Super-Krete® Products
Surface Preparation Guide

TABLE OF CONTENTS

SURFACE PREPARATION OF CONCRETE

All concrete substrates surfaces will require surface preparation prior to the installation of a polymer coating, decking or flooring system, including crack, spall and joint repair, resurfacing, topping, underlayment or overlayment.

The first step in these operations is extremely critical. The best materials correctly mixed and applied are doomed to fail unless the concrete substrate is properly prepared. At a minimum the concrete substrate must be prepared in compliance with minimum standards for the system to be placed per ACI, ASTM, ICRI, NACE, PCSI and SSPC Standards.

Deleterious surface contaminants and deteriorated concrete must be removed, repaired if necessary and the surface roughened and cleaned. There are many different techniques, methods, and types of equipment, which can be used to effectively prepare concrete.

Shot blasters, water blasters, scarifiers, scabblers, acid etching, etc. are some of the commonly used equipment and techniques for surface preparation.

General – Concrete surfaces to be bonded must be clean and sound, which in all cases requires some form of substrate preparation.

Surface Evaluation – The following methods, tests and standards can be used to evaluate the condition of the concrete substrate and the effectiveness of the surface preparation procedure.

Strength – The direct tensile strength of the concrete substrate should be determined prior to placement of coatings and surfacing materials.

Contaminants – The presence of grease, wax, or oil may be detected by dropping a small amount of muriatic acid and a small amount of water onto the concrete prior to preparation and after preparation to determine the condition.

Contaminants Tests – There are several easy tests to determine if the concrete substrate is contaminated.

1. The surface exposed to drops of muriatic acid should react, if there is no reaction it suggests the presence of contaminants.
2. If the water droplets bead up and the water is not immediately absorbed, it suggests the presence of contaminants.

IMPORTANCE of CONCRETE pH

pH is believed to stand for “potential hydrogen” or “power of hydrogen” and it is measured on a negative logarithmic scale. The pH scale ranges from 0 to 14, and a pH of 7 (de-ionized water) is considered to be neutral.

A strong acid may have a pH of 1-2, while a strong alkaline base may have a pH of 13-14. A pH near 7 is considered to be neutral.

pH is an approximate measure of acidity or alkalinity and is defined as the negative logarithm scale of the hydrogen ion (H+) concentration. As the pH of a solution increases, the number of free hydrogen ions decreases, and a change in pH of one reflects a tenfold change in the H+ concentration. For example, there are 10 times as many hydrogen ions available at a pH of 7 than at a pH of 8 and at a pH of 9 there are 100 times (10 times 10) fewer hydrogen ions.

The industry standard is that the concrete surfaces must be sound and free of all bond-inhibiting substance, which normal have a pH below that of properly prepared concrete.

Carbonated concrete is contaminated concrete, it is not sound durable concrete, it is weak concrete, especially low pull-off strengths, therefore, it must be removed. Steel-reinforced concrete (wire-wire, rebar, dowels, etc.) is used throughout the world in the construction of bridges, marine structures, parking garages, and buildings. The alkaline environment of the concrete protects the steel from corrosion; however, this protective environment can be disrupted due to the migration of chloride ions to the steel and/or to carbonation of the concrete.

Sound and durable concrete is highly alkaline, with a of pH 10.0 or above and it will passivates the steel. A pH below a pH 10 is week concrete, subjecting the steel to oxidation (rusting) and the concrete to internal stresses (spalling, cracking, etc.) resulting from the oxidized steel increase in volume expansion. Which is why a pH 10 or greater, is recommended.

ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring:

> *pH Testing*—Concrete floors shall be tested for pH prior to the installation of resilient flooring. Levels of pH shall not exceed the written recommendations of the resilient flooring manufacturer or the adhesive manufacturer, or both.
>
> To test for pH at the surface of a concrete slab, use wide range pH paper, its associated pH chart, and distilled or deionized water. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 in. (25 mm) in diameter. Allow the puddle to set for 60 +/-5 seconds, then dip the pH paper into the water. Remove immediately, and compare to chart to determine pH reading. Other pH testing methods such as pH pencils or pH meters, or both, are available and may be used to measure pH.

Readings at or above a pH of 10.0 are ideal for most epoxy primer, but may be too high for some non-epoxy adhesives. Refer to resilient flooring or decking manufacturer's written instructions for guidelines.

There is always a question regarding is the surface clean enough, free a curing compounds, and other bond breakers, prior to the installation of coating or flooring system?

A simple litmus test is an inexpensive and quick way to see if the mechanical or chemical concrete preparation treatment has adequately prepared the surface. The litmus test (paper or pencil or equipment) should always be run when testing Moisture Vapor Emissions per ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

ICRI Selecting and Specifying Concrete Surface Preparation

> (SSPC highly recommends that individuals involved in the coatings and surfacing industry obtain ICRI [International Concrete Repair Institute] Guideline NO. 310.2R Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer

Overlays, text and physical profile samples.)

Concrete Substrate Profiles, at a minimum, must comply with ICRI Guideline No. 310.2R – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays, however SSPC does not recommend Detergent Scrubbing or Low-Pressure Water Cleaning or Acid Etching as stand-alone methods of surface preparation. These processes can be used in conjunction with others.

Great care must be taken not to "bruise" the concrete when using aggressive methods of surface preparation. Bruising causes micro-cracking, which will weaken the substrate at the surface. Since proper surface adhesion, especially for those systems subjected to stresses relies on the tensile strength of the substrate and tensile adhesion of the system installed upon the substrate.

Aggressively prepared substrates, such as those methods listed as CSP 6 and above should be examined for micro-cracking prior to placement of a coating or overlayment. If micro-cracking has taken place, re-prepare the substrate with a less aggressive method to remove the weakened substrate, such as methods ranging from CSP 2 – CSP 5.

Preparation Methods

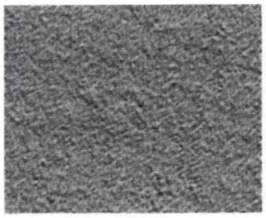
CSP 1	Detergent Scrubbing
CSP 1	Low-Pressure Water Blasting
CSP 1 – 2	Acid Etching
CSP 1 – 3	Grinding
CSP 2 – 5	Abrasive Grit (Sand) Blasting
CSP 3 – 8	Steel Shotblasting
CSP 4 – 9	Scarifying
CSP 5 – 8	Needle Scaling
CSP 6 – 9	High/Ultra High Pressure Water Jetting
CSP 7 – 9	Scabbling

CSP Methods Acceptable to SSPC - Require Meeting the Minimum Acceptable CSP (Concrete Surface Profile) Method listed below:

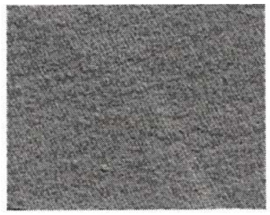
CSP 2	Sealers	0 – 3 mils (0 – 75 μm)
CSP 2 – 3	Thin Film Coatings	4 – 10 mils (100 – 250 μm)
CSP 3 – 5	High Build Systems	10 – 40 mils (250 – 1000 μm)
CSP 4 – 6	Broadcast	50 mils – 1/8 inch (1250 μm – 3 mm)
CSP 4 – 6	Self-Leveling	50 mils – 1/8 inch (1250 μm – 3 mm)
CSP 5 – 8	Overlay Systems	1/8 – 1/4 inch (3mm – 6mm)

Super-Krete® Products
Surface Preparation Guide

ICRI CONCRETE SUBSTRATE PROFILES

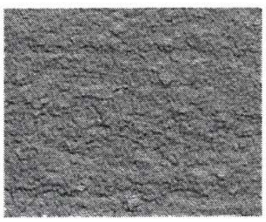


CSP 1
(acid etched)

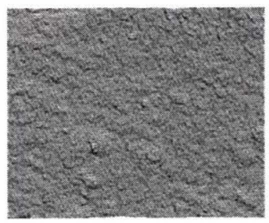


CSP 2
(grinding)

CSP 3
(light shotblast)

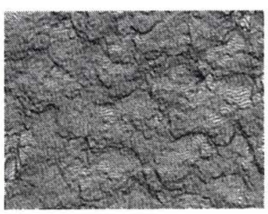


CSP 4
(light scarification)

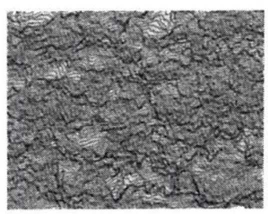


CSP 5
(medium shotblast)

CSP 6
(medium scarification)



CSP 7
(heavy abrasive blast)



CSP 8
(scabbled)

CSP 9
(heavy scarification)

Super-Krete® Products
Surface Preparation Guide

CHOOSING THE RIGHT SURFACE PREPARATION EQUIPMENT

Before starting a concrete preparation job, consider the following:

- Does the concrete have an existing coating or surfacing that needs to removed? What is it, and what are its properties?
- What is the thickness of the concrete, overlayment, or coating?
- What is the current condition of the concrete, and what is it's in place tensile pull bond strength? (ACI 503R or ASTM D7234)
- What type of material will be placed or applied?
- What is the concrete coverage thickness over reinforcement steel, if any?

Failure to consider all concrete issues per ACI 201.1R can cause result in significant mis-calculation the required method and production rates of the surface preparation selected. The wrong material(s) could be specified for use. Environment, Health and Safety potential impact must be considered, such as volatile organic content regulations, odor threshold, dust, dirt, noise, waste-water and waste materials/packaging and disposal, suppression, etc.?

After all of these concerns are addressed and answered, an educated choice regarding the type of equipment and surface preparation techniques can be made.

NEW CONSTRUCTION

In new construction, proper planning prior to pouring a concrete slab can minimize problems later (ACI 302.1R Guide for Concrete Floor and Slab Construction). When trowelled finish is used or an existing slab has a trowel finish, the concrete surface is smooth and slick with laitance (cement particles carried by water rising to the surface of freshly placed concrete) and is usually unsuitable for proper adhesion of coatings, toppings, or overlayments.

Acid etched surfaces require flushing and neutralization before coatings or toppings are applied, and it usually only recommended when other methods of surface preparation cannot be used.

Formed concrete pours should be vibrated to minimize pockets and holes, and to maximize densification. Suitable form facing material should be used to produce a smooth form finish as described in ACI 302.1R. If the surface has been cured with conventional curing compounds, or is contaminated with form oil or other release agents, it must be completely cleaned by mechanical or chemical abrasion.

EXISTING CONCRETE SUBSTRATES

Existing concrete substrates should be sound and durable or in need of restoration prior to placement of a polymer coating or overlay. If contamination is discovered, the first requirement is to isolate the surrounding surface(s) from the contaminated areas.

When the concrete is sound, but contaminated, it should be cleaned. It then may be chemically etched or mechanically abraded in the same manner as preparing new concrete thereby obtaining a laitance free surface. If the concrete substrate surface is deteriorated, the surface must be reduced to a sound and durable concrete by abrasive blasting, high pressure water blasting, chipping, scarifying, or other suitable means to remove all loose or deteriorated material from the surface. In some cases, the existing concrete is in such poor condition that it must be replaced and treated as new concrete.

NEW & EXISTING CONCRETE STANDARDS

Concrete surfaces to be covered with polymer coatings or surfacing systems must be sound, durable and dry (in most cases) during installation and cure. The Concrete Industry Standard is that PCC be at least 28 days and Fly Ash PCC at least 56 days old before it is coated or surfaced.

The Concrete Industry Standard is not the Polymer Industry Standard. After 28 or 56 days the concrete has reached the majority of its strength and the majority of cement hydration has taken place. However, the excess water, not used in the hydration of the cement, slowly migrates out of the concrete reaching a homeostasis with its environment in around twelve months.

Concrete slabs should be placed in compliance with ACI 302.1R Guide for Concrete Floor and Slab Construction, ACI 318 Building Code Requirements for Structural Concrete and SSPC/PCSI TU-10. Concrete that is damaged or fails to comply with the conditions set forth in ACI 302.1, ACI 302.2, ACI 318, ACI 503.1-.4 and ACI 503R-Appendix A and SSPC/PCSI TU-10 and SSPC-SP 13/NACE No. 6 must be brought into compliance prior to placement of a coating or surfacing system. See reference to industry standards, ACI, ASTM, ICRI, PCSI and SSPC.

GUIDE FOR SELECTING SURFACE PREPARATION METHODS

1. Bush Hammering (not an approved method)
2. Scabbling (not an approved method)
3. Horizontal Planing
4. Scarifying
5. Sanding, Grinding
6. Scraping
7. Steam Cleaning
8. Stripping
9. Etching – Acid (ASTM D4260)
10. Shot Blasting
11. Abrasive Grit (a.k.a. sand) Blasting (ASTM D4259)
12. Wet Sandblasting
13. Water Blasting

SURFACE PREPARATION METHODS

1. BUSH HAMMERING – Bush hammering is a method for roughening or correcting defects in the concrete substrate surface by impacting it with a device having a serrated face with rows of round or pyramidal hardened steel points. Bush hammering produces a roughened surface by removing the top layer of concrete substrate. Fine particles are removed, exposing intermediate and larger size aggregate.

   Bush hammering is usually not recommended because of the impact damage it may cause to underlying sound concrete. If bush hammering is required, it must be followed by grit-blasting with a small projectile to remove micro-cracked or micro-fractured concrete. The degree of micro-cracking is dependent upon the size of the hammer, the impact force exerted and the quality of the concrete.
   Damage caused during the removal of bad concrete includes damage to the underlying concrete cement-gel matrix, including rupture of the larger aggregate's mechanical lock in the matrix, thereby causing a "bruised" layer to be formed approximately 1/8 inch (3.18 mm) to 1/2 inch (6.35 mm) below the surface, resulting in low cohesive strength of the concrete. The most important physical property for placing a coating and surfacing

applications is the tensile strength of the concrete substrate at the bonding surface.

Bush hammering is not approved for use alone as the only method of surface preparation. It can be used if followed by a non-impacting, non-vibrating method such as grit-blasting to insure that the "bruised" concrete layer is removed. It must be used in conjunction with other approved methods of concrete surface preparation.

Advantages:
- Extremely aggressive
- Removes large amounts of material (quickly)
- Removes most deleterious materials

Disadvantages:
- Can be highly abusive to the concrete substrate
- Requires a skilled operator
- Dusty and dirty
- Must be used in conjunction with other methods of concrete preparation

2. **SCABBLING** – Scabbling is a method for roughening the surface of concrete similar to a bush hammering, utilizing a scabbling machine fitted with air actuated cylinders faced with rows of round or pyramidal points of hardened steel, arranged for impacting the concrete substrate with great force and velocity.

   Scabblers are designed to remove the top layer of concrete substrate, exposing and fracturing the intermediate and large aggregates to produce a very rough surface. Scabbling is particularly useful for removal of thick, hard overlayments such as epoxy mortars, setting beds, pre-topped and cast-in-place concrete capped slabs. These machines act in exactly the same manner as a hand held bush hammer and are only recommended for use per the instructions addressed under bush hammering above. It must be used in conjunction with other approved methods of concrete surface preparation.

Advantages:
- Extremely aggressive
- Removes large amounts of material (quickly)
- Removes most deleterious materials

Disadvantages:
- Can be highly abusive to concrete substrate
- Requires a skilled operator
- Dusty and dirty
- Must be used in conjunction with other methods of concrete preparation

3. **HORIZONTAL PLANING** – Horizontal planing is a method of improving the flatness of a concrete slab by mechanically removing irregularities utilizing a machine fitted with multiple rows of high speed closely spaced vertical cutters.

   Horizontal planing can be used to remove paints, coatings, adhesives and laitance. Followed by a vibration free method, it can be used to remove epoxies, rubber-like coatings, overlays, and low cohesive concrete.

Advantages:
- Extremely effective
- Removes large amounts of material (quickly)
- Removes most deleterious materials
- Levels substrate
- Dust reduction shrouds available

Disadvantages:
- Highly expensive

- Requires a skilled operator
- Without excellent dust recovery, extremely dusty

4. **SCARIFYING** – Scarifying is a method for removing heavy buildups of surface contamination or other substances from concrete substrate, utilizing a mechanical action similar to horizontal planning. Scarifiers are heavy machines equipped with hardened steel cutters vertically aligned and arranged on a large, horizontal cylinder that rotates at high velocity. Scarification will impact and partially remove the concrete surface in closely spaced parallel lines. It must be used in conjunction with other approved methods of concrete surface preparation.

   Advantages:
   - Extremely aggressive
   - Removes large of material (quickly)
   - Removes most deleterious materials
   - Dust reduction shrouds available

   Disadvantages:
   - Can be highly abusive to concrete substrate
   - Requires a skilled operator
   - Without excellent dust recovery, extremely dusty
   - Must be used in conjunction with other methods of concrete preparation

5. **SANDING & GRINDING** – Sanding and grinding are methods of cleaning and scratching the surface of concrete substrate by abrasion utilizing sanding disks or abrasive impregnated grinding wheels. This method produces a finely scratched surface finish free of surface laitance and contamination and a portion of surface fines. Extreme care must be taken to sand and grind "long-enough" and "deep-enough" into the concrete substrate to fully remove the laitance, especially cure-and-seal sealers. Concrete substrate "polish-gloss" must be removed, exposing the aggregate profile.

   Advantages:
   - Low cost, relatively low equipment cost
   - Fast operation especially for light removal
   - Removes most deleterious materials
   - Can get into tighter places than most mechanical method of surface preparation
   - Dust free or dust reduction shrouds available

   Disadvantages:
   - Can give "false" sense that surface is properly
   - Prepared, when unground
   - Slow, when deep removal is required
   - Without excellent dust recovery, extremely dusty

6. **SCRAPING** – Scraping is a method for removal of surface films from concrete utilizing the scraping action of hardened steel cutting blades arranged on counter-rotating horizontal discs. Scraping is particularly useful for removal of thick elastomeric coatings and traffic decking materials, heavy concentration of tile mastic and carpet adhesive. Scraping is not a final surface preparation method. It must be used in conjunction with other approved methods of concrete surface preparation.

   Advantages:
   - Low cost
   - Effective
   - Removes otherwise difficult to remove materials
   - Limited to dust free

   Disadvantages:
   - Creates waste that can be costly to remove

- Must be used in conjunction with other methods of concrete preparation

7. **STEAM CLEANING** – Steam cleaning is an effective method for removal of many forms of contamination that is present on the concrete substrate. Steam cleaning machines produce quantities of wet steam, directed at the concrete in a high concentration and at a velocity sufficient to loosen, soften, and remove the contaminants. Steam cleaning coupled with detergents, degreasers, and other chemicals greatly increases its effectiveness. Steam cleaning will only remove surface contaminants and only a small amount of contamination within the pores of the concrete. Steam cleaning is not a final surface preparation method. It must be used in conjunction with other approved methods of concrete surface preparation.

Advantages:
- Low cost
- Fast operation
- Removes material
- Dust free

Disadvantages:
- Hot, can cause burns to the operator
- Elevated temperature can affect low temperature Heat Deformation Materials, such as plastics, causing deformation
- Requires proper and adequate drainage
- Used in conjunction with chemicals cleaning could cause later problem, such as corrosive damage of metals
- Introduces water into the concrete substrate that may be deleterious to bond of some materials
- Must be used in conjunction with other methods of concrete preparation

8. **CHEMICAL STRIPPING** – Chemical stripping is a method of surface preparation utilizing chemicals to soften or dissolve cured films to facilitate their removal. Chemical stripping of contaminating films from concrete is usually confined to small areas that cannot be prepared more effectively. Like scrapping, stripping requires additional surface preparation prior to coating. Chemical stripping is not a final surface preparation method. It must be used in conjunction with other approved methods of concrete surface preparation.

Advantages:
- Low cost
- Fast operation
- Removes material
- Dust free

Disadvantages:
- EHS issues odor, VOC and chemical exposure
- May not be "Legal" in some locations
- Removal, transportation and disposal could be extremely costly
- Used in conjunction with chemicals cleaning could cause later problem, such as corrosive damage of metals
- Introduces chemical into the concrete substrate that may be deleterious to bond of some materials

9. **ETCHING-ACID (ASTM D4260)** – Etching-Acid works well on horizontal non-surface-hardened and non-cure-and-seal concrete substrates. Thickened etching-acids are available for vertical surfaces. Acid etching does roughen the concrete surface, but does not remove laitance and may not loosen other materials that are acid resistant. (SSPC C.7.1 seldom recommends acid etching.)

Super-Krete® Products Surface Preparation Guide

Acid etching is often accomplished with a 10% solution of hydrochloric (muriatic) acid or an aggressive citric acid. The concrete substrate should be pre-wetted to assure uniform etching of the surface. One gallon of muriatic acid or citric acid should be spread over 50 to 75 sq. ft. (5 to 7 sq. m.) of concrete and allowed to stand for five minutes, coupled with aggressive scrubbing with a stiff bristle broom.

The surface should be immediately rinsed with fresh water to avoid formation of "bonded" salt deposits. This procedure should be repeated until the concrete has the texture of fine sandpaper. The surface should be thoroughly rinsed following each etching and the final surface checked with pH paper to assure that it has been neutralized.

Citric Acid - In place of using muriatic acid, citric acid can be effectively used to etch concrete surfaces. The use of citric acid offers some advantages, such as:

- Can be used at low concentration 5-10%
- Has a relatively moderate pH, 3.5 – 4.0.
- Low toxicity factor
- Safer to handle
- No harsh vapors during etching, does not interfere with other work in the immediate area
- Rinse and power wash

Citric acid can be purchased from, among others, The Pfizer Chemical Co., Pfizer Inc. Groton, CT 06340.

Neutralization - Regardless of which acid is used for etching the concrete substrate, it must be neutralized with clean water, preferably with two steps, first a low-pressure rinse to remove spent acid volume, followed by a high-pressure rinse to move embedded and surface residue. Pressure should be a minimum of 2,500 PSI at the nozzle for adequate results. The use of pressure washing assures the removal of the acid weakened and etched surface layer of concrete. This is conducive to promoting better adhesion of subsequently applied coatings, surfacing, toppings, etc.

ASTM D4262 - Standard Test Method for Determining the pH of Chemically Cleaned or Etched Concrete Surfaces. The test utilizes pH Test Paper in final rinse water on the concrete surface. A strip of test paper should be dipped in the rinse water remaining on the surface. After the paper changes color, it should be compared with the color chart accompanying the paper to determine acidity or alkalinity. The pH reading of the fresh rinse water should also be taken. The pH reading from the rinse water on the concrete surface should not be more than 1.0 pH unit lower or 2.0 pH units higher than the fresh rinse water. If it is, the surface should be further neutralized with fresh water and retested until the pH is acceptable. Two readings should be taken on random sections of every 500 sq. ft. (50 sq.m.) of concrete.

Advantages:

- Minimal equipment
- Fast operation
- Creates uniform profile (may require multi- applications)
- Can easily get into "tight places"
- Dust free

Disadvantages:

- EHS issues, especially with acid concentrates
- Does not remove acid resistant contaminates
- May not be "Legal" in some locations
- May require re-claiming of all spent bi-products, even if neutralized

- Used in conjunction with chemicals cleaning could cause later problem, such as corrosive damage of metals that may be deleterious to the bond of some materials

10. **SHOT BLASTING** – Shot blasting is an effective, relatively clean and dust-free (or dust-reduced) method for removing hardened films of contamination, and for texturing the concrete substrate by impacting the surface with high velocity metal abrasive. Shot blasting medium is available in a range of different sizes and a limited number of particle shapes. The blasting medium is thrown against the concrete substrate from a high velocity wheel. The abrasive scours the concrete surface, rebounds and is recaptured for continued use. The abraded surface fines and other contaminants are captured by a vacuum system.

    The pulverized concrete, spent abrasives, dust and contaminants are removed by a separate vacuum dust collector. The reclaimed steel shot is then recycled to the blast wheel. Shot blasting machines are intended to be fully enclosed and provide an excellent means of cleaning and texturing concrete substrates, without the use of water or etching chemicals, and with a minimal release of airborne dust and contaminants. Shot blasting, using small shot, will provide a clean, physically sound concrete substrate, with a relatively uniform texture ranging from fine granular to a coarse sandpaper finish. Heavy shot can damage micro-crack or micro-fracture the concrete substrate in a similar manner to other aggressive surface preparation methods. Shot blasting is particularly useful and cost-effective on large, unobstructed floors, decks, and other horizontal concrete surfaces. In addition, there is shot blasting equipment for vertical surfaces.

    Normally, shot blasting is coupled with grinding or other methods of surface preparation, which is required for "can't get to areas" with shot blast equipment, such as under encumbered areas.

    Preparing concrete surfaces using shot blasting generally results in concrete substrate removal of up to 0.125 inch (3.18 mm) per pass. If surface laitance alone are to be removed or if the surface is to be prepared for thin (< 35mil) coatings, the steel shot abrasive should be fine. Using fine shot coupled with moving quickly, will produce a light etch on the concrete substrate similar to a brush blast. If a thick film topping or overlay is to be installed, a deeper texture must be achieved, which will produce surface profiles (IRCI-CSP) illustrated above.

    Three parameters control the depth of surface profile or concrete removal:

    - The mesh size of the shot (surface profile is proportional to shot size)
    - The amount of shot flow to the surface, which is controlled (increased or decreased) by the operator.
    - Speed of travel over the concrete substrate determines cut. The slower the travel speed the more concrete is removed and correspondingly the greater the depth of cut.

    Advantages:

    - Free of vibration
    - Fast operation
    - Very good keyed surface
    - Dry surface
    - Removes material of the same strength or lesser strength
    - Dust free

Disadvantages:

- Not very effective on rubber like
- Elastomeric coatings or adhesives
- Does not reach the edges or corners effectively
- Horizontal equipment does not operate on vertical surfaces, such as curbs

11. **ABRASIVE BLASTING** – Abrasive Blasting are methods for cleaning and texturing the concrete substrate by impacting it with a high velocity stream of fine aggregate (silica sand or other medium) projected by compressed air. The blasting medium usually consists of hard, angular aggregates of a size range selected to be most effective. Sandblasting produces a textured, physically sound substrate free of surface contamination and fines.

    The actual surface hardness of concrete and depth of desired profile should determine whether abrasive (silica sand or other medium) blast cleaning is the best concrete preparation method. Test areas should be tried, using the same equipment, air pressure, and abrasive you would intend to use. Production rates, dusting, and cleaning profiling (roughening) effects should be noted. EHS concerns regarding siliceous materials continues to reduce the annual use of silica sands, while other abrasives are seeing a corresponding increase in demand.

    Larger abrasive grit sizes are used for preparing concrete than are used on steel. Grit abrasives having an 8 to 12-mesh size are recommended for heavy cleaning and profiling. If only the removal of concrete laitance is required, a 20-40 mesh size grit gradation is sufficient. Grit abrasives should have angular to sub-angular particle shapes and be at least a 6.0 on the Mohs Mineral Hardness Scale, where talc is a 1.0, and diamonds are 10.0. Grit abrasives having Mohs Hardness of less than 6.0 are too soft to clean and texture concrete at high production rates. Grit that fractures along cleavage planes, such as aluminum oxide, garnet, etc. remain angular and do not polish like silica sand.
    The higher the impact velocity the greater the rate of production and the greater the rate of breakdown-fracturing of the abrasive. Reuse of fractured abrasives, called the next generation or fines, should be mixed with the large abrasives.

    The use of sand, grit, or shot impelled under high pressure gives a variety of results by adjusting:

    - Abrasive Material (hardness and shape)
    - Impact Speed
    - Motion and Speed of the Nozzle or Machine

Advantages:

- Free of vibration
- Fast operation
- Very good keyed surface
- Dry surface
- Removes all material of the same strength or lesser strength

Disadvantages:

- Dust (pollution, silicosis, health hazards)
- Not very effective on rubber-like surfacing
- Through the high velocity of the abrasive particles, the impact on the rebar is so heavy that there is a change in the molecular matrix structure of the superficial layer of the rebar which cuts down on the rebar's resistance to corrosion

12. **WET GRIT-BLASTING** – Wet grit-blasting is a hybrid surface preparation method whereby abrasive grit is injected into a stream of high velocity water, and the solution is directed at the concrete substrate surface in a manner similar to sand and water blasting. Often referred to as grit injected water blasting, this method of surface preparation produces a clean, physically sound profile of varying degree, free of contamination and fines.

    Due to the many variations and operating parameters associated with water blasting, a complete description is presented below:

    Water Blasting – high water pressure cleaning. The use of water impelled under high pressure gives a wide variety of results by adjusting:
    - Stand-Off Distance
    - Water Pressure
    - Water Volume
    - Nozzle Shape
    - Trajectory (Angle of Attack)
    - Abrasive Grit Wet Blasting

    Basic rules:
    - The Flow Rate Normally Decreases as the Pressure Increases (use of smaller orifice to increase pressure)
    - Pressure and Flow Rate Decreases as Abrasives are Introduced Into the Water Stream.

    Advantages:
    - Relatively clean operation (except water and grit residue)
    - Fast operation
    - Relatively low noise operation
    - Good keyed surface profile
    - Removes material of the same or lesser strength

    Disadvantages:
    - Supply, handling and disposal of water
    - Usually more costly than other methods
    - Requires highly skilled operator
    - Substrate normally are required to be dry

13. **WATER-BLASTING/HYDRO DEMOLITION** – Water blasting or hydro demolition are methods of removal of concrete surface contamination and fines from a concrete surface by impacting with an extremely high velocity stream of water. Water blasting and hydro demolition are normally used to remove significant thicknesses. This surface preparation method is usually more difficult to control than other methods of blasting and appears to produce greater surface profile irregularities. However, water blasting may be preferable if it is imperative to avoid airborne particulates, such as blasting aggregate residue, cement particles, contaminates, dust, etc. Water blasting produces a surface texture of widely varying degrees, free of contamination and fines.

    Hydro-demolition sometimes referred to as hydro-blasting or hydro-jetting is one of the most efficient methods of removing and preparing concrete. Hydro-demolition does not produce the "bruised" micro-cracked layer, as do other mechanical methods previously discussed. Water pressures associated with hydro-demolition is selective in its concrete removal process. That is, it can be adjusted to remove concrete to a specific depth, remove poor unsound concrete until good sound concrete is reached. Recent industrial research shows that hydro-demolition prepared concrete has produced tensile bond interface strengths far superior to bush hammering or scabbling. Tensile bond strength tests performed on hydro-demolition prepared concrete have been measured at more than double (2x) the strength for concrete prepared by bush hammering.

Terminology - Although there is little consensus within the industry, the term high pressure is generally used to describe pressure up to 1,000 bars (15,000 PSI), ultrahigh pressure is above that level (commonly used with current equipment = 2,500 bars = 35,000 PSI)

Advantages:

- Dustless
- Free of vibration (does not bruise concrete)
- Relatively clean operation (except water and grit residue)
- Fast operation
- Relatively low noise operation
- Good keyed surface profile
- Removes material of the same or lesser strength

Disadvantages:

- Supply, handling and disposal of water
- Usually more costly than other methods
- Requires highly skilled operator
- High pressure water can be very dangerous
- Substrate normally are required to be dry

DISCLAIMER

Arizona Polymer Flooring Technical Bulletins are developed in good faith for the sole purpose of assisting others with products, systems and industry standards. The information published herein is gathered from different sources that are thought to be reliable, but the reader should not assume that the information absolves the reader from validating information from other sources, such as listed below, before making a decision. Since information from others can change without notice, Arizona Polymer Flooring cannot be held at fault if any of the information conveyed in good faith is deemed in error. Listed below is a number of Trade Association Organization that can provide additional assistance to the reader.

***Questions:* Contact Arizona Polymer Flooring**

Arizona Polymer Flooring
4565 W. Watkins St.
Phoenix, Arizona 85043
Phone: 623.435.2277
www.apfepoxy.com

Super-Krete® Products
Surface Preparation Guide

AMERICAN CONCRETE INSTITUTE STANDARDS

ACI 201.1R	Guide for Making a Condition Survey of Concrete in Service
ACI 201.2R	Guide to Durable Concrete
ACI 302.1R	Guide for Concrete Floor and Slab Construction
ACI 302.2R	Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
ACI 318	Building Code Requirements for Structural Concrete
ACI 364.1R	Guide for Evaluation of Concrete Structures Prior to Rehabilitation
ACI 503R	Use of Epoxy Compounds with Concrete
ACI 503.1	Standard Specification for Producing a Skid Resistant Surface on Concrete by the Use of a Multi Component Epoxy System
ACI 503.4	Standard Specification for Repairing Concrete with Epoxy Mortars
ACI 546R	Concrete Repair Guide

AMERICAN SOCIETY FOR TESTING OF MATERIALS

ASTM D4258	Standard Practice for Surface Cleaning Concrete for Coating
ASTM D4260	Standard Practice for Acid Etching Concrete
ASTM D4262	Standard Test Method of pH of Chemically Cleaned or Etched Concrete Surfaces
ASTM D7234	Standard Test Method for Pull-Off Adhesion Strength of Coating on Concrete Using Portable Pull-Off Adhesion Testers
ASTM F710	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
ASTM F1869	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

INTERNATIONAL CONCRETE REPAIR INSTITUTE STANDARDS (ICRI)

ICRI Guideline No. 310.1R
Guide for Surface Preparation of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion

ICRI Guideline No. 310.2R
Selecting and Specifying Concrete Surface Preparation for Sealers Coatings and Polymer Overlays

ICRI Guideline No. 320.1R
Guide for Selecting Application Methods for the Repair of Concrete Surfaces

IRCI Guideline No. 320.2R
Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces

SOCIETY OF PROTECTIVE COATINGS (SSPC STANDARDS & JOINT STANDARDS)

SSPC-TU 2/NACE 6G197
Design, Installation and Maintenance of Coating Systems for Concrete Used in Secondary Containment SSPC-SP 13/NACE No. 6 Surface Preparation of Concrete SSPC-TU 10/PCSI Procedures for Applying Thick Film Coatings and Surfacings Over Concrete Floors

Super-Krete® Products
Surface Preparation Guide

ORGANIZATION CONTACT INFORMATION

ACI (American Concrete Institute), P.O Box 9094, Farmington Hills, MI 48331 (http://www.aci-int.org)

ASTM International (American Society for Testing of Materials), 100 Barr Harbor Dr., West Cohshohocken, PA 19428 (http://www.astm.org)

ICRI (International Concrete Repair Institute), 1323 Shepard Drive, Suite D, Sterling, VA 21064 (http://www.icri.org)

NACE International (The Corrosion Society), 1440 South Creek, Houston, TX 77084 (http://www.nace.org)

SSPC (The Society for Protective Coatings), 40 24th St., 6th Floor, Pittsburgh, PA 15222 (http://www.sspc.org)