Cape Cod Railroad Bridge
Coating Field Test Results

Alfred D. Beitelman

This report documents observations on the performance of six representative coating systems applied to a steel railroad bridge in 1994 as part of an Army Corps of Engineers field study. The objective of the study was to compare the performance of industry-accepted coating systems as applied to steel surfaces cleaned and prepared according to four different industry standards. The coatings were applied under contract by a local sandblasting and painting company working under typical field conditions.

Two field inspections of the coatings were conducted — once after 1 year of service and again after 5 years of service.

This report provides details on surface preparation, coating application, and field performance, including photographs of the test structure and manufacturers’ literature on the six coatings tested.
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This report provides details on surface preparation, coating application, and field performance, including photographs of the test structure and manufacturers’ literature on the six coatings tested.
Foreword

This study was conducted for Headquarters, U.S. Army Corps of Engineers (HQUSACE) under Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Research Program Work Unit 32666, “Maintenance and Removal of Lead-Pigmented Paints From Hydraulic Structures.” The technical monitor was Andy Wu, CECW-EE.

The work was performed by the Materials and Structures Branch (CF-M) of the Facilities Division (CF), Construction Engineering Research Laboratory (CERL). The CERL Principal Investigator was Alfred D. Beitelman. A portion of this work was performed by USACE New England Division. Dr. Ilker R. Adiguzel is Chief, CEERD-CF-M, and L. Michael Golish is Chief, CEERD-CF. The technical editor was Gordon L. Cohen, Information Technology Laboratory – CERL.

The Director of CERL is Dr. Michael J. O’Connor.

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1 Introduction

Background

On 22 July 1999 final observations were made on a field test of various types of coatings applied in 1994 to parts of a steel railroad bridge spanning the Cape Cod Canal near Buzzards Bay, MA. The coatings were applied under contract by a local sandblasting and painting company working under typical field conditions. Each test coating was applied to several areas of structural steel that had been cleaned to various grades according to industry standards.

Objective

The objective of this work was to test a number of coating systems as they would be applied in the field to a steel structure under a typical contract. The objective of this report is to document the performance of the subject coatings after 5 years of exposure in the field.

Approach

Six coatings were selected as representative of several generic types of products. Some of the proprietary coatings were selected because of good performance in a Steel Structures Painting Council APEC program. (There was no final report on the APEC program.) The coatings tested in this study were the following:

1. Amerlock 400 AL manufactured by Ameron Corporation, Protective Coatings Division, Brea CA. This product was selected as being typical of the numerous high solids epoxy coatings available in the market. It has a high solids content (88% by volume) which should have resulted in low shrinkage. This was deemed an important factor in the selection of a coating for application over an existing system which might have marginal adhesion.

2. Kolorane 9500 manufactured by Keeler & Long, Watertown, CT. This product was selected as being typical of the numerous moisture cure aluminum coatings
available in the market. These products are known for their exceptional adhesion to poorly cleaned surfaces as well as their excellent corrosion resistance.

3. Steelmastic 168 manufactured by Steelcote Manufacturing Co., St. Louis, MO. This product was selected as being typical of the numerous aluminum epoxy mastics available in the market. These products are marketed as being easily applied over marginally cleaned steel as well as over existing coatings.

4. SSPC Paint 25 primer (SSPC: The Society for Protective Coatings specification for Red Iron Oxide, Zinc Oxide, Raw Linseed Oil & Alkyd Primer) followed with 2 coats of TT-P-38 (Federal specification for Paint, Aluminum, Ready Mixed). This is a standard paint system for the Corps of Engineers in the civil works guide specification CEGS 09965 (Painting: Hydraulic Structures). Paint 25 is a conventional slow drying long oil product having no lead or chromates. TT-P-38 is a 33 gallon oil length phenolic aluminum. The oil is 80% tung oil and 20% alkali refined linseed oil.

5. Corps of Engineers Formula 19466 is a specially formulated aluminum epoxy mastic having a solids content of 76%.

6. Rustbond penetrating sealer manufactured by Carboline Co., St. Louis, MO was applied to some surfaces prior to the application of the above System 4. Rustbond is a 2 component polymeric amidoamine having excellent wetting properties. Due to the temperatures at the time of the application, a ‘winter grade’ product was used. The winter grade is specified for use between 10 – 32 °C (50 – 90 °F).

Product literature for the test coatings is reproduced in Appendix A. The coatings were applied to a steel railroad bridge at Cape Cod, MA. The surfaces of discrete test areas (all of the same approximate size) were prepared to four different degrees using different methods, as detailed in Chapter 2. Two field inspections of the coatings were conducted — once after 1 year of service and again after 5 years of service.

The main text of this report provides details on surface preparation, coating application, and field performance.
Units of Weight and Measure

U.S. standard units of measure are used throughout this report. A table of conversion factors for Standard International (SI) units is provided below.

<table>
<thead>
<tr>
<th>SI conversion factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in. = 2.54 cm</td>
</tr>
<tr>
<td>1 mil = 0.0245 mm</td>
</tr>
<tr>
<td>1 sq ft = 0.093 m²</td>
</tr>
<tr>
<td>1 gal = 3.78 L</td>
</tr>
<tr>
<td>1 lb = 0.453 kg</td>
</tr>
<tr>
<td>1 psi = 6.89 kPa</td>
</tr>
<tr>
<td>°F = (°C x 1.8) + 32</td>
</tr>
</tbody>
</table>
2 Field Test Summary and Results

Railroad Bridge Structure

The railroad bridge over the Cape Cod Canal is of riveted construction. The existing paint system consisted of red lead in oil primers (TT-P-68 Type I and Type II) and phenolic aluminum (TT-P-38) topcoats. The structure had been repainted numerous times without removing the existing coating. Some paint chips removed indicate 4 applications of the orange/aluminum paint system. Some of the removed paint revealed intact mill scale indicating the structure had never been completely blast cleaned. Total coating thickness was quite erratic but was mostly in the 500 – 750 μ (20 – 30 mil) range. At the time of the test application the coating had deteriorated beyond the time for optimum repainting. SSPC Vis 2 rust grade 8 – 9 was common on much of the higher vertical surfaces having few rivets; grade 5 was common on many riveted areas especially near the track bed; grade 0 was found in recesses where water was retained. Overall, there was virtually no pitting corrosion, no deformation of steel due to exfoliation, and a minimal number of rivet heads requiring replacement.

Each test area consisted of at least 50 sq ft. Some test areas were located on large girders located below and to the side of the tracks and others were located on the truss structure on the west side of the tracks. Some truss surfaces were eastern exposure and others were western exposure. Figure 1 shows the basic layout of the test areas and Table 1 identifies which coating systems were applied to which test areas.

Application of Test Coatings

Table 2 lists the film thicknesses specified in the painting contract. All test coatings were applied over each of four different degrees of surface preparation. The four degrees are described as follows:

A. SSPC SP5, White Metal Blast Cleaning. Grit blasting was used to produce an anchor profile of approximately 2.5 to 3.0 mils.
Figure 1. Diagram of paint test areas.

<table>
<thead>
<tr>
<th>Coating System</th>
<th>Area A</th>
<th>Area B</th>
<th>Area C</th>
<th>Area D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface Preparation</strong></td>
<td>SSPC SP5</td>
<td>SSPC SP6</td>
<td>SSPC SP3</td>
<td>Existing Paint</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>West exposure on superstructure</td>
<td>East exposure on superstructure</td>
<td>West exposure on superstructure</td>
<td>Girder below level of tracks</td>
</tr>
<tr>
<td><strong>System #1</strong></td>
<td>1A</td>
<td>1B</td>
<td>1C</td>
<td>1D</td>
</tr>
<tr>
<td>Amerlock 400AL/Amerlock 4000AL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System #2</strong></td>
<td>2A</td>
<td>2B</td>
<td>2C</td>
<td>2D</td>
</tr>
<tr>
<td>Kolorane 9500/Kolorane 9500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System #3</strong></td>
<td>3A</td>
<td>3B</td>
<td>3C</td>
<td>3D</td>
</tr>
<tr>
<td>Steelmastic 168/Steelmastic 168</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System #4</strong></td>
<td>4A</td>
<td>4B’</td>
<td>4C</td>
<td>4D</td>
</tr>
<tr>
<td>SSPC Paint 25/TT-P-38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System #5</strong></td>
<td>5A</td>
<td>5B</td>
<td>5C</td>
<td>5D</td>
</tr>
<tr>
<td>CoE Formula 19466/CoE Formula 19466</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System #6</strong></td>
<td>6A</td>
<td>6B</td>
<td>6C</td>
<td>6D</td>
</tr>
<tr>
<td>Rustbond Sealer/SSPC Paint 25/TT-P-38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Film thickness required by contract.

<table>
<thead>
<tr>
<th>Coating system</th>
<th>Sealer (applied to all surfaces)</th>
<th>Primer (applied to bare steel only)</th>
<th>Intermediate (applied over primer only)</th>
<th>Finish (applied to all surfaces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>System #1</td>
<td>---</td>
<td>5-8 mils</td>
<td>---</td>
<td>3-4 mils</td>
</tr>
<tr>
<td>Amerlock400AL/Amerlock400AL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System #2</td>
<td>---</td>
<td>1.5-2.0 mils</td>
<td>---</td>
<td>1.5-2.0 mils</td>
</tr>
<tr>
<td>Kolorane 9500/Kolorane 9500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System #3</td>
<td>---</td>
<td>6-8 mils</td>
<td>---</td>
<td>5-7 mils</td>
</tr>
<tr>
<td>Steelmastic 168/Steelmastic 168</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System #4</td>
<td>---</td>
<td>2-3 mils</td>
<td>1.5-2.5 mils</td>
<td>1.5-2.5 mils</td>
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<tr>
<td>SSPC Paint 25/TT-P-38</td>
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<td></td>
</tr>
<tr>
<td>System #5</td>
<td>---</td>
<td>5-8 mils</td>
<td>---</td>
<td>3-4 mils</td>
</tr>
<tr>
<td>CoE Formula 19466/CoE Formula 19466</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System #6</td>
<td>1-2 mils</td>
<td>2-3 mils</td>
<td>1.5-2.5 mils</td>
<td>1.5-2.5 mils</td>
</tr>
<tr>
<td>Rustbond Sealer/SSPC Paint 25/TT-P-38</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. SSPC SP6, *Commercial Blast Cleaning*. Grit blasting was used to produce an anchor profile of approximately 2.5 to 3.0 mils.

C. SSPC SP3, *Power Tool Cleaning*. Power wire brushes were used.

D. Manual removal of dirt, grease, and loose coating material only.

Surface preparation A was thorough and met the requirements of the specification in all except tight areas around rivets. Surface preparation B was thorough in riveted areas but was less than specification requirements on flat areas where many traces of mill scale remained on the surface. Surface preparation C was thorough and met specification requirements. Surface preparation D was indeed minimal. No solvent cleaning was performed. Hand tool removal of loose coatings removed only some of the loosely attached coating leaving many other areas that, although not curled, were not adherent to the substrate.

All paint was applied by brush using a method typical for brush-applied coatings. Thickness requirements on flat areas were normally met; however, coatings were often thin on projections such as rivet heads.
Observations

All test coatings were observed and photographed after 1 year and again after 5 years. (See Appendix B for photos). Observations of each area are shown in order from the poorest appearance to the best appearance.

1-Year Observations

Area A, 1-year observations

All test coatings were providing perfect protection.

Area B, 1-year observations

Light rust was observed on many rivets in Systems 1B and 2B. All other test coatings were providing perfect protection.

Area C, 1-year observations

1C and 4C exhibited the poorest protection with many rivets exhibiting light rust.

2C, 3C, and 6C exhibited better protection with only a few rivets exhibiting light rust.

System 5C was providing perfect protection.

Area D, 1-year observations

4D exhibited the poorest protection including rusting rivets and numerous locations where rust was bleeding from loose edges of the existing coating.

1D exhibited the poor protection including minor rusting in flat areas as well as general rusting on some rivets.

5D exhibited fair to poor protection minor rusting in flat areas.

2D provided good protection but had obvious brush marks, which detracted from its appearance. These brush marks were not noted on other areas perhaps indicating this was the last area coated with this material and some curing had taken place prior to the application.
3D and 6D were providing excellent protection.

**5-Year Observations**

**Area A, 5-year observations**

All test coatings were providing very good protection on flat areas but traces of rust are visible on a high percentage of the rivets. There were no significant differences among the systems.

**Area B, 5-year observations**

2B and 1B both had rust on many rivets with 2B in slightly poorer condition with minor rust undercutting on some edges.

3B, 4B, and 5B were all providing excellent protection. Unfortunately, the test areas contain very few rivets to inspect for rust.

6B was providing excellent protection except on a few rivets where unsatisfactory surface preparation allowed residues of the original coating to remain.

**Area C, 5-year observations**

4C exhibited the poorest protection with many rivets rusting. There was light rust beginning in flat areas.

2C, 5C were good. 5C had a few rusting rivets. The 2C area had few rivets but minor rust undercutting was noted along edges.

1C was only slightly better than 5C.

3C exhibited very good protection however; the test areas had few rivets, a small percentage of which were exhibiting light rust.

6C was providing very good protection including in areas with many rivets. No difference was noted between 6A and 6C.

**Area D, 5-year observations**

4D exhibited the poorest protection with many rivets rusting and many areas of old coating pulling loose allowing rust to bleed from under the coating. There
was light rust beginning in areas where surface preparation had exposed bare substrate.

2D also exhibited the poor protection with general rusting in many rivet areas and areas of old coating pulling loose allowing rust to bleed from under the coating. There was light rust beginning in areas where surface preparation had exposed bare substrate.

1D exhibited minor rusting on flat areas as well as general rusting in rivet areas.

5D exhibited fair to poor protection including general rusting in flat areas and rust undercutting along edges of the original coating.

6D was beginning to exhibit general rusting in areas where bare substrate had been exposed during surface preparation.

3D was providing the best protection with only a minor amount of rust undercutting around rivets and along a bottom flange and slight rusting in areas where bare substrate had been exposed.
3 Conclusions and Recommendations

Conclusions

Part of the objective of this work was to test a number of coating systems as they would be field applied under a typical contract. It was thought that frequently contract requirements for the quality of the surface preparation, thickness of the paint, or perhaps other requirements of the contract are not fully met by the contractor. Such was the case on this test site. The contractor provided his own QC and the Corps’ QA was not onsite while the work was being performed.

The requirement to for a White-Metal blast resulted in a thorough amount of abrasive blasting. The previous coatings remaining around rivets would not have met the specification requirement however this deficiency is unavoidable and typical of many White-Metal blast jobs. Similarly, the level of surface preparation performed in the Commercial grade areas was probably sufficient for the types of coatings applied; however, mill scale is not allowed by the specification. The amount of paint remaining around rivets and in areas the blasters missed would technically have reduced the rating of the surface preparation to the Brush-Off grade. The Power Tool grade of surface preparation met the specification requirements. The areas chosen for this grade were easily accessible making compliance easy with only a power wire brush. On these areas, minor rust undercutting was only noted on systems 2B, 2C, and 5C. The excellent resistance to rust undercutting at edges and the lack of any failures of adhesion to the substrate indicate these variations in surface preparation had no effect on the performance of the other coatings.

In the minimally prepared areas the contract writer probably had the SSPC Hand Tool Cleaning requirement in mind, but did not reference the specification. A putty knife was used to remove paint that had peeled away from the plane of the surface but other paint that had lost adhesion but had not curled was not removed. The areas chosen for this grade of surface preparation were the worst areas of the bridge having the greatest amount of initial corrosion as well as the greatest complexity. The areas also had the only horizontal surfaces (top and bottom flanges of the girder). This level of surface preparation as well as the configuration of the test areas had a strong effect on the performance of the various coatings. After 1 year systems 2D, 3D and 6D were all providing complete
protection but probably through different mechanisms. 3D was a heavy mastic that tended to encapsulate the existing coating while 2D had the ability to penetrate under loose edges due to its resin. System 6D used a separate penetrating sealer to penetrate under the edges of poorly adherent coating and provide a base for the same coatings as used for system 4D. In contrast, system 4D provided the poorest protection primarily because it did not bridge over the edges of poorly adherent coatings nor did it penetrate sufficiently under the edges to provide protection.

The effects of thinner than specified applications were noted after only 1 year. At the end of 5 years, the effects were more extensive affecting more areas and detracting from the appearance of the coating system but not resulting in any significant destruction of the substrate. In general, the coatings were probably brushed thinner than specification requirements on projections such as rivets. This lead to rust showing through coatings after only 1 year. After 5 years rust was showing through some of the coatings in areas where surface preparation had exposed the substrate. Poorest of the coatings in this respect were 4 and 2, both of which used low film build coatings. Best of the systems in this respect were 3 and 6. Of all the systems applied, system 3 had the greatest film thickness requirement as well as a capability, according to the tech data sheet, of being able to be applied at a 25 mil film thickness in a single coat. System 6 was the only 4 coat system. It did not appear that chalking was a factor in reducing the thickness of any of the coatings.

**Recommendations**

1. Based on the 5-year study, quality control of coating thickness had the greatest impact on coating performance. When coatings are brush applied there is a normal tendency to brush the coating thin, especially on projections such as rivet heads. Magnetic thickness gages are not accurate on such projections making measurement impractical. Spray application usually results in more uniform thicknesses. QC/QA inspectors should be conscious of these tendencies and promote uniform applications by painters.

2. The philosophy of “Better surface preparation results in better coating performance” is only valid to some limit. With the coatings in this study, it was not found that White Metal Blasting resulted in better coating performance than Commercial Blasting. Indeed, areas where Power Tool Cleaning allowed existing sound coatings to remain also resulted in excellent coating performance of some of the systems. Prior to specifying surface preparation, the existing coating system should be critically evaluated to determine if it can be successfully main-
tained with touch-up and overall topcoat or if total removal is necessary. When total removal is indicated, the need for high quality surface preparation should be critically evaluated because the extra expense may not result in greater coating performance.

3. The penetrating sealer used in System #6 greatly added to the performance of the standard Corps coating system on the minimally cleaned test areas. Such a low grade of surface preparation is not recommended by Corps guide specifications and (hopefully) is seldom allowed within the Corps. However, on areas where surface preparation is extremely low the product should be applied for increased coating life. The standard system should provide satisfactory performance without the added sealer when applied according to guide specification requirements.

4. The aluminum epoxy mastic (System #3) performed very well on all surface preparations. Since the initiation of this test program the Corps has developed a Commercial Item Description (CID A-A-3127) for these types of coatings and incorporated it into guide specification CEGS 09965. Recommendations regarding its use are included in the guide specification.
Appendix A: Technical Data on Products Applied

In this appendix technical data are provided for all products applied except System 4. This consisted of SSPC Paint 25 primer and two topcoats of TT-P-38, and is fully described in CEGS09965, Painting: Hydraulic Structures.
System 1

Amerlock 400
High-solids epoxy coating

Product Data
- VOC compliant
- High-performance general maintenance coating for new or old steel
- Cures through wide temperature range
- Self-priming topcoat over most existing coatings
- Can be overcoated with wide range of topcoats
- Compatible with prepared damp surfaces
- Compatible with adherent rust remaining on prepared surfaces
- 5 mils or more in a single coat
- Resists high humidity and moisture

Amerlock's low solvent level meets VOC requirements, reduces the chances for film pinholing and solvent entrapment at the substrate-coating interface, often a major cause of coating failure with conventional epoxies and lower solids systems. Amerlock 400 is available in a variety of colors, including aluminum, and therefore does not require a topcoat. For extended weatherability or special uses, a topcoat may be desired.

Typical Uses
Amerlock 400 is used in those areas where blasting is impractical or impossible. As a maintenance coating, Amerlock 400 protects steel structures in industrial facilities, bridges, tank exteriors, marine weathering, offshore, oil tanks, piping, roofs, water towers and other exposures. Amerlock 400 has good chemical resistance to splash/spillage, fumes and immersion in neutral, fresh and salt water (see resistance table). Contact your Ameron representative for specific information.

Typical Properties
Physical
Abstraction resistance (ASTM D4060)
1 kg load/1000 cycles
CS-17 wheel
102 mg
Impact resistance (ASTM D2794)
Direct
24 in – lb
Reverse
6 in – lb
Moisture vapor transmission (ASTM F 1249)
4.49 g/m²
Adhesion (ASTM D4541)
800 psi

Performance
Salt spray (ASTM B 117) 3000 hours
Face blistering None
Humidity (ASTM D2247) 750 hours
Face corrosion, blistering None
Immersion (NACE TM-01-69) fresh water 1 year
blistering None

Physical Data
Semigloss Finish
Color: Standard, Rapid Response, custom colors and aluminum

White and light colors may show yellowing on aging. Use old Amercoat 861 with white or light colors will slightly discolor. Do not use with 400FD cure. With white and light colors, 400FD cure will cause yellowing.

Yellow, red and orange colors will fade faster than other colors due to the replacement of lead-based pigments with lead-free pigments in these colors

Components
2

Curing mechanism: Solvent release and chemical reaction between components

Volume solids (ASTM D2807 modified)
400
83% ± 3%
400AL
88% ± 3%

Dry film thickness (per coat) 5-8 mils (125-200 microns)

Coats
1 or 2

Theoretical coverage
fl/gal mL
1 mil (25 microns)
400
1331 32.6
400AL
1412 34.7
5 mils (12.5 microns)
400
266 6.5
400AL
282 6.9
VOC
lb/gal WL
400 mixed
1.4 168
mixed/thinned (1/2 pt/gal)
1.7 204
400AL mixed
1.0 120
mixed/thinned (1/2 pt/gal)
2.0 240
400FD mixed
1.2 144
mixed/thinned (1/2 pt/gal)
1.6 192

Temperature resistance
continuous wet 5°F/F 5°C/C
intermittent 100 38 200 93 350 177
Flash point (SETA) 5°F/F
400 resin
131 55
400 cure
85 29
400FD cure
67 30
400AL resin
110 43
400AL cure
116 47
Amercoat 8
67 19
Amercoat 65
78 25
Amercoat 12
0 -18

Qualifications
USDA - Incidental food contact
NFPA - Class A

NSF Standard 61 - For use in drinking water; Amerlock 400 and 400FD - White, Ivory and RT - 1805 Blue, Certain restrictions do apply.

Chemical Resistance Guide
System 1 continued

<table>
<thead>
<tr>
<th>Environment</th>
<th>Immersion</th>
<th>Splash and Fumes and Weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>Alkaline</td>
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<td>E</td>
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<td>Solvents</td>
<td>G</td>
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<td>G</td>
<td>Good</td>
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<td></td>
</tr>
</tbody>
</table>

*Contact your Ameron representative*

This table is only a guide to show typical resistances of Amerock 400 and 400AL. For specific recommendations, contact your Ameron representative representative for your particular corrosion protection needs.

**Systems using Amerock 400 or 400AL**

<table>
<thead>
<tr>
<th>1st coat</th>
<th>2nd Coat***</th>
<th>3rd Coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>400</td>
<td>400HS</td>
<td>None</td>
</tr>
<tr>
<td>400</td>
<td>Amershield-</td>
<td>None</td>
</tr>
<tr>
<td>400**</td>
<td>400</td>
<td>None</td>
</tr>
<tr>
<td>Dimetacel 9, 9FT</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>or 21-9</td>
<td>400</td>
<td>None</td>
</tr>
<tr>
<td>Dimetacel 9, 5FT</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>or 21-9</td>
<td>400</td>
<td>None</td>
</tr>
</tbody>
</table>

**Water Immersion.

***For color contrast when 2 coats of 400AL are used, 400AL red can be used as first coat.

<table>
<thead>
<tr>
<th>Recoat/Topcoat time</th>
<th>9°F/F (3°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum (hours)</td>
<td>90/32 70/21 50/10</td>
</tr>
<tr>
<td>400</td>
<td>8</td>
</tr>
<tr>
<td>400 with 1 pt 861</td>
<td>4</td>
</tr>
<tr>
<td>400FD</td>
<td>2</td>
</tr>
<tr>
<td>400AL</td>
<td>3</td>
</tr>
<tr>
<td>400AL with 1/2 pt 861</td>
<td>3</td>
</tr>
</tbody>
</table>

**Recoat/Topcoat time @ 70°F (21°C)**

<table>
<thead>
<tr>
<th>System</th>
<th>Maximum time</th>
</tr>
</thead>
<tbody>
<tr>
<td>400/400</td>
<td>3 months</td>
</tr>
<tr>
<td>400 with 861/400</td>
<td>1 month</td>
</tr>
<tr>
<td>400FD/400FD</td>
<td>2 weeks</td>
</tr>
<tr>
<td>400/Amershield or 450HS</td>
<td>1 month</td>
</tr>
<tr>
<td>400/540S</td>
<td>1 day</td>
</tr>
<tr>
<td>400FD/Amershield or 450HS</td>
<td>7 days</td>
</tr>
<tr>
<td>400 with 861/Amershield or 450HS</td>
<td>2 weeks</td>
</tr>
</tbody>
</table>

Note: If maximum time is exceeded, roughen surface. For topcoat (finish coats) not listed, see Product Data sheet for specific topcoat time limitations.

**Application Data Summary**

See Application Instructions for complete information on surface preparation, environmental conditions, application procedures and equipment. To obtain maximum performance, apply as recommended. Adhere to all safety precautions during storage, handling, application and drying periods.

**Surface Preparation**

Coating performance is, in general, proportional to the degree of surface preparation. Abrasive blasting is usually the most effective and economical method. When this is impossible or impractical, Amerock 400 can be applied over mechanically cleaned surfaces. All surfaces must be clean, dry and free of all contaminants, including salt deposits.

**Application Data**

- Applied over steel, concrete, aluminum, galvanizing
- Surface preparation: SSPC-SP2, 3, 7 or 10
- Concrete: ASTM D4259 or 4260
- Aluminum: Alodine® or Alumiprep® or light abrasive blast
- Galvanizing: Galvapreg® or light abrasive blast

**Method:** Airless or conventional spray. Brush or roller may require additional coats.

**Mixing Ratio (by volume):**

1 part resin to 1 part cure

**Pot Life (hours):**

- 851 Accelerator:Amerock 80/32 70/21 50/10 32/0
- Amount: mixed 5 gal
- None: 400 11/2 21/2 4 7
- 400AL 11/2 21/2 10 15
- 400FD 1 11/2 21/2 4
- 1/2 pt 400 1 11/2 21/2 4
- 400AL 1 11/2 21/2 4
- 1 pt 400 1 1/2 1 11/2 2

**Pot life is the period of time after mixing that a five-gallon unit of material is sprayable when thinned as recommended. Mixtures may appear fluid beyond this time, but spraying and film build characteristics may be impaired.

**Environmental Conditions**

- Product: Air and Surface Temperature Amerock 400 or 400 AL 40°F to 122°F (4°C to 50°C)
- Amerock with 861 20°F to 122°F (-6°C to 50°C)
- Amerock 400FD cure 20°F to 122°F (-6°C to 50°C)

**Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation. At freezing temperatures, surface must be free of ice.

**Drying Time (ASTM D 1640) (hours):**

**Drying Time (ASTM D 1640) (hours):**

- **861 Amerock**
  - Ant/mixed 5 gal 120/49 90/32 70/21 50/10 32/0 20/- six
  - None 400 11/2 41/2 9 28 96 NR
  - 400AL 1 4 12 36 96 NR
  - 400FD cured 1 2 8 24 48 160
  - 1/2 pt 400 11/2 3 5 24 72 120
  - 400AL 1 11/2 21/2 5 10 24
  - 1 pt 400 1 2 4 15 48 96

- **400/400AL**
  - Drying time through
    - None 400 6 12 20 40 140 NR
    - 400AL 11/2 V/2 24 72 210 NR
    - 400FD cured 2 1/2 21/2 13 38 96
    - 1/2 pt 400 3 6 10 30 96 180
    - 400AL 2 4 9 24 48 120
    - 1 pt 400 21/2 5 9 24 72 160
### System 1 continued

**Cure for Immersion (days)**

| None | 400 | 2 | 4 | 7 | 21 | NR | NR |
| 400AL | 2 | 4 | 7 | 21 | NR | NR |
| 400FD cure | 2 | 3 | 7 | 21 | NR | NR |
| 1/2 Pt 400AL | 1 | 2 | 3 | 7 | 21 | NR | NR |
| 1 pt 400 | 1 | 2 | 3 | 7 | 21 | NR | NR |

*Amcor 861 Accelerator will slightly discolor Amelock 400 white and other Amelock light colors. Do not use 861 Accelerator with 400FD cure.*

**NR = Not recommended**

### Safety Precautions

Read each component’s material safety data sheet before use. Mixed material has hazards of both components. Safety precautions must be strictly followed during storage, handling, and use.

*This product is for industrial use only. Not for residential use in California*

### Warranty

Amcor warrants its products to be free from defects in material and workmanship. Amcor’s sole obligation and Buyer’s exclusive remedy in connection with the products shall be limited, at Amcor’s option, to either replacement of products not conforming to this Warranty or credit to Buyer’s account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Amcor in writing within five (5) days of Buyer’s discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer’s failure to notify Amcor of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

*Amcor makes no other warranties concerning the product. No other warranties, whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Amcor be liable for consequential or incidental damages.*

Any recommendation or suggestion relating to the use of the products made by Amcor, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment changes in procedures of use, or extrapolation of data may cause unsatisfactory results.

**Thinner** Amcor 8 or 65

**Equipment cleaner** Thinner or Amcor 12

### Shipping Data

<table>
<thead>
<tr>
<th>Packaging unit</th>
<th>2 gal</th>
<th>5 gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>cure</td>
<td>1-gal can</td>
<td>2.5-gal can</td>
</tr>
<tr>
<td>resin</td>
<td>1-gal can</td>
<td>2.5-gal can</td>
</tr>
<tr>
<td>Shipping weight (approx)</td>
<td>lbs</td>
<td>kg</td>
</tr>
<tr>
<td>2-gal unit</td>
<td>12.5</td>
<td>5.7</td>
</tr>
<tr>
<td>400 cure</td>
<td>2.2</td>
<td>5.5</td>
</tr>
<tr>
<td>400FD cure</td>
<td>13.7</td>
<td>6.2</td>
</tr>
<tr>
<td>400AL cure</td>
<td>2.1</td>
<td>5.5</td>
</tr>
<tr>
<td>400AL resin</td>
<td>11.0</td>
<td>5.0</td>
</tr>
<tr>
<td>5-gal unit</td>
<td>31.8</td>
<td>14.4</td>
</tr>
<tr>
<td>400 cure</td>
<td>31.2</td>
<td>14.2</td>
</tr>
<tr>
<td>400 resin</td>
<td>35.0</td>
<td>15.9</td>
</tr>
<tr>
<td>400AL cure</td>
<td>30.9</td>
<td>14.0</td>
</tr>
<tr>
<td>400AL resin</td>
<td>28.3</td>
<td>12.8</td>
</tr>
</tbody>
</table>

**Shelf life when stored indoors at 40°F to 100°F (4°C to 38°C)**

<table>
<thead>
<tr>
<th>resin and cure</th>
<th>1 year from shipment date</th>
</tr>
</thead>
</table>

Numerical values are subject to normal manufacturing tolerances, color and testing variances. Allow for application losses and surface irregularities.

This mixed product is photochemically reactive as defined by the South Coast Air Quality Management District’s Rule 102 or equivalent regulations.

### Limitation of Liability

Amcor’s liability on any claim of any kind, including claims based upon Amcor’s negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. In no event shall Amcor be liable for consequential or incidental damages.
System 2

KOLORANE ALUMINUM PRIMER
No. 9500 SERIES

<table>
<thead>
<tr>
<th>GENERIC TYPE:</th>
<th>AROMATIC MOISTURE CURED URETHANE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCT DESCRIPTION:</td>
<td>A single component, aluminum primer that cures rapidly to a hard, solvent and chemical resistant finish. It shows exceptional ability to adhere to irregular surfaces, even with minimal surface preparation.</td>
</tr>
<tr>
<td>RECOMMENDED USES:</td>
<td>As a corrosion resistant primer or primer/finish (multi-coat system) over blasted, or power or hand tool cleaned, slightly rusted steel. Also suitable for priming concrete floors, where only minimal surface preparation is possible, and as a &quot;barrier coat&quot; between solvent sensitive coatings and either urethanes or epoxies.</td>
</tr>
<tr>
<td>NOT RECOMMENDED FOR:</td>
<td>Areas where the relative humidity is less than 30%.</td>
</tr>
<tr>
<td>COMPATIBLE UNDERCOATS:</td>
<td>Kolor-Poxy Hi-Build Enamels, Kolor-Poxy Enamels, Kolorane Enamels, Acrythane Enamels, Acrythane Intermediate Primer</td>
</tr>
<tr>
<td>COMPATIBLE TOPCOATS:</td>
<td></td>
</tr>
<tr>
<td>SOLIDS BY VOLUME:</td>
<td>56% ± 3%</td>
</tr>
<tr>
<td>SOLIDS BY WEIGHT:</td>
<td>64% ± 3%</td>
</tr>
<tr>
<td>RECOMMENDED DRY FILM THICKNESS:</td>
<td>1.5 - 2.5 mils</td>
</tr>
<tr>
<td>THEORETICAL COVERAGE:</td>
<td>450 Sq. Ft./Gallon @ 2.0 mils DFT</td>
</tr>
<tr>
<td>FINISH:</td>
<td>Metallic Luster</td>
</tr>
<tr>
<td>AVAILABLE COLORS:</td>
<td>Aluminum (9500) and Light Green Aluminum (9510)</td>
</tr>
<tr>
<td>DRYING TIME @ 72°F:</td>
<td>To Touch: 2 Hours, To Handle: 4 Hours, To Recoat: 6 Hours</td>
</tr>
<tr>
<td>VOC CONTENT:</td>
<td>3.15 Pounds/Gallon, 377 Grams/Liter</td>
</tr>
<tr>
<td>WEIGHT PER GALLON:</td>
<td>9.3 ± 0.5 (pounds)</td>
</tr>
<tr>
<td>FLASH POINT (Pensky-Martens):</td>
<td>96 ± 3°F</td>
</tr>
</tbody>
</table>
System 2 continued

<table>
<thead>
<tr>
<th>PHYSICAL DATA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelf Life:</td>
</tr>
<tr>
<td>Pot Life @ 72°F:</td>
</tr>
<tr>
<td>Temperature Resistance:</td>
</tr>
<tr>
<td>Viscosity @ 77°F:</td>
</tr>
<tr>
<td>Gloss (60° meter):</td>
</tr>
<tr>
<td>Storage Temperature:</td>
</tr>
<tr>
<td>Mixing Ratio (Approx. By Vol.):</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application Procedure Guide:</th>
<th>APG-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Film Thickness Range:</td>
<td>3.0 - 4.5 mils</td>
</tr>
<tr>
<td>Dry Film Thickness Range:</td>
<td>1.5 - 2.5 mils</td>
</tr>
<tr>
<td>Temperature Range:</td>
<td>20 - 100°F</td>
</tr>
<tr>
<td>Relative Humidity:</td>
<td>30% Minimum</td>
</tr>
<tr>
<td>Substrate Temperature:</td>
<td>Dew Point + 5°F</td>
</tr>
<tr>
<td>Minimum Surface Preparation:</td>
<td>SSPC-SP2, SP3, SP6</td>
</tr>
<tr>
<td>Induction Time @ 72°F:</td>
<td></td>
</tr>
<tr>
<td>Recommended Solvent:</td>
<td>No. 1200</td>
</tr>
</tbody>
</table>

**Application Methods**

- Air Spray
  - Tip Size: .055”
  - Pressure: 30 - 60 PSIG
  - Thin: Thinning Not Recommended

Airless Spray
- Tip Size: .013” - .017”
- Pressure: 2000 - 2500 PSIG
- Thin: Thinning Not Recommended

Flow Coat
- Viscosity: 19 - 21 SEC. (Sears Cup)

Brush or Roller
- Thin: Thinning Not Recommended
System 3

STEELMACHTIC 168

SELECTION DATA

GENERIC TYPE: High Build Aluminum Epoxy Mastic

PRODUCT DESCRIPTION: Steelmastic 168 is a surface tolerant, self-priming, direct-to-rust, high build maintenance coating designed to give excellent water, chemical and corrosion protection to a wide variety of substrates in the minimum number of coats. Its superior adhesion properties allow it to be applied over marginally prepared metallic and old existing coatings. Steelmastic 168 exhibits an affinity towards covering and protecting edges and corners where most coatings have a tendency to pull away. Its high build formulation allows it to obtain a high performance barrier up to 25 mils (625 microns) thick in a one-coat application. U.S.D.A. acceptable for food contact in food processing and packaging plants.

RECOMMENDED FOR: Excellent coating for bridges, pipes, forms, machinery, structural steel or tank exteriors, especially where corrosion of the metal has taken place. May be applied over most old coatings, thermostatic or organic zinc rich primers where optimal performance is desired.

NOT RECOMMENDED FOR: Immersion other than salt or fresh water. Do not apply in temperatures below 50°F (10°C).

PHYSICAL PROPERTIES

RESISTANCE TO:
(Scratch & Spillage)
Acids: Fair - Good
Alkalis: Very Good
Solvents: Fair - Good
Water: Excellent

VOLUME SOLIDS: 85% +/- 2%
WEIGHT SOLIDS: 90% +/- 2%
MIX RATIO: 100 Part B to 60.2 Part A
MIX RATIO, VOLUME: One Part B to One Part A
FLASH POINT: 85°F (29°C) TCC
POT LIFE: 8 Hours
SHELF LIFE: 1 Year, Minimum
INDUCTION TIME: 30 Min.
THINNER - REDUCTION: Stockcoat T-300
THINNER - CLEAN UP: Stockcoat T-300
APPLICATION TEMPERATURE: 50° - 100°F (10° - 38°C)
SERVICE TEMPERATURE: 250°F (120°C) Maximum
GLOSS: Semi-Gloss
COLOR:
PACKAGING: 2 gal and 10 gal units
WEIGHT PER GALLON: 10.2 lbs (4.6 kg) ± 2%
V.O.C. (Volatile Organic Compound): 1,250 g/l (45 g/l) mixed
THEORETICAL COVERAGE: 1,350 sq. ft. per gallon at 1 mils (25 microns) DFT
(allow for application losses)

RECOMMENDED WET FILM THICKNESS: 6 mils (150 microns)

RECOMMENDED DRY FILM THICKNESS:
5 mils (125 microns) minimum
25 mils (625 microns) maximum

DRYING TIME
8 - 10 Hours
TO TOUCH: 24 Hours
TO RECOAT: 7 Days
FINAL CURE: 7 Days

RECOMMENDED FINISH COATS

Steelmatic 168 is designed as a primer/finish coat, but may be used over zinc-rich shop coats.

Two-Package Urethane: Epo-Lux Nos. 593 and 600
Epoxy-Polyamide: Epo-Lux 121 or Epo-Lux 150
Epoxy Polyester: Tile-X 2000
System 3 continued

SURFACE PREPARATION

TO CONCRETE: Steelastic 168 is not generally used as a primer or finish coat on concrete. Consult Steelcote's Technical Service Department for optional systems.

TO STEEL: Surface must be clean and free from oil, grease, moisture and loose matter. Clean by solvent wiping with T-300 in accordance with SSPC-SP1 specification. Follow by hand or power tool cleaning in accordance with SSPC-SP2 or SSPC-SP5 specifications in order to remove all loose rust or mill scale. For severe environments, dry abrasive blast in accordance with SSPC-SP7 (blast-effect) specification to remove loose rust, mill scale, paint and other foreign matter from the surface. Remove all dust.

TO GALVANIZED STEEL: Surface must be clean and free from oil, grease, moisture and loose matter. Degrease by solvent wiping with T-300 in accordance with SSPC-SP1 specification. For white rust or weathered (red-oxide ranting) galvanized steel, prepare by hand or power tool cleaning in accordance with SSPC-SP2 or SSPC-SP3 specifications to remove any loose rust or scale. Remove any dust. Apply Steelastic 168 per label instructions. Do not apply over moist or damp surfaces. Clean all tools and equipment with Steelcote T-300 reducer after use.

TO EXISTING COATINGS: Apply only over clean, sound coatings. If the existing coating is brittle, caked, or under film rusting exists, or if less than 75% of the film is intact, the coating must be totally removed by brush-blasting (SSPC-SP7) or other specified method. For sound existing coatings that are greater than 75% intact, remove any oil, grease, dirt or foreign matter by wiping with Steelcote Hood-Prep in accordance with SSPC-SP1 specification. Remove any remaining gloss or loose existing coating by hand or power tool cleaning in accordance with SSPC-SP2 or SSPC-SP3 specifications. Spot prime bare areas with Steelastic 168 and allow to dry. Apply Steelastic 168 over the entire existing coating and spot-prime areas per label instructions. Do not apply over moist or damp surfaces. Clean all tools and equipment with Steelcote T-300 after use.

APPLICATION EQUIPMENT

BRUSH: Use a clean, natural bristle brush. Reduce 15% with Steelcote T-300 if necessary.

ROLL: Use a clean, short nap mohair roller with a phenolic core (EZ Paint® or equivalent). Reduce 15% with T-300 if necessary.

CONVENTIONAL SPRAY

<table>
<thead>
<tr>
<th>Gas</th>
<th>Air Manifold: 66</th>
<th>Air Hose ID: 5/16&quot;</th>
<th>Material Hose ID: 3/8&quot;</th>
<th>Nozzle: 65</th>
<th>Pressure: 15-20 psi</th>
</tr>
</thead>
</table>

Use moisture and oil traps.
Reduce up to 15% if necessary with Steelcote T-300.

AIRLESS SPRAY

<table>
<thead>
<tr>
<th>Pump Ratio: 32:1</th>
<th>Gage: Graco 205-592 or equivalent</th>
<th>Tip Size: 0.019</th>
<th>Fan Size: 8&quot; - 10&quot;</th>
<th>Pressure: 2500 - 3000 psi</th>
<th>Material Hose ID: 3/8&quot;</th>
</tr>
</thead>
</table>

Reduce up to 15% if necessary with Steelcote T-300.

LIMITED WARRANTY: The information presented herein is, to the best of our knowledge, true and accurate. No warranty or guarantee, express or implied, is made regarding the performance or suitability of any product which bears the name of use and conditions of storage and handling are beyond our control. Our liability in supplying these products is limited solely to replacement of any product found to be defective. THIS LIMITED WARRANTY IS GIVEN EXPRESSLY AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSES, CONSTITUTES THE ONLY WARRANTY MADE BY THE MANUFACTURER OF FITNESS OR MERCHANTABILITY, AND THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, IN FACT OR BY LAW. No representative for product use is employed or authorized to alter the specifications for its use in fulfillment of any written caveat.

The information contained herein is based upon data found by our own, or independent testing laboratory. It is considered accurate at the date of issuance, and is subject to change without notice.
<table>
<thead>
<tr>
<th>CODE</th>
<th>INGREDIENTS</th>
<th>LB</th>
<th>GALS</th>
<th>MANUFACTURER</th>
<th>SOLID</th>
<th>SOLID</th>
<th>PIGMENT</th>
<th>PIGMENT</th>
<th>POLY VOL</th>
<th>CRITICAL POLY</th>
<th>VEHICLE</th>
<th>VEHICLE</th>
<th>SOLVENT</th>
<th>SOLVENT</th>
<th>NON-ACQ VOL</th>
<th>ACQ VOLUME</th>
<th>WET VOL</th>
<th>LESS ACQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Acryla 2050</td>
<td>241.57</td>
<td>20</td>
<td>Pacific Anchor</td>
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</tr>
<tr>
<td></td>
<td>MPA-1078</td>
<td>0</td>
<td>1.041061</td>
<td>Rheox</td>
<td>3.2</td>
<td>0.42150</td>
<td>3.2</td>
<td>0.42150</td>
<td>4.6</td>
<td>0.695456</td>
<td>4.8</td>
<td>0</td>
<td>1.041061</td>
<td>4.8</td>
<td>0</td>
<td>1.041061</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mix Wet Under Agitation In 127°F</td>
<td>125.36</td>
<td>10.1689</td>
<td>Silbarite</td>
<td>81.497</td>
<td>3.62310</td>
<td>81.497</td>
<td>3.62310</td>
<td>0.275656</td>
<td>29.58246</td>
<td>63.583</td>
<td>6.545584</td>
<td>43.683</td>
<td>0</td>
<td>10.1689000</td>
<td>43.683</td>
<td>0</td>
<td>10.1689000</td>
</tr>
<tr>
<td></td>
<td>Then add slowly under mild agitation</td>
<td>45.5</td>
<td>0.375863</td>
<td>EDCON</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>38.52543</td>
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<td>38.9477</td>
<td>81.497</td>
<td>3.62310</td>
<td>81.497</td>
<td>3.62310</td>
<td>0.275656</td>
<td>29.58246</td>
<td>63.583</td>
<td>6.545584</td>
<td>43.683</td>
<td>0</td>
<td>48.525437</td>
<td>43.683</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>Aromatic 100</td>
<td>43.01</td>
<td>0.392413</td>
<td>EDCON</td>
<td>10</td>
<td>0.42</td>
<td>0.42</td>
<td>0.42</td>
<td>0.03178</td>
<td>26.38785</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6.38785</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Grind Und 127°F</td>
<td>22.45</td>
<td>2.006168</td>
<td>Union Carbide</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>324.04</td>
<td>28.53267</td>
<td>317.932</td>
<td>38.9203</td>
<td>81.497</td>
<td>3.62310</td>
<td>81.497</td>
<td>3.62310</td>
<td>0.275656</td>
<td>29.58246</td>
<td>63.583</td>
<td>6.545584</td>
<td>43.683</td>
<td>0</td>
<td>48.53267</td>
<td>43.683</td>
<td>0</td>
</tr>
</tbody>
</table>

**Formulation Constants**
- Non Volatile by Weight
- Non Volatile by Volume
- PVC
- CPC
- Pigment Content
- NV% by wt. of Vehicle
- VOC primer/liter
- VOC Ep/ gal

**Formulation Details**
- Weight/ Gallon Comp A
- Weight/ Gallon Comp B
- Mixing Ratio
- Weight per Gallon
- Cost per Gallon
RUSTBOND PENETRATING SEALER SG

### SELECTION DATA

**GENERIC TYPE:** Cross linked epoxy

**GENERAL PROPERTIES:** A penetrating sealer with excellent wetting properties. It is highly flexible with good chemical and solvent resistance and accepts a wide variety of topcoats.
- Universal primer and tie coat
- Excellent adhesion to minimal surface preparation
- Low Stress
- Extremely high solids
- Low odor
- Meets VOC (Volatile Organic Content) regulations
- Contains corrosion inhibitors
- Green tint improves visibility

**RECOMMENDED USES:** As a sealer for marginally prepared steel and over old coatings. Its excellent wetting properties allows it to penetrate rust and discontinuities in existing coatings to provide a firm anchorage for a variety of topcoats. Its thixotropic character reduces run off, ensuring that the edges of existing coatings are covered thus reducing undercutting and peeling.

May also be used as a primer for various non-ferrous metals, including aged and new galvanized steel which is free of white rust inhibiting chemicals or oils, and as a tie coat for coatings that have exceeded their 'recoat window'.

**NOT RECOMMENDED FOR:** Immersion service or any application without a topcoat.

**TYPICAL CHEMICAL RESISTANCE:*** Depends on topcoat.

**TEMPERATURE RESISTANCE:** (Non-Immersion)
- Continuous: 175°F (80°C)
- Non-Continuous: 200°F (93°C)

**SUBSTRATES:** Apply over properly prepared metal or other surfaces as recommended.

**COMPATIBLE COATINGS:** May be applied over most coatings. A last patch is recommended over existing coatings. May be topcoated with most epoxies, polyurethanes, drying oils, alkyls and acrylics.

### SPECIFICATION DATA

**THEORETICAL SOLIDS CONTENT OF MIXED MATERIAL:**

<table>
<thead>
<tr>
<th></th>
<th>By Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUSTBOND PENETRATING SEALER SG</td>
<td>99% ± 1%</td>
</tr>
</tbody>
</table>

**VOLATILE ORGANIC CONTENT (VOC):** The following are nominal values:
- As supplied: 0.2 lbs/gal (24 g/l)
- Per EPA Method 24: 0.7 lbs/gal (85 g/l)

**RECOMMENDED DRY FILM THICKNESS PER COAT:**
- 1-2 mils (25-50 microns)

Puddles on horizontal surfaces should be minimized.

**THEORETICAL COVERAGE PER MIXED GALLON:**
- 1572 ml ft² (38.6 m² at 25 microns)
- 786 ft² at 2 mils (19.3 m² at 50 microns)

Mixing and application losses will vary and must be taken into consideration when estimating job requirements.

**STORAGE CONDITIONS:** Store indoors. Temperature: 40-110°F (4-43°C) Humidity: 0-90%
Bring material temperature up to 75°F (24°C) before use.

**SHELF LIFE:** 24 months when stored indoors at 75°F (24°C).

**COLOR:** Translucent Green (0300)

**FINISH:** Gloss. Chalks rapidly in sunlight.

### ORDERING INFORMATION

Prices may be obtained from your Carboline Sales Representative or Carboline Customer Service.

**APPROXIMATE SHIPPING WEIGHT:**

<table>
<thead>
<tr>
<th></th>
<th>0.5 Gal Kit</th>
<th>2 Gal Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUSTBOND PENETRATING SEALER SG</td>
<td>6 lbs</td>
<td>22 lbs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>0.5 Gal Kit</th>
<th>2 Gal Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUSTBOND PENETRATING SEALER SG Part A</td>
<td>&gt;205°F</td>
<td>(&gt;96°C)</td>
</tr>
<tr>
<td>RUSTBOND PENETRATING SEALER SG Part B</td>
<td>176°F</td>
<td>(80°C)</td>
</tr>
</tbody>
</table>

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To the best of our knowledge the Technical data contained herein is true and accurate on the date of publication and is subject to change without prior notice. User must contact Carboline Company to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. The assumption of responsibility for coverage, performance or injury resulting from use. Liability, if any, is limited to replacement of products. Prices and data are subject to change without prior notice. NO OTHER WARRANTY OR GUARANTEES OF ANY KIND IS MADE BY CARBOLINE, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
APPLICATION INSTRUCTIONS
RUSTBOND PENETRATING SEALER SG

These instructions are not intended to show product recommendations for specific service. They are issued as an aid in determining correct surface preparation, mixing instructions and application procedures. It is assumed that the proper product recommendations have been made. These instructions should be followed closely to obtain the maximum service from the materials.

SURFACE PREPARATION: Remove all oil or grasse from the surface to be coated with Thinner 2 or Carboline Surface Cleaner 3 (refer to Surface Cleaner 3 instructions) in accordance with SSPC-SP 1.

Steel: Hand Tool or Power Tool clean in accordance with SSPC-SP 2 or SSPC-SP 3.

Galvanized Steel: Wash with Carboline Surface Cleaner 3 and rinse thoroughly. Solvent wiping is not recommended.

Existing Coatings: A test patch is recommended to verify compatibility with existing coatings to evaluate the adhesion to any existing coatings and the adhesion of existing coatings to the substrate.

MIXING: Power mix the Part A, then slowly add the Part B and mix in the proportions stated below. Keep the mixing blades at slow speed and submerged in the product to minimize whipping of air into the material. Mix to blend thoroughly. Scrape the sides of the container occasionally to insure uniformity. Continue to mix for 1-2 minutes.

<table>
<thead>
<tr>
<th>Material</th>
<th>Surface</th>
<th>Ambient</th>
<th>Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>70-90°F (21-32°C)</td>
<td>80-100°F (27-38°C)</td>
<td>0-80%</td>
</tr>
<tr>
<td>Minimum</td>
<td>60°F (16°C)</td>
<td>70°F (21°C)</td>
<td>0%</td>
</tr>
<tr>
<td>Maximum</td>
<td>100°F (38°C)</td>
<td>130°F (54°C)</td>
<td>90%</td>
</tr>
</tbody>
</table>

Do not apply when the surface temperature is less than 8°F or 3°C above the dew point.

Special application techniques may be required above or below normal conditions.

SPRAY: May be applied by conventional, airless or plural component. Please contact Carboline Technical Service for specific application instructions.

BRUSH: Distribute evenly using full brush strokes.

ROLLER APPLICATION: Use a roller suitable for solvent base materials to evenly distribute the material. Nap length will depend on the roughness of the substrate.

Apply only enough material to uniformly wet the surface. Any puddles formed must be brushed out.

DRYING TIMES: These times are based on a dry film thickness of 2 mils (50 microns). Excessive film thickness, insufficient ventilation or cooler temperatures will require longer cure times.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Dry to</th>
<th>Dry to</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Handle</td>
<td>Tocast</td>
<td>Cure</td>
</tr>
<tr>
<td>70°F (21°C)</td>
<td>34 Hours</td>
<td>16 Hours</td>
<td>9 Days</td>
</tr>
<tr>
<td>80°F (28°C)</td>
<td>22 Hours</td>
<td>12 Hours</td>
<td>8 Days</td>
</tr>
<tr>
<td>90°F (32°C)</td>
<td>14 Hours</td>
<td>9 Hours</td>
<td>4 Days</td>
</tr>
<tr>
<td>100°F (38°C)</td>
<td>11 Hours</td>
<td>4 Hours</td>
<td>3 Days</td>
</tr>
</tbody>
</table>

Maximum Recoat Times Ø 70°F (24°C):

<table>
<thead>
<tr>
<th>Surface</th>
<th>Epoxies</th>
<th>Acrylics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Polyurethanes</td>
<td>Alloys</td>
</tr>
<tr>
<td>50°F (10°C)</td>
<td>30 Days</td>
<td>14 Days</td>
</tr>
<tr>
<td>70°F (21°C)</td>
<td>30 Days</td>
<td>14 Days</td>
</tr>
<tr>
<td>90°F (32°C)</td>
<td>15 Days</td>
<td>7 Days</td>
</tr>
</tbody>
</table>

If the maximum recoat times have been exceeded, the surface must be abraded by sand blasting or application of another coat of Rustbond Penetrating Sealer SG prior to the application of any additional coatings.

CLEAN UP: Use Thinner 2

CAUTION: READ AND FOLLOW ALL CAUTION STATEMENTS ON THIS PRODUCT DATA SHEET AND ON THE MATERIAL SAFETY DATA SHEET FOR THIS PRODUCT.

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CAUTION: CONTAINS COMBUSTIBLE SOLVENTS. KEEP AWAY FROM SPARKS AND OPEN FLAMES. IN CONFINED AREAS, WORKERS MUST WEAR FRESH AIRLINE RESPIRATORS. HYPOSENSITIVE PERSONS SHOULD WEAR GLOVES OR USE PROTECTIVE CREAM. ALL ELECTRIC EQUIPMENT AND INSTALLATIONS SHOULD BE MADE AND GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. IN AREAS WHERE EXPLOSION HAZARDS EXIST, WORKERS SHOULD BE REQUIRED TO USE NONFERROUS TOOLS AND TO WEAR CONDUCTIVE AND NON-SparkING SHOES. IN CASE OF SPILLAGE, ABSORB AND DISPOSE OF IN ACCORDANCE WITH LOCAL APPLICABLE REGULATIONS.

Carboline
Appendix B: Photos of Test Structure

Figure 2. Segment of railroad bridge over Cape Cod Canal used for 1994 coatings field test.
Figure 3. Test sections 1B, 3B, and 6B after 1 year.

Figure 4. Test sections 2A, 4A, and 6A after 1 year.
Figure 5. Close-up of section 4A after 1 year.

Figure 6. Section 1D after 5 years.
Figure 7. Section 3D after 5 years.

Figure 8. Section 4D after 5 years.
Figure 9. Section 5D after 5 years.

Figure 10. Section 5D close-up.
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10
8/99
Cape Cod Railroad Bridge Coating Field Test Results

Alfred D. Beitleman

U.S. Army Construction Engineering Research Laboratory (CERL)
P.O. Box 9005
Champaign, IL 61826-9005

HQUACE
ATTN: CECW-EE
20 Massachusetts Ave. NW
Washington, DC 20314-1000

Copies are available from the National Technical Information Service, 5385 Port Royal Road, Springfield, VA 22161

Approved for public release; distribution is unlimited.

This report documents observations on the performance of six representative coating systems applied to a steel railroad bridge in 1994 as part of an Army Corps of Engineers field study. The objective of the study was to compare the performance of industry-accepted coating systems as applied to steel surfaces cleaned and prepared according to four different industry standards. The coatings were applied under contract by a local sandblasting and painting company working under typical field conditions.

Two field inspections of the coatings were conducted — once after 1 year of service and again after 5 years of service.

This report provides details on surface preparation, coating application, and field performance, including photographs of the test structure and manufacturers' literature on the six coatings tested.