

How Mix Water Conditioner creates better concrete

A technical explanation of how Mix Water Conditioner uses the leftover mix water to create more cement paste and thus, a better quality concrete

What it does:

PROTECRETE-MWC utilization results in the production of more cement paste per cement particle. It creates concrete with lower void percentages. It provides greater impermeability and increased strengths. It improves workability through increased lubricity. It reduces plastic separation and surface bleed water volume. It improves surface abrasion resistance. It reduces cementitious material waste.

How it works:

During Portland cement concrete manufacturing, and upon introduction of mix water to cement, reactions immediately occur between the mix water and cement. These reactions are part of cement's hydration processes, called hydrolysis. During hydrolysis varying molecular portions of cement's tricalcium and dicalcium silicate are split-off, producing varying quantities of calcium hydroxide residue. Hydrolysis, along with the dilution caused by the mix water quickly lowers the cement's potency. Whenever PROTECRETE-MWC has been added to the mix water, the cement's potency loss (normally ascribable to mix water dilution/hydrolysis) either becomes very minimal or is completely eliminated. This creates hydrolysis by-products of much-improved quality, ultimately improving the concrete's silicate hydrate components. The highest attainable cement paste quality, at this point in time, is far more important than is sometimes realized. During initial hydration/hydrolysis, as mix water comes into contact with cement, the freshly-produced cement

paste begins to coat concrete's aggregates. At the same time, hydrate envelopes begin being formed around each grain of dry cement.

PROTECRETE-MWC uses concrete's mix water as its vehicle to get at its cement ingredient at exactly the same time as its mix water before hydrolysis. PROTECRETE-MWC provides ingredients to the mix water which ensure that only the highest quality cement paste, feasibly attainable, is being initially produced. This greatly improves the concrete installation's ultimate paste-to-aggregate bond quality.

As initial hydration continues, following hydrolysis, the produced calcium hydroxide begins laminating silicate polymer particles/strands/chains, resulting in a hardened gel mass, containing crystalline products, referred to as calcium silicate hydrate or C-S-H gel. This gel is capable of binding inert particles, such as aggregates, including unused cores of the cement particles, into a coherent mass known as concrete. During manufacturing where PROTECRETE-MWC is *not* utilized, significant portions of the included mix water does not participate in cement hydration since some mix water is used to make concrete workable. For example, assume *no* water loss agents or plasticizers are used and 5 gallons of mix water fully hydrates 100 lbs. of cement with a water-cement ratio of 0.42. In this example, only 2.88 gallons of mix water actually chemically combines with cement, while the remaining 2.12 gallons, following surface finish (after workability is no longer needed), just occupies capillary

spaces until used for production of hydration products, or is later evaporated leaving void capillaries.

Mix water volume containing PROTECRETE-MWC, left to be evaporated, is greatly reduced or completely eliminated, due to the increased cement particle saturation of mix water. This significantly lowers void capillary percentages, translating to greater impermeability. Increased mix water and cement particle utilization of the already-included cement, through using PROTECRETE-MWC, allows additional mix water volume to be used while raising concrete's cementitious material content. The end result is concrete that will still exhibit low water-cement ratio quality, or even better. Very importantly, through increase of cement particle utilization, significantly smaller and variously-sized cement particle cores are left remaining in the concrete. They become very excellent filler aggregate that is between sand and cement grain size and provides additional impermeability and density. This action causes the concrete to be even more resistant to chloride-induced rebar corrosion and freeze-thaw damage, etc. PROTECRETE-MWC's benefits are similar to those of micro silica or silica fume, only it does *not* require special storage, handling, mixing, finishing or curing techniques, as does silica fume.