Fluorescing Coatings for Improved Inspection During Bridge Maintenance Painting
Our Mission

*We provide services to the transportation community through research, technology transfer and education. We create and participate in partnerships to promote safe and effective transportation systems.*
Research Report
KTC-12-15/SPR377-09-1F

FLUORESCING COATINGS FOR IMPROVED INSPECTION DURING BRIDGE MAINTENANCE PAINTING

By

Bobby W. Meade
Research Technician

Theodore Hopwood II
Program Manager, Research

and

Sudhir Palle
Senior Research Engineer

Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, Kentucky

In cooperation with
Kentucky Transportation Cabinet
Commonwealth of Kentucky

The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or the policies of the University of Kentucky, the Kentucky Transportation Center, nor the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

October 2012
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Report No.</strong></td>
<td><strong>2. Government Accession No.</strong></td>
<td><strong>3. Recipient’s Catalog No.</strong></td>
</tr>
<tr>
<td>KTC-12-15/SPR377-09-1F</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. Title and Subtitle</strong> Fluorescing Coatings for Improved Inspection during Bridge Maintenance Painting</td>
<td><strong>5. Report Date</strong> October 2012</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>6. Performing Organization Code</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7. Author(s)</strong>, Bobby W. Meade, Theodore Hopwood II and Sudhir Palle</td>
<td><strong>8. Performing Organization Report No</strong> KTC-12-15/SPR377-09-1F</td>
<td></td>
</tr>
<tr>
<td><strong>9. Performing Organization Name and Address</strong></td>
<td><strong>10. Work Unit No. (TRAIS)</strong></td>
<td><strong>11. Contractor Grant No.</strong> KYSPR 09-377</td>
</tr>
<tr>
<td>Kentucky Transportation Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College of Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Kentucky</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lexington, KY 40506-0043</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>12. Sponsoring Agency Name and Address</strong></td>
<td><strong>13. Type of Report and Period Covered</strong> Final</td>
<td><strong>14. Sponsoring Agency Code</strong></td>
</tr>
<tr>
<td>Kentucky Transportation Cabinet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Office Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frankfort, KY 40622</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15. Supplementary Notes</strong></td>
<td>Prepared in cooperation with the Kentucky Transportation Cabinet, Federal Highway Administration, and U.S. Department of Transportation. Study Title: Fluorescing Coatings for Improved Inspection during Bridge Maintenance Painting</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>16. Abstract</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optically active pigments (OAPs) fluoresce under light exposures with wavelengths (&lt;200 to 400 nm) producing emissions in the visible spectra (380 to 740 nm). They are used as paint pigments to aid visual inspection of applied coatings for defects such as pin-holing and incomplete coverage. OAP coatings are widely used in various industries outside of bridge maintenance painting.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>This study addressed the laboratory evaluation and field trial of an OAP coating for KYTC bridges. OAP coatings were evaluated for inspectability and accelerated weathering performance in a laboratory test program. After successful laboratory performance, OAP coatings were specified for a KYTC bridge painting project incorporating two deck-girder bridges. One bridge was coated with an OAP zinc urethane primer/non-OAP epoxy mid-coat/OAP urethane top-coat system. The second bridge was coated with a non-OAP zinc urethane primer/OPA epoxy mid-coat/non-OAP urethane top-coat. Field observations revealed that OAP coatings improved inspectability by making uncoated and thinly coated areas more readily identifiable.</td>
<td></td>
</tr>
<tr>
<td><strong>17. Key Words</strong></td>
<td></td>
<td><strong>18. Distribution Statement</strong> Unlimited with the approval of the Kentucky Transportation Cabinet</td>
</tr>
<tr>
<td>bridges, coatings, inspection, maintenance painting, optically active pigments, OAP, paint</td>
<td><strong>19. Security Classif. (of this report)</strong> Unclassified</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>20. Security Classif. (of this page)</strong> Unclassified</td>
<td><strong>21. No. of Pages</strong> 31</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>22. Price</strong></td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE OF CONTENTS</td>
<td>III</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>IV</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>V</td>
</tr>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>VI</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1. BACKGROUND</td>
<td>1</td>
</tr>
<tr>
<td>1.2. WORK PLAN</td>
<td>2</td>
</tr>
<tr>
<td>2. LABORATORY TESTING</td>
<td>3</td>
</tr>
<tr>
<td>2.1. INSPECTABILITY</td>
<td>3</td>
</tr>
<tr>
<td>2.2. ACCELERATED WEATHERING PERFORMANCE</td>
<td>4</td>
</tr>
<tr>
<td>3. FIELD TRIAL</td>
<td>5</td>
</tr>
<tr>
<td>4. CONCLUSIONS</td>
<td>8</td>
</tr>
<tr>
<td>5. RECOMMENDATIONS</td>
<td>9</td>
</tr>
<tr>
<td>6. REFERENCES</td>
<td>9</td>
</tr>
<tr>
<td>7. APPENDIX A - PRODUCT DATA SHEETS</td>
<td>10</td>
</tr>
<tr>
<td>8. APPENDIX B - DRAFT SPECIAL NOTE FOR INSERTION INTO KYTC OAP BRIDGE PAINTING PROJECT</td>
<td>21</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure 1. Mock beams with fabrication details................................................................. 3
Figure 2. Lab inspection with fluorescent light............................................................... 4
Figure 3. Lab inspection with white light........................................................------------ 4
Figure 4. Fluorescent light illumination........................................................................ 6
Figure 5. White light illumination................................................................................ 6
Figure 6. Fluorescent light illumination....................................................................... 7
Figure 7. White light illumination............................................................................... 7
Figure 8. OAP zinc primer by white light................................................................. 7
Figure 9. OAP zinc primer by fluorescent light....................................................... 7
ACKNOWLEDGEMENTS

The authors would like to thank the KYTC Study Advisory Committee members who assisted on this study. They include: Derrick Castle (Division of Materials), Mike Baase (Division of Construction), and Tom Mathews (Division of Maintenance).
EXECUTIVE SUMMARY

Bridge coatings utilizing Optically Activated Pigments (OAPs) were evaluated for inspectability and performance in laboratory testing. The first part of the laboratory evaluation included fabrication of mock girders with details replicating those typically found on bridge girders. OAP coatings were then applied with designed defects and subjected to timed inspections by certified coatings inspectors. Results indicated a 15 percent increase in coating defect detection.

Coatings previously tested and included on KYTC’s List of Approved Materials (LAM) were formulated with OAP, and then tested with the same accelerated weathering protocol used by KYTC to populate the LAM. OAP coatings met all performance criteria established by KYTC with no measurable differences from non-OAP coatings.

Two bridges were coated with three-coat systems involving OAP coatings. One bridge had OAP in the primer and top-coat and the other had OAP in the mid-coat. Inspection of the field application indicated that defects (pin-holes, thin/discontinuous coverage and missed areas) in OAP coatings are easier to detect when inspected with fluorescent lighting as opposed to white light. Another potential benefit is that inspection of OAP coatings with fluorescent light indicted a difference in film build. This could be beneficial in detecting areas of thin coating.

The field trials also identified some issues with OAP coatings. The OAP zinc urethane developed crystals when stored at temperatures at or slightly below recommended temperature. OAP loading of the coatings need to be adjusted to allow better fluorescing at the relatively thin film build specified for bridges.
1. INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) currently conducts most bridge maintenance painting in urban areas during off-hours (nights) to limit inconvenience to motorists. This practice also presents constraints on painters as they have limited time to establish their containment and conduct coatings operations. Lighting in bridge containment is often poor resulting in paint defects (primarily misses and thin spots). Lighting problems are commonly encountered in both nighttime and daytime conditions in bridge containment (the situation being more severe at night). This presents problems for coatings inspectors as it is difficult to detect coatings defects under marginal lighting conditions, especially under the added constraint of limited time for inspections. These factors lead to missed defects, significant rework, extended contactor work time, and consequently higher project costs.

In addition to the issues with multi-coat systems listed above, inspection of single coats of paint are particularly problematic. As pressure increases to minimize lane closures and costs, single-coat systems become more attractive. Multi-coat systems have a certain level of redundancy that still provides protection in the case of small areas of thinner-than-specified coatings. Single-coat systems are likely to have small areas of thin film build that are virtually impossible to eliminate. In either case, the quality of the final paint job is compromised. Improved inspectability of coatings is needed to better detect coatings defects and permit timely remediation.

1.1. BACKGROUND

Optically activated pigments (OAP) have come into widespread use over the past five to ten years as additives to coatings that are applied in confined spaces with poor lighting (ship bulkheads and storage tanks). Optically activated pigments fluoresce when exposed to ultraviolet light. The excitation of those at ultraviolet and near ultraviolet wavelengths (<200 to 400 nm) produces emissions in the visible spectra (380 to 740 nm). The result is that OAP coatings will luminate emitting light in the visible spectra (1). This luminance provides significantly improved visibility of the coating compared to conventionally pigmented coatings, especially in conditions of poor (< 10 ft.-candles) lighting (2). However, it is also beneficial in conditions of good lighting (~30 ft.-candles). It generally eliminates problems of visual wash-out that mask coatings flaws and are a common issue with incandescent lighting (especially conventional flashlights).

OAP technology has been adopted with success by the U.S. Navy for use in painting ship bulkheads. It has been shown to provide better inspection, providing a 25-50 percent increase in detection of coating pin-holes and a 50-75 percent increase in inspection productivity (3). The technology is developing with ASTM specifications for inspection lights (E 2501) published in August 2006, and with a test method for coating luminance under development by ASTM subcommittee E12.05 under Work Item “WK 10687 New Standard Practice for the Determination of Luminance under Monochromatic LED Illumination”. Other ASTM committees have been formed, but have not initiated work, including subcommittee “D01.26
The OAP technology has been reviewed initially by the Kentucky Transportation Center (KTC) as part of a project for the National Surface Treatment Center in Louisville, KY in 2005-06. The coatings tested (low VOC epoxies) were intended for immersion use in ship bulkheads and are not optimized for bridge work. The defects of concern for the Navy application are typically different from those encountered by KYTC (e.g. pin-holing vs. misses/thinning). Ad hoc tests by KTC researchers indicated that OAP coatings would provide excellent contrast for the types of common defects of concern to KYTC.

KYTC funded this study beginning in FY 2009 to evaluate OAP coatings for potential use on maintenance bridge painting projects.

### 1.2 WORK PLAN

The study objectives approved by the KYTC Study Advisory Committee were:

1. Determine the state of OAP technology and identify potential sources of OAP bridge coatings.
2. Develop a test procedure to effectively test OAP coatings under a range of lighting levels that replicate inspection circumstances along with comparative tests on conventional coatings (i.e. by inspections using light sources in the visual light spectrum). These procedures should include evaluations of common bridge coatings defects.
3. Determine the effectiveness of the OAP coatings by comparison tests in the visible light spectrum for typical KYTC coatings inspectors. Identify OAP coatings that work satisfactorily and any that do not.
4. If OAP coatings perform well, seek to extend the use of OAP/UV technology to coating applicators/contractors for use during spray-out with the intent of improving the quality of applied coatings.
5. Develop special notes for experimental maintenance painting projects using OAP coatings.
6. Conduct laboratory tests of the OAP coatings to determine whether they meet current KYTC Category 2 Maintenance Coatings requirements.
7. Document all research findings.

The research study was comprised of two primary components, a laboratory evaluation and a field trial if the laboratory evaluation indicated a viable product. The laboratory evaluation was designed to determine the effect of OAP pigments on the performance of coatings and the effect of the OAP pigments on the inspectability of laboratory applied coatings. If the coatings performance was not adversely affected and the inspectability was enhanced, KYTC would
program a field application for evaluation.

2. LABORATORY TESTING

2.1. INSPECTABILITY

KYTC officials and KTC researchers contacted manufacturers of bridge coatings soliciting them to provide OAP structural coatings (commercial or laboratory grade) for evaluation. Laboratory-grade OAP coatings systems were obtained from Watson Coatings and the Sherwin Williams Company. These coatings were based on formulations that had been previously tested and placed on the KYTC List of Approved Materials. The coatings included: 1) a moisture-cured polyurethane zinc primer, 2) a two-component polyurethane top-coat and 3) a calcium sulfonate coating (that could be used for a one coat system or as the primer or top-coat in a two-coat system). Organic OAP pigments were incorporated in all of the test coatings. Those pigments emit a blue glow when subjected to UV light. To provide contrast, conventional non-OAP coatings of those types were also provided by the manufacturers.

KTC researchers also acquired commercially available LED UV flashlights in the 405 to 415 nm light spectrum range. Those units were especially designed for use with OAP coatings. Protective yellow glasses were also acquired for protection from prolonged exposure to the UV lighting.

The first portion of the laboratory testing was to evaluate the ability of the OAP coatings to provide better and faster inspection by inspectors who worked on bridge maintenance painting projects. Twelve wooden mock-up bridge beams were fabricated that replicated actual beam details including: splice plates, bolts, fillet welds and stiffeners. The mock-ups were coated with a conventional moisture-cure polyurethane zinc primer to simulate blast-cleaned steel (Figure 1). Over the zinc substrate, coatings for evaluation were applied as single-coat and two-coat systems. Calcium sulfonate coatings from two suppliers were applied both as single-coat and two-coat systems. The single-coat calcium sulfonate coatings contained OAP pigments and the two-coat calcium sulfonate systems used OAP pigments in primer coats. The zinc polyurethane primer/polyurethane top coat system was applied with OAP pigments in the primer on one beam and in the top coat on another beam.

Figure 1. Mock-up beams with fabrication details.
Each mock-up beam had a surface area of approximately 1,000 ft² and contained intentionally placed flaws (missed areas, or thin /discontinuous coatings) with 97 coating flaws distributed among the beams. Five SSPC Bridge Coating Inspector- certified personnel were selected to inspect the beams. The inspections were conducted in low ambient light (2-3 foot-candles) to simulate field containment conditions encountered during night painting. Each inspector was allowed 45 seconds per beam face for inspection with white light (Figure 2) and subsequently repeated using the fluorescent light (Figure 3). Again, the 45-second time restriction was used to simulate field conditions. The fluorescent light used was a Flashlights Unlimited/Xenopus Electronix Deep Purple Inspection Lantern. It had a peak wavelength of 410 nm and an overall bandwidth of 405 nm to 415 nm. It has 80 LEDs to provide a smooth beam image and an extended range for paint inspection.

An observer documented each inspection call with location and description of the defect identified. Of a possible 485 designed flaw detects (5 inspectors x 97 flaws), 371 (76 percent) were detected with “white” light and 445 (91 percent) were detected with fluorescent light.

There were a total of 73 overcalls (defects other than designed flaws) from “white” light inspections and 205 overcalls using fluorescent light. KTC was unable to assemble five qualified inspectors at one time and was forced to conduct the inspections over a period of several weeks during which the beams were moved about to provide normal working access. This resulted in damage to the coatings replicating defects that were not accounted for in follow-on tests. Further, the inspectors touched the coated surfaces during inspections which probably created some additional unaccounted coating flaws, especially in the soft calcium sulfonate coatings which were on eight of the 12 beams.

2.2. ACCELERATED WEATHERING PERFORMANCE

Based on the initial inspectability results, several OAP coatings were chosen for accelerated
corrosion/weathering testing. That test method is used to qualify all structural steel coatings placed on the KYTC List of Approved Materials (LAM). Since KYTC had recently decided to discontinue the use of calcium sulfonate coatings on its bridges, samples of non-OAP and OAP coatings of KYTC LAM approved zinc-pigmented moisture-cured urethane primer, a two-component epoxy mid-coat and two-component urethane coating systems were obtained from the Sherwin Williams Company. Steel panels measuring four inches by six inches by three-sixteenths of an inch were abrasive blasted to a SSPC SP5 surface condition, and OAP coatings were applied according to the manufacturers’ recommendations using airless spraying. The coatings systems are listed in Table I. System NN was chosen to address the performance of non-zinc primer systems for maintenance overcoating.

<table>
<thead>
<tr>
<th>System</th>
<th>Primer</th>
<th>Intermediate</th>
<th>Top</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL</td>
<td>OAP Zinc Urethane</td>
<td>MIO-Aluminum Urethane</td>
<td>OAP Urethane</td>
</tr>
<tr>
<td>MM</td>
<td>Zinc Urethane</td>
<td>OAP Epoxy</td>
<td>Urethane</td>
</tr>
<tr>
<td>NN</td>
<td>OAP Epoxy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table I. OAP coating systems evaluated in accelerated weathering.

Six test panels of each system were selected for testing, three from each system were scribed to evaluate rust undercutting and the others were not scribed to evaluate blistering and field rusting. The panels were subjected to weathering/corrosion testing per ASTM D5894 - 05 Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet), which incorporates accelerated weathering (cyclic UV/humidity) and corrosion (cyclic condensation/evaporation). Rust creep was evaluated by measuring at five millimeter intervals along the scribe. Rusting was evaluated according to ASTM D 610-01 – Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces, and blistering was evaluated according to ASTM D 714-87 (Reapproved 2000) – Standard Test Method for Evaluating Degree of Blistering of Paints. The KYTC LAM performance criteria and the OAP systems performance values for 5,000 hours cyclic weathering are listed in Table II. As shown in Table II, all coating systems met the required performance criteria for KYTC structural steel coatings.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>KYTC LAM Criteria</th>
<th>System LL</th>
<th>System MM</th>
<th>System NN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rust Creep</td>
<td>5 mm - zinc primer</td>
<td>3.94</td>
<td>3.97</td>
<td>NA</td>
</tr>
<tr>
<td>Rust Creep</td>
<td>15 mm – no zinc</td>
<td></td>
<td></td>
<td>5.69</td>
</tr>
<tr>
<td>Blistering</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Field Rusting</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Table II. Performance data for OAP systems in accelerated weathering.

3. FIELD TRIAL

Based on the success of both laboratory study components, KYTC programmed an experimental field project to apply OAP coatings to two steel deck-girder bridges. Bridge B39N is a 400-foot-
long non-redundant continuous girder that was abrasive blasted to an SSPC-SP 10/NACE NO. 2 “Near White Metal Blast Cleaning” condition with a specified 1.5 to 4.5 mil anchor profile and coated with an OAP zinc urethane primer/Epoxy/OAP urethane system. Bridge B27N, a 66-foot-long multi-girder, received the same surface preparation and was coated with a moisture cure polyurethane zinc primer/OAP epoxy/polyurethane system. The moisture cure zinc primers were specified at three to four mils Dry Film Thickness (DFT) and both mid- and top-coats were specified at three to six mils DFT. The Sherwin Williams recommendations for OAP coatings are the same as non-OAP materials of the same coating type. Product Data Sheets for the coatings are found in Appendix A.

The contract language required the contractor to provide appropriate ASTM E2501-07 fluorescent inspection lighting, an ASTM E2501-07 spectroradiometer, specific protective eyewear for UV light exposure, and maintenance of full containment through the coating inspection process. KTC developed “Special Notes”, Appendix B, for inclusion into the KYTC contract documents. The eyewear not only protects the inspector but also aids the detection of different degrees of fluorescence.

Coating application began September 24, 2011 on Bridge B27N. The coating system at this bridge only employed OAP in the epoxy mid-coat. Numerous missed areas and thin areas of coating were revealed. Figures 4 through 7 show the same areas, with the top coat applied over the OAP epoxy mid-coat, illuminated with white light and fluorescent light. The thin areas are visible in white illumination but are much more readily apparent under fluorescent illumination. Ambient light as measured in containment ranged from zero foot-candles in the interior area between girders to 45 foot-candles at the fascia.

![Figure 4. White light illumination.](image1)

![Figure 5. Fluorescent light illumination.](image2)

Inspection of the OAP epoxy with fluorescent light revealed spray patterns that were not visible with white light. Tooke gage measurements revealed DFTs of five mils in the darker areas and eight mils in the lighter areas. The coating was accepted with the out-of-specification DFT if no other defects were present. The fluorescent light inspection indicated that the OAP epoxy was fluorescing more at the higher DFT. Photographs taken at this bridge, without filters
similar to the protective eyewear, was overexposed. The contractor top-coated the OAP mid-coat before filtered photographs could be obtained.

Painting of the second bridge, B39N, began on October 2, 2011. The contractor immediately had problems with mixing the OAP moisture cure zinc primer. When mixed, there were lumps and strings in the paint and a 60-mesh standard spray filter retained approximately one quart of a three-gallon kit. The filtered paint required approximately 15 ounces of reducer per kit to spray. The coatings supplier and KYTC obtained samples of the defective primer to determine the cause of the problem.

During inspection of the primer application on the bridge, spray patterns could be seen with fluorescent light that were not visible using white light, Figures 8 and 9. Photograph 9 was taken with a yellow filter. The primer DFT was checked with a Tooke Gage and found to be two and a half to four mils in the darker area and six to seven mils in the “lighter” areas. The OAP remaining after filtering appeared to fluoresce more in the areas with higher DFT.
The painting operations on bridge B39N continued with application of the epoxy mid-coat and the OAP urethane top-coat and concluded with touch-up of the top coat on October 9. Field inspections noted that the OAP primer was readily visible when using fluorescent lighting in areas where the epoxy mid-coat was missing or thin.

In non-compliance with the special notes, the contractor removed the containment immediately after top coat application at both bridges instead of leaving it in place until the KYTC QA inspections were completed. Therefore, inspection with fluorescent lighting was difficult to evaluate. Ambient lighting measured after containment was removed ranged from 10 foot-candles in the interior areas to 150 foot-candles outside the fascia girders.

4. CONCLUSIONS

OAP technology has been in use for several years in the marine and water tank industries, especially by the US Navy. OAP has been used primarily in epoxy barrier coatings. For use in the bridge painting industry, modifications to type and amount of active pigments will be necessary to optimize the benefits of OAPs.

The laboratory evaluation of the inspectability of OAP coatings was conducted under lighting conditions, time constraints, and with typical bridge design details that replicate field conditions. The inspections, conducted by multiple certified coatings inspectors, indicate that OAP coatings significantly improve the detection of defects in applied coatings when using fluorescent lighting (91 percent) as opposed to white lighting (76 percent). The time element was held constant for both white light and fluorescent light inspections; therefore any advantage in reduced inspection time was not realized in the laboratory evaluation.

Accelerated weathering testing was conducted on coatings systems typical of those approved and used by KYTC but incorporating OAP technology. Laboratory tests indicated that the use of OAP in bridge coatings did not adversely affect the performance of the coatings.

Based on the success of the laboratory evaluation, KTC developed specifications for the use of OAP coatings in a KYTC field project. Two coating systems were specified to be applied over an SSPC-SP 10/NACE NO. 2 “Near White Metal Blast Cleaning” surface preparations. The coating for one bridge used OAP in the zinc urethane primer, a non OAP epoxy mid-coat, and an OAP urethane top-coat. The coating for the second bridge used a non-OAP zinc urethane primer, an OAP epoxy mid-coat, and a non-OAP urethane top-coat.

Several observations resulted from KTC monitoring of the field project. Coating defects were typically detectable with white light and/or fluorescent light; however, defects were visible from a greater distance and were more readily identified with fluorescent lighting. OAPs aided in inspection of not only the coating containing OAPs but also coatings subsequently applied over OAP coatings. Holidays (missed areas) in the non-OAP coating were more readily revealed by the fluorescing OAP from the underlying OAP coating.
The OAP zinc moisture cure urethane primer was sensitive to the cold temperature and the OAP pigments partially crystallized at temperatures at or below the manufacturers’ recommended storage temperature. The contractor did not maintain records of paint storage temperatures but storage was in an unheated box truck and ambient temperatures dropped to less than 40° F prior to use.

The OAP coatings did not fluoresce appropriately (were not bright enough) for field inspection conditions. The relatively high levels of ambient light (up to 150 foot-candles) and the relatively low coating film thickness (three to six mils) as compared to OAP coatings in other industries probably contributed to this problem. While the detection of thin/discontinuous areas, missed areas or pin holes were the objective of this application, variations in coating thickness was observable by the difference in coating fluorescence. This indicates that proper dosing of OAP coatings may be viable for go-no go inspections of specified coatings thicknesses. That would replace time-consuming spot DFT measurements and provide a 100 percent indication that proper coatings thicknesses were obtained. Contractors could use that feature along with fluorescent lighting to enable painters to achieve proper coating thickness, providing them with a beneficial QC tool.

5. RECOMMENDATIONS

OAP coatings should be reformulated to maximize the fluorescing of the pigments at the film build range typically recommended for bridge coatings. This could involve both the pigment loading and the type (organic or inorganic) of pigment. Any change in formulation would then require additional accelerated weathering testing to insure continued minimum performance and inclusion on the KYTC LAM.

KYTC will continue to be faced with the challenge of minimizing lane closures and the time required for coating inspection for maintenance bridge painting projects. The use of OAP coatings will help meet that challenge in reduced inspection time, and when KYTC considers the use of single or two-coat systems to accelerate painting schedules, OAP will greatly enhance the quality of the painting project.

6. REFERENCES

7. APPENDIX A - PRODUCT DATA SHEETS

APPLICATION BULLETIN

COROTHANE® I
GALVAPAC ONE PACK ZINC PRIMER

B65G11
GRAY

APPLICATION PROCEDURES

Surface preparation must be completed as indicated.

Mix material thoroughly prior to use with a low speed power agitator until completely uniform. After mixing, pour through a 50 mesh filter.

Apply paint at the recommended film thickness and spreading rate as indicated below.

Recommended Spreading Rate per coat:

<table>
<thead>
<tr>
<th>Standard</th>
<th>AWWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet mils (microns)</td>
<td>4.5 112</td>
</tr>
<tr>
<td>Dry mils (microns)</td>
<td>3.0 75</td>
</tr>
</tbody>
</table>

Coverage sq. ft/gal (m²/L):

| 268 6.5 | 358 8.8 | 286 6.5 | 536 13.1 |

Theoretical coverage sq. ft/gal (m²/L) at 1 mil/25 microns:

1072 (26.2)

NOTE: Brush or roll application may require multiple coats to achieve maximum film thickness and uniformity of appearance.

*See Recommended Systems on reverse side.

Drying Schedule @ 5.0 mils wet (125 microns):

<table>
<thead>
<tr>
<th>40°F/4.4°C</th>
<th>77°F/25°C</th>
<th>100°F/38°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% RH</td>
<td>24 hours</td>
<td>8 hours</td>
</tr>
</tbody>
</table>

To touch: 45 minutes 20 minutes 10 minutes

To recoat (minimum), atmospheric service:

8 hours 4.6 hours 1 hour

To recoat (minimum), immersion service:

24 hours 12 hours 10 hours

To cure, atmospheric service:

5 days 3 days 1 day

To cure, immersion service:

14 days 7 days 5 days

Drying time is temperature, humidity, and film thickness dependent. For Portable Water Service, allow a minimum cure time of 7 days at 77°F (25°C) prior to placing in service. Sterilize and rinse per AWWA C652.

Application of coating above maximum or below minimum recommended spreading rate may adversely affect coating performance.

CLEAN UP INSTRUCTIONS

Clean spills and splatters immediately with Reducer #15, R7K15 or R7K11. Clean tools immediately after use with Reducer #15, R7K15 or R7K11. Follow manufacturer's safety recommendations when using any solvent.

SAFETY PRECAUTIONS

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

DISCLAIMER

The information and recommendations set forth in this Product Data Sheet are based upon tests conducted by or on behalf of The Sherwin-Williams Company. Such information and recommendations are subject to change and pertain to the product offered at the time of publication. Consult your Sherwin-Williams representative to obtain the most recent Product Data Information and Application Bulletin.

The Sherwin-Williams Company warrants our products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product or the refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY SHERWIN-WILLIAMS, EXPRESSED OR IMPLIED, STATUTORY, OR OTHER, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
APPLICATION BULLETIN

SURFACE PREPARATIONS

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Iron & Steel (immersion service)
Remove all oil and grease from surface by Solvent Cleaning per SSPC-SP1. Minimum surface preparation is Near White Metal Blast Cleaning per SSPC-SP10/NACE 2. Blast clean all surfaces using a sharp, angular abrasive for optimum surface profile (2 mils / 50 microns). Remove all weld spatter and round all sharp edges by grinding. Prime any bare steel the same day as it is cleaned or before flash rusting occurs.

Iron & Steel (atmospheric service)
Remove all oil and grease from surface by Solvent Cleaning per SSPC-SP1. Minimum surface preparation is Commercial Blast Cleaning per SSPC-SP6. For better performance, use Near White Metal Blast Cleaning per SSPC-SP10/NACE 2. Blast clean all surfaces using a sharp, angular abrasive for optimum surface profile (2 mils / 50 microns). Prime any bare steel the same day as it is cleaned or before flash rusting occurs.

APPLICATION CONDITIONS

| Temperature: | 20°F (-7°C) minimum, 120°F (49°C) maximum |
| material: | 45°F (7°C) minimum |
| Relative humidity: | 30% minimum, 99% maximum |

APPLICATION EQUIPMENT

The following is a guide. Changes in pressures and tip sizes may be needed for proper spray characteristics. Always purge spray equipment before use with listed reducer. Any reduction must be compliant with existing VOC regulations and compatible with the existing environmental and application conditions.

Reducer/Clean Up: Reducer #15, R7K15 (or) Reducer #111, R7K111 for non-NSF, VOC exempt applications

Airless Spray
- Pump: 30:1
- Pressure: 2500 - 3000 psi
- Hose: 1/4" ID
- Tip: 017" - 019"
- Filter: 60 mesh
- Reduction: As needed up to 10% by volume

Conventional Spray
- Unit: Graco, Binks
- Gun: 900, 95
- Fluid Nozzle: 070, 68/65
- Air Nozzle: 947, 66PR
- Atomization Pressure: 60-70 psi
- Fluid Pressure: 15-20 psi
- Reduction: As needed up to 10% by volume

Brush
- brushes: Natural bristle
- Reduction: As needed up to 10% by volume

Roller
- Cover: 3/8" natural or synthetic with solvent resistant core
- Reduction: As needed up to 10% by volume

Surface Preparation Standards

If specific application equipment is not listed above, equivalent equipment may be substituted.

www.sherwin-williams.com/protective
### PRODUCT INFORMATION

**COROTHANE® I GALVAPAC ONE PACK ZINC PRIMER**

#### B65011  GRAY

**RECOMMENDED SYSTEMS**

<table>
<thead>
<tr>
<th>Immersion Service (Potable Water), Steel:</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>AWWA D102: Inside Coating System No. 5</em></td>
</tr>
<tr>
<td>minimum AWWA</td>
</tr>
<tr>
<td>1 ct. Corothane I – GalvaPac Zinc Primer</td>
</tr>
<tr>
<td>2.0 (50)</td>
</tr>
<tr>
<td>2 ct. Macropoxy 646 PW</td>
</tr>
<tr>
<td>4.0 (100)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immersion Services, Potable Water, Steel:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ct. Corothane GalvaPac Zinc Primer</td>
</tr>
<tr>
<td>3.0-4.0 (75-100)</td>
</tr>
<tr>
<td>2 ct. Macropoxy 646 PW</td>
</tr>
<tr>
<td>5.0-10.0 (125-250)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immersion Service (Non-Potable Water), Steel:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ct. Corothane I GalvaPac Zinc Primer</td>
</tr>
<tr>
<td>3.0-4.0 (75-100)</td>
</tr>
<tr>
<td>2 ct. Corothane I Coal Tar</td>
</tr>
<tr>
<td>5.0-7.0 (125-175)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Atmospheric Service, Steel:</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>AWWA D102: Outside Coating System No. 2</em></td>
</tr>
<tr>
<td>minimum AWWA</td>
</tr>
<tr>
<td>1 ct. Corothane I GalvaPac Zinc Primer</td>
</tr>
<tr>
<td>3.0 (75)</td>
</tr>
<tr>
<td>1 ct. Corothane I HS</td>
</tr>
<tr>
<td>1.5 (40)</td>
</tr>
</tbody>
</table>

| *AWWA D102: Outside Coating System No. 6* |
| minimum AWWA                             |
| 6.0 (150)                                 |
| 1 ct. Corothane I GalvaPac Zinc Primer    |
| 2.0 (50)                                  |
| 1 ct. Macropoxy 646 NSF                   |
| 2.0 (50)                                  |
| 1 ct. Acrolon 218HS                      |
| 2.0 (50)                                  |

<table>
<thead>
<tr>
<th>Steel: Rapid Return to Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ct. Corothane I GalvaPac Zinc Primer</td>
</tr>
<tr>
<td>3.0-4.0 (75-100)</td>
</tr>
<tr>
<td>1 ct. Fast Clad Urethane</td>
</tr>
<tr>
<td>6.0-9.0 (150-225)</td>
</tr>
</tbody>
</table>

Acceptable for use over Zinc Clad PCP Ultra. Topcoat required.

The systems listed above are representative of the product’s use; other systems may be appropriate.

### SURFACE PREPARATION

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Refer to product Application Bulletin for detailed surface preparation information.

Minimum recommended surface preparation:
- **Iron & Steel**
  - Atmospheric:
    - SSPC-SP6, 2 mil (50 micron) profile preferred
  - Immersion, with recommended topcoat:
    - SSPC-SP10/NACE 2, 2 mil profile

### Surface Preparation Standards

<table>
<thead>
<tr>
<th>Condition of Surface</th>
<th>ISO 8501-1</th>
<th>Swedish Std</th>
<th>SSPC</th>
<th>NACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rusted</td>
<td>Sa 3</td>
<td>Sa 3</td>
<td>Sa 4</td>
<td>Sa 4</td>
</tr>
<tr>
<td>Pitted &amp; Rusted</td>
<td>Sa 3</td>
<td>Sa 3</td>
<td>Sa 4</td>
<td>Sa 4</td>
</tr>
<tr>
<td>Painted</td>
<td>Sa 2</td>
<td>Sa 2</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td>Powder Coating</td>
<td>Sa 2</td>
<td>Sa 2</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td>Sand Blasted</td>
<td>Sa 2</td>
<td>Sa 2</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td>Shot Blasted</td>
<td>Sa 2</td>
<td>Sa 2</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td>Stamped Metal</td>
<td>Sa 2</td>
<td>Sa 2</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
</tbody>
</table>

### TINTING

Do not tint.

### APPLICATION CONDITIONS

- **Temperature:**
  - air and surface: 20°F (-7°C) minimum, 120°F (49°C) maximum
  - material: 45°F (7°C) minimum
- **Relative humidity:** 30% minimum, 99% maximum
- Do not apply over surface ice

Refer to product Application Bulletin for detailed application information.

### ORDERING INFORMATION

- **Packaging:** 3 gallon (11.3L) container
- **Weight:** 28.5 ± 0.2 lb/gal; 3.42 Kg/L

### SAFETY PRECAUTIONS

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

### WARRANTY

The Sherwin-Williams Company warrants its products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product or the refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY SHERWIN-WILLIAMS, EXPRESSED OR IMPLIED, STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

www.sherwin-williams.com/protective
**PRODUCT INFORMATION**

**PRODUCT DESCRIPTION**
MACROPOXY® 646 PW EPOXY is a high solids, high build, fast drying, polyamide epoxy classified by UL to ANSI/NSF 61 as a tank lining for potable water storage tanks. The high solids content ensures adequate protection of sharp edges, corners, and welds. B58VX605 Hardener contains Opti-Check OAP pigment technology for rapid holiday detection with safe blue light inspection lamps.

- Low VOC
- Low odor
- Outstanding application properties

**PRODUCT CHARACTERISTICS**
- **Finish:** Semi-Gloss
- **Color:** Mill White and Light Blue
- **Volume Solids:** 72% ± 2%, mixed
- **Weight Solids:** 95% ± 2%, mixed
- **VOC (EPA Method 24):**
  - Unreduced: <250 g/L, 2.0 lb/gal
  - Reduced 10%: <300 g/L, 2.5 lb/gal
- **Mix Ratio:** 1:1 by volume

**Recommended Spreading Rate per coat:**
- **Standard:**
  - Wet mils (microns): 0.071
  - Coverage sq ft/gal (m²/L):
    - 116 2.8
  - Theoretical coverage sq ft/gal (m²/L):
    - 1152 (28.2)
- **AWWA:**
  - Wet mils (microns): 0.071
  - Coverage sq ft/gal (m²/L):
    - 116 2.8
  - Theoretical coverage sq ft/gal (m²/L):
    - 1152 (28.2)

**Drying Schedule at 70 mils wet (175 microns):**
- **At 40°F/4.5°C:**
  - RH: 50%
  - Touch: 4-5 hours
  - To handle: 8 hours
  - To recoat: 48 hours
  - Cure for:
    - Minimum: 1 year
    - Maximum: 1 year
  - Immersion: 14 days

**Immersion Times:**
- 5 years potable water
- 18 months fresh and salt water

**Water Resistance:**
- ASTM D3363: 3H

**Permeance:**
- ASTM D1653: 1.16 grains/day

**Paint Life:**
- 36 months, unopened
- Store indoors at 40°F (4.5°C) to 100°F (38°C)

**Flash Point:**
- 91°F (33°C), TCC, mixed

**Reducer/Clean Up:**
- Reducer R7K15

**PERFORMANCE CHARACTERISTICS**
- **System Tested:**
  - 1 ct. Macroxy 646 PW Fast Cure @ 6.0 mils (150 microns) dft

**Test Name** | **Test Method** | **Results**
--- | --- | ---
Abrasion Resistance | ASTM D4060, CS17 wheel, 1000 cycles, 1 kg load | 84 mg loss
Adhesion | ASTM D4541 | 1,037 psi
Corrosion Resistance | ASTM D5894, 36 cycles, 12,000 hours | Rating 10 per ASTM D714 for blistering.
Direct Impact Resistance | ASTM D2794 | 30 in. lb.
Dry Heat Resistance | ASTM D2485 | 250°F (121°C)
Flexibility | ASTM D522, 180° bend, 3/4" mandrel | Passes
Humidity Resistance | ASTM D4585, 6000 hours | No blistering, cracking, or rusting
Immersion | Rating 10 per ASTM D610 for Rusting, Rating 10 per ASTM D714 for blistering
Immersion | 18 months fresh and salt water | Passes, no rusting, blistering, or loss of adhesion
Pencil Hardness | ASTM D3363 | 3H
Water Vapor Permeance | ASTM D1653, Method B | 1.16 grains/day

**Footnotes:**
- 1 Zinc Clad II Plus Primer
- 2 Galvapar 2 cts Macroxy 646 PW

**RECOMMENDED USES**
- **Potable Water Tank Restrictions**
  - Water Contact Temp.: 23°C
  - Standard Cure: Tanks: 1,500 gal: 2 cts
  - Standard Cure: Pipe: >= 492
  - Forced Cure: Tanks: >= 100 gal: 2 cts
  - Forced Cure: Pipe: >= 152: 2 cts
  - Forced Cure: Maximum DFT: 6 mils/dt, 2 cts

- Conforms to AWWA D102-03 IC# #1, #2, and #5, and OCS #5***
- Meets or exceed the performance requirements of SSPC Paint Spec 22

***Refer to respective systems

**Substrate:**
- Steel

**Surface Preparation:**
- SSPC-SP10/NACE 2

**System Tested:**
- 1 ct. Macroxy 646 PW Fast Cure @ 6.0 mils (150 microns) dft

*unless otherwise noted below

- **Test Name** | **Test Method** | **Results**
--- | --- | ---
Abrasion Resistance | ASTM D4060, CS17 wheel, 1000 cycles, 1 kg load | 84 mg loss
Adhesion | ASTM D4541 | 1,037 psi
Corrosion Resistance | ASTM D5894, 36 cycles, 12,000 hours | Rating 10 per ASTM D714 for blistering.
Direct Impact Resistance | ASTM D2794 | 30 in. lb.
Dry Heat Resistance | ASTM D2485 | 250°F (121°C)
Flexibility | ASTM D522, 180° bend, 3/4" mandrel | Passes
Humidity Resistance | ASTM D4585, 6000 hours | No blistering, cracking, or rusting
Immersion | Rating 10 per ASTM D610 for Rusting, Rating 10 per ASTM D714 for blistering
Immersion | 18 months fresh and salt water | Passes, no rusting, blistering, or loss of adhesion
Pencil Hardness | ASTM D3363 | 3H
Water Vapor Permeance | ASTM D1653, Method B | 1.16 grains/day

**Paint Life:**
- 36 months, unopened
- Store indoors at 40°F (4.5°C) to 100°F (38°C)

**Flash Point:**
- 91°F (33°C), TCC, mixed

**Reducer/Clean Up:**
- Reducer R7K15

**Recommended Spreading Rate per coat:**
- **Standard:**
  - Wet mils (microns): 0.071
  - Coverage sq ft/gal (m²/L):
    - 116 2.8
  - Theoretical coverage sq ft/gal (m²/L):
    - 1152 (28.2)

**Drying Schedule at 70 mils wet (175 microns):**
- **At 40°F/4.5°C:**
  - RH: 50%
  - Touch: 4-5 hours
  - To handle: 8 hours
  - To recoat: 48 hours
  - Cure for:
    - Minimum: 1 year
    - Maximum: 1 year
  - Immersion: 14 days

**Immersion Times:**
- 5 years potable water
- 18 months fresh and salt water

**Water Resistance:**
- ASTM D3363: 3H

**Permeance:**
- ASTM D1653, Method B: 1.16 grains/day

**Footnotes:**
- 1 Zinc Clad II Plus Primer
- 2 Galvapar 2 cts Macroxy 646 PW

**Recommended Uses**
- **Potable Water Tank Restrictions**
  - Water Contact Temp.: 23°C
  - Standard Cure: Tanks: 1,500 gal: 2 cts
  - Standard Cure: Pipe: >= 492
  - Forced Cure: Tanks: >= 100 gal: 2 cts
  - Forced Cure: Pipe: >= 152: 2 cts
  - Forced Cure: Maximum DFT: 6 mils/dt, 2 cts

- Conforms to AWWA D102-03 IC# #1, #2, and #5, and OCS #5***
- Meets or exceed the performance requirements of SSPC Paint Spec 22

***Refer to respective systems

**Substrate:**
- Steel

**Surface Preparation:**
- SSPC-SP10/NACE 2

**System Tested:**
- 1 ct. Macroxy 646 PW Fast Cure @ 6.0 mils (150 microns) dft

*unless otherwise noted below
**PRODUCT INFORMATION**

**RECOMMENDED SYSTEMS**

<table>
<thead>
<tr>
<th>Immersion, Steel:</th>
<th>Dry Film Thickness / ct. Mila</th>
<th>Microns</th>
</tr>
</thead>
<tbody>
<tr>
<td>*AWWA D102-03: Inside Coating System No. 1</td>
<td>minimum AWWA</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>1 ct. Macropoxy 646 PW</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>1 ct. Macropoxy 646 PW</td>
<td>5.0</td>
</tr>
<tr>
<td>*AWWA D102-03: Inside Coating System No. 2</td>
<td>minimum AWWA</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>1 ct. Macropoxy 646 PW</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>1 ct. Macropoxy 646 PW</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>1 ct. Macropoxy 646 PW</td>
<td>5.0</td>
</tr>
<tr>
<td>*AWWA D102-03: Inside Coating System No. 3</td>
<td>minimum AWWA</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>1 ct. Zinc Clad II UV or Plus</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>1 ct. Macropoxy 646 PW</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>1 ct. Macropoxy 646 PW</td>
<td>5.0</td>
</tr>
<tr>
<td>*AWWA D102-03: Inside Coating System No. 5</td>
<td>minimum AWWA</td>
<td>10.0</td>
</tr>
</tbody>
</table>
| | 1 ct. Corathane 
Galvacap | 2.0 | (50) |
| | 2 cts. Macropoxy 646 PW | 4.0 | (100) |

Steel, forced cure (100 gallon minimum tank size or 15" or greater pipe diameter):

| 2 cts. Macropoxy 646 PW | 5.0-6.0 | (125-150) |
| *12 mils maximum film thickness | During requirements | 
| Flash 2 hours @ 75°F (24°C) | 24 hours @ 150°F (66°C) | 24 hours @ 75°F (24°C) |

Atmospheric, Steel:

| *AWWA D102-03: Outside Coating System No. 5 | minimum AWWA | 6.0 | (150) |
| | 1 ct. Macropoxy 646 PW | 2.0 | (50) |
| | 1 ct. Macropoxy 646 PW | 2.0 | (50) |
| | 1 ct. Acroton 218HS | 2.0 | (50) |

| *AWWA D102-03: Outside Coating System No. 6 | minimum AWWA | 6.0 | (150) |
| | 1 ct. Corathane 
GalvaPac PW | 2.0 | (50) |
| | 1 ct. Macropoxy 646 PW | 2.0 | (50) |
| | 1 ct. Acroton 218HS | 2.0 | (50) |

Concrete/Masonry, smooth:

| 2 cts. Macropoxy 646 PW | 3.0-6.0 | (75-150) |

Refer to UL com for maximum df restrictions.

The systems listed above are representative of the product's use, other systems may be appropriate.

**SURFACE PREPARATION**

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Refer to product Application Bulletin for detailed surface preparation information.

Minimum recommended surface preparation:

- **Iron & Steel**
  - Atmospheric: SSPC-SP2/3
  - Immersion: SSPC-SP10NACE 2, 2.3 mil (50-75 micron) profile
  - Concrete & Masonry: SSPC-SP10NACE 6.4.3.1 or 4.3.2.
  - or ICI No. 310.2, CSP 1-3

**Surface Preparation Standards**

<table>
<thead>
<tr>
<th>Condition of Surface</th>
<th>ISO 8501-1</th>
<th>Swedish Std.</th>
<th>NACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rusted Cleaned</td>
<td>Sa 3.5</td>
<td>Sa 3.5</td>
<td>Sp 1</td>
</tr>
<tr>
<td>Rusted Cleaned</td>
<td>Sa 3.5</td>
<td>Sa 3.5</td>
<td>Sp 1</td>
</tr>
<tr>
<td>Hand Tool Cleaning</td>
<td>Sa 2.5</td>
<td>Sa 3.5</td>
<td>Sp 1</td>
</tr>
<tr>
<td>Power Tool Cleaning</td>
<td>Sa 3.5</td>
<td>Sa 3.5</td>
<td>Sp 1</td>
</tr>
</tbody>
</table>

**TINTING**

Do not tint.

**APPLICATION CONDITIONS**

Temperature: 40°F (4.5°C) minimum, 110°F (43°C) maximum

Relative humidity: 85% maximum

Refer to product Application Bulletin for detailed application information.

**ORDERING INFORMATION**

- **Packaging:**
  - Part A: 1 gallon (3.78L) and 5 gallon (18.9L) containers
  - Part B: 1 gallon (3.78L) and 5 gallon (18.9L) containers

- **Weight:**
  - 12.7 ± 0.2 lb/gal; 1.5 Kg/L

- **Safety Precautions**

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

**WARRANTY**

The Sherwin-Williams Company warrants our products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product or the refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY SHERWIN-WILLIAMS, EITHER EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
**Application Bulletin**

**Surface Preparations**

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

**Carbon Steel, Immersion Service:**
Clean and degrease the surface prior to abrasive blasting per SSPC-SP1 Solvent Cleaning. Methods described in SSPC-SP1 include solvents, alkali, detergent, water, emulsions, and steam. The surface shall be abrasively blasted to SSPC-SP10/NACE No. 2 Near-White Blast Cleaning with a 2-3 mil (50-75 micron) profile. The anchor pattern shall be sharp with no evidence of a polished surface. The finished surface shall be free of all visible oil, grease, dust, dirt, mill scale, rust, coating oxides, corrosion products, and other foreign matter with no more than 5% staining. After blasting, all dust and loose residue should be removed from the surface by acceptable means. Coat steel the same day as it is prepared and prior to the formation of rust.

**Iron & Steel, Atmospheric Service:**
Minimum surface preparation is Hand Tool Clean per SSPC-SP2. Remove all oil and grease from surface by Solvent Cleaning per SSPC-SP1. For better performance, use Commercial Blast Cleaning per SSPC-SP6/NACE 3 blast cleaning all surfaces using a sharp, angular abrasive for optimum surface profile (2 mils / 50 microns). Prime any bare steel within 8 hours or before flash rusting occurs.

**Ductile Iron, Immersion Service:**
Refer to National Association of Pipe Fabricators Surface Preparations Standard NAPF 500-03 as follows:

- **a.** NAPF 500-03-01 “Solvent Cleaning”
- **b.** NAPF 500-03-02 “Hand Tool Cleaning”
- **c.** NAPF 500-03-03 “Power Tool Cleaning”
- **d.** NAPF 500-03-04 “Abrasive Blast Cleaning of Ductile Iron Pipe”

**Concrete and Masonry**
For surface preparation, refer to SSPC-SP13/NACE 6, or ICRI No. 310.2, CSP 1-3. Surfaces should be thoroughly clean and dry. Concrete and mortar must be cured at least 28 days (75°F (24°C)). Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement and hardeners. Fill bug holes, air pockets and other voids with Steel-Seam FT910. Follow the standard methods listed below when applicable:

- **ASTM D4258 Standard Practice for Cleaning Concrete.**
- **ASTM D4260 Standard Practice for Abrading Concrete.**
- **ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete.**

**SSPC-SP 13/Nace 6 Surface Preparation of Concrete.**

**Concrete, Immersion Service:**
For surface preparation, refer to SSPC-SP13/NACE 6, Section 4.3.1 or 1.3.2 or ICRI No. 310.2, CSP 1-3.

**Previously Painted Surfaces:**
If in sound condition, clean the surface of all foreign material. Scaryfy the surface to create the desired surface profile. Apply coatings on a test area, allowing paint to dry one week before testing adhesion. If adhesion is poor, or if this product attacks the previous finish, removal of the previous coating may be necessary.

**Surface Preparation Standards**

<table>
<thead>
<tr>
<th>Condition of</th>
<th>Surface</th>
<th>SSMS787</th>
<th>SSPC NACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Metal</td>
<td>S5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Near White Metal</td>
<td>S5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Commercial Blast</td>
<td>S5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Brush-Off Blast</td>
<td>S5.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Hand Tool Cleaning</td>
<td>S6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Power Tool Cleaning</td>
<td>S8</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**Application Conditions**

- **Temperature:** 40°F (4.5°C) minimum, 110°F (43°C) maximum
- **Relative humidity:** 85% maximum

**Application Equipment**

The following is a guide. Changes in pressures and tip sizes may be needed for proper spray characteristics. Always purge spray equipment before use with listed reducer. Any reduction must be compliant with existing VOC regulations and compatible with the existing environmental and application conditions.

**Reducer/Clean Up**

- **Reducer R7K15**

**Airless Spray**

- **Pump:** 30:1
- **Pressure:** 2800 - 3000 psi
- **Hose:** 1/4" ID
- **Tip:** 0.17" - 0.23"
- **Filter:** 60 mesh
- **Reduction:** As needed up to 10% by volume

**Brush**

- **Nylon/Polyester or Natural Bristle**
- **Reduction:** As needed up to 10% by volume

**Roller**

- **Cover:** 3/8" woven with solvent resistant core
- **Reduction:** As needed up to 10% by volume

**Recommended Spreading Rate per coat**

- **Standard:**
  - **AWWA**
    - Wet mils (microns): 7.0 (175) - 13.5 (340)
    - Dry mils (microns): 5.0 (125) - 10.0" (250)
  - **Coverage:** 116 (2.8) - 232 (5.6) sq ft/gal (m²/L)

*See recommended systems on Product Information page*

If specific application equipment is not listed above, equivalent equipment may be substituted.
**APPLICATION BULLETIN**

**APPLICATION PROCEDURES**

Surface preparation must be completed as indicated.

Mix contents of each component thoroughly with low speed power agitation. Make certain no pigment remains on the bottom of the can. Then combine one part by volume of Part A with one part by volume of Part B. Thoroughly agitate the mixture with power agitation. Allow the material to sweat-in as indicated prior to application. Re-stir before using.

If reducer solvent is used, add only after both components have been thoroughly mixed, after sweat-in.

Apply paint at the recommended film thickness and spreading rate as indicated below:

<table>
<thead>
<tr>
<th>Wet mils (microns)</th>
<th>Dry mils (microns)</th>
<th>Coverage sq ft/gal (m²/l)</th>
<th>Theoretical coverage sq ft/gal (m²/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>15</td>
<td>0.125</td>
<td>5.0</td>
</tr>
<tr>
<td>15</td>
<td>25</td>
<td>0.250</td>
<td>10.5</td>
</tr>
<tr>
<td>20</td>
<td>30</td>
<td>0.375</td>
<td>16.2</td>
</tr>
<tr>
<td>25</td>
<td>50</td>
<td>0.750</td>
<td>32.8</td>
</tr>
<tr>
<td>30</td>
<td>75</td>
<td>1.0</td>
<td>41.3</td>
</tr>
</tbody>
</table>

**PERFORMANCE TIPS**

Stripe coat all crevices, welds, and sharp angles to prevent early failure in these areas.

When using spray application, use a 50% overlap with each pass of the gun to avoid holidays, bare areas, and pinholes. If necessary, cross spray at a right angle.

Spreading rates are calculated on volume solids and do not include an application loss factor due to surface profile, roughness or porosity of the surface, skill and technique of the applicator. Method of application, various surface irregularities, material lost during mixing, spillage, over thinning, climatic conditions, and excessive film build.

Excessive reduction of material can affect film build, appearance, adhesion and ULANS/NSF 61 approval. Do not mix previously catalyzed material with new. Do not apply the material beyond recommended pot life.

In order to avoid blockage of spray equipment, clean equipment before use or before periods of extended downtime with Reducer R7K15.

Tinting is not recommended for immersion service. Quik-Kick Epoxy Accelerator is acceptable for atmospheric use. Do not use Quik-Kick Epoxy Accelerator for immersion service when UL certification is required.

Insufficient ventilation, incomplete mixing, miscalculation, and external heaters may cause premature yellowing.

Excessive film build, poor ventilation, and cool temperatures may cause solvent entrapment and premature coating failure.

For **Immersion Service**: (If required) Holiday test in accordance with ASTM D5162 for steel, or ASTM D4787 for concrete.

Refer to Product Information sheet for additional performance characteristics and properties.

**SAFETY PRECAUTIONS**

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

**WARRANTY**

The Sherwin-Williams Company warrants its products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product or the refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY SHERWIN-WILLIAMS. EXPRESSED OR IMPLIED, STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
ACROLON™ 218 HS
ACRYLIC POLYURETHANE

**PRODUCT INFORMATION**

**PRODUCT DESCRIPTION**

ACROLON 218 HS acrylic polyurethane is a low VOC, polyester modified, aliphatic acrylic polyurethane formulated specifically for in-shop applications. Also suitable for industrial applications. A fast drying, urethane that provides color and gloss retention for exterior exposure:

- Can be used directly over organic zinc rich primers (epoxy zinc primer and moisture cure urethane zinc primer)
- Color and gloss retention for exterior exposure
- Fast dry
- Outstanding application properties

**PRODUCT CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish:</td>
<td>High Gloss or Semi-Gloss</td>
</tr>
<tr>
<td>Color:</td>
<td>Wide range of colors available</td>
</tr>
<tr>
<td>Volume Solids:</td>
<td>65% ± 2%, mixed, may vary by color</td>
</tr>
<tr>
<td>Weight Solids:</td>
<td>78% ± 2%, mixed, may vary by color</td>
</tr>
<tr>
<td>VOC (EPA Method 24):</td>
<td>Unreduced: &lt;300 g/L; 2.5 lb/gal</td>
</tr>
<tr>
<td></td>
<td>Mixed: Reduced 10% with R7K16; &lt;340 g/L; 2.8 lb/gal</td>
</tr>
<tr>
<td></td>
<td>Reduced 9% with MEK, R6K10; &lt;340 g/L; 2.8 lb/gal</td>
</tr>
<tr>
<td>Mix Ratio:</td>
<td>6:1 by volume, 1 gallon or 5 gallon mixes premixed components</td>
</tr>
</tbody>
</table>

**Recommended Spreading Rate per coat:**

| Wet mils (micros) | 4.5 112.5 9.0 225 |
| Dry mils (micros) | 3.0 75 6.0 150 |
| Coverage sq ft/gal (m²/L) | 175 43 346 8.5 |
| Theoretical coverage sq ft/gal (m²/L) | 1040 25.5 |

**Drying Schedule @ 6.0 mils wet (150 microns):**

- At 35°F/1.7°C @ 77°F/25°C @ 120°F/49°C
- RH

| To touch:               | 4 hours | 30 minutes | 20 minutes |
| To handle:             | 18 hours | 6 hours    | 4 hours    |
| To recoat:             | minimum: 18 hours | 8 hours | 6 hours |
|                       | maximum: 3 months | 3 months | 3 months |
| To cure:               | 14 days | 7 days     | 5 days     |
| Pot Life:              | 4 hours | 2 hours    | 45 minutes |

**Sweat-in-Time:** None

- If maximum recoat time is exceeded, abrade surface before recoating.
- Drying time is temperature, humidity, and film thickness dependent.
- Paint temperature must be at least 40°F (4.5°C) minimum.

**Shelf Life:**

- Part A - 36 months, unopened
- Part B - 24 months, unopened

**Flash Point:**

- 55°F (13°C), Seta, mixed

**Reducer/Clean Up:**

- Reducer R7K15, MEK R6K10, or R7K111
- Reducer #132, R7K132 or R7K111

**ACROLON™ 218 HS**

| PART A | B65-600 | GLOSS SERIES |
| PART A | B65-650 | SEMI-GLOSS SERIES |
| PART B | B65V600 | HARDENER |

**Recommended Uses**

Specifically formulated for in-shop applications.

For use over prepared metal and masonry surfaces in industrial environments such as:

- Structural steel
- Rail cars and locomotives
- Pipelines
- Conveyors
- Bridges
- Offshore platforms - exploration and production
- Suitable for use in USDA inspected facilities
- Conforms to AWWA D102 Outside Coating Systems #4 (OCS-4), #5 (OCS-5) & #6 (OCS-6)
- Acceptable for use in high performance architectural applications.

**Performance Characteristics**

**Substrate:** Steel

**Surface Preparation:** SSPC-SP10/NACE 2

**System Tested:**

- 1 ct. Macropoxy 646 @ 6.0 mils (150 microns) dft
- 1 ct. Acrolon 218 HS Gloss @ 4.0 mils (100 microns) dft

**Test Name** | **Test Method** | **Results**
--- | --- | ---
Abrasions | ASTM D4060, C517 | 43 mg loss
Resistance 1 | | |
Adhesion | ASTM D4541 | 975 psi
Corrosion | ASTM D5989, 9 cycles | Rating 10 per ASTM D610, for rusting; Rating 10 per ASTM D714, for blistering
Weathering 1 | | |
Direct Impact | ASTM D2794 | 50 in. Ib.
Resistance | | |
Dry Heat Resistance 1 | ASTM D2445, Method A | 200°F (93°C)
Flexibility 1 | ASTM D522, 180° bend, 1/8" mandrel | Passes
Humidity Resistance 1 | ASTM D4585, 100°F (38°C), 1500 hours | Rating 10 per ASTM D610, for rusting; Rating 10 per ASTM D714, for blistering
Pencil Hardness | ASTM D3363 | 3H
Salt Fog Resistance 1 | ASTM B117, 700 hours | Rating 10 per ASTM D610, for rusting; Rating 9 per ASTM D714, for blistering

Meets the requirements of SSPC Paint No. 36, Level 3.

**Footnotes:**

1 Finish coat only tested
2 Primer Zinc-Clad II Plus
3 Intermediate Macropoxy 646
4 Finish Acrolon 218 HS

www.sherwin-williams.com/protective

continued on back
# ACROLON™ 218 HS ACRYLIC POLYURETHANE

## PRODUCT INFORMATION

### RECOMMENDED SYSTEMS

<table>
<thead>
<tr>
<th>Dry Film Thickness / ct.</th>
<th>Steel:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 ct. Macropoxy 646</td>
<td>5.0-7.0 (125-180)</td>
</tr>
<tr>
<td></td>
<td>1-2 cts. Acrolon 218 HS Polyurethane</td>
<td>3.0-6.0 (75-150)</td>
</tr>
</tbody>
</table>

| Steel: | 1 ct. Zinc Clad IV | 3.0-5.0 (75-125) |
|        | 1-2 cts. Acrolon 218 HS Polyurethane | 3.0-6.0 (75-150) |

| 1 ct. Corotherm I-GalvaPac Zinc Primer | 3.0-4.0 (75-100) |
| 1-2 cts. Acrolon 218 HS Polyurethane | 3.0-6.0 (75-150) |

| Steel: | 1 ct. Epoxy Mastic Aluminum | 6.0 (150) |
|        | 1-2 cts. Acrolon 218 HS Polyurethane | 3.0-6.0 (75-150) |

| 1 ct. Recoat Epoxy Primer | 4.0-6.0 (100-150) |
| 1-2 cts. Acrolon 218 HS Polyurethane | 3.0-6.0 (75-150) |

### CONCRETE/MASONRY:

<table>
<thead>
<tr>
<th>Condition of Surface</th>
<th>ISO 8501</th>
<th>Swedish Std.</th>
<th>S559900</th>
<th>SSPC NACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filler/Sealer</td>
<td>Sa 3.5</td>
<td>Sa 3.5</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td>Component Blast</td>
<td>Sa 3.5</td>
<td>Sa 3.5</td>
<td>Sa 3</td>
<td>Sa 3</td>
</tr>
<tr>
<td>Hand Tool Cleaning</td>
<td>Sa 2.5</td>
<td>Sa 2.5</td>
<td>Sa 2.5</td>
<td>Sa 2.5</td>
</tr>
<tr>
<td>Power Tool Cleaning</td>
<td>Sa 3.0</td>
<td>Sa 3.0</td>
<td>Sa 3.0</td>
<td>Sa 3.0</td>
</tr>
</tbody>
</table>

### TINTING

- Tint Part A with Maxitoner Colors.
- Extra white tints at 100% tint strength.
- Ultradeep base tints at 150% tint strength.

Five minutes minimum mixing on a mechanical shaker is required for complete mixing of color.

### APPLICATION CONDITIONS

- Temperature: 35°F (1.7°C) minimum, 120°F (49°C) maximum (air and surface).
- Relative humidity: 85% maximum.

Before application, refer to the Product Application Bulletin for detailed application information.

### ORDERING INFORMATION

- Packaging: 1 gallon (3.78L) mix, 5 gallon (18.9L) mix.
- Part A: 96 gal (3.52L)
- Part B: 14 gal (0.53L)
  - (preamer measured components)

### SAFETY PRECAUTIONS

Refer to the MSDS sheet before use. Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

### WARRANTY

The Sherwin-Williams Company warrants its products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product or the refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY, EXPRESSED OR IMPLIED, STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
APPLICATION BULLETIN

SURFACE PREPARATIONS

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Iron & Steel
Remove all oil and grease from surface by Solvent Cleaning per SSPC-SP1. Minimum surface preparation is Commercial Blast Cleaning per SSPC-SP6/NACE 3. For better performance, use Near White Metal Blast Cleaning per SSPC-SP10/NACE 2. Blast clean all surfaces using a sharp, angular abrasive for optimum surface profile (1.2 mils/25-50 microns). Prime any bare steel the same day as it is cleaned or before flash rusting occurs.

Aluminum
Remove all oil, grease, dirt, oxide and other foreign material by Solvent Cleaning per SSPC-SP1. Primer required.

Galvanized Steel
Allow to weather a minimum of six months prior to coating. Solvent Clean per SSPC-SP1. When weathering is not possible, or the surface has been treated with chromates or silicates, first Solvent Clean per SSPC-SP1 and apply a test patch. Allow paint to dry at least one week before testing adhesion. If adhesion is poor, brush blasting per SSPC-SP7 is necessary to remove these treatments. Rusty galvanizing requires a minimum of Hand Tool Cleaning per SSPC-SP2, prime the area the same day as cleaned or before flash rusting occurs. Primer required.

Concrete and Masonry
For surface preparation, refer to SSPC-SP13/NACE 6, or ICRI 03732, CSP 1-3. Surfaces should be thoroughly clean and dry. Concrete and mortar must be cured at least 28 days at 75°F (24°C). Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement and hardeners. Fill bug holes, air pockets and other voids with Steel-Seam FT910. Primer required.

Always follow the standard methods listed below:
ASTM D4258 Standard Practice for Cleaning Concrete.
ASTM D4259 Standard Practice for Abrading Concrete.
ASTM D4260 Standard Practice for Etching Concrete.
ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete.
SSPC-SP 13/NACE 6 Surface Preparation of Concrete.
ICRI 03732 Concrete Surface Preparation.

Surface Preparation Standards

<table>
<thead>
<tr>
<th>Condition of Surface</th>
<th>ISO R901-1</th>
<th>Swedish Std.</th>
<th>SSPC</th>
<th>NACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Metal</td>
<td>57079/A1</td>
<td>Sn059900</td>
<td>SP 1</td>
<td>1</td>
</tr>
<tr>
<td>Near White Metal</td>
<td>5268</td>
<td>Sn2545</td>
<td>SP2</td>
<td>2</td>
</tr>
<tr>
<td>Commercial Blast</td>
<td>5264</td>
<td>Sn2545</td>
<td>SP2</td>
<td>2</td>
</tr>
<tr>
<td>Brush-Off Blast</td>
<td>5264</td>
<td>Sn2545</td>
<td>SP2</td>
<td>2</td>
</tr>
<tr>
<td>Hand Tool Cleaning</td>
<td>Rusted</td>
<td>Sn2545</td>
<td>SP2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Rotted</td>
<td>Sn2545</td>
<td>SP2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Power Tool Cleaning</td>
<td>Sn2545</td>
<td>SP2</td>
<td>2</td>
</tr>
</tbody>
</table>

APPLICATION CONDITIONS

Temperature: 35°F (1.7°C) minimum, 120°F (49°C) maximum (air and surface)
40°F (4.5°C) minimum, 120°F (49°C) maximum (material)
At least 5°F (2.8°C) above dew point

Relative humidity: 85% maximum

APPLICATION EQUIPMENT

The following is a guide. Changes in pressures and tip sizes may be needed for proper spray characteristics. Always purge spray equipment before use with listed reducer. Any reduction must be compliant with existing VOC regulations and compatible with the existing environmental and application conditions.

Reducer/Clean Up:
Spray.....................Reducer R7K15, MEK R6K10, or R7K111
Brush/Roll..................Reducer #132, R7K132, or R7K111
If reducer is used, reduce at time of catalyzation.

Airless Spray
Pressure..............2500 - 2800 psi
Hose................3/8" ID
Tip..................013" - 017"
Filter..................60 mesh
Reduction..............As needed up to 10% by volume with R7K15 or R7K111, or up to 9% with MEK, R6K10

Conventional Spray
Gun..................Binks 95
Cap..................63P
Atomization Pressure......50 - 70 psi
Fluid Pressure.............20 - 25 psi
Reduction..............As needed up to 10% by volume with R7K15 or R7K111, or up to 9% with MEK, R6K10

Brush
Brush..................Natural Bristle
Reduction..............As needed up to 10% by volume*

Roller
Cover..................3/8" woven with solvent resistant core
Reduction..............As needed up to 10% by volume*

If specific application equipment is not listed above, equivalent equipment may be substituted.

* Note: Reducing more than maximum recommended level will result in exceed VOC exceeding 340g/L

www.sherwin-williams.com/protective
continued on back
## Application Bulletin

### Application Procedures

Surface preparation must be completed as indicated.

Mix contents of each component thoroughly with low speed power agitation. Make certain no pigment remains on the bottom of the can. Then combine six parts by volume of Part A with one part by volume of Part B (premeasured components). Thoroughly agitate the mixture with power agitation. Re-stir before using.

If reducer is used, add only after both components have been thoroughly mixed.

Apply paint at the recommended film thickness and spreading rate as indicated below:

<table>
<thead>
<tr>
<th>Recommended Spreading Rate per coat:</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet mls (microns)</td>
<td>4.5</td>
<td>112.5</td>
</tr>
<tr>
<td>Dry mls (microns)</td>
<td>3.0</td>
<td>75</td>
</tr>
<tr>
<td>Coverage sq ft/gal (m²/L)</td>
<td>175</td>
<td>4.3</td>
</tr>
<tr>
<td>Theoretical coverage sq ft/gal (m²/L) @ 1 mil / 25 microns thick</td>
<td>1040</td>
<td>25.5</td>
</tr>
</tbody>
</table>

*NOTE: Brush or roll application may require multiple coats to achieve maximum film thickness and uniformity of appearance.*

### Drying Schedule @ 6.0 mls wet (150 microns):

- **At 35°F/1.7°C**
  - To touch: 4 hours
  - To handle: 6 hours
  - To recoat: minimum 18 hours

- **At 77°F/25°C**
  - To touch: 30 minutes
  - To handle: 4 hours
  - To recoat: maximum 3 months

- **At 120°F/49°C**
  - To touch: 6 hours
  - To handle: 6 days
  - To recoat: maximum 18 months

**Pot Life**: 4 hours (reduced 5% with Reducer R7K15)

**Sweat-in-Time**: None

*If maximum recoat time is exceeded, abrade surface before recoating. Drying time is temperature, humidity, and film thickness dependent. Paint temperature must be at least 40°F (4.4°C) minimum.

Application of coating above maximum or below minimum recommended spreading rate may adversely affect coating performance.

### Clean Up Instructions

Clean spills and splatters immediately with Reducer #132, R7K132. Clean tools immediately after use with Reducer #132, R7K132. Follow manufacturer’s safety recommendations when using any solvent.

### Disclaimer

The information and recommendations set forth in this Product Data Sheet are based upon tests conducted by or on behalf of The Sherwin-Williams Company. Such information and recommendations set forth herein are subject to change and pertain to the product offered at the time of publication. Consult your Sherwin-Williams representative to obtain the most recent Product Data Information and Application Bulletin.

### Performance Tips

Stripe coat all crevices, welds, and sharp angles to prevent early failure in these areas.

When using spray application, use a 50% overlap with each pass of the gun to avoid holidays, bare areas, and pinholes. If necessary, cross spray at a right angle.

Spreading rates are calculated on volume solids and do not include an application loss factor due to surface profile, roughness or porosity of the surface, skill and technique of the applicator, method of application, various surface irregularities, material lost during mixing, spillage, overthinning, climatic conditions, and excessive film build.

Excessive reduction of material can affect film build, appearance, and adhesion.

Do not apply the material beyond recommended pot life.

Do not mix previously catalyzed material with new.

In order to avoid blockage of spray equipment, clean equipment before use or before periods of extended downtime with Reducer #15, R7K15 or MEK, R6K10.

Mixed coating is sensitive to water. Use water traps in all air lines. Moisture contact can reduce pot life and affect gloss and color.

Quick-Thane Urethane Accelerator is acceptable for use. See data page 5.97 for details.

E-Z Roll Urethane Defoamer is acceptable for use. See data page 5.99 for details.

Refer to Product Information sheet for additional performance characteristics and properties.

### Safety Precautions

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

### Warranty

The Sherwin-Williams Company warrants our products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product and/or refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY SHERWIN-WILLIAMS, EXPRESSED OR IMPLIED STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
8. APPENDIX B - DRAFT SPECIAL NOTE FOR INSERTION INTO KYTC OAP BRIDGE PAINTING PROJECT

Special Note For B00039N And B00027N

Paint Application
Do not paint areas until they have been inspected and approved by the engineer. Apply paint only to clean, dry surfaces. Ensure that the appropriate surface condition, as described in the Abrasive Blast Cleaning section, is present at the time of primer application (i.e. Re-treat if rust-back occurs). Apply System 1 referenced in the Special Notes For Paint to B00039N and apply System 2 referenced in the Special Note For Paint to B00027N. Apply all coating within manufacturers recommended dry film thickness range. Comply with KYTC “Standard Specifications For Road And Bridge Construction” section 614.03.02 and coatings supplier recommended conditions for application.

The finish coat will be gray closely approaching federal standard no. 595B-X6187.

Damages - take all steps necessary to preclude damage to public property from paint overspray. Those steps may include changes in the type of containment or cessation of spraying operations. The contractor is solely responsible for any damages arising from the painting operations.

Repair of paint defects - repair all defects in new paint.
Special Note For Quality Control

The contractor will provide lighting, for both QC and QA inspectors, meeting the requirements of ASTM E2501 – 07. The contractor will also provide at least one spectroradiometer meeting the requirements of ASTM E2501 – 07. Inspection of applied coatings will not proceed without the specified lighting and spectroradiometer in good working condition.

The contractor will provide eyewear for all inspectors or other personnel observing the specified inspection lighting. The eyewear will be one of the following.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yamamoto-Kogaku</td>
<td>YS-760 UV Yellow</td>
</tr>
<tr>
<td>Elvex</td>
<td>TTS SG-15A</td>
</tr>
<tr>
<td>AO Safety</td>
<td>X-Factor 174661</td>
</tr>
<tr>
<td>Pyramex</td>
<td>Venture II SB1830S</td>
</tr>
<tr>
<td>Pyramex</td>
<td>Ztek S2530S</td>
</tr>
<tr>
<td>Elvex</td>
<td>Ranger SG-10A</td>
</tr>
<tr>
<td>3M</td>
<td>Virtua AP Amber 11817-00000-20</td>
</tr>
</tbody>
</table>

All specified lighting and eyewear will become the property of KYTC upon completion of the project.

The contractor will allow QC inspectors to monitor all work, insure that all work is completed in accordance with the special notes and standard specifications, and record inspection results. All QC inspectors will possess at a minimum one of the following certifications: SSPC-BCI Level 1 or NACE CIP Level 1 & CIP one day bridge course. The QC inspector(s) may not perform production work that requires QC/QA inspection. The department’s (QA) inspector will conduct in-progress reviews of the contractor’s operations and perform follow-up quality assurance (QA) inspections after the QC inspector has certified that a portion of work is complete.

Progress of work - work shall proceed by sections, bays or other readily identifiable parts of the structure. All work will proceed from top to bottom of the structure. The work will be broken down into adjacent sections (control areas) separated by bulkheads. Bulkheads will be sealed to the containment and meet all SSPC GUIDE 6 – Containment Classification Class 2A requirements. Only one phase of work will be permitted in a given control area at any time.

In any control area, quality control point inspection and approval must precede the start of succeeding phases of work. Quality control points are progress milestones that occur when one phase of work is complete and ready for inspection prior to continuing with the next operational step. At those points, the contractor will provide the departments’ QA inspectors with OSHA compliant access to inspect all pertinent surfaces. If QA inspection indicates a deficiency, that phase of the work shall be corrected and re-inspected prior to beginning the next phase of work.
Quality control point
1. Surface preparation
   a. Solvent cleaning
   b. Abrasive blast cleaning
2. Full prime coat application
3. Full intermediate coat application
4. Finish coat application

Verify the surface profile with a minimum of three measurements per shift. Each measurement shall be the average of three individual readings. Report individual gage readings and averages in the log book. The engineer may request additional measurements at any time.

The QC inspector will inspect prepared surfaces to determine whether those conform to the specification (see Special Note For Surface Preparation And Paint Application). Inspect each individual coat of paint using KM 64-258-08 Procedure C. Inspect for areas of incomplete coating coverage and coating defects. The engineer may request tests, including destructive DFT tests, at additional sites or he may elect to perform additional tests.

The QC inspector will maintain a handwritten record of all-painting activities, operations and inspections in the log book(s). At a minimum, the following information must be recorded: All paint inventory and approval information, daily records of ambient conditions (including all measurements taken), daily progress of work information including start-up/shut-down times, bridge locations by control numbers, structural steel components by proper terminology and pertinent operations by control points, and QC inspection information including evaluations at control points, rework comments, or approvals. Make entries on consecutive pages of the logbook (in indelible ink) and make corrections by marking through mistakes with a single line. Do not remove pages or erase or obliterate entries in the logbook.

The QC inspector and QA inspector will jointly assign adjacent control areas consecutive numbers and a short description defining their location. After completion of a phase of work in a control area, the QC inspector will perform an inspection and will determine whether the area has been satisfactorily prepared. If work in a control area is unsatisfactory, the QC inspector will require the contractor to make the necessary corrections. That process will be repeated as necessary until suitable corrections have been made. Maintain all logbooks at the job site at all times during the project. Make those available, upon request, to the Department’s representatives. At the end of the project, submit all such logs to the Engineer for his review and records.

Test patch - prior to initiation of painting, prepare at least one test patch in each section of work.
to serve as a standard for reference during the balance of the painting operations. Locate the test patch at an accessible area incorporating surface types of the project. Use the specified surface preparation on a surface with at least 20 ft² per application method per coating, plus 20 ft² for surface preparation.

When central office personnel, the engineer, QC inspector, and the QA inspector, agree that the appropriate level of cleanliness and surface preparation have been achieved, the contractor will apply a clear sealer, supplied by the coatings manufacturer, to at least 20 ft² of the prepared surface. The contractor will then apply coating to the remainder (at least 20-ft³) of the test patch. Set aside the test patch area as a standard for proper application and appearance. Do not paint the reference areas until the balance of the project is completed. After the project is complete, reblast the area of the test patch with clear sealer, and apply all specified coatings. Apply all coatings, including the clear sealer, in the presence of Central Office personnel, the Engineer, the QA inspector, QC inspector, and a technical representative of the paint manufacturer. If QC and QA inspectors agree, clear coat preservation of the test patch may be replaced with pictorial records.
Special Note For Paint

Use a coatings system from an approved supplier. A list of approved suppliers may be found in the Department’s List of Approved Materials maintained by the Division of Materials. All paint supplied must conform to the applicable Special Notes contained in this proposal. The Department requires acceptance testing of samples obtained on a per-lot basis per-shipment. The Division of Materials will perform acceptance testing. At his option, the Engineer may elect to conduct more frequent sampling and testing. Test samples will be taken at the contractor’s paint storage site. Department personnel will perform sampling. Allow ten (10) working days for testing and approval of the sampled paint.

Contrary to the List of Approved Materials, bridges B00039N and B00027N will be coated with the following systems supplied by the Sherwin Williams Company.

B00039N
One Coat Corothane I Galvapac I K Zinc Primer OAP DOT - B65 G25 Gray at three to four mils dft.
Apply: One Coat Macropoxy 646 Fast Cure Epoxy - B58W610/ B58V600 at three to six mils dft.
Apply: One Coat Acrolon 218 HS OAP DOT Acrylic Polyurethane - B65AW611X / B65V600 - Color FS 16515 Gray at three to six mils dft.

B00027N
One Coat Corothane I Galvapac I K Zinc Primer DOT - B65 G25 Gray at three to four mils dft.
Apply: One Coat Macropoxy 646 Fast Cure Epoxy OAP - B58W610/ B58V600 at three to six mils dft.
Apply: One Coat Acrolon 218 HS DOT Acrylic Polyurethane - B65AW611X / B65V600 - Color FS 16515 Gray at three to six mils dft.

Note: it is the contractor’s responsibility to maintain an adequate inventory of approved paint. The department assumes no responsibility for lost work due to rejection of paint or approved paint subsequently found to be defective during the application process.