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Report on Testing Five Coatings for Direct Application to Aged Fences

Background:

Alco Fence Company of West Virginia, Inc. sells two products, Vinco, and Low-VOC Vinco for the painting of aged, rusty fences. The low-VOC formulation meets California's architectural regulation for which the VOC content is 2.04 lbs/gal (245 g/L). The purpose of this study was to evaluate the Vinco coatings against two nationally reputable coatings that might be used for similar purposes. The competitive coatings were purchased from Sherwin-Williams and Rust-Oleum, respectively.

At the outset it was understood that when the Vinco products are used, they are generally applied to rusty steel or old, aged galvanized fence surfaces that are not prepared prior to paint application. Vinco and Low-VOC Vinco are not intended for application directly to new galvanized surfaces.

Methodology:

All four coatings were evaluated by a series of standard industrial test methods. They were tested in accordance with Method ASTM B117 Salt Spray for Corrosion Resistance, ASTM D3359 Adhesion Tape Test, Dry, and FTMS 141C Method 6301 Wet Adhesion test.

- Panels and Surface Preparation
Two panels each of cold rolled steel (CRS) and two panels each of cold rolled steel treated with Zinc Phosphate (Zn Phos.) were prepared in accordance with ASTM-B117.
- Coatings Tested
Coatings are identified as:
 - #1 Vinco Low VOC
 - #2 Vinco
 - #3 Sherwin Williams ASE Oil Gloss Black
 - #4 Rust-Oleum Exterior Enamel - Black

All of the coatings were of the same resin type; solvent-based alkyd and all were black.

The Sherwin-Williams ASE Oil Gloss Black, and the Rust-Oleum Exterior Enamel coatings were selected for evaluation against the Vinco coatings as good representation of quality exterior enamels available and manufactured by nationally known companies.

- Application of Coatings
All coatings were spray applied according to their manufacturers' recommendations using a conventional air atomizing spray gun.
- Quality Control of Panels
After the coatings were applied they were allowed to dry and cure for 96 hours, after which dry film thickness was measured using a Positector® dry film thickness gauge. Every effort was made to achieve approximately the same film thickness for all coatings.
- Exposure to Salt Spray
After 96 hours of conditioning at ambient conditions the panels were placed into a salt spray cabinet in accordance with ASTM B117.

Edges were sealed with black vinyl tape, and a vertical scribe line in the coating was scored to expose the underlying metal substrate. Panels were inspected almost daily, but results were recorded after 72 hrs and at 168 hrs exposure.

At the conclusion of the first 168 hours both the Sherwin-Williams and the Rust-Oleum products had failed, but the two Vinco paints were still in good condition. Therefore, they were exposed for another 312 hours to a total of 480 hours.

- Adhesion Testing
The coatings' adhesion properties to the metal substrate were determined in accordance with ASTM D3359 Method B, "Adhesion tape test dry", and in accordance with FTMS 141C Method 6301 wet adhesion test.
- Evaluation of Blistering
Blistering was evaluated per ASTM Method D714 "Test Method for Evaluating the Degree of Blistering of Paints". Blisters with a rating of #2 are large; blisters with a rating of #4 are medium, those with a rating of #6 are small, and those with a rating of #8 are the size of a pin head.

In addition, blisters are rated as few, medium, medium dense and dense.

Results

Table #1 summarizes the results of the tests for all of the panels.

TABLE #1

| Coating ID | Panel Type | Dry Film Thickness (mils) | ASTM B117 Salt Spray 72 Hours | ASTM B117 Salt Spray 168 Hours | ASTM D3359 Method B Tape Test, Dry | FTMS 141C Method 6301.2 Wet Adhesion |
|---|--------------|---------------------------|------------------------------------|---|------------------------------------|--------------------------------------|
| Low VOC Vinco | CRS | 1.4 | Rust at score. | Rust at score. | Pass | N.E |
| | CRS | 1.4 | Rust at score. | Rust at score. | Pass | Pass |
| | Zn Phosphate | 1.4 | Rust at score. | Rust at score. No blisters 1/8" Undercut | Pass | Pass |
| | Zn Phosphate | 1.3 | Rust at score. | Rust at score. | Pass | Pass |
| | | | | | | |
| Vinco | CRS | 1.3 | Rust at score. | Rust at score. | Pass | Pass |
| | CRS | 1.4 | Rust at score. | Rust at score. | Pass | Pass |
| | | | | | | |
| | Zn Phosphate | 1.2 | Rust at score. | Rust at score. No blisters 1/8" Undercut | Pass | Pass |
| | Zn Phosphate | 1.2 | Rust at score. | Rust at score. | Pass | Pass |
| Sherwin-Williams ASE Oil Gloss Black | CRS | 1.3 | Heavy rust at score. 3/8" Undercut | Coating lifts at score. Heavy dense blisters. | Pass | Failed |
| | CRS | 1.3 | Heavy rust at score. 3/8" Undercut | Coating lifts at score. Heavy dense blisters. | Pass | Pass |
| | | | | | | |
| | Zn Phosphate | 1.3 | Rust at score. 1/8" Undercut. | Rust at score. 1/8" Undercut | Pass | Pass |
| | Zn Phosphate | 1.2 | Rust at score. 1/8" Undercut | Rust at score. 1/8" Undercut | Pass | Pass |

| Coating ID | Panel Type | Dry Film Thickness (mils) | ASTM B117 Salt Spray 72 Hours | ASTM B117 Salt Spray 168 Hours | ASTM D3359 Method B Tape Test, Dry | FTMS 141C Method 6301.2 Wet Adhesion |
|------------------------------------|--------------|---------------------------|------------------------------------|---|------------------------------------|--------------------------------------|
| Rust-Oleum Exterior Enamel - Black | CRS | 1.3 | Heavy rust at score. 1/4" Undercut | Coating lifts at score. Heavy dense blisters. | Pass | Failed |
| | CRS | 1.3 | Heavy rust at score. 1/4" Undercut | Coating lifts at score. Heavy dense blisters. | Pass | Failed |
| | | | | | | |
| | Zn Phosphate | 1.3 | Rust at score. 1/8" Undercut | Rust at score. 1/8" Undercut | Pass | Pass |
| | Zn Phosphate | 1.3 | Rust at score. 1/8" Undercut | Rust at score. 1/8" Undercut | Pass | Pass |

After the Sherwin-Williams and Rust-Oleum panels were removed from salt spray because of their poorer performance on cold rolled steel (CRS), the two Vinco products were allowed to remain in the cabinet for an additional 312 hours. The results at the end of this time are given in Table #2.

Table 2

| Coating | Cold Rolled Steel | Zinc Phosphated Steel |
|---------|---|--|
| Low-VOC | A few blisters, Size #2 with 1/4" undercut at score line. Coating lifted from 30% of panel surface. | No blisters – 1/8" undercut at score line. |
| Vinco | A few blisters, Size #2- with 1/3" under cut at score line. Coating lifted from 25% of panel surface. | A few blisters – Size #6 with 1/8" undercut at score line. |

Discussion of Results – 168 hours Salt Spray

Salt Spray Resistance

- On CRS panels, none of the Vinco coatings showed any blistering. The only corrosion was with within the score itself, which is understandable because the CRS panels were not protected with a conversion coating, such as an iron or zinc phosphate. On the other hand, the Vinco coatings were formulated to include fairly significant concentrations of zinc chromate corrosion inhibitor, and hence there was no undercutting of rust on the edges of the score.

- On the zinc phosphated panels there no more than 1/8” undercutting took place, and none of the panels showed signs of blistering.
- On the CRS panel the Sherwin-Williams coating showed considerably more corrosion at the score while on the zinc phosphate panel (72 hours) the performance was comparable to that of the Vinco coatings. However, after 168 hours the Sherwin-Williams coating exhibited both dense blisters and lifting (on the CRS panel) but no additional degradation on the zinc phosphate panel.
- The Rust-Oleum coating performed very much like the Sherwin-Williams coating on both the CRS and zinc phosphate panels, except that on the CRS panel at 168 hours the coating had blistered badly.

Adhesion (Dry and Wet)

- The two Vinco coatings performed well on all panels.
- The Sherwin-Williams coating failed the wet adhesion test on the CRS panel, but passed on the zinc phosphate panel.
- Results for the Rust-Oleum coating were the same as for the Sherwin-Williams coating.

Discussion of Results – 480 hours Salt Spray

Salt Spray Resistance

- After 480 hours of salt spray all of the CRS panels that were coated with Vinco had failed.
- On the zinc phosphated panels the Vinco coatings withstood salt spray extremely well and had not deteriorated significantly from their 168 hour values. In fact, Low VOC Vinco showed no deterioration.

Conclusions

Based on the results of these salt spray tests the corrosion resistant properties of the Vinco coatings proved to be superior to remaining two coatings. This is understandable. The Vinco products were formulated by adding significant amounts of corrosion inhibitors specifically so that they can be applied directly over rusty or aged tennis court fences. When formulating these products it was understood that they will be applied without the use of a primer.

Both the Sherwin-Williams and Rust-Oleum coatings are high quality solvent-based alkyd enamels. Generally, we would expect that they are applied as topcoats, and not as “self-priming” topcoats. However, where corrosion resistance is required a corrosion resistant primer is usually recommended.

Since the Vinco coatings were formulated to be applied directly to the metal substrate it is understandable that in the wet adhesion tests they performed better than the competitive products.

While the Sherwin-Williams and Rust-Oleum paints failed after 168 hours on CRS, the Low VOC Vinco performed extremely well even up to 480 hours. We failed the Low VOC Vinco at the end of this period because of the blisters and lifting.

Based on the results of these tests, we estimate that the Vinco and Low VOC Vinco performed approximately 50% better than its competitive products.

Cordially yours,

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