

**Testing Results for SUPER THERM Coating After
1000, 2000, and 5000 Hours of Exposure in Ultraviolet
and Salt-Spray Chambers**

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October 2013



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1 Introduction

This report documents testing data and results of coupons coated with SUPER THERM coating after 1000, 2000, and 5000 hours of exposure. Superior Products International II, Inc. states that SUPER THERM is water-based coating. The SUPER THERM 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 coupon.

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

The UV exposure does not cause any discoloration in the coating. This is determined through Figure 1 which shows no visible signs of discoloration in the coupons after 1000, 2000, and 5000 hours of exposure. In the UV chamber, the coupon surface is only partially exposed to the UV radiation. If there was any effect of UV radiation on the coating, it would produce a marked change in coating color and can be distinguished by two shades on a coupon surface. An absence of any discoloration on the coupon surface clearly indicate that UV radiation does not affect the coating. One might argue that there is lot of rusting on the coupon surface, and it may be due to UV exposure. The rusting is not due to UV exposure because it is spread through the coupons' surfaces. In fact, the rusting is due to spray of the salt solution which is corrosive, and this rusting effect is evaluated next.



(a) 1000 Hours

(b) 2000 Hours

(c) 5000 Hours

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

The degree of rusting on the three coupons is evaluated in accordance with ASTM D610–08. The coupons show varying degrees of rusting with exposure time. After 1000 hours of exposure, the coupons show pinpoint rusting with rust grade 7-P. This rating means that 0.3 percent of the coupon surface has rusted. After 2000 hours of exposure, the degree of rusting has considerably increased compared to the 1000 hours of exposure. The coupons show both general and pin point rusting after 2000 hours of exposure. The degree of rusting is rust grade 5-G plus 5-P as per ASTM D610–08 after 2000 hours of exposure. This rating indicate that approximately 3-6 percent of the coupons' surfaces have rusted. After 5000 hours of exposure, the degree of rusting has increased to a point that original coating color, as seen in Figure 1(a), is no longer visible. The coupons show both general and pin point rusting after 5000 hours of exposure. The degree of rusting is rust grade 4-G plus 4-P as per ASTM D610–08 after 5000 hours of exposure. This rating indicate that approximately 10-20 percent of the coupons' surfaces have rusted. These results are summarized in Table 1.

Exposure Time (hours)	Rating as Per ASTM D610-08	Notes
1000	7-P	0.3 percent rusting
2000	5-G plus 5-P	3-6 percent rusting
5000	4-G plus 4-P	10-20 percent rusting

3 Conclusions

SUPER THERM coating show no signs of blistering after 1000, 2000, and 5000 hours of exposure. The coating is not affected by UV radiation. However, the coating shows extensive rusting due to exposure to the salt solution. Since SUPER THERM is a water-based coating, its corrosion performance is consistent with its formulation.

The testing results indicate that this coating will perform well in the dry conditions where limited rainfall occurs annually. This coating can be used as a topcoat which is exposed to the environment. It is suggested that a primer over metal should be used before applying SUPER THERM as a topcoat. This will improve corrosion protection of the metal surface where SUPER THERM is applied as the topcoat.

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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