

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2005
 DateRun: 08/04/2005
 Experimenters: Jason Marshall
 ClientType: Cleaner Manufacturer
 ProjectNumber: Project #1
 Substrates: Marble
 PartType: Coupon
 Contaminants: Calcium/lime
 Cleaning Methods: Immersion/Soak
 Analytical Methods: Gravimetric, Photography, Visual
 Purpose: To evaluate effect on marble substrate through overnight immersion.

Experimental Procedure: Several marble chips of similar size and shape were weighed to determine the baseline weight of each piece. The selected chips were then immersed in the two supplied products at full strength as well as a tap water bath and allowed to sit overnight. After soaking at room temperature for 18 hours, the marble chips were removed from the products and rinsed in a tap water spray at 120 F for 3 minutes to remove loose material from the chips. Then the chips were dried for 15 minutes using a Master Appliance Heat gun at 300 F. When the chips cooled to room temperature, final weights were recorded to determine weight loss, if any. Parts were then allowed to air dry for 72 hours and weighed again to determine if all the moisture had been removed from the chips. Observations were made and photographs were taken after the initial immersion of the chips into solutions (5 minutes), at 60 minutes and then following the overnight immersion.

Results: From visual observations the two supplied solutions appeared to effect the marble chips. During the soak, the two supplied solutions started to bubble. This bubbling was more vigorous after 60 minutes of soaking. The solutions overflowed the beaker overnight. Both solutions shifted from being transparent to opaque overnight. The water beaker had no signs of interacting with the marble. The photos of the beakers show the status at 5 minutes, 60 minutes and 18 hours. In addition to the beakers, there are photographs showing the baseline marble chips, the 18 hour soaks for DFC 23, DFC 30 and water. Both DFC 23 and DFC 30 resulted in more than 5% loss in weight after soaking. The water had an average loss of 0.06%. The extended drying time of 72 hours did not change the final weights of the marble chips. The table lists the initial weight, final weight and weight change for each marble chip soaked.

| Product | Initial wt | Final wt | % Wt loss |
|---------|------------|----------|-----------|
| DFC 23 | 22.5369 | 20.7137 | 8.09 |
| | 30.6078 | 28.7485 | 6.07 |
| | 22.7806 | 21.6803 | 4.83 |
| | 29.4623 | 27.5022 | 6.65 |
| DFC 30 | 23.8107 | 22.2973 | 6.36 |
| | 17.6874 | 16.6576 | 5.82 |
| | 30.6460 | 29.3322 | 4.29 |
| | 32.8858 | 31.2474 | 4.98 |
| Water | 16.5910 | 16.5813 | 0.06 |
| | 17.0030 | 16.9947 | 0.05 |
| | 12.3762 | 12.3675 | 0.07 |
| | 16.0933 | 16.0808 | 0.08 |

Summary:

| Substrates: | Marble | | | | |
|--------------------------------|---------------|--------|-------------|-------------------------------------|---------------------|
| Contaminants: | Calcium/lime | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Cogent Environmental Solutions | DFC 23 | 100 | 6.41 | <input checked="" type="checkbox"/> | Average weight loss |
| Cogent Environmental Solutions | DFC 30 | 100 | 5.36 | <input checked="" type="checkbox"/> | Average weight loss |
| Water | Water | 100 | 0.06 | <input type="checkbox"/> | Average weight loss |

Conclusion: The two DFC products decreased the weight of the marble chips by more than 5%, indicating dissolving of the calcium in the marble.