chemical bond.

Warning: These chemicals may present a fire hazard if improperly used. Each user of such products should determine whether there is potential hazard in a specific application and take the necessary precautions.

Disclaimer: The information herein is believed to be reliable, but unknown risks may be present. No warranties, express or implied, including patent warranties or warranties of merchantability or fitness for use, are made by "PSI". With respect to products or information set forth herein. Nothing contained herein shall constitute permission or recommendation to practice any invention covered by a patent without a license from the owner of the patent. Accordingly, buyer assumes all risks whatsoever as to the use of these materials and buyer's exclusive remedy as to any breach of warranty, negligence or other claim shall be limited to the purchase price of the material. It is recommended that each user conduct a sufficient investigation to establish the suitability of product application in any particular use. Failure to adhere to any recommended procedures shall relieve "PSI" of all liability with respect to the material and the use thereof.

Note: The material supplied is two components (Component "A"/Component "B") used to formulate "PSI" PURE POLYUREA PRODUCTS. The quality and characteristics of the finished polymer is determined by the mixture and application of the two components.

"PSI" has no role in the manufacture of the finished polymer other than to supply its two components. It is vital that the person applying this product understand the product and be fully trained and certified in the use of plural component equipment.

Polysource Industries Inc. ("PSI"), a BC Provincial copropration, warrants only that the two components of "PSI" PRIMER(S) & PURE POLYURE PRODUCTS shall conform to the technical specifications published in the product literature. The quality and fitness of the product is dependent upon the proper mixture and application of the components by the applicator. There are no warranties which extend beyond the description on the face of this instrument. "PSI" MAKES NO WARRANTY OF MERCHANTABILITY OF THE PRODUCT OR OF FITNESS OF THE PRODUCT FOR ANY PARTICULAR PURPOSE. "PSI" makes no warranty as to the quality of any product modified, supplemented, tinted or altered in any way after it leaves the manufacturing plant.

The liability of "PSI" for any non-conformity of the product to its technical specifications shall be limited to replacement of the product. The sole exclusive remedy of buyer, which is to have "PSI" replace any non-conforming product at no cost to buyer, is conditioned upon buyer notifying "PSI" or its distributor in writing of such defect within thirty days of the discovery of such defect. "PSI" shall not be liable for any direct, incidental, or consequential damages resulting from any breach of warranty.