



## Basic Surface Preparation

Coating performance is directly affected by surface preparation. Coating integrity and service life will be reduced because of improperly prepared surfaces. As high as 80% of all coating failures can be directly attributed to inadequate surface preparation that affects coating adhesion. Selection and implementation of the proper surface preparation ensures coating adhesion to the substrate and prolongs the service life of the coating system.

The majority of paintable surfaces are concrete, ferrous metal, galvanizing, and aluminum. They all require protection to keep them from deteriorating in aggressive environments. Selection of the proper method for surface preparation depends on the substrate, the environment, the coating selected, and the expected service life of the coating system. Economics, surface contamination, and the effect on the substrate will also influence the selection of surface preparation methods.

**WARNING!** Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50°F, unless the products to be used are designed to be used in those environments.

### **Aluminum**

#### **S-W 1**

Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

### **Block (Cinder and Concrete)**

#### **S-W 3**

Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 28 days at 75°F. The pH of the surface should be between 6 and 9. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound (per ASTM D4261).

### **Brick**

#### **S-W 4**

Must be free of dirt, loose and excess mortar, and foreign material. All brick should be allowed to weather for at least one year followed by wire brushing to remove efflorescence. Treat the bare brick with one coat of Loxon Conditioner or Masonry Conditioner.

### **Concrete and Masonry**

#### **S-W 5**

Concrete, Poured – Exterior or Interior

The preparation of new concrete surfaces is as important as the surface preparation of steel. The following precautions will help assure maximum performance of the coating system and satisfactory coating adhesion:

#### **1. Cure**

Concrete must be cured prior to coating. Cured is generally defined as concrete poured and aged at a material temperature of at least 75°F for at least 28 days

#### **2. Moisture** – Reference ASTM F1869-98 Moisture Test by use of Calcium Chloride or ASTM D4263 Plastic Sheet Method

Concrete must be free from moisture as much as possible (it seldom falls below 15%). Vapor pressures, temperature, humidity, differentials, and hydrostatic pressures can cause coatings to prematurely fail. The source of moisture, if present, must be located, and the cause corrected prior to coating.

#### **3. Temperature**

Air, surface and material temperatures must be in keeping with requirements for the selected product during and after coating application, until coating is cured.

#### **4. Contamination**

Remove all grease, dirt, paint, oil, laitance, efflorescence, loose mortar, and cement by the recommendations listed in the surface preparation section.

#### **5. Surface Condition**

Hollow areas, bug holes, voids, honeycombs, fin form marks, and all protrusions or rough edges are to be ground or stoned to provide a continuous surface of suitable texture for proper adhesion of the coating. Imperfections may require filling, as specified, with a recommended Sherwin-Williams product.

#### **6. Concrete Treatment**

Hardeners, sealers, form release agents, curing compounds, and other concrete treatments should be removed to ensure adequate coating adhesion and performance.

#### **Methods of Surface Preparation on Concrete per SSPC-SP13/NACE 6 or ICRI 03732 Surface Cleaning Methods:**

##### **Vacuum cleaning, air blast cleaning, and water cleaning per ASTM D4258.**

Used to remove dirt, loose material, and/or dust from concrete.

##### **Detergent water cleaning and steam cleaning per ASTM D4258.**

Used to remove oils and grease from concrete.

Prior to abrasive cleaning, and after abrasive cleaning, surfaces should be cleaned by one of the methods described above.

##### **Mechanical Surface Preparation Methods:**

Dry abrasive blasting, wet abrasive blasting, vacuum assisted abrasive blasting, and centrifugal shot abrasive blasting per ASTM D4259. Used to remove contaminants, laitance, and weak concrete, to expose subsurface voids, and to produce a sound concrete surface with adequate profile and surface porosity.

##### **High-pressure water cleaning or water jetting per SSPC-SP12-NACE5.**

Used to remove contaminants, laitance, and weak concrete, to expose subsurface voids, and to produce a sound concrete surface with adequate profile and surface porosity.

##### **Impact tool methods per ASTM D4259.**

Used to remove existing coatings, laitance, and weak concrete. Methods include scarifying, planing, scabbling, and rotary peening. Impact tools may fracture concrete surfaces or cause microcracking requiring surface repair.

##### **Power tool methods per ASTM D4259.**

Used to remove existing coatings, laitance, weak concrete, and protrusions in concrete. Methods include circular grinding, sanding, and wire brushing. These methods may not produce the required surface profile to ensure adequate adhesion of subsequent coatings.

##### **Chemical Surface Preparation Methods:**

**Acid etching per ASTM D4260.** Use to remove some surface contaminants, laitance, and weak concrete, and to provide a surface profile on horizontal concrete surfaces. This method requires complete removal of all reaction products and pH testing to ensure neutralization of the acid. Not recommended for vertical surfaces. Etching with hydrochloric acid shall not be used where corrosion of metal in the concrete is likely to occur. Adequate ventilation and safety equipment required.

1. Clean surface per ASTM D4268
2. Wet surface with clean water
3. Etch with 10-15% muriatic acid solution at the rate of 1 gallon per 75 square feet
4. Scrub with stiff brush
5. Allow sufficient time for scrubbing and until bubbling stops
6. If no bubbling occurs, surface is contaminated. Refer to ASTM D4258 or ASTM D4259
7. Rinse surface two or three times. Remove acid/water each time.
8. Surface should have a texture similar to medium grit sandpaper.
9. Neutralize surface with a 3% solution of tri-sodium phosphate and flush with clean water.
10. Allow to dry and check for excess moisture.

#### **Cement Composition Siding/Panels**

##### **S-W 6**

Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Glossy surfaces should be sanded dull. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. If the surface is new, test it for pH, many times the pH may be 10 or higher.

#### **Composition Board (Hardboard)**

##### **S-W 9**

Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

#### **Copper**

##### **S-W 7**

Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP2, Hand Tool Cleaning.

#### **Drywall—Interior and Exterior**

#### **S-W 8**

Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

#### **Galvanized Metal**

#### **S-W 10**

Allow to weather a minimum of 6 months prior to coating. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner, then prime as required. When weathering is not possible or the surface has been treated with chromates or silicates, first Solvent Clean per SSPC-SP1 and apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.

#### **Plaster**

#### **S-W 11**

Must be allowed to dry thoroughly for at least 30 days before painting. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

#### **Steel/Ferrous Metal Substrates**

##### **SSPC-SP1- Solvent Cleaning**

Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No.1.

##### **SSPC-SP2 - Hand Tool Cleaning**

Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No.2.

##### **SSPC-SP3 - Power Tool Cleaning**

Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No.3.

##### **SSPC-SP5 / NACE 1 - White Metal Blast Cleaning**

A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods. For complete instructions, refer to Joint Surface Preparation Standard SSPC-SP5/NACE No.1.

##### **SSPC-SP6 / NACE 3 - Commercial Blast Cleaning**

A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods. For complete instructions, refer to Joint Surface Preparation Standard SSPC-SP6/NACE No.3.

##### **SSPC-SP7 / NACE 4 - Brush-Off Blast Cleaning**

A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Mill scale, rust, and coating are considered adherent if they cannot be removed by lifting with a dull putty knife. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods. For complete instructions, refer to Joint Surface Preparation Standard SSPC-SP7/NACE No.4.

##### **SSPC-SP10 / NACE 2 - Near-White Blast Cleaning**

A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods. For complete instructions, refer to Joint Surface Preparation Standard SSPC-SP10/NACE No.2.

#### **SSPC-SP11 - Power Tool Cleaning to Bare Metal**

Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP 1, Solvent Cleaning, or other agreed upon methods. For complete instructions, refer to Steel Structures Paint Council Surface Preparation Specification No.11.

#### **SSPC-SP12 / NACE 5 - Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating**

High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials

This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only, without the addition of solid particles in the stream. For complete instructions, refer to Joint Surface Preparation Standard SSPC-SP12/NACE No.5.

#### **SSPC-SP13 / NACE 6 or ICRI 03732 - Surface Preparation of Concrete**

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. 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. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a dry, sound, uniform substrate suitable for the application of protective coating or lining systems. Depending upon the desired finish and system, a block filler may be required. For complete instructions, refer to Joint Surface Preparation Standard SSPC-SP13/NACE No.6 or ICRI 03732

#### **SSPC-SP14 / NACE 8 – Industrial Blast Cleaning**

This standard gives requirements for industrial blast cleaning of unpainted or painted steel surfaces by the use of abrasives. This joint standard allows defined quantities of mill scale and/or old coating to remain on the surface. An industrial blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dust, and dirt. Traces of tightly adherent mill scale, rust, and coating residue are permitted to remain on 10% of each unit area of the surface. The traces of mill scale, rust, and coating shall be considered tightly adherent if they cannot be lifted with a dull putty knife. Shadows, streaks, and discolorations caused by stains of rust, stains of mill scale, and stains of previously applied coating may be present on the remainder of the surface.

#### **Water Blasting NACE Standard RP-01-72**

Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

### **Stucco**

#### **S-W 22**

Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9.

### **Wood—Exterior**

#### **S-W 23**

Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth. Caulk should be applied after priming.

### **Wood—Interior**

#### **S-W 24**

All finishing lumber and flooring must be stored in dry, warm rooms to prevent absorption of moisture, shrinkage, and roughening of the wood. All surfaces must be sanded smooth, with the grain, never across it. Surface blemishes must be corrected and the area cleaned of dust before coating.

### **Vinyl Siding**

#### **S-W 25**

Vinyl siding must be cleaned thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly.

### **Previously Coated Surfaces**

#### **S-W 12**

Maintenance painting will frequently not permit or require complete removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease, loose paint, mill scale dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull before repainting. Thorough washing with an abrasive cleanser will clean and dull in one operation, or, wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer. Recognize that any surface preparation short of total removal of the old coating may compromise the service length of the system. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required per ASTM D4259.

### **Touch-Up, Maintenance and Repair**

For a protective coating system to provide maximum long-term protection, regularly scheduled maintenance is required. Maintenance includes inspection of painted areas, cleaning of surfaces to remove oils, chemicals, and other contaminants, and touch-up of areas where the coatings have been damaged. Highly corrosive areas, such as those subjected to frequent chemical spillage, corrosive fumes, and/or high abrasion or temperature areas should be inspected frequently – every six months, for example. Areas exposed to less severe conditions, such as interiors and exteriors of potable water tanks, may be inspected annually to assess the condition of the coating system.

The SSPC-VIS 2, Standard Method for Evaluating Degree of Rusting on Painted Steel Surfaces, can be used as a guide to determine appropriate touch-up and repairs maintenance schedules. Touch-up would be suggested when the surface resembles Rust Grade 5-S (Spot Rusting), 6-G (General Rusting), or 6-P (Pinpoint Rusting). Surface preparation would generally consist of SSPC-SP2, SP3, SP11, or SP12. Overcoating a well protected, but aged steel surface showing no evidence of rusting, may be achieved by Low Pressure Water Cleaning per SSPC-SP12/WJ4, and applying an appropriate coating system.

Full removal of the existing coating system by abrasive blasting would be recommended when the surface resembles Rust Grade 3-S (Spot Rusting), 4-G (General Rusting), or 4-P (Pinpoint Rusting). When the coating system has deteriorated to encompass approximately 33% of the surface area, it is always more economical to consider full removal and reapplication of the appropriate protective coating system.

### **Mildew**

Remove mildew before painting by washing with a solution of 1 quart liquid household bleach and 3 quarts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.