



Product Application Sheet

CrystalStones™ is a cement based pool finish, engineered to be reproduced with the same superior results of long lasting natural beauty time after time. In order to accomplish this, simple basic procedures must be followed to help eliminate various phenomenon associated with cementitious pool finishes. The CrystalStone™ recipe consists of graded pebble aggregate and Portland cement.

Don't attempt to plaster when the shell temperature is below 40° F (5° C). This usually translates into ambient temperatures above 60° F (16° C) during the day and not below 40° F (5° C) during the night. Portland cement almost stops curing at or below 40° F (5° C) shell temperature and it becomes necessary to add extreme amounts of calcium chloride to speed the set time. Calcium chloride above 1½% by cement weight increases the possibilities of hydration problems (graying), of shrinkage (check cracks) and of poor mechanical bonding (delamination) from the first day and up to a 12-month cure time. Don't plaster on windy days for the same reasons. Too many extra men and extra hours must be spent hard troweling under windy conditions to prevent check cracking.

CrystalStones™ is a cosmetic cementitious pool finish, that when properly installed at a minimum of 1/2 to a maximum 3/4 inches will be 90% watertight and aid in an even cure. For this to be accomplished the correct amount of water to cement (w/c) must be maintained and a consistent mix time of 6 to 8 minutes followed.

Check batch numbers and colors for consistency. If the batch numbers are different box the batches by mixing an even number bags of different batch numbers to each mixed batch to maintain uniformity. This is especially important when mixing pigmented pool finishes.

Do not abuse accelerator (maximum 1½% of cement weight not bag weight). Add the required amount of bagged CrystalStones™ and water to the mixer and mix for 6 to 8 minutes after the last bag is dropped. Because of the large graded pebble the mix time must be approximately 3 to 4 minutes longer than typical white plaster finishes. The large aggregate needs more absorption time with the water to satisfy the aggregate's water demand. Different colored pebble aggregates come from different parts of the world. Each pebble aggregate has its own characteristics. Some aggregates are more porous than others. Short mix times can cause a false set and become hard to trowel and plug hoses if it is being pumped. Allowing for a few extra minutes of mix time will create a creamier mixture that is much easier to trowel helping to eliminate rapid drying which helps prevent crazing and delamination. Surface checking or crazing is inherent to some degree in all cement products. This is a normal occurrence and is not considered a deficiency.

Troweling and finish work is an art. It combines the manual troweling of the material compressing the aggregate and cement as well as the art of sculpturing. The trowel affects approximately 1/2 inch of material at a time. If thicker surfaces are needed layers should be applied followed by troweling. Compressing or troweling the minimum 1/2 inch finish mixture causes a settling of the larger solid pebbles in response to gravity driving the aggregates tighter together raising the fines made up of cement, aggregate talc, water and air to the surface. The surface talc is the weakest part of any cementitious mix because of the high water-to-cement ratio.

Tests have shown that the duration of wet curing required bringing pastes of different water to cement ratios to an equivalent permeability varied from 3 days for low water to cement, to 1 year for high water to cement. (Powers, Copland and Mann 1959) It is during this time that cementitious finishes are susceptible to trauma such as chemical abuse and aggressive water chemistry.

The interior cementitious finish of a pool is the only cosmetic part of a pool that is handcrafted in an uncontrolled environment. For this reason it is *absolutely imperative* that supervision of the shell and shell preparation prior to plastering be carefully monitored and any questionable areas corrected.



The first step in the installation of a CrystalStone™ pool finish is to make a preliminary site inspection to ensure that there is power to the filtration equipment and the shell has been properly prepared.

POOL SHELL PREPARATION

NEW CONSTRUCTION

- Step 1.** High or low areas of the pool shell should be ground down or filled in and blocked at least 2 weeks prior to the application of the finish. This helps the plasterers maintain a more consistent 1/2 inch minimum up to a 3/4 inch maximum thickness. Uneven thicknesses promote uneven curing.
- Step 2.** Weepers, return and suction line penetrations *must* be sealed with a suitable cement at least 2 weeks prior to cleaning and acid washing the pool shell. Possible voids may create leaks and gray streaks.
- Step 3.** De-watering is important to assure a reasonably dry shell. Wet areas in the shell will cure differently and create shaded areas. Example: A wet bowl can cause a halo around the main drain.
- Step 4.** The equipment and electric hook up *must* be in place before the final finish is applied. Proper fire-up immediately following the pool fill helps correct any environmental problems the applicators may experience during the finish application.
- Step 5.** “Where uncontrollable ground water or rainy season is prevalent” a dead line *must* be installed.
- Step 6.** Acid wash, neutralize, and rinse entire pool surface to remove efflorescence, and debris.
- Step 7.** The use of a scratch coat is recommended to promote a good bond and even curing when the shell has porosity problems. This includes renovation as well as new construction.



RENOVATION

- Step 8.** Inspect the existing pool surface for degradation and stains. There is usually a reason why these problems occur. Re-plumb chlorinators with a Hartford loop, tether floaters, remove metallic pool fittings including pipe and replace with plastic. Replace bronze gate valves with plastic ball valves, install bypasses on heaters, and discontinue the use of metallic algaecides. If the pool is stained always lower the pH and add a testable sequestering agent to pre-release any existing metal stains that exist within the plumbing system for at least a week before application. This will help prevent metallic stains from re-staining the new finish.
- Step 9.** The use of a scratch coat is recommended to promote even curing and a good bond over an existing finish. Whether shotcrete, gunite, poured, or hand packed, every pool shell is different because of location, environment, and especially the competency of the technicians on the job. *Assume nothing.* Be there and manage the job. The pool contractor is responsible for the entire construction of the pool, start to finish. We are working with a cementitious product that takes up to a year to cure. Follow manufacturer's recommended start-up procedures. Maintenance and operation is also critical during this 10 - 12 month period.

Renovations need inspection and correction of existing troublesome conditions to prevent the same unsightly circumstances from re-occurring. If you always do what you always did, you will always get what you've always got.



TRADITIONAL CRYSTALSTONE APPLICATION

- Step 1.** Prep the pool surface according to manufacturer's recommendations.
- Step 2.** Drain all water from equipment and pipes and/or plug return lines before application.
- Step 3.** If calcium chloride is needed, pre-dilute and screen calcium chloride (not to exceed 1½% of the cement weight) in 5 gallon buckets of water, one for each batch.
- Step 4.** In most cases a retarder not an accelerator is required to provide adequate troweling time.
- Step 5.** Add a measured amount of water to mixer with calcium chloride liquid. Dispose of residue in an environmentally safe manner. Excessive calcium causes air entrapment, poor bonding, and moisture entrapment leading to hydration problems.
- Step 6.** Add the proper number of bags according to mixer capacity. Make sure to box different batch numbers.
- Step 7.** Mix 6 to 8 minutes.
- Step 8.** Apply an even ½ to ¾ inch thickness.
- Step 9.** Fill in spike holes with aggregate and cement, not just cream.
- Step 10.** Finish trowel for a good bond, and smooth finish as you would a white plaster pool.
- Step 11.** During final trowel remove accumulated excess paste from trowel into a bucket for disposal. This will help reveal divots, spike holes, or trowel marks for immediate repair and promote a better exposure. Expose the same day after at least 4 hours of cure time in a warm environment. An overnight cure is not a problem as long as the material is well troweled*. If there is any doubt purchase misters at a home/garden store and keep the surface damp.
- Step 12.** Troweling spreads smooths and compresses the mixture driving the larger aggregates back and brings the mediums and smaller aggregates forward. At the same time troweling compresses the CrystalStone™ working the cement paste and mix water to the surface reducing the amount of water in the mixture, reducing hydration problems and shrinkage that causes check cracking and/or crazing.
- Step 13.** Hard trowel waterline tile, decorative tile and the seats and steps front and back to eliminate shrinkage.



WATER WAND CRYSTALSTONE APPLICATION

- Step 1.** Prep the pool surface according to manufacturer's recommendations.
- Step 2.** Drain all water from equipment and pipes and/or plug return lines before application.
- Step 3.** In most cases a retarder not an accelerator is required to provide adequate troweling time.
- Step 4.** If calcium chloride is needed, pre-dilute and screen calcium chloride (not to exceed 1½% of the cement weight) in 5 gallon buckets of water, one for each batch.
- Step 5.** Add a measured amount of water to mixer with calcium chloride liquid. Dispose of residue in an environmentally safe manner. Excessive calcium causes air entrapment, poor bonding, and moisture entrapment leading to hydration problems.
- Step 6.** Add the proper number of bags according to mixer capacity. Make sure to box different batch numbers.
- Step 7.** Mix 6 to 8 minutes.
- Step 8.** Apply an even ½ to ¾ inch thickness.
- Step 9.** Fill in spike holes with aggregate and cement, not just cream.
- Step 10.** Finish trowel for a good bond, and smooth finish as you would a white plaster pool.
- Step 11.** When the surface starts to set-up (harden) lightly spray the surface using the wand system. Trowel the excess water and paste to the sump pump. With a sponge paint roller (for popcorn ceilings) roll any excess water off horizontal surfaces continuously.
- Step 12.** During final trowel remove accumulated excess paste with trowel from surface into a bucket for disposal. This will help expose the aggregate and reveal divots, spike holes, or trowel marks for immediate repair.
- Step 13.** Repeat the hard troweling after you have exposed the surface to achieve a tighter finish.



FINAL PHASE (Minimum of 2 personnel)

Step 1. Mix 1 gallon muriatic acid with 3 ounces of liquid dish detergent such as Dawn.

Example: 6 gallons of acid with 18 ounces of liquid dish detergent in a 15 gallon carboy or other plastic container. You now have one consistent mix for approx. 600 square feet of interior surface area, walls and floor. (If the traditional sprinkler can method is used place the acid jugs in a row on the beam, open them, add a measured 3 ounces of liquid dish soap to each gallon, replace the lids shake and proceed with the acid wash process. Always acid wash from the cove up, deep end to shallow end, brush and rinse. Where protective masks and clothing and neutralize the acid and cement with bicarb before disposing.)

Step 2. Before you start to acid wash saturate the new finish with clean fresh water to prevent over penetration of wash down solution. *Keep the finish saturated with water.*

Step 3. Generously sprinkle neutralizing agent (sodium bicarbonate) in approximately an 8 foot diameter around the main drain (the deepest part of the pool).

Step 4. Siphon the acid mixture using an acid resistant garden hose secured to the bottom of the drum, squirt fresh water backwards into the siphon hose to prime. Allow siphoning until acid runs freely. Use a ball valve on the end of the hose for regulation. The acid drum needs to be at least 24 inches above the beam of the pool for good siphon flow. A plastic sprinkler can may be used on smaller pools.

Step 5. Place a submersible pump in main drain or the deepest part of the pool, to immediately remove neutralized acid from pool.

Step 6. Keep the walls and floor saturated with fresh water during the acid washing.

Step 7. Acid wash the walls from the floor up and then the floor from the deepest end to the shallow end.

Step 8. The second man should brush evenly distributing the acid mixture to expose the finish reducing streaking and troughing.

Step 9. Using a stiff bristled broom, spot acid wash any remaining pasty areas.

CAUTION: Failure to remove the excess paste in the above procedure will result in an uneven cure. Please follow the directions carefully to achieve the greatest results possible.

FINAL PHASE (Cont.)

- Step 10.** Thoroughly rinse the pool spray down the finish with the pressure washer and brush to remove remaining residue.
- Step 11.** Fill pool with no interruptions and follow the proven start up procedure. Brush the pool regularly.
- Step 12.** After the 28 day start-up maintain the pool water using the "Saturation Index" and a good testable sequestering agent to help prevent scaling (efflorescence), a normal phase of the hydration process. Do not exceed chemical levels recommended by the manufacturer. *Dilution is the low cost solution!*

Note 1: The acid solution with soap is very important to achieve contact time without over exposing finish. Soap is high in alkalinity and buffers the acid strength.

Note 2: The curing process of dark plaster causes more visible efflorescence, which are calcium hydroxide crystals forming in the capillaries and on the surface of the pool. This phenomenon can be controlled with a proper start-up procedure. A proper start-up consists of chemical balance and brushing. After 28 to 60 days this initial curing process is greatly reduced. The beauty of CrystalStones™ is that it can be re-acid washed if a proper start-up is not followed.

The deepest area of the pool should be protected with sodium bi-carb or soda ash during the acid washing process preventing over exposure. Care should be taken to ensure that the acid solution is completely neutralized and removed in an environmentally acceptable manor.

Note 3: Different aggregate finishes have different water demands. That means: If the aggregate is still absorbing water as it is being pumped or troweled it can get hard prematurely in the hoses or as it is being troweled. This can appear as being too lean in cement. Follow the manufacturers directions. Mix batches adequately before applying which is usually 6 to 8 minutes after the last bag is dropped. The material will stay trowelable longer for better compression eliminating shrinkage and hydration problems.

Pool finishes are similar to kitchen and bathroom fixtures. They are in contact with water daily and will scale and stain if preventative measures are not taken. Frequent water chemistry adjustments and the regular use of a quality sequestering agent at 10 to 15 ppm monthly in conjunction with brushing will help to prevent staining and scaling on pool surfaces.

TOOLS

- 1-Finisher for every 200 square feet
- 1-Water pump with wand assembly
- 1-Sump pump sufficient to remove excess water &/or neutralized acid from pool
- 4-Sponge rollers
- 2-Stiff bristled acid brooms
- 1-15 gallon carboy or larger acid drum (Large plastic garbage can)
- 1-Sprinkler can
- 1-Hand held Acid brush for spot brushing
- 1-10 lb. Bag minimum of neutralizing agent (bicarb of soda)
- 3-ounces per gallon of liquid dish detergent (Dawn)
- 1-gallon acid per 100 - 140 square feet interior area