SUPERIOR PRODUCTS
INTERNATIONAL II, INC.

U.S. Army Corp of Engineers®

Evaluation of Moisture-Cure Urethane Coatings for Compliance with Industry Specifications SSPC Paint 41

Prepared by
Construction Engineering Research Laboratory
U.S. Army Engineer Research and Development Center

ERCD/CERL TR-11-45
December 2011

Specification for RUST GRIP® Testing is No. 41 involving Paint:

- All tests require application to steel substrates and steel panels
- Stability in accordance with ASTM D 1849
- Adhesion in accordance with ASTM 4541
- Weathering resistance in accordance with ASTM D 5894/ ASTM D4587/ASTM G154/ ASTM G85 / ASTM D614 and ASTM D1654
- Impact resistance in accordance with ASTM D 2794

Manufacturers and Products Involved:

- Superior Products International II, Inc. with RUST GRIP® marked MC 4
- Sherwin Williams with Corothane I Ironox B marked MC 2
- Wasser Coatings with MC Ferrox B 100 marked MC 6
- Wasser Coatings with MC-Miomastic 100 Red Oxide marked MC 8
- Indmar Coatings Corp with Chem-thane 2821 marked MC 10

Test Results

Stability: MC 2, MC 4, MC 6, MC 8, and MC 10 met all requirements of the specification for stray stability, mixing properties and spraying properties except for MC 10 that failed the storage stability requirement.

Adhesion: All met the minimum requirements. Noted: MC 4 (RUST GRIP®) and MC 8 (Wasser Miomastic 100 Red Oxide) exceeded the minimum requirements for adhesion to the substrate (Appendix A, Table A1).

MC 2, MC 6 and MC 10 were tested under a different system as intermediate coats over their perspective primers (two coat system).

MC 4 and MC 8 were tested as one coat primers direct to metal.

Weathering: Scribed panels and cycled between a fluorescent UV/Condensation apparatus and a salt fog apparatus.

All the coatings exceeded the minimum requirements for blistering and rust undercutting at the scribe (Appendix A, Table A2).

Only two of the products MC 2 (Sherwin Williams Corothane I Ironox B) and MC 4 (RUST GRIP®) passed the rust evaluation requirement of the specification.

The other three products MC 6 (Wasser MC Ferrox B 100), MC 8 (Wasser MC-Miomastic 100 Red Oxide) and MC 10 (Indmar Coatings Chem-thane 2821) showed a range of rusting with MC 10 being the worst.

Impact: All the products exceeded the minimum impact requirement for intrusion testing but fell far short of the specification value when evaluated on the extrusion side of the panel with MC 10 the worst.

Conclusions

MC 4 (RUST GRIP®) was the most consistent performer of all the coatings.

RUST GRIP® was one of two coating (MC 4 and MC 8) to **"exceed" the minimum requirements for adhesion** and only one of two coating to be applied directly to metal.

RUST GRIP® was one of two coating (MC 4 and MC 2) to **"pass" the rust evaluation requirement of the specification.**

No other coating performed at the same level as RUST GRIP® in exceeding and passing the test requirements.

Page 1 under Article 1.3 Approach and it reads, " If products known to provide satisfactory performance in field applications are also found to comply with SSPC specifications, then they will be made available to Corps districts through draft revisions of the guide specification UFGS 099702 by referencing the industry specifications."

ERDC/CERL TR-11-45

Construction Engineering
Research Laboratory

US Army Corps
of Engineers®
Engineer Research and
Development Center

Evaluation of Moisture-Cure Urethane Coatings for Compliance with Industry Specifications

Alfred D. Beitelman and Jeffrey P. Ryan

December 2011

ERDC/CERL TR-11-45
December 2011

Evaluation of Moisture-Cure Urethane Coatings for Compliance with Industry Specifications

Alfred D. Beitelman and Jeffrey Ryan

Construction Engineering Research Laboratory
U.S. Army Engineer Research and Development Center
2902 Newmark Drive
Champaign, IL 61822

Final report

Prepared for U.S. Army Corps of Engineers
Washington, DC 20314-1000

Under Customer Order W74RDV82058922

Abstract: The Army Corps of Engineers has observed the performance of commercially available moisture-cure coatings on various hydraulic structures over the years, but has had no generic specifications—government or private industry—for reference in specifying the products. The Society for Protective Coatings (SSPC) recently published specifications for several moisture-cure urethane coatings. However, it cannot be assumed that other commercially available moisture-cure urethanes meet those specifications without confirmation through formal testing. In this project, commercially available products were obtained and tested against the requirements of the SSPC specifications. As a result of this work, new coating systems employing moisture-cure urethane paints were added to the Corps of Engineers Guide Specification UFGS 099702, Painting: Hydraulic Structures.

Table of Contents

Preface

This study was conducted for the Directorate of Civil Works, Headquarters, US Army Corps of Engineers, under Customer Order W74RDV82058922, Task SC80014, "Paint Evaluation for HSS," dated 23 July 2008. The proponent was Christopher H. Westbrook, CECW-CE; and the Technical Monitor was Peter J. Rossbach, Jr., CECW-CE.

The work was performed by the Materials and Structures Branch (CF-M) of the Facilities Division (CF), US Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL). The Project Manager was Alfred D. Beitelman (CEERD-CF-M). At the time of publication, Vicki L. Van Blaricum was Chief, CEERD-CF-M; Mike Golish was Chief, CEERD-CF; and Martin J. Savoie (CEERD-CV-ZT) was the Technical Director for Installations. The Deputy Director of ERDC-CERL was Dr. Kirankumar Topudurti and the Director was Dr. Ilker Adiguzel.

COL Kevin J. Wilson was the Commander and Executive Director of ERDC, and Dr. Jeffery P. Holland was the Director.

Unit Conversion Factors

Multiply	By	To Obtain
inches	0.254	centimeters
inch-pounds (force)	0.1129848	newton meters
mils	0.0254	millimeters

1 Introduction

1.1 Background

Moisture-cure (MC) urethane coating systems are quite common in Europe and have been marketed in this country for several decades. The Corps of Engineers has evaluated products from several manufacturers in the laboratory and applied the products in the field on immersed dams and atmospheric bridges, cranes, etc. All of this preliminary work has been done on a brand name basis using only major manufacturers of the products. All of the products did not perform equally. There are now numerous small companies marketing MC products, none of which have been subjected to any standardized testing regiment. To allow these coatings to be used on Corps projects without some level of testing would pose a significant potential for failure.

Specifications have been developed in the past several years by private industry notably by SSPC (SSPC: The Society for Protective Coatings) and MPI (Master Painters Institute). While these organizations have developed the specifications, there has not been any significant testing of the products for specification compliance.

1.2 Objective

The objective of this work is to evaluate a number of MC coatings and coating systems for compliance with industry specifications. Assuming the industry specifications can identify superior products, the specifications will be included in draft text for inclusion in the painting guide specification UFGS 099702, “Painting: Hydraulic Structures”.

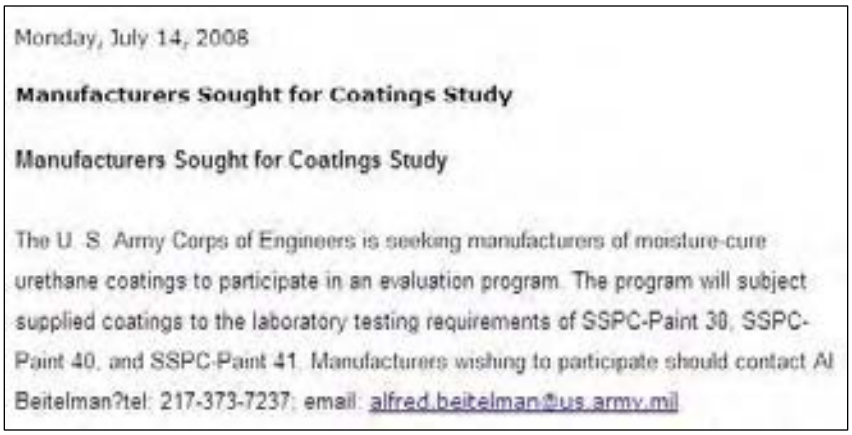
1.3 Approach

Work consisted of obtaining samples of MC products and subjecting them to the tests specified in SSPC Paint Specifications No. 38, 40, and 41. If products known to provide satisfactory performance in field applications are also found to comply with SSPC specifications, then they will be made available to Corps districts through draft revisions of the guide specification UFGS 099702 by referencing the industry specifications.

2 Testing of Products

2.1 Obtaining Samples

An advertisement was published by Journal of Protective Coatings & Linings (JPCL) in their Paint Square News on July 14, 2008 asking manufacturers to participate in the study by sending in samples to be tested along with associated documentation (Figure 1). Thirteen manufacturers requested additional information and four submitted the required samples and documentation (Appendix C). The samples submitted by the four manufacturers were then given laboratory numbers (Table 1).



Monday, July 14, 2008

Manufacturers Sought for Coatings Study

Manufacturers Sought for Coatings Study

The U. S. Army Corps of Engineers is seeking manufacturers of moisture-cure urethane coatings to participate in an evaluation program. The program will subject supplied coatings to the laboratory testing requirements of SSPC-Paint 38, SSPC-Paint 40, and SSPC-Paint 41. Manufacturers wishing to participate should contact Al Beitelman?tel: 217-373-7237; email: alfred.beitelman@us.army.mil

Figure 1. Advertisement for manufacturer submittals.

Table 1. Sample identification.

Laboratory Number	Manufacturer	Trade Designation	SSPC Specification Reference
MC 1	Sherwin Williams	Corothane I Galvapac	40
MC 2	Sherwin Williams	Corothane I Ironox B	41
MC 3	Sherwin Williams	Corothane I HS	38
MC 4	Superior Products	Rust Grip	41
MC 5	Wasser Coatings	MC-Zinc 100	40
MC 6	Wasser Coatings	MC Ferrox B 100	41
MC 7	Wasser Coatings	MC Luster 100	38

Laboratory Number	Manufacturer	Trade Designation	SSPC Specification Reference
MC 8	Wasser Coatings	MC-Miomastic 100 Red Oxide	41
MC 9	Indmar Coatings Corp.	Zinc-thane 2805	40
MC 10	Indmar Coatings Corp.	Chem-thane 2821	41
MC 11	Indmar Coatings Corp.	Chem-thane 2822HS	38

Three zinc-rich primers were submitted to be tested for compliance with SSPC Paint Specification No. 40 and were given laboratory numbers of MC1, MC 5, and MC 9. The manufacturer's documentation submitted with the samples, Appendix C, was reviewed to determine compliance with the pigment and resin requirements. The paints were tested for package stability in accordance with ASTM D 1849.

For all tests that required application to steel substrates, steel panels were prepared by blast cleaning to a white metal grade (SSPC SP 5) in an abrasive blast cabinet with aluminum oxide grit. The surface profile was 2.5 mils when measured according to ASTM D 4417 Method C using replica tape. The coatings were applied according to the manufacturer's directions using conventional air atomization spray equipment consisting of a DeVilbiss MBC gun with an E tip and needle. During application of the paint, the mixing and working properties were observed. The primers were allowed to cure according to the manufacturer's drying schedule. Three of the panels per manufacturer were then top-coated with the respective manufacturer's topcoat that was submitted for SSPC Paint Specification No. 41 testing. The applied thickness of each coat was measured prior to the application of the next coat in accordance with SSPC-PA2, using a Positector, Model 6000 thickness gage.

Weathering resistance was tested according to ASTM D 5894 which requires scribed panels to be cycled between a fluorescent UV/Condensation apparatus and a salt fog apparatus. The UV/Condensation portion of the test was performed in accordance with ASTM D 4587, Cycle 2, using a QUV Accelerated Weathering Tester complying with ASTM G 154. The salt fog exposure portion was performed in accordance with ASTM G 85 using a Q-Fog apparatus. The panels were cycled for 5000 hours and then in-

spected and evaluated for rust and blistering according to paragraph 8.1.1 of the SSPC Paint Specification No. 40 and ASTM D 614, respectively. The scribe on each panel was inspected and evaluated in accordance with ASTM D 1654.

Water immersion testing was performed in accordance with paragraph 7.4 of SSPC Paint Specification No. 40. The panels were completely immersed in de-ionized water with conductivity no higher than 5 μΩ-1 (5 μS). The test only required the panels be immersed for one year, but the panels were evaluated at one year and again at eighteen months. Upon removal from the water immersion, the panels were inspected and evaluated for rust and blistering according to paragraphs 7.4.2 and 7.4.3 of the specification. The scribe was inspected and evaluated according to ASTM D 1654.

Primer adhesion to the substrate was tested in accordance with ASTM D 4541 using a DeFelsko PosiTest AT-M adhesion tester which is designated as a Type V adhesion tester. The dollies used with the adhesion tester were 0.787 in (20 mm) in diameter. The panels used for this test were 1/8 in. (3.18 mm) thick steel panels. Three pulls per panel were performed and the average was recorded as the result. The three panels that had been topcoated were used to test topcoat adhesion in the same manner as the panels with just primer. The results recorded are the average of three pulls per panel.

Impact resistance was tested in accordance with ASTM D 2794 using a Paul N Gardner Co. Impact Apparatus with a 0.500 in. (12.7 mm) diameter indenter and a Panasonic Light Scope with 30X magnification for crack detection. The panels used for this test were 0.032 in. (0.813 mm) thick. ASTM D 2794 does not use the term “direct impact” but uses the terms “intrusion” and “extrusion”. Both intrusion and extrusion results were recorded.

2.2 SSPC Paint Specification No. 41

Five paints were submitted for performance testing for compliance with SSPC Paint Specification No. 41 and were given laboratory numbers of MC 2, MC 4, MC 6, MC 8, and MC 10. The manufacturer’s documentation submitted with the samples was reviewed to determine compliance with the pigment and resin requirements. The paints were tested for package stability in accordance with ASTM D 1849.

For all tests that required application to steel substrates, steel panels were prepared by blast cleaning to a white metal grade (SSPC SP 5) in an abrasive blast cabinet with aluminum oxide grit. The surface profile was 2.5 mils when measured according to ASTM D 4417 Method C using replica tape. All of the paints used were applied according to the manufacturer's directions using conventional air atomization spray equipment including a DeVilbiss MBC gun with an E tip and needle. The mixing and working properties were observed upon application.

A series of panels was set up with paint systems to test for adhesion with MC 2, MC 6, and MC 10 as intermediate coats. They were applied to three panels per manufacturer on top of each respective manufacturer's primer that had been submitted for SSPC Paint Specification No. 40. MC 4 and MC 8 were treated as primers and were applied to three panels per manufacturer and were not top-coated. The paints were allowed to cure according to the manufacturer's drying schedule. The applied thickness of each coat was measured prior to the application of the next coat in accordance with SSPC-PA2, using a Positector model 6000 thickness gage.

Weathering resistance was tested in accordance with ASTM D 5894 which requires scribed panels be cycled between a fluorescent UV/Condensation apparatus and a salt fog apparatus. The UV/Condensation was performed in accordance with ASTM D 4587, Cycle 2, using a QUV Accelerated Weathering Tester complying with ASTM G 154. The salt fog exposure was performed in accordance with ASTM G 85 using a Q-Fog apparatus. The panels were cycled for 1500 hours and then inspected and evaluated for rust and blistering according to paragraph 8.1.1 of the spec and ASTM D 614, respectively. The scribe on each panel was inspected and evaluated in accordance with ASTM D 1654.

Adhesion to the substrate was tested in accordance with ASTM D 4541 using a DeFelsko PosiTest AT-M adhesion tester which is designated as a Type V adhesion tester. The dollies used with the adhesion tester were 0.787 in (20 mm) in diameter. The panels used for this test were 1/8 in. (3.18 mm) thick steel panels. Three pulls per panel were performed and the average was recorded as the result. The three panels that had been topcoated were used to test topcoat adhesion in the same manner as the panels with just primer. The results recorded are the average of three pulls per panel.

Impact resistance was tested in accordance with ASTM D 2794 using a Paul N Gardner Co. Impact Apparatus with a 0.500 in. (12.7 mm) diameter indenter and a Panasonic Light Scope with 30X magnification for crack detection. The panels used for this test were 0.032 in. (0.813 mm) thick. ASTM D 2794 does not use the term "direct impact" but uses the terms "intrusion" and "extrusion". Both intrusion and extrusion results were recorded.

2.3 SSPC Paint Specification No. 38

Three paints were submitted to be performance tested for compliance with SSPC Paint Specification No. 38 and were given laboratory numbers of MC 3, MC 7, and MC 11. The manufacturer's documentation submitted with the samples was reviewed to determine compliance with the resin requirement. The paints were tested for package stability in accordance with ASTM D 1849.

For all tests that required application to steel substrates, steel panels were prepared by blast cleaning to a white metal grade (SSPC SP 5) in an abrasive blast cabinet with aluminum oxide grit. The surface profile was 2.5 mils when measured according to ASTM D 4417 Method C using replica tape. All of the paints were applied according to manufacturer's directions using conventional air atomization spray equipment consisting of a DeVilbiss MBC gun with an E tip and needle. The mixing and working properties were observed upon application. The coating system applied to the panels consisted of a primer, intermediate topcoat, and a final topcoat with each coating being specific to the manufacturer. The paint was allowed to cure in accordance with the manufacturer's drying schedule. The applied thickness of each coat was measured prior to the application of the next coat in accordance with SSPC-PA2, using a Positector model 6000 thickness gage.

Weathering resistance was tested in accordance with ASTM D 4587, Cycle 2, using a QUV Accelerated Weathering Tester complying with ASTM G 154. The panels were tested for color change and gloss reduction at 500, 1000, and 2000 hours in accordance with ASTM D 2244 and ASTM D 523 respectively. The color change was tested using a Konica Minolta Spectrophotometer CM-2500C using a standard D65 illuminant. The panels were then tested for gloss reduction using a BYK Gardner Micro-TRI-Gloss Glossmeter calibrated with a 60° black glass standard. The individual results from triplicate panels was recorded.

Adhesion to the primer was tested in accordance with ASTM D 4541 using a DeFelsko PosiTest AT-M adhesion tester which is designated as a Type V adhesion tester. The dollies used with the adhesion tester were 0.787 in (20 mm) in diameter. The panels used for this test were 1/8 in. (3.18 mm) thick steel panels. Three pulls per panel were performed and the average was recorded as the result.

Impact resistance was tested in accordance with ASTM D 2794 using a Paul N Gardner Co. Impact Apparatus with a 0.500 in. (12.7 mm) diameter indenter and a Panasonic Light Scope with 30X magnification for crack detection. The panels used for this test were 0.032 in. (0.813 mm) thick. ASTM D 2794 does not use the term “direct impact” but uses the terms “intrusion” and “extrusion”. Both intrusion and extrusion results were recorded.

Solvent (MEK) resistance was tested in accordance with ASTM D 5402 using Method A and the degree of chalking was tested in accordance with ASTM D 4214 using the wet finger method.

3 Test Results

3.1 SSPC Paint Specification No. 40

Upon completion of testing for compliance with SSPC Paint Specification No. 40, only one of the products failed to meet all requirements within the specification. All of the products, MC 1, MC 5, and MC 9, met the storage stability, mixing properties, and spraying properties requirements of the specification except for MC 9. MC 9 failed the storage stability requirement because the product packaging was bulging which constituted a failure according to paragraph 6.2 of the specification.

All of the products performed above specification requirements for adhesion to the substrate and topcoat adhesion to the primer (Appendix A, Table A1). Additionally, the products all met specification requirements when subjected to water immersion and accelerated weathering tests. There were no signs of rust or blisters, and the scribes showed no undercutting (Appendix A, Tables A2 and A3).

All of the products exceeded the minimum impact requirement for intrusion testing but fell far short of the specification value when evaluated on the extrusion side of the panel (Appendix A, Table A4). Although MC 9 exceeded the minimum requirement for impact resistance, it is worth noting that it had an impact resistance of 40 in-lb (4.52 N-m), which is lower than the other products.

3.2 SSPC Paint Specification No. 41

Testing for compliance with SSPC Paint Specification No. 41 has shown that all of the products, MC 2, MC 4, MC 6, MC 8, and MC 10, met the requirements of the specification for storage stability, mixing properties, and spraying properties except for MC 10. MC 10 failed the storage stability requirement because the product packaging was bulging thus constituting a failure according to paragraph 6.2 of the specification.

Test results showed that MC 4 and MC 8 exceeded the minimum requirements for adhesion to the substrate (Appendix A, Table A1). Additionally, Table A1 shows that the products that were used as intermediate topcoats exceeded the minimum requirement for adhesion to the primer.

All of the products subjected to the weathering resistance testing exceeded the minimum requirements for blistering and rust undercutting at the scribe (Appendix A, Table A2). Only two of the products, MC 2 and MC 4, passed the rust evaluation requirement of the specification. The other three products, MC 6, MC 8, and MC 10, showed a range of rusting with MC 10 being the worst. Dry film thickness measurements confirmed that all three products had been applied according to the manufacturer's recommendations. The three products were closely inspected under a 30X Bosch & Lomb MDL microscope and found to have no apparent pin holes or coating abnormalities. Areas of the coating were removed and it was observed that the rusting originated at the substrate.

All of the products exceeded the minimum impact requirement for intrusion testing but fell far short of the specification value when evaluated on the extrusion side of the panel (Appendix A, Table A4). It is worth noting that MC 10 had the lowest impact resistance out of all of the products. All of the products fell far short of meeting the impact value when evaluated on the extrusion side of the panel (Table A4).

3.3 SSPC Paint Specification No. 38

Testing for compliance with SSPC Paint Specification No. 38 has shown that all of the products, MC 3, MC 7, and MC 11, met the requirements within the specification for storage stability, mixing properties, and spraying properties except for MC 11. MC 11 failed the storage stability requirement because the product packaging was bulging which constitutes a failure according to paragraph 5.1 of the specification.

Testing results show that all of the products exceeded specification requirements for adhesion to the primer (Appendix A, Table A1).

All of the products (with the exception of a single panel) met accelerated weathering requirements for color change and gloss reduction required for the Level 1 performance (Appendix A, Tables A5 and A6). None of the panels met the Level 2 or Level 3 requirements for gloss retention. It should be noted that all of the products tested were white in color. One would not expect any significant color change of a white coating but the significant change in gloss indicates all the products are affected by UV light and implies that colored products may exhibit a significant color change in sunlight. SSPC Paint 38 has 3 levels of performance for both accelerated testing and South Florida exposure. The specification states that, "If no level is

specified, Level 3 will be assumed" and references South Florida testing. It is unknown how the performance of the products exposed in South Florida might compare to the accelerated testing performed in this program.

All of the products exceeded the minimum impact requirement for intrusion testing but fell far short of the specification value when evaluated on the extrusion side of the panel (Appendix A, Table A4). It is worth noting that MC 11 had the lowest impact resistance out of all of the products.

MC 3 was the only product that met the solvent (MEK) resistance requirement of the specification (Appendix A, Table A7). All of the products did exceed the minimum requirement used for evaluating the degree of chalking (Appendix A, Table A8).

4 Conclusions and Recommendations

This study has successfully shown that there are commercial products available that can meet the requirements of SSPC Specification No. 38, 40, and 41. The study has also shown that there are products available that come close to meeting specification requirements but pose a potential risk of failure if applied to Corps projects.

It has been shown that there are moisture-cure urethane products which meet SSPC specification requirements and can be successfully used on Corps projects. It is recommended that these specifications be included in UFGS 099702. The inclusion of these specifications will also benefit the Corps by eliminating inferior moisture-cured urethane products from being coated on Corps projects. It is also recommended that UFGS 099702 require the performance level of SSPC Paint 38 be a performance Level 1 using accelerated testing.

It is also recommended that all three SSPC specifications be edited so that terminology describing the method of impact resistance testing be made consistent with the ASTM test method. It is recommended that the method of impact resistance testing for all three specifications be the “intrusion” method with a minimum requirement of 60 in-lb (6.8 N-m).

Appendix A: Tables of Test Results

Table A1. Adhesion test results (ASTM D 4541).

	System			Pressure (MPa)		
1st Coat	2nd Coat	3rd Coat	4TH Coat	Pull 1	Pull 2	Pull 3
MC 1				16.2 (∞GF)	14.8 (∞GF)	14 (∞GF*)
MC 1	MC 2			19 (intercoat)	16.4 (intercoat)	18 (intercoat)
MC 1	MC 2	MC 3		16 (~30% GF)	17 (~40% GF)	7.4 (~60% GF)
MC 4				12.8 (∞GF)	17.2 (∞GF)	13.4 (∞GF)
MC 5				16	17	14
MC 5	MC 6			15 (60% GF)	15 (30% GF)	13.2 (∞GF)
MC 5	MC 6	MC 7		14.4 (60% GF)	14.2 (∞GF)	13.6 (∞GF)
MC 8				13.4	12.2	12.4
MC 9				13.6 (∞GF)	12.8 (∞GF)	13.2 (∞GF)
MC 9	MC 10			10.8 (∞GF)	11.8 (∞GF)	11 (∞GF)
MC 9	MC 10	MC 11		17.8	17.8	16.2
MC 9	MC 10	MC 11	MC 11	13.8 (80% GF)	14 (90%GF)	15.4 (60% GF)

*GF indicates glue failure.

Table A2. Accelerated weathering test results.

Sample	Rust Rating SSPC-VIS-2	Blister Rating ASTM D714	Scribe Rating ASTM D1654
MC 1	10	10	10
MC 2	10	10	8
MC 4	10	10	7
MC 5	10	10	10
MC 6	9G	10	9
MC 8	4P	10	10
MC 9	10	10	10
MC 10	3G	10	9

SSPC specifications require a minimum rust and blister ratings of 10 and scribe rating of 7.

Table A3. Water immersion test results.

Sample	Rust Rating SSPC-VIS-2	Blister Rating ASTM D714	Scribe Rating ASTM D1654
MC 1	10	10	10
MC 5	10	10	10
MC 9	10	10	10

SSPC Paint 38 requires minimum rust and blister ratings of 10 and a minimum scribe rating of 7.

Table A4. Impact resistance test results (ASTM D 2794).

Sample	Avg. Thickness (mils)	Minimum Force to Cause Cracking (Intrusion) (lbs-in)	Minimum Force to Cause Cracking (Extrusion) (lbs-in)
MC 1	4	155	3
MC 2	4	85	14
MC 3	3	83	6
MC 4	4	74	4
MC 5	4	140	3
MC 6	3	78	4
MC 7	5	78	7
MC 8	7	70	4
MC 9	3	100	3
MC 10	2	66	8
MC 11	5	70	3

SSPC specifications require a minimum direct impact of 6.8 N•m (60 inch-lb).

Table A5. Color change test results after accelerated weathering test (ASTM D 2244).

Duration of Cycle	MC3			MC7			MC11		
	Panel A	Panel B	Panel C	Panel A	Panel B	Panel C	Panel A	Panel B	Panel C
500 hours	0.98	0.91	1.26	1.17	1.16	1.19	0.66	1.21	0.46
1000 hours	1.23	1.33	1.49	1.58	1.61	1.66	2.19	2.76	2.45
2000 hours	1.88	2.09	2.01	1.70	1.80	1.82	2.54	3.04	2.89

SSPC Paint 38 requires a color change no greater than 3.0 ΔE* C.I.E.1976 L*A*B*.

Table A6. Gloss change test results after accelerated weathering test (ASTM D 523).

Duration of Cycle	MC3			MC7			MC11		
	A	B	C	A	B	C	A	B	C
Initial	88.9	88.9	88.9	42.7	42.7	42.7	13.1	12.7	12.7
500 hours	66	68.9	65.1	31.2	32.6	34.1	9.0	11.1	10.3
1000 hours	58.8	60.1	59.2	28.7	29.6	29.3	5.2	6.3	6.5
2000 hours	44.4	42.4	47.3	21.7	24.3	20.3	4.1	4.9	3.5

SSPC Paint 38 requires a 60˚gloss change no greater than 25% from original reading.

Table A7. MEK resistance test results (ASTM D 5402).

Sample	Avg. Thickness (mils)	# Rubs till Intermediate Topcoat Exposed
MC 3	3	121
MC 7	5	96
MC 11	5	72

Table A8.Degree of chalking test results (ASTM D 4214).

Sample	Chalk Rating
MC 3	3
MC 7	5
MC 11	5

Appendix B: Lab Data

Table B1. Product samples.

Laboratory Number	Manufacturer	Product	SSPC Specification
MC 1	Sherwin Williams	Corothane I Galvapac	40
MC 2	Sherwin Williams	Corothane I Ironox B	41
MC 3	Sherwin Williams	Corothane I HS	38
MC 4	Superior Products	Rust Grip	41
MC 5	Wasser Coatings	MC-Zinc 100	40
MC 6	Wasser Coatings	MC Ferrox B 100	41
MC 7	Wasser Coatings	MC Luster 100	38
MC 8	Wasser Coatings	MC-Miomastic 100 Red Oxide	41
MC 9	Indmar Coating Co	Zinc-thane 2805	40
MC 10	Indmar Coating Co	Chem-thane 2821	41
MC 11	Indmar Coating Co	Chem-thane 2822HS	38

Table B2. Adhesion test results.

	Pressure (MPa)		
System	Pull 1	Pull 2	Pull 3
MC 1	16.2 (GF)	14.8 (GF)	14 (GF)
MC 1,2	19 (intercoat)	16.4 (intercoat)	18 (intercoat)
MC 1,2,3	16 (~30% GF)	17 (~40% GF)	7.4 (~60% GF)
MC 4	12.8 (GF)	17.2 (GF)	13.4 (GF)
MC 5	16	17	14
MC 5,6	15 (60% GF)	15 (30% GF)	13.2 (GF)
MC 5,6,7	14.4 (60% GF)	14.2 (GF)	13.6 (GF)
MC 8	13.4	12.2	12.4
MC 9	13.6 (GF)	12.8 (GF)	13.2 (GF)
MC 9,10	10.8 (GF)	11.8 (GF)	11 (GF)
MC 9,10,11	17.8	17.8	16.2
MC 9,10,11, 11	13.8 (80% GF)	14 (90%GF)	15.4 (60% GF)

GF indicates virtually 100% glue failure.

Table B3. MEK resistance results.

Sample	Avg. Thickness (mils)	# Rubs till Intermediate Topcoat Exposed
MC3	3	121
MC7	5	96
MC11	5	72

Table B4. Chalking results for Spec 38.

Sample	Chalk Rating (ASTM 4214)
MC3	3
MC7	5
MC11	5

Table B5. Impact resistance results.

Sample	Avg. Thickness (mils)	Minimum Force to Cause Cracking (Intrusion) (lbs-in)	Minimum Force to Cause Cracking (Extrusion) (lbs-in)
MC1	4	155	3
MC2	4	85	14
MC3	3	83	6
MC4	4	74	4
MC5	4	140	3
MC6	3	78	4
MC7	5	78	7
MC8	7	70	4
MC9	3	100	3
MC10	2	66	8
MC11	5	70	3

Table B6. Water immersion test results for Spec. 40.

Sample	Rust Rating SSPC-VIS-2	Blister Rating ASTM D714	Scribe Rating ASTM D1654
MC1	10	10	10
MC5	10	10	10
MC9	10	10	10

Table B7. Accelerated weathering test results for Spec. 40 and 41.

Sample	Rust Rating SSPC-VIS-2	Blister Rating ASTM D714	Scribe Rating ASTM D1654	Comments
MC1	10	10	10	1/3 panels with rust rating 9G
MC2	10	10	8	1/3 panels with rust rating 9G
MC4	10	10	7	
MC5	10	10	10	1/3 panels with rust rating 9G
MC6	9G	10	9	1/3 panels with rust rating 8G
MC8	4P	10	10	
MC9	10	10	10	
MC10	3G	10	9	

Table B8. Color change results for accelerated weathering test for Spec. 38.

Duration of Cycle	MC3			MC7			MC11		
	A	B	C	A	B	C	A	B	C
500 hours	0.98	0.91	1.26	1.17	1.16	1.19	0.66	1.21	0.46
1000 hours	1.23	1.33	1.49	1.58	1.61	1.66	2.19	2.76	2.45
2000 hours	1.88	2.09	2.01	1.70	1.80	1.82	2.54	3.04	2.89

Table B9. Gloss change results for accelerated weathering test for Spec. 38.

Duration of Cycle	MC3			MC7			MC11		
	A	B	C	A	B	C	A	B	C
Initial	88.9	88.9	88.9	42.7	42.7	42.7	13.1	12.7	12.7
500 hours	66	68.9	65.1	31.2	32.6	34.1	9.0	11.1	10.3
1000 hours	58.8	60.1	59.2	28.7	29.6	29.3	5.2	6.3	6.5
2000 hours	44.4	42.4	47.3	21.7	24.3	20.3	4.1	4.9	3.5

Appendix C: Manufacturers' Documentation

Manufacturer Participation in Testing Program

The U. S. Army Corps of Engineers is seeking manufacturers of moisture cure urethane coatings interested in participating in an evaluation program. The program will subject supplied coatings to the laboratory testing requirements of SSPC Paint 38, SSPC Paint 40, and SSPC Paint 41. Manufacturers wishing to participate should contact Al Beitelman at 217-373-7237 {alfred.beitelman@us.army.mil}

Products to be tested must be standard production materials for the manufacturer. To be considered for inclusion in the study, the following must be submitted:

1. A one gallon size liquid sample of each product to be tested delivered to the laboratory. (Shipping address below.)
2. The liquid sample must have the manufacturer's standard label for the product and product data information which includes application recommendations.
3. Any thinner that would normally be required for conventional spray application at laboratory conditions.
4. A statement identifying the above SSPC specification the product is to be tested under.
5. A statement specifically affirming the product meets the Compositional Requirements (Resin content, Pigment requirement) of the specification.
6. The manufacturers calculated VOC for the product.
7. The MSDS for the product.
8. When samples for SSPC Paint 38 are submitted, a medium gray color (reflectance 20-24) is preferred but not required.

Shipping address:

Al Beitelman
U. S. Army ERDC-CERL
2902 Newmark Drive
Champaign, IL 61822

To: Albert Beitelman, CERL

From: John Grey, Superior Products
(843) 813-6402

Date: October 21, 2008

Re: Moisture Cure Urethane Testing Program

1. 1 gallon of Rust Grip – primer and topcoat all in one – enclosed.
2. Product label must show application recommendations – on gallon container.
3. Thinner – Not required.
4. Statement of SSPC Specification Conformance – attached.
5. Statement of affirming compositional requirements of the SSPC Specification – attached.
6. Manufactures calculated VOC for the product – attached.
7. Product MSDS
8. SSPC 38 – medium gray color preferred – Rust Grip cannot be tinted but is gray in color.

STATEMENT IDENTIFYING THE SSPC SPECIFICATION THE PRODUCT IS TO BE TESTED UNDER:

SSPC 38 – SINGLE COMPONENT MOISTURE CURE WEATHERABLE ALIPHATIC POLYURETHANE TOPCOAT. It is intended to be used as a topcoat that provides good color and gloss retention. Generally applied over a primer or intermediate coat.

SSPC 40 - ZINC RICH MOISTURE CURE POLYURETHANE PRIMER – PERFORMANCE BASED
This specification contains performance requirements for an organic zinc-rich moisture cure polyurethane with a thermoset binder.

SSPC 41 – MOISTURE CURE POLYURETHANE PRIMER OR INTERMEDIATE TOPCOAT, MICACEOUS, IRON OXIDE REIN
This standard contains performance requirements for a moisture-cure aromatic polyurethane coating with a thermoset binder and micaceous iron oxide pigment reinforcement.

Since SSPC paint specifications are designed for zinc rich primers, intermediate coats and topcoat systems, we feel the only SSPC specification we can work under is SSPC 38. This is a common problem Rust Grip faces, performing tests designed for other type of paint systems. It like comparing apples and oranges. You must follow Rust Grip instructions because we are not applied in the same manner as traditional 3-coat systems. Any deviations from our application instructions will result in a failure. We are not a 3-coat system and cannot be applied as such.

Rust Grip is a ONE-COAT, one-part paint system. It is a primer and topcoat all in one. It cannot be tinted due to its metallic content.

RUST GRIP®

TECHNICAL DATA SHEET (6/27/06)

DESCRIPTION:

RUST GRIP is a one-part polyurethane metallic pigmented coating that absorbs atmospheric moisture to cure. Upon curing, RUST GRIP provides a protective coating of superior adhesion, flexibility, abrasion- and impact-resistance. It is resistant to most chemical solvents and acid splash.

RUST GRIP can be used as a primer or a stand-alone coating. It is patented as an encapsulant of lead-based paints and other toxic materials, including asbestos. RUST GRIP can be applied over cleaned flash rust or most firmly bonded paints. In most cases, no near-white metal blasting is required.

TYPICAL USES:

* As an encapsulant for lead-based paints, rust and other biohazardous materials
* As a protective coating on metal, concrete, wood, etc. to add strength and prevent deterioration
* As a single coat for bridges, oil platforms, roofs, etc. with minimal surface preparation
* As a moisture barrier to stop water penetration, contamination, and mold/mildew

APPLICATION METHODS:

Surfaces should be clean, dry and sound; all dirt, salts, oil, tar, grease and film must be removed prior to application. Can be sprayed, brushed or rolled in 2 coats (20-30 minutes apart). Before using, stir thoroughly--without creating a vortex--to blend all metallic paste from the bottom. For specific instructions on surface preparation, mixing and application, refer to the SPI's application instructions for RUST GRIP. **NOTE: SURFACE MUST BE COMPLETELY DRY**.

PHYSICAL DATA:

* Solids: By weight 62.2% / By Volume 51.37%
* Cure time at 70F (21C): 2 hours to touch. Overcoat with RUST GRIP or other coatings immediately after surface is dry to the touch to achieve proper adhesion. Higher temperatures and humidity will shorten cure times, lower temperatures will slow curing. Must be overcoated within 2 hours or within 1 hour after reaching the dry-to-touch stage, or the surface must be lightly sanded to achieve good adhesion.
* Lead and Chromate free
* Cures by reacting to moisture in the air
* Weight: 9.18 lbs. per gallon
* Surface Tensile Strength: 6,780+ psi
* VOC Level: 414 grams/liter
* Impact Resistance: 200+ psi front/160+ psi back
* Shelf Life: up to 3 years (unopened) under appropriate storage conditions (see MSDS)

TESTS AND CERTIFICATIONS:

1) Tensile Properties (6,780 psi after 3 weeks)
2) USDA Approved
3) Marine Approvals for salt water/maritime use:
   *DNV (Det Norske Veritas) *US Coast Guard
   *ABS (American Bureau of Shipping)
   *IMO (International Marine Organization)
4) Factory Mutual Approval
5) E-108-00: spread of flame on pitched roofs (Class "A" non-combustible)
6) Mildew Resistance - (ASTM D3273, 3274)
7) Chemical Resistance (24 hours/12 reagents)
8) Flexibility (Mandrel Bend: ASTM D522) - 1/8"
9) Direct Impact Resistance (ASTM D2794)
10) Adhesion (ASTM D3359, D4541)
11) Water Vapor Transmission (ASTM D1653)
12) Surface Burning Characteristics (E84)
13) Weathering (2000 hours) - China
14) Scrub Resistance (ASTM D2486)
15) Biohazard Encapsulation Approval - (ASTM E1795)

SAFETY PRECAUTIONS:

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: proper ventilation, use of proper lamps, wearing of protective clothing and masks, tenting, and proper separation of application areas.

This coating is flammable. Keep away from flame, fire, or other sources of ignition.

KEEP OUT OF REACH OF CHILDREN.

For more specific safety procedures, please refer to the RUST GRIP Material Safety Data Sheet.

MINIMUM SPREAD RATES:

Film Thickness: Metal (non bridges) - 8 mils wet / 4 mils dry; Concrete - 10 mils wet / 5 mils dry; Wood - 8 mils wet / 4 mils dry

SUPERIOR PRODUCTS INTERNATIONAL II, INC.

RUST GRIP®

APPLICATION INSTRUCTIONS (8/4/06)

Rust Grip is a one-part, moisture-cured polyurethane that can be used as a primer, topcoat or encapsulant. It can be applied to metal, concrete, masonry and wood.

SURFACE PREPARATION

New construction (metal, concrete, masonry, wood):

1) Power wash surface (3,500 psi) with a citrus cleaner to remove dirt, oil, tar, grease and film. In coastal areas, Chlor-Rid should be used in addition to the citrus cleaner to remove salts.
2) Surface must be completely dry (if surface moisture persists, wipe down with Acetone prior to application).

NOTE: Flash rust on the substrate surface will not hinder the adhesion strength of Rust Grip. Rust Grip can be applied directly over flash rust when completely dry.

Previously coated (metal, concrete, masonry, wood):

1) Power wash surface (3,500 psi) with citrus cleaner to remove loose or flaking paint, and to clean the surface of dirt, oil, tar, grease and film. Chlor-Rid should also be used to remove salts.
2) Wipe down with Acetone to remove any loose particles and to completely dry the surface.
3) Surface must be completely dry before applying the coating.
4) If existing coating surface is glossed, sanding or roughing the surface must be done before application -- no glossed surface.

NOTE: If pack rust, scale or bright glossy painted surfaces exist, they must be removed by grit blast, power tool or needle gun down to surface rust. Once removed, begin with step 1 (power wash).

MIXING

1) Rust Grip can be mixed by hand or with a power drill using low speed.
2) When the container is opened, the coating will be a yellowish green color. Mix continuously until the entire surface of the coating turns a silver gray color. Once the coating color is completely silver grey, mix for two more minutes making sure the paste is off of the bottom. (Metallics are visible when the coating is stirred properly.)

NOTE: Once a container is opened, the product must be used or repackaged and sealed well in an unlined metal can. If left open, the product will harden in the container.

POT LIFE

Four hours at 70F. degrees, and 60% humidity or higher.

APPLICATION

1) Rust Grip can be applied by brush (soft bristle), roller (1/4-inch nap) or spray (use a standard airless sprayer--3,000 psi or less--with a .015 tip).
2) In all applications (brush, roller or spray), use the cross-hatch method (side-to-side, then top-to-bottom) slowly to prevent pinholes.
3) If using a brush or roller, keep them very wet at all times to insure proper coverage.
4) If spraying, use half-speed and cross hatch to insure proper coverage.
5) If encapsulating rust, lead-based paint, other biohazardous materials or bridges, brushing is the preferred application method. Apply the first coat by brush (keeping it very wet at all times), using the cross-hatch method. Go about 30 feet then return to the beginning and apply a second coat identical to the first. This method will insure the coating is worked into the pores and fully encapsulates the existing surface to, while leaving enough coating over the surface to avoid pinholes.
6) Overcoating Rust Grip with Rust Grip has to be done within four hours or less. All other compatible overcoatings have to be utilized within fourteen days.

NOTE: The number of coats necessary and the thickness of each coat will be in accordance with the job specifications.

CURE TIME

1) Two hours to touch at 70F. degrees.
2) Overcoating window is four hours at 70F. degrees and up to two weeks. The exception is overcoating Rust Grip with Rust Grip, which has to be done within four hours or less.
3) Fully cures in thirty days.
4) After three weeks, the coating will have a surface tensile strength of 6,780 psi. That number could easily double after four months.

TEMPERATURE

1) Apply between 30F. and 100F. degrees.
2) Store between 30F. and 100F. degrees according to hazmat standards indicated on MSDS.

CLEAN-UP OF EQUIPMENT

1) If breaks are taken, spray systems should be flushed with solvent.
2) After completion, spray systems should be flushed and cleaned with solvent.
3) After completion, brushes and rollers should be discarded.

Notice

. 142, No. 17 — April 26, 2008

Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations

Statutory authority

Canadian Environmental Protection Act, 1999

Sponsoring department

Department of the Environment

REGULATORY IMPACT ANALYSIS STATEMENT

(*This statement is not part of the Regulations.*)

Description

Purpose

The purpose of the proposed *Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations* (the proposed Regulations), to be made pursuant to subsection 93(1) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999), is to protect the environment and health of Canadians by setting VOC

Item	Column 1	Column 2	Column 3
	Architectural Coating	VOC Concentration Limit (g/L)	Anniversary of the Day on which these Regulations Come into Force
1.	Antenna coating, including coatings for an antenna2019;s associated structural appurtenances	530	1st
2.	Thermoplastic rubber coating and mastic, incorporating no less than 40% by weight of thermoplastic rubbers in its total resin solids, for application to roofing or other structural surfaces	550	1st
3.	Metallic pigmented coating, containing at least 48 g of elemental metallic pigment per litre of coating as applied	500	1st
4.	Bituminous roof primer	350	3rd
5.	Any other bituminous roof coating	300	3rd
6.	Non-bituminous roof coating, for application to roofs to prevent penetration of the substrate by water or to reflect heat and ultraviolet radiation	250	1st
7.	Calcimine recoater, flat solvent-borne coating for re-coating calcimine-painted surfaces	475	1st
8.	Bond breaker, for application between layers of concrete	350	1st
9.	Concrete curing compound, for application to freshly poured concrete to retard the evaporation of water	350	1st
10.	Concrete surface retarder,	780	1st

MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT INFORMATION:
PRODUCT IDENTIFIER: **RUST GRIP**
MANUFACTURER: **SUPERIOR PRODUCTS INT'L II, INC.**
ADDRESS: **10835 W. 78th St., Shawnee, KS 66214**
PRODUCT USE: **Corrosion coating protection for steel and concrete surfaces**
EMERGENCY TELEPHONE NUMBER: **800-424-9300; 202/483-7616**

SECTION II - HAZARDOUS INGREDIENTS:

HAZARDOUS INGREDIENTS	%	CAS/PIN	LD_{50} (Species/Route)	LC_{50} (Species)
aromatic 100	15-40	64742-95-6	2.9 g/kg (oral,rat) 21.6 g/kg (dermal,rabbit)	1500 ppm (rat)
mineral spirits	5-10	64741-41-9	8.5 g/kg (i.p.,rat)	NAV
prepolymer diphenyl methane diisocyanate	3-7	26447-40-5	NAV	NAV
4,4-diphenyl methane diisocyanate	3-7	101-68-8	2.2 g/kb (oral,mouse)	178 mg/m3 (rat) 369-490 mg/m3, 4h (rat)
aluminum pigment	10-30	7429-90-5	NAV	NAV
isocynate catalysed polyurethane	15-40	58043-05-3	NAV	NAV

SECTION III - HAZARD IDENTIFICATION:
The product is a flammable, solvent-based product and should be treated according to all known safety precautions. Refer to Section VII for Storage and Handling recommendations, Section VIII for Personal Protection, Section XIV for transport.

SECTION IV - FIRST AID MEASURES:
INHALATION: Remove to fresh air. Give oxygen if required. Seek medical help.
EYES: Flush w/water for at least 15 minutes; see physician.
SKIN: Remove contaminated clothing; wash affected areas w/mild soap & water.
INGESTION: Do not induce vomiting. Give 1-2 glasses milk or water. Seek medical attention according to amount of product ingested.

SECTION V - FIREFIGHTING MEASURES:
CONDITIONS OF FLAMMABILITY: Spraying/activities that create fine mist
HAZARDOUS COMBUSTION PRODUCTS: Carbon monoxide, isocyanate-based fume **AUTOIGNITION TEMP.**: 214C. degrees
MINIMUM IGNITION ENERGY: 6.1% **FLASH POINT & METHOD**: 44C. TCC
FLAMMABLE LIMITS: (Lower) 1.4% **(Upper)** NAV%
SENSITIVITY TO STATIC DISCHARGE? Yes
SENSITIVITY TO MECHANICAL IMPACT? POssible due to aluminum content
SPECIAL PROCEDURES: Firefighters should wear full-body protection & SCBA
MEANS OF EXTINCTION: Foam, dry chemical, carbon dioxide; water fog to cool containers exposed to heat.

SECTION VI - ACCIDENTAL RELEASE MEASURES: Use kitty litter or similar absorbent to contain spill. Neutralize w/solution of 80% water/20% Tergitol TMN-10. Use protective clothing; use non-sparking tools.

SECTION VII - HANDLING AND STORAGE:
Storage Requirements: Maintain temperature between 32-122F. degrees; average shelf life is 12 months @ 77F. degrees.
Handling Procedures/Equipment: Ground all containers; use non-sparking tools.

NAP = Not Applicable NAV = Not Available

SECTION VIII - EXPOSURE CONTROLS AND PERSONAL PROTECTION:
PERSONAL PROTECTIVE EQUIPMENT: To be worn when spraying or within contained areas--Half-face respirator w/organic vapor filter, safety glasses w/shields, PVA or nitrile chemical-resistant gloves, skin protection; for all other applications, good judgement should be used.
ENGINEERING CONTROLS: To spray, mechanical exhaust ventilation is required
SECTION IX - PHYSICAL AND CHEMICAL PROPERTIES:
PHYSICAL STATE: Liquid **SOLUBILITYIN WATER**: Insoluable
APPEARANCE AND ODOR: Silver grey liquid, aromatic odor
FREEZING POINT: NAP **BOILING POINT**: >150C. deg. **pH**: NAP
SPECIFIC GRAVITY: 1.1 **ODOR THRESHOLD**: 0.4ppm
COEFF. WATER/OIL: NAV **EVAPORATION RATE**: very slow% **VOLATILES**: 45
VAPOUR DENSITY (Air=1): NAV **VAPOUR PRESSURE**: 8mmHg@20C. deg.
SECTION X - STABILITY AND REACTIVITY:
CONDITIONS OF REACTIVITY: Dry aluminum powder **CORROSIVE**? No
CHEMICAL INCOMPATIBILITY: Ammonium nitrate chorofluoro carbons, chlorinated solvents, metal oxides, strong bases, peroxides, amines
CONDITIONS OF INSTABILITY: Impact, heat, friction
HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen gas, reactive chlorides
SECTION VI - TOXICOLOGICAL PROPERTIES:
ROUTES OF ENTRY:SKIN CONTACT **_X_** EYE CONTACT **_X_** INHALATION **_X_** INGESTION **_X_** SYNERGISTIC PRODUCTS **NAV**
EXPOSURE LIMITS: Diphenyl methane diisocyanate prepolymer (0.005 mg/m3); 4,4-diphenyl methane diisocyanate (0.005 mg/m3)
EFFECTS OF ACUTE EXPOSURE: Headache, dizziness, nausea, intoxication, pulmonary edema
EFFECTS OF CHRONIC EXPOSURE: Defatting of skin, dryness; allergic asthma
MUTAGENICITY: NAV **TERATOGENICITY**: Insufficient information
CARCINOGENICITY: Possible based on study of population exposed to mineral spirits
IRRITANCY: Skin & eye irritation **REPRODUCTIVE TOXICITY**: NAV
SENSITIZATION: Respirator sensitization, skin sensitization
SECTION XII - ENVIRONMENTAL INFORMATION:
Air: 3.48 lbs./gallon; 414 grams/liter V.O.C.
Water: Insoluble in water; reacts slowly w/water forming polyurea polymer and liberating CO2 gas
Soil: Lead- and chromate-free, not hazardous under RCRA 40CFR
SECTION XIII - WASTE DISPOSAL:
Dispose of as paint/aluminum waste according to local regulations.
SECTION XIV - TRANSPORT INFORMATION:
Product is considered hazardous material, to be handled according to Class 3//UN1263//P.G. III guidelines.
SECTION XV - REGULATORY INFORMATION:
No listed materials under Superfund Amendments & Reauthorization Act of 1988 (SARA) 302, 304, 311, 312, 313
SECTION XVI - OTHER INFORMATION: NAV

PREPARED BY: J. Pritchett, Superior Products Int'l II, Inc. **DATE**: 05/18/06

STATEMENT SPECIFICALLY AFFIRMING THE PRODUCT MEETS THE COMPOSITIONAL REQUIREMENTS OF THE SPECIFICATION – SSPC 38

Rust Grip does not meet the compositional requirements of the SSPC Paint 38 specification. We discussed this during our telephone conversation and you said submit it anyway. I have attached the composition of Rust Grip for your use.

October 21, 2008

Component Breakdown for RUST GRIP®.

Material	**Percentage**	**CAS#**
Aromatic 100	30.0%	100/64742-95-6
Mineral Spirits	10.0%	64741-41-9
Pre-polymer Diphenyl Methane Diisoyanate	5.0%	26447-40-5
Aluminum Pigment	30.0%	7429-90-5
Catalysed Polyurethane	25.0%	58043-05-5
Total	100.00%	

Solids By Weight	62.20%
Solids By Volume	51.37%
Theoretrical Coverage Per Mils	8 mils wft/4 mils dft
Pot Life	4 hours @ 70 F. degrees

This information is true and accurate.

Signed:

J.E. Pritchett
President
Superior Products International II, Inc.
USA

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE	3. DATES COVERED (From - To)
December 2011	Final	

4. TITLE AND SUBTITLE
Evaluation of Moisture-Cure Urethene Coatings for Compliance with Industry Specifications

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Alfred D. Beitelman and Jeffrey P. Ryan

5d. PROJECT NUMBER
CO W74RDV82058922

5e. TASK NUMBER
SC80014

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Engineer Research and Development Center
Construction Engineering Research Laboratory
PO Box 9005
Champaign, IL 61826-9005

8. PERFORMING ORGANIZATION REPORT NUMBER
ERDC/CERL TR-11-45

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Headquarters, U.S. Army Corps of Engineers
Directorate of Civil Works (CECW)
441 G Street NW
Washington, DC 20314-1000

10. SPONSOR/MONITOR'S ACRONYM(S)
HQUSACE

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The Army Corps of Engineers has observed the performance of commercially available moisture-cure coatings on various hydraulic structures over the years, but has had no generic specifications—government or private industry—for reference in specifying the products. The Society for Protective Coatings (SSPC) recently published specifications for several moisture-cure urethane coatings. However, it cannot be assumed that other commercially available moisture-cure urethanes meet those specifications without confirmation through formal testing. In this project, commercially available products were obtained and tested against the requirements of the SSPC specifications. As a result of this work, new coating systems employing moisture-cure urethane paints were added to the Corps of Engineers Guide Specification UFGS 099702, Painting: Hydraulic Structures.

15. SUBJECT TERMS
paints and coatings, moisture-cure urethane, guide specifications, testing, hydraulic structures, Civil Works

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (include area code)
Unclassified	Unclassified	Unclassified		113	