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Cement Grout
Sealer Performance

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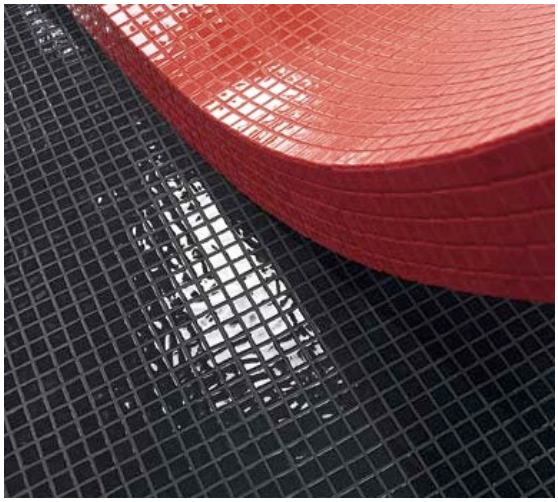
Technical Article



In the past few weeks I've had several distributors have problems with the performance of grout sealers on cementitious grout. The problems varied from a reduction in sealer performance to grout shade variation. In all cases the sealer was deemed to be the culprit. However in each case this was actually not true. The problem was with the grout itself and a lack of understanding on how sealers interact with a cement grout joint and more importantly rely on the integrity of the grout joint to fulfil their performance potential. To fully understand this interaction you firstly need to know the basics on how cement works.

All cement grouts on the market use sand and cement as the basic ingredients to which can be added other materials such as oxides or stains for colour and other additives to modify how the cement cures or performs during installation. However these do not change the basic chemistry which is that cement cures by hydration. This means that cement needs the presence of water to cure and go hard. Once the sand and cement have been mixed with water it combines with the cement to slowly form the solid mass we call concrete. During this process the water also slowly evaporates changing the volume of the mass, creating shrinkage. The goal is to minimize the degree of shrinkage so the resulting concrete is as dense and as strong as possible. This is done in numerous ways including the correct ratio and particle size distribution of the sand (aggregate) as well as the addition of additives that can control this shrinkage by simply reducing the amount of water that is needed to hydrate the cement. The bottom line is that the quantity of water and how it is added and leaves the curing cement has a massive affect on the grouts final performance. It is the control of the quantity of water that is perhaps the most critical element of how a grout will cure and perform.

Let's look at two of the most common problems with grout and see how they are caused and then we can see how these also have a direct relationship to how a grout sealer will also perform.

Perhaps the most common problem is shade variation. Due to the process of hydration no cement will be absolutely uniform in colour. However this natural characteristic can be exaggerated by either increasing or decreasing the amount of water present during installation and cure. The most common way of doing this is by adding too much or not enough water to the grout mix during installation. However it can also be due to external sources such as high humidity (prolonging the cure by increasing hydration) and high temperatures (shortening the cure and speeding up evaporation and reducing hydration) both of which will create variable hydration and exaggerated colour variation.

The second common problem is shrinkage. This manifests itself in numerous different ways such as cracks in the grout joints and weak and sometimes powdery joints. The main cause of these problems is again all to do with the management of water in the mix and curing grout. The greater the amount of water in the mix the more water must eventually evaporate creating a higher volumetric change and shrinkage. Hence the higher the shrinkage the lower the ultimate density and strength of the grout (cement).

So once again we look firstly to how the grout is mixed. With the advent of rectified tiles we are seeing smaller and smaller joints and this is leading to installers using wetter, thinner mixes to get into these joints. Unfortunately the result is too much shrinkage. Excess water is also often used in the clean up of the grout again creating excessive shrinkage. This is becoming a very common practice due to the increasing quantities of textured anti-slip tiles that are now being installed which make grout clean up more labour intensive. Other factors affecting shrinkage are again temperature and humidity, that can accelerate the loss of water creating a rapid cure and shrinkage and also the ratio and particle size of the aggregate added to the cement. The latter is not common to all markets but is common in markets where grouts are mixed on site.

So do these problems affect the performance of a grout sealer? The simple answer is YES. Let's firstly look at the problem of poor sealer performance on a grout joint. A grout sealer is installed to basically reduce the water absorption of the grout and in doing so increase stain resistance and reduce maintenance. So it follows that the denser the grout joints (through proper mixing and installation) the better job the sealer will do in reducing absorption. Anything that reduces the grouts density will also reduce the effectiveness of the sealer. Sealers have difficulty bridging cracks so shrinkage cracks will adversely affect sealer performance. Sealers generally work by penetrating the porous cement and bonding to it hence if the sand and cement ratio is not correct or has been altered by way of excessive water in clean up for example then the sealer performance will be compromised. If we look at the second issue of shade variation grout sealers are often blamed for this problem. However it is usually guilt by association only. As it takes theoretically 28 days for cement to cure the final colour and shade of a grout is still forming when many grout sealers are applied. Hence clients blame the last applied product as they don't commonly understand the hydration process of cement and its duration. Also bear in mind the quantity of moisture added to a joint by correctly installed water based grout sealers would not be enough to dramatically affect hydration and create serious shade variation.

As an example of how the performance of a grout sealer is inextricably linked to the performance of the grout and how it is installed let's look at a job problem I have recently been asked to investigate. This job involved a polished limestone interior floor where the factory prepared grout joint was sealed with a water based grout sealer. The complaint was that the sealer was not repelling liquids very well at all and furthermore the grout had become shaded in colour not long after the application of the sealer. On inspection I found the grout to be quite powdery with very fine cracks across the joints. There were numerous different shades, the shading worse the closer you got to the large windows, and there was no doubt that the sealer was not repelling liquids as it should. My eventual findings were as follows: The grout joint had not cured properly and had relatively high shrinkage (hence the fine cracks) due to a combination of events.

The installer had decided to add sand to the factory prepared grout due to the wide joints specified by the client. He then mixed the grout quite wet and then turned on the underfloor heating to speed up the cure of the wide joints. The installation was done in spring when the sun coming in the windows was strong but air temperature mild. The combination of underfloor heating, sun and the wet mix resulted in a high loss of water (volume) very quickly and hence the weak, cracking joint. This fast cure also created uneven hydration and hence the shade variation. This was exasperated by the high porosity of the limestone. The incorrect addition of the sand (the tiler did this ironically to reduce shrinkage) to the factory prepared grout changed the cement aggregate ratio making a weaker sand-rich joint which the sealer had difficulty bonding to. In this case the grout sealer was a potassium siliconate which relies on the alkalinity of the cement to properly cure hence its performance was severely compromised.

The bottom line is that the grout sealers performance was totally compromised by the performance of the grout itself. Grout Sealers rely heavily on the working properties and integrity of the grout. Grout Sealer performance is a function of the interaction of the two mediums and this must be clearly communicated when specifying and marketing grout sealer performance.

Featured Product

Aqua Mix Grout Sealer

Aqua Mix Grout Sealer is an easy to use premium, no sheen, natural look, water-based sealer that resists water, oil, and acid-based contaminants.

Key Features:

- Dual Protection - Penetrates & Coats
- Repels Food, Dirt & Grease
- Inhibits Mildew & Bacteria
- Simplifies Maintenance
- Allows Moisture Vapor Transmission (MVT)
- Lasts up to 5 years

For use on:

As a sealer or grout release on all natural stone surfaces, unglazed tile, porcelain, clay pavers, concrete, brick, masonry and grout. For internal and external use.