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8211 Needles Drive, Palm Beach Gardens, Florida 33418

LESSON LEARNED

By Bob Cusumano

I really hate do this again, but I must. I know that some of you are going to say oh no, he's going to talk about doing adhesion tests again. Yes, afraid so. But until contractors start listening, I'll keep preaching about this simple test that can save you thousands of dollars. I just saw two new failures this week that could have been avoided with that simple test.

First, let's explain how to perform the test for those that are unfamiliar, and then we'll discuss these recent incidents. ASTM Test D3359 describes two methods whereby a painted surface is scribed with a sharp blade and the adhesion of the coating is then assessed. In Method A, incisions are made through the coating in an X cut. This method is used for coatings that exceed 5 mils in dry film thickness. For thinner coatings, Method B is used where incisions are made through the coating in a grid pattern. In both methods a particular adhesive tape of known and tested pull strength is firmly applied to the area and then removed in a prescribed manner. The adhesion of the coating is then evaluated by the amount of paint that is removed by comparing the rear of the tape to a pictorial standard where six individual ratings are available for each method.

For consulting purposes, the adhesion by tape test should be precisely performed using the prescribed materials. For painting contractors assessing their own work or surfaces they intend to paint, making an X cut with a razor blade, applying a strong masking tape and then sharply removing it will suffice. A pass or fail system can then be used to evaluate the results. Photo 1 shows a result that would definitely be termed a "failed" test.



Photo 1

The adhesion test will provide much more information than whether the paint you applied or the surface you are about to paint is sound. By examining the paint that is removed during the test and is attached to the tape you can determine how many layers or coats must be removed as a part of surface preparation. What you are doing when performing the test is identifying the weakest bond between any two layers of coating, or between the first coat of paint and the substrate, or the cohesive strength within any particular layer of paint. This determination is an indication of how much coating should be removed as a part of surface preparation.

Although the adhesion test performed above identifies the weakest bond, it does not follow that any coats not removed by the test are properly adhered. A second test should be performed at the same location to determine if additional paint is removed. If the second test “passes”, then you now have a sound surface for painting. If the second test “fails”, then successive adhesion tests should be performed until a passing grade is achieved. It should be noted that surface chalk will interfere with the performance of adhesion by tape tests and must be removed prior to testing to obtain valid results.

Now let's discuss the two incidents where the use of this test could have saved a lot of extra work and money. In the first case, a painting contractor repainted the ceiling of a large parking garage. The contractor pressure cleaned and applied an acrylic top coat. During the warranty period, extensive peeling occurred and the contractor provided paint chips for analysis. It was determined that the delaminated paint chips ranged from 20 mils to 50 mils thickness. Since the paint applied by the contractor would only have a thickness of 2 to 3 mils, it was evident that the newly applied paint was well adhered to the existing paint, but existing paint has delaminated with the new paint attached. There was heavy chalk found at the rear of all of the delaminated chips. Also the rear surface of the chips was very rough and contained many pinholes and craters. This was an indication that the delamination has occurred as a result of a cohesion failure within one of the original coats of paint. As paints age, they become brittle and lose their film strength. As more and more coats are applied, the weight and stress increase. When the stress exceeds the lowest bond strength between coats or the lowest cohesive bond within a coat, then delamination occurs. It was recommended that all of the poorly or marginally adhered coating be removed by high pressure water cleaning and that repainting be performed by priming with a penetrating masonry conditioner and then applying a top coat of latex paint.



Photo 2

Within six months of repainting, additional peeling of paint was evident (photo 2). This time the analysis included a site inspection. It was determined that some of the delaminating paint chips measured 20 or more mils, indicating that these were areas where the pressure cleaning performed was not aggressive enough to remove all of the marginally adhered existing paint. However, at other locations the delaminated chips only measured 2 to 3 mils, indicating that only the new paint peeled. Again, there was heavy chalk on the rear of all of the delaminated chips and in all instances a white paint remained on the concrete. A black cloth was repeatedly wiped against the now exposed white paint and each time a significant amount of chalk was transferred to the cloth. What had happened? The base coat of paint was so badly degraded that it was “dusting”. When chips were removed and measured with a microscope, it was determined that the chalk was 8 to 10 mils thick! Penetrating masonry conditioner will only penetrate a mil or two and therefore could not satisfy this thick chalk level. It was like trying to paint a beach!

The second incident involves painting the exterior of a four story condominium with elastomeric coating. The specifications stated that all loose existing coating was to be removed by pressure cleaning with a minimum of 3,000 PSI. The contractor pressure cleaned the building with some existing coating being removed. The specified masonry conditioner had been discontinued, so the contractor thinned some of the finish coat, supposedly at a paint salesman’s suggestion, to use as a primer where chalky. When the building was ready for a final inspection, spontaneous peeling had already begun. Adhesion tests were then performed and they revealed that there was poor coating adhesion at most areas of the building. It was recommended that the painting contractor pressure cleaned the exterior of the building again using a turbo tip. Photos 3 and 4 show that a majority of the newly applied elastomeric coating was removed. The building had to be primed and refinished; definitely not good for the contractor’s wallet!



Photo 3



Photo 4

Two mistakes were made here. First, the pressure cleaning originally performed was not aggressive enough to remove poorly and marginally adhered existing paint. It was more of a wash down. Second, the thinned down elastomeric coating was an improper primer because it does not penetrate through any surface chalk to provide a sound base for the final coat.

The moral of the story is that both of these failures could have been avoided if a few simple adhesion tests had been performed on test areas. The results would have indicated that the preparation and priming performed did not provide satisfactory results. A razor blade and tape; that simple test could have saved thousands of dollars.