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OUTSMARTING YOURSELF

By Bob Cusumano

This month's case history is an example of what problems can occur when you get creative with a project's painting specifications.

A new facility for the maintenance of school buses was recently built in a south Florida city. As a part of the building construction, interior exposed galvanized metal ceilings and related structural steel and metal piping were to be painted. Section 09900 Painting of the project specifications, states that metal surfaces are to be washed and pretreated as required prior to painting. The specification further states that the spray application of paint is prohibited. The painting schedule for interior galvanized metal states that these surfaces are to be primed with one coat of galvanized metal primer and finished with two coats of high gloss latex enamel. The shop primer on ferrous metal surfaces was to be touched up where bare or damaged and these surfaces were then to be painted with two coats of high gloss latex enamel.

After the job was bid and contracted, the paint manufacturer made a product submittal on behalf of the painting contractor for the project. The paint system proposed for use was generically equal to the products specified and were subsequently approved by the project architect. Within six months of completion of the painting, it was noted that paint began to delaminate from metal ceiling areas and we were asked to assess the overall condition of the painted ceilings and determine the cause of the peeling paint.

A visual inspection of the painted ceilings revealed that the paint was peeling from galvanized metal ceiling decks (photo #1) and galvanized metal pipes (photo #2), but not from primed steel joists (photo #3).



Photo 1



Photo 2



Photo 3

Adhesion tests were performed on randomly selected surfaces in general accordance with ASTM D3359, Adhesion by Tape Test, Method A. Incisions were made through the coating in an X pattern. Permacell adhesive tape was firmly applied to the area and then sharply removed. The adhesion of the coating was then evaluated by the amount of paint that was removed. The adhesion was found to be "poor" on galvanized metal ceiling decks and galvanized metal pipes and "good" on primed steel joists. Delamination occurred back to bare metal surfaces. The adhesion tests confirmed the visual observations previously noted.

The thickness of the delaminated paint that delaminated during the adhesion tests was measured using an electronic coating thickness gauge and a polished steel plate. The thickness of the delaminated paint ranged from 6.5 to 11.2 mils.

The paint chips were then examined using an ultraviolet light. Under this type of examination, the presence of petroleum oil or grease is identified by its "shine". No oil was detected on the rear of the delaminated paint. Had oil been present, it could have compromised adhesion.

The paint chips were then visually examined using a stereo zoom microscope. No contamination was noted on the rear of the delaminated paint. From examination of the face of the paint chips, it is evident that the paint was spray applied. Photo #4 is a view at 60X magnification. The round, rough appearance is typical of the spray application of a dry fall paint. Observation of a cross section of the paint indicates that there is only one paint product throughout; that is, individual prime and finish coats could not be discerned.

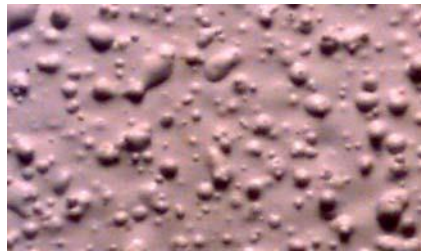


Photo 4

The determination between alkyd and latex paint was made by subjecting paint chips to denatured alcohol and xylene. Latexes and traditional acrylics are easily softened and dissolved, while alkyds are relatively unaffected by these solvent. None of the paint chips from the deck or the pipes showed any softening. This indicates that the applied paint is not a latex. The chips were then immersed in methyl ethyl ketone (MEK). All of the paint chips softened and partially dissolved. This indicates that the applied paint on these surfaces was an alkyd, rather than catalyzed epoxy or urethane.

Based on our observations and testing, the paint applied to the exposed metal ceiling surfaces at the bus maintenance facility was an alkyd dry fall product. It is further our opinion that no primer was applied. When a traditional alkyd paint is applied directly to a galvanized surface, then a failure known as saponification is likely. Saponification occurs when the alkyd resin is

chemically attacked. Because the steel joists are ferrous rather than galvanized and factory primed rather than bare, the alkyd dry fall is well adhered to these surfaces.

Had a galvanized primer been applied to the galvanized ceiling deck and pipe surfaces, as specified by both the architect and the paint manufacturer, then the delamination from these surfaces would not have occurred. Unfortunately, the painting contractor tried to save a few bucks by applying an alkyd dry fall directly to these surfaces.

While the architect was unreasonable by stating that "no spray painting was allowed", the painting contractor made a huge mistake by ignoring to apply the specified products. Both the architect and the paint manufacturer made a "proper" paint specification. In this instance, the painting contractor unilaterally elected to apply an alkyd dry fall directly to galvanized metal, which was doomed to fail.

Now let's look at the remedial options available, keeping in mind that the facility is now open and must remain so when the work is performed. Obviously, all of the existing paint must be removed from the galvanized ceiling deck and pipes. Potential remedial measures available to the painting contractor include:

1. Hand scraping and/or power tool cleaning - these methods are impractical due to the large size of the ceiling, would be slow and the result in a high labor cost.
2. High pressure water blasting- this method is impractical because there are finished office spaces immediately below failing ceiling surfaces that would be damaged by water intrusion from above and would require extensive cover up.
3. Chemically stripping- this method would be both messy and expensive.
4. Abrasive blasting- must use an abrasive like plastic pellets that will not damage or remove the galvanizing.

All of these options will be expensive for the unfortunate, but foolish, painting contractor on this project. Trying to save a dime in this instance, cost a lot of dollars.