

Answers to the most commonly asked questions about Mix Water Conditioner

Q. What is PROTECRETE-MWC (Mix Water Conditioner)?

A. It is an environmentally safe, user friendly, nontoxic, odorless, non-petroleum, liquid product that provides to mix water the ability to enhance Portland cement concrete. It provides concrete with values capable of preventing or alleviating most, if not all, of concrete's potential ailments that could lower or destroy its integrity. PROTECRETE-MWC readily solublizes with water, using concrete's mix water as its vehicle to get at the mix's cement ingredient during mix water introduction. PROTECRETE-MWC is an effective and hassle-free alternative to using silica fume or microsilica. It has no special requirements for storage, handling, mixing, finishing, and curing, as does silica fume. PROTECRETE-MWC provides mix water the ability to upgrade conventional concrete mix designs, without risky, complicated, expensive or labor intensive measures.

What technique is best to introduce PROTECRETE-MWC into mix water?

PROTECRETE-MWC can be added into mix water using a mix water holding tank at the site of batching or if the holding tank method is not practical, PROTECRETE-MWC can be put directly into a rinsed clean mixer, just prior to putting mixer under batching plant. With the mixer running in its mixing mode, load approximately 90% of the total planned mix water volume, then

begin loading cement, aggregate, and remainder of mix water in the usual order. The slump factor may be increased using PROTECRETE-MWC treated mix water or plain untreated water.

Does PROTECRETE-MWC use require special mixing procedures other than the one above?

No. However, for best benefits/results, concrete should be mixed for an adequate period of time, prior to placement whether using PROTECRETE-MWC or not. Optimal mix time for concrete utilizing PROTECRETE-MWC in its mix water should be equivalent to a cumulative total of approximately 110 revolutions in a transit mixer drum. Mix water volume should be calculated, without allowing any water reduction for water loss agents, plasticizers, or super plasticizers, where they are not to be used. PROTECRETE-MWC implements easy shear of the cement particle hydrate envelopes, making adequate mix water volume and mixing time very important, especially since the easy shear actions also increase concrete's cementitious material to water ratio, resulting in a concrete with low water-cement ratio quality, or even better.

How does PROTECRETE-MWC improve concrete?

Initially, PROTECRETE-MWC, in mix water, greatly decreases Portland cement potency loss and its adverse effects caused by dilution

and hydrolysis during mix water introduction. A reduction in initial cement potency loss significantly improves hydrolysis by-product quality, specifically, the subsequently produced calcium hydroxide residue, and ultimately concrete's hydrated silicates. Through utilization of PROTECRETE-MWC during mix water introduction, PROTECRETE-MWC's ingredients contact concrete's cement ingredient at the exact same time as the mix water prior to hydrolysis. Hydrolysis is responsible for the splitting off of varying molecular portions of cement's tricalcium and dicalcium silicate components, producing varying quantities of calcium hydroxide residue. PROTECRETE-MWC ingredients ensure that the hydrolysis' by-products are favorably affected. Particularly the calcium hydroxide quality, since calcium hydroxide is utilized to laminate the cement paste's silicate polymer particles/strands/chains during setting. Subsequently it provides strength to concrete's tobermorite gel, the main strength component of concrete. Another result of PROTECRETE-MWC enhancing concrete's calcium hydroxide quality is that a more efficient lamination is achieved. It further increases flexural and compressive strengths, while significantly decreasing the volume of calcium hydroxide residue left in the concrete. The residue could potentially later on participate in detrimental internal chemical reactions that could erode or even destroy the integrity of the installation. As hydration continues, following

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saturation by the mix water, PROTECRETE-MWC enhances concrete through implementing increased cement particle saturation by the mix water, generating an increased volume of cement paste per cement particle. This increased saturation effectively increases the concrete's cementitious material content volume, producing a paste volume increase using the already-included cement content, improving concrete's performance in many ways. It produces a fine-textured cement paste with smaller, more uniform-sized porosity. It improves freeze-thaw damage resistance. It improves workability through increased lubricity. It decreases separation to lower surface bleed water volume. It increases surface abrasion resistance, lowering cementitious material waste and etc. Since concrete's aggregates begin being coated by cement paste immediately following mix water introduction to cement, PROTECRETE-MWC provides ingredients that will ensure that only the highest attainable quality cement paste is available during this aggregate coating process. This improved paste-to-aggregate bond quality even further enhances its flexural and compressive strengths.

Does PROTECRETE-MWC contain anything that could harm our environment?

No. PROTECRETE-MWC is environmentally neutral.

Can PROTECRETE-MWC be used in mixes containing silica fume/microsilica?

Yes. However, where utilizing PROTECRETE-MWC in a concrete

containing silica fume or microsilica, most if not all of the silica fume or microsilica may be omitted with little or no loss to objective performance values. If however, total silica fume or microsilica deletion is undesirable, the silica fume or microsilica content may be reduced by up to 75% without objective performance value loss. PROTECRETE-MWC provides numerous benefits to concrete similar to those of silica fume or microsilica, including their fine solids effect. The fine solids effect in concrete utilizing PROTECRETE-MWC is achieved through increased utilization of each cement particle. This result in smaller than usual particle cores to act as aggregates. These cement particle cores that are left behind in the concrete to act as filler aggregate, are smaller than usual, between sand and cement grain sizes. The concrete becomes more impermeable and resistant to chloride-induced corrosion, as with silica fume or microsilica. PROTECRETE-MWC's ability to reduce free calcium hydroxide content was previously explained.

Should PROTECRETE-MWC be used in concrete containing fly ash?

Yes. Fly ash is a pulverized fuel ash (PFA) and is the most widely used artificial pozzolan in the manufacturing of concrete. Fly ash is generally obtained from flue gases of furnaces, particularly at coal fired stations, through electrostatic or mechanical means. Fly ash particles are spherical in shape and are at least as fine as Portland cement particles. This makes fly ash's silica component readily available for reaction. Fly ash is a finely divided admixture, as

is silica fume and microsilica, and is generally not needed in concrete mixes utilizing PROTECRETE-MWC. However, should fly ash be utilized for whatever reason, PROTECRETE-MWC provides numerous benefits to concrete, even where fly ash is included.

Can PROTECRETE-MWC be used in mixes containing air entrainment chemicals?

Yes. Air entrainment is generally used in concrete mixes to provide improved durability and resistance to freeze-thaw damage, to discourage plastic particle separation or to improve workability. However, air entrainment over and above the actual percentage needed for such improvements, serves only to weaken concrete needlessly. For example, tests show that air entrainment in concrete mixes without any other mix proportion changes, decrease strength proportional to its air content up to a level of eight (8) per cent. However, PROTECRETE-MWC added to mix water, produces concrete that has significantly improved impermeability. Greater impermeability serves to lower, or eliminate penetration of water into concrete. This reduces or eliminates the need for purposely entraining air for freeze damage resistance. PROTECRETE-MWC provides concrete a small amount of purposely entrained air and when combined with the unavoidable incidental air gained during batching air percentage should be adequate, especially when PROTECRETE-MWC takes into account the other reasons to purposely entrain additional air, such as workability and particle separation.

Can PROTECRETE-MWC be used in concrete's containing water loss agents, or super plasticizers?

Yes. Water loss agents or water reducers often contain ingredients such as hydroxylated carboxylic acid or lignosulphonic acid, while superplasticizers may contain sulphonated formaldehyde condensates. Neither of these agents are necessary if utilizing PROTECRETE-MWC. PROTECRETE-MWC provides all of the desired benefits of water loss agents, water reducers, or superplasticizers without the undesirable effects. Instead of discouraging mix water absorption by dry cement particles to lower mix water volume requirements, as do water reducers and superplasticizers, PROTECRETE-MWC encourages absorption instead. Consequently, it utilizes more mix water volume instead of less, while at the same time utilizing significantly higher percentages of the already included cement. This effectively raises concrete's cementitious material content volume and results in concrete with low water-cement ratio performance values, or even better. PROTECRETE-MWC provides concrete the desired particle charge effect usually afforded by water reducers and superplasticizers. It produces extremely homogenous plastic concrete mixes. PROTECRETE-MWC in the mix water improves plastic concrete's workability by increasing its lubricity.

How does PROTECRETE-MWC increase concrete's impermeability?

Permeability is the ease with which liquids or gases can travel through set concrete. Permeability can be

measured in a laboratory test by sealing the sides of a concrete specimen, then applying water pressure to its top surface while measuring volume of water flow through the specimen once flow rate stabilization has occurred. In concrete with normal weight aggregate, permeability is governed by tobermorite gel porosity and the presence of larger capillary porosity, that originally formed as mix water pockets. Generally, permeability is a function of capillary porosity, governed by water-cement ratio and degree of hydration. PROTECRETE-MWC provides mix water with ingredients to significantly improve the mix water's degree of hydration. This is achieved through greater cement particle saturation. This works to ensure optimal mix water volumes are absorbed by the cement, even to beneath the cement particles' hydrate envelopes. This facilitates easier shear of these hydrate envelopes, which were formed around each dry cement particle upon introduction of the mix water. PROTECRETE-MWC's ingredients also ensure that only minimal amounts of mix water are left in the concrete, to later on be evaporated and leave behind capillary voids. PROTECRETE-MWC encourages acceleration of the cement's strong initial hydration processes. It encourages concrete to fill its own porosity with internally produced hydration product. This results in smaller than usual, more segmented capillary porosity that creates very impermeable concrete. Since higher volumes of the already included cement and mix water are utilized using PROTECRETE-MWC, each cement particle core is significantly reduced in size. They become smaller than usual, cause the cement particle

cores left behind in the concrete to act as aggregates and become an unmatched filler between concrete's sand and cement grain sizes.

What is the recommended dosage volume of PROTECRETE-MWC?

When mixing at a dry batch facility, 10 fluid ounces per CWT (100 pounds) of cement should be used. If the mix water holding tank method is utilized for various cement content batching, 10 fluid ounces per 4 gallons of mix water is recommended. For continuous mixing such as concrete unit manufacturing, gunite, shotcrete, or flowcrete, PROTECRETE-MWC is recommended to be used at the rate of 10 fluid ounces per 3 1/2 gallons of mixing water, added or injected into mix water, prior to combining with cement.

How does PROTECRETE-MWC eliminate plastic cracking of concrete?

Plastic cracks usually develop between 1 and 8 hours following concrete placement, and are in the form of shrinkage or settlement cracks. Shrinkage cracks may result as cement paste contracts while still in a plastic state. This type of cracking is fairly common. They usually occur as a result of surface weakness, generally due to work-in excessive surface bleed water volume. This creates a weakened layer of concrete at the surface. Shrinkage cracks also can result from too-rapid water evaporation at the surface. However, all of the many reasons for shrinkage cracking such as surface water suction by dry concrete below, excessive bleed water volume, too-

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rapid water evaporation, etc. are alleviated/eliminated when utilizing PROTECRETE-MWC. A related form of plastic cracking is surface crazing, which takes place when the surface layer of concrete has more water content than the concrete's interior. Conditions creating surface crazing do not exist when utilizing PROTECRETE-MWC. Settlement cracking, in plastic concrete, is usually due to particle desegregation/settlement and uneven settlement. This crackage sometimes occurs due to the presence of an obstruction such as imbedded steel. This type of cracking is not likely to occur when using PROTECRETE-MWC due to its production of an extremely homogenous plastic mix, discouraging particle segregation/settlement. As always, normal safe concreting practices should also be observed, in plastic cracking prevention, such as applying a proper cure at the proper time etc.

How does PROTECRETE-MWC eliminate slab curl?

Slab curl occurs around the slab's perimeter or at the joints, usually with the corners curling most. This is generally because concrete near the top and edges dry first, the corners drying fastest and concrete near the top cools while the mass below remains warm. PROTECRETE-MWC prevents slab curl by creating an extraordinarily homogenous plastic concrete mix which discourages particle separation and promotes uniform wetness, uniform hydration, uniform setting, uniform drying and uniform internal humidity, effective with or without a vapor barrier.

How does PROTECRETE-MWC work to prevent dusting?

Cement concrete surfaces usually only dust excessively if the mix was poured too wet or its surface troweled too soon while excessive bleed water was laying on it, or if surface

dried completely before being properly cured prior to covering, or the surface was exposed to carbon dioxide while still plastic. PROTECRETE-MWC added to mix water allows concrete to be poured, even at very high slumps, without particle separation. It subsequently produces very low volumes of surface bleed water, virtually eliminating the potential for excessive amounts of bleed water to be troweled into the surface to encourage dusting.