

Testing Results for MOIST METAL GRIP Coating After 1000, 2000, and 5000 Hours of Exposure in Ultraviolet and Salt-Spray Chambers

Prepared for

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Contents

Section	Page
1 Introduction	1
2 Testing Data and Results.....	1
3 Conclusions.....	3
4 References.....	4

Figure

Figure	Page
1 Images of the Three MOIST METAL GRIP Coupons After (a) 1000, (b) 2000, and (c) 5000 Hours of Exposure	2

Table

Table	Page
1 Ratings of the Coupons After 1000, 2000, and 5000 Hours of Exposure	3

1 Introduction

This report documents testing data and results of coupons coated with MOIST METAL GRIP coating after 1000, 2000, and 5000 hours of exposure. The average dry film thickness of the coating on the coupons was 6 mils (150 μm). The coated coupons have been exposed to the ultraviolet (UV) radiation and a salt solution for up to 5000 hours (30 weeks). The testing has been conducted according to ASTM D5894, Standard Practice for Cyclic Salt Fog/ UV Exposure of Painted Metal. This test is used to provide realistic test conditions to evaluate the outdoor corrosion of painted metal, including the synergistic effects of multiple factors including condensation, UV exposure, wet/dry cycling, and temperature cycling. The results of this test can be used to assess corrosion performance of coatings subjected to outdoor environmental conditions.

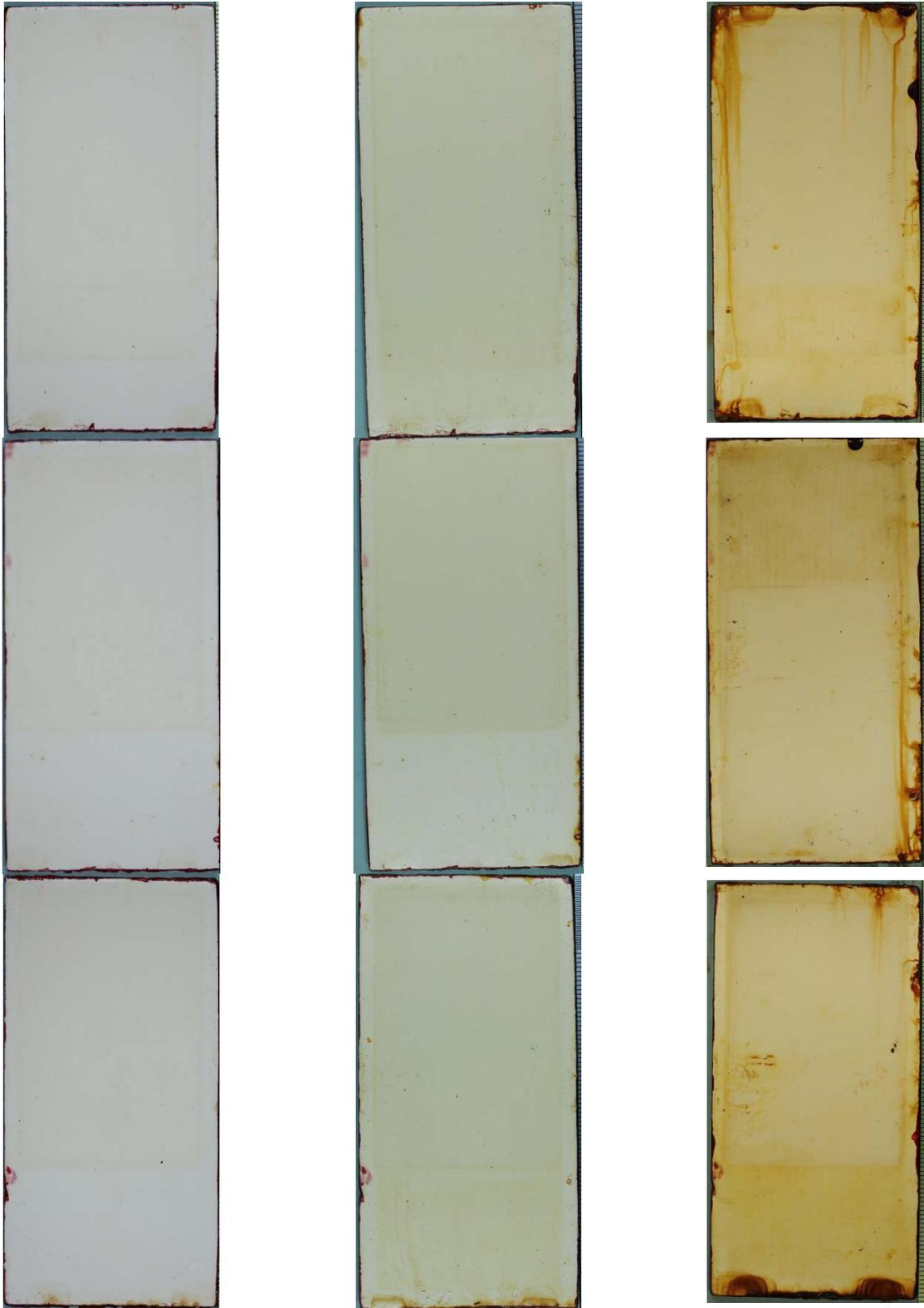
The testing was conducted in two week increment which consists of one week of UV exposure and one week of salt fog exposure. For each two week increment, the testing was conducted according to the following procedure. The testing started with fluorescent UV-Condensation exposure, per Section 8.1 of ASTM D5894. Southwest Research Institute[®] (SwRI[®]) placed three coupons for the coating type in UV-Condensation exposure chamber (here after called UV chamber). The coupons were placed in coupon holders that exposed a part of the coated surfaces of the coupons to the UV light. The coupons were exposed to the UV conditions for 4 hours followed by a 4-hour condensation period. The coupons were exposed for a total of 168 hours (1 week) in this UV chamber. Following UV exposure, the coupons were transferred to the salt spray chamber. The salt fog-dry exposure was conducted in accordance with Section 8.2 of ASTM D5894. The coupons are placed a coupon holder which directly exposed the coupons surfaces to the salt solution which is sprayed on the coupons. The coupons were exposed to a 1 hour fog cycle followed by a 1 hour dry cycle. The salt solution, as per ASTM D5894, consisted of 0.05 percent sodium chloride and 0.35 percent ammonium sulfate by mass. The coupons were exposed to the cyclic salt spray-dry conditions for a total of 168 hours (one week). The two week increment was repeated for 30 weeks.

2 Testing Data and Results

The testing data is presented in form of coupons images after 1000, 2000, and 5000 hours (6, 12, and 30 weeks) of exposure. Images of the coupons are presented in Figures 1. The testing data is analyzed to determine the blistering and degree of rusting on the coupons.

As seen in Figure 1, the coupons shows no signs of blistering after 1000, 2000, and 5000 hours of exposure throughout their surfaces. The coating pass according to ASTM D714-02 because of no signs of blistering.

The UV exposure does not cause any perceptible discoloration and it does not affect its corrosion performance. This is determined through Figure 1 which shows barely-visible signs of discoloration in the coupons after 1000, 2000, and 5000 hours of exposure. In the UV chamber, the coupons' surfaces are only partially exposed to the UV radiation. If there was any effect of UV radiation, it would produce a marked change in coating color and can be distinguished by two shades on a coupon surface. There are two shades of coating color on the coupons, however, the two shades are barely visible in Figure 1. The UV exposure does not affect corrosion resistance performance of the coating. This effect is evaluated next.



(a) 1000 Hours

(b) 2000 Hours

(c) 5000 Hours

Figure 1. Images of the Three MOIST METAL GRIP Coupons After (a) 1000, (b) 2000, and (c) 5000 Hours of Exposure

The coating does not show any marked change in rusting where discoloration due to UV exposure has occurred. This proves that UV exposure does not affect the corrosion resistance performance of the coating.

The degree of rusting on the three coupons is evaluated in accordance with ASTM D610–08. None of the three coupons show any signs of rusting. As per ASTM D610–08, if the rusting surface area is less than 0.01 percent, the coupons are rated 10. Therefore, the coupons are rated 10. The rating data is summarized in Table 1.

The coupons were also examined microscopically. The microscopic examination of the coupons indicated that rusting did not occur even at the locations of coating defects. One might notice few yellowish-red spots on the coupons. The spots are due to the paint solution which was applied on the edges of the coupons to protect them from the edge effects. The applied paint solution is red in color, and its leachate due to its interaction with the salt solution is yellowish red. Overtime, the paint releases the leachate due to its chemical interaction with the salt solution. The solution spreads over the surface and produces yellowish red spots.

Table 1. Ratings of the Coupons After 1000, 2000, and 5000 Hours of Exposure		
Exposure Time (hours)	Rating of the Three Coupons as Per ASTM D610-08	Notes
1000	10, 10, and 10	As per ASTM D610-08, up to 0.01 percent rusting on the coupons with rust grade 10. However, no visible signs of rusting are notices on any of the three coupons.
2000	10, 10, and 10	
5000	10, 10, and 10	

3 Conclusions

Three coupons coated with MOIST METAL GRIP coating were tested according to ASTM D5894 for 5000 hours of exposure. The average dry film thickness of the coating on the coupons was 6 mils (150 µm).

The coating shows no signs of blistering after 1000, 2000, and 5000 hours of exposure.

The UV radiation causes imperceptible discoloration of the coating, and does not affect its corrosion resistance performance.

The coating shows no signs of rusting even after 5000 hours of exposure. It was also determined that corrosion did not occur even at the coating defect locations. All three coupons are rated 10 as per ASTM D610-08. This indicates that the coating has excellent corrosion resistance characteristics.

4 References

ASTM International. ASTM D5894 – 10, “Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet).” West Conshohocken, Pennsylvania: ASTM International. 2010.

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