Sealing concrete

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Concrete: Sealing

This section explains the different methods of "sealing" concrete (and their pros and cons); key things to watch out for; how to achieve the right result and what products Stratmore offers.

01 Concrete: **Sealing**

Sealing concrete is supposed to improve its service life

Why Seal Concrete?

Concrete is a porous material and is prone to absorbing dirt, both in solid (dust, grease) and liquid from (oil and waterborne contaminants). Sealing concrete is supposed to improve its service life. Reasons for sealing include:

- Maintain the original "new" look.
- Improve the appearance by enriching or deepening the colour intensity.
- Reduce aging and weathering of the surface which often results in dusting.
- Prevent absorption of contaminants, thus making cleaning easier.
- Protect the surface from wear and abrasion.
- Change the sheen by increasing the gloss. A high gloss "wet look" can be achieved if desired, or anything in between.
- Prevent unsightly efflorescence.
- Prevent the ingress of water and chlorides, thus protecting from spalling caused by freeze-thaw damage or corrosion of reinforcing steel.

Terminology

In the trade, the term "sealing" refers to a number of different types of surface treatments, each with its own special set of characteristics, as illustrated in the diagram on the next page.

There is a difference between an impregnating agent – which lines the pores but leaves them open – and a coating – which blocks them and is also capable of forming a film on top. With coatings, an intermediate situation may result, depending on:

The porosity of the concrete, i.e. the number of pores per unit surface area and how large they are.

- How much product is applied, i.e. the spreading rate.
- The viscosity and surface tension of the material, which determines how deeply into the pores it can penetrate.
- The solids content of the coating i.e. how much remains after the carrier (water or solvent) has evaporated.

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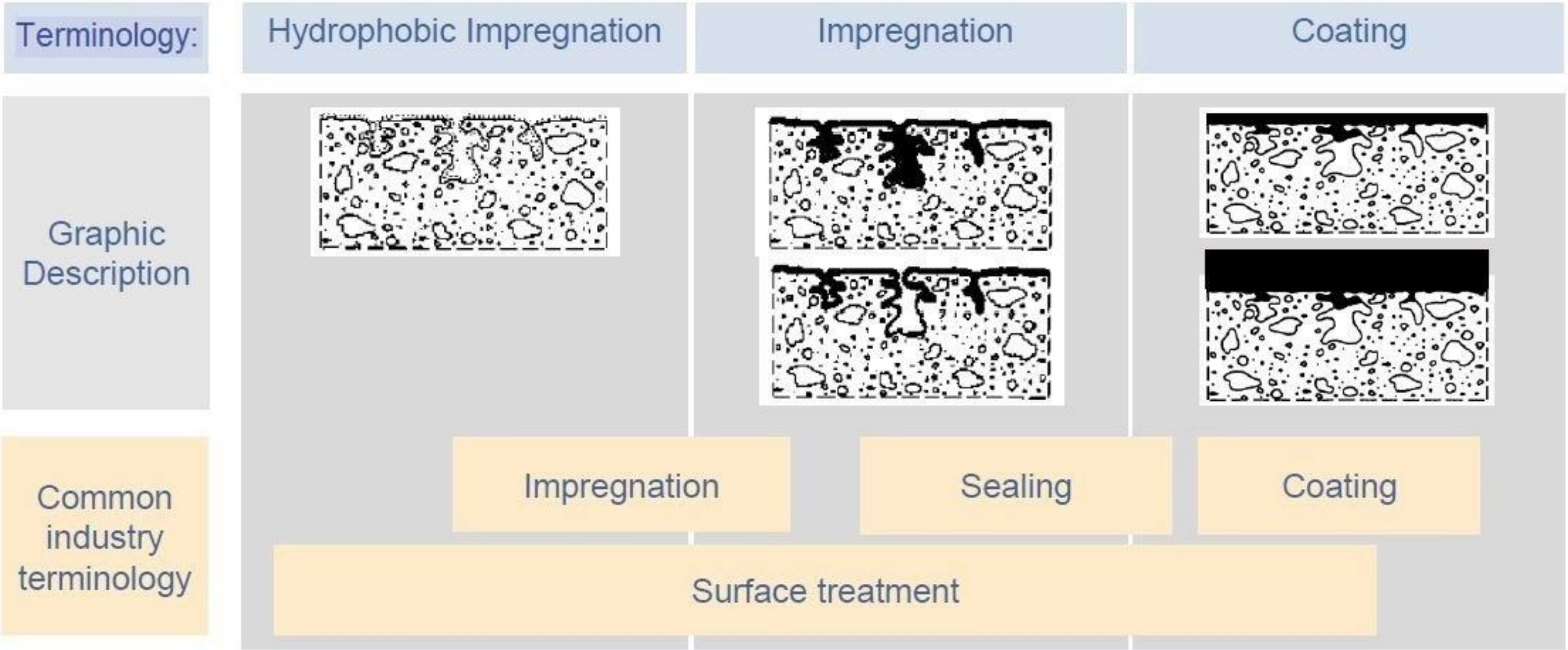
Overview of Terminology as Defined by DIN (EN 1504-2) and Common Terminology Found in the Industry



01 Concrete: **Sealing**

Preliminary Testing

FOR OLD CONCRETE:

How porous is the concrete?

Has the concrete been sealed previously?

A good test to see both how porous the concrete is and whether it has been sealed previously, is to splash some water on it and see if it is absorbed and darkens or is repelled and forms beads on the surface. This should be carried out on several representative areas as results can be variable, even across the same slab. It can be absorbed in some areas and repelled in others, indicating a variation in porosity and / or previous sealing. This test is also ideal to test the effectiveness of your sealing once it is completed.

FOR NEW CONCRETE:

Is the concrete ready to be sealed?

Since the presence of water in the concrete can cause problems, a simple test can be carried out:

1. Tape a transparent plastic sheet over a small area of the concrete and leave it overnight.
2. If droplets of water are visible under the sheet the next day, then the concrete is most likely too wet to seal and should be allowed to dry further.

Precautions

In a slab situation, using a reliable damp proof membrane below the slab is recommended to prevent water wicking up to the surface from under the slab. This is essential in areas where there is a high-water table or where such problems are known to exist, such as in flat low-lying areas.

If this is not done, problems may present after sealing. The most common is blooming (a white discolouration of the concrete), which is caused by water coming up from underneath at a faster rate than the sealer is able to allow the vapour to diffuse out. This phenomenon may appear years after the concrete is sealed and because of this, it is often erroneously attributed to the sealer, rather than the real cause, which is moisture coming up from below. Dark coloured exterior concrete is more prone to this phenomenon, as the dark colour causes it to heat more, thus driving out the moisture at a faster rate than the sealer will allow to permeate through. Full details of this issue can be found in Section 2 "**Causes and Correction of Blushing, Blooming, Blanching or Whitening of Sealed Concrete**".

Apply as thin a coating as you can get away with, while ensuring that sealing is complete. It should be remembered that two thin coats are better than one thick coat. If the concrete has to be sealed early (such as to protect it from rain, dirt, etc.) a suitable sealer should be used (such as Same Day Sealer) and only one coat should be applied at the thinnest possible film build. No further coats should be applied, at least until the concrete has had a chance to dry out completely. The drying out of sealed concrete will, of course, take much longer than unsealed concrete.

In some cases where a full gloss or "wet look" is desired, several coats may need to be applied and this is mentioned in the various Stratmore Technical Data Sheets. Therefore, it is important to understand when reading Technical Data Sheets for our various sealers, that it is assumed that the concrete is in a low moisture state and that there is no possibility of water wicking up from underneath. If these conditions have not been met, then precautions must be taken to prevent problems occurring later. The most important of these is to apply the minimum amount of sealer.

01 Concrete: **Sealing**

The Right Result: Impregnation vs Sealing vs Coating

COATINGS

Coatings prevent rapid water loss and this can lead to problems when there is too much water in the concrete or excessive water is wicking up from underneath the concrete slab or the reverse face of a wall. If the water cannot escape quickly enough, pressure can be built up under the coating which results in microscopic areas of delamination from the concrete. This becomes visible as a whitening or blanching, which is referred to as blushing or blooming, and what was originally a clear coating can develop unsightly white patches. This is especially noticeable on dark coloured concrete.

In most cases, aside from "cure and seal" products or "same day" products, **most sealers are recommended to be applied only after the concrete has initially cured and dried out**, usually at least 14 days but preferably longer.

While clear coatings can appear to be the panacea for sealing concrete, they should only be used where there is certainty that no water is constantly coming up from underneath at a faster rate than it can diffuse through the coating as vapour

Important considerations:

- Total coating thickness – the thicker the coating, the less permeable it is. It is important to get the right balance between applying the minimum coating thickness which is required to seal the concrete effectively while not applying so much as to cause blooming. The water splash test mentioned above under **"PRELIMINARY TESTING for old concrete"** can be used to determine whether sealing has been effective and complete.
- The chemical make-up of the coating, including the presence of any additives. This determines its water vapour transmission rate. For example, "Cure and Seal" products contain additives designed to reduce the rate of water loss which can make them even more prone to blooming.
- Total amount of water in the concrete and whether any more is entering the concrete from behind the coating.
- Rate at which water is trying to escape, often dependent on porosity and temperature. Darker concrete absorbs more heat, creating more pressure from the water to escape more rapidly.

Coating concrete may not always be advisable for various reasons:

- It can alter the appearance of the substrate by darkening the concrete or increasing the gloss. This may not be desirable.
- It may be best to allow concrete to "breathe" to allow water vapour to escape easily. Water is present in concrete, either from the mix water or through wicking up from underneath or the rear face or simply from rainwater– and measures to dry it out are not always possible or feasible.
- Sometimes a better alternative to a solid barrier coating is provided by products which are absorbed into the pores, perhaps to a depth of several millimetres. These products react with the concrete and line the pores with a water-repellent material, without blocking them, thus allowing moisture to escape. This is called hydrophobic impregnation. This type of treatment provides a different type of barrier to water but it allows water vapour to escape relatively quickly. The disadvantage is that these do not form a film on the surface of the concrete and therefore will not prevent or minimise staining caused by dirt, grease, oil, etc.

01 Concrete: **Sealing**

The Right Result continued

Notes

1. When applying a coating, as liquid product enters the pores, air must escape. This can lead to bubbles or foam formation which can be permanent if the coating has started to dry before all the air has escaped. For this reason, **coatings are best applied when the concrete is cooling rather than warming up**. This means that air is entering rather than leaving the concrete, so that the coating is "sucked in" rather than having bubbles formed by escaping air.
2. For extremely porous surfaces (such as concrete blocks), it is sometimes better to apply a more viscous coating which will only partly be absorbed but will mainly "bridge" the gaps over the pores. Provided the coating thickness is sufficient (by using a high solids coating and applying at a low spreading rate) this is a perfectly acceptable solution, but it must be borne in mind that a thicker coating reduces the breathability of the surface. Hence **there must be no water trapped underneath the coating when it is applied**, as this can cause problems such as variable appearance (dark and light patches).

IMPREGNATING AGENTS

These enter the pores and line them with a water-repellent material. They react with the substrate and become part of it, so cannot be easily washed out. Their effectiveness depends on the pressure of rainwater against the surface, as well as the size of the pores. For normal concrete, hydrophobic treatments work well against rainwater. However, highly porous materials (such as Oamaru stone) are more difficult to render hydrophobic because the repulsion of water can be affected by capillary action. In this situation, a possible solution is to make the pores smaller by lining them to some extent, as well as including a hydrophobic agent to repel water, i.e. partially filling the pores as well as making them hydrophobic.

Impregnating agents do not form a film and therefore must not be overapplied so as to pond on the surface. Any remaining on the surface must be removed immediately. The same applies if the product accidentally gets onto glass or other surfaces where it is not intended to be. Otherwise, if allowed to react with the substrate, it will lead to the formation of an unsightly scum, which can only be rectified by grinding off the surface layer (see photos).

Impregnating agents are much easier to apply on a vertical or sloping surface, where the excess can run down to an untreated area but care must be exercised to prevent accidental treatment of areas not intended to be treated. Areas such as windows should be masked to prevent contact with the impregnating agent.

01 Concrete: **Sealing**

The Right Result continued

SEALER OR IMPREGNATING AGENT?

The choice of product often depends on the extent to which a change in appearance can be tolerated. Impregnating agents change the appearance the least, often not at all if applied correctly. However, their drawback is that they only repel water and not solid or oily contaminants, although more expensive variants are available which repel oils more effectively.

Hydrophobic impregnation is generally regarded as less effective and generally not recommended on horizontal surfaces where water may pond for extended periods, especially if subject to foot or vehicular traffic.

Even with smaller pores, the level of repellence can be affected if the rainwater pressure is sufficient. This can occur with strong wind-blown rain or when washing a surface with a water blaster. Using detergents can also affect the repulsion of water, since these lower its surface tension. Provided they are rinsed out thoroughly and the surface allowed to dry, no permanent harm is done to the surface treatment.

Clear coatings generally change the appearance in varying ways – from a little to a more significant extent. Solvent based sealers usually deepen the colour of the concrete significantly, much more than waterborne sealers. Coatings can also change the gloss level, from a low gloss similar to natural concrete, right up to a high gloss, often referred to as a “wet look” which is sometimes preferred.

It is possible to tint sealers such that the concrete can still be seen underneath while imparting some colour to the finished job. These are useful when there are imperfections or other defects in the concrete which cannot be removed or remedied, and the only solution is to mask the problem as much as practicable. At the other extreme, we have paints which are opaque and hide the surface of the concrete completely.

Sealers can be used for other purposes, too. Since coatings reduce the rate of water loss from the concrete considerably, this property can be used to aid the hydration of concrete by slowing down the loss of water from the surface in the first days after placement.

Hydration of concrete is important in achieving its final strength. This process is known as curing concrete and many products are sold as “cure and seal” materials, which means that they are supposed to prevent or much reduce the rate of loss of water from the surface and once this function is fulfilled, they remain on the surface and fulfil the function of sealing. While all coatings will slow down the loss of water from concrete, there are various standards which specify in quantitative terms how efficient a curing agent is at slowing down the loss of water (the water vapour transmission rate) and only some sealers can meet this standard.

Sometimes sealers are used to prevent water permeating up through concrete in an attempt to prevent efflorescence (refer to separate **Fact Sheet “Efflorescence in Concrete Pavers”)**. It is possible to adopt this approach under some circumstances, but once again the warning about possible blooming from the pressure exerted by the water vapour against the underside of the coating should be heeded.

01 Concrete: **Sealing**

Types of Sealers

Using the term "sealers" for all types of surface treatments, the following is a short summary of the different types of sealers but is not exhaustive.

PENETRATING SEALERS

These are absorbed into the surface with the aim of either substantially blocking the pores or making the pores hydrophobic (repel water), oleophobic (repel oily substances) or both. True oleophobic treatments are more expensive and relatively rare.

Advantages:

- They do not change the natural look of the surface.
- They do not compromise the slip resistance of the surface when wet
- Ease of application.
- Ease of re-application when necessary.
- As a general rule, they can be easily overcoated with other materials once cured completely. But it is prudent to do a small test.
- They offer good weathering and UV resistance.

Disadvantages:

- Water and waterborne contaminants can be forced into the surface, overcoming its repellence. Wind-blown rain or ponding water can be sufficient to do this.
- They may not be effective if the surface is exposed to a different type of contaminant. For example, sealers that repel water may not repel oily materials.
- They are ineffective against solid contaminants since the porosity of the surface remains and dust and dirt can still be trapped.
- If overapplied and allowed to cure, they can form an unsightly white scum on the surface which can be difficult to remove.

Major classes:

1. Silanes and siloxanes. These are oily materials which react inside the pores of the concrete and render them water repellent. Some are chemically modified (and therefore more expensive) and can repel oils as well. They are usually dissolved in solvent, but some types are emulsified in water.

Generally, there is little difference in performance between the two. The waterborne ones are safer and more convenient to use, i.e. no dangerous fumes, not flammable, easier to wash equipment when finished. But sometimes they do not soak so well into less porous surfaces because of the higher surface tension of water compared to solvent. Since they bond to the substrate, they do not wash out and, because they are not on the surface, they also last a long time. **It is important that these are applied to a dry substrate to permit maximum penetration and to allow reaction within the concrete**. Some moisture can be tolerated with the waterborne materials but the solvent borne ones may give an uneven finish in the presence of moisture. None of these should be applied if rain is expected within 4 hours or so as they need time to react with the substrate.

STRATMORE PRODUCTS: Aquellux S (solvent) Aquellux S WB (water).

01 Concrete: **Sealing**

Major Classes continued

2. Siliconates. The most common is potassium methyl siliconate. These react with the carbon dioxide in the air and then with the masonry surface, resulting in a hydrophobic layer in the pores of the material, much like the silanes and siloxanes but have a longer service life and require more frequent re-application. Siliconates are often used for tiles, bricks and ceramic pots etc, where there is a reliable method (such as dipping) of achieving an adequate and uniform coating. Excess material can cause an unsightly white deposit on the surface of coloured materials. **They are not as stable on very alkaline substrates such as concrete, compared to silanes and siloxanes**.

Therefore, they will often require reapplication much earlier. Aside from methyl siliconates, there are others which are more resistant to alkalis, but these are more expensive.

STRATMORE PRODUCTS: Aquellux No. 2 and Silicone Concentrate

3. Silicates. These are aqueous (water based) solutions of sodium, potassium or lithium silicate. Colloidal silica is also included in this category as it acts in the same way. They are absorbed into the surface and chemically react with a component of the concrete to form a hard gel, thus blocking the pores and becoming an integral part of the concrete matrix. **The surface should not be flooded with the product.** The result is a stronger surface with and less prone to dusting. They are often used prior to polishing concrete.

Following cure (reaction with the concrete) they can be subsequently overcoated with other materials, **but not with more silicate or any other material which is intended to penetrate the concrete**. Because they harden the surface and reduce porosity, they are often referred to as 'densifiers'.

STRATMORE PRODUCT: Hardcoat Dustguard. More to be introduced.

4. Combinations of the previous classes in the same product. For example, silicates with siliconates make the surface hydrophobic and densify it at the same time. Another example is to use siloxanes with acrylic polymers which make the pores hydrophobic and partially block them at the same time, increasing water repellence while maintaining breathability.

These are often recommended for very porous materials with large pores such as Oamaru stone, where the acrylic component also "strengthens" the weak stone where the product has been absorbed.

STRATMORE PRODUCT: Silac (siloxane and acrylic)

01 Concrete: **Sealing**

SURFACE COATINGS

These sit on the surface of the concrete, although some will be absorbed (depending on viscosity and porosity of substrate) which aids adhesion (see first diagram). Their efficacy depends on the thickness of the coating applied which, in turn depends, on several factors:

- The porosity of the substrate. The more porous, the less coating remains on the surface.
- The spreading rate. More product applied results in a thicker coating, but it is usually best to apply several thin coats rather than a few thick coats. Each coat should be allowed to dry completely before applying the next.
- The solids content of the product; that is, the amount of solids left on the substrate after the carrier (water or solvent) has evaporated. The lower the solids content, the more that has to be applied to get effective sealing.

Notes:

1. The correct product should be selected for each particular application. For more porous substrates, a higher solids coating should be chosen and vice versa. The spreading rate should also be carefully adjusted according to how much is absorbed.

2. Usually the first coat is applied at a lower spreading rate (fewer square metres per litre) and succeeding coats at a higher spreading rate (more square metres per litre) as less product is absorbed after the first coat has been applied.

Advantages:

- They are more effective in protecting concrete from all types of contaminants (solids, water, oils) unless the contaminant can chemically attack or dissolve the coating (e.g. some solvents).
- They make the concrete much easier to clean if it does get contaminated as the contaminant sits on the surface rather than being absorbed into the pores.
- They can bring up the colour and change the gloss in almost any way desired, depending on the particular sealer.

Disadvantages:

- The changes in appearance mentioned previously can be a disadvantage if the natural appearance of the concrete is desired.
- As the coating wears due to traffic (foot, vehicular, etc.), the worn areas will show up much more quickly than those areas not subjected to traffic.
- The major disadvantage of coatings on concrete is the possibility of blanching occurring (also called whitening, blushing or blooming). This can have many causes and is discussed in greater detail in Section 2 *Causes and correction of blushing, blooming, blanching or whitening of sealed concrete.*

01 Concrete: **Sealing**

SURFACE COATINGS continued

Major classes:

1. Acrylics. These are either waterborne or solvent based. As a class, acrylics are very resistant to UV radiation and do not yellow. The solvent based ones are more foolproof. They are easy to apply, to recoat whenever necessary and to correct problems which may occur. However, they are extremely smelly and highly flammable, so not very pleasant to use, especially indoors. The waterborne ones do not suffer from these disadvantages. But they can be troublesome to apply and cure during very cold weather as film formation can be compromised unless they are specially formulated for low temperature application. They are also more prone to foam formation (which exhibits as very small bubbles in the coating if left after the coating dries).

A wide variety of polymers and co-polymers are used. The lower quality ones can suffer from blanching when wet for extended periods, so are not suitable for exterior horizontal surfaces..

Some of the higher performance ones form stronger molecular bonding after application, improving their abrasion resistance and are very resistant to blanching caused by water absorption. While this type of blanching is reversible (it disappears upon drying) it can weaken the film, even causing delamination if left wet for extended periods. None of the acrylics are suitable for exposure to heat, as most types will soften or melt.

STRATMORE PRODUCTS: Solvent borne: Hardcoat, Same Day Sealer (including textured versions), Same Day Sealer Satin. Waterborne: Protectacoat (standard and gloss), WBHP Concrete Sealer.

2. Epoxies. These are always two-pack and can be waterborne, solvent based, or solvent-less (100% solids). They bond very well to concrete. When cured, these have stronger molecular bonding, providing a very hard and tough surface which is more resistant to wear and tear. However, the standard grades are very susceptible to degradation by UV, yellowing and chalking. This is usually too great a disadvantage in clear coatings but is not too much of an issue when they are used in pigmented paints.

There are more expensive grades which are more resistant to this type of weathering. Many epoxies are quite "breathable" in that they allow water vapour to pass easily, but exact characteristics depend on formulation type and coating thickness. They are reasonably heat resistant, making them suitable for use in kitchen benches, where heat is more of an issue than UV resistance. They are quite forgiving to the presence of small amounts of moisture in the concrete, when applied. Hybrid types are also available, combining the properties of an epoxy and an acrylic, for example.

STRATMORE PRODUCTS: All 100% solids: Epar 226 (clear), Epar S, Epar 733HV (grey) Epar 121B, Epar CTA (black). Others under development.

01 Concrete: **Sealing**

SURFACE COATINGS continued

Major classes continued:

3. Polyurethanes. There are many types available. As with epoxies, some grades can tend to yellow but the non-yellowing grades are more common than with epoxies. Although urethanes have an inherent tendency towards hydrolysis (breaking up under the presence of water), most are generally formulated to withstand this weakness. Various types exist:

- Waterborne single-pack emulsions. These are similar to acrylics in usage with the advantage of having slightly better abrasion resistance. Mostly they do not yellow. They are often preferred for wood finishes but do not present much advantage in sealing concrete, compared to acrylics.
- Waterborne twin-pack. These are much tougher and more abrasion resistant than the single pack types. They are comparatively new technology and can be more expensive.
- Solvent based, single pack, moisture cured. They rely on moisture to cure and attain final properties. They have very good abrasion resistance and are often used in wooden and composite flooring finishes. Their yellowing resistance is dependent on the grade chosen, as both types exist. Their use in sealing concrete is less common (dry concrete only).
- Solvent based twin-pack. These are at least as resistant as the moisture cured types. As with all solvent based materials, the usual hazards and disadvantages apply, and in addition they cannot be applied to damp surfaces, as failure will result.

STRATMORE PRODUCTS: **Under development**.

4. Polyurea/polyaspartic. Essentially a subgroup of polyurethanes. They can be very fast curing. Their performance is of a high standard, with excellent abrasion resistance and good bonding to concrete. They are adversely affected by moisture on the surface. They are usually quite high build materials (i.e. they are designed to be applied thickly) and can fail if too much water vapour is coming up through the concrete. The fast curing ones require expensive specialised equipment to apply.

STRATMORE PRODUCTS: None under development.

5. Hybrid coatings. Examples include urethane acrylics and epoxy acrylics. The aim is to include the advantages of both types and reduce the disadvantages of each.

STRATMORE PRODUCTS: **Epoxy acrylic under development.**

Notes:

1. Although coatings should seal the concrete surface against contaminants, they should also allow the concrete to breathe to some extent, allowing water vapour to escape. **If they don't – with excessive coating thickness – they can tend to delaminate and bloom.**
2. When problems occur, the higher performing types (which have stronger molecular bonding) are the most difficult to correct, often needing complete removal by blasting or grinding off the surface. The easiest to remedy are the solvent-based acrylics, which require the application of the correct solvent. This, and their lower cost, could explain their popularity, despite their average performance.
3. The more expensive and higher performing coatings are always best applied after the concrete has aged, and the longer the better. This is to ensure that it has reached an equilibrium condition, with no further moisture escaping. However, it is also highly dependent on moisture not being wicked up from underneath the concrete, especially when there is no damp-proof membrane or it is placed on absorbent material (for example, pavers on sand).

01 Concrete: **Sealing**

ADMIXTURES

Another option for preventing water and contaminants from entering the mass of concrete is to make the concrete less absorbent. To achieve this a hydrophobic material (such as calcium stearate) can be added to the mix with the aim of making the pores repel water – much like the way that silanes / siloxanes operate. **The use of hydrophobic materials in the mix is generally not considered very effective as there is no guarantee the material will end up where it is required when the concrete has set; and increasing the amount used may be detrimental to the physical properties of the concrete.**

A better alternative is to use an additive that blocks the pores at the time the concrete is being formed. Such additives have the ability to create crystals inside the pores and render them permanently blocked. In addition, if water does manage to get inside the concrete, the active ingredients remain active and use the water to create new crystals. In effect this reseals the concrete from the new ingress of water. This also applies to any new cracks which might form, although it only applies to very fine cracks. These additives do not change the appearance of the concrete in any way nor are they detrimental to its physical properties. They do not generally make the concrete easier to clean and applying a coating may still be desirable.

The use of these admixtures is essential for concrete which is to be in constant contact with water, such as tanks used for the containment of water or concrete used in wet areas such as showers and bathrooms or where concrete is placed on ground without a damp-proof membrane.

Admixtures are added to the concrete during mixing. There are also products which use the same technology, and these can be applied to the surface of any concrete which was not so treated during placement. The crystal forming materials permeate into the surface of the untreated concrete and create crystals therein. The depth of penetration is variable and dependent on a variety of factors. **They are not clear products and they do change the appearance of the original concrete and replace it with a fresh cementitious surface.** Some of these coatings may be ground off a number of weeks after application, having transferred the active ingredient into the concrete surface.

These crystal-forming pore blockers are proprietary materials, and little is made known regarding their composition. Some brands are believed to contain hydrophobic water repellents as well, but again, it is not the intention to discuss their mode of action in detail here.

STRATMORE PRODUCTS: Stratmore distributes all of the Kryton range of products: Krystol Internal Membrane (KIM) as an admixture when mixing and placing concrete, and cementitious coatings such as Krystol T1 and T2, Krystol Bari-Cote, etc. when KIM has not been used in the first place.

01 Concrete: **Sealing**

CONCLUSIONS

1. Successful sealing depends on preventing water coming from behind the coating, whether this is water wicking up from beneath the slab or from the rear face of a wall. Therefore, suitable precautions should be taken, such as using a good reliable damp-proof membrane.

2. In all cases where the concrete is to be constantly in contact with water, such as in water containment tanks or in showers or bathrooms, it is essential to use a crystal forming admixture in the concrete when placing the concrete in the first place. It can then be sealed with confidence for further protection. KIM is also highly recommended for slabs in areas where there is a known water problem, such as in low-lying areas or areas with a high water table or to save on the purchase and application costs of proprietary membrane waterproofing systems.

01 Concrete: **Sealing: Summary**

Sealer Type	How They Work	Primary Applications	Type of Finish	Performance
Penetrating sealers: Silanes and Siloxanes	No film on surface. Penetrate and react chemically within the capillaries, repelling water and all waterborne contaminants.	Exterior vertical/inclined concrete surfaces subject to corrosion and freeze-thaw damage where a natural, matte finish is desired.	"Invisible" protection without changing the surface appearance or leaving a sheen.	Excellent protection against exterior exposure conditions. Breathable, allowing moisture vapour to escape. Less effective on very porous surfaces and when water is forced into the surface. Not recommended on horizontal surfaces. No protection against dirt.
Penetrating Sealers: Siliconates	As above.	Finished masonry articles such as tiles, bricks and ceramic pots.	As above.	Excellent protection when used for the recommended application. Most are sensitive to alkaline environments, so are not used in concrete.
Penetrating sealers: Silicates and Colloidal Silica	No film on surface. Penetrate and react chemically, forming a hard surface and physically blocking the pores.	Concrete floors, especially prior to polishing.	"Invisible" protection. Can be polished to a glossy finish.	Good protection without further treatment but protection is improved by polishing and / or suitable coating.
Coatings: Acrylics	Form a thin protective film on the concrete surface. Available in both solvent and waterborne formulations. Selection of correct grade is important to provide desired performance.	Both exterior and interior concrete. Easy application and economy. Enhance the beauty of coloured, stamped or exposed aggregate concrete. Often fast drying, allowing quick return to service.	Range of sheen levels. Solvent-based acrylics generally enhance colour more than water-based products.	Good protection against water and chloride intrusion. Usually less abrasion resistant than polyurethanes and epoxies. Solvent-based acrylics generally better where water ponding occurs. Softer acrylics usually require regular maintenance with several coats of a sacrificial floor finish, or wax, to prevent wear and tear.
Coatings: Polyurethanes	Form a high build protective film on the concrete surface. Available in both solvent and waterborne formulations. Both single pack and two component versions available.	Suitable for exterior and interior. On floors in high-traffic areas, to provide good resistance to scuffs and staining to enhance the beauty of coloured, stamped or exposed-aggregate concrete. Concrete countertops.	Available in a range of sheen levels. Finish is transparent and non-yellowing.	Higher build (thicker film) than acrylic sealers, and produce a very durable finish resistant to abrasion and chemicals. Most urethanes are moisture intolerant until they cure, so no water should be present on the surface when the sealer is applied.
Coatings: Epoxies	High build protective film on the concrete surface. Most are two-component products mixed prior to application.	On floors in high traffic areas Cement based overlays Concrete counter tops May yellow with UV exposure, so generally limited to interior use.	Available clear, can be pigmented. Most products impart a glossy finish.	Hard, long-wearing, abrasion and heat resistant finish. Repels water, but some products are impermeable and could trap moisture in the concrete.

Note: Always check with the sealer manufacturer to verify the compatibility of its product with the decorative surface you plan to apply it to

02

Concrete: Issues

This section explains the causes and correction of typical concrete issues such as blushing, blooming, blanching or whitening of sealed concrete.

02 Concrete: **Issues**

Concrete issues can have several causes

What are the common problems?

The terms blushing, blooming, blanching or whitening are all used to describe a phenomenon where a clear sealer, after application and drying, at first appears transparent as it should, but later starts to acquire a hazy white or milky appearance, in other words it becomes opaque.

Causes

There are several possible causes for this, depending on the particular product that has been applied and the conditions under which the blanching becomes apparent.

PENETRATING SEALERS

Penetrating sealers can sometimes result in a white scum appearing on the surface after application and drying. This is the result of over-application. These products should be applied at such a rate that they are completely absorbed into the substrate and should never be allowed to puddle on the surface. Excess product will react with the concrete and form a white scum which cannot be removed using solvents. The only way is to grind it off the surface and present a new concrete surface for correct sealing.

WATER ON CLEAR COATINGS

Some of these are prone to blanching when water is allowed to pond or pool on the surface for extended periods of time. This is more common with waterborne coatings and is the result of using the wrong type of sealer for the particular situation. Most of the common types are not recommended on exterior horizontal surfaces. Correction can only be implemented by recoating with the correct type of sealer designed for use in such situations. Although this type of blanching is reversible in most cases, i.e. the blanching disappears and the coating returns to clear after the water has evaporated, nevertheless, the coating is weakened while wet, especially in the case of long-term exposure, which makes it more susceptible to wear and tear, or in the worst cases, to complete failure.

02 Concrete: **Issues**

WATER UNDER CLEAR COATINGS

This type of blanching is caused by a delamination or loss of adhesion of the sealer to the concrete. The white appearance is a result of the vapours trapped under the sealer. In extreme cases, flakes of the sealer can start to come off the concrete surface.

This is caused by moisture coming up through the concrete. Since concrete is a porous material, it will always wick up any moisture which lies underneath. Acrylic sealers designed for use on concrete will prevent liquid water from penetrating them and entering the concrete but will allow a certain amount of moisture to escape as vapour. However, there is a limit to the rate at which this moisture can escape. If this rate is exceeded, it can result in blanching.

Notes:

There are several factors which will limit or impair the permeability of water vapour through the concrete:

1. Using the wrong grade of sealer, in other words one with limited permeability to water vapour.
2. Applying too thick a coat or coats of the product to the concrete. Obviously, the thicker the coating, the less permeable it will be.
3. A large volume of water in the concrete trying to escape rapidly. Rapid escape of water vapour can be the result of sunlight heating the concrete, especially concrete which is tinted to a dark colour.

02 Concrete: **Issues**

Prevention

The first requirement to minimise these sorts of problems is to allow the concrete to dry out as much as possible and to ensure that no more water can be wicked up from underneath by using a reliable damp proof membrane. This must be done before the concrete is laid and is an essential step in low-lying areas, areas with a high water table and areas where such problems are known to exist.

If unsure whether the concrete is ready for sealing, a quick and simple test can be carried out. Tape the perimeter of a transparent plastic sheet over a small area of the concrete and leave it overnight. If there are droplets of water visible under the sheet, the concrete is most likely too wet to seal. If still unsure, a quantitative test can be carried out by an expert, for example using the calcium chloride water absorption test.

A second requirement to minimise the chances of blooming is to apply as thin a coating as one can get away with, ensuring however that sealing is complete. It should be remembered that two thin coats are better than one thick coat.

If the concrete has to be sealed early (such as to protect it from rain, dirt, etc.) a suitable sealer should be used (such as Same Day Sealer) and only one coat should be applied at the thinnest possible film build.

No further coats should be applied, at least until the concrete has had a chance to dry out completely. The drying out of sealed concrete will, of course, take longer than unsealed concrete.

Remedies

Since delamination or loss of adhesion between the concrete and the sealer is often the problem, the method of correction involves re-dissolving the sealer and allowing it to re-bond to the concrete.

With respect to **waterborne acrylic sealers**: these will dissolve satisfactorily in the right solvent, sufficiently to allow them to be re-bonded to the concrete. **However, some grades cannot be re-dissolved.** These are generally the harder wearing types with stronger molecular bonding.

With **solvent based sealers** the dissolving is easy to do since they started off by being dissolved in solvent in the first place. The correct procedure involves firstly using the right type of solvent to allow quick and easy dissolution of the coating. Aromatic solvents are the most suitable. Xylene is widely used in the industry and is eminently suitable, but it has some drawbacks. Aside from being extremely toxic, it is also very fast evaporating and therefore requires the operator to work quickly before the solvent has evaporated.

The best solvents are slower evaporating. HARDCOAT SOLVENT is ideally formulated for such remedial work. It is a strong solvent, being fully aromatic, but is slower evaporating than Xylene and slightly less hazardous to work with.

Before carrying out the remediation procedure on the whole job, it is highly recommended that a small trial patch be attempted first, in an out of the way, inconspicuous area. Proceed with the whole job only if satisfied that the trial area gave the desired result.

02 Concrete: **Issues**

Remedies continued

The procedure involves application of solvent by any convenient method. This could involve pouring the solvent and spreading it out by brush, or application by roller. Spraying is also acceptable at very low pressure using a setting that will expel large drops rather than a fine mist which will markedly increase the hazards. The coating will become soft and sticky during this process, so keep the job site clean as for any coating application. Avoid wind-blown dust and dirt and use only lint-free rags, and solvent resistant rollers and brushes.

In some mild cases, the application of solvent may be all that is required, but usually the solvent will have to be worked into the coating, especially if the cause of the issue is excessive coating. Use a stiff nylon brush and work the solvent into the coating gently in a circular motion. Remove excess solvent with a dry lint-free, absorbent rag or sponge. If the coating is very thick, jelly-like lumps will appear during the brushing process and these will have to be removed by mopping up with rags or other suitable means.

Once this is completed, repeat the application of solvent to ensure the final finish will be even. Again, wipe up any excess of solvent and allow the remainder to dry. This should result in a good even finish, with the blanching removed. If there are still any small remaining areas of blanching, the treatment can be repeated.

The best method is to work quickly in small manageable areas rather than doing the whole job at once (unless of course it is only a small area).

IMPORTANT NOTE: Always read the Material Safety Data Sheets (MSDS) before using flammable and hazardous solvents. Note the very low flash point and do not use electrical equipment such as fans and drills which could generate sparks, especially when using indoors.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