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PEELING CEILING

By Bob Cusumano

Painting galvanized decks can be a tricky proposition. There are various pre-treatments that can interfere with the adhesion of subsequently applied paint. However, this month's case history is an example of what problems can occur when the painting contractor fails to adhere to the project specifications.

A new high school gymnasium facility was recently in a built in a mid western community. As a part of the building construction, interior exposed galvanized metal ceilings and related structural steel and metal piping were to be painted. According to the painting section of the specifications, galvanized metal surfaces were 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. The specifications further indicated that no spray painting was allowed.

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.

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 by tape tests were performed on the various ceiling surfaces. 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, even at locations where no delamination was visible. However, the adhesion was found to be "good" on primed steel joists. Where the paint delaminated on the galvanized steel, it did so to bare metal surfaces.

The delaminated paint chips were 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, contrary to the project specifications. Photo #4 is a view at 60X magnification. The round, rough appearance is typical of the spray application of a dryfall 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 and therefore no primer was applied in accordance with the contract requirements.

Photo 5

Solvent tests were performed to indicate the generic nature of the applied paint. 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 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 most likely an alkyd, rather than catalyzed coating like an epoxy or urethane.

Infrared spectroscopy confirmed that the paint that had been applied to the exposed metal ceiling surfaces at the gymnasium facility was an alkyd dry fall product. This was contrary to both the painting specifications and the paint submittal made by the paint manufacturer. Unfortunately, when alkyd paint is applied directly to a galvanized surface, then a failure known as saponification will occur. Saponification is a chemical degradation of the alkyd resin in the paint.

Because the steel joists are ferrous metal or steel rather than galvanized and factory primed rather than bare, the alkyd dry fall did not saponify and 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 and had to pay the consequence.

The architect was certainly unreasonable by stating that "no spray painting was allowed". However, the painting contractor should have objected during the bid process and made appropriate clarifications to the contract. But the biggest mistake that the painting contractor made was failing to apply the specified products. The paint he applied was doomed to fail.

Unfortunately for the painting contractor, all of the options for remedial action are costly. All of the paint applied to the galvanized deck, ducts and other surfaces must be removed as applying additional paint on top will only further compromise the adhesion. The options available include 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 hand scraping, power tool cleaning, chemical stripping, and abrasive blasting. All of these options are expensive either due to the low production rates achieved or the extensive cover up of finished floors, walls, and other surfaces that must be accomplished.

Learn a lesson from this painting contractor. Sometimes when you attempt to save your self a few dollars, you may cost yourself thousands!