

SERVICE INDUSTRY NEWS

Reprinted from January 15, 2003 Issue

Copyright ©2003 Service Industry Publications, Inc.

Breakthrough in pool plaster research Application technique, not water chemistry, blamed for spot etching

After years of debate among pool and spa service professionals, plasterers and plaster manufacturers over just who is to blame for the common problem of swimming pool spot etching, it appears there may be definitive good news for the service sector.

An independent industry research group studying the problem for nearly a decade now states that the chemical makeup of the plaster itself, combined with plaster finishing procedures — and *not* “aggressive” water chemistry — is to blame for plaster discoloration and failure.

Industry veterans Que Hales, Kim Skinner and Doug Latta — who operate under the research and consulting firm onBalance — have completed the laboratory analysis of spot etching on 10 swimming pool plaster samples from across the United States with the assistance of a professional concrete analysis firm.

Their research conclusively points to three factors contributing to the cause of spot etching:

- The use and abuse of calcium chloride used as a plaster set accelerator.
- Retempering — which refers to the practice of sprinkling, brushing, sponging or otherwise adding water to the surface of plaster during finishing operations.
- Excessive hard troweling or overworking of the finished plaster.

Based on previous research by members of the Portland Cement Association and the American Concrete Institute, which determined that calcium chloride was a primary cause in surface discoloration and the creation of excess

cement paste porosity, its use in plaster aggregate has been discouraged.

When that it not possible, manufacturers recommend that it never exceed two percent by weight to the cement and should not be used as an additive when it is incompatible with other plaster additives.

The onBalance team found that there is a direct connection between high calcium chloride levels — ranging from almost 2 percent up to over 4 percent in actual pool samples — and the presence of spot etching.

The cement industry recognizes that the most important factor in concrete durability is its water content. Therefore, in any Portland cement application (including swimming pool plaster), limiting the amount of water used in the mix is critical, and water should never be added to the surface during finishing operations. Doing so creates a surface with areas of excessive porosity.

As part of the onBalance conclusions, it was determined that the primary characteristic of spot etched plaster is excess surface porosity, even in samples where subsurface porosity was acceptable.

This is an indication of both excess calcium chloride use and the use of water in finishing. Improperly timed trowel passes — where surface bleed water is trowelled back into the cement paste — can also cause excess surface porosity.

Plaster finishing expertise includes learning how to time trowel passes and how to place and finish the surface material with the correct amount of finish troweling. Inexperienced finishers, or finishers attempting to cope with an

over-accelerated surface, must often over-trowel the surface, resulting in a weakening in or breakage of the surface density.

Any one of these failures can result in inferior or failed plaster surfaces. Most often, retempering and over-troweling are “coping mechanisms” resulting from abuse of the calcium chloride accelerator.

Mild abuse of these practices may often not result in visible defects, but when spot etching appears, there are usually clear indications that all three came into play, the researchers now say.

The onBalance team also addressed the widely promoted but now possibly debunked concept that it is water chemistry — specifically, “aggressive” or acidic water — that causes spot etching.

“We have long made the argument that acidic water does not create the problem, and common sense and logic support that statement,” Hales states. “Consider the fact that thousands of freshly plastered pools have been subjected to heavy acid startup techniques; thousands of swimming pools are initially filled with low-hardness waters; thousands of pools have been acid washed or treated with in-pool acid wash techniques — yet not one of these processes results in spot etching.”

If water conditions are responsible, the researchers say, then every pool subjected to these conditions should spot etch. But it does not occur this way in the field. Also, if spot etching were caused by water chemistry, then a correction of water chemistry should stop

the problem. However, there is no stopping spot etching once it starts.

And there are thousands of pool service professionals and homeowners who have maintained proper pool chemical balance and still suffered the spot etch plague.

“Until now,” Hales states, “this simple logic seems to have evaded the industry.”

OnBalance’s study includes an independent research team, including Niels Thaulow, a world recognized expert on aggressive attack on cementitious surfaces, who has documented that there is *no* evidence of aggressive attack on spot etched plaster.

Thaulow, along with Dr. Boyd Clark of the R.J. Lee Group, have determined that the cause of spot etching is linked to surface porosity caused by troweling and finishing techniques that cause surface variations in the water/cement ratio, as well as elevated levels of calcium chloride.

They have not only examined the onBalance research specimens, but also failed swimming pool plaster from court cases and lawsuits, and their conclusions are consistent.

The surface defects resulting in spot etching can be minimized or avoided by proper mix components and proper finishing techniques.

OnBalance is recommending the elimination of calcium chloride accelerators and the use of alternative accelerating chemicals, and advising plaster crews to minimize hard troweling and retempering during finishing operations.

When plaster is over-accelerated and sets too quickly to be properly troweled, surface problems will result, including variations in surface water to cement ratios, water marks, and possibly some variation of spot etching.

The current research also shows that a combination of errors is usually involved when spot etching actually occurs. OnBalance reports that plastering crews typically employ the same finishing techniques on every pool.

A certain amount of hard troweling is employed to create the smooth, watertight surface that is expected of plaster, and there are very few crews

that do not employ some method of finish retempering. Also, the use of calcium chloride is widespread. However, plaster is very forgiving and can survive a certain amount of hard troweling, water finishing, and calcium chloride use.

The one factor that the research seems to indicate is the predictor for potential problems is the amount of calcium chloride used (or the abuse of calcium chloride).

“The risk potential for spot etching is greatest when calcium chloride is used in conjunction with retempering and hard troweling,” Hales reports. “However, that potential seems to increase dramatically as the two-percent limit for calcium chloride is approached or exceeded.”

He states that this appears to be a combination of the chemistry of calcium chloride in the plaster mix as well as the finishing techniques that have to be employed when the plaster starts setting too quickly to be properly troweled as a result of over-acceleration.

Hales also cites the original presentations included a 1995 published statement from former National Plasterers Council Chairman Robert Tomlinson, who said, “When you’re plastering, you have to be mindful of how fast the material is setting or you can really get yourself into trouble... If you let the plaster set too long and get away from you, sometimes you have to wet it to bring it back to life so you can trowel it. That can create a surface that is susceptible to problems like spot etching.”

OnBalance believes that its research is more definitive than past efforts because it used a research protocol that involved long term investigation and independent laboratory analysis by objective scientists who are experts in their field. The investigation included research of the immense archives of established cement science.

Until now, the only definitive study of spot etching by the pool and spa industry was the Dow Whitney report, conducted in Florida under the auspices of the National Spa & Pool Institute.

Hales states that the Dow Whitney report was poorly produced, contained

material errors in chemistry and cement science, and blatantly plagiarized the work of another researcher, Dr. Dwain Chapman.

Dr. Chapman’s work also contained material errors in chemistry and science, Hales says, and to the further embarrassment of all parties connected to the Whitney report, these mistakes were passed along in the plagiarized material.

Other, more recent studies by plasterers and chemistry associations were labeled self serving by the onBalance team.

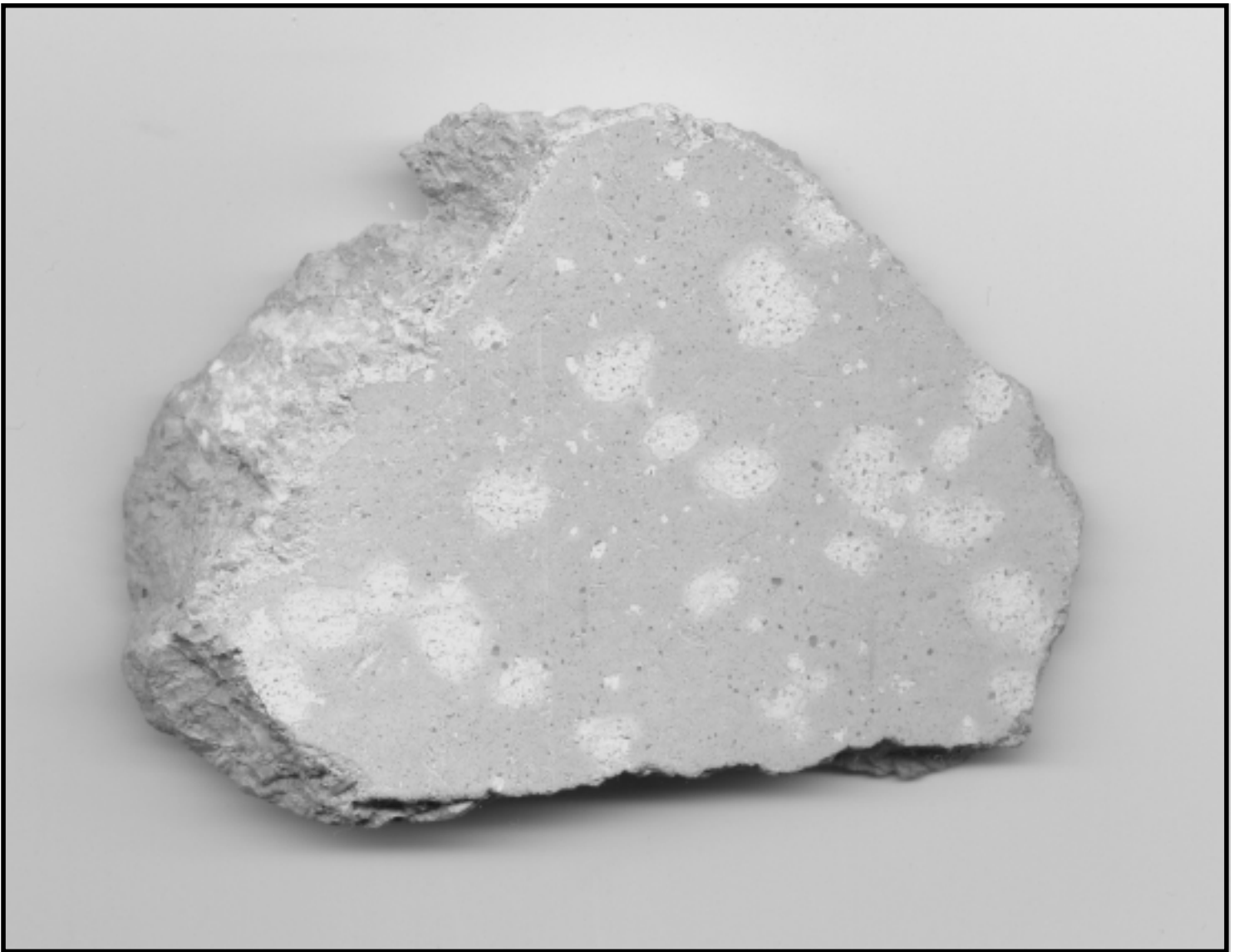
“What distinguishes our research efforts is the fact that our observations are corroborated by both independent analysis and cement science,” Hales says. “We initiated our work in 1993, and almost a decade later, we have amassed enough information upon which we can base our conclusions. We understand that many people don’t want to agree with our position, but it is not our opinion that forms the basis for the strength or validity of our conclusions.”

Hales says that it is the expert opinions and conclusions by renowned cement scientists who have investigated spot etching at length and determined that the phenomenon is not caused by water chemistry or water treatment. On the contrary, the experts have concluded that it is a combination of factors during the application and finishing of swimming pool plaster that predispose some plaster to the problem.

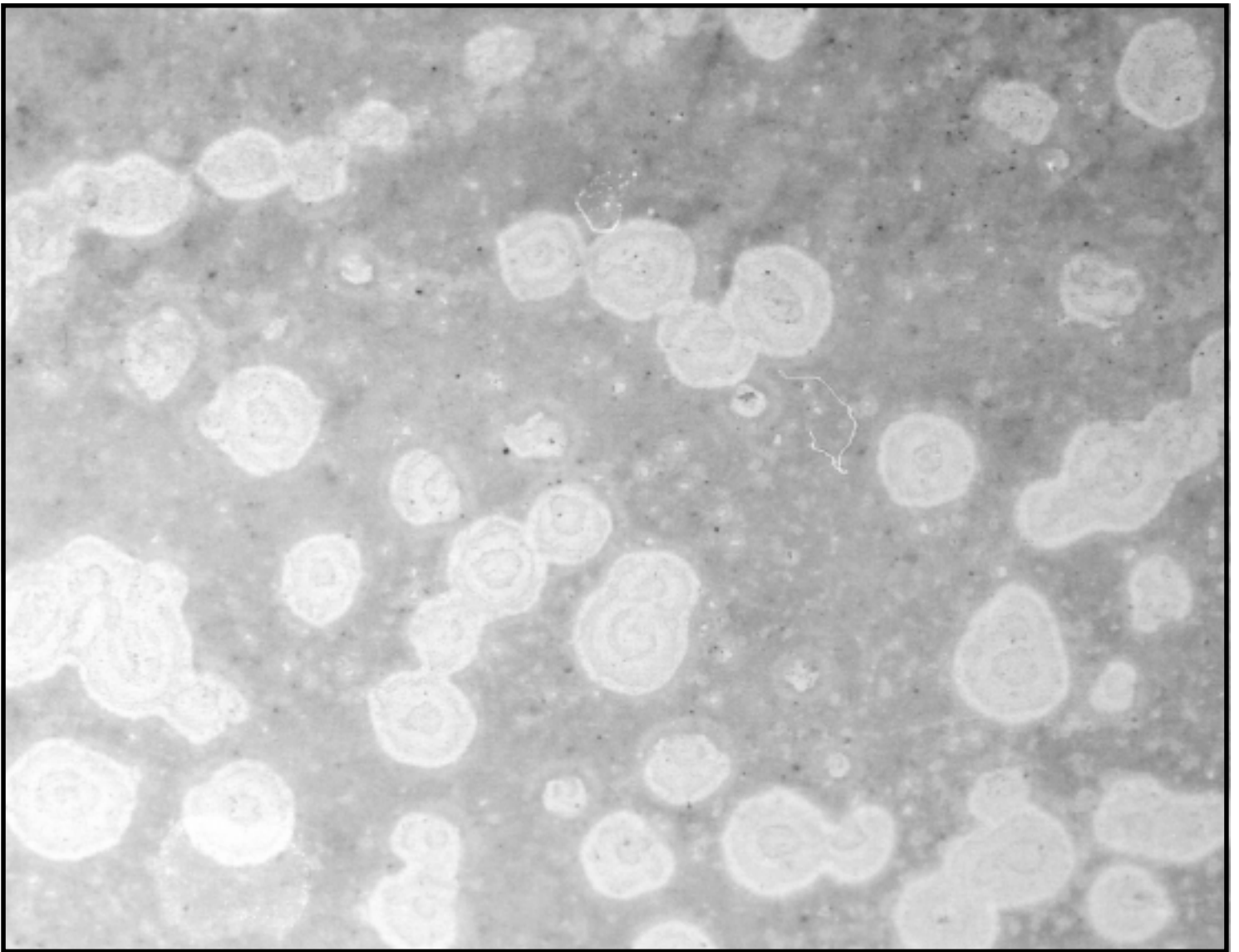
In its research conclusion, onBalance calls on the industry to take a realistic look at the situation and move forward. Ultimately, the industry’s most valuable commodity — the consumer — has suffered enough from the spot etching problem.

“We understand the frustration that all parties involved have endured, from builders and plastering contractors to pool service technicians to pool owners, and hope that the suggestions we have made will benefit all,” Hales says.

The National Plasterers Council is due to release its new plastering guidelines at the end of February. Until now, that organization has taken a “wait and see” attitude toward this research. We will be interested in seeing how the findings reported here affect the NPC recommendations. ■



This plaster sample is spot etched on surface. For years, many blamed condition on “aggressive” water. But breakthrough research indicates that spot etching is caused during plaster preparation and application — not as result of water chemistry.



This photo of swimming pool wall reveals severe case of spot etching. It is hoped that new research will lay to rest “finger pointing” that often accompanies condition and will usher in new era of cooperation between plasterers and service techs.