GUIDELINE INSTRUCTIONS FOR CONCRETE SURFACE PREPARATION (FORM G-1, REVISED 02/26)

INTRODUCTION

The following concrete surface preparation guidelines serve as an aid to owners, design professionals, specifiers and contractors. All surfaces to receive Sherwin-Williams High Performance Flooring sealers, coatings, mortars and resurfacers must be structurally sound and clean. Proper surface preparation is an extremely important factor in the immediate and long-term successful performance of applied polymer floor or wall systems.

The contractor responsible for the installation of the polymer system shall be provided a substrate that is clean, durable, flat, pitched to specifications and free of surface contaminants. Providing the properly prepared substrate is the responsibility of the owner, the owner's appointed representative and the concrete contractor, unless specifically stated otherwise.

PROPER SURFACE PREPARATION

Proper surface preparation includes the following:

1. Inspection of the concrete substrate
2. Removal and replacement of non-durable concrete
3. Decontamination of the concrete surface
4. Creation of surface profile
5. Repair of surface irregularities

1. **Inspection of the concrete substrate** to determine its general condition, soundness, presence of contaminants, presence of moisture vapor emissions and the best methods to use in preparation of the surface to meet the requirements of the owner or the owner's appointed representative is critical. A proper evaluation will lead to the selection of the proper tools and equipment to accomplish the objective.
2. **Removal and replacement of non-durable concrete** must be accomplished prior to installation of the polymer system. Localized weak or deteriorated concrete must be removed to sound concrete and replaced with either cementitious or polymer concrete repair mortars or an engineered concrete mix design. For application of these systems and compatibility with the selected polymer sealer, coating, lining or topping, refer to the appropriate application guide or the Technical Service Department.
3. **Decontamination of the concrete surface.** ASTM D 4258-83 Standard Practice for Surface Cleaning Concrete for Coating: This practice includes surface cleaning the concrete to remove grease, dirt and loose material prior to the application of coatings. Procedures include vacuum cleaning, air blast cleaning, water cleaning, detergent water cleaning and steam cleaning.

Removal of bond inhibiting contaminants: This includes, but is not limited to, removal of oils, grease, wax, sealers, curing compounds, laitance, salts and any other hydrocarbon-based materials. This will ensure that a good bond takes place between the resinous flooring and the concrete substrate.

Removal of adhesives, mastics and membranes: In many retrofit projects, existing tile, VCT or sheet goods are being replaced with polymer flooring systems. Removal of the floor finish will often leave a layer of some type of mastic, adhesive or membrane. In thin applications, these materials can often be completely cleaned up by shotblasting the concrete. In thicker applications, the steel shot will tend to bounce, requiring additional preparation with the use of grinding equipment.

A simple method to ensure you have sound concrete is to test the pH. The chemistry of concrete is alkaline in nature. Normal concrete should be in the range of 11-13. Most of the contaminants mentioned are neutral to acidic in nature. After preparation, test the floor in multiple locations using distilled water and the pH paper. If the pH is 10 or lower, additional preparation will be required to ensure a good bond. In areas where the contaminants cannot be removed, the contaminated concrete must be removed and replaced as in Step 2 above.

CAUTION: Decontamination methods that introduce large amounts of water may contribute to moisture-related problems as referenced in APPENDIX A.

4. **Creation of surface profile** can be accomplished by a number of methods, each utilizing a selection of tools, equipment and materials to accomplish the intended purpose. Selection is dependent upon the type of surface to be prepared and the type of system to be installed. In addition, floors, walls, ceilings, trenches, tanks and sumps each have their own particular requirements. The type and thickness of the selected polymer system also plays an important role in the selection process. Regardless of the method selected or tools employed, we must provide a surface that will accept the application of polymer-based products and allow the secure mechanical bond of the polymer to the concrete. The type of service the structure will be subjected to will also help to define the degree of profile required. The surface profile is the measure of the average distance from the peaks of the surface to the valleys as seen through a cross-sectional view of the surface of the concrete.

   This dimension is defined pictorially and through physical samples in the ICRI Technical Guideline No. 310.2, and is expressed as a Concrete Surface Profile number (CSP 1-10).

Source: International Concrete Repair Institute

SHERWIN-WILLIAMS HPF SYSTEM		CSP 1	CSP 2	CSP 3	CSP 4	CSP 5	CSP 6
Resuflor™ Grind and Seal Resuflor Vent-E			■				
Accelera™ S Crylaflor™ Shield Resuflor Aqua systems Resuflor Gard systems Resuflor NMP Performance EV Resuflor Performance HPS	Resuflor Performance HTS Resuflor Topcoat FX Resuflor Topcoat Metallic II Resuflor Topcoat SDE Resuflor Topcoat SDU and SDU EV		■	■			
Accelera B, C, Q, HB, HC and HQ systems All Crylaflor systems except Crylaflor Shield All Hybri-Flex™ systems Poly-Crete™ SLB Resuflor Deco Flake systems	Resuflor Deco Quartz systems Resuflor Gard SL Resuflor Mechanical Room systems Resuflor Shop Floor systems Resuflor TopFloor systems SofTop™ systems			■	■		
Cemlack™ Terrazzo Poly-Crete MD, MDB, MDC and MDQ systems Resuflor Terrazzo TG				■	■	■	
Cemlack UM Poly-Crete WR Resuflor Screed systems				■	■	■	■
Poly-Crete HF					■	■	■

5. **Repair of surface irregularities** including bugholes, spalls, cracks, deteriorated joints, slopes, areas near transition zones such as around drains and doorways, etc., must be repaired prior to the placement of the polymer system and/or the system must be designed to offset the thickness of the irregularities. For removal and replacement information and materials, refer to Step 2 above. For bugholes and other minor surface irregularities, fill with epoxy quick patch Resuflor 3500, Resuflor 3513, Resutile 4700 Instant Patch Resin, Poly-Crete MD, WR, UM or other approved Sherwin-Williams HPF patching products. For treatment of cracks and joints, refer to the section below entitled CRACK ISOLATION. For additional questions, contact the Technical Service Department or your local sales representative for specific recommendations.

   For specific applications, always consult Sherwin-Williams System Overviews, Application Guides, data sheets or a Technical Service representative.

METHODS OF SURFACE PREPARATION

Depending upon conditions of the concrete, one or more methods of surface preparation may be required. It is common for decontamination to precede mechanical preparation, and if necessary a second decontamination to follow.

CAUTION: The use of high-pressure water jetting will introduce large amounts of water, which may contribute to moisture-related problems as referenced in APPENDIX A. Surfaces to receive the bonded polymer system must be inspected after the surface is prepared to ensure that the substrate is sound and structurally durable. Areas found to be unsound or non-durable must be removed and replaced as described in Step 2 above. Dust or other deleterious substances not removed after the initial surface preparation must be vacuumed, leaving the surface dust free and clean.

Other surface preparation methods are mentioned in ADDITIONAL SURFACE PREPARATION REFERENCES below.

CRACK ISOLATION

The performance of elastomeric products such as Resuflor 3555 or Resuflor EOC internally flexible epoxy requires a relatively uniform dry film thickness to resist drying shrinkage and thermal movement of the concrete while maintaining a seamless bridge or seal over the concrete. Therefore it is critical that all mortar splatter, protrusions, ridges, penetrations or sharp projections in the surface of the concrete be ground smooth or otherwise made smooth, in addition to the normal surface preparation outlined above.

Prior to application of an elastomeric system, control/contraction joints, construction joints and cracks should be sealed with the selected system flexible sealant, i.e., Resuflor 3580 joint and crack filler. This coating should extend a minimum of 6″ on either side of the joint or crack. The entire surface area should then receive the specified crack isolation system. Isolation and/or expansion joints should be detailed in accordance with the plans and specifications of an architectural or engineering design professional for the type of structure being considered. Consult the Technical Service Department for the proper selection and use of isolation materials and the potential use of fiberglass scrim cloth for additional crack bridging capabilities. Please refer to our crack and joint details documents.

NOTE: Sherwin-Williams High Performance Flooring systems can be applied to a variety of substrates if the substrate is properly prepared. Preparation of surfaces other than concrete or steel, such as wood, concrete block, brick, quarry tile, glazed tile, cement terrazzo, vinyl composition tile, plastics and existing polymer systems, can be accomplished to receive bonded polymer sealers, coatings or toppings. For questions regarding a substrate other than concrete or steel, or a condition not mentioned in this Guideline, contact the Technical Service Department prior to starting the project.

ADDITIONAL SURFACE PREPARATION REFERENCES

Important and relevant information on surface preparation of concrete is available by referencing the following codes, standards and guidelines.

ADDITIONAL SURFACE PREPARATION REFERENCES	
AMPP	Association for Materials Protection and Performance, 800 Trumbull Drive, Pittsburgh, PA 15205, (412) 281-2331 • SSPC-SP 13 Surface Preparation of Concrete • SSPC-TU 2/NACE 6G197 Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment
ICRI	International Concrete Repair Institute, 38800 Country Club Drive, Farmington Hills, MI 48331, (248) 848-3809 • Technical Guideline No. 310.2, "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays." Includes visual standards to act as a guide in defining acceptable surface profiles for the application of industrial coatings and polymer floor toppings. • Technical Guideline No. 03730, "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion"
ASTM	American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, (610) 832-9585 • ASTM D4258 "Practice for Surface Cleaning Concrete for Coating" • ASTM D4260 "Standard Practice for Acid Etching Concrete" • ASTM D4261 "Practice for Surface Cleaning Unit Masonry for Coating" • ASTM D4262 "Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces"

APPENDIX A: TESTING FOR MOISTURE VAPOR EMISSION FROM CONCRETE

Excess moisture in concrete can produce harmful effects of discoloration, interruption of the polymerization of products, and delaminating of non-permeable resinous systems. Sources of moisture fall into three distinct categories: moisture present at the surface prior to or during application, moisture within the concrete that attempts to escape during and after application, and a distinct source of moisture in intimate contact with the concrete that provides a continuous supply of moisture. Avoiding moisture-related problems and understanding the options available for remediation once they occur is important. Detecting moisture in concrete may be accomplished by employing a number of methods briefly described below:

ASTM F2170-19a – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes — The test method, modeled after the process used in Europe for several years, requires drilling holes at a diameter of 5/8″ to a depth equal to 40% of the slab's thickness. The hole is then lined with a plastic sleeve, capped and allowed to acclimate for 72 hours. The probe is placed in the sleeve, allowed to equilibrate for 30 minutes, and then readings are recorded.

Acceptable relative humidity readings for substrates receiving non-permeable flooring are 80% or lower. Testing should take place in an acclimated building and is required to equal three tests in the first 1,000 square feet, with one additional test per each additional 1,000 square feet of concrete slab surface. This test method is less subject to conditions occurring at the concrete surface that may influence calcium chloride test results. This method only defines existing moisture content of the sample and cannot address moisture vapor transmission.

ASTM D4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method — This qualitative method will indicate the presence of moisture movement, but it will not quantify the amount of moisture movement and is only useful in determining whether additional testing is required.

ASTM F1869-23 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride Moisture Emissions Test — This ASTM test must be conducted over raw exposed concrete which has been exposed to the environment for at least 24 hours. A quantitative evaluation is conducted wherein the anhydrous calcium chloride container and contents are pre-weighed on a gram scale, allowed to remain in its container with the lid removed, and the container placed under a sealed dome to prevent loss of moisture for a period of 60-72 hours.

Three tests are required for the first 1,000 square feet, with one additional test for every 1,000 square feet or fraction thereafter. These results are quantified as the rate of moisture vapor transmission expressed as pounds per 1,000 square feet of surface area per 24 hours.

Sherwin-Williams High Performance Flooring has adopted a commonly accepted value for application of polymer coatings or toppings to be not more than 3 pounds of moisture per 1,000 square feet per 24 hours.

Moisture content and moisture movement are merely snapshots in time of dynamic conditions within the concrete. Moisture vapor movement is dependent upon the relationship between temperature and humidity of the two adjacent environments — in this case, the internal environment of concrete and the external environment of the air surrounding the concrete.

The Moisture Vapor Test Kit values will not be useful in predicting possible problem areas unless the tests are conducted in the environment in which the structure will be used. The air temperature and humidity around the concrete during the test should be the same air temperature and humidity that will be in place during the useful life of the structure. Contact the Technical Service Department if there are any questions concerning the use of the test kits or interpretation of the results.

To successfully and predictably reduce moisture vapor emission rates, apply one of the following remediation systems:

- Poly-Crete SLB, MD, MDB, HF
- Hybri-Flex systems
- Resuflor Aqua MCS
- Resuflor Vent-E
- Resuprime™ MVB, MVP, MVP3

Consult with the Technical Service Department for specific recommendations and utilize in accordance with application instructions. For slabs with potential moisture issues, utilizing systems that are designed to accommodate moisture movement from the slab such as Poly-Crete SLB, Resuflor Aqua, Resuflor Vent-E and Resuprime MVB, MVP or MVP3 may be the most cost-effective alternative. Whenever moisture issues present themselves on a project, document the conditions, inform the owner representative and consult with Sherwin-Williams High Performance Flooring Technical Service personnel.

NOTE: Concrete curing is the chemical process that gives concrete strength and the industry standard for curing concrete is 28 days. This is not always sufficient time to allow excess moisture to leave a concrete slab, and may cause issues with a non-permeable flooring installation. To minimize moisture-related disbondment when installing Sherwin-Williams High Performance Flooring non-permeable resinous flooring systems, Calcium Chloride and/or Humidity tests should be run to document the presence of moisture in the slab.

DEW POINT CALCULATION CHART (FAHRENHEIT)											
% RELATIVE HUMIDITY	AMBIENT AIR TEMPERATURE °F										
	20	30	40	50	60	70	80	90	100	110	120
90	18	28	37	47	57	67	77	87	97	107	117
85	17	26	36	45	55	65	75	84	95	104	113
80	16	25	34	44	54	63	73	82	93	102	110
75	15	24	33	42	52	62	71	80	91	100	108
70	13	22	31	40	50	60	68	78	88	96	105
65	12	20	29	38	47	57	66	76	85	93	103
60	11	19	27	36	45	55	64	73	83	92	101
55	9	17	25	34	43	53	61	70	80	89	98
50	6	15	23	31	40	50	59	67	77	86	94
45	4	13	21	29	37	47	56	64	73	82	91
40	1	11	18	26	35	43	52	61	69	78	87
35	-2	8	16	23	31	40	48	57	65	74	83
30	-6	4	13	20	28	36	44	52	61	69	77

TESTING

Testing for an Existing Sealer

Test to see if the floor is “sealed” by using the Water Break Test; please refer to ASTM 3191. If the poured water forms into droplets, then an existing sealer and/or paint may exist on the surface and must be removed by diamond grinding, steel shot blasting or other mechanical methods.

Salt Contamination Testing

Salt-contaminated slabs that contain steel reinforcement are very susceptible to corrosion of the reinforcing steel. As the steel corrodes, it expands, causing cracking, delamination of concrete and any toppings bonded to it, and eventually, structural failure of the slab. Obvious signs of chloride or salt contamination are spalled concrete with exposed, rusted, reinforcing steel. Please refer to the Floor Evaluation Guidelines document on our website to assist in determining the condition of the concrete. Core analysis is recommended to determine the depth of soluble ion contamination which may contribute to osmotic blistering and floor system failure. Sherwin-Williams High Performance Flooring offers in-house core testing using ion chromatography technology. Refer to the Sherwin-Williams High Performance Core Analysis Program on our website for more information.

METHODS OF SURFACE PREPARATION

Diamond Grinding

Diamond grinding is another preferred choice for preparing concrete for polymer floor systems. Diamond grinders are floor grinders equipped with diamond abrasives. With multiple grit options available, they are capable of achieving a wide range of concrete surface profiles appropriate for most resinous flooring systems. Additionally, diamond grinding is used for mechanically profiling and removing existing coatings and adhesives. Immediately after diamond grinding, vacuuming is required to remove all dust from the substrate.

Shot Blasting

Shot blasting is an excellent method for surface preparation of concrete for most polymer floor installations. Shot blast equipment utilizes an alloy wheel spinning at high speeds to throw small steel particles at the substrate in a controlled, dry, 99% dust-free operation. This process removes surface contamination, adds profile and vacuums the concrete clean in one process. The size and angularity of shot, along with the travel speed of the unit, can be adjusted to determine the degree of the surface profile. Because shot blasting is a dry preparation process, it allows the installation to begin immediately after completion of prep (surface must be dry before blasting). Shot blasting will also identify weak areas in the surface of the concrete.

Hand Tool

Hand tool preparation consists of the use of mechanical tools and equipment designed to abrade or chip away the surface of the concrete. Common tools available include chipping hammers, handheld diamond grinders and concrete crack chasing saws. These tools are typically used to make keyways and prepare edges against walls and columns.

TYPES OF SUBSTRATES

Fiber-Filled Concrete

Fiber-filled concrete must be burned with a propane weed burner, swept and vacuumed perfectly clean, and then primed. When primer has completely cured, the floor must be sanded and tack ragged (This step may not be necessary for thick resurfacing systems).

Quarry/Ceramic Tile

Quarry/ceramic tile has been successfully resurfaced on many projects without the removal of the tile and setting bed. A site investigation along with cores through the entire slab will help identify the type of setting bed, the existence of any waterproofing membranes, additional toppings, or other unusual existing conditions. Water trapped within the floor will create long-term sanitation and performance problems.

If the tile is well bonded and placed over an unsaturated latex setting bed, the floor may be resurfaced. Please consult with a Sherwin-Williams Technical Service Representative to determine appropriate mechanical surface prep method, fillers and products.

Existing Epoxy Coating/Resurfacer

Existing seamless floors may be resealed or resurfaced from time to time due to excessive wear, or the need to change the appearance or skid resistance of the floor. The existing floor should first be cleaned and degreased with either EZ-Clean floor cleaner/degreaser or Simoniz 969 cleaner. It must then be mechanically abraded to totally remove the gloss and vacuumed perfectly clean. “Tack rag” area to remove remaining dust. Consult your Technical Service Manager to determine the best preparation for the individual coatings.

Plywood

The plywood substrate must be sound and non-flexing under the expected load. Typical plywood substrate must be exterior or marine grade, new, clean and smooth finish (NO KNOTS). Two layers with staggered joints are required. Plywood should be positively fastened to the existing surface with a high-quality construction adhesive as well as a 6″ screw pattern. For further information on plywood substrates, please contact your local sales representative or the Sherwin-Williams Technical Service Department.

WALLS

For Resuwall applications:

Block Wall

Apply Block Filler to fill pores over new or existing concrete block, following the application instructions.

Drywall

Drywall must be finished to a level #5 paint-ready finish prior to coating. Prime with Extreme Bond Primer. Substrate will affect final appearance of wall coating.

NOTE: Resuwall products require preparation in order to perform as expected. Substrates must be clean, sound and dry. If installing over substrates other than block wall or drywall, please consult the Sherwin-Williams Technical Service Department.