



CRETE DEFENDER™

Permanent Concrete Protection.

Understanding How CreteDefender™ Works By: Stuart Hoeke

CreteDefender is a full strength, ready-to-use formulation of reactive silicates and surfactants that are carried in solution with water. When applied to concrete, a chemical reaction occurs which hardens, densifies, and prevents the penetration of water and other chemicals in concrete. CreteDefender will, when properly applied, eliminate dusting, scaling, and efflorescence, prevent damage due to salts, sulfates, acid rain, and freeze/thaw cycles, and significantly reduce chloride intrusion thereby inhibiting corrosion of steel reinforcement.

Preventing Concrete Damage:

The structure of the concrete, if you were to look at it under a microscope, would show aggregates, cement paste (CSH and very small aggregate particles) and a network of tiny air voids and capillaries. These voids and capillaries are what allow water and other chemical compounds to enter into the concrete. These compounds either expand and create pressure to break the concrete, or deteriorate the concrete through acidic reactions.

In order to prevent damage, it is critical to prevent access to the pore and capillary structure of the concrete. Most sealers do this by creating a thin membrane on the surface of the concrete that will wear out over time. Other sealers repel water and become ineffective in a few weeks to a few years. CreteDefender works by entering the concrete's pore and capillary structure and filling this structure with the same elements that occur naturally in concrete. Once inside the structure of the concrete, CreteDefender becomes a permanent part of the concrete.

The Chemistry of CreteDefender:

CreteDefender's chemical reaction is completely natural to concrete. When concrete is mixed, portland cement is hydrated with water, and a reaction takes place that creates heat, Calcium Silicate Hydrate (CSH), Calcium Hydroxide (lime), and water. CSH is the compound that gives concrete its stability, density, strength, and hardness. Lime is a by-product of the hydration process, and is frequently called "free lime" since it is an unused by-product.

When applied to concrete, CreteDefender reacts with the free-lime in the hardened concrete to create Calcium Silicate Hydrate (CSH), Sodium Oxide, and water. The CSH created in this chemical reaction fills the pore and capillary structure of the concrete, making a much denser and more impervious concrete. Concrete that is made with Supplemental Cementitious

Materials, such as fly ash, silica fume, and slag, is also made denser and much more resistant to damage.

Sodium Oxide, the other byproduct of the reaction of concrete and CreteDefender, raises the pH of the concrete, thereby slowing the carbonation process and neutralizing any acidic reactions that may be taking place.

The reaction of CreteDefender in concrete takes approximately 75 days to complete, but protection of the concrete is effective within 24 hours of application.

Depth of Penetration:

The surfactants in CreteDefender allow the solution to migrate deeper into the concrete than water alone. The exact depth of penetration is dependent upon the porosity of the concrete and the amount of CreteDefender used in the application. In highly dense concrete, CreteDefender may penetrate 1-2 cm, while in more porous concrete, 8-10 cm is possible. Generally, CreteDefender will penetrate about 1-2 cm deeper than water would penetrate the untreated concrete. This creates sufficient protection both to the concrete and the reinforcement.

CreteDefender is really permanent:

CreteDefender is permanent. The reaction takes place inside the matrix of the concrete and when complete, becomes a permanent part of the matrix. It cannot be removed or worn off. Since the product of the reaction is CSH, which is natural to concrete, the bond created cannot be removed except by destroying the concrete.

Application is easy, but the method is critical to success:

CreteDefender works differently than any other coating or sealing product. Due to the way it works, you need to suspend what you know about how sealers or coatings are applied and what you can expect to see once applied. Most sealers and coatings require a specific application rate or thickness. This requirement allows for the establishment of a membrane or a water repellant seal. CreteDefender does not form a membrane or repellant seal. It seals the pore and capillary structure **inside** the concrete mass. Therefore, CreteDefender requires direct contact with concrete in a way that allows it to be absorbed into the pore and capillary structure. Proper application is critical to achieve the protection CreteDefender provides.

CreteDefender must be applied by saturating the surface of the concrete sufficiently so that the concrete stays wet (not damp) for 20-30 minutes. A minimum of two applications is required for all exterior surfaces. When estimating how much material you will need, we generally recommend one gallon for every 125 square feet (1 liter per 3 square meters) for each application. However, this is not a “target coverage rate,” but merely an estimate for ordering roughly the right amount of CreteDefender. The amount you ultimately use may be substantially more or less than that amount, since coverage is entirely dependent on the air temperature, humidity, and the porosity of the concrete. Saturation is key, since you are wanting CreteDefender to penetrate into the pore structure as deeply as possible.

You will use less CreteDefender if you apply it out of direct sunlight during the coolest part of the day (early morning or night-time is the best). The most effective methods for application are a low-pressure “garden sprayer” or a water pump with a garden hose and “rain shower” nozzle. On level surfaces, pouring CreteDefender directly onto the concrete and spreading it with a push broom is also very effective.

Care should be taken to remove any puddles or areas where CreteDefender is standing after the 20-30 minute saturation period by pushing the excess material onto areas that have become dry with a broom or squeegee. If puddles of CreteDefender are left to harden, a hard, white crystal is left behind. Crystallized CreteDefender may have to be removed by burnishing stones, so it is important to remove any puddles of wet CreteDefender during application.

What you will (and won't) see:

It is important to note that CreteDefender is not a water repellent. It will not make water “bead” on the surface or have any visible effect on the surface of the concrete. Concrete treated with CreteDefender may turn slightly darker, but it should not be noticeable if the entire area is treated. Otherwise, there is normally no visible evidence on the surface of the concrete after CreteDefender has been applied.

It is possible that, when applied to older concrete, salts or other impurities that are inside the pore structure of the concrete may be forced out, leaving a white crystalline substance on the surface. These crystallized impurities can be removed with a strong pressure washer. In concrete that has high iron content in the aggregate, CreteDefender may turn the concrete brown. However, this coloration will dissipate with time (usually about a year).

Quality Concrete is required:

CreteDefender is only effective on properly mixed and properly placed concrete. This means that CreteDefender is effective when applied to concrete that has a maximum water to cement ratio of .5:1, that is properly consolidated at placement, and that has been finished so that air is not entrapped at the surface. We highly recommend the use of a plasticizer in the formulation of the concrete mix. CreteDefender is equally effective on air-entrained concrete and non-air-entrained concrete.

CreteDefender will not be effective on pervious concrete or on masonry units, such as cinder blocks, CMU's, or bricks. Additionally, CreteDefender will not make good concrete out of bad concrete. It will make good concrete extremely durable and long lasting.