

SCP Optimiser 1000



Technical Data

REV.2015-2

INTRODUCTION

Would a more workable, less permeable, more defect-free, stronger, harder (but not more brittle), and more durable concrete, made without additional effort in mixing, placing, finishing or curing, and requiring only a minimal cost adjustment (if any) be of interest for your project(s)?

The answer to the above question would be an immediate resounding **yes**, if the finest quality, yet affordable, most durable concrete installation is the objective.

Why should lower permeability be important to concrete? Concrete permeability is the most important predictor of long-term durability. The permeability of concrete is directly responsible for whether pollutants or contaminants such as sulfates, acids, chlorides, etc. have the ability to penetrate concrete.

Therefore, concrete permeability should be of critical interest.

Placing concrete with improper curing, higher than designed water to cementitious ratio (w/cm), or with aggregates that are porous can lead to unintentionally higher permeability values. For normal weight concrete, permeability is governed by the porosity of cement paste in general. However, pore-size, distribution, and interconnectivity of voids dictate the volume and speed that water (and the contaminants it carries) can pass through the concrete, gaining access to critical reinforcing steel and aggregate/paste interfacial zones.

When concrete is first placed, it contains the water that is needed for the hydration reaction, typically between 0.25 and 0.32 the weight of the total cementitious content of the mix. The remaining water is often referred to as "water of convenience", which allows the concrete to be placed. Much of this water of convenience leaves the concrete during its early life through the formation of capillaries and evaporation. The number and size of capillaries result from a combination of many variables, but the overall governing factor is the water to cementitious ratio. As w/cm increases, capillary voids increase. As capillary voids increase, drying shrinkage (and the resultant restrained tensile stress development and cracking) increases.

A portion of the water of convenience remains in the concrete in the form of non-evaporable water. As the cement in the concrete mix continues to hydrate, capillary void space becomes smaller, and the permeability of the concrete lessens. SCP Optimiser 1000™ works by reducing the surface tension of the water, allowing more complete initial hydration to take place, and thus reducing the size and number of capillary voids. This extraordinary action greatly reduces concrete permeability, with the added benefits of providing greater compressive strengths due to more complete cement hydration.

From the viewpoint of durability, it is very important to achieve low permeability quickly, before the significant formation of capillary voids can occur.

INTRODUCTION (continued)

SCP Optimiser 1000™ ingredients promote very low permeability concrete by ensuring capillary voids are as small and disconnected as possible, using your mix design. Testing and chloride diffusion modeling has demonstrated that concrete treated with SCP Optimiser 1000™ behaves like concrete with a much lower w/cm ratio. For example, life cycle analysis studies for reinforced concrete, using laboratory-derived chloride diffusion coefficients, demonstrated that concrete treated with SCP Optimiser 1000™ behaved like concrete with a w/cm ratio .10 to .20 lower than actually used.

Why should a more defect-free concrete be important to a concrete installation? Concrete generally is considered to be under attack from the environment from the moment it is placed. Crack reduction of newly-placed concrete should be of the utmost importance in preserving its integrity over the long term.

Basically, with newly placed concrete there are three intrinsic visible types of cracking to be concerned with - *plastic shrinkage cracks*, *early-age thermal cracks*, and *drying shrinkage cracks* all of which leave the concrete surface more vulnerable to contaminant ingress. **SCP Optimiser 1000™** provides built-in ingredients to concrete mixwater which work to counteract the causes of these three types of visible cracking. However, surface visible cracks are not the only defects that can cause concrete integrity inferiority; there are internal defects to also be considered such as cracking in the aggregate-paste contact zone. Along with permeability, aggregate-paste contact zone cracking has a tremendous effect on concrete's permeability/durability factor and reinforced concrete's vulnerability to steel corrosion. Very often concrete will initially develop internal defects in the form of micro-cracks in the contact zone between the aggregates and the cement paste matrix causing it to be weaker and become more permeable to moisture, oxygen, and other aggressive media. The aggregate-paste contact zone is very often the weakest link in concrete structure because of bleed-water voids, as well as micro-cracking due to shrinkage and the elastic mismatch between the cement paste and the aggregate.

The production of the cement reaction products that ultimately winds up in the aggregate-paste contact zone begins immediately upon contact between mix water and cement, and almost immediately begins coating or absorbing into the aggregates of the mix. However, this aggregate coating is later very often interfered with by bleed-water coming from within the aggregate. This problem is significantly reduced when **SCP Optimiser 1000™** is added to mix water prior to exposing aggregates to mix water.

The presence of **SCP Optimiser 1000™** would also encourage additional hydration of presently unhydrated cement particles - even to beneath particle hydrate envelopes, significantly improving paste quality inside aggregate-paste contact zones.

SCP Optimiser 1000™ ingredients also promote extraordinary homogeneity of the produced cement paste - an action which minimizes bleed-water coming from inside the paste itself. During consolidation and setting, where internal bleed-water is present there is possibility that bleed-water migrating upward becomes trapped under horizontally stratified grain surfaces of aggregates.

Bleeding and inefficient packing of cement paste around affected aggregate can cause voids to be formed. These types of voids are not filled during hydration, creating a zone that can be more porous than the entire matrix would have been without the presence of these voids. This situation even further promotes existence of initial bond microcracks at interfaces between aggregates and cement paste. When microcracking in concrete remains localized, and is not continuous, this is not an extremely serious situation initially. However, this phenomenon can "artificially" lower compressive strengths. Over time, volume changes, freeze-thaw and wetting-drying cycles, fatigue, alkali-aggregate reactions, etc all tend to increase microcracking, eventually manifesting itself in external failure. These crack networks serve to facilitate permeation of liquid contaminants, ions and gases which destroy concrete integrity and corrode reinforcement steel. A more defect free concrete is produced where **SCP Optimiser 1000™** was utilized in the mix water, due to significant improvement in the cement efficiency of the concrete.

Since **SCP Optimiser 1000™** is added to mix water, prior to mixing it with cement, it has the distinct advantage of being present at the exact same moment water and cement make contact, greatly improving the hydrolysis reaction's by-product quality, such as calcium hydroxide, etc. The use of **SCP Optimiser 1000™** ensures only the finest quality cement paste attainable is being initially produced, paste which almost immediately begins coating aggregates. The higher-quality paste significantly improves the concrete's final paste-to-aggregate bond quality, ultimately producing a much higher quality concrete installation, both externally and internally, that is extraordinarily more defect-free than it would have been without **SCP Optimiser 1000™**.

Also, improved paste-to-aggregate bond quality helps to increase concrete's flexural and compressive strength values.

Why should additional compressive strength to an already adequate strength concrete mix design be attractive, even though the added cubic meter price increase (if any) is low?

NOTE: *Concrete mix designs should reflect what is thought to be the most economical and practical combination of aggregate, cement, and water that produces concrete of required workability strength and durability under specific service conditions.*

SCP Optimiser 1000™ coincidentally provides additional compressive and flexural strengths as a direct result of improvements to the concrete mix quality, and is not its main conceptual objective. Depending on the concrete installation's intended purpose, higher compressive and flexural strengths may or may not be needed. However, every concrete needs the benefits of reduced chances of crack formation.

Abrasion, erosion, wear and cavitation have similar effects on concrete. An example of wear in building construction is abrasion from forklifts or other hard wheeled traffic or production operations where heavy objects may be dropped on the concrete floor. Concrete compressive strength at the wearing surface is an indicator of potential wear resistance. Higher compressive strengths usually result in greater wear resistance.

SCP Optimiser 1000™ added to concrete mix water produces a concrete which is extraordinarily strong, hard, and impermeable. SCP Optimiser 1000™ accomplishes this in several ways beginning with improvement in hydrolysis by-product quality, particularly calcium hydroxide which later provides a more efficient lamination, due to its improved quality, minimizing volume of leftover unused calcium hydroxide residue remaining in the concrete installation, lowering potential for detrimental internal chemical reactions. SCP Optimiser 1000™ provides mix water the ingredients to initiate cement hydration without the turbulence and violence associated with hydrolysis, including cement potency loss ascribable to mix water dilution of the cement.

This action, at the point of hydrolysis, also works to ensure that only finest quality cement paste attainable is absorbing into and coating the aggregates during this critical event, greatly improving cement paste in the aggregate-cement paste contact zone, significantly improving final paste to aggregate bond quality, among other things of importance to durability. SCP Optimiser 1000™ utilizes a significantly greater volume of the already included Portland cement which in turn increases the cementitious cement hydration products volume material content of a mix, an action that tremendously improves durability by producing smaller and more segmented capillaries thus more impermeability. Since SCP Optimiser 1000™ increases

utilization of the already included Portland cement, . this means that more of each cement particle will be utilized, greatly decreasing the size of each particle left over to act as filler aggregate. These particles ultimately become sized somewhere between sand and cement grain sizes causing them to perform as silica fume would, except without the brittleness. This action alone causes concrete integrity to increase, becoming even denser, stronger, and less susceptible to contaminant pollution, freezing and thawing, cycle damage, embedded steel corrosion etc - factors which translate to greater durability.

The durability of a material is that property which indicates whether or not the material will endure, even though it may not be subjected to loads sufficient to destroy it. Durability of Portland cement concrete is defined as its ability to resist weathering action, chemical attack, abrasion, or any other process of deterioration. Durable concrete will retain its original form, quality, and serviceability when exposed to its environment.

Durability of concrete is one of its most important properties because it is essential that concrete should be capable of withstanding the conditions for which it has been designed throughout the life of a structure. Durability of concrete is affected by innumerable factors such as alternate wetting and drying, freezing and thawing, aggressive sulfates exposure, heating and cooling, capillary water. abrasion, corrosion of steel and other embedded materials, chemical reactions of aggregates, deposition of salts by percolating water, dissolving of certain constituents (principally calcium hydroxide) by percolating water, dissolving of cement by certain acids, etc. Each and every one of the aforementioned problems potentially affecting concrete durability is addressed by SCP Optimiser 1000™ utilized as a mixing water conditioner.

SUMMARY INTRODUCTION TO SCP OPTIMISER 1000™

SCP Optimiser 1000™ is a safe, user-friendly liquid, that when added to a Portland cement mix, effectively, and without complexity, converts a conventional portland cement concrete design into very workable, high-performance / high-quality / high-durability concrete mix. This "converter" product possesses unique ability to consistently, significantly enhance every critical performance criteria (including permeability) that is associated with Portland cement concrete.

As this product name implies, this extremely unique “one of a kind” product provides Portland cement concrete mixes with the maximum beneficial degree of hydration currently possible, generating the consistent production of significantly increased volumes of hydrate product (C-S-H), during hydration, in a shorter period of time than in a normal mix, producing significantly increased volumes of C-S-H which greatly lower the resultant concrete’s capillary pore sizes while also increasing the utilization of the concrete’s available mix water volume. This significantly diminishes concrete’s permeability. **SCP Optimiser 1000™** poses no threat to our environment nor does it require special handling, storage, or curing procedures, plus it already has been thoroughly tested in the laboratory, and extensively utilized in a variety of projects.

Today’s concrete structures and pavements are being designed to last longer than ever before. To keep pace with these demanding performance standards and to combat our decaying infrastructure, high performance concrete is being specified every day. SCP Optimiser 1000™ is the most efficient, effective, and consistent method of consistently, without complexity, producing high performance portland cement concrete

Some laboratory observed conclusions on SCP Optimiser 1000™ use are:

- 1) Significantly increased concrete’s workability, through added lubricity and homogeneity.
- 2) Increased concrete’s compressive strength by at least 10%, flexural strength by 30%.
- 3) Remained effective in normal and severe environments.
- 4) Reduced the air-void percentage in its specimens, as compared to control specimens, by approximately 50%.
- 5) Treated specimens showed a reduced coulomb current passage of 29%, as compared to control specimens.
- 6) Control specimens in the “severe environment” test experienced rust, leaching, and longitudinal cracking at steel level, while no such cracking or rusting was observed in beams utilizing **SCP Optimiser 1000™**.
- 7) Specimens containing **SCP Optimiser 1000™** showed a lower creep value than control specimens, confirming **SCP Optimiser 1000™** enhances creep behavior.
- 8) Specimens containing **SCP Optimiser 1000™** had a noticeable increase in Modulus of elasticity.
- 9) Specimens utilizing **SCP Optimiser 1000™** had significantly lower measured percentages of chloride ion penetration than that of the control specimens.

NOTES:

- (1) Accelerated test results are based on concrete specimens exposed to “severe environment” exposure
- (2) Prior to testing, specimens were placed in three environments: normal conditions, i.e., Moisture room with 100% humidity and constant temperature of 23° Celsius,

severe conditions, i.e., tank with 10% sodium chloride solution, by weight of water, and laboratory conditions.
(3) Specimens incubated in the “severe environment” vessel were subjected to continuous wetting and drying cycles.

SCP Optimiser 1000™ works to ensure that both produced cement pastes (paste-aggregate zone cement paste and bulk cement paste), produced during concrete’s batching processes, are of the ultimate highest attainable quality, and will consistently produce concrete that has the same high-quality cement paste.

In summary, **SCP Optimiser 1000™** utilization consistently will translate to production of high-quality high-performance concrete, therefore, translating to consistent production of concrete with a significantly extended useful life span.

TECHNICAL DESCRIPTION

SCP Optimiser 1000™ is a cloudy-white, odorless, non-toxic zero VOC / VOS, user friendly, environmentally neutral colloidal silica liquid borne product.

BASIC USE

SCP Optimiser 1000™ added to Portland cement concrete's mix water will convert conventional mix designs to high-performance, generating production of concrete that is extraordinarily hard, dense and of low permeability. SCP Optimiser 1000™ causes concrete's enhancement in several various ways, beginning with improvement of hydrolysis actions and reactions, by significantly and favorably enhancing hydration by-product quality, i.e., calcium hydroxide, while also significantly increasing cement efficiency. The resultant concrete permeability / durability values become tremendously improved while SCP Optimiser 1000™ causes the production of very fine-textured, extremely homogenous, aggregate zone paste, and bulk paste, finally creating smaller more uniform capillary and gel pore sizes, with virtually no plastic particle separation.. SCP Optimiser 1000™ in a concrete mix provides the mix with ability to initially introduce Portland cement to mix water without the usual abruptly violent actions and reactions which creates a cement potency loss, normally ascribable to water dilution and hydrolysis, which will create poor quality early produced cement paste, paste which initially coats concrete's aggregates. SCP Optimiser 1000™ utilization works to ensure early, initially-produced cement paste (aggregate zone paste), immediately coating the concrete's aggregates, is of the highest attainable quality, ultimately and significantly improving concrete's paste-aggregate zone and paste to-aggregate bond quality, greatly reducing potential for micro cracks. Also, ultimately increasing concrete's flexural strength, and etc. SCP Optimiser 1000™ enhanced, hydration by-products, i.e., calcium hydroxide quality, also sets the stage for concrete to receive a significantly greater, more efficient, calcium lamination of C-S-H silicate polymer particles, strands, and/or chains, an action also causing reduction in ultimate volume of unutilized calcium hydroxide, left in concrete, which may later interfere with concrete's ability to retain its integrity, due to potential detrimental internal chemical reactions such as delayed ettringite formation etc.

SCP Optimiser 1000™ ingredients prompt prolific formation, extension, and branching of silica polymer particle strands, and/or chains, vital constituents in C-S-H tobermorite gel component, concrete's main strength component. SCP Optimiser 1000™ requires no special safety gear, handling, storage, finishing, or curing.

INSTALLATION SUGGESTIONS

Dry Mix Batching:

As a temporary measure, SCP Optimiser 1000™ can be poured directly into empty rinsed out transit mixer (If transit mixer is not clean, add 90% of potable mix water volume prior to adding SCP Optimiser 1000™ prior to pulling the truck under the batch plant for loading.) Under batching plant, with mixer turning in its mixing mode, load a minimum of 75% of the total planned potable mix water volume then begin loading cement, aggregate (in the usual order and at the usual speeds) and then follow with the remaining balance of mix water. SCP Optimiser 1000™ in this scenario, is used at 652 milliliters per 100 kilos of cement mixed.

Slump may be increased later, if desired, using potable water, followed by 5 minutes of additional mixing by transit mixer.

Central Mixing Operations:

Determine volume needed at 652 milliliters of SCP Optimiser 1000™ per 100 kilos of Portland cement. Pour or pump the calculated volume of SCP Optimiser 1000™ into potable mix water pre-measure tank as you add mix water. Then batch concrete as usual. After concrete is batched, extra mixing time will be needed. For best results, a minimum of 50% more mixing time is required. Slump may be increased later, if desired, using potable water, followed by 5 minutes of additional mixing by transit mixer.

Continuous Mixing Operations:

Determining dosage of SCP Optimiser 1000™ Calculate volume needed at 652 milliliters of SCP Optimiser 1000™ per 100 Kilos of Portland cement. Calculate amount of mix water needed per 100 kilos of Portland cement. This will provide your ratio of SCP Optimiser 1000™ to mix water. (For example, if calculations show that 50 liters of mix water are required per 100 kilos of cement, then the potable water in the tank should be treated at the rate of 652ml of SCP Optimiser 1000™ per 50 liters of water.)

PRECAUTIONS

1. **NEVER ADD Mix Water Enhancer TO FRESH CONCRETE! ADD ONLY TO THE MIXING WATER.**
2. SCP Optimiser 1000™ may etch glass or dull shiny aluminum and can be difficult to remove from other surfaces once it dries.
3. For more information read **Material Safety Data Sheet.**

ADVANTAGES

- Converts regular mix designs to high performance mixes
- Quicker and Easier Concrete Placement
- Adds Workability by Increased Lubricity
- Stronger Bond of Concrete to Steel
- Decrease Cementitious Material Waste
- Greater Density and Less Permeability
- Reduces Bleed Water Volume
- Reduced Shrinkage and Cracking
- Reduced Honeycombing and Laitance
- Reduced Leaching and Efflorescence
- Reduced Slab Curl Potential
- Reduced Internal/External Dusting Potential
- Reduced Rate of Absorption
- Greater Freeze-Thaw Resistance
- Increased Flexural Strength
- Increased Compressive Strength
- Increased Acid / Chemical Resistance
- Lower Internal Chemical Reaction Potential
- Lowers Chloride Induced Corrosion Potential
- Greatly Improves Durability
- Improves Surface Abrasion Resistance

MATERIAL SAFETY DATA SHEET

MSDS can be downloaded from our website (www.spraylockcp.com)

FREQUENTLY ASKED QUESTIONS

(Q) **What is SCP Optimiser 1000™?**

(A) It is an environmentally safe, user friendly, non-toxic, 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. **SCP Optimiser 1000™** is readily soluble in water, using concrete's mix water as its vehicle to get at the mix cement ingredient during mix water introduction. **SCP Optimiser 1000™** 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. **SCP Optimiser 1000™** provides mix water the ability to upgrade conventional concrete mix designs, without risky, complicated, expensive or labor intensive measures.

(Q) **What technique is best to introduce SCP Optimiser 1000™ into mix water?**

(A) **SCP Optimiser 1000™** 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, **SCP Optimiser 1000™** 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 75% 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 plain untreated water.

(Q) **Does use of SCP Optimiser 1000™ require special mixing procedures other than the one above?**

(A) No. However, for best benefits/results, concrete should be mixed for an adequate period of time, prior to placement whether using SCP Optimiser 1000™ or not. Optimal mix time for concrete utilizing SCP Optimiser 1000™ in its mix water should be equivalent to a cumulative total of approximately 70-80 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. **SCP Optimiser 1000™** 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.

(Q) **How does SCP Optimiser 1000™ improve concrete?**

(A) Initially, **SCP Optimiser 1000™** 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 SCP Optimiser 1000™ during mix water introduction, SCP Optimiser 1000™ 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 tricalcium and dicalcium silicate components, producing varying quantities of calcium hydroxide residue. **SCP Optimiser 1000™** 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 silica polymer particles/strands/chains during setting. Subsequently it provides strength to concrete's tobermorite gel, the main strength component of concrete. Another result of SCP Optimiser 1000™ 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 which could erode or even destroy the integrity of the installation. As hydration continues, following saturation by the mix water, SCP Optimiser 1000™ 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 etc. Since concrete's aggregates begin being coated by cement paste immediately following mix water introduction to cement, **SCP Optimiser 1000™** 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.

(Q) Does SCP Optimiser 1000™ contain anything that could harm our environment?

(A) No. **SCP Optimiser 1000™** is environmentally neutral.

(Q) Can SCP Optimiser 1000™ be used in mixes containing silica fume/ microsilica?

(A) Yes. However, where utilizing **SCP Optimiser 1000™** 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. **SCP Optimiser 1000™** 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 **SCP Optimiser 1000™** is achieved through increased utilization of each cement particle. This results in smaller than usual particle cores to act as aggregate. 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. **SCP Optimiser 1000™** ability to

reduce free calcium hydroxide content was previously explained.

(Q) Should SCP Optimiser 1000™ be used in concretes containing fly ash?

(A) 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 power 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 the fly ash silica component readily available for reaction.

(Q) Can SCP Optimiser 1000™ be used in mixes containing air entrainment chemicals?

(A) 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, **SCP Optimiser 1000™** added to mix water, produces concrete that has significantly improved impermeability. Greater impermeability serves to lower, or eliminate penetration of water into concrete.. **SCP Optimiser 1000™** 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 **SCP Optimiser 1000™** takes into account the other reasons to purposely entrain additional air, such as workability and particle separation.

(Q) Can SCP Optimiser 1000™ be used in concretes containing water loss agents, or super plasticizers?

(A) Yes. Water loss agents or water reducers often contain ingredients such as hydroxylated carboxylic acid or lignosulphonic acid, while super-plasticizers may contain sulphonated formaldehyde condensates. Neither of these agents is necessary if utilizing **SCP Optimiser 1000™** as it provides ail of the desired benefits of water loss agents, water reducers, or super-plasticizers 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, **SCP Optimiser 1000™** 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.

SCP Optimiser 1000™ provides concrete the desired particle charge effect usually afforded by water reducers and super- plasticizers. It produces extremely homogenous plastic concrete mixes. **SCP Optimiser 1000™** in the mix water further improves plastic concrete's workability by increasing its lubricity.

(Q) How does SCP Optimiser 1000™ increase concrete's impermeability?

(A) 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.

Hydration

SCP Optimiser 1000™ provides mix water with ingredients to significantly improve the cement'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. **SCP Optimiser 1000™** 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. SCP Optimiser 1000™ 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 SCP Optimiser 1000™ each cement particle core is significantly reduced in size. They become smaller than usual, causing 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.

(Q) What is the recommended dosage volume of SCP Optimiser 1000™?

(A) When mixing at a dry batch facility, 652ml per 100 kilos of cement should be used. If the mix water holding tank method is utilized for various cement content batching, 19ml per liter of mix water is recommended. For continuous mixing such as concrete unit manufacturing, gunite, shotcrete, or flowcrete, **SCP**

Optimiser 1000™ is recommended to be used at the rate of 22ml per liter of mixing water, added or injected into mix water, prior to combining with cement.

(Q) How does SCP Optimiser 1000™ eliminate plastic shrinkage cracking of concrete?

(A) Plastic shrinkage cracks occur due to the rapid, differential drying of concrete at its surface typically caused by low humidity, high winds, high concrete temperatures, or a combination of any of these factors. Because SCP Optimiser 1000™ reduces total capillary action considerably, this phenomenon is effectively countered. A related form of 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 **SCP Optimiser 1000™**. As always, normal safe concreting practices should also be observed, in plastic cracking prevention, such as applying a proper cure at the proper time such as SCP 743 etc.

(Q) How does SCP Optimiser 1000™ eliminate slab curl?

(A) Slab curl occurs around the slab perimeter or at the joints, usually with the corners curling most. This is generally because concrete near the top and edges will dry first, the corners drying fastest and concrete near the top cools while the mass below remains warm. **SCP Optimiser 1000™** 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.

(Q) How does SCP Optimiser 1000™ work to prevent dusting?

(A) Cement concrete surfaces usually only dust excessively if the mix was poured too wet or its surface trowelled 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. SCP Optimiser 1000 produces very low volumes of surface bleed water, virtually eliminating the potential for dusting from excessive bleed water to occur.

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SCP Optimiser 1000



KEY BENEFITS FOR UTILIZING SCP OPTIMISER 1000 IN YOUR PORTLAND CEMENT BASED CONCRETE MIXES

- ☑ **SCP Optimiser 1000™** significantly aids with concrete placement/ finishing, generally saving about 25% finishing time, i.e., concrete pours. It spreads easier since it becomes extraordinarily homogenous and non-segregating, during its mixing process, plus the volume of surface bleed water production becomes reduced and efflorescence potential eliminated.
- ☑ **SCP Optimiser 1000™** is a colloidal, custom-mineralized, pozzolanistic liquid which provides concrete the maximum possible degree of hydration during its curing process, and at the same time, **SCP Optimiser 1000™** is simple and easy to use, as an alternative to microsilica, silica fume, or costly special-blends of cement, i.e., slag cement etc.
- ☑ **SCP Optimiser 1000™** utilized in Portland cement concrete effectively provides extraordinary ultimate durability. Also, concrete becomes self-compacting / self-leveling / more mobile / more cohesive, lower in permeability. It increases surface abrasion resistance, plastic cracking resistance, becoming naturally (not chemically induced) shrinkage compensated, with reduced or eliminated slab-curl potential, improved aesthetic appeal, improved workability, compatibility, pumping ability / lowered pumping pressures, thus effectively lowering rebound volume in spray concrete applications.
- ☑ **SCP Optimiser 1000™** utilization generally lowers concrete's permeability percentages by about 35 to 50%, of mixes not utilizing **SCP Optimiser 1000™** - providing extraordinary freeze-thaw damage resistance such as scaling, while significantly increasing affected concrete's density. Laitance, honeycombs, dusting, and reinforcement steel corrosion potential becomes virtually non-existent.

- ☑ **SCP Optimiser 1000™** utilization provides adequate pozzolan utilization to a mix to consistently and effectively convert conventional Portland cement concrete into high-performance concrete, evidenced by its ultimate performance characteristics, i.e., durability, impermeability and surface abrasion resistance..

SCP Optimiser 1000™ contains natural ingredients that effectively increase the volume of calcium hydroxide ($\text{Ca}(\text{OH})_2$) produced during mixing. Subsequently, **SCP Optimiser 1000™** natural ingredients convert significantly higher than normal amounts of the internally-produced calcium hydroxide into beneficial calcium silicate hydrate (C-S-H), which among many other things, benefits flexural strength, and reduces or eliminates delayed ettringite formation potential.

- ☑ **SCP Optimiser 1000™** does not require special handling, safety equipment, storage procedures, or curing techniques as does other pozzolan products, yet consistently works to ensure, that each and every time, both of concrete's cement pastes (paste-aggregate zone cement paste / bulk cement paste), produced during mixing, is of the highest attainable quality, thus, microcracking (invisible internal cracking significantly affecting permeability) potential is virtually eliminated, and modulus of elasticity, flexural strength, and impermeability become significantly enhanced.

SCP Optimiser 1000



IMPORTANT: ONLY USE POTABLE WATER AS MIX WATER

1. Determine how many kilos of cement per cubic meter of concrete.
2. Determine how much SCP Optimiser 1000™ volume per cubic meter should be used at the rate of **652ml per 100 kilos** of cement, using the amount of cement determined in step one.
3. Prior to batching concrete, pour the predetermined volume of SCP Optimiser 1000™ into rinsed clean transit mixer truck, then pull truck under plant for loading. With mixer turning in its mixing mode, load approximately 75% of the total potable mix water volume to be used **before loading any cement, sand or aggregate**, then load cement, sand and aggregate in any order, plus the remainder of calculated mix water volume.
4. There must be at least **70 - 80 revolutions** on the transit mixer before concrete is placed.

Note: **Use the following procedure to properly predetermine volume of mix water needed since SCP Optimiser 1000™ automatically increases the cementitious material content in the mix, using the already included cement, causing mix water requirements to differ from normal.** Multiply kilos of cement as determined in step one, times 0.06 in order to get the approximate cementitious material increase in equivalent kilos of cement.

Add the increased amount to the original weight of cement, determined in step one, getting a new total weight of cement per cubic meter, **to be used for mix water volume calculation purposes**. Example: Kilos of cement, $350 \times 0.06 = 21$ kg equivalent increase plus 350 kg cement actual = 371 kg total of cement, including cementitious material increase equivalent, generated by utilizing SCP Optimiser 1000™.

To calculate the amount of mix water needed apply your required c/w ratio, in this example .50. Multiply 0.50×371 kg cement, to get the total liters of water needed per cubic meter ($0.50 \times 371 = 185.5$ liters). (One liter of potable water weighs one kilogram) This example should yield a tight slump concrete mix, however, slump can be increased, as desired, using **plain** potable water and a further 3 minutes or 70 - 80 revolutions prior to placement.

Do not use water dosed with SCP Optimiser 1000™ to adjust the slump.

Note: **Aggregate moisture correction, if any, should be made by the batching plant following water volume calculation.**