onBalance

Case History
#oB–00005E

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The (homeowner name) pool on (homeowner address) in Tracy California was built by Aqua Pool and Spa, and plastered by Burkett Pool Plastering. According to the records of Aqua Pools and Spas, the pool was built and plastered in September of 1998, and turned over to a service company, Aqua Chlor, who started the service on 9/2/98. On that first day of service, the service company already documented that the pool surface had “white spots and streaks throughout pool and spa – mottled.”

This pool was involved in legal activity between the owner of Aqua Pools and Spas, and Aqua Chlor. The pool has subsequently been replastered, and the litigation is now completed. To summarize, the litigation involved a suit instigated by Aqua Chlor (plaintiff) on multiple counts, including breach of contract, trademark infringement, and slander issues. The slander issue included the contention that the builder and/or plasterer were blaming the poor appearance of pool surfaces on the quality of service provided by Aqua Chlor. Aqua Chlor’s position was that the statements constituted slander, especially in light of their contention that the damage to the pools was actually a result of construction defects.

Two years into the lawsuit, the owner of Aqua Pools and Spas counter-sued, contending that they were due damages based upon the damage they felt Aqua Chlor caused to a list of specific pools.

Aqua Chlor engaged onBalance as expert witnesses in the actions, and Aqua Pools and Spas engaged Rob Burkett and Greg Garrett as expert witnesses. Rob Burkett also brought in Alan Smith of Alan Smith Plastering (Orange County, California) and Randy Beard (a swimming pool service technician) for onsite inspections, and Bob O’Neill (Micro-Chem Laboratories) for additional laboratory analysis.

During the course of the litigation, this pool was core sampled, and analysis was performed by:

- RJ Lee Group (Niels Thalow) for the plaintiff
- onBalance (Que Hales) for the plaintiff
- Micro-Chem Laboratories (Bob O’Neill) for the defendant

The three analysts prepared reports of the plaster, and Smith and Beard prepared reports based on the onsite visit. These reports are attached.

Also, the builder was required as part of the litigation to provide a list of plaster components. That listing declared that the pool plaster was composed of cement, aggregate, water, calcium chloride, and Davis dye. It was also brought out in deposition that the plastering crew used wet tools or wet finishing techniques, as well as engaging in hard troweling.

The resolution of the lawsuit and counter-suit were as follows:

- The counter-suit was dismissed on summary judgement, meaning that the court dismissed the Aqua Pools and Spas allegations without hearing evidence, determining that the legal action was without merit.
- The original suit was decided by a jury in favor of the plaintiff (Aqua Chlor), and monetary damages were awarded. Additionally, legal fees were paid by the defendant (i.e., the owner of Aqua Pools and Spas and/or his insurance company).

It is important to note that neither the judge nor the jury actually made a ruling as to specifically who was responsible for the condition of the pool plaster surfaces. The verdict rendered was a general verdict on all causes of action. However, the general verdict was for the plaintiff (Aqua Chlor), and against Richard Townsend, owner of Aqua Pools and Spas. No defendant in this case was awarded any monetary judgement, legal fees or costs.

Hundreds of pages of testimony, both in deposition and in open court, were generated by this lawsuit, as well as the generation of the previously mentioned lab analyses. The gist of the evidence presented is that:

- The primary characteristic of the surface problems in this pool can be characterized as excessive porosity and the leaching of calcium (Thalow)
- The surface did not display the characteristic evidence of acid etching (Thalow)
- The pattern of the leaching may have been associated with the finishing process, with local areas of higher water:cement being more susceptible to leaching (Thalow)
- There was a high concentration of chloride… and it is known that this may influence the color of concrete surfaces (Thalow)
- There is a known incompatibility between calcium chloride and Davis color dye, which can result in blotching and discoloration (Davis)
- There is a known correlation between the use of wet finishing tools and surface paling (Davis)
- There is a known correlation between over-troweling and surface discoloration (Davis)
- There is a specific causal chain of events evidenced in this pool, which includes the use of incompatible admixtures, prohibited finishing practices, and an overall disregard for professional workmanship practices which, in this pool, led to the severe discoloration seen on the pool surface (onBalance)
- It is permissible to violate manufacturers recommendations if the contractor believes they do not apply (Garrett & Burkett)
- Plaster is, indeed, composed of portland cement, aggregate, and water, but it is not really a version of concrete, so accepted concrete practices, rules, and guidelines such as those from the Portland Cement Association and the American Concrete Institute do not apply (Garrett & Burkett)
- In spite of the lack of any hard evidence, and in spite of hard evidence to the contrary, this pool was discolored by aggressive water chemistry (Garrett & Burkett)
- Pool is “smooth to the touch” but also “extremely etched” (Smith)
- Pool has “water corroded metals in pool system, skimmer basket handle and light screws indicating contact with corrosive and/or aggressive water.” (Smith)
- Light niche screws corroded and, grout only discolored below water line, surface appears to be “attacked by acidic pool chemicals.” (Beard)
- “The observed leaching of calcium-based cementitious constituents from the plaster system by pool water is the likely cause of the surface problems.” (O’Neill)

It is interesting to note the following about the reports from the defendant’s experts:

– Dr. Campbell, Garrett/Burkett’s expert from a previous study (see oB-00005D) had recommended O’Neill as a consultant for this problem. Dr. Campbell specifically noted porosity problems with the plaster, and recommended that O’Neill perform a chloride analysis and an apparent water:cement ratio determination. Although Mr. O’Neill reports having been provided “several reports, photographs, and documents” with his sample (presumably including Dr. Campbell’s report and recommendation?), he failed to analyze the plaster for water:cement ratio or to make any statements at all relative to the excess porosity that other researchers tied directly to the discoloration problem. Excess porosity, which other researchers (onBalance, RJ Lee, and CTL) have associated with abuse of chloride admixtures and wet-troweling techniques, was ignored by Mr. O'Neill.

As far as chloride analysis, O'Neill performed that task and reached the same conclusion as the other two labs that looked at this specific pool (onBalance and RJ Lee Group) – that the sample contained approximately 2% calcium chloride. In addition, he performed the chloride test independently on the surface and on the interior surfaces, and found that the chloride content was higher in the interior, showing that the contained chloride was, indeed, from the plastering process rather than from penetration. If he was given copies of the onBalance reports, which were available at the time, he should also have also addressed the admixture incompatibility issue, which he unfortunately fails to do.

After failing to address the porosity issue as recommended by Dr. Campbell, and after failing to address the admixture incompatibility issue, O'Neill concluded that leaching was the causative issue. Note that *leaching* is a non-aggressive removal of material, as opposed to *etching*, which denotes an aggressive dissolution.

Appended to Mr. O'Neill's report is an analysis which onBalance commissioned from Dr. Clark and Neils Thalow of R.J. Lee. In their report, Dr. Clark and Mr. Thalow find Mr. O'Neill's material lacking in many areas, and discount his findings.

– The "discolored grout" mentioned by Beard and Smith is actually discolored plaster which was pulled up over the grout by the plastering crew, and not cleaned off (see attached photograph oB-00005Eb).
– onBalance did not observe the metal deterioration claimed by Beard and Smith. The glaring problem with their written observations is that, although they were provided with a list of plaster components by the plastering contractor (Burkett), they did not address the obvious admixture incompatibility, nor did they address why the plaster was already discolored a day after plastering, before the service company ever added chemicals to the pool. Smith also does not explain how plaster could simultaneously be "smooth to the touch" and also "extremely etched," when the two conditions are usually considered mutually exclusive.

Attachment A	Written report by onBalance
Attachment B	Written report by Thalow (RJ Lee Group)
Attachment C	Written report with attachment by O'Neal (Micro-Chem Laboratories)
Attachment D	Written observations by Smith (Alan Smith Plastering)
Attachment E	Written observations by Beard
Attachment F	Scanned image of the Davis Color Chart (note injunctions against wet finishing and overworking, and the statement that the use of calcium chloride is the only known incompatibility, which causes blotching and discoloration)
Attachment G	Photograph of a Davis Powder Color tint package (note injunctions against wet finishing, overworking, and use of calcium chloride)
Attachment H	Photograph of a Davis Liquid Color tint package (note injunctions against wet finishing, overworking, and use of calcium chloride)

onBalance

Swimming Pool Chemistry and Plaster Consulting

Mr. Jerry Wallace
General Manager, Aqua Chlor

Re: onBalance Project oB-00005E

Mr. Wallace:

You engaged onBalance to diagnose the cause(s) for discolorations on the surface of the swimming pool plaster located at [homeowner's address] in Tracy California, at the residence of [homeowner's name]. The onBalance partners visited the pool, and obtained photographs and core samples of the pool for analysis. The following is a summary of the observations and results of the analysis.

Methods

Visual/Tactile

The pool was inspected when drained.

The grey plaster pool exhibits an extreme discoloration pattern, and the pattern coincides with fan patterns of discoloration, smeared plaster up onto the grout, driplines, etc. At these inspections, it was noted that the plaster surface was predominantly very smooth to the touch and to visual analysis.

Optical Photography

Photographs were taken of the pool. The photographs document the discolorations, driplines, tile grout, etc. (see attached photo and microphotographs with description and commentary).

Document Review

onBalance performed a review of start-up and weekly chemical maintenance records maintained for this pool. The chemical ranges were maintained within accepted industry standards, and the documentation does not show any incidences of aggressive water conditions.

Core Analysis

Photography – Samples of the plaster were obtained, and the samples were photographed both in situ and in the lab.

Photomicrography – The surface of a sample was photographed at 40X magnification, with care taken to document the level of surface cement paste erosion as evidenced by the exposure of aggregate (sand) at surface. The surface was found to be smooth, and did not display characteristics of aggressive chemical attack.

Chloride analysis – A sample of the plaster was analyzed for chloride content using ASTM Standard Method C1152 (Standard Test Method for Acid-Soluble Chloride in Mortar and Concrete) and a Hach Quantab titrator variation of ASTM Standard Method C114.19 (Standard Test Methods for Chemical Analysis of Hydraulic Cement – Chloride). The chloride content was found to be 460 ppm, which calculates to

2.6% calcium chloride dihydrate by weight to the cement in standard swimming pool plaster.

Laboratory Analysis

Review of RJ Lee Analysis by Dr. Boyd Clark – We have reviewed the analysis of the pool's plaster by Dr. Clark, which you provided to us (RJ Lee Project #MAH912505). Dr. Clark's report is observational in nature, rather than specifying causation, and states that he is not determining the mechanisms for the artifacts he observes. He finds that the outstanding characteristic of the phenomenon is excess porosity. He also notes the reconstruction of components (calcium and silica phases) into separate microstructures, rather that the combined microstructure that one would normally expect. He notes a degree of carbonation and ionic movement which is facilitated by the fact that the material (plaster) was submerged in fluid (pool water), which makes these things happen at a faster speed than if the cementitious material had been kept relatively dry (such as driveways, sidewalks, and other cement-based cores he is hired to analyze). He notes that the pH of hydration was lower than that of saturated $Ca(OH)_2$. This means that the ponding fluid (pool water) was at a pH lower than 13. In the supplemental report, Dr. Clark reinforces his conclusion that the primary problem is one of porosity. He rules out abnormal calcium depletion.

Commission of Analysis by Niels Thalow of RJ Lee – onBalance cored the pool and sent the two cores (along with two samples from another pool we analyzed for you) to Mr. Niels Thalow of RJ Lee Group for analysis. The two cores from this pool are identified in the report (RJ Lee Group Project #MAH112353) as ES1 and ES2. Mr. Thalow is an internationally recognized expert in the diagnosis of the various types of aggressive attacks on cement-based surfaces. His finding was that there was no evidence of aggressive attack, and hypothesized that the patterning (fan-shaped sweeps) may be due to the finishing process, which included a technique which left areas or spots of high surface water:cement ratios. He also notes the addition of high concentrations of calcium chloride – an admixture known to cause porosity and color-mottling.

Observations

The presence of calcium chloride is associated with discoloration in cementitious products. Industry-accepted documentation from the Portland Cement Association, the American Concrete Institute, and other authorities indicate that even low levels of calcium chloride (<2%) will cause discoloration. The accepted standard is to not exceed 2% dihydrate to the weight of the cement. However, there is also a provision in the standard that all admixtures must be compatible. Calcium chloride and color plaster admixtures are not compatible. Davis Color was reportedly used in this pool. Attached is a copy of Davis' color chart, stating that there is a known incompatibility with calcium chloride. Also attached are copies of the Davis color powder and liquid packaging which includes the statement of incompatibility. Tests of the this pool plaster show levels of calcium chloride which exceed the industry-accepted maximum even for white plaster. Since there should be no chloride at all in this plaster, exceeding 2% is a particularly serious failure on the part of the plastering contractor.

The microphotographs of the this plaster were compared by onBalance with photographs of other plaster standards (at the same magnification) which had been subjected to known degrees of aggressive chemical attack. There was no indication of an aggressive attack on this surface.

There are indications that the plaster surface was finished with wet tools, or that water was applied to the surface during finishing. This is a poor finishing practice which is prohibited by ACI and PCA. Davis Color also indicates on the attached color chart and on the packaging that water should not be used in finishing. The striped walls of the pool, along with chatter marks, is an indication that water was applied to the finished surface and that the finished surface was then hard troweled after the time such troweling could be safely accomplished.

This plaster coating is thin, as seen in the photographs, which also may have played a role in the discoloration problems.

Conclusion

The pool has not undergone an aggressive chemical attack. None of the accepted hallmarks of aggressive attack (such as surface cement paste dissolution and etching of the surface-exposed aggregate) are evident. This is consistent with the chemical history documentation provided onBalance and with the analysis undertaken by onBalance.

Many factors are usually associated with spot discolorations, including excess calcium chloride, wet finishing, and overworking the surface. All of these factors appear to have been contributory to the problems seen in this pool.

Sincerely,
Partner – onBalance Consulting

oB-00005Ea – Patterns on wall

oB-00005Eb – Tile grout with plaster pulled up from pool, calcium buildup above and below water line. Blotchy pattern on plaster.

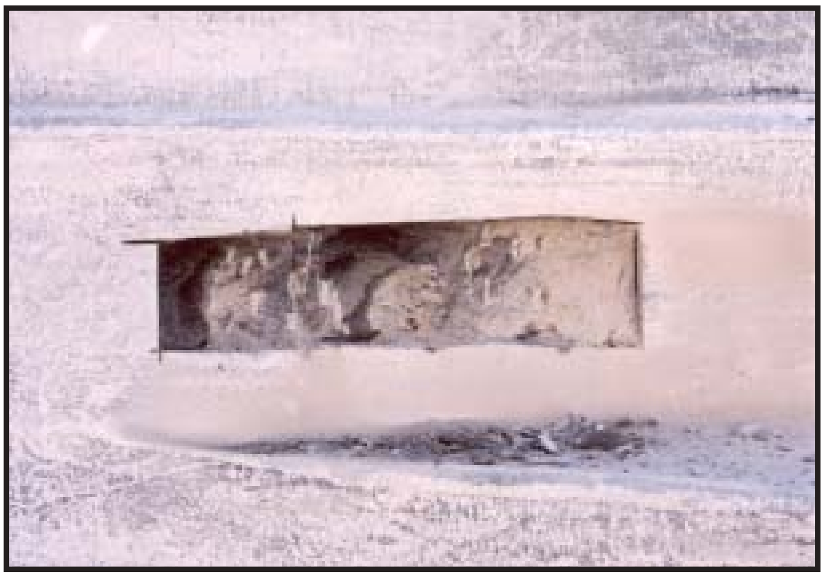
oB-00005Ec – Footstep patterns and blotchy discolorations on floor

oB-00005Ed – Fan patterns on wall

oB-00005Ee – Crazing on step face

oB-00005Ef – Trowel-pattern streaking on surface highlighted by discoloration

oB-00005Eg – Plaster samples *in situ*



oB-00005Eh – Plaster samples removed

oB-00005Ei – Plaster samples removed

RJ Lee*Group*, Inc.

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Monroeville, PA 15146
Tel: (724) 325-1776
Fax: (724) 733-1799

The Materials Characterization Specialists

February 18, 2002

Mr. Que Hales
Pool Chlor
3116E Pennsylvania Street
Tucson, AZ 85714

RE: Petrographic Examination of Concrete
Project No. MAH112353

Dear Mr. Hales:

Enclosed is a summary of the results from the examination of two concrete samples by scanning electron microscopy (SEM) and acid soluble chloride analysis. Four concrete samples were received at RJ Lee Group's laboratory on December 12, 2001. The samples were identified as follows:

RJ Lee Group Sample No.	Client Sample ID.	Type of Test Performed
0815911	ES1	Not analyzed
0815912	ES2	SEM and acid soluble chloride analysis
0815913	M1	Not analyzed
0815914	M2	SEM and acid soluble chloride analysis

The concrete samples submitted for petrographic analysis were first examined visually. Samples ES1 (0815911) and ES2 (0815912) were chunks of mortar having two layers. The bottom mortar layers were gray in color, top layers were dark-gray in color and approximately ¼" in thick. White areas were observed on the top, almost completely covering the surface. Samples M1 (0815913) and M2 (0815914) were cores of approximately 2¾" diameter. Similarly, these cores consisted of two layers. The top layer was approximately ½" thick. White spots were observed on the top surface. The samples were photographed in its as-received condition. The depth of carbonation was measured after slicing and application of phenolphthalein. A section obtained from the top of the core was analyzed by SEM. Small amounts of powdered samples from the top layers were used for acid soluble chloride analysis according to ASTM C1152/1152M-92. The analysis results are summarized in a table.

SEM Sample Preparation

Vertical cross sections of sample ES2 and M2 were cut from the samples after sections cut for carbonation test. The sections were polished using 163 through 30 μm grit abrasives. The sections were dried, and vacuum impregnated using a low viscosity epoxy resin that contained a fluorescent dye. The excess epoxy was removed using metallographic abrasive papers. Care was taken not to grind into the sample. The impregnated samples were then polished using consecutively finer silicon carbide grit slurries (600 to 1000 grit) on a glass plate. Polishing was performed starting with the use of 9 μm diamond paste and final polishing to 1/4 μm diamond paste on cloth. The polished surface was then coated with a thin layer of carbon by evaporative deposition.

SEM Analysis

The prepared section was analyzed using an SEM operated in the backscattered electron (BSE) imaging mode, coupled with energy dispersive spectroscopy (EDS). The top layers of the samples were analyzed comparing white verses dark areas. BSE images of representative features are attached in the Appendix B.

Sample No. 0815912 (ES2)

- Depth of carbonation at the top of the sample was about 1 mm.
- Crushed dolomite was used as fine aggregate.
- Decalcification of C-S-H was observed below the carbonation layer.
- Depletion of calcium hydroxide was observed in this zone.
- AFt deposits were observed below the decalcification zone.
- Increased porosity was observed in the decalcified zone.
- The carbonation zone at the top surface was not uniform.
- Below the decalcified zone cracking of the paste was observed, which extended 2-3 mm.
- The paste was not altered below this zone.
- Calcium hydroxide was present in this zone.
- The composition of the C-S-H was normal.
- Patches of Cl-rich AFm and C-S-H were observed.
- Estimated water to cementitious ratio was 0.45 in the unaltered zone.

Sample No. 0815914 (M2)

White area

- Depth of carbonation at the top of the sample was about 1 mm.
- Crushed dolomite was used as fine aggregate.
- Decalcification of C-S-H was observed below the carbonation layer.
- Magnesium silicate formation was observed.
- Depletion of calcium hydroxide was observed in this zone.
- AFt deposits were observed below the decalcification zone.
- Increased porosity was observed in the decalcified zone.
- The carbonation zone at the top surface was not uniform.
- Below the decalcified zone cracking of the paste was observed, which extended 3-4 mm.
- The paste was not altered below this zone.
- Calcium hydroxide was present in this zone.
- The composition of the C-S-H was normal.
- Patches of Cl-rich AFm and C-S-H were observed.

Dark area

- Depth of carbonation at the top of the sample was about 1 mm.
- Minor decalcification of <1 mm thickness was observed below the carbonation zone.
- Magnesium silicate formation was observed.
- The paste was unaltered below this zone.

- Cracking of the paste was not visible.
- Patches of Cl-rich AFm and C-S-H were observed.
- Estimated water to cementitious ratio was 0.45 in the unaltered zone.

Summary

Petrographic analysis of the concrete samples shows white area on the surface. The paste of the white areas shows carbonation and decalcification of the C-S-H. Increased porosity was observed in these areas. Below this decalcified zone, deposits of ettringite and cracking were observed. This altered zone extends up to maximum 5 mm. Angular, fine aggregates were exposed at the surface due to loss of material from the surface. The exposed dolomite aggregate did not show evidence of acid etching. The white areas seem to form due to local leaching of cement paste creating porous, decalcified areas. The pattern of the leached areas may have been determined by the finishing process, with local areas of higher w/c being more susceptible to leaching of calcium ions.

Bulk analysis of mortar indicates high concentration of chloride present in the samples. The chloride-containing compounds were distributed all over the cement paste, except the decalcified zone. This indicates that chloride was added to the mortar mix. It is known that addition of calcium chloride accelerators may influence the color of the concrete surface.

The results are submitted pursuant to RJ Lee group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which the results are used or interpreted. The samples for this project will be stored for a period of 60 days.

If you have any questions or if you want us to do any further investigations, please call me at 724-325-1776.

Sincerely,

Niels Thaulow
Director of Construction Materials

Attachments

Top & Bottom Views of As Received Sample

MAH112353 – Sample No. 0815911- ES1

Side View of As Received Sample

MAH112353 – Sample No. 0815911- ES1

MAH112353

Sample No. 0815911

Figure 1: DSCN0203.JPG

Figure 2: DSCN0204.JPG

1

MAH112353

Sample No. 0815911

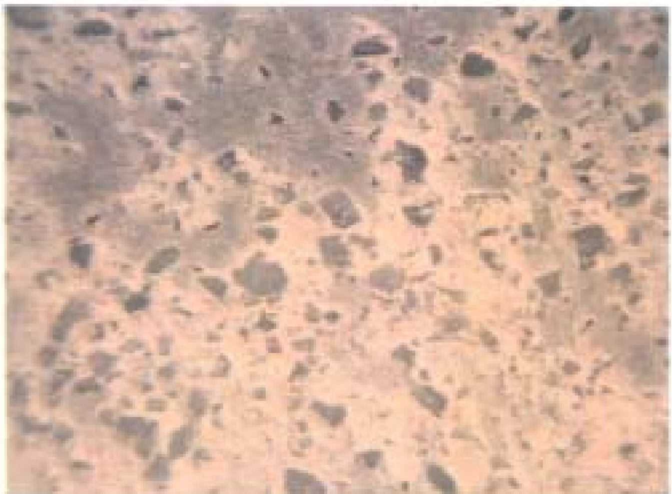


Figure 3: DSCN0205.JPG

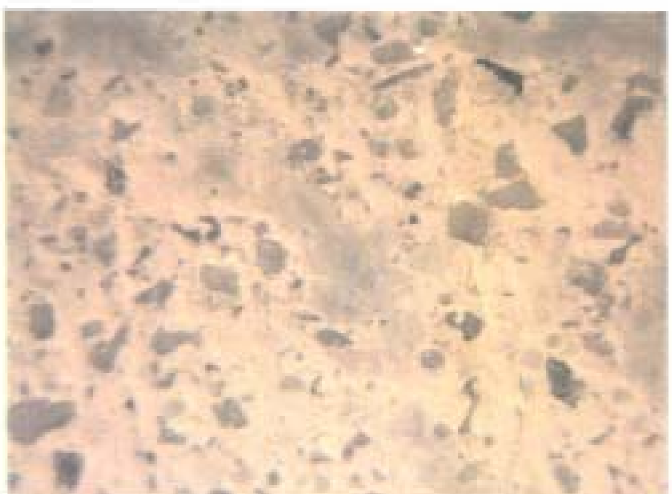
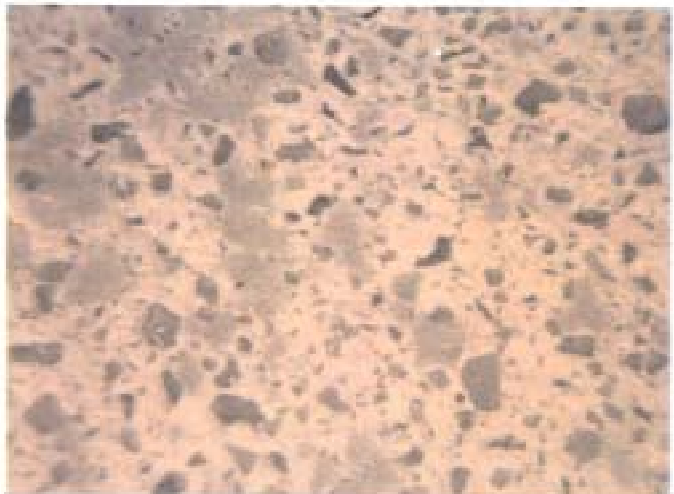


Figure 4: DSCN0206.JPG

2

MAH112353

Sample No. 0815911



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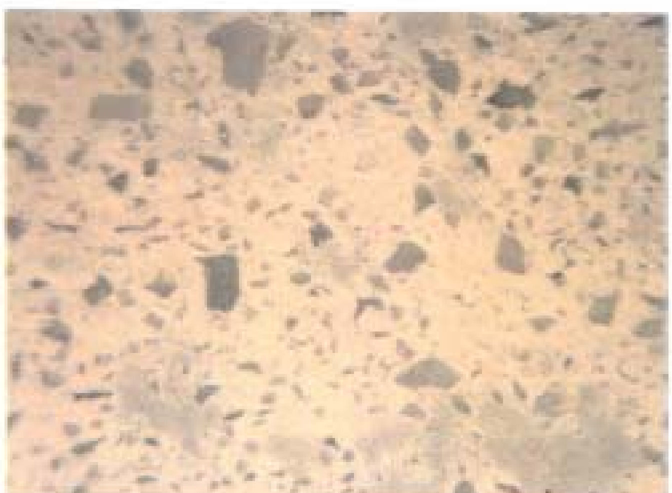


Figure 6: DSCN0208.JPG

3

MAH112353

Sample No. 0815911

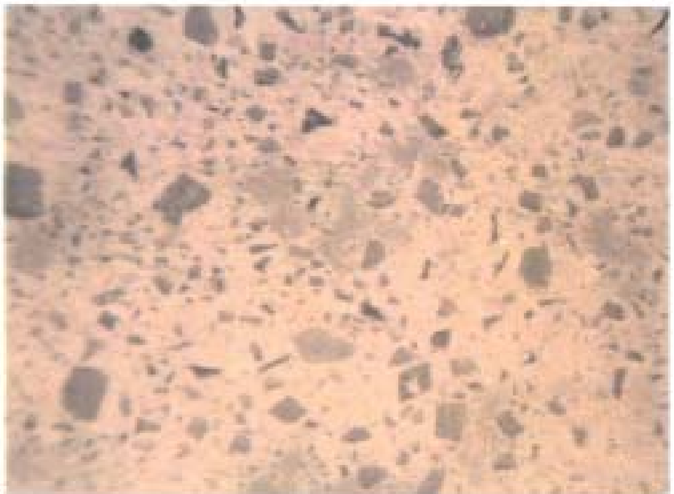


Figure 7: DSCN0209.JPG

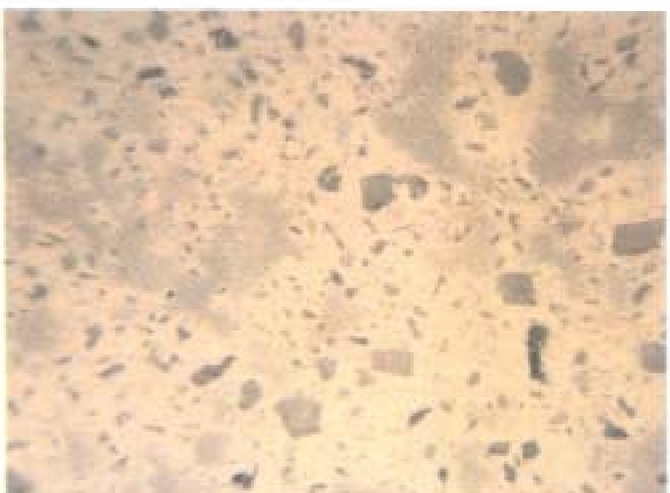


Figure 8: DSCN0210.JPG

4

Top & Bottom Views of As Received Sample

MAH112353 – Sample No. 0815912- ES2

Side View of As Received Core

MAH112353 – Sample No. 0815912- ES2

MAH112353

Sample No. 0815912 – ES2

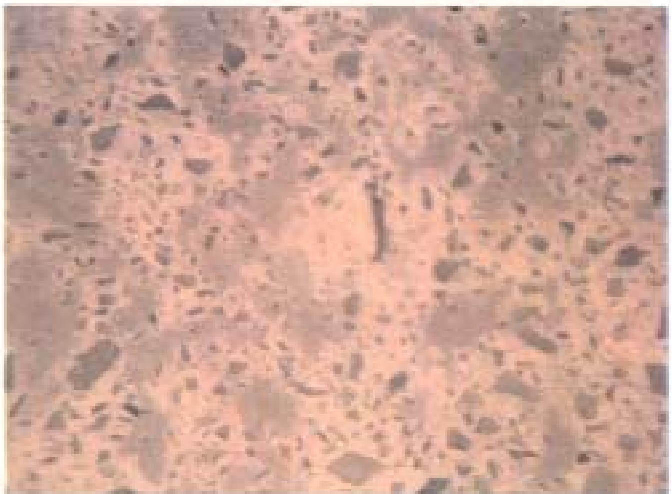


Figure 1: DSCN0193.JPG

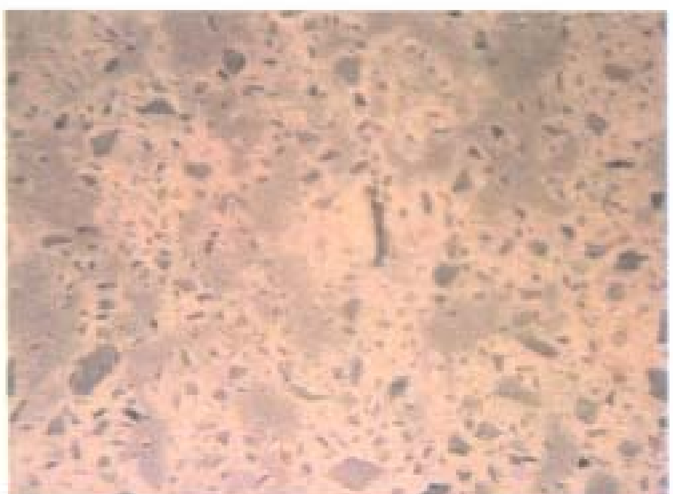


Figure 2: DSCN0194.JPG

1

MAH112353

Sample No. 0815912 – ES2

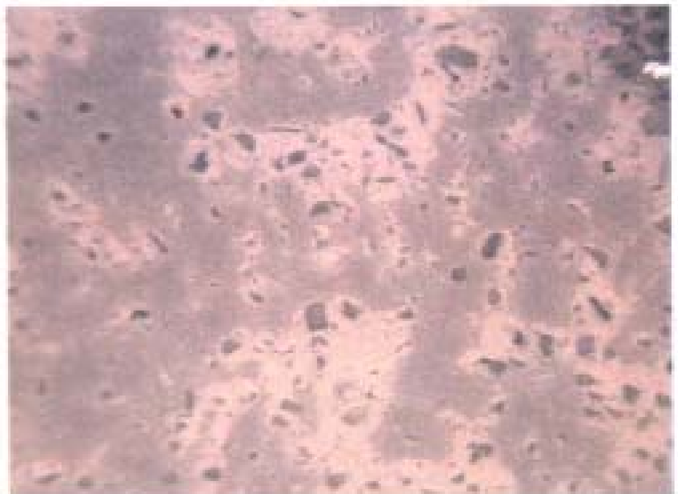


Figure 3: DSCN0195.JPG

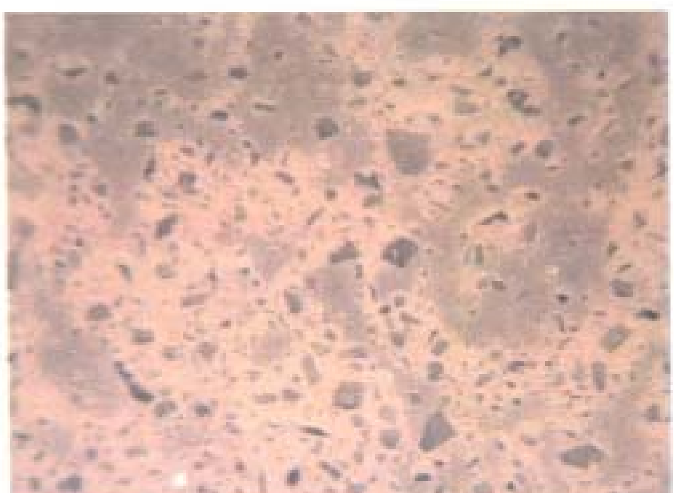


Figure 4: DSCN0196.JPG

2

MAH112353

Sample No. 0815912 – ES2

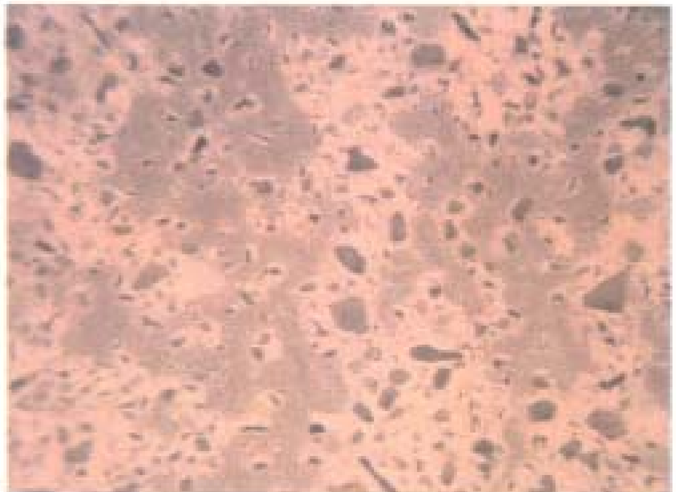


Figure 5: DSCN0197.JPG

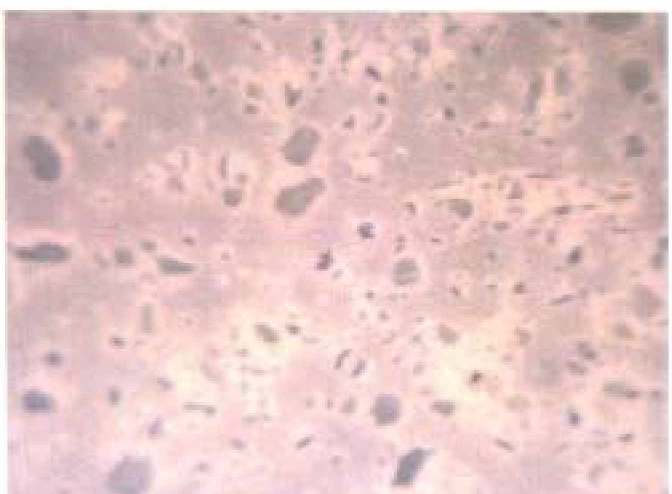


Figure 6: DSCN0198.JPG

3

MAH112353

Sample No. 0815912 – ES2

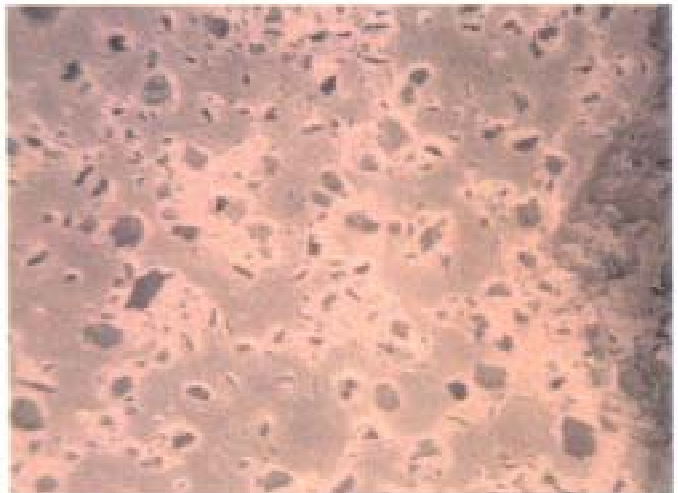


Figure 7: DSCN0199.JPG

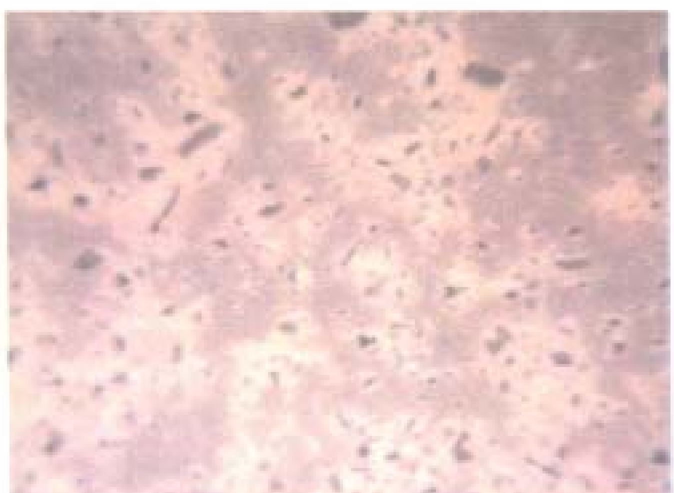


Figure 8: DSCN0200.JPG

4

MAH112353

Sample No. 0815912 – ES2

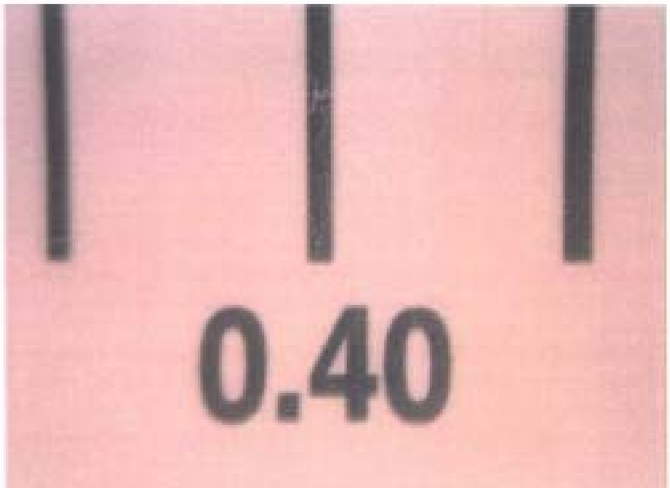
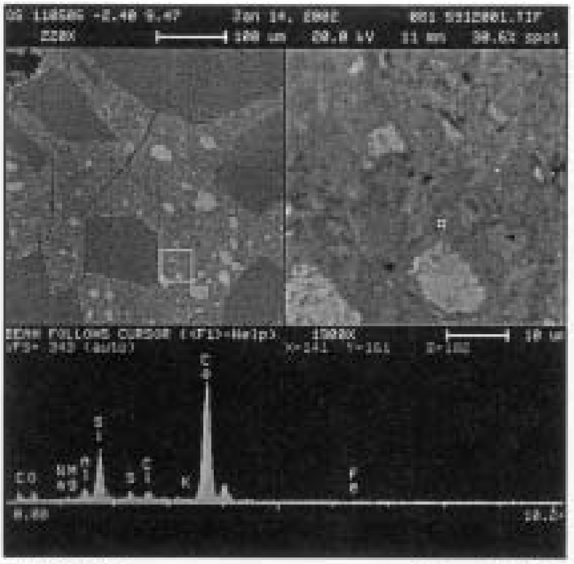


Figure 9: DSCN0201.JPG

Figure 10: DSCN0202.JPG

5

MAH112353 - Sample No. 0815912 - ES2



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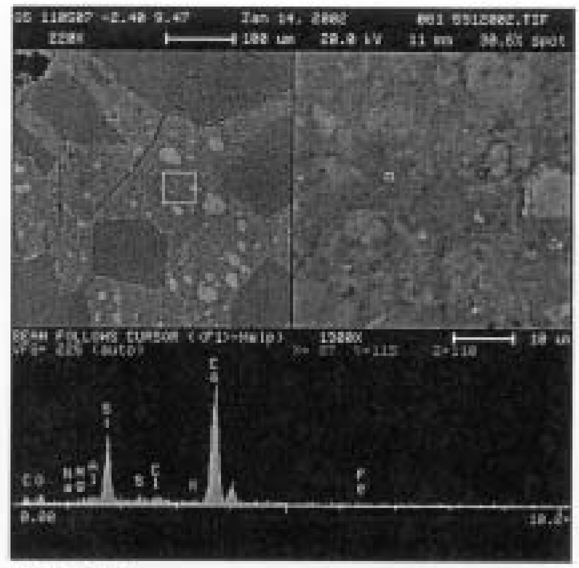
Composition of C-S-H



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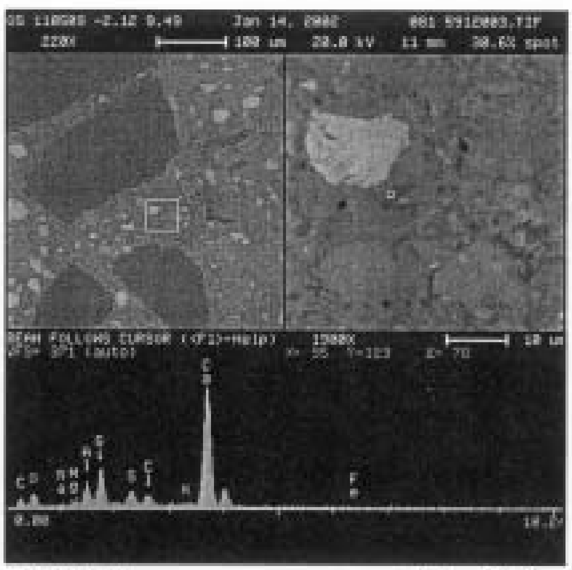
Composition of C-S-H



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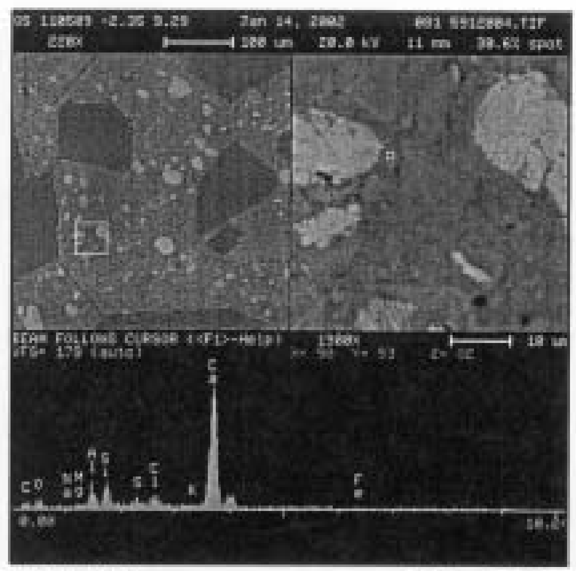
Cl-rich AFt/AFm

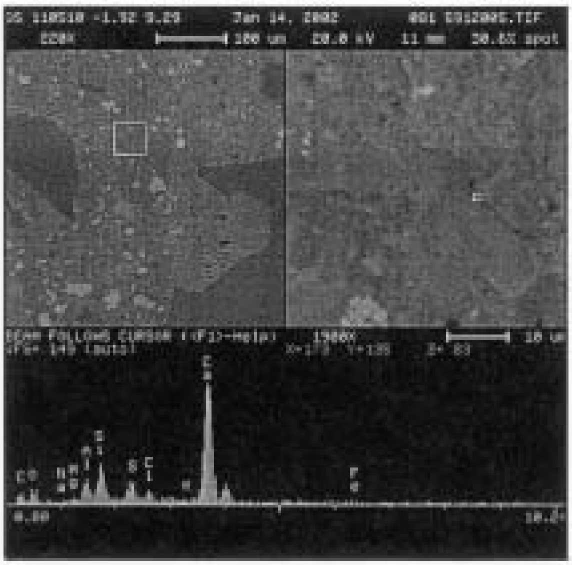


5912004.TIF Y (mm) 9.292

Cl-rich AFt/AFm

RP04IA.lyo Page 1 of 9 (c) 1997-00 RJ Lee Group, Inc.

MAH112353 - Sample No. 0815912 - ES2



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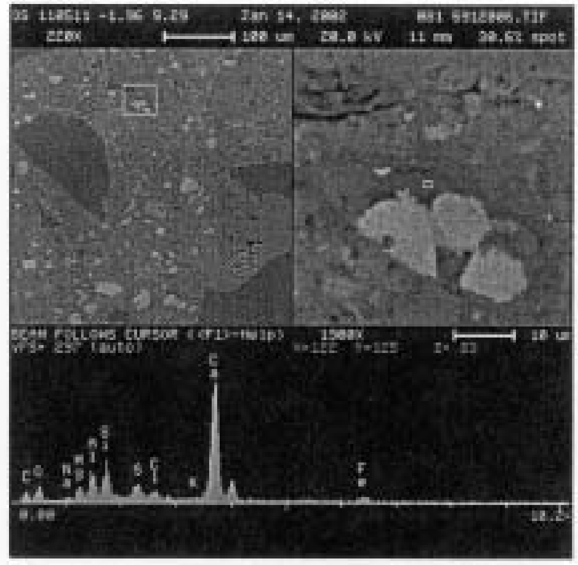

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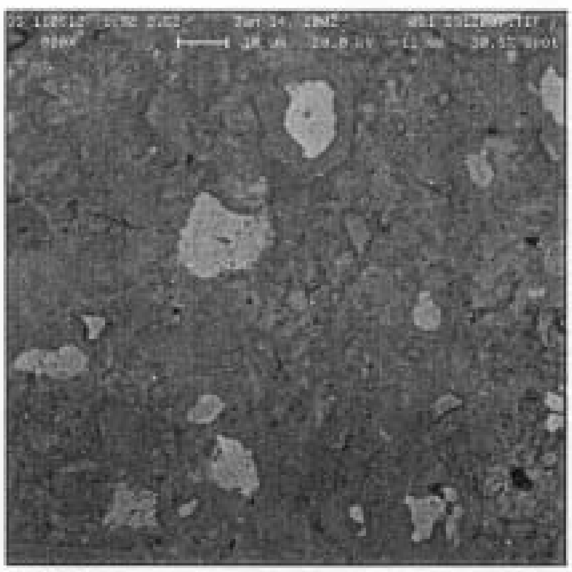

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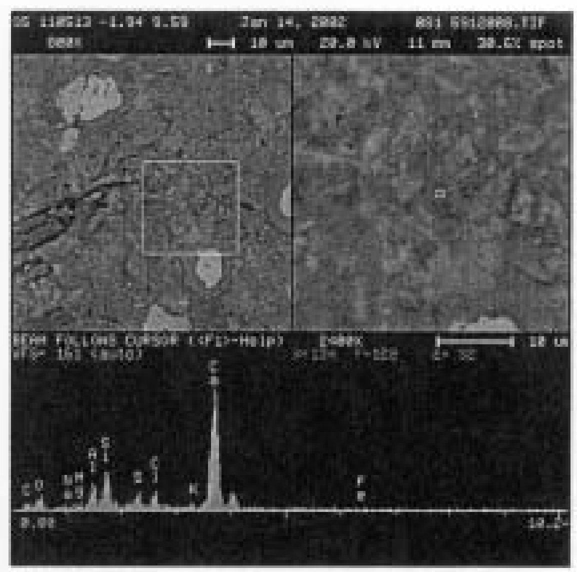
Dense paste



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Cl-rich AFt/AFm

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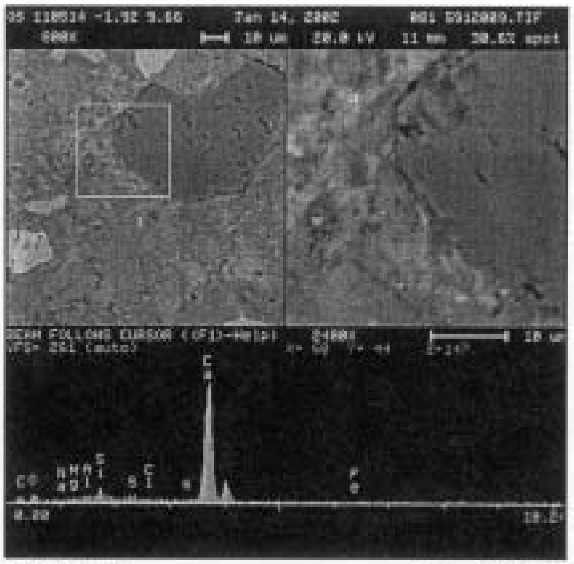
MAH112353 - Sample No. 0815912 - ES2



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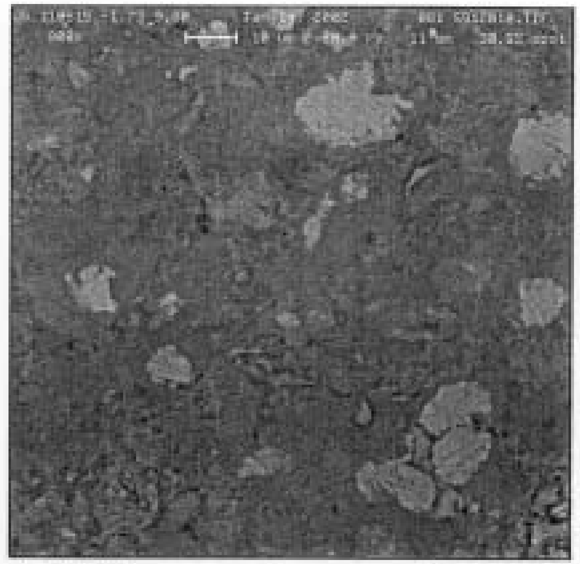
Ca(OH)2



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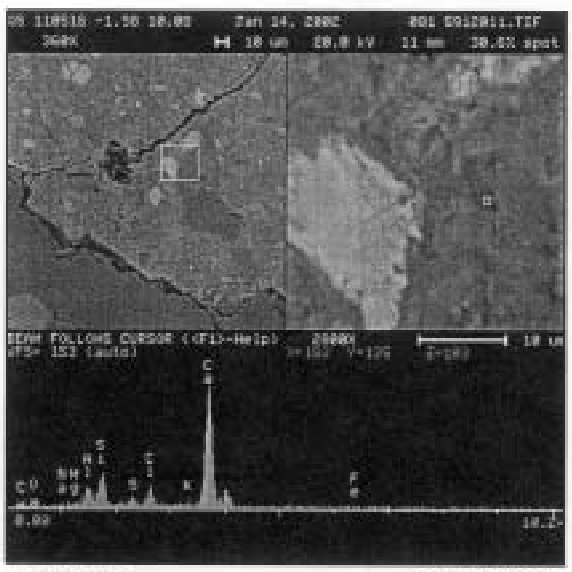
Dense paste



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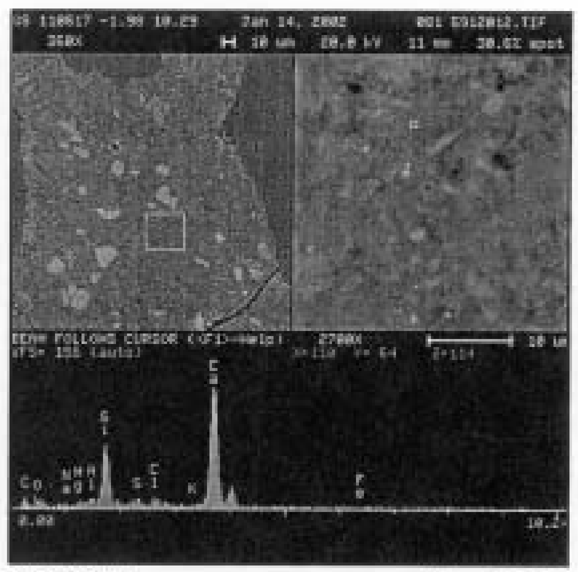
Cl-rich AFt/AFm



5912012.TIF Y (mm) 10.293

Composition of C-S-H

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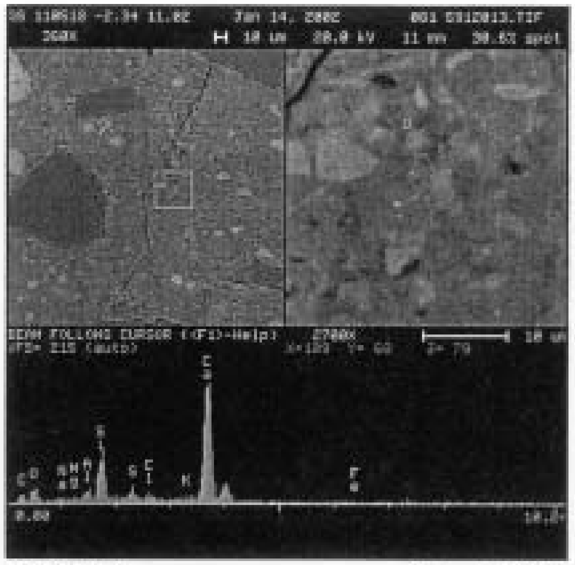
MAH112353 - Sample No. 0815912 - ES2



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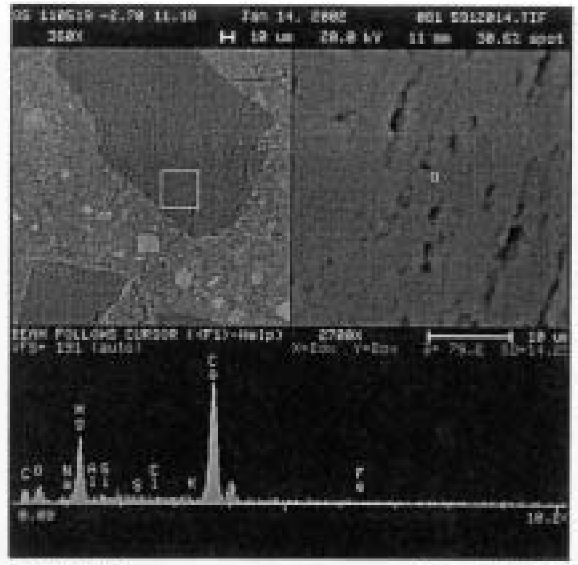
Composition of C-S-H



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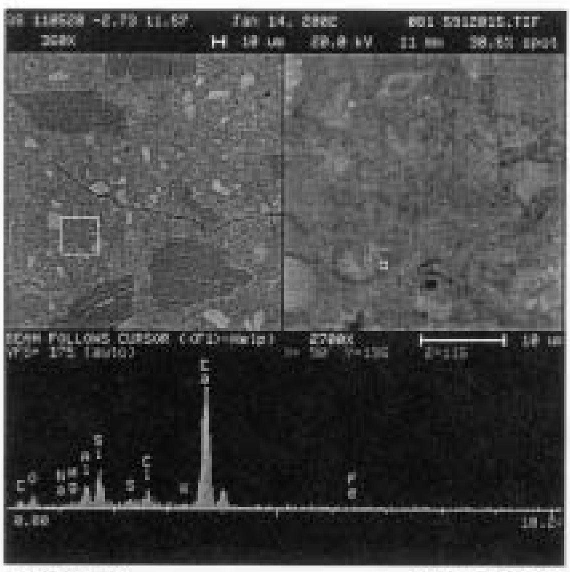
Dolomite



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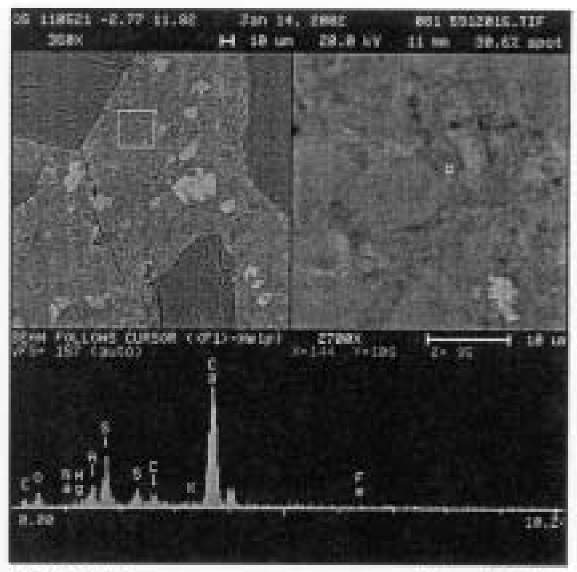
Cl-rich AFt/AFm



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Cl-rich AFt/AFm

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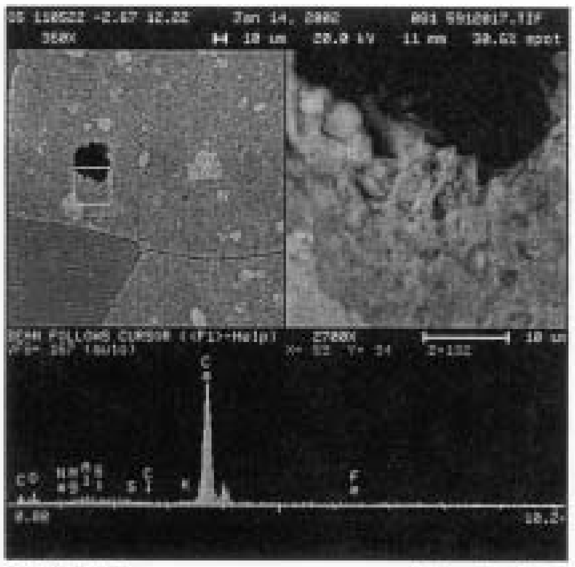

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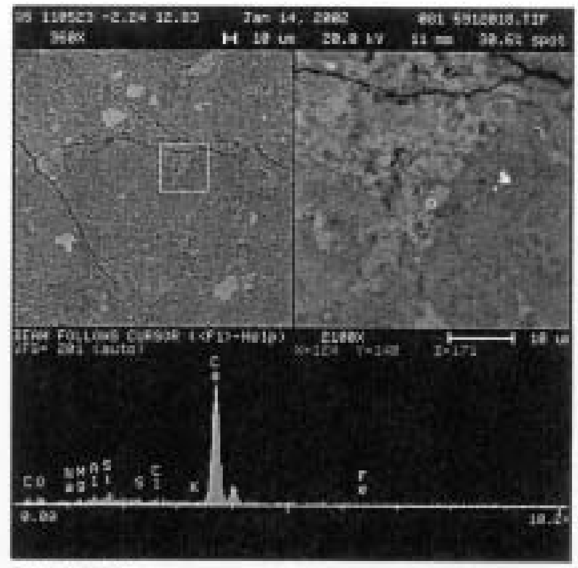
Ca(OH)2



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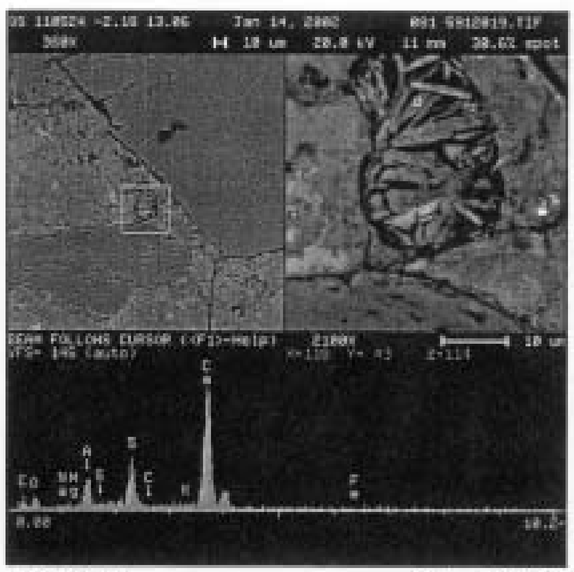
Ca(OH)2



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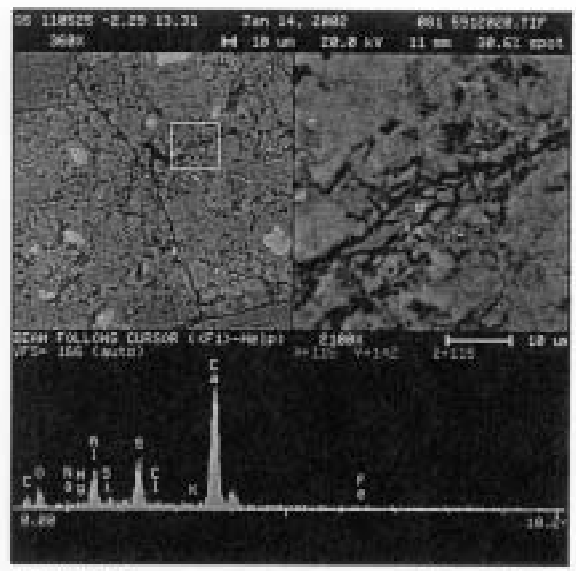
AFt deposit(s)



5912020.TIF Y (mm) 13.314

AFt deposit(s)

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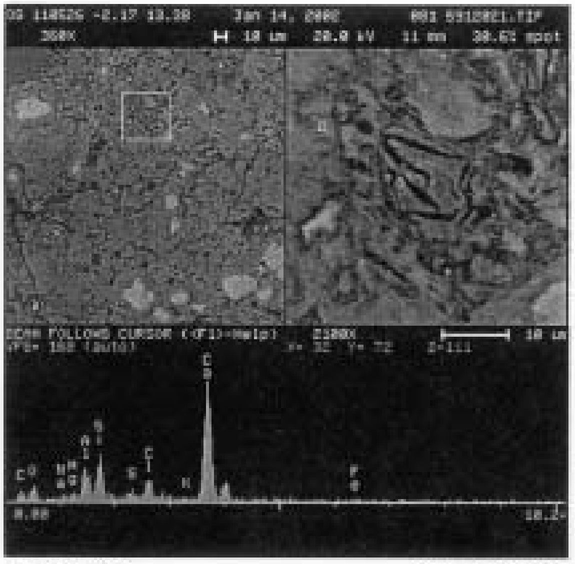
MAH112353 - Sample No. 0815912 - ES2



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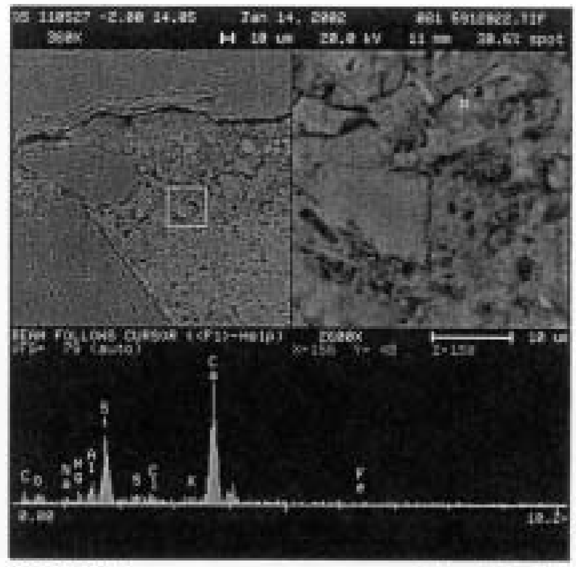
Cl-rich AFt/AFm



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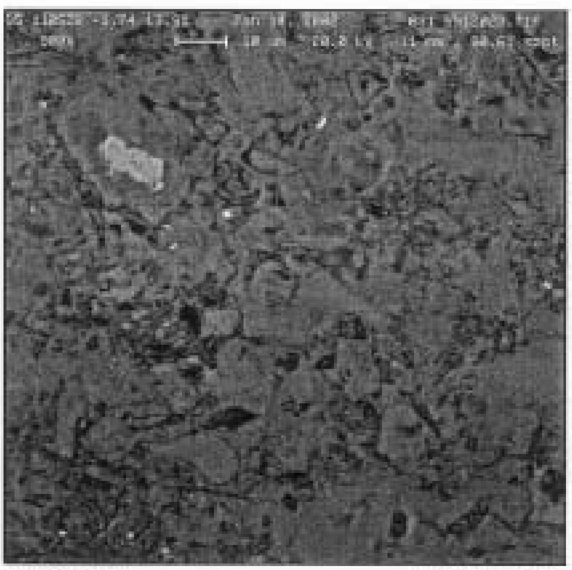
Composition of C-S-H



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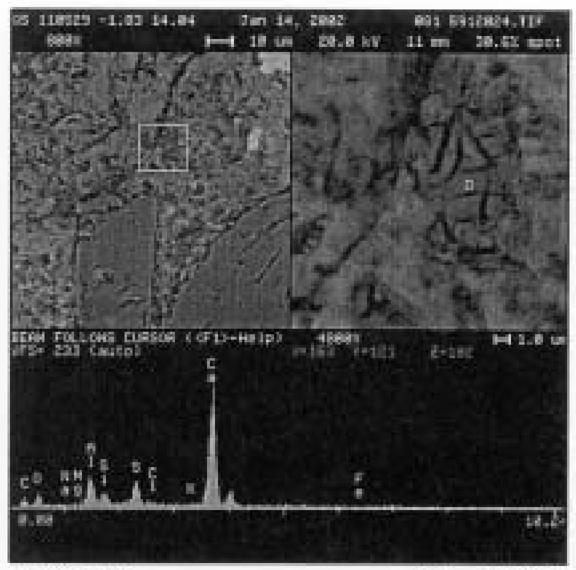
Porous paste



5912024.TIF Y (mm) 14.044

AFt deposit(s)

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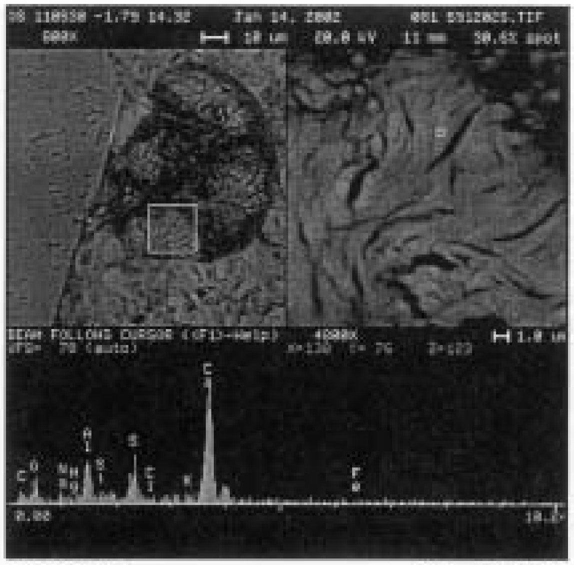
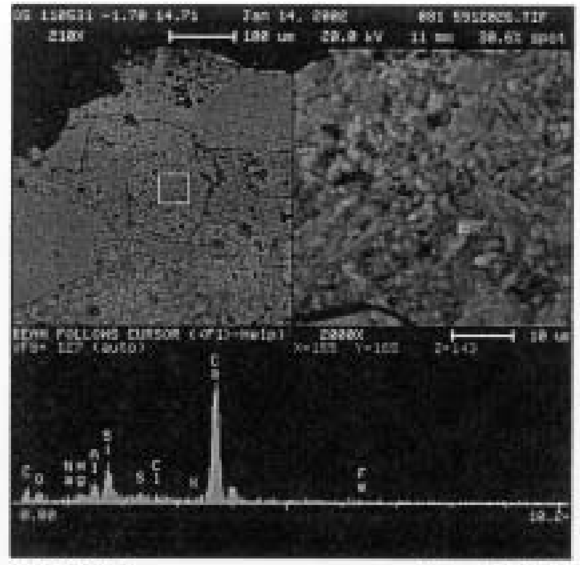
MAH112353 - Sample No. 0815912 - ES2



5912025.TIF Y (mm) 14.318

AFt (Ettringite) in Air Void(s)



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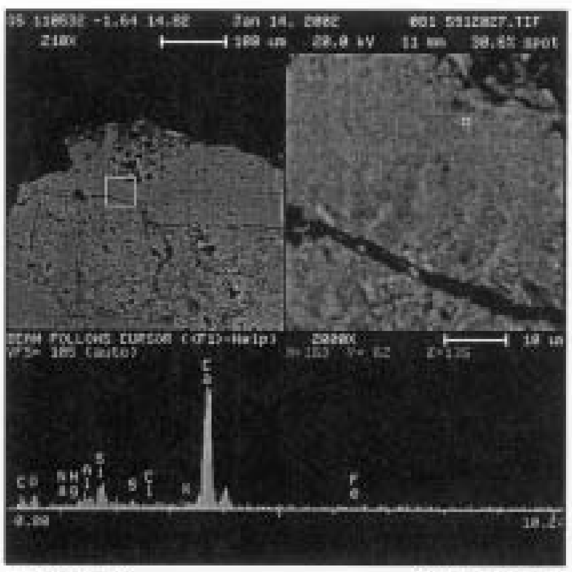
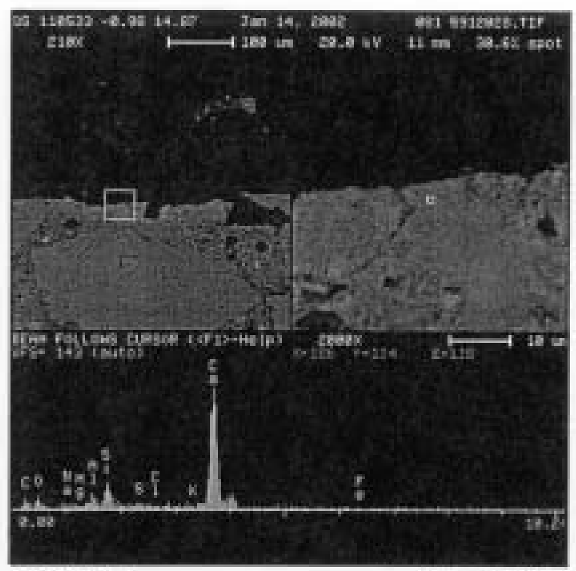
Carbonated paste



5912027.TIF Y (mm) 14.818

Carbonated paste



5912028.TIF Y (mm) 14.872

Carbonated paste

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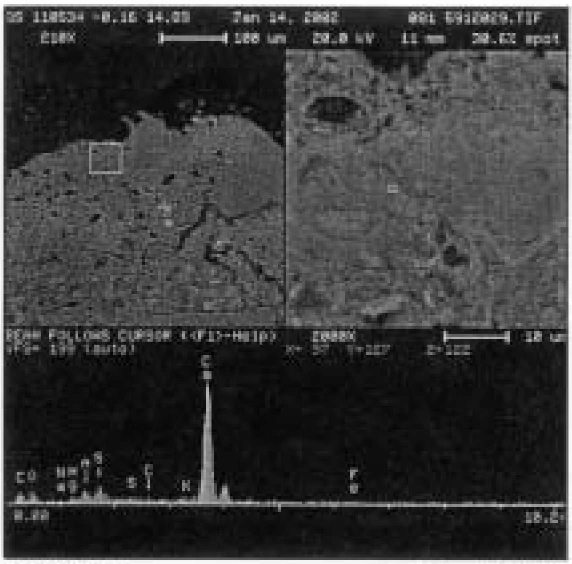
MAH112353 - Sample No. 0815912 - ES2



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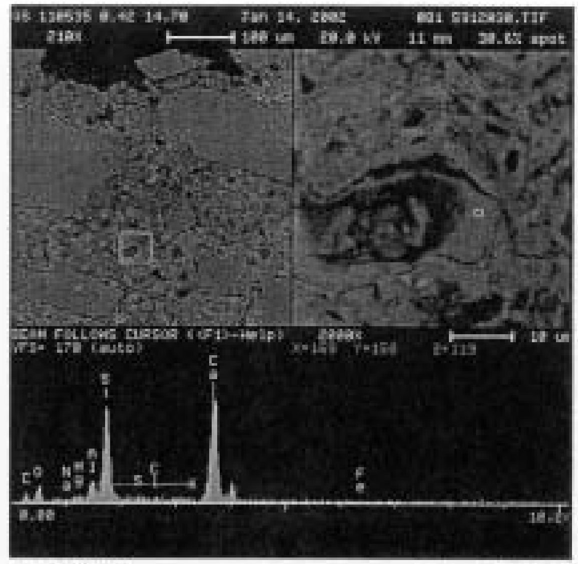
Carbonated paste



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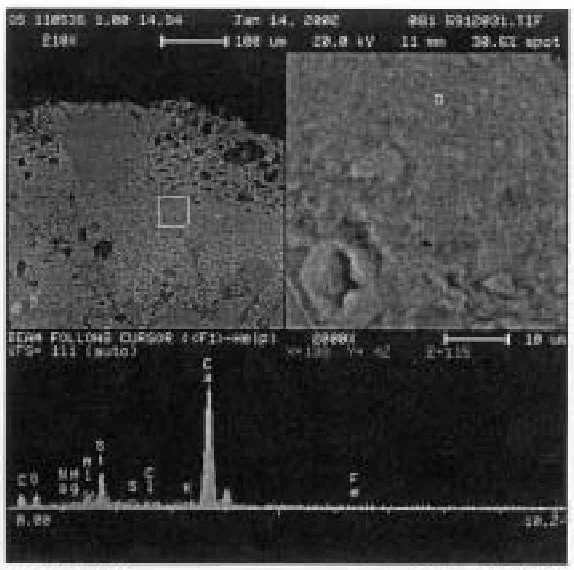
Partially decalcified paste



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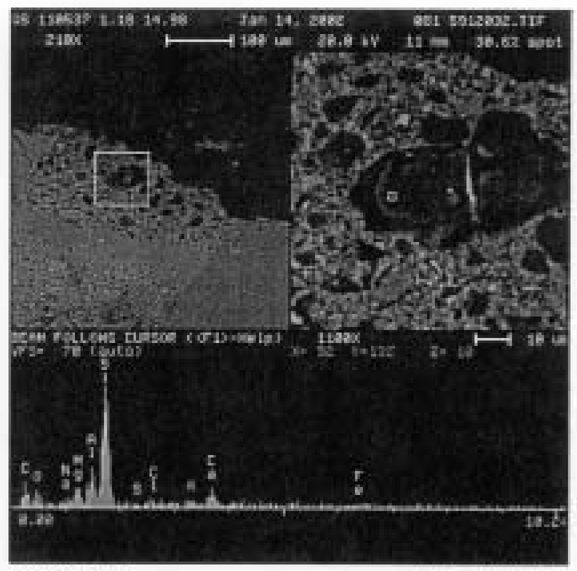
Carbonated paste



5912032.TIF Y (mm) 14.983

Si-rich structure in carbonated paste

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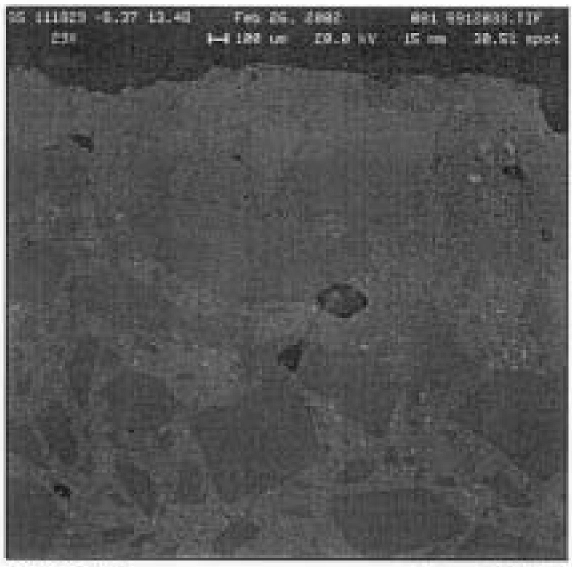
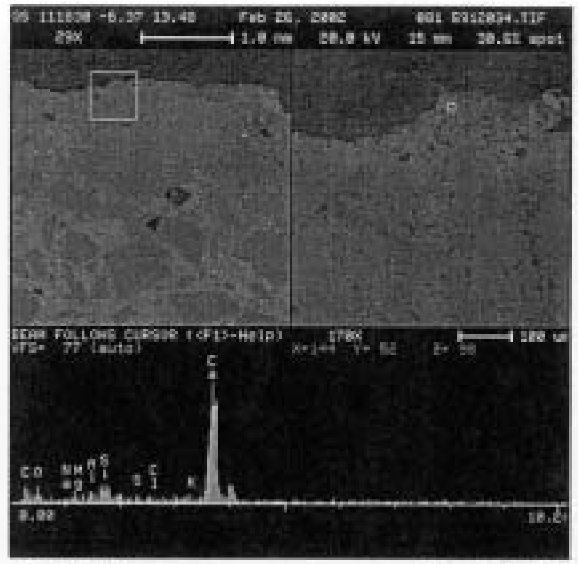


5912033.TIF Y (mm) 13.482

Paste/aggregate distribution



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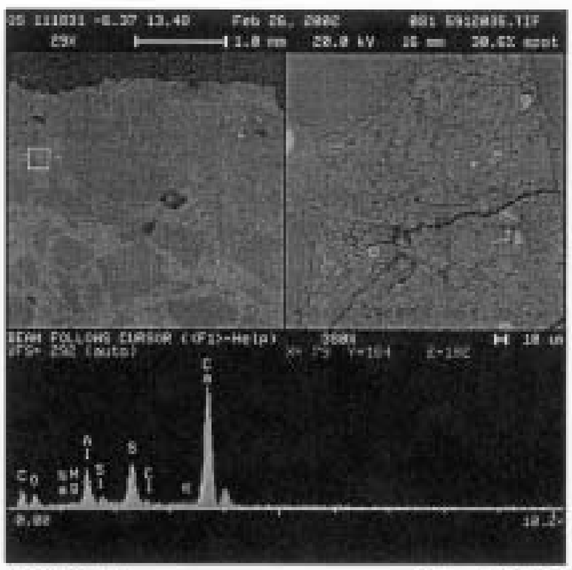
Carbonated paste



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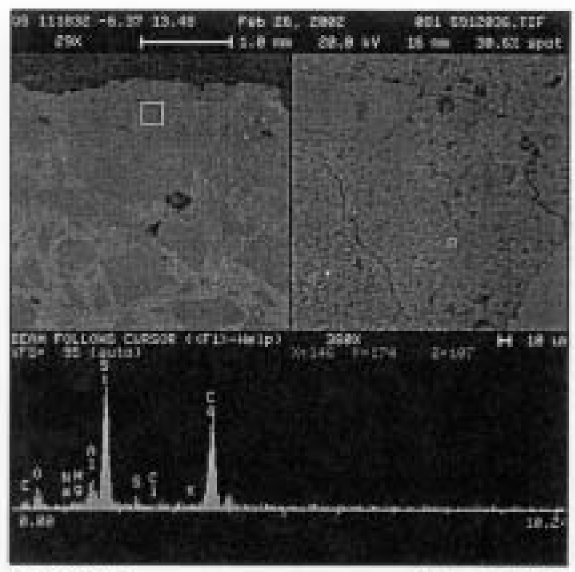
AFt deposit(s)



5912036.TIF Y (mm) 13.482

Partially decalcified paste

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RJ LeeGroup, Inc.

Acid Soluble Chloride Analysis

Project No: MAH112353

RJ Lee Sample No.	Client Core Id.	Chloride Concentration (wt.%)
815912	ES2	0.38
815914	M2	0.32

Note: Chloride percent is by mass of concrete

Note-
(Maaske) 0.32% = 1½% pure cc
or 2% flake
(Echo Summit) 0.36% = 1¾% pure cc
or 2.25% flake

DEFENDANT'S EXHIBIT S
HALES
4-21-03 SK

Acid Soluble Chloride table.xls1

PETROGRAPHIC EXAMINATION OF POOL PLASTER

PROJECT: 1213 Echo Summit
Livermore, CA

JOB NO. C-4232-03

APRIL 28, 2003

MICRO-CHEM LABORATORIES
635 Bret Harte Drive
P.O. Box 485
Murphys, CA 95247-0485
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April 28, 2003

Burkett's Pool Plastering, Inc.
4612 Castle Cary Lane
Salida, CA 95368

Job No. C-4232-03

Attn: Mr. Rob Burkett

Re: Petrographic Examination of Pool Plaster
Project: 1213 Echo Summit
Livermore, CA

In response to your request, a sample of gray pool plaster was received for petrographic analysis. Several reports, photographs, and documents were also submitted with the sample. The supplied plaster sample was reportedly obtained from a pool located at the above referenced project that exhibited surface discoloration or "spot etching." The objectives of the examination were to evaluate the physical and mineralogical properties of the plaster, and ascertain the possible cause(s) for the reported surface discoloration as represented by the supplied plaster sample.

Test Method

The plaster sample was analyzed according to ASTM C856-02, "Standard Practice for Petrographic Examination of Hardened Concrete." The plaster was examined with a stereomicroscope. Portions of the exterior surface were removed with a dental tool, mounted in a series of refractive index oils, and examined with a petrographic microscope. Exterior areas of the sample were epoxied, saw cut, lapped, and reexamined with a stereomicroscope to evaluate the physical properties of the sample. Thin sections were prepared from the epoxied areas and examined at various magnification with the petrographic microscope to study the mineralogy and microstructure of the plaster. Areas of the thin sections were stained with an Alizarin Red S (solution) and examined.

Sample Description

The following plaster sample was received.

Micro-Chem Sample No.	Approximate Dimensions, in.	Description	Date
1	4.9 x 3.4 x 1.3 4.0 x 3.6 x 0.8	Two pieces of plaster. 213 Echo Summit Livermore, CA	11/6/2001

Burkett's Pool Plastering, Inc.
Job No. C-4232-03
April 28, 2003
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Petrographic Examination

1. Sample No. 1 consisted of gray plaster bonded to a layer of shotcrete. The plaster was composed of dolomite sand, white cement, and pigment materials. The plaster was approximately $^{3}/_{16}$-$^{3}/_{8}$ in. thick.

2. The results of the petrographic examination are presented in Table I.

Discussion and Conclusions

1. The overall strength properties of the plaster below the exterior face were satisfactory based on the observed paste hardness and paste-aggregate bonding properties by petrographic analysis. In fact, the strength of the plaster was excellent. The plaster was well mixed and properly consolidated.

2. The exterior surface displayed a mottled light brown-gray to medium gray color. The light brown-gray discoloration was confined to the exterior surface area. The discoloration did not extend into the plaster to any significant depth. The discoloration was spotty and did not exhibit any pattern across the surface. However, the discoloration was fairly uniform along both sides of a small longitudinal crack in the plaster. The light brown-gray areas were soft, very lightly scaled, and contained a very low amount of unhydrated white cement particles. Conversely, the medium gray areas were fairly hard to hard, intact, and contained moderate amounts of unhydrated white cement. No scaling was present in the medium gray areas. The depth of paste carbonation in the light brown-gray areas measured a maximum of 2.0 mm. Carbonation in the medium gray areas was spotty or, in some cases, non-existent. Leaching of calcium was evident along the exterior areas in the carbonated regions. This was apparent both from the staining characteristics of the thin sections in plane polarized light, and the optical properties of the carbonated regions with crossed polars. The intensity and depth of the paste carbonation was not uniform along the exterior surfaces.

3. Based on the petrographic analysis of the supplied plaster specimens, the light brown-gray discoloration, weak paste, and very light scaling of the exterior surfaces in areas were not due to poor quality plaster. The mottled appearance of the surface and random distinct spots of discoloration suggested that improper finishing was not the cause of the surface discoloration. Further, the fairly uniform discolored weak areas along the small surface crack also suggested that the discoloration was caused by factors other than improper finishing or quality of the plaster. The observed leaching of calcium-based cementitious constituents from the plaster system by pool water is the likely cause of the surface problems. The leaching over time would promote a localized loss in strength of the cement paste and would tend to lighten and discolor the surface. Removal of pigment from these areas by leaching and non-uniform carbonation would contribute to the mottled appearance of the surface.

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Job No. C-4232-03
April 28, 2003
Page 3

Should any questions arise concerning the findings of this report, please contact the undersigned.

Respectfully submitted,
MICRO-CHEM LABORATORIES

Robert C. O'Neill, P.G.
Senior Petrographer

RCON/jamc
C423203
Attachment

Sample Disposition: The sample will be stored for a period of one month and thereafter discarded. Charges for additional sample storage time and/or shipping of the sample will be billed to the client.

TABLE I

JOB NO. C-4232-03

SAMPLE NO. 1

!!! w:c ?
porosity ?

PETROGRAPHIC EXAMINATION OF PLASTER SAMPLE
ASTM C856-02

Physical Description of Plaster

Exterior Surface	Interior Surface	Exterior Surface Deposits/Coatings	Cracks	Microcracks
Mottled light brown-gray to medium gray. Medium gray areas are fairly hard to hard, and intact. Light brown-gray areas are soft and very light scaled.	Tightly bonded to underlying shotcrete	~10 mm thick layer of secondary $CaCO_3$ on exterior face	No large cracks. One small longitudinal crack. Areas on both sides of crack are light brown-gray and soft on exterior surface.	Few to some along exterior area. Few below.

Physical Properties of Plaster

Paste Hardness	Paste Color	Paste Volume	Paste-Aggregate Bond	Air Content, %	Consolidation
Hard with few fairly hard areas	Patches of light brown-gray from exterior to <1 mm. Medium gray below.	High	Very strong	<1	Good

Mineralogical Properties of Cementitious Paste

Location	Unhydrated Cement, %	Calcium Hydroxide, %	Fly Ash, %	Depth of Carbonation
Exterior 25 mm	Areas along exterior contain <1% to 1 mm deep. Other exterior areas 10-15%. Plaster below exterior contains 10-15%.	5-12	None	Spotty in areas with 10-15% unhydrated cement and to 2.0 mm in areas with <1% unhydrated cement. Carbonated paste is leached in areas.

PHOTOGRAPHS OF AS-RECEIVED PLASTER SAMPLE
SAMPLE 1 (scale in cm)

PHOTO NO. 1 – Exterior surface of sample

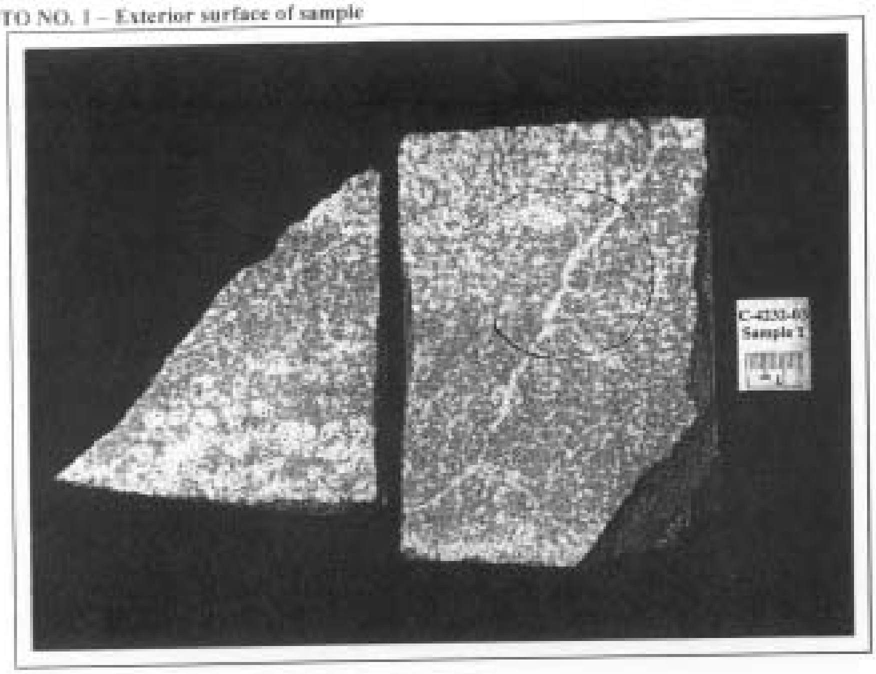
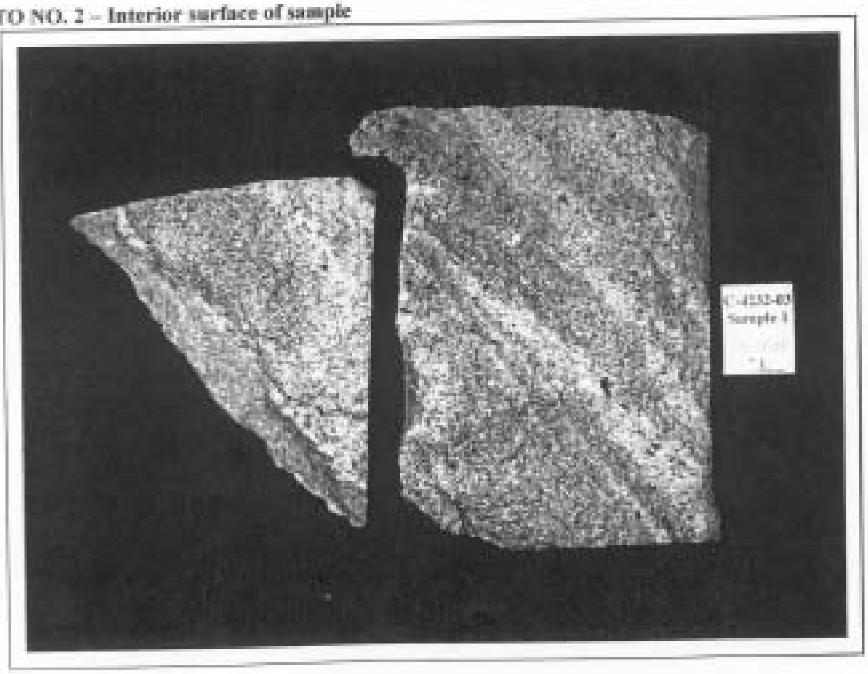


PHOTO NO. 2 – Interior surface of sample



C-4232-03

STEREOMICROGRAPHS OF EXTERIOR SURFACE OF AS-RECEIVED PLASTER SAMPLE 1
LOW ANGLE LIGHT (scale in mm)

PHOTO NO. 3 – Shows light brown-gray very lightly scaled paste and medium gray paste that is not scaled. Crack in light brown-gray paste is indicated by arrows.

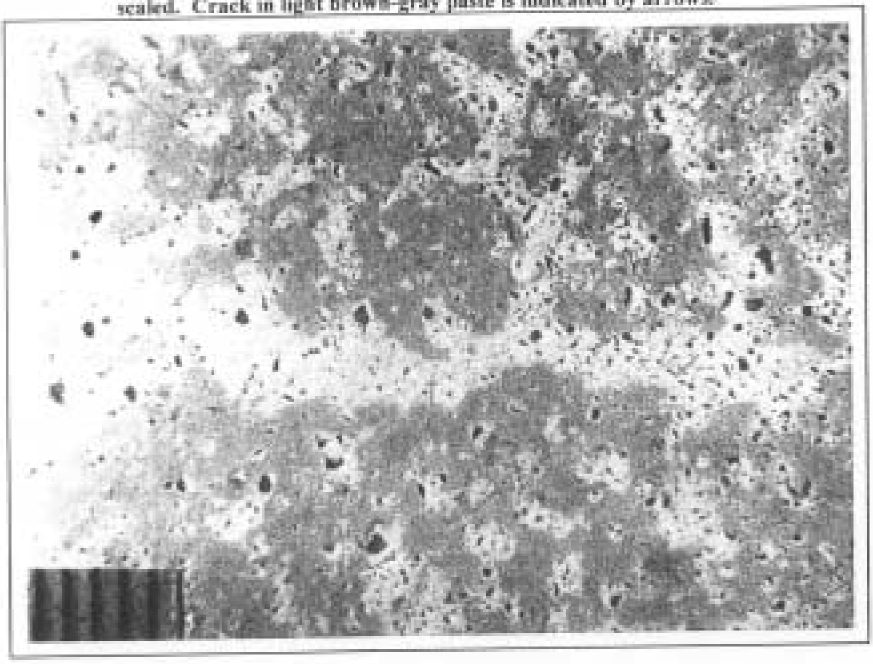


PHOTO NO. 4 – Close-up of Photo No. 3. Sample rotated 90° to accentuate crack.

C-4232-03

PHOTOMICROGRAPHS OF THIN SECTIONS

PHOTO NO. 5 – Stained section shows exterior surface at top of photo. Rectangle indicates area of Photo No. 7. (Magnification = 40X, Field length = 1.8 mm, Plane polarized light)

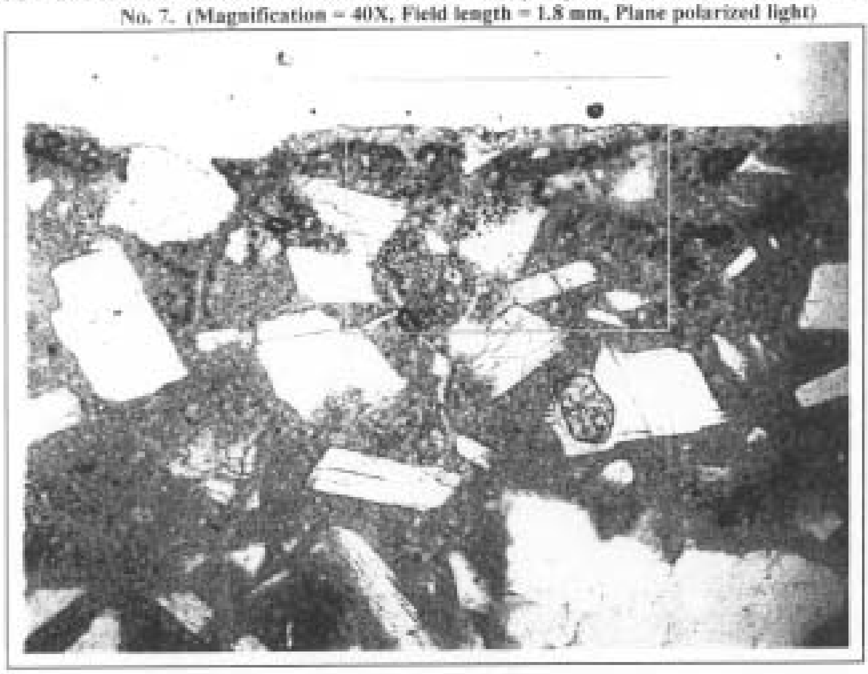
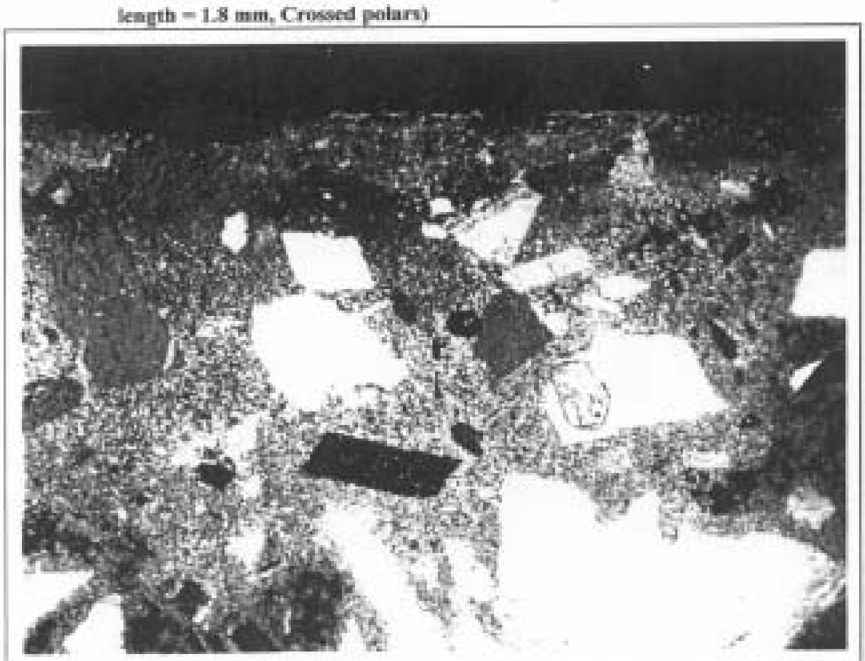


PHOTO NO. 6 – Same field of view as Photo No. 5 with crossed polars. (Magnification = 40X, Field length = 1.8 mm, Crossed polars)



C-4232-03

PHOTO NO. 7 – Close-up of Photo No. 5. Thin layer of secondary $CaCO_3$ on exterior face (arrows). (Magnification = 100X, Field length = 0.72 mm, Plane polarized light)

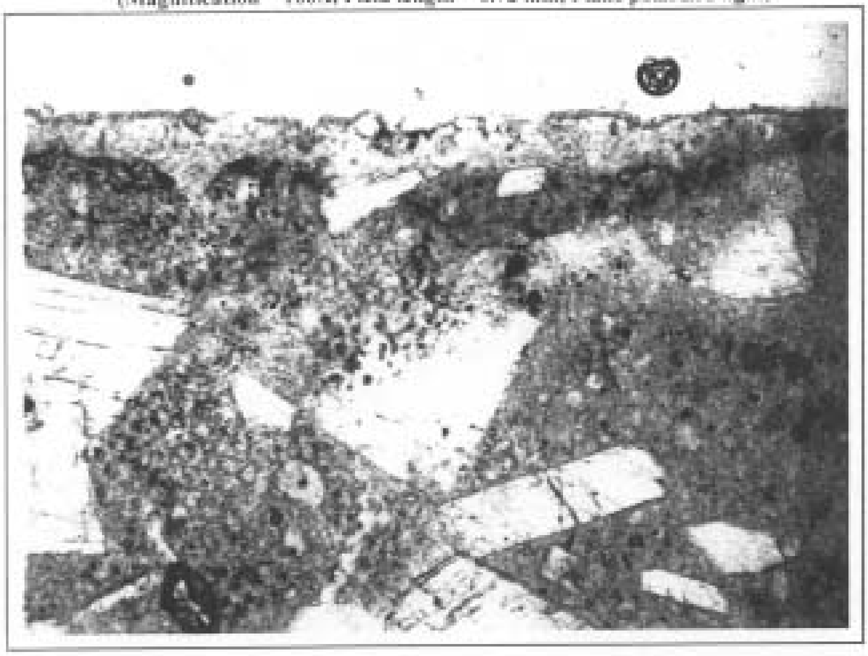
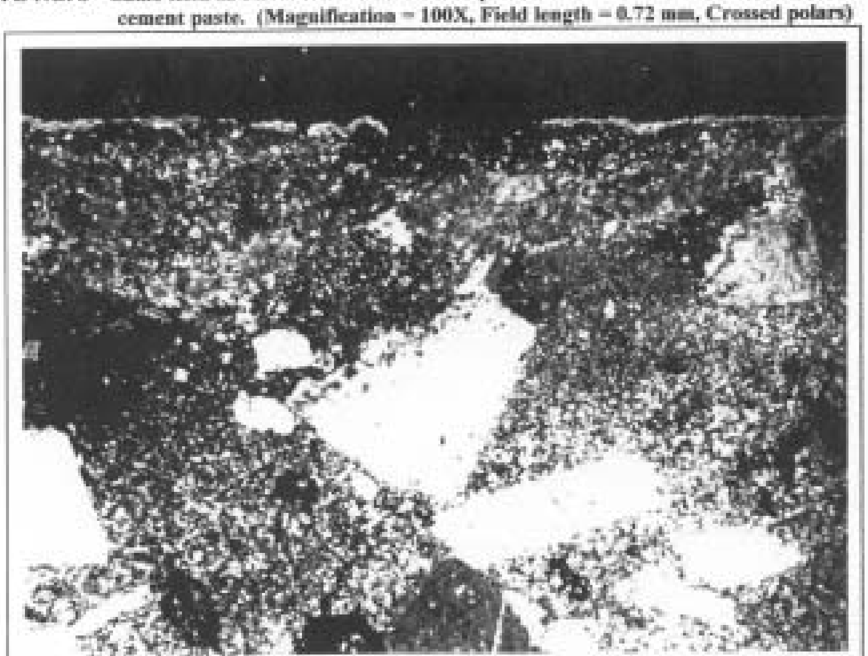


PHOTO NO. 8 – Same field as Photo No. 7 with crossed polars. Shows non-uniform carbonation of cement paste. (Magnification = 100X, Field length = 0.72 mm, Crossed polars)



C-4232-03

PHOTOMICROGRAPHS OF THIN SECTIONS

PHOTO NO. 9 – Unstained area of thin section similar to Photo No. 7. Shows very low amount of unhydrated white cement particles. (Magnification = 100X, Field length = 0.72 mm, Plane polarized light)

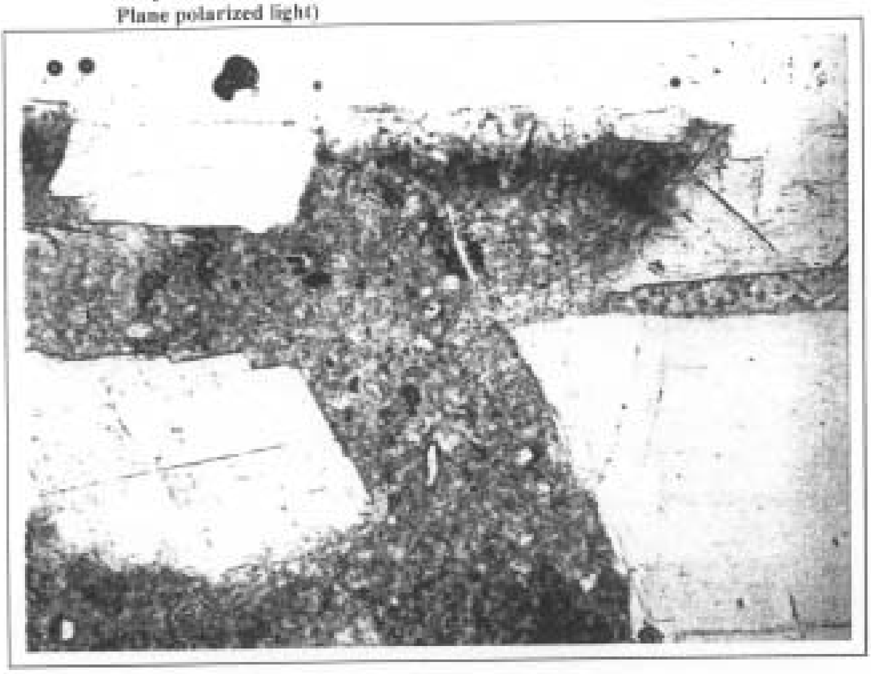


PHOTO NO. 10 – Same field as Photo No. 9 with crossed polars shows non-uniform paste carbonation. (Magnification = 100X, Field length = 0.72 mm, Crossed polars)

C-4232-03

PHOTOMICROGRAPHS OF THIN SECTIONS

PHOTO NO. 11 – Unstained area shows a moderate amount of unhydrated white cement particles in paste (arrows). (Magnification = 100X, Field length = 0.72 mm, Plane polarized light)

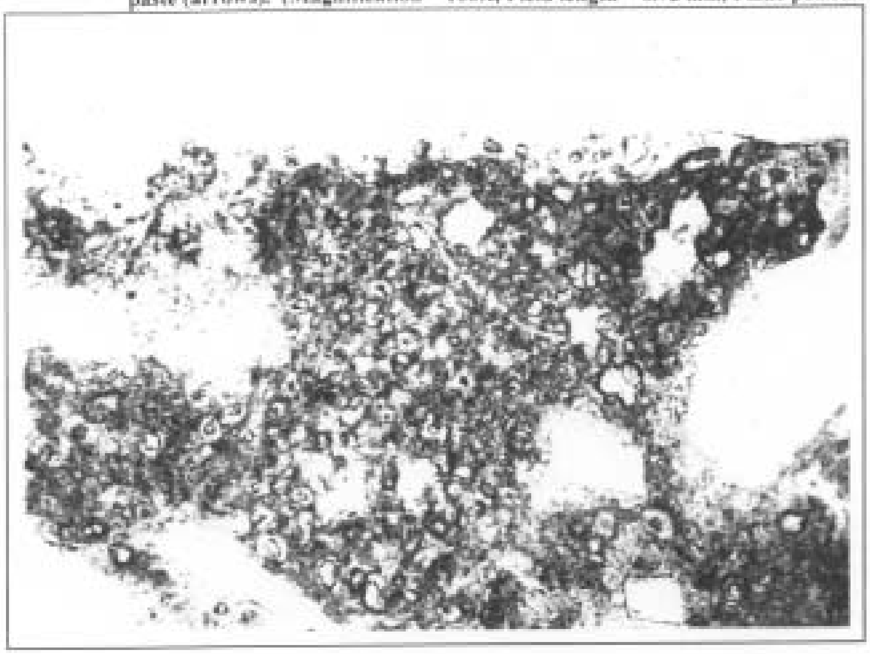
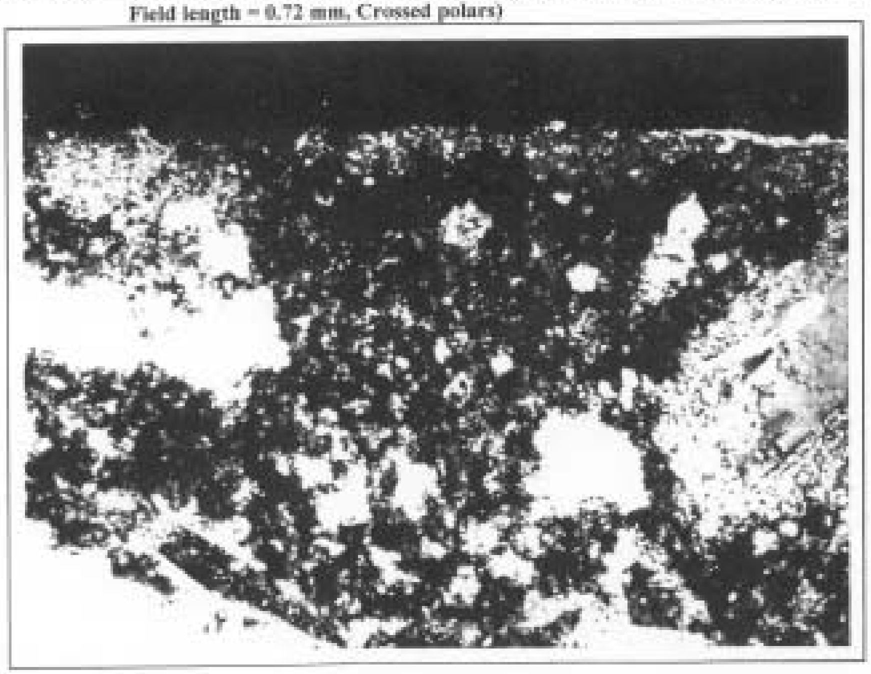


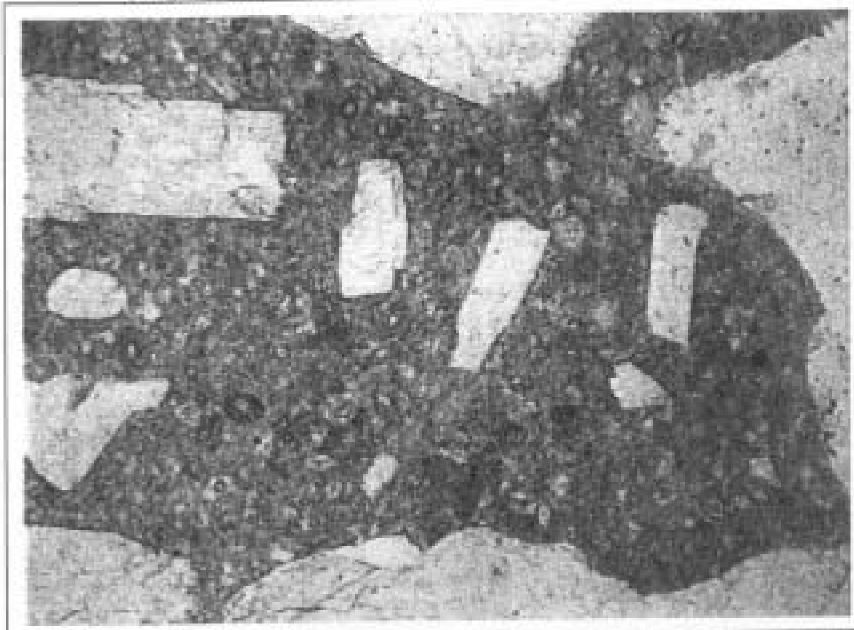
PHOTO NO. 12 – Same field as Photo No. 11 shows spotty paste carbonation. (Magnification = 100X, Field length = 0.72 mm, Crossed polars)



C-4232-03

PHOTOMICROGRAPHS OF THIN SECTIONS

PHOTO NO. 13 – Stained section of paste below exterior face adjacent to shoterete layer. Note strong pink colored paste as compared to stained section from Photo Nos. 5 and 7. (Magnification – 40X, Field length – 1.8 mm, Plane polarized light)



C-4232-03

CHLORIDE CONTENT OF PLASTER SAMPLE

PROJECT: 1213 Echo Summit
Livermore, CA

JOB NO. C-4232A-03

MAY 6, 2003

MICRO-CHEM LABORATORIES
635 Bret Harte Drive
P.O. Box 485
Murphys, CA 95247-0485
(209) 728-8200

MICRO-CHEM LABORATORIES

635 Bret Harte Drive • P.O. Box 485 • Murphys, CA • 95247 • (209) 728-8200 • FAX 209-728-8251 • www.micro-chem.com

May 6, 2003

Burkett's Pool Plastering, Inc.
4612 Castle Cary Lane
Salida, CA 95368

Job No. C-4232A-03

Attn: Mr. Rob Burkett

Re: Chloride Content of Plaster Sample
Project: 1213 Echo Summit
Livermore, CA

In response to your request, a sample of gray pool plaster was chemically analyzed for acid-soluble chloride content. The sample was reportedly obtained from the above referenced project. The plaster was previously analyzed by petrographic methods (see Micro-Chem Laboratories report dated 28 April 2003).

Test Method

A representative piece of the plaster from Sample No. 1 was saw cut parallel to the exterior surface to provide two 0.2 in. thick samples. The samples were prepared and tested according to ASTM C1152-97, "Standard Test Method for Acid-Soluble Chloride in Mortar and Concrete."

Test Results

The results of the acid-soluble chloride analysis of the plaster were as follows.

Sample location from exterior face, in.	Cl^-, % by mass of sample	Cl^-, % by mass of cement[1]	Equivalent $CaCl_2$ content, % by mass of cement
0.0-0.2	0.336	0.87	1.81
0.2-0.4	0.361	0.94	1.94

[1] assuming a reported cement content of 38.5%, by mass

? implications ?

Burkett's Pool Plastering, Inc.
Job No. C-4232A-03
May 6, 2003
Page2

Should any questions arise concerning the findings of this report, please contact the undersigned.

Respectfully submitted,
MICRO-CHEM LABORATORIES

Robert C. O'Neill, P.G.
Senior Petrographer

RCON/jarne
C4232A03

Sample Disposition: The sample will be stored for a period of one month and thereafter discarded. Charges for additional sample storage time and/or shipping of the sample will be billed to the client.

RJ Lee*Group*, Inc.
350 Hochberg Road
Monroeville, PA 15146
Tel: (724) 325-1776
Fax: (724) 733-1799

The Materials Characterization Specialists

OnBalance
3116 E. Pennsylvania Street
Tucson, AZ 85714

Attention: Mr. Que Hales

Per your request, I have reviewed the report for Western Technologies provided by Robert C. O'Neill (Micro-Chem Laboratories) dated February 13, 1995. Niels Thaulow has also reviewed this report and concurs with my findings.

The report is an example of Mr. O'Neill's standard letter report format. Niels has reviewed other reports from Micro-Chem Laboratories. While the report is a standard format and gives a overview of samples observed, there are weaknesses in Mr. O'Neill's description of sample preparation and in the microstructural details. These lacking details make concurrence with his findings impossible.

- The report states that a "thin section was prepared from a selected area of the plaster…", but does not describe whether the section was taken through one of the affected surface regions (described on page 2 of the report) or whether the selected area was along the surface at all.
- No photomicrographs were provided, nor were any described in the report.
- While the report describes the condition of the paste and aggregate, no mention is made describing the relative percentage of sand to paste. Typically, pool plasters are extremely paste rich and can produce micro-cracking quite easily.
- The report observed that micro-cracking "autogenously healed", which can only be achieved by fluid movement through the paste.
- No chemical profiles are described in the report (i.e. depth of chloride, alkalies, …). The movement of an aggressive fluid through the paste will also be accompanied by the deposition of cationic and anionic species.
- While the report describes "a sandy texture" along the surface and describes the aggregate, no characterization is given of chemical attack to the aggregate along the surface. "Aggressive pool water" as described in the report would by nature attack the calcite aggregate as well as the paste matrix.

While Mr. O'Neill is a well known and respected petrographer, I cannot agree with his findings that the "surface deterioration was caused by aggressive pool water". There is not enough evidence presented in the report to support this claim. Also, Mr. O'Neill's findings are reached solely on petrographic microscope examination and should have been supplemented with scanning electron microscopy (SEM). Niels Thaulow and I concur that these subtle surface discolorations require instrumentation that can resolve much finer detail.

Mr. O'Neill has reached a conclusion without enough supporting data and I can only assume that he has made the assertion that the "surface deterioration was caused by aggressive pool water" is due to a lack of understanding concerning the pool water environment. Pool water is by nature an "aggressive media" for the plaster surface, but plaster pool surfaces are used in the industry extensively without ill affects.

Sincerely,

Dr. Boyd A. Clark
Senior Materials Scientist
RJ Lee Group, Inc.

Cc Niels Thaulow

Alan Smith Pool Plastering
1767 N. Batavia
Orange, CA 92667

November 6, 2001

Per the request of Burkett Pool Plastering, I completed plaster inspections today upon three different pool projects. My opinion was requested due to my status as an industry expert, as an expert witness for the State Contractor's Board, National Plasterer's Council, IPSSA (Independent Pool and Servicemen's Association), UPA (United Poolman's Association), and a Firemen's Fund Insurance Claims Inspector. I have also been instrumental in research projects involving the effects of water chemistry on pool plaster and have spent years developing alternative products to help hinder the corrosive damage to pool surfacing.

My conclusions are:

Job Site: 1213 Echo Summit
Pool inspected under daylight conditions: pool water level empty

1. Mix Ratio:
   (4) parts Riverside white cement: (6) parts Doliwhite pool aggregate: (2)lbs Calcium Chloride: (16) ounces black liquid Davis pigment:
   Mix ratio per Burkett Pool Plastering and is a standard and accepted pool mix

2. Pool Surface is smooth to the touch and meets and exceeds trade standards for the workmanship in the pool industry.

3. Pool surface is extremely etched and/or spot-etched throughout entire surface area, including all troweled surfaces and all un-troweled plaster under main drain covers. This fact eliminates the possibility of over or under troweling of plaster surface as cause for spot-etching or etching of surface.

4. Also note, extreme etching on all tile grout at water level and below indicating aggressive water attack. Also note, grout above waterline is un-etched and normal.

5. Also note: water corroded metals in pool system, skimmer basket handle and light screws indicating contact with corrosive and/or aggressive water.

It is my opinion that this pool has been subjected to corrosive and aggressive water which caused etching on the pool surface, tile grout, and metals.

INDUSTRY EXPERT PROGRAM

PHOTO IDENTIFICATION REPORT BY COMPLAINT ITEM

EXHIBIT B

COMPLAINT NUMBER: - Burkett

JOB SITE ADDRESS: 1213 Echo Summit

DATE PHOTO TAKEN: November 6, 2001

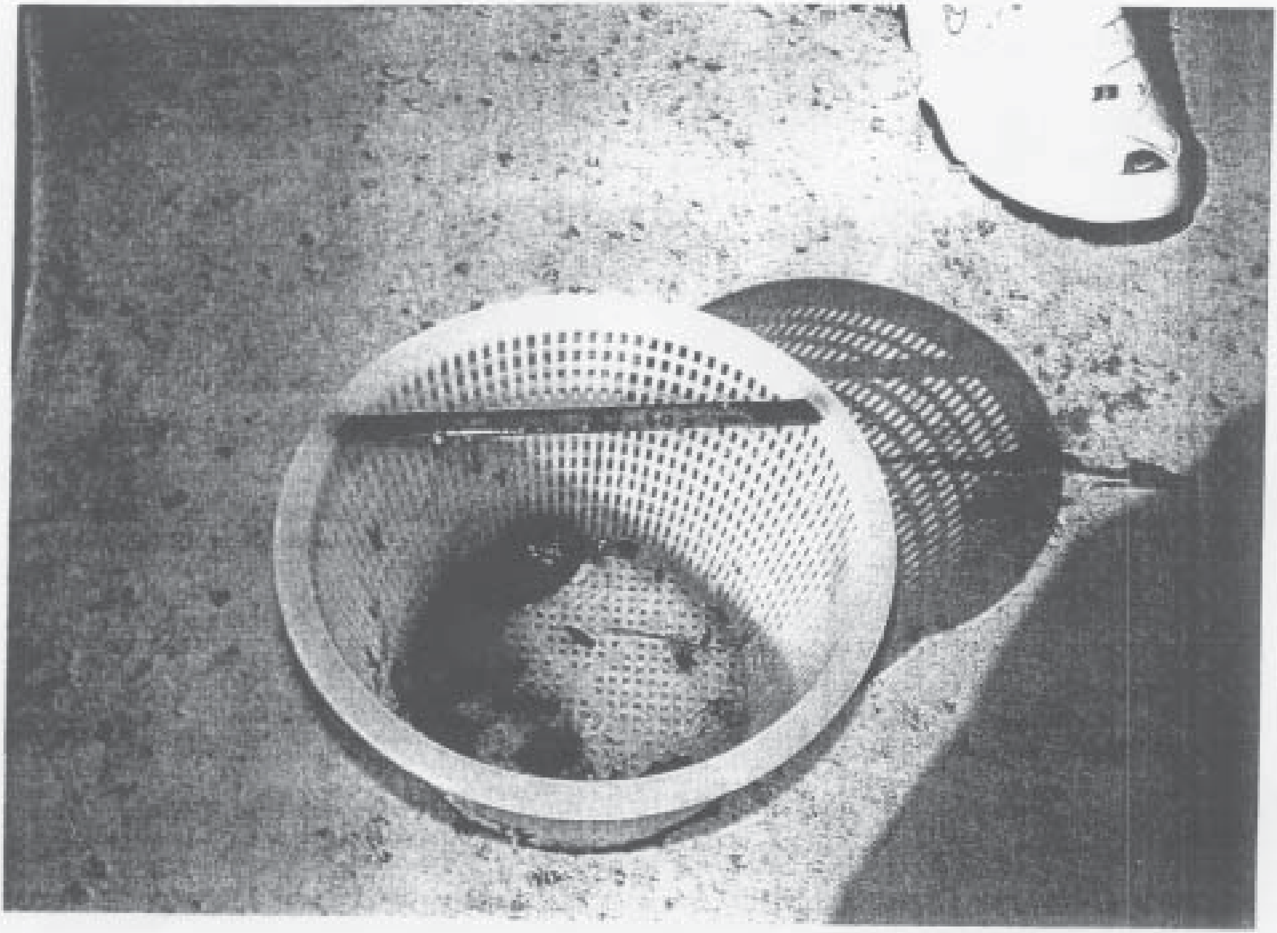
PHOTOGRAPHER: Alan Smith

DESCRIPTION: Etched un-troweled plaster in main drain cavity

INDUSTRY EXPERT PROGRAM

PHOTO IDENTIFICATION REPORT BY COMPLAINT ITEM

EXHIBIT C



COMPLAINT NUMBER: - Burkett

JOB SITE ADDRESS: 2518 Pebble Creek Rd

DATE PHOTO TAKEN: November 6, 2001

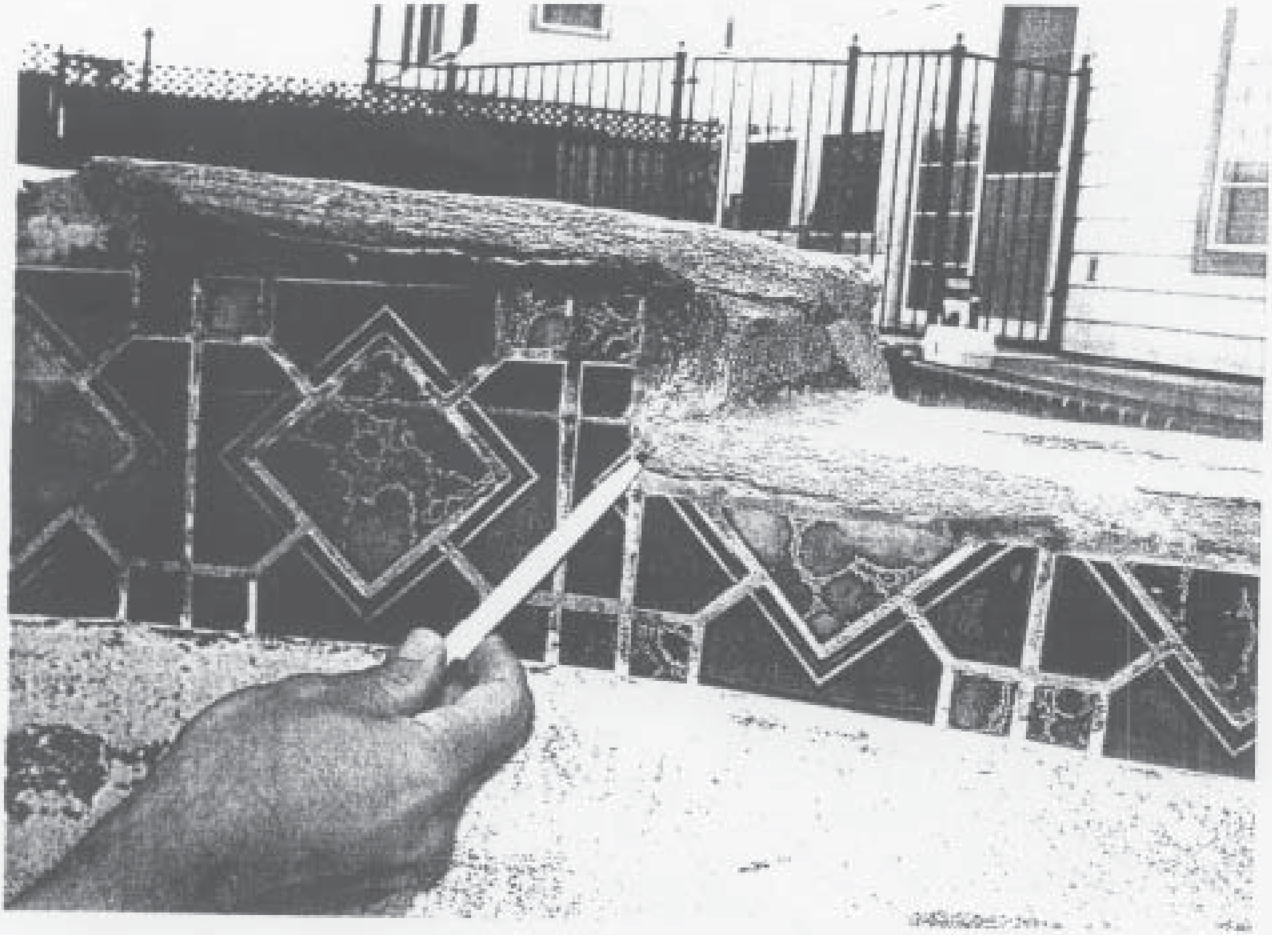
PHOTOGRAPHER: Alan Smith

DESCRIPTION: Corroded copper in skimmer basket

INDUSTRY EXPERT PROGRAM

PHOTO IDENTIFICATION REPORT BY COMPLAINT ITEM

EXHIBIT D



COMPLAINT NUMBER: - Burkett

JOB SITE ADDRESS: 1213 Echo Summit

DATE PHOTO TAKEN: November 6, 2001

PHOTOGRAPHER: Alan Smith

DESCRIPTION: Etched tile grout below water line

Report from Randy Beard to Rob Burkett:

The pool located at [pool owner address] had been emptied of all water. There was discoloration evident on the plaster surfaces. The swimming pool light screws, which are made of brass, were at the state of dissolving (exhibit 5). The grout at the pool tile line was only discolored below the water line level (Exhibit 6). This pool appears to have been attacked by acidic pool chemicals.
I conclude that all of these properties I observed today have had swimming pool plaster, tile, and equipment that originally met every trade standard invoked. It appears that, in these cases, improper maintenance is the most likely reason for the damage to the surface structure.

Sincerely,
Randy Beard

Job Site: [pool owner address]

Pool inspected under daylight conditions: pool water level empty

1. Mix ratio:
   (4) parts Riverside white cement: (6) parts Doliwhite pool aggregate: (2) lbs Calcium Chloride: (16) ounces black liquid Davis pigment:
   Mix ratio per Burkett Pool Plastering and is a standard and accepted pool mix

2. Pool Surface is smooth to the touch and meets and exceeds trade standards for the workmanship in the pool industry.

3. Pool surface is extremely etched and/or spot-etched throughout entire surface area, including all troweled surfaces and all untroweled plaster under main drain covers. This fact eliminates the possibility of over or under troweling of plaster surface as cause for spot-etching or etching of surface.

4. Also note, extreme etching on all tile grout at water level and below indicating aggressive water attack. Also note, grout above water line is un-etched and normal.

5. Also note: water corroded metals in pool system, skimmer basket handle and light screws indicating contact with corrosive and/or aggressive water.

It is my opinion that this pool has been subjected to corrosive and aggressive water which caused etching on the pool surface, tile grout, and metals.

MIX-IN COLORS FOR CONCRETE

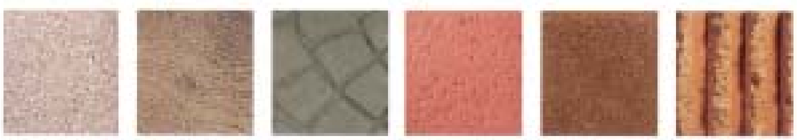
Uses: Davis Colors are used in cast-in-place, slab-on-grade, precast, tilt-up and ornamental concrete; shotcrete, mortar, concrete masonry units, pavers, retaining wall units and roofile. They can also be used to color cast stone, plaster, stucco and other cement-based construction materials. Designed for mix-in use only; they should not be sprinkled or dusted onto the concrete surface.

Ingredients: Pure, concentrated pigments made of high-quality metal oxides recycled from iron or refined from the earth and specially processed for mixing into concrete. Davis Colors comply with ASTM C979 *Pigments for Integrally Colored Concrete*. They are lightfast, alkali-resistant, weather-resistant, durable and long-lasting like concrete. Davis Colors are available in a wide spectrum of standard colors and can be custom formulated to match design requirements. ✱ Unlike other Davis Colors, Supra-Instant® black #8084 is a specially treated carbon black. Carbon black is the highest in tint strength and the most economical, but can fade if concrete is not sealed against water penetration. Sealing and periodic re-sealing can minimize this effect.

Packaging: Concrete suppliers use our Mix-Ready® disintegrating bags or Chameleon™ bulk handling system. Mix-Ready® bags are tossed into the mix without opening or pouring. They disintegrate under mixing action, releasing pigments to disperse uniformly leaving no bags to litter the environment. The Chameleon™ is a computer-controlled automatic bulk-color dosing system.

Installation: Integrally colored concrete is installed the same way as high quality uncolored concrete. Choose a color on the inside of this color card and specify it by name, color number and dose rate. Create a custom color by varying the amount of color added to the mix. Confirm desired color with a fully-cured job-site test panel. Typical dose rates range from 1/2 to 7 lbs. per 94 lbs. of cement content and should never exceed 10% of cement content. Cement content includes portland cement, fly ash, silica fume, lime and other cementitious materials but does not include aggregate or sand. Davis Colors have been used successfully in a wide variety of mix designs and are compatible with commercially available admixtures. The only known incompatibility is with calcium chloride set accelerator which causes blotching and discoloration. ✱ Supra-Instant® black #8084 reduces or negates the effect of air-entraining admixtures.

Finishes: Paving and floors can be finished with pattern-stamped, broomed, troweled, exposed aggregate, salt-finished, sand-blasted, or many other visually appealing textures. Cast-in-place, precast and tilt-up structures can be textured with sand-blasting, bushhammering, grinding, polishing, special forms or form liners. The combinations and possibilities are endless. Here are just a few:



Exposed Aggregate · *Light Broom (wavy)* · *Stamped/ Patterned* · *Salt Finish* · *Sand Blasted* · *Form Liner*

Curing & Sealing: W-1000 Clear™ is a non-clouding, spray-on cure and sealer that meets or exceeds ASTM C309 standards and is specially formulated for colored concrete and exposed aggregate finishes. Other curing methods, such as water curing or plastic sheets cause discoloration. Color Seal™ is an optional, thin-film sealer that's tinted to match the shades on this Color Selector. When applied over colored concrete or the W-1000 Clear™, it provides a more uniform appearance.

Quality Tips: For best results; materials, curing, weather conditions and workmanship should be uniform throughout a project. Quality starts with the concrete mix; use a low water-content, high-performance mix design. When planning a project, budget for craftsmanship.

Consumer Advice: Contractors are independently owned and operated without affiliation to Davis Colors. Choose a licensed and qualified contractor who provides written information and example projects you can see before you buy. Check the yellow pages, ask your local ready mix or building material dealer or visit www.concreteconnection.com to find contractors who specialize in colored concrete.

Specify Davis: Choose a color from this color selector and specify it by name, color number and dose rate. Add color call-out to plan documents or specifications. For complete architectural and guide spec information, visit our web site, refer to our architectural binder, call, fax or write. Our guide specifications can be found in SweetSource®, Spec-Data®, ARCAT/Spec-Disk® or at www.daviscolors.com/tech.

For samples or additional information contact:

DAVIS COLORS

Tel: 800-356-4848
Fax: 323-269-1053
www.daviscolors.com

Mixing Guide:

Use the same pigment-to-cement ratio, type and brand of cement and aggregates throughout project. Changes in cement and aggregate color affect final color.

Keep slump less than 5" (12.5 cm) and water content consistent. High water content causes concrete to appear pale or "faded". If higher slump is required, use a water reducing admixture instead of added water.

Calcium Chloride set-accelerator causes discoloration. Do not use with color.

Specify air content of 5% to 7% for improved workability and long term durability in freeze/thaw climates.

Schedule loads for consistent mix times. Deliver and discharge in less than 1-1/2 hours. Clean mixer thoroughly between color change-overs.

Confirm color number and weight in Mix-Ready® bag (or combination of bags) is the same required by mix design.

Wet mixer with 1/2 to 2/3 total batch water. Toss in Mix-Ready® bags and mix at charging speed for at least one minute. Add cement, aggregate and remaining batch water. Continue mixing at charging speed for at least 5 minutes (7 minutes for pea-gravel mixes).

Notice: In mixes with small aggregate or batches with short mixing duration, Mix-Ready® bags may not completely disintegrate. In sand-blasted or exposed aggregate finishes, use small bag sizes (15 lbs. maximum) or open bag and pour color normally.

The Chameleon™ is a computer-controlled color dosing system for Ready Mix operators exclusively from Davis. It improves color accuracy and availability. Chameleon™ dose rates differ from the rates on front of this card. For more information, go to www.daviscolors.com/chameleon.

Contractor's Guide:

Prepare a well-drained subgrade. Add a 2 to 3 inch (50 to 75 mm) layer of sand, gravel or crushed stone. Uniformly compact the subgrade and moisten evenly, leaving no puddles, standing water, ice, frost, or muddy areas.

If vapor barrier is used, overlap sheets and tape over holes in barrier. Place a 3" (75mm) layer of granular self-draining compactible fill over the barrier to minimize shrinkage cracking.

Position forms for uniform slab thickness. Follow American Concrete Institute standards for reinforcement and joint placement to control cracking.

Allow ample time and manpower for placement and finish work. Finish evenly and with care.

Begin troweling after bleed water evaporates. Late or hard troweling and edging causes "burns" or dark spots.

Water added at job-site to mixer or pumps will cause color to pale. Keep additions to a minimum and consistent among loads. Don't wet finishing tools or brooms or sprinkle water on the surface.

Do not sprinkle pigment or cement onto the surface.

Rotary, dry-broom, pattern stamped or rough finishes usually cure more even-colored than smooth-troweled finishes.

Uneven curing=uneven drying=uneven color. Cure colored concrete with Davis W-1000 Clear™ cure and seal. (Info at: www.daviscolors.com/literature/pdf/W-1000.pdf)

Do not use plastic sheets, water curing or curing products which discolor. Wood and other objects left on curing concrete cause discoloration.

Efflorescence is a white powdery substance that appears on concrete surfaces. A result of water evaporation, it is more noticeable on colored surfaces making them look faded or lighter in color when not cleaned off. Proper curing and protection against water penetration reduces tendency for efflorescence to occur. Remove with detergent or mild-acid cleaners formulated to remove efflorescence. Follow cleaner instructions and test in a small area to make sure cleaner will not etch or discolor the surface. Wear rubber gloves and eye protection.

Because the conditions of use and application of our products are beyond our control, DAVIS COLORS MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE and expressly disclaims liability for consequential or incidental damages whether based on warranty or negligence. Buyer's sole remedy shall be refund of color purchase price from point of purchase.

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PRODUCT

Davis Colors™ are color "Admixtures" made of metal or mineral oxides either recycled from iron or refined from the earth that are lightfast, limeproof and permanent. They transform concrete into the stuff dreams are made of.

The Davis Colors™ card shows a spectrum of concrete colors. Custom color shades are made by varying the amount of color added to the mix. Mix-Ready™ colors are designed for mix-in use only, **not** "dust-on" use.

Every batch of Davis Colors is tested to verify it exceeds industry requirements for consistency. Color of concrete may differ from color card or samples and is influenced by the base-color of cement, mix water content, finishing methods and curing conditions.

Please read the Davis Colors™ Card, How-To Brochure or contact Davis Colors for tips on using this product.

PACKAGE

Mix-Ready™ bags are made of special paper which rapidly get soggy and disintegrate under mixing action releasing color deep in the mixer to disperse uniformly. Color handling is clean and environmental waste minimized.

CONTENTS

Iron Oxide (C.A.S. 1309-37-1 or 1317-61-9 or 51274-00-1 or combination), Silicon Dioxide-Amorphous (C.A.S. 7631-86-9)

STORAGE

Keep dry in a cool place, away from sources of heat or open flame.

HAZARDS

Contact a Doctor if accidentally ingested. This product is non-hazardous and non-toxic. Protect against inhalation, wear eye protection and avoid contact with skin or clothing. Clean-up with soap and water. Refer to MSDS for complete handling information.

HANDLING

Keep unused product in closed container. Protect against spillage and accidental contact—product can stain and create quite a mess.

DISPOSAL

Recycle in process whenever possible. Verify current regulatory status with state waste agency or the EPA before disposing in authorized landfill. Product passes EPA 1990 TCLP criteria (40 CFR part 261.32(9/90)) Non-RCRA waste.

DIRECTIONS

- Select a color by number and mix rate from the color card.
- Confirm the color number and weight in this bag (or combination of bags) is the same required by the mix.
- Use the lowest number of bags required for the batch. Mix limit for this bag = 1 per cubic yard (meter).
- Wet mixer drum with approximately 1/2 to 2/3 total batch water. Toss in Mix-Ready™ bags and mix at charging speed for at least one minute.
- Add cement and aggregate and remaining batch water. Continue mixing at charging speed for at least 5 minutes (7 minutes for pea gravel mixes).

MIXING TIPS

- Keep slump less than 5" (12.5 cm) and water content consistent among batches.
- Do not use with Calcium Chloride set-accelerator.
- Schedule loads for consistent mix times. Clean mixer thoroughly to prevent color carry-over.

JOBSITE TIPS

- Grade, compact and moisten subgrade thoroughly and evenly.
- Allow extra time for placement and finish work—finish evenly and with care.
- Do not over-trowel. Rotary, dry-broom or rough finishes usually cure more even-colored than smooth-trowelled finishes. Do not wet broom.
- Water added at job-site to mixer or pump will cause color to "pale"—keep additions to a bare minimum and consistent among loads.

CURING TIPS

- Cure colored concrete with Davis W-1000 Clear Cure & Seal or Color Seal II in a matching color.
- Do not use plastic sheets, water-curing or other curing products which can discolor. Wood contact can stain fresh concrete.

LIMITATION

Package and contents have not been tested for compatibility with every admixture or in all mix designs. Confirm compatibility with the concrete—mix and check a test pour before finalizing mix design. Field check mix characteristics throughout pour(s).

DAVIS COLORS

Made in U.S.A. by Davis Colors
Los Angeles, CA 90023 • (323) 269-7311
Beltsville, MD 20705 • (301) 210-3400

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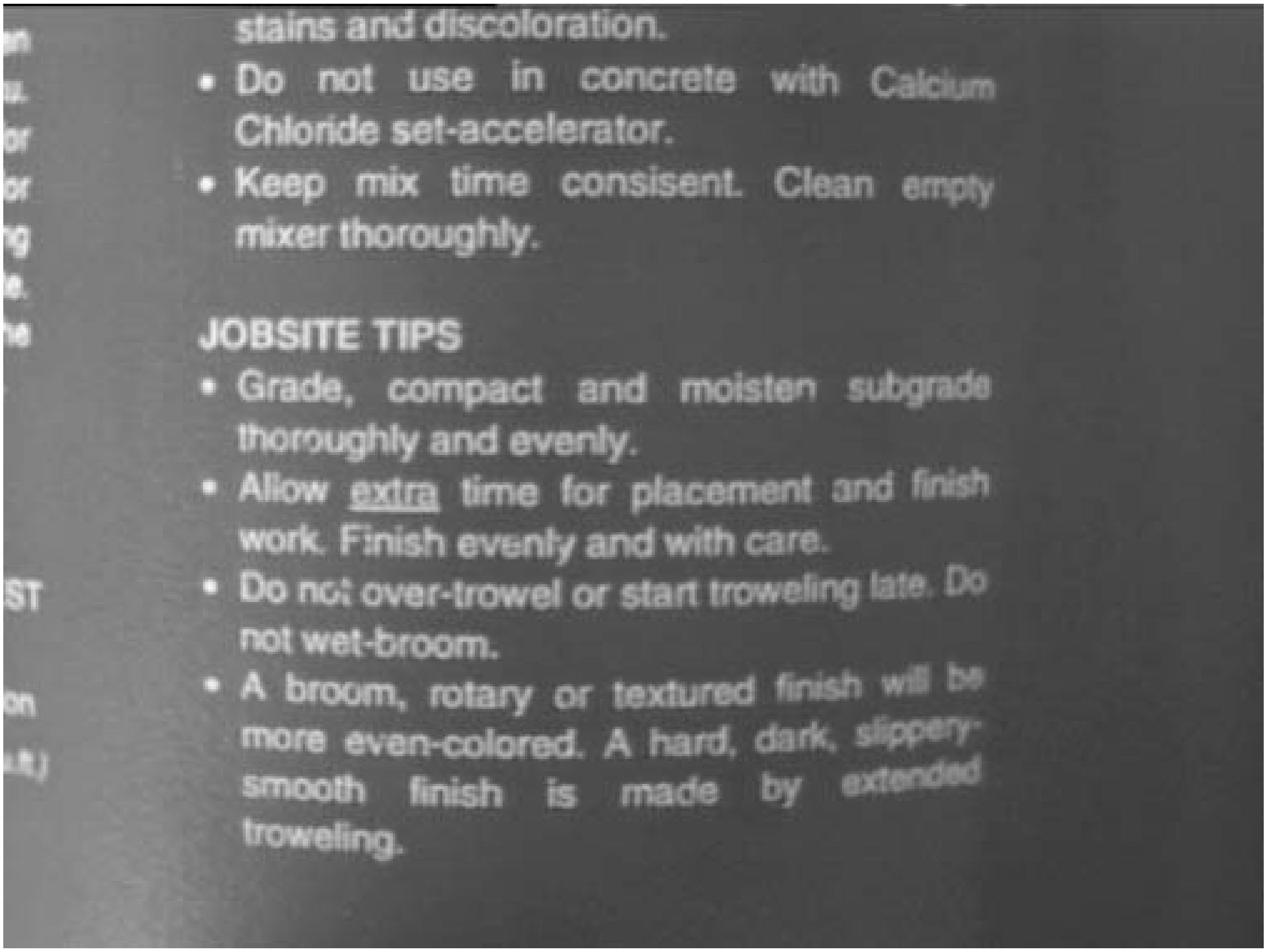
Hydrotint
LIQUID COLOR FOR CONCRETE, MORTAR & PLASTER
CO-MO-BLAK* / HYDROJET
D886
1 GALLON
MADE BY DAVIS COLORS
LOS ANGELES, CA • BELTSVILLE, MD
SHAKE OR STIR BEFORE USE • PROTECT FROM FREEZING
REPLACES TAMMS HYDRO COLORS



stains and discoloration.

- Do not use in concrete with Calcium Chloride set-accelerator.
- Keep mix time consisent. Clean empty mixer thoroughly.

JOBSITE TIPS

- Grade, compact and moisten subgrade thoroughly and evenly.
- Allow extra time for placement and finish work. Finish evenly and with care.
- Do not over-trowel or start troweling late. Do not wet-broom.
- A broom, rotary or textured finish will be more even-colored. A hard, dark, slippery-smooth finish is made by extended troweling.