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SOMETIMES IT STICKS AND UNFORTUNATELY, SOMETIMES IT DOESN'T

By Bob Cusumano

The Emerald Arms is a large six story condominium building shown in photo 1. Exterior concrete floors had been previously coated with silicone acrylic floor stain. The stain was in relatively good condition with some areas showing a wear pattern. The reason for refinishing the floors at this time was because the building walls had been repainted and the color of the floors did not complement the new color scheme.

Photo 1

The specifications, written by a paint distributor, called for pressure cleaning of the walkways at 2,000 PSI, acid washing as required, and painting with one coat of an acrylic floor paint. As a note, the specified acid washing was unnecessary and does not improve the overall system. Acid washing is a method of etching bare concrete, but does not provide any mechanical adhesion on a painted surface.

A short time after the painting work was initiated, it was determined that the acrylic paint was not properly adhering to the existing coating in some areas. At that time, a product change was made to apply two coats of alkyd gloss enamel in lieu of the previously specified acrylic. One property of alkyds is that they tend to penetrate and bond as opposed to latex paints that tend to lay on the surface. A non-skid additive was to be incorporated into the paint. As the painting work was nearing completion, it was noted that there was already delamination of the floor paint at some locations so the Association's management decided that determination of the cause was necessary.

Observations made at the time of inspection revealed that most of the delamination occurred at areas of heavy traffic, including ground floor areas near stairs and the outer perimeter of ground floor walkways as shown in photo 2. Only a few isolated spots had failed on the upper floors of the building as shown in photo 3.

Photo 2

Photo 3

Adhesion tests were performed at all floor levels. At the ground floor the results varied greatly. Some areas, particularly near the edges of walkways were "poor", but the adhesion was found to generally be "good" adjacent to the building wall. At the other floors, the adhesion was found to be "good" at nearly all locations with just a few isolated spots having "fair" or "poor" ratings.

Concrete floors were also tested for moisture content. At the first floor, the readings were low at areas where the paint had delaminated and got progressively higher towards the wall of the building. The readings were also high at perimeter areas where the paint had not delaminated. At the second and third floors, most readings were relatively low, with a few spots somewhat higher.

Examination of the delaminated floor chips revealed that only the newly applied alkyd gloss enamel had delaminated. Previous coats had remained intact with good adhesion.

Let's discuss the possibilities that could cause this failure and examine each one. Potential causes of the peeling paint include incompatibility of the newly applied alkyd floor paint with the previously applied silicone acrylic floor stain, insufficient surface preparation, and delamination due to moisture.

The adhesion tests performed indicate that the “poor” adhesion had a pattern to it, that is, it was confined to first floor areas, particularly near the perimeter. If the cause of the delamination was incompatibility of the new paint with the existing, then poor adhesion should have been found not only the ground floor, but at the upper floors of the building as well. Therefore, we can eliminate incompatibility as the cause.

It is theoretically possible that the surface preparation performed at different areas varied and that contamination of the surface being finished could be the reason for the failure observed. Remember, however, the pattern of the failure. It provides important insight into the cause of a particular coating failure. It is very unlikely that poor surface preparation would only occur at certain ground floor areas and would not occur at the upper floors. Microscopic examination did not reveal any surface contaminants between the delaminated paint and the existing coating from which the paint delaminated. Therefore, we can eliminate contamination as the cause of failure.

Regarding moisture, it was found that at ground floor areas where the alkyd paint had delaminated, the readings were low and progressed to higher levels near the building wall. Some paints form a film that "breathes", thus allowing water vapor to pass through without affecting the bond to the substrate. Latex paints fall into this category. Other paints form films that "seal", and do not allow water vapor to pass through. These paints are more "waterproof", however, when moisture gets behind a paint film of this type, the moisture destroys the bond with its immediate substrate and peeling results. Alkyd paints fall into this category.

The cause of the paint delamination at the Emerald Arms was moisture migrating through the concrete walkway. The moisture could pass through the silicone acrylic stain, but was stopped at the alkyd/ stain interface. Because the moisture could not escape, delamination resulted. The moisture readings were low where the paint had peeled because the water was no longer trapped. Examination of the site indicated that there were sprinklers adjacent to ground floor walkways, a constant source of moisture. As is common, there was no vapor barrier beneath the concrete walks. pH testing on the rear of the delaminated paint chips yielded highly alkaline results, confirming moisture migration as the cause of the problem.

In this case, the change from a more breathable paint system to one that would not allow moisture to escape was the cause of the failure. Since the paint distributor provided the final product specifications, that entity should be responsible for the poor results. However, as we all painfully know, whenever a coating fails, the painting contractor will be involved in the solution.