AC•TECH 2170™ SYSTEM
For Vapor Reduction

Silican'ts

The CAN'Ts of Silicate Useage in Concrete Slabs Destined for Final Floor Coverings and Installation Systems

Silicates DO have a place in the construction of concrete flooring. This is especially true of concrete slabs in warehouses, manufacturing plants, and other industrial facilities where no additional floor coating or finished flooring system is contemplated.

For whatever reason ... or from whatever source ... there is a serious misconception in the marketplace today about what Silicates can and cannot actually do.

As a premiere manufacturer of vapor reduction and alkalinity control epoxies, AC•Tech is often called upon to diagnose and fix flooring failures caused by high moisture, high alkalinity, and high undissolved silicate content in the concrete substrate.

This short note is intended to highlight some of the issues relating to the use of Silicates in concrete substrates where subsequent floor coatings and finished flooring systems are contemplated.

We hope that this information may assist those involved in designing, specifying, and installing flooring systems over concrete substrates to avoid these problems from the beginning (rather than be forced to fix them later at great cost and at great inconvenience).

A more comprehensive, annotated white paper on this subject is available on our website.

Silicates cannot prevent water vapor from escaping from concrete. Therefore, Silicates cannot be used as a curing compound.

Whether used as an admixture or as a topically applied chemical, Silicates cannot prevent water **in vapor form** from migrating and evaporating through the concrete.

Silicates cannot be used as curing compounds as per ASTM C309 and ASTM C1315. Silicates are reactive materials rather than film-forming or membrane-forming materials. As such, they allow vapor to evaporate through the concrete.

This evaporation will not allow the concrete to retain the necessary amount of water to cure and harden properly.

Silicates will remain undissolved and unreacted when applied to fresh concrete or added directly to a concrete mix as an admixture,

Silicates harden concrete the same way that water hardens concrete: silicates react with unreacted cement and free lime to form Calcium Silicate Hydrate (C- S- H) crystals. The crystallization process causes an expansion that will decrease the porosity of the surface and increase the hardness of the concrete.

However, when silicates are added to concrete while concrete is initially reacting, silicates will compete with water for the unreacted cement.

Since much of the silicates will not react, undissolved silicates will be left behind.

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Silicates can harden concrete and decrease the surface porosity, but will later act as a bond breaker for most coatings and adhesives.

When applied to cured concrete, silicates can harden concrete and decrease it's porosity.

However, silicates are glass- like materials and will act as a bond- breaker for many floor coatings.

On unprepared concrete, even high performance epoxies and water- based polyurethanes will often "fish-- eye" or bead up in the presence of silicates.

Undissolved Silicates on the surface of concrete will sponsor osmosis and cause failure in epoxy and polyurethane flooring osystems.

Though undissolved Silicates may not always be visible to the naked eye, they often will remain on or near the surface of the concrete.

Once the concrete has had an adhesive or coating installed on top of it, moisture from within the concrete will push towards the surface to dissolve those silicates and reach a solution.

This process creates a tremendous amount of osmotic pressure, sometimes upwards of 500 PSI, and will cause even very hard and dense coating materials to fail.

Silicates have a very high pH, which may cause problems for pH sensitive adhesives and floor coating materials.

Depending on the individual silicate chemical and solution used, silicates are likely to have a pH of ~13. Such a high pH can pose a problem for many resilient flooring adhesives, resinous coatings and other flooring materials.

Though an initial pH test may appear normal, undissolved silicates from within the slab will migrate in solution with moisture to the surface of the concrete where they will often cause adhesive or bond failure.

Undissolved Silicates, even more so than undissolved salts, will cause failure in many coatings due to crystallization and expansion.

The lack of visible efflorescence -- and a water droplet test showing easy absorption -- does not necessarily mean that undissolved silicates are not lying dormant within the concrete.

Often times, silicates are applied excessively or added integrally to the concrete mix design, which means they may be more uniformly distributed. Though osmosis likely will not form, silicates will move to the surface and rapidly crystallize. The resulting expansion may create bubbles or blisters in the coating.

Though not as severe and immediate as osmosis, over time this process will repeat, continue to spread and eventually cause a flooring failure.

If you're working with a project where silicate use is even remotely suspected, it is best to take a concrete core and send it to an independent lab for forensic testing. While the water droplet test is a good indication of silicate contamination, it can only account for silicates on the surface and does not indicate whether silicates are uniformly spread throughout (or deeply penetrated within) the concrete.

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