



PENCE CORROSION SERVICES, LLC

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A Veteran Owned Small Business

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Mr. John Griffin, President, Grace Distributing, Inc.

Subject: Condition report, tank barge Margaret Belle

Background: On Thursday, November 21, 2016, John M. Pence of Pence Corrosion Services (PCS) accompanied Mr. John Griffin and Royal Shore of Grace Distributing to assess the condition of the subject vessel. The barge was moored in the brackish waters of the Cooper River outside of Bushy Park, SC. The bow and starboard side were available for close inspection. About half of the portside was viewable and the underwater hull was inaccessible.

The Margaret Belle is reported to be 31 years old and has been in marine service for many years.

NOTE: PCS was not present for surface preparation or coating application. All references to the products and processes utilized were derived from reports acquired from Grace Distributing and Stevens Shipyard.

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Surface preparation was reported to be accomplished by fresh water pressure washing to minimize soluble salt contaminants followed by slurry blasting (coal slag and water) in accordance with SSPC-SP7 / NACE 4, "Brush-off blast cleaning" with spot blasting of heavily corroded areas to a "Near White Metal" blast in accordance with SSPC-SP10 / NACE 2. Areas of "tight" old coating material were allowed to remain. The coating system on the barge has been in service for five (5) years and ten (10) months since dry docking took place and at the time of condition assessment.

Coating System: Subsequent to surface preparation, two (2) coats of Lifeguard Active Rust Primer were applied to all prepared steel surfaces on successive days. Primer was applied at 1.5 – 2.0 mils dry film thickness (DFT) per coat. Finish coats of a commercially available, high build, polyamide epoxy coal tar material were then applied at 8.0 – 10.0 mils DFT per coat.

Instrumentation & Calibration: Coating Dry Film Thickness Gage, Positector 6000 F-1 (Model), Serial Number 21730. Calibrated on 22 August, 2013 to manufacturer's specifications according to procedure MP 2530 using DeFelsko Standards @ .010" and .020". 5X Flash Magnifier, Textex micrometer, serial no. 208508.

Visual Observations: Observations will refer to photographs listed in Appendix A and numbered MB-1 through MB-20. Some photos from an August 20, 2013 inspection are included for comparison purposes. Note that the finish coats are black in color. Photographs may appear gray due to weathering, chalking and streaking in some areas.

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Discussion & Conclusions: Upon arrival at the mooring area, we first observed the condition of the starboard side of the barge. The vast majority of the coated surfaces were observed to be in very good condition. As previously noted, typical chalking and fading of the epoxy coal tar was evident in all areas subject to heavy UV exposure. Initial observations revealed areas of “micro-cracking” (MB 2, 3, 5, 6). Evidence of mechanical damage from typical barge rubbing was noted. Areas of physical damage have exacerbated the rate of corrosion in those areas. A number of damaged areas revealed the old coating, which was allowed to remain, has begun to lose adhesion. Note that the old coating was not applied over the Lifeguard primer. Some of the micro-cracking of the finish coats referenced above was likely caused initially by impact in service (MB-2, 3, 5, 6). The barge has been moored in-place for the last five years and the cracking that was slightly evident in 2013 is now much more pronounced. MB-4 shows an overall view of the starboard side of the barge with the coating system largely intact. A comparison of photos MB-5 from 2016 and 2013 shows the progression of surface cracks in the coal tar epoxy. Photos MB-7 from 2016 and 2013 depict a slow progression of corrosion in blisters caused by mechanical damage to the substrate. Photos MB-8 show the general good condition of the majority of the starboard surfaces including the welds. MB-9 shows additional blistering near the waterline of the barge. MB-10 has further mechanical or physical damage to the top rail of the barge. Note that the corrosion is localized with no undercutting evident. It is also noteworthy that the starboard side, which is exposed to much greater UV levels, has significantly more cracking and deterioration than does the portside.

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The bow area of the barge, while exhibiting heavy “streaking” due to water runoff, was also found to be in very good condition with no evidence of failure or premature corrosion (MB-12 and 13). The comparison from 2013 to 2016 revealed virtually no deterioration over that time period.

Photos MB-11 show heavy surface pitting. No evidence of any corrosion was found in these pitted areas attesting to excellent penetration of barrier properties of the Lifeguard primer.

The port side was only partially accessible due to the mooring position. Photos MB-14, 15, 18, 19 and 20 display a mostly intact coating system on the portside. Some mechanical damage was evident, but the overall condition is very good.

Several DFT readings were taken ranging from 12.0 mils to 33.0 mils. This wide variance in film thickness is consistent with the surface preparation process used on this project. Areas that were prepared in accordance with SSPC-SP 7 / NACE 4, will leave existing, intact coating. The existing coating will be profiled to enhance adhesion; however, it will also be accounted for in DFT readings. It was impractical to arrive at an industry recognized average (e.g. SSPC-PA 2) as the surface conditions presented unpredictable irregularities. An amount of disbonded “free film” was removed from areas where the old coating had lost adhesion. These films were then measured by micrometer ranging from 39.6 to 48.8 mils (photos MB-21 &22). The underside of the removed coating film (MB-23) appears to have loosened due to stress as indicated by the extreme curvature of the detached film. A combination of high film thickness, age and exposure due to adjacent mechanical damage is likely the cause of disbondment.

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It is my opinion that the overall condition of the tank barge, Margaret Belle, is very good, particularly considering the degree of surface preparation, age of the vessel and time in service since the dry docking at Stevens Shipyard. I estimate the percentage of overall damage / failure at < 2.0 %.

All information contained herein is based upon my personal measurements and observations. Should you or your colleagues have any questions or comments concerning the content of this report, please contact the undersigned.

Respectfully,

J.M.Pence

John M. Pence

NACE International Certification No. 5806



SSPC Protective Coating Specialist No. 721-626-1101

