Decorative Concrete Council
A Specialty Council of the American Society of Concrete Contractors

SEALER SELECTION & APPLICATION GUIDE



Sealer Selection and Application Guide

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INTRODUCTION

Concrete driveways, walkways, and patios can greatly enhance the appearance and value of a property. Residential and commercial building owners count on their concrete floors to be durable and have a pleasing appearance. Many factors contribute to producing strong durable concrete, including a quality concrete mix, professional placement, and proper curing and sealing. No decorative concrete installation is complete without the application of a sealer. Taking the time to put down this final layer of protection not only prolongs the life of your creative handiwork, but enhances and preserves its appearance. The benefits, depending on the product used, include:

- Enriching the color intensity of the concrete, whether the color is integral, a stain or dye, or obtained from a dry-shake hardener and antiquing release
- Adding sheen to the surface, ranging from satin to high gloss
- Blocking the penetration of dirt, oil, grease, chemicals, and stains, making the concrete easier to clean and maintain
- Inhibiting dusting of the surface
- Preventing the intrusion of water and chlorides, which minimizes freeze-thaw damage
- Protecting against abrasion and wear

To obtain these results, however, you must choose the right sealer for the job. There are hundreds of products on the market to suit just about every type of concrete application, but no one sealer is perfect for all projects. Using the wrong sealer or applying it improperly can ruin an otherwise flawless decorative concrete installation.

This Guide will help you understand the concrete sealing process, and how, when selected and applied properly, a concrete sealer will protect and beautify your investment. We have included a troubleshooting section with photographs to help identify the type and cause of failures, along with suggested corrective action.

The Guide focuses on acrylic, film-forming sealers in solvent and water based forms. It does not address epoxies, urethanes, polyaspartic-type floor coatings or liquid floor hardeners and densifiers associated with concrete floor polishing. These types of coatings and finishes are industries unto themselves and each should be addressed separately.

SECTION 1 PRODUCT SELECTION

Concrete sealers offer protection and aesthetic appeal essential to many residential and commercial projects. The choice and correct usage of sealers for a decorative concrete project continues to be one of the most challenging issues facing concrete contractors and their customers. Contractors need to understand and be able to explain the characteristics, gloss levels, protection, and color enhancement each type of sealer will produce. In addition, sealer types can also affect slip resistance. This will be covered in more detail under Safety.

There's a wide range of sealers to choose from, depending on the requirements of each job. UV stability, abrasion resistance, affordability and longevity, among other traits, can all be achieved with the right sealer. To single out the sealer that meets the demands of your project, remember the acronym SAP:

Safety – Make sure the sealer does not increase slip potential or emit harmful fumes during application, especially on indoor projects. (See Section 4)

Appearance – Sealers come in various sheens, ranging from satin to glossy. The higher the gloss level, the greater the degree of color enrichment. (See Section 2)

Performance – Sealer application thickness, durability, weather resistance, and maintenance requirements vary among the different products. Choose a sealer that will protect your concrete from the traffic conditions and elements to which it will be exposed. Also make sure the system is compatible with the decorative surface treatment, such as an overlay or topically applied color.

Cost will always be a factor, but when it comes to sealers, you really do get what you pay for. Save now, pay later is often the result for going cheap. Solvent and water based acrylics generally cost between $0.10-0.20 per square foot, but most important is to make sure the sealer you choose meets the requirements of your project. The following chart provides a comprehensive guideline to selecting the proper sealer.

PRODUCT SELECTION GUIDE

SEALER CATEGORIES	STANDARD SEALER NAME	COMMON NAMES FOR SEALER	SOLVENT or WATERBORNE	TECHNOLOGY DESCRIPTION	CURE-N-SEAL STANDARD (Y/N)	SHEEN	FEATURES	BENEFITS	PRIMARY PERFORMANCE CHARACTERISTICS	Recoat Time Frame Years**
WATER-BASED ACRYLICS	**Acrylic Sealer Water-based**	WB Sealer	Waterborne	Pure Acrylic Emulsion	N	Gloss Satin	Usually one-part, easy to apply, low odor, previously applied substrates	Fast drying, non-yellowing, very clear, breathable, low V.O.C., easy cleanup	Leave translucent or transparent application similar to original color application	1-2 Years
	Acrylic Silicone Fortified Water-based	Acrylic Water-based Sealer, Water-based Sealer	Waterborne	Pure Acrylic Emulsion, Styrene Acrylic, Solvent-hybrids with water clean up	N	Gloss Satin	Usually one-part, easy to apply, low odor, goes on milky white and dries clear, bare or previously applied substrates, concrete surfaces, builds film	Fast drying, colors remain very close to application color, higher solids, more topical, less bubbling during application, low V.O.C.	Breathable (allowing the release of moisture), crystal clear, non-yellowing in most cases, softer than solvent film, good stain resistance, great adhesion	1-2 Years
SOLVENT -BASED ACRYLICS	**Acrylic Sealer Solvent-based**	Acrylic Sealer, Solvent Sealer, Oil Sealer, Silicone Acrylic Sealer	Solvent	Carrier - Xylene, Mineral Spirits, Silicone. Resin – pure acrylic, methyl methacrylate, solution acrylic	N	Gloss	Usually one-part, easy to apply, high odor, bare or unsealed concrete surfaces, builds film	Fast drying, richer colors, excellent clarity, higher solids, better penetration	May yellow or amber over time, may bubble during application, surface heat sensitive, chemical and stain resistant , resists hot tire pick up	1-3 Years
	Acrylic Thermoplastic Solvent-based	Solvent-Sealer, Quick Flash Solvent Sealer	Solvent	Carrier – Solvents, aromatic naphtha. Resin – pure acrylic, methyl methacrylate, solution acrylic	Y	Gloss	Usually one-part, easy-to-apply, high odor	Very fast drying, excellent penetration, moderate solids, less bubbling during application, richer color, excellent clarity	Not breathable, can be applied to green concrete, often used as a cure-n-seal walkaway sealer, richer colors, chemical and stain resistant	2-4 Years
	Cure-N-Seal	Cure-N-Seal, Fresh Concrete Sealer, Green Concrete Sealer	BOTH	Styrene acrylic copolymer, either in solution (solvent based) or as a latex emulsion (water based)	Y	Gloss Satin	Usually one-part, easy-to-apply, moderate odor, excellent penetration, helps with concrete hydration, most cases high odor, clear, sometimes amber color	Wet look appearance, Helps with concrete curing process, meets ASTM C 309 and ASTM C 1315 requirements, can be breathable, color enhancement, chemical resistant	Can be applied to freshly poured concrete, excellent penetration, seals and locks in colors	2-5 Years

SECTION 2 GLOSS LEVEL, & COLOR ENHANCEMENT

Sealer appearance is generally separated by the gloss level of the sealer and by how much it enhances the concrete color or stain it is covering. Similar to the paint for your walls, sealers come in various gloss levels, from flat (matte) to a high gloss that gives a wet look. Gloss, or sheen, as it is sometimes called, is simply a measurement of how much light is reflected back from the surface. The higher the reflection, the higher the gloss. Gloss is typically measured using the MPI standard gloss ratings, which range from 1 to 100.

The concrete color is also affected by how the sealer enhances the surface. Generally, solvent based acrylic film forming sealers will provide more color enhancement than water based acrylic film forming sealers. Penetrating sealers that are not film forming generally provide no enhancement. They are typically not used on stamped concrete because they provide no protection to the surface "antique" coloring used with powdered release agents or secondary coloring methods.

Gloss level in acrylic sealers is dependent on the percentage of acrylic solids in the sealer. Sealers typically are classified by the percentage of acrylic resin in the sealer. For example, a sealer that contains 25% acrylic resin and 75% solvent carrier or water is generally called a 25% solids sealer. The lower the solids, the lower the gloss or sheen. Sealer solids content availability varies by region but generally ranges from a low of 20% to a high of 35%. With many states adopting tougher Volatile Organic Compound (VOC) laws, many solvent sealers are now a minimum of 25% solids. This has caused the introduction of flattening agents to achieve a low sheen or matte finish. Flattening agents are designed to scatter the light across the surface, producing a matte or less-than-glossy appearance. The gloss level varies, so check with your supplier for information on the sealer you are using.

The final appearance of decorative concrete is heavily affected by the choice of sealer. By understanding the sealer choices and characteristics, choices can be made that will alleviate many customer issues. Do not assume that your typical sealer is the correct sealer for each and every job.

SEALER TYPE	FLAT	MATTE	SEMI-GLOSS	GLOSS	HIGH GLOSS
GLOSS RATINGS	0-20	20-40	40-60	60-90	80-100
SOLIDS CONTENT	< 20%	20-25%	20-25%	25-30%	> 30%

SECTION 3 PERFORMANCE EXPECTATIONS & MAINTENANCE

To protect a new decorative concrete surface, sealer is applied to add durability and enhance color. The solvent or water based acrylic sealer will need occasional cleaning and periodic re-application to continue to decrease water penetration, and maintain stain and UV resistance. Concrete is meant to be a long-term element of your home or building site, and the owner's participation in the maintenance is essential.

The surface color may come from pigments in the concrete or dyes and stains applied after the concrete was placed, but having a quality sealer applied and maintained will ultimately determine the color intensity. Light reflecting off any surface determines the color intensity and brightness, so sealer plays a critical role. As sealer wears, the light becomes more scattered and the color loses intensity. Sealer applied to a surface that has been left unsealed for years will bring the color back to life, giving the pavement a nearly new appearance.

Decorative concrete sealers protect and add to the lifespan of concrete by acting as a sacrificial coat. Weather is one of the worst offenders for causing damage to concrete. A sealer can be used to slow this type of deterioration. Sealers are "scratch and stain resistant", not "scratch and stain proof". As a sacrificial coat it should be expected that over time sealer will show wear, and eventually need reapplication. The timing of this reapplication will vary tremendously based on exposure, conditions (interior or exterior), location (interior floor, sidewalks, or driveway), and traffic. A general rule of thumb is higher traffic and UV exposed areas should receive new sealer every 2-3 years, while lighter traffic and interior areas should last 4-5 years. Faded areas, and blotchiness, especially when the surface is wet, are all signs of a surface needing new sealer.

Slip resistance must be addressed during the initial application of sealer and in all subsequent reseals. Numerous additives that give the surface a "grittiness" and help reduce slip and fall occurrences are available to mix with the sealer prior to application. The location and use of the concrete are factors in determining how much anti-skid material should be added. Interior floors that are likely to have little or no wet shoe traffic will require little or no anti-skid material, while exterior public walkways should always include sufficient material to a point that it can be felt with a bare hand. Please note that grip additives do not make the surface totally non-slip. The best broom finished concrete with sealer and grip additive that is ice covered will still be slippery.

Many people assume a concrete surface with a glossy finish will be slippery. This can be true, however the underlying texture of the concrete can have as much to do with slipperiness of the surface as the gloss. Make sure your sealer meets ASTM 2047 standards for slip resistance. Anti-skid material should be made specifically for your sealer type and purchased from a concrete or decorative concrete supply house. Adding sand and some silica materials is not recommended and can actually cause sealer deterioration.

Periodic maintenance of your sealed surface is necessary to extend both the life of the sealer and the concrete. Leaves, oils, grease, mildew, and other natural occurrences will eventually stain all concrete. Stains can set over time if they are allowed to penetrate and eat into the surface coating. General cleanup guidelines include:

- Oil and grease – detergents or degreasers like Simple Green, or common engine degreasers
- Rust and leaf stains – mild acidic products like Lime Away, CLR, or specific concrete cleaners
- Mildew – household bleach will eliminate most mildew when treated in a timely manner
- Tree sap or road tar – spot cleaners such as Goo Gone or Dissolves-It

Occasional cleaning of the concrete surface with a mild detergent (dish soap), a little elbow grease, and a thorough rinsing will provide the best maintenance. Be aware that many concrete floor cleaners contain chemicals that strip and remove a small layer of the sealer. Read labels carefully. Concrete, specifically sealed concrete, is a very durable surface but the owner has a part in making it last.

SECTION 4 SAFETY

When using concrete sealers, pay attention to the necessary precautions for your personal health and safety. Sealers, particularly solvent sealers, contain solvents that are flammable and can be hazardous to breathe over extended periods of time.

- Protective Clothing - Remember to wear protective clothing whenever handling or applying a concrete sealer. The fumes and vapors produced by solvent sealers can be very dangerous and when inhaled can cause nausea, fatigue, headache and dizziness. Protective eyewear should be worn to prevent irritation to eyes. Gloves are recommended because sealer in contact with bare skin can cause cracks, rashes and dryness.
- Ventilation - Due to the high toxicity of the fumes produced when utilizing a concrete floor sealer, it is important that the area is properly ventilated. The room should have proper air exchange, removing the irritating odors to the outdoors. Open all windows and set up fans to push fumes out and move fresh air in.
- Keeping Sealer Away from Open Flames and Sparks – Solvent sealers are highly flammable and can cause explosions or fires very easily. Workers should not smoke when they are applying sealer. Sealers must be kept at a distance from any fire and heat sources. Store sealers in their own containers in a place specified for flammable liquid substances.
- Preventing Water Pollution - Apart from causing damage to human health, sealers can pollute lakes, rivers, seas and oceans. They can poison the water, kill fish and other living organisms. Never dispose of sealers in public drains or waterways.
- Rinsing and Cleaning - Wash hands thoroughly before smoking, drinking, or eating.
- First Aid - If sealer comes in contact with skin, apply a suitable hand cream or lotion to protect the skin against cracking and dryness. In cases where a person inhales the fumes of a sealer and is having difficulty breathing, provide him or her with oxygen or artificial respiration and call 911. If sealer has been swallowed, thoroughly wash the mouth and drink lots of milk or water. Do not induce the person to vomit. If he or she vomits, keep the head at a low position and take the person to the hospital for medical attention as soon as possible.

Always follow manufacturer guidelines for safety and handling, and refer to MSDS sheets for individual product information.

SECTION 5 APPLICATION

Manufacturer's directions should be followed in all sealer applications. Sealer can be applied by sprayer, roller, or broom, but it is imperative to remember that sealer must be applied in thin coats. Over-application can cause numerous problems including bubbling, cracking, and whitening. Coverage rates listed on the product labeling are the best guideline to application rate. Ensure that the product is mixed thoroughly. If anti-skid additives are used, continue to mix throughout the application to keep the flattening materials from settling.

Prior to resealing, the area should be systematically cleaned with a walk-behind scrubber, power washer, or given a thorough hand scrubbing. Any detergents used in the cleaning process need to be carefully rinsed off and the surface should be dry before sealer application. Resealing is best performed by a qualified contractor, who is trained and experienced in proper preparation, sealer selection, and application techniques.

At an ambient temperature of 70°F (21°C) sealer will typically be dry to the touch in 1-2 hours, and accept light foot traffic in 3-4 hours. It is recommended not to place furniture or park a car on a freshly sealed surface for a full 24 hours or more. Do not seal a surface when rain or condensation is expected within 12 hours of the sealer being placed.

Concrete Surface Preparation

Before sealing or re-sealing concrete that has already hardened, the surface must be well cleaned to ensure good product performance. Removal of dirt, oil, and other contaminants is necessary. Work slowly and steadily. Clean one section at a time before moving to the next. Following a random washing pattern may result in uneven streaks after the concrete dries. Spot clean stains or oil-soaked areas, as sealing over these spots may result in poor adhesion or inadequate penetration of the product.

Allow the concrete to dry thoroughly before applying a sealer. Following a wash, there may be a significant amount of water left in the concrete even though the surface may appear dry. Any residual curing compounds need to be chemically stripped or mechanically removed before sealing. On stamped concrete with powdered release it is essential that 75% or more of the powdered release be removed prior to sealing, especially on high traffic spots.

Ideal Conditions for Application

Concrete sealers are sensitive to environmental conditions during application and drying, including air temperature, humidity, concrete moisture content and temperature, wind, direct sunlight, possibility of rain, etc. This is especially true for water-based products, where proper drying is highly dependent on temperature and humidity. Many sealer problems can be alleviated by sealing in conditions when the air and surface temperature are equal, and moderate (50-65°F (10-18°C)). Applying sealers to wet concrete can cause the surface to "fog up" or "blush", which will turn it white and/or cause adhesion problems.

Temperature

Water based sealers must be applied when the air and concrete temperatures are 45°F (7°C) and rising, but not higher than 90°F (32°C). This is critical for proper film formation or reaction with the concrete. Application when the temperature is outside this range can cause the sealer to bubble, turn white and/or dry chalky instead of as a clear, strong film.

Solvent based products are less sensitive at the low end of the temperature range; they will dry when the temperature is as low as 40°F (4°C) but application at low temperatures will be difficult since solvent based sealers thicken as they get cold. Product containers should be kept at room temperature before application so the material stays viscous and easy to spray or apply by roller.

As the temperature reaches 85°F (29°C) and above, applying a solvent based sealer becomes difficult, since the solvent in the product will evaporate much faster at these temperatures. Application during warm weather is best done early in the morning or late in the evening, during the coolest part of the day. Using a solvent based sealer in hot weather or in direct sunlight can result in bubbling, which in turn leads to peeling or flaking. Solvent based sealers formulated with the VOC-exempt solvents tertiary-butyl acetate (TBAC), or acetone, are especially affected by temperature, as these solvents dry as much as nine times faster than standard xylene-based sealers. Applying a TBAC or acetone-based sealer in hot weather will greatly increase the chances of bubbling and failure of the sealer to adhere to the substrate.

Humidity

In high humidity conditions, above 70% R.H., any type of concrete cure and seal or penetrating sealer will take longer to dry. If the humidity is very high, or the product is applied in a location with little air flow, it can take weeks for a concrete sealer to dry or cure thoroughly. Additionally, high humidity during application and drying of a water based sealer may cause the product to dry with a white appearance or chalky consistency. It is best to wait for normal humidity conditions, below 70% R.H. (or use dehumidifiers on interior projects) before applying a water based sealer. Sealers used on interior projects with little or no cross-ventilation or air exchange can also result in delayed dry times.

Sun, Wind and Rain

Direct sunlight and windy conditions during application can cause a solvent based sealer to bubble or turn white. This is because the sealer will “skin over”, or dry on its surface before the solvent has fully evaporated. Over time, the pressure of the solvent vapor trying to evaporate will cause blisters or bubbles. This can be prevented by applying sealer in cool weather, or on a calm, overcast day. The product needs to dry from the bottom up, not the top down.

Methods of Application

Spraying

Application of a sealer with an industrial, hand-held pump-up sprayer is one way to achieve even coverage and appearance, especially when combined with a back-roll. Be sure to wear protective clothing, gloves, and eyewear and protect surrounding buildings, vehicles, etc. from overspray. When spraying, the product should exit the nozzle in a fine and even fan pattern. If there are streams of material coming out of the nozzle, the sprayer needs to be pumped up to create more pressure, or a nozzle with a larger orifice should be used. Most sprayers come equipped with a 0.5 gallon per minute (1.9 liters per minute) spray nozzle, but for higher solids materials, a 1 gallon per minute (3.8 liters per minute) nozzle may be required to produce an even spray pattern.

When spraying a sealer, do not leave areas of heavy overlap. A good practice is to have one person applying the sealer by sprayer, and another person immediately back-rolling over the applied areas to even out the coverage and eliminate any overlapped areas. A sealer that has been allowed to puddle, or is overlapped, will dry with a darker color, resulting in a blotchy appearance.

Follow the manufacturer's directions regarding sprayer cleaning and maintenance, as a dirty or clogged sprayer will produce uneven coverage and poor results. Do not spray water based and solvent based sealers with the same sprayer without a thorough cleaning before product changeover. Water based and solvent based materials are not compatible and co-mingling will cause clogging of the sprayer.

Rolling

Most do-it-yourselfers will choose to apply a sealer with a paint roller on an extension pole. The roller must have a short nap, 3/8 inch (0.95 cm) is preferred, and all equipment including the roller and paint tray must be solvent resistant. Again, applying a sealer according to the recommended coverage rate is critical to product performance and appearance. Do not saturate the roller with the product, as this can cause dripping and heavy areas, which will discolor the concrete. While rolling, keep a wet edge and do not create heavy overlapped areas. Rolling too vigorously can cause bubbling.

If it is necessary to "cut in" with sealer around landscaping, structures, etc., be sure to keep a wet edge between the cut in parts and the main area application. If a section is cut in and allowed to dry, there will likely be a visible line between the cut in area and the rest of the sealed concrete.

Water vs. Solvent Based Sealer Application

A few minor differences exist between application methods for solvent and water based sealers that a contractor needs to consider. Although both sealers need to be applied in thin (1-3 mils) layers, water based sealers are especially sensitive to this. If water based sealer is placed too thick, immediate whitening will be seen once it dries which can only be repaired by mechanical grinding or blasting. Water based sealer is also more sensitive to lower temperatures and high humidity, as mentioned previously, due to the inability to form a film. Finally, a wet edge needs to be maintained at all times when rolling out water based sealer.

Solvent based sealers are a little easier to apply and repair, but still need care and concern. Solvents are much more sensitive to higher temperatures, both surface and ambient, and can form a film too quickly under these conditions. Good solvent based sealers meet the requirements of ASTM 1315, while offering a breathable technology that mitigates possible problems. Still, the majority of solvent based sealer problems come from applying the product thicker than the recommended rate.

Who Should Apply Sealers

Unfortunately some contractors treat sealer application as a job anyone can do, and often leave it to the most unskilled person. Not coincidentally, the majority of decorative concrete problems revolve around sealers and coatings. Surface preparation and sealer application are two of the most important pieces of a project and when left to conscious, caring employees, can be a beautiful finish to your hard work. When left to people who are only concerned about getting finished, it will likely become a source of customer call backs.

SECTION 6 VOC LAWS

Special application details for exempt solvent sealers.

In January 2005 several East coast and Mid-Atlantic states enacted regulations that made traditional xylene solvent sealers and penetrating water repellent products illegal to sell or use. These regulations are currently in effect in Maryland, New York, New Jersey, Delaware, the District of Columbia, Pennsylvania, Maine, New Hampshire, Connecticut, Massachusetts, Rhode Island, and the northern counties of Virginia. Similar regulations have been enacted in Ohio, Indiana, and Illinois. . As a result, sealers are now being offered in “exempt solvent” formulations; solvents such as acetone and tertiary-butyl acetate (TBAC) have “low photochemical activity” – they do not react in the atmosphere to produce ozone, a ground level pollutant. For this reason, the EPA and most state air quality boards consider one or both of these solvents to be “exempt”, which means that they do not count toward the VOC content of a product.

With exempt solvent sealers, consumers in regulated areas once again have options for sealing concrete in conditions or applications where water based products are unusable (in cold weather, for example) or when the predictable and reliable results of a solvent based product are desired.

TBAC and acetone have evaporation rates that are five and nine times as fast as xylene, respectively. As a result, sealers formulated with acetone and TBAC dry much faster than standard sealers that use xylene-type solvents as the carrier, and the application methods must be altered slightly to ensure a successful end result.

Exempt solvent sealers can be applied with an industrial, hand held pump-up sprayer equipped with a 0.5 gallon per minute (1.9 liters per minute) brass spray tip with a fan pattern. Additionally, contractors must be sure that the sprayer is equipped with neoprene gaskets, O-rings, and hoses, as standard rubber fittings will deteriorate upon contact with acetone or TBAC. Chapin Manufacturing offers their Xtreme Industrial Concrete Sprayer, which is specifically resistant to acetone and tertiary-butyl acetate.

Because exempt solvent sealers dry quickly, the nozzle of the sprayer must be held close to the concrete surface – no more than 6" (15 cm) above. The contractor should not wave the sprayer nozzle around at waist level. This can lead to flash drying of the product before it hits the ground. These products can also be roller-applied, although a more even application is accomplished by spraying the product, then immediately back rolling over the applied area to re-distribute any heavy or puddled spots. If back rolling is to follow spraying, it must be done immediately behind the spray application. Do not overwork the roller; this can cause bubbling, stringing, and roller nap pullout.

The fast dry times of these products means that application during the coolest times of the day (early morning or late evening, not in direct sunlight) is especially critical to good results. Applying exempt solvent products in hot weather or direct sun will result in severe bubbling.

SECTION 7 TROUBLESHOOTING

Problem Prevention, and Solutions

Sealers continue to be an issue at all levels of the decorative concrete industry. The discomfort comes from new regulations, use of incorrect products, lack of knowledge, willingness to learn new methods, and unrealistic expectations. Blame can be placed on everyone: the manufacturer, the distributor, the contractor, and even the homeowner. VOC laws keep changing from region to region throughout the United States, forcing manufacturers to make changes that are not always communicated to the end user. This section is a short guide to sealer troubleshooting, prevention, and solution, to be used primarily by contractors who are encountering the problems first hand.

Pictures of each type of problem have been included to define the issues. You will find the answers to many sealer problems come from more than one solution. The options for correction are somewhat limited, and the ultimate answer is frequently not pleasant to perform (stripping sealer). We hope this information will guide contractors and owners to make better choices in sealer selection, application methods, and owner expectations will be correctly set.

Sealer Troubleshooting Glossary -

- Mil – Sealer thickness is measured in mils. For reference a credit card is over 100 mils thick and standard copy paper is over 10 mils thick. Acrylic sealers should be applied around 5 mils thick wet, which will be 1-2 mils thick when dry.
- Acid Wash – A mixture of 10 parts water to 1 part muriatic acid used to clean release off a stamped surface. Wet the surface and spray the acid / water mixture on the surface, using a standard push broom in a circular motion. The release will be removed from the high spots of the stamped concrete, leaving release in the lower areas as desired.
- Acid Rinse – A mixture of 20 or more parts water to 1 part muriatic acid is effective in cleaning colored concrete prior to sealing. Following the acid rinse, thoroughly neutralize and rinse the entire surface, allow surface to dry, and then apply sealer.
- Solvent Wash – Solvents such as xylene or Aromatic 100 are used to soften and emulsify an existing sealed surface. Apply the solvents using a sprayer or roller, and liberally spread around the surface. Solvent washing will help thin and level existing sealer while opening it up to expel any moisture.

Bubbles or Blistering

Definition

Finished surface has small bubbles that pop or shatter when stepped on. Can be found on the top of the surface but are typically more prevalent in lower spots or joints on stamped concrete projects.

Probable Cause 1 - Product was applied too thick.

Prevention

Take time to fully understand coverage rates and place a uniform coating over the entire surface, removing any puddles from low areas.

Solution

Solvent wash and allow to dry, do not apply additional sealer.

Probable Cause 2 – Product was applied in temperatures outside of manufacturer's recommendation. Sealer placed on a hot surface will bubble or crack shortly after installation. Sealer placed on a cold surface will not dry properly and can become a sticky or powdery mess.

Prevention

Follow manufacturer's recommendations for the air and ambient temperatures. If possible, apply sealer during the coolest part of the day, when the concrete is not in direct sun.

Solution

Solvent wash and allow to dry, do not apply additional sealer.

Efflorescence or Blushing

Definition

Efflorescence is the white powdery substance on the surface of unsealed concrete and the white blush seen with sealed floors. Efflorescence is caused by water in the concrete evaporating from the slab and leaving behind soluble salts on the concrete surface. Colder temperatures, coupled with increased bleed water in cold weather, increases the likelihood of efflorescence showing up after winter concrete placement. Efflorescence and sealer whitening are commonly mistaken for each other.

Probable Cause 1 - Concrete was placed with a high water to cement (w/c) ratio.

Prevention

Start with a concrete mix that uses well-graded aggregates, a low w/c ratio, and fly ash or other pozzolan as a partial cement replacement. Water reducers can be used to increase workability without adding extra water to the mix.

Solution

Although a solvent wash may temporarily fix the problem, efflorescence will likely return during moist or cooler conditions. A permanent fix involves stripping the sealer, followed by a light acid wash (20-40 parts water to 1 part muriatic acid), or the use of an efflorescence remover. Let the surface dry thoroughly prior to proper reapplication of sealer.

Probable Cause 2 – Moisture is migrating from below the slab to the surface.

Prevention

Create a base with proper dry materials and complete drainage, ensuring no extra moisture is introduced below the slab once it is placed. In decorative applications ensure that cleaning steps do not leave behind excessive moisture on the slab.

Solution

Although a solvent wash may temporarily fix the problem, efflorescence will likely return during moist or cooler conditions. A permanent fix involves stripping the sealer, followed by a light acid wash (20-40 parts water to 1 part muriatic acid), or the use of an efflorescence remover. Let the surface dry thoroughly prior to proper reapplication of sealer.

WHITENING

DEFINITION

Commonly mistaken for efflorescence or blushing, sealer whitening occurs when moisture (water vapor or solvent) is trapped in the layers of sealer. Can also be a result of sealer application taking place in cool or damp conditions resulting in poor film coalescence.

PROBABLE CAUSE 1 - Initial sealer coat placed with excessive moisture on the surface.

PREVENTION

Do not place sealer over a wet or damp surface and utilize an ASTM 1315 Cure and Seal, Class A, breathable decorative concrete sealer with a lower solid content.

SOLUTION

A solvent wash will typically take care of this problem if the solvent can leave the sealer open long enough for the moisture to dissipate. Otherwise, stripping and sealer re-application will be necessary.

PROBABLE CAUSE 2 – Incompatible sealers have been used, causing trapped solvents between sealer layers

PREVENTION

Use the same sealer that was originally applied. Re-sealing always poses a risk because the original sealer used is typically unknown, not only the manufacturer, but the type (water or solvent).

SOLUTION

A solvent wash will typically take care of this problem if the solvent can leave the sealer open long enough for the moisture to dissipate. Otherwise, stripping and sealer re-application will be necessary.

PROBABLE CAUSE 3 – Water based acrylic was used that was either not mixed properly or applied too thick.

PREVENTION

Water based sealers require thorough mixing throughout the application, and applying the sealer in thin coats is even more important when compared to the use of solvent sealers.

SOLUTION

Solvent washes will sometimes work in correcting some of the problems related to whitening of a water based sealer, but it is likely that sanding or stripping the sealer will be the correct course of action.

Adhesion Failure

Definition

Sealer begins to flake off or wear off causing light spots. Usually appears like dots across the surface.

Probable Cause 1 - Excessive release was left on the surface prior to sealing a stamped project.

Prevention

This is one of the biggest reported sealer problems, which in reality is an application error. When cleaning release off the surface it is imperative that 75% or more of the release be removed. It is highly recommended that a mixture of 15-20 parts water to 1 part muriatic acid be used to clean powdered release off the stamped concrete surface. This will not only remove the release but also create porosity in the surface to which the sealer can adhere. Be sure to thoroughly rinse the cleaning solution.

Solution

Sealer must be stripped, then acid wash the surface to remove the bulk of the release (80% or more). Use antiquing to recolor if necessary, and re-apply two thin sealer coats.

Probable Cause 2 – Simple wear and tear.

Prevention

When initially sealing be sure to provide the owner with the ASCC Sealer Expectations & Maintenance Guide. Acrylic sealer will realistically last somewhere between 2-3 years on a surface experiencing minimal traffic or UV rays.

Solution

Clean the surface using soap and water, then thoroughly rinse. A solvent wash is also a good practice prior to resealing. Apply two thin coats of sealer while the surface is clean and dry.

Probable Cause 3 – A high solids sealer was used on the initial sealer application.

Prevention

Sometimes high solid sealers cannot penetrate into the surface sufficiently, causing a weak bond and eventual adhesion failure.

Solution

Even if a higher gloss or sheen is desired, use a low solid sealer for the first thin coat, then apply a thin coat of a higher gloss sealer to obtain the desired sheen.

PROBABLE CAUSE 4 –Too many coats of sealer.

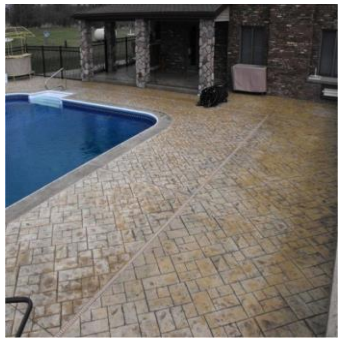
PREVENTION

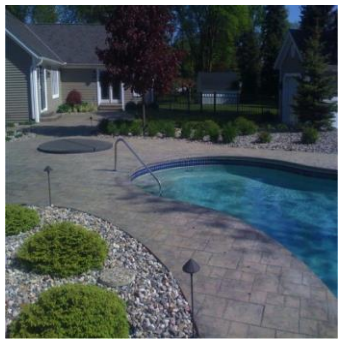
Be sure the surface is thoroughly clean and dry prior to resealing to ensure moisture is not trapped between layers causing adhesion failures.

SOLUTION

After years of resealing and building up layers of sealer, sometimes just a good solvent wash will provide the same look of a new coat of sealer. Wet the surface with the solvent and move it around with a roller to allow for even coverage.

YELLOWING





DEFINITION

Sealer turns yellow in areas exposed to UV rays.

PROBABLE CAUSE 1 - A non-yellowing Class A sealer was not used or the Class A sealer was defective.

PREVENTION

Decorative contractors should always use a non-yellowing, Class A, breathable sealer. Buying sealer products from distributors or manufacturers who stand behind their product is essential.

SOLUTION

Once a sealer has yellowed the only proper fix is to strip and reseal, otherwise the yellow coating will be trapped under the new sealer.

PROBABLE CAUSE 2 – Separation has occurred between the layers of sealer. This will act and appear almost identically to some of the adhesion issues.

PREVENTION

Be sure the surface is thoroughly clean and dry prior to resealing to ensure moisture is not trapped between layers, causing adhesion failures.

SOLUTION

Once a sealer has yellowed the only proper fix is to strip and reseal, otherwise the yellow coating will be trapped under the new sealer.

PROBABLE CAUSE 3 – The sealer's UV inhibitors have a life span.

PREVENTION

Sealer maintenance is an ongoing process that cannot be ignored. Sealer older than 3 years can lose its effectiveness as the UV inhibitors lose strength.

SOLUTION

Once a sealer has yellowed the only proper fix is to strip and reseal, otherwise the yellow coating will be trapped under the new sealer.

Streaks or Roller Marks

Definition

Distinguishable marks are visible from roller or sprayer.

Probable Cause 1 – The sealer has been applied unevenly without keeping a wet edge.

Prevention

As sealer is applied, keeping a wet edge will help maintain a uniform thickness and reduce the occurrence of roller marks.

Solution

Use a solvent wash to redistribute the sealer evenly and apply an additional coat if necessary.

Probable Cause 2 – Sealer was applied in hot conditions and flash dried on the hot surface.

Prevention

Seal when conditions are more favorable, in the morning or evening.

Solution

Use a solvent wash to redistribute the sealer evenly and apply an additional coat if necessary.

Probable Cause 3 – The sealer has been applied by an inexperienced applicator.

Prevention

Sealing should not be left to the least experienced person on the crew, as it is a very important step in the overall project.

Solution

Use a solvent wash to redistribute the sealer evenly and apply an additional coat if necessary.

Surface Stains

Definition

Oil, fertilizer, leaves, debris, or animals have left stains on the surface.

Probable Cause 1 – Sealer has worn away, or has not been maintained properly.

Prevention

Sealers will help prevent but not eliminate stains. Removing sources of stains such as automotive oil, fertilizer granules, or leaves as quickly as possible, will reduce the likelihood of permanent stains.

Solution

Many manufacturers offer specific rust or stain removers for concrete. Consider reapplication of sealer after the surface has been thoroughly cleaned. Additional information on surface stains and maintenance can be found in Section 3.

Blotchy Areas

Definition

Sealed surface has areas of dark and light spots, along with some appearance of crazing.

Probable Cause 1 - Sealer has been unevenly applied or had only one coat applied.

Prevention

Follow the application methods provided by the manufacturer and use experienced installers.

Solution

Use a solvent wash to redistribute the sealer evenly and apply an additional coat if necessary.

Probable Cause 2 – Incorrect sealer was chosen for the project.

Prevention

Utilize a sealer made specifically for decorative concrete. Standard CS 309 curing sealers are not recommended and will be detrimental to decorative concrete.

Solution

Allow the curing agent to wear away, clean the entire surface with a light acid wash, rinse, dry, and utilize a Class A, breathable decorative concrete sealer.

DISCOLORATION

DEFINITION

Carpets, mats, or weather stripping have stuck to the concrete.

PROBABLE CAUSE 1 - Sealer was not allowed to fully cure prior to being covered.

PREVENTION

Although most sealers can be walked on within hours of application, full curing can take 72 hours or more. Mats, carpets, patio furniture, etc., should remain off the surface as long as possible after it has been sealed.

SOLUTION

Use non-rubber backed mats and delay placement as long as possible. If the surface is discolored, solvent wash to redistribute the product around the affected area. Be aware that some mats contain a backer with plasticizers that can migrate together with the sealer even in older applications.

SCRATCHES

DEFINITION

Sealer shows signs of scratching from furniture, scuff marks, or other heavy wear.

PROBABLE CAUSE 1 – The chosen sealer is not durable enough to withstand the demands on that particular floor.

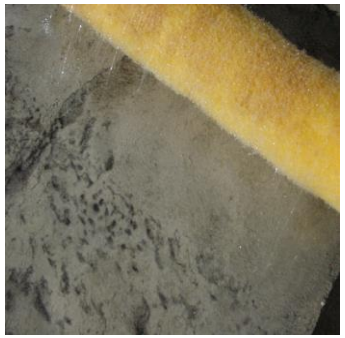
PREVENTION

Concrete waxes can be used to improve durability to acrylic sealers, but products such as epoxy or urethanes should be used in certain situations.

SOLUTION

If the scratches are minimal, solvents can be wiped over the affected areas. Larger areas can be solvent washed and resealed.

STRINGING & FOAMING



DEFINITION

Sealer starts to dry and “spider web” or foam on the roller during application.

PROBABLE CAUSE 1 – Over rolling or aggressively rolling sealer injects extra air into the material, creating a foam in the sealer. Use of a large (>3/8”) nap roller can make this more prevalent.

PREVENTION

Use ¼” to 3/8” nap rollers, spray and lightly back roll during application for even coverage.

SOLUTION

A solvent wash is unlikely to take care of this. If the solvent wash does not work, stripping and sealer re-application will be necessary.

PROBABLE CAUSE 2 – Using sealer outside the manufacturer’s recommended temperature range. High temperatures will cause the sealer to dry while rolling. Low temperatures will cause the sealer to not form a film, leaving a sticky, powdery mess when it eventually dries.

PREVENTION

Always follow manufacturer’s temperature range listings, and install during the coolest part of the day.

SOLUTION

A solvent wash will typically take care of this problem if the solvent can leave the sealer open long enough for the moisture to dissipate. If the solvent wash does not work, stripping and sealer re-application will be necessary.

SECTION 8 GLOSSARY

Abrasion Resistance ..... The extent to which a concrete surface or decorative coating resists being worn away by friction or mechanical wear.

Abrasive Blasting ..... Propelling an abrasive medium (such as sand or steel shot) at high velocity against concrete to roughen, clean, or profile the surface in preparation for decorative coatings or overlays. Methods include sandblasting, shot blasting, bead blasting, and sand brushing.

Acetone ..... Common solvent often used as a carrier for solvent based sealers. Considered exempt from most VOC regulations.

Acid Etching ..... Application of muriatic or phosphoric acid to clean or profile a concrete surface. Used as a less effective alternative to abrasive blasting for surface preparation. Must be neutralized and rinsed prior to final coating application.

Acrylic Resin ..... A synthetic resin that dries transparent and is resistant to discoloration, moisture, alcohol, acids, alkalis and mineral oils. It is usually made by polymerization of acrylic acid and methacrylic acid.

Acrylic Sealer ..... A simple, single-component polymer that is either water or solvent based. Acrylic sealers can allow moisture penetration, scratch more easily than others, and provide moderate stain protection.

Adhesion ..... The property that causes one material to stick to another. Adhesion is affected by the condition of the surface to be coated and by the closeness of contact, as well as by the molecular forces of the unlike substances. Thus, the surface should allow a certain amount of penetration, should be chemically clean and not too smooth, hard or nonporous for good adhesion.

Aging ..... Exposure of materials to an environment for an interval of time. The change of a material with time under defined environmental conditions, leading to improvement or deterioration of properties (see weathering).

Air Bubbles ..... Trapped air or gases below the dried surface sealer. Can be caused by sealer drying too fast due to extreme temperatures or material applied too thickly or incorrectly.

Alkaline Salts .....Diluted salts carried to the surface of a concrete subfloor by water coming up from the ground below. There is no guarantee any treatment will keep the surface free of alkali, but washing the surface with clear water or soda water will lower the alkalinity. Traditionally, muriatic acid has been used, but it too may leave behind residue.

Alligatoring .....Surface imperfections in a coating resulting in a wrinkled appearance. Usually caused by incompatibility of a newly applied coating with an existing surface coating or sealer. Also known as orange peel or fish eyeing.

Ambient Environment (Temperature) .....The surrounding environment; can refer to ambient air, ambient water, or ambient soil. Ambient temperature refers to the temperature in a room, or the temperature that surrounds an object under discussion.

ASTM .....American Society for Testing and Materials is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

Bleeding .....Undesired migration of materials in a coating to the surface of the floor through construction joints or saw cuts. May be caused by moisture in subbase, not enough open dry time, or the use of no-rinse strippers within the first two years of the installation.

Blister .....A raised spot on the surface of a floor similar in shape to a blister on human skin. How soon after installation a blister develops can help determine the cause. Blisters that occur within a few hours are usually due to a concentration of trapped air. Blisters that occur at a later time often indicate the presence of moisture in the substrate.

Blistering .....The formation of blisters in toppings or coatings and the loss of adhesion with the underlying substrate. On concrete surfaces, this is often caused by moisture or moisture vapor transmission problems.

Blush/Blushing.....Commonly used to describe a sealer or cure & seal that has turned milky-white in appearance.

Bond .....The degree of adhesion or grip of a material (such as coatings, toppings, repair mortars, or sealers) to an existing surface.

Bond Breaker .....A material that prevents adhesion of materials to a concrete substrate. Common sealer bond breakers include release agents and environmental debris.

Bubbling .....The appearance of bubbles in the finish film while a finishing material is being applied. It is caused by any condition that causes air, vapors or gases to be trapped in the film while it's soft, but after it has hardened sufficiently to prevent the gas from escaping.

Build .....The wet or dry thickness of a coating or topping. (Also see high-build coating). Typically measured in mils. (Also see mil)

Build Coat .....A finishing material, usually of a transparent nature, used over the sealer or color coats and under the finishing coats to increase the fullness and sometimes glossiness of the finished work.

Calcium Chloride Vapor Emission Test ....ASTM F 1869, a test used to measure the volume of moisture vapor released from a concrete substrate over time (typically 24-72 hours). Too much moisture emitted from a slab can affect the performance and bonding of overlays, coatings, and sealers. Moisture vapor test kits are available that include small containers of pre-weighed, un-hydrated calcium chloride.

Chalking.....Loose, powdery substance caused by deterioration of a concrete surface or degradation of a coating or overlay.

Chemical Resistance.....Resistance to softening, bleaching or discoloration from common chemicals that may be spilled on the floor. Chemical resistance is most dependent on the composition of the product, the existence and chemistry of the surface coating and the susceptibility of the seams to failure in chemical spills.

Chipping .....The condition that occurs when a dried film of finishing material separates from the surface underneath in the form of flakes or chips. It is usually caused by insufficient elasticity or improper adhesion to the base material.

Combustible .....Having a flash point of 80-150 degrees F.

Coverage Rate .....The area that a specified volume of coating will cover to a specified thickness upon drying.

Crazing.....The appearance of minute, interlacing cracks or checks on the surface of a dried film of finishing material. Not complete product failure but can be caused by high weathering or elongation.

Crosshatching.....Sealer application method completed by rolling in alternate directions within a single coat. Crosshatching ensures complete coverage of the base surface.

Cure Time .....Time required to complete the cure process, before the material exhibits maximum physical, thermal, and chemical properties.

Curing ..... Action taken to maintain favorable moisture and temperature conditions of freshly placed concrete or cementitious materials during a defined period of time following placement. Helps to ensure adequate hydration and proper hardening.

Curing Compound ..... A liquid that, when applied to the surface of newly placed concrete, forms a membrane on the concrete or penetrates the concrete to retard the evaporation of water.

Degreaser ..... A chemical solution for removing grease, oils, and other contaminants from concrete surfaces.

Delamination ..... Separation of a coating or topping from a substrate or the layers of a coating from each other due to poor adhesion.

Densifier ..... A penetrating liquid chemical hardener applied to concrete to help solidify and densify the surface and provide extra protection from water penetration and staining. Often recommended for polished concrete, because hard concrete produces a better polish.

Dew Point ..... Dew point temperature is defined as: "the temperature at which dew begins to form." Dew is the water you find on your grass or car early in the morning. Some things to know about dew point: The current dew point will never be higher than the current temperature. If the temperature is at the dew point and the temperature falls, the dew point must follow. The higher the dew point temperature, the more moisture is in the air. Sealers being applied over a dew covered surface can fail to properly adhere.

Dry Film Thickness (DFT) ..... The final thickness of a cured coating. It is directly proportional to the volume solids of the coating. Therefore if you apply a wet film of 2.0 mils and the coating has a solids volume of 50%, you can expect the dry film thickness to be 1.0 mils. Dry Film Thickness (DFT) = Wet Film Thickness (mils) x %Volume Solids

Dry Tack-Free ..... The stage of solidification of a film of finishing coating when it doesn't feel sticky or tacky when a finger is drawn lightly across it in a quick continuous motion.

Dry to Sand ..... The stage of solidification of an applied film of finishing material when it can be sanded without undue softening, sticking or clogging of the sandpaper.

Dry to Touch ..... The stage of drying of a film of finishing material when it has solidified sufficiently that it can be touched lightly without any of the finishing material adhering to the fingers.

Drying ..... The act of changing from a liquid film to a solid film by the evaporation of solvents, oxidation, and polymerization or by a combination of these phenomena.

Dusting ..... Appearance of powdery material on the surface of newly hardened concrete. Sometimes caused by allowing the surface to dry too rapidly without curing.

Efflorescence ..... A crystalline deposit of salts (usually white in color) that forms on a concrete surface when soluble calcium hydroxide leaches from the concrete and combines with carbon dioxide in the atmosphere. On colored concrete, especially darker tones, these white deposits can be particularly unsightly. Prior to sealer application these areas can be treated with an acid washing and thorough rinsing.

Epoxy Sealer ..... A dual component system that reacts when mixed to form a hard, durable surface over the concrete. Epoxy sealers are excellent for high gloss surfaces but can be very UV sensitive and are not heat resistant.

Film Forming Sealer ..... A type of sealer that forms a surface film to block the penetration of water and contaminants. Film forming sealers are available in various gloss levels ranging from dull up to gloss, and typically enhance the color intensity of the finished concrete surface.

Film Thickness ..... The depth of the film when wet (wet film thickness) and the final depth when dry (dry film thickness). Typically measured in mils (1 mil = .001 inches), typical piece of paper = 10 mils, typical credit card = 120 mils.

Fish Eyes ..... Also called cratering, crawling, holes, spots or flow marks. When caused by surface contaminants the finish is applied over areas in which the wetting agents cannot perform their function. The finish then recedes away from this area reforming into the film. This "crawling" creates round or elliptical areas lacking adequate finish.

Flattening Agent ..... A material added to a normally glossy coating to reduce luster and produce a flat appearance.

Gallons Per Minute ..... GPM is used to rate the tips used in spraying sealer, generally ranging from 0.1 to 1.0 gallons per minute.

Gauge ..... The nominal thickness of a layer within the material.

Gauge Rake ..... A rake (or squeegee) with either feet (or notches) used to apply a coating to a pre-determined uniform thickness (aka Pin Rake).

Gloss Meter ..... An instrument for measuring the luster or gloss of a finished surface.

Grinding.....A mechanical surface preparation method using rotating abrasive stones or discs to remove thin coatings and mastics or slight flaws and protrusions.

Hardness .....That property of the dried film of finishing material that causes it to withstand denting or being marked when pressure is exerted on its surface by an outside object or force.

High Build Coating.....A protective or decorative coating that produces a thick film (usually greater than 10 mils) in a single coat.

High Pressure Water Blasting .....A process for cleaning or roughening concrete surfaces using a stream of water delivered at high pressure, typically above 2,500 psi.

High Solids.....A general term used to denote the presence of a higher than average percentage of solid ingredients and thus a lower percentage of solvents.

Humidity.....The amount of water vapors in the air. See Relative Humidity.

Hydrostatic Pressure.....Pressure which forces water up through a below-grade slab, generally causing installation problems due to moisture. This occurs when the water table is higher than the slab. Hydrostatic pressure is caused by the weight of the water pressing down on itself.

Hygrometer.....An instrument for measuring the degree of humidity or relative humidity of the atmosphere.

Impact Test.....A test for determining the resistance to shattering of a dried film by dropping a weight onto the finish.

Incompatible .....Not capable of being mixed together without impairing the original properties of the materials being mixed. Mixing incompatible materials usually results in a separation of solid particles, cloudiness or turbidity.

Joint Sealant.....A material that minimizes both infiltration of surface water and incompressible material into the joint system.

Laitance.....A thin layer of fine, loosely bonded particles on the surface of fresh concrete, caused by the upward movement of water. Laitance must be removed before application of a decorative coating or topping.

Lap.....To lay or place one coat so its edge extends over and covers the edge of a previous coat, causing an increased thickness where the two coats are present, as compared to the single thickness on either side of the lap.

LEED .....(Leadership in Energy and Environmental Design®): A green building rating system developed by the U.S. Green Building Council in 2000 through a consensus based process. LEED is a tool for buildings of all types and size. LEED certification offers third party validation of a project's environmental features.

Light Reflectivity.....The characteristics of a material, which determines the degree or amount of light which will be reflected from its surface from any given angle.

Membrane .....Formed over a concrete surface to provide protection and enhance color. Typically clear plastic like acrylic, polyurethane or epoxy.

Mil .....A measurement equal to 1/1,000 (0.001) inch. Commonly used to denote coating thickness.

Milky.....Having the appearance of milk or showing whiteness. Can be caused by over application of water-based sealers or when a dried transparent film starts to turn white from moisture.

Mineral Spirits.....A solvent product used as a thinner and/or cleaner.

Moisture Resistance.....The measure of concrete floors directly in contact with the ground that are never completely dry. Note: The moisture content of new concrete is high, regardless of grade levels.

Moisture Vapor Transmission.....The migration of moisture vapor to the surface of a concrete slab, caused by vapor pressure differentials in the concrete and the surrounding atmosphere. Can contribute to the failure of impermeable coatings or other floor toppings that do not permit moisture to escape. (See calcium chloride vapor-emission test.)

Nap.....The raised hairs or threads on the surface of a roller, in terms of the direction in which they naturally lie. Typically measured in thickness (e.g., 3/8" nap roller)

Neutral Cleaner.....A mild (pH of 6 to 8) detergent that does not contain strongly alkaline materials and is designed to remove soil.

Neutralize.....To return concrete to the proper pH after acid etching, generally by washing the surface with a mixture of water and ammonia or sodium carbonate. Ideal pH is 7.0 (neutral), but a pH range of 6.0-9.0 is acceptable for most coatings. ASTM D 4262, "Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces," covers the procedure for determining the acidity or alkalinity of concrete surfaces prepared by chemical cleaning or etching prior to coating application. (See pH test)

Non-Skid Coating.....A surface coating designed to prevent or reduce the slipperiness of a surface.

Nonvolatile.....That portion of a material which doesn't evaporate at ordinary temperatures; the solid substances left behind after the volatiles have evaporated.

Orange Peel.....A finish that exhibits a surface texture resembling the surface of an orange. Normally caused by rolling a finish that has cured excessively which freezes the roller pattern in the film. May also be caused by excessive airflow, the velocity of which freezes waves in the film when it sets.

Outgassing.....The release of absorbed or occluded gases or water vapor.

Peeling.....A defect in a dried film manifested by large pieces becoming detached from the under surface and coming loose in sheets or large flakes.

Penetrating Sealer.....A sealer with the ability to penetrate into the concrete surface to increase water repellency and resist stains. Often used on decorative concrete to provide invisible protection without changing the surface appearance.

Percent Solids.....Also referred to as Solids Content, it is the relative weight content of the total product which is not water or other volatiles.

Permeability.....The degree to which a membrane or coating will allow the passage or penetration of a liquid or gas.

pH Pencil .....Will indicate the acidity/alkalinity level of a slab for subsequent procedures. Water based stains and some sealers are pH sensitive.

pH Test .....A test performed on the concrete surface to determine the level of acidity or alkalinity. Typically performed prior to applying sealers or coatings.

pH Value.....The concentration of the hydrogen ion in a material. A pH value of 7 is considered neutral. Lower values are acidic; higher values are alkaline.

Pin Holing .....A defect in a coating characterized by pinhead-sized holes that expose the underlying substrate.

Polymer Flooring.....A system where individual components are combined to achieve a high grade surface. Usually consists of surface preparation, priming, coating, and finish sealing of a surface. The coating thickness and the selection of the system depends on the surface to be applied to.

Porosity .....A matter which is porous or contains pores which are able to absorb liquid. Subfloors, which are porous, are normally concrete and wood. If there is any doubt as to the porosity of a subfloor, put a few drops of water on the surface. If the water is quickly absorbed, the surface is porous. If the water remains on the surface, the surface is not porous.

Primer.....The first coat of material applied to a concrete surface to improve bonding or adherence of subsequent coats. (See bond coat)

Profile.....The act of preparing a concrete surface to achieve the necessary degree of roughness. (See surface profile)

Psychrometer.....A simple form of hygrometer, an instrument which measures relative humidity. The psychrometer compares the dry-bulb and wet-bulb air temperatures.

Pump Up Sprayer .....An airless sprayer often used to apply sealers and liquid release agents.

Recoatability .....The application characteristics of a polish and the appearance of the film after successive coatings to a surface.

Recoat Window.....Manufacturer directed time in which successive coats of material must be applied to the previous coat. When materials are applied outside the recoat window, adhesion failures typically occur.

Relative Humidity.....Ratio of the amount of water vapor present in the air to that which the air would hold at saturation at the same temperature. It is usually considered on the basis of the weight of the vapor, but for accuracy should be considered on the basis of vapor pressures.

Sacrificial Coating.....A final floor finish or wax designed to protect the sealer or topcoat from wear. Usually applied by mop or floor buffer in several coats to act as a shock absorber to scuffs, scratches, and grime.

Scarifier .....Milling equipment used to clean and profile concrete surfaces or to remove existing coatings. Uses rotary impact cutters held at a right angle to the surface.

Scrubbing .....Washing a floor by wetting it with detergent solution, then using a moderately abrasive non-woven pad or appropriate brush, either by hand or attached to a low-speed floor machine, to vigorously agitate the wet surface. This procedure is used when a floor is heavily soiled, and less-aggressive cleaning methods have been unsuccessful. Always rinse thoroughly after scrubbing.

Sealer .....Sealers are normally a finish coating used to protect concrete floors from traffic and surface cleaning and should not be used when the slab is intended as a substrate for resilient flooring. They are designed to prevent water and dirt from getting into the concrete from the surface and render the concrete less porous. Sealing is a recommended step for enhancing and protecting decorative concrete colors. Sealing decorative concrete reduces maintenance requirements and helps prevent unwanted staining. Both water-based and solvent-based formulations can be purchased. Some sealers are available in finishes such as gloss, semi-gloss and matte.

Shot Blasting .....An abrasive blasting method using round iron shot to clean and profile concrete surfaces.

Solvent .....Liquid typically used as a carrier for sealers and curing compounds.

Solvent Based Products .....Some stains, sealers and coatings are manufactured using solvents as the carrier for the liquid mixtures. During application, solvents evaporate into the air. Therefore, solvents are considered "volatile organic compounds," or VOCs, and it is vital to adhere to the manufacturer's health and safety recommendations during application of any solvent-based product. An MSDS (Materials Safety Data Sheet) will document the percentage of VOCs in a specific product. Please note: The specific percentage of VOCs permitted is regulated in most areas of the United States and Canada. The use of solvent-based products is prohibited in some states. Where environmental considerations prohibit use of solvent-based materials, water-based alternatives are readily available.

Spall.....Concrete spalling, also known as concrete scaling, is the name used for flaking and chipping of concrete that sometimes occurs in new construction. Often caused by a combination of freezing temperatures and improper mixing and creaming of concrete during placement.

Spiked Roller .....Pin needle type of textured roller used in application of high build coatings, relieves surface tension by eliminating gas bubbles.

Sprayer (HVLP) .....A high volume low pressure spraying device that applies high-solids paints and coatings at low pressure and low velocity, to reduce overspray.

Sprayer Nozzles.....Fitting designed for use with sprayers made from various materials, plastic, steel, brass and more. Nozzle can be made to spray in many different patterns such as fan, cone, flat. Choice of the nozzle type and spray pattern should be based on the manufacturer's recommendation.

Squeegee.....A tool with a flat, smooth rubber blade, that is used to remove or control the flow of liquid on a flat surface. Can also be notched to function as a gauge tool.

Substrate.....An existing concrete surface that receives an overlay, decorative or protective coating, repair procedure, or other resurfacing treatment.

Surface Profile.....The degree of roughness of a concrete surface achievable with various surface preparation methods. The International Concrete Repair Institute has identified nine distinct roughness profiles considered to be suitable for the application of sealers, coatings, and polymer-modified overlays.

Tack .....The stickiness or adhesiveness of a material.

Technical Data Sheet.....Contains important specifications and manufacturer guidelines for product usage. Includes such data as coverage rates, recommended applications, product limitations, surface preparation guidelines, mix ratios and required mixing times, pot life, application procedures, cure times, performance data, and precautions.

Ultraviolet .....Light rays that are outside the visible spectrum at its violet end. These rays have a chemical effect upon the dried film of finishing materials. Ultraviolet light is commonly used in curing finishes at the factory for prefinished flooring.

Viscosity .....A measure of the fluidity of a liquid material. The more viscosity a material such as a sealer or coating has, the less it flows.

Volatile Organic Compounds (VOCs) .....Organic chemicals that readily vaporize at normal room temperatures. Concrete coatings, sealers, or cleaning materials that are solvent-based generally have higher VOC contents than water-based materials. Some VOCs can be hazardous when inhaled.

Water-Based Finishes .....This large family of finishes has the common trait of having the solids suspended in water, which is used as the solvent. A clear, color free finish that is easy to apply with low odor and good stain resistance, fast drying and easy to recoat.

Wet Film Thickness (WFT).....The thickness of an uncured coating material.

Xylene.....A common solvent. Used as a carrier for solvent based sealers. High in odor and flammability.

SUMMARY

The Decorative Concrete Council of the ASCC convened a forum in which contractors, distributors, manufacturers, and consultants worked together to find answers to the many reported sealer failures. The driving force for the meeting was the desire to reduce the high cost of callbacks, claims and litigations by improving our communication and identifying areas in which information and education will reduce sealer difficulties.

A major finding of the sealer forum was that changes in VOC regulations have forced manufacturers to modify their product formulations. The changes in the formulations have not been clearly made known to the distributors and contractors, resulting in application methods that have not been altered to meet the requirements of the new sealers. The Sealer Selection & Application Guide was written in response to numerous requests by contractors questioning why sealer problems are on the rise. The Guide attempts to bridge the education gap between the manufacturer and the contractor, and reduce the number and severity of issues with decorative sealers through product education and clear application guidelines.

If you have questions about the material contained in this document please contact the ASCC Decorative Concrete Hotline at 888.483.5288.

Special thanks to many individuals, companies, and organizations who have provided content for this document.

ASCC Decorative Concrete Council, The Euclid Chemical Company, Decorative Concrete Resources, Sherwin Williams, ChemSystems, The Concrete Network, Butterfield Color Decorative Concrete Supply, Sundek, Concrete Construction, Hyde Concrete, Patterned Concrete of Cincinnati, New England Hardscapes, T.B. Penick & Sons, Vexcon Chemical, Creative Maintenance Solutions, Concrete Décor, Wiki Concrete Forums.